3.7 Historic and Cultural Resources

Cultural resources include prehistoric era and historic era archaeological sites and objects, architectural properties and districts, and traditional cultural properties (TCPs), which are defined as significant objects or places important to Native American tribes for maintaining their culture (USDOI 1998; NHPA [16 USC 470]). Of particular concern are those cultural resources that may be considered eligible for listing on the National Register of Historic Places (NRHP). Any cultural resources listed on or eligible for the NRHP are considered historic properties under the National Historic Preservation Act (NHPA) [16 USC 470].

Prior to taking any action to implement an undertaking, Section 106 of the NHPA [16 USC 470] requires the NRC as a federal agency to do the following:

- Take into account the effects of an undertaking (including issuance of a license) on historic properties, including any district, site, building, structure, or object included in or eligible for inclusion in the NRHP.

- Afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment on such undertaking.

State and tribal historic preservation officers serve as proxies to the ACHP [16 USC 470; 36 CFR Part 800, page 108]. For the purposes of Section 106, the NRC is the lead federal agency consulting with the Michigan state historic preservation office/officer (SHPO) for the Fermi 2 license renewal.

To provide early consultation for the Section 106 process, DTE has contacted the Michigan SHPO and office of the state archaeologist (OSA) for informal consultation concerning the Fermi 2 LRA and potential effects on cultural resources within the 1,260-acre Fermi property and on historic properties within a 10-mile band around the Fermi property boundary (for consultations see Attachment C). Native American groups and additional cultural-historical interest groups recognized as potential stakeholders for the Fermi site area were also consulted by DTE with the opportunity for comment (Section 3.7.5.4; Attachment C).

In support of license renewal, Commonwealth Cultural Resources Group, Inc. (CCRG) developed a report (Demeter et al. 2012) which contains the results of field surveys conducted in 2012 on previously unsurveyed portions of the 1,260-acre Fermi property along with the results of updated file reviews of archaeological sites within a 1.5-mile band beyond the Fermi property boundary and NRHP-eligible archaeological sites and NRHP-eligible aboveground properties within a 10-mile band around the Fermi property boundary. That report also contains information on aboveground properties recommended as eligible for the NRHP during a previous (2007–2008) offsite field survey (Demeter et al. 2008; Demeter et al. 2012) conducted by CCRG which are still pending official SHPO determinations. These investigations were conducted in compliance with Section 106 of the NHPA, as amended, and the implementing regulations contained within 36 CFR Part 800.

The onsite and offsite historic properties discussed in this section have been determined or recommended eligible for the NRHP with regard to national register criteria of significance as established by the U.S Secretary of the Interior and set forth in 36 CFR 60.4. Likewise, those resources determined or recommended not eligible for the NRHP are evaluated by the same criteria. Properties considered eligible are those that have integrity and satisfy one or more of criteria A through D as set forth in 36 CFR 60.4:

> The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and that
>
> A. Are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> B. Are associated with the lives of persons significant in our past; or
>
> C. Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> D. Have yielded, or may be likely to yield, information important in prehistory or history.

The 1,260-acre Fermi property consists primarily of developed areas, woodlands, and swamp or wetland areas, and the land within the 10-mile band is mostly rural (Figure 3.7-1). For the purpose of this license renewal, the aboveground area of potential effects (APE) is defined as the 1,260-acre Fermi property and a 10-mile band around the Fermi property boundary. The aboveground APE considers the visual integrity of historical properties in relation to Fermi 2 continued operations. The archaeological APE is considered bounded by the 1,260 acres (the "onsite" area), where ground disturbance, though unanticipated during Fermi 2 operations throughout the license renewal period, might compromise the physical integrity of archaeological data. The only transmission lines associated with Fermi 2 that are considered within the scope of this evaluation are located within the developed industrialized area of the Fermi 2 property and as such are already contained within both the aboveground and the archaeological APE. Portions of Lake Erie are also contained within the 10-mile band, and within the 1,260-acre Fermi property for offshore facilities (Figure 3.7-1), but offshore areas are limited to underwater archaeological resources and none have been recorded within the offshore facilities area of the Fermi property (Weir 2010).

The file review conducted in 2012 (Demeter et al. 2012) for previously recorded archaeological sites included the Fermi property and the 1.5-mile band around the Fermi property (Figure 3.7-1). Although not an APE for ground disturbance, the 1.5-mile (offsite) band is considered part of the local archaeological context for the Fermi property. The purpose of that file review was to inventory all previously and newly recorded archaeological sites on and within 1.5 miles of the

Fermi property, regardless of NRHP status, to help develop an understanding of that local context. Although portions of Lake Erie are contained within the 1.5-mile band, and although the offshore facilities area within the Fermi 2 property contains no recorded cultural resources, the larger offshore area of the 1.5-mile band does contain previously recorded shipwreck locations that reflect historical maritime activities (Weir 2010). Results of the 2012 file review (Demeter et al. 2012), of the maritime file review (Weir 2010), and of Fermi 3 scoping meeting comments (NRC 2013c, page 2-211 to 2-212) are used here in combination for a comprehensive summary of known cultural resources. The summary includes historic properties identified on and within the 10-mile band and archaeological resources located on and within the 1.5-mile band of the Fermi 2 property (Figure 3.7-1) presented below and in Tables 3.7-1 and 3.7-2.

The combined results of previous and recent (2012) cultural resource investigations and previous consultations show that within the 1,260-acre Fermi site and 10-mile band, there are 47 resources that are either NRHP-listed, determined eligible, or recommended eligible for the NRHP, or have the equivalent eligibility or potential eligibility under national heritage or legacy commission designations. These 47 resources include 44 aboveground properties, one archaeological site (20MR227), one designated national heritage area, and one additional proposed legacy commission resource (Table 3.7-1). Only one of these 47 resources is located within the 1,260-acre Fermi property, and consists of the older, Enrico Fermi Atomic Power Plant Unit 1 facility (Fermi 1). Fermi 1 is considered NRHP-eligible by the SHPO (Conway 2011). Beyond the 1,260-acre Fermi property but within the 10-mile band are 17 NRHP-listed properties, including 16 aboveground properties (including a historic trail) and the River Raisin Battlefield archaeological site (20MR227, also a national battlefield site); 13 additional aboveground resources determined eligible by the SHPO (Conway 2009; NRC 2010); and 14 more aboveground properties recommended as NRHP eligible during 2007–2008 field investigations that have not yet been fully evaluated by the SHPO (Table 3.7-1). The designated national heritage area and the additional proposed legacy commission resource complete the final two of the 47 historically significant or potentially significant resources on or within a 10-mile band of the Fermi property (NRC 2013c, page 2-212). Those properties listed here as recommended but without determinations are those known to DTE through 2007–2008 intensive field investigations in neighborhoods near the Fermi property, or are known to DTE through public scoping meetings (Table 3.7-1) (Demeter et al. 2008; NRC 2013c, page 2-211 to 2-212). Any additional resources that might be considered as recommended for the NRHP but are not within those neighborhoods or were not addressed in public meetings are not considered here, because the SHPO has previously determined that visual effects on aboveground resources from Fermi operations would be limited to those neighborhoods (Conway 2007), and no additional public comments have been received (NRC 2013c, page 2-212).

Finally, there are 24 archaeological resources located on or within 1.5 miles of the Fermi property that are either determined not eligible for the NRHP or remain unevaluated. Of these 24 archaeological resources, 16 are located within the 1,260-acre Fermi property and eight are located within the larger 1.5-mile band including four terrestrial archaeological sites and four offshore shipwreck locations. For those 16 sites on Fermi property, eight have been determined not eligible by the SHPO, and eight are recommended not eligible by CCRG from 2012 field investigations that await SHPO concurrence, including one previously recorded site location

(20MR207) based solely on historical reference that could not be relocated during field investigations. For those archaeological resources located outside the Fermi property but still within the 1.5-mile band, all eight remain unevaluated and include three terrestrial prehistoric sites and one terrestrial site with a prehistoric and historic-era component along with two 19th century and two early 20th-century shipwreck locations. The one archaeological site discussed above as NRHP-listed, the River Raisin Battlefield, is approximately 7 miles from the Fermi property. No TCPs have been suggested to date by research or by potentially interested parties for the Fermi property or 10-mile band. (Table 3.7-2; see also Conway 2009 and OSA 2012 for sites 20MR702 and 20MR818–20MR822 and the deferred assessment of 20MR823 to CCRG including its final assessment in OSA 2012; Demeter et al. 2012 for 20MR823 and 20MR825; and Demeter et al. 2012 for sites 20MR828–20MR834 and 20MR207; see Demeter et al. 2012, OSA 2012, and Weir 2010 for offsite archaeological resources; see NRC 2013c and Demeter et al. 2012 for mention of the River Raisin Battlefield; and see NRC 2013c for lack of responses that would suggest TCPs).

3.7.1 Land Use History

The land-use history for Fermi 2 and the surrounding region was developed as part of Phase I cultural resource investigations for the Fermi property and are summarized here (Demeter et al. 2008; Demeter et al. 2012). This summary is also adapted directly from the final environmental impact statement (FEIS) for the proposed Fermi 3 facility (NRC 2013c, Section 2.7.1) with additional Fermi site information from Demeter et al. 2012. A more detailed discussion of historical land use follows this section as part of the cultural history (Section 3.7.2) and is adapted directly from Demeter et al. 2012. The following figures include historical maps and historical aerial photos of the Fermi property and its immediate surroundings to help frame the discussion of historical land use. These are Figures 3.7-1, 3.7-2, 3.7-3, 3.7-4, 3.7-5, 3.7-6, 3.7-7, 3.7-8, 3.7-9, 3.7-10, and 3.7-11. Figure 3.0-1 provides an aerial photograph of Fermi 2 already constructed and includes the Fermi property boundary and labeled roads referred to in the following discussion. Figure 3.0-2 provides the most recent 7.5-minute USGS topographic map with the Fermi property boundary.

The Fermi 2 property and surrounding region show evidence of both prehistoric and historic occupation by Native Americans and Euroamericans. Archaeological records suggest that Fermi 2 and the surrounding area have had the potential for occupation from the Paleo-Indian period (ca. 10,000 BC to 8,000 BC), the Archaic Period (ca. 8,000 BC to 550 BC), and the Woodland Period (ca. 600 BC to AD 1600), for Native American populations. Native American groups that lived in the region at the time of contact with early European explorers and settlers were identified from historic written accounts which indicate that these contact-period Native American groups were associated with the Erie, an Iroquoian group, and the Wendat/Huron, Ottawa, Miami, and the allied Fox and Mouscatine, which are all Algonkian groups. (NRC 2013c, Section 2.7.1, page 2-194)

According to the Michigan Department of Human Services (MDHS) and the U.S. Bureau of Indian Affairs (BIA), there are currently 12 federally recognized tribes in the State of Michigan, all primarily associated with the Chippewa, Ottawa, and Potawatomi. None of these 12 federally

recognized tribes are currently located within the Fermi 2 region or its surrounding region in southeastern Michigan. However, the closest of these 12 federally recognized tribes are three groups of Potawatomi Indians in southwestern Michigan and one group of Chippewa Indians in central Michigan: the Nottawaseppi Huron Band of Potawatomi Indians in Calhoun County, the Pokagon Band of Potawatomi Indians in Cass County, the Gun Lake Potawatomi Tribe (also known as the Match-e-be-nash-she-wish Band of Pottawatomi Indians of Michigan) in Allegan County, and the Saginaw Chippewa Indian Tribe on the Isabella Indian Reservation in Isabella County. (NRC 2013c, Section 2.7.1, page 2-194)

The National Park Service's (NPS) Native American Consultation Database (NACD), developed as part of NPS's national program for compliance with the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA), identified three federally recognized Indian tribes with judicially established land claims within Monroe County, Michigan. One is the Hannahville Indian Community in Menominee County (northern Michigan). The other two are outside the State of Michigan: the Forest County Potawatomi Community in Forest County, Wisconsin (northeastern Wisconsin), and the Ottawa Tribe of Oklahoma in Ottawa County, Oklahoma (northeastern Oklahoma). Because judicially established land claims are based on proven ancestral or historic ties to lands, these three federally recognized Indian tribes may also have been prehistorically or historically associated with the Fermi 2 property or its surrounding region. (NRC 2013c, Section 2.7.1, page 2-194)

The regional historic era cultural background begins with European exploration and settlement by the French in the 17th century, followed by British control of the area in the mid- to late-18th century. After the War of 1812, the region came under American control and was reorganized into counties, including the establishment of Monroe County and the Village of Monroe in 1817. With the opening of a federal land office in the area in 1824, increasing settlement occurred in the region throughout the remainder of the 19th century. However, because the Fermi 2 property was historically a wetland environment, little settlement occurred there in the 19th century, although the shoreline areas were used for commercial fishing purposes and upland areas in the vicinity were used for vineyards and silica sand mining. By the early 20th century, wealthy Detroit residents began to purchase lots and build summer cottage communities or resorts along the Lake Erie shoreline south of the Fermi property. These seasonal communities have been converted since the mid-20th century to year-round communities that are still occupied today, including Stony Point, Woodland Beach, and Detroit Beach, all located south/southwest of the Fermi property. (NRC 2013c, Section 2.7.1, page 2-195)

Shoreline and offshore areas in the vicinity of the Fermi property have been used prehistorically and historically by Native Americans for fishing, hunting, and gathering plant resources. Historic Euroamerican activities along the shoreline and in offshore areas in the region have also included fishing, with the development of commercial fishing industries associated with lake herring (*Coregonus artedii*), lake sturgeon, lake whitefish, and common carp in the region from the mid-19th to the early 20th centuries. The local commercial fishing industry was subsequently replaced in the early 20th century by the development of shoreline areas as seasonal (summer) communities or resorts, as described above. Currently, shoreline areas in the vicinity of the

Fermi site support the Fermi facilities and the year-round beach communities to the northeast and southwest of the Fermi property. (NRC 2013c, Section 2.7.1, page 2-195)

Historical maps and aerial photographs show a somewhat different land-use history for the northern and central versus the southern portions of the Fermi property, a distinction that seems to be underway by 1838 and clearly by 1859. A 1797–1798 map appears to depict the entire Fermi property as undeveloped, with wetlands north to south, and with only distant settlement far to the northeast and southwest, well beyond the Fermi property (Figure 3.7-2). An 1810 plat map depicts the Fermi property again as undeveloped, and also unplatted with the exception of a series of long rectilinear platted lots along the far west Fermi property boundary (Figure 3.7-3). An 1838 map shows the same limited platting but also shows roads, including one near the Fermi property that appears to run the same course as the current Pointe Aux Peaux Road, which today defines the southern Fermi property boundary (Figure 3.7-4). That 1838 road depiction is the first sign of development for what would become the Fermi property. The 1838 map also lists land cover, and again, the coastal areas and much of the interior of the Fermi property, and land both north and south of Pointe Aux Peaux Road are listed as "marsh," "marshy," or "wet," and the words "partly overflowed" cross the Pointe Aux Peaux Road depiction with "partly" to the south and "overflowed" to the north of the road. An 1859 map shows some additional platting but not within the Fermi property and also illustrates marsh both north and south of the Pointe Aux Peaux Road with no development within the northern or central portions of the Fermi property (Figure 3.7-5). However, that same map (1859) illustrates a southern extension of the Pointe Aux Peaux Road along the coast and at least six structures (probable residences) indicated by black dots, with at least two north and four south of Pointe Aux Peaux Road, with four labeled with a first initial and surname indicating occupants/owners). The 1859 map thus shows an increasing trend toward development along and near the southern Fermi property boundary, and continued undeveloped marshland north and central. The southern developments were also apparently in opportunistic locations given that the surrounding land north and south of Pointe Aux Peaux Road is still depicted as wetland.

An 1876 map shows additional platting including platted parcels for all of the 1,260-acre Fermi property, and continued development near Pointe Aux Peaux Road (Figure 3.7-6). Significantly, the depiction of wetland in 1876 is limited within the Fermi property to the central and northern portions including parcels designated as "State Swamp Land," but no wetland is depicted within 0.25 miles either to the north or south of Pointe Aux Peaux Road, indicating drainage efforts by 1876 of the Pointe Aux Peaux Road area. The 1942 USGS topographic 7.5-minute quadrangle (Figure 3.7-7) shows the same spatial pattern of wetlands as the 1876 map and depicts water control features, including some that are internal to the wetlands and may include water impoundments for fish hatcheries, but also some that define the southern limits of the wetlands as water barriers and provide very discrete boundaries to the wetlands there. That same map (1942) also shows neighborhood development south of Pointe Aux Peaux Road indicating complete drainage of those former wetlands. A 1949 aerial photograph (Figure 3.7-8) also clearly shows that the drained southern lands south of the water control features are in cultivated fields.

Conversely, the northern and central areas continue to be largely undeveloped land, mostly wetlands, albeit with water control features in the south-central wetlands (Figure 3.7-8). The exception is the higher ground that extends along the entire far western Fermi boundary on land shown platted as a long rectilinear lot (lot 528) as early as 1810 (Figure 3.7-3). That strip of land is clearly cultivated in a series of fields in 1949 (Figure 3.7-8) with one farmstead complex built sometime after 1942. That farm complex is also visible on the 1961 aerial photograph (Figure 3.7-9), but is absent on the 1967 USGS map depiction (Figure 3.0-2).

On the 1942 map (Figure 3.7-7), Estral Beach quadrangle, a structure is also depicted by a black dot on the extreme northeast shoreline within the Fermi property, and another to the far northwest within the Fermi property on the Stony Point quadrangle; however, the 1961 aerial photograph (Figure 3.7-9) and the 1967 USGS topographic map (Figure 3.0-2) illustrate the northern portions of the property to be largely unchanged except for the absence of those structures. Therefore, northern areas of the Fermi property show very limited and relatively ephemeral settlement. Conversely, along Pointe Aux Peaux Road to the south and Long Road to the southeast, the 1942 map (Figure 3.7-7) depicts numerous structures, and on the 1967 map (Figure 3.0-2) there are several additional structures along both Pointe Aux Peaux Road east of the 28/29 section line and along Long Road, compared to 1942, such that early trends toward development along the southern Fermi property boundary continued through at least 1967.

Overall, the 1961 aerial photograph (Figure 3.7-9) and the 1967 topographic map (Figure 3.0-2) show relatively unchanged land-use patterns in both the northern and southern area of the Fermi property since 1942 and 1949, including a lack of development and continued wetlands in the majority of the northern and central portions of the Fermi property and continuous development of the southern portions with drainage, farming, and construction. A well-developed Fermi 1 facility near the center of the Fermi property is the only major change in land-use patterns for Fermi property between 1949 and 1961.

During construction of Fermi 2, the central Fermi area underwent major changes, replacing much of the former wetland with construction. The water control features appear altered, less evident, and less effective for fields to the south (Figures 3.0-1 and 3.0-2) than they were in 1942 or 1949 (Figures 3.7-7 and 3.7-8). Most of the buildings (depicted as black dots) on the 1967 USGS topographic map north of Pointe Aux Peaux Road, and many depicted along Long Road, are no longer extant today. Review of modern plat maps for the area (Demeter et al. 2012) revealed that the property containing the former residences in the far southern portions of the Fermi property was under private ownership as recently as 1979. By 1982, DTE owned some of the tracts, by 1986 owned additional tracts, and, by 1990, owned all of the parcels (Rockford 1979; Rockford 1982; Rockford 1986; Rockford 1990).

3.7.2 Cultural History

3.7.2.1 Paleo-Indian (10,000 BC to 8,000 BC)

Paleo-Indian groups are the earliest known inhabitants of North America. Paleo-Indian occupation around Lake Erie probably began as early as 10,000 BC. These populations expanded into the Great Lakes region following the retreat of the Wisconsinan glaciers and the

drop in glacial lake levels. By about 10,500 BC in the Lake Erie basin, the retreat of glacial ice from the isostatically depressed Niagara peninsula opened an outlet for Lake Erie below the elevation of the present lake level, which resulted in the drainage of much of the lake basin (Coakley and Lewis 1985). Lake levels remained low (substantially below those of today) until approximately 5,050 BC (7,050 BP) (Coakley and Lewis 1985). This drop in the elevation of Lake Erie provided a variety of shoreline environments that were progressively colonized by new plant species. The changing environmental conditions also resulted in an increase in plant and animal diversity along river valleys and inland lakes as well as the lake margins (Fitting 1975). Though it is likely that some Paleo-Indian sites are now under water, several major sites in Michigan and Ontario are inland, away from relict shorelines (Ellis and Deller 1990).

Although Paleo-Indian populations are traditionally viewed as possessing a focal subsistence pattern based on the exploitation of Pleistocene megafauna, other resources were also exploited. A review of Paleo-Indian hunting and land-use practices characterized these early groups as generalists in relation to large terrestrial faunal resources (including caribou and elk), and opportunists in relation to all other food resources (Kelly and Todd 1988).

Two adaptations are recognized for this period. The early Paleo-Indian hunters exploited the recently de-glaciated environment characterized as spruce parkland and/or a mosaic of diverse microhabitats (Brown and Cleland 1969). Large fluted, lanceolate projectile points, often with concave bases, as well as large chopping implements, gravers, and unifacial scrapers represent the material culture of the period prior to 8,500 BC. Late Paleo-Indian hunters expanded across frontiers that opened as the glacial fronts retreated northward. Fluctuations in the Great Lakes water levels provided a variety of shoreline environments progressively colonized by new plants exploited by a variety of faunal communities. In response to changes in the faunal and floral composition of the region, further adaptational shifts were necessary. Projectile points such as Hi-Lo and unfluted lanceolate styles appear at this time, and prehistoric tool assemblages reflect a regional subsistence orientation that would reflect local resource availability and scheduling. (Brown and Cleland 1969; Ellis et al. 1990)

Paleo-Indian sites are sparse in the immediate vicinity of the project area and in southeast Michigan in general. The nearest well-documented Paleo-Indian occupation in southeast Michigan is the Holcombe Beach complex of Paleo-Indian occupations. These are located just south of the Thumb in Macomb County. The Holcombe Beach sites probably date to the beginning of the Late Paleo-Indian period, or around 9,000 BC (11,000 BP) based on the points found. (Fitting et al. 1966)

3.7.2.2 Archaic (8,000 BC to 550 BC)

3.7.2.2.1 Early Archaic (8,000 BC to 6,000 BC)

An apparent transition in artifact assemblages that defines the Early Archaic period takes place ca. 8,000 BC. The actual timing of this change is still poorly understood, with some late Paleo-Indian point styles persisting in certain areas to ca. 7,500 BC. A direct transition is suggested by some side-notched points in Ontario, which, except for the notches, are identical to Hi-Lo points (Ellis et al. 1990). The most recognizable artifacts, however, are projectile points of the Kirk,

MacCorkle, LeCroy, St. Albans, Kanawha Stemmed, St. Charles, Thebes, and Decatur types. Other artifacts from the period include groundstone implements, choppers, knives, and scrapers. This diversity of projectile point forms and general tool assemblage hints at increased regional population segmentation and/or modifications in subsistence activities; therefore, a more generalized form of subsistence involving a greater balance of hunting, fishing, and gathering of plant foods appears to have been established. Sites tended to be small and ephemeral, although some rather extensive sites are known, such as the Nettling site in southern Ontario (Ellis et al. 1990).

Reference is oftentimes made to the hypsithermal warming (also altithermal and xerothermic) as the primary environmental variable driving Archaic shifts in subsistence (e.g., Branstner et al. 1991). Of course, as with all paleoclimatic events, the exact nature, timing, and duration of climatic shifts is a matter of debate. Assuming that such shifts in the biotic regime and climate were periodic, Early Archaic foragers would likely have exploited a wide area in small groups and utilized a variety of resources given the resulting spatial and temporal variability in resource distribution and contributing to a more generalized and balanced subsistence.

3.7.2.2.2 Middle Archaic (6,000 BC to 3,000 BC)

Site densities in southeastern Michigan and throughout the state appear to have diminished during the Middle Archaic period. The paucity of Middle Archaic sites between about 6,000 BC and 3,000 BC is in part due to a lack of sites producing diagnostic projectile point types from this period though sites in the region may simply be poorly represented by known diagnostic points and may therefore be culturally unassigned. With a few exceptions (below) diagnostic material from this time period is generally lacking.

In 1981, Michigan State University excavated the Weber I site in Saginaw County (20SA581). The site dates as early as 4,200 BC (6,200 BP) (Lovis 1989). Large side-notched points with ground haft elements were recovered. These points are comparable to variously named side-notched types that date to between 2,500 BC and 4,200 BC (4,500 BP and 6,200 BP) throughout the region (Lovis and Robertson 1989). Other excavated Middle Archaic sites like Weber I are lacking in southeastern Michigan.

In southwestern Ontario, broad-bladed side- and corner-notched points are assumed to date to the same period as those from Weber I and are not associated with "Laurentian assemblages" like those in southeastern Ontario (Ellis et al. 1990). Towards the end of the Middle Archaic period, Brewerton points begin to appear. Analyses suggest that such points may date to as early as 3,000 BC to 4,000 BC. (George and Davis 1986)

If Weber I can be used as an example of the Middle Archaic adaptation in southeastern Michigan, then a continuation of the diffuse subsistence pattern of the Early Archaic may be suggested. Weber I yielded artifactual and subsistence remains suggestive of a small, late summer/fall campsite indicative of seasonal occupation and therefore of continued high residential mobility at this time (Robertson 1987). Subsistence remains from the site include wapiti, deer, goose, raccoon, turtle, fish, walnut, acorn, blackberry, grape, elderberry, and mustard seed (Egan 1988; Smith and Egan 1990).

3.7.2.2.3 Late Archaic (3,000 BC to 550 BC)

In contrast to earlier Archaic periods, Late Archaic period adaptations have received considerable attention. The chronology for the Late Archaic was synthesized by Lovis and Robertson (1989). Although most research has centered on Saginaw Valley sites, inferences regarding typology, subsistence, and settlement can generally be applied in establishing the cultural context for southeastern Michigan. In general, the Late Archaic period is characterized by an increase in site frequency and, in turn, a seeming increase in population size, compared with previous periods.

Based on research in New York (Ritchie and Funk 1973) and Ontario (Ellis et al. 1990), Brewerton points appear to persist to at least 2,500 BC (4,500 BP). Subsequently, Brewerton points are replaced by a broad-bladed point phase termed Satchell, which dates to as early as ca. 2,500 BC (4,500 BP) (Ellis et al. 1990). A terminal Late Archaic small point phase follows, lasting some 1,000 years. Point styles include small notched forms, small expanding stemmed forms, and narrow-point forms (Lovis and Robertson 1989).

By the Late Archaic period, modern forest communities were well established (Lovis 1989), and the elevations of Lake Erie and Lake Huron had stabilized at near their present levels (Coakley and Lewis 1985). Within this dynamic environmental context, Archaic populations continued to develop an increasingly diffuse subsistence pattern and a larger and more varied tool kit. Groundstone tools are a common element of Late Archaic artifact assemblages. As with the Middle Archaic, grooved axes were still present; however, chisel-shaped celts of similar rock types are also found. Slate was also a common raw material. A variety of abstract forms, termed bannerstones and birdstones, are often found in conjunction with these sites. Evidence of the fabrication of copper tools also appears during the Late Archaic. (Demeter et al. 2012; Ellis et al. 1990)

Development of ceremonial burial complexes also occurs during the Late Archaic period (Fitting 1975; Mason 1981). Subsumed under archaeological constructs such as Glacial Kame, Red Ocher, and Old Copper, formal burials of these "cultures" are associated with exotic grave goods including turkey-tail points, red ochre, copper and shell artifacts, and/or elaborate groundstone forms.

3.7.2.3 Woodland (600 BC to AD 1600)

3.7.2.3.1 Early Woodland (600 BC to 200 BC)

The Woodland period in Michigan is distinguished from the Archaic period by several traits, including ceramics, burial mounds, new artifact types, and stylistic shifts (Mason 1981). Pottery first appears between about 600 BC and 500 BC in southern Michigan (e.g., Garland 1986), northern Ohio (Shane 1967) and southern Ontario (Spence and Fox 1986).

The early ceramics are crude, thick-walled, poorly fired, with massive temper. The interior and exterior surfaces are often cordmarked. Early ceramic types in southern Michigan and northern Ohio include Marion Thick, Schultz Thick, Leimbach Thick, and Leimbach Cordmarked (Fischer

1972; Garland 1986; Shane 1967). The Leimbach ceramic types are particularly noteworthy because they include traits characteristic of forms found in the northeastern Great Lakes. Shane (1967) suggests that the Leimbach assemblage and the lacustrine orientation of the site, "undoubtedly reflects its position at the periphery of the western Great Lakes area, adjacent to the Ohio Valley and the Northeast." Ties to the Adena phase of the Scioto tradition, however, are also seen (Shane 1967).

The Early Woodland period is also characterized by a shift in lithic technology. Projectile points of this period are most commonly stemmed forms such as Schultz Stemmed (Kramer pointed) and Adena Stemmed points (Fitting 1975; Justice 1987). These attributes suggest influence from Illinois coming into western Michigan and extending eastward into southeastern Michigan and northwestern Ohio. Influences from the Ohio Valley (Adena) can also be seen, as suggested by the Adena Robbins Stemmed point from the Stone School site (20WA18) (Wobst 1965).

To the east, in Ontario, Early Woodland ceramics are more closely related to the Vinette ceramics of New York and southern Quebec, and Meadowood points predominate (Spence and Fox 1986). Interaction is clearly with eastern manifestations (Spence and Fox 1986; Spence et al. 1990) and is suggestive of a sociopolitical boundary falling along the St. Clair River. Kramer points are rare in Ontario, although some do appear in the southwestern portions of the province (Spence et al. 1990). Conversely, Meadowood components are not widely distributed in Michigan, and may be associated with the slightly earlier (terminal Late Archaic) and/or aceramic Meadowood occupations (Lovis and Robertson 1989). Interaction and/or movement between Michigan and Ontario is suggested by the Conservation Park site, where Meadowood points are often made on Onondaga chert (Beld 1991).

Interpretations of Early Woodland settlement/subsistence patterns are variable and daunted by the limited number of well-documented sites. The Schultz site (20SA2) in the Saginaw Valley and the Wymer (20BE132) and Eidson (20BE122) sites in southwestern Michigan are among the few sites for which there are detailed subsistence data. These sites reflect persistence of a hunting and gathering adaptation. Cultigens (squash [*Cucurbita pepo*] and sunflower [*Helianthus annuus*]) first appear during the terminal Archaic and Early Woodland (Garland and Clark 1990; Ozker 1982), although their importance in the local economy is debatable.

3.7.2.3.2 Middle Woodland (200 BC to AD 500)

The Middle Woodland period in Michigan is often defined as exhibiting a definite Hopewell cultural influence through ceramic stylistic elements and elaborate burial procedures. Large conical burial mounds are associated with the Middle Woodland period. These structures are often located adjacent to villages and may reflect territorial markers.

The Hopwellian expression is characterized by exotic raw materials, such as copper and marine shell, and finished goods, such as earspools, breastplates, and effigy platform pipes. The typical Hopewell artifacts served ceremonial purposes and have been recovered from burials. (Struever 1965) Middle Woodland/Hopewellian ceramics exhibit dentate and rocker stamping, incising, trailing, punctating, and zonation (Fischer 1972; Mason 1981).

Subsistence and settlement changes are also characteristic of the Middle Woodland period. Analyses of Middle Woodland subsistence assemblages from the Saginaw Valley suggest that there was an increasing reliance on wetland and aquatic resources and potential use of native cultigens (Egan 1990; Egan 1993). In addition, maize appears for the first time in the Great Lakes in Berrien County, Michigan, at the Eidson site (20BE122), in a feature dating to AD 300 (Garland and Clark 1990). Associated with these shifts in the subsistence pattern is a shift in the settlement pattern toward the use of base camps (e.g., Schultz site, 20SA2; Fletcher site, 20BY29; and Dodge site, Ohio), which were occupied for multiple seasons and supported by satellite extractive camps from which seasonally available resources were exploited.

In southwestern Ontario, Middle Woodland manifestations at this time have been designated as the Couture complex. The complex extends over an area defined by the drainages for the St. Clair River and the northwest shore of Lake Erie. This area corresponds roughly to the northern limits of the Carolinian biotic province (Spence et al. 1990). Thus, similar environments were being exploited, and interaction with groups in both Ohio and Michigan probably occurred on a regular basis (Spence et al. 1990). Spence et al. (1990), suggest continuity between the Couture complex and the Late Woodland Western Basin materials of Michigan, Ohio, and southwestern Ontario, whereas relationships with the Saugeen complex to the north and east are less than clear.

3.7.2.3.3 Late Woodland (AD 500 to AD 1600)

The Late Woodland period is characterized by an increase in population as well as in the size and number of aboriginal sites. The assumption is that agriculture facilitated a shift to permanent village life, with task-specific camps established outside of the main village sites. Evidence suggests that the introduction of more productive cultigens (especially maize) played an important role in the evolution of the Late Woodland settlement system and social organization. (Fitting 1975; Krakker 1983)

The Late Woodland cultural sequence in southeastern Michigan, northwestern Ohio, and southwestern Ontario centering around the drainages of western Lake Erie, the Detroit River, Lake St. Clair, the St. Clair River, and lower Lake Huron can be collectively referred to as the Western Basin (or Younge) tradition (e.g., Stothers and Pratt 1981). Although there is disagreement over precise terminology, classifications, and distinctions, the basic Late Woodland cultural sequence, particularly as it applies to Michigan, ultimately rests on Fitting's (1965; 1975) distinctions between the Wayne and Younge traditions (e.g., Brashler 1981).

The Wayne tradition is defined ceramically by Wayne ware, a transitional Middle to early-Late Woodland pottery style that is globular in form. The bodies of these vessels are cordmarked and the rims are plain. Some debate centers on whether Wayne wares represent a distinct cultural manifestation (Brashler 1981; Halsey 1976; Lovis 1990) or if they are simply a common Woodland ceramic type used by groups throughout the region (Krakker 1983; Lovis 1990).

Projectile points at this time are predominantly notched forms, such as Jack's Reef corner-notched. Small pentagonal bifaces also occur. Other artifacts characteristic of the early-Late Woodland period are rolled copper beads, copper awls, small celts, and marine shell beads.

Most Wayne tradition sites in southeast Michigan are burial sites, indicative of the Wayne mortuary tradition, dating to ca. AD 500 to AD 1100 (Halsey 1976; Halsey 1981).

Settlement and subsistence adaptations during the Wayne tradition in southeastern Michigan (Krakker 1983), northwestern Ohio (Stothers and Yarnell 1977), the Saginaw Valley (Brashler and Holman 1985), and Ontario were probably broadly similar to those of the preceding periods, although there is some evidence for maize horticulture as early as the Riviere au Vase phase (Schurr and Redmond 1991). Analysis of osteological collections from the Gard Island 2 site (20MR161) indicates that early-Late Woodland, Riviere au Vase populations were involved in incipient maize agriculture (Schurr and Redmond 1991). Krakker's (1983) analysis of Late Woodland settlement and subsistence data from southeastern Michigan indicates, however, that there is little direct (archaeobotanical) evidence for maize agriculture before AD 1000, nor is there any indication of an obvious shift in settlement location toward sites with greater access to arable land until after AD 1300.

A cultural shift approximately 1,000 years ago is indicated when Younge tradition ceramics begin to replace Wayne tradition ceramic styles. Younge tradition ceramics are characteristically large, globular to elongated vessel forms that are usually collared and exhibit complex rim and shoulder designs (Fitting 1975). Triangular Levanna points also appear and are subsequently replaced by Madison projectile points about AD 1350 (Justice 1987).

Far-reaching changes in diet and settlement, attributable to the use of corn and other domesticates, occurred at this time. In southeastern Michigan, populations gradually shifted towards locations where soil conditions were more suited to agricultural production (Stamps and Zurel 1980). In addition, late Younge tradition villages are significantly larger sites than those of the preceding phases, suggesting shifts in social organization to accommodate these subsistence changes (Krakker 1983). Camps were also occupied to facilitate exploitation of seasonally available natural resources that were not available within the immediate vicinity of the villages. Thus, while villages were located in close proximity to easily tilled soils, seasonal camps were likely located along "ecological edge" areas including along headwaters of river systems in upland areas (Stamps and Zurel 1980).

During the Wolf phase of the Younge tradition, Upper Mississippian influence, if not its presence, was felt in this region. Parker Festooned ceramics reflect an abrupt shift in style (Fitting 1975) that may be the result of Upper Mississippian influence (Mason 1981). Stothers and Pratt (1981), in fact, contend that the Wolf phase should be considered a separate and intrusive Upper Mississippian-influenced phase unrelated to the Younge tradition. Regardless, the effects of this influence on settlement and subsistence are still poorly understood.

3.7.2.4 Historic Era

3.7.2.4.1 Native American Settlement

Information relative to Native American land use in the Detroit region prior to the establishment of Fort Pontchartrain is conjectural. Incessant warfare between the Iroquois and the western tribes over control of the regional fur trade resulted in large-scale displacement of Native peoples

throughout the last half of the 17th century. With the implementation of a French-negotiated peace between the warring factions in 1701, a degree of stability was achieved. Iroquois acquiescence to the French occupation of the Straits of Detroit also opened the region to settlement by other Native groups such as the Wendat/Huron, Ottawa, and Miami. These movements into new territories and the opening of alternative economic opportunities tended, however, to create their own sets of problems as traditional boundary networks were reshaped or discarded to take advantage of new situations. (Callender 1978; Demeter et al. 2012; Goddard 1978)

The intrusion of allied Fox and Mascouten into the region at the invitation of the French in 1712 threatened to set aside one such priority arrangement with regard to the position of the lower lakes groups as middlemen in the interior trade (Goddard 1978). The fact that these new settlers also reportedly aimed at bypassing the French supply monopoly, by dealing directly through the Iroquois for English goods, soon led to open warfare. The destruction of the Fox-Mascouten at Detroit set the stage for a long period of intermittent, and sometimes concerted, hostilities between the French and Fox-Mascouten groups in the Wisconsin region. The threat of reprisal led to a certain amount of shifting in settlement among native peoples involved in the conflict (Goddard 1978).

It was at this time that the Potawatomi from the southeast of Lake Michigan began to appear in increasing numbers around Detroit. As of 1714, they were reported to be residing in a village between the fortified French and Wendat/Huron settlements having "not as yet had time to erect one" (Thwaites 1902). Four years later, the number of Potawatomi warriors at Detroit was estimated at 180 (Thwaites 1902).

Over the next several decades, elements of the tribe moved southwards along the Detroit River and Lake Erie, establishing villages near the Rouge and Raisin rivers and Ecorse Creek. Following the British capture of Detroit in 1760 and the abortive attempt on the part of the tribes to drive them out three years later, the Potawatomi began to move inland away from areas of more intensive European settlement. In doing so, their leaders often sold or gifted the tribe's riverside holdings to both the British crown and private individuals (e.g., Dickins and Forney 1860). In 1780, the lands along the Rouge River were acquired by the British crown. At about the same time, an approximately 1,500-acre tract on the Raisin River was secured by Francois Navarre (Fuller 1916). This purchase served as the basis of the Frenchtown settlement, which by 1784 reportedly consisted of upwards of 100 families (Wing 1890).

3.7.2.4.2 Euroamerican Settlement

European habitation in the Pointe Aux Peaux/Stony Point area was likely initiated with the late 18th century Francois Pepin (1786) and Catherine Godfroy purchases of extensive tracts from the Potawatomi extending from Sandy Creek to Swan Creek; the former tract was purchased in 1797 by George McDougall and George Meldrum (Dickins and Forney 1860; Lowrie 1834; MPHS 1886). McDougall and Meldrum developed a 4-acre mill and still house lot on Stony Creek (MPHS 1886; Wing 1890). Both this and the remaining properties were eventually

awarded to the partners and their assignees under several private claim patent deeds from the federal government (Lowrie 1834).

The Stony Creek mill complex represented an important component of the regional economy, allowing Frenchtown-produced grains to be processed as either flour or distilled spirits for the upper Great Lakes trade. Its operations, however, proved to be short lived. As with other improvements in the Detroit and Raisin settlements, the Stony Creek mill was leveled by fire during the War of 1812 (Wing 1890).

The reorganization of the Michigan Territory at the close of the war ushered in a number of administrative changes. These included the establishment of Monroe County and the platting of the town of Monroe in 1817. Several years later, in 1824, the opening of the federal land office in the community commenced a period of slow but steady growth. As of 1827, the settlement was incorporated as a village, based on its 62 residential voters. In 1830, the federal census placed the county population at 3,187, with the village enumerated at 478 inhabitants. During this period, in 1826, 14 families settled about 4 miles up Stony Creek in the vicinity of a new mill erected by Alexis Soleau (Solo), the same individual who had earlier been the builder of the Meldrum and Park mill (Wing 1890).

The area of Stony Point existed mainly as unsold wetland during this period. Exceptions to this pattern included the sale of a 100-acre tract in 1834 to William McFitridge in Section 17 and a 352-acre parcel acquired that same year by Lennox Brickhead in Section 20 (Williams and Williams 1968). McFitridge was a Monroe County resident at the time of his purchase. Brickhead, an Eastern speculator who lived in Baltimore, likely never set foot on his property. Other large real estate investments in the area were Lewis Goddard's Brest community at the mouth of Stony Creek (southwest of the Fermi 2 project area) and William White's Newport settlement on Swan Creek (northwest of the Fermi 2 project area) (Palmer 1906; Romig 1973).

In 1837, Goddard's partners were actively constructing piers for a proposed harbor with hopes that the community would eventually become "the great commercial center of the West" (Fuller 1916). The banking collapse of that year quickly destroyed any aspirations in this direction. As late as 1860, the population at Brest was less than 100 (Fuller 1916). At that time, the community was developing into one of the region's more important fishing centers. Commercial fishing operations were begun at Brest Bay in 1857 by the firm of Chittenden and Company, which soon sold out to the Detroit-based shipbuilder and fishing fleet owner John P. Clark (Wing 1890). Clark's interest in the area continued through 1887. Two of his employees, Joseph B. Dewey and Jessee N. Dewey, began their own independent operations at the location in 1860. While the Dewey brothers eventually expanded their business interests into Lakes Huron and Michigan, Brest remained their center of operations. With the construction of a freezer and packing plant at this location, their trade was eventually extended westward as far as Denver. By the 1890s and even by the 1880s, much of their harvest of sturgeon caviar was reportedly shipped to Europe (Wing 1890).

The commercial outlets that became available to the local fishing industry during the closing decades of the 19th century were primarily the direct result of ongoing railroad development

initiated with the ca. 1857 completion of the Detroit, Toledo & Monroe Railroad (DTM) (Bulkley 1913). In 1873, transportation potential was further augmented by the construction of the adjacent routing of what would be combined as the Toledo, Canada Southern & Detroit Railroad (TCSD) (Wing 1890). The DTM had early been absorbed as a division of the Michigan Southern Railroad. In 1883, the TCSD was acquired as a Vanderbilt interest, rendering it an integrated component of the Michigan Central railroads (Wing 1890).

One immediate result of railroad development in the area between the Huron River and Stony Creek was the logging of what had existed as a "heavily timbered country" (Polk 1875). It was at this time that the Newport community on Swan Creek began to figure as an important milling and marketing center. Its location was of particular significance in that it was early reported to "receive goods by the Detroit and Toledo railroad, and by steamers in the lake" (Clark 1863). With a population ranging from 500 to 550 inhabitants, Newport figured as an important forwarding center for grain, produce, and lumber well into the 1890s (Polk 1875; Polk 1895). Its growth had, by 1867, contributed to the creation of Berlin Township as an independent administrative unit separate from Ash Township. According to the 1870 federal census, Berlin was the third most populous township in the county with 1,844 inhabitants residing in 350 dwellings (Detroit Tribune 1872).

Settlement on Stony Point/Pointe Aux Peaux had been minimal through the 1850s, with much of the promontory consisting of either state-owned or county-owned swamp lands. Members of the Nadeau, Reaume, and Sonkrie (i.e., Sanscrainte) families are identified as tract holders on the point in 1859. Census information suggests that A. M. Nadeau was probably a farmer who owned approximately 60 acres (Bureau of the Census 1860; United States Census 1850). No other historical information of note could be located about Nadeau.

The 25-acre parcel held by Sonkrie at the foot of Pointe Aux Peaux Road, in Section 28 (immediately outside of the Fermi 2 Project area), was purchased in 1865 by the Pointe Aux Peaux Company (Wing 1890). The tract was quickly planted as vineyard, and wine production began in 1868. The company produced upwards of 5,000 gallons of wine in 1871 and 15,000 gallons the following year. The price per gallon of Monroe County-grown wines at that time ranged from $0.80 to $1.25 (Wing 1890). As of 1870, the company also erected a two-story masonry wine cellar with limestone blocks imported from Sandusky. The chief investors in the project, Joseph M. Sterling and William A. Noble, had for years dominated the forwarding trade out of Monroe and were early shareholders in the Michigan Southern Railroad. Under the corporate names of Noble and Company (or Noble & Sterling) and J. M. Sterling and Son (or J. Sterling & Co.), they also played a further role in the local lumber and coal trades (Polk 1875; Polk 1877; Wing 1890). As of 1876, Pointe Aux Peaux Company lands were held under the individual corporate designations of the J. M. Sterling Company and Noble and Sterling.

Other large landowners on the point at that time were Charles Toll and Alfred I. Sawyer. Toll was variously described in directories of the period as the proprietor of a "glass sand mill" on the Canada Southern Railroad or as "a paint and glass sand manufacturer" with offices on Front Street in the city of Monroe (Polk 1875; Polk 1877). Sawyer was a physician in the city and served as mayor 1869–70 and in 1878 (Wing 1890).

Silica sands mined from Raisinville Township had early been shipped to Pittsburgh for glass manufacture (Rominger 1876). The association of this sand rock was invariably noted as a bedded component of the Helderberg limestones encountered throughout much of western and southern Monroe County. Winchell (1861) linked the deposit with the Oriskany sandstones of New York, but indicated that it was, "...much broken up" and "not distinctly identifiable...at Pt. Aux Peaux and Stony Pt." Quite possibly Toll and Sawyer saw a hidden opportunity in this direction when they began acquiring lands in the project vicinity. Regardless, as of 1876 a lime quarry had been opened on their lands bordering PCs 528 and 529 along Toll Road.

Alternative activities on the part of Sterling may be suggested in an early business investment of his sons, William C. and Frank S., who, under the corporate designation of Sterling Brothers are listed as "telegraph pole" manufacturers in 1887 (Polk 1887). A little over 30 years later, William C. Sterling figured prominently among the Sterling heirs in the 1919 platting of the Sterling Williams subdivision (State of Michigan 1919). This move was quickly followed by the subdivision of the Dewey-owned parcels along with those of virtually every significant shoreline landowner from Sandy Creek to Stony Creek. The area's noted reputation as a fishery, coupled with its extensive sand beaches, served as a ready attraction for those seeking summer recreational properties. The attraction of Pointe Aux Peaux as a resort area was foreshadowed when local historian Talcott E. Wing had, by 1876, secured an interest at Pointe Aux Peaux and, under the name of T. E. Wing and Company, created the area's first summer resort.

The new wealth of Detroit's growing working classes that emerged out of the region's industrial expansion during World War I created a new potential in real estate marketing. The premium placed on rural lakefront properties in Monroe County during the 1920s drew heavily upon the new transportation technologies of the automobile and the removable "rowboat engine" or outboard motor, which became available at that time (Mirken 1970). The boom era in vacation property investments was short-lived, however, and was obliterated by the financial collapse of the Great Depression. During the 1930s, only two new subdivisions were recorded, with a similar number recorded in the 1940s. Other properties north and south of the project vicinity were acquired as state-owned parklands during this period, including the Pointe Mouilee State Game Area at the mouth of the Huron River (PMSGA 2012), and the Monroe/Sterling State Park at the mouth of Sandy Creek (USGS 1936; USGS 1942a).

Records for the 20th century for land use and commercial enterprise are obviously far more complete than for previous centuries. Progress in mapping and aerial photography continuing to the modern era now assists interpretation where written records are inadequate. The preceding section on land-use history (Section 3.7.1) provides a background for land use more specific to the Fermi 2 region and property. That section covers land use and land-use change including interpretation of historical maps and aerial photographs, and provides a more thorough treatment of the historical era for the Fermi property leading up to the construction of the Fermi facilities than is addressed here.

3.7.3 Onsite Cultural Resources

Onsite cultural resources are those located within the 1,260-acre Fermi property. That property includes the entirety of the archaeological APE, which is also the onsite portion of the aboveground APE (Figure 3.7-1). Although no license-renewal-related refurbishment activities have been identified, such that no adverse effects on cultural resources would occur, the 1,260-acre Fermi property is still considered an APE for the continued operations of the Fermi 2 facility for the purpose of Section 106 compliance for the LRA. Cultural resources recorded on site include one NRHP-eligible aboveground property (Fermi 1) and 16 archaeological sites determined or recommended not eligible for the NRHP. No TCPs have been suggested to be located on site by research or by potentially interested parties for the Fermi property to date. (Demeter et al. 2012)

3.7.3.1 Fermi 1

One NRHP-eligible cultural resource is located on site (Table 3.7-1). That resource is Fermi 1. Fermi 1 has been determined NRHP-eligible by the SHPO (Conway 2011). There are no additional NRHP-eligible cultural resources on the 1,260-acre Fermi property (Demeter et al. 2012; NRC 2010).

The NRHP-eligible Fermi 1 property includes the reactor-associated buildings (NRC 2010). Fermi 1 is one of the nation's earliest reactors and was the nation's only commercial-sized, liquid-metal-cooled fast breeder reactor, and the world's largest at the time of construction. Construction began in 1956 and the plant was initially decommissioned in 1975. In terms of criteria of eligibility for the NRHP [36 CFR 60.4], the facility retains significance under Criterion A for its role in the development of the nuclear power industry in the United States, and under Criterion C for the engineering design of the reactor and its associated components. Although components of the plant were removed during initial decommissioning in 1975 and subsequent salvage and remediation efforts, the facility contains sufficient physical integrity, supported by extensive archival evidence, to convey the significance of the plant. (NRC 2010)

3.7.3.2 Onsite Archaeological Resources Recorded Prior to 2012

There are 16 archaeological sites on the 1,260-acre Fermi site that are either determined not eligible for the NRHP or remain unevaluated by the SHPO (Table 3.7-2). Of the 16 archaeological sites on the Fermi property, eight have been previously determined not eligible by the SHPO. The remaining eight sites are recommended not eligible by CCRG from its 2012 field investigations and await SHPO concurrence. These include seven new sites recorded during the 2012 CCRG investigations and one previously recorded site location (20MR207) based solely on historical reference. This site could not be relocated during the 2012 field survey (Demeter et al. 2012). The 16 onsite archaeological sites include previously recorded sites 20MR207, 20MR702, 20MR818–20MR823, and 20MR825, and newly recorded sites 20MR828–20MR834. (Table 3.7-2; see also Conway 2009 and OSA 2012 for sites 20MR702 and 20MR818–20MR822 and the deferred assessment of 20MR823 to CCRG, including its final assessment in OSA 2012; Demeter et al. 2012 for 20MR823 and 20MR825; and Demeter et al. 2012 for sites 20MR828–20MR834 and 20MR207).

Site 20MR207 is a previously recorded prehistoric site, the location of which is based entirely on literature sources (Pilling and Teeter 1981) and has never been field verified. Its NRHP eligibility has not been evaluated; however, the reported site area was revisited during the 2012 field investigations and the area was visibly eroded, and again no evidence of the site was found at the location. The site, at the reported location, is therefore recommended not eligible for the NRHP. (Demeter et al. 2012)

Site 20MR702 is a previously recorded prehistoric site described as a lithic scatter on the beach/ shoreline of Lake Erie. The site could not be relocated during the 2007–2008 CCRG field survey or the 2012 CCRG field survey and was presumed destroyed by shoreline modifications resulting from prior construction activities. In consequence, the site has been determined not eligible for the NRHP by the SHPO. (Conway 2009; Demeter et al. 2012; NRC 2010)

Site 20MR818 consists of a prehistoric isolated flake and an early 20th-century artifact scatter identified during the 2007–2008 CCRG field survey and is considered to possess limited interpretive value. The site was recommended not eligible for the NRHP and later determined not eligible by the SHPO. (Conway 2009; Demeter et al. 2012; NRC 2010)

Sites 20MR819–20MR822 were also identified during the 2007–2008 CCRG field survey and are prehistoric sites represented by single-flake isolated finds (or find-spots) that, as such, cannot meet eligibility requirements for the NRHP and have been determined not eligible by the SHPO. (Conway 2009; Demeter et al. 2012; NRC 2010)

Site 20MR823 is a 20th-century (1920–1960) site consisting of a building foundation, concrete pad, box cistern, and artifact scatter also identified during the 2007–2008 CCRG field survey. Considered to possess limited interpretive value, the site was recommended not eligible for the NRHP with SHPO concurrence deferred to the CCRG recommendation. (Conway 2009; Demeter et al. 2012; NRC 2010)

Site 20MR825 is a 20th-century artifact scatter (otherwise non-diagnostic), with additional wooden markers interpreted as pet burials given the names on the crosses; i.e., "Rocky", "...Nip", and "Kid." The resource was identified during the 2007–2008 CCRG field survey, and was provided a site trinomial (20MR825) by CCRG request; however, given its contents it is not recognized as an archaeological site by the SHPO and is not considered eligible for the NRHP. (Demeter et al. 2012; NRC 2010)

3.7.3.3 Onsite Archaeological Resources Identified and Recorded in 2012

There were seven onsite archaeological sites recorded during the 2012 CCRG field survey conducted on August 22 and 23 (Demeter et al. 2012). These were assigned site trinomials 20MR828–20MR834. Given that the 2012 CCRG field investigations were conducted specifically for the Fermi 2 license renewal, these sites are described in greater detail here than are the previously recorded sites identified during 2007–2008 or earlier investigations (e.g., Demeter et al. 2008). All seven sites consist of highly disturbed remains of historic era residences and/or outbuildings recorded within a previously unsurveyed portion of the 1,260-acre Fermi property along the southern Fermi boundary. All seven sites were identified within the

"south parcel" as depicted in Figure 3.7-10 (the south parcel is depicted in that figure although site locations are withheld; see Demeter et al. 2012 for site locations). None of these sites maintain sufficient integrity of features or deposits to meet NRHP eligibility Criterion D for research potential, and none demonstrate associations that could meet eligibility requirements for the NRHP under Criteria A–C [36 CFR 60.4]. Therefore, all seven sites have been recommended not eligible for the NRHP. (Demeter et al. 2012)

Site 20MR828 is situated approximately 121 feet north of Pointe Aux Peaux Road (global positioning system [GPS] site datum location). The site consists of a substantially disturbed raised (2 to 3 feet) and rectilinear-shaped earthen platform or foundation approximately 79 feet north-south by 26 feet east-west with several large rocks defining its perimeter. Many of the rocks composing the perimeter of the structure have either been somewhat or entirely displaced, presumably by mechanical means. No cultural material was recovered as a result of the pedestrian survey of the site area. A single shovel test unit (STU) in the middle of the remains did not produce any archaeological material. The site probably represents a foundation for a barn or other farm-related outbuilding associated with an unidentified dwelling/farmstead. The use of fieldstone rather than poured concrete or concrete blocks suggests that the structure could date to as early as the late 19th/early 20th century. The site has been severely disturbed by demolition that occurred sometime between 1979 and 1990. Nothing in the historical record has been discovered to indicate that the site is associated with a significant event (NRHP Criterion A) or person (NRHP Criterion B). Due to its lack of integrity and lack of intact subsurface artifacts or features, the site does not contribute information relative to NRHP Criterion C (design/construction/work of a master) or D (information potential). CCRG recommends that site 20MR828 is not eligible for listing in the NRHP. (Demeter et al. 2012)

Site 20MR829 is situated on a low rise about 102 feet north of Pointe Aux Peaux Road (GPS site datum location). The site consists of a significantly disturbed concrete block foundation measuring approximately 33 feet north-south by 39 feet east-west with a presumed entrance extending from the south wall. The site has two extensive piles of concrete rubble strewn across the structural remains. A small line of bricks and concrete blocks was noted on the east side of the site along the bottom of the rise. The site also contained a light density of late 20th-century debris on the surface. A total of four STUs were excavated in the middle and outside of the structural remains. No artifacts were found. (Demeter et al. 2012)

The hollow concrete blocks found at the site are somewhat diagnostic, as they date to at least 1866, when C. S. Hutchinson was granted a patent for a hollow building block that "...is remarkably similar in many respects to many of the hollow building blocks on the market to-day" [ca. 1906] (Rice and Torrance 1906). In 1905, it was reported that the concrete block industry was growing, with 1,600 plants successfully operating; however, the industry was, "still in its infancy..." and "...looked upon as an innovation..." (Seafert 1905). Given that the foundation is constructed of concrete block, the site could date as early as the last few decades of the 19th century, but likely dates no earlier than the beginning of the 20th century when the material became more common. (Demeter et al. 2012)

The site likely represents the remains of a 20th-century dwelling that has been severely disturbed by demolition that occurred sometime between 1979 and 1990. A light scatter of late 20th-century debris was observed across the site; however, no artifacts were discovered during shovel testing to corroborate the likely period of occupancy. Nothing in the historical record has been discovered to indicate that the site is associated with a significant event (NRHP Criterion A) or person (NRHP Criterion B). Due to its lack of integrity and lack of intact subsurface artifacts or features, the site does not contribute information relative to NRHP Criterion C (design/ construction/work of a master) or D (information potential). CCRG recommends that site 20MR829 is not eligible for listing in the NRHP. (Demeter et al. 2012)

Site 20MR830 is situated approximately 79 feet north of Pointe Aux Peaux Road (GPS site datum location). The site consists of the eastern portion of a concrete block foundation that measures 33 feet north-south with only 10 to 13 feet of the north and south foundation walls still intact. Two intact tile-lined cisterns were also noted southeast of the east wall. These are 3 feet in diameter. Small piles of concrete blocks and bricks were also observed in close proximity to the structural remains in the west portion of the site. A small scatter of late 20th-century debris was also observed on the surface. Five STUs were excavated at the site and all were devoid of artifacts. (Demeter et al. 2012)

Hollow concrete blocks are only somewhat diagnostic (see 20MR829 site description above). Given that the foundation is constructed of concrete block, the site could date as early as the last few decades of the 19th century, but likely dates no earlier than the beginning of the 20th century, when the material became more common. With the exception of a small quantity of late 20th-century cultural material, no other diagnostic debris was identified that might corroborate earlier dates of occupation. Site 20MR830 likely represents the remains of a 20th-century dwelling that has been severely disturbed by demolition that occurred sometime between 1979 and 1990. Nothing in the historical record has been discovered to indicate that the site is associated with a significant event (NRHP Criterion A) or person (NRHP Criterion B). Due to its lack of integrity and lack of intact subsurface artifacts or features, the site does not contribute information relative to NRHP Criterion C (design/construction/work of a master) or D (information potential). CCRG recommends that site 20MR830 is not eligible for listing in the NRHP. (Demeter et al. 2012)

Site 20MR831 is located about 82 feet north of Pointe Aux Peaux Road and 66 feet south of an east-west powerline ROW (GPS site datum location). The site consists of a 10 foot x 10 foot poured concrete pad with a poured concrete driveway extending southward out to the road. The grounds contained a scatter of automotive-related debris, which suggests that 20MR831 functioned as a garage with the associated driveway. Shovel testing of the site (three STUs) did not produce any additional archaeological material. (Demeter et al. 2012)

The first widespread use of modern poured concrete occurred during the first decade of the 20th century following the invention of the rotary kiln in 1899 (Cleland 1983). Sites with poured concrete construction were therefore likely constructed after 1900. It is possible that site 20MR831 represents a garage foundation associated with the dwelling and/or farmstead at 20MR832 (see below), which is about 105 feet to the east, although the exact relationship between the two sites is unclear. 20MR831 likely represents the remains of a 20th-century

garage and driveway that has been severely disturbed by demolition that occurred sometime between 1979 and 1990. Nothing in the historical record has been discovered to indicate that the site is associated with a significant event (NRHP Criterion A) or person (NRHP Criterion B). Due to its lack of integrity and lack of intact subsurface artifacts or features, the site does not contribute information relative to NRHP Criterion C (design/construction/work of a master) or D (information potential). CCRG recommends that site 20MR831 is not eligible for listing in the NRHP. (Demeter et al. 2012)

Site 20MR832 is situated approximately 89 feet north of Pointe Aux Peaux Road and about 105 feet south of an east-west oriented power line ROW (GPS site datum location). The site is a severely disturbed poured concrete dwelling and/or farmstead foundation that is missing half of its south wall and its entire west wall. The structural remains extend 36 feet north-south, and its full length, judging by its intact north wall, runs 49 feet east-west. The interior contains eight poured reinforced concrete supports measuring approximately 2 feet in width by 3 to 7 feet in length. In addition, a tile-lined cistern is situated about 7 feet south of the south wall. The cistern is 10 feet in diameter. None of five STUs produced any cultural material. (Demeter et al. 2012)

Approximately two-thirds of the northwestern portion of the site contained a light-density surface scatter of domestic artifacts that included stoneware and earthenware ceramics and beer and milk bottle glass, an inventory that largely dates to the first half of the 20th century. Diagnostic artifacts within this inventory included examples of Bristol- and Bristol/Albany-slip stoneware sherds. Bristol-slip stoneware came into widespread use by the 1890/1900 period (Stelle 2001). According to Greer (1981), the main period of use for Bristol-slip glazed stoneware was between 1885 and 1917, though it continued to be used on a more limited basis well into the 1930s. One of the bottle glass fragments exhibited the Duraglas trademark indicative of an Owens-Illinois brand of glass introduced in about 1940 (Lockhart 2004; Toulouse 1971). The first widespread use of modern poured concrete occurred during the first decade of the 20th century following the invention of the rotary kiln in 1899 (Cleland 1983). Given poured concrete foundation supports, the site is likely post 1900. It is also possible that site 20MR832 is related to the poured concrete pad (possible garage feature) of site 20MR831, located approximately 105 feet to the west, although this relationship is uncertain. 20MR832 likely represents the remains of a 20th-century dwelling/farmstead building that has been severely disturbed by demolition that occurred sometime between 1979 and 1990. A light scatter of late 19th-/early 20th-century artifacts was observed across the site; however, no artifacts were discovered during shovel testing. The diagnostic stoneware could date the site to the late 1800s; however, the presence of poured concrete suggests a date sometime during the early 1900s. Due to its lack of integrity, site 20MR832 cannot contribute information relative to NRHP Criterion A (events), B (individuals), C (design/construction/work of a master), or D (information potential); therefore, CCRG recommends that site 20MR832 is not eligible for listing in the NRHP. (Demeter et al. 2012)

Site 20MR833 is situated approximately 131 feet north of Pointe Aux Peaux Road and about 62 feet south of an east-west running power line ROW (GPS site datum location). The site represents a heavily disturbed concrete block dwelling and/or farmstead foundation, of which only the north wall is partially intact. Remnants of the east wall trench are visible. No evidence of either the west or south wall could be detected. Also observed at the site was a 10-foot by 5-foot

concrete lined oval-shaped cistern located off of the northeast corner of the structure. A few fragments of non-diagnostic domestic tile were noted on the surface, but none of five STUs produced any cultural material. (Demeter et al. 2012)

The hollow concrete blocks at the site are only somewhat diagnostic (see discussion of site 20MR829 above). Given that the foundation is constructed of concrete block, the site could date as early as the last few decades of the 19th century, but likely dates no earlier than the beginning of the 20th century when the material became more common. The site likely represents the remains of a 20th-century dwelling that has been severely disturbed by demolition that occurred sometime between 1979 and 1990. Nothing in the historical record has been discovered to indicate that the site is associated with a significant event (NRHP Criterion A) or person (NRHP Criterion B). Due to its lack of integrity and lack of intact subsurface artifacts or features, the site does not contribute information relative to NRHP Criterion C (design/construction/work of a master) or D (information potential). CCRG recommends that site 20MR833 is not eligible for listing in the NRHP. (Demeter et al. 2012)

Site 20MR834 is situated approximately 246 feet west of the Lake Erie shoreline (GPS datum location). The site consists of a disturbed poured concrete pad and concrete block foundation that likely represents a dwelling and/or farmstead. Its dimensions are 36 feet north-south and 33 feet east-west with a presumed entrance off of the northwest corner of the building. A well pipe was also noted just to the north of the northeast corner. Though none of the five STUs contained cultural material, the site exhibited a light-density surface scatter of domestic debris including stoneware ceramics, porcelain, pressed glass, aquamarine patent medicine and beer bottle fragments, a few burned brick fragments, and a machine-cut nail, an inventory that could date the earliest occupation to the late 19th/early 20th century. Diagnostic artifacts within this inventory included examples of Bristol- and Bristol/Albany-slip stoneware sherds. Bristol-slip stoneware came into widespread use by the 1890/1900 period (Stelle 2001). According to Greer (1981), the main period of use for Bristol-slip glazed stoneware was between 1885 and 1917, though they continued to be used on a more limited basis well into the 1930s. The first widespread use of modern poured concrete occurred during the first decade of the 20th century following the invention of the rotary kiln in 1899 (Cleland 1983). Given poured concrete at the site, it would likely postdate 1900. The site likely represents the remains of an early 20th-century dwelling that has been severely disturbed by demolition that occurred sometime between 1979 and 1990. Nothing in the historical record has been discovered to indicate that the site is associated with a significant event (NRHP Criterion A) or person (NRHP Criterion B). Due to its lack of integrity and lack of intact subsurface artifacts or features, the site does not contribute information relative to NRHP Criterion C (design/construction/work of a master) or D (information potential). CCRG recommends that site 20MR834 is not eligible for listing in the NRHP. (Demeter et al. 2012)

3.7.4 Offsite Cultural Resources

Offsite cultural resources are those outside the 1,260-acre Fermi property boundary. Those addressed by this study include historic properties within a 10-mile band, and any archaeological sites located within a 1.5-mile band around the Fermi property boundary. Offsite resources

addressed here are those recorded prior to the 2012 CCRG investigations that were already known to CCRG/DTE/NRC prior to 2012, or were added to the list of known resources as a result of the 2012 file searches by CCRG (Table 3.7-1). No offsite cultural resources were newly recorded during the 2012 CCRG investigations as no new offsite field surveys were conducted. Prior to 2012, the SHPO determined that the investigations by CCRG during the 2007–2008 field investigations would cover all areas/neighborhoods that the SHPO deemed potentially sensitive to indirect (especially visual) effects on aboveground properties by potential operations at the Fermi facilities (Conway 2007; Demeter et al. 2012) (see Figure 3.7-11 for offsite aboveground field surveys). Therefore, no new field investigations for offsite areas were deemed necessary for the Fermi 2 license renewal. However, file review updates were conducted by CCRG for offsite archaeological resources within a 1.5-mile band and for offsite historic properties within a 10-mile band. Additional offsite resources were suggested by Fermi 3 scoping meeting comments (NRC 2013c, page 2-212) and others were reported for offshore areas (Weir 2010).

3.7.4.1 Offsite Historic Properties and Aboveground Cultural Resources

Within offsite areas, there are 46 resources that are NRHP-listed, determined eligible, or recommended eligible for the NRHP, or have the equivalent eligibility or potential eligibility under national heritage or legacy commission designations (Table 3.7-1). These 46 resources include 43 aboveground properties, one archaeological site (20MR227), one designated national heritage area, and one additional proposed legacy commission resource. Within the offsite APE are 17 NRHP-listed properties including 16 aboveground properties (including a historic trail) and the River Raisin Battlefield archaeological site (20MR227, also a national battlefield site), 13 additional aboveground resources determined eligible by the SHPO, and 14 more aboveground properties recommended as NRHP eligible during 2007–2008 field investigations that have not yet been fully evaluated by the SHPO. The one designated national heritage area and the one additional proposed legacy commission resource, complete the final two of the 46 historically significant or potentially significant offsite resources within a 10-mile band of the Fermi property. Those properties listed here as recommended but without determinations are those known to DTE through 2007–2008 intensive field investigations in neighborhoods near the Fermi property, or are known to DTE through Fermi 3 public scoping meetings (Demeter et al. 2008; Demeter et al. 2012; NRC 2013c, page 2-211 to 2-212). Any additional resources that might be considered as recommended for the NRHP but are not within those neighborhoods or were not addressed in public meetings are not considered here, because the SHPO has previously determined that visual effects on aboveground resources from Fermi operations would be limited to those neighborhoods (Conway 2007) and no additional public comments have been received (NRC 2013c, page 2-212). Furthermore, a recent (September 2012) drive-by visual survey of areas containing aboveground historic properties revealed that, due to intervening vegetation and other visual obstruction, those areas actually within the viewshed of the Fermi 2 facility are, in fact, limited to those in immediate proximity to the facility (Stapleton 2012; see also Section 3.1).

The 46 properties include homes (14), building districts (4), bridges (7), farmsteads (3), church complexes (2), cemeteries (2), monuments (2), a school, an armory, a trading post, a mission building, an industrial building, a recreational building, a resort clubhouse, a light station, a historic trail, a battlefield site, the MotorCity Heritage Area, and a proposed wild rice legacy area. (Table 3.7-1)

3.7.4.2 Offsite Archaeological Resources

There are four offsite terrestrial archaeological sites within a 1.5-mile band of the Fermi property (Figure 3.7-1) and there are also four offshore (and offsite) shipwreck locations. Specific resource locations are withheld; see Demeter et al. 2012 for mapped terrestrial site locations and Weir 2010 for shipwreck locations. All four terrestrial sites and all four shipwreck locations remain unevaluated for the NRHP. Three of the terrestrial sites are prehistoric, and one is multi-component (prehistoric and historic era) and two shipwreck locations are 19th century and two are early 20th century. The one archaeological site discussed above as NRHP-listed, the River Raisin Battlefield, is located approximately 7 miles from the Fermi property. In addition, no TCPs have been suggested to date by research or by potentially interested parties for the Fermi property or 10-mile band. (Demeter et al. 2012; NRC 2013c, page 2-208)

Site 20MR417 is a prehistoric site located off site but within 1.5 miles of the Fermi property. The site, recorded by Michael Shott in 1980, is part of the privately held Cyndee Bacon collection, which is a collection of artifacts from multiple sites representing both prehistoric and historic periods. Site 20MR417 is listed in the OSA site files as a "prehistoric site" containing both Late Archaic and Late Woodland components, both of which are undetermined as to site function. The NRHP status as recorded on the OSA site file is that additional information is required to determine NRHP eligibility. The site remains unassessed for the NRHP (Demeter et al. 2012).

Site 20MR419 is a multi-component, culturally undetermined prehistoric era and historic era site located off site but within 1.5 miles of the Fermi property. The site, recorded by Michael Shott in 1980, is part of the privately held Cyndee Bacon collection, which is a collection of artifacts from multiple sites representing both prehistoric and historic periods. Site 20MR419 is listed in the OSA site files as a "prehistoric site" and "historic site." Neither component is identified as to cultural affiliation, age, or function. The NRHP status as recorded on the OSA site file is that additional information is required to determine NRHP eligibility. The site remains unassessed for the NRHP. (Demeter et al. 2012)

Site 20MR694 is a prehistoric era, Late Archaic and Late Woodland period site located off site but within 1.5 miles of the Fermi property. According to the OSA site files, the site was discovered during an amateur excavation. The Late Archaic component is undetermined as to function; the Late Woodland component is identified as a "habitation". The NRHP status as recorded on the OSA site file is that additional information is required to determine NRHP eligibility. The site remains unassessed for the NRHP. (Demeter et al. 2012)

Site 20MR703 (also known as the Gustafson site) is a prehistoric era Archaic period occupation located off site but within 1.5 miles of the Fermi property. The site, recorded by the OSA in 1986, was reported by Mrs. George Low as her father's private collection. Site 20MR703 is

undetermined as to site function. The NRHP status as recorded on the OSA site file is that additional information is required to determine NRHP eligibility. The site remains unassessed for the NRHP. (Demeter et al. 2012)

The four previously recorded offshore shipwreck locations include the *Adieu*, the *Fame*, the *Roy*, and the *General Franz Sigel* (GLMD 2013; Harrison 2013; Toledo Blade 2001; Weir 2010; Weir et al. 2011). The *Adieu* is reported as a steamer yacht that foundered on September 16, 1906. The *Fame* is reported as a schooner loaded with general cargo that capsized off of the Monroe Piers on August 31, 1858. The *Roy* is reported as a tug that struck ice and sank southeast of Stony Point on December 16, 1895. And the *General Franz Sigel* is reported as a schooner that sank off of River Raisin in July 1903. As reported in the maritime database (GLMD 2013) and as discussed by Harrison (2013), the *Fame* was raised and renamed the *Lively* in 1860 (Attachment C). As discussed in Weir et al. (2011) and Harrison (2013), the *Adieu* sank in shallow waters and was likely raised, but its fate is unknown. Nonetheless, for both the *Fame* and the *Adieu*, materials such as cargo may still remain at the sites, and the locations are therefore still considered archaeological resources. All four of these shipwreck locations remain unassessed for the NRHP.

3.7.5 Cultural Resource Surveys

Cultural resource investigations for the Fermi property and nearby areas include those conducted prior to the preparation for the Fermi 3 COL application to the NRC (Section 3.7.5.1), those conducted in preparation for the Fermi 3 COL ER and EIS that began in 2007 (Section 3.7.5.2), and those conducted in 2012 in preparation for the Fermi 2 license renewal (Section 3.7.5.3).

3.7.5.1 Cultural Resource Investigations Prior to 2007

Fermi 1 was constructed, and therefore the project site was disturbed, prior to enactment of environmental regulations or legislation that requires addressing project impacts to cultural resources (most notably NHPA [16 U.S.C. 407 et seq.], enacted in 1966 and NEPA [49 U.S.C. 4321 and 4331-4335], enacted 1970). Prior to the current (2012) survey for the Fermi 2 project (Demeter et al. 2012), cultural resources had been addressed in environmental documents prepared for the construction of the Fermi 2 facility (AEC 1972), for Fermi 2 operations (DECo 1977; NRC 1981), and for the proposed Fermi 3 licensing (DECo 2011). Most recently, Fermi 3 licensing activities resulted in a systematic survey of both archaeological and aboveground resources on and in the vicinity of the Fermi property.

One previous investigation was conducted on the Fermi 2 property for archaeological resources prior to 2007, and that was a drive-through field view conducted by Dr. James B. Griffin in May 1972 following site preparation for the Fermi 2 complex. None were identified (Griffin 1972). A 1973 Monroe County Historic Building Survey exists as a collection of cards at the Monroe County Historical Museum and addresses resources located within and immediately near the city of Monroe.

The AEC's 1972 environmental statement advised that, at the time, there were no NRHP-listed sites in the project vicinity and that, "...the plant will not affect any known historical resources of the State" (AEC 1972). According to the report, any archaeological materials might have been capped or disturbed by construction activities on the site (AEC 1972). The 1977 environmental report states that "There has been no relevant revision in data pertaining to this topic since the Final Environmental Statement was issued in July, 1972" (DECo 1977, Section 2.3). The 1981 final environmental statement notes that there are "several houses ...listed in the Register for Monroe..."...and "...no listing in the...National Register of Historic Landmarks for the area within 16 km (10 mi) of the Fermi site" (NRC 1981, Section 2.2.3). In the same document, Section 4.2.3, "Historical, Archeological, and Natural Landmarks," notes that "...there are still no known historical or archaeological resources or natural landmarks on the site" and "the State Historical Preservation Officer has concurred with this evaluation" (NRC 1981, Section 4.2.3).

3.7.5.2 Cultural Resource Investigations 2007–2010

Comprehensive studies to address cultural resources on and in the vicinity of the Fermi property were conducted by CCRG for the Fermi 3 COL application in 2007 and 2008, at which time both archaeological and aboveground resources were systematically surveyed. The aboveground field survey performed during the Fermi 3 investigations was conducted on approximately 7,135 acres and included intensive field surveys of aboveground resources in offsite areas near the Fermi facility. This 7,135-acre area was determined by the Michigan SHPO in consultation with CCRG and DTE. A review of records was conducted for historic properties including aboveground resources during the Fermi 3 investigations for a 10-mile band around the Fermi property boundary. Intensive aboveground field surveys were targeted to an area encompassing the Fermi property and the communities of Estral Beach, Stony Point, Woodland Beach, and the settlement of Oldport (Figure 3.7-11). (Demeter et al. 2008)

During the Fermi 3 aboveground resources field survey, the project architectural historians recorded 83 previously unrecorded aboveground properties within the 7,135-acre area and recommended 20 resources (19 individual properties and one four-building historic district) as eligible for listing in the NRHP. To date (2012), the Michigan SHPO has determined six as eligible for listing in the NRHP (Table 3.7-1). The remaining 14 resources are undetermined as to NRHP eligibility by the SHPO, but are still considered potentially eligible by CCRG (Table 3.7-1). As part of the Fermi 3 investigations, researchers from R. Christopher Goodwin and Associates evaluated the NRHP eligibility of the Fermi 1 facility and recommended it eligible for listing (Doerrfeld and Riggle 2009). The SHPO's formal review of the Fermi 1 NRHP evaluation concurred with that recommendation (Conway 2009; Conway 2011). A mitigation plan for Fermi 1 is in place as a result of Fermi 3 licensing activities.

The 2007–2008 cultural resources investigations for Fermi 3 also identified six previously unrecorded archaeological sites on the Fermi property (as defined for the Fermi 3 investigations), none of which were recommended eligible for listing in the NRHP (Demeter et al. 2008). In 2009, an additional archaeological field survey was conducted to investigate a proposed meteorological tower and access road location, and a proposed construction laydown area for Fermi 3. This survey resulted in the identification and recording of one additional previously

unrecorded archaeological site, which was recommended not eligible for listing in the NRHP (Demeter et al. 2012). SHPO subsequently concurred with these seven recommendations (Conway 2009). Records review conducted 2007–2008 indicated two additional archaeological sites on the 1,260-acre Fermi property (as defined today in Figure 3.7-1) that had been recorded prior to CCRG field investigations and an additional four previously recorded sites located outside of the Fermi property boundary but within a 1.5-mile band (Figure 3.7-1; Table 3.7-2).

In 2010, CCRG conducted a desktop assessment of resources within a slightly modified meteorological tower and access road location, slightly expanded construction laydown area, and a proposed onsite transmission line corridor, again associated with the Fermi 3 investigations (Demeter et al. 2012). Additional fieldwork was not conducted at that time, because approximately two-thirds of the western portion of the 2010 proposed meteorological tower site had been visually inspected and shovel tested during the 2009 survey, and examination of historic maps and aerial photographs revealed that the unsurveyed portion of the 2010 proposed Fermi 3 meteorological tower and access road locations were unlikely to contain significant prehistoric or historic archaeological sites. Similarly, visual reconnaissance of the proposed Fermi 3 construction laydown area in 2009 had revealed it to be disturbed by past dumping and construction episodes.

Finally, an assessment of maritime resources located within Lake Erie in the vicinity of the Fermi property was conducted in 2008 (revised 2010), which identified four possible shipwreck locations within 3 miles of the Fermi property (Weir 2010). However, no maritime resources were located within the offshore areas of the Fermi 2 property (Figure 3.7-1). No additional cultural resource surveys or file searches were conducted by CCRG or other researchers for Fermi operations until the current efforts in 2012 for the Fermi 2 license renewal effort (Demeter et al. 2012).

3.7.5.3 Cultural Resource Investigations Conducted in 2012

In conjunction with the 2012 CCRG Phase I report preparation for the Fermi 2 license renewal, documentary sources for prehistoric and historic-era cultural resources were reviewed at the OSA, including site file forms and site location topographic maps. The SHPO historic database and geographic information system coordinator provided information regarding NRHP-listed resources in their files. Searches of the NRHP online data base (NRHP NPS Focus) and of the Michigan historic sites online database were also conducted. All previous investigative reports for the Fermi 2 property from CCRG archives were reviewed and additional statements/reports were obtained from DTE archives. Historical aerial photographs and topographic and plat maps were obtained, along with historical census data for the Fermi property and immediate surroundings. For the 2012 investigations, previously unsurveyed areas within the 1,260-acre Fermi property were surveyed using several methods including pedestrian transects and shovel testing (Demeter et al. 2012). As a result of the 2012 fieldwork, seven historic-period archaeological sites were added to the list of previously known cultural resources for the area (Demeter et al. 2012).

The entirety of an approximately 7,135-acre aboveground resources sensitivity area surrounding the Fermi property was subject to aboveground field survey during the 2007–2008 field season for the proposed Fermi 3 COL application (Figure 3.7-11); therefore, CCRG did not conduct additional field surveys for aboveground resources for the 2012 Fermi 2 license renewal investigation. As discussed above, a records review for the Fermi property and entire 10-mile band for previously recorded historic properties was conducted by CCRG for the 2012 study, with additional records review for previously recorded archaeological sites regardless of NRHP status for the 1.5-mile band (Figure 3.7-1). The 2012 field investigations were limited to archaeological surveys on the Fermi property. (Demeter et al. 2012).

On August 22 and 23, 2012, CCRG archaeologists conducted a survey of previously unsurveyed property within the 1,260-acre Fermi 2 property. Previously, during the 2007–2008 cultural resources investigations (Demeter et al. 2008; Demeter et al. 2012) approximately 1,039 acres had been surveyed. The remaining, unsurveyed areas addressed in 2012 were contained within two parcels, one at the extreme north end of the Fermi 2 property (the north parcel) and one at the extreme south end (the south parcel) bounded on the south by Pointe Aux Peaux Road (Figure 3.7-10). The majority of the north parcel was in swamp/wetland and lake bottom. Approximately 41 acres within the north parcel were wooded or open ground that could be, and was, subject to field survey. The south parcel (approximately 101 acres) was marked by swamp or wetland, standing water, and inaccessible private property along Pointe Aux Peaux and Long roads. The south parcel also contained the previously surveyed and proposed Fermi 3 meteorological tower site and access road corridor that were archaeologically surveyed by CCRG in 2009 (Demeter et al. 2012). Approximately 38 acres of previously unsurveyed land were accessible in the south parcel and subject to systematic survey for the 2012 Fermi 2 license renewal effort (Demeter et al. 2012).

Survey methods included systematic pedestrian reconnaissance in areas exhibiting 25 percent or greater surface visibility combined with opportunistic shovel testing. Surface reconnaissance was conducted along transects spaced at 15-meter intervals. Subsurface testing consisted of hand-excavated STUs placed in areas identified by the project archaeologist as having the highest potential to contain artifacts or features. Soil excavated from STUs was screened through quarter-inch hardware cloth to ensure uniform recovery of cultural materials. Notes were recorded on pre-printed standardized forms and field maps. (Demeter et al. 2012)

The archaeological survey of the north parcel included walkover visual reconnaissance as well as limited shovel testing on accessible/unsaturated portions of the area (Figure 3.7-10). The eastern shoreline/beach of the property was examined using visual techniques because the ground exposure in this area was 100 percent. (Demeter et al. 2012)

The beach was composed of both sandy portions and rockier areas where the sand had been washed or eroded away by waves. Tree falls were also a common feature encountered during the survey of the north parcel. Exposed root balls were examined for cultural material; however, no archaeological remains were found. Investigation of the interior areas of the northern peninsula revealed not only large tracts of wetland (as documented historically) but also some slightly elevated ridges of loose wind-blown sand or dunes situated back of the present shoreline

which exhibited 50 to 100 percent surface visibility. The subsequent survey of these dune features revealed extensive scatters of modern trash that were probably deposited by the action of the lake. A few exploratory STUs were excavated into these dunes and revealed "bottomless," loose sandy profiles. It was concluded that these wind-blown ridges represent relatively recent or continuously changing and shifting formations that do not contain any buried archaeological deposits aside from the late 20th-century/early 21st-century debris that covered the surface. (Demeter et al. 2012)

No new prehistoric or historic-period sites were identified as a result of the 2012 archaeological survey of the north parcel, nor were previously recorded prehistoric scatters 20MR702 and 20MR207 relocated. Site 20MR207 is a prehistoric site, the location of which is based entirely on literature sources (Pilling and Teeter 1981) and has never been field verified. Its NRHP eligibility is unevaluated, but it is recommended not eligible for the reported location. Site 20MR702 is a prehistoric site recorded in the OSA site files as a "lithic scatter on beach." CCRG archaeologists attempted to relocate the site during both the 2007–2008 and 2012 archaeological surveys, without success; however, the site has been determined not eligible for the NRHP (NRC 2010). Neither 20MR207 nor 20MR702 were relocated during the 2012 Fermi 2 survey of the north parcel.

Files maintained at the OSA contain a 1972 letter from James Griffin, Ph.D., then director of the University of Michigan Museum of Anthropology, documenting his visit to the Fermi site shortly after construction of Fermi 2, in which he notes that "...any...remains which might have been there have either been removed or covered up" (Griffin 1972). Consequently, it is likely that previously recorded sites 20MR207 and 20MR702, if they had existed within the north parcel, were capped or destroyed by earlier construction activities. (Demeter et al. 2012)

Walkover survey of the south parcel (Figure 3.7-10) revealed relatively flat property devoid of knolls or other natural topographic relief. The ground cover ranged from sufficiently open and exposed to wooded, but with surface visibility in excess of 25 percent. Within the south parcel, the archaeological reconnaissance of the meteorological tower location in 2009 resulted in the identification of a single historic-period site (20MR825) composed of a non-diagnostic artifact surface scatter and three small wooden crosses. Based on the names engraved on the crosses (i.e., Rocky, ...Nip, and Kid), they were assumed to mark pet burials. During the meteorological tower survey, there was no attempt to verify this through shovel testing. These crosses could not be relocated during the 2012 survey. (Demeter et al. 2012)

In addition to the extensive wetlands that define a majority of the south parcel, artificial earthen dikes were also noted in some of the areas; these dikes were presumably employed to control water from the wetlands. The presence of such dikes sometimes indicates that a dwelling or farmstead is or had been in close proximity. Examination of historic atlases, plat maps, aerial photographs, and USGS topographic maps (Section 3.7.1) suggested that all known historic-period structures in the south parcel were located either along Pointe Aux Peaux Road or Long Road (that is, outside of the wetlands); therefore, the archaeological survey concentrated on these specific areas. The 1967 topographic map (Figure 3.0-2) depicts seven structures along the north side of Pointe Aux Peaux Road in Sections 28 and 29 and along the east side of the

abandoned Long Road in Section 28. The investigation of these areas included walkover visual reconnaissance and opportunistic STUs. (Demeter et al. 2012)

The archaeological survey of the south parcel resulted in the identification of seven historic-era archaeological sites assigned site trinomials 20MR828–20MR834 (Section 3.7.3.3; Table 3.7-2). Six of these sites were located in proximity to Pointe Aux Peaux Road and one (20MR834) along the abandoned northern extension of Long Road.

3.7.5.4 Consultation

Consultation letters (Attachment C) were sent to potential stakeholders who might have cultural and historical interest in the Fermi 2 site and region. These consultation letters detailed the results of the CCRG 2012 and previous investigations and sought input on the investigations, as well as any concerns relating to historic and cultural resources, including TCPs. Consultations included letters to the Michigan SHPO and OSA. Tribal consultation letters with the same content were submitted to the following 18 Native American organizations: the Keweenaw Bay Indian Community; Bay Mills Indian Community; Grand Traverse Band of Ottawa and Chippewa Indians; Lac Vieux Desert Band of Lake Superior Chippewa Indians; Little Traverse Bay Bands of Odawa Indians; Pokagon Band of Potawatomi Indians; Sault Ste Marie Tribe of Chippewa Indians of Michigan; Hannahville Indian Community; Nottawaseppi Huron Band of the Potawatomi; Saginaw Chippewa Indian Tribe of Michigan; Match-e-be-nash-she-wish Band of Pottawatomi Indians of Michigan; Little River Band of Ottawa Indians; Shawnee Tribe; Delaware Nation; Wyandotte Nation; Ottawa Tribe of Oklahoma; Walpole Island First Nation (Bkejwanong); and Forest County Potawatomi.

3.7.6 Procedures and Integrated Cultural Resources Management Plans

No refurbishment or other license-renewal-related construction activities or plant operational changes have been identified. Any maintenance activities necessary to support continued operation of Fermi 2 would be limited to currently developed areas of the site. In addition, no viewsheds will be altered and there will be no increases in operational noises as a result of license renewal. Although administrative procedural controls are in place for management of cultural resources ahead of any future ground-disturbing activities at the plant as discussed in Section 9.1.4, none are planned or needed in support of license renewal.

In addition, DTE is undertaking due diligence mitigation activities for Fermi 1 through a recent memorandum of agreement (MOA) related to the Fermi 3 COL application (NRC 2012b). This mitigation includes recordation, creating a public exhibit, and identifying qualified institutions interested in retention of portions of the Fermi 1 records (NRC 2012b). An NRHP evaluation was also conducted for Fermi 1 in 2009 (Doerrfeld and Riggle 2009). Further, the American Nuclear Society published a book on the Fermi 1 plant titled *Fermi-1 New Age for Nuclear Power* (see NRC 2010). This book provides a 454-page detailed account of the history of the Fermi 1 site, including initial considerations, organizational structures, conceptual design, financing, legal matters, construction permitting, design and construction, testing and preparations for operations, operations, the fuel melting accident, renewal operation, safety, nuclear research and development, and other related information (NRC 2010). This work, combined with the 2009

assessment (Doerrfeld and Riggle 2009), appears to meet and exceed the Historic American Engineering Guidelines published by the NPS (NRC 2010).

Two concrete natural draft cooling towers at Fermi 2 are the tallest and most predominant visible structures on the Fermi property at up to 400 feet above the grade elevation (DECo 2011, Section 3.1.1). Visual impacts from the towers on nearby neighborhoods (Figure 3.0-3) are limited to adjacent residents and traffic, associated with the Dixie Highway and smaller arterial roads, and the cooling towers can also be seen sporadically from I-75 and I-275. (DECo 2011, Section 3.1.2). During a 2012 windshield survey of aboveground properties listed below in Table 3.7-1, only one resource (the rural Joseph Fix Farmstead at 6511 Leroux Road) was found to have the Fermi cooling towers within view (Stapleton 2012). No other aboveground resource listed in Table 3.7-1 has view of the Fermi 2 cooling towers, and the Joseph Fix Farmstead was recommended eligible despite that view. Furthermore, no TCPs have been identified or suggested through consultations for the Fermi 2 region, and no maritime cultural resources have been identified within the offshore portions of the Fermi 2 property (Figure 3.7-1) (Weir 2010).

Table 3.7-1
NRHP-Listed, NRHP-Eligible, or Recommended Eligible Properties on or within a 10-Mile Band around the Fermi 2 Property

Name	Address	Resource Description	City or Township/County	NRHP Status
Enrico Fermi Power Plant Unit 1	64000 N. Dixie Hwy.	Early nuclear reactor; the nation's only commercial-sized liquid-metal-cooled fast breeder reactor, and the world's largest at the time of construction. Construction began 1956; the reactor reached criticality 1963 and was decommissioned in 1975.	Frenchtown Township/ Monroe	Eligible[a]
River Raisin Battlefield Site (20MR227)	E. Elm Ave	Site of the 1813 battles of Frenchtown (War of 1812).	Monroe/Monroe	Listed[b)]
Hull's Trace North Huron River Corduroy Segment Historic Trail/Road	36000 W. Jefferson Avenue	Only known extant segment of military road between Urbana, Ohio, and Detroit; segment dates to 1812.	Brownstown Township/ Wayne	Listed[c]
Jefferson Avenue Bridge	Jefferson Avenue over the Huron River	Three main spans; steel I-beam construction; representative example of new mill technology; erected in 1930.	Brownstown Township/ Wayne	Listed[d]
Gibraltar Road Bridge	Gibraltar Road over Waterway Canal	Reinforced concrete cantilevered-arch bridge; constructed in 1931.	Gibraltar/Wayne	Listed[d]
East River Road-North Hickory Canal Bridge	East River Road over Hickory Canal	Three-span bridge; illustrates evolution of Wayne County road commission's bridge design; constructed in 1945.	Grosse Ile/Wayne	Listed[d]
South Pointe Drive Bridge	Pointe Drive over Swan Island Canal	Concrete T-beam span; WPA construction project; bridge plate dated 1939.	Grosse Ile/Wayne	Listed[d]

Table 3.7-1 (Continued)
NRHP-Listed, NRHP-Eligible, or Recommended Eligible Properties on or within a 10-Mile Band around the Fermi 2 Property

Name	Address	Resource Description	City or Township/County	NRHP Status
Edward Loranger House	7211 S. Stony Creek Road	Brick residence; example of early 19th-century French-Canadian architecture; constructed in 1925.	Monroe Vicinity/Monroe	Listed[(d)]
George Armstrong Custer Equestrian Monument	SW corner Elm and North Monroe (M-125) streets	Monument depicting General Custer "sighting the enemy;" commemorates Custer's Michigan Cavalry Brigade on Rummel fields at Gettysburg (July 3, 1863); dedicated in 1910.	Monroe/Monroe	Listed[(d)]
East Elm-North Macomb Street Historic District	Roughly bounded by the River Raisin, Lorain, Monroe, and Macomb streets	Historic district of high-style homes and working-class dwellings; represents all periods from 1820 to 1930.	Monroe/Monroe	Listed[(d)]
Governor Robert McClelland House	47 E. Elm Street	Greek Revival-style home of Michigan Governor Robert McClelland; constructed ca. 1841.	Monroe/Monroe	Listed[(d)]
Navarre-Anderson Trading Post	West of Monroe at N. Custer (M-130) and Raisinville roads	Log structure; *pièce sur pièce* construction technique; restored to 1799 appearance.	Monroe/Monroe	Listed[(d)]
Rudolph Nims House	206 W. Noble Avenue	Greek Revival-style dwelling; constructed ca. 1836–1846.	Monroe/Monroe	Listed[(d)]

Table 3.7-1 (Continued)
NRHP-Listed, NRHP-Eligible, or Recommended Eligible Properties on or within a 10-Mile Band around the Fermi 2 Property

Name	Address	Resource Description	City or Township/County	NRHP Status
Old Village Historic District	Along the River Raisin, Navarre, Wadsworth, LaPlaisance, Seventh, Washington, Monroe, and Third streets	District containing 19th- and early 20th-century residential, commercial, ecclesiastical, and institutional architecture; represents the period spanning 1825 to 1925.	Monroe/Monroe	Listed[(d)]
Saint Mary's Church Complex	Elm Avenue and M-125 (N. Monroe Avenue)	Gothic Revival-influenced stone and brick church (1836–1839), school (1903), rectory (ca. 1920s), and Brothers of Holy Cross Hall (Italianate-style former residence, 1870).	Monroe/Monroe	Listed[(d)]
Sawyer House	320 E. Front Street	Red brick Italianate cube dwelling; constructed in 1873.	Monroe/Monroe	Listed[(d)]
Weis Manufacturing Company Building	Union and Seventh streets	Former home of local employers Weis Manufacturing Company, Floral City Furniture Company, and La-Z-Boy Chair Company; constructed 1905–1912.	Monroe/Monroe	Listed[(d)]
Detroit River Light Station	Lake Erie, 3.75 miles SE of Millerville Beach	Light tower and fog signal building; aka Bar Point Light Station; first established in 1885.	Rockwood vicinity/ Monroe	Listed[(d)]
5046 Williams Road House	5046 Williams Road	Two-story gable-front residence; constructed ca. 1940.	Frenchtown Township/ Monroe	Eligible[(d)]

Table 3.7-1 (Continued)
NRHP-Listed, NRHP-Eligible, or Recommended Eligible Properties on or within a 10-Mile Band around the Fermi 2 Property

Name	Address	Resource Description	City or Township/County	NRHP Status
2187 Hurd Road House	2187 E. Hurd Road	Red brick; gabled-ell residence; constructed ca. 1860s.	Frenchtown Township/ Monroe	Eligible[d]
I-75 Bridge	I-75 Bridge over Conrail and Raisin River	Three main spans; steel girder and floor beam spans; constructed in 1955.	Monroe/Monroe	Eligible[d]
Monroe Armory	15483 S. Dixie Hwy.	Classic armory form head-house and drill hall; constructed 1926–1928.	Monroe/Monroe	Eligible[d]
St. Mary's Academy Historic District	610 W. Elm Avenue	Catholic girls' school; founded in 1846.	Monroe/Monroe	Eligible[d]
Horse Island Drive Bridge	Horse Island Drive Bridge over Horse Island Bayou	Concrete closed spandrel deck arch bridge; constructed in 1925.	Gibraltar/Wayne	Eligible[d]
Horse Island Drive Bridge	Horse Island Drive Bridge over Adams Bayou	Concrete closed spandrel deck arch bridge; constructed in 1925.	Gibraltar/Wayne	Eligible[d]
St. Charles (Borromeo) Church and Complex	8109 Swan Creek Road	Gothic revival Catholic church; polychrome brick masonry construction; constructed 1882–1886; rectory (built 1886); convent, auditorium, garages (all built in the 1930s).	Berlin Township/ Monroe	Eligible[e]
2381 Hurd Road Farmhouse	2381 Hurd Road	Red brick farmhouse; former home of early settler James Fix; constructed ca. 1850.	Frenchtown Township/ Monroe	Eligible[e]

Table 3.7-1 (Continued)
NRHP-Listed, NRHP-Eligible, or Recommended Eligible Properties on or within a 10-Mile Band around the Fermi 2 Property

Name	Address	Resource Description	City or Township/County	NRHP Status
2122 N. Dixie Hwy. House	2122 N. Dixie Hwy.	Brick residence; home of Columbus, Henry, and Oliver Fix (sons of early settler Joseph Fix); constructed ca. 1875.	Frenchtown Township/ Monroe	Eligible[e]
6511 Leroux Road Farmstead	6511 Leroux Road	Joseph Fix (son of early settler Joseph Fix) farmstead; brick gabled-ell residence and brick three-bay threshing barn; house constructed 1878.	Frenchtown Township/ Monroe	Eligible[e]
Dixie Skateland Building	5179 N. Dixie Hwy.	Barrel-vaulted recreational structure; yellow brick exterior cladding; constructed in 1958.	Frenchtown Township/ Monroe	Eligible[e]
St. Anne's Catholic Church Grotto	2430 N. Dixie Hwy.	Stone grotto housing statues of St. Anne and the Virgin Mary; constructed in 1958.	Frenchtown Township/ Monroe	Eligible[e]
2983 Third Street House	2983 Third Street	Storybook Tudor residence; constructed ca. 1930.	Frenchtown	Recommended eligible[e]
3360 Elmwood Street House	3360 Elmwood Street	Mediterranean-style residence; yellow brick; constructed ca. 1940.	Frenchtown	Recommended eligible[e]
3390 Lawndale Street House	3390 Lawndale Street	Modest Queen Anne-style residence; constructed ca. 1910.	Frenchtown	Recommended eligible[e]
3518 Nippising Street Building	3518 Nippising Street	Concrete "log" resort clubhouse; constructed ca. 1930–1940s.	Frenchtown	Recommended eligible[e]

Table 3.7-1 (Continued)
NRHP-Listed, NRHP-Eligible, or Recommended Eligible Properties on or within a 10-Mile Band around the Fermi 2 Property

Name	Address	Resource Description	City or Township/County	NRHP Status
3677 Lakeview Drive House	3677 Lakeview Drive	Possible Mershon & Morley "portable" (panelized) residence; constructed ca. 1945.	Frenchtown	Recommended eligible[(e)]
3535, 3555, 3575, and 3595 Pearl Drive houses	Pearl Drive Historic District	Two-/two and one-half-story stucco-finished residences; constructed ca. 1927.	Frenchtown	Recommended eligible[(e)]
Frenchtown Township District No. 13 School	3684 Brest Road	One-story brick schoolhouse; constructed 1926–1927.	Frenchtown	Recommended eligible[(e)]
3738 Brest Road house	3738 Brest Road	Greek revival-style residence; possible home of prominent 19th-century fishing and business Dewey family; constructed ca. 1840.	Frenchtown	Recommended eligible[(e)]
6068 N. Dixie Hwy. farmstead	6068 N. Dixie Hwy.	Side-gabled residence and three-bay threshing barn farmstead complex; constructed ca. 1885.	Frenchtown	Recommended eligible[(e)]
South of 4973 N. Dixie Hwy. building	No visible address	Former Redemptorist Mission; constructed ca. 1850s.	Frenchtown	Recommended eligible[(e)]
3606 Lakeshore Drive house	3606 Lakeshore Drive	Mediterranean-style residence; constructed ca. 1940.	Frenchtown	Recommended eligible[(e)]
Old St. Charles Cemetery	N. Dixie Hwy. (no visible address)	Third burial ground associated with St. Charles (Borromeo) Catholic Church; aka White Cemetery, LaDuc Cemetery; established 1851.	Berlin	Recommended eligible[(e)]

Table 3.7-1 (Continued)
NRHP-Listed, NRHP-Eligible, or Recommended Eligible Properties on or within a 10-Mile Band around the Fermi 2 Property

Name	Address	Resource Description	City or Township/County	NRHP Status
St. Charles Cemetery	N. Dixie Hwy. (no visible address)	Fourth burial ground associated with St. Charles (Borromeo) Catholic Church; established 1882.	Berlin	Recommended eligible[e]
6344 Trombley Road farmstead	6344 Trombley Road	Farmstead complex held by early settler Jacob Masserant; contains building of possible notched log construction; farmstead established ca. 1853.	Berlin	Recommended eligible[e]
Motor Cities National Heritage Area	Includes over 1,200 contributing sites in 13 Michigan counties[f]	Cohesive, nationally important landscape in the development of the automotive industry and the relationship between labor and industry.[f]	Overlaps within 10-mile vicinity but does not "have specific or identified locations within" the 2007–2008 aboveground survey area (NRC 2013c).	Designated National Heritage Area, 1998[c][f]
Wild rice (*Zizania aquatica*) reestablishment Legacy Project Area with additional interest groups	Proposed to be established in as yet unspecified areas suitable for propagation	Wild rice (*Zizania aquatica*) reestablishment in coordination with the Native American community.	Overlaps within 10-mile vicinity, but does not "have specific or identified locations within" the 2007–2008 aboveground survey area (NRC 2013c).	Proposed War of 1812 Bicentennial Legacy Commission project[c]; alternative designations likely.

a. Located within 1,260-acre Fermi 2 property and determined eligible by SHPO (Conway 2011).
b. Designated national battlefield site.

c. Designated heritage area or proposed legacy project recommended for consideration (in comments from Fermi 3 EIS public scoping meetings (NRC 2013c, page 2-212). The extant Hull's Trace mentioned in the scoping meeting is NRHP-listed and therefore addressed earlier in the table. The Monroe Harbor, also mentioned in the scoping meeting, has since been determined not eligible for the NRHP and so is not included here.
d. (Demeter et al. 2012) from research of Michigan SHPO files for NRHP-listed and eligible properties.
e. Recommended during 2007–2008 CCRG aboveground survey (Demeter et al. 2008); with "eligible" as determined by SHPO (Conway 2009).
f. (MotorCities 2012).

Table 3.7-2
Known Archaeological Sites on or within a 1.5-Mile Band around Fermi 2 Property

Site Number	Period/Description	Location	NRHP Status
20MR207 (Holmquist M-33)	Prehistoric/historic reference	On Fermi property	Not relocated; recommended not eligible[(a)(b)]
20MR417	Late Archaic, Late Woodland/undetermined	Offsite, but within 1.5-mile band	More information needed[(b)]
20MR419	Prehistoric, Historic era /undetermined	Offsite, but within 1.5-mile band	More information needed[(b)]
20MR694	Late Archaic and Late Woodland	Offsite, but within 1.5-mile band	More information needed[(b)]
20MR702	Prehistoric/lithic scatter on beach	On Fermi property	Not eligible[(b)(c)]
20MR703 (Gustafson)	Archaic	Offsite, but within 1.5-mile band	More information needed[(b)]
20MR818 (Charles Toll Farmstead)	Prehistoric/isolated flake; early 20th century/artifact scatter	On Fermi property	Not eligible[(b)(c)]
20MR819	Prehistoric/isolated flake	On Fermi property	Not eligible[(b)(c)]
20MR820	Prehistoric/isolated flake	On Fermi property	Not eligible[(b)(c)]
20MR821	Prehistoric/isolated flake	On Fermi property	Not eligible[(b)(c)]
20MR822	Prehistoric/isolated flake	On Fermi property	Not eligible[(b)(c)]
20MR823	20th century (1920–60)/ building foundation, concrete pad, box cistern, artifact scatter	On Fermi property	Not eligible[(b)(c)]
20MR825	20th century/artifact scatter, wooden markers (crosses; possible pet burials)	On Fermi property	Not eligible; not recognized as a site by OSA[(c)]
20MR828	Late 19th-early 20th century/structural remains (former foundation)	On Fermi property	Recommended not eligible[(a)]
20MR829	20th century/structural remains (former foundation), artifact scatter	On Fermi property	Recommended not eligible[(a)]

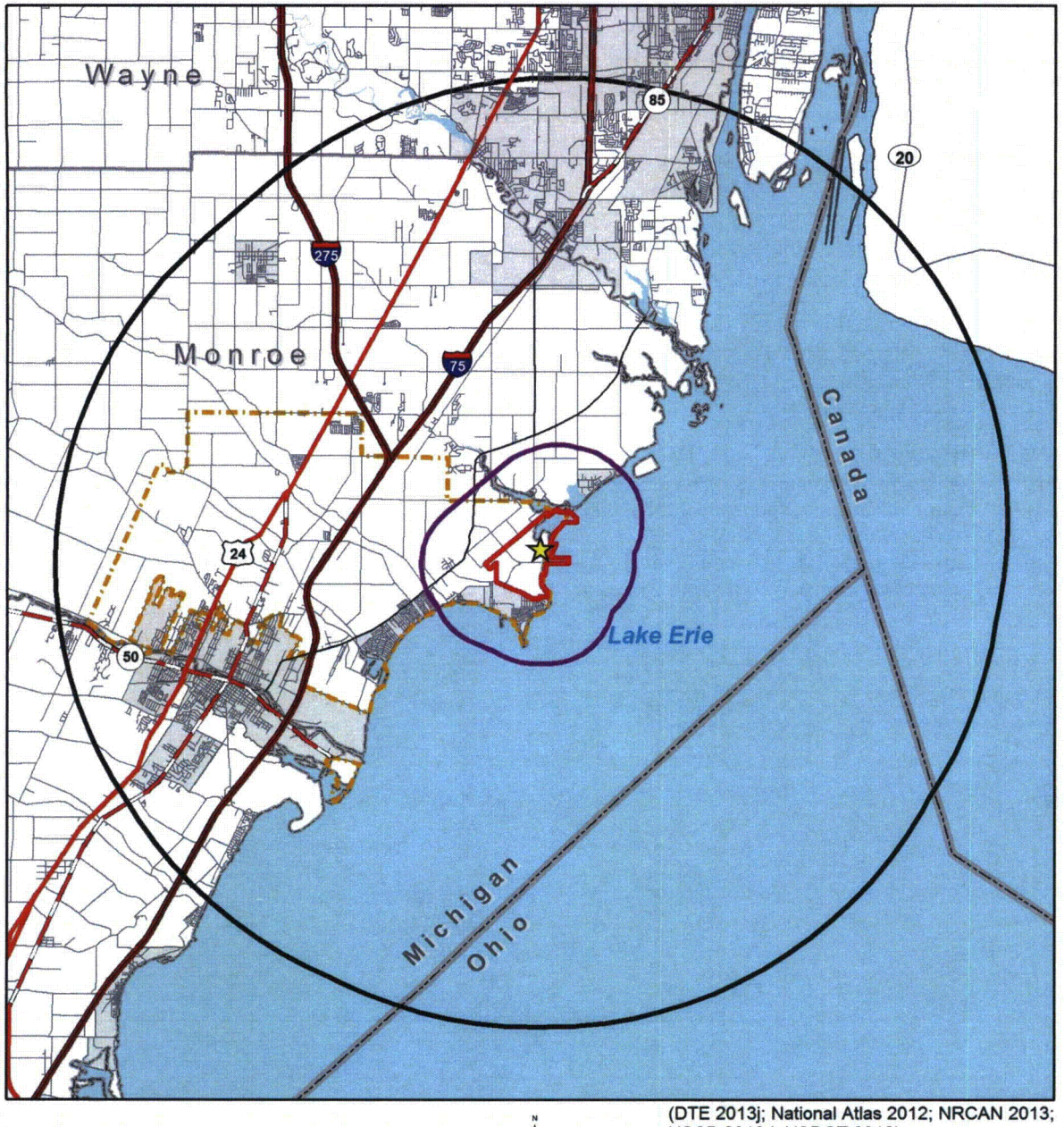
Table 3.7-2 (Continued)
Known Archaeological Sites on or within a 1.5-Mile Band around Fermi 2 Property

Site Number	Period/Description	Location	NRHP Status
20MR830	20th century/structural remains (former foundation), cisterns, artifact scatter	On Fermi property	Recommended not eligible[a]
20MR831	20th century/structural remains (poured concrete pads), artifact scatter	On Fermi property	Recommended not eligible[a]
20MR832	20th century/structural remains (former foundation), artifact scatter	On Fermi property	Recommended not eligible[a]
20MR833	20th century/structural remains (former foundation), cistern	On Fermi property	Recommended not eligible[a]
20MR834	20th century/structural remains (former foundation, poured concrete pad), well pipe	On Fermi property	Recommended not eligible[a]
The *Adieu* shipwreck	Maritime archaeological resource: A steamer yacht that foundered on September 16, 1906. Reported in shallow water; unknown if raised, but materials likely remain.	Offsite, but within 1.5-mile band (Lake Erie)	More information needed[d]
The *Fame* shipwreck	Maritime archaeological resource: A schooner loaded with general cargo that capsized and foundered off of the Monroe Piers on August 31, 1858. Raised and renamed the *Lively* in 1860, but materials likely remain.	Offsite, but (approximately) within 1.5-mile band (Lake Erie)	More information needed[d]

Table 3.7-2 (Continued)
Known Archaeological Sites on or within a 1.5-Mile Band around Fermi 2 Property

Site Number	Period/Description	Location	NRHP Status
The *Roy* shipwreck	Maritime archaeological resource: A tug that struck ice and sank southeast of Stony Point on December 16, 1895	Offsite, but within 1.5-mile band (Lake Erie)	More information needed[(d)]
The *General Franz Sigel* shipwreck	Maritime archaeological resource: A schooner that sank off of River Raisin in July 1903	Offsite, but within 1.5-mile band (Lake Erie)	More information needed[(d)]

a. 2012 Phase I CCRG recommendations (SHPO concurrence pending) (Demeter et al. 2012).
b. NRHP status as recorded on OSA files (Demeter et al. 2012; OSA 2012).
c. NRHP determinations in response to 2007–2008 CCRG investigations (Conway 2009; Demeter et al. 2012; OSA 2012).
d. (GLMD 2013; Harrison 2013; Toledo Blade 2001; Weir 2010; Weir et al. 2011). The Harrison 2013 contributions are the result of consultation comments dated July 5, 2013, and are included in Attachment C.



(DTE 2013j; National Atlas 2012; NRCAN 2013; USCB 2012d; USDOT 2012)

Legend

- Fermi 2
- 1.5-Mile Band
- 10-Mile Band
- Surface Water
- Municipality
- Frenchtown Township
- County
- State
- Property Boundary (Approximate)
- Interstate
- U.S. Route
- State Highway
- Road

0 3 6 Miles

Figure 3.7-1
Fermi Property/Archaeological APE, 1.5-Mile Band, and 10-Mile Band/ Aboveground APE

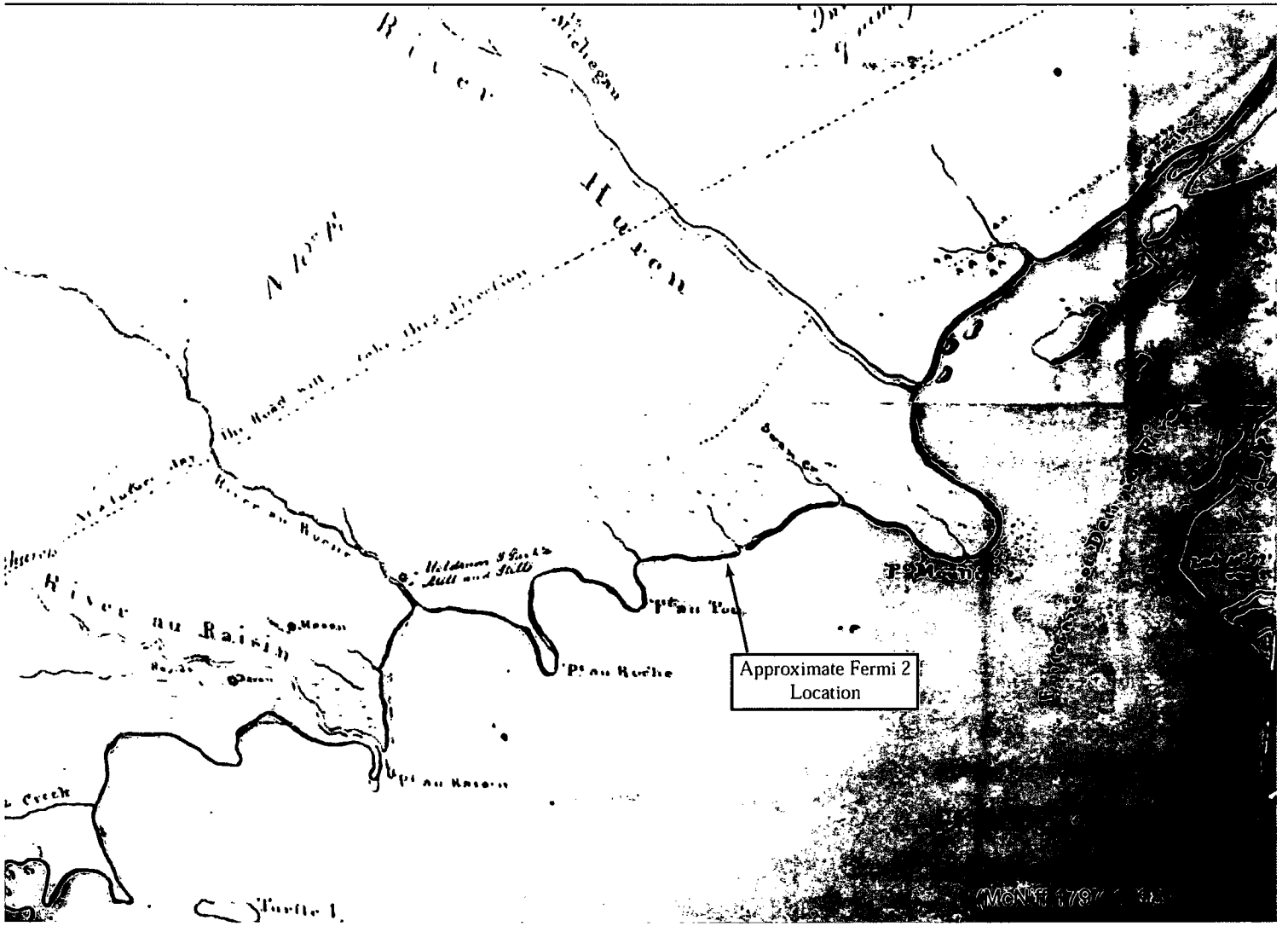


Figure 3.7-2
1797–1798 Map of Future Fermi Site and Vicinity

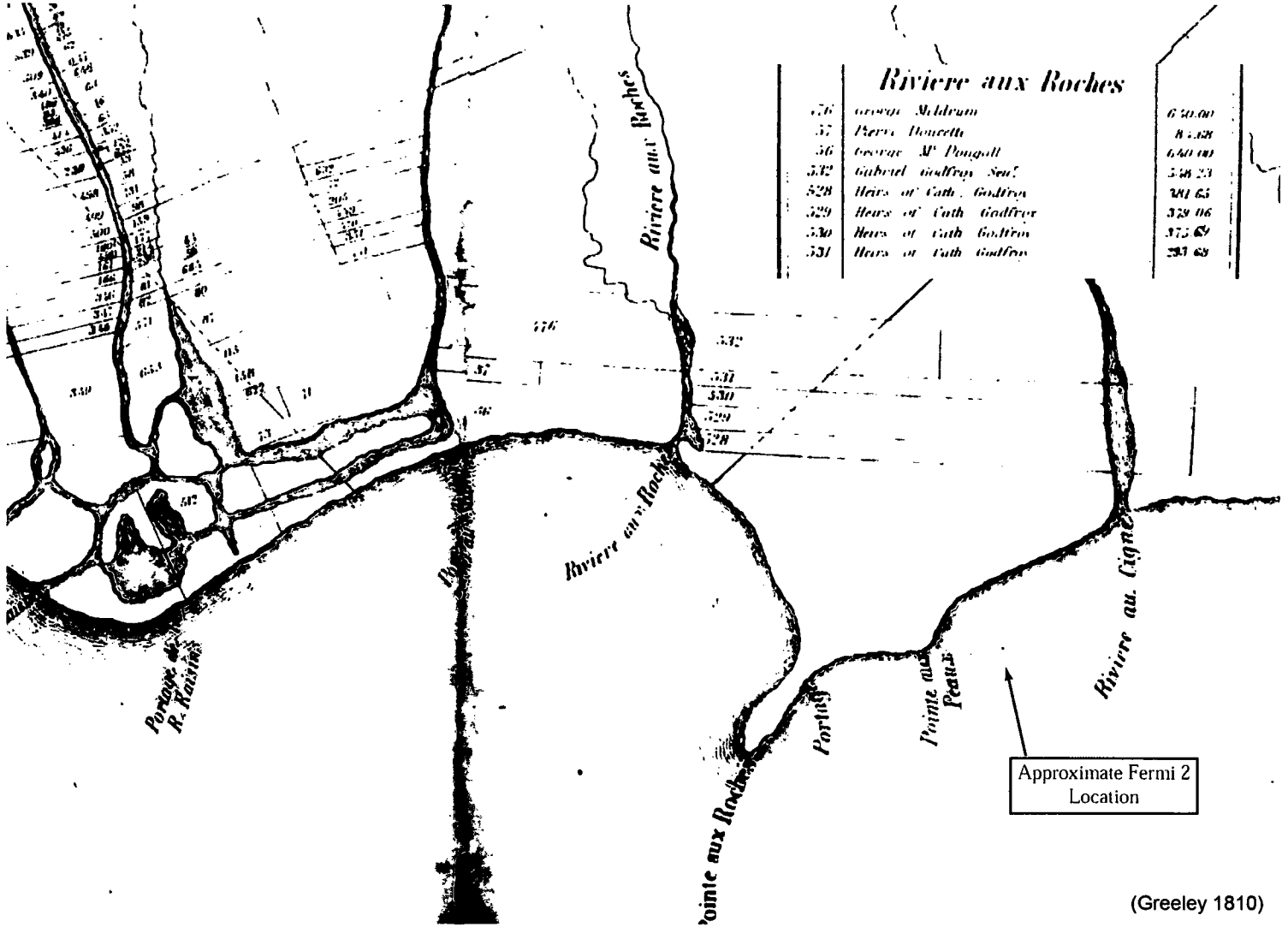


Figure 3.7-3
1810 Map of Future Fermi Property and Vicinity

Figure 3.7-4
1838 Map of Future Fermi Site and Vicinity

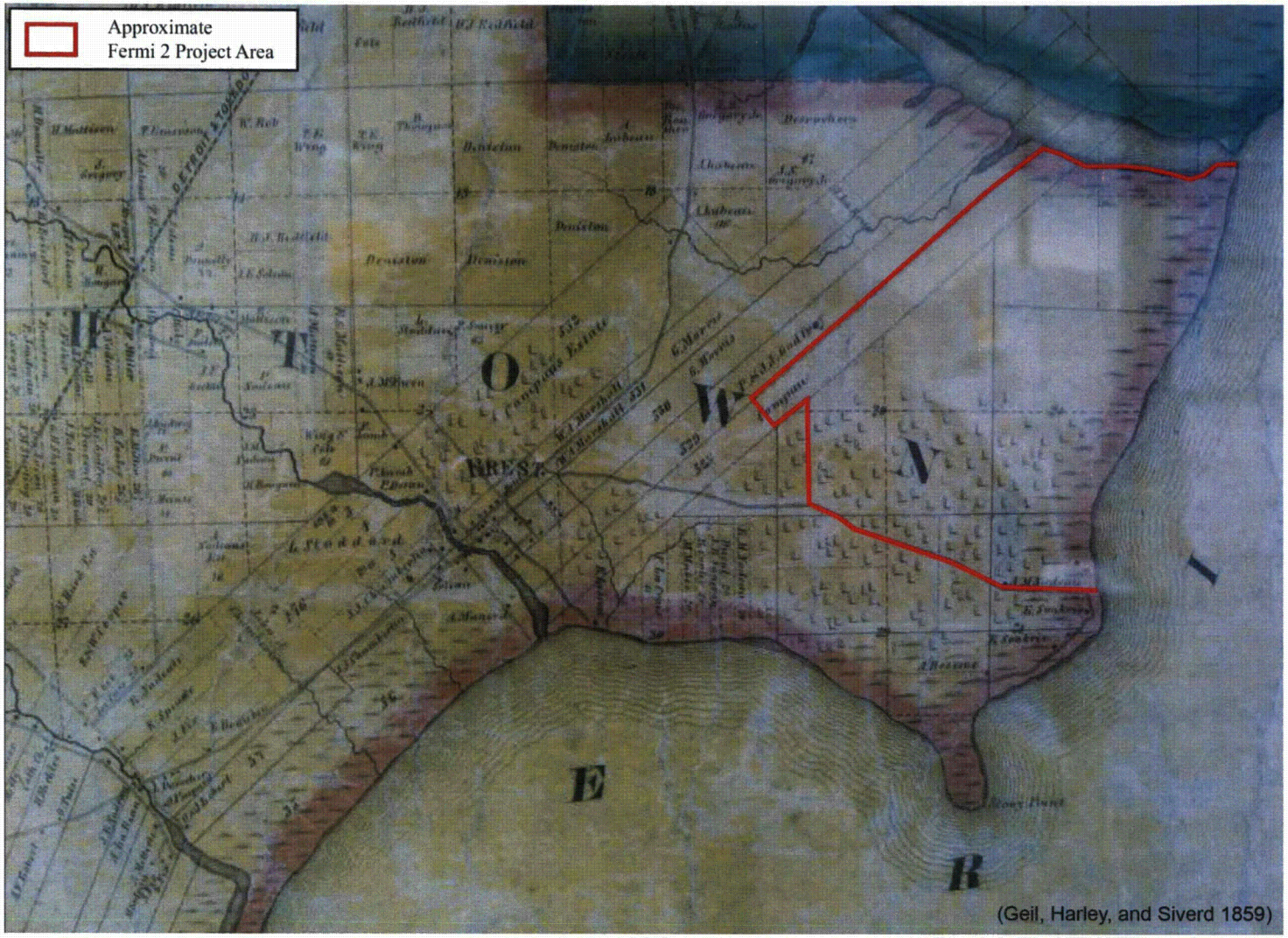


Figure 3.7-5
1859 Map of Future Fermi Site and Vicinity

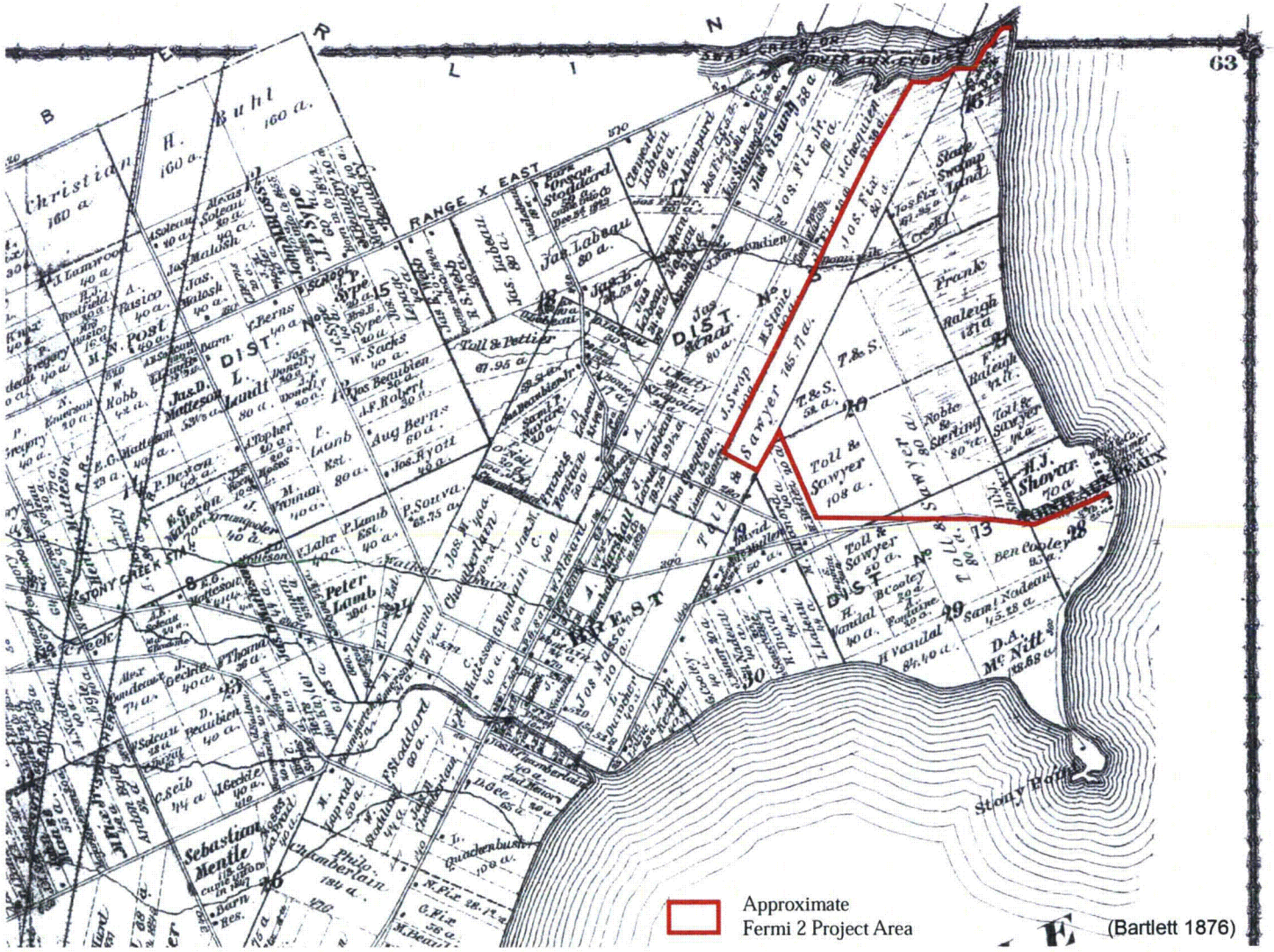
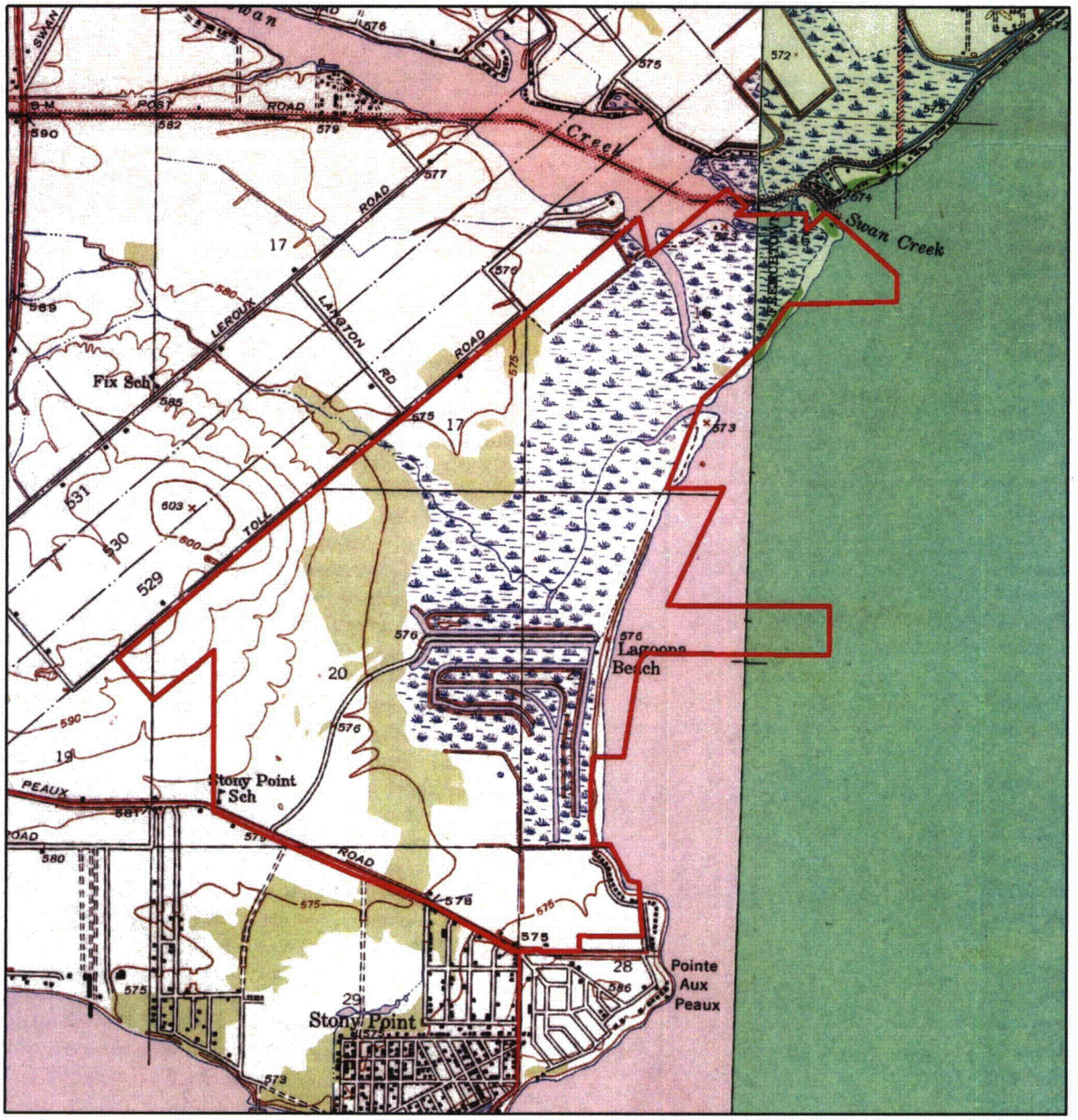


Figure 3.7-6
1876 Map of Future Fermi Site and Vicinity



(DTE 2013j; USGS 1942a; USGS 1942b)

Legend

Property Boundary (Approximate)

N
W E
S

0 0.5 1 Miles

Figure 3.7-7
1942 Map of Future Fermi Site and Vicinity

(Demeter et al. 2012; DTE 2013j)

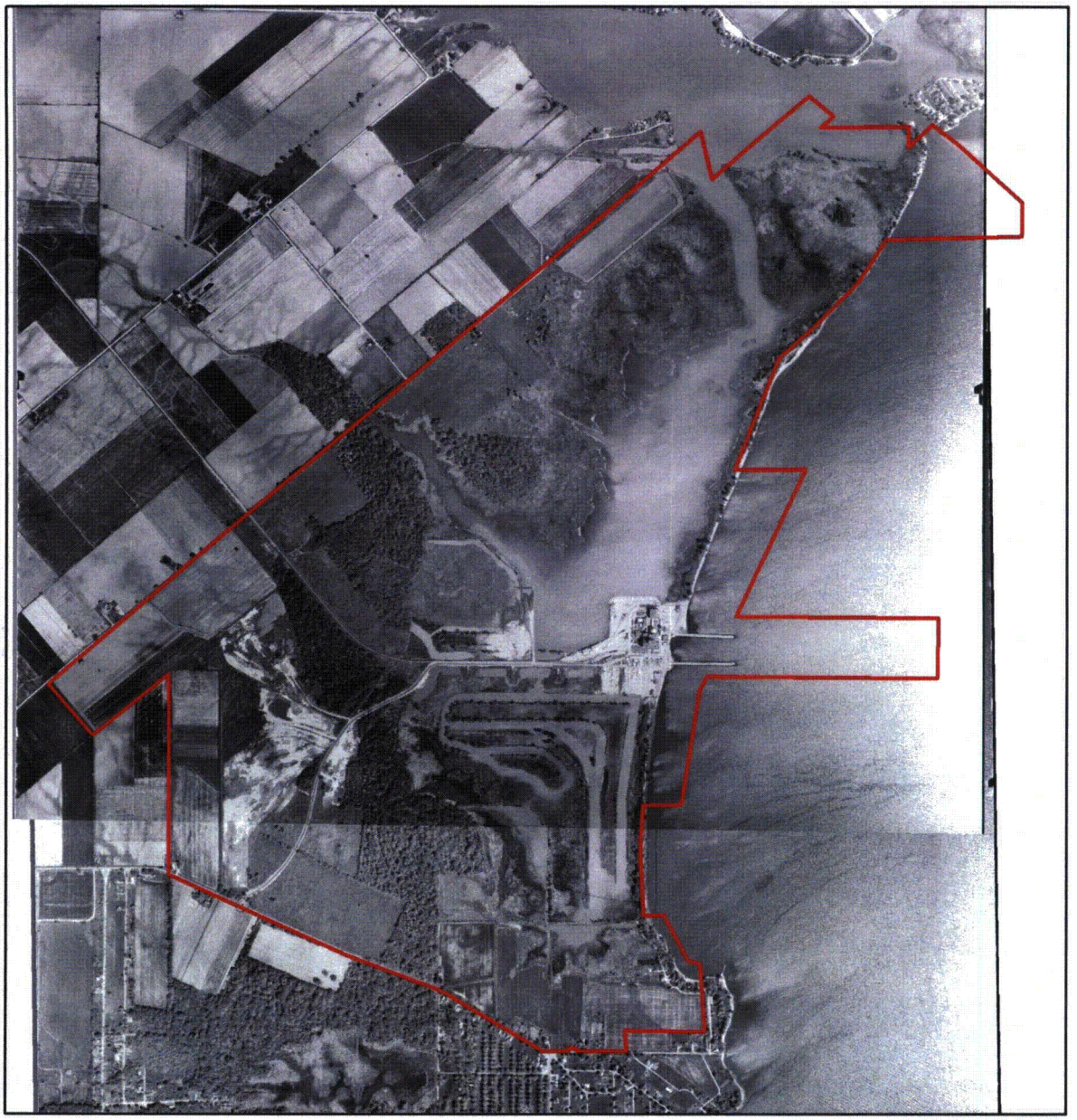
Legend

Property Boundary (Approximate)

N
W E
S

0 0.4 0.8 Miles

Figure 3.7-8
1949 Aerial Photograph of Future Fermi Site and Vicinity



(Demeter et al. 2012; DTE 2013j)

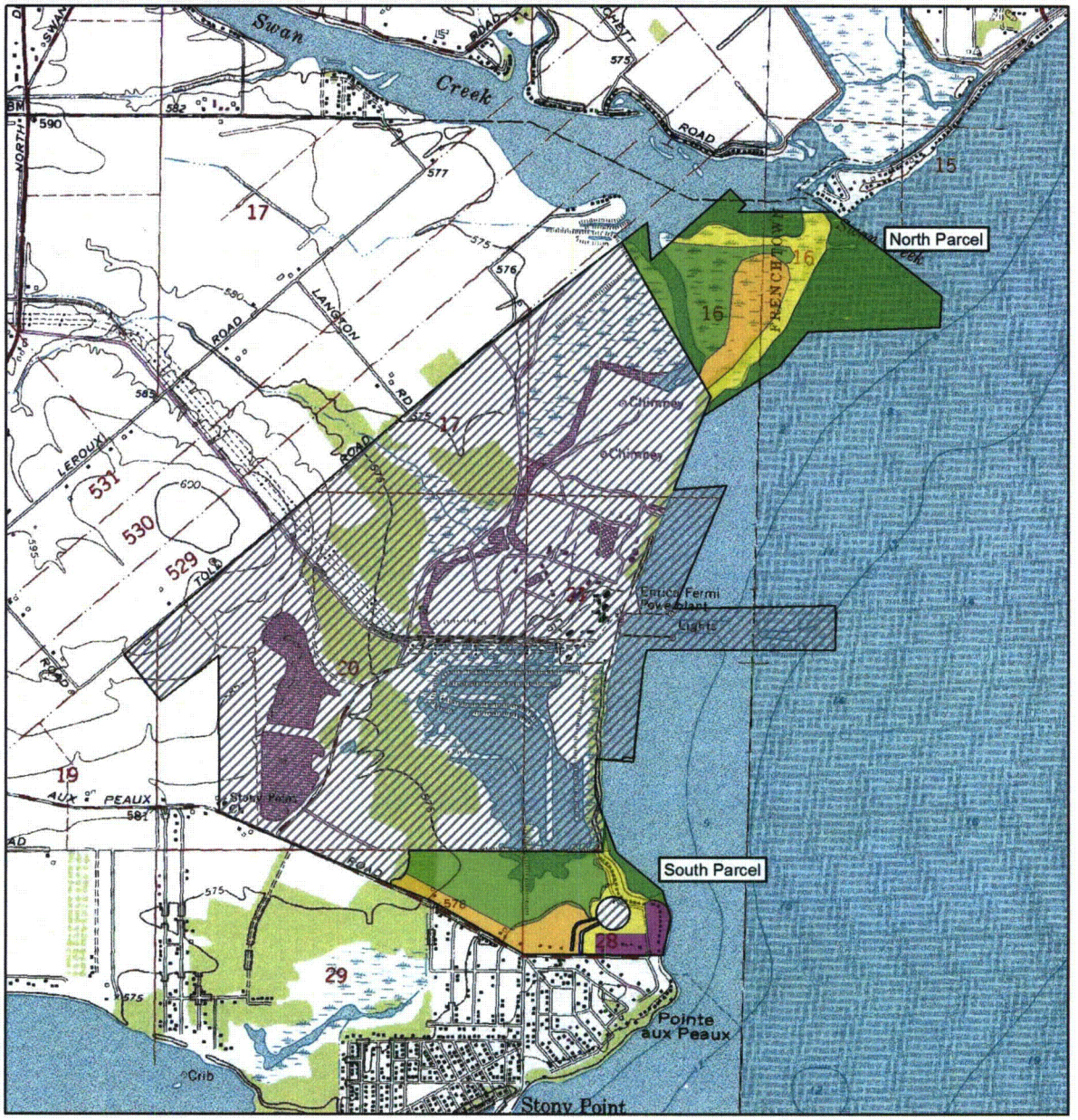
Legend

Property Boundary (Approximate)

N
W E
S

0 0.4 0.8 Miles

Figure 3.7-9
1961 Aerial Photograph of Fermi Property and Vicinity



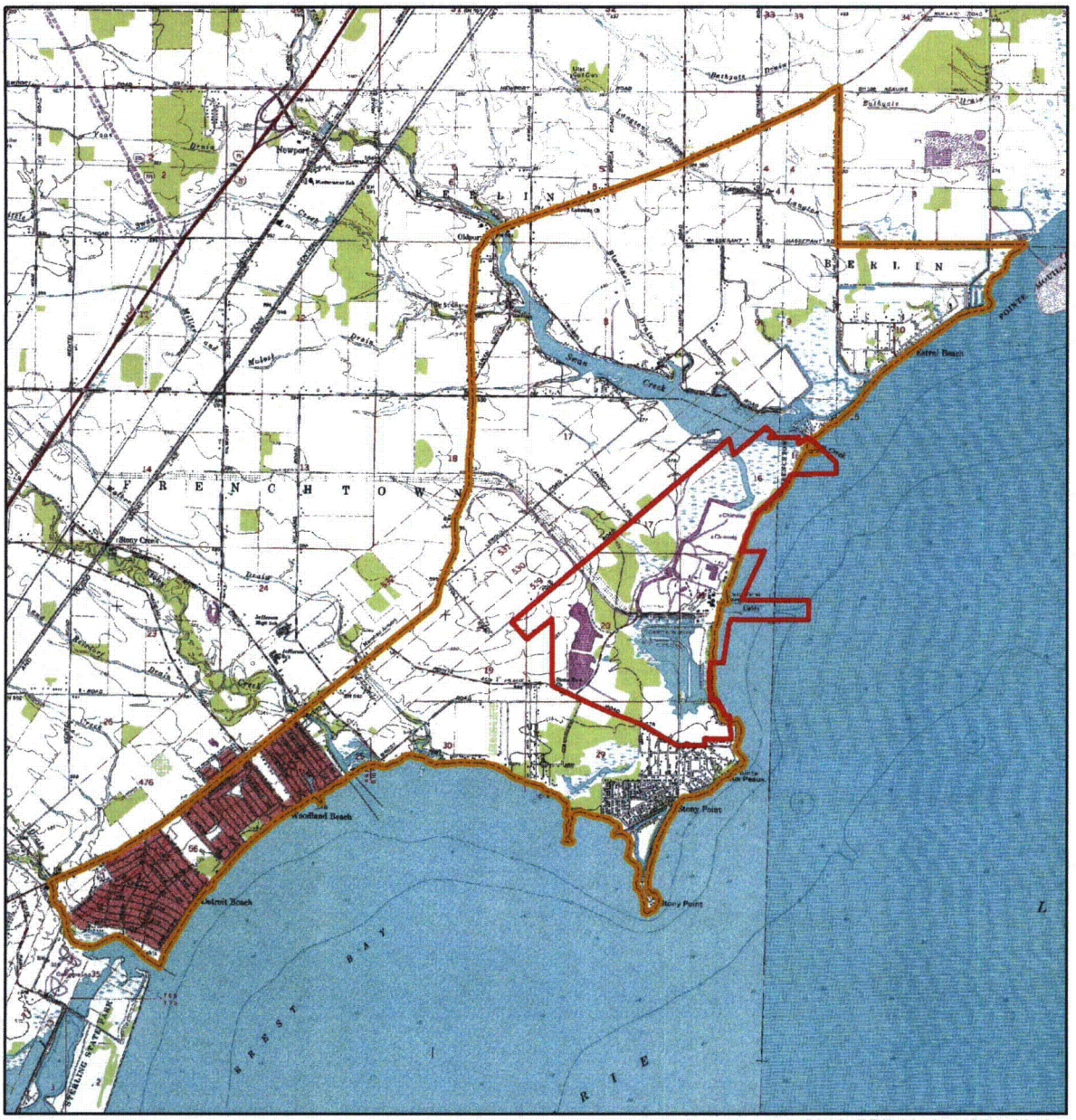
(Demeter et al. 2012; USDA 2012a; USGS 1967a; USGS 1967b)

- Previously Surveyed
- Pedestrian Survey
- Pedestrian and Shovel Test
- Wet
- No Access

N
W E
S

0 0.5 1 Miles

Figure 3.7-10
CCRG 2012 Archaeological Survey Methods for Previously Unsurveyed Parcels



(Demeter et al. 2012; DTE 2013j; USDA 2012a; USGS 1967a; USGS 1967b)

Legend

- 2007-2008 CCRG Aboveground Field Survey Area
- Property Boundary (Approximate)

N
W E
S

0 1 2 Miles

Figure 3.7-11
CCRG 2007–2008 Aboveground Resources Field Survey Area Relative to Fermi Property Boundary

3.8 Socioeconomics

As of 2012, approximately 78 percent of the 889 Fermi 2 full-time workers are located in Monroe and Wayne counties in Michigan. Of these, 526 workers, or approximately 59 percent, reside in Monroe County and 167 workers, or approximately 19 percent, live in Wayne County. Remaining workers live in the surrounding region and other states, as presented in Table 2.5-1. As described in Section 2.5, refueling outages occur on an 18-month cycle and historically have lasted approximately 42 days, on average. During outages, there are typically an additional 1,400 to 1,500 contractor employees on site. A number of motel and restaurant conveniences are located in the city of Monroe along I-75. Both the Detroit and Toledo metropolitan areas are located within a 50-mile radius of Fermi 2 and have additional services that support workers during refueling outages. There are also nine public and private campgrounds located throughout Monroe County, with 1,355 modern and primitive campsites available. (MCRP 2008)

3.8.1 Employment and Income

The two counties most influenced by Fermi 2 operations are Monroe and Wayne counties, because approximately 78 percent of Fermi 2 employees live in these two counties, and because Fermi 2 pays property taxes to Monroe County. As discussed in Section 3.10, Monroe County's population is expected to increase during the license renewal period, whereas Wayne County's population is expected to decline. Low-income populations and poverty thresholds for these two counties are described in Section 3.10.

The estimated employed population of Monroe County in 2011 was 53,641 persons, with no particular occupation sector showing employment dominance. The leading occupation was the retail trade sector, with 11.7 percent, or approximately 6,270 persons employed. This was closely followed by government and government enterprises sector with 10.7 percent, or 5,750 persons employed; and health care and social assistance sector with 10.4 percent, or approximately 5,580 persons employed. (BEA 2012) The largest employer in Monroe County, as of 2005, was Automotive Components Holdings Inc., followed by DTE Energy, Mercy Memorial Hospital, and Monroe Public Schools (Monroe County 2012). The annual payroll in Monroe County was reported to be approximately $5.4 billion in 2011, and average wage per job was $42,683 (BEA 2012). In 2011, per capita personal income was $35,647 and the annual unemployment rate decreased from 12.4 percent in 2010 to 9.7 percent in 2011 (BEA 2012; BLS 2012). SEMCOG projects that employment in Monroe County will grow by 14.2 percent between the years 2010 and 2040 (SEMCOG 2012b).

The estimated employed population in Wayne County in 2011 was 887,308 persons. The leading occupation was the health care and social assistance sector with 15.5 percent, or approximately 137,669 persons employed. This was closely followed by the government and government enterprises sector with 11.7 percent, or approximately 103,574 persons employed, and the retail trade sector with approximately 9.0 percent, or 79,644 persons employed. (BEA 2012) A listing of the largest employers was unavailable for Wayne County. In 2012, the City of Detroit was the largest employer in Detroit, followed by Detroit Public Schools, the Detroit Medical Center, Henry Ford Health System, and the U.S. government (DEGC 2012). The annual

payroll in Wayne County was approximately $61.3 billion in 2011, and average wage per job was $52,436 (BEA 2012). In 2011, per capita personal income was $34,012 and the annual unemployment rate decreased from 14.8 percent in 2010 to 12.6 percent in 2011 (BEA 2012; BLS 2012). SEMCOG projects employment in Wayne County will grow by 4.6 percent between the years 2010 and 2040 (SEMCOG 2012b).

3.8.2 Housing

Between 2000 and 2010, the total population for Monroe County increased by 4 percent (Table 3.10-1). As seen in Table 3.8-1, available housing within Monroe County followed the population growth trend, with an 11.5 percent growth in total housing units and a vacancy rate that increased 2.7 percentage points to 7.5 percent, indicating that enough housing was available even with an increase in county population. (USCB 2012f)

As described in Section 3.1, Wayne County and the city of Detroit experienced a significant decline in both population and jobs during the recent multi-year recession. Between 2000 and 2010, the total population in Wayne County decreased by 11.7 percent, from 2,061,162 to 1,820,584 (Table 3.10-1). Due to the out-migration of population in Wayne County, the number of vacant housing units increased by 106.1 percent for this same period, which resulted in an increase in the vacancy rate from 7 percent to 14.5 percent (Table 3.8-1). The total number of housing units declined by 0.5 percent during this period, reducing the number of total available housing units to 821,693. (USCB 2012f)

Between 2000 and 2010, median home values for Monroe County grew by 11.7 percent, whereas Wayne County saw a 10 percent decline in median home values for the same time period. Both Monroe County and Wayne County experienced an increase in monthly rental rates, with Monroe County rentals growing by 37.9 percent and Wayne County rentals increasing 43 percent. (USCB 2012f)

Wayne County has been in the process of reversing the decline of neighborhoods and housing values by addressing the numerous abandoned and foreclosed properties scattered across the County. In 2009, Wayne County received $25.9 million in funding through HUD's Neighborhood Stabilization Program to place properties back into productive use. The county received an additional $7.8 million in HUD funding in 2011 and is slated to continue the program through 2014. (Wayne County 2012) In 2011, Wayne County issued 955 residential building permits (single-family, condominium, and apartments) while 2,705 structures were demolished, for a net loss of 1,750 housing units. (SEMCOG 2012c) In 2011, Monroe County issued 123 new residential building permits and demolished 63 structures, for a net gain of 60 new housing units (SEMCOG 2012c).

3.8.3 Water Supply and Wastewater

Several municipal water suppliers provide water to residents of Monroe County, including the City of Monroe; Frenchtown Charter Township; City of Toledo, Ohio; and the Detroit Water and Sewage District (DWSD). Residents outside areas supported by these municipal supplies obtain water through private wells. (NRC 2013c, Section 2.5.2.6)

The City of Monroe pumps and treats water from Lake Erie. It operates a joint intake and pumping facility with Frenchtown Charter Township. The city's water treatment and distribution system serves the city of Monroe and portions of the surrounding townships, including Monroe Charter, Raisinville, Exeter, Ida, and London. In addition, the City of Monroe supplies water in bulk to the village of Dundee and the city of Petersburg, serving an estimated population of 53,000 residents. The City of Monroe treatment plant has a treatment capacity of 18 MGD. The average daily and maximum daily water demands for the service area provided by the City of Monroe treatment plant were 7.8 MGD and 10.9 MGD, respectively, in 2005. (NRC 2013c, Section 2.5.2.6)

Frenchtown Charter Township shares the water intake with the City of Monroe and operates a water treatment plant that services approximately 20,000 residents and other nonresidential customers within the township. Frenchtown Charter Township also provides the potable water supply for the Fermi plant site. 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 to 8 MGD in 2006, which was projected to be sufficient for a minimum of 20 years. (NRC 2013c, Section 2.5.2.6)

The city of Milan in Monroe County has its own water treatment plant, drawing from groundwater wells located within the city limits. The plant has a 2.0 MGD capacity and treats an average daily demand of 1.2 MGD. (NRC 2013c, Section 2.5.2.6)

The southern portion of Monroe County, including Bedford, Erie, and LaSalle townships, and the city of Luna Pier receive water supplies from the City of Toledo, Ohio, water treatment and distribution system. This includes two facilities that are part of the Collins Park Treatment Plant, one with an 80-MGD treatment capacity and a second with a 40-MGD treatment capacity. In 2009, the average daily demand was 73 MGD, and the maximum daily demand was 104 MGD. (NRC 2013c, Section 2.5.2.6)

Northern portions of Monroe County, including Ash Township, Berlin Township, and the villages of Carleton, Estral Beach, and South Rockwood receive water supplies directly through DWSD. The DWSD maintains three intake facilities that draw water from Lake Huron and the Detroit River and five water treatment plants. The total capacity of the treatment plants is approximately 1,720 MGD. The average daily and maximum daily water demands in 2009 were 622 MGD and 794 MGD, respectively. (NRC 2013c, Section 2.5.2.6)

Wastewater treatment services are provided by a number of townships and municipalities in Monroe County which service residential, commercial, and industrial customers within the city of Monroe; in Frenchtown Charter, Monroe Charter, Raisinville, Bedford, Berlin, Ida, York, LaSalle and Ash townships; in the cities of Milan, Petersburg and Luna Pier, and in the villages of Dundee, Carleton, and Maybee. Other residents within the county are served by private, onsite wastewater disposal systems. (NRC 2013c, Section 2.5.2.6)

The Monroe Metropolitan Water Pollution Control System serves approximately 52,000 residents within the city of Monroe, large portions of Monroe Charter and Frenchtown Charter townships, and a small portion of Raisinville Township. The plant has a design capacity of 24 MGD and

average daily flow of 16 MGD, for an available capacity of about 34 percent during normal flow periods. During heavy rain events, the treatment plant can be overloaded from excessive stormwater and groundwater. The maximum daily flow that has occurred is 67 MGD. (NRC 2013c, Section 2.5.2.6)

3.8.4 Community Services and Education

Monroe County has 13 public school districts. Based on the 2010–2011 school year, there were 60 schools in the county with 26,230 students. Monroe Public Schools has the largest enrollment with 6,446 students and 10 schools, and a student/teacher ratio of 20.84. The second-largest school district is Bedford Public Schools with 5,055 students and 7 schools, with a student/ teacher ratio of 19.41. Monroe County also has 13 private schools with an additional 2,038 students. (NCES 2012) There are 34 school districts in Wayne County communities serving approximately 236,000 students. Additionally, there are 109 public school academies serving approximately 60,000 students for a combined total of approximately 296,000 students in public schools county-wide. (RESA 2012) There are also 115 private schools in Wayne County that served approximately 21,818 students in the 2009–2010 school year. Scattered throughout the counties in a 50-mile radius are 11 public 2-year and 4-year higher education institutions. Monroe County is served by the Monroe County Community College. (NCES 2012)

Police jurisdictions operating in Monroe County include the City of Monroe Police Department, Monroe County Sheriff, and Michigan State Police. Municipal jurisdictions including the cities of Luna Pier and Milan, the villages of Carleton and South Rockwood, and Erie Township also maintain police departments. In 2009, Monroe County had 277 law enforcement personnel, serving an estimated population of 152,021. The ratio of law enforcement personnel per 1,000 residents was 1.8 in 2010. Neighboring Wayne County had 6,957 law enforcement personnel, serving a population of 1,820,584. The ratio of law enforcement personnel per 1,000 residents was 3.8 in 2010. (NRC 2013c, Section 2.5.2.6, Table 5-19)

Twenty-one jurisdictions within Monroe County have fire response services, primarily staffed by volunteer firefighters (NRC 2013c, Section 2.5.2.6, Table 5-19). In 2010, the City of Monroe combined the police and fire departments into a public safety division to utilize police officers as public safety officers. The primary goal of this process was to improve the City's ability to adequately respond to fire incidents due to reductions in fire department staffing levels that had occurred since 2005. The City of Monroe currently employs 12 fire personnel plus the fire chief. In total, the city of Monroe now has 45 personnel trained in fire suppression. (City of Monroe 2013) The Frenchtown Charter Township Department has a staff of 33 firefighters.

The largest fire departments in the region are in the city of Detroit, which has 48 stations and a staff of 1,738. In 2010, Monroe County had 606 fire protection service personnel, serving an estimated population of 152,021. The ratio of firefighters per 1,000 residents was 4.0 in 2010. In 2010, Wayne County had 3,407 fire protection service personnel, serving an estimated population of 1,820,584. The ratio of firefighters per 1,000 residents was 1.9 in 2010. (NRC 2013c, Section 2.5.2.6, Table 5-19)

Mercy Memorial Hospital is staffed by 235 full-time physicians and 1,100 full-time equivalent staff members and is the primary healthcare facility in Monroe County. It is also the primary treatment facility for any injury at the Fermi plant. There are 238 licensed beds in the hospital, and the daily average number of inpatients in 2010 was approximately 169. Thirty-two hospitals are located in Wayne County, 17 of which are located in the city of Detroit. In 2008, Monroe Metropolitan Statistical Area had 2,770 health care workers, serving a population of 152,021 in Monroe County. The ratio of healthcare workers per 1,000 residents was 18.2. Detroit-Livonia-Dearborn Metropolitan Division had 69,030 health care workers, serving a population of 4,296,250. The ratio of workers per 1,000 residents was 16.1 in 2010. (NRC 2013c, Section 2.5.2.6, Table 5-19)

3.8.5 Local Government Revenues

All Michigan sales tax payments are remitted to the state. There are no additional local, city, or county sales taxes. Fermi 2 property taxes are paid to Frenchtown Township, Monroe County, Michigan. The property taxes paid for Fermi 2 for the years of 2007 through 2011 are listed in Table 3.8-2. For the 5 years reported, Fermi 2 has paid $96,266,707 in total property taxes. As shown in Table 3.8-2, tax payment amounts for the reported years fluctuated from year to year, with a considerable decrease in 2009 followed by a noted increase in 2010. This was due in part to an order issued by the Michigan State Tax Commission in December 2008 that changed the classification of nuclear fuel from real property to industrial personal property. This classification change meant that nuclear fuel was no longer subject to the school millage rate (i.e., 24 mils), which resulted in a refund for the 2008 tax year. This refund was provided to DTE in the form of three equal installments from 2009 to 2011. Additionally, the value of nuclear fuel decreases each year, and because there were no additions in nuclear fuel in 2009, the taxes for that year decreased. In 2010, however, the tax payments increased due to a refueling that increased the value subject to the new tax order. (DTE 2012f)

The 2011 tax payments associated with Fermi 2 were distributed in accordance with the Frenchtown Charter Township millage spread (tax rates per $1,000 of taxable value) detailed in Table 3.8-3. Fermi 2 is subject to the non-homestead (NH) millage rates listed. A listing of millage totals by district is presented in Table 3.8-4. (DTE 2012f) Property tax bills are prepared by the Frenchtown Charter Township by July 1st and December 1st. The summer tax bill includes state education tax millage and Monroe County allocated operating millage. The winter tax bill includes revenues for the Monroe County Community College, Monroe County Intermediate Schools, Monroe County seniors, Lake Erie Transportation, additional voted school millage, local township operations and, when applicable, the Resort Authority. At the end of the winter tax season, the Frenchtown Charter Township reaches a settlement with the Monroe County Treasurer and provides their appropriate apportionment. (FCT 2012b)

Fermi 2 is located within the Jefferson Resort School District and, in 2011, paid approximately 47.8428 mils in total property tax payments (Table 3.8-5). Of that amount, 6.8041 mils (14.2 percent) went to Frenchtown Township, 13.5387 mils (28.3 percent) went to Monroe County (Monroe Intermediate School District, Monroe County Library, and Monroe County Community College), approximately 24.5 mils (51.2 percent) went to the school district, and the

remaining 3 mils (6.3 percent) went to the Resort Authority. Of the 24.5 mils portioned to the school district, 6 mils were divided and sent to the State of Michigan. (DTE 2012f)

3.8.6 Transportation

The region within a 50-mile radius of the Fermi site has a highly developed roadway network (Figures 3.0-3 and 3.0-5). I-75, which extends through Monroe County and Frenchtown Charter Township, is 2 miles west of the Fermi site and provides access from the Fermi site north to Detroit and south to Toledo. I-275 splits from I-75 north of the Fermi site and continues a northwesterly direction, providing a western bypass around the Detroit metropolitan area, and access to Detroit Metropolitan Wayne County Airport, western Wayne County, and Oakland County. It connects to I-94 and I-96, which are the primary Michigan east-west interstates. (NRC 2013c, Section 2.5.2.3)

The main entrance to the site is at Enrico Fermi Drive, which connects to N. Dixie Highway after crossing Toll Road and Leroux Road. N. Dixie Highway links the site to local communities north and south and connects to many other key local and regional highways. To the south, N. Dixie Highway provides access to I-75 at an interchange approximately 6.2 miles southwest of the site. It also intersects Nadeau Road south of the site, which provides another interchange with I-75 approximately 6 miles west of the site. To the north, N. Dixie Highway intersects with Swan Creek Road, which has an interchange with I-75 approximately 6 miles to the northwest of the Fermi site. (NRC 2013c, Section 2.5.2.3)

The average daily traffic (ADT) volume for local roadways near the site is listed in Table 3.8-6. Most of the roads in the area, excluding I-75 and N. Dixie Highway, are low-volume roads, with an ADT of fewer than 5,000 vehicles per day. These traffic volumes are generally below the capacity of the roads. (NRC 2013c, Section 2.5.2.3)

In 2009, DTE performed a level of service (LOS) and traffic count analysis for the intersections of these roadways during the peak traffic periods associated with the arrival and departure of Fermi 2 workers during normal operations and outage conditions. 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 in Table 3.8-7. 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 roadway(s). Table 3.8-8 provides the LOS at local intersections during the morning and afternoon commutes to and from the Fermi plant site (Figure 3.0-3). All intersections in the immediate vicinity of the Fermi plant site operated at acceptable LOSs. The study identified deficiencies at three intersections associated with the I-75 interchanges (NRC 2013c, Section 2.5.2.3):

- Northbound I-75 ramp, left turn to westbound Nadeau Road.
- Northbound I-75 ramp, left turn to westbound Swan Creek Road.
- Southbound I-75 ramp, northbound approach at Swan Creek Road.

The study determined that beyond the immediate vicinity at Fermi 2, traffic associated with the Fermi workforce would not be distinguishable from the ADT volumes on major community routes, such as I-75. (NRC 2013c, Section 2.5.2.3) The Michigan Department of Transportation does not have an updated ADT count that includes the roads described above (MDOT 2012).

3.8.7 Recreational Facilities

As shown in Figure 3.0-4, the nearest designated recreational areas within a 6-mile radius are the beaches at Stony Point and Estral Beach. Nearby state recreational areas include Pointe Mouille State Game Area, Pointe Aux Peaux State Wildlife Area, and Sterling State Park. Stony Point and Estral Beach have no camping facilities and are located on the shore of Lake Erie. Along with Lake Erie beach access, Stony Point has a playground and basketball court. (MCRP 2008)

Pointe Aux Peaux State Wildlife Area (182 acres) and Pointe Mouillee State Game Area (7,709 acres) have been dedicated by the State of Michigan for wildlife conservation and management. Recreational uses included at state game and wildlife areas include hunting and wildlife viewing. (MDNR 2012b; MDNR 2012c) Sterling State Park, located on the shoreline of Lake Erie, is a 1,300-acre facility with 256 camp sites available, and offers 1 mile of beach access, boating, fishing, and 6 miles of biking, cross country ski and hiking trails. (MCRP 2008; MDNR 2012d)

Established in 2001, the DRIWR is the first international refuge in North America and includes individual management units consisting of islands, coastal wetlands, marshes, shoals, and riverfront lands scattered along 48 miles of the Detroit River and western Lake Erie (Figure 3.0-6). The top priority for the DRIWR is acquiring land for conservation and the benefit of future generations. Public access is currently limited. Special use permits are required for entry to all DRIWR units with public access. The Lagoona Beach Unit of the DRIWR located at the Fermi 2 site does not allow public access. Public access to DRIWR units is restricted, with the exception of public use open houses and hunting activities in units covered by the Refuge Hunting Plan. DTE clears planned work in the Lagoona Beach Unit with the USFWS prior to proceeding. (USFWS 2012e)

The River Raisin National Battlefield Park, located in Monroe County, is also under federal control. Located approximately 7 miles from the Fermi site, it is a recent addition to the national park system. The park and visitor center were previously operated by the Monroe County Historical Society and the Monroe County Historical Commission. The River Raisin Battlefield Visitor Center, a remembrance to the largest battle fought in the state of Michigan during the War of 1812, and the Custer Home, which was purchased by General Custer and his brother, are also tourist attractions. (NRC 2013c, Section 2.5.2.11)

No visitation information specific to the recreational sites found within a 6-mile radius was available. The USFWS estimates that statewide, during 2006, 756,000 people (aged 16 and over) hunted in Michigan, more than 1.4 million people (aged 16 and over) fished, and almost 3.2 million people participated in wildlife viewing. (MDNR 2012e)

Table 3.8-1
Monroe and Wayne County Housing Statistics, 2000–2010

County	2000	2010	2000–2010 Change
Monroe			
Total housing units	56,471	62,971	11.5% increase
Occupied units	53,772	58,230	8.3% increase
Vacant units	2,699	4,741	75.7% increase
Vacancy rate (percent)	4.8	7.5	56.3% increase
Median house value ($)	132,000	147,400	11.7% increase
Median rent ($/month)	549	757	37.9% increase
Wayne			
Total housing units	826,145	821,693	0.5% decrease
Occupied units	768,440	702,749	8.5% decrease
Vacant units	57,705	118,944	106.1% increase
Vacancy rate (percent)	7.0	14.5	107.1% increase
Median house value ($)	99,400	89,500	10.0% decrease
Median rent ($/month)	530	758	43.0% increase

(USCB 2012f)

Table 3.8-2
Fermi 2 Property Tax Distributions 2007–2011

Year	Plant Property Taxes	Nuclear Fuel Property Taxes	Total Property Taxes
2007	$17,806,833	$1,251,114	$19,057,947
2008	$17,754,010	$1,615,155	$19,369,165
2009	$17,901,418	$182,717	$18,084,135
2010	$18,370,895	$1,595,989	$19,966,884
2011	$18,402,570	$1,386,006	$19,788,576
Five-Year Total	**$90,235,726**	**$6,030,981**	**$96,266,707**

(DTE 2012f)

Table 3.8-3
2011 Frenchtown Charter Township Millage Spread

Tax District	Amount[a]	Tax District	H[b]	NH[c]
County	**Winter Levy**	**(01) Monroe Schools Winter**		
Senior Citizen	0.5000	Operating	0.0000	18.0000
Fairview	0.2000	Building & Site	1.0000	1.0000
Veterans	0.0500	**Total Monroe Schools**	**1.0000**	**19.0000**
Tourism	0.0600			
Total County	**0.8100**			
Monroe ISD[d]		**(02) Airport Schools Winter**		
Technology Enhancement	0.9866	Operating	0.0000	18.0000
Allocated	0.2897	Building & Site	1.0000	1.0000
Voted Operating	3.4778	Debt	0.9000	0.9000
Total ISD	**4.7541**	**Total Airport Schools**	**1.9000**	**19.9000**
Monroe County Community College		**(08) Jefferson Schools Winter**		
Allocated	1.2108	Operating	0.0000	18.0000
Operating	0.9686	Rec Millage	0.5000	0.5000
Total MCCC	**2.1794**	**Total Jefferson Schools**	**0.5000**	**18.5000**
Monroe County Library	**1.0000**	**Resort Authority**	**3.0000**	**3.0000**
Frenchtown Township		**Summer Millage**		
Operating	2.7166	County	4.7952	4.7952
Water Debt	1.5000	State Education	6.0000	6.0000
Lake Erie Transit	0.5875	**Summer Total**	**10.7952**	**10.7952**
Fire Department	2.0000			
Total FT Township	**6.8041**			
Annual W/O School or Resort	**15.5476**			

(DTE 2012f)

a. 1.0000 (1 Mill) = $1.00 per $1,000.00 of taxable value.
b. H = Homestead (e.g., residential).
c. NH = Non-homestead. NH millage rates apply to Fermi 2.
d. ISD = Intermediate School District.

Table 3.8-4
2011 Frenchtown Charter Township Millage Totals by District

Totals By District	Winter PRE[a]	Winter Non-PRE[a]	Summer All	Annual PRE[a]	Annual Non-PRE[a]	Annual Industrial Personal[b]	Annual Commercial Personal[c]
Monroe Schools	16.5476	34.5476	10.7952	27.3428	45.3428	21.3428	33.3428
Airport Schools	17.4476	35.4476	10.7952	28.2428	46.2428	22.2428	34.2428
Jefferson Schools	16.0476	34.0476	10.7952	26.8428	44.8428	20.8428	32.8428
Jefferson Resort District	19.0476	37.0476	10.7952	29.8428	47.8428	23.8428	35.8428

(DTE 2012f)

a. PRE = principal residences exemption.
b. Industrial personal is exempt from 18 school operating mills and six state education mills.
c. Commercial personal is exempt from 12 school operating mills.

Table 3.8-5
2011 Property Tax Distribution Associated with Fermi 2

Jurisdiction	Total (Mils)	Percent of Total
Frenchtown Charter Township	6.8041	14.2
Monroe County	13.5387	28.3
Jefferson Resort School District	24.5000	51.2
Resort Authority	3.0000	6.3
Total	**47.8428**	100.0

(DTE 2012f)

Table 3.8-6
Existing Average Daily Traffic Volumes on Local Roadways, 2009

Roadway	Weekday ADT	Weekend ADT
I-75, I-275 to Newport/Swan Creek Road	31,200	(a)
I-75, N. Dixie Highway to Nadeau Road	16,800	(a)
N. Dixie Highway, I-75 to Nadeau Road	12,700	(a)
N. Dixie Highway, Stony Creek to Pointe Aux Peaux	8,494	7,219
N. Dixie Highway, south of Enrico Fermi Drive	4,307	(a)
Nadeau Road	5,300	(a)
Pointe Aux Peaux Road	4,110	3,766
Swan Creek Road	4,300	(a)
Enrico Fermi Drive	2,378	611
Post Road, east of N. Dixie Highway	275	260
Leroux Road	124	125

(NRC 2013c, Section 2.5.2.3).

a. ADT volumes were not collected during the weekend for these roadways.

Table 3.8-7
Level of Service Designations

Level of Service	Definition
Intersections with Signals	
A	Acceptable: little or no delay, few vehicles stopped at intersection
B	Acceptable: short traffic delays, progression is still good
C	Acceptable: average traffic delays, many vehicles go through intersection without stopping, but a significant amount are stopped
D	Acceptable (marginal): long traffic delays unfavorable progression, more vehicles stopped at intersection, individual cycles may fail
E	Moderately deficient: very long traffic delays, individual cycles frequently fail
F	Deficient: extreme traffic delays, over-saturation
Intersections with no Signals	
A	Acceptable: primarily free flow
B	Acceptable: reasonably free flow
C	Acceptable: stable flow
D	Acceptable (marginal): marginal congestion
E	Moderate deficient: unstable congestion
F	Deficient: very congested

(NRC 2013c, Section 2.5.2.3)

Table 3.8-8
Existing Level of Service in 2009 on Area Roadway Intersections during Peak Morning and Afternoon Workforce Commutes

Intersection	Approach/Movement	LOS Peak	
		Morning	Afternoon
Northbound I-75 ramps and Dixie Highway	Northbound ramp	C	C
	N. Dixie Hwy/eastbound	A	A
	N. Dixie Hwy/westbound	A	A
Northbound I-75 ramps and Nadeau Road	Northbound ramp/left turn	F	D
	Northbound ramp/right turn	Free[a]	Free[a]
	Nadeau Rd/eastbound/thru/left turn	A	A
	Nadeau Rd/westbound	Free[a]	Free[a]
Northbound I-75 ramps and Swan Creek Road	Northbound ramp/left turn	D	E
	Northbound ramp/right turn	B	B
	Swan Creek Rd/southeast-bound	Free[a]	Free[a]
	Swan Creek Rd/northwest-bound	A	A
Southbound I-75 ramps and Swan Creek Road/Newport Road	Southbound ramp (northbound approach)	C	E
	Newport Rd/northwest-bound	A	A
	Newport Rd/southeast-bound	A	A
	Swan Creek Rd/eastbound	A	D
North Dixie Highway and Stony Creek Road	Stony Creek Rd/eastbound	C	C
	N. Dixie Hwy/northbound	A	A
	N. Dixie Hwy/southbound	Free[a]	Free[a]
North Dixie Highway and Pointe Aux Peaux Road	N. Dixie Hwy/northeast-bound	B	B
	N. Dixie Hwy/southwest-bound	A	C
	Pointe Aux Peaux Rd/northwest-bound	B	B
North Dixie Highway and Leroux Road	Leroux Rd/southwest-bound	B	B
	N. Dixie Hwy/northbound	Free[a]	Free[a]
	N. Dixie Hwy/southbound	A	A

Table 3.8-8 (Continued)
Existing Level of Service in 2009 on Area Roadway Intersections during Peak Morning and Afternoon Workforce Commutes

Intersection	Approach/Movement	LOS Peak	
		Morning	Afternoon
North Dixie Highway and Enrico Fermi Drive	N. Dixie Hwy/northbound	A	A
	N. Dixie Hwy/southbound	A	B
	Enrico Fermi Dr/westbound	C	B
North Dixie Highway and Post Road	Post Rd/eastbound	C	C
	Post Rd/westbound	B	B
	N. Dixie Hwy/northbound	A	A
	N. Dixie Hwy/southbound	B	A
Enrico Fermi Drive and Leroux Road	Leroux Rd/northeast-bound	B	A
	Leroux Rd/southwest-bound	A	A
	Enrico Fermi Dr/southeast/northwest	Free[a]	Free[a]

(NRC 2013c, Section 2.5.2.3)

a. Free flow.

3.9 Human Health

3.9.1 Radiological Hazards

As discussed in Section 2.3, no license-renewal-related refurbishment activities have been identified. Therefore, there would be no license-renewal-related refurbishment radiological impacts.

The NRC reviewed occupational exposure for all nuclear power reactors in NUREG-0713, indicating that the average collective exposure for BWRs in 2011 was 142 person-rem (NRC 2013d, page iii). The 3-year average collective exposure for Fermi 2 workers for the period of 2009–2011 was 106 person-rem (NRC 2013d, Table 4.5). Fermi 2's occupational exposure is within the bounds of exposure for BWRs.

Moreover, recent exposure measurement demonstrates that Fermi 2 workers' occupational exposure is well within regulatory limits. In 2011, a non-refueling year, the total collective exposure was approximately 24 total effective dose equivalent (TEDE) person-rem, with no worker having measurable exposure more than 0.5 rem (DTE 2013w), well below the occupational dose limit of 5 rem/year [10 CFR Part 20].

As discussed in Section 9.1.3.7.2, liquid and gaseous radioactive effluents are monitored as required by the Fermi 2 ODCM. The last time that a liquid effluent radwaste discharge occurred at Fermi 2 was in 1994. Based on monitoring conducted over the previous 5 years (2008–2012), all site boundary doses and dose rates, and all doses to members of the public due to effluent releases, were within the limits specified by the ODCM, 10 CFR Part 20, 40 CFR Part 190, and Appendix I to 10 CFR Part 50. As discussed in Section 9.1.3.7.3, the results of the REMP also indicate no significant or measurable radiological impact attributable to Fermi 2 operations.

3.9.2 Microbiological Hazards

Thermal discharges from Fermi 2 into the circulating water system and Lake Erie have the potential to increase the growth of thermophilic microorganisms. The types of organisms of concern for public and occupational health include enteric pathogens (such as *Salmonella spp.*, *Shigella spp.*, and *Pseudomonas aeruginosa*), thermophilic fungi, bacteria (such as *Legionella spp.*), and free-living amoeba (such as *Naegleria fowleri* and *Acanthamoeba spp.*). These microorganisms could give rise to potentially serious human health concerns, particularly at high exposure levels. (NRC 2013c, Section 2.10.1.3) Of greatest concern is *Naegleria fowleri*, which has been determined to be pathogenic in humans. (NRC 2013a, Section 4.9)

As discussed in Section 2.2.2.3, blowdown water from the Fermi 2 circulating water reservoir is discharged to Lake Erie via an onshore discharge structure at the edge of the vegetation along the lake shore. Exiting the discharge structure, the blowdown water flows east down a gentle riprap-protected slope into the lake. The average heated discharge flow is very small compared with the volume of Lake Erie water in the vicinity of Fermi 2; the temperature of the discharge water is typically about 18°F higher than that of the intake water. There are no temperature limits established in the NPDES permit for this discharge other than daily reporting.

Fermi 2's heated effluent discharge mixes with large volumes of ambient lake waters where there is limited opportunity for rapid growth and population increases of thermophilic microorganisms. The heated effluent from Fermi 2 discharges into a restricted industrial area not used for recreation activities, such as boating, swimming, diving, and other water sports. Diseases caused by thermophilic microorganisms associated with warm waters are typically contracted via nasal passageway contact with contaminated water (NRC 2013b, Section 3.9.3.3). Therefore, there is a very limited chance that people on the shoreline or engaging in water sports would contact the warm water that could support thermophilic microorganisms (NRC 2013c, Section 5.8.1).

Based on available data assembled by the U.S. Centers for Disease Control and Prevention (CDC) for the years 2000–2008, *Legionellosis*, *Salmonellosis*, or *Shigallosis* outbreaks that occurred in Michigan were within the range of national trends in terms of cases per 100,000 population or total cases per year, and the outbreaks were associated with pools, spas, or lakes. (NRC 2013c, Section 2.10.1.3) Based on conversation with the Monroe County Health Department, there have been no reported waterborne disease outbreaks in Monroe County going back to 2008 (MCHD 2013).

The Lake Erie Lakewide Management Plan has designated the drinking water use of Lake Erie as unimpaired (DECo 2011, Section 5.3.4.1.1). The closest potable water intakes utilizing water from Lake Erie are the Frenchtown Township and Monroe water intakes approximately 2 miles south of the Fermi site, which draw water approximately 2,000 feet and 6,000 feet offshore through two separate intake lines. Either or both intakes can be utilized to supply water to Frenchtown Township or Monroe. There are no streams, ponds, or other small water resources influenced by the Fermi 2 thermal discharge, thus eliminating the potential for heated effluent retention which might lead to increased abundance of thermophilic etiological agents (DECo 2011, Section 5.3.4.1). In addition, there are no regulatory or NPDES permitting requirements that impose thermophilic monitoring in relation to the Fermi 2 thermal discharge.

It should be noted that there are 23 reactor sites that fit the category of plants whose discharge into cooling ponds, lakes, canals, or small rivers may enhance the presence of thermophilic organisms. (NRC 2013b, Section 3.9.3.4) All 23 plants are listed in Tables 5.18 and 5.19 of the 1996 GEIS. Fermi 2 is not listed as a plant in this category.

3.9.3 Electric Shock Hazards

The transmission lines that currently connect Fermi 2 to the regional electrical distribution grid and which would remain energized only if the plant's operating license were renewed are identified and discussed in Section 2.2.10.1. These in-scope lines are entirely within the Fermi 2 owner-controlled area and span industrial areas within the plant. In addition, there is no associated ROW with these lines because they span industrial areas only.

The greatest hazard from a transmission line is direct electrical contact with the conductors. The electrical contact can occur without physical contact between a grounded object and the conductor (e.g., when arcing occurs across an air gap). The electrical field created by a high-voltage line extends from the energized conductors to other conducting objects, such as the

ground, vegetation, buildings, vehicles, and persons. Potential field effects can include induced currents, steady-state current shocks, spark-discharge shocks, and in some cases, field perception and neurobehavioral responses. (NRC 2013b, Section 3.9.5.2)

The National Electric Safety Code (NESC) contains the basic provisions considered necessary for the safety of employees and the public under the specified conditions. Design criteria that limit hazards from steady-state currents are based on the NESC, which requires that utility companies design transmission lines so that the short-circuit current to ground produced from the largest anticipated vehicle or object is limited to less than 5 milliamperes (mA). (NRC 2013b, Section 3.9.5.2).

As stated above, the lines considered in scope are entirely within the Fermi 2 owner-controlled area. The public does not have access to this area; therefore, no induced shock hazards would exist for the public.

In addition, MIOSHA governs the occupational safety and health of Fermi 2 operations staff. As discussed in Section 2.2.10.6, all electric shock hazards, including those from induced current shock, are managed by DTE in compliance with MIOSHA occupational health and safety requirements to protect onsite workers. Also as discussed in Section 2.2.10.6, Fermi 2 controls all electric shock hazards within the plant in compliance with MIOSHA requirements (Fermi 2008b; Fermi 2009b).

Specifically, as it relates to transmission lines and acute shock hazards, Fermi 2 has measures in place to limit the potential for workers to receive an "induced" current from an object becoming capacitively charged.

3.10 Environmental Justice

3.10.1 Regional Population

NUREG-1437, the GEIS, presents a population characterization method based on two factors: "sparseness" and "proximity" (NRC 1996, Section C.1.4). "Sparseness" measures population density and city size within 20 miles of a site and categorizes the demographic information as follows.

Demographic Categories Based on Sparseness

		Category
Most sparse	1.	Less than 40 persons per square mile and no community with 25,000 or more persons within 20 miles.
	2.	40 to 60 persons per square mile and no community with 25,000 or more persons within 20 miles.
	3.	60 to 120 persons per square mile or less than 60 persons per square mile with at least one community with 25,000 or more persons within 20 miles.
Least sparse	4.	Greater than or equal to 120 persons per square mile within 20 miles.

(NRC 1996)

"Proximity" measures population density and city size within 50 miles and categorizes the demographic information as follows.

Demographic Categories Based on Proximity

		Category
Not close proximity	1.	No city with 100,000 or more persons and less than 50 persons per square mile within 50 miles.
	2.	No city with 100,000 or more persons and between 50 and 190 persons per square mile within 50 miles.
	3.	One or more cities with 100,000 or more persons and less than 190 persons per square mile within 50 miles.
Close proximity	4.	Greater than or equal to 190 persons per square mile within 50 miles.

(NRC 1996)

The GEIS then uses the following matrix to rank the population in the vicinity of the plant as low, medium, or high.

GEIS Sparseness and Proximity Matrix

Sparseness	Proximity 1	2	3	4
1	1.1	1.2	1.3	1.4
2	2.1	2.2	2.3	2.4
3	3.1	3.2	3.3	3.4
4	4.1	4.2	4.3	4.4

Low Population Area | Medium Population Area | High Population Area

(NRC 1996)

The 2010 census population and TIGER/Line data from the U.S. Census Bureau (USCB) were used to determine demographic characteristics in the vicinity of the site. The data were processed at the state, county, and census block levels using ArcGIS (USCB 2010a; USCB 2010b). Census data include people living in group quarters such as institutionalized and non-institutionalized populations. Examples of institutional populations living in group quarters are correctional institutions (i.e., prisons, jails, and detention centers), nursing homes, mental (psychiatric) hospitals, hospitals or wards for the chronically ill, and juvenile institutions. Examples of non-institutional populations living in group quarters are group homes, college dormitories, military quarters, soup kitchens, shelters for abused women (shelters against domestic violence or family crisis centers), and shelters for children who are runaways, neglected, or without conventional housing.

The 2010 census data indicate that approximately 434,209 people live within a 20-mile radius of the Fermi site, which equates to a population density of 346 persons per square mile (USCB 2010a; USCB 2010b). According to the GEIS sparseness index, the site is classified as Category 4, least sparse, with greater than or equal to 120 persons per square mile within 20 miles.

The 2010 census data indicate that approximately 5,176,563 people live within a 50-mile radius of the site, which equates to a population density of 659 persons per square mile (USCB 2010a;

USCB 2010b). There are five cities in the region that have a population greater than 100,000 residents (Table 3.10-1) (USCB 2012c). According to the GEIS proximity index, the site is classified as Category 4, greater than or equal to 190 persons per square mile within 50 miles.

According to the GEIS sparseness and proximity matrix, the combination of "sparseness" Category 4 and "proximity" Category 4 results in the conclusion that the site is located in a "high" population area.

The area within the region (50-mile radius of the site) totally or partially includes 17 counties from two states (Michigan and Ohio) as well as a small portion of Ontario, Canada (see Table 3.10-2). According to the 2010 census, the permanent population (not including transient populations) of the entire 17 counties was approximately 5,839,295 (Table 3.10-2). (USCB 2012a) The 2011 Canadian Census reported that Ontario's population was 12,851,821. Taking the average annual difference between the 2006 and 2011 Canadian Census counts, the 2010 population is calculated to be 12,713,513 (Table 3.10-2). (Statistics Canada 2012a) By 2045, the end of the proposed license renewal period, the permanent population (not including transient populations) of the entire 17 counties is projected to be approximately 6,151,814 (BTP 2012; PRSPO 2011; Statistics Canada 2012a; USCB 2012a). Ontario's expected population is projected to be 20,809,780 (Statistics Canada 2012a). Based on 2010–2045 population projections, an annual growth rate of approximately 1.42 percent is anticipated for the permanent population in Ontario and 0.13 percent for the 17 counties wholly or partially within the 50-mile region (BTP 2012; PRSPO 2011; Statistics Canada 2012a; USCB 2012a).

The total population (including transient populations) of the entire 17 counties, which are totally or partially included within a 50-mile radius, is projected to be approximately 6,476,833 in 2045. Ontario's 2045 total population is expected to be 22,868,450. The total population (including transient populations) within a 50-mile radius is projected to be only 6,055,850 in 2045. (BTP 2012; DKSA 2010; Longwoods 2012; OMTC 2009; PRSPO 2011; Statistics Canada 2012a; USCB 2012a)

The latest permanent population projections were obtained from the following sources:

- *Ohio County Indicators June 2011* from the Ohio Department of Development, Policy Research and Strategic Planning Office (PRSPO 2011)
- *The Economic and Demographic Outlook for Michigan through 2040* from the Michigan Department of Transportation, Bureau of Transportation Planning (BTP 2012)
- *Population Projections for Canada, Provinces and Territories 2009 to 2036* from Statistics Canada (Statistics Canada 2012a)

Michigan and Ohio projection data were based on the 2000 census counts and have been adjusted using the 2010 census counts. The Canadian projections are based on 2006 population counts adjusted using July 2009 estimates.

County-level permanent population values for the counties included in the region and Ontario are shown in Table 3.10-2. Transient data for Canada, Michigan, and Ohio were obtained from state and national sources (DKSA 2010; Longwoods 2012; OMTC 2009).

Fermi 2 is located in rural Monroe County. The population of Monroe County, Michigan, as reported in the 2010 census was 152,021 (USCB 2012a). Based on Michigan's projected data set (Table 3.10-3), Monroe County's projected population for 2045 is expected to be 166,782 (BTP 2012). The average projected annual growth rate for this period is 0.25 percent.

Estimated projected populations and average annual growth rates for Monroe and Wayne counties are shown in Table 3.10-3 (BTP 2012; USCB 2012a). Because Wayne County's population is expected to decline, its population value was held at the 2010 value to be conservative.

Cities and towns with centers falling within a 50-mile radius are listed in Table 3.10-1. The town nearest to Fermi 2 with a census-reported population is Estral Beach. Its 2010 population was reported at 418 residents (USCB 2012c). Monroe, Michigan, the largest city in Monroe County, had a 2010 population of 20,733 residents (USDOT 2012; USCB 2012c). Five cities within a 50-mile radius have a population greater than 100,000: Ann Arbor, Michigan (32 miles); Detroit, Michigan (28 miles); Sterling Heights, Michigan (44 miles); Toledo, Ohio (26 miles); and Warren, Michigan (37 miles). These cities have a 2010 population of 113,934; 713,777; 129,699; 287,208; and 134,056 residents, respectively. A total of 30 cities within a 50-mile radius have a population greater than 25,000. (USCB 2012c)

3.10.1.1 Migrant Labor

Migrant labor, or migrant worker, is defined by the USDA as "a farm worker whose employment required travel that prevented the migrant worker from returning to his/her permanent place of residence the same day." In 2007, Monroe County reported that 222 out of 1,119 total farms employed farm labor. Approximately 33 of these farms reported employing migrant farm workers. To the north, Wayne County reported that 86 out of 313 total farms employed farm labor. Of these, nine farms employed migrant farm workers. For these two counties, a total of 2,748 farm laborers were hired, of which 1,636 were reported to work fewer than 150 days per year. The largest use of hired farm labor was in Monroe County, with 1,854 total workers hired, of which 1,035 worked fewer than 150 days per year. Wayne County had a total of 894 workers hired, of which 601 worked fewer than 150 days per year. (USDA 2012b)

3.10.1.2 Subsistence Consumption

Subsistence refers to the use of natural resources as food for consumption and for ceremonial and traditional cultural purposes, usually by low-income or minority populations. Specific examples of subsistence uses include gathering plants for direct consumption (rather than produced for sale from farming operations), for use as medicine, or in ritual practices. Fishing or hunting activities associated with direct consumption or use in ceremonies, rather than for sport, are other examples.

Determining the presence of subsistence use can be difficult, as data at the county or block group level is aggregated and not usually structured to identify such uses on or near the site, where any potential impacts arising from the continued operation of Fermi 2 would arise. Frequently, the best means of investigating the presence of subsistence use is through dialogue with the local population who are most likely to know of such activity. This may include county officials as well as land owners in the immediate vicinity who would have knowledge of subsistence activity.

As described in the Fermi 3 COL application environmental report, contact was made with the Monroe County sheriff and the superintendent of the Monroe County Intermediate School District. In addition, two local church officials and a local land owner who has farmed more than 200 acres approximately 2 miles from the site for more than 30 years were contacted about subsistence uses. Through discussions with each of these individuals, no populations involved in subsistence use activities (as described above) were identified on or near the site. This is consistent with the controlled access to the Fermi site, and the use of the adjacent land either for farmland or for residences (DECo 2011, Section 2.5.4.2.4).

3.10.2 Minority and Low-Income Populations

3.10.2.1 Background

The NRC performs environmental justice analyses utilizing a 50-mile radius around the plant as the environmental "impact area." LIC-203 Revision 3 defines a geographic area for comparison as the 50-mile radius centered on the nuclear plant. An alternative approach is also addressed that uses the two states included within the 50-mile radius individually for comparative analysis as the "geographic area." Both approaches were used to assess the minority and low-income population criteria for Fermi 2.

NRC guidance suggests using the most recent USCB decennial census data. However, low-income data are collected separately from the decennial census and are available in 5-year averages. The 2010 (low-income) and 2010 (minority) census population data and TIGER/Line data for Michigan and Ohio were obtained from the USCB website and processed using ArcGIS software. Census population data were used to identify the minority and low-income populations within a 50-mile radius of Fermi 2. Environmental justice evaluations for minority and low-income populations are based on the use of U.S. Census block groups for minority and low-income populations.

3.10.2.2 Minority Populations

NRC procedural guidance defines a "minority" population as American Indian or Alaskan Native, Asian, Native Hawaiian or Pacific Islander, Black or African American, other, two or more races, the aggregate of all minority races, Hispanic or Latino ethnicity, and the aggregate of all minority races and Hispanic ethnicity (NRC 2013e, pages D-4 and D-5). The guidance indicates that a minority population is considered present if either of the following conditions exists:

1. The minority population in the census block group exceeds 50 percent; or

2. The minority population percentage is more than 20 percentage points greater in the census block group than the minority percentage of the geographic area chosen for the comparative analysis.

To establish minimum thresholds for each minority category, the non-white minority population total for each state was divided by the total population in the state. This process was repeated with a 50-mile radius total minority population and 50-mile radius total population. As described in the second criterion, 20 percent was added to the minority percentage values for each geographic area. The lower of the two NRC conditions for a minority population was selected as defining a minority area (i.e., census block group minority population exceeds 50 percent, or minority population is more than 20 percent greater than the minority population of the geographic area). Any census block group with a percentage exceeding this value was considered a minority population. Minority percentages for Michigan, Ohio, and a 50-mile radius, along with corresponding thresholds, are shown in Table 3.10-4.

A minority category of "Aggregate of All Races" is created when the populations of all the 2010 U.S. Census minority categories are summed. The 2010 "Aggregate of All Races" category, when compared to the total population, indicates 30.4 percent of the population in a 50-mile radius are minorities. The minority population percentages for Michigan and Ohio are 21.1 and 17.3 percent, respectively (Table 3.10-4). (USCB 2012g) Using the second criterion listed above for identification of a minority population, when a 50-mile radius is used as the geographic area, any census block group with a combined minority population equal to or greater than 50.4 percent would be considered a minority population. Because 50.4 percent exceeds the criterion of 50 percent, the first criterion (50 percent) would be used. The states are evaluated in a similar manner. When the two states are used as the geographic area, any census block group with an "Aggregate of All Races" population exceeding 41.1 percent in Michigan and 37.3 percent in Ohio would be considered a minority population.

Because Hispanic is not considered a race by the USCB, Hispanics are already represented in the census-defined race categories. Because Hispanics can be represented in any race category, some white Hispanics not otherwise considered minorities become classified as a minority when categorized in the "Aggregate and Hispanic" category. Also, Hispanics of non-white racial background are included in both the racial group and the Hispanic group, and thereby counted twice. The "Aggregate and Hispanic" category, however, results in the greatest chance of consideration of populations within a block group to be classified as minority.

The number of census block groups contributing to the minority population count was evaluated using the criteria shown in Table 3.10-4 and summarized in Table 3.10-5. The results of the evaluation are census block groups flagged as having a minority population(s). The resulting maps (Figures 3.10-1, 3.10-2, 3.10-3, 3.10-4, 3.10-5, 3.10-6, 3.10-7, 3.10-8, 3.10-9, 3.10-10, 3.10-11, 3.10-12, 3.10-13, 3.10-14, 3.10-15, 3.10-16, 3.10-17, and 3.10-18) depict the location of minority population census block groups flagged accordingly for each race or aggregate category.

The percentage of census block groups exceeding the "Aggregate of All Races" minority population criterion was 28.6 percent when a 50-mile radius was used and 31.9 percent when each individual state was used as the geographic area. For the "Aggregate and Hispanic" category, 31.4 percent of the census block groups contained a minority population when the region was used, and 33.6 percent of the block groups contained minority populations when each individual state was used. The minority population values of the block groups were significantly reduced when races were analyzed individually. (USCB 2010a; USCB 2010b)

The identified minority population closest to Fermi 2 is located approximately 6.3 miles southwest in census block group 261158318001. The census block group contained a total of 802 people, with 287 "Black or African American," 2 "American Indian," 30 "Other Race," 32 "Two or More Races," and 113 "Hispanic or Latino" individuals. Using the individual state criteria, the block group contains a "Black or African American" population, an "Aggregate of All Races" population, and an "Aggregate and Hispanic" population. The regional criteria identify an "Aggregate and Hispanic" population.

There are no block groups in a 6-mile radius that meet the criteria for a minority population. All but one identified minority population block groups are located in, partially within, or adjacent to cities, municipalities, or USCB-defined urban areas (USCB 2012d). The block group that does not fall within these boundaries is block group 261635894005. This block group has a population of 1,105 with a "Black or African American" population of more than 35 percent (390 individuals). The population of this block group meets the criteria derived using the individual state criteria but does not meet the criteria using the regional criteria. Block groups that meet the minority population criteria are concentrated inside the centers of Detroit and Toledo.

It should be noted that there are no Native American Indian reservations within a 50-mile radius of Fermi 2 (USDA 2012a). In addition, as previously discussed, no minority populations were identified in the vicinity of Fermi 2 during the environmental justice review.

3.10.2.3 Low-Income Populations

NRC guidance defines "low-income" using USCB statistical poverty thresholds for individuals or families (NRC 2013e, page D-5). As addressed above with minority populations, two alternative geographic areas (Michigan and Ohio individually, and the region) were used as the geographic areas for comparison in this analysis.

The guidance indicates that a low-income population is considered present if either of the two following conditions exists:

1. The low-income population in the census block group exceeds 50 percent; or
2. The percentage of households below the poverty level in a block group is significantly greater (typically at least 20 percentage points) than the low-income population percentage of the geographic area chosen for the comparative analysis (i.e., individual state and the region's combined average).

The latest data provided in block group geography corresponding to the low-income population are available from the USCB in the 2006–2010 American Community Survey. To establish minimum thresholds for the individual low-income category, the population with an income below the poverty level for each state was divided by the total population for whom poverty status is determined in the state. To establish minimum thresholds for the family low-income category, the family population count with an income below the poverty level for each state was divided by the total family population count in the state. This process was repeated for the regional population with an income below the poverty level and regional total population for whom poverty status is determined. As described in the second criterion, 20 percent was added to the low income values for individuals and families and each geographic area. None of the geographic areas described in the first criterion exceeded 50 percent.

When the 2006–2010 census data category "income in the past 12 months below poverty level" (individual) is compared to "total population for whom poverty status is determined," 15.3 percent of the population in the region has an individual income below poverty level. In the states of Michigan and Ohio, the percentage of individuals with an income below poverty level is 14.8 percent and 14.2 percent, respectively (Table 3.10-6).

According to the USCB, Michigan and Ohio have an estimated 2,553,979 and 2,983,500 families, respectively. When the 2006–2010 census data family category "income in the past 12 months below poverty level" is compared to "total" family count, 11.1 percent of the families in the region have an income below poverty level. In the states of Michigan and Ohio, the percentage of the family population with an income below poverty level is 10.6 percent and 10.3 percent, respectively (Table 3.10-6). (USCB 2012g)

For example, when Michigan is used as the geographic area, any census block group within the region with a low-income population equal to or greater than 34.8 percent of the total block group population would be considered a "low-income population" (individual). Using the appropriate criteria for each individual state, 693 of the total 4,311 census block groups (16.1 percent) have low-income individual population percentages which meet or exceed the percentages in Table 3.10-6. These census block groups are illustrated in Figure 3.10-19. (USCB 2010b; USCB 2012h)

When the region is used as the geographic area, any census block group within a 50-mile radius with populations of low-income individuals equal to or greater than 35.3 percent of the total block group population would be considered a "low-income population." Using these criteria, 674 of the 4,311 census block groups (15.6 percent) were identified within a 50-mile radius of the site, as shown in Figure 3.10-20. (USCB 2010b; USCB 2012h)

Similarly, these criteria are found using both geographies and family census counts (see Table 3.10-6). Using the family "individual state" and "regional" criteria, 659 and 644 census block groups, respectively, were identified as having low-income families (see Table 3.10-5). These census block groups are illustrated in Figure 3.10-21 and Figure 3.10-22. (USCB 2010b; USCB 2012h)

The closest low-income block group that meets the guidance criteria for individuals or families is located approximately 6.3 miles southwest of the Fermi 2 site, inside the city of Monroe, Michigan. It is Block Group 261158318001, which is the same block group described in detail in Section 3.10.2.2. All of the low-income population block groups are located in, partially within, or adjacent to municipalities or USCB-defined urban areas. (USCB 2010b; USCB 2012h) No low-income populations were identified in the vicinity of Fermi 2 during the environmental justice review.

Table 3.10-1
Cities or Towns Located Totally or Partially within a 50-Mile Radius of Fermi 2

State and City/Town	County	2000 Census Population[a]	2010 Census Population[a]	Distance to Fermi 2 (miles)[b]	Direction
MICHIGAN					
Adrian	Lenawee	21,574	21,133	40	W
Blissfield	Lenawee	3,223	3,340	32	WSW
Britton	Lenawee	699	586	30	W
Clinton	Lenawee	2,293	2,336	37	WNW
Deerfield	Lenawee	1,005	898	27	W
Onsted	Lenawee	813	917	48	W
Tecumseh	Lenawee	8,574	8,521	35	W
Brighton	Livingston	6,701	7,444	47	NNW
Pinckney	Livingston	2,141	2,427	49	NW
Center Line	Macomb	8,531	8,257	38	NNE
Eastpointe	Macomb	34,077	32,442	38	NNE
Fraser	Macomb	15,297	14,480	43	NNE
Mount Clemens	Macomb	17,312	16,314	48	NNE
Roseville	Macomb	48,129	47,299	40	NNE
Saint Clair Shores	Macomb	63,096	59,715	41	NNE
Sterling Heights	Macomb	124,471	129,699	44	NNE
Utica	Macomb	4,577	4,757	47	NNE
Warren	Macomb	138,247	134,056	37	NNE
Carleton	Monroe	2,562	2,345	9	NW
Dundee	Monroe	3,522	3,957	21	W
Estral Beach	Monroe	486	418	2	NE
Luna Pier	Monroe	1,483	1,436	14	SW
Maybee	Monroe	505	562	14	WNW
Monroe	Monroe	22,076	20,733	8	WSW

Table 3.10-1 (Continued)
Cities or Towns Located Totally or Partially within a 50-Mile Radius of Fermi 2

State and City/Town	County	2000 Census Population[a]	2010 Census Population[a]	Distance to Fermi 2 (miles)[b]	Direction
Petersburg	Monroe	1,157	1,146	24	W
South Rockwood	Monroe	1,284	1,675	7	N
Auburn Hills	Oakland	19,837	21,412	50	N
Berkley	Oakland	15,531	14,970	37	N
Beverly Hills	Oakland	10,437	10,267	39	N
Bingham Farms	Oakland	1,030	1,111	38	N
Birmingham	Oakland	19,291	20,103	40	N
Bloomfield Hills	Oakland	3,940	3,869	43	N
Clawson	Oakland	12,732	11,825	40	N
Farmington	Oakland	10,423	10,372	35	N
Farmington Hills	Oakland	82,111	79,740	37	N
Ferndale	Oakland	22,105	19,900	35	NNE
Franklin	Oakland	2,937	3,150	39	N
Hazel Park	Oakland	18,963	16,422	35	NNE
Huntington Woods	Oakland	6,151	6,238	36	N
Keego Harbor	Oakland	2,769	2,970	45	N
Lathrup Village	Oakland	4,236	4,075	37	N
Madison Heights	Oakland	31,101	29,694	37	NNE
Milford	Oakland	6,272	6,175	47	NNW
Novi	Oakland	47,386	55,224	37	NNW
Oak Park	Oakland	29,793	29,319	34	N
Pleasant Ridge	Oakland	2,594	2,526	36	N
Pontiac	Oakland	66,337	59,515	47	N
Rochester	Oakland	10,467	12,711	50	N

Table 3.10-1 (Continued)
Cities or Towns Located Totally or Partially within a 50-Mile Radius of Fermi 2

State and City/Town	County	2000 Census Population[a]	2010 Census Population[a]	Distance to Fermi 2 (miles)[b]	Direction
Rochester Hills	Oakland	68,825	70,995	48	N
Royal Oak	Oakland	60,062	57,236	37	N
South Lyon	Oakland	10,036	11,327	40	NNW
Southfield	Oakland	78,296	71,739	35	N
Sylvan Lake	Oakland	1,735	1,720	45	N
Troy	Oakland	80,959	80,980	45	N
Walled Lake	Oakland	6,713	6,999	41	NNW
Wixom	Oakland	13,263	13,498	41	NNW
Wolverine Lake	Oakland	4,415	4,312	42	NNW
Ann Arbor	Washtenaw	114,024	113,934	32	NW
Barton Hills	Washtenaw	335	294	36	NW
Chelsea	Washtenaw	4,398	4,944	46	NW
Dexter	Washtenaw	2,338	4,067	41	NW
Manchester	Washtenaw	2,160	2,091	42	WNW
Milan	Washtenaw	4,775	5,836	23	WNW
Saline	Washtenaw	8,034	8,810	30	WNW
Ypsilanti	Washtenaw	22,362	19,435	26	NW
Allen Park	Wayne	29,376	28,210	20	N
Belleville	Wayne	3,997	3,991	20	NNW
Dearborn	Wayne	97,775	98,153	25	N
Dearborn Heights	Wayne	58,264	57,774	26	N
Detroit	Wayne	951,270	713,777	28	NNE
Ecorse	Wayne	11,229	9,512	20	NNE
Flat Rock	Wayne	8,488	9,878	9	N
Garden City	Wayne	30,047	27,692	25	N

Table 3.10-1 (Continued)
Cities or Towns Located Totally or Partially within a 50-Mile Radius of Fermi 2

State and City/Town	County	2000 Census Population[a]	2010 Census Population[a]	Distance to Fermi 2 (miles)[b]	Direction
Gibraltar	Wayne	4,264	4,656	10	NNE
Grosse Pointe	Wayne	5,670	5,421	34	NNE
Grosse Pointe Farms	Wayne	9,764	9,479	36	NNE
Grosse Pointe Park	Wayne	12,443	11,555	33	NNE
Grosse Pointe Shores	Wayne	2,823	–	38	NNE
Grosse Pointe Woods	Wayne	17,080	16,135	38	NNE
Hamtramck	Wayne	22,976	22,423	32	NNE
Harper Woods	Wayne	14,254	14,236	37	NNE
Highland Park	Wayne	16,746	11,776	32	NNE
Inkster	Wayne	30,115	25,369	23	N
Lincoln Park	Wayne	40,008	38,144	20	NNE
Livonia	Wayne	100,545	96,942	28	N
Melvindale	Wayne	10,735	10,715	22	NNE
Northville	Wayne	6,459	5,970	34	NNW
Plymouth	Wayne	9,022	9,132	30	NNW
River Rouge	Wayne	9,917	7,903	22	NNE
Riverview	Wayne	13,272	12,486	15	NNE
Rockwood	Wayne	3,442	3,289	7	N
Romulus	Wayne	22,979	23,989	19	NNW
Southgate	Wayne	30,136	30,047	18	NNE
Taylor	Wayne	65,868	63,131	19	N
Trenton	Wayne	19,584	18,853	13	NNE
Wayne	Wayne	19,051	17,593	23	NNW

Table 3.10-1 (Continued)
Cities or Towns Located Totally or Partially within a 50-Mile Radius of Fermi 2

State and City/Town	County	2000 Census Population[a]	2010 Census Population[a]	Distance to Fermi 2 (miles)[b]	Direction
Westland	Wayne	86,602	84,094	26	NNW
Woodhaven	Wayne	12,530	12,875	12	N
Wyandotte	Wayne	28,006	25,883	18	NNE
OHIO					
Bay View	Erie	692	632	41	SSE
Castalia	Erie	935	852	45	SSE
Kelleys Island	Erie	367	312	38	SE
Sandusky	Erie	27,844	25,793	46	SE
Delta	Fulton	2,930	3,103	47	WSW
Lyons	Fulton	559	562	46	WSW
Metamora	Fulton	563	627	38	WSW
Swanton	Fulton	3,307	3,690	42	SW
Berkey	Lucas	265	237	35	WSW
Harbor View	Lucas	99	123	21	SSW
Holland	Lucas	1,306	1,764	33	SW
Maumee	Lucas	15,237	14,286	34	SW
Oregon	Lucas	19,355	20,291	25	SSW
Ottawa Hills	Lucas	4,564	4,517	29	SW
Sylvania	Lucas	18,670	18,965	29	SW
Toledo	Lucas	313,619	287,208	26	SW
Waterville	Lucas	4,828	5,523	40	SW
Whitehouse	Lucas	2,733	4,149	42	SW
Clay Center	Ottawa	294	276	28	SSW
Elmore	Ottawa	1,426	1,410	34	S
Genoa	Ottawa	2,230	2,336	31	S
Marblehead	Ottawa	762	903	40	SE

Table 3.10-1 (Continued)
Cities or Towns Located Totally or Partially within a 50-Mile Radius of Fermi 2

State and City/Town	County	2000 Census Population[a]	2010 Census Population[a]	Distance to Fermi 2 (miles)[b]	Direction
Oak Harbor	Ottawa	2,841	2,759	32	S
Port Clinton	Ottawa	6,391	6,056	35	SSE
Put-in-Bay	Ottawa	128	138	31	SE
Rocky Ridge	Ottawa	389	417	30	S
Burgoon	Sandusky	199	172	48	S
Clyde	Sandusky	6,064	6,325	48	SSE
Fremont	Sandusky	17,375	16,734	43	S
Gibsonburg	Sandusky	2,506	2,581	40	S
Helena	Sandusky	236	224	43	S
Lindsey	Sandusky	504	446	38	S
Woodville	Sandusky	1,977	2,135	36	S
Bettsville	Seneca	784	661	49	S
Green Springs	Seneca	1,247	1,368	50	S
Bowling Green	Wood	29,636	30,028	45	SSW
Bradner	Wood	1,171	985	45	SSW
Grand Rapids	Wood	1,002	965	49	SW
Haskins	Wood	638	1,188	41	SW
Luckey	Wood	998	1,012	37	SSW
Millbury	Wood	1,161	1,200	29	SSW
Northwood	Wood	5,471	5,265	27	SSW
Pemberville	Wood	1,365	1,371	40	SSW
Perrysburg	Wood	16,945	20,623	34	SW
Portage	Wood	428	438	48	SSW
Risingsun	Wood	620	606	49	SSW
Rossford	Wood	6,406	6,293	29	SW
Tontogany	Wood	364	367	45	SW

Table 3.10-1 (Continued)
Cities or Towns Located Totally or Partially within a 50-Mile Radius of Fermi 2

State and City/Town	County	2000 Census Population[a]	2010 Census Population[a]	Distance to Fermi 2 (miles)[b]	Direction
Walbridge	Wood	2,546	3,019	29	SSW
Wayne	Wood	842	887	47	SSW

a. (USCB 2012c).
b. (USDOT 2012).

Table 3.10-2
County Population by State Totally or Partially Included in a 50-Mile Radius of Fermi 2

State and County	2000 Population[a]	2010 Population[b]	2045 Projected Permanent Population[c][d]	2045 Projected Total Population[c][d]
Ontario	–	**12,713,513**	**21,924,597**	**22,868,450**
Ontario Total	–	12,713,513	21,924,597	22,868,450
Michigan (nine counties)	**5,090,805**	**4,964,883**	**5,224,784**	**5,495,906**
Jackson	158,422	160,248	160,248	168,564
Lenawee	98,890	99,892	99,892	105,076
Livingston	156,951	180,967	232,290	244,344
Macomb	788,149	840,978	918,005	956,641
Monroe	145,945	152,021	166,782	175,436
Oakland	1,194,156	1,202,362	1,256,922	1,322,145
St. Clair	164,235	163,040	166,659	175,307
Washtenaw	322,895	344,791	403,402	424,336
Wayne	2,061,162	1,820,584	1,820,584	1,915,057
Ohio (eight counties)	**888,424**	**874,412**	**927,030**	**980,927**
Erie	79,551	77,079	83,061	87,890
Fulton	42,084	42,698	54,328	57,486
Henry	29,210	28,215	30,110	31,861
Lucas	455,054	441,815	441,815	467,502
Ottawa	40,985	41,428	41,428	43,837
Sandusky	61,792	60,944	60,944	64,487
Seneca	58,683	56,745	56,745	60,044
Wood	121,065	125,488	158,599	167,820
U.S. Regional Counties Total	**5,979,229**	**5,839,295**	**6,151,814**	**6,476,833**

Note: For counties with projected negative population growth, the 2010 population values for that county were held constant.

a. (USCB 2012a).
b. (Statistics Canada 2012a; USCB 2012a).
c. (BTP 2012; DKSA 2010; Longwoods 2012; OMTC 2009; PRSPO 2011; Statistics Canada 2012a; USCB 2012a).
d. The 2045 projected permanent population estimates do not include transient population; however, the 2045 projected total population estimates include both transient and permanent populations.

Table 3.10-3
County Population Growth, 2000–2045

Year	Monroe County		Wayne County	
	Population	Average Annual Growth (%)	Population	Average Annual Growth (%)
2000	145,945	–	2,061,162	–
2005	148,983	0.41	1,940,873	-1.20
2010	152,021	0.40	1,820,584	-1.27
2015	155,691	0.48	1,820,584	0.00
2020	156,592	0.12	1,820,584	0.00
2025	158,333	0.22	1,820,584	0.00
2030	160,841	0.31	1,820,584	0.00
2035	163,181	0.29	1,820,584	0.00
2040	164,720	0.19	1,820,584	0.00
2045	166,782	0.25	1,820,584	0.00

Note: Projected population values are based on the population projection growth trend for the years reported by the State of Michigan (BTP 2012). To be conservative, for Wayne County, which was projected to have a population in decline, the 2010 census population count was held constant throughout the projection period (USCB 2012a).

Table 3.10-4
Minority Populations Evaluated Against Criterion

Geographic Area:	Michigan			Ohio			50-Mile Radius (Region)[a]		
Total Population[b]	9,883,640			11,536,504			4,879,412		
Census Categories	**Population by Category[b]**	**Percent[c]**	**Criterion**	**Population by Category[b]**	**Percent[c]**	**Criterion**	**Population by Category[d]**	**Percent[c]**	**Criterion**
Black	1,400,362	14.2	34.2	1,407,681	12.2	32.2	1,109,675	22.7	42.7
American Indian	62,007	0.6	20.6	25,292	0.2	20.2	16,267	0.3	20.3
Asian	238,199	2.4	22.4	192,233	1.7	21.7	169,884	3.5	23.5
Native Hawaiian/ Other Pacific Islander	2,604	0.03	20.03	4,066	0.04	20.04	1,094	0.02	20.02
Other	147,029	1.5	21.5	130,030	1.1	21.1	67,884	1.4	21.4
Two or more Races	230,319	2.3	22.3	237,765	2.1	22.1	118,909	2.4	22.4
Aggregate of All Races	2,080,520	21.1	41.1	1,997,067	17.3	37.3	1,483,713	30.4	50
Hispanic	436,358	4.4	24.4	354,674	3.1	23.1	214,304	4.4	24.4
Aggregate and Hispanic	2,516,878	25.5	45.5	2,351,741	20.4	40.4	1,698,017	34.8	50

a. Population values reported in this column do not include Canadian population data. Furthermore, block groups located on the 50-mile radius boundary were not area weighted for these calculations.
b. (USCB 2012g).
c. Percent values were calculated by dividing each census category's population by the Michigan, Ohio, and 50-mile radius total population values.
d. (USCB 2010a).

Table 3.10-5
Minority Census Block Group Counts, 50-Mile Radius of Fermi 2

	Individual State Method		50-Mile Radius	
Total block groups with population within the 50-mile radius[a]	4,311		4,311	
Census Categories	**Block Groups with Identified Minority or Low Income Category**	**Percent Block Groups within 50-Mile Radius**	**Block Groups with Identified Minority or Low Income Category**	**Percent Block Groups within 50-Mile Radius**
Black	1,229	28.5	1,139	26.4
American Indian	0	0	0	0
Asian	76	1.8	67	1.6
Native Hawaiian/Other Pacific Islander	1	0.02	1	0.02
Other	52	1.2	52	1.2
Two or more Races	1	0	1	0
Aggregate of All Races	1,377	31.9	1,231	28.6
Hispanic	103	2.4	99	2.3
Aggregate and Hispanic	1,448	33.6	1,352	31.4
Low Income[b][c] (Individuals)	693	16.1	674	15.6
Low Income[b][c] (Families)	659	15.3	644	14.9

a. (USCB 2010a).
b. (USCB 2012g).
c. (USCB 2012h).

Table 3.10-6
Low-Income Population Criteria Using Two Geographic Areas

	Michigan			Ohio			50-Mile Radius (Region)		
(Income) Total Population[a]	9,726,785			11,199,642			4,848,302		
Census Category	**Population by Category**	**Percent[b]**	**Criteria**	**Population by Category**	**Percent[b]**	**Criteria**	**Population by Category**	**Percent[b]**	**Criteria**
Low Income - Number of Individuals Below Poverty Level	1,444,004	14.8	34.8	1,586,292	14.2	34.2	739,479	15.3	35.3
Low Income - Number of Families Below Poverty Level	269,839	10.6	30.6	307,869	10.3	30.3	137,357	11.1	31.1

a. (USCB 2012g; USCB 2012h).
b. Percent values were calculated by dividing each census category's population by the Michigan, Ohio, and 50-mile radius total population values.

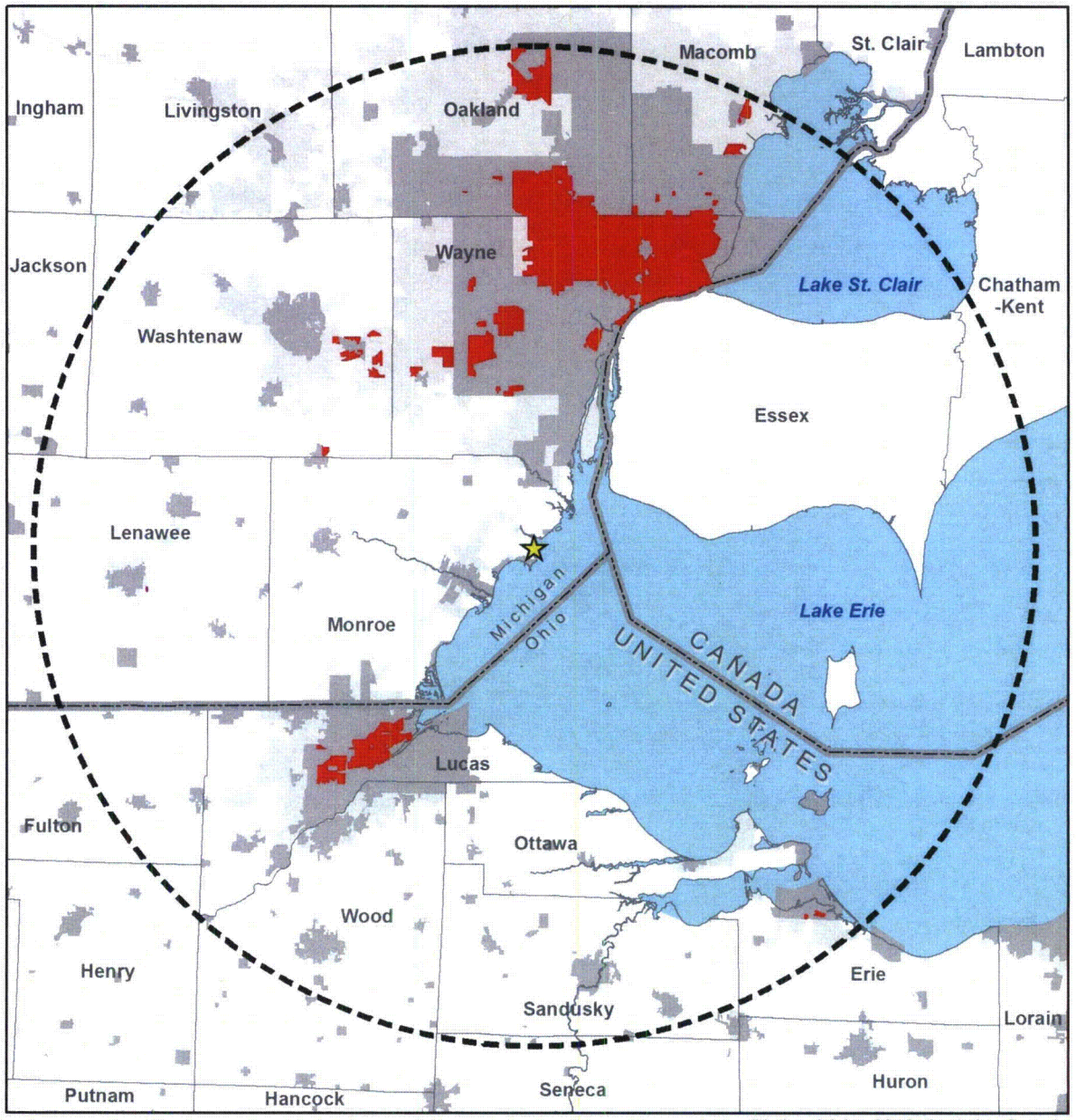


Figure 3.10-1
Census—Black or African American Populations (Regional)

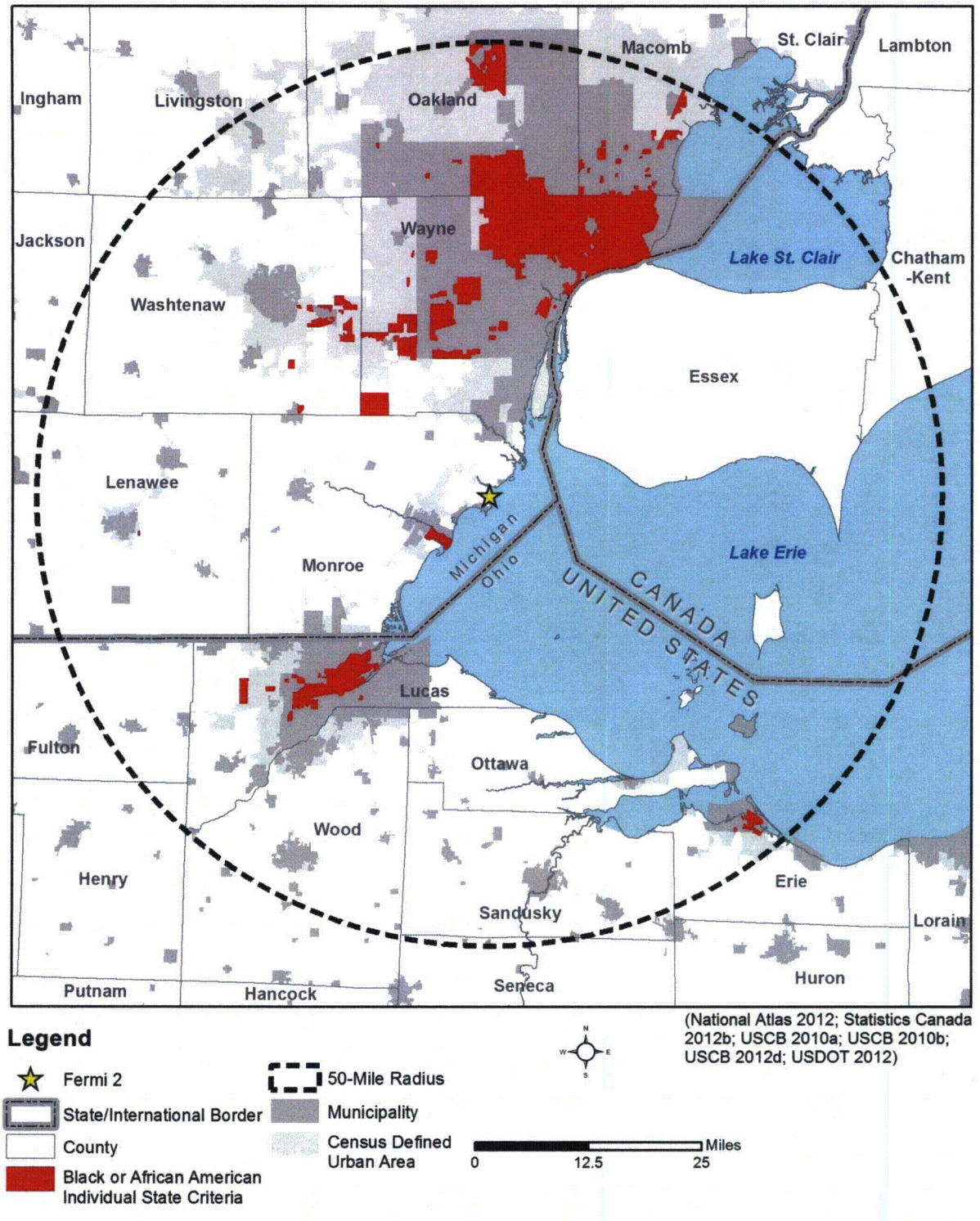


Figure 3.10-2
Census—Black or African American Populations (Individual States)

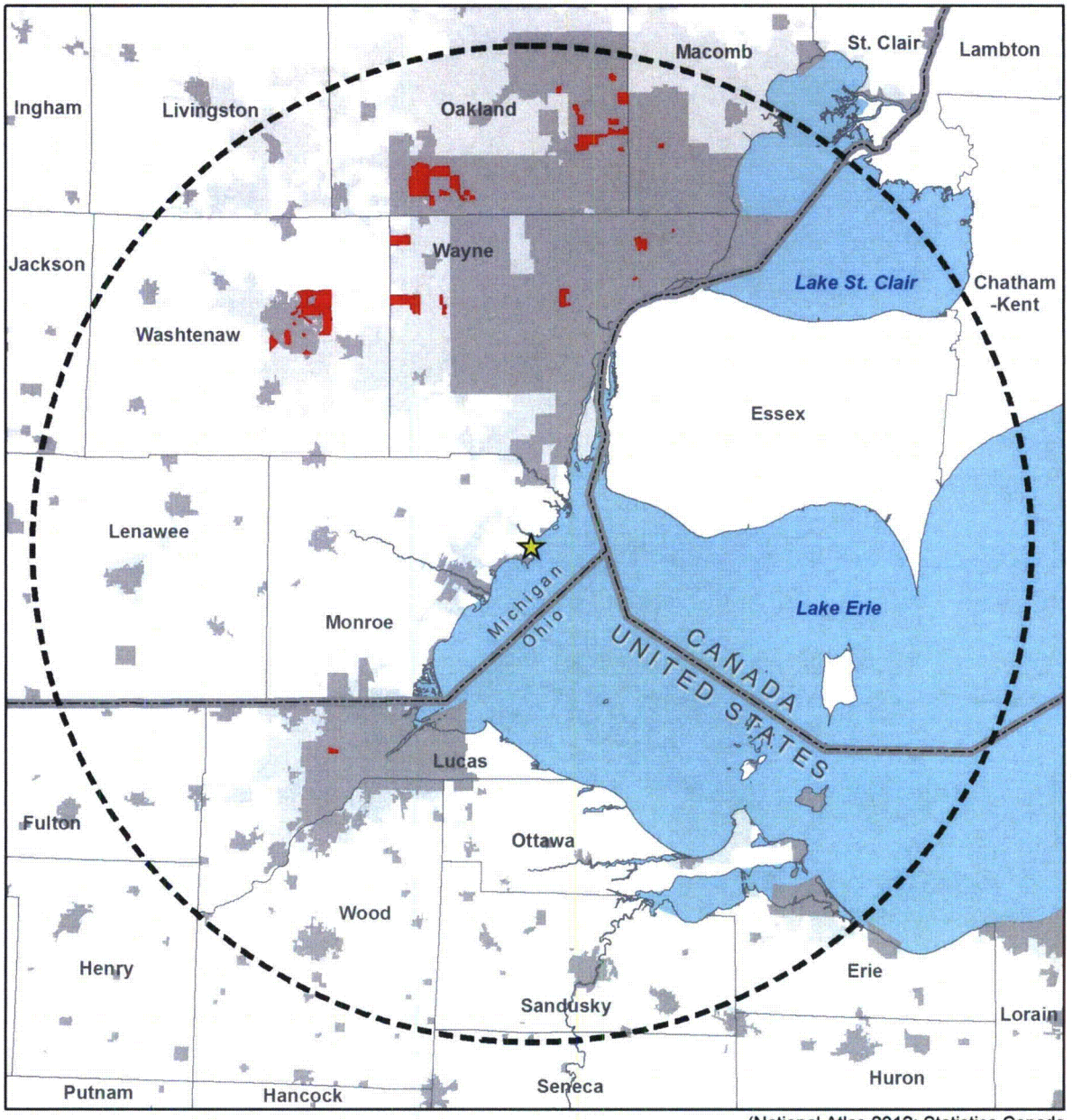


Figure 3.10-3
Census—Asian Populations (Regional)

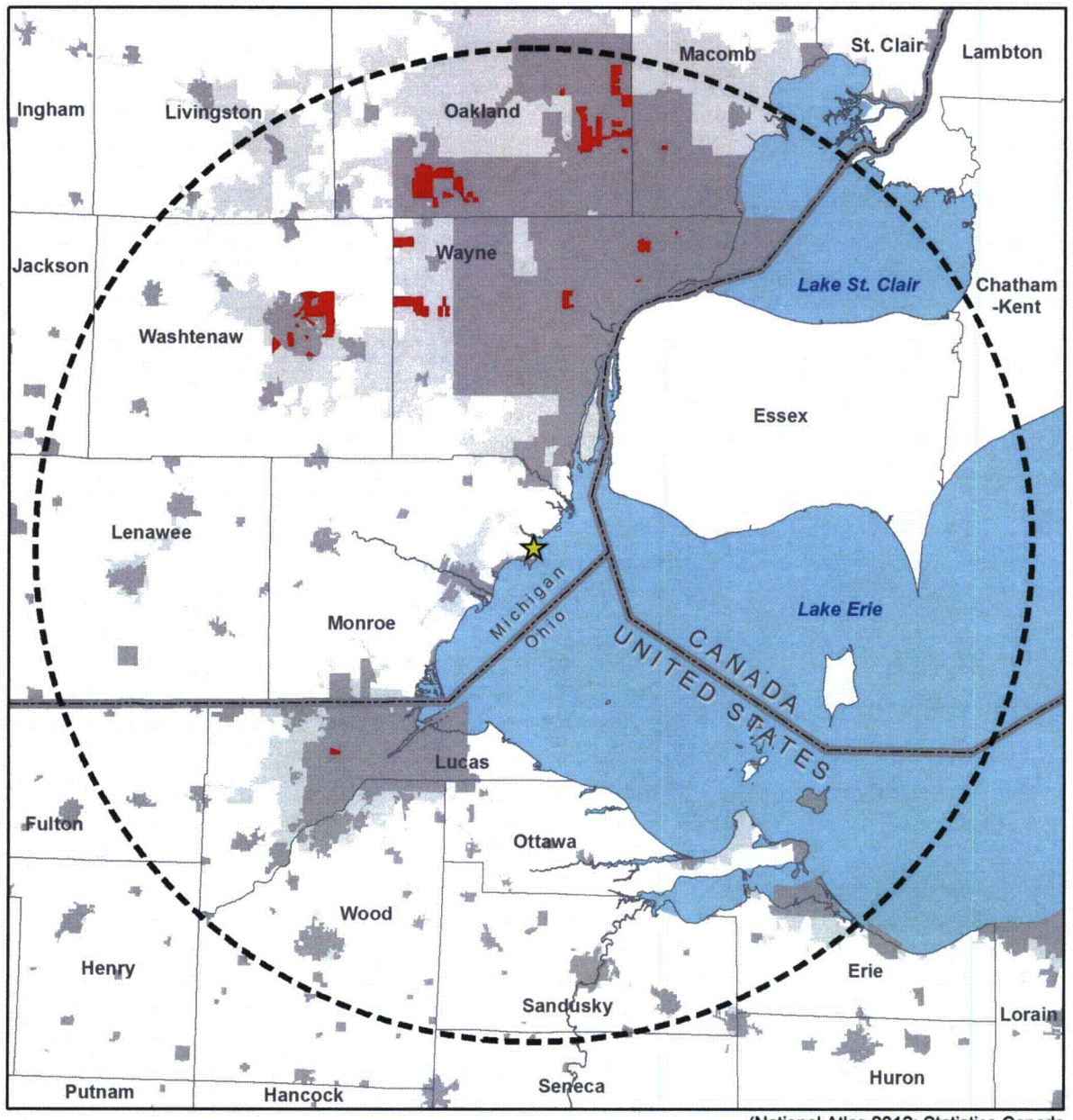


Figure 3.10-4
Census—Asian Populations (Individual States)

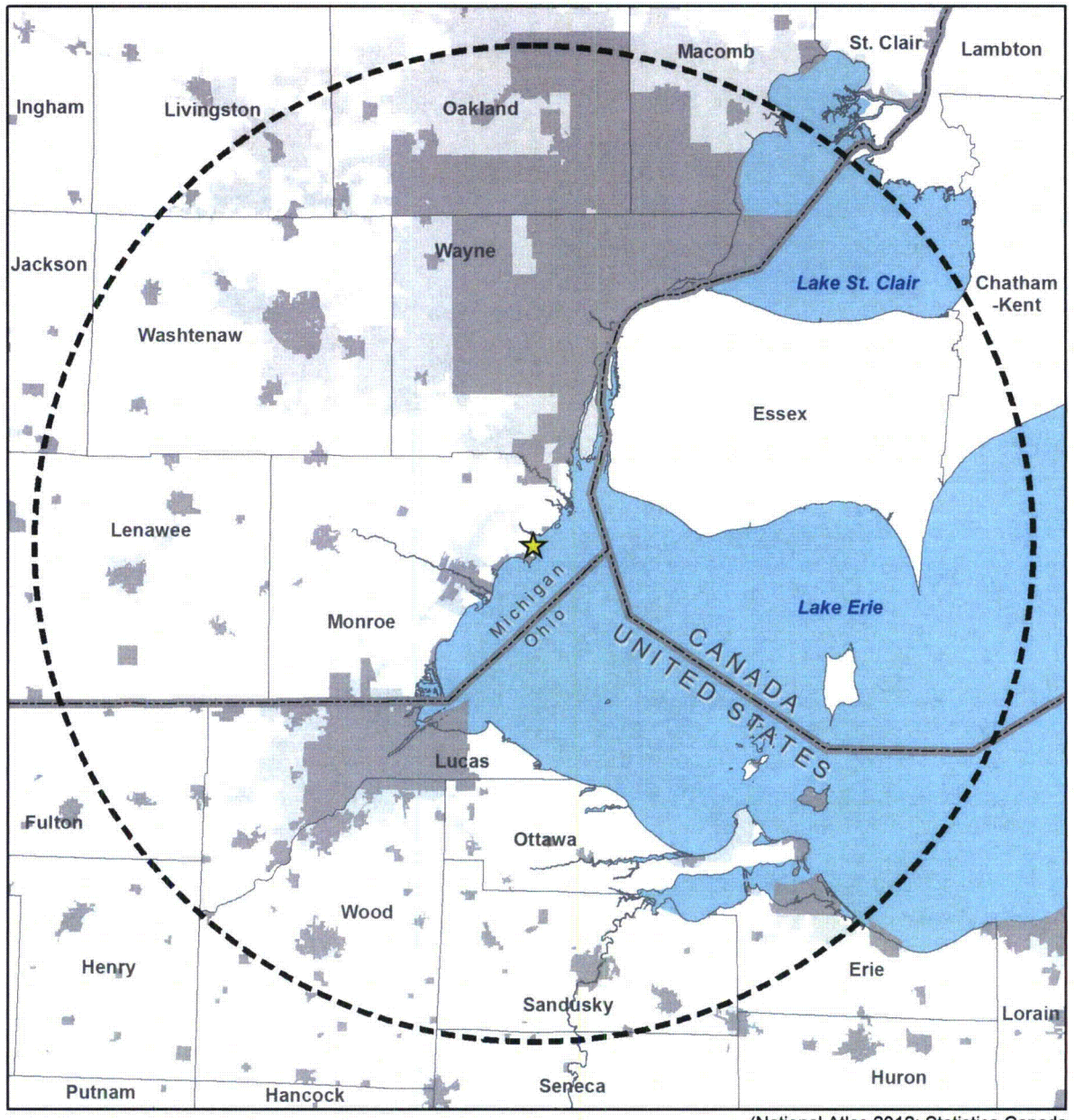


Figure 3.10-5
Census—American Indian Populations (Regional)

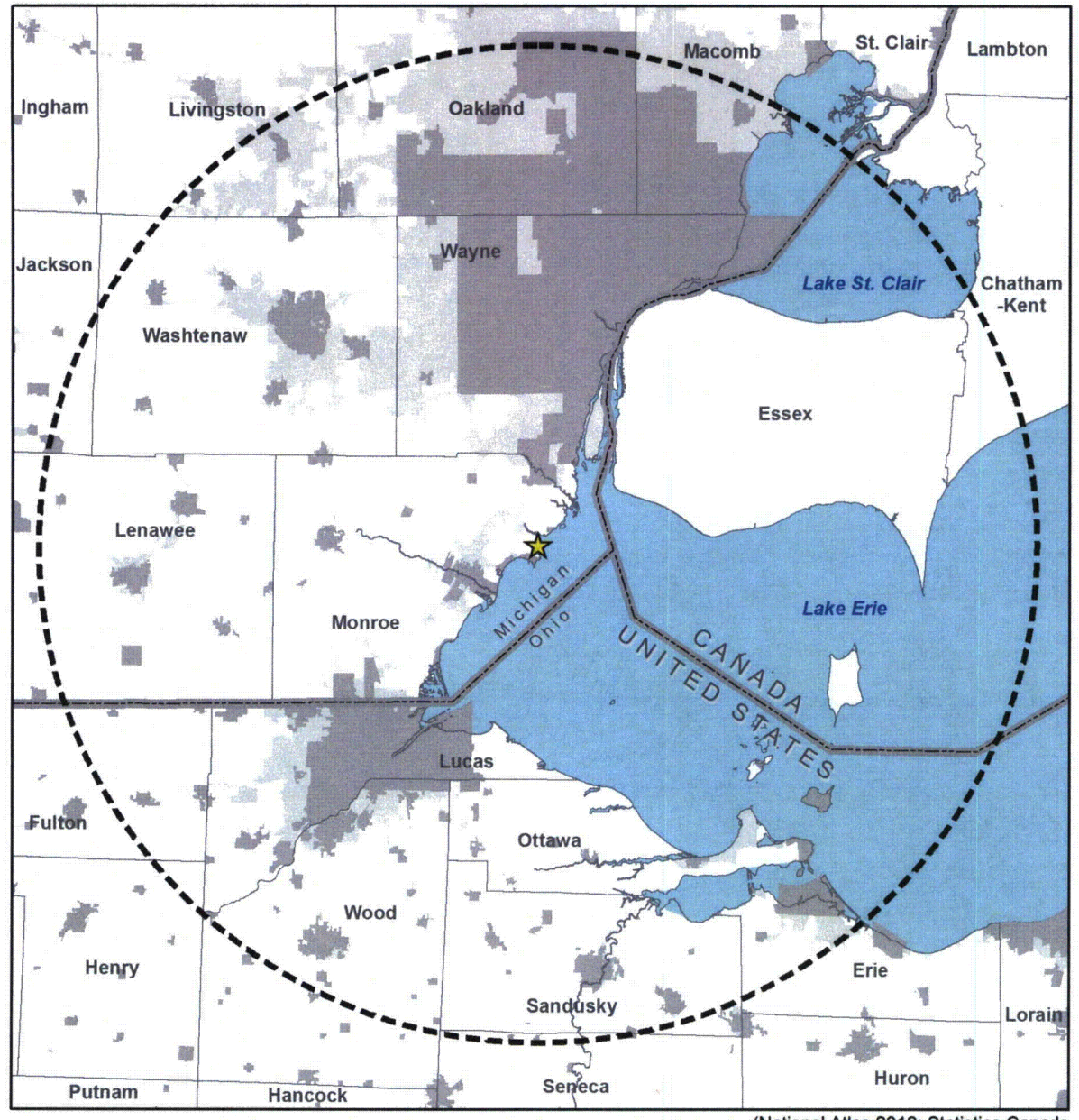
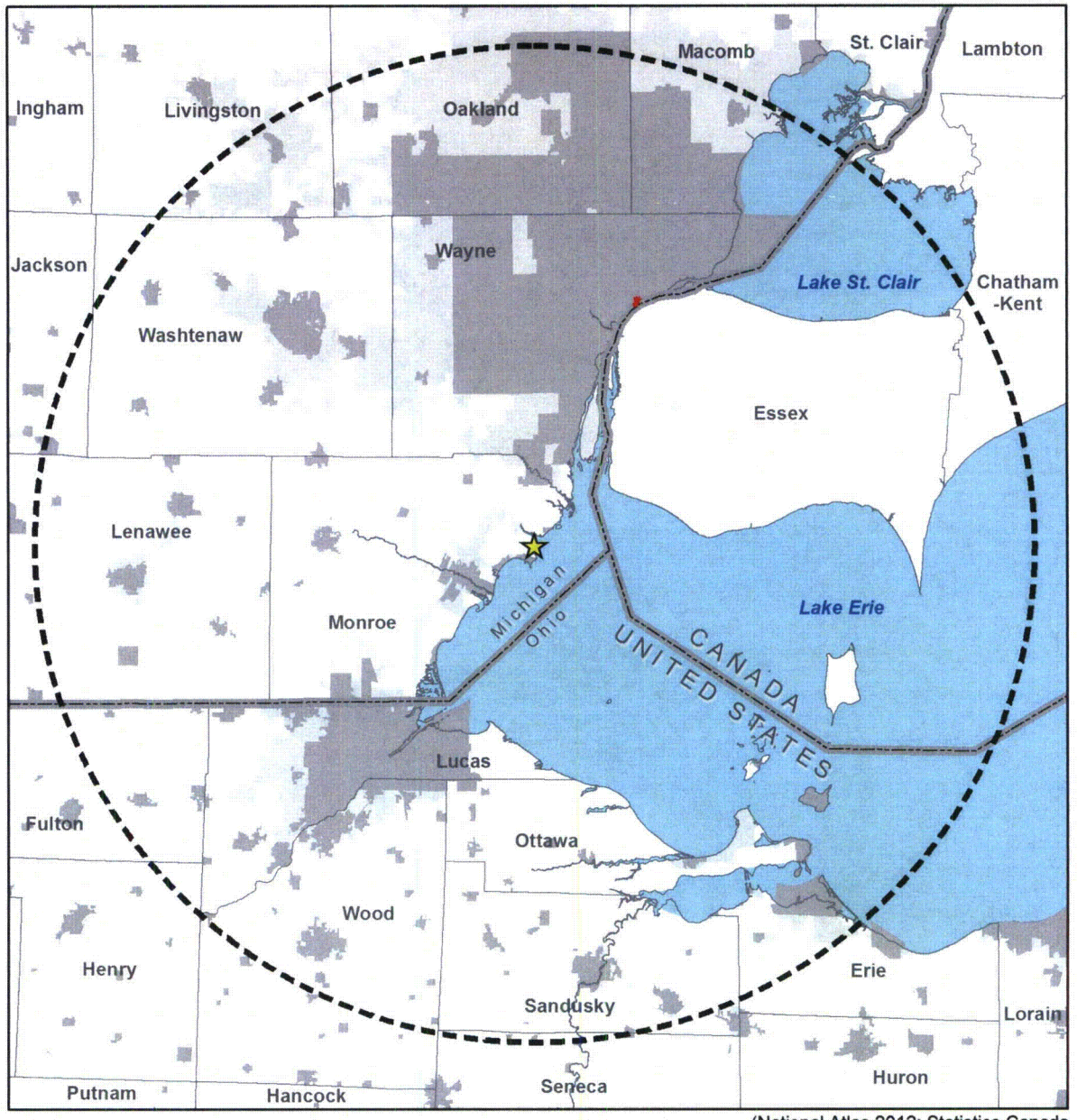


Figure 3.10-6
Census—American Indian Populations (Individual States)



(National Atlas 2012; Statistics Canada 2012b; USCB 2010a; USCB 2010b; USCB 2012d; USDOT 2012)

Legend

- Fermi 2
- State/International Border
- County
- Hawaiian or Pacific Islander Regional Criteria
- 50-Mile Radius
- Municipality
- Census Defined Urban Area

Miles: 0 — 12.5 — 25

Figure 3.10-7
Census—Hawaiian or Pacific Islander Populations (Regional)

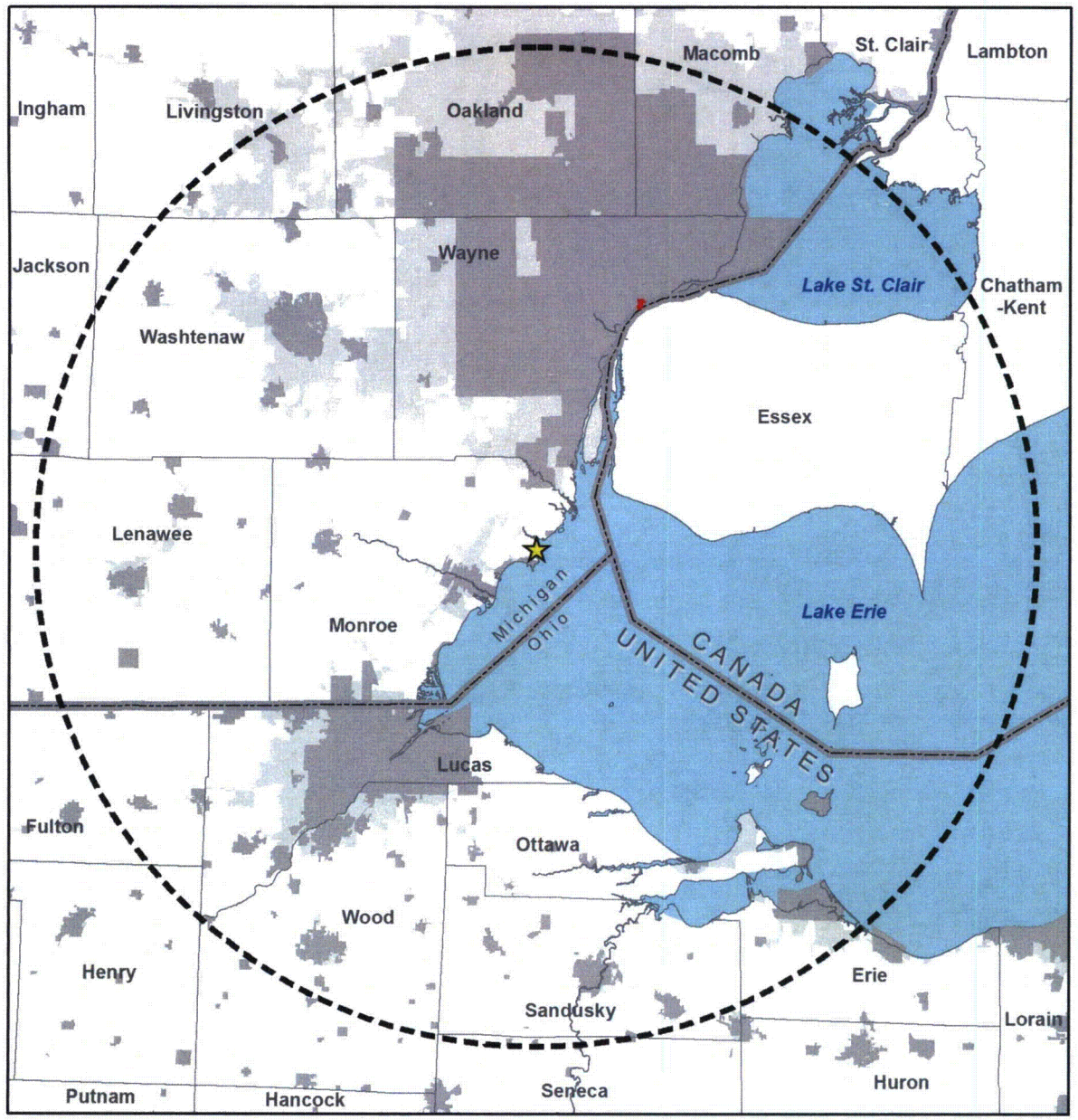
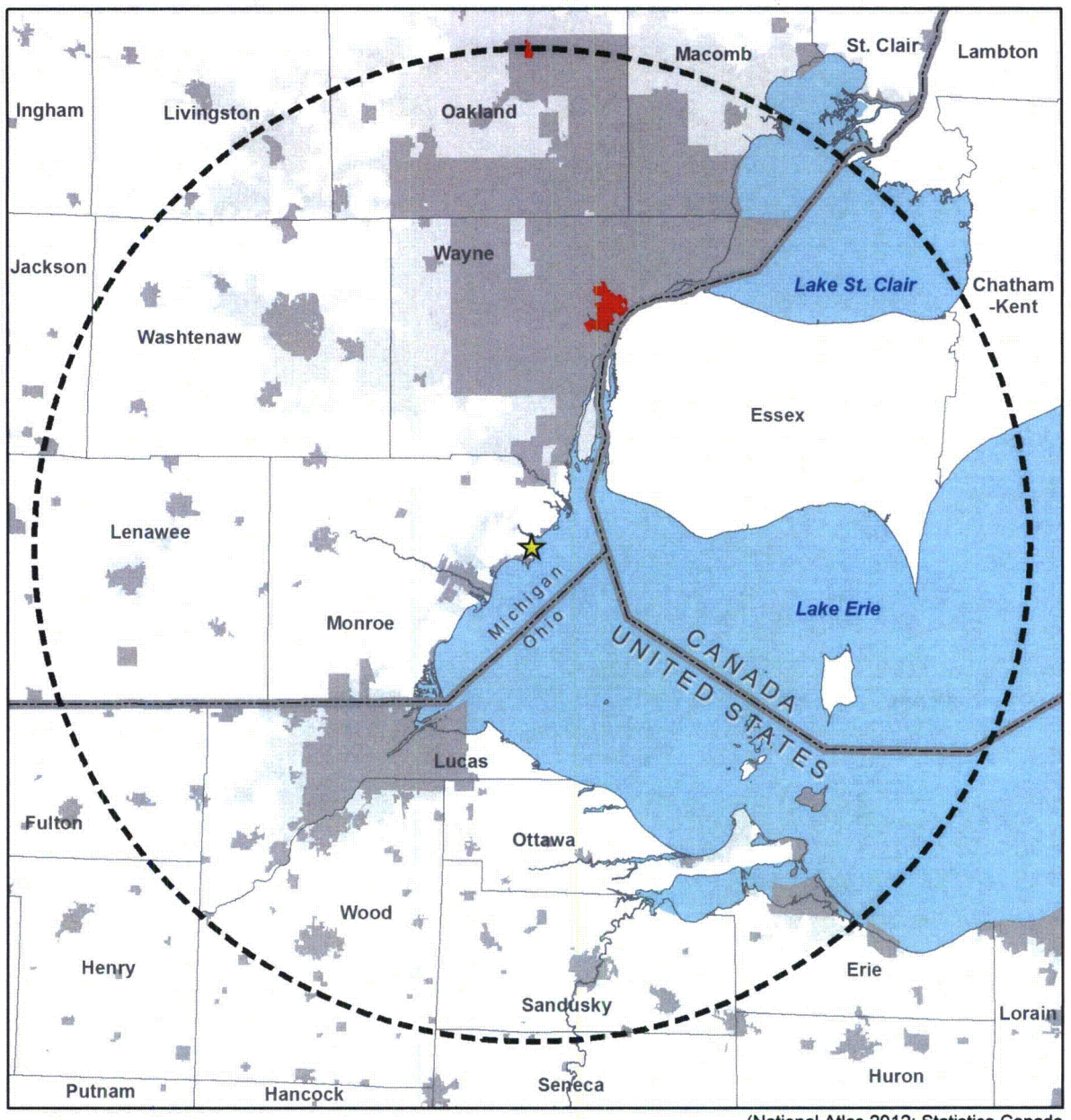


Figure 3.10-8
Census—Hawaiian or Pacific Islander Populations (Individual States)



(National Atlas 2012; Statistics Canada 2012b; USCB 2010a; USCB 2010b; USCB 2012d; USDOT 2012)

Figure 3.10-9
Census—Some Other Race Populations (Regional)

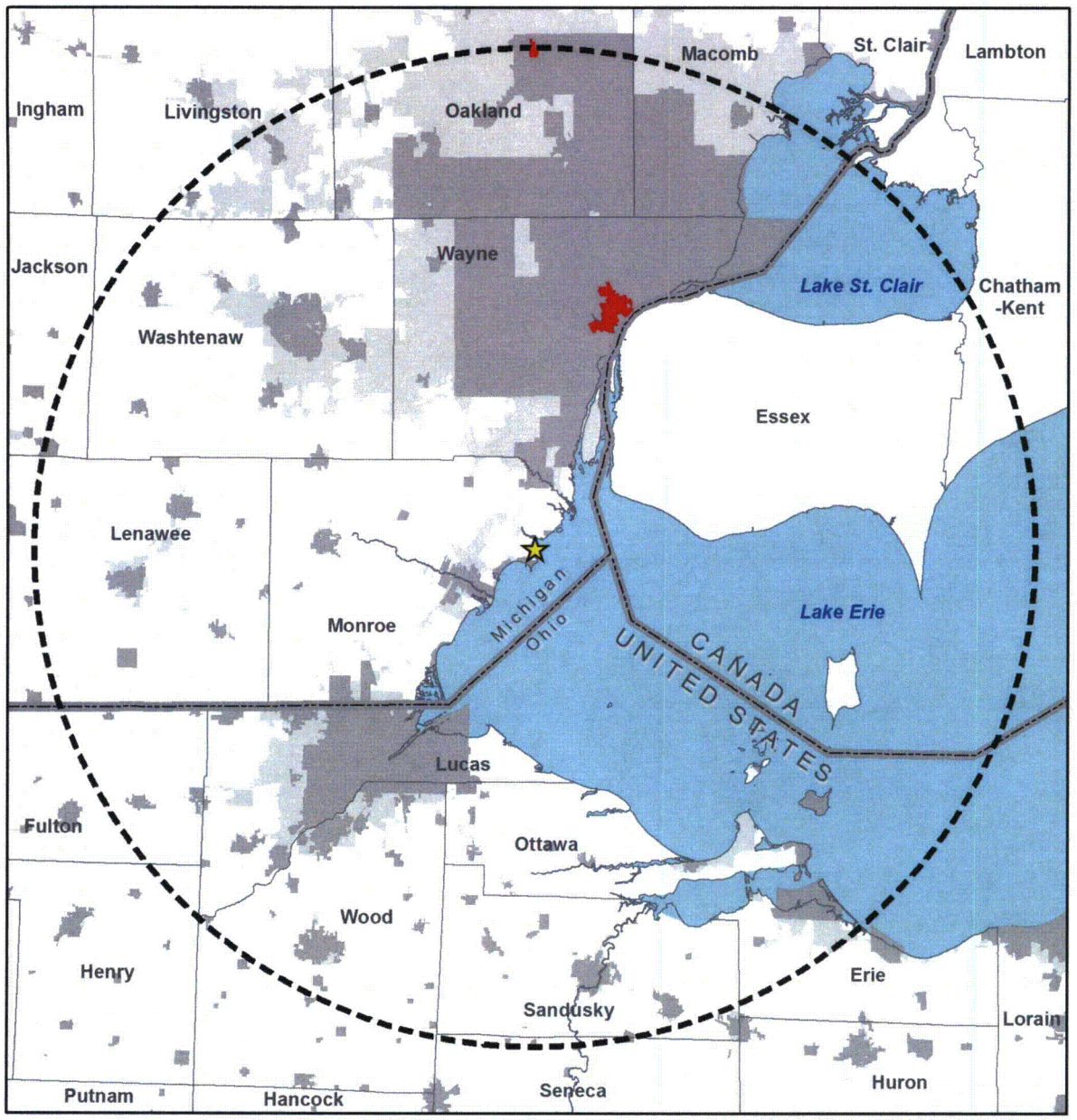
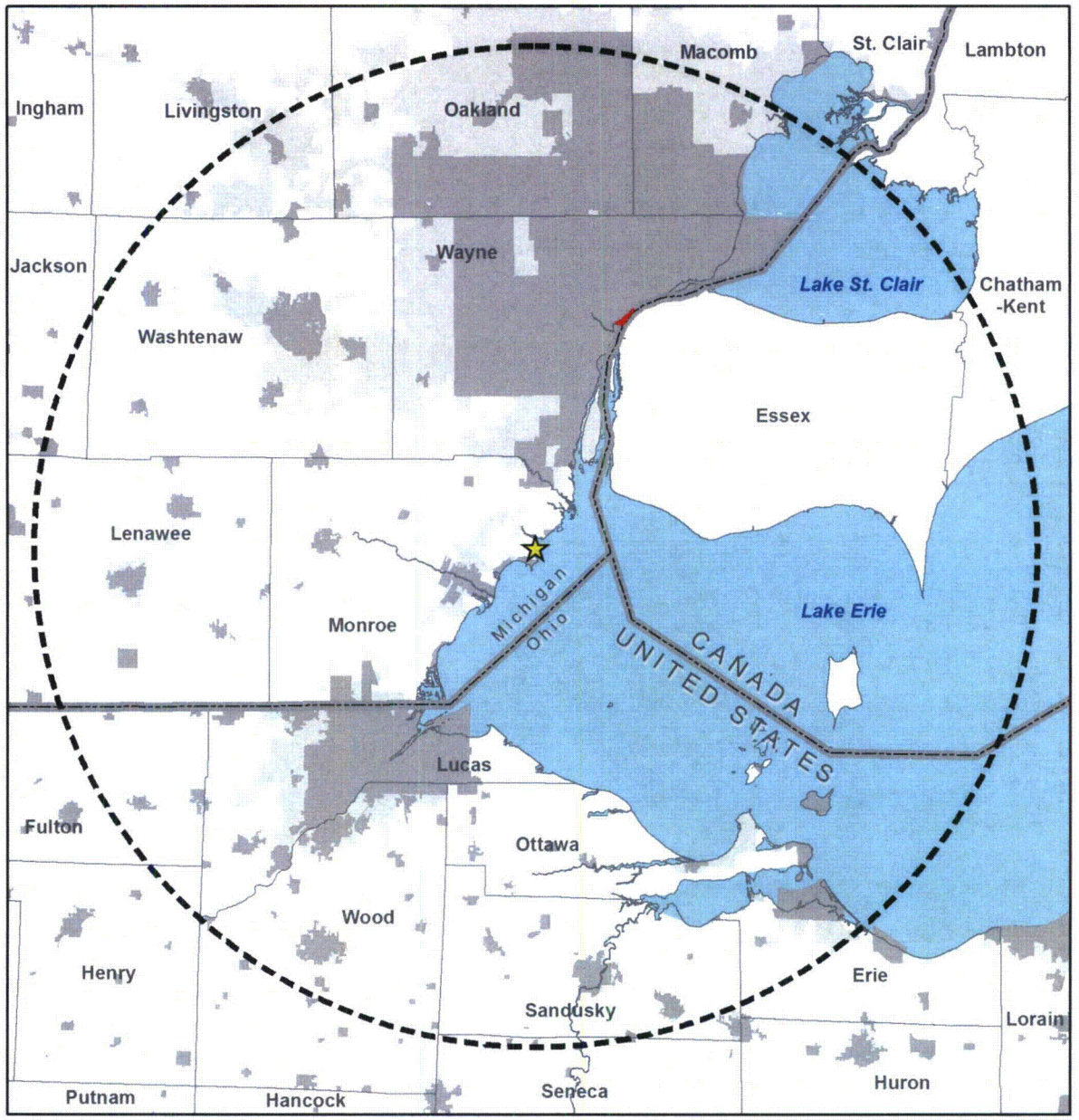


Figure 3.10-10
Census—Some Other Race Populations (Individual States)



(National Atlas 2012; Statistics Canada 2012b; USCB 2010a; USCB 2010b; USCB 2012d; USDOT 2012)

Figure 3.10-11
Census—Two or More Races Populations (Regional)

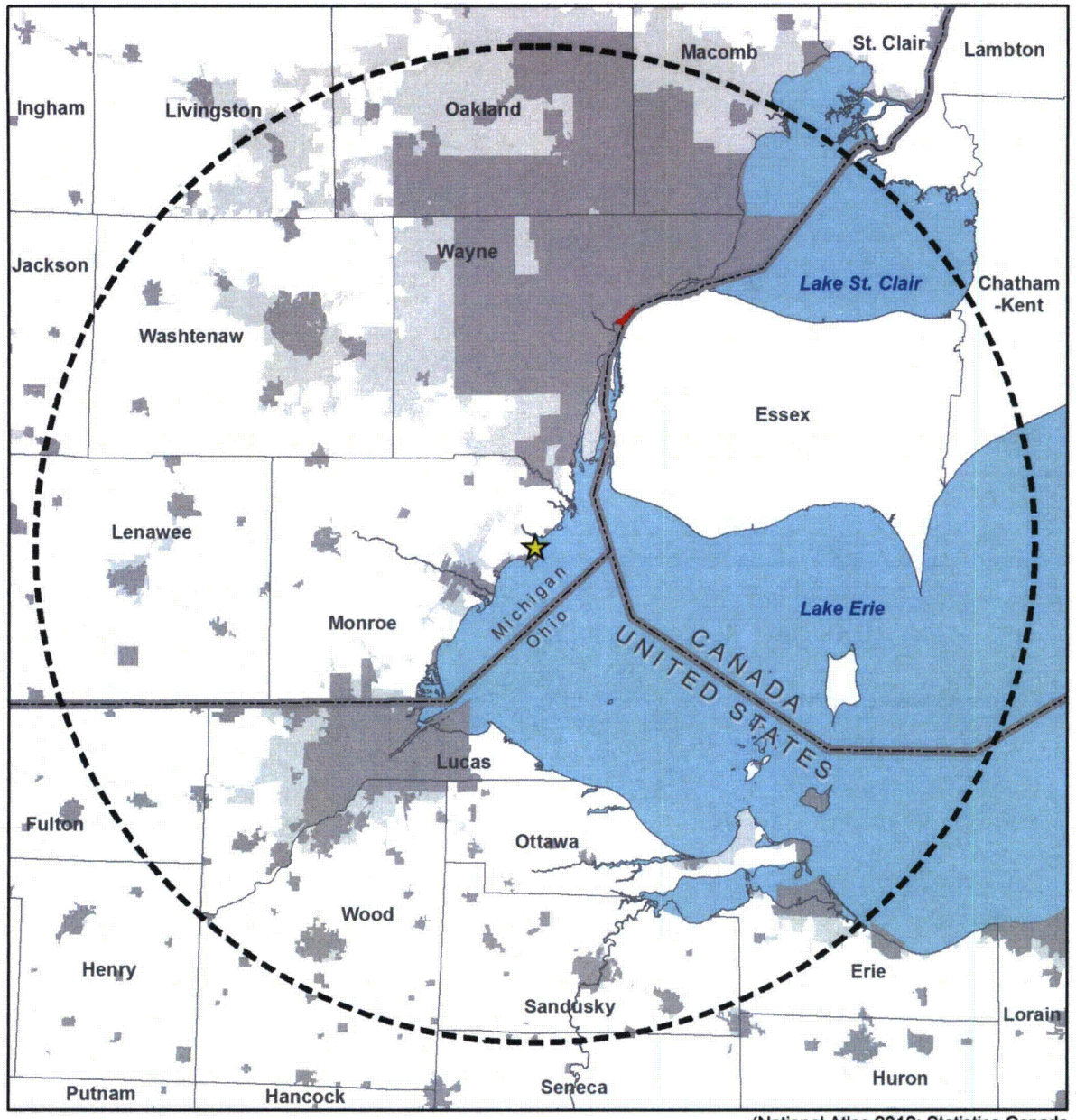


Figure 3.10-12
Census—Two or More Races Populations (Individual States)

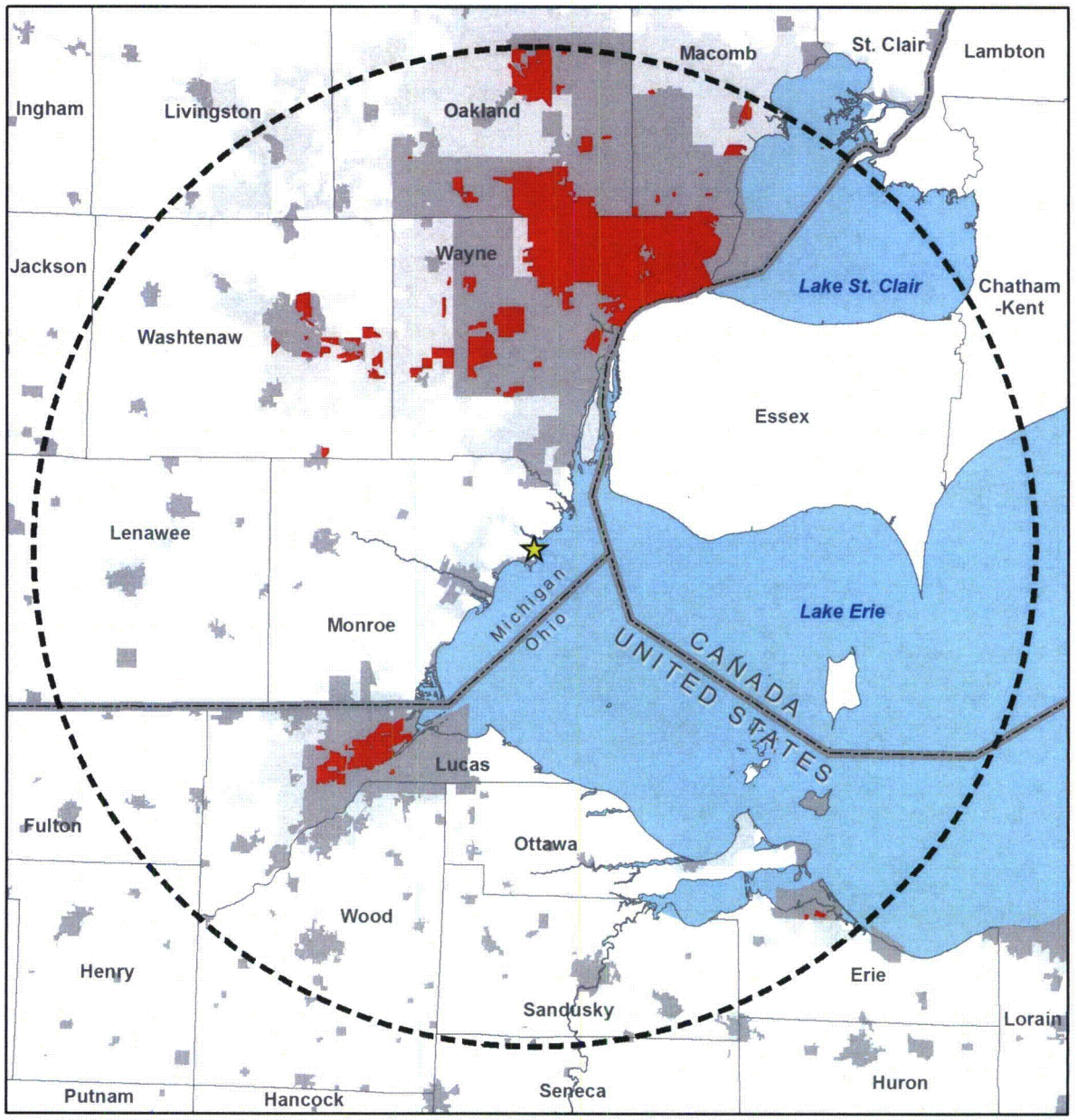
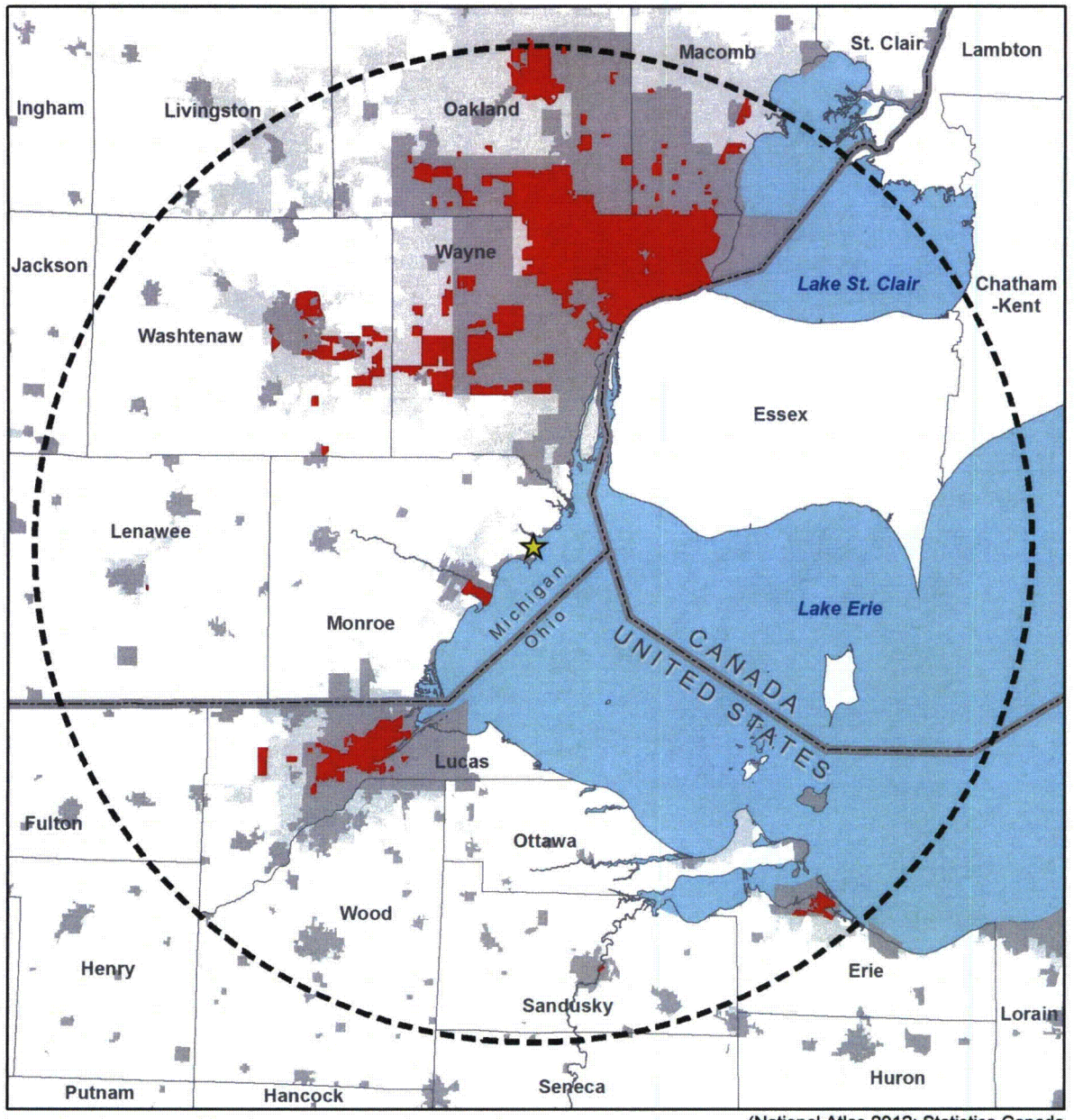


Figure 3.10-13
Census—Aggregate of All Races Populations (Regional)



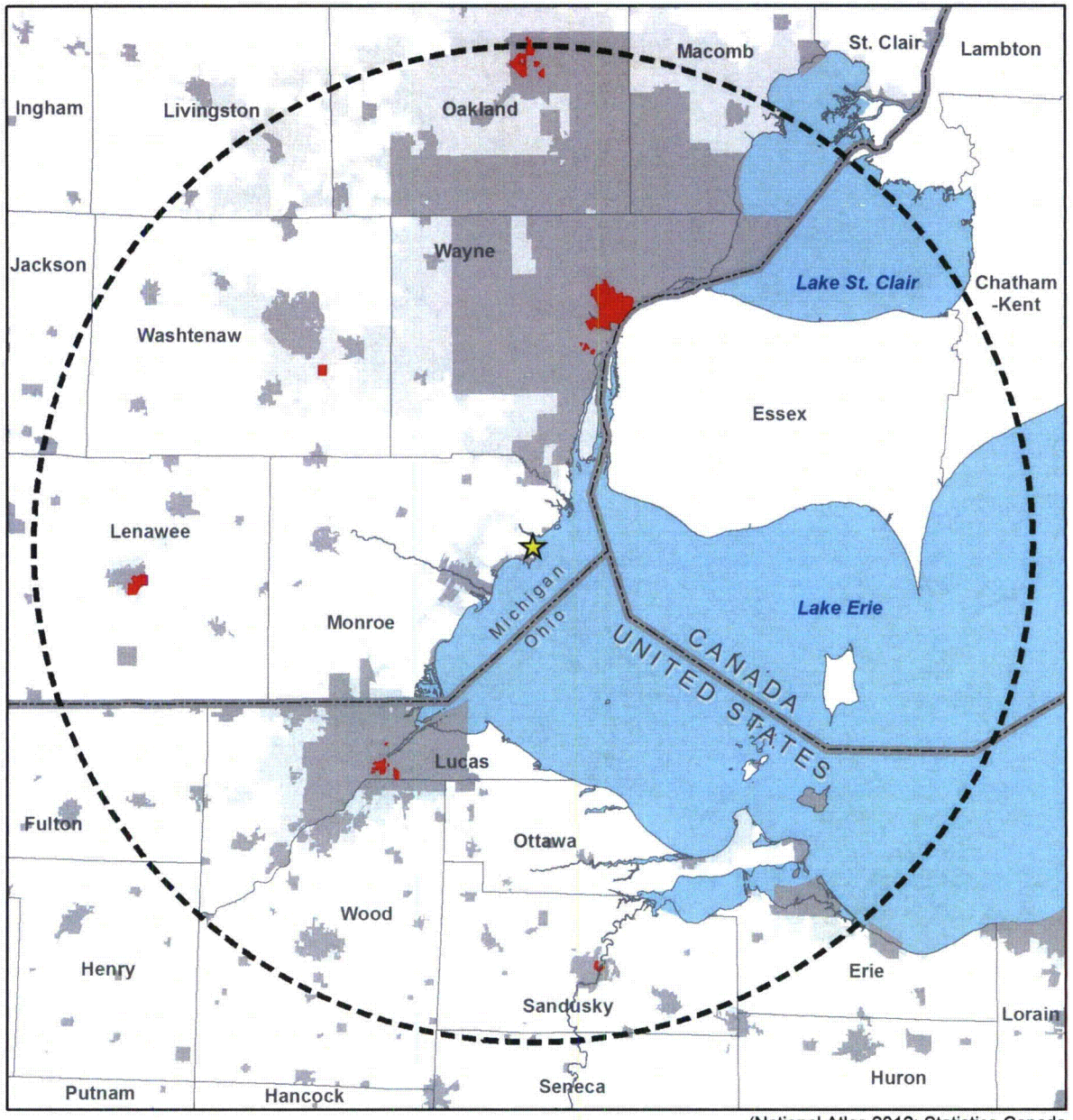
(National Atlas 2012; Statistics Canada 2012b; USCB 2010a; USCB 2010b; USCB 2012d; USDOT 2012)

Legend

- Fermi 2
- State/International Border
- County
- Aggregate of All Races Individual State Criteria
- 50-Mile Radius
- Municipality
- Census Defined Urban Area

Miles: 0 — 12.5 — 25

Figure 3.10-14
Census—Aggregate of All Races Populations (Individual States)



(National Atlas 2012; Statistics Canada 2012b; USCB 2010a; USCB 2010b; USCB 2012d; USDOT 2012)

Legend

- Fermi 2
- State/International Border
- County
- Hispanic or Latino Regional Criteria
- 50-Mile Radius
- Municipality
- Census Defined Urban Area

Miles: 0 — 12.5 — 25

Figure 3.10-15
Census—Hispanic or Latino Populations (Regional)

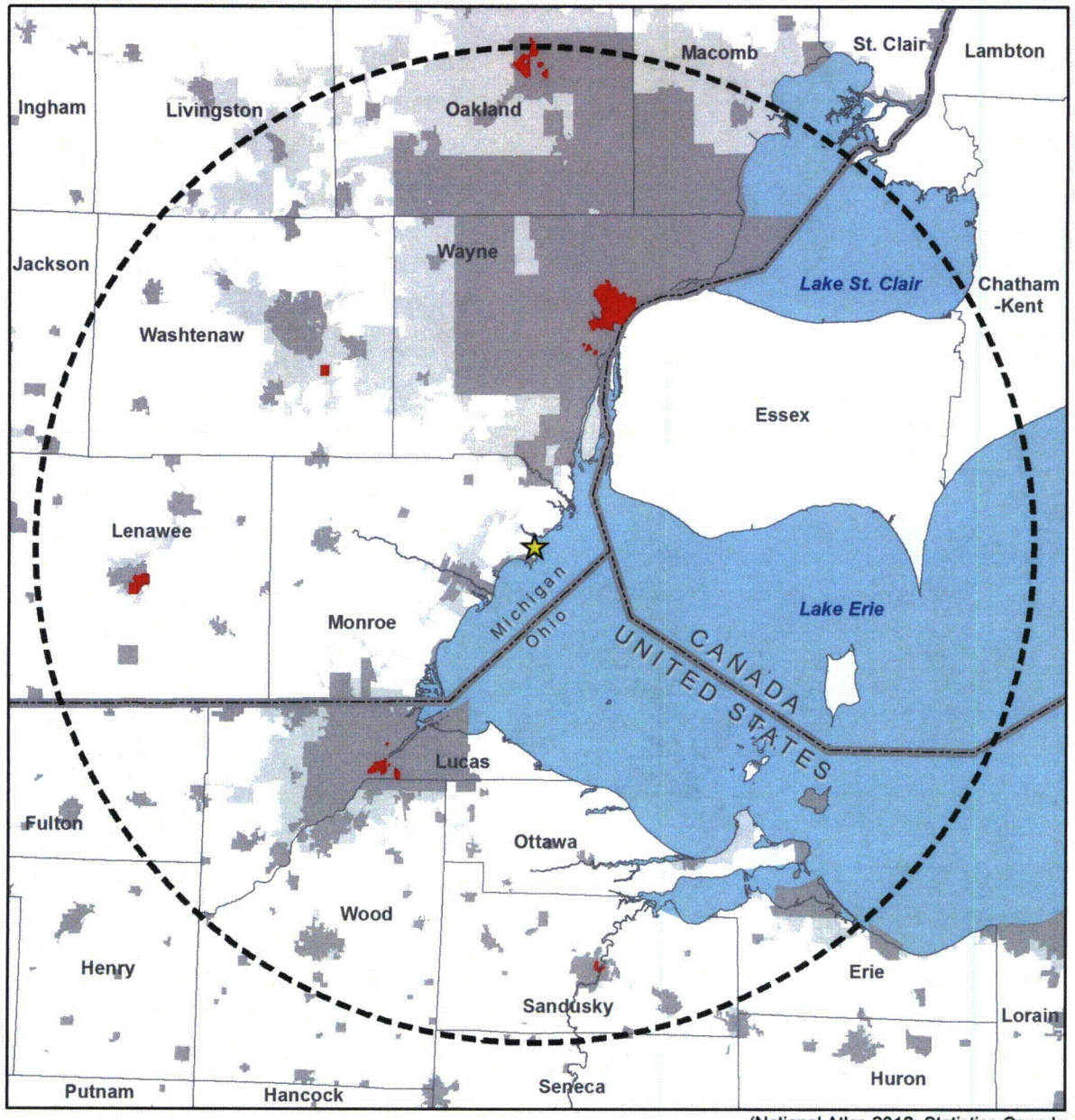
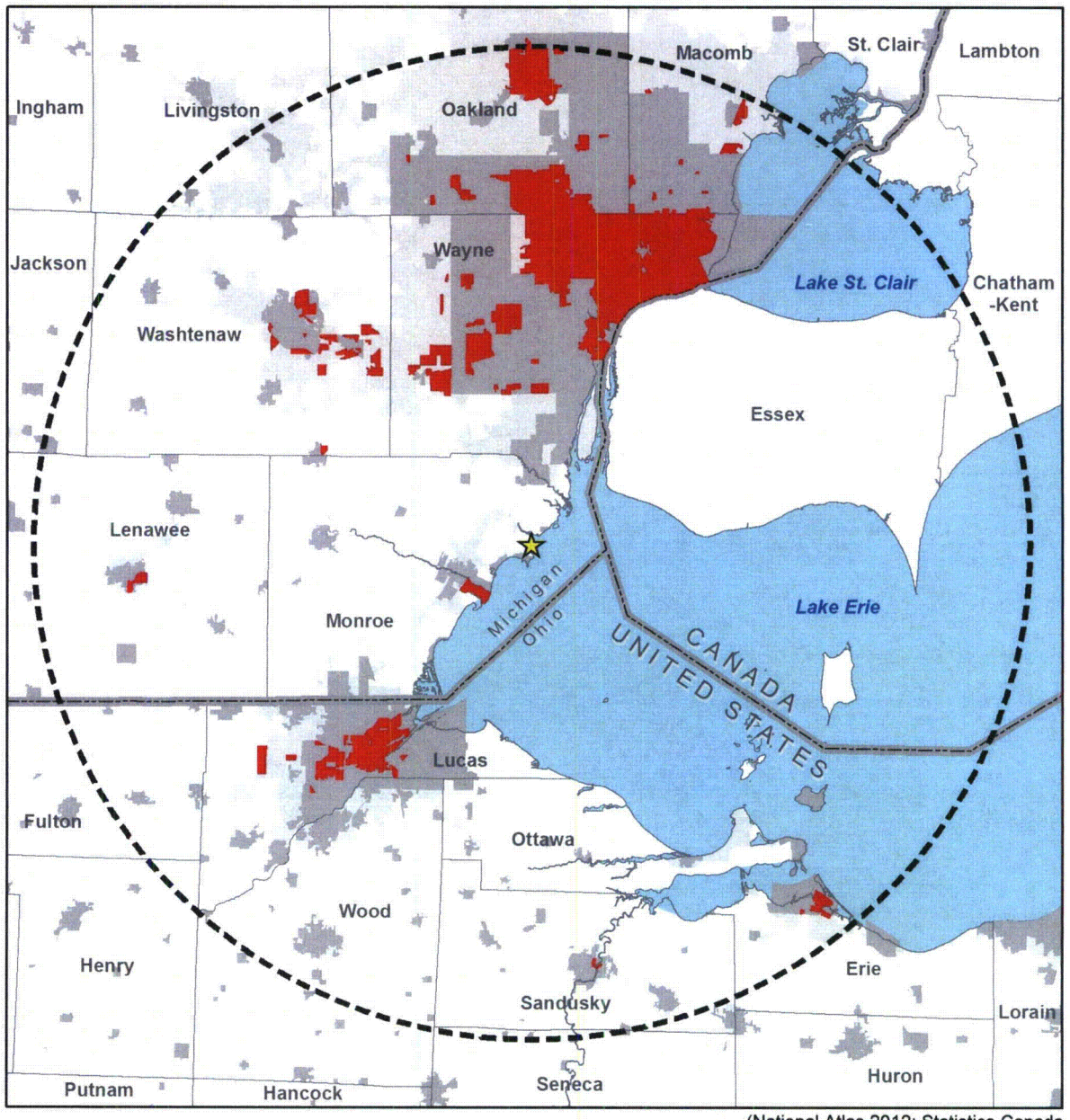


Figure 3.10-16
Census—Hispanic or Latino Populations (Individual States)



(National Atlas 2012; Statistics Canada 2012b; USCB 2010a; USCB 2010b; USCB 2012d; USDOT 2012)

Legend

- Fermi 2
- State/International Border
- County
- Aggregate and Hispanic Regional Criteria
- 50-Mile Radius
- Municipality
- Census Defined Urban Area

0 12.5 25 Miles

Figure 3.10-17
Census—Aggregate and Hispanic Populations (Regional)

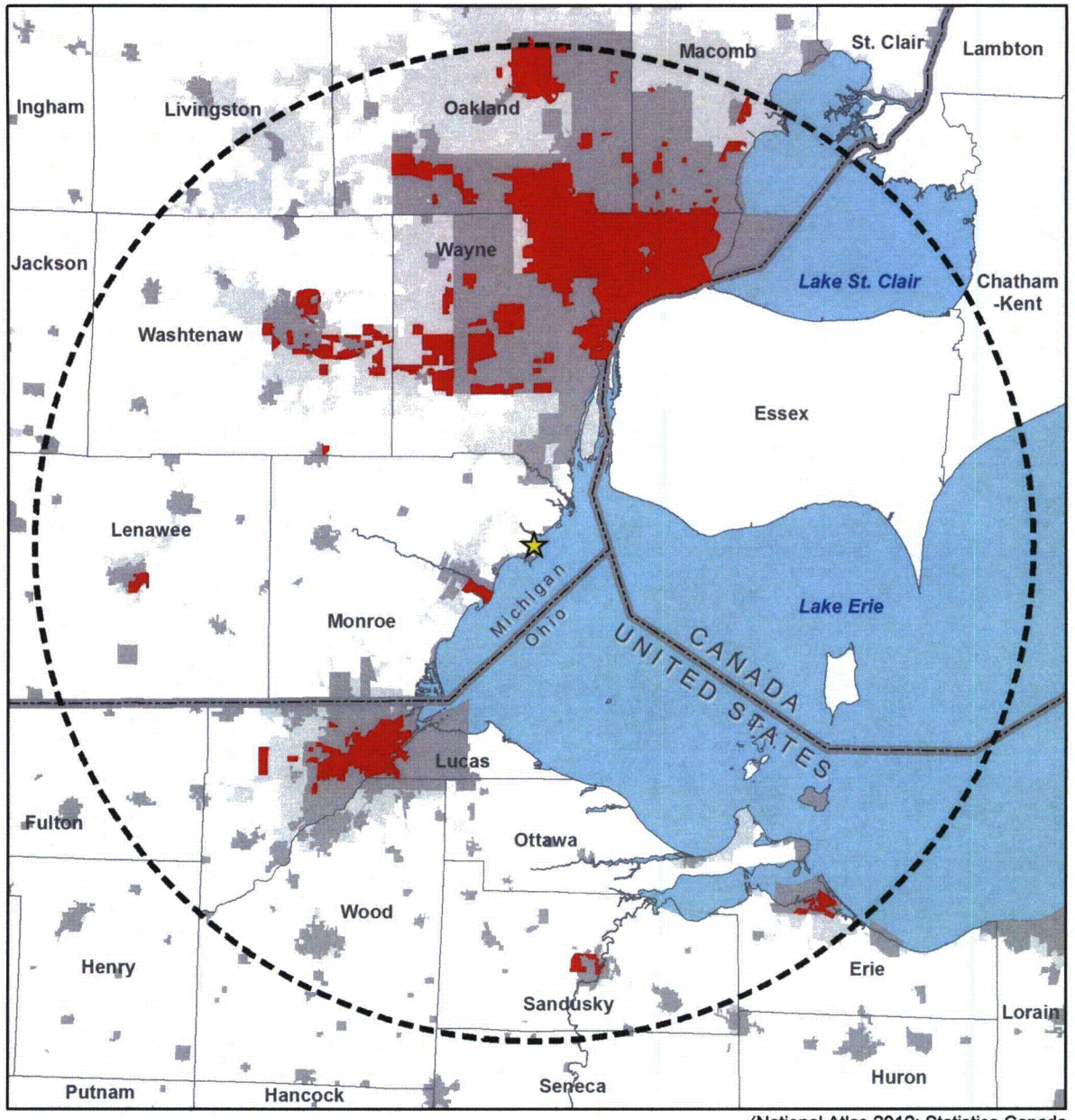


Figure 3.10-18
Census—Aggregate and Hispanic Populations (Individual States)

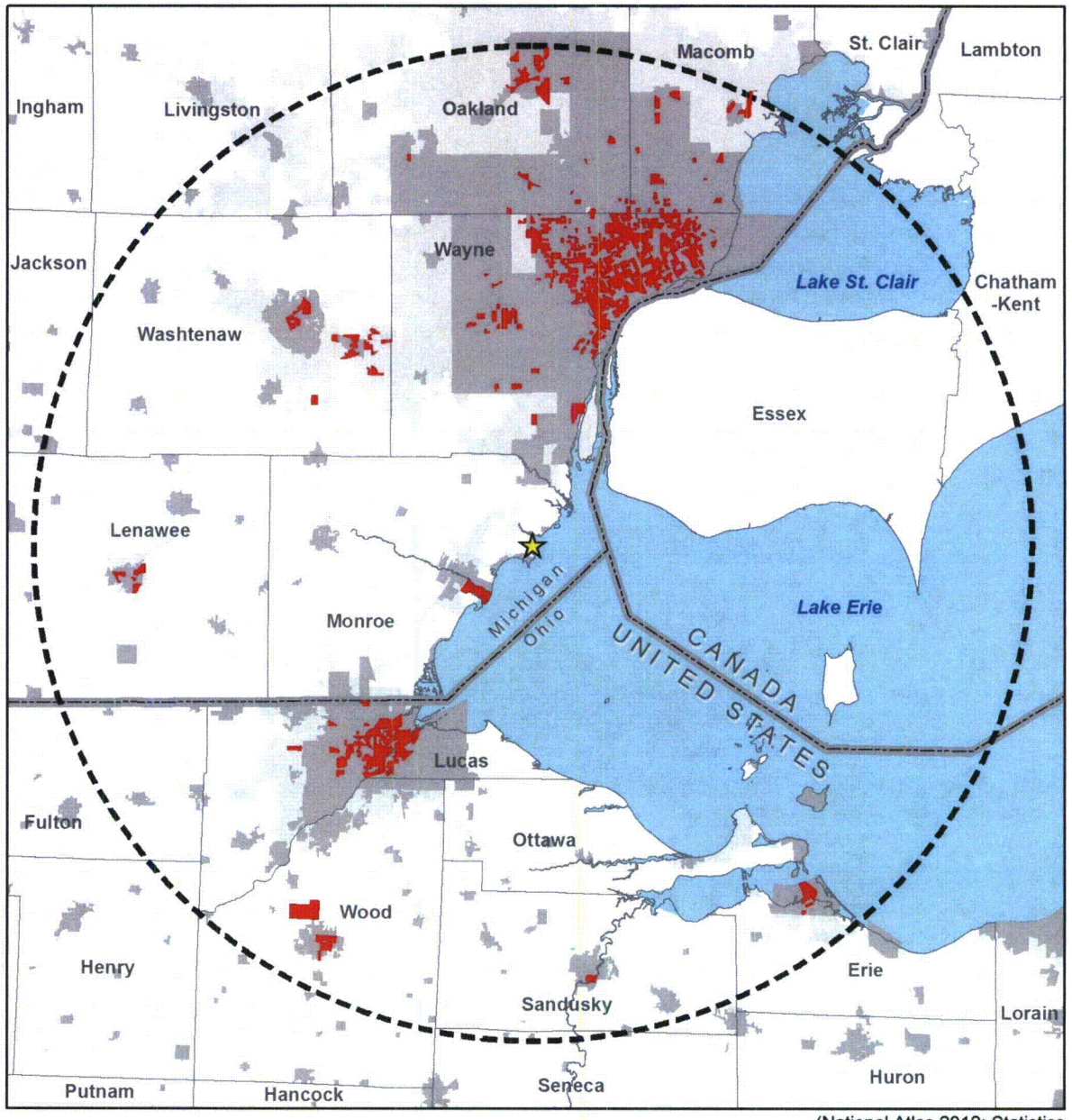


Figure 3.10-19
Census—Low Income Individuals (Regional)

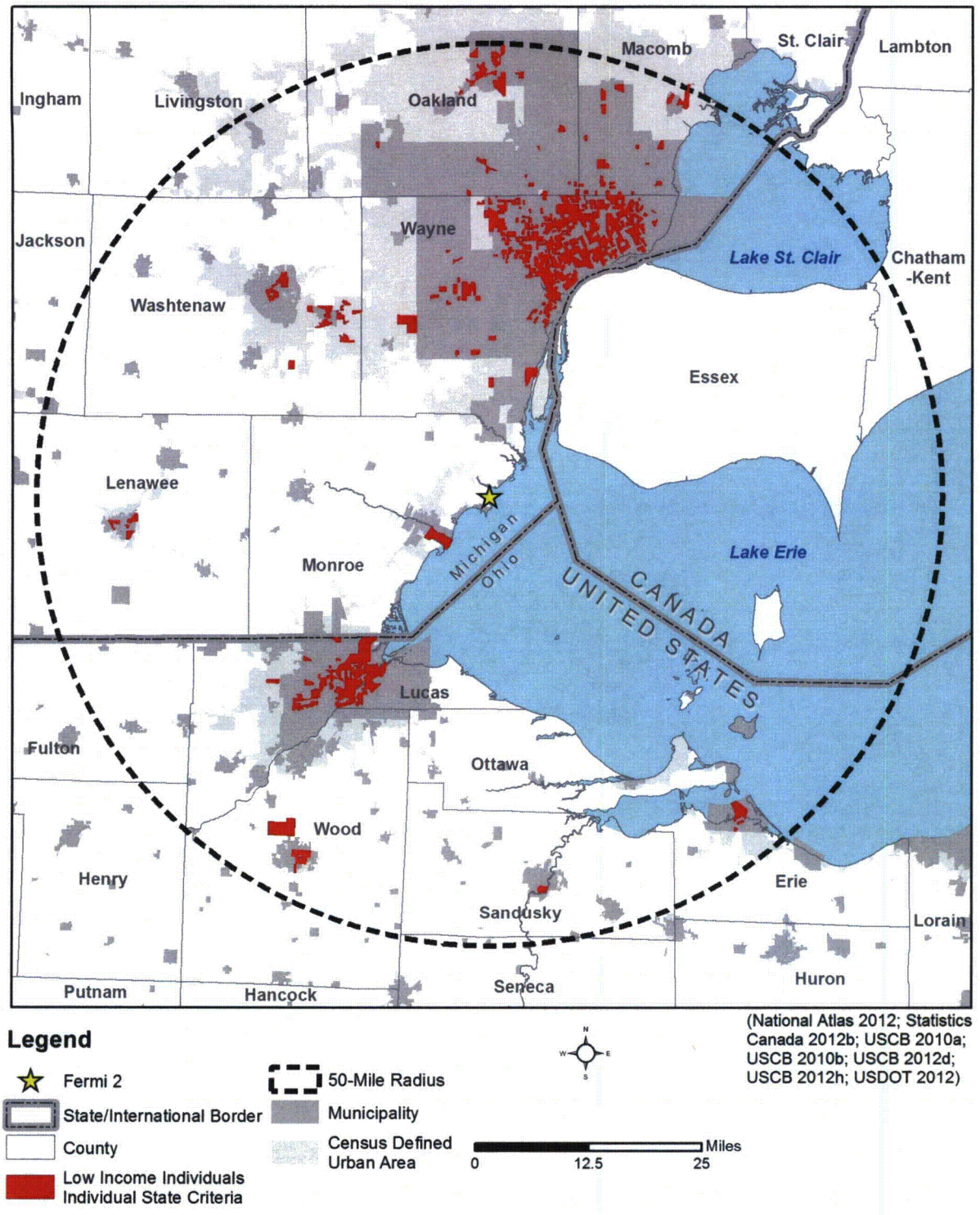


Figure 3.10-20
Census—Low Income Individuals (Individual States)

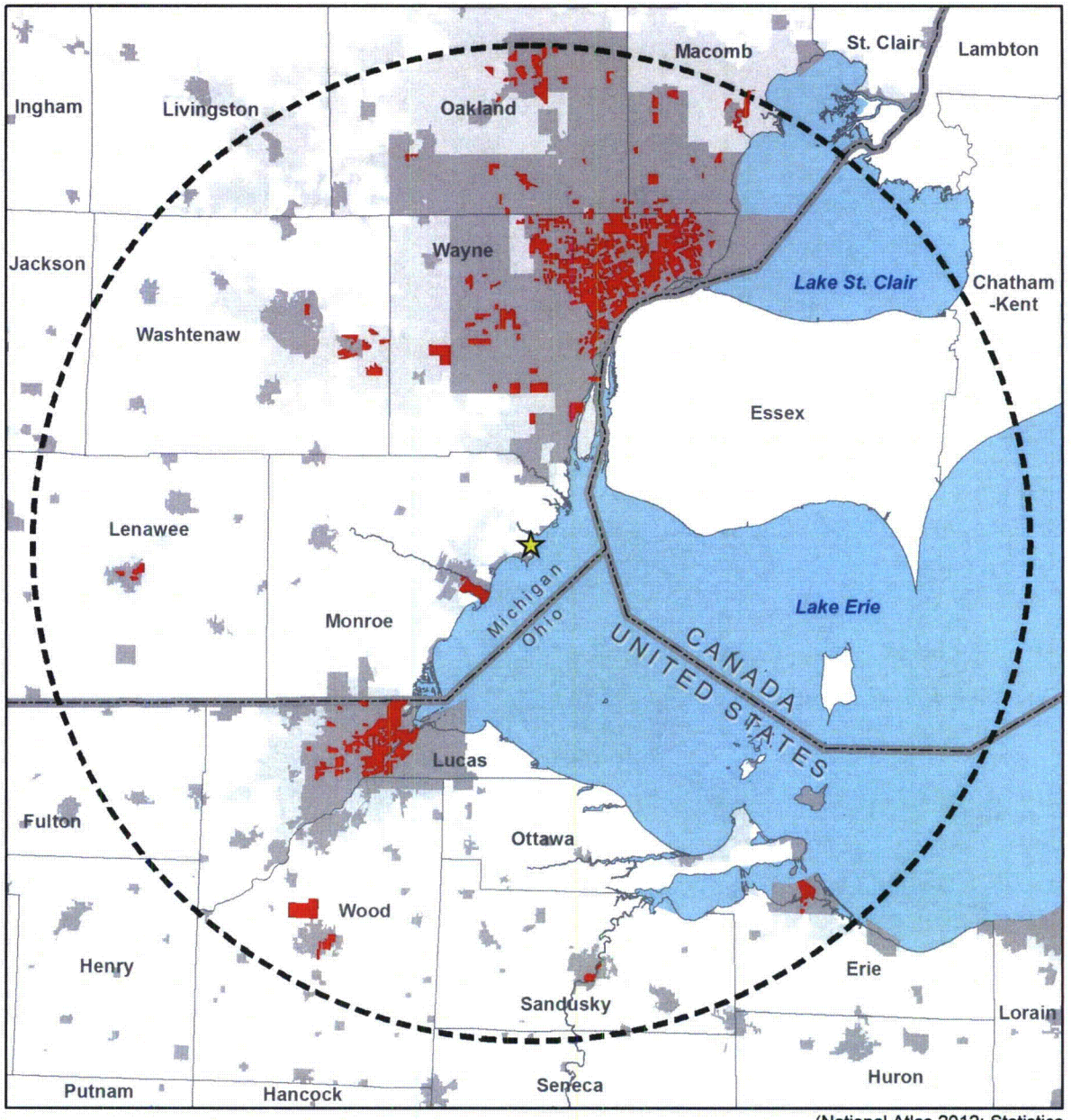


Figure 3.10-21
Census—Low Income Families (Regional)

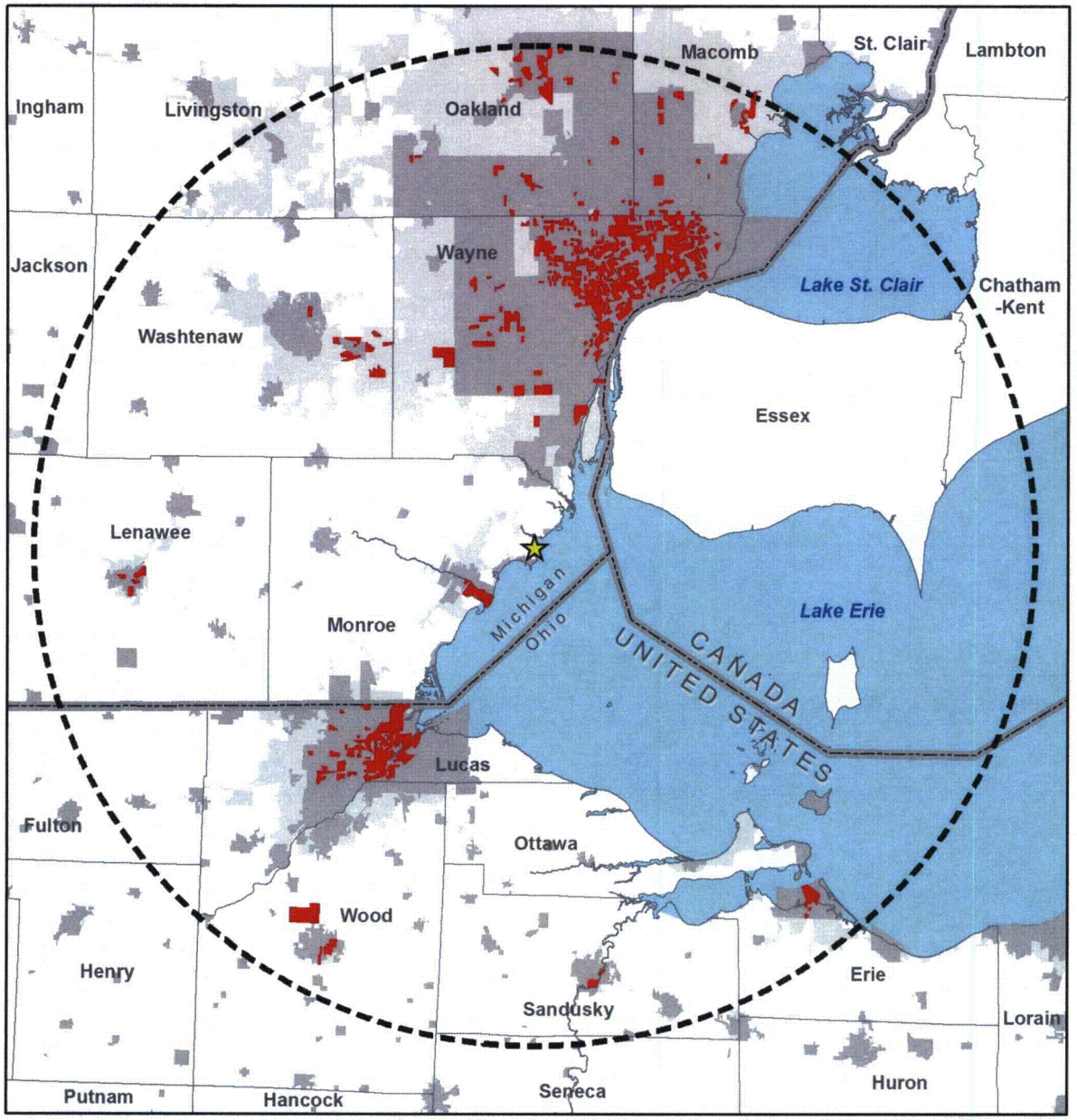


Figure 3.10-22
Census—Low Income Families (Individual States)

3.11 Waste Management

In addressing the plant's radioactive and nonradioactive waste management systems and programs, Regulatory Guide 4.2, Supplement 1, Revision 1, specifies that the information being requested in this section can be incorporated by reference to Section 2.2 of the ER (NRC 2013a, Section 3.11). Therefore, consistent with Regulatory Guide 4.2, DTE is providing the information below to address Fermi 2's radioactive and nonradioactive waste management systems and programs.

Section 2.2.3 includes a discussion of Fermi 2's liquid, gaseous and solid radwaste systems. The section provides a description of the systems, controls for limiting the releases of radioactive liquid and gaseous effluents, management of low-level mixed wastes, radwaste storage, and spent fuel storage. Section 2.2.4 identifies permitted facilities currently utilized for offsite processing and disposal of radioactive wastes.

Section 2.2.8 includes a discussion of the following Fermi 2 nonradioactive waste management program areas:

- Management of RCRA waste, types of wastes generated and quantities, and minimization programs (Section 2.2.8.1).
- NPDES permitted discharges and associated permit requirements, stormwater pollution prevention, and sanitary wastewater discharges (Section 2.2.8.2).
- Air permitted discharges and associated permit requirements, quantities of emission pollutants, and GHG emissions associated with plant operations (Section 2.2.8.3).
- Spill prevention programs for minimizing the potential for a chemical release to the environment (Section 2.2.8.4).

3.12 Federal and Non-Federal Related Project Activities

Fermi 2 is on existing land owned by DTE. Approximately 650 acres of undeveloped lands on the Fermi site are managed as part of the DRIWR (DTE 2013o). DTE has had a cooperative agreement with the USFWS since 2003 that allows the USFWS to assist in managing the refuge areas while DTE retains ownership and control of the entire site. Under the agreement, DTE and the USFWS may end the agreement either in whole or in part, meaning that lands currently included as part of the DRIWR could be removed from the refuge. While approximately 2 acres would be removed during the construction of Fermi 3, DTE intends to return all undisturbed wetlands to the DRIWR after construction of Fermi 3 is complete. (NRC 2013c, Section 2.12)

There is little federal land within a 50-mile radius of the Fermi 2 site. A 480-acre former U.S. Department of Defense (DOD) property lies approximately 6 miles northwest of the Fermi 2 site. The majority of this property was sold to a private owner in the mid-1980s. A portion of the property, located at the corner of Newport Road and Telegraph Road near Nike Park, is currently owned by the State of Michigan and is used by the Michigan Army National Guard. No plans for future use of this property have been specified by the DOD. The River Raisin National Battlefield Park in Monroe County, 7 miles southwest of the Fermi site, is under federal control. The Cedar Point National Wildlife Refuge and the Ottawa National Wildlife Refuge, both east of Toledo, Ohio, are approximately 25 miles and 30 miles from the site, respectively. There are no wilderness areas or rivers included in the national wild and scenic rivers system within 50 miles of the Fermi 2 site, and the closest Native American tribal reservations are more than 50 miles from the site. (NRC 2013c, Section 2.12)

Because no refurbishment or other license-renewal-related construction activities have been identified, no new permits such as those related to the MDEQ or USACE will be required. Based on other actions and projects identified during this review (Table 3.12-1), there are no federal projects that would make it desirable for another federal agency to become a cooperating agency in the license renewal process. However, DTE considered the impacts of other past, present, and foreseeable actions and projects in its cumulative impacts analysis (Section 4.12).

Table 3.12-1
Past, Present, and Reasonably Foreseeable Future Projects and Other Actions Considered in the Cumulative Analysis (Ordered from Closest to Farthest from the Fermi Site within Each Project Category)

Project Name[a]	Summary	Location	Status
Energy Projects			
Fermi 2 operations	Routine infrastructure renovation and maintenance projects.	On the Fermi site	Ongoing
Fermi Nuclear Power Plant Unit 2 measurement uncertainty recapture	1,170-MWe nuclear power plant.	On the Fermi site	Approved February 2014
Fermi Nuclear Power Plant Unit 1	Decommissioning of shut-down nuclear power plant.	On the Fermi site	SAFSTOR
Fermi Nuclear Power Plant Unit 3	1,535-MWe nuclear power plant.	On the Fermi site	COL application submitted
Independent spent fuel storage installation for Fermi 2	Dry spent fuel storage.	On the Fermi site	Recently completed, but preoperational
Monroe Power Plant	3,280-MW coal-fired plant.	6 miles SW of Fermi site on Lake Erie	Operational, includes recent and planned refurbishment
Trenton Channel Power Plant	730-MW coal-fired plant.	12 miles NNE of Fermi site on the Detroit River	Operational
J.R. Whiting Power Plant, Luna Pier, Michigan	328-MW coal-fired plant.	14 miles SSW of Fermi site on Lake Erie	To be shut down in approximately 2015
Bayshore Power Plant	499-MW coal-fired plant.	20 miles SSW of Fermi site on Lake Erie in Maumee Bay	Operational
River Rouge Power Plant	540-MW coal-fired plant.	26 miles NNE of Fermi site on the Detroit River	Operational

Table 3.12-1 (Continued)
Past, Present, and Reasonably Foreseeable Future Projects and Other Actions Considered in the Cumulative Analysis (Ordered from Closest to Farthest from the Fermi Site within Each Project Category)

Project Name[a]	Summary	Location	Status
Davis-Besse Nuclear Power Station Unit 1	925-MW nuclear power plant.	27 miles SE of Fermi site on Lake Erie	Operational
Davis-Besse independent spent fuel storage installation	Dry spent fuel storage.	On Davis-Besse site	Operational
Mining Projects			
Rockwood Quarry	Crushed and broken limestone quarry.	2.5 miles NNE of Fermi site	Operational
Stoneco Newport	Crushed and broken limestone quarry.	2.5 miles NNE of Fermi site	Operational
Sylvania Minerals	Crushed and broken limestone and crushed silica quarry.	6 miles NNW of Fermi site	Operational
Stoneco Denniston	Crushed and broken limestone quarry.	9 miles SW of Fermi site	Operational
Stoneco Maybee	Crushed and broken limestone quarry.	13 miles WNW of Fermi site	Operational
Sibley Quarry	Crushed and broken limestone quarry.	14 miles NNE of Fermi site	Operational
Transportation Projects			
Cleveland-Toledo-Detroit Passenger Rail Line	Addition to regional transportation hub with rail lines connecting Cleveland, Buffalo, Toronto, Pittsburgh, Cincinnati, and Detroit.	Rail line would pass through Monroe County on its way to Detroit	Proposed; schedule undetermined

Table 3.12-1 (Continued)
Past, Present, and Reasonably Foreseeable Future Projects and Other Actions Considered in the Cumulative Analysis (Ordered from Closest to Farthest from the Fermi Site within Each Project Category)

Project Name[a]	Summary	Location	Status
Other Actions/Projects			
Berlin Township Wastewater Treatment Plant	Wastewater treatment plant that discharges to Swan Creek near its confluence with Lake Erie.	1.1 miles NW of Fermi site	Operational
Frenchtown Township Water Plant	Water treatment plant that withdraws water from Lake Erie.	2 miles SW of Fermi site	Operational
Taylor Welded Blanks	Steel processing plant.	Approximately 4.5 miles W of Fermi site	Operational
Spartan Steel Coating LLC	Steel processor of hot-dipped galvanized coils.	Approximately 5 miles W of Fermi site	Operational
JCIM	Plastics injection molding.	Approximately 5 miles WSW of Fermi site	Operational
Spiratex Company	Manufacturer of thermoplastics extrusions.	Approximately 5 miles WSW of Fermi site	Operational
Monroe Metropolitan Wastewater Treatment Facility	Wastewater treatment plant that discharges to Lake Erie-Plum Creek-Levee Channel.	6 miles SW of the Fermi site on Lake Erie	Operational
Ventower Industries	Wind turbine tower manufacturing facility.	6 miles SW of Fermi site in Monroe, Michigan	Operational
Monroe Water Filtration Plant	Water treatment plant that withdraws water from Lake Erie.	7 miles SW of Fermi site	Operational
Carleton Wastewater Treatment	Wastewater treatment plant that discharges to Swan Creek.	9 miles NW of Fermi site	Operational

Table 3.12-1 (Continued)
Past, Present, and Reasonably Foreseeable Future Projects and Other Actions Considered in the Cumulative Analysis (Ordered from Closest to Farthest from the Fermi Site within Each Project Category)

Project Name[a]	Summary	Location	Status
Guardian Industries Glass Plant	Manufacturing facility that discharges into Swan Creek.	10 miles NNW of Fermi site	Operational
Luna Pier Wastewater Treatment	Wastewater treatment plant that discharges to La Pointe Drain.	14 miles SSW of Fermi site	Operational
Oil refineries	Plants that refine crude oil for other applications.	Various throughout region	Operational
Future urbanization	Construction of housing units and associated commercial buildings, roads, bridges, and rail; construction of water and/or wastewater treatment and distribution facilities and associated pipelines, as described in local land use planning documents (no specific data found on development and expansion of towns within 20 miles of the site).	Throughout region	Construction would occur in the future, as described in state and local land use planning documents
Great Lakes restoration initiative	Restoration activities to address toxic substances, invasive species, near-shore health and nonpoint source pollution, and habitat and wildlife protection.	Great Lakes watershed	Began in FY 2011
Global climate change/natural environmental stressors	Short- or long-term changes in precipitation or temperature.	Throughout region	Impacts would occur in the future

(NRC 2013c, Table 7-1)

a. Listed projects are based on best available public information.

4.0 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND MITIGATING ACTIONS

The NRC has identified and analyzed 78 environmental issues that it considers to be associated with nuclear power plant license renewal and has designated the issues as Category 1, Category 2, or NA (not applicable). NRC designated an issue as Category 1 if the following criteria were met:

- The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristic.

- A single significance level (i.e., small, moderate, or large) has been assigned to the impacts that would occur at any plant, regardless of which plant is being evaluated (except for collective offsite radiological impacts from the fuel cycle and from high-level waste [HLW] and spent fuel disposal).

- Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely to be not sufficiently beneficial to warrant implementation.

If the NRC concluded that one or more of the Category 1 criteria could not be met, NRC designated the issue Category 2, which requires plant-specific analysis. NRC designated one issue as NA, signifying that the categorization and impact definitions do not apply to this issue. NRC rules do not require analyses of Category 1 issues that were resolved using generic findings [10 CFR Part 51, Appendix B, Table B-1] as described in the GEIS. Therefore, an applicant may reference the GEIS findings for Category 1 issues, absent new and significant information.

4.0.1 Category 1 License Renewal Issues

DTE has determined that, of the 59 Category 1 issues, seven are not applicable to the Fermi 2 site because they apply to design or operational features that do not exist at the facility. Table 4.0-1 lists these seven issues and provides a brief explanation of why they are not applicable to the site. Table 4.0-2 lists the 52 issues applicable to the site. DTE reviewed the NRC findings on these 52 issues and identified no new and significant information that would invalidate the findings for the site (Chapter 5). Therefore, DTE adopts by reference the NRC findings for these Category 1 issues.

4.0.2 Category 2 License Renewal Issues

NRC designated 17 issues as Category 2. DTE has determined that, of the 17 issues shown in Table 4.0-3, nine are not applicable to the Fermi 2 site because they apply to design or operational features that do not exist at the facility. Where the issue does not apply to the site, the section explains the basis.

For the eight issues applicable to the site, the corresponding sections contain the required analyses. These analyses include conclusions regarding the significance of the impacts relative to renewal of the Fermi 2 OL for the site and, when applicable, discuss potential mitigative alternatives to the extent appropriate. With the exception of threatened and endangered species/EFH, historic and cultural resources, and environmental justice, DTE has identified the significance of the impacts associated with each issue as SMALL, MODERATE, or LARGE consistent with the criteria that NRC established in 10 CFR Part 51, Appendix B, Table B-1, Footnote 3 as follows:

> **SMALL:** Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, the NRC has concluded that those impacts that do not exceed permissible levels in the NRC's regulations are considered small.
>
> **MODERATE:** Environmental effects are sufficient to alter noticeably, but not to destabilize, any important attributes of the resource.
>
> **LARGE:** Environmental effects are clearly noticeable and are sufficient to destabilize any important attributes of the resource.

Threatened and endangered species/EFH, historic and cultural resources, and environmental justice were not assigned a significance impact of SMALL, MODERATE, or LARGE in 10 CFR Part 51, Appendix B, Table B-1. Therefore, consistent with NRC guidance, DTE identified the significance of the impacts for these three Category 2 issues as follows:

- For threatened and endangered species (Endangered Species Act [ESA]), effects (1) would have no effect, (2) are not likely to adversely affect, (3) are likely to adversely affect, or (4) are likely to jeopardize the listed species or adversely modify the designated critical habitat of federally listed species populations or their critical habitat during the license renewal term. For EFH (Magnuson-Stevens Fishery Conservation and Management Act), effects would have (1) no adverse impact, (2) minimal adverse impact, or (3) substantial adverse impact to the essential habitat of federally managed fish populations during the license renewal term.

- For historic and cultural resources (NHPA), effects would be based on a determination that (1) no historic properties are present, (2) historic properties are present, but not adversely affected, or (3) there is an adverse effect.

- For environmental justice, impacts would be based on disproportionately high and adverse human health and environmental effects on minority and low-income populations.

In accordance with NEPA practice, DTE considered ongoing and potential additional mitigation in proportion to the significance of the impact to be addressed (i.e., impacts identified as small receive less mitigative consideration than impacts identified as large).

4.0.3 Not Applicable License Renewal Issues

NRC determined that its categorization and impact-finding definitions did not apply to chronic effects of electromagnetic fields and offsite radiological impacts of spent nuclear fuel and HLW disposal. Because the categorization and impact finding definitions do not apply as noted in 10 CFR Part 51, Appendix B, Table B-1, Footnote 5, applicants are not currently required to submit information on these two issues.

4.0.4 Format of Issues Reviewed

The review and analysis of the Category 1 and 2 issues are discussed in Sections 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 4.10, 4.11, 4.12, 4.13, and 4.14. The format for the review of these issues is described below:

- *Resource Area*: Title of the resource area.
- *Issue*: Title of the issue.
- *Findings from Table B-1, Appendix B to Subpart A*: The findings for the issue from Table B-1, Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants, Appendix B to Subpart A.
- *Requirement*: Restatement of the requirement from 10 CFR 51.53(c)(3)(ii).
- *Background*: A background excerpt from the applicable section of the GEIS. The specific section of the GEIS is referenced for the convenience of the reader.
- *Analysis of Environmental Impact*: An analysis of the environmental impact as required by 10 CFR 51.53(c)(3)(ii). The analysis takes into account information provided in the GEIS, Appendix B to Subpart A of 10 CFR Part 51, as well as current site-specific information.
- *Conclusion*: For issues applicable to the site or where new and significant information is identified, the conclusion of the analysis along with the consideration of mitigation alternatives as required by 10 CFR 51.45(c) and 10 CFR 51.53(c)(3)(iii).

Table 4.0-1
Category 1 Issues Not Applicable to Fermi 2

Issue	Comment
Land Use	
Offsite land use of transmission line ROWs	All in-scope transmission lines subject to the evaluation of environmental impacts for license renewal are located within the Fermi 2 site property.
Surface Water Resources	
Altered salinity gradients	Fermi 2 does not discharge to an estuary.
Surface water use conflicts (plants with once-through cooling systems)	Fermi 2 utilizes a closed-cycle cooling heat dissipation system equipped with natural draft cooling towers.
Groundwater Resources	
Groundwater use conflicts (plants that withdraw less than 100 gpm)	Fermi 2 does not withdraw groundwater from the site; potable water is provided by Frenchtown Township Water Supply and makeup cooling water is supplied by Lake Erie.
Groundwater quality degradation resulting from water withdrawals	Fermi 2 does not withdraw groundwater from the site; potable water is provided by Frenchtown Township Water Supply and makeup cooling water is supplied by Lake Erie.
Groundwater quality degradation (plants with cooling ponds in salt marshes)	Fermi 2 is located on a freshwater body and does not utilize cooling ponds.
Terrestrial Resources	
Cooling system impacts on terrestrial resources (plants with once-through cooling systems or cooling ponds)	Fermi 2 utilizes a closed-cycle cooling heat dissipation system and is not listed as a plant utilizing cooling ponds in Table 3.1-2 of the GEIS.

Table 4.0-2
Category 1 Issues Applicable to Fermi 2

Issue	Subcategories
Land Use	Onsite land use
	Offsite land use
Visual Resources	Aesthetic impacts
Air Quality	Air quality impacts (all plants)
	Air quality effects of transmission lines
Noise	Noise impacts
Geologic Environment	Geology and soils
Surface Water Resources	Surface water use and quality (non-cooling system impacts)
	Altered current patterns at intake and discharge structures
	Altered thermal stratification of lakes
	Scouring caused by discharged cooling water
	Discharge of metals in cooling system effluent
	Discharge of biocides, sanitary wastes, and minor chemical spills
	Effects of dredging on surface water quality
	Temperature effects on sediment transport capacity
Groundwater Resources	Groundwater contamination and use (non-cooling system impacts)
Terrestrial Resources	Exposure of terrestrial organisms to radionuclides
	Cooling tower impacts on vegetation (plants with cooling towers)
	Bird collisions with plant structures and transmission lines
	Transmission line ROW management impacts on terrestrial resources
	Electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock)

Table 4.0-2 (Continued)
Category 1 Issues Applicable to Fermi 2

Issue	Subcategories
Aquatic Resources	Impingement and entrainment of aquatic organisms (plants with cooling towers)
	Entrainment of phytoplankton and zooplankton (for all plants)
	Thermal impacts on aquatic organisms (plants with cooling towers)
	Infrequently reported thermal impacts (all plants)
	Effects of cooling water discharge on dissolved oxygen, gas supersaturation, and eutrophication
	Effects of nonradiological contaminants on aquatic organisms
	Exposure of aquatic organisms to radionuclides
	Effects of dredging on aquatic organisms
	Effects on aquatic resources (non-cooling system impacts)
	Impacts of transmission ROW management on aquatic resources
	Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses
Socioeconomics	Employment and income, recreation, and tourism
	Tax revenues
	Community services and education
	Population and housing
	Transportation
Human Health	Radiation exposures to the public
	Radiation exposures to plant workers
	Human health impact from chemicals
	Microbiological hazards to plant workers
	Physical occupational hazards
Postulated Accidents	Design-basis accidents

Table 4.0-2 (Continued)
Category 1 Issues Applicable to Fermi 2

Issue	Subcategories
Waste Management	Low-level waste storage and disposal
	Onsite storage of spent nuclear fuel
	Mixed-waste storage and disposal
	Nonradiological waste storage and disposal
Uranium Fuel Cycle	Offsite radiological impacts—individual impacts from other than the disposal of spent fuel and HLW
	Offsite radiological impacts—collective impacts from other than the disposal of spent fuel and HLW
	Nonradiological impacts of the uranium fuel cycle
	Transportation
Termination of Nuclear Power Plant Operations and Decommissioning	Termination of plant operations and decommissioning

Table 4.0-3
Category 2 Issues Applicable to Fermi 2

Issue	Applicability	ER Section
Surface Water Resources		
Surface water use conflicts (plants with cooling ponds or cooling towers using makeup water from a river)	Not applicable	4.5.1
Groundwater Resources		
Groundwater use conflicts (plants with closed-cycle cooling systems that withdraw makeup water from a river)	Not applicable	4.5.2
Groundwater use conflicts (plants that withdraw more than 100 gpm)	Not applicable	4.5.3
Groundwater quality degradation (plants with cooling ponds at inland sites)	Not applicable	4.5.4
Radionuclides released to groundwater	Applicable	4.5.5
Terrestrial Resources		
Water use conflicts with terrestrial resources (plants with cooling ponds or cooling towers using makeup water from a river)	Not applicable	4.6.1
Effects on terrestrial resources (non-cooling system impacts)	Applicable	4.6.2
Aquatic Resources		
Impingement and entrainment of aquatic organisms (plants with once-through cooling systems or cooling ponds)	Not applicable	4.6.3
Thermal impacts on aquatic organisms (plants with once-through cooling systems or cooling ponds)	Not applicable	4.6.4
Water use conflicts with aquatic resources (plants with cooling ponds or cooling towers using makeup water from a river)	Not applicable	4.6.5
Special Status Species and Habitats		
Threatened, endangered, and protected species and essential fish habitat	Applicable	4.6.6
Historic and Cultural Resources		
Historic and cultural resources	Applicable	4.7

Table 4.0-3 (Continued)
Category 2 Issues Applicable to Fermi 2

Issue	Applicability	ER Section
Human Health		
Microbiological hazards to the public (plants with cooling ponds or canals or cooling towers that discharge to a river)	Not applicable	4.9.1
Electric shock hazards	Applicable	4.9.2
Environmental Justice		
Minority and low-income populations	Applicable	4.10
Cumulative Impacts		
Cumulative impacts	Applicable	4.12
Postulated Accidents		
Severe accidents	Applicable	4.9.3

4.1 Land Use and Visual Resources

4.1.1 Onsite Land Use

4.1.1.1 Findings from Table B-1, Appendix B to Subpart A

SMALL. Changes in onsite land use from continued operations and refurbishment associated with license renewal would be a small fraction of the nuclear power plant site and would involve only land that is controlled by the licensee.

4.1.1.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

4.1.1.3 Background [GEIS Section 4.2.1.1]

Operational activities at a nuclear power plant during the license renewal term would be similar to those occurring during the current license term. Generally, onsite land-use conditions would remain unchanged. However, additional spent nuclear fuel and low-level radioactive waste generated during the license renewal term could require the construction of new or expansion of existing onsite storage facilities. Should additional storage facilities be required, this action would be addressed in separate license reviews conducted by the NRC. The NRC has not identified any information or situations during previous license renewal reviews that would alter the conclusion that impacts from continued plant operations and refurbishment would be SMALL for all commercial nuclear power plants.

4.1.1.4 Analysis

Onsite land-use information is presented in Section 3.1.1 of this ER. No license-renewal-related refurbishment activities have been identified as discussed in Section 2.3. In addition, as discussed in Section 2.1, no license-renewal-related construction activities have been identified. Therefore, based on DTE's review, no new and significant information was identified as it relates to onsite land use, and further analysis is not required.

4.1.2 Offsite Land Use

4.1.2.1 Findings from Table B-1, Appendix B to Subpart A

SMALL. Offsite land use would not be affected by continued operations and refurbishment associated with license renewal.

4.1.2.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

4.1.2.3 Background [GEIS Section 4.2.1.1]

The impacts of continued plant operations during the license renewal term and refurbishment on offsite land use were evaluated separately in the 1996 GEIS. It was predicted that impacts associated with refurbishment and changes in population and tax revenue on offsite land use could range from SMALL to MODERATE. Subsequent license renewal reviews, however, have shown no power plant-related population changes or significant tax revenue changes due to license renewal. Non-outage employment levels at nuclear power plants have remained relatively unchanged or have decreased. With no increase in the number of workers, there has been no increase in housing, infrastructure, or demand for services beyond what has already occurred. Operational activities during the license renewal term would be similar to those occurring during the current license term and would not affect offsite land use beyond what has already been affected.

4.1.2.4 Analysis

Offsite land-use information is presented in Section 3.1.2 of this ER. As discussed in Section 2.5, there are no plans to add workers to support plant operations during the extended license renewal period and, as discussed in Section 2.3, no license-renewal-related refurbishment activities have been identified. Therefore, based on DTE's review, no new and significant information was identified as it relates to offsite land use, and further analysis is not required.

4.1.3 Offsite Land Use of Transmission Line Right-of-Ways

4.1.3.1 Findings from Table B-1, Appendix B to Subpart A

SMALL. Use of transmission line ROWs from continued operations and refurbishment associated with license renewal would continue with no change in land-use restrictions.

4.1.3.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

4.1.3.3 Background [GEIS Section 4.2.1.1]

Operational activities in offsite transmission line ROWs, within this scope of review, during the license renewal term, would be similar to those occurring during the current license term and would not affect offsite land use in transmission line ROWs beyond what has already been affected. Certain land-use activity in the ROW is usually restricted. Land cover is generally managed through a variety of maintenance procedures so that vegetation growth and building construction do not interfere with power line operation and access. Land use within ROWs is limited to activities that do not endanger power line operation; these include recreation, off-road vehicle use, grazing, agricultural cultivation, irrigation, roads, environmental conservation, and wildlife areas. Transmission lines do not preclude the use of the land for farming or environmental and recreational use. Transmission lines connecting nuclear power plants to the electrical grid are no different from transmission lines connecting any other power plant.

4.1.3.4 Analysis

Land-use information associated with the in-scope transmission lines for the environmental evaluation is presented in Section 2.2.10 of this ER. As discussed in Section 2.2.10.1, in-scope transmission lines are located within the developed and industrialized area of the Fermi property. Therefore, this issue is not applicable, and further analysis is not required.

4.1.4 Aesthetics Impacts

4.1.4.1 Findings from Table B-1, Appendix B to Subpart A

SMALL. No important changes to the visual appearance of plant structures or transmission lines are expected from continued operations and refurbishment associated with license renewal.

4.1.4.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

4.1.4.3 Background [GEIS Section 4.2.1.2]

A case study performed for the 1996 GEIS found a limited number of situations where nuclear power plants had a negative effect on visual resources. Negative perceptions were based on aesthetic considerations (for instance, the plant is out of character or scale with the community or the viewshed), physical environmental concerns, safety and perceived risk issues, an anti-plant attitude, or an anti-nuclear orientation. It is believed that these negative perceptions would persist regardless of mitigation measures. Subsequent license renewal reviews have not revealed any new information that would change this perception.

In addition, the visual appearance of transmission lines is not expected to change during the license renewal term. After the containment building and cooling towers, transmission line towers are probably the most frequently observed structure associated with nuclear power plants. Transmission lines from nuclear power plants are generally indistinguishable from those from other power plants. Since electrical transmission lines are common throughout the United States, they are generally perceived with less prejudice than the nuclear power plant itself. Also, the visual impact of transmission lines tends to wear off when viewed repeatedly. Replacing or moving towers or burying cables to reduce the visual impact would be impractical from both an efficiency and cost-benefit perspective.

4.1.4.4 Analysis

The visual appearance of the plant and in-scope transmission lines is presented in Section 3.1.3 of this ER. No license-renewal-related refurbishment activities have been identified as discussed in Section 2.3. As discussed in Section 3.1.3, visual impacts from the cooling towers, the tallest structures on the Fermi site, are limited to the adjacent residents and traffic associated with the Dixie Highway and smaller arterial roads, and the cooling towers can also be seen sporadically from I-75 and I-275. Locally, the cooling towers are visible from locations in Sterling State Park

and Pointe Mouillee State Game Area, but overall the site does not visually impact areas that have a high degree of visitor use or recreational areas. Therefore, based on DTE's review, no new and significant information was identified as it relates to aesthetics, and further analysis is not required.

4.2 Air Quality

4.2.1 Findings from Table B-1, Appendix B to Subpart A

SMALL. Air quality impacts from continued operations and refurbishment associated with license renewal are expected to be small at all plants. Emissions resulting from refurbishment activities at locations in or near air quality nonattainment or maintenance areas would be short-lived and would cease after these refurbishment activities are completed. Operating experience has shown that the scale of refurbishment activities has not resulted in exceedance of the *de minimis* thresholds for criteria pollutants, and best management practices, including fugitive dust controls and the imposition of permit conditions in state and local air emissions permits, would ensure conformance with applicable state or tribal implementation plans.

Emissions from emergency diesel generators and fire pumps and routine operations of boilers used for space heating would not be a concern, even for plants located in or adjacent to nonattainment areas. Impacts from cooling tower particulate emissions even under the worst-case situations have been small.

4.2.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

4.2.3 Background [GEIS Section 4.3.1.1]

Impacts on air quality during normal plant operations can result from operations of fossil fuel-fired equipment needed for various plant functions. Each licensed plant typically employs emergency diesel generators for use as a backup power source. Emergency diesel generators and fire pumps typically require state or local operating permits. These diesel generators are typically tested once a month with several test burns of various durations (e.g., 1 to several hours). In addition to these maintenance tests, longer-running endurance tests are also typically conducted at each plant. Each generator is typically tested for 24 hours on a staggered test schedule (e.g., once every refueling outage).

In addition to the emergency diesel generators, fossil fuel (i.e., diesel-, oil-, or natural-gas-fired) boilers are used primarily for evaporator heating, plant space heating, and/or feed water purification. These units typically operate at a variable load on a continuous basis throughout the year unless end use is restricted to one application, such as space heating. The utility boilers at commercial plants are relatively small when compared with most industrial boilers and are typically regulated through state-level operating permits.

The potential impact from emergency generators and boilers on air quality would be expected to be SMALL for all plants and, given the infrequency and short duration of maintenance testing, it would not be an air quality concern even at those plants located in or adjacent to nonattainment areas.

As discussed in Section 3.3 of the GEIS, cooling tower drift can increase downwind particulate matter (PM) concentrations, impair visibility, ice roadways, cause drift deposition, and damage vegetation and painted surfaces. Thus, although there is the potential for some air quality impacts to occur as a result of equipment and cooling tower operations, even in the worst-case situation (Hope Creek), the impacts have been small, and licensees would be required to operate within state permit requirements.

The NRC concludes that the impact of refurbishment activities on air quality during the license renewal term would be SMALL for most plants, but could be cause for concern at plants located in or near air quality nonattainment or maintenance areas, depending on the nature of the planned activity. Still, the impacts would be temporary and cease once projects were completed and implementation of BMPs including fugitive dust controls and the imposition of new and/or revised conditions in state and local air emissions permits would ensure conformance with applicable state or tribal implementation plans.

4.2.4 Analysis

Air quality information is presented in Sections 2.2.8.3 and 3.2.3 of this ER. No license-renewal-related refurbishment activities have been identified as discussed in Section 2.3. As discussed in Section 3.2.3, Monroe County is in attainment for all criteria NAAQS air pollutants.

As discussed in Section 2.2.8.3, the Fermi 2 air permit contains conditions established by the MDEQ to protect Michigan's ambient air quality standards and ensure impacts are maintained at acceptable levels. These same conditions would regulate any future Fermi 2 activities that may increase air pollutants or threaten the attainment status of Monroe County. Therefore, based on DTE's review, no new and significant information was identified as it relates to air quality, and further analysis is not required.

4.3 Noise

4.3.1 Findings from Table B-1, Appendix B to Subpart A

SMALL. Noise levels would remain below regulatory guidelines for offsite receptors during continued operations and refurbishment associated with license renewal.

4.3.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

4.3.3 Background [GEIS Section 4.3.1.2]

Given the industrial nature of the power plant and the number of years of plant operation, noise from a nuclear plant is generally nothing more than a continuous minor nuisance. However, noise levels may sometimes exceed the 55 dBA level that the EPA uses as a threshold level to protect against excess noise during outdoor activities. However, according to the EPA, this threshold does "not constitute a standard, specification, or regulation," but was intended to provide a basis for state and local governments establishing noise standards. Nevertheless, noise levels at the site boundary are expected to remain well below regulatory standards for offsite residents.

Noise would also be generated by construction-related activities and equipment used during refurbishment. However, this noise would occur for relatively short periods of time (several weeks) and is not expected to be distinguishable from other operational noises at the site boundary nor create an adverse impact on nearby residents.

4.3.4 Analysis

Noise associated with plant operations is presented in Section 3.3 of this ER. No license-renewal-related refurbishment activities have been identified as discussed in Section 2.3. In addition, as discussed in Section 3.3, noise associated with Fermi 2 operational activities is within acceptable levels, and no changes in plant operation which would alter noise levels were identified for the purpose of license renewal. Based on the previous 5 years (2008–2012), there have only been a few noise complaints associated with Fermi Security's nighttime training at the firing range, which is NRC-required training that cannot be rescheduled to daytime hours. Although these complaints are sporadic and no trend has been identified, Fermi proactively notifies the communities of Frenchtown Township, Village of Estral Beach, and Berlin Township prior to any nighttime firing range training activities. (DTE 2013x) Therefore, based on DTE's review, no new and significant information was identified as it relates to noise, and further analysis is not required.

4.4 Geology and Soils

4.4.1 Findings from Table B-1, Appendix B to Subpart A

SMALL. The effect of geologic and soil conditions on plant operations and the impact of continued operations and refurbishment activities on geology and soils would be small for all nuclear power plants and would not change appreciably during the license renewal term.

4.4.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

4.4.3 Background [GEIS Section 4.4.1]

The impact of continued operations and refurbishment associated with license renewal on geologic and soil resources would consist of soil disturbance, including sediment and/or any associated bedrock, for projects, such as replacing or adding buildings, roads, parking lots, and belowground and aboveground utility structures. Implementing BMPs would reduce soil erosion and subsequent impacts on surface water quality. These practices include, but are not limited to, minimizing the amount of disturbed land, stockpiling topsoil before ground disturbance, mulching and seeding in disturbed areas, covering loose materials with geotextiles, using silt fences to reduce sediment loading to surface water, using check dams to minimize the erosive power of drainages, and installing proper culvert outlets to direct flows in streams or drainages.

Detailed geotechnical analyses would be required to address the stability of excavations, foundation footings, and slope cuts for building construction, road creation, or other refurbishment-related construction projects. Depending on the plant location and design, riverbank or coastline protection might need to be upgraded, especially at water intake or discharge structures, if natural flows, such as storm surges, cause an increase in erosion. In addition, the Farmland Protection Policy Act [7 USC 4201 et seq.] requires federal agencies to take into account agency actions affecting the preservation of farmland including prime and other important farmland soils, as described in Section 3.4 of the GEIS. While the Farmland Protection Policy Act could apply in some circumstances at nuclear power plant sites (e.g., development of renewable energy resources as an alternative to license renewal, other projects completed with federal assistance, including funding), it does not apply to federal permitting or licensing actions for activities on private or non-federal lands [7 CFR 658.2].

4.4.4 Analysis

Geology and soils information is presented in Section 3.4 of this ER. No license-renewal-related refurbishment activities have been identified as discussed in Section 2.3. Routine infrastructure, renovation, and maintenance projects would be expected during continued operation as mentioned above. As discussed in Section 3.4, Fermi 2 maintains and implements a SWPPP that identifies potential sources of pollution that would reasonably be expected to affect the quality of stormwater, such as erosion, and identifies the practices that are used to prevent or reduce the pollutants in stormwater discharges. In addition, any earth change that disturbs one

or more acres or is within 500 feet of a lake or stream requires an SESC permit. Therefore, based on DTE's review, no new and significant information was identified as it relates to geology and soils, and further analysis is not required.

4.5 Water Resources

4.5.1 Surface Water Use Conflicts (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)

4.5.1.1 Findings from Table B-1, Appendix B to Subpart A

SMALL or MODERATE. Impacts could be of small or moderate significance, depending on makeup water requirements, water availability, and competing water demands.

4.5.1.2 Requirement [10 CFR 51.53(c)(3)(ii)(A)]

If the applicant's plant utilizes cooling towers or cooling ponds and withdraws makeup water from a river, an assessment of the impact of the proposed action on water availability and competing water demands, the flow of the river . . . must be provided.

4.5.1.3 Background [GEIS Section 4.5.1.1]

Water use conflicts associated with plants with cooling ponds or cooling towers using makeup water from a river with low flow were considered to vary among sites because of differing site-specific factors, such as makeup water requirements, water availability (especially in terms of varying river flow rates), changing or anticipated changes in population distributions, or changes in agricultural or industrial demands. No new information has been identified in plant-specific supplemental environmental impact statements (SEISs) or associated literature that would alter this conclusion.

On the basis of these considerations, the impact of water use conflicts from the continued operation of nuclear power plants with cooling ponds or cooling towers using makeup water from a river could be SMALL or MODERATE, depending on factors such as plant-specific design characteristics affecting consumptive water use, the characteristics of the water body serving as the source for makeup water, and the amount of competing use for that water.

4.5.1.4 Analysis

As discussed in Section 2.2.2 of this ER, Fermi 2 withdraws makeup water for cooling purposes from Lake Erie, not from a river. Therefore, this issue is not applicable and further analysis is not required.

4.5.2 Groundwater Use Conflicts (Plants with Closed-Cycle Cooling Systems that Withdraw Makeup Water from a River)

4.5.2.1 Findings from Table B-1, Appendix B to Subpart A

SMALL, MODERATE, or LARGE. Water use conflicts could result from water withdrawals from rivers during low-flow conditions, which may affect aquifer recharge. The significance of impacts would depend on makeup water requirements, water availability, and competing water demands.

4.5.2.2 Requirement [10 CFR 51.53(c)(3)(ii)(A)]

If the applicant's plant utilizes cooling towers or cooling ponds and withdraws makeup water from a river, an assessment of the impact of the proposed action on water availability and competing water demands . . . must be provided. The applicant shall also provide an assessment of the impacts of the withdrawal of water from the river on alluvial aquifers during low flow.

4.5.2.3 Background [GEIS Section 4.5.1.2]

In the case of plants with cooling towers or cooling ponds that rely on a river for makeup of consumed (evaporated) cooling water, it is possible water withdrawals from the river could lead to groundwater use conflicts with other users. This situation could occur because of the interaction between groundwater and surface water, especially in the setting of an alluvial aquifer in a river valley. Consumptive use of the river water, if significant enough to lower the river's water level, would also influence water levels in the alluvial aquifer. Shallow wells of nearby groundwater users could therefore have reduced water availability or go dry. During times of drought, the effect would be occurring naturally, although withdrawals for makeup water would increase the effect.

In the 1996 GEIS, groundwater use conflicts were evaluated for plants that use cooling towers withdrawing makeup water from a river during continued operations and refurbishment. The NRC found that conflicts would not necessarily be the same at all nuclear plant sites because of site-specific factors (e.g., the amount of surface water decline, well pump rates, well locations, and hydrogeologic factors). The resulting impact could be SMALL, MODERATE, or LARGE. No new information has been identified in plant-specific SEISs or associated literature that would alter this conclusion.

4.5.2.4 Analysis

As discussed in Section 2.2.2 of this ER, Fermi 2 withdraws makeup water for cooling purposes from Lake Erie, not from a river. Therefore, this issue is not applicable and further analysis is not required.

4.5.3 Groundwater Use Conflicts (Plants that Withdraw More Than 100 gpm)

4.5.3.1 Findings from Table B-1, Appendix B to Subpart A

SMALL, MODERATE, or LARGE. Plants that withdraw more than 100 gpm could cause groundwater use conflicts with nearby groundwater users.

4.5.3.2 Requirement [10 CFR 51.53(c)(3)(ii)(C)]

If the applicant's plant pumps more than 100 gallons (total on site) of groundwater per minute, an assessment of the impact of the proposed action on groundwater must be provided.

4.5.3.3 Background [GEIS Section 4.5.1.2]

A nuclear plant may have several wells, with combined pumping in excess of 100 gpm (378 liters per minute [L/min]). Overall site pumping rates of this magnitude have the potential to create conflicts with other local groundwater users if the cone of depression extends to the offsite well(s). Large offsite pumping rates for municipal, industrial, or agricultural purposes may, in turn, lower the water level at power plant wells. For any user, allocation is normally determined through a state-issued permit.

Groundwater use conflicts have not been observed at any nuclear power plants, and no significant change in water well systems is expected over the license renewal term. If a conflict did occur, it might be possible to resolve it if the power plant relocated its well or wellfield to a different part of the property. The siting of new wells would be determined through a hydrogeologic assessment.

In the 1996 GEIS, groundwater use conflicts were considered for plants that withdraw more than 100 gpm (378 L/min) or plants that use Ranney wells. The NRC concluded that the impacts of continued operations and refurbishment would not necessarily be the same at all nuclear plant sites (i.e., a Category 2 issue) because of site-specific factors (e.g., well pump rates, well locations, and hydrogeologic factors) and that the impacts could be SMALL, MODERATE, or LARGE. No new information has been identified in plant-specific SEISs or associated literature that would alter this conclusion.

4.5.3.4 Analysis

Fermi 2 does not have any onsite wells that are utilized for plant operations. As discussed in Section 2.2.2 of this ER, Lake Erie is the source of makeup cooling water and fire protection water, while Frenchtown Water System is the source of potable water. Therefore, this issue is not applicable and further analysis is not required.

4.5.4 Groundwater Quality Degradation (Plants with Cooling Ponds at Inland Sites)

4.5.4.1 Findings from Table B-1, Appendix B to Subpart A

SMALL, MODERATE, or LARGE. Inland sites with closed-cycle cooling ponds could degrade groundwater quality. The significance of the impact would depend on cooling pond water quality, site hydrogeologic conditions (including the interaction of surface water and groundwater), and the location, depth, and pump rate of water wells.

4.5.4.2 Requirement [10 CFR 51.53(c)(3)(ii)(D)]

If the applicant's plant is located at an inland site and utilizes cooling ponds, an assessment of the impact of the proposed action on groundwater quality must be provided.

4.5.4.3 Background [GEIS Section 4.5.1.2]

Some nuclear power plants that rely on unlined cooling ponds are located at inland sites surrounded by farmland or forest or undeveloped open land. Degraded groundwater has the potential to flow radially from the ponds and reach offsite groundwater wells. The degree to which this occurs depends on the water quality of the cooling pond; site hydrogeologic conditions (including the interaction of surface water and groundwater); and the location, depth, and pump rate of water wells.

Mitigation of significant problems stemming from this issue could include lining existing ponds, constructing new lined ponds, or installing subsurface flow barrier walls. Groundwater monitoring networks would be necessary to detect and evaluate groundwater quality degradation. The degradation of groundwater quality associated with cooling ponds has not been reported for any inland nuclear plant sites.

The 1996 GEIS considered the impacts of this issue during continued operations and concluded that the impact would not necessarily be the same at all sites (i.e., a Category 2 issue) and could be SMALL, MODERATE, or LARGE. No new information has been identified in plant-specific SEISs or associated literature that would alter this conclusion.

4.5.4.4 Analysis

Fermi 2 is not considered an inland site and is not listed as a plant utilizing cooling ponds in Table 3.1-2 of the GEIS. Therefore, this issue is not applicable to the site and further analysis is not required.

4.5.5 Radionuclides Released to Groundwater

4.5.5.1 Findings from Table B-1, Appendix B to Subpart A

SMALL or MODERATE. Leaks of radioactive liquids from plant components and pipes have occurred at numerous plants. Groundwater protection programs have been established at all operating nuclear power plants to minimize the potential impact from any inadvertent releases. The magnitude of impacts would depend on site-specific characteristics.

4.5.5.2 Requirement [10 CFR 51.53(c)(3)(ii)(P)]

An applicant shall assess the impact of any documented inadvertent releases of radionuclides into groundwater. The applicant shall include in its assessment a description of any groundwater protection program used for the surveillance of piping and components containing radioactive liquids for which a pathway to groundwater may exist. The assessment must also include a description of any past inadvertent releases and the projected impact to the environment (e.g., aquifers, rivers, lakes, ponds, ocean) during the license renewal term.

4.5.5.3 Background [GEIS Section 4.5.1.2]

This issue was added because there were numerous instances of inadvertent releases of liquids containing radioactive material into the groundwater at nuclear power plants. The issue is relevant to license renewal because all commercial nuclear power plants routinely release radioactive gaseous and liquid materials into the environment. These radioactive releases are designed to be planned, monitored, documented, and released into the environment at designated discharge points. However, within the past several years, there have been numerous events at power reactor sites which involved unknown, uncontrolled, and unmonitored release of liquids containing radioactive material into the groundwater. NRC regulations in 10 CFR Part 20 and in 10 CFR Part 50 limit the amount of radioactive material, from all sources at a nuclear power plant, released into the environment to levels that are ALARA. The regulations are designed to protect the public and the environment.

The majority of the inadvertent liquid release events involved tritium, which is a radioactive isotope of hydrogen. However, other radioactive isotopes, such as cesium and strontium, have also been inadvertently released into the groundwater. The types of events include leakage from spent fuel pools, buried piping, and failed pressure relief valves on an effluent discharge line.

In 2006, the NRC's executive director for operations chartered a task force to conduct a lessons-learned review of these incidents. On September 1, 2006, the task force issued its report: *Liquid Radioactive Release Lessons Learned Task Force Report.* The most significant conclusion dealt with the potential health impacts on the public from the inadvertent releases. Although there were numerous events where radioactive liquid was released to the groundwater in an unplanned, uncontrolled, and unmonitored fashion, based on the data available, the task force did not identify any instances where public health and safety was adversely impacted.

On the basis of the information and experience with these leaks, the NRC concluded that the impact to groundwater quality from the release of radionuclides could be SMALL or MODERATE, depending on the magnitude of the leak, radionuclides involved, hydrogeologic factors, the distance to receptors, and the response time of plant personnel to identify and stop the leak in a timely fashion. Since the leaks are not planned and there are currently no NRC regulations that would require the timely identification and termination of a leak, there is no information available to make a generic assessment.

4.5.5.4 Analysis

Groundwater hydrology is described in Section 3.5.2 of this ER. Groundwater monitoring wells and piezometers currently installed on the Fermi site are shown in Figure 3.5-2. Figures 3.5-4 and 3.5-5 provide groundwater flow direction maps for the unconfined, surficial aquifer (glacio-lacustrine sediments and engineered aggregate fill) and the confined, bedrock aquifer (Bass Islands Group) at the site. A groundwater flow direction map for the deeper bedrock aquifer (Salina Group) is not provided, because only one monitoring well on site is completed within this formation. Table 3.5-1 provides details of the monitoring well construction, and Table 3.5-2 provides monitoring well depth-to-water and groundwater elevation.

Results of tritium analysis of groundwater sampled since the fall of 2007 have been reported in Fermi 2's annual radioactive effluent release reports (Fermi 2009c; Fermi 2010f; Fermi 2011d; Fermi 2012c; Fermi 2013b). Groundwater samples from many of the site's wells have not identified tritium above detectable levels. Table 4.5-1 lists only the positive tritium results associated with groundwater sampling since the fall of 2007.

As shown in Table 4.5-1, the low-level concentrations of tritium detected were below the REMP lower limit of detection (LLD) of 2,000 picocuries per liter (pCi/L), and less than one-tenth of EPA's drinking water limit of 20,000 pCi/L. The REMP LLD is based on NUREG-1302, Table 4.12-1. DTE has set the laboratory LLD for tritium 75 percent lower at 500 pCi/L, to be conservative. The laboratory sets equipment and other parameters to be able to measure activities below the REMP LLD to ensure DTE can at least meet the REMP LLD. After the sample is counted, the laboratory calculates the minimum detectable activity (MDA) for that count. Because the MDA must be equal to or preferably below the LLD, positive values below the LLD can be assayed, and these are subsequently reported.

Concentrations in the shallow wells ranged from 100 pCi/L to 1,950 pCi/L, and concentrations in the deep wells ranged from 207 pCi/L to 574 pCi/L. For comparison, a picocurie is equivalent to parts per trillion, which is one million times smaller than the commonly used "parts per million" measurement—thus a very small number. As a note, the "RHR" wells shown in Table 4.5-1 were a one-time sampling event and are not included in the Fermi 2 Integrated Groundwater Protection Program.

Most of the shallow monitoring well samples have consistently indicated that tritium is not present at the detection limit. Of the shallow monitoring wells that were sampled quarterly (periodic sample events) in accordance with Fermi 2's Integrated Groundwater Protection Program in 2012, only three samples from three wells produced results with detectable tritium (Table 4.5-1). The results were sporadic and variable with tritium concentrations all less than the REMP LLD of 2,000 pCi/L (less than one-tenth of the EPA drinking water limit for tritium). Furthermore, since the Integrated Groundwater Protection Program was initiated in the fall of 2007, plant-related gamma isotopes or hard-to-detect isotopes have never been identified in groundwater samples from any of the shallow monitoring wells. (Fermi 2012c; Fermi 2013b)

If the tritium found in groundwater from shallow wells was attributable to a leaking plant system, then it would be anticipated that the levels remain consistent, or steadily increase over time, especially during the winter when there is normally less recharge from surface water. Instead, the results show periodic low-level detections of tritium in groundwater with no clear trend. This pattern is more consistent with tritium recapture in precipitation. Recapture of tritium emitted from nuclear power plant stacks in precipitation is well documented, and these emissions are continuously monitored and reported annually by the utility as part of an approved effluents program. A tritium rainwater washout study performed at the Fermi site revealed that tritium is found in rainwater collected at the site. Tritium activity in rainwater samples, taken at the site over a period of 2 months, ranged from 400 pCi/L to 5,750 pCi/L. (Fermi 2012c) The scenario of radioactive material being released in gaseous effluents per 10 CFR 20.2001(a)(3) and then returning to a facility as part of a natural process, such as rainfall or condensation, was

recognized in NRC Regulatory Issue Summary 2008-03, "Return/Re-use of Previously Discharged Radioactive Effluents" (NRC 2008).

Plant-related gamma isotopes or hard-to-detect isotopes have never been identified in groundwater samples from any of the deep monitoring wells since the Integrated Groundwater Protection Program was initiated. (Fermi 2012c) The positive tritium results from the bedrock aquifer are considered spurious because none of the adjacent shallow aquifer wells have elevated tritium levels nor is there a credible source for licensed material in the bedrock aquifer. In addition, deep monitoring wells in the vicinity of Fermi 2 are screened 40–45 feet below ground surface in bedrock. An approximately 10-foot thick inorganic clay layer between surficial aquifer and the bedrock aquifer impedes flow to such a degree that the bedrock aquifer is saturated and under pressure to the point that groundwater in deep monitoring wells rises to a level several feet above the top of the clay layer. Plant components outside of buildings that contain tritiated water are either above ground in tanks or piping running through aggregate at or above the water table. If these components were to generate a leak, the contamination would be evident by the presence of high levels of activity in nearby shallow monitoring wells screened in the surficial aquifer. Furthermore, buildings completed in bedrock (e.g., reactor building, turbine building, and radwaste building) that contain contaminated systems are so far below the potentiometric surface that, should they leak, groundwater would flow into the building and, therefore, the leak could not be a source of contamination under any probable circumstance (for an evaluation of this, see Fermi 2 UFSAR, Chapter 2). (Fermi 2012c)

Under these conditions (hydrogeological and plant construction), it is highly improbable that any activity attributed to tritium in groundwater from deep monitoring wells is indicative of plant-related tritium, because there is no known pathway for plant-related tritium to contaminate the bedrock aquifer. Additionally, natural radioisotopes commonly found in bedrock, such as Pb-210, produce low-energy betas in an energy range similar to tritium and may cause spurious results. The low-level of activity in groundwater from deep monitoring wells may also be attributable to chemiluminescence due to natural compounds that occur in the hard water from the bedrock (Bass Islands Group) dolomite. (Fermi 2012c)

In 2012, Fermi 2 performed several emergent sample events. Table 4.5-2 presents only the positive tritium results detected during these sampling events. Emergent sample events are performed in response to a leak of licensed material; in response to a spill; unusual analytical results in samples taken during the course of periodic sampling; or if there is a concern over the integrity of a system, structure, or component containing licensed material. All emergent sample events (E-2012-G-01 through E-2012-G-08) were performed in response to the discovery of indications of possible corrosion found on a spare condensate line associated with the Fermi 2 condensate return tank. Analytical results from these emergent sample events indicate that the spare condensate line is intact (maximum tritium activity 875 pCi/L). Plant-related gamma-emitting radioisotopes and hard-to-detect radioisotopes were not detected in any of groundwater samples collected during these events. (Fermi 2013b)

Figure 4.5-1 depicts the locations where low levels of tritium have been detected in the shallow and deep groundwater monitoring wells based on 2012 results shown in Tables 4.5-1 and 4.5-2.

4.5.5.5 Conclusion

Tritium has not been detected at the majority of Fermi 2 groundwater monitoring wells. The low tritium concentrations detected in some shallow monitoring wells are attributed to precipitation recapture of tritium emitted from the nuclear power plant stacks and not from leaking plant systems. The low tritium concentrations detected in deep monitoring wells are believed to be spurious, because none of the adjacent shallow aquifer wells have elevated tritium levels nor is there a credible source for licensed material in the bedrock aquifer. Emergent sampling events have not identified any leaking plant systems. In addition, no plant-related gamma-emitting radioisotopes or hard-to-detect radioisotopes have been detected on the Fermi site. Based on sampling results, there is no indication that any tritium has migrated off site, and tritium results of offsite REMP groundwater wells have been < LLD. Therefore, DTE concludes that impacts from a radiological dose perspective and EPA drinking water perspective are SMALL, and mitigation measures beyond Fermi 2's existing Integrated Groundwater Protection Program and Underground Piping and Tanks Integrity Program are not warranted.

Table 4.5-1
Monitoring Well Tritium Results, 2007–2012

Monitoring Well[(a)]	Event ID	Result (pCi/L)
EF2-07-003S	P-2010-G-Q1	231
EF2-07-005S	P-2009-G-Q3	253
EF2-07-005S	P-2009-G-Q4	267
EF2-07-005S	P-2010-G-Q1	376
EF2-07-005S	P-2010-G-Q2	487
EF2-07-005S	P-2010-G-Q4	215
EF2-07-005S	P-2012-G-Q1	392
EF2-07-007S	P-2009-G-Q3	378
EF2-07-007S	P-2010-G-Q2	356
EF2-07-012S	P-2008-G-Q3	500
EF2-07-012S	P-2008-G-Q4	550
EF2-07-012S	P-2009-G-Q3	251
EF2-07-012S	P-2010-G-Q2	270
EF2-07-012S	P-2010-G-Q4	297
EF2-07-013S	P-2007-G-Q4	1,950
EF2-07-013S	P-2008-G-Q2	1,540
EF2-07-013S	P-2008-G-Q3	780
EF2-07-013S	P-2008-G-Q4	870
EF2-07-013S	P-2009-G-Q2	376
EF2-07-013S	P-2009-G-Q3	409
EF2-07-013S	P-2010-G-Q1	678
EF2-07-013S	P-2010-G-Q2	592
EF2-07-013S	P-2010-G-Q3	257
EF2-07-013S	P-2010-G-Q4	663
EF2-07-013S	P-2011-G-Q2	493
EF2-07-013S	P-2011-G-Q3	529
EF2-07-014S	P-2007-G-Q4	680

Table 4.5-1 (Continued)
Monitoring Well Tritium Results, 2007–2012

Monitoring Well[a]	Event ID	Result (pCi/L)
EF2-07-014S	P-2008-G-Q2	500
EF2-07-014S	P-2008-G-Q3	530
EF2-07-014S	P-2008-G-Q4	800
EF2-07-014S	P-2009-G-Q2	446
EF2-07-014S	P-2009-G-Q3	363
EF2-07-014S	P-2009-G-Q4	303
EF2-07-014S	P-2010-G-Q1	374
EF2-07-014S	P-2010-G-Q2	346
EF2-07-014S	P-2010-G-Q3	331
EF2-07-014S	P-2010-G-Q4	479
EF2-07-014S[b]	P-2010-G-Q4	521
EF2-07-014S	P-2011-G-Q1	593
EF2-07-014S	P-2011-G-Q3	667
EF2-07-014S	P-2011-G-Q4	542
EF2-07-016S	P-2009-G-Q4	267
EF2-07-016S	P-2010-G-Q1	100
EF2-07-018S	P-2010-G-Q1	303
EF2-07-019S	P-2008-G-Q2	560
EF2-07-019S	P-2009-G-Q2	462
EF2-07-019S	P-2009-G-Q3	517
EF2-07-019S[b]	P-2009-G-Q3	386
EF2-07-019S	P-2009-G-Q4	234
EF2-07-019S	P-2010-G-Q1	436
EF2-07-019S	P-2010-G-Q3	278
EF2-07-019S	P-2010-G-Q4	428
EF2-07-019S	P-2011-G-Q3	398
EF2-07-020S	P-2009-G-Q4	345

Table 4.5-1 (Continued)
Monitoring Well Tritium Results, 2007–2012

Monitoring Well[a]	Event ID	Result (pCi/L)
EF2-07-021S	P-2008-G-Q2	670
EF2-07-021S	P-2008-G-Q4	650
EF2-07-021S	P-2009-G-Q2	461
EF2-07-021S	P-2009-G-Q3	549
EF2-07-021S	P-2009-G-Q4	524
EF2-07-021S	P-2010-G-Q2	329
EF2-07-021S	P-2010-G-Q4	297
EF2-07-021S	P-2011-G-Q3	354
EF2-07-021S	P-2012-G-Q1	376
EF2-07-022S	P-2008-G-Q3	660
EF2-07-023S	P-2008-G-Q2	740
EF2-07-023S	P-2009-G-Q2	275
EF2-07-023S	P-2009-G-Q3	259
EF2-07-023S	P-2010-G-Q1	254
EF2-07-023S	P-2010-G-Q2	620
EF2-07-023S	P-2010-G-Q4	919
EF2-07-023S	P-2011-G-Q3	457
EF2-07-023S	P-2012-G-Q1	479
EF2-07-024S	P-2007-G-Q4	822
EF2-07-024S	P-2008-G-Q2	860
EF2-07-024S	P-2008-G-Q4	610
EF2-07-024S	P-2009-G-Q2	279
EF2-07-024S	P-2009-G-Q3	330
EF2-07-024S	P-2010-G-Q1	237
EF2-07-024S	P-2011-G-Q1	932
EF2-07-024S	P-2011-G-Q3	381
EF2-07-025S	P-2008-G-Q2	1,050

Table 4.5-1 (Continued)
Monitoring Well Tritium Results, 2007–2012

Monitoring Well[a]	Event ID	Result (pCi/L)
EF2-07-025S[b]	P-2008-G-Q2	1,050
EF2-07-025S	P-2008-G-Q3	600
EF2-07-025S[b]	P-2008-G-Q3	870
EF2-07-025S	P-2008-G-Q4	610
EF2-07-025S	P-2009-G-Q3	442
EF2-07-025S	P-2010-G-Q1	361
EF2-07-025S	P-2010-G-Q2	316
EF2-07-025S	P-2011-G-Q4	1,090
EF2-07-026S	P-2010-G-Q4	281
EF2-07-027S	P-2009-G-Q2	413
EF2-07-027S	P-2009-G-Q3	249
EF2-07-028S	P-2009-G-Q4	263
EF2-07-029S	P-2009-G-Q3	220
EF2-07-029S[b]	P-2009-G-Q3	286
EF2-07-031S	P-2010-G-Q1	241
EF2-07-031S[b]	P-2010-G-Q1	237
EF2-07-031S	P-2010-G-Q2	1,260
EF2-07-031S	P-2010-G-Q4	291
EF2-07-003D	P-2010-G-Q4	270
EF2-07-004D	P-2009-G-Q3	339
EF2-07-004D	P-2009-G-Q4	321
EF2-07-004D	P-2010-G-Q1	393
EF2-07-004D	P-2010-G-Q2	284
EF2-07-006D	P-2009-G-Q3	279
EF2-07-006D	P-2010-G-Q1	207
EF2-07-008D	P-2010-G-Q2	334
EF2-07-008D	P-2010-G-Q4	303

Table 4.5-1 (Continued)
Monitoring Well Tritium Results, 2007–2012

Monitoring Well[a]	Event ID	Result (pCi/L)
EF2-07-009D	P-2008-G-Q4	574
EF2-07-009D	P-2009-G-Q2	489
EF2-07-009D[b]	P-2009-G-Q3	527
EF2-07-009D	P-2009-G-Q3	517
EF2-07-009D	P-2009-G-Q4	312
EF2-07-009D	P-2010-G-Q1	421
EF2-07-009D	P-2010-G-Q2	424
EF2-07-009D	P-2010-G-Q4	262
EF2-07-009D	P-2012-G-Q3	241
EF2-07-015D	P-2009-G-Q3	239
EF2-07-015D	P-2011-G-Q3	402
EF2-07-020D	P-2009-G-Q3	363
EF2-07-020D	P-2009-G-Q4	442
EF2-07-020D[b]	P-2009-G-Q4	415
EF2-07-020D	P-2010-G-Q1	295
EF2-07-020D	P-2010-G-Q2	278
EF2-07-020D	P-2010-G-Q4	297
EF2-07-029D	P-2010-G-Q4	284
MW-18S	P-2010-G-Q1	253
RHR-9	P-2009-G-Q3	206
RHR-10	P-2009-G-Q3	225
RHR-11	P-2009-G-Q3	231
RHR-18	P-2009-G-Q3	212
RHR-18	P-2009-G-Q4	434
RHR-21	P-2009-G-Q4	307

(Fermi 2009c; Fermi 2010f; Fermi 2011d; Fermi 2012c; Fermi 2013b)

a. "S" designation represents shallow well; "D" designation represents deep well.
b. Duplicate.

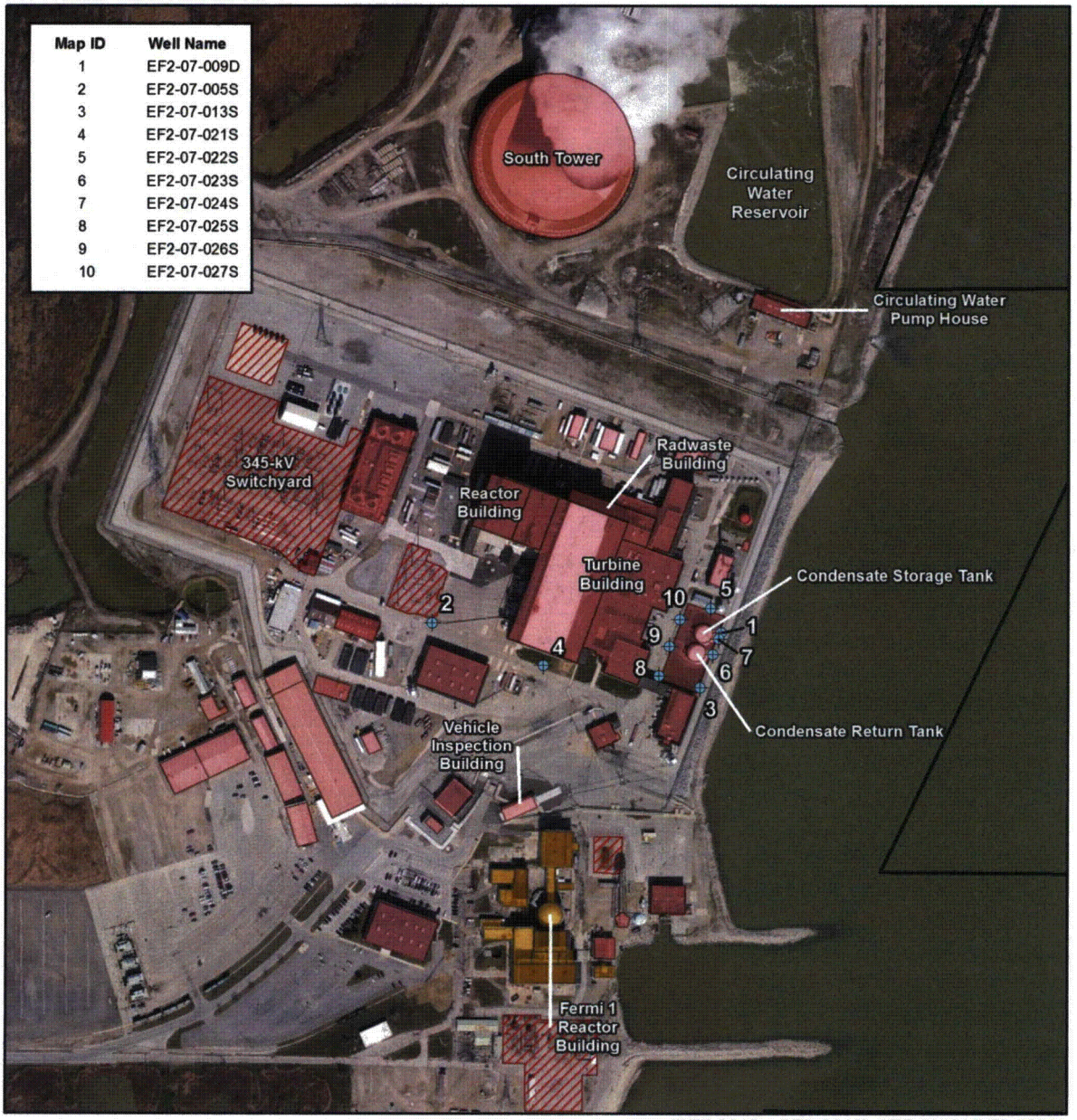
Table 4.5-2
Monitoring Well Tritium Analysis Results for Year 2012—Emergent Sample Events

Monitoring Well	Event ID	H-3 (pCi/L)
EF2-07-013S	E-2012-G-01	347
EF2-07-013S	E-2012-G-02	875
EF2-07-013S	E-2012-G-03	568
EF2-07-013S	E-2012-G-04	554
EF2-07-013S	E-2012-G-05	357
EF2-07-013S	E-2012-G-07	575
EF2-07-013S	E-2012-G-08	496
EF2-07-022S	E-2012-G-01	203
EF2-07-022S	E-2012-G-02	451
EF2-07-022S	E-2012-G-04	462
EF2-07-022S	E-2012-G-05	238
EF2-07-022S	E-2012-G-07	288
EF2-07-022S	E-2012-G-08	466
EF2-07-023S	E-2012-G-01	405
EF2-07-023S	E-2012-G-02	564
EF2-07-023S	E-2012-G-03	718
EF2-07-023S	E-2012-G-04	462
EF2-07-023S	E-2012-G-05	475
EF2-07-023S	E-2012-G-07	345
EF2-07-023S	E-2012-G-08	437
EF2-07-024S	E-2012-G-01	318
EF2-07-024S	E-2012-G-02	451
EF2-07-024S	E-2012-G-03	415
EF2-07-024S	E-2012-G-04	431
EF2-07-024S	E-2012-G-05	446
EF2-07-024S	E-2012-G-07	547
EF2-07-024S	E-2012-G-08	321

Table 4.5-2 (Continued)
Monitoring Well Tritium Analysis Results for Year 2012—Emergent Sample Events

Monitoring Well	Event ID	H-3 (pCi/L)
EF2-07-025S	E-2012-G-01	724
EF2-07-025S	E-2012-G-02	705
EF2-07-025S	E-2012-G-03	564
EF2-07-025S	E-2012-G-04	646
EF2-07-025S	E-2012-G-05	386
EF2-07-025S	E-2012-G-07	575
EF2-07-025S	E-2012-G-08	496
EF2-07-026S	E-2012-G-02	395
EF2-07-026S	E-2012-G-03	267
EF2-07-026S	E-2012-G-04	369
EF2-07-026S	E-2012-G-05	267
EF2-07-026S	E-2012-G-07	259
EF2-07-026S	E-2012-G-08	321
EF2-07-027S	E-2012-G-01	492
EF2-07-027S	E-2012-G-02	339
EF2-07-027S	E-2012-G-04	277
EF2-07-027S	E-2012-G-07	374
EF2-07-027S	E-2012-G-08	379

(Fermi 2013b)



(DTE 2012e; DTE 2013i; DTE 2013j; DTE 2013l; ESRI 2012; Fermi 2012c; Fermi 2013b)

Figure 4.5-1
Groundwater Tritium Distribution—Fermi Site

4.6 Ecological Resources

4.6.1 Water Use Conflicts with Terrestrial Resources (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)

4.6.1.1 Findings from Table B-1, Appendix B to Subpart A

SMALL or MODERATE. Impacts on terrestrial resources in riparian communities affected by water use conflicts could be of moderate significance.

4.6.1.2 Requirement [10 CFR 51.53(c)(3)(ii)(A)]

If the applicant's plant utilizes cooling towers or cooling ponds and withdraws makeup water from a river, an assessment of the impact of the proposed action on water availability and competing water demands, the flow of the river, and related impacts on . . . riparian (terrestrial) ecological communities must be provided.

4.6.1.3 Background [GEIS Section 4.6.1.1]

Water use conflicts with terrestrial resources in riparian communities could occur when water that supports these resources is diminished either because of decreased availability due to droughts; increased water demand for agricultural, municipal, or industrial usage; or a combination of such factors. For future license renewals, the potential range of impact levels at plants with cooling ponds or cooling towers using makeup water from a river cannot be determined at this time.

4.6.1.4 Analysis

As discussed in Section 2.2.2 of this ER, Fermi 2 withdraws makeup water for cooling purposes from Lake Erie, not from a river. Therefore, this issue is not applicable and further analysis is not required.

4.6.2 Effects on Terrestrial Resources (Non-Cooling System Impacts)

4.6.2.1 Findings from Table B-1, Appendix B to Subpart A

SMALL, MODERATE, or LARGE. Impacts resulting from continued operations and refurbishment associated with license renewal may affect terrestrial communities. Application of best management practices would reduce the potential for impacts. The magnitude of impacts would depend on the nature of the activity, the status of the resources that could be affected, and the effectiveness of mitigation.

4.6.2.2 Requirement [10 CFR 51.53(c)(3)(ii)(E)]

All license renewal applicants shall assess the impact of refurbishment, continued operations, and other license-renewal-related construction activities on important plant and animal habitats.

4.6.2.3 Background [GEIS Section 4.6.1.1]

Continued operations and refurbishment activities could continue to affect onsite terrestrial resources during the license renewal term at all operating nuclear power plants. Factors that could potentially result in impacts include landscape maintenance activities, stormwater management, and elevated noise levels. These impacts would, for the most part, be similar to past and ongoing impacts.

The characteristics of terrestrial habitats and wildlife communities currently on nuclear power plant sites have generally developed in response to many years of typical operations and maintenance programs. While some may have reached a relatively stable condition, some habitats and populations of some species may have continued to change gradually over time. Operations and maintenance activities during the license renewal term are expected to be similar to current activities. Because the species and habitats present on the sites (i.e., weedy species and habitats they make up) are generally tolerant of disturbance, it is expected that continued operations during the license renewal term would maintain these habitats and wildlife communities in their current state, or maintain current trends of change.

Site-specific factors related to refurbishment activities may vary considerably among nuclear power plant sites. The habitats present on or in the vicinity of nuclear power plants also vary greatly. Therefore, a generic determination of potential impacts on terrestrial resources from refurbishment or other activities is not possible. Impacts on terrestrial habitats and wildlife would depend on site-specific factors, and impact assessments would need to be conducted on a site-specific basis prior to license renewal.

On the basis of these considerations, the NRC concluded that the impact of continued operations and refurbishment activities similar to those occurring during the current license term on terrestrial resources could be SMALL, MODERATE, or LARGE, depending on site-specific differences in the terrestrial resources present, project-specific activities, and the effectiveness of mitigation measures.

4.6.2.4 Analysis

4.6.2.4.1 Refurbishment Activities

As discussed in Section 2.3, no license-renewal-related refurbishment activities have been identified. Therefore, there would be no license-renewal-related refurbishment impacts to important plant and animal habitats, and no further analysis is required.

4.6.2.4.2 Operational Activities

No license-renewal-related construction activities or changes in operational practices have been identified that would involve disturbing habitats. As previously discussed in Section 3.6.10, DTE has administrative controls in place at the Fermi site to ensure that operational changes or construction activities are reviewed, and the impacts minimized through implementation of BMPs, permit modifications, or acquisition of new permits as needed. In addition, regulatory

programs that the site is currently subject to such as stormwater management, spill prevention, dredging, and herbicide usage further serve to minimize impacts to terrestrial resources.

In addition to DTE's existing management programs at the Fermi site and regulatory programs that the site is subject to, the DRIWR encompasses approximately 650 acres of the existing 1,260-acre Fermi site (DTE 2013o). As discussed in Section 3.6.10, DTE and the USFWS are responsible for management of the DRIWR Lagoona Beach Unit, which is located within the Fermi property boundary. The Lagoona Beach Unit encompasses the remaining high-quality fish and wildlife habitats on site. The DRIWR is tasked with maintaining wildlife habitats associated with the Detroit River, as well as promoting awareness of the important resources of the refuge. Because the Lagoona Beach Unit is protected and jointly managed by the USFWS and DTE, it is anticipated there would be no impact from continued operation of Fermi 2 on important plant and animal habitat in these areas.

In summary, adequate management programs and regulatory controls are in place to ensure that important plant and animal habitats are protected during the Fermi 2 license renewal operational period.

4.6.2.5 Conclusion

As discussed in Section 2.3, no license-renewal-related refurbishment activities have been identified. Also as discussed above, no construction activities or changes in operational practices have been identified for the purpose of license renewal that would involve disturbing terrestrial habitats, and management programs and regulatory controls are in place to protect onsite important terrestrial ecosystems. Therefore, DTE concludes the impacts to the terrestrial ecosystems from license renewal are SMALL and no additional mitigation measures beyond current management programs and existing regulatory controls are required.

4.6.3 Impingement and Entrainment of Aquatic Organisms (Plants with Once-Through Cooling Systems or Cooling Ponds)

4.6.3.1 Findings from Table B-1, Appendix B to Subpart A

SMALL, MODERATE, or LARGE. The impacts of impingement and entrainment are small at many plants but may be moderate or even large at a few plants with once-through and cooling-pond cooling systems, depending on cooling system withdrawal rates and volumes and the aquatic resources at the site.

4.6.3.2 Requirement [10 CFR 51.53(c)(3)(ii)(B)]

If the applicant's plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of current Clean Water Act 316(b) determinations . . . or equivalent State permits and supporting documentation. If the applicant cannot provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from . . . impingement and entrainment.

4.6.3.3 Background [GEIS Section 4.6.1.2]

Impingement occurs when organisms are held against the intake screen or netting placed within intake canals. Most impingement involves fish and shellfish. Entrainment occurs when organisms pass through the intake screens and travel through the condenser cooling system. Aquatic organisms typically entrained include ichthyoplankton (fish eggs and larvae) and larval stages of shellfish and other macroinvertebrates, zooplankton, and phytoplankton. Juveniles and adults of some species may also be entrained if they are small enough to pass through the intake screen openings, which are commonly 0.38 inches (1 cm) at the widest point.

The magnitude of the impact would depend on plant-specific characteristics of the cooling system (including location, intake velocities, screening technologies, and withdrawal rates) and characteristics of the aquatic resource (including population distribution, status, management objectives, and life history).

In the 1996 GEIS, the NRC categorized the impacts of license renewal on impingement and entrainment of aquatic organisms to be SMALL, MODERATE, or LARGE at plants with once-through cooling or cooling ponds (i.e., a Category 2 issue). No new information has been identified in the plant-specific SEISs prepared to date or in the literature that would alter those conclusions.

4.6.3.4 Analysis

As discussed in Section 2.2.2 of this ER, Fermi 2 utilizes a closed-cycle cooling system equipped with natural draft cooling towers and is not listed as a plant utilizing cooling ponds in Table 3.1-2 of the GEIS. Therefore, this issue is not applicable and further analysis is not required.

4.6.4 Thermal Impacts on Aquatic Organisms (Plants with Once-Through Cooling Systems or Cooling Ponds)

4.6.4.1 Findings from Table B-1, Appendix B to Subpart A

SMALL, MODERATE, or LARGE. Most of the effects associated with thermal discharges are localized and are not expected to affect overall stability of populations or resources. The magnitude of impacts, however, would depend on site-specific thermal plume characteristics and the nature of aquatic resources in the area.

4.6.4.2 Requirement [10 CFR 51.53(c)(3)(ii)(B)]

If the applicant's plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of . . . a 316(a) variance in accordance with 40 CFR Part 125, or equivalent state permits and supporting documentation. If the applicant cannot provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from thermal changes . . . .

4.6.4.3 Background [GEIS Section 4.6.1.2]

In the 1996 GEIS, the NRC found that for plants with a once-through cooling system or cooling ponds, the level of impact for thermal discharge on aquatic biota (primarily due to heat shock) was SMALL at many plants and MODERATE or LARGE at some nuclear plants. Because characteristics of both the thermal discharges and the affected aquatic resources are specific to each site, NRC classified heat shock as a Category 2 issue that required a site-specific assessment for license renewal. The NRC found the potential for thermal discharge impacts to be greatest at plants with once-through cooling systems, primarily because of the higher discharge temperatures and larger thermal plume area compared to plants with cooling towers.

Based on these considerations, the NRC concluded that the issue of thermal discharges on aquatic organisms at nuclear plants with once-through cooling systems or cooling ponds over the license renewal term could have SMALL, MODERATE, or LARGE impact levels and is a Category 2 issue. The impact level at any plant depends on the characteristics of its cooling system (including location and type of discharge structure, discharge velocity and volume, and three-dimensional characteristics of the thermal plume) and characteristics of the affected aquatic resources (including the species present and their physiology, habitat, population distribution, status, management objectives, and life history).

4.6.4.4 Analysis

As discussed in Section 2.2.2 of this ER, Fermi 2 utilizes a closed-cycle cooling system equipped with natural draft cooling towers and is not listed as a plant utilizing cooling ponds in Table 3.1-2 of the GEIS. Therefore, this issue is not applicable and further analysis is not required.

4.6.5 Water Use Conflicts with Aquatic Resources (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)

4.6.5.1 Findings from Table B-1, Appendix B to Subpart A

SMALL or MODERATE. Impacts on aquatic resources in stream communities affected by water use conflicts could be of moderate significance in some situations.

4.6.5.2 Requirement [10 CFR 51.53(c)(3)(ii)(A)]

If the applicant's plant utilizes cooling towers or cooling ponds and withdraws makeup water from a river, an assessment of the impact of the proposed action on water availability and competing water demands, the flow of the river, and related impacts on stream (aquatic) . . . ecological communities must be provided.

4.6.5.3 Background [GEIS Section 4.6.1.2]

In the 1996 GEIS, water use conflicts included ecological impacts on aquatic and riparian communities.

Increased temperatures and/or decreased rainfall would result in lower river flows, increased cooling pond evaporation, and lowered water levels in the Great Lakes or reservoirs. Regardless of overall climate change, droughts could result in problems with water supplies and allocations. Because future agricultural, municipal, and industrial users would continue to share their demands for surface water with power plants, conflicts might arise if the availability of this resource decreased.

Water use conflicts with aquatic resources could occur when water to support these resources is diminished either because of decreased water availability due to droughts; increased demand for agricultural, municipal, or industrial usage; or due to a combination of such factors. Water use conflicts with biological resources in instream communities are a concern due to the duration of license renewal and potentially increasing demands on surface water.

The potential range of impact levels at plants with cooling ponds or cooling towers using makeup water from a river with low flow applying for license renewal in the future cannot be determined at this time.

4.6.5.4 Analysis

As discussed in Section 2.2.2 of this ER, Fermi 2 withdraws makeup water for cooling purposes from Lake Erie, not from a river. Therefore, this issue is not applicable and further analysis is not required.

4.6.6 Threatened, Endangered, and Protected Species, and Essential Fish Habitat

4.6.6.1 Findings from Table B-1, Appendix B to Subpart A

The magnitude of impacts on threatened, endangered, and protected species, critical habitat, and essential fish habitat would depend on the occurrence of listed species and habitats and the effects of power plant systems on them. Consultation with appropriate agencies would be needed to determine whether special status species or habitats are present and whether they would be adversely affected by continued operations and refurbishment associated with license renewal.

4.6.6.2 Requirement [10 CFR 51.53(c)(3)(ii)(E)]

All license renewal applicants shall assess the impact of refurbishment, continued operations, and other license-renewal-related construction activities on important plant and animal habitats. Additionally, the applicant shall assess the impact of the proposed action on threatened or endangered species in accordance with federal laws protecting wildlife including, but not limited to, the Endangered Species Act and essential fish habitat in accordance with the Magnuson-Stevens Fishery Conservation and Management Act.

4.6.6.3 Background [GEIS Section 4.6.1.3]

Site-specific factors related to continued operations and refurbishment activities may vary widely among nuclear power plants. The listed species on or in the vicinity of nuclear power plants also range widely, depending on numerous factors such as the plant location and habitat types present. In addition, the list of threatened and endangered species is not static and is frequently modified by the USFWS and the National Marine Fisheries Service (NMFS), with new listings being added as species are determined to be eligible, other species delisted (removed from the list), or the listing category of some species changed because of changes in the status of or threats to the species population. Therefore, a generic determination of potential impacts on listed species during a nuclear power plant's license renewal term is not possible. Impacts on threatened and endangered species would depend on site-specific factors, and impact assessments would need to be conducted on a site-specific basis.

4.6.6.4 Analysis

4.6.6.4.1 Refurbishment Activities

As discussed in Section 2.3, no license-renewal-related refurbishment activities have been identified. Therefore, there would be no license-renewal-related refurbishment impacts to threatened, endangered, and protected species, or EFH, and no further analysis is required.

4.6.6.4.2 Operational Activities

Section 3.6 addresses issues related to critical and important habitats, wetlands, and unique natural areas. Section 3.6.12 identifies and discusses threatened, endangered, and protected species that could occur on or transit the Fermi site and within Monroe and Wayne counties. As discussed in Section 3.6.12 and shown in Table 3.6-6, the USFWS and the State of Michigan have listed some plants and animals as either endangered, threatened, of special concern, or candidate species. The only federally listed species observed on the Fermi site is the piping plover, which was identified once in 2008, and was believed to be transient. Based on 2013 surveys, no piping plovers were observed and no suitable habitat for nesting was identified on site (Kogge and Heslinga 2013). There are several state-listed terrestrial species that either occur on or transit the Fermi site, as discussed in Section 3.6.12. However, there are no state-designated critical habitats for these species on the Fermi site.

As discussed in Section 3.6.12.3, NOAA concluded there was no EFH in the vicinity of the Fermi site during the Fermi 3 COLA project. Therefore, no adverse impact to EFH from Fermi 2 operations would exist during the license renewal period.

DTE is not aware of any adverse impacts regarding threatened, endangered, and protected species attributable to the site. Maintenance activities necessary to support license renewal would be limited to previously disturbed areas on site, and no additional land disturbance has been identified for the purpose of license renewal. In addition, there are no plans to alter plant operations during the license renewal term which would affect threatened, endangered, and protected species that could potentially exist on or transit the Fermi site.

As discussed in Section 3.6.10, DTE has administrative controls in place at the Fermi site to ensure that operational changes or construction activities are reviewed, and the impacts minimized through implementation of BMPs. In addition, regulatory programs, such as those discussed in Chapter 9 that the site is subject to, further serve to minimize impacts to any threatened, endangered, and protected species that may exist on or transit the Fermi site.

In an effort to obtain an independent review, the USFWS and the MDNR were also consulted for input regarding federally and state-listed threatened, endangered, and protected species, and designated critical habitat on the Fermi 2 site and vicinity (Attachment B). The USFWS did not identify any adverse impacts from license renewal. The MNFI, who performs project reviews on behalf of the State of Michigan, indicated that adverse impacts would be highly likely only if major construction (e.g., new buildings or roads) occurs that significantly impacts relevant habitat, or in the event of a severe accident. The MNFI also indicated that mitigation efforts could greatly reduce any construction-related impacts. As discussed above, no license-renewal-related refurbishment activities have been identified.

In addition, it was determined in Section 4.9.3 that the probability-weighted impacts from a severe accident would be SMALL. Therefore, based on this independent review and DTE's review, no adverse impacts to federally and state-listed threatened, endangered, and protected species were identified as a result of renewing the Fermi 2 OL.

4.6.6.5 Conclusion

No license-renewal-related refurbishment activities have been identified. In addition, NOAA concluded there was no EFH in the vicinity of the Fermi site. As discussed above, the continued operation of the site would have no adverse effects to any federally or state-listed species that may exist on or transit the Fermi site. Therefore, based on the impact findings defined in the ESA, license renewal would have no adverse effects on threatened, endangered, and protected species in the vicinity of the Fermi site, and mitigation measures beyond DTE's current management programs and existing regulatory controls are not warranted.

4.7 Historic and Cultural Resources

4.7.1 Historic and Cultural Resources

4.7.1.1 Findings from Table B-1, Appendix B to Subpart A

Continued operations and refurbishment associated with license renewal are expected to have no more than small impacts on historic and cultural resources located onsite and in the transmission line ROW because most impacts could be mitigated by avoiding those resources. The National Historic Preservation Act (NHPA) requires the federal agency to consult with the State Historic Preservation Officer (SHPO) and appropriate Native American tribes to determine the potential effects on historic properties and mitigation, if necessary.

4.7.1.2 Requirement [10 CFR 51.53(c)(3)(ii)(K)]

All applicants shall identify any potentially affected historic or archaeological properties and assess whether any of these properties will be affected by future plant operations and any planned refurbishment activities in accordance with the National Historic Preservation Act (NHPA).

4.7.1.3 Background [GEIS Section 4.7.1]

The NRC will identify historic and cultural resources within a defined APE. The license renewal APE is the area that may be impacted by land-disturbing or other operational activities associated with continued plant operations and maintenance during the license renewal term and/or refurbishment. The APE typically encompasses the nuclear power plant site, its immediate environs, including viewshed, and the transmission lines within this scope of review. The APE may extend beyond the nuclear plant site and transmission lines when these activities may affect historic and cultural resources.

Continued operations during the license renewal term and refurbishment activities at a nuclear power plant can affect historic and cultural resources through (1) ground-disturbing activities associated with plant operations and ongoing maintenance (e.g., construction of new parking lots or buildings), landscaping, agricultural or other use of plant property; (2) activities associated with transmission line maintenance (e.g., maintenance of access roads or removal of danger trees); and (3) changes to the appearance of nuclear power plants and transmission lines. Licensee renewal environmental reviews have shown that the appearance of nuclear power plants and transmission lines have not changed significantly over time; therefore additional viewshed impacts to historic and cultural resources are not anticipated.

The NHPA of 1966 requires the NRC to conduct a site-specific assessment to determine whether historic properties are present in the APE, and if so, whether the license renewal decision would result in any adverse effect upon such properties.

4.7.1.4 Analysis

4.7.1.4.1 Refurbishment Activities

As discussed in Section 2.3, no license-renewal-related refurbishment activities have been identified. Therefore, there would be no license-renewal-related refurbishment impacts to historic and cultural resources, and no further analysis is required.

4.7.1.4.2 Operational Activities

A cultural resource analysis was conducted for the 1,260-acre Fermi 2 property and surrounding 10-mile band for historic properties, including aboveground and archaeological resources, and for TCPs. The analysis also considered archaeological resources regardless of NRHP eligibility on and within a 1.5-mile band around the Fermi property (Section 3.7). The analysis resulted in an inventory including both onsite and offsite historic properties and aboveground resources, and both onsite and offsite archaeological resources with terrestrial archaeological sites and offsite/ offshore shipwreck locations (Section 3.7). Potential effects were assessed using the criteria for assessment of adverse effects given in 36 CFR 800.5, "Assessment of Adverse Effects." The analysis concluded that although historic properties are present, they would not be adversely affected from continued operation of Fermi 2 during the license renewal period.

Given that all of the aboveground historic properties on site and within a 10-mile band have achieved or maintained their eligibility or eligibility recommendation after the completion of the Fermi 2 facility, continued operation of Fermi 2 would have no adverse effects on the existing physical or visual integrity, or on the NRHP eligibility of those resources. No TCPs have been identified or suggested through consultations for the Fermi 2 region, and no maritime cultural resources have been identified within the offshore portions of the 1,260-acre Fermi 2 property (Figure 3.7-1).

DTE does not expect Fermi 2 operations during the license renewal term (an additional 20 years) to adversely affect aboveground or archaeological resources on the 1,260-acre Fermi property or within a 10-mile band around the property boundary. In addition, no license-renewal-related construction activities or changes in operational practices have been identified, and any maintenance activities necessary to support continued operation of Fermi 2 would be limited to currently developed areas of the site. Although administrative procedural controls are in place for management of cultural resources ahead of any future ground-disturbing activities at the plant as discussed in Section 9.1.4, none are planned or needed in support of license renewal.

4.7.1.5 Conclusion

As discussed in Section 2.3, no license-renewal-related refurbishment activities have been identified. There are also no plans to alter operations, expand existing facilities, or disturb additional land for the purpose of license renewal. In addition, as discussed in Section 3.7, no historic or cultural resources such as NRHP-eligible or -listed archaeological sites or aboveground historical properties or TCPs would be adversely affected by operation of the plant during the license renewal period. Therefore, although historic properties are present, they

would not be adversely affected by continued operation of Fermi 2 during the license renewal period, and additional mitigation measures beyond DTE's existing procedural administrative controls are not warranted.

4.8 Socioeconomics

4.8.1 Employment and Income, Recreation and Tourism

4.8.1.1 Findings from Table B-1, Appendix B to Subpart A

SMALL. Although most nuclear plants have large numbers of employees with higher than average wages and salaries, employment, income, recreation, and tourism impacts from continued operations and refurbishment associated with license renewal are expected to be small.

4.8.1.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

4.8.1.3 Background [GEIS Section 4.8.1.1]

Employees receive income from the nuclear power plant in the form of wages, salaries, and benefits. Employees and their families, in turn, spend this income on goods and services within the community thereby creating additional opportunities for employment and income. In addition, people and businesses in the community receive income for the goods and services sold to the power plant. Payments for these goods and services create additional employment and income opportunities in the community. The measure of a communities' ability to support the operational demands of a power plant depends on the ability of the community to respond to changing socioeconomic conditions.

Some communities experience seasonal transient population growth due to local tourism and recreational activities. Income from tourism and recreational activities creates employment and income opportunities in the communities around nuclear power plants.

Nevertheless, the effects of nuclear power plant operations on employment, income, recreation, and tourism are ongoing and have become well established during the current license term for all nuclear power plants. The impacts from power plant operations during the license renewal term on employment and income in the region around each nuclear power plant are not expected to change from what is currently being experienced. In addition, tourism and recreational activities in the vicinity of nuclear plants are not expected to change as a result of license renewal.

4.8.1.4 Analysis

Information related to employment and income, recreation, and tourism is presented in Section 3.8 of this ER. No license-renewal-related refurbishment activities have been identified as discussed in Section 2.3. In addition, as discussed in Section 2.5, there are no plans to add workers to support plant operations during the license renewal period. As previously discussed in Section 3.1.3, the site overall does not visually impact areas that have a high degree of visitor use or recreational areas locally. Therefore, based on DTE's review, no new and significant

information was identified as it relates to employment and income, recreation, and tourism, and further analysis is not required.

4.8.2 Tax Revenues

4.8.2.1 Findings from Table B-1, Appendix B to Subpart A

SMALL. Nuclear plants provide tax revenue to local jurisdictions in the form of property tax payments, payments in lieu of taxes (PILOT), or tax payments on energy production. The amount of tax revenue paid during the license renewal term as a result of continued operations and refurbishment associated with license renewal is not expected to change.

4.8.2.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

4.8.2.3 Background [GEIS Section 4.8.1.2]

Nuclear power plants and the workers who operate them are an important source of tax revenue for many local governments and public school systems. Tax revenues from nuclear power plants mostly come from property tax payments or other forms of payments such as payments in lieu of (property) taxes (PILOT), although taxes on energy production have also been collected from a number of nuclear power plants. County and municipal governments and public school districts receive tax revenue either directly or indirectly through state tax and revenue-sharing programs.

A review of license renewal applications received by the NRC since the 1996 GEIS has shown that refurbishment activities, such as steam generator and vessel head replacement, have not had a noticeable effect on the assessed value of nuclear plants, thus changes in tax revenues are not anticipated from future refurbishment activities.

The primary impact of license renewal would be the continuation or change in the amount of taxes paid by nuclear power plant owners to local governments and public school systems. The impact of nuclear plant operations on tax revenues in local communities and the impact that the expenditure of tax revenues has on the region are not expected to change appreciably from the amount of taxes paid during the current license term. Tax payments during the license renewal term would be similar to those currently being paid by each nuclear plant.

4.8.2.4 Analysis

Information related to tax revenues is presented in Section 3.8 of this ER. DTE's annual property taxes are expected to remain relatively constant through the license renewal period. Therefore, based on DTE's review, no new and significant information was identified as it relates to tax revenues, and further analysis is not required.

4.8.3 Community Services and Education

4.8.3.1 Findings from Table B-1, Appendix B to Subpart A

SMALL. Changes resulting from continued operations and refurbishment associated with license renewal to local community and educational services would be small. With little or no change in employment at the licensee's plant, value of the power plant, payments on energy production, and PILOT payments expected during the license renewal term, community and educational services would not be affected by continued power plant operations.

4.8.3.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

4.8.3.3 Background [GEIS Section 4.8.1.3]

Any changes in the number of workers at a nuclear plant will affect the demand for public services from local communities. Environmental reviews conducted by NRC since the 1996 GEIS have shown, however, that the number of workers at relicensed nuclear plants has not changed significantly because of license renewal, so demand-related impacts on community services, including public utilities, are no longer anticipated from future license renewals.

In addition, refurbishment activities, such as steam generator and vessel head replacement, have not required the large numbers of workers and the months of time that were conservatively analyzed in the 1996 GEIS, so significant impacts on community services are no longer anticipated. Because of the relatively short duration of refurbishment-related activities, workers are not expected to bring families and school-age children with them; therefore, impacts from refurbishment on educational services are also no longer anticipated.

Taxes paid by nuclear power plant owners support a range of community services, including public water, safety, fire protection, health, and judicial, social, and educational services. In some communities, tax revenues from power plants can have a noticeable impact on the quality of services available to local residents. Although many of the community services paid for by tax revenues from power plants are used by plant workers and their families, the impact of nuclear plant operations on the availability and quality of community services and education is SMALL and is not expected to change as a result of license renewal.

4.8.3.4 Analysis

Information related to community services and education is presented in Section 3.8 of this ER. No license-renewal-related refurbishment activities have been identified as discussed in Section 2.3. In addition, as discussed in Section 2.5, there are no plans to add workers to support plant operations during the license renewal period. Therefore based on DTE's review, no new and significant information was identified as it relates to community services and education, and further analysis is not required.

4.8.4 Population and Housing

4.8.4.1 Findings from Table B-1, Appendix B to Subpart A

SMALL. Changes resulting from continued operations and refurbishment associated with license renewal to regional population and housing availability and value would be small. With little or no change in employment at the licensee's plant expected during the license renewal term, population and housing availability and values would not be affected by continued power plant operations.

4.8.4.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

4.8.4.3 Background [GEIS Section 4.8.1.4]

Socioeconomic impact analyses of resources (e.g., housing) affected by changes in regional population are based on employment trends at nuclear power plants . . . however, employment levels at nuclear power plants are expected to remain relatively constant with little or no population growth or increased demand for permanent housing during the license renewal term. The operational effects on population and housing values and availability in the vicinity of nuclear power plants are not expected to change from what is currently being experienced, and no demand-related impacts are expected during the license renewal term.

The increased number of workers at nuclear power plants during regularly scheduled plant refueling and maintenance outages does create a short-term increase in the demand for temporary (rental) housing units in the region around each plant. However, because of the short duration and the repeated nature of these scheduled outages and the general availability of rental housing units (including portable trailers) in the vicinity of nuclear power plants, employment-related housing impacts have had little or no long-term impact on the price and availability of rental housing. Refurbishment impacts would be similar to what is experienced during routine plant refueling and maintenance outages.

4.8.4.4 Analysis

Information related to population and housing is presented in Section 3.8 of this ER. No license-renewal-related refurbishment activities have been identified as discussed in Section 2.3. In addition, as discussed in Section 2.5, there are no plans to add workers to support plant operations during the license renewal period. Therefore, based on DTE's review, no new and significant information was identified as it relates to population and housing, and further analysis is not required.

4.8.5 Transportation

4.8.5.1 Findings from Table B-1, Appendix B to Subpart A

SMALL. Changes resulting from continued operations and refurbishment associated with license renewal to traffic volumes would be small.

4.8.5.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

4.8.5.3 Background [GEIS Section 4.8.1.5]

Transportation impacts depend on the size of the workforce, the capacity of the local road network, traffic patterns, and the availability of alternate commuting routes to and from the plant. Because most sites have only a single access road, there is often congestion on these roads during shift changes.

Nevertheless, license renewal is not likely to affect local transportation conditions in the vicinity of a nuclear power plant beyond what is currently being experienced. Transportation impacts are ongoing and have become well established during the current licensing term for all nuclear power plants . . . it is unlikely that the number of permanent operations workers would increase at a nuclear power plant during the license renewal term. While it was estimated in the 1996 GEIS that up to 60 additional workers per unit could be required during the license renewal term, subsequent environmental reviews have shown little or no need for additional operations workers. In addition, refurbishment activities, such as steam generator and vessel head replacement, have not required the numbers of workers and the months of time conservatively estimated in the 1996 GEIS. Consequently, employment at nuclear power plants during the license renewal term is expected to remain unchanged. Refurbishment impacts would be similar to what has been experienced during routine plant refueling and maintenance outages.

The increased number of workers at nuclear power plants during regularly scheduled plant refueling and maintenance outages has caused short-term increases in traffic volumes on roads in the vicinity of each plant. However, because of the relative short duration of these outages, increased traffic volumes have had little or no lasting impact. Therefore, there would be no transportation impacts during the license renewal term beyond those already being experienced.

4.8.5.4 Analysis

Information related to transportation is presented in Section 3.8 of this ER. No license-renewal-related refurbishment activities have been identified as discussed in Section 2.3. As discussed in Section 2.5, there are no plans to add workers to support plant operations during the license renewal period. In addition, as discussed in Section 3.8.6, all intersections in the immediate vicinity of the Fermi plant site operate at acceptable LOSs. Therefore based on DTE's review, no

new and significant information was identified as it relates to transportation, and further analysis is not required.

4.9 Human Health

4.9.1 Microbiological Hazards to the Public (Plants with Cooling Ponds or Canals or Cooling Towers or Discharges to a River)

4.9.1.1 Findings from Table B-1, Appendix B to Subpart A

SMALL, MODERATE, or LARGE. These organisms are not expected to be a problem at most operating plants except possibly at plants using cooling ponds, lakes, or canals, or that discharge into rivers. Impacts would depend on site-specific characteristics.

4.9.1.2 Requirement [10 CFR 51.53(c)(3)(ii)(G)]

If the applicant's plant uses a cooling pond, lake, or canal or discharges into a river, an assessment of the impact of the proposed action on public health from thermophilic organisms in the affected water must be provided.

4.9.1.3 Background [GEIS Section 4.9.1.1.3]

N. fowleri, which is the pathogenic strain of the free-living amoebae *Naegleria spp.*, appears to be the most likely microorganism that may pose a public health hazard resulting from nuclear power plant operations. Increased populations of *N. fowleri* may have significant adverse impacts.

Since *Naegleria* concentrations in freshwater can be enhanced by thermal effluents, nuclear power plants that use cooling lakes, canals, ponds, or rivers experiencing low-flow conditions may enhance the populations of naturally occurring thermophilic organisms. There are currently 23 reactor sites that fit this category. Data for 14 sites from this category that have gone through license renewal were reviewed to predict the level of thermophilic microbiological organism enhancement at any given site with current knowledge. For all 14 sites, no actual hazards to public health from enhancement of thermophilic microbiological organisms were identified, documented, or substantiated. However, without site-specific data, the same conclusion cannot be drawn for all reactor sites that would go through license renewal.

Changes in microbial populations and in the public use of water bodies might occur after the operating license is issued and the application for license renewal is filed. Other factors could also change, including the average temperature of the water, which could result from climate change that affected water levels and air temperature. Finally, the long-term presence of a power plant might change the natural dynamics of harmful microorganisms within a body of water. Therefore, the magnitude of the potential public health impacts associated with thermal enhancement of thermophilic organisms could be SMALL, MODERATE, or LARGE, depending on plant-specific conditions.

4.9.1.4 Analysis

As discussed in Section 2.2.2 of this ER, Fermi 2 discharges to a Great Lake (Lake Erie). Based on the GEIS, there are currently 23 reactor sites that fit the category of a plant that uses cooling lakes, canals, ponds, or rivers (NRC 2013b, Section 4.9.1.1.3). Fermi 2 is not listed as one of these 23 sites. Therefore, this issue is not applicable and further analysis is not required.

4.9.2 Electric Shock Hazards

4.9.2.1 Findings from Table B-1, Appendix B to Subpart A

SMALL, MODERATE, or LARGE. Electrical shock potential is of small significance for transmission lines that are operated in adherence with the NESC. Without a review of conformance with NESC criteria of each nuclear power plant's in-scope transmission lines, it is not possible to determine the significance of the electrical shock potential.

4.9.2.2 Requirement [10 CFR 51.53(c)(3)(ii)(H)]

If the applicant's transmission lines that were constructed for the specific purpose of connecting the plant to the transmission system do not meet the recommendations of the National Electric Safety Code (NESC) for preventing electric shock from induced currents, an assessment of the impact of the proposed action on the potential shock hazard from the transmission lines must be provided.

4.9.2.3 Background [GEIS Section 4.9.1.1.5]

Design criteria for nuclear power plants that limit hazards from steady-state currents are based on the NESC, adherence to which requires that utility companies design transmission lines so that the short-circuit current to ground produced from the largest anticipated vehicle or object is limited to less than 5 mA. With respect to shock safety issues and license renewal, three points must be made. First, in the licensing process for the earlier licensed nuclear plants, the issue of electrical shock safety was not addressed. Second, some plants that received operating licenses with a stated transmission line voltage may have chosen to upgrade the line voltage for reasons of efficiency, possibly without reanalysis of induction effects. Third, since the initial NEPA review for those utilities that evaluated potential shock situations under the provision of the NESC, land use may have changed, resulting in the need for a reevaluation of this issue. The electrical shock issue, which is generic to all types of electrical generating stations, including nuclear plants, is of SMALL significance for transmission lines that are operated in adherence with the NESC. Without a review of the conformance of each nuclear plant's transmission lines within this scope of review with NESC criteria, it is not possible to determine the significance of the electrical shock potential generically; it could be SMALL, MODERATE, or LARGE.

4.9.2.4 Analysis

The greatest hazard from a transmission line is direct contact with the conductors. Tower designs preclude direct public access to the conductors. However, electrical contact can be

made without physical contact between a grounded object and the conductor. Secondary shock currents are produced when a person makes contact with (1) capacitively charged bodies, such as a vehicle parked near a transmission line, or (2) magnetically linked metallic structures, such as fences near transmission lines. That is, objects located near transmission lines can become electrically charged due to their immersion in the lines' electric fields. The current is called "induced" because there is no direct connection between the line and the object. An object that is insulated from the ground can actually store an electrical charge, becoming what is called "capacitively charged." A person standing on the ground and touching a vehicle or a fence can receive an electrical shock due to the sudden discharge of the capacitive charge through the person's body to the ground. After the initial discharge, a steady-state current can develop, the magnitude of which depends on several factors, including the following:

- Strength of the electric field which, in turn, depends on the voltage of the transmission line as well as its height and geometry.
- Size of the object on the ground.
- Extent to which the object is grounded.

In 1977, the NESC adopted a provision that describes how to establish minimum vertical clearances to the ground for electric lines having voltages exceeding 98-kV alternating current to ground. The clearance must limit the induced current due to electrostatic effects to 5 mA if the largest anticipated truck, vehicle, or equipment were short-circuited to ground. By way of comparison, the setting of ground fault circuit interrupters used in residential wiring (special breakers for outside circuits or those with outlets around water pipes) is 4 to 6 mA.

As discussed in Section 2.2.10.1, all in-scope transmission lines are located totally within the Fermi site owner-controlled area. Therefore, the public does not have access to this area and as a result, no induced shock hazards would exist for the public. The MIOSHA governs the occupational safety and health of plant operations staff. As discussed in Section 2.2.10.6, all electric shock hazards, including those from induced current shock, are managed by DTE in compliance with MIOSHA occupational health and safety requirements to protect onsite workers.

It was determined in the GEIS that occupational safety and health hazard issues are generic to all types of electrical generating stations, including nuclear power plants, and are of small significance if the workers adhere to safety standards and use protective equipment (NRC 2013b, Section 3.9.5.1).

Therefore, because Fermi 2 has occupational safety and health measures in place to address shock hazards from overhead lines, and plant areas under the in-scope transmission lines where vehicles or equipment could be parked or positioned are limited by Fermi procedures, DTE concludes that impacts from the electrical shock potential for these lines are SMALL.

4.9.2.5 Conclusion

The public does not have access to transmission lines that are considered in scope; therefore, no induced shock hazards would exist for the public. All electric shock hazards, including those from induced current shock, are managed by DTE in compliance with MIOSHA requirements to protect onsite workers. Therefore, consistent with the GEIS, impacts would be of SMALL significance, and further mitigation measures beyond Fermi 2's existing procedures are not warranted.

4.9.3 Severe Accidents

4.9.3.1 Findings from Table B-1, Appendix B to Subpart A

The probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are SMALL for all plants. However, alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives.

4.9.3.2 Requirement [10 CFR 51.53(c)(3)(ii)(L)]

If the staff has not previously considered severe accident mitigation alternatives for the applicant's plant in an environmental impact statement or related supplement or in an environmental assessment, a consideration of alternatives to mitigate severe accidents must be provided.

4.9.3.3 Background [GEIS Section 4.9.1.2]

Alternatives to mitigate severe accidents still must be considered for all plants that have not considered such alternatives; however, . . . those plants that have already had a severe accident mitigation alternative (SAMA) analysis considered by the NRC as part of an environmental impact statement, supplement to an environmental impact statement, or environmental assessment, need not perform an additional SAMA analysis for license renewal.

4.9.3.4 Analysis

This section summarizes the DTE Fermi 2 analysis of alternative ways to mitigate the impacts of severe accidents. Attachment D provides a detailed description of the SAMA analysis.

The term "accident" refers to any unintentional event (i.e., outside the normal or expected plant operation envelope) that results in the release or a potential for release of radioactive material to the environment. The NRC categorized accidents as "design basis" or "severe." Design basis accidents are those for which the risk is great enough that the NRC requires plant design and construction to prevent unacceptable accident consequences. Severe accidents are those that the NRC considers too unlikely to warrant design controls.

The NRC concluded in its license renewal rulemaking that the unmitigated environmental impacts from severe accidents met its Category 1 criteria. However, the NRC made consideration of mitigation alternatives a Category 2 issue because not all plants had completed ongoing regulatory programs related to mitigation (e.g., individual plant examinations and accident management). Site-specific information to be presented in the license renewal ER includes the following:

1. Potential SAMAs.

2. Benefits, costs, and net value of implementing potential SAMAs.

3. Sensitivity of analysis to changes in key underlying assumptions.

For the SAMA analysis, DTE used the Fermi 2 PRA model output as input to an NRC-approved methodology that calculates economic costs and dose to the public from hypothesized releases from the containment structure to the environment. Then, using NRC regulatory analysis techniques, DTE calculated the monetary value of the unmitigated severe accident risk for Fermi 2. The result represents the monetary value of the base risk of dose to the public and workers, offsite and onsite economic impacts, and replacement power. The value became a cost/benefit screening tool for potential SAMAs. A SAMA whose cost of implementation exceeded the base risk value was rejected as being not cost-beneficial. The steps of this process are summarized below:

- Fermi 2 PRA Model: Use the Fermi 2 PRA internal events model for the analysis.

- Level 3 PRA: Use Fermi 2 Level 1 and 2 PRA output and site-specific meteorology, demographic, economic, land-use, and emergency response data as input in performing a Level 3 PRA using Version 3.7.0 of the Windows Interface for MACCS2, MELCOR Accident Consequence Code System (WinMACCS).

- Baseline Risk Monetization: Use the analysis techniques specified in NEI 05-01, Revision A, to calculate the monetary value of the unmitigated Fermi 2 severe accident risk. This becomes the maximum averted cost-risk (MACR) that is possible.

- Phase I SAMA Analysis: Identify potential SAMA candidates based on the Fermi 2 PRA, Individual Plant Examination (IPE), Individual Plant Examination for External Events (IPEEE), and documentation from the industry and the NRC. Screen out Phase I SAMA candidates using the following criteria:

    1. Not Applicable: If a proposed SAMA does not apply to the Fermi 2 design, it is not retained.

    2. Already Implemented: If the SAMA or equivalent was previously implemented, it is not retained.

3. Combined With Another SAMA: If a SAMA is similar in nature and can be combined with another SAMA to develop a more comprehensive or plant-specific SAMA, only the combined SAMA is further evaluated.

4. Excessive Implementation Cost: If the estimated cost of implementation is greater than the modified MACR, the SAMA cannot be cost-beneficial and is screened from further analysis.

5. Very Low Benefit: If the SAMA is related to a non-risk significant system which is known to have negligible impact on the risk profile, it is not retained.

6. Implementation in Progress: If plant improvements that address the intent of the SAMA are already in progress, it is not retained.

- Phase II SAMA Analysis: Calculate the risk reduction attributable to each remaining SAMA candidate, in dollars, and compare to its implementation cost to identify the net cost-benefit.

- Sensitivity Analysis: Evaluate how changes in the SAMA analysis assumptions might affect the cost-benefit evaluation.

- Conclusions: Summarize results and identify conclusions.

Using this process, DTE incorporated industry, NRC, and plant-specific information to create a list of 220 SAMAs for consideration. Phase I screening eliminated 141 SAMA candidates from further consideration. The remaining 79 SAMA candidates were evaluated in Phase II. The Phase II analysis identified one SAMA that is potentially cost-beneficial. The SAMA candidate is described below.

- SAMA 206: Improve the ability of operators to manually close a damper to isolate the third floor of Reactor Building from hardened vent path.

While these results are believed to accurately reflect potential areas for improvement at Fermi 2, DTE notes that this analysis should not necessarily be considered a formal disposition of the proposed changes, as other engineering reviews are necessary to determine the ultimate resolution. DTE will consider the SAMA using the appropriate design evaluation process and evaluate it considering other planned plant modifications. This SAMA is not related to adequately managing the effects of aging during the period of extended operation. Therefore, it need not be implemented as part of license renewal pursuant to 10 CFR Part 54.

Two sensitivity analyses were conducted to evaluate how the SAMA analysis would change if certain key parameters were changed. The sensitivity analyses include use of a conservative discount rate of 3 percent and an evaluation of risk uncertainty using an uncertainty factor which incorporates the ratio of the 95th percentile value of core damage frequency to the point estimate of core damage frequency. These sensitivity analyses identified additional SAMA candidates that are potentially cost-beneficial. They are described below.

- SAMA 112: Revise EOPs to improve ISLOCA identification.
- SAMA 113: Improve operator training on ISLOCA coping.
- SAMA 115: Revise procedures to control vessel injection to prevent boron loss or dilution following SLC injection.

The conservative discount rate sensitivity did not result in the identification of any additional cost-beneficial SAMA candidates. Therefore, the sensitivity results are driven by the 95th percentile sensitivity, which is much more conservative than the baseline SAMA analysis. These SAMAs are not related to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of license renewal pursuant to 10 CFR Part 54. This analysis should also not be considered a formal disposition of the proposed changes, as other engineering reviews are necessary to determine the ultimate resolution.

4.9.3.5 Conclusion

All four of the above SAMA candidates will be entered into the DTE Regulatory Action and Commitment Tracking System (RACTS), and DTE will consider the SAMAs using the appropriate evaluation process. None of the SAMAs are related to adequately managing the effects of aging during the period of extended operation. Therefore, they do not need to be implemented as part of license renewal pursuant to 10 CFR Part 54.

4.10 Environmental Justice

4.10.1 Minority and Low-Income Populations

4.10.1.1 Findings from Table B-1, Appendix B to Subpart A

Impacts to minority and low-income populations and subsistence consumption resulting from continued operations and refurbishment associated with license renewal will be addressed in plant-specific reviews. See the NRC Policy Statement on the Treatment of Environmental Justice Matters in NRC Regulatory and Licensing Actions (69 FR 52040).

4.10.1.2 Requirement [10 CFR 51.53(c)(3)(ii)(N)]

Applicants shall provide information on the general demographic composition of minority and low-income populations and communities (by race and ethnicity) residing in the immediate vicinity of the plant that could be affected by the renewal of the plant's operating license, including any planned refurbishment activities, and ongoing and future plant operations.

4.10.1.3 Background [GEIS Section 4.10.1]

Disproportionately high and adverse human health effects occur when the risk or rate of exposure to an environmental hazard for a minority or low-income population is significant and exceeds the risk or exposure rate for the general population or for another appropriate comparison group. Disproportionately high environmental effects refer to impacts or risk of impact on the natural or physical environment in a minority or low-income community that are significant and appreciably exceed the environmental impact on the larger community. Such effects may include biological, cultural, economic, or social impacts. Minority and low-income populations are subsets of the general public residing around the site and all are exposed to the same risks and hazards generated from a nuclear power plant.

Continued reactor operations and other activities associated with license renewal could have an impact on air, land, water, and ecological resources in the region around each nuclear power plant site, which might create human health and environmental effects on the general population. Depending on the proximity of minority and low-income populations in relation to each nuclear plant, the environmental impacts of license renewal could have a disproportionate effect on these populations.

The location and significance of environmental impacts may affect population groups that are particularly sensitive because of their resource dependencies or practices (e.g., subsistence agriculture, hunting, or fishing) that reflect the traditional or cultural practices of minority and low-income populations. The analysis of special pathway receptors can be an important part of the identification of resource dependencies or practices. Special pathways take into account the levels of contaminants in native vegetation, crops, soils and sediments, surface water, fish, and game animals on or near the power plant sites in order to assess the risk of radiological exposure through subsistence consumption of fish, native vegetation, surface water, sediment, and local

produce; the absorption of contaminants in sediments through the skin; and the inhalation of airborne particulates.

Although the overall impact of nuclear plants on the general population has usually been found to be small, because of these unique considerations, the additional examination of the nature and geographic extent of impacts and population demographics should be considered on a plant-specific basis.

4.10.1.4 Analysis

4.10.1.4.1 Refurbishment Activities

As discussed in Section 2.3, no license-renewal-related refurbishment activities have been identified. Therefore, there would be no license-renewal-related refurbishment impacts to minority and low-income populations, and no further analysis is applicable.

4.10.1.4.2 Operational Activities

The consideration of environmental justice is required to assure that federal programs and activities will not have disproportionately high and adverse human health or environmental effects on minority populations and low-income populations. DTE's analyses of the Category 2 issues defined in 10 CFR 51.53(c)(3)(ii) determined that environmental impacts from the continued operation of Fermi 2 during the license renewal period would either be not detectable or so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. In NUREG-2105, NRC also determined the following for the Fermi site:

- No subsistence 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. (NRC 2013c, Section 5.5.4)

- There are no location-dependent disproportionate impacts affecting minority and low-income populations. (NRC 2013c, Section 5.5.2.5)

- There are no expected disproportionately high and adverse socioeconomic impacts affecting minority and low-income populations. (NRC 2013c, Section 5.5.3)

As described in Section 2.2.5, DTE maintains a REMP. In this program, DTE monitors important radiological pathways and considers potential radiation exposure to plant and animal life in the environment surrounding Fermi 2. There has been no detectable plant-related activity associated with this monitoring. Thus, no disproportionate impact on minority or low-income populations would occur from the proposed action of renewing the Fermi 2 OL. DTE presents environmental justice demographic information in Section 3.10 to assist the NRC in its independent review.

4.10.1.5 Conclusion

As part of its environmental assessment of this proposed action, DTE has determined that no significant offsite environmental impacts would be created by the renewal of the Fermi 2 OL. This conclusion is supported by the review of the Category 2 issues defined in 10 CFR 51.53(c)(3)(ii) presented in this ER, NUREG-2105, and previous radiological environmental sampling. As discussed in Section 4.10.1.4 above, no unusual resource dependencies or practices, such as subsistence agriculture, hunting, or fishing, exist through which the populations could be disproportionately affected in the Fermi 2 area. In addition, as concluded in Section 5.5.5 of NUREG-2105, no likely environmental pathways exist in the region that would cause a disproportionately high and adverse effect as a result of the operation of Fermi Unit 3. Thus, no disproportionate impact on minority or low-income populations is anticipated to occur from the proposed action of renewing the Fermi 2 OL.

As the NRR Office Instruction LIC-203 (NRC 2013e) recognizes, if no significant offsite impacts occur in connection with the proposed action, then no member of the public would be substantially affected. Therefore, there can be no disproportionately high and adverse impacts or effects on members of the public, including minority and low-income populations, resulting from the renewal of the Fermi 2 OL.

4.11 Waste Management

4.11.1 Low-Level Waste Storage and Disposal

4.11.1.1 Findings from Table B-1, Appendix B to Subpart A

SMALL. The comprehensive regulatory controls that are in place and the low public doses being achieved at reactors ensure that the radiological impacts to the environment would remain small during the license renewal term.

4.11.1.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

4.11.1.3 Background [GEIS Section 4.11.1.1]

The NRC believes that the comprehensive regulatory controls that are in place and the low public doses being achieved at reactors ensure that the radiological impacts on the environment will remain SMALL during the term of a renewed license. The maximum additional onsite land that may be required for LLW storage during the term of a renewed license and associated impacts would be SMALL. Nonradiological impacts on air and water would be negligible. The radiological and nonradiological environmental impacts of long-term disposal of LLW from any individual plant at licensed sites are SMALL. In addition, the NRC concludes that there is reasonable assurance that sufficient LLW disposal capacity will be made available when needed for facilities to be decommissioned consistent with NRC decommissioning requirements.

4.11.1.4 Analysis

As discussed in Section 2.2.3.5, DTE has developed long-term plans which would ensure that radwaste generated during the license renewal term would be sent directly for disposal, stored on site in existing structures, or shipped to an offsite licensed facility for processing and disposal.

In addition, as discussed in Section 2.2.3.5, the majority of LLW generated at Fermi 2 would be Class A waste and can be shipped to processors, such as Energy Solutions in Oak Ridge, Tennessee, for reduction and repackaging, or shipped directly to a Class A disposal facility such as Energy Solutions LLC in Clive, Utah. Classes B and C wastes constitute a low percentage by volume of the total LLW generated and are currently stored in the onsite storage facility at Fermi 2. As indicated in Section 2.2.3.5, the Waste Control Specialist LLC facility in Texas is licensed for disposal of Classes A, B, and C wastes, and could be utilized for disposal of Fermi 2 Classes B and C wastes as needed in the future. Therefore, based on DTE's review, no new and significant information was identified as it relates to onsite LLW storage and disposal.

4.11.2 Onsite Storage of Spent Nuclear Fuel

4.11.2.1 Findings from Table B-1, Appendix B to Subpart A

SMALL. The expected increase in the volume of spent fuel from an additional 20 years of operation can be safely accommodated onsite during the license renewal term with small environmental effects through dry or pool storage at all plants.

4.11.2.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

4.11.2.3 Background [GEIS Section 4.11.1.2]

The storage of spent fuel in spent fuel pools was considered for each plant in the safety and environmental reviews at the construction permit and operating license stage. This onsite storage of spent fuel and HLW is expected to continue into the foreseeable future.

Interim storage needs vary among plants, with older units likely to lose pool storage capacity sooner than newer ones. Given the uncertainties regarding the final disposition of spent fuel and HLW, it is expected that expanded spent fuel storage capacity will be needed at all nuclear power plants.

As discussed above, current and potential environmental impacts from spent fuel storage onsite at the current reactor sites have been studied extensively, are well understood, and the environmental impacts during the license renewal term were found to be SMALL. No new information was found during the development of this GEIS revision that would alter that conclusion.

4.11.2.4 Analysis

Compliance with NRC's regulatory requirements for spent fuel storage ensures that environmental impacts are minimized. Therefore, based on DTE's review, no new and significant information was identified as it relates to onsite storage of spent nuclear fuel, and further analysis is not required.

4.11.3 Mixed Waste Storage and Disposal

4.11.3.1 Findings from Table B-1, Appendix B to Subpart A

SMALL. The comprehensive regulatory controls and the facilities and procedures that are in place ensure proper handling and storage, as well as negligible doses and exposure to toxic materials for the public and the environment at all plants. License renewal would not increase the small, continuing risk to human health and the environment posed by mixed waste at all

plants. The radiological and nonradiological environmental impacts of long-term disposal of mixed waste from any individual plant at licensed sites are small.

4.11.3.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

4.11.3.3 Background [GEIS Section 4.11.1.4]

Mixed waste is regulated both by the EPA or the authorized state agency under RCRA and by the NRC or the agreement state agency under the Atomic Energy Act (AEA) [Public Law 83 703]. The waste is either treated onsite or sent offsite for treatment followed by disposal at a permitted landfill. The comprehensive regulatory controls and the facilities and procedures that are in place at nuclear power plants ensure that the mixed waste is properly handled and stored and that doses to and exposure to toxic materials by the public and the environment are negligible at all plants. License renewal will not increase the small but continuing risk to human health and the environment posed by mixed waste at all plants. The radiological and nonradiological environmental impacts from the long-term disposal of mixed waste at any individual plant at licensed sites are considered SMALL for all sites.

4.11.3.4 Analysis

As discussed in Section 2.2.3.4 of the Fermi 2 ER, low-level mixed wastes are periodically generated at Fermi 2. These low-level mixed wastes are stored in the onsite storage facility and managed in accordance with Fermi 2's low-level mixed waste management procedure, which prescribes the storage and disposal requirements. Also as discussed in Section 2.2.3.4, Fermi 2 currently operates under the conditional exemption for low-level mixed waste storage and disposal per Michigan Administrative Code R299.9822, which allows for unlimited quantity and time of storage as long as the mixed waste exemption conditions are observed. Therefore, based on DTE's review, no new and significant information was identified as it relates to mixed waste storage and disposal, and further analysis is not required.

4.11.4 Nonradioactive Waste Storage and Disposal

4.11.4.1 Findings from Table B-1, Appendix B to Subpart A

SMALL. No changes to systems that generate nonradioactive waste are anticipated during the license renewal term. Facilities and procedures are in place to ensure continued proper handling, storage, and disposal, as well as negligible exposure to toxic materials for the public and the environment at all plants.

4.11.4.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

4.11.4.3 Background [GEIS Section 4.11.1.5]

As does any industrial facility, nuclear power plants and the rest of the uranium fuel-cycle facilities also generate nonradioactive nonhazardous waste. These wastes are managed by following good housekeeping practices and are generally disposed of in local landfills permitted under RCRA Subtitle D regulations.

In the 1996 GEIS, the impacts associated with managing nonradioactive wastes at uranium fuel cycle facilities, including nuclear power plants, were found to be SMALL. It was indicated that no changes to nonradioactive waste generation would be anticipated for license renewal, and that systems and procedures are in place to ensure continued proper handling and disposal of the wastes at all plants.

4.11.4.4 Analysis

Section 2.2.8.1 discusses the type of nonradioactive wastes generated at Fermi, and typical quantities generated on an annual basis. These nonradioactive wastes are collected in central collection areas and managed in accordance with appropriate regulatory requirements and good practices that are specified in company and site-specific waste management procedures. In addition, waste minimization measures such as material control, process control, waste management, recycling, and feedback are considerations that are an integral part of all work planning and implementation at the facility to reduce, to the extent feasible, waste generated, treated, accumulated, or disposed. Therefore, based on DTE's review, no new and significant information was identified as it relates to nonradiological waste and storage disposal, and further analysis is not required.

4.12 Cumulative Impacts

4.12.1 Findings from Table B-1, Appendix B to Subpart A

Cumulative impacts of continued operations and refurbishment associated with license renewal must be considered on a plant-specific basis. Impacts would depend on regional resource characteristics, the resource-specific impacts of license renewal, and the cumulative significance of other factors affecting the resource.

4.12.2 Requirement [10 CFR 51.53(c)(3)(ii)(O)]

Applicants shall provide information about other past, present, and reasonably foreseeable future actions occurring in the vicinity of the nuclear plant that may result in a cumulative effect.

4.12.3 Background [GEIS Section 4.13]

Actions to be considered in cumulative impact analyses include new and continuing activities, such as license renewal, that are conducted, regulated, or approved by a federal agency. The cumulative impacts analysis takes into account all actions, however minor, because impacts from individually minor actions may be significant when considered collectively over time. The goal of the analysis is to identify potentially significant impacts to improve decisions and move toward more sustainable development.

For some resource areas (e.g., water and aquatic resources), the contributions of ongoing actions within a region on cumulative impacts are regulated and monitored through a permitting process (e.g., NPDES) under state or federal authority. In these cases, it may be assumed that cumulative impacts are managed as long as these actions (facilities) are in compliance with their respective permits.

4.12.4 Analysis

DTE considered potential cumulative impacts in its environmental analysis associated with the resources discussed in the following sections during the license renewal period. For the purposes of this analysis, past actions are those related to the resources at the time of plant licensing and construction, present actions are those related to the resources at the time of current operation of the power plant, and future actions are considered to be those that are reasonably foreseeable through the end of plant operation, which would include the 20-year license renewal term. The geographic area over which past, present, and future actions would occur is dependent on the type of action considered and is described below for each impact area.

The impacts of the proposed action are combined with other past, present, and reasonably foreseeable future actions (Table 3.12-1) regardless of what agency (federal or non-federal) or person undertakes such other actions. These combined impacts are defined as "cumulative" in 40 CFR 1508.7 and include individually minor, but collectively significant, actions taking place over a period of time. It is possible that an impact that may be SMALL by itself could result in a MODERATE or LARGE impact when considered in combination with the impacts of other actions

on the affected resource. Likewise, if a resource is regionally declining or imperiled, even a SMALL individual impact could be important if it contributes to or accelerates the overall resource decline. Because a portion of the Fermi site has been considered for the future construction and operation of Fermi 3, as addressed extensively in the COLA submitted for that project, the potential cumulative impacts of Fermi 3 are considered throughout in this evaluation.

4.12.4.1 Land Use

Although mostly agricultural land surrounds the Fermi site, past land-use changes have included the construction of the Fermi facilities. There are also areas of residential development in the city of Monroe to the southwest of the plant, in the Stony Point area directly southeast of the Fermi site, along the Lake Erie shoreline, and to the north of the Fermi site near Swan Creek. There are a number of industrial areas to the southwest of the site along the Lake Erie shoreline, Frenchtown Township, and in the city of Monroe. Although land to the south of the site is anticipated to remain a low-and medium-density residential area, it is expected that the site will continue to be surrounded primarily by agricultural lands, open areas, and woodlands to the west and north for the foreseeable future. A farmland preservation and conservation program in Monroe County may prevent additional residential and other development from occurring on undeveloped land used for agriculture that is close to the Fermi site. (NRC 2013c, Section 7.1)

The USACE and USFWS regulate some actions involving terrestrial resources along the shoreline of Lake Erie. As described in Section 3.6, DTE manages most onsite undeveloped lands jointly with the USFWS as part of the DRIWR, which extends along the shore of Lake Erie from the Ohio state line to the Detroit River in Wayne County on the north, and contains habitat for wildlife, including some wetland and water-dependent species. There are proposals to add to the land included in the DRIWR; these additions to recreational and conservation land uses in the vicinity of the Fermi site would be SMALL. There are currently no plans to remove land elsewhere from the DRIWR. (NRC 2013c, Section 7.1)

As discussed in Sections 2.1 and 2.3, no license-renewal-related refurbishment activities have been identified. The transmission lines associated with Fermi 2 that are within the scope of this evaluation are located in the developed and industrialized area of the plant and within the property boundary. As discussed in Section 3.1.2, Monroe County, Wayne County, and the nearby City of Detroit all have master plans with active zoning regulations. Because there are no planned changes to land use related to renewal of the Fermi 2 OL, land-use impacts are expected to remain SMALL.

The proposed construction of Fermi 3 and associated facilities (other than offsite transmission lines) would be situated entirely within the existing Fermi site, with limited land-use impacts to previously disturbed and undisturbed portions of the site. Practices used for extending the new Fermi 3 transmission lines would be expected to comply with the requirements of local, state, and federal environmental regulations. Industry standards for best environmental practices would also be observed during the construction and operation of the transmission lines. Therefore, the construction and operation of Fermi 3 would result in SMALL land-use impacts. (NRC 2013c, Sections 4.1.1, 4.1.2, and 5.1.1)

Climate change could increase precipitation and lake storm surges in the geographic area of interest, thus changing land use as a result of the inundation of low-lying areas along the lakeshore. The rate of forest growth and growth of other vegetation may increase as a result of more carbon dioxide in the atmosphere. In addition, climate change could change crop yields and livestock productivity, which might alter the characteristics of land used for agriculture in the geographic area of interest. Changes resulting from climate change could cause minor shifts in land use in the geographic area of interest. (NRC 2013c, Section 7.1)

Cumulative land-use impacts from renewal of the Fermi 2 OL combined with the construction and operation of Fermi 3, including impacts associated with Fermi 3 transmission line development, and minor changes resulting from climate change are anticipated to be SMALL, primarily because few land-use changes are anticipated from reasonably foreseeable projects.

4.12.4.2 Air Quality

As discussed in Section 2.2.8.3, actual emissions from Fermi 2 are less than those associated with a "major source" (100 tons/year or greater of any air pollutant) as defined in the CAA. Emission sources such as the emergency diesel generators, combustion turbines, and auxiliary boilers are operated intermittently and in accordance with the conditions outlined in the air permit. Therefore, impacts to air quality from renewal of the Fermi 2 OL would be SMALL and localized.

Operational activities at Fermi 2 do release GHGs. However, as discussed in Section 3.2, the GHG emissions associated with renewal of the Fermi 2 OL would be similar to the life-cycle GHG emissions from renewable energy sources and lower than those associated with fossil fuel-based energy sources. The impact of GHG emissions is global rather than local or regional. The GHG emissions associated with the renewal of the Fermi 2 OL would contribute to global cumulative levels of GHG emissions. The cumulative impact to GHG emissions associated with license renewal would be comparable to the characterization of GHG cumulative impacts due to the operation of other nuclear generating units, which NRC has characterized as noticeable, but not destabilizing (NRC 2013c, Section 7.6.2). However, continued operation of Fermi 2 would avoid millions of tons of greenhouse gases from a fossil fuel-fired alternative such as those presented in Chapter 7 whose impact to cumulative GHG levels would be greater.

Combustion-related GHG emissions (such as carbon dioxide [CO_2], methane [CH_4], and nitrous oxide [N_2O]) at Fermi 2 are minor. Fermi 2 stationary emission sources at the site include minor emissions from emergency diesel generators, combustion turbines, diesel fire pumps, and miscellaneous portable equipment. These combustion sources are operated using good combustion practices on a limited basis throughout the year (often only for testing). Other combustion-related GHG emission sources at Fermi 2 include vehicular traffic within, to, and from the Fermi site. These are considered insignificant when compared to the beneficial impacts from avoided GHG emissions associated with nuclear power.

Transportation of workforce personnel causes air pollutants due to the operation of fossil-fueled vehicles. However, an increase in the workforce for the license renewal term is not anticipated,

so there would be no increase in the air quality impact due to workers commuting. Therefore, Fermi 2's contribution to cumulative impacts on air quality is expected to be SMALL.

Based on the above, GHG emissions associated with Fermi 2 operations are minor, and the potential impacts of continued operation of Fermi 2 on climate change are anticipated to be SMALL and, on balance, beneficial with respect to slowing the rate of climate change because they involve fewer GHG emissions than other equivalent reasonably available fossil sources.

Other past, present, and reasonably foreseeable future activities exist in the geographic area of interest (local and regional for criteria pollutants and global for GHG emissions) that could affect air quality resources. The cumulative impacts on the emissions of criteria pollutants from Fermi 2 and other projects would be minimal. The national and worldwide cumulative impacts of GHG emissions are noticeable but not destabilizing, with or without the GHG emissions from Fermi 2. It is expected that cumulative impacts from other past, present, and reasonably foreseeable future actions on air quality resources in the geographic areas of interest would be SMALL for criteria pollutants and MODERATE for GHGs. (NRC 2013c, Section 7.6.3)

4.12.4.3 Surface Water

The region of influence for surface water resources at the Fermi site is concentrated in the western basin of Lake Erie and Swan Creek, but extends throughout the Great Lakes basin with regard to the potential for consumptive water use to impact users. Water consumption due to cooling water withdrawals at Fermi 2 is a very small percentage of the overall volume of Lake Erie. There are no surface water withdrawals from Swan Creek for operations at Fermi 2. Fermi 2 discharges directly to Lake Erie through a discharge pipe (Outfall 001) and the dredge basin (Outfall 013), and to Swan Creek through the overflow canal (Outfalls 009 and 011) in accordance with the Fermi 2 NPDES permit (Section 2.2.8.2).

During the license renewal term, Fermi 2 is expected to consume water from Lake Erie at current rates. Fermi 2 returns approximately 60 percent of the water withdrawn back to Lake Erie (Section 3.5.3.1). Extended operation of Fermi 2 is not anticipated to result in a water use conflict on Lake Erie due its large size; therefore, cumulative impacts from water consumption are not expected.

Fermi 2 has in place programs to protect the quality of surface water resources. As discussed in Section 2.2.8.2, Fermi 2 discharges are in accordance with its NPDES permit and associated ecological and biological monitoring of Lake Erie. As discussed in Section 2.2.8.4, Fermi 2 has programs in place to protect surface water quality. These programs include spill prevention, control, and countermeasures (SPCC) procedures to prevent spills and implement immediate cleanup activities in the event of a spill to protect soils and groundwater, as well as surface water resources.

As discussed in Section 3.1.2, further residential development in the area is expected. Any offsite development could lead to additional discharges to Lake Erie that could impact water quality. However, any such discharges, including stormwater, would be subject to NPDES permit

limits designed to be protective of surface water resources, minimizing cumulative impacts. Therefore, cumulative impacts to surface water are expected to be SMALL.

Potential increases in Lake Erie water temperature resulting from climate change could increase the amount of cooling water needed for the operation of Fermi 2 and other major users. Therefore, the operation of Fermi 2 and other thermoelectric plants on Lake Erie could be altered as a result of climate change. If the volume of Lake Erie water decreased by 2 percent as a result of climate change, then the annual consumptive water use by Fermi 2 would still be negligible, even if the monthly average use increased significantly. (NRC 2013c, Section 7.2.1) Therefore, cumulative impacts are expected to be SMALL.

Considering the cumulative consumptive use of surface water from the operation of the existing Fermi 2, proposed Fermi 3, and other (existing or reasonably foreseeable) consumptive uses and the potential effects of climate change, the greatest potential future impact on Lake Erie water availability is predicted to be from climate change. The impact predicted for the lowest-emissions scenario (maximum CO_2 air concentration of 550 ppm by 2100 [roughly double pre-industrial levels]) would not be detectable or would be so minor that it would not noticeably alter the availability of water from Lake Erie. However, if CO_2 emissions follow the trend evaluated in the highest-emissions scenario (maximum CO_2 air concentration of 940 ppm by 2100 [about four times pre-industrial levels]), the cumulative effects on the quantity of surface water in Lake Erie may be detectable and may noticeably alter the availability of water in the lake, resulting in the potential for water-use restrictions and less water availability. (NRC 2013c, Section 7.2.1)

Therefore, it is concluded that the potential impacts of both increased future use (assuming constant per capita use and projected population increase) and climate change on surface water quantity in Lake Erie could range from SMALL to MODERATE. A SMALL impact would be expected under the condition of minimal climate change associated with the lowest-emissions scenario. A MODERATE impact would be expected under the highest-emissions scenario, which is expected to produce the highest increases in air and water temperatures (NRC 2013c, Section 7.2.1).

4.12.4.4 Groundwater

As discussed in Section 3.5, Fermi 2 does not use groundwater, so license renewal would not impact the quantity of groundwater resources available for use. Groundwater resources underlying the Fermi site are described in Section 3.5. Section 3.5 also explains that the groundwater movement in the shallow soils and fill are towards Lake Erie, and deeper groundwater (Bass Islands) is dominated by dewatering actives from nearby quarry operations. Thus, groundwater resources outside the Fermi site that are drinking water sources are unaffected by Fermi 2 operations.

Fermi 2 has in place programs to protect the quality of groundwater resources from nonradiological site activities. As discussed in Section 2.2.8.4, these programs include SPCC procedures to prevent spills and implement immediate cleanup activities in the event of a spill to protect groundwater as well as surface water resources. Using these programs, no groundwater

quality impacts are expected, and there would be no cumulative impacts to groundwater resources.

As discussed in Section 2.2.5, DTE has an ongoing REMP that includes sampling indicators and control locations within an 18.5-mile radius of Fermi 2 to show any increases or buildup of radioactivity that might occur due to station operation. Groundwater monitoring detects radioactivity from all sources, anthropogenic and naturally occurring, in groundwater samples. Groundwater is sampled from onsite and offsite wells in areas unaffected by Fermi 2. Based on 2012 REMP results, no fission or activation products were detected in the groundwater samples taken from REMP monitoring locations. (Fermi 2013b)

In addition to the REMP program, DTE has been monitoring tritium levels in various onsite wells for several years in accordance with the NEI GPI (Section 2.2.6). As discussed in Section 4.5.5, DTE studies indicate that the low-level tritium detected in the groundwater samples is located in a very small area and is attributable to rainwater uptake from stack emissions, and all monitoring results have been below EPA drinking water limits for tritium. In addition, several emergent sampling events were conducted in 2012 to test for potential releases from various subsurface lines. No indications of leakage from these lines were found. Monitoring events performed thus far on site indicate that no tritiated groundwater has migrated past the site property boundary.

The proposed Fermi 3 facility would not use groundwater for operations and there would be no discharges to groundwater from Fermi 3 during operations. Temporary dewatering operations during preconstruction and construction activities would have limited spatial effect and would not affect the overall productivity of the Bass Islands Group aquifer. Therefore, the potential impacts on groundwater use from building and operating Fermi 3 would be minimal and would pose no cumulative groundwater use impact. (NRC 2013c, Section 7.2.2)

Given the understanding of groundwater movement underlying the site and the existing groundwater protection and monitoring programs, impacts to groundwater resources from Fermi 2 operations are not expected to combine with offsite groundwater impacts. However, the incremental contribution attributable to the continued operation of Fermi 2 during the license renewal period would still be SMALL should groundwater impacts from Fermi 2 be combined with those attributable to other actions.

4.12.4.5 Ecology

4.12.4.5.1 Terrestrial Resources

Cumulative impacts to terrestrial resources could stem from land use, noise, air quality, water use conflicts, and ROW vegetative management practices. As indicated in Sections 2.1 and 2.3, no refurbishment or other license-renewal-related construction activities have been identified; therefore, no terrestrial habitat areas would be impacted. In addition, any land disturbance activities are reviewed to ensure that the BMPs appropriate for the environment are used to protect terrestrial habitat and wildlife, threatened and endangered species, wetland areas, and water quality. Fermi 2 operations resulting in noise and localized air quality impacts from fossil fuel-fired equipment and vehicles would continue, but these impacts are anticipated to be SMALL

and not to extend beyond the Fermi property boundary. Since the plant became operational, water withdrawal has caused no water availability concerns for Lake Erie and no adverse impacts on riparian or instream ecological communities.

ROW vegetative management practices are not needed because all ROW lines are contained within the industrialized portion of the Fermi site. Therefore, no habitat issues exist.

Currently a population of eastern fox snakes resides in the undeveloped areas of the Fermi site. This species is listed as threatened by the State of Michigan. Continued operation of the Fermi 2 facility would not add any additional constraints on the snake population than already occur from current operations. Similarly, bald eagles nest on the Fermi site, but human activities did not prevent them from producing eaglets in 2012. There is one federal and several other state-protected terrestrial species that either occur on or transit the site, as discussed in Section 3.6.12. It is unlikely that continued operation of the Fermi 2 plant would cause any additional stresses to these federally and state-protected species than currently exist.

With the exception of the eastern fox snake, the cumulative impacts of other past, present, and reasonably foreseeable future projects such as the preconstruction, construction, and operation of Fermi 3 on terrestrial ecological resources are SMALL. For the eastern fox snake, cumulative impacts are likely to adversely affect this species as a result of the Fermi 3 project and possible effects of climate change. While local fox snake populations would be affected, the overall impact on the species as a whole would be minor and would not destabilize the regional population. The NRC's evaluation of the potential impacts on the eastern fox snake recognized the potential for mitigation measures proposed by DTE and approved by the MDNR to significantly reduce impacts from Fermi 3 on that species, thereby leading to no adverse effects, but acknowledged the possibility of adverse effects if proposed mitigation is not implemented as described in their plan. The incremental contribution of building and operating the Fermi 3 project could be noticeable with respect to the eastern fox snake but would be minor for other terrestrial resources. The incremental contribution of NRC-authorized elements of the Fermi 3 project, which exclude preconstruction activities such as site preparation and building transmission lines, but which include operations, could likewise be noticeable with respect to the eastern fox snake but would be minor with respect to other terrestrial resources. (NRC 2013c, Section 7.3.1.3)

4.12.4.5.2 Aquatic Resources

The region of influence is concentrated in Lake Erie, but also extends into the surrounding wetland areas with regard to the potential for consumptive water use to impact aquatic resources. Section 3.6 describes the existing environmental conditions for aquatic and riparian communities.

With regard to cumulative impacts occurring during the license renewal term, Fermi 2's existing SMALL impacts could combine with impacts from other future projects. Fermi 2's impacts stem from water consumption, entrainment, and impingement due to the operation of Fermi 2's cooling water intake structures, and NPDES-permitted discharges (chemicals, metals, and waste heat). Because Fermi 2 is considered a closed-loop cooling system with respect to cooling water use,

the typical impingement, entrainment, and thermal impacts are significantly reduced and considered SMALL.

In addition, no algal blooms of *Lyngbya* or other nuisance species have been reported at the site due to Fermi 2's operation and associated NPDES-permitted wastewater discharges. It was also determined in the Fermi 3 FEIS (NUREG-2105) that neither construction activities nor the heated discharge from the proposed Fermi 3 would significantly increase the potential for development of algal blooms. This conclusion was confirmed by the NPDES permit review performed by MDEQ for Fermi 3, which determined that the associated chemical and thermal discharges will not cause algal blooms or otherwise lead to adverse impacts in Lake Erie. Therefore, the operation of Fermi 2 and the proposed construction and operation of Fermi 3 is not expected to increase the potential for algal blooms in the vicinity of the site or increase the potential for establishment or survival of nuisance algal species in Lake Erie. (NRC 2012a)

Offsite projects such as industrial development could potentially lead to discharges to Lake Erie. However, any such discharges, including stormwater, would be subject to NPDES permit limits designed to be protective of surface water and aquatic ecology resources, minimizing cumulative impacts. As discussed in Section 2.2.3.1.4, the last time a planned liquid effluent radwaste discharge occurred at Fermi 2 was in 1994. Since that time, Fermi 2 has operated as a zero-discharge liquid effluent radwaste release facility with a goal to continue operating in this manner in the future. Therefore, cumulative impacts on aquatic resources due to radiological releases are not expected to occur during the license renewal term. In summary, cumulative impacts to aquatic resources during the license renewal term would be SMALL.

Impacts from water use conflicts have not been experienced to date and are not projected for the future. Thus, the incremental contribution attributable to the continued operation of Fermi 2 during the license renewal period would be SMALL should there be a combining of impacts attributable to other actions resulting in cumulative impacts.

The construction and operation of Fermi 3 would affect a small amount of aquatic habitat within the western basin of Lake Erie, including habitat used by species or taxa described in Section 3.6. Considering the incremental contribution (i.e., individual) to impacts on aquatic resources from construction and operation of Fermi 3, Fermi 2 operations would not contribute significantly to the overall cumulative impact to the geographical area of interest. Therefore, cumulative impacts to aquatic resources are anticipated to be SMALL.

With projected climate change and past, present, and reasonably foreseeable future actions in the lower Swan Creek watershed and the western basin of Lake Erie, cumulative impacts on aquatic resources would be MODERATE. (NRC 2013c, Section 7.3.2)

Therefore, DTE concludes that although the renewal of the Fermi 2 OL would have SMALL impacts by itself, impacts from climate change would be MODERATE.

4.12.4.6 Socioeconomics

The socioeconomic conditions involving population, taxes, housing, local public services, utilities, education, employment, offsite land use, and transportation were presented in Section 3.8. The

impacts to housing, local public services/utilities, education, and transportation as measures of socioeconomic indicators were evaluated separately in Section 4.8.

As noted in Section 3.8, Fermi 2 makes a significant contribution to the local and state tax base. Property taxes are paid to Frenchtown Township in Monroe County, Michigan, and distributed in accordance with the Frenchtown Charter Township millage spread. Continued operation of the plant through the license renewal term would extend the existing beneficial impact of economic support and tax revenues in Monroe County. The tax benefit due to license renewal is expected to remain approximately the same as it is currently, because no license-renewal-related refurbishment activities have been identified. Should Fermi 3 be licensed and constructed, there would also be a beneficial impact throughout the 50-mile region, with Monroe County most likely receiving the most beneficial impacts. (NRC 2013c, Section 7.4.1)

Because Fermi 2 has no plans to add additional workers during the license renewal period and all intersections in the immediate vicinity of the Fermi site operate at acceptable LOSs, transportation impacts would be SMALL. During the construction and operation of Fermi 3, impacts could range from SMALL to MODERATE, with a SMALL incremental impact on traffic during normal operations, and an incremental MODERATE impact during outages on traffic along local roadways near the Fermi site (NRC 2013c, Section 7.4.1).

Information on minority and low-income populations is presented in Section 3.10. As discussed in Section 4.10, no disproportionate adverse impact on minority or low-income populations would occur from renewal of the Fermi 2 OL. Thus, the proposed action would not contribute to a cumulative disproportionate adverse impact on minority or low-income populations.

As discussed in Section 4.7, it was determined that the renewal of the Fermi 2 OL would not adversely affect historic aboveground properties or archaeological sites. Although no refurbishment or other license-renewal-related construction activities have been identified, any future developments on and near the Fermi site would be required to comply with applicable federal and state laws regarding protection of cultural and archaeological resources, and any impacts would be mitigated accordingly. Based on this information, DTE concludes that the continued operation of Fermi 2 during the license renewal term would not incrementally contribute to cumulative impacts on historic and archaeological resources on the Fermi site and in the surrounding area. Therefore, DTE determined that historic and archaeological resources during the license renewal term would not be adversely affected from a cumulative impact perspective.

4.12.4.7 Human Health

4.12.4.7.1 Nonradiological Health

Most of the nonradiological impacts of the continued operation (e.g., etiological agents) of Fermi 2 would be localized and would not have a significant impact at offsite locations. The health impacts of operating the existing Fermi 2 and the proposed Fermi 3 at the Fermi site were evaluated relative to Lake Erie and the potential propagation of etiological microorganisms. It was determined that the thermal discharges would not have detrimental impacts on the

concentration levels of deleterious etiological microorganisms. In addition, no recreational activity occurs in the immediate vicinity of Fermi 2's discharge structure and the proposed discharge structure for Fermi 3 that would have any bearing on potential nonradiological health impacts. (NRC 2013c, Section 7.7) Therefore, cumulative impacts would be SMALL.

Existing and potential development of new transmission lines could increase electromagnetic fields (EMFs). However, as stated in Section 4.9.2.5, the public does not have access to transmission lines that are considered in scope for Fermi 2; therefore, no induced shock hazards would exist for the public. All electric shock hazards, including those from induced current shock are managed by DTE in compliance with MIOSHA occupational health and safety requirements to protect onsite workers. Therefore, cumulative impacts would be SMALL.

Potential development of new transmission lines for Fermi 3 could increase nonradiological health impacts for exposure to acute EMFs. However, adherence to federal criteria and state utility codes would help keep any cumulative nonradiological health impacts at the minimal level. (NRC 2013c, Section 7.7) Therefore, cumulative impacts would be SMALL

4.12.4.7.2 Radiological Health

Within the 50-mile radius of the Fermi site, there are the existing operating Fermi 2 plant, Fermi 1 (decommissioned—in SAFSTOR status), and the Davis-Besse Nuclear Power Station. DTE also plans to operate the Fermi 2 ISFSI on the Fermi site. In addition, there are likely to be medical, industrial, and research facilities that use radioactive materials within a 50-mile radius of the Fermi site.

The REMP measures radiation and radioactive materials from all sources, including existing Fermi 1 and 2, Davis-Besse, area hospitals, and industrial facilities. The results of the REMP indicate that the levels of radiation and radioactive material in the environment around the Fermi site are generally not above or only a little above natural background levels. As described in Section 4.12.4.4, sporadic and variable trace quantities of tritium were detected in a few onsite shallow groundwater wells downwind from the Fermi 2 stack as a result of the recapturing of tritium in precipitation from the plant's gaseous effluent. (NRC 2013c, Section 7.8)

It is estimated that the dose to construction workers during the building of the proposed Fermi 3 would be within NRC annual exposure limits (i.e., 100 mrem), which are designed to protect public health. This estimate includes exposure to doses from the operation of Fermi 2, the decommissioned Fermi 1, and the Fermi 2 ISFSI. The public and occupational doses predicted from the proposed operation of Fermi 3 would be below regulatory limits and standards. In addition, the site boundary dose to the maximally exposed individual (MEI) from existing Fermi 2 and proposed Fermi 3 at the Fermi site would be well within the regulatory standard of 40 CFR Part 190. (NRC 2013c, Section 7.8)

The results of the REMP indicate that effluents and direct radiation from area medical, industrial, and research facilities that use radioactive materials do not contribute measurably to the cumulative dose for biota in the vicinity of the Fermi site. Currently, there are no other nuclear facilities planned within 50 miles of the Fermi site. The NRC, U.S. Department of Energy, State of Michigan, and State of Ohio would regulate or control any reasonably foreseeable future

actions in the region that could contribute to cumulative radiological impacts. Therefore, the conclusion is that the cumulative radiological impacts of operation of the proposed Fermi 3 and existing Fermi 1 (undergoing decommissioning) and Fermi 2 (operational) and the influence of other manmade sources of radiation nearby would be SMALL. (NRC 2013c, Section 7.8)

4.12.4.8 Waste Management and Pollution Prevention

The cumulative impacts of nonradioactive waste destined for land-based treatment and disposal are related to (1) the available capacity of the area treatment and disposal facilities and (2) the amount of solid waste generated by the proposed project and the current and reasonably foreseeable future projects. The geographic area of interest for the cumulative analysis is the area within 15 miles of the Fermi site. This area included four landfills that could potentially be used by DTE. (NRC 2013c, Section 7.9)

Nonradioactive wastes generated at the Fermi site, including those from Fermi 3, would be managed in accordance with applicable federal, state, and local laws and regulations and with permit requirements. The nonradiological waste management practices would include the following (NRC 2013c, Section 7.9):

- Nonradioactive solid waste would be collected and stored temporarily on the Fermi site and disposed off site only at authorized and licensed commercial waste disposal sites or recovered at an offsite permitted recycling or recovery facility, as appropriate.
- Sanitary wastewater would be delivered to the Monroe Metropolitan Wastewater Treatment Facility for treatment.
- Debris (e.g., vegetation) collected on trash screens at the water intake structure would be disposed off site as solid waste, in accordance with state regulations.
- Dredge spoils resulting from construction and periodic maintenance of the discharge and intake areas are temporarily placed in the existing dredge basin.
- Scrap metal, lead acid batteries, and paper on the Fermi site would be recycled.
- Industrial wastewater discharges from cooling and auxiliary systems would be discharged directly and indirectly to Lake Erie through permitted outfalls.
- Air emissions from Fermi 2 and Fermi 3 operations would be compliant with air quality standards as permitted by MDEQ.

Because the effective practices already in place at Fermi 2 for recycling, minimizing, and managing waste will be used for Fermi 3, the expected impacts on land from nonradioactive waste generated during continued operation of Fermi 2, and the construction and operation of Fermi 3 are expected to be SMALL. Future area projects, in addition to the operation of Fermi 2 and Fermi 3 construction and operation, would potentially generate municipal and industrial

waste. However, no known capacity constraints exist for the treatment or disposal of such types of waste either within Michigan, Ohio, or the nation as a whole. (NRC 2013c, Section 7.9)

Small quantities of hazardous waste and mixed waste (waste that has both hazardous and radioactive characteristics), would be generated during the continued operation of Fermi 2 and operation of Fermi 3. Each reactor at the Fermi site is expected to produce about 0.5 m^3 per year of mixed waste. DTE anticipates that Fermi 3 will claim a low-level mixed waste exemption from the State of Michigan, the same type of exemption Fermi 2 currently operates under. Along with Fermi facilities, area hospitals and industrial facilities that use radioactive materials have the potential to generate mixed waste. None of the other area projects are expected to generate mixed waste in significant quantities above the current rates, and therefore cumulative impacts of nonradioactive and mixed waste would be SMALL. (NRC 2013c, Section 7.9)

In addition to fuel-cycle impacts from Fermi 3, within the 50-mile region cumulative analysis also considers fuel-cycle impacts from existing Fermi 2 and Davis-Besse, located southeast of Toledo, Ohio. The fuel-cycle impacts of Fermi 2 and Davis-Besse would be similar to those of the proposed Fermi 3 and in accordance with 10 CFR 51.51(a). Therefore, cumulative fuel cycle impacts would be SMALL. (NRC 2013c, Section 7.11)

4.12.5 Conclusion

DTE considered the potential impacts from continued operation of Fermi 2 during the license renewal term and other past, present, and future actions for cumulative impacts. Based on the various impacts discussed above, DTE's conclusion is the potential cumulative impacts resulting from Fermi 2 operation during the license renewal term (2025 to 2045) could be SMALL to MODERATE for air quality and surface water and aquatic resources due to potential GHG emissions and climate change; potential likely adverse effects on the eastern fox snake habitat due to Fermi 3 construction activities, and SMALL impacts on remaining terrestrial ecology resources; SMALL to MODERATE impacts on transportation due to Fermi 3 construction activities; no adverse effects on historic and cultural resources due to construction of transmission lines associated with Fermi 3; and no disproportionate adverse impact on minority or low-income populations. It is anticipated that there would be beneficial impacts on the economy and local government revenues from the continued operation of Fermi 2 and the construction and operation of Fermi 3. Impacts on remaining resources would be SMALL.

4.13 Impacts Common to All Alternatives: Uranium Fuel Cycle

4.13.1 Offsite Radiological Impacts—Individual Impacts from other than the Disposal of Spent Fuel and High-Level Waste

4.13.1.1 Findings from Table B-1, Appendix B to Subpart A

SMALL. The impacts to the public from radiological exposures have been considered by the Commission in Table S-3 of this part. Based on information in the GEIS, impacts to individuals from radioactive gaseous and liquid releases, including radon-222 and technetium-99, would remain at or below the NRC's regulatory limits.

4.13.1.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

4.13.1.3 Background [GEIS Section 4.12.1.1]

The analyses performed by the NRC in the preparation of Table S-3 and found in the 1996 GEIS indicate that as long as the facilities operate under a valid license issued by either the NRC or an agreement state, the individual effects will meet the applicable regulations. On the basis of these considerations, the NRC has concluded that the impacts on individuals from radioactive gaseous and liquid releases during the license renewal term would remain at or below the NRC's regulatory limits. Accordingly, the NRC concludes that offsite radiological impacts of the uranium fuel cycle (individual effects from sources other than the disposal of spent fuel and HLW) are SMALL. The efforts to keep the releases and doses at ALARA will continue to apply to fuel-cycle-related activities.

4.13.1.4 Analysis

This issue concerns the direct impacts from facilities involved in supplying nuclear fuel to nuclear power plants. The cumulative impact (inclusive of Fermi 2) of the fuel cycle was addressed in Section 7.11 of the Fermi 3 FEIS, concluding that the impacts would be SMALL. No changes in Fermi 2 fueling practices have been identified for the license renewal term. Therefore, based on DTE's review, no new and significant information was identified as it relates to offsite radiological impacts—individual impacts from other than the disposal of spent fuel and HLW, and further analysis is not required.

4.13.2 Offsite Radiological Impacts—Collective Impacts from other than the Disposal of Spent Fuel and High-Level Waste

4.13.2.1 Findings from Table B-1, Appendix B to Subpart A

There are no regulatory limits applicable to collective doses to the general public from fuel-cycle facilities. The practice of estimating health effects on the basis of collective doses may not be

meaningful. All fuel-cycle facilities are designed and operated to meet the applicable regulatory limits and standards. The Commission concludes that the collective impacts are acceptable.

4.13.2.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

4.13.2.3 Background [GEIS Section 4.12.1.1]

There are no regulatory limits applicable to collective doses to the general public from fuel cycle facilities. All regulatory limits are based on individual doses. All fuel cycle facilities are designed and operated to meet the applicable regulatory limits.

As discussed in the 1996 GEIS, despite the lack of definitive data, some judgment as to the regulatory NEPA implications of these matters should be made and it makes no sense to repeat the same judgment in every case. The Commission concludes that these impacts are acceptable in that these impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR Part 54 should be eliminated. Accordingly, while the Commission has not assigned a single level of significance for the collective effects of the fuel cycle; this issue was considered Category 1. No new information has been identified that would alter this conclusion.

4.13.2.4 Analysis

This issue concerns the direct impacts from facilities involved in supplying nuclear fuel to nuclear power plants. The cumulative impact (inclusive of Fermi 2) of the fuel cycle was addressed in Section 7.11 of the Fermi 3 FEIS, concluding that the impacts would be SMALL. No changes in Fermi 2 fueling practices have been identified for the license renewal term. Therefore, based on DTE's review, no new and significant information was identified as it relates to offsite radiological impacts—collective impacts from other than the disposal of spent fuel and HLW, and further analysis is not required.

4.13.3 Nonradiological Impacts of the Uranium Fuel Cycle

4.13.3.1 Findings from Table B-1, Appendix B to Subpart A

SMALL. The nonradiological impacts of the uranium fuel cycle resulting from the renewal of an operating license for any plant would be small.

4.13.3.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

4.13.3.3 Background [GEIS Section 4.12.1.1]

Data on the nonradiological impacts of the fuel cycle are provided in Table S-3. These data cover land use, water use, fossil fuel use, and chemical effluents. The significance of the environmental impacts associated with these data was evaluated in the 1996 GEIS on the basis of several relative comparisons. It was noted that the impacts associated with uses of all of the above resources would be SMALL. Any impacts associated with nonradiological liquid releases from the fuel cycle facilities would also be SMALL. As a result, the aggregate nonradiological impact of the uranium fuel cycle resulting from the renewal of an operating license for a plant would be SMALL, and it was considered a Category 1 issue in the 1996 GEIS. No new information has been identified that would alter this conclusion.

4.13.3.4 Analysis

This issue concerns the direct impacts from facilities involved in supplying nuclear fuel to nuclear power plants. The cumulative impact (inclusive of Fermi 2) of the fuel cycle was addressed in Section 7.11 of the Fermi 3 FEIS, concluding that the impacts would be SMALL. No changes in Fermi 2 fueling practices have been identified for the license renewal term. Therefore, based on DTE's review, no new and significant information was identified as it relates to nonradiological impacts of the uranium cycle, and further analysis is not required.

4.13.4 Transportation

4.13.4.1 Findings from Table B-1, Appendix B to Subpart A

SMALL. The impacts of transporting materials to and from uranium-fuel-cycle facilities on workers, the public, and the environment are expected to be small.

4.13.4.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

4.13.4.3 Background [GEIS Section 4.12.1.1]

The impacts associated with transporting fresh fuel to one 1,000 MWe model light-water reactor and with transporting spent fuel and radioactive waste (LLW and mixed waste) from that light water reactor are provided in Table S-4 in 10 CFR 51.52. Similar to Table S-3, and as indicated in 10 CFR 51.52, every environmental report prepared for the construction permit stage of a commercial nuclear power plant must contain a statement concerning the transport of fuel and radioactive waste to and from the reactor. A similar statement is also required in LRAs. Table S-4 forms the basis of such a statement.

In 1999, the NRC issued an addendum to the 1996 GEIS in which the agency evaluated the applicability of Table S-4 to future license renewal proceedings, given that the spent fuel is likely to be shipped to a single repository (as opposed to several destinations, as originally assumed in

the preparation of Table S-4) and given that shipments of spent fuel are likely to involve more highly enriched fresh fuel (more than 4 percent as assumed in Table S-4) and higher-burnup spent fuel (higher than 33,000 MWd/MTU as assumed in Table S-4). In the addendum, the NRC evaluated the impacts of transporting the spent fuel from reactor sites to the candidate repository at Yucca Mountain and the impacts of shipping more highly enriched fresh fuel and higher-burnup spent fuel. The impacts were found to be SMALL, and the findings were stated as follows:

> The impacts of transporting spent fuel enriched up to 5 percent uranium-235 with average burnup for the peak rod to current levels approved by NRC up to 62,000 MWd/MTU and the cumulative impacts of transporting HLW to a single repository, such as Yucca Mountain, Nevada, are found to be consistent with the impact values contained in 10 CFR 51.52(c), Summary Table S-4, Environmental Impact of Transportation of Fuel and Waste to and from One Light-Water-Cooled Nuclear Power Reactor. If fuel enrichment or burnup conditions are not met, the applicant must submit an assessment of the implications for the environmental impact values reported in §51.52.

4.13.4.4 Analysis

As discussed in Section 2.2.1.1 of this ER, fuel enrichment and average peak rod burnup conditions are no more than 5 percent uranium-235 and 60,000 MWd/MTU, respectively. Therefore, no new and significant information exists and further analysis is not required.

4.14 Termination of Nuclear Power Plant Operations and Decommissioning

4.14.1 Findings from Table B-1, Appendix B to Subpart A

SMALL. License renewal is expected to have a negligible effect on the impacts of terminating operations and decommissioning on all resources.

4.14.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

4.14.3 Background [GEIS Sections 4.12.2 and 4.12.2.1]

The impacts of decommissioning nuclear plants were evaluated in the *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities: Supplement 1, Regarding the Decommissioning of Nuclear Power Reactors*, NUREG-0586.

The majority of the impacts associated with plant operations would cease with reactor shutdown; however, some impacts would remain unchanged, while others would continue at reduced or altered levels. Some new impacts might also result directly from terminating nuclear power plant operations.

4.14.4 Analysis

The only impacts of license termination and decommissioning attributable to operation during an extended license period are the effects of an additional 20 years of operations on the impacts of decommissioning. NRC considered information on this issue available since the 1996 GEIS, confirming that the impact anticipated for this issue as SMALL (NRC 2013b). In addition, the cumulative impact analysis for the Fermi 3 FEIS included consideration of license renewal at Fermi 2 (NRC 2013c, Table 7-1). The NRC concluded that the cumulative impact of the fuel cycle and decommissioning would be SMALL (NRC 2013c, Section 7.11). Therefore, based on DTE's review, no new and significant information was identified as it relates to termination of nuclear power plant operations and decommissioning, and further analysis is not required.

5.0 ASSESSMENT OF NEW AND SIGNIFICANT INFORMATION

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware. [10 CFR 51.53(c)(3)(iv)]

The NRC has resolved most license renewal environmental issues generically and requires an applicant to analyze only those issues the NRC has not resolved generically. While NRC regulations do not require an applicant's environmental report to contain analyses of the impacts of those Category 1 environmental issues that have been generically resolved [10 CFR 51.53(c)(3)(i)], the regulations do require that an applicant identify any new and significant information of which the applicant is aware. [10 CFR 51.53(c)(3)(iv)]

DTE's process for the new and significant information review pertaining to Category 1 environmental issues identified in the GEIS and other issues that may have not been addressed in the GEIS includes ongoing reviews and monitoring under the corporate and Fermi 2 International Organization for Standardization 14001 environmental management system (EMS), including procedures to keep abreast of new and emerging environmental concerns and regulations (DTE 2013y), review of public and agency comments on the Fermi Unit 3 draft EIS, review of Revision 1 of the license renewal GEIS, and collection and review of information for the Fermi 2 ER, such as the comprehensive compliance status documented in Chapter 9 of this ER. Information reviewed included environmental monitoring results, compliance history, Fermi 2 performance, and ongoing review of environmental performance and new regulations. Also, as discussed in Chapter 2 of this ER, plant reviews indicated that no specific modifications have been identified for the purpose of license renewal that would result in a new impact on the environment.

5.1 New and Significant Information

NRC provides guidance on new and significant information in Regulatory Guide 4.2, Supplement 1, Revision 1 (NRC 2013a), stating that new and significant information is:

(1) "Information that identifies a significant environmental impact issue that was not considered or addressed in the GEIS and, consequently, not codified in Table B-1, 'Summary of Findings on NEPA Issues for License Renewal of Nuclear Plants,' in Appendix B, 'Environmental Effect of Renewing the Operating License of a Nuclear Power Plant,' to Subpart A, 'National Environmental Policy Act—Regulations Implementing Section 102(2),' of 10 CFR Part 51," or

(2) "Information not considered in the assessment of impacts evaluated in the GEIS leading to a seriously different picture of the environmental consequences of the action than previously considered, such as an environmental impact finding different from that codified in Table B-1."

Further, a significant environmental issue includes, but is not limited to, any new activity or aspect associated with the nuclear power plant that can act upon the environment in a manner or an intensity and/or scope (context) not previously recognized.

NRC does not specifically define the term "significant." Accordingly, for the purposes of this review, DTE relied on Council on Environmental Quality (CEQ) regulations, which include a lengthy definition of "significant" that requires consideration of the context of the action and the intensity or severity of the impact(s) [40 CFR 1508.27].

5.2 DTE's New and Significant Information Review Process

DTE's new and significant information review process drew from (1) the existing EMS program for identification of environmental aspects of plant operations, emerging and new environmental issues and regulations, and monitoring and measurement of environmental releases and impacts (DTE 2013y); (2) the recent environmental reviews for the proposed Fermi 3 unit for its characterization of the affected environment, evaluation of impacts that are comparable to Fermi 2, and cumulative impacts; (3) Revision 1 of the license renewal GEIS for its recent review of environmental issues; and (4) collection and review of information for the Fermi 2 ER such as the comprehensive compliance status documented in Chapter 9 of this ER.

DTE relied on its EMS program used at Fermi 2 for identifying new information and evaluating its significance. As part of the EMS, DTE has a process for managing environmental requirements related to Fermi 2 operations, minimizing impacts through identification of aspects of activities and operations that have the potential for affecting the environment, and review of monitoring and measurement data against targets to ensure compliance and minimization of environmental impacts, which allows for development and implementation of contingency actions should a target be in jeopardy of being exceeded. The EMS does not just oversee environmental conditions and compliance requirements as identified when the program was established, but includes ongoing processes for continuous or periodic reviews to identify environmental aspects of operations such as process inputs, releases to the environment, and identification and review of operational controls related to significant environmental aspects for their adequacy. Also, the EMS and tiered procedures establish a process for DTE staff to keep abreast of emerging environmental concerns and requirements.

DTE also used information included in the recent Fermi 3 COLA ER and the NRC's Fermi 3 FEIS (NRC 2013c) for related information on the Fermi site and ongoing operations at Fermi 2. The Fermi 3 FEIS was completed in November 2012 and published in January 2013. It presents the affected environment for the Fermi site, describing the quality of the environment inclusive of the Fermi 2 unit. Its preparation included state and other federal agency consultations and reviews, as well as public outreach meetings. These reviews included the operating Fermi 2 unit and are an important part of the "new and significant" information review addressing Category 1 issues and other issues that may have not been addressed in the NRC's GEIS.

The NRC staff recommended that the Fermi 3 COL be issued based on the analyses for the Fermi 3 COLA, which addressed construction and operational activities as well as cumulative impacts. This recommendation indicates that the surrounding environment can continue to support operation of Fermi 2 without destabilizing or noticeably altering the environment.

In this review, any "new" site-specific information was evaluated for its implication on NRC's generic decision in the GEIS that the issue represents only an impact of small severity for the

nuclear power plant's site and surrounding environment. If review of the information indicated that the issue would potentially be better characterized as having an impact greater than the generically assigned SMALL impact severity level (e.g., MODERATE and LARGE impacts as defined by NRC), DTE would have considered the information "significant."

DTE's review for the Fermi 2 ER did not identify any new and significant information in the context of 10 CFR 51.53(c)(3)(iv) regarding the environmental impacts of license renewal associated with Fermi 2.

6.0 SUMMARY OF LICENSE RENEWAL IMPACTS AND MITIGATING ACTIONS

6.1 License Renewal Impacts

Chapter 4 incorporates by reference NRC findings for the 52 Category 1 issues that apply to Fermi 2 (and for the two uncategorized issues for which the NRC came to no generic conclusion), all of which have environmental impacts that are SMALL. The remainder of Chapter 4 analyzes the 17 Category 2 issues. Table 6.1-1 identifies the environmental impacts that renewal of the Fermi 2 OL would have on resources associated with Category 2 issues.

In summary, DTE has reviewed the environmental impacts of renewing the Fermi 2 OL and has concluded that further mitigation measures beyond those currently discussed in Section 6.2.2 and listed in Table 6.1-1 of this ER to avoid, reduce the severity of, or eliminate adverse impacts are not warranted. This ER documents the basis for DTE's conclusion.

Table 6.1-1
Environmental Impacts Related to License Renewal at Fermi 2

Issue	ER Section	Environmental Impact
Surface Water Resources		
Surface water use conflicts (plants with cooling ponds or cooling towers using makeup water from a river) [10 CFR 51.53(c)(3)(ii)(A)]	4.5.1	No impact. Issue is not applicable because Fermi 2 withdraws makeup water from Lake Erie, not from a river.
Groundwater Resources		
Groundwater use conflicts (plants with closed-cycle cooling systems that withdraw makeup water from a river) [10 CFR 51.53(c)(3)(ii)(A)]	4.5.2	No impact. Issue is not applicable because Fermi 2 withdraws makeup water from Lake Erie, not from a river.
Groundwater use conflicts (plants that withdraw more than 100 gpm) [10 CFR 51.53(c)(3)(ii)(C)]	4.5.3	No impact. Issue is not applicable because Fermi 2 does not withdraw groundwater from the site; potable water is provided by Frenchtown Township Water Supply and makeup cooling water is supplied by Lake Erie.
Groundwater quality degradation (plants with cooling ponds at inland sites) [10 CFR 51.53(c)(3)(ii)(D)]	4.5.4	No impact. Issue is not applicable because Fermi is not considered an inland site and is not listed as a plant utilizing cooling ponds in Table 3.1-2 of the GEIS.
Radionuclides released to groundwater [10 CFR 51.53(c)(3)(ii)(P)]	4.5.5	SMALL impact. Detectable tritium in low concentrations located exclusively onsite typical of precipitation washout, and well below EPA's drinking water regulatory limits; no plant-related gamma isotopes or hard-to-detect radionuclides detected since groundwater program was initiated in 2007; sampling has not identified any leaking plant systems.
Terrestrial Resources		
Water use conflicts with terrestrial resources (plants with cooling ponds or cooling towers using makeup water from a river) [10 CFR 51.53(c)(3)(ii)(A)]	4.6.1	No impact. Issue is not applicable because Fermi 2 withdraws makeup water from Lake Erie, not from a river.
Effects on terrestrial resources (non-cooling system impacts) [10 CFR 51.53(c)(3)(ii)(E)]	4.6.2	SMALL impact. No refurbishment or other license-renewal-related construction activities have been identified; management programs in place to protect onsite important terrestrial ecosystems.

Table 6.1-1 (Continued)
Environmental Impacts Related to License Renewal at Fermi 2

Issue	ER Section	Environmental Impact
Aquatic Resources		
Impingement and entrainment of aquatic organisms (plants with once-through cooling systems or cooling ponds) [10 CFR 51.53(c)(3)(ii)(B)]	4.6.3	No impact. Issue is not applicable because Fermi 2 utilizes a closed-cycle cooling heat dissipation system equipped with two natural draft hyperbolic cooling towers and is not listed as a plant utilizing cooling ponds in Table 3.1-2 of the GEIS.
Thermal impacts on aquatic organisms (plants with once-through cooling systems or cooling ponds) [10 CFR 51.53(c)(3)(ii)(B)]	4.6.4	No impact. Issue is not applicable because Fermi 2 utilizes a closed-cycle cooling heat dissipation system equipped with two natural draft hyperbolic cooling towers and is not listed as a plant utilizing cooling ponds in Table 3.1-2 of the GEIS.
Water use conflicts with aquatic resources (plants with cooling ponds or cooling towers using makeup water from a river) [10 CFR 51.53(c)(3)(ii)(A)]	4.6.5	No impact. Issue is not applicable because Fermi 2 withdraws makeup water from Lake Erie, not from a river.
Special Status Species and Habitats		
Threatened, endangered, and protected species and essential fish habitat [10 CFR 51.53(c)(3)(ii)(E)]	4.6.6	No adverse effects on threatened and endangered species or essential fish habitat. No refurbishment or other license-renewal-related construction activities have been identified; management programs in place to protect threatened and endangered species; no essential fish habitat designated in Lake Erie.
Historic and Cultural Resources		
Historic and cultural resources [10 CFR 51.53(c)(3)(ii)(K)]	4.7	No adverse effects on historic properties. No refurbishment or other license-renewal-related construction activities have been identified; administrative procedure ensures protection of these type resources in the event of excavation activities.
Human Health		
Microbiological hazards to the public (plants with cooling ponds or canals or cooling towers that discharge to a river) [10 CFR 51.53(c)(3)(ii)(G)]	4.9.1	No impact. Issue is not applicable because Fermi 2 discharges to Lake Erie, not to a river.

Table 6.1-1 (Continued)
Environmental Impacts Related to License Renewal at Fermi 2

Issue	ER Section	Environmental Impact
Electric shock hazard [10 CFR 51.53(c)(3)(ii)(H)]	4.9.2	SMALL impact. Public access to onsite transmission lines restricted; electric shock hazards to onsite workers managed in accordance with MIOSHA occupational health and safety requirements; GEIS determined that occupational safety and health hazard issues are of small significance if workers adhere to safety standards and use protective equipment.
Environmental Justice		
Minority and low-income populations [10 CFR 51.53(c)(3)(ii)(N)]	4.10	No disproportionately high and adverse impacts or effects on minority and low-income populations. No significant offsite Category 2 environmental impacts; no unusual resource dependencies or practices identified; no plant-related radionuclides detected in plant and animal life in the environment surrounding Fermi 2.
Cumulative Impacts		
Cumulative impacts [10 CFR 51.53(c)(3)(ii)(O)]	4.12	SMALL to MODERATE impacts. SMALL to MODERATE for air quality, surface water, and aquatic resources due to potential GHG emissions and climate change; potential likely adverse effects to the eastern fox snake habitat due to Fermi 3 construction activities, and SMALL impacts for remaining terrestrial ecology resources; SMALL to MODERATE for transportation due to Fermi 3 construction activities; no adverse effects on historic and cultural resources; SMALL for remaining resources; beneficial for economy and local government revenues with construction and operation of Fermi 3.
Postulated Accidents		
Severe accidents [10 CFR 51.53(c)(3)(ii)(L)]	4.9.3	SMALL impact. Potentially cost-effective SAMAs are not related to adequately managing the effects of aging during the period of extended operation.

6.2 Mitigation

6.2.1 Requirement [10 CFR 51.45(c)]

The report must contain a consideration of alternatives for reducing adverse impacts, as required by §51.45(c), for all Category 2 license renewal issues in Appendix B to subpart A of this part. No such consideration is required for Category 1 issues in Appendix B to subpart A of this part. [10 CFR 51.53(c)(3)(iii)]

6.2.2 DTE Response

Regulatory Guide 4.2, *Preparation of Environmental Reports for Nuclear Power Plant License Renewal Applications*, specifies that the applicant should identify any ongoing mitigation and should discuss the potential for additional mitigation. However, applicants are only required to consider mitigation alternatives in proportion to the significance of the impact. (NRC 2013a, page 8)

As discussed in Section 6.1, impacts associated with Fermi 2 license renewal do not require the implementation of additional mitigation measures. The permits and programs discussed in Chapter 9 (i.e., NPDES permit, stormwater program, air permit, SPCC program, hazardous waste program, radioactive effluents monitoring program, groundwater protection program, REMP, and environmental review programs) that currently mitigate the operational environmental impacts of Fermi 2 are adequate. Therefore, additional mitigation measures are not sufficiently beneficial as to be warranted.

6.3 Unavoidable Adverse Impacts

6.3.1 Requirement [10 CFR 51.45(b)(2)]

The applicant's report shall discuss any adverse environmental effects which cannot be avoided upon implementation of the proposed project.

6.3.2 DTE Response

An environmental review conducted at the license renewal stage differs from the review conducted in support of a construction permit, because the facility is in existence at the license renewal stage and has operated for a number of years. As a result, adverse impacts associated with the initial construction have been avoided, have been mitigated, or have already occurred. As discussed in Section 2.3, no refurbishment or other license-renewal-related construction activities have been identified. Therefore, the environmental impacts to be evaluated for license renewal are those associated with continued operation during the renewal term. DTE adopts by reference NRC findings for the 52 Category 1 issues applicable to Fermi 2, including discussions of any unavoidable adverse impacts. In addition, DTE identified the following site-specific unavoidable adverse impacts associated with license renewal:

- The majority of the land use at Fermi 2 would continue to be designated as industrial until the plant is shut down and decommissioned (decommissioning can take up to 60 years after permanent shutdown of Fermi 2). Uranium mining associated with the nuclear fuel cycle also has offsite land-use implications.

- The cooling towers and their vapor plumes are visible from offsite. This visual impact will continue during the license renewal term.

- Operation of Fermi 2 results in consumptive use of Lake Erie water as a result of evaporative losses from the cooling towers and reservoir, as well as drift losses from the cooling towers. As discussed in Section 3.5.3.1, the total volume of Lake Erie is approximately 128 trillion gallons, with the average annual consumptive use from all sources in the Lake Erie basin at approximately 0.14 percent of the total lake volume. Therefore, impacts to water use as a result of evaporative losses from Fermi 2 operations is minimal.

- Normal plant operations result in industrial wastewater discharges containing small amounts of water treatment chemical additives to Lake Erie at or below MDEQ-approved concentrations. Compliance with the NPDES permit and SWPPP would ensure that impacts remain SMALL.

- Operation of Fermi 2 results in the generation of spent nuclear fuel and waste material, including LLW, hazardous waste, and nonhazardous waste. However, specific plant design features in conjunction with a waste minimization program; employee safety training programs and work procedures; and strict adherence to applicable regulations for storage, treatment, transportation, and ultimate disposal of this waste ensure that the impact is SMALL.

- Operation of Fermi 2 results in a very small increase in radioactivity in the air. The incremental radiation dose to the local population resulting from Fermi 2 operations is typically less than the magnitude of the fluctuations that occur in natural background radiation. Operation of Fermi 2 also creates a very low probability of accidental radiation exposure to inhabitants of the area.

6.4 Irreversible or Irretrievable Resource Commitments

6.4.1 Requirement [10 CFR 51.45(b)(5)]

The applicant's report shall discuss any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

6.4.2 DTE Response

The term "irreversible" applies to the commitment of environmental resources (e.g., permanent use of land) that cannot by practical means be reversed to restore the environmental resources to their former state. In contrast, the term "irretrievable" applies to the commitment of material

resources (e.g., irradiated steel, petroleum) that, once used, cannot by practical means be recycled or restored for other uses.

The continued operation of Fermi 2 for the period of extended operation will result in irreversible and irretrievable resource commitments, including the following:

- Uranium in the nuclear fuel consumed in the reactor that becomes high-level radioactive waste if the used fuel is not recycled through reprocessing.
- Land required for permanent storage or disposal of spent nuclear fuel, LLW generated as a result of plant operations, and sanitary wastes generated from normal industrial operations.
- Elemental materials that will become radioactive.
- Materials used for the normal industrial operations of Fermi 2 that cannot be recovered or recycled or that are consumed or reduced to unrecoverable forms.

Other than the above, no license-renewal-related refurbishment activities have been identified that would irreversibly or irretrievably commit significant environmental components of land, water, and air.

However, if Fermi 2 ceases operations on or before the expiration of the current OL, the likely power generation alternatives would require a commitment of resources for construction of the replacement plants as well as for fuel to run the plants.

6.5 Short-Term Use versus Long-Term Productivity of the Environment

6.5.1 Requirement [10 CFR 51.45(b)(4)]

The applicant's report shall discuss the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity.

6.5.2 DTE Response

The current balance between short-term use and long-term productivity of the environment at the site has remained relatively constant since Fermi 2 began operations. The Fermi 2 FES evaluated the relationship between the short-term uses of the environment and the maintenance and enhancement of the long-term productivity associated with the construction and operation of Fermi 2 (NRC 1982, Section 8.3). The period of extended operation will not alter the short-term uses of the environment from the uses previously evaluated in the Fermi 2 FES. The period of extended operation will postpone the availability of the site resources (land, air, water) for other uses. Denial of the application to renew the Fermi 2 OL would lead to the shutdown of the plant and would alter the balance in a manner that depends on the subsequent uses of the site. For example, the environmental consequences of turning the Fermi 2 site into a park or an industrial facility are quite different. However, extending Fermi 2 operations would not alter the potential long-term uses of the site that are currently possible.

In summary, no license-renewal-related refurbishment activities have been identified that would alter the evaluation of the Fermi 2 FES for the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity of these resources.

7.0 ALTERNATIVES TO THE PROPOSED ACTION

7.1 Energy Alternatives That Meet System Generating Needs

Each energy alternative should meet the purpose of the proposed action (i.e., renewal of a commercial nuclear power plant operating license), which is to provide the option to continue plant operations beyond the current operating license term. If the Fermi 2 operating license were not renewed, the 1,170 MWe of reliable base-load power produced by Fermi 2 would not be available to continue to meet DTE's system generating needs during the Fermi 2 license renewal period, 2025–2045. Therefore, DTE would need to provide an alternative approach to meeting the electric power requirements of their customers. Any alternative that did not include replacing the capacity of Fermi 2 would be unreasonable.

Alternative approaches for meeting DTE's system generating needs are as follows:

- Build new base-load generating capacity (i.e., construct and operate a replacement base-load power plant).
- Purchase power.
- Reduce power requirements through demand reductions and conservation or energy efficiency measures.

With regard to the first approach, constructing replacement generating capacity, not all generating alternatives would be reasonable alternatives to the proposed action. The NRC has defined "reasonable alternative" as "commercially viable on a utility scale and operational prior to the expiration of the reactor's operating license, or expected to become commercially viable on a utility scale and operational prior to the expiration of the reactor's operating license (NRC 2013b, Section 2.3). In addition, for new construction to be a reasonable replacement alternative, all necessary federal permits, licenses, approvals, and other entitlements would have to be obtainable within a time frame that would allow construction and startup testing by 2025. In evaluating reasonable alternatives to license renewal for Fermi 2, DTE has reviewed both discrete power generation sources for replacement of the base-load generating capacity of Fermi 2 and a combination of sources.

Likewise for the purchase power alternative to be a reasonable alternative, there would have to be assurance that approximately 1,170 MWe of reliable power is available during the 2025–2045 time frame for purchase by DTE. Finally, for the demand reductions and conservation or energy efficiency measures to be a reasonable alternative to continued base-load generation by Fermi 2, the reductions would have to total approximately 1,170 MWe of reliable power for this same time frame.

7.1.1 Energy Alternatives Considered As Reasonable

NRC provided an independent review of alternatives for providing base-load power to DTE customers in the Fermi 3 FEIS (NRC 2013c). The alternatives to construction and operation of a

new nuclear generating unit (Fermi 3) determined to be reasonable were coal-fired units and natural gas-powered units, and a combination of alternatives. NRC's independent review, which included a full range of renewable energy source powered facilities, confirmed DTE's review for base-load energy capacity alternatives for Fermi 3 presented in its COLA ER (DECo 2011). Therefore, DTE has used these two reviews (Fermi 3 FEIS and COLA ER) as the primary sources of information for the alternatives analysis presented in this chapter. Findings from these two reviews have been updated or adapted as necessary to accommodate recently acquired information, adjust for the capacity criteria for Fermi 2 base-load generation replacement discussed in Section 7.1, and account for increased land development on the Fermi property to site both a Fermi 2 replacement and the proposed Fermi 3.

The license renewal alternatives review in this chapter presents coal-fired, natural gas-fired, and nuclear power plants, and a combination of alternatives, as reasonable base-load alternatives for replacing Fermi 2's generating capacity.

The rationale is further discussed in the following sections. The review of other alternatives and the rationale for not considering them to be reasonable for replacement of Fermi 2's base-load generation is presented in Section 7.1.2.

7.1.1.1 Coal-Fired Generation

As discussed above, NRC determined the coal-fired generation alternative to be a reasonable replacement for new base-load capacity in the Fermi 3 FEIS. NRC's analysis is also applicable for a coal-fired replacement for Fermi 2's base-load generation; therefore, NRC's analysis is used as a basis for a coal-fired replacement alternative for Fermi 2.

NRC's analysis considered various technologies for coal-fired units including integrated gasification combined-cycle (IGCC) and selected a supercritical pulverized coal (SCPC) plant using a closed-loop cooling system. NRC concluded that IGCC plants are expensive to build and operate, and the technology continues to be plagued by reliability problems, relatively high parasitic loads (primarily associated with operation of the gasifiers), and low capacity factors. Therefore, the NRC review team determined that, at this time, IGCC is unsuitable as a base-load power alternative for Fermi 3. (NRC 2013c, Section 9.2.2.1) Improvements in IGCC technology could be realized for a 2025 replacement of Fermi 2; however, given the uncertainty about whether they will in fact be realized, and NRC's selection of SCPC as a more reasonable coal-fired alternative, this coal-fired option was not selected for the Fermi 2 replacement review.

Corresponding with the Fermi 3 FEIS analysis, the SCPC plant's boilers are presumed to be supercritical, dual wall-fired dry bottom boilers, configured to be New Source Performance Standard (NSPS) compliant with an overall thermal efficiency of 39 percent. The plant is presumed to burn Powder River Basin coal and be equipped with the pollution control devices to control criteria pollutants. When determining an appropriate collective nameplate rating, NRC's analysis accounted for existing and proposed air emission control equipment regulatory requirements and consideration for promulgation of regulations requiring capture and sequestration of CO_2.

NRC's alternative analysis assumed the plant would be sited at the Fermi site with the acquisition of adjacent parcels of land to provide the full complement of land required and that Lake Erie would serve as the cooling water source. Because the coal-fired alternative for replacing Fermi 2 is assumed to be located at the Fermi site, it is assumed that the existing transmission line infrastructure would serve the replacement facility.

7.1.1.2 Natural Gas-Fired Generation

As discussed above, NRC determined the natural gas-fired generation alternative to be a reasonable alternative for new base-load capacity in the Fermi 3 FEIS. The NRC analysis is also applicable for a natural gas-fired replacement for Fermi 2's base-load generation; therefore, NRC's analysis is used as a basis for a natural gas-fired replacement alternative for Fermi 2.

In its analysis, NRC selected a natural gas combined-cycle (NGCC) plant with a primary cycle using natural gas-powered combustion turbines (CTs) and a secondary cycle which generates power by recovering latent heat from gases exiting the CT, which are then delivered to a heat recovery steam generator, with the resulting steam subsequently directed to a conventional Rankine cycle steam turbine generator (STG) set. NRC's analysis presumed that the Fermi 3 replacement plant would have appropriately sized CTs, heat recovery steam generators (HRSGs), and STGs assembled in appropriate powertrain configurations. The CTs are Advanced F-Class designs equipped with water or steam injection as a pre-combustion control to suppress nitrogen oxide (NO_x) formation and selective catalytic reduction (SCR) (ammonia introduction) for post-combustion control of NO_x emissions.

NRC's alternative analysis assumed the plant would be sited at the Fermi site and that Lake Erie would serve as the cooling water source for closed-cycle cooling. Because the facility is assumed to be located at the Fermi site, it is assumed that the existing transmission line infrastructure would serve the replacement facility.

7.1.1.3 Nuclear Generation

The proposed action in the Fermi 3 FEIS is construction and operation of an economic simplified boiling water reactor (ESBWR) designed by GE-Hitachi Nuclear Energy Americas LLC at the Fermi site. NRC's independent analysis of this proposed action supports it as a means of providing base-load generating capacity. Thus, replacement of Fermi 2's base-load generation with a new nuclear unit is a reasonable alternative. The replacement nuclear unit would use closed-cycle cooling with Lake Erie as the source of cooling water. The replacement unit would be designed to supply approximately 1,170 MWe net, and it is assumed that the existing transmission line infrastructure would serve the replacement facility. The Fermi 3 FEIS analysis is used as the basis for evaluating the impacts of replacing Fermi 2 with a new nuclear generating unit.

7.1.1.4 Combination of Alternatives

As discussed above, a combination of alternatives was determined to be a reasonable alternative for new base-load capacity by NRC in the Fermi 3 FEIS. NRC concluded that a

reasonable combination of alternatives could involve the NGCC option, energy conservation and DSM, and wind and solar power coupled with energy storage. (NRC 2013c, Section 9.2.4)

Therefore, consistent with NRC's determination of reasonable alternatives, DTE has elected to include a discussion in Section 7.1.3.4 below of the combination of alternatives that NRC presented in the Fermi 3 FEIS.

7.1.2 Energy Alternatives Not Considered Reasonable

NRC reviewed a full range of energy alternatives in the GEIS, including alternatives that require new generating capacity and those that do not (NRC 2013b, Section 2.3). DTE considered alternatives, as presented in the GEIS, for its analysis for Fermi 3 (DECo 2011, Chapter 9), with the exception of ocean wave and ocean current technology because DTE's service area does not include ocean coastline. For Fermi 3, DTE's review also included fuel cell technology.

For its analysis of alternatives for Fermi 3, the NRC reviewed DTE's reasonable alternatives presented in the Fermi 3 COLA ER for providing base-load capacity and conducted an independent analysis of potential reasonable alternatives. This alternatives analysis for replacement of Fermi 2's base-load generation considers the full range of energy alternatives included in the 2009 draft GEIS and draws on DTE's and NRC's analyses for Fermi 3. The following sections discuss the energy alternatives not considered reasonable.

7.1.2.1 Alternatives Not Requiring New Generating Capacity

7.1.2.1.1 Purchased Power

Power to replace the capacity of a nuclear unit would have to be purchased from sources within the United States and/or from sources within Canada. The power purchased would likely be generated from coal, natural gas, nuclear, or some amount of intermittent renewables such as wind or solar or a combination of these. There is a risk that purchased power will not be delivered. Furthermore, one of the objectives being promoted by the State of Michigan is to "avoid undue reliance on energy produced by other states." Thus, reliance on electrical power produced outside the State of Michigan is contrary to the objectives of Michigan's 21st Century Electric Energy Plan (MPSC 2007). In addition, purchased power is generally economically adverse in that the cost of generated power has historically been less than the cost of the same power provided by a third party. (NRC 2013c, Section 9.2.1)

The environmental impacts of purchased power would still occur, but would be located elsewhere within the region, nation, or another country. The description of environmental impacts of generating technologies presented in Chapter 8 of the 1996 GEIS is representative of the purchased power alternative. In addition, purchased power could require new transmission lines. The construction of these lines could have both environmental and aesthetic consequences, particularly if new transmission line ROWs have to be acquired. Therefore, the local environmental impacts from purchased power would be SMALL when existing transmission line ROWs are used, and could range from SMALL to LARGE if acquisition of new ROWs is required.

Accordingly, purchasing power from other utilities or power generators is not considered a reasonable or environmentally preferred alternative for replacement of Fermi 2's base-load generation.

7.1.2.1.2 Plant Reactivation or Extended Service Life

The power plants that would likely provide capacity equivalent to Fermi 2 would be coal-fired or natural gas-fired power plants. In the Michigan Public Service Commission's (MPSC's) review of Michigan's electric generating capacity for the 2007 21st Century Energy Plan, the MPSC found that Michigan's base-load power plants were 48 years old on average in January 2007. Fossil-fueled plants slated for retirement tend to be ones that are old enough to have difficulty in meeting today's restrictions on air emissions and, as a result, would require extensive refurbishment to meet the more restrictive environmental standards at great economical cost. The environmental impacts of a refurbishment scenario would be bounded by the coal- and natural gas-fired alternatives (DECo 2011, Section 9.2.1.2).

Similar to older operating plants, retired generating plants, predominantly coal-fired and natural gas-fired plants that could be reactivated, would ordinarily require extensive refurbishment prior to reactivation. Such plants would typically be old enough that refurbishment would be very costly, and the refurbished plants would likely be viewed as new sources, subject to the current day complement of regulatory controls on air emissions and waste management. The environmental impacts of any reactivation scenario would be bounded by the impacts associated with coal-fired and natural-gas-fired alternatives. (NRC 2013c, Section 9.2.1)

In the DTE electric service area (11-county area in southeastern Michigan), there is no potential for another nuclear plant to replace the base-load generating capacity of Fermi 2 by reactivation, license renewal, or delayed retirement. There are no other existing nuclear units in the DTE service area. Therefore, there are no nuclear plants in DTE's electric service area with a planned retirement within the 2025–2045 time frame that could be delayed (DECo 2011, Section 9.2.1.2).

There are three other operating nuclear units in Michigan, all of which already have renewed licenses with the earliest expiration date not being until 2031 (NRC 2012c). Power uprates for existing nuclear units in Michigan would also not be sufficient to replace the base-load generating capacity of Fermi 2. Therefore, none of these plants would be available for replacing Fermi 2's power when its current license expires in 2025.

7.1.2.1.3 Conservation or Demand-Side Management

DTE offers several conservation and DSM programs to its customers to reduce peak electricity demands and daily power consumption. DTE's energy optimization plan is in compliance with State of Michigan requirements and was approved by the MPSC (NRC 2013c, Section 9.2.1).

The MPSC modeled energy savings for recommendations that include a statewide comprehensive energy efficiency program administered by an independent third party working under a performance-based contract; implementation of utility programs for managing load and advanced metering technologies; promulgation and enforcement of energy-efficient commercial

building codes; and the adoption of energy-efficiency standards for certain electric appliances. The MPSC's modeled savings indicated that implementation of the recommendations could reduce the need for expanding generating capacity in Michigan (MPSC 2007).

When considering alternatives to the proposed Fermi 3, which would be an expansion of generating capacity, NRC translated the MPSC-estimated statewide saving for the DTE service area and projected that assuming all appropriate policies and standards were adopted and enforced, the projected electricity demand could be reduced by about 1,400 MWe by the year 2025. However, NRC went on to state that "identification of potential savings does not necessarily guarantee demand response programs will be successfully implemented or that all eligible customers will participate fully; consequently, there is no guarantee that the identified potential amounts of demand reduction will actually materialize." (NRC 2013c, Section 8.2.1) Furthermore, the NRC did not consider conservation or DSM programs as reasonable alternatives to new base-load power generation in the amounts represented by the proposed Fermi 3 (NRC 2013c, Section 9.2.1). NRC's rejection of conservation and DSM programs as a reasonable alternative to providing base-load energy to meet projected demand, coupled with the acknowledged concern that conservation and DSM programs provide no guarantee that reductions will materialize and that service area power demand can be met, add up to this alternative not being a reasonable replacement of Fermi 2's base-load generating capacity. A recent MPSC energy efficiency report supports this analysis. Assuming that DTE customers would contribute to the postulated statewide demand reductions in roughly the same proportion as their contribution to the total power generated in the state of Michigan and accounting for the spending caps on efficiency programs in Michigan law, the report estimated an achievable potential demand reduction of approximately 800 MWe for the DTE service area by the year 2023. (MPSC 2013b, Appendix B)

In addition, 29 fossil fuel units throughout Michigan are scheduled for retirement through 2024, representing a total generating capacity of 3,755 MW. In the MPSC Plan's Southeast Michigan Planning Area, generating unit retirements are projected to total 2,039 MW through year 2024 (1,877 MW from Detroit Edison, 93 MW from the Lansing Board of Water and Light, 47 MW from the City of Detroit, and 22 MW from the City of Wyandotte). All of the units projected to be retired are currently supplying power to customers in the same area that would be served by Fermi 2. (NRC 2013c, Section 8.3).

7.1.2.2 Alternatives Requiring New Generating Capacity

A range of new generation alternatives was reviewed by NRC in the Fermi 3 FEIS as a base-load alternative to the 1,535 MWe net capacity and reliability and efficiency of the proposed Fermi 3 unit. The range included consideration of combinations of generating alternatives and renewable energy alternatives. NRC reviewed the Fermi 3 COLA ER analysis and conducted an independent review that considered information on electricity-generating technologies identified in the GEIS. NRC determined that discrete generating alternatives other than coal, natural gas, or nuclear power plants were not reasonable for providing reliable base-load levels of electricity at the 1,535 MWe net level. However, the NRC did identify a combination of alternatives composed of a natural gas-fired plant, a wind farm, a solar installation, and a compressed air energy storage (CAES) system to support the wind and solar facilities, along with an aggressive

DSM program, as a reasonable alternative to Fermi 3. (NRC 2013c, Chapter 9) An alternative requiring new generating capacity would need to be sized to replace Fermi 2 (Table 7.1-1).

As stated above, NRC determined that discrete renewable energy alternatives were not reasonable for the replacement of Fermi 3's base-load generating capacity. The applicability of this conclusion to replacement of the Fermi 2 unit is provided in the discussions of individual renewable energy sources below.

Applicable to all the renewable energy alternatives was the potential for the Michigan Renewable Mandate (also known as the "25 by 25" proposal), a proposed amendment to the State constitution, to factor into the reasonableness review. However, this proposed mandate, which would have required Michigan utilities to derive at least 25 percent of their annual electric retail sales from renewable sources, including wind, solar, biomass, and hydropower by 2025, was defeated in the November 2012 election. However, the state continues working toward its mandate of 10 percent renewable energy by 2015, as required by the 2008 Clean, Renewable and Efficient Energy Act. (mLive 2012)

Michigan is also preparing for a 2015 update to its energy policy. The State is focusing on the development of an energy policy that has adaptability as the foundation of every energy decision and establishes excellent reliability, an affordable price, and a protected environment as the three pillars that every decision must stand on. The State launched a public participation process to gather input from the public and legislators in 2013 and to identify existing information and suggestions for areas where further development of information is needed. The energy policy is anticipated to facilitate energy resources production including natural gas and oil, development of natural gas storage assets including a strategic natural gas reserve, and energy generation and transmission improvements in the Upper Peninsula. (Snyder 2012)

7.1.2.2.1 Wind

For wind energy to be considered for replacement base-load power generation for Fermi 2, it must provide equivalent MWe power generation at similar capacity factors. Whereas a single wind farm generation unit would not provide consistent power generation, multiple wind farms scattered within a reasonable region and interconnected together via the grid may potentially provide power generation that could approach base-load capacity. However, there may be times when the wind energy may not be sufficient to maintain grid stability or to provide consistent base-load power generation.

In addition to the capacity factor limitations of wind, development of large-scale, land-based wind power facilities could have SMALL to LARGE impacts on aesthetics, land use, and terrestrial ecology. The environmental impacts of a large-scale wind farm are described in the GEIS (NRC 1996, Section 8.3.1; updated in NRC 2013b). In summary, the construction of roads and turbine tower supports would result in short-term impacts, such as increases in noise, erosion, and sedimentation, and decreases in air quality from fugitive dust and equipment emissions. Construction in undeveloped areas would also have the potential to disturb and impact cultural resources or habitat for sensitive species.

Land-use requirements for wind generation and its associated grid system are quite large compared to fossil-fuel and nuclear plants. The "area" utilized includes not only land directly disturbed by installation of the turbines, but also the surrounding area that potentially may be impacted. In reviewing various environmental impact assessments and other evaluations of wind plant land use, two general types of "areas" can be considered. The first is the direct surface area impact (i.e., disturbed land) due to plant construction and infrastructure. The second is more vaguely defined, but is associated with the total area of the wind power plant as a whole. The average total land use required for wind development is about 85 ± 55 acres per megawatt (or 30 to 140 acres per megawatt) of installed capacity. The total direct impact area (both temporary and permanently disturbed land) is approximately 0.74 to 4.2 acres per megawatt due to the land occupied by turbines, access roads, and other equipment and the land disturbed during construction. (NREL 2009) Therefore, assuming 1,170 MWe of wind generation, the deployment would require 35,100 to 163,800 acres, with about 866 to 4,914 acres occupied by turbines and support facilities.

During operation, some land near wind turbines could be available for compatible uses such as agriculture. There is some continuing noise from wind turbine operation, light flicker caused by reflection of the sun, and aesthetic impacts, although whether a wind farm improves the landscape is subject to public opinion. Wind farms generate very little waste and pose limited human health risk other than from occupational injuries. There is a potential for bird and bat collisions with turbine blades as discussed further below. Although most environmental impacts associated with a single wind farm are SMALL or can be mitigated, the cumulative impacts from the many wind farms that would be needed to support an interconnected grid system, such as impacts to sensitive habitats and endangered species, could be LARGE, depending on the locations.

The incorporation of offshore wind resources from Lake Erie could reduce the amount of land use impacts; however, a new set of impacts related to offshore wind would be created. Placing wind farms offshore eliminates some of the obstacles encountered when siting wind farms on shore and limits conflicts with other planning interests. However, other impacts are created, including influence on birds, marine life, hydrography, and marine traffic. (IEAWIND 2002)

Migratory birds, eagles and other raptors, and bat mortalities are potential impacts related to wind turbines. The deaths of birds and bats at wind farm sites have raised concerns by fish and wildlife agencies and conservation groups. USFWS estimates indicate that wind turbine rotors kill approximately 33,000 birds annually (USFWS 2002). Concerns of the potential impacts of wind power deployment have led the USFWS to release guidance that provides agency employees, developers, federal agencies, and state organizations information for reviewing and selecting sites for interconnected and community-scale wind energy facilities to avoid and minimize negative impacts to fish, wildlife, plants and their habitats (USDOI 2011). The guidelines discuss various risks to "species of concern" from wind energy projects, including collisions with wind turbines and associated infrastructure; loss and degradation of habitat from turbines and infrastructure; fragmentation of large habitat blocks into smaller segments that may not support sensitive species; displacement and behavioral changes; and indirect effects such as increased predator populations or introduction of invasive plants. (USFWS 2012f)

Although wind turbine/bird collision studies seem to indicate that wind generating facilities in some locations of the United States have a minor impact on migratory birds, eagles and other raptors, and bats as compared to other sources of collision mortality, one cannot assume that similar impacts would occur using wind-generating sites built in Michigan, Ohio, or offshore in Lake Erie. Based on a feasibility study conducted by Great Lakes Wind Energy Center, the avian mortality rate of a proposed offshore project near Cleveland is expected to be minimal (GLWEC 2009). DTE assumes that construction BMPs and awareness of critical habitat during operations would minimize impacts to ecological resources. Therefore, impacts to migratory birds, eagles and other raptors, and bats would depend on the location of the wind farms and could be SMALL to MODERATE.

As detailed in the Fermi 3 FEIS, DTE, NRC, and the MPSC all undertook assessments of the potential for wind energy in the DTE service area. The most optimistic of the assessments, those of MPSC's Wind Energy Resource Zone Board, indicated that electricity supply comparable to Fermi 2 was a possibility with transmission upgrades. However, at the time that NRC conducted its independent review, only a fraction of the wind energy prediction had been realized. Another Michigan assessment looked at offshore wind energy development and identified two wind resource areas adjacent to the DTE service area. However, NRC noted in the Fermi 3 FEIS that the necessary legislation for development of offshore wind farms in Michigan had not been proposed by April 2012. (NRC 2013c, Section 9.2.3.2) A subsequent search of the Michigan's Legislature website (http://www.legislature.mi.gov) for 2012 to March 2013 legislative bills did not identify any offshore wind bills.

Beyond the availability of wind resource areas in Michigan or the DTE service area, NRC reviewed technology to store wind-generated energy to overcome a significant shortcoming of wind power systems: power is produced intermittently and dependent on whether the wind is blowing at sufficient velocity and duration, thus making wind power, standing alone, incapable of providing base-load energy supplies. NRC considered both pumped storage and CAES technologies. Pumped storage technology would require hydroelectric power, for which there is limited potential for expansion to provide the needed energy storage facilities. (NRC 2013c, Section 9.2.3.2) In addition, new pumped storage would result in significant construction impacts from creating reservoirs, dams, and diversion of streams. NRC also concluded that the current state of maturity of the CAES technology was not sufficient to determine long-term reliability and cost, and noted that the overall technical and economic feasibility of CAES is dependent on the existence of conveniently located appropriate geologic formations in which to store the compressed air. NRC's determination was that wind power was not a reasonable alternative to the proposed Fermi 3 unit. (NRC 2013c, Section 9.2.3.2)

The NRC concluded in the Fermi 3 FEIS that wind power was not a reasonable alternative for Fermi 3 based on the lack of adequate wind resources in the DTE service area, the significant shortcomings of reliability of wind as a base-load energy source, limited availability for new pumped storage, and the undetermined availability of geologic formations for CAES. Although the existence of conveniently located appropriate geologic formations in which to store the compressed air has not been confirmed, it is estimated that more than 80 percent of the United States has geology suitable for a CAES (Gardner and Haynes 2007). DTE has conducted a brief review of the geology of Monroe County and southeastern Michigan regarding the potential

availability of underground storage for a CAES. In southeastern Michigan, potential may exist to support CAES operations in salt caverns. However, further work would be required to confirm the feasibility of these geologic formations as appropriate for a CAES.

Consistent with the NRC's conclusion in the Fermi 3 FEIS, based on the lack of adequate wind resources in the DTE service area, the significant shortcomings of reliability of wind as a base-load energy source, the unconfirmed availability and feasibility of convenient energy storage options, and the impacts to land use and terrestrial ecological resources discussed above, DTE does not consider wind power a reasonable alternative.

7.1.2.2.2 Solar Technologies: Photovoltaic Cells and Solar Thermal Power

Generation from solar power is available in two different technologies: CSP and PV (NRC 2013c, Section 9.2.3.3). CSP requires direct solar radiation, but PV can make use of both direct solar radiation and diffuse horizontal radiation (TVA 2011).

NRC's review relied on NREL data indicating that the Fermi site receives approximately 4.0 kWh of solar insolation per square meter per day (kWh/m^2/day) for fixed-plate solar collectors oriented at an angle equal to the installation's latitude (NRC 2013c, Section 9.2.3.3). NREL estimates Michigan direct solar radiation as 3.0 to 4.5 kWh/m^2/day (NREL 2007). For CSP generating facilities, the minimum viable level is 6.75 kWh/m^2/day (Blair et al. 2006). Even though Michigan's direct solar radiation levels are modest, DTE has installed solar facilities in its service area. The largest of these is 485 kW with another 502 kW installation under development (DTE Energy 2013b). CSP is not viable at the Fermi site because of the low solar flux.

Due to the amount of solar generating capacity needed as a Fermi 2 replacement, the modest levels of direct solar radiation in Michigan and the lower efficiencies in producing electricity from solar power versus nuclear power substantially increase land requirements beyond those of other alternatives considered. The land requirements for solar replacement of Fermi 3 were estimated by the NRC to be 8,000 to 16,000 acres.

A recent NREL study (for the United States) indicated current estimates of the amount of land required for utility-scale solar generation. Direct land-use requirements for PV installations range from 1.6 to 5.8 acres/gigawatt hours per year (GWh/yr), with a generation-weighted average of 3.1 acres/GWh/yr. Direct land-use requirements for CSP installations range from 1.5 to 5.3 acres/GWh/yr, with a generation-weighted average of 2.7 acres/GWh/yr. (NREL 2013) Based on these estimates, land use for replacement of Fermi 2's 1,170 MWe (7,861 GWh/yr) could be between 12,578 and 45,594 acres of new land disturbance for PV generation, and between 11,792 and 41,663 acres of new land disturbance for CSP power generation[1]. Depending on the location of the solar generation, this land disturbance could result in MODERATE to LARGE impacts to affected resources (terrestrial habitat, land use, and aesthetic impacts).

1. Fermi 2 energy generation is calculated based on its electric power supplied to the switchyard of 1,170 MWe times 8,760 hours per year, times its recent capacity factor of 76.7 percent, times 1 gigawatt per 1,000 megawatts, or 7,861 GWh/yr.

Because CSP is a thermoelectric technology, like a fossil fuel-fired or nuclear power plant, a cooling system would be required. Cooling water demand would be the same or more than a comparably sized nuclear power plant. (NRC 2013c, Section 9.2.3.3) A coal-fired plant uses 110 to 300 gallons of cooling water per megawatt hour (MWh); a nuclear plant uses between 500 and 1,100 gallons/MWh; and a CSP plant uses 760 to 920 gallons/MWh (AWR 2008). Therefore, impacts to aquatic resources would be expected to be similar to base-load fossil or nuclear power and depend on the site location and type of cooling system employed. Because it is likely any utility-scale power generation would utilize closed-loop cooling technologies, such as cooling towers, water consumption could be similar to that of Fermi 2, but the cumulative impacts could be SMALL to MODERATE depending on the location of replacement power water withdrawals.

Solar power is an intermittent power source because direct or indirect solar radiation is not available throughout each day. Therefore, a solar facility would need to be coupled with energy storage to overcome its inherent intermittency. CSP technology lends itself more than PV to energy storage. Two types of CSP technology that have enjoyed the greatest technological development are the parabolic trough and the power tower. Both CSP options involve using the sun's energy to produce steam to power a conventional Rankine cycle STG, thus they have the intrinsic potential to store some of the captured heat in materials such as molten salt for delayed production of electricity. PV technology, by contrast, captures the light energy of the sun and converts it directly to electricity and, thus, production of electricity is inherently intermittent. (NRC 2013c, Section 9.2.3.3) NRC's review of CSP examined the opportunity to store heat and thus overcome intermittency. However, the storage space would further increase land requirements.

Given the relatively modest solar radiation in Michigan, increased land requirements, intermittency of the power source, and drawbacks to energy storage, solar is not considered a reasonable alternative for replacement of Fermi 2's base-load generation.

NRC also reviewed solar technology (CSP and PV) as an alternative to the proposed Fermi 3 unit. NRC's Fermi 3 FEIS concluded that solar power technologies do not present a reasonable alternative to Fermi 3 based on the relatively modest value of solar resources within the DTE service area, the exceptionally large land area required for utility-scale power, power intermittency, and expected capacity factors. (NRC 2013c, Section 9.2.3.3)

NRC's conclusion is also applicable to replacement of Fermi 2's base-load generation. Therefore, DTE does not consider solar power (CSP and PV) by itself, or coupled with energy storage, to be a reasonable alternative.

7.1.2.2.3 Hydropower

NRC's research for the Fermi 3 FEIS indicated that the potential generating capacity of undeveloped hydroelectric resources in Michigan is relatively low, citing a 1998 Idaho National Laboratory study. The level fell well below the replacement generation associated with Fermi 2. In addition, few if any new hydroelectric facilities are expected to be built, and even with repowering of existing facilities to improve efficiency and performance, hydroelectric resources in Michigan are not sufficient to serve as a replacement for Fermi 2's base-load generation.

Because of the relatively low amount of undeveloped hydropower resources in Michigan, the large land use and related environmental and ecological resource impacts associated with siting hydroelectric facilities large enough to produce 1,170 MWe, and the absence of announced plans for construction of new large pumped storage or dam-and-release facilities that could match Fermi 2's expected production, hydropower is not considered a reasonable replacement alternative for Fermi 2. The NRC also reached the same conclusion with regard to hydropower's potential as an alternative to Fermi 3. (NRC 2013c, Section 9.2.3.4)

7.1.2.2.4 Geothermal

Geothermal technology is not widely used as base-load power generation because of the limited geographical availability of the resource and immature status of the technology. Geothermal plants are most likely to be sited in the western continental United States, Alaska, and Hawaii, where hydrothermal reservoirs are prevalent. No geothermal energy generation currently occurs in Michigan. (NRC 2013c, Section 9.2.3.5)

The reviews of geothermal energy potential in Michigan as an alternative for Fermi 3 undertaken by DTE and NRC both concluded that Michigan does not have the geothermal resources for development of base-load energy production (DECo 2011, Section 9.2.2.1.4; NRC 2013c, Section 9.2.3.5). Therefore, the geothermal alternative is not a reasonable alternative for replacement of Fermi 2's base-load generation.

7.1.2.2.5 Wood Waste

Use of wood waste as a fuel for generating electricity depends on supply volume and proximity to the site of the proposed project. NRC's review for the Fermi 3 FEIS indicated that the wood residue resources required for a wood-to-energy facility are concentrated in northern Michigan, far removed from the DTE service area (NRC 2013c, Section 9.2.3.6). In addition, the volume of the supply of fuel would be dependent on the volume of wood waste from lumber or other wood product production to avoid timber harvesting just as fuel. NRC's conclusion that wood waste was not a reasonable alternative to Fermi 3 was based on these uncertainties, as well as the ecological impacts of large-scale timber harvesting (NRC 2013c, Section 9.2.3.6). This conclusion is also applicable to replacement of Fermi 2's base-load generation.

7.1.2.2.6 Municipal Solid Waste

As with wood waste, municipal solid waste (MSW) as a fuel is dependent on supply. NRC's GEIS review of this alternative stated, "While it is technically feasible to operate a biomass combustion plant on municipal solid waste or refuse derived fuel, source material may not be reliable or consistent." (NRC 2013b, Section 2.3.3.4)

The overall level of impact from construction of a waste-fired plant would be approximately the same as that for a coal-fired power plant. In addition, waste-fired plants have the same or greater operational impacts as coal-fired technologies (including impacts on the aquatic environment, air, and waste disposal). (NRC 2013c, Section 9.2.3.7)

For example, the average air emission rates in the United States from municipal solid waste-fired generation are 3,685 lbs/MWh of carbon dioxide (it is estimated that the fossil fuel-derived portion of carbon dioxide emissions represent approximately one-half of the total carbon emissions), 1.2 lbs/MWh of sulfur dioxide, and 6.7 lbs/MWh of nitrogen oxides. The variation in the composition of MSW affects the emissions impact. For example, if MSW containing batteries and tires are burned, toxic materials can be released into the air. A variety of air pollution control technologies are used to reduce toxic air pollutants from MSW power plants. (EPA 2013c)

The NRC considered waste-to-energy alternatives in its Fermi 3 FEIS analysis. Its conclusion was that waste-to-energy alternatives were not feasible based on the level of waste-to-energy facility penetration into the commercial electric utility market, the small average installed size of MSW plants, and the unfavorable regulatory environment noting the air emissions concerns (NRC 2013c, Section 9.2.3.7).

Given the limitations in generating capacity due to supply and its operational impacts, DTE does not consider a municipal solid waste-to-energy plant as a reasonable replacement alternative for Fermi 2's base-load generation.

7.1.2.2.7 Other Biomass-Derived Fuels

NRC's review of biomass fuels other than wood and municipal solid waste as an alternative to Fermi 3 indicated that while they are being used as electricity sources, their application is limited to small-scale facilities and co-firing with other fuels such as coal and, therefore, they are not a reasonable alternative (NRC 2013c, Section 9.2.3.8). DTE operates three biomass facilities, the largest of which has a capacity of 17 MWe (DTE Energy 2013b). DTE's experience with biomass facilities and its agreement with NRC's conclusion on the limited capacity for this fuel source contribute to the conclusion that this alternative is not a reasonable replacement for Fermi 2's base-load generation.

7.1.2.2.8 Fuel Cells

NRC's Fermi 3 FEIS review of fuel cells as an alternative energy source concluded that this technology is not economically or technologically competitive with other alternatives for electricity generation. In addition, it was determined that while it may be possible to use a distributed array of fuel cells, it would be extremely costly to do so and would require many units and wholesale modifications to the existing transmission system (NRC 2013c, Section 9.2.3.9). This conclusion is also applicable to a replacement alternative to Fermi 2's base-load generation; therefore, fuel cells are not considered a reasonable alternative.

7.1.2.2.9 Oil

Oil-fired generation is more expensive than the nuclear, natural gas-fired, or coal-fired generation options. In addition, future increases in oil prices are expected to make oil-fired generation increasingly more expensive. The environmental impacts of an oil-fired plant would be similar to those of a coal-fired plant. (NRC 2013c, Section 9.2.3.1) For economic reasons, oil is not a

reasonable alternative to Fermi 2's base-load generation nor is it an environmentally preferred alternative.

7.1.3 Environmental Impacts of Alternatives

Each of the alternatives considered as reasonable (Section 7.1.1) are discussed below. The generation alternatives are sized to provide replacement of the approximately 1,170 MWe of power generated by Fermi 2 in order to compare the environmental impacts of the alternatives to the "proposed action" which is renewal of the Fermi 2 OL.

DTE assumed the following for the coal-fired, natural gas-fired (both discrete alternative and combination of alternatives), and nuclear power plants:

- Located on the Fermi site outside of the Fermi 2 and proposed Fermi 3 footprints.
- Constructed while Fermi 2 is still operational and become operational by the time the Fermi 2 OL expires. Subsequently, Fermi 2 would undergo decommissioning.
- Proposed Fermi 3 would be constructed and operated at the Fermi site.
- Lake Erie would be the source of water for cooling.
- Alternative would utilize a closed-cycle cooling system equipped with cooling towers.
- Same transmission infrastructure supporting Fermi 2 would be used.

The wind and solar generating facilities that are part of the combination of alternatives would be located at sites that meet siting criteria for these energy sources and minimize impacts to the surrounding environment.

The following discussion of impacts is based on the Fermi 3 FEIS analysis scaled for the proposed action's generation of 1,170 MWe. Table 7.1-1 lists the generating capacities for the alternatives discussed below to replace the Fermi 2 generating capacity. The capacities are scaled from the Fermi 3 FEIS analysis and account for the differences in assumed capacity factors and parasitic (house) loads between the alternatives. The parasitic loads are significantly higher for the coal-fired alternative due to air emission controls due to existing and proposed air emission regulations. Nuclear-powered generation technology has a greater capacity factor than other energy source generation; thus, to replace the generating capacity of Fermi 2, the megawatt electric capacities needed for non-nuclear alternatives are higher than nuclear generation.

7.1.3.1 Coal-Fired Generation

As discussed in Section 7.1.1.1, the coal-fired generation alternative involves a plant of multiple SCPC units located at the Fermi site. The following impact discussions are based on the Fermi 3 FEIS alternatives analysis scaled down to 1,363 MWe (Table 7.1-1).

7.1.3.1.1 Land Use and Visual Resources

Approximately 1.7 acres of land per MWe would be required to construct a coal-fired plant (NRC 1996, Table 8.1). Therefore, for the 1,363 MWe plant utilized in this analysis, the entire industrial site, inclusive of coal storage and ash management units, would require approximately 2,300 acres of land. As discussed in Section 3.1.1, the Fermi site comprises approximately 1,260 acres, and approximately 650 acres (DTE 2013o) of the Fermi site is within the DRIWR. Utilizing the Fermi site to the fullest possible extent to build a coal-fired plant and ancillary activities would not be possible without disturbing substantially greater areas of wetlands, including forested wetlands, than would be necessary for a nuclear facility. To meet the land requirement, DTE would have to acquire additional contiguous parcels of land. Those parcels would most likely consist of a mix of land uses, including agricultural and residential, and could include wetlands (DECo 2011).

The coal-fired plant would also impact additional offsite land for its coal supply. It was estimated that approximately 22 acres of land per MWe would be affected for mining the coal and disposing of the waste to support a coal-fired plant during its operational life (NRC 1996, Section 8.3.9). Therefore, for the 1,363 MWe plant utilized in this analysis, approximately 30,000 acres of land would be needed. This acreage would be slightly offset by the elimination of the need for uranium mining to supply fuel for Fermi 2, estimated at approximately 1 acre per MWe (NRC 1996, Section 8.3.12).

Given the large acreages that would be needed to support the coal-fired plant and the disturbance of onsite wetlands, the land-use impact from the construction and operation of the coal-fired power plant alternative would be LARGE.

Because the Fermi site is already aesthetically altered by the presence of an existing nuclear power plant and construction impacts would be temporary, significant adverse impacts to visual aesthetics of the site and vicinity are not expected from the construction or operation of the SCPC units. Therefore, it is concluded that the aesthetic impacts associated with the construction and operation of the coal-fired power plant alternative at the Fermi site would be SMALL.

7.1.3.1.2 Air Quality

Construction of a coal-fired power plant would result in the release of various criteria pollutants from the operation of internal combustion engines in construction vehicles, equipment, delivery vehicles, and vehicles used by the commuting construction workforce. Volatile organic chemical releases will also result from the onsite storage and dispensing of vehicle and equipment fuels. Onsite activities would also generate fugitive dust. These impacts would be intermittent and short-lived, however, and adherence to well-developed and well-understood construction BMPs (e.g., development and execution of an appropriate fugitive dust control plan) would mitigate such impacts. Given that construction-related impacts on air quality from a coal-fired alternative would be of relatively short duration, NRC concluded that for a coal-fired alternative to Fermi 3, the impact would be SMALL. (NRC 2013c, Section 9.2.2.1) This conclusion is also applicable to a coal-fired alternative to Fermi 2.

Air quality impacts associated with the operation of coal-fired generation are considerably different from those of nuclear power. SCPC coal-fired plants emit oxides of sulfur (SO_x), NO_x, PM, and carbon monoxide (CO), all of which are regulated pollutants. Table 7.1-2 provides emission estimates for the coal-fired alternative replacement for Fermi 2. Emission control technology and percent control assumptions were based on alternatives the EPA has identified as being available for minimizing emissions. A new coal-fired generating plant would qualify as a new major source of criteria pollutants and would be subject to Prevention of Significant Deterioration of Air Quality review under CAA requirements and to Michigan state regulations. A new coal-fired generating plant would also need to comply with the NSPS for coal-fired plants set forth in 40 CFR Part 60, Subpart Da: particulate matter and opacity [40 CFR 60.42Da]; SO_2 [40 CFR 60.43Da], and NO_x [40 CFR 60.44Da). In addition, the new coal-fired generating plant would qualify as a major source because of its potential to emit (PTE) greater than 100 tons/year of criteria pollutants and would be required to secure a Title V operating permit from MDEQ. (NRC 2013c, Section 9.2.2.1)

Section 169A of the CAA [42 USC 7401] establishes a national goal of preventing future, and remedying existing, impairment of visibility in mandatory Class I federal areas when impairment results from manmade air pollution. The Regional Haze Rule, promulgated by EPA in 1999 and last amended in October 2006 (71 FR 60612), requires states to demonstrate reasonable progress toward the national visibility goal for Class I areas established in 1977. The only Class I areas in Michigan are located in the Upper Peninsula of Michigan: Isle Royale National Park (approximately 500 miles from the site) and Seney National Wildlife Refuge (about 340 miles from the site). Neither of these Class I areas could reasonably be expected to be adversely affected by the operation of a coal-fired plant at the Fermi site. There are no Class I areas in the neighboring state of Ohio. (NRC 2013c, Section 9.2.2.1)

Carbon dioxide emissions are a major contributor to anthropogenic greenhouse gas emissions, which have been suggested to contribute to climate change. These emissions result from the efficiency of the technologies utilized to produce and deliver the energy and carbon content of the fuel being utilized. Coal-fired electricity generation has the highest emissions rate of CO_2 of the fossil fuel sources, and significantly higher emissions compared to nuclear power generation. The technology needed for capture and removal of greenhouse gases in fossil fuel emissions (primarily CO_2) will require additional development to become commercially viable. The infrastructure necessary to remove GHGs on a scale sufficient to support utility-scale power generation does not presently exist, though it is the subject of ongoing research. (NRC 2013b, Section 2.3.1)

The NRC did not quantify coal-fired emissions in the 1996 GEIS, but implied that air impacts would be substantial. The NRC noted that adverse human health effects from coal combustion have led to federal legislation in recent years and that public health risks have been alleged to be associated with coal combustion. The 1996 GEIS also mentioned global warming and acid rain as potential impacts. (NRC 1996, Section 8.3.13) DTE concludes that federal legislation and large-scale concerns, such as global warming and acid rain, are indications of concerns about destabilizing important attributes of air resources. However, SO_x emission allowances, NO_x emission offsets, low NO_x burners with overfire air and selective catalytic reduction, fabric filters or electrostatic precipitators, and scrubbers are provided as mitigation measures.

Overall, it is concluded that air quality impacts during the operations period from the coal-fired alternative would be MODERATE. The impacts would be noticeable, but would not destabilize air quality.

7.1.3.1.3 Noise

During construction at the Fermi 2 site, noise would increase with the operation of vehicles, earthmoving equipment, materials-handling equipment, impact equipment, and other stationary equipment (such as pumps and compressors), and the increase of human activity. However, as discussed in Section 3.1.3, the vicinity surrounding Fermi 2 is primarily agricultural and subject to farming-related events, such as planting and harvesting. Because noise activities associated with construction are temporary and the area around Fermi 2 is subject to farming activities, impacts from noise levels are anticipated to be effectively managed and kept SMALL.

The Fermi 3 FEIS analysis of this resource is also applicable to this analysis. Coal-fired power generation would introduce mechanical sources of noise that would be audible off site. Sources contributing to the noise produced by plant operation are classified as continuous or intermittent. Continuous sources include the mechanical equipment associated with normal plant operations and mechanical draft cooling towers. Intermittent sources include the equipment related to coal handling, solid waste disposal, transportation related to coal and lime/limestone delivery, use of outside loudspeakers, and the commuting of plant employees. Noise impacts associated with rail delivery of coal and lime/limestone would be most significant for residents living in the vicinity of the facility and along the rail route. Although noise from passing trains significantly increases noise levels near the rail corridor, the short duration of the noise reduces the impacts. Nevertheless, given the expected frequency of coal and limestone deliveries, the Fermi 3 coal-fired alternative's potential impacts of noise on residents in the vicinity of the facility and the rail line are considered MODERATE. (NRC 2013c, Section 9.2.2.1) This conclusion is also applicable to a coal-fired alternative to Fermi 2.

7.1.3.1.4 Geology and Soils

Building on site and on adjacent land parcels would require land clearing and likely some filling of onsite water bodies and dewatering the excavation. The impacts to geology and soils from these construction activities would be localized and reduced with the implementation of BMPs and mitigation measures required by the necessary permits (e.g., stormwater, SESC permit). Through these measures, the impacts during construction would be minimized and SMALL. Land disturbance during operations would also be conducted in accordance with stormwater permits, SESC permit, and associated BMPs; therefore, the impacts during operation would also be SMALL.

7.1.3.1.5 Hydrology (Surface Water and Groundwater)

Minor impacts on surface water would occur during construction of a new coal-fired power plant because of ground disturbances, alteration of natural drainage patterns, and potential increases in sediment loadings in surface drainage. However, implementation of BMPs and mitigation measures required by the necessary permits (e.g., construction stormwater permit, SESC permit)

would prevent or significantly mitigate such impacts. During operation, stormwater runoff to the receiving water bodies will be controlled by adherence to the SWPPP and design features as required by the NPDES permit. Adherence to the NPDES permit would reduce the impacts on the quality of surface water near the plant from stormwater runoff. The relatively small amount of water withdrawn from Lake Erie for cooling purposes during the operations period would not cause a destabilizing effect on other potential uses of Lake Erie water. The SCPC plant would require less cooling capacity than a comparably sized nuclear plant due to the difference in thermal efficiency, so less cooling water would be required for the SCPC plant than projected for Fermi 3. Cooling water discharges would have relatively low projected contaminant levels, which would be controlled through the NPDES permit. NRC concluded for the Fermi 3 coal-fired alternative that surface water impacts during the construction and operations periods would be SMALL. (NRC 2013c, Section 9.2.2.1) This conclusion is also applicable to a coal-fired alternative to Fermi 2.

Construction of a coal-fired plant may have a limited and minor impact on groundwater due to changes to surface drainage patterns during construction and operation, and the onsite storage of coal and coal combustion residuals (CCR). DTE does not anticipate onsite disposal of CCR would occur, and controls to capture and treat any hazardous leachate from coal and CCR piles would limit impacts. Therefore, NRC concluded for the Fermi 3 coal-fired alternative that groundwater impacts during the construction period would be SMALL. (NRC 2013c, Section 9.2.2.1) This conclusion is also applicable to a coal-fired alternative to Fermi 2.

Impacts on groundwater from the operation of the SCPC alternative would be minimal. Except for potable uses, the immediate availability of lake water suggests that groundwater resources would not likely be utilized to support operation of the SCPC plant. Total usage for potable purposes would likely be less for operation of a coal-fired power plant than for reactor operation because of a smaller operating workforce. Therefore, NRC concluded for the Fermi 3 coal-fired alternative that groundwater impacts during the operations period would be SMALL. (NRC 2013c, Section 9.2.2.1) This conclusion is also applicable to a coal-fired alternative to Fermi 2.

7.1.3.1.6 Ecological Resources (Terrestrial and Aquatic)

During the construction phase, effects on aquatic resources could stem from disturbance of aquatic habitat and associated plant and animal species on site, as well as increased runoff and sedimentation from the addition of impervious surfaces. However, due to the controls on the surface water discharges imposed by a stormwater permit issued by MDEQ and an SESC permit issued by the Monroe County drain commissioner, impacts on aquatic ecosystems would be minimal. Impacts on aquatic ecosystems during operation could take the form of some limited impingement and entrainment due to the closed-cycle cooling system's water withdrawals, and thermal and chemical discharges associated with blowdown. Impingement and entrainment effects would be dependent on the quality of the source water and organisms residing within the local habitat. However, all impacts associated with impingement, entrainment, and blowdown discharges would be controlled by an NPDES permit issued by MDEQ. NRC concluded in its analysis for the coal-fired alternative to Fermi 3 that impacts would be virtually equivalent to projected impacts from Fermi 3 and considered them SMALL (NRC 2013c, Section 9.2.2.1).

Therefore, impacts on aquatic ecology from the construction and operation of the Fermi 2 coal-fired alternative would also be SMALL.

Terrestrial ecology impacts would primarily occur from land disturbance and destruction of habitat. The SCPC units would require much more land than is available at the Fermi site. As discussed in Section 7.1.3.1.1, the coal plant would require approximately 2,300 acres of land, but the Fermi site in its entirety is approximately 1,260 acres of which approximately 650 acres (DTE 2013o) are within the DRIWR. Utilizing the Fermi site to the fullest possible extent to build a coal-fired plant and ancillary activities would not be possible without disturbing substantially greater areas of wetlands, including forested wetlands, than would be necessary for a nuclear facility. The additional land parcels that would have to be acquired to meet the land requirement would most likely consist of a mix of land uses including agriculture and residential, and could include wetlands (DECo 2011).

Impacts to terrestrial plants could be greater than impacts to wildlife, because many wildlife species have the ability to relocate by their own means. Plant communities in the proposed construction footprint would be cleared to accommodate the new plant site, and wildlife would be displaced. As detailed in Section 3.6.12.2, some state-protected terrestrial species are known to occur on the Fermi site. Wetland and wildlife habitat mitigation would offset some impacts on protected species during construction and operation.

As discussed in Section 7.1.3.1.1, approximately 30,000 acres of land would be affected for mining the coal and disposing of the waste to support a coal-fired plant during its operational life. Partially offsetting this offsite land use would be the elimination of the need for uranium mining and processing to supply fuel for Fermi 2. It was estimated that approximately 1 acre per MWe would be affected for mining and processing the uranium during the operating life of a nuclear power plant (NRC 1996, Section 8.3.12).

Onsite temporary storage of coal, CCR, spent catalysts, and scrubber sludge, as well as any offsite waste disposal by landfilling of CCR, would also affect terrestrial ecology by requiring conversion of existing habitat. Deposition of acid rain resulting from NO_x or SO_x emissions and deposition of other pollutants could also affect terrestrial ecology. For the Fermi 3 coal-fired alternative, NRC concluded that air deposition impacts may also noticeably affect terrestrial vegetation and wildlife, but would likely not be regionally destabilizing. Also, NRC concluded that operation of the cooling towers would cause some deposition of dissolved solids on surrounding vegetation and soil from cooling tower drift; however, these impacts would generally be minimal, about the same as those that are now occurring from the operation of Fermi 2. (NRC 2013c, Section 9.2.2.1) Impacts on terrestrial habitats caused by air emissions could also be noticeable.

Primarily because of the potential disturbances to offsite habitats from coal mining, and onsite and offsite impacts on wetlands caused by building the coal plant and associated facilities, impacts on terrestrial resources from a coal-fired power plant would be LARGE.

7.1.3.1.7 Cultural Resources

As discussed in Section 7.1.3.1.1, land requirements for the coal-fired plant are greater than the available land at the Fermi site, and additional parcels would be required. Surveys conducted on the Fermi site, as detailed in Section 3.7.5, provide a basis for avoiding and mitigating impacts on historic and cultural resources. Surveys of previously undisturbed offsite land parcels would provide a basis for mitigation of impacts on historic and cultural resources. The NRHP-eligible historic property on site, Fermi 1, is anticipated to be impacted by the proposed Fermi 3, or perhaps demolished, under the terms of an MOA between the NRC, the Michigan SHPO, and DTE (NRC 2013c, Section 9.2.2.1). The siting of a coal-fired plant on the Fermi site would not further alter that impact. Overall, there would be no adverse effects on historic and cultural resources from construction and operation of a new coal-fired power plant at the Fermi site.

7.1.3.1.8 Socioeconomics

The NRC assessed socioeconomic impacts from the proposed Fermi 3 and its alternatives in the Fermi 3 FEIS. DTE has assumed for this analysis that Fermi 3 would also be constructed and operated on the Fermi site. The construction time frames for Fermi 3 and the coal-fired plant could overlap, resulting in greater impacts both beneficial to the economy and adverse to traffic and social services.

The construction period for SCPC units would be shorter, and the number of construction workers is estimated at approximately 85 percent of that required for a comparably sized nuclear plant. Because the construction of SCPC units on the Fermi site to replace Fermi 2 would draw workers from the same geographic area and have the same region of influence, the impacts of both would be expected to be similar. The majority (about 85 percent) of the workforce would already live in the region, so the relative economic contributions of these workers to local business and tax revenues in the region would remain generally the same. It is expected that the remainder of the building-related workforce would in-migrate from outside the 50-mile region in the same residential distribution as the current operations workers at the Fermi site. It is not expected that many in-migrating construction workers would permanently relocate to the region, so any socioeconomic effect induced by the in-migrating workers would be temporary. (NRC 2013c, Section 9.2.2.1) Based on the site's proximity to the Detroit and Toledo metropolitan statistical areas (MSAs) and expected limited worker relocation, it is concluded that construction impacts on the local infrastructures and services would be SMALL.

The impacts to the economy during construction would primarily be from wages being spent in the region of influence, worker's income taxes, sales tax revenues, and construction material purchases. This impact would be beneficial locally and regionally.

During construction, workers would be commuting to the plant site, most coming primarily from the Detroit and Toledo MSAs. The Fermi 3 FEIS determined that traffic-related impacts from the construction of Fermi 3 would be short term, MODERATE, and adverse, occurring only during peak construction employment periods. The NRC considered this impact assessment to be applicable to the Fermi 3 coal-fired alternative as well. (NRC 2013c, Section 9.2.2.1) Likewise, DTE considers this conclusion also applicable to a Fermi 2 coal-fired alternative.

Once Fermi 2 is no longer operational and a decision to decommission the plant has been made, the plant's taxable asset status would be expected to generate little or no tax revenues. Therefore, the beneficial economic impact in Monroe County and regionally would cease. However, the coal-fired alternative would provide a beneficial economic impact on the tax base comparable to that of Fermi 2.

The permanent workforce during the operations period most likely can be absorbed into the surrounding region due to the site's proximity to the Detroit and Toledo MSAs. Therefore, it is anticipated that operational impacts on the local infrastructures and services would be SMALL.

Operations-related traffic impacts would result from (1) the commuting of the operating workforce; (2) several trainloads per day of rail deliveries of coal and/or limestone; and (3) large vehicles transporting CCR, scrubber sludge, and spent catalyst to recycling and/or disposal sites. By comparison, transportation-related impacts from the operation of a nuclear plant would be considerably smaller due to less frequent deliveries; however, transportation impacts from the commuting workforce would be greater due to the expected larger operating workforce for the reactor. Thus, NRC determined that because of the scale of deliveries of coal and limestone, combined with the large number of disposal truckloads leaving the plant, operating a new coal-fired power plant would result in MODERATE and adverse impacts on transportation, even with mitigation measures such as having an established traffic management plan in place. (NRC 2013c, Section 9.2.2.1)

7.1.3.1.9 Human Health

Coal-fired power plants introduce worker risks from coal and limestone mining, coal and limestone transportation, industrial operations at the plant, and waste disposal operations. In addition, there are stack emissions and secondary effects of deposition of pollutants emitted from plant stacks. However, many of the byproducts of coal combustion responsible for health effects are largely controlled, captured, or converted in modern power plants. (NRC 2013c, Section 9.2.2.1)

Regulations restricting emissions enforced by either EPA or delegated state agencies have reduced potential health effects. These agencies also impose site-specific emissions limits as needed to protect human health. Even if the coal-fired power plant alternative were located in a nonattainment area, emission controls and trading or offset mechanisms could prevent further regional degradation; however, local effects could be visible. (NRC 2013c, Section 9.2.2.1)

Aside from emission impacts, the coal-fired alternative would introduce the risk of coal pile fires and the risk of accidental releases from the ash management unit.

Given industrial safety practices and occupational regulations and standards implementation to protect workers and the installation of air pollution control equipment and compliance with waste regulations, the overall human health impacts are expected to be SMALL for the construction and operation of the SCPC units.

7.1.3.1.10 Environmental Justice

NRC reviewed the potential for environmental justice impacts from the proposed Fermi 3 and its alternatives in the Fermi 3 FEIS. The conclusion was that there are no pathways by which disproportionately high and adverse impacts could be imposed on minority or low-income populations from the construction and operation of Fermi 3 and that the physical and socioeconomic impacts on minority or low-income populations from the construction and operation of a coal-fired alternative would be similar. This conclusion is also applicable to the construction and operation of the SCPC units to replace generating capacity of Fermi 2.

7.1.3.1.11 Waste Management and Pollution Prevention

Both sanitary wastes resulting from support of the construction crew and industrial wastes (some hazardous) would be generated during construction, such as clearing the construction site of vegetation, excavating and preparing the site surface before other crews begin actual construction of the plant, modifying existing infrastructure, and constructing any additional required infrastructure. Minor amounts of industrial wastes will result from the onsite maintenance of construction vehicles and equipment, the use of cleaning solvents, and the application of corrosion control coatings. Construction-related wastes are expected to be properly characterized and initially managed on site and eventually removed to properly permitted offsite treatment disposal or recycling facilities. Waste impacts from construction are expected to be SMALL. (NRC 2013c, Section 9.2.2.1)

Coal combustion generated during the operations period includes several waste streams, including ash (a dry solid recovered from both pollution control devices [fly ash] and from the bottom of the boiler [bottom ash]) and sludge (a semisolid byproduct of emission control system operation; in this case, primarily calcium sulfate from the operation of the wet calcium carbonate SO_2 scrubber) (NRC 2013c, Section 9.2.2.1). The estimated annual volumes of these wastes are presented in Table 7.1-3. Recycling and waste minimization programs applicable to these waste streams and other plant waste streams would be implemented as appropriate.

The impacts from waste generated during operation of the SCPC would be dependent on the ability to recycle the solid wastes and dispose of the wastes that could not be recycled in dry ash piles in compliance with regulatory requirements. Based on the waste quantities requiring disposal as presented in Table 7.1-3, 40 years of operation would require approximately 101 acres to hold the ash and dry sludge wastes if the wastes were piled 30 feet high. Therefore, it is concluded that the waste impacts during the operations period could range from SMALL to MODERATE, largely depending on recycling percentages.

7.1.3.2 Natural Gas-Fired Generation

As discussed in Section 7.1.1.2, the natural gas-fired generation alternative involves a plant of multiple units located at the Fermi site. The following impact discussions are based on the Fermi 3 FEIS alternatives analysis scaled down to 1,266 MWe (Table 7.1-1).

7.1.3.2.1 Land Use and Visual Resources

Approximately 110 acres of land would be required to construct a 1,000-MWe natural gas-fired plant (NRC 1996, Section 8.3.10). Scaling the NGCC plant analyzed from the Fermi 3 FEIS, a 1,266-MWe plant would be needed for Fermi 2 replacement. Therefore, an NGCC plant would require approximately 140 acres of land. Utilizing the Fermi site to the fullest possible extent to build an NGCC plant at the Fermi site would further encroach on wetlands and the DRIWR and likely lead to an increase in land-use and ecological impacts. In addition to on site, land would be required off site for natural gas pipelines and gas wells. This would include land for a new 10-mile-long pipeline segment connecting the site to existing natural gas distribution infrastructure. A new or expanded compressor station may also be required. DTE estimated offsite land impacts from the gas pipeline and compressor station to total 200 acres, which is anticipated to have temporary impacts to some wetlands and prime farmland for installation of pipeline. (NRC 2013c, Section 9.2.2.2) In its 1996 GEIS, NRC estimated that approximately 3,600 acres would be needed for a natural gas well field of sufficient size to support a 1000-MWe gas-fired plant (NRC 1996, Section 8.3.10). Therefore, for a 1,266-MWe NGCC plant, approximately 4,560 acres alone could be needed for the natural gas well field.

Offsetting these offsite land requirements would be the elimination of the need for uranium mining to supply fuel for Fermi 2, estimated at approximately 1 acre per MWe (NRC 1996, Section 8.3.12). Therefore, the offset would be approximately 1,170 acres.

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

Because the Fermi site is already aesthetically altered by the presence of an existing nuclear power plant and construction impacts would be temporary, significant adverse impacts to visual aesthetics of the site and vicinity are not expected from the construction or operation of an NGCC plant. Therefore, it is concluded that the aesthetic impacts associated with the construction and operation of an NGCC power plant alternative at the Fermi site would be SMALL.

7.1.3.2.2 Air Quality

Construction of an NGCC power plant would result in the release of various criteria pollutants from the operation of internal combustion engines in construction vehicles, equipment, delivery vehicles, and vehicles used by the commuting construction workforce. Volatile organic chemical releases will also result from the onsite storage and dispensing of vehicle and equipment fuels. Onsite activities would also generate fugitive dust. These impacts would be intermittent and short-lived, however, and adherence to well-developed and well-understood construction BMPs, such as development and execution of an appropriate fugitive dust control plan, would mitigate such impacts. NRC concluded in the Fermi 3 FEIS that construction-related impacts on air quality from an NGCC alternative would be of relatively short duration and SMALL. (NRC 2013c, Section 9.2.2.2) This conclusion is also applicable to an NGCC alternative replacement of Fermi 2.

As discussed in Section 7.1.1.2, an NGCC plant would have CTs of Advanced F-Class design equipped with water or steam injection as a precombustion control to suppress NO_x formation and SCR (ammonia introduction) for postcombustion control of NO_x emissions. The facility would consume 56,300 million cubic feet of natural gas annually. The emissions from an NGCC alternative would be significantly less than those from the coal-fired alternative. Emission estimates for the NGCC plant alternative for replacement of Fermi 2 are shown in Table 7.1-4.

A new NGCC generating plant would qualify as a new major source of criteria pollutants and would be subjected to Prevention of Significant Deterioration of Air Quality review under CAA requirements and Michigan state regulations. As such, it would need to comply with the NSPS for NGCC plants set forth in 40 CFR Part 60 Subpart Da: particulate matter and opacity [40 CFR 60.42Da], SO_2 [40 CFR 60.43Da], and NO_x [40 CFR 60.44Da]. A new NGCC generating plant would also qualify as a major source because its PTE is greater than 100 tons/year of criteria pollutants and its CO_2 is greater than 75,000 tons/year, and would be required to secure a Title V operating permit from MDEQ. In addition, the combined-cycle plant CTs would be subject to EPA's National Emission Standards for Hazardous Air Pollutants (HAPs) for Stationary Combustion Turbines [40 CFR 63, Subpart YYYY], if the NGCC was a major source of HAPs (having the potential to emit 10 tons/year or more of any single HAP or 25 tons/year or more of any combination of HAPs [40 CFR 63.6085(b)]. (NRC 2013c, Section 9.2.2.2)

A natural gas-fired power plant would also have carbon dioxide emissions. Gas-fired electricity generation emissions of CO_2 are approximately half of those from coal generation, but still significant. Overall, it is concluded that air quality impacts from the NGCC alternative during the operations period would be MODERATE.

7.1.3.2.3 Noise

The construction-related noise sources for an NGCC alternative would be virtually the same as those for construction of the coal-fired alternative. However, the construction period for the NGCC alternative would be shorter and the construction less extensive (i.e., no facilities needed for management of coal and only limited facilities needed for management of operational wastes). (NRC 2013c, Section 9.2.2.2) The NRC concluded that construction-related noise from the NGCC alternative to Fermi 3 would be SMALL. This conclusion is also applicable to the Fermi 2 NGCC alternative.

Operation-related noise for an NGCC plant would be less than operation-related noise for the coal-fired alternative, because outdoor fuel-handling activities would not occur, outdoor waste handling activities would be limited, and there would be few, if any, rail deliveries of emissions control materials. Pipelines delivering natural gas fuel could be audible off site near gas compressor stations, but such sound impacts would be similar to impacts already occurring in the vicinity of the existing pipeline to which the Fermi site would connect. Therefore, NRC concluded that operation-related noise from the NGCC alternative to Fermi 3 would be SMALL. (NRC 2013c, Section 9.2.2.2) This conclusion is also applicable to the Fermi 2 NGCC alternative.

7.1.3.2.4 Geology and Soils

Construction activities would require land clearing and likely dewatering. The impacts to geology and soils from these construction activities would be localized and reduced with the implementation of BMPs and mitigation measures required by the necessary permits (e.g., stormwater, SESC permit). Through these measures, the impacts would be minimized and SMALL. Land disturbance during operations would also be conducted in accordance with stormwater permits, the SESC permit, and associated BMPs; therefore, the impacts during operations would also be SMALL.

7.1.3.2.5 Hydrology (Surface Water and Groundwater)

NRC's analysis of surface water impacts of a Fermi 3 NGCC alternative indicated that during construction, production of concrete and other construction activities would result in consumption of minimal amounts of surface water, presumably acquired from Lake Erie, and that ground disturbance might result in some impacts on surface water quality in the form of increased sediment loading to stormwater runoff from active construction zones; however, a construction stormwater permit is expected to require BMPs that would prevent or significantly mitigate such impacts. The impacts on water quality from sedimentation during construction of a natural gas-fired plant were characterized in Fermi 3 FEIS as SMALL. (NRC 2013c, Section 9.2.2.2) The surface water impacts of constructing an NGCC replacement for Fermi 2 would also be SMALL.

NRC's discussion of surface water use and impacts during the operations period for a Fermi 3 NGCC alternative is also applicable to a Fermi 2 NGCC replacement. As discussed in the Fermi 3 FEIS, a Fermi 2 NGCC replacement would also use Lake Erie as the water source for operational cooling and other industrial applications. The slightly lower operating temperatures and relatively high thermal efficiencies of an NGCC plant would also result in smaller cooling water requirements than those of the comparably sized nuclear plant. Lake Erie would receive blowdown from the cooling tower, while industrial wastewaters would be discharged to the sanitary sewer under a treatment agreement with the municipal treatment facility that currently serves the Fermi site. Discharges to Lake Erie would be controlled by an NPDES permit. Therefore, NRC concluded that the impact on surface water during the operations period would be adequately controlled by permits and would be SMALL. (NRC 2013c, Section 9.2.2.2) The surface water impacts of operating an NGCC replacement for Fermi 2 would also be SMALL.

No groundwater is expected to be used in the construction or operation of an NGCC alternative. For the Fermi 3 NGCC alternative, NRC anticipated that some foundation excavations may intrude on groundwater zones and require dewatering while they are being constructed. Furthermore, surface water drainage from active construction sites could contain contaminants that could affect groundwater, but major construction sites would be required to have a construction stormwater and an SESC permit that would preempt such adverse impacts. Otherwise, NRC anticipated no impacts on groundwater quality and concluded that the impact of the NGCC alternative on groundwater would be SMALL. (NRC 2013c, Section 9.2.2.2) This conclusion is also applicable to an NGCC replacement alternative for Fermi 2.

7.1.3.2.6 Ecological Resources (Terrestrial and Aquatic)

Lake Erie would be the primary source of water to support the construction and operation of an NGCC plant. Impacts on aquatic ecosystems during construction would be minimal, due to the relatively small amount of water required (compared to the volume of water in Lake Erie), and controls on the quality of surface water discharges imposed by a stormwater permit issued by MDEQ and an SESC permit issued by the Monroe County drain commissioner. Impingement and entrainment impacts from water withdrawals and thermal and chemical impacts from blowdown discharges during operation would be less than projected impacts from a nuclear plant due to smaller heat rejection demand. All such impacts would be controlled by an NPDES permit issued by MDEQ. (NRC 2013c, Section 9.2.2.2) Therefore, impacts on aquatic ecology from the construction and operation of the NGCC alternative would be SMALL.

Terrestrial ecology impacts would primarily occur from land disturbance and destruction of habitat. As discussed in Section 7.1.3.2.1, an NGCC plant would require approximately 140 acres of land on site and another 200 acres off site for gas transmission. Utilizing the Fermi site to the fullest possible extent to build an NGCC plant, its construction at the Fermi site would further encroach on wetlands and the DRIWR and likely lead to an increase in ecological impacts.

As detailed in Section 3.6.12.2, some protected terrestrial species are known to occur on the Fermi site. Impacts to terrestrial plants could be greater than impacts to wildlife, because many wildlife species have the ability to relocate by their own means. Plant communities in the proposed construction footprint would be cleared to accommodate the new plant site, and wildlife would be displaced. Disturbed areas would be revegetated with native and non-invasive flora species. Wetland and wildlife habitat mitigation would offset some impacts on protected species during construction and operation.

Approximately 3,600 acres would be needed for a natural gas well field of sufficient size to support a 1,000-MWe gas-fired plant based on the 1996 GEIS (NRC 1996, Section 8.3.10). Correspondingly, a 1,266-MWe facility would require approximately 4,560 acres of gas field. Existing natural gas fields would initially be expected to provide the necessary amount of gas for this facility. In addition, impacts would also result from installation and maintenance of the new 10-mile gas supply pipeline mentioned in Section 7.1.3.2.1 along an as-yet-unspecified route.

Operation of the cooling towers would cause some deposition of dissolved solids on surrounding vegetation and soil from cooling tower drift. Other impacts such as fogging, icing, shadowing, etc., would also occur as is now the case for the Fermi 2 cooling towers, but impacts would be somewhat less and would be minimal (NRC 2013c, Section 9.2.2.2).

Based on the above information, it is concluded that impacts on terrestrial resources from the construction and operation of an NGCC alternative would be MODERATE.

7.1.3.2.7 Cultural Resources

As discussed in Section 7.1.3.2.1, an NGCC plant would require approximately 140 acres of land on site and another 200 acres off site for gas transmission. Surveys conducted on the Fermi site, as detailed in Section 3.7.5, provide a basis for avoiding and mitigating impacts on historic and cultural resources. The NRHP-eligible Fermi 1 is anticipated to be impacted by the proposed Fermi 3, or perhaps demolished under the terms of an MOA between the NRC, the Michigan SHPO, and DTE (NRC 2013c, Section 9.2.2.1). The siting of an NGCC plant on the Fermi site would not further alter that impact.

An ROW for the required new 10-mile pipeline segment has not been specified, so it is impossible to determine whether historic or cultural resources would be present along that path. However, DTE would undertake the appropriate surveys prior to commencement of constructing a supporting natural gas pipeline segment. Overall, there would be no adverse effects on historic and cultural resources from construction and operation of a new NGCC plant at the Fermi site.

7.1.3.2.8 Socioeconomics

The NRC assessed socioeconomic impacts from the proposed Fermi 3 and its alternatives in the Fermi 3 FEIS. DTE has assumed for this analysis that Fermi 3 would also be constructed and operated on the Fermi site. The construction time frames for Fermi 3 and an NGCC plant could overlap, resulting in greater impacts both beneficial to the economy and adverse to traffic and social services.

Because the construction of an NGCC plant on the Fermi site to replace Fermi 2 would draw workers from the same geographic area and have the same region of influence, the impacts of both would be expected to be distributed in the region in similar ways. The impacts on the local economy from construction of an NGCC alternative would be less than the impacts from construction of a nuclear plant, because an NGCC alternative would require a smaller construction workforce and a shorter construction period. The impact on the local economy during construction would also be expected to be less than the impacts from construction of a coal-fired plant (NRC 2013c, Sections 9.2.2.1 and 9.2.2.2).

The majority of the workforce during construction would already live in the region, so the relative economic contributions of these workers to local business and tax revenues in the region would remain generally the same. It is expected that the remainder of the building-related workforce would in-migrate from outside the 50-mile region in the same residential distribution as the current operations workers at the Fermi site. It is not expected that many in-migrating construction workers would permanently relocate to the region, so any socioeconomic effect induced by the in-migrating workers would be temporary. Based on the site's proximity to the Detroit and Toledo MSAs and expected limited worker relocation, it is concluded that construction impacts on the local infrastructures and services would be SMALL.

The impacts to the economy during construction would primarily be from wages being spent in the region of influence, worker's income taxes, sales tax revenues, and construction material purchases. These impacts are anticipated to be beneficial to the local and regional economy.

NRC also assessed traffic impacts for construction of an NGCC alternative to Fermi 3. As noted above, the construction workforce for an NGCC alternative would be smaller than that projected for Fermi 3, and the construction period would be substantially shorter. Some major NGCC plant components, such as CTs and STGs, are likely to be delivered by rail via the existing onsite rail spur. Pipeline construction and modification of existing natural gas pipeline systems could also have a temporary impact on local traffic where the new pipeline segment crosses existing road or rail infrastructure. The operations workforce would be approximately 150 full-time workers, substantially smaller than the workforce projected for Fermi 3 operation or the existing workforce for Fermi 2. NRC concluded that the overall traffic-related impacts during construction and operation would be SMALL and adverse. (NRC 2013c, Section 9.2.2.2) This conclusion is also applicable to an NGCC plant alternative to Fermi 2.

Once Fermi 2 is no longer operational and a decision has been made to decommission the plant, the plant's taxable asset status would be expected to generate little or no tax revenues. Therefore, the beneficial economic impact in Monroe County and regionally would cease. The NGCC plant would contribute beneficial economic impacts in Monroe County and possibly regionally, but not to the degree received from an operating nuclear or coal-fired plant.

Due to the small permanent operations workforce associated with the NGCC replacement alternative, and the site's proximity to the Detroit and Toledo MSAs, it is anticipated that operational impacts on the local infrastructures and services would be SMALL.

7.1.3.2.9 Human Health

Like the coal-fired power plant alternative discussed above, the NGCC plant alternative would emit criteria air pollutants but in lesser quantities (Tables 7.1-1 and 7.1-3). Human health effects of gas-fired generation are generally low. In addition, health risks to workers might also result from handling spent catalysts that might contain heavy metals. (NRC 2013c, Section 9.2.2.2)

Given industrial safety practices and occupational regulations and standards implementation to protect workers and the installation of air pollution control equipment and compliance with waste regulations, the overall human health impacts are expected to be SMALL for the construction and operation of the NGCC plant alternative.

7.1.3.2.10 Environmental Justice

NRC reviewed the potential for environmental justice impacts from the proposed Fermi 3 and its alternatives in the Fermi 3 FEIS. The conclusion was that there are no pathways by which disproportionately high and adverse impacts could be imposed on minority or low-income populations from the construction and operation of Fermi 3 and that the impacts on minority or low-income populations from the construction of a natural gas-fired alternative would be similar (NRC 2013c, Section 9.2.2.2). This conclusion is also applicable to construction and operation of an NGCC plant to replace generating capacity of Fermi 2.

7.1.3.2.11 Waste Management and Pollution Prevention

Both sanitary wastes resulting from support of the construction crew and industrial wastes (some hazardous) would be generated during construction. Construction-related wastes are expected to be properly characterized and initially managed on site and eventually removed to properly permitted offsite treatment or disposal facilities. Waste impacts from construction are expected to be SMALL.

During NGCC operation, spent SCR catalysts used to control NO_x emissions would make up the majority of the waste, and this waste stream could exhibit hazardous characteristics (NRC 2013c, Section 9.2.2.2). DTE would properly manage and dispose of hazardous and nonhazardous waste generated by operations in permitted offsite facilities. Recycling and waste minimization programs such as those at Fermi 2 would also be implemented as appropriate. NRC concluded that a natural gas-fired alternative to Fermi 3 would result in SMALL impacts (NRC 2013c, Section 9.2.2.2). Likewise, it is concluded that a natural gas-fired alternative to Fermi 2 would have SMALL waste management impacts.

7.1.3.3 Nuclear Generation

As discussed in Section 7.1.1.3, the new nuclear generation alternative involves the construction and operation of an ESBWR at the Fermi site. For purposes of this evaluation, it is assumed that the alternative discussion for nuclear generation would consider one unit with generating capacities similar to Fermi 2 (1,170 MWe). The environmental impacts associated with constructing and operating a new nuclear power plant using a closed-cycle cooling system with Lake Erie as the source of cooling water are discussed below.

7.1.3.3.1 Land Use and Visual Resources

The proposed Fermi 3 was sited to minimize impacts to wetlands and the DRIWR. The estimate of acreage needed for construction of Fermi 3 was 301 acres, with 112 acres overlapping with previously developed or previously altered areas on site (NRC 2013c, Section 4.1.1). Assuming that a replacement nuclear unit could be sited at the Fermi site and that it would require the same acreage of undisturbed land, its construction would further encroach on wetlands and the DRIWR and likely lead to an increase in land-use and ecological impacts. The land-use impact for Fermi 3 was determined to be small based on the 1,235-acre threshold that the NRC considers a SMALL impact (NRC 2007, Section 4.1.1). However, because a nuclear unit replacement for Fermi 2 would further encroach on the wetlands on site and the DRIWR, impact to land use could range from SMALL to MODERATE depending on the extent of encroachment.

There would be no net change in offsite land-use impacts from the mining of uranium fuel, if supplies destined to be used during Fermi 2 license renewal period were redirected for use at a new nuclear facility.

Because the Fermi site is already aesthetically altered by the presence of an existing nuclear power plant and construction impacts would be temporary, significant adverse impacts to visual aesthetics of the site and vicinity are not expected from the construction or operation of a new

nuclear unit replacement for Fermi 2. Therefore, it is concluded that the aesthetic impacts associated with the construction and operation of the new nuclear alternative at the Fermi site would be SMALL.

7.1.3.3.2 Air Quality

Ground-clearing, grading, and excavation activities would raise dust, as would the movement of materials and machinery. Fugitive dust may also rise from cleared areas during windy periods. Exhaust from the vehicles required to transport the construction workforce could also decrease air quality somewhat. However, construction impacts are short term and can be mitigated. Therefore, overall impacts to air quality would be SMALL.

However, air quality impacts during the operations phase would be SMALL because the emission sources (e.g., diesel generators, and plumes and drift from cooling towers) would be operated intermittently and emissions would be within federal, state, and local air quality limits. In addition, as discussed in Section 3.2.4, GHG emissions that would be associated with nuclear are lower than fossil fuel-based energy sources, and similar to the life-cycle GHG emissions from renewable energy sources. Therefore, air quality impacts associated with new nuclear as an alternative would avoid millions of tons of greenhouse gases that otherwise would be produced by fossil fuel-fired generation.

7.1.3.3.3 Noise

Sources of noise during construction would include bulldozers, draglines, scrapers, haulers to excavate earth and grade, cranes, front loaders, graders, forklifts, man lifts, compressors, backhoes, dump trucks, a pier driller, and portable welding machines. The construction of a new nuclear plant would require a larger workforce and a longer construction period than the NGCC alternative (NRC 2013c, Section 9.2.2.2) and could involve blasting (NRC 2013c, Section 4.8.2). However, due to the anticipated noise levels, restricting construction activities to daylight hours, compliance with local noise regulations, and the temporary duration of construction activities, impacts are expected to be SMALL for the nearest residents and for the surrounding communities.

Noise associated with the operation of a new nuclear plant would include sources such as the cooling tower, switchyard, motors, generators, pumps, and trucks and cars typical of an operating industrial facility. The permanent workforce would also produce traffic noise during their commute to and from work. However, impacts are expected to be SMALL for the surrounding communities and for the nearest residents.

7.1.3.3.4 Geology and Soils

Building on site and on adjacent land parcels would require land clearing and likely some filling of onsite water bodies and dewatering the excavation. The impacts to geology and soils from these construction activities would be localized and reduced with the implementation of BMPs and mitigation measures required by the necessary permits (e.g., stormwater, SESC permit). Through these measures, the impacts would be minimized and be SMALL. Land disturbance

during operations would also be conducted in accordance with stormwater permits, the SESC permit, and associated BMPs; therefore, the impacts during operations would also be SMALL.

7.1.3.3.5 Hydrology (Surface Water and Groundwater)

During the construction period, Lake Erie water would be used for concrete batch plant operation, temporary fire protection, dust control, and sanitary needs (NRC 2013c, Table 4-23). Hydrological alterations resulting from site preparation and building activities, including discharge of water from dewatering, clearing, grading, filling and dredging for the intake and discharge, would be localized and temporary. In addition, federal and state permits and certifications would require the disturbed land to be stabilized to prevent erosion through implementation of BMPs to minimize impacts, and potential impacts to be monitored. (NRC 2013c, Section 4.2.3.1) As a result, it is concluded that surface water impacts during the construction period for the new nuclear alternative would be SMALL.

During operation of the new nuclear alternative, stormwater runoff to the receiving water bodies will be controlled by adherence to the SWPPP and design features as required by the NPDES permit. Adherence to the NPDES permit would reduce the impacts on the quality of surface water near the plant from stormwater runoff.

Cooling water discharges would have relatively low projected contaminant levels, which would be controlled through the permitting process and would be similar to an already permitted discharge. (NRC 2013c, Section 5.2.3.1)

Water withdrawals for the cooling system would vary seasonally. As discussed in Section 2.2.2.2, Fermi 2 requires approximately 22,000 to 28,000 gpm in makeup water for its cooling water system and, as stated in Section 4.12.4.3, approximately 60 percent of this is returned to Lake Erie. Water consumption due to cooling water withdrawals at Fermi 2 is a very small percentage of the overall volume of Lake Erie. Withdrawals for the proposed Fermi 3 are estimated at 23,780 to 34,264 gpm with approximately 50 percent being returned. 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 (NRC 2013c, Section 5.2.2.1). A nuclear replacement for Fermi 2 would have similar water withdrawal and consumption levels. As a result, it is concluded that surface water impacts during the operations period for the new nuclear alternative would be SMALL.

As discussed in Section 3.5.3.2, Fermi 2 does not withdraw groundwater from the site; potable water is provided through a local utility, and makeup cooling water is supplied by Lake Erie. The proposed new nuclear alternative would also not rely on groundwater for operations, and any construction impacts due to dewatering systems would depress the water table in the general vicinity for the short term. BMPs would prevent or mitigate the impacts of spills on groundwater. (NRC 2013c, Tables 4-23 and 5-37) With a replacement alternative relying on similar technologies, there would be no groundwater use conflicts or groundwater quality degradation from water withdrawals or cooling ponds during construction or operation of a new facility. Therefore, groundwater impacts due to plant construction and operations are anticipated to be SMALL.

7.1.3.3.6 Ecological Resources (Terrestrial and Aquatic)

During the construction phase, effects on aquatic resources could stem from disturbance of aquatic habitat and associated plant and animal species on site, in addition to increased runoff and sedimentation from the addition of impervious surfaces. Impacts on aquatic ecosystems during construction would be minimal, due to the relatively small amount of water required (compared to the volume of water in Lake Erie), and controls on the quality of surface water discharges imposed by a construction stormwater permit issued by MDEQ and an SESC permit issued by the Monroe County drain commissioner. Impacts during the construction phase are expected to be SMALL.

Impacts on aquatic ecosystems during operation could take the form of some limited impingement and entrainment impacts due to the closed-cycle cooling system's water withdrawals and thermal and chemical impacts associated with blowdown discharges. However, all such impacts would be controlled by an NPDES permit. Therefore, impacts on aquatic ecology from the operation of the new nuclear alternative would be SMALL.

Terrestrial ecology impacts would primarily occur from land disturbance and destruction of habitat as a result of clearing and construction activities for a new unit at the site. Siting the new nuclear plant at the Fermi site would require approximately 300 acres and disturb substantially greater areas of sensitive habitat, including wetlands and forested wetlands. As detailed in Section 3.6.12, some protected terrestrial species are known to occur on the Fermi site. Impacts to terrestrial plants could be greater than impacts to wildlife, because many wildlife species have the ability to relocate by their own means. Plant communities in the proposed construction footprint would be cleared to accommodate the new plant site, and wildlife would be displaced. Disturbed areas would be revegetated with native and non-invasive flora species. In addition, wildlife species that recolonize the area are expected to be better adapted to life in and around an industrial/urban environment. Wetland and wildlife habitat mitigation would offset some impacts on protected species during construction and operation.

During operations, salt drift and fogging from operation of cooling towers would have only a minimal impact on terrestrial species and habitats.

Overall, construction and operational impacts to terrestrial ecology would be MODERATE.

7.1.3.3.7 Cultural Resources

Prior to new plant construction, studies would be needed to identify, evaluate, and address mitigation of the potential impacts on cultural resources. The studies would be needed for areas of potential disturbance at the plant site (e.g., roads, rail lines). During the operations phase, activities such as trenching, excavation, or ground penetration would be managed under procedures that would be protective of cultural resources, if present. Minor impacts on offsite historic properties associated with visible condensate plume from cooling towers may occur (NRC 2013c, Table 5-37).

Surveys conducted on the Fermi site, as detailed in Section 3.7.5, provide a basis for avoiding and mitigating impacts on historic and cultural resources. The NRHP-eligible Fermi 1 is anticipated to be impacted by the proposed Fermi 3, or perhaps demolished under the terms of an MOA between the NRC, the Michigan SHPO, and DTE (NRC 2013c, Section 9.2.2.1). Therefore, it is anticipated that the construction and operation of the new nuclear alternative at the Fermi site facility would have no adverse effects on cultural resources in the area.

7.1.3.3.8 Socioeconomics

DTE has assumed for this analysis that Fermi 3 would also be constructed and operated on the Fermi site. The construction time frames for Fermi 3 and the new nuclear plant could overlap, resulting in greater impacts both beneficial to the economy and adverse to traffic and social services. Once Fermi 2 is no longer operational and a decision to decommission the plant has been made, the plant's taxable asset status would be expected to generate little or no tax revenues, and workforce levels would be reduced. However, the loss of tax revenues and workforce level reductions would be offset by the new nuclear plant alternative.

Potential adverse impacts from constructing the new nuclear plant alternative that might affect the population in the Fermi vicinity and region include small increases in noise and air emissions during construction; worker in-migration to the region putting pressure on food and housing prices; and impacts to area road conditions, and increases in local traffic congestion. Potential beneficial impacts that would help offset negative impacts would include economic growth beneficial to local economies and additional tax income supporting regional infrastructure improvements. Construction adverse impacts would be SMALL for all socioeconomic categories except traffic, which would have short-term MODERATE impacts during peak building employment. (NRC 2013c, Table 4-23)

Potential adverse impacts during the operations period that might affect the population in the Fermi vicinity and region include SMALL impacts on traffic, recreation, housing, public services, and education associated with a population increase, which would be offset by an increase in tax revenue. Therefore, NRC concluded that there would be a beneficial impact to the local and regional economy as a result of the additional tax revenue from Fermi 3. (NRC 2013c, Table 5-37) This impact is also applicable to Fermi 2 with the understanding that a new nuclear replacement for Fermi 2 would also result in the continuation of beneficial impacts, but not necessarily an increase.

7.1.3.3.9 Human Health

Compliance with industrial safety practices and occupational standards during construction would be protective of site workers. There could be temporary public health impacts from exposure to fugitive dust and vehicular emissions. However, compliance with state CAA standards would minimize those impacts. Hazardous and nonhazardous solid wastes would be managed according to state regulatory requirements and either recycled or reduced in volume through site waste minimization programs. Overall, the human health impacts are anticipated to be SMALL during construction.

Human health impacts for a nuclear power plant are identified in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. Overall, human health impacts of a new nuclear plant at the Fermi 2 site during the operational phase are considered SMALL, which is consistent with the impact determination in NUREG-2105.

7.1.3.3.10 Environmental Justice

Potential adverse impacts that might disproportionately impact minority or low-income communities include, for example, pressure on food and housing prices and increased road congestion and noise near residential communities. No environmental pathways or preconditions exist in the Fermi region that could lead to disproportionately high and adverse impacts on minorities or low-income populations. (NRC 2013c, Tables 4-23 and 5-37) Therefore, there will be no disproportionately high and adverse impacts on minority and low-income populations from the construction and operation of a new nuclear power plant.

7.1.3.3.11 Waste Management and Pollution Prevention

The waste impacts associated with operation of a nuclear power plant are listed in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B. Waste would be generated during the construction and operations period and removed to an appropriate disposal site.

For construction and operation of an alternative new nuclear facility at the Fermi site, hazardous and nonhazardous solid wastes would be managed according to county, state, and federal regulations. Recycling and waste minimization programs would also be implemented. Overall, waste impacts of a new nuclear plant at the Fermi site are considered SMALL.

7.1.3.4 Combination of Alternatives

The combination of alternatives consists of an 822-MWe NGCC facility, 218 MWe of conservation and DSM programs, and 190 MWe of wind and 2 MWe of solar, both supported by a 192-MW CAES facility. The following impact discussions draw from the Fermi 3 FEIS. The energy efficiency component of the combination of alternatives was not scaled from that proposed as a reasonable alternative in the Fermi 3 FEIS because the level of energy savings was considered achievable. The wind and solar and supporting CAES sizes were also not scaled to maximize the renewables component because the NRC had identified the sizes as reasonable, and one of the bases for reasonableness was DTE's plans for future renewable energy sources. The remaining component, an 822-MWe NGCC facility, needed to have a net generation of 760 MWe for the combination to replace Fermi 2's capacity of 1,170 MWe.

7.1.3.4.1 Land Use and Visual Resources

A natural-gas-fired plant would have land-use impacts for a power block, cooling towers and support systems, and connection to a natural gas pipeline. The land requirements would be 90 acres for the plant (NRC 1996, Section 8.3.10 scaled for an 822-MWe plant) at the Fermi site. Utilizing the Fermi site to the fullest possible extent to build an NGCC plant would further encroach on wetlands and the DRIWR. Offsite land impacts from the gas pipeline and

compressor station would total approximately 200 acres, which is anticipated to have temporary impacts to some wetlands and prime farmland for installation of pipeline (NRC 2013c, Section 9.2.2.2); approximately 3,000 acres would be needed for gas fields (NRC 1996, Section 8.3.10 scaled for an 822-MWe plant).

As previously discussed in Section 7.1.2.2.1, land-use requirements for wind generation and its associated grid system are quite large compared to fossil-fuel and nuclear plants. The construction of roads, laydown areas, and turbine tower supports would result in short-term impacts. Land use required for wind development can range from 30 to 140 acres per megawatt due to site-specific factors such as terrain, wind conditions, avoidances (wetlands, land development and urban areas, archaeological sites), and proximity to transmission and other transportation. The total direct impact area (both temporary and permanently disturbed land) is approximately 0.74 to 4.2 acres per megawatt due to the land occupied by turbines, access roads, and other equipment and the land disturbed during construction. (NREL 2009) Therefore, assuming 190 MWe of wind generation, the deployment would require 5,700 to 26,600 acres, with about 141 to 798 acres occupied by turbines and support facilities. The small solar component would require about 10 to 20 acres based on NRC's estimate of acreage needed for a Fermi 3 replacement (NRC 2013c, Section 9.2.3.3). Commitment of land would also be required for the CAES facility needed for backup power. If existing mines or subterranean compressed air reservoirs are utilized, these would limit other uses, such as for natural gas CO_2 storage. Regardless, the CAES facility would require additional land to support the air storage, turbines, and ancillary operational equipment and structures required. No land-use impacts would result from implementation and/or expansions of DSM programs. (NRC 2013c, Table 9-5)

While the NGCC facility would utilize Fermi 2's existing transmission lines, the wind, solar, and CAES facilities may require additional land for construction of transmission lines dependent on the access point to the electrical grid. Overall, impacts to land use from the combination of alternatives would be MODERATE.

An NGCC plant and CAES facility would have aesthetic impacts comparable to those anticipated for Fermi 3. Wind turbines and solar panels would have noticeable aesthetic impacts. Transmission lines for the wind, solar and CAES facilities, if needed, could also have a potential noticeable impact. Overall increase in adverse impact on aesthetics is MODERATE.

7.1.3.4.2 Air Quality

Air quality impacts would be similar to those presented in Section 7.1.3.2.2 of this ER. Emissions from the 822-MWe natural-gas-fired plant utilized in this combination of alternatives that have been scaled from those analyzed in the Fermi 3 FEIS are approximately as follows (NRC 2013c, Table 9-5):

- SO_2: 63.4 tons/year
- NO_x: 242 tons/year

- Particulate: 124 tons/year (all as particulate matter with an aerodynamic diameter up to 10 micrometers [PM_{10}])
- CO: 560 tons/year
- N_2O: 56.0 tons/year
- VOC: 39.2 tons/year
- CO_2: 2.1 million tons/year

No air impacts are projected from any of the energy conservation and DSM programs, or from the wind and solar power generation (NRC 2013c, Table 9-5). However, a natural gas-powered CAES facility would emit the same air pollutants as the NGCC in lower levels per MW. Natural gas-fired CAES facilities use natural gas during the expansion process only, so the consumption is about one-third of that needed for electricity production using gas turbines without CAES. (Gardner and Haynes 2007) The CAES facility would also most likely have an induced draft mechanical wet cooling tower, which would result in particulate emissions.

Overall, impacts to air quality from the combination of alternatives could range from SMALL to MODERATE.

7.1.3.4.3 Noise

NGCC noise impacts from construction would be similar to major project construction: temporary and restricted to daylight hours. Operational noise would be similar to NGCC as discussed in Section 7.1.3.2.3. Noise impacts associated with the CAES facility would also be similar to the NGCC plant, albeit on a smaller scale.

Wind turbines would have noticeable noise and could be an annoyance to nearby receptors. The level of noise impact is dependent on local background noise and distance to residences. (Renewable Energy News 2013) No noise impacts are projected from solar power generation.

Overall, noise impacts from the combination of alternatives are anticipated to be SMALL.

7.1.3.4.4 Geology and Soils

The impacts to geology and soils from construction activities associated with the NGCC, wind, solar, and CAES facilities would be localized and reduced with the implementation of BMPs and mitigation measures required by the necessary permits (e.g., stormwater). Through these measures, the impacts would be minimized and be SMALL. Land disturbance during operations would also be conducted in accordance with stormwater permits and associated BMPs; therefore, the impacts during operations would also be SMALL.

7.1.3.4.5 Hydrology (Surface Water and Groundwater)

Small quantities of water would be required for construction of the NGCC, wind, solar, and CAES generation facilities. During construction, water quality would be protected by implementation of BMPs and mitigation measures required by the necessary permits (e.g., stormwater). Through these measures, the impacts would be minimized and be SMALL.

During operations, impacts associated with the NGCC, wind and solar facilities would be less than those of the NGCC alternative. For the CAES facility, the greatest potential for impact involves groundwater that could be related to the use of subsurface mines or caverns for the compressed air storage, especially if there were already existing nearby groundwater contamination from past mining activities, nearby waste disposal activities, nearby oil and gas exploration and production activities, or if there were saltwater in close proximity to fresh groundwater supplies. If the pressures within the mine or cavern(s) used for the CAES were allowed to influence the hydraulic pressures of the local groundwater regimes, there could be unexpected and unintended impacts. Unintended release of compressed air in the subsurface could cause contamination from nearby sources to be forced into groundwater or surface water resources. However, these potential impacts would be controlled by site selection and engineering controls, so impacts would most likely be minor.

7.1.3.4.6 Ecological Resources (Terrestrial and Aquatic)

During the construction phase of the NGCC, effects on aquatic resources could stem from disturbance of aquatic habitat and associated plant and animal species on site, as well as increased runoff and sedimentation from the addition of impervious surfaces. However, impacts on aquatic ecosystems during construction would be minimal, due to the relatively small amount of water required (compared to the volume of water in Lake Erie), and controls on the quality of surface water discharges imposed by a construction stormwater permit issued by MDEQ and an SESC permit issued by the Monroe County drain commissioner.

Impacts on aquatic ecology from operation of the cooling system would be similar and somewhat smaller than those anticipated from the Fermi 2 NGCC discrete alternative discussed in Section 7.1.3.2.6. Impacts on terrestrial ecology from cooling tower drift would also be similar but somewhat smaller. Additional impacts are associated with natural gas extractions at offsite gas fields. (NRC 2013c, Table 9-5) For the CAES facility, impacts to aquatic ecological resources would be expected to be similar to an equivalently sized natural gas-fired generation facility (i.e., one of equivalent use of natural gas) due to the need for cooling water intake and discharge.

Terrestrial ecology impacts would primarily occur from land disturbance and destruction of habitat. This NGCC plant would require approximately 40 percent less land than for the discrete alternative discussed in Section 7.1.3.2.6, but would further encroach on wetlands and the DRIWR and require the gas pipeline installation, another 200 acres for offsite gas transmission. Wetland and wildlife habitat mitigation would offset some impacts on protected species during construction and operation.

As noted in Section 7.1.3.4.1, the wind power portion of this alternative has the potential to affect substantial areas of land, and construction activities for the wind farm and solar installation would disturb land temporarily. However, once operational, these facilities could be compatible with land-use classes such as farming and be less disruptive to terrestrial ecology than an NGCC plant.

Migratory birds, eagles, other raptors, and bat mortality are potential impact issues related to wind turbines. The deaths of birds and bats at wind farm sites have raised concerns by wildlife agencies and conservation groups. Mortality rates vary among facilities and regions. Studies have indicated that relatively low raptor (e.g., hawks, eagles) fatality rates exist at most modern wind energy developments. Generally, studies in the East have reported higher rates of bat fatalities than facilities in the West. The USFWS issued final guidance for land-based wind energy facilities to avoid and minimize negative impacts to fish, wildlife, plants, and their habitats (USFWS 2012f).

If transmission lines are constructed to connect the wind, solar, and CAES facilities to the electrical grid, impacts to terrestrial ecology could be MODERATE depending on the nearest access point.

In conclusion, impacts to aquatic ecology from the combination of alternatives would be SMALL, while impacts to the terrestrial ecology from the NGCC plant on the Fermi site would be MODERATE due to the further encroachment on wetlands and the DRIWR, potential impacts on birds and bats from the wind power facility, and the potential for constructing transmission lines for the wind, solar, and CAES facilities.

7.1.3.4.7 Cultural Resources

Newly disturbed ground would result from construction of an NGCC and CAES facility and its necessary natural gas pipeline. Newly disturbed ground would also result from construction of wind turbines, solar facilities, and potential transmission lines associated with the wind, solar, and CAES facilities. Surveys were conducted on the Fermi site, as detailed in Section 3.7.5, with minimal potential for impacts identified. The NRHP-eligible Fermi 1 is anticipated to be impacted by the proposed Fermi 3, or perhaps demolished under the terms of an MOA between the NRC, the Michigan SHPO, and DTE (NRC 2013c, Section 9.2.2.1). The siting of an NGCC plant on the Fermi site would not further alter that impact. Although the 10-mile pipeline segment has not been specified, DTE would undertake the appropriate surveys prior to commencement of constructing a supporting natural gas pipeline segment.

For wind, solar, and CAES installations, site surveys would be conducted prior to construction, which would preempt adverse impacts by avoiding cultural resource sites. During the operations phase of the combination of alternatives, activities such as trenching, excavation, or ground penetration would be managed under procedures that would be protective of cultural resources, if present.

Overall, there would be no adverse effects on historic and cultural resources from construction and operation of the combination of alternatives.

7.1.3.4.8 Socioeconomics

Increased economic activity from new jobs and spending in the region would stimulate economic growth and tax revenues. The local property tax base would benefit Monroe County during construction and operations, but to a lower level than the impacts characterized for Fermi 3 because of the lower property value of an NGCC plant versus a nuclear plant and because the capacity rating would be lower. In addition, the wind, solar, and CAES facilities are not assumed to be located in Monroe County. All beneficial tax-related impacts elsewhere in the 50-mile region would also be less than for the Fermi 3 plant because of the smaller workforce needed to operate the combination of technologies alternative.

Construction-related impacts would be somewhat less than those described for the NGCC alternative (Section 7.1.3.2.8). The construction workforce is likely to originate primarily from the Detroit and Toledo MSAs. Impacts on local communities with regard to housing and services would be expected to be SMALL and temporary for construction and SMALL for operation. (NRC 2013c, Table 9-5)

The construction workforce for the wind, solar, and CAES generation facilities would be substantially smaller than that of an NGCC plant and for a shorter duration. Construction-related impacts would be limited and temporary.

Once Fermi 2 is no longer operational and a decision to decommission the plant has been made, the plant's taxable asset status would be expected to generate little or no tax revenues. Therefore, the beneficial economic impact in Monroe County and regionally would cease. The NGCC plant would contribute beneficial economic impacts in Monroe County and possibly regionally, but not to the degree received from an operating nuclear or coal-fired plant. There would be no offset of tax revenues associated with the wind, solar, and CAES generation facilities because as previously stated above, they are not assumed to be located in Monroe County. Therefore, although there would be some beneficial economic impact from these alternatives, the degree of impact locally and regionally would be dependent on the location of the installations.

7.1.3.4.9 Human Health

Regulatory controls and oversight would be protective of human health (NRC 2013c, Table 9-5). Therefore impacts to human health from the combination of alternatives during the construction and operations stages would be SMALL.

7.1.3.4.10 Environmental Justice

Potential adverse impacts that might disproportionately impact minority or low-income communities include, for example, pressure on food and housing prices and increased road congestion and noise near residential communities. No environmental pathways or preconditions exist in the Fermi region that could lead to disproportionately high and adverse impacts on minorities or low-income populations. Although site-specific, it is anticipated that there would be no environmental justice impacts from the wind, solar, and CAES generation

facilities. Therefore, there would be no disproportionately high and adverse impacts on minority and low-income populations from the construction and operation of the NGCC, wind, solar, and CAES facilities. Although site-specific, it is anticipated that there would be no environmental justice impacts from the wind and solar facilities.

7.1.3.4.11 Waste Management and Pollution Prevention

The only significant waste that would be generated from the combination of alternatives would be from spent SCR catalyst used to control NO_x emissions associated with the NGCC and CAES facilities. Recycling and waste minimization programs would also be implemented as appropriate. Therefore, overall impacts to waste management and pollution prevention from the combination of alternatives during the construction and operations stages would be SMALL.

Table 7.1-1
Scaled Megawatt Electric Capacities of Alternatives Needed for Fermi 2 Replacement

Alternative	Technology	FEIS Capacity Rating[a][b]	Scaling Factor for Fermi 2	Fermi 2 Alternative Capacity Rating
Coal-fired generation	SCPC	1,788 MWe	0.76[c]	1,363 MWe
Natural gas-fired generation	NGCC	1,661 MWe	0.76[c]	1,266 MWe
New nuclear generation	ESBWR	1,535 MWe	0.76[c]	1,170 MWe
Combination of alternatives[d]	NGCC	1,218 MWe	0.675[e]	822 MWe[f]
	Wind turbines	190 MWe	None[g]	190 MWe
	PV solar	2 MWe	None[g]	2 MWe
	CAES	192 MWe	None[g]	192 MWe

a. (NRC 2013c, Chapter 9).
b. Accounting for the alternatives' capacity factors and parasitic loads.
c. 1,170 MWe [Fermi 2] ÷ 1,535 MWe [Fermi 3] = 0.762214984 ≈ 0.76.
d. Also includes reduction of demand of 218 MW through energy efficiency and DSM programs.
e. The remaining component, an NGCC facility, needed to have a generating capacity of 822 MWe for the combination to replace Fermi 2's capacity of 1,170 MWe. The ratio of 822 MWe to 1,218 MWe is 0.675.
f. Wind and solar components of the combination of alternatives provide a sum of 192 MWe generating capacity and the energy efficiency component reduces the demand by 218 MWe, so 760 MWe capacity is remaining to replace Fermi 2's capacity of 1,170 MWe. An NGCC plant would need to be sized to account for the difference in efficiency between a nuclear plant and an NGCC plant. Based on NRC's Fermi 3 FEIS analysis, an NGCC plant's generating capacity would need to be increased by approximately 8 percent. (Ratio of Fermi 3 NGCC replacement to Fermi 3, 1661 MWe/1535 MWe.) Therefore, 760 x 1661/1535 = 822.
g. The energy efficiency and renewables components of the combination of alternatives was not scaled from that proposed as a reasonable alternative in the Fermi 3 FEIS, because implementation of programs and facilities of these sizes were considered reasonable (i.e., achievable).

Table 7.1-2
Air Emissions from Super-Critical Pulverized Coal Alternative[a]

Parameter	Tons/year
Annual coal consumption	4.95 million
Sulfur dioxide	2,072
Nitrogen oxides	2,556
Carbon monoxide	1,233
Filterable particulate matter	159
Particulates less than 10 microns in diameter	36.6
Carbon dioxide	9.2 million

a. Scaled from NRC 2013c, Table 9-2 using scaling factor to account for smaller Fermi 2 generating capacity, approximately 0.76 (see Table 7.1-1 footnote c).

Table 7.1-3
Solid Waste from Super-Critical Pulverized Coal Alternative[a]

Parameter	Amount
Annual SO_2 generated	39,570 tons per year
Annual SO_2 captured	37,591 tons per year
Annual scrubber sludge (calcium sulfate)	84,080 tons per year
Annual scrubber sludge disposed based on 90 percent recycling	8,408 tons per year
Annual ash generated	317,781 tons per year
Annual ash disposed based on 50 percent recycling	158,732 tons per year
Annual total waste disposed	167,140 tons per year
Waste pile area (40-year period)	101 acres, 30 feet high

a. Scaled from NRC 2013c, Section 9.2.2.1 using scaling factor to account for smaller Fermi 2 generating capacity, approximately 0.76 (see Table 7.1-1, footnote c).

Table 7.1-4
Air Emissions from Natural Gas-Fired Alternative[a]

Emission	Annual Amount
Gas consumption	56,300,000,000 ft^3
Sulfur dioxide	97.6 tons
Nitrogen oxides	373.5 tons
Carbon monoxide	861 tons
Particulate matter[b]	189.8 tons
Nitrous oxide	86.1 tons
Volatile organic compounds	60.2 tons
Carbon dioxide	3.2 million tons

a. Scaled from NRC 2013c, Section 9.2.2.2 using scaling factor to account for smaller Fermi 2 generating capacity, approximately 0.76 (see Table 7.1-1, footnote c).
b. Although expected to be relatively minor, particulate emissions from the CT cannot be specified with precision at this time. Consequently, the estimates presented do not include CT particulate emissions.

7.2 Alternatives for Reducing Adverse Impacts

7.2.1 Alternatives Considered

As noted in 10 CFR 51.53(c)(3)(iii), "The report must contain a consideration of alternatives for reducing adverse impacts, as required by § 51.45(c), for all Category 2 license renewal issues in Appendix B to Subpart A of this part." The review of the environmental impacts associated with the Category 2 issues required by 10 CFR 51.53(c)(3)(ii) provided in Chapter 4 identified no significant adverse effects that would warrant consideration of additional alternatives to reduce or avoid those impacts. Based on the Chapter 4 analysis, DTE concludes that the impacts of renewal of the Fermi 2 OL do not warrant additional consideration of alternatives for reducing adverse impacts, as specified in NRC Regulatory Guide 4.2, Revision 1 (NRC 2013a, Section 7.2), and existing mitigation measures specified in Section 6.2.2 to avoid, reduce the severity of, or eliminate adverse impacts are adequate for minimizing adverse impacts.

7.2.2 Environmental Impacts of Alternatives for Reducing Adverse Impacts

As discussed in Section 7.2.1 above, there were no alternatives identified to reduce adverse impacts as a result of renewal of the Fermi 2 OL. Therefore, there are no associated environmental impacts.

7.3 No-Action Alternative

7.3.1 Proposed Action

The proposed action is to renew the Fermi 2 OL, which would preserve the option for DTE to continue to operate Fermi 2 to provide reliable base-load power and meet future system generating needs throughout the 20-year license renewal period. The analysis of the environmental impacts required by 10 CFR 51.53(c)(3)(ii) and presented in Chapter 4 identified no significant adverse effects from the continued operation of Fermi 2 during the license renewal period.

7.3.2 No-Action Alternative

The "no-action alternative" to the proposed action is not to renew the Fermi 2 OL. In this alternative, it is expected that Fermi 2 would continue to operate up through the end of the existing OL, at which time plant operations would cease and decommissioning would begin (see Section 7.3.3). The environmental impacts of the no-action alternative would be the impacts associated with the construction and operation of the type of replacement power utilized, such as those identified in Section 7.1.1 of this ER. In effect, the net environmental impacts would be transferred from the continued operation of Fermi 2 to the environmental impacts associated with the construction and operation of a new generating facility or a combination of facilities. Therefore, the no-action alternative would have no net environmental benefits.

The environmental impacts associated with the proposed action (the continued operation of Fermi 2) were compared to the environmental impacts from the no-action alternative (the

decommissioning of Fermi 2) (Section 7.3.3) and the construction and operation of other reasonable sources of electricity generation. DTE believes this comparison shows that the continued operation of Fermi 2 would produce no significant environmental impacts while the no-action alternative would have greater impacts than the proposed action on certain environmental resources as described in Section 7.1.3.

In addition, CO_2 emissions are suspected to be a major contributor to anthropogenic GHG emissions, which some scientists believe contribute to climate change. The burning of fossil fuels (coal, natural gas, and petroleum) is the largest energy-related contributor of CO_2 emissions in the world (EIA 2011). Table 7.3-1 shows the amount of CO_2 released by the consumption of various fuel sources to produce electricity. This table illustrates that all fossil fuel-based energy sources produce GHG emissions, whereas nuclear power produces none. In addition, as previously discussed in Section 3.2.4, GHG emissions associated with renewal of an OL would be similar to the life-cycle GHG emissions from renewable energy sources and lower than those associated with fossil fuel-based energy sources.

7.3.3 Decommissioning Impacts

The NRC defines decommissioning as the safe removal of a nuclear facility from service and the reduction of residual radioactivity to a level that permits (1) release of the property for unrestricted use and termination of the license or (2) release of the property under restricted conditions and termination of the license [10 CFR 20.1003]. NRC-evaluated decommissioning options include (1) immediate dismantling soon after the facility closes and prompt decontamination (DECON); (2) safe storage and monitoring of the facility for a period of time that allows the radioactivity to decay, followed by dismantling and additional decontamination (SAFSTOR); and (3) permanent entombment on site in structurally sound material, such as concrete, and appropriately maintained and monitored (ENTOMB). Regardless of the option chosen, decommissioning must be completed within the 60-year period following permanent cessation of operations and permanent removal of fuel.

Under the no-action alternative, DTE would continue operating Fermi 2 until the existing OL expires, and then initiate decommissioning activities in accordance with NRC requirements. As the GEIS notes, NRC has evaluated environmental impacts from decommissioning. NRC-evaluated impacts include those associated with land use, visual resources, air quality, noise, geology and soils, hydrology, ecology, historic and cultural resources, socioeconomics, human health, environmental justice, and waste management and pollution prevention. (NRC 2013b, Section 4.12.2.1) DTE considers NRC's evaluation of these impacts in the GEIS to be reasonably representative of actions that DTE would perform for decommissioning at Fermi 2. Therefore, DTE relies on the NRC conclusions regarding environmental impacts of decommissioning Fermi 2.

DTE notes that decommissioning activities and their impacts are not discriminators between the proposed action and the no-action alternative. Fermi 2 will have to be decommissioned eventually, regardless of the NRC decision on license renewal; license renewal would only postpone decommissioning for another 20 years. NRC has established in the GEIS that the

timing of decommissioning operations does not substantially influence the environmental impacts of decommissioning.

DTE relies on NRC findings [10 CFR Part 51, Subpart A, Appendix B, Table B-1] to the effect that delaying decommissioning until after the renewal term would have SMALL environmental impacts. The discriminators between the proposed action and the no-action alternative lie within the choice of generation replacement options to be part of the no-action alternative. Section 7.1.3 analyzes the impacts from these options.

DTE concludes that the decommissioning impacts under the no-action alternative would not be substantially different from those following license renewal, as identified in the GEIS and in the decommissioning generic environmental impact statement. Decommissioning impacts under the no-action alternative would be temporary and could overlap with operation of a Fermi 2 replacement.

Table 7.3-1
CO_2 Emissions from Electricity Generation

Fuel	Pounds CO_2 per Million Btu
Sub-bituminous coal	213
Bituminous coal	205
Lignite coal	215
Distillate oil (No. 2)	161
Residual oil (No. 6)	174
Natural gas	117[a]
Nuclear	0
Renewable sources	0

(EIA 2013)

a. NRC used 110 pounds per million Btu in its Fermi 3 FEIS analysis and the Section 7.1.3 analysis was scaled from NRC's Fermi 3 FEIS analysis.

8.0 COMPARISON OF THE ENVIRONMENTAL IMPACT OF LICENSE RENEWAL WITH THE ALTERNATIVES

"To the extent practicable, the environmental impacts of the proposal and the alternatives should be presented in comparative form..." [10 CFR 51.45(b)(3) as adopted by 10 CFR 51.53(c)(2)].

The proposed action is renewal of the Fermi 2 OL, which would preserve the option to continue to operate Fermi 2 to provide reliable base-load power and meet DTE's future system generating needs throughout the 20-year license renewal period. Chapter 4 analyzes environmental impacts of the proposed action and Chapter 7 describes potential energy alternatives to the proposed action, and analyzes impacts from the alternatives deemed to be reasonable.

Table 8.0-1 summarizes the environmental impacts of the proposed action and the alternatives deemed reasonable, for comparison purposes. Table 8.0-2 provides a more detailed comparison. The environmental impacts compared in Tables 8.0-1 and 8.0-2 are either Category 2 issues that apply to the proposed action or issues that the GEIS identified as major considerations in an alternatives analysis.

As shown in Tables 8.0-1 and 8.0-2, there are no reasonable alternatives superior to that of the continued operation of Fermi 2, providing approximately 1,170 MWe of base-load power generation. The continued operation of Fermi 2 would create significantly less environmental impact than the construction and operation of new alternative generating capacity. In addition, the continued operation of Fermi 2 will have a significant positive economic impact on the communities surrounding the station, such as reduced local unemployment, economic support of surrounding communities, and lower energy costs.

Table 8.0-1
Environmental Impacts Comparison Summary[a]

		No-Action Alternative				
Impact Area	**Proposed Action**	**Decommissioning**	**Coal-Fired Alternative**	**Natural Gas-Fired Alternative**	**New Nuclear Alternative**	**Combination of Alternatives**
Land use	SMALL	SMALL	LARGE	MODERATE	SMALL to MODERATE	MODERATE
Visual resources	SMALL	SMALL	SMALL	SMALL	SMALL	MODERATE
Air quality	SMALL	SMALL	SMALL (construction) MODERATE (operation)	SMALL (construction) MODERATE (operation)	SMALL (construction) SMALL (operation)	SMALL (construction) MODERATE (operation)
Noise	SMALL	SMALL	SMALL (construction) MODERATE (operation)	SMALL	SMALL	SMALL
Geology and soils	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Hydrology (surface water and groundwater)	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Aquatic ecological resources[b]	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Terrestrial ecological resources[b]	SMALL	SMALL	LARGE	MODERATE	MODERATE	MODERATE

Table 8.0-1 (Continued)
Environmental Impacts Comparison Summary[a]

		No-Action Alternative				
Impact Area	**Proposed Action**	**Decommissioning**	**Coal-Fired Alternative**	**Natural Gas-Fired Alternative**	**New Nuclear Alternative**	**Combination of Alternatives**
Cultural resources	No adverse effects	No adverse effects	No adverse effects	No adverse effects	No adverse effects	No adverse effects
Socioeconomics	SMALL	SMALL	SMALL (local infrastructure and services) MODERATE (traffic)	SMALL	SMALL (local infrastructure and services) MODERATE (traffic)	SMALL
Human health	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Environmental justice	No disproportionate impact on minority or low-income populations	No disproportionate impact on minority or low-income populations	No disproportionate impact on minority or low-income populations	No disproportionate impact on minority or low-income populations	No disproportionate impact on minority or low-income populations	No disproportionate impact on minority or low-income populations
Waste management and pollution prevention	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL	SMALL

a. As defined in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Footnote 3:
SMALL: Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
MODERATE: Environmental effects are sufficient to alter noticeably, but not to destabilize, any important attribute of the resource.
LARGE: Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

b. NRC also did not assign an impact level to threatened and endangered species/EFH as discussed in Section 4.0.2; however, this issue is included collectively in ecological resources.

Table 8.0-2 (Sheet 1 of 11)
Environmental Impacts[a] Comparison Detail

Land Use and Visual Resources	
Proposed action	**SMALL** (Land Use): No license-renewal-related refurbishment activities have been identified. No changes in onsite land use are anticipated. **SMALL** (Visual Resources): No changes are anticipated to area visual resources.
Decommissioning	**SMALL** (Land Use and Visual Resources): Adopting by reference the 2013 GEIS conclusion for the land use and visual resources.
Coal-fired alternative	**LARGE** (Land Use): 2,300-acre site required, which is more than Fermi site, requiring acquisition of adjacent land parcels. Further development on the Fermi site would encroach upon onsite wetlands. Approximately 30,000 acres are required for fuel supply, which would be slightly offset by the elimination of the need for uranium mining to supply fuel for Fermi 2. **SMALL** (Visual Resources): Because the Fermi site is already altered by the presence of a nuclear plant, significant adverse impacts to visual resources are not expected.
Natural gas-fired alternative	**MODERATE** (Land Use): 140-acre site required on the Fermi site, which would encroach upon onsite wetlands. Approximately 4,560 acres are required for offsite activities, including a natural gas pipeline and compressor station, and a natural gas well field, which would be offset by the elimination of the need for uranium mining to supply fuel for Fermi 2. **SMALL** (Visual Resources): Because the Fermi site is already altered by the presence of a nuclear plant, significant adverse impacts to visual resources are not expected.
New nuclear alternative	**SMALL to MODERATE** (Land Use): Approximately 300-acre site required for an alternate nuclear facility on the Fermi site, which would encroach upon onsite wetlands; 1,170 acres required for fuel supply, which is offset in full by the elimination of the need for uranium mining to supply fuel for Fermi 2. **SMALL** (Visual Resources): Because the Fermi site is already altered by the presence of a nuclear plant, significant adverse impacts to visual resources are not expected.
Combination of alternatives	**MODERATE** (Land Use): A natural gas-fired plant on the site would have 40 percent less land-use requirements than the discrete natural gas-fired plant alternative (approximately 90 acres on site and 3,000 acres off site). The wind power has the potential to affect substantial areas of land, but the land between turbines could be used for farming, grazing, etc. Wind deployment would require 5,700 to 26,600 acres, with about 141 to 798 acres occupied by turbines and support facilities. The small solar component would also have land-use impacts and require about 10 to 20 acres. **MODERATE** (Visual Resources): Because the Fermi site is already altered by the presence of a nuclear plant, significant adverse impacts to visual resources are not expected. Wind turbines would have noticeable aesthetic impacts.

Table 8.0-2 (Sheet 2 of 11)
Environmental Impacts[a] Comparison Detail

Air Quality	
Proposed action	**SMALL**: No license-renewal-related refurbishment activities have been identified; emissions associated with plant operations primarily from the auxiliary boilers, combustion turbines, and testing emergency generators; beneficial to climate change.
Decommissioning	**SMALL**: Adopting by reference the 2013 GEIS conclusion for air quality.
Coal-fired alternative	**SMALL** (Construction): Construction impacts would be temporary. **MODERATE** (Operations): Emission estimates during the operations period, which does not include cooling tower particulate emissions, are as follows: • Sulfur dioxide = 2,072 tons per year • Nitrogen oxides = 2,556 tons per year • Carbon monoxide = 1,233 tons per year • Particulates: ◆ PM_f (total filterable particulates) = 159 tons per year ◆ PM_{10} (particulates having a diameter of less than 10 microns) = 36.6 tons per year • Carbon dioxide = 9.2 million tons per year
Natural gas-fired alternative	**SMALL** (Construction): Construction impacts would be temporary. **MODERATE** (Operations): Emission estimates during the operations period, which does not include cooling tower particulate emissions, are as follows: • Sulfur dioxide = 97.6 tons per year • Nitrogen oxides = 373.5 tons per year • Carbon monoxide = 861 tons per year • Particulate Matter = 189.8 tons per year • Nitrous oxide = 86.1 tons per year • Volatile organic compounds = 60.2 tons per year • Carbon dioxide = 3.2 million tons per year
New nuclear alternative	**SMALL** (Construction): Construction impacts would be temporary. **SMALL** (Operations): Operational impacts would be minor with site emission sources operating intermittently and emissions maintained within federal, state, and local regulatory limits.
Combination of alternatives	**SMALL** (Construction): Construction impacts would be temporary. **MODERATE** (Operations): No air impacts are projected from any of the energy conservation programs, or from wind and solar power generation. Emission estimated during the operations period from the natural gas-fired plant are as follows: • Sulfur dioxide = 63.4 tons per year • Nitrogen oxides = 242 tons per year • Particulates = 124 tons per year (all as PM_{10}) • Carbon monoxide = 560 tons per year • Nitrous oxide = 56.0 tons per year • Volatile organic compounds = 39.2 tons per year • Carbon dioxide = 2.1 million tons per year

Table 8.0-2 (Sheet 3 of 11)
Environmental Impacts[a] Comparison Detail

Noise	
Proposed action	**SMALL**: No license-renewal-related refurbishment activities have been identified; noise primarily associated with the cooling towers, switchyard, motors, generators, pumps, and trucks and cars typical of an operating industrial facility.
Decommissioning	**SMALL**: Adopting by reference the 2013 GEIS conclusion for noise.
Coal-fired alternative	**SMALL** (construction), **MODERATE** (operations): Noise impacts from construction of alternatives would be similar to major project construction, temporary, and restricted to daylight hours. Mechanical sources of noise would be introduced that would be audible off site. Operational noise impacts associated with rail delivery of coal and lime/ limestone would be most significant for residents living in the vicinity of the facility and along the rail route.
Natural gas-fired alternative	**SMALL**: Noise impacts from construction of alternatives would be similar to major project construction, temporary, and restricted to daylight hours. Minimal noise would be anticipated for natural gas plant operations because outdoor fuel-handling activities would not occur, outdoor waste handling activities would be limited, and there would be few, if any, rail deliveries.
New nuclear alternative	**SMALL**: Noise impacts from construction of alternatives would be similar to major project construction, temporary, and restricted to daylight hours. Noise associated with operations would include such sources as the cooling tower, switchyard, motors, generators, pumps, and trucks and cars typical of an operating industrial facility.
Combination of alternatives	**SMALL**: Noise impacts from construction of alternatives would be similar to major project construction, temporary, and restricted to daylight hours. Minimal noise would be anticipated for natural gas plant operations because outdoor fuel-handling activities would not occur, outdoor waste handling activities would be limited, and there would be few, if any, rail deliveries. Wind turbines would have noticeable noise. No noise impacts are projected from solar power.

Table 8.0-2 (Sheet 4 of 11)
Environmental Impacts[a] Comparison Detail

Geology and Soils	
Proposed action	**SMALL**: No license-renewal-related refurbishment activities have been identified. Land disturbance activities during operations would be conducted in compliance with stormwater permits and associated BMPs.
Decommissioning	**SMALL**: Adopting by reference the 2013 GEIS conclusion for geology and soils.
Coal-fired alternative	**SMALL**: Construction activities would be localized and reduced with the implementation of BMPs, and land disturbance activities during operations would be conducted in compliance with stormwater permits and associated BMPs.
Natural gas-fired alternative	**SMALL**: Construction activities would be localized and reduced with the implementation of BMPs, and land disturbance activities during operations would be conducted in compliance with stormwater permits and associated BMPs.
New nuclear alternative	**SMALL**: Construction activities would be localized and reduced with the implementation of BMPs, and land disturbance activities during operations would be conducted in compliance with stormwater permits and associated BMPs.
Combination of alternatives	**SMALL**: Construction activities would be localized and reduced with the implementation of BMPs, and land disturbance activities during operations would be conducted in compliance with stormwater permits and associated BMPs.

Table 8.0-2 (Sheet 5 of 11)
Environmental Impacts[a] Comparison Detail

Hydrology (Surface Water and Groundwater)	
Proposed action	**SMALL**: No license-renewal-related refurbishment activities have been identified; Fermi 2 does not withdraw groundwater from the site and discharges to surface water are regulated by NPDES permit. Fermi 2 requires approximately 22,000 to 28,000 gpm in makeup water for its cooling water system, and approximately 60 percent of this amount is returned to Lake Erie. Water consumption due to cooling water withdrawals at Fermi 2 is a very small percentage of the overall volume of Lake Erie.
Decommissioning	**SMALL**: Adopting by reference the 2013 GEIS conclusion for hydrology (surface water and groundwater).
Coal-fired alternative	**SMALL**: Minor impacts on surface water during construction. Water consumption due to cooling water withdrawals would be a very small percentage of the overall volume of Lake Erie. Water consumption would be less than for a new nuclear alternative. It is unlikely groundwater would be used for construction or operational purposes, and stormwater permit with BMPs would minimize any potential runoff.
Natural gas-fired alternative	**SMALL**: Minor impacts on surface water during construction. Water consumption due to cooling water withdrawals would be a very small percentage of the overall volume of Lake Erie. Water consumption would be less than for a new nuclear alternative. It is unlikely groundwater would be used for construction or operational purposes, and stormwater permit with BMPs would minimize any potential runoff.
New nuclear alternative	**SMALL**: Hydrological alterations to surface water and groundwater resources resulting from site preparation and building activities would be localized and temporary. Average withdrawals and return of water from Lake Erie would vary seasonally and be similar to Fermi 2 and that estimated for the proposed Fermi 3. Water consumption due to cooling water withdrawals would be a very small percentage of the overall volume of Lake Erie. It is unlikely groundwater would be used for construction or operational purposes, and stormwater permit with BMPs would minimize any potential runoff.
Combination of alternatives	**SMALL**: Small quantities of water would be required for construction of the generation facilities. Water quality will be protected by implementation of BMPs and mitigation measures required by the necessary permits (e.g., stormwater). Water consumption due to the NGCC plant's cooling water withdrawals would be a very small percentage of the overall volume of Lake Erie. Water consumption would be less than for a comparably sized nuclear alternative.

Table 8.0-2 (Sheet 6 of 11)
Environmental Impacts[a] Comparison Detail

Ecological Resources (Terrestrial and Aquatic)[b]	
Proposed action	**SMALL** (Aquatic and Terrestrial): No license-renewal-related refurbishment activities have been identified; management programs in place to protect terrestrial habitats; operates within NPDES permit limits; minimal impacts to fish population in Lake Erie because Fermi 2 utilizes a closed-cycle cooling system.
Decommissioning	**SMALL**: Adopting by reference the 2013 GEIS conclusion for ecological resources.
Coal-fired alternative	**SMALL** (Aquatic): Impacts on aquatic ecosystems during construction would be minimal, due to the relatively small amount of water required and controls on the surface water discharges imposed by a stormwater permit. Impacts on aquatic ecosystems during operation would be controlled by an NPDES permit issued by MDEQ. **LARGE** (Terrestrial): Terrestrial ecology impacts would primarily occur from land disturbance and destruction of habitat on site. There would be further encroachment on onsite wetlands and the DRIWR. Potential disturbances to offsite habitats from coal mining requirement.
Natural gas-fired alternative	**SMALL** (Aquatic): Impacts on aquatic ecosystems during construction would be minimal, due to the relatively small amount of water required and controls on the surface water discharges imposed by a stormwater permit. Impacts on aquatic ecosystems during operation would be controlled by an NPDES permit issued by MDEQ. **MODERATE** (Terrestrial): Terrestrial ecology impacts would primarily occur from land disturbance and destruction of habitat on site and in the installation and maintenance of a natural gas pipeline. There would be further encroachment on onsite wetlands and the DRIWR.
New nuclear alternative	**SMALL** (Aquatic): Impacts on aquatic ecosystems during construction would be minimal, due to the relatively small amount of water required and controls on the surface water discharges imposed by a stormwater permit. Impacts on aquatic ecosystems during operation would be controlled by an NPDES permit issued by MDEQ. **MODERATE** (Terrestrial): Terrestrial ecology impacts would primarily occur from land disturbance and destruction of habitat on site. There would be further encroachment on onsite wetlands and the DRIWR.
Combination of alternatives	**SMALL** (Aquatic): Impacts on aquatic ecosystems during construction would be minimal, due to the relatively small amount of water required and controls on the surface water discharges imposed by a stormwater permit. Impacts on aquatic ecosystems during operation of natural gas-fired plant would be controlled by an NPDES permit issued by MDEQ. **MODERATE** (Terrestrial): Terrestrial ecology impacts would primarily occur from land disturbance and destruction of habitat on site and in the installation and maintenance of a natural gas pipeline. There would be further encroachment on onsite wetlands and the DRIWR; however, the impact would be less than that of the discrete natural gas-fired plant due to a smaller land requirement. Construction of the wind farm and solar facilities could have some impacts on terrestrial ecology due to land disturbance and construction activities. Migratory birds, eagles, other raptors, and bat mortality are potential impact issues related to operation of wind turbines.

Table 8.0-2 (Sheet 7 of 11)
Environmental Impacts[a] Comparison Detail

Cultural Resources[c]	
Proposed action	**No adverse effects**: No license-renewal-related refurbishment activities have been identified; DTE procedures ensure protection of these types of resources in the event of excavation activities.
Decommissioning	**No adverse effects**: Adopting by reference the 2013 GEIS conclusion regarding impacts to cultural resources.
Coal-fired alternative	**No adverse effects**: Impacts on disturbed and undisturbed land parcels may occur both on the Fermi site and on adjacent properties. Surveys conducted on the Fermi site provide a basis for avoiding and mitigating impacts on historic and cultural resources. Surveys of previously undisturbed offsite land parcels would provide a basis for mitigation of impacts on historic and cultural resources.
Natural gas-fired alternative	**No adverse effects**: Impacts on disturbed and undisturbed land parcels may occur both on the Fermi site and on adjacent properties. Surveys conducted on the Fermi site provide a basis for avoiding and mitigating impacts on historic and cultural resources.
New nuclear alternative	**No adverse effects**: Impacts on disturbed and undisturbed land parcels may occur both on the Fermi site and on adjacent properties. Surveys conducted on the Fermi site provide a basis for avoiding and mitigating impacts on historic and cultural resources.
Combination of alternatives	**No adverse effects**: Along with construction of a natural gas plant at the Fermi site, newly disturbed ground would result from construction of the necessary natural gas pipeline, wind turbines, and solar facilities. Surveys conducted on the Fermi site provide a basis for avoiding and mitigating impacts on historic and cultural resources. Surveys prior to construction and archiving of any identified resources would avoid or mitigate adverse impacts.

Table 8.0-2 (Sheet 8 of 11)
Environmental Impacts[a] Comparison Detail

Socioeconomics	
Proposed action	**SMALL**: No license-renewal-related refurbishment activities have been identified; no additional workers anticipated during the period of extended operation; beneficial economic impacts on a local and regional level expected to continue at current levels.
Decommissioning	**SMALL**: Adopting by reference the 2013 GEIS conclusion for socioeconomics.
Coal-fired alternative	**SMALL** (except traffic), **MODERATE** (Adverse traffic): Based on the site's proximity to the Detroit and Toledo MSAs and expected limited worker relocation, construction impacts on the local infrastructures and services would be minor and less than the impacts for the new nuclear alternative, due to a smaller construction workforce and a shorter construction period. The operations workforce would also be smaller than a nuclear plant workforce and would likely be drawn from the Detroit and Toledo MSAs, so the impacts during operations to local infrastructure and services would be SMALL. Construction traffic from the construction workforce and materials delivery would be MODERATE. Because of the scale of deliveries of coal and limestone, combined with the large number of disposal truckloads leaving the plant, operating a new coal-fired power plant would result in noticeable impacts on transportation, so the traffic impact during operations would also be MODERATE; beneficial economic impacts on a local and regional level anticipated to be comparable to Fermi 2.
Natural gas-fired alternative	**SMALL**: Impacts on the local infrastructures and services from construction and operation of a natural gas alternative would be minor and less than the impacts for the coal-fired alternative. It would also have less of an impact on the area transportation infrastructure; beneficial economic impacts locally and regionally, but less than those associated with an operating nuclear or coal-fired plant.
New nuclear alternative	**SMALL** to **MODERATE**: Construction impacts would be minor for all socioeconomic categories except traffic, which would have short-term noticeable impacts during peak building employment; beneficial economic impacts on a local and regional level equivalent to Fermi 2. Operational impacts would be minor for all socioeconomic categories.
Combination of alternatives	**SMALL**: Construction-related impacts would be limited and temporary. Along with the NGCC plant workforce, the construction and operation workforce for the wind and solar generation facilities would be smaller in size. Overall, impacts on local communities with regard to housing and services would be expected to be SMALL and temporary for construction and SMALL for operations; beneficial economic impacts from NGCC plant locally and possibly regionally, but less than those associated with an operating nuclear or coal-fired plant; degree of local and regional beneficial economic impacts from wind, solar, and CAES installations dependent on location.

Table 8.0-2 (Sheet 9 of 11)
Environmental Impacts[a] Comparison Detail

Human Health	
Proposed action	**SMALL**: Human health impacts for an operating nuclear power plant are set out in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. The results of the Fermi 2 REMP indicate no significant or measurable radiological impact attributable to Fermi 2 operations. Recent exposure measurement demonstrates that Fermi 2 workers occupational exposure is well within regulatory limits. Compliance with MIOSHA requirements for protecting workers will keep nonradiological human health impacts minor.
Decommissioning	**SMALL**: Adopting by reference the 2013 GEIS conclusion for human health.
Coal-fired alternative	**SMALL**: Given industrial safety practices and occupational regulations and standards implementation to protect workers and the installation of air pollution control equipment and compliance with waste regulations, the overall human health impacts are expected to be minor.
Natural gas-fired alternative	**SMALL**: Given industrial safety practices and occupational regulations and standards implementation to protect workers and the installation of air pollution control equipment and compliance with waste regulations, the overall human health impacts are expected to be minor.
New nuclear alternative	**SMALL**: Human health impacts for an operating nuclear power plant are set out in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. Impacts to Fermi onsite workers and the public are expected to be minor during the construction and operations phases. DTE would operate the plant in compliance with NRC and EPA standards, and programs to maintain doses ALARA would be implemented.
Combination of alternatives	**SMALL**: Regulatory controls and oversight would be protective of human health. Compliance with MIOSHA requirements for protecting workers will keep nonradiological human health impacts minor.

Table 8.0-2 (Sheet 10 of 11)
Environmental Impacts[a] Comparison Detail

Environmental Justice	
Proposed action	No disproportionate impact on minority or low-income populations is anticipated to occur from the proposed action of renewing the Fermi 2 OL.
Decommissioning	Adopting by reference the 2013 GEIS conclusion for environmental justice.
Coal-fired alternative	There are no known pathways by which disproportionately high and adverse impacts could be imposed on minority or low-income populations from the construction and operation of a coal-fired plant.
Natural gas-fired alternative	There are no known pathways by which disproportionately high and adverse impacts could be imposed on minority or low-income populations from the construction and operation of a natural gas-fired plant.
New nuclear alternative	There are no known pathways by which disproportionately high and adverse impacts could be imposed on minority or low-income populations from the construction and operation of a new nuclear plant.
Combination of alternatives	There are no known pathways by which disproportionately high and adverse impacts could be imposed on minority or low-income populations from the construction and operation of a combination of energy-producing alternatives.

Table 8.0-2 (Sheet 11 of 11)
Environmental Impacts[a] Comparison Detail

Waste Management and Pollution Prevention	
Proposed action	**SMALL**: Waste impacts for an operating nuclear power plant are set out in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. Fermi 2 has effective practices for recycling, minimizing, and managing waste. Generated hazardous and nonhazardous wastes are properly managed and disposed of at permitted offsite facilities.
Decommissioning	**SMALL**: Adopting by reference the 2013 GEIS conclusion for waste management.
Coal-fired alternative	**SMALL** to **MODERATE**: Waste impacts from construction are expected to be minor. Waste impacts during operations would be dependent on ability to recycle the solid wastes and dispose of the wastes that could not be recycled in dry ash piles in compliance with regulatory requirements. Fermi 2 has effective practices for recycling, minimizing, and managing waste that would be continued for this alternative.
Natural gas-fired alternative	**SMALL**: Construction-related wastes are expected to be properly characterized and properly disposed of at permitted offsite treatment or disposal facilities. During operations, spent SCR catalysts used to control NO_x emissions would make up the majority of the waste. DTE would properly manage and dispose of hazardous and nonhazardous waste generated during operations at permitted offsite facilities. Fermi 2 has effective practices for recycling, minimizing, and managing waste that would be continued for this alternative.
New nuclear alternative	**SMALL**: Waste impacts for an operating nuclear power plant are set out in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. DTE would properly manage and dispose of hazardous and nonhazardous waste generated during operations at permitted offsite facilities. Fermi 2 has effective practices for recycling, minimizing, and managing waste that would be continued for this alternative.
Combination of alternatives	**SMALL**: The only significant waste would be from spent SCR catalyst used for control of NO_x emissions. DTE would properly manage and dispose of hazardous and nonhazardous waste generated during operations at permitted offsite facilities. Fermi 2 has effective practices for recycling, minimizing, and managing waste that would be continued for this alternative. No significant waste would be produced from wind and solar alternatives.

a. As defined in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Footnote 3:
SMALL: Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
MODERATE: Environmental effects are sufficient to alter noticeably, but not to destabilize, any important attribute of the resource.
LARGE: Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

b. NRC did not assign a significance impact level of SMALL, MODERATE, or LARGE in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 to threatened and endangered species/EFH as discussed in Section 4.0.2; however, this issue is included collectively in ecological resources.

c. NRC did not assign a significance impact level of SMALL, MODERATE, or LARGE in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 to cultural resources as discussed in Section 4.0.2.

9.0 STATUS OF COMPLIANCE

9.1 Requirement [10 CFR 51.45(d)]

"The environmental report shall list all Federal permits, licenses, approvals, and other entitlements which must be obtained in connection with the proposed action and shall describe the status of compliance with these requirements. The environmental report shall also include a discussion of the status of compliance with applicable environmental quality standards and requirements including, but not limited to, applicable zoning and land-use regulations, and thermal and other water pollution limitations or requirements which have been imposed by Federal, State, regional, and local agencies having responsibility for environmental protection..."

9.1.1 Fermi 2 Authorizations

Table 9.1-1 provides a summary of authorizations held by Fermi 2 for current plant operations. Authorizations in this context include any permits, licenses, approvals, or other entitlements. These authorizations would continue to be in place as appropriate throughout the period of extended operation given their respective renewal schedules. Table 9.1-2 lists environmental consultations related to the renewal of the Fermi 2 OL.

9.1.2 Status of Compliance

Fermi 2 has established control measures in place to ensure compliance with the authorizations listed in Table 9.1-1, including monitoring, reporting, and operating within specified limits. Fermi 2 chemistry personnel and DTE corporate environmental personnel are primarily responsible for monitoring and overseeing that the site complies with its environmental permits and applicable regulations. Monitoring and sampling results associated with environmental programs are submitted to appropriate agencies as specified in the permits and/or governing regulations.

9.1.3 Federal, State, and Local Regulatory Standards: Discussion of Compliance

9.1.3.1 Notices of Violation

Based on review of records over the previous 5 years (2009–2013) of the various environmental programs and permits that Fermi 2 is subject to and complies with, there have been no federal (i.e., agencies other than NRC), state, or local regulatory notices of violations issued to the facility (DTE 2012g; DTE 2014).

9.1.3.2 Remediation Activities

There are no current or ongoing remediation activities or investigations occurring at the Fermi 2 site that are subject to any regulatory standards. (DTE 2012g; DTE 2013z)

9.1.3.3 Clean Water Act

9.1.3.3.1 Water Quality (401) Certification

The federal CWA, Section 401, requires an applicant for a federal license to conduct an activity that may result in a discharge into navigable waters to provide the licensing agency a certification from the state that the discharge will comply with applicable CWA requirements [33 USC 1341] or the state must have waived certification. The MDNR issued a Section 401 state water quality certification (WQC) for Fermi 2 on September 27, 1977 (Attachment A). Based on the 1977 401 WQC, the NPDES permit is the certification under Section 401 of Public Law 92-500 (Federal Water Pollution Control Act). The EPA has granted Michigan the authority to issue NPDES permits under a fully delegated NPDES program. Based on a meeting with the MDEQ in January 2013, it was re-confirmed that Fermi 2's existing NPDES permit constitutes 401 WQC (DTE 2013aa). Therefore, Fermi 2 is providing a copy of its NPDES permit as demonstration of the existing state water quality (401) certification (Attachment A).

9.1.3.3.2 NPDES Permit

The release of pollutants in wastewaters at the Fermi 2 facility is regulated and controlled through NPDES Permit No. MI0037028 issued by the MDEQ. As discussed in Section 2.2.8.2.1, there are four external outfalls identified in the NPDES permit. Monitoring results associated with these outfalls are submitted in discharge monitoring reports to the MDEQ at the frequency specified in the permit. Fermi 2's compliance with the NPDES permit over the previous 5 years (2009–2013) has been excellent. For example, there have been only four noncompliances associated with the NPDES permit, with the deviations properly addressed and reported in accordance with either the conditions outlined in the permit or as recommended by the regulatory agency. Table 9.1-3 provides a summary of noncompliances associated with Fermi 2's NPDES outfalls during the period 2009–2013.

Fermi 2 is also required to have its waste treatment or control facilities under the specific supervision and control of a person who has been certified by the Water Resources Commission as being properly qualified to operate the facilities. Fermi 2 is in compliance with this certification requirement.

Fermi 2 Mercury Pollution Prevention Program

As required by Part I.A.10 of NPDES Permit No. MI0037028, DTE maintains a pollutant minimization program (PMP) for total mercury for the Fermi 2 plant (DTE Energy 2006). The goal of the PMP is to maintain the effluent concentration of total mercury at or below 1.3 nanograms/liter. The PMP was initially applicable to discharges from NPDES-permitted Outfalls 001 and 011. However, based on years of sampling, DTE requested from MDEQ and received approval that the mercury PMP no longer be required as a condition at NPDES Outfall 001 after the 2009 monitoring period. However, because Fermi 2 retains the ability to discharge treated oily wastewater via Outfall 011, the mercury PMP is still applicable to this outfall. (DTE 2013bb)

As required by the PMP conditions established in Part I.A.10 of NPDES Permit No. MI0037028, DTE annually submits a status report of the monitoring results for the previous year, an updated list of potential mercury sources, and a summary of all actions taken to reduce or eliminate identified sources of mercury (DTE Energy 2009; DTE Energy 2010; DTE Energy 2011b; DTE Energy 2012a; DTE Energy 2013c). Fermi 2 is in compliance with the PMP.

9.1.3.3.3 Stormwater Permit

Stormwater discharges associated with industrial activities at the Fermi 2 site are regulated and controlled through NPDES Permit No. MI0037028 issued by the MDEQ. As specified in Part I, Section A.13 of NPDES Permit No. MI0037028, Fermi 2 is required to develop, maintain, and implement a SWPPP that identifies potential sources of pollution that would reasonably be expected to affect the quality of stormwater and identify the practices that will be used to prevent or reduce the pollutants in stormwater discharges. In addition, Fermi 2 is required to maintain certified stormwater operators in conjunction with this program. Fermi 2 is in compliance with the terms and conditions specified in NPDES Permit No. MI0037028 as it relates to the management of stormwater discharges (Fermi 2012f).

Fermi 2 is also subject to MDEQ's SESC program, which requires a permit to be obtained from the Monroe County drain commissioner for any earth change that disturbs one or more acres or is within 500 feet of a lake or stream. This permit specifies BMPs for the control of soil erosion and to protect adjacent properties and the waters of the state from sedimentation. Fermi 2 complies with the conditions established in the SESC permit, when applicable.

9.1.3.3.4 Sanitary Wastewaters

As discussed in Section 2.2.8.2.2, sanitary sewage is collected and pumped off site to the Monroe Metropolitan Water Pollution Control Facility for treatment and disposal. Prior to discharging to this POTW, the sanitary effluent must meet the pretreatment effluent limitations (Table 2.2-5) and other conditions specified in the Fermi 2 Industrial/Non-Domestic User Discharge Permit No. 1020. Monitoring reports are submitted to the Monroe Metropolitan Water Pollution Control Facility by Fermi 2 on a semiannual basis (Fermi 2008e; Fermi 2008f; Fermi 2009d; Fermi 2009e; Fermi 2010g; Fermi 2010h; Fermi 2011e; Fermi 2011f; Fermi 2012g; Fermi 2012h). Fermi 2 is in compliance with this permit.

9.1.3.3.5 Spill Prevention, Control and Countermeasures

The EPA's Oil Pollution Prevention Rule became effective January 10, 1974, and was published under the authority of Section 311(j)(1)(C) of the Federal Water Pollution Control Act. The regulation has been published in 40 CFR Part 112, and facilities subject to the rule must prepare and implement an SPCC plan to prevent any discharge of oil into or upon navigable waters of the United States or adjoining shorelines. Fermi 2 is subject to this rule and has a written SPCC plan that identifies and describes the procedures, materials, equipment, and facilities that are utilized at the station to minimize the frequency and severity of oil spills to meet the requirements of this rule (Fermi 2008a).

Reportable Spills [40 CFR Part 110]

Fermi 2 is subject to the reporting provisions of 40 CFR Part 110 as it relates to the discharge of oil in such quantities as may be harmful pursuant to Section 311(b)(4) of the Federal Water Pollution Control Act. Any discharges of oil in such quantities that may be harmful to the public health or welfare or the environment must be reported to the National Response Center. Based on review of records over the previous 5 years (2009–2013), there have been two spill events that resulted in a notification to the National Response Center. (DTE 2012g; DTE 2014)

In November 2012, an oil sheen was discovered at stormwater Outfall 002. The source of the sheen was from an oil water separator tank which overflowed to the ground due to the installed pumps failing to operate, and subsequently to the plant stormwater drain system, during routine flushing of a fire water header. The amount of oil spilled was estimated to be less than 10 gallons. Absorbent material was deployed to soak up and contain oil that had been spilled on the asphalt and surrounding soil, and a containment boom was deployed to prevent the release from spreading to a larger area of the canal. In addition, an offsite vendor removed residual oil within the stormwater drain system. Offsite agencies were appropriately notified in accordance with the SPCC plan. (DTE 2012g) This event also triggered a notification to the MDEQ in accordance with the Part 5 Rules as discussed in Section 9.1.3.15 of this ER.

In October 2013, during the testing of a submersible hydraulically operated water pump at the Quarry Lakes, a leak developed from a fitting in the high-pressure hydraulic lines resulting in the release of approximately 3–4 gallons of vegetable-based (rape seed oil) hydraulic fluid. Although this event still qualified as an oil spill, the spill dissipated quickly with little to no cleanup required. (DTE Energy 2013d) This event also triggered a notification to the MDEQ in accordance with the Part 5 Rules as discussed in Section 9.1.3.15 of this ER.

9.1.3.3.6 Facility Response Plan

Facilities that could reasonably be expected to cause "substantial harm" to the environment by discharging oil into or on navigable waters are required to prepare and submit facility response plans as described in 40 CFR 112.20. Because Fermi 2 has a total oil storage capacity greater than 1 million gallons and is located at a distance such that a discharge could cause injury to fish and wildlife and sensitive environments, and could shut down a public drinking water intake, Fermi 2 is subject to and complies with this requirement (Fermi 2008a).

9.1.3.3.7 Section 404 Permit

As discussed in Section 3.1.1 of this ER, wetland and open water are the predominant land-use/ land-cover types on the Fermi site. Prior to performing activities that may disturb these types of areas, a USACE Section 404 permit, along with applicable MDEQ permits, such as Part 303 Wetland Protection and Part 325 Great Lakes Submerged Lands Permits, would need to be obtained. Fermi 2 currently possesses permits issued by the USACE and MDEQ for hydraulically dredging up to 25,000 cubic yards of sediment from the intake channel each year.

In 2013, a dredging activity associated with maintenance of the intake canal was performed in an area that was not authorized under Fermi 2's current MDEQ Permit No. 11-58-0055-P and current USACE Permit No. 88-001-040-8. As directed by MDEQ, DTE submitted an after-the-fact (ATF) authorization to bring the site into compliance with the permit and associated statutory requirements. (DTE Energy 2013e; MDEQ 2013a) MDEQ issued the ATF permit June 25, 2013, to cover future dredging activities in this specific area until June 25, 2018 (MDEQ 2013b). In addition, the USACE issued an ATF permit under Nationwide Permit 3 to address this one-time event in March 20, 2013 (USACE 2013b). USACE also issued Army Permit LRE-1988-10408-L13 to cover future dredging activities in this specific area until August 22, 2023 (USACE 2013c); therefore, Fermi 2 is in compliance with the conditions established in the USACE and MDEQ permits.

9.1.3.4 Safe Drinking Water Act

As discussed in Section 2.2.2.5, potable water for Fermi 2 is supplied by the Frenchtown Water System and no further treatment for potable water usage is performed on site. Therefore, there are no activities at the Fermi 2 site subject to the Safe Drinking Water Act.

9.1.3.5 Michigan Water Use Law

Fermi 2 is subject to the water usage reporting and water usage fee requirements in Section 324.32707 of the Michigan Public Act 451, Part 327 (Great Lakes Preservation). In accordance with this requirement, Fermi 2 submits an annual water usage report and water usage fee. Fermi 2 is in compliance with this requirement (Fermi 2009f; Fermi 2010i; Fermi 2011g; Fermi 2012i; Fermi 2013c).

9.1.3.6 Clean Air Act

9.1.3.6.1 Air Permit

In November 2013, Fermi 2's Air Permit 462-99B was replaced by ROP MI-ROP-B4321-2013 (Fermi 2013a). Therefore, Air Permit 462-99B is considered inactive. However, for purposes of this ER, operation of the air emission sources associated with this permit was maintained within the opacity, fuel usage, and sulfur limits established in the station air permit (DECo 2004). In addition, Fermi 2 was required to submit an annual emissions inventory report to the MDEQ, known as the Michigan Air Emissions Reporting System, in accordance with MDEQ's regulation R336.202—Rule 2 (Annual Reports). Based on the previous 5 years (2008–2012), Fermi 2 has been in compliance with this requirement (DTE 2013cc; Fermi 2008g; Fermi 2009g; Fermi 2010j; Fermi 2011h; Fermi 2012j).

Fermi 2 is currently subject to and complies with MI-ROP-B4321-2013. This permit is for the operation of the auxiliary boilers, emergency diesel generators, combustion turbines, and portable outage generators. Operation of these air emission sources is maintained within the material (fuel sulfur content) and operational conditions (opacity and use of No. 2 diesel fuel), and emission limitations established in the station air permit (Table 2.2-8) issued by MDEQ. In

addition, Fermi 2 is required annually to submit a certification of compliance with the ROP and actual air emissions which will occur in 2014.

Because Enrico Fermi Energy Center operates two auxiliary boilers, it is also considered to be an area source of hazardous air pollutants under the CAA national emission standards for HAPs standards. Specifically 40 CFR Part 63, Subpart JJJJJJ, requires a one-time energy assessment and biennial tune-ups of the auxiliary boilers. DTE is in compliance with these requirements.

9.1.3.6.2 Chemical Accident Prevention Provisions [40 CFR Part 68]

Fermi 2 is not subject to the risk management plan requirements described in 40 CFR Part 68 because the amount of regulated chemicals present on site do not exceed the threshold quantities specified in 40 CFR 68.130.

9.1.3.6.3 Stratospheric Ozone [40 CFR Part 82]

Under Title VI of the CAA, the EPA is responsible for several programs that protect the stratospheric ozone layer. Regulations promulgated by the EPA to protect the ozone layer are in 40 CFR Part 82. Refrigeration appliances and motor vehicle air conditioners are regulated under Sections 608 and 609 of the CAA. A number of service practices, refrigerant reclamation, technician certification, and other requirements are covered by these programs. Fermi 2 is in compliance with Sections 608 and 609 of the CAA as amended in 1990 and the implementing regulations codified in 40 CFR Part 82. The program to manage stationary refrigeration appliances and motor vehicle air conditioners at Fermi 2 is described in company and site-specific procedures (Fermi 2006; DTE Energy 2012b).

9.1.3.7 Atomic Energy Act

9.1.3.7.1 Radioactive Waste

As a generator of both LLW and spent fuel, Fermi 2 is subject to and complies with provisions and requirements of the Low-Level Radioactive Waste Policy Amendments Act of 1985 and the Nuclear Waste Policy Act of 1982, as subsequently amended.

Fermi 2 also complies with permits issued by (1) Tennessee Department of Environment and Conservation (TDEC) for shipping radioactive material to a licensed disposal/processing facility within the state of Tennessee, and (2) the Utah Department of Environmental Quality (UDEQ) for shipping radioactive material to a licensed disposal facility within the state of Utah (Table 9.1-1).

9.1.3.7.2 Liquid and Gaseous Effluent Monitoring Program

Liquid and gaseous radioactive effluents are monitored as required by the Fermi 2 ODCM (Fermi 2010b, Section 3/4.11). Based on monitoring conducted over the previous 5 years (2008–2012), all site boundary doses and dose rates, and all doses to members of the public due to effluent releases, were within the limits specified by the ODCM, 10 CFR Part 20, 40 CFR Part 190, and Appendix I to 10 CFR Part 50. (Fermi 2009c; Fermi 2010f; Fermi 2011d; Fermi 2012c; Fermi

2013b) In summary, releases were generally consistent from year to year, allowing for variations based on plant operation and refueling outages, fuel status, and the scope of routine maintenance work performed. No trends were observed which were not explainable by these factors.

9.1.3.7.3 Radiological Environmental Monitoring Program

The airborne, direct radiation, waterborne, and ingestion pathways are monitored as required by the Fermi 2 ODCM (Fermi 2010b, Section 3/4.12). Based on monitoring conducted over the previous 5 years (2008–2012), review of data has shown no unusual or adverse trends and no significant or measurable radiological impact attributable to Fermi 2 operations (Fermi 2009c; Fermi 2010f; Fermi 2011d; Fermi 2012c; Fermi 2013b).

9.1.3.8 Resource Conservation and Recovery Act

9.1.3.8.1 Nonradioactive Wastes

As a generator of hazardous and nonhazardous wastes, Fermi 2 is subject to and complies with RCRA and specific regulations contained in Michigan Public Act 451, Part 111 (Hazardous Waste Management), Part 121 (Liquid Industrial Waste), and Part 115 (Solid Waste Management). As discussed in Section 2.2.8.1, Fermi 2 is typically classified as a small quantity generator; therefore, hazardous wastes routinely make up only a small percentage of the total wastes generated. As a generator of hazardous wastes, Fermi 2 maintains a hazardous waste generator identification number (Table 9.1-1), which is inclusive of Fermi 1, and annually submits to the MDEQ hazardous waste user charges based on number of shipments, generator classification, and used oil processed (Fermi 2008h; Fermi 2009h; Fermi 2010k; Fermi 2011i; Fermi 2012k).

Reportable Spills [Part 111 of Public Act 451]

Fermi 2 is subject to the reporting provisions of Part 111 of Public Act 451 as it relates to a fire, explosion, or other release of hazardous waste, which could threaten human health outside the facility boundary or when the facility has knowledge that a spill has reached surface water. Any such events must be reported to the MDEQ. Based on review of records over the previous 5 years (2009–2013), there have been no hazardous waste releases at Fermi 2 that have triggered this notification requirement (DTE 2012g; DTE 2014).

9.1.3.8.2 Mixed Wastes

As discussed in Section 2.2.3.4, low-level mixed wastes generated at Fermi 2 may consist of paint debris, oil laboratory waste, halogenated oil, grease, solvents, aerosol cans, and parts cleaner filters. Radioactive materials are regulated by the NRC under the Atomic Energy Act of 1954, and hazardous wastes are regulated by the EPA under the RCRA of 1976. As discussed in Section 2.2.8.1, MDEQ has received authorization from the EPA to administer and enforce the hazardous waste management program in Michigan. Fermi 2 operates under a conditional

exemption for low-level mixed waste storage per Michigan Administrative Code R 299.9822. Fermi 2 is in compliance with NRC and MDEQ requirements associated with this program.

9.1.3.8.3 Underground Storage Tanks

Fermi 2 has two underground fiberglass storage tanks that are located on site: one 8,000 gallon gasoline tank and one 6,000 gallon diesel fuel tank. Both tanks are a fuel source for onsite vehicles. In accordance with Michigan's underground storage regulations specified in Sections 29.2101–29.2173, these two tanks are subject to the spill and overfill control, release detection, release reporting and investigation, release response and corrective actions, and financial responsibility requirements. Fermi 2 is in compliance with these requirements (DTE 2013dd).

In addition, Fermi 2 is subject to and complies with the Section R 29.2108 requirement for having certified operators on site for operating and maintaining the underground storage tanks, and for implementing day-to-day aspects of operating, maintaining, and recordkeeping for the underground storage tanks (DTE 2013dd).

Reportable Spills [Section R 29.2129]

Fermi 2 is subject to the reporting provisions of Section R 29.2129 as it relates to discovering a release of a regulated substance at the underground storage site or in the surrounding area. Any such events must be reported to the State of Michigan. Based on review of records over the previous 5 years (2009–2013), there have been no releases at Fermi 2 that have triggered this notification requirement (DTE 2012g; DTE 2014).

9.1.3.9 Pollution Prevention Act

In accordance with RCRA Section 3002(b) and 40 CFR 262.27(a), a small or large quantity generator must certify that there is a waste minimization program in place to reduce the volume and toxicity of the waste generated to the degree determined to be economically practical. This certification statement is found in Section 15 of the uniform hazardous waste manifest and must be signed by the generator. As previously discussed in Section 2.2.8.1, Fermi 2 is meeting this requirement as procedural measures are in place to minimize hazardous waste generated to the maximum extent practical.

9.1.3.10 Federal Insecticide, Fungicide, and Rodenticide Act

Michigan's Department of Agriculture Regulation 636 (Pesticide Applicators) requires that individuals who apply pesticides (inclusive of herbicides) must be certified or registered. Pesticide usage does occur periodically at the Fermi 2 site, and may either be mechanically or hand-applied. In addition, biocide chemicals such as sodium hypochlorite utilized to control microbial organisms are injected by station personnel into service waters. Because only certified or registered personnel conduct pesticide applications on site and procedural measures exist to manage these applications (Fermi 2014a), Fermi 2 is in compliance with this regulation.

9.1.3.11 Toxic Substances Control Act

The Toxic Substances Control Act of 1976 regulates PCBs [40 CFR Part 761] and asbestos [40 CFR Part 763], both of which are present at Fermi 2. PCBs are present in some lighting ballasts and capacitors, while asbestos is present in specific types of materials such as some gaskets, packing, cable tags, and Fermi 1 siding. Fermi 2 is in compliance with the PCB and asbestos regulations applicable to the facility.

9.1.3.12 Hazardous Materials Transportation Act

Because Fermi 2 ships USDOT hazardous materials off site, the facility is subject to and complies with the applicable requirements of the Hazardous Materials Transportation Act described in 49 CFR, including the requirement to possess a current Hazardous Materials Certificate of Registration, which is maintained at the DTE corporate level (Table 9.1-1).

9.1.3.13 Emergency Planning and Community Right-to-Know Act

9.1.3.13.1 Section 312 Reporting [40 CFR Part 370]

Fermi 2 is subject to and complies with Section 312 of the Emergency Planning and Community Right-to-Know Act (EPCRA) that requires the submittal of an emergency and hazardous chemical inventory report (Tier II) to the Local Emergency Planning Commission, the State Emergency Response Commission, and the local fire department. This report which typically includes, but is not limited to, chemicals such as diesel fuel oil, gasoline, hydrogen, liquid nitrogen, lubrication oils, liquid oxygen, phosphonic acid, propane, propylene glycol, sodium hypochlorite, and sulfuric acid is submitted to these agencies annually (Fermi 2009i; Fermi 2010l; Fermi 2011j; Fermi 2012l; Fermi 2013d).

9.1.3.13.2 Section 313 Reporting [40 CFR Part 372]

Fermi 2 is subject to and complies with Section 313 of the EPCRA. Consistent with Section 313 of the EPCRA, Fermi 2 is required to submit reports each year on the amounts of chemicals the facility releases into the environment (either routinely or as a result of accidents), or otherwise managed as waste, if the threshold reporting quantity established in Section 313 for that particular chemical is met or exceeded. Based on Section 313 threshold reporting quantities, only one chemical (lead) has been reported over previous years (Fermi 2009j; Fermi 2010m; Fermi 2011k; Fermi 2012m; Fermi 2013e).

9.1.3.14 Comprehensive Environmental Response, Compensation, and Liability Act

Fermi 2 is subject to the hazardous substance release and reporting provisions of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as subsequently amended. Any release of reportable quantities of listed hazardous substances to the environment requires a report to the National Response Center and MDEQ, and subsequent written follow-up. Based on review of records over the previous 5 years (2009–2013), there have

been no releases at Fermi 2 that have triggered this notification requirement (DTE 2012g; DTE 2014).

9.1.3.15 Michigan Pollution Prevention Program

In accordance with MDEQ Part 5 Rules [Sections R 324.2001–R 324.2009], facilities that store polluting materials in excess of the threshold management quantity listed in Section R 324.2009 are required to prepare and implement a pollution incident prevention plan to address release prevention planning, secondary containment, surveillance, and release reporting requirements. Because Fermi 2 stores polluting materials in excess of the threshold management quantity, Fermi 2 is subject to and complies with these requirements (Fermi 2008a).

Reportable Spills [Section R 324.2007]

Fermi 2 is subject to the reporting provisions of Section R 324.2007 as it relates to releases of polluting materials in excess of a threshold reporting quantity. Based on review of records over the previous 5 years (2009–2013), there have been three events that resulted in a notification to the MDEQ under this regulation (DTE 2012g; DTE 2013ee; DTE 2014).

On January 26, 2011, a release of sodium hypochlorite to secondary containment was self-identified. All of the sodium hypochlorite remained inside the secondary containment and was not released to surface water, groundwater, or to a public sewer. The sodium hypochlorite was removed from the secondary containment on January 29, 2011, and the remaining product was transferred to an existing onsite tank. Because the leak was identified in early November 2010 and recovery of the material did not begin within 24 hours of the discovery of the leak, this condition triggered the notification requirements associated with MDEQ's Part 5 Rules. (DTE 2013ee)

In November 2012, an oil sheen was discovered at stormwater Outfall 002. The source of the sheen was an oil water separator tank which overflowed to the ground due to the installed pumps failing to operate, and subsequently to the plant stormwater drain system during routine flushing of a fire water header. The amount of oil spilled was estimated to be less than 10 gallons. Absorbent material was deployed to soak up and contain oil that had been spilled on the asphalt and surrounding soil, and a containment boom was deployed to prevent the release from spreading to a larger area of the canal. In addition, an offsite vendor removed residual oil within the stormwater drain system. MDEQ was appropriately notified in accordance with the Part 5 rules. (DTE 2012g)

In October 2013, during the testing of a submersible hydraulically operated water pump at the Quarry Lakes, a leak developed from a fitting in the high-pressure hydraulic lines resulting in the release of approximately 3–4 gallons of vegetable-based (rape seed oil) hydraulic fluid. Although this event still qualified as an oil spill, the spill dissipated quickly with little to no cleanup required. (DTE Energy 2013d)

9.1.3.16 Migratory Bird Treaty Act

The MBTA makes it unlawful to pursue, hunt, take, capture, kill or sell birds listed and grants protection to any bird parts including feathers, eggs, and nests. Although there are no activities associated with Fermi 2 that trigger any requirements associated with the MBTA, DTE remains in contact with the USFWS to keep abreast of future changes in the regulatory environment regarding compliance with the MBTA. (DECo 2011, Section 2.4.1.2.1; DTE 2013ff)

9.1.3.17 Endangered Species Act

Potential impacts on federally and state-listed species were considered in DTE's review and analysis in Section 4.6.6, and it was concluded that none would likely be adversely affected as a result of license renewal.

Section 7 of the ESA requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of species that are listed, or proposed for listing, as endangered or threatened. Depending on the action involved, the ESA requires consultation with the USFWS, regarding effects on non-marine species, and with National Marine Fisheries Service when marine species could be affected. Although DTE invited comment from the USFWS (Attachment B) during the development of this ER, a more structured consultation process with the USFWS may be initiated by the NRC per Section 7 of the ESA.

9.1.3.18 Michigan Natural Resources and Environmental Protection Act

The Michigan Natural Resources and Environmental Protection Act protects all species listed as threatened and endangered in Michigan. Potential impacts on state-listed species were considered in DTE's review and analysis in Section 4.6.6, and it was concluded that none would likely be adversely affected as a result of license renewal.

9.1.3.19 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act prohibits the take, transport, sale, barter, trade, import and export, and possession of eagles, making it illegal for anyone to collect eagles and eagle parts, nests, or eggs without a USFWS permit. Although bald eagles are present on site and in the vicinity of Fermi 2 as discussed in Section 3.6.8 of this ER, there are no activities associated with Fermi 2 that trigger any requirements associated with the Bald and Golden Eagle Protection Act (DTE 2013ff).

9.1.3.20 Coastal Zone Management Act

The federal Coastal Zone Management Act [16 USC 1451 et seq.] imposes requirements on applicants for a federal license to conduct an activity that could affect a state's coastal zone. The act requires the applicant to certify to the licensing agency that the proposed activity would be consistent with the state's federally approved coastal zone management program [16 USC 1456(c)(3)(A)]. NOAA has promulgated implementing regulations that indicate that the requirement is applicable to renewal of federal licenses for activities not previously reviewed by

the state [15 CFR 930.51(b)(1)]. The regulation requires that the license applicant provide its certification to the federal licensing agency and a copy to the applicable state agency [15 CFR 930.57(a)].

The NRC's Office of Nuclear Reactor Regulation has issued guidance to its staff regarding compliance with the act. This guidance acknowledges that Michigan has an approved coastal zone management program (NRC 2013e, page E-3). Fermi 2, located in Monroe County, is within the Michigan coastal zone.

Based on a meeting with MDEQ personnel (Great Lakes Shorelands Unit) in January 2013 regarding the process for obtaining a coastal zone management consistency determination, DTE was directed to submit the Fermi 2 LRA along with a letter requesting the consistency determination after the LRA is submitted to the NRC. (DTE 2013aa) Therefore, DTE will submit the Fermi 2 LRA with a letter requesting a consistency determination to the MDEQ after submittal of the LRA to the NRC in fulfillment of the regulatory requirement for submitting a copy of the coastal zone consistency certification to the appropriate state agency.

9.1.3.21 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act is not applicable to Fermi 2 because no EFH has been designated for species in Lake Erie or other Great Lakes (NRC 2013c, page D-67).

9.1.3.22 Marine Mammal Protection Act

Fermi 2 is not subject to the Marine Mammal Protection Act because the facility is located on a freshwater body.

9.1.3.23 Farmland Protection Act

The Farmland Protection Policy Act only applies to "federal programs." The term "federal program" under this act does not include federal permitting or licensing for activities on private or non-federal lands. Therefore, because license renewal is considered a federal licensing activity and Fermi 2 is located on non-federal lands, the Farmland Protection Policy Act is not applicable.

9.1.3.24 National Historic Preservation Act

Potential impacts on historic properties were considered in DTE's review and analysis in Section 4.7 and it was concluded that although historic properties are present, none would be adversely affected as a result of license renewal. As discussed in Section 9.1.4, Fermi 2 has administrative controls in place for management of cultural resources ahead of future ground-disturbing activities at the plant. These administrative controls ensure that existing or potentially existing cultural resources are adequately protected and assist Fermi 2 in meeting state and federal expectations.

Section 106 of the NHPA requires federal agencies having the authority to license any undertaking to take into account the effect of the undertaking on historic properties and to afford the ACHP an opportunity to comment on the undertaking, prior to the agency issuing the license. Although DTE invited comment from the SHPO (Attachment C) during development of this ER, a more structured consultation process with the SHPO may be initiated by the NRC per Section 106 of the NHPA.

9.1.3.25 Federal Aviation Act

Coordination with the Federal Aviation Administration (FAA) is required when it becomes necessary to ensure that the highest structures associated with a project do not impair the safety of aviation. Submission of a letter of notification (with accompanying maps and project description) to the FAA would result in a written response from the FAA certifying that no hazard exists or recommending project changes and/or the installation of warning devices such as lighting.

The site elevation is dominated by the two 400-foot high cooling towers equipped with an FAA lighting system. There are no license-renewal-related activities planned at this time to build any new structures; therefore, no new notifications to the FAA are required.

9.1.3.26 Occupational Safety and Health Act

MIOSHA governs the occupational safety and health of Fermi 2 workers. Fermi 2 and its contractors comply with MIOSHA's substantive requirements, as these are incorporated in the site's occupational health and safety practices.

In addition, Fermi 2 has obtained a Michigan Voluntary Protection Program star facility status (Michigan LARA 2014), which is provided for workplaces that have an exemplary safety and health management system.

9.1.3.27 Monroe County Ordinances

9.1.3.27.1 Zoning

Land throughout the Fermi site is zoned as "industrial" by Monroe County and as "public service" by Frenchtown Charter Township (NRC 2013c, Section 5.1.1). Because license renewal involves continuation of existing operations, Fermi 2 is expected to be consistent with and comply with all applicable land-use and zoning regulations of Monroe County and Frenchtown Charter Township. As a note, regional and state land-use plans do not contain measures that apply specifically to the Fermi site (NRC 2013c, Section 5.1.1).

9.1.3.27.2 Noise

There are no noise ordinances associated with Monroe County. The only local noise ordinance 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." (NRC 2013c, Section 2.10.2) However, as previously discussed in Section 2.1, no license-renewal-related construction activities have been identified.

9.1.4 Environmental Reviews

DTE has administrative controls in place that require environmental reviews of proposed programs, projects, or actions at the Fermi site to be conducted to ensure that impacts to air quality, water quality, waste management, chemical usage, spill prevention, or land management are properly assessed, and that actions are implemented to minimize impacts on the environment and the associated resources (DTE 2013gg; Fermi 2014a; Fermi 2014b; Fermi 2014c).

These administrative controls ensure that:

- Appropriate local, state, and/or federal permits are obtained or modified as necessary.
- BMPs are implemented to protect wetlands and sensitive ecosystems.
- Appropriate agencies are consulted on matters involving federally and state-listed threatened, endangered, and protected species, and that BMPs are implemented to minimize impacts to these species.
- Appropriate agencies are consulted on matters involving cultural resources and that BMPs are implemented to minimize impact to this resource.

In summary, DTE's administrative controls ensure that appropriate local, state, and/or federal permits are obtained or modified as necessary, that cultural resources and threatened and endangered species are protected if present, and that other regulatory issues are adequately addressed as necessary.

Table 9.1-1
Fermi 2 Environmental Permits and Compliance Status

Agency	Authority	Requirement	Number	Expiration Date	Authorized Activities
City of Monroe	Federal Water Pollution Control Act	Industrial/Non-Domestic User Discharge Permit	1020	August 31, 2015	Discharge of sanitary wastewater, oil water separator effluent, and chem basin effluent to a POTW.
MDEQ	Federal Water Pollution Control Act	NPDES Permit	MI0037028	October 1, 2014	Discharge of wastewater to waters of the state.
MDEQ	Federal Clean Air Act	Air Permit	462-99B[(a)]	None	Operation of air emission sources (auxiliary boilers, emergency diesel engines and generators, and combustion turbines).
MDEQ	Federal Clean Air Act	Renewable Operating Permit	MI-ROP-B4321-2013	November 1, 2018	Operation of air emission sources (auxiliary boilers, emergency diesel engines and generators, and combustion turbines).
MDEQ	Michigan Administrative Code R 299.9303	Hazardous Waste Generator Identification	MID087056685	None	Hazardous waste generation and shipments.
MDEQ	Part 325, Great Lakes Submerged Lands, Natural Resources and Environmental Protection Act, Public Act 451 of 1994	Great Lakes Submerged Lands Permit	11-58-0055-P	April 25, 2017	Hydraulically dredging in the intake channel.

Table 9.1-1 (Continued)
Fermi 2 Environmental Permits and Compliance Status

Agency	Authority	Requirement	Number	Expiration Date	Authorized Activities
MDEQ	Part 211, Underground Storage Tank Regulations, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended	Underground Storage Tank Registration Certificate	00010793	Updated annually	Underground storage of gasoline and diesel fuel.
MDEQ	Part 325, Great Lakes Submerged Lands, Natural Resources and Environmental Protection Act, Public Act 451 of 1994	Great Lakes Submerged Lands Permit (After-the-Fact)	13-58-0013-P	June 25, 2018	Hydraulically dredging in the general services water intake canal.
NRC	Atomic Energy Act 10 CFR Part 50	License to Operate	NPF-43	March 20, 2025	Operation of Fermi 2.
NRC	Atomic Energy Act 10 CFR Part 71	10 CFR Part 71 Quality Assurance Program Approval for NRC Packages	0526	December 31, 2019	Procurement, maintenance, repair, and use of transportation packaging for the transport of Fermi 1 and 2 radioactive materials.
SCDHEC	Act No. 429 of 1980, South Carolina Radioactive Waste Transportation and Disposal Act	Fermi 1 and 2 Radioactive Waste Transport Permit	0233-21-13	Updated annually[(b)]	Shipment of radioactive waste into South Carolina to a processing facility

Table 9.1-1 (Continued)
Fermi 2 Environmental Permits and Compliance Status

Agency	Authority	Requirement	Number	Expiration Date	Authorized Activities
TDEC	Tennessee Department of Environment and Conservation Rule 1200-2-10-32	Fermi 1 and 2 Radioactive Waste License for Delivery	T-MI004-L13	Updated annually	Shipment of radioactive material into Tennessee to a disposal/ processing facility.
UDEQ	Utah Radiation Control Rules R313-26	Fermi 1 and 2 Generator Site Access Permit	0203001330	Updated annually	Waste generator access permit for shipping radioactive wastes to a Utah land disposal facility.
USACE	Federal Water Pollution Control Act Section 404	Individual Permit	88-001-040-8	December 31, 2014	Hydraulically dredging in the intake channel.
USACE	Federal Water Pollution Control Act Section 404	Letter of Permission	LRE-1988-10408-L13	August 22, 2023	Hydraulically dredging in the general services water intake canal.
USDOT	49 CFR Part 107, Subpart G	Hazardous Materials Certificate of Registration	052412550047UW	June 30, 2015	Radioactive and hazardous materials shipments.

a. Permit inactive as of November 2013.
b. Permit obtained or renewed as needed.

Table 9.1-2
Environmental Consultations Related to License Renewal

Agency	Authority	Activity Covered	Response
U.S. Fish and Wildlife Service	Endangered Species Act Section 7 [16 USC 1636]	Requires federal agency issuing a license to consult with USFWS.	Concur that the renewal of the Fermi 2 OL will not likely adversely affect federally listed species.
Michigan Department of Natural Resources	MCL 324.36501 et seq.	Consultation with the fish and wildlife agency at the state level.	MDNR no longer conducts these reviews and has delegated these responsibilities to the MNFI.
Michigan Natural Features Inventory	MCL 324.36501 et seq.	Consultation with the fish and wildlife agency at the state level.	Adverse effects only in the event of a major nuclear accident (probability determined to be SMALL in Section 4.9.3) or due to license-renewal-related major construction activities, of which none are occurring (Section 2.1).
Michigan State Historic Preservation Office	National Historic Preservation Act Section 106	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or tribal historic preservation officer (THPO).	Communications currently ongoing with the Michigan SHPO regarding the completed Fermi 2 Phase I Cultural Resources Evaluation as it relates to license renewal.

Table 9.1-2 (Continued)
Environmental Consultations Related to License Renewal

Agency	Authority	Activity Covered	Response
Keweenaw Bay Indian Community	National Historic Preservation Act Section 106	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or THPO.	As of the time of the ER submittal, no response to DTE's consultation letter received.
Bay Mills Indian Community	National Historic Preservation Act Section 106	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or THPO.	As of the time of the ER submittal, no response to DTE's consultation letter received.
Grand Traverse Band of Ottawa and Chippewa Indians	National Historic Preservation Act Section 106	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or THPO.	As of the time of the ER submittal, no response to DTE's consultation letter received.
Lac Vieux Desert Band of Lake Superior Chippewa Indians	National Historic Preservation Act Section 106	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or THPO.	No concern on adverse effects to traditional cultural properties expressed during follow-up consultations due to site already in use.
Little Traverse Bay Bands of Odawa Indians	National Historic Preservation Act Section 106	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or THPO.	As of the time of the ER submittal, no response to DTE's consultation letter received.
Pokagon Band of Potawatomi Indians	National Historic Preservation Act Section 106	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or THPO.	As of the time of the ER submittal, no response to DTE's consultation letter received.

Table 9.1-2 (Continued)
Environmental Consultations Related to License Renewal

Agency	Authority	Activity Covered	Response
Sault Ste. Marie Tribe of Chippewa Indians of Michigan	National Historic Preservation Act Section 106	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or THPO.	As of the time of the ER submittal, no response to DTE's consultation letter received.
Hannahville Indian Community	National Historic Preservation Act Section 106	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or THPO.	As of the time of the ER submittal, no response to DTE's consultation letter received.
Nottawaseppi Huron Band of the Potawatomi	National Historic Preservation Act Section 106	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or THPO.	As of the time of the ER submittal, no response to DTE's consultation letter received.
Saginaw Chippewa Indian Tribe of Michigan	National Historic Preservation Act Section 106	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or THPO.	As of the time of the ER submittal, no response to DTE's consultation letter received.
Match-e-be-nash-she-wish Band of Pottawatomi Indians of Michigan	National Historic Preservation Act Section 106	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or THPO.	As of the time of the ER submittal, no response to DTE's consultation letter received.
Little River Band of Ottawa Indians	National Historic Preservation Act Section 106	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or THPO.	As of the time of the ER submittal, no response to DTE's consultation letter received.

Table 9.1-2 (Continued)
Environmental Consultations Related to License Renewal

Agency	Authority	Activity Covered	Response
Shawnee Tribe	National Historic Preservation Act Section 106	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or THPO.	As of the time of the ER submittal, no response to DTE's consultation letter received.
Delaware Nation	National Historic Preservation Act Section 106	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or THPO.	As of the time of the ER submittal, no response to DTE's consultation letter received.
Wyandotte Nation	National Historic Preservation Act Section 106	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or THPO.	As of the time of the ER submittal, no response to DTE's consultation letter received.
Ottawa Tribe of Oklahoma	National Historic Preservation Act Section 106	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or THPO.	As of the time of the ER submittal, no response to DTE's consultation letter received.
Walpole Island First Nation (Bkejwanong)	National Historic Preservation Act Section 106	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or THPO.	As of the time of the ER submittal, no response to DTE's consultation letter received.
Forest County Potawatomi	National Historic Preservation Act Section 106	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or THPO.	As of the time of the ER submittal, no response to DTE's consultation letter received.

Table 9.1-3
Fermi 2 NPDES Outfall Noncompliances, 2009–2013

NPDES Outfall	Noncompliance	Date
002[a]	Unauthorized discharge: Due to a leak in the auxiliary boiler blowdown line, nonradioactive water percolated up to the ground surface where it eventually discharged to Stormwater Outfall 002.	November 3, 2010
011A	Exceeded discharge limit of 1.8 MGD: Due to a significant gizzard shad intrusion, the GSW traveling screens were placed in continuous operation with backwash water directed to Outfall 011A to maintain safe and reliable operation of the plant, which resulted in an exceedance of the allowable daily maximum discharge at this outfall.	December 26, 2010
002[a]	Unauthorized discharge: Due to an oil water separator tank equipment failure, nonradioactive oily wastewater overflowed from the tank onto the ground surface where it discharged to Stormwater Outfall 002, resulting in an oil sheen.	November 1, 2012
Not applicable	Reportable spill: Due to a leak from a submersible hydraulically operated water pump at the Quarry Lakes, vegetable-based hydraulic fluid was released resulting in a discoloration of the water.	October 18, 2013

(DTE 2012g; DTE 2014; DTE Energy 2013d)

a. Stormwater outfall.

9.2 Requirement [10 CFR 51.45(d)]

"The discussion of alternatives in the report shall include a discussion of whether the alternatives will comply with such applicable environmental quality standards and requirements."

9.2.1 Alternatives

The coal, natural gas, new nuclear, and combination of alternatives discussed in Chapter 7 could probably be constructed and operated to comply with all applicable environmental quality standards and requirements. However, increasingly stringent air quality protection requirements could make the construction of a large fossil-fueled power plant infeasible in certain regional locations.