4.0 Environmental Impacts of Operation

Environmental issues associated with plant operations during the renewal term are discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS)*, NUREG-1437, Volumes 1 and 2 (NRC 1996, 1999b).[(a)] The GEIS includes a determination of whether the analysis of the environmental issues could be applied to all plants and whether additional mitigation measures would be warranted. Issues were then assigned a Category 1 or a Category 2 designation. As set forth in the GEIS, Category 1 issues are those that meet all of the following criteria:

(1) 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 characteristics.

(2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective offsite radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal).

(3) 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 not to be sufficiently beneficial to warrant implementation.

For issues that meet the three Category 1 criteria, no additional plant-specific analysis is required unless new and significant information is identified.

Category 2 issues are those that did not meet one or more of the criteria of Category 1 and, therefore, additional plant-specific review of these issues is required.

This chapter addresses the issues related to operation during the renewal term that are listed in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, and are applicable to McGuire Nuclear Station, Units 1 and 2 (McGuire). Section 4.1 addresses the issues applicable to the McGuire cooling water systems. Section 4.2 addresses issues related to transmission lines and land use. Section 4.3 addresses the radiological impacts of normal operation. Section 4.4 addresses issues related to the socioeconomic impacts of normal operation during the renewal term. Section 4.5 addresses issues related to groundwater use and quality. Section 4.6 discusses the impacts of renewal-term operations on threatened and endangered species. Section 4.7 addresses new information that was raised during the scoping period. The results of the evaluation of environmental issues related to operation during the renewal term are

(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the “GEIS” include the GEIS and its Addendum 1.

summarized in Section 4.8. Finally, Section 4.9 lists the references for Chapter 4. Appendix F lists Category 1 and Category 2 issues that are not applicable to McGuire Nuclear Station, Units 1 and 2 because they are related to plant design features or site characteristics not found at McGuire.

4.1 Cooling System

Category 1 issues in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, that are applicable to cooling system operation for McGuire during the renewal term are listed in Table 4-1. Duke Energy Corporation (Duke) stated in its environmental report (ER) that "no new information existed for the issues that would invalidate the GEIS conclusions" (Duke 2001a). The staff has not identified any significant new information during its independent review of the McGuire ER (Duke 2001a), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of the issues, the staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for each of these issues follows:

- Altered current patterns at intake and discharge structures. Based on information in the GEIS, the Commission found that

  > Altered current patterns have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of altered current patterns during the renewal term beyond those discussed in the GEIS.

- Altered thermal stratification of lakes. Based on information in the GEIS, the Commission found that

  > Generally, lake stratification has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.

Table 4-1. Category 1 Issues Applicable to Operation of the McGuire Cooling System During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
SURFACE WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)	
Altered current patterns at intake and discharge structures	4.2.1.2.1; 4.3.2.2; 4.4.2
Altered thermal stratification of lakes	4.2.1.2.3; 4.4.2.2
Temperature effects on sediment transport capacity	4.2.1.2.3; 4.4.2.2
Scouring caused by discharged cooling water	4.2.1.2.3; 4.4.2.2
Eutrophication	4.2.1.2.3; 4.4.2.2
Discharge of chlorine or other biocides	4.2.1.2.4; 4.4.2.2
Discharge of sanitary wastes and minor chemical spills	4.2.1.2.4; 4.4.2.2
Discharge of other metals in wastewater	4.2.1.2.4; 4.3.2.2; 4.4.2.2
Water use conflicts (plants with once-through cooling systems)	4.2.1.3
AQUATIC ECOLOGY (FOR ALL PLANTS)	
Accumulation of contaminants in sediments or biota	4.2.1.2.4; 4.3.3; 4.4.3; 4.4.2.2
Entrainment of phytoplankton and zooplankton	4.2.2.1.1; 4.3.3; 4.4.3
Cold shock	4.2.2.1.5; 4.3.3; 4.4.3
Thermal plume barrier to migrating fish	4.2.2.1.6; 4.4.3
Distribution of aquatic organisms	4.2.2.1.6; 4.4.3
Premature emergence of aquatic insects	4.2.2.1.7; 4.4.3
Gas supersaturation (gas bubble disease)	4.2.2.1.8; 4.4.3
Low dissolved oxygen in the discharge	4.2.2.1.9; 4.3.3; 4.4.3
Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses	4.2.2.1.10; 4.4.3
Stimulation of nuisance organisms	4.2.2.1.11; 4.4.3
HUMAN HEALTH	
Microbial organisms (occupational health)	4.3.6
Noise	4.3.7

The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, its review of monitoring programs, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of altered thermal stratification of Lake Norman during the renewal term beyond those discussed in the GEIS.

- Temperature effects on sediment transport capacity. Based on information in the GEIS, the Commission found that

  > These effects have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of temperature on sediment transport capacity during the renewal term beyond those discussed in the GEIS.

- Scouring caused by discharged cooling water. Based on information in the GEIS, the Commission found that

  > Scouring has not been found to be a problem at most operating nuclear power plants and has caused only localized effects at a few plants. It is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, its review of monitoring programs, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of scouring during the renewal term beyond those discussed in the GEIS.

- Eutrophication. Based on information in the GEIS, the Commission found that

  > Eutrophication has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, its review of monitoring programs, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of eutrophication during the renewal term beyond those discussed in the GEIS.

- Discharge of chlorine or other biocides. Based on information in the GEIS, the Commission found that

  > Effects are not a concern among regulatory and resource agencies and are not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, its evaluation of other available information including the National Pollutant Discharge Elimination System (NPDES) permit for McGuire or discussion with the NPDES compliance office. Therefore, the staff concludes that there are no impacts of discharge of chlorine or other biocides during the renewal term beyond those discussed in the GEIS.

- Discharge of sanitary wastes and minor chemical spills. Based on information in the GEIS, the Commission found that

  > Effects are readily controlled through NPDES permit and periodic modifications, if needed, and are not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, its evaluation of other available information including the NPDES permit for McGuire or discussion with NPDES compliance office. Therefore, the staff concludes that there are no impacts of discharges of sanitary wastes and minor chemical spills during the renewal term beyond those discussed in the GEIS.

- Discharge of other metals in wastewater. Based on information in the GEIS, the Commission found that

  > These discharges have not been found to be a problem at operating nuclear power plants with cooling-tower-based heat dissipation systems and have been satisfactorily mitigated at other plants. They are not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, its evaluation of other available information including the NPDES permit for McGuire or discussion with NPDES compliance office. Therefore, the staff concludes that there are no impacts of discharges of other metals in wastewater during the renewal term beyond those discussed in the GEIS.

- Water-use conflicts (plants with once-through cooling systems). Based on information in the GEIS, the Commission found that

  > These conflicts have not been found to be a problem at operating nuclear power plants with once-through heat dissipation systems.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no water-use conflicts during the renewal term beyond those discussed in the GEIS.

- Accumulation of contaminants in sediments or biota. Based on information in the GEIS, the Commission found that

  > Accumulation of contaminants has been a concern at a few nuclear power plants but has been satisfactorily mitigated by replacing copper alloy condenser tubes with those of another metal. It is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, or its evaluation of available information. Therefore, the staff concludes that there are no impacts of accumulation of contaminants in sediments or biota during the renewal term beyond those discussed in the GEIS.

- Entrainment of phytoplankton and zooplankton. Based on information in the GEIS, the Commission found that

  > Entrainment of phytoplankton and zooplankton has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, its review of monitoring programs, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of entrainment of phytoplankton and zooplankton during the renewal term beyond those discussed in the GEIS.

- Cold shock. Based on information in the GEIS, the Commission found that

  > Cold shock has been satisfactorily mitigated at operating nuclear plants with once-through cooling systems, has not endangered fish populations or been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds, and is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of cold shock during the renewal term beyond those discussed in the GEIS.

- Thermal plume barrier to migrating fish. Based on information in the GEIS, the Commission found that

  > Thermal plumes have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of thermal plumes to migrating fish during the renewal term beyond those discussed in the GEIS.

- Distribution of aquatic organisms. Based on information in the GEIS, the Commission found that

  > Thermal discharge may have localized effects but is not expected to effect the larger geographical distribution of aquatic organisms.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, its review of monitoring programs, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts on the distribution of aquatic organisms during the renewal term beyond those discussed in the GEIS.

- Premature emergence of aquatic insects. Based on information in the GEIS, the Commission found that

  > Premature emergence has been found to be a localized effect at some operating nuclear power plants but has not been a problem and is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of premature emergence during the renewal term beyond those discussed in the GEIS.

- Gas supersaturation (gas bubble disease). Based on information in the GEIS, the Commission found that

  > Gas supersaturation was a concern at a small number of operating nuclear power plants with once-through cooling systems but has been satisfactorily mitigated. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of gas supersaturation during the renewal term beyond those discussed in the GEIS.

- Low dissolved oxygen in the discharge. Based on information in the GEIS, the Commission found that

  > Low dissolved oxygen has been a concern at one nuclear power plant with a once-through cooling system but has been effectively mitigated. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, its review of monitoring programs, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of low dissolved oxygen during the renewal term beyond those discussed in the GEIS.

- Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses. Based on information in the GEIS, the Commission found that

  > These types of losses have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of losses from predation, parasitism, and disease among organisms exposed to sub-lethal stresses during the renewal term beyond those discussed in the GEIS.

- Stimulation of nuisance organisms. Based on information in the GEIS, the Commission found that

  > Stimulation of nuisance organisms has been satisfactorily mitigated at the single nuclear power plant with a once-through cooling system where previously it was a problem. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of stimulation of nuisance organisms during the renewal term beyond those discussed in the GEIS.

- Microbiological organisms (occupational health). Based on information in the GEIS, the commission found that

  > Occupational health impacts are expected to be controlled by continued application of accepted industrial hygiene practices to minimize worker exposure.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's onsite visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there is no impacts of microbiological organisms during the renewal term beyond those discussed in the GEIS.

- Noise. Based on information in the GEIS, the Commission found that

  > Noise has not been found to be a problem at operating plants and is not expected to be a problem at any plant during the license renewal term.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of noise during the renewal term beyond those discussed in the GEIS.

The Category 2 issues related to cooling system operation during the renewal term that are applicable to McGuire are discussed in the section that follows, and are listed in Table 4-2.

4.1.1 Entrainment of Fish and Shellfish in Early Life Stages

For plants with once-through cooling systems, entrainment of fish and shellfish in early life stages into cooling water systems associated with nuclear power plants is considered a Category 2 issue, requiring a site-specific assessment prior to license renewal.

Table 4-2. Category 2 Issues Applicable to Operation of the McGuire Cooling System During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
AQUATIC ECOLOGY (FOR PLANTS WITH ONCE-THROUGH COOLING POND HEAT-DISSIPATION SYSTEMS)			
Entrainment of fish and shellfish in early life stages	4.2.2.1.2; 4.4.3	B	4.1.1
Impingement of fish and shellfish	4.2.2.1.3; 4.4.3	B	4.1.2
Heat shock	4.2.2.1.4; 4.4.3	B	4.1.3
HUMAN HEALTH			
Microbiological organisms (public health)(plants using lakes or canals, or cooling towers or cooling ponds that discharge into a small river)	4.3.6	G	4.1.4

The staff independently reviewed the McGuire ER (Duke 2001a), visited the site, and reviewed the application for NPDES Permit No. NC0024392, which was issued by the North Carolina Department of Environment and Natural Resources (NCDENR) and expires February 28, 2005.

In response to requirements set by the North Carolina Department of Natural Resources and Community Development (NCDNRCD), Division of Environmental Management, Duke submitted a Clean Water Act (CWA) Section 316(b) demonstration for McGuire in October 1978 (Duke Power Company 1978).

The 316(b) study conclusions related to entrainment of juvenile fish were based on determinations of larval fish species composition and abundance evaluated on a biweekly basis when larval fish were present between 1974 and 1977 (Duke Power Company 1978). Species known to spawn in the McGuire intake cove are the introduced forage fish—threadfin shad (*Dorosoma petenense*), yellow perch (*Perca flavescens*), bluegill sunfish (*Lepomis macrochirus*), and crappie (*Poxomis* spp). The collection site was in the upper intake area, at a depth of 15 m (49 ft). Icthyoplankton losses to entrainment were primarily threadfin shad eggs and larvae. Because of the rapid threadfin shad reproduction rate and the presence of more suitable spawning habitat outside the influence of the intake structures, losses do not have a measurable effect on the standing crop of shad. Most fish species that reside in the vicinity of McGuire spawn in shallow shoreline areas and produce demersal, adhesive eggs that would not be subject to entrainment. In addition, during summer up to 45 percent of the intake water was predicted to come from the low-level intake, which pulls water from the hypolimnion at a depth of approximately 30 m (100 ft). Because there are few plankton of any sort in this cold, low-oxygen water, opportunities for larval fish entrainment were expected to be further reduced during the summer period.

After reviewing Duke's submittal, the NCDNRCD concurred with the conclusions of the study (NCDNRCD 1984) and re-issued the site's NPDES permit (dated September 1, 1984) with no additional monitoring or studies required.

The staff reviewed the available information, the results of entrainment studies, and operating history of the intake and concludes that the potential impacts of the cooling-water-intake system's entrainment of fish and shellfish in the early life stages are SMALL, and additional mitigation is not warranted.

4.1.2 Impingement of Fish and Shellfish

For plants with once-through cooling systems, impingement of fish and shellfish on debris screens of cooling water systems associated with nuclear power plants is considered a Category 2 issue, requiring a site-specific assessment prior to license renewal.

The staff independently reviewed the McGuire ER (Duke 2001a), visited the site, and reviewed the application for NPDES Permit No. NC0024392, which was issued by the NCDENR and expires February 28, 2005.

In response to requirements set by the North Carolina Department of Natural Resources and Community Development (NCDNRCD), Division of Environmental Management, Duke submitted a Clean Water Act (CWA) Section 316(b) demonstration for McGuire in October 1978 (Duke Power Company 1978).

The 316(b) study conclusions related to impingement of fish and shellfish were based on studies of fish species composition and abundance evaluated on a monthly, quarterly, or annual basis using electrofishing, gillnetting, and rotenone sampling techniques between 1974 and 1977 (Duke Power Company 1978). Based on studies conducted in the 1970s, most fish impinged at McGuire were threadfin shad, especially during the fall and winter when the introduced species is susceptible to low-temperature stress and exhibits high mortality associated with cool water temperatures. Fish swimming between the trash racks and screens were predicted to be most susceptible to impingement. However, it was predicted that fish approaching the upper-level trash racks when the low-level pumps were operating could be repelled by the low temperature and oxygen levels associated with water drawn from the hypolimnion by the low-level pumps.

After reviewing Duke's submittal, the NCDNRCD concurred with the conclusions of the study (NCDNRCD 1984) and re-issued the site's NPDES permit (dated September 1, 1984), with no additional monitoring or studies required.

An in-house impingement sampling program that began in December 2000 and is scheduled to continue through November 2002 incorporates a full count of all fishes impinged on condenser cooling water intake screens for Units 1 and 2 through a weekly sampling program (Duke 2001b). Preliminary results indicate that impingement rates at McGuire are very low. Between December 2000 and December 2001, a total of 1746 fish were impinged. Weekly impingement ranged from a low of 5 fish to a high of 455 fish. Threadfin shad was the species most commonly impinged (50 percent). Seventy-one percent of these threadfin shad were observed during a 14-day period between December 29, 2000, and January 12, 2001, when the water temperature was a low 10°C. Threadfin shad are a nonindigenous, temperate species with documented potential for cold shock morbidity and mortality when water temperatures drop below 9°C (Strawn 1963). These data suggest that the high impingement rate for threadfin shad during the 14-day period resulted from a natural die-off in the vicinity of the intake. Other species observed on the intake screens were bluegill sunfish (*Lepomis macrochirus*; 9 percent), alewife (*Alosa pseudoharengus*; 8 percent), and a combination of other species that individually comprised less than 5 percent of the total number impinged (30 percent).

Impacts to shellfish from impingement are not considered important because adult shellfish are not motile and susceptible to impingement.

The staff has reviewed the available information relative to potential impacts of the cooling water intake on the impingement of fish and shellfish and, based on this data, concludes that the impacts are SMALL, and additional mitigation is not warranted.

4.1.3 Heat Shock

For plants with once-through cooling systems, the effects of heat shock are listed as a Category 2 issue and require plant-specific evaluation before license renewal.

The staff independently reviewed the McGuire ER (Duke 2001a), visited the site, and reviewed the application for NPDES Permit No. NC0024392, which was issued by the NCDENR and expires February 28, 2005.

Duke submitted a CWA Section 316(a) demonstration for McGuire to the NCDNRCD, Division of Environmental Management, in June 1985 (Duke 1985). In summary, the NCDNRCD indicated that “the effects of the discharge from the McGuire Nuclear Station is such that the protection and propagation of a balanced indigenous aquatic community is assured in Lake Norman and that interaction of the two thermal plumes of McGuire and Marshall do not occur” (NCDNRCD 1985). Thus, the 316(a) submittal was successful and suggested that the limits in the NPDES permit were sufficient to protect the aquatic environment of Lake Norman.

Studies performed for the 316(a) submittal were initiated in 1973 and continued through submission of the document. Physical and mathematical models were developed to determine Lake Norman hydrodynamics and thermal plume characteristics in relation to station operation (Duke Power Company 1985). Both models were validated with surface-temperature data and were found to predict surface thermal plume size with a high degree of confidence. Both predicted that operation of McGuire would not result in discharge temperatures outside those allowed in the NPDES permit. Fish species collected during preoperational and operational studies indicated no substantial change in species composition over time (Duke Power Company 1985). The most significant changes were increases in specific fish taxa abundance in winter at the McGuire discharge, associated with fish congregating in the discharge plume due to increased water temperature.

McGuire currently operates under thermal limits established in its NPDES permit issued February 1, 1990. Annual aquatic monitoring to assess impacts of current thermal limits on the aquatic biota of Lake Norman is required. Results of the monitoring studies conducted in support of this requirement are reported annually to the NCDENR (formally NCDNRCD).

Monitoring of fish populations in and around the McGuire mixing zone is coordinated with the North Carolina Wildlife Resource Commission (NCWRC). The latest report covers data collected in 1999 (Duke 2000). Observed striped bass mortalities during the summer of 1999

included one mortality within the mixing zone and five mortalities in the main channel outside the mixing zone which may or may not have been related to heat shock. Shoreline electrofishing catches at the McGuire mixing zone area were only slightly lower than a reference area in total biomass and taxa composition. Hydroacoustic and purse seine sampling were also conducted in 1999, in cooperation with the NCWRC, to evaluate Lake Norman forage fish populations. According to the applicant, “fisheries data to date indicate that the Lake Norman fishery is consistent with the trophic status and productivity of the reservoir” (Duke 2000).

Based on its review of available information, the staff concludes that the potential heat shock impacts resulting from operation of the plant’s cooling water discharge system to the aquatic environment on or in the vicinity of the site are SMALL, and additional mitigation is not warranted.

4.1.4 Microbiological Organisms (Public Health)

McGuire has a once-through cooling system that uses the Catawba River as the cooling source. The Catawba River, which was impounded from Lake Norman, has an annual average flow rate of 2.38E+9 cubic meters per year (8.42E+10 cubic feet per year). This flow rate is lower than the 9E+10 cubic meters per year (3.15E+12 cubic feet per year) 10 CFR 51.53 (c)(3)(ii)(G), which requires an evaluation of potentially harmful thermophylic (heat-loving) microorganisms on human health. The flow rate raises a concern from the standpoint of the potential for enhancement of thermophylic microorganisms such as *Naegleria fowleri*. This type of organism could be a potential health concern for members of the public swimming in the cooling source and can under certain conditions cause a fatal condition called primary ameobic meningoencephalitis.

Lake Norman is a popular site for a variety of water-based recreational activities, including boating, fishing, water skiing, and swimming. All of these activities are dispersed throughout the lake, rather than being concentrated in certain areas. Swimming occurs from private boat docks and piers located around the lake shoreline and from boats anchored offshore.

The Catawba River, which was impounded to form Lake Norman, has an annual average flow rate of 75.6 m^3/s (2670 cubic feet per second). McGuire uses Lake Norman as a source for condenser cooling water. The heated effluent from the condenser discharge enters Lake Norman through a discharge canal. This canal is 1 km (0.6 mi) long with an average depth of 12.2 m (40 ft). The heated effluent mixes initially in the canal with surface waters of the main lake before stabilizing vertically and spreading over the lake surface, ultimately dissipating its heat to the atmosphere.

No swimming or boating is allowed in the canal, although fishing is permitted from its banks. Boating, fishing, and water contact activities take place at the confluence of the canal and the lake. The closest privately owned dock is located outside the 760-m (2500-ft) exclusion zone and is approximately 150 m (495 ft) from the confluence of the canal and the lake.

The state agency responsible for public health is the North Carolina Department of Health and Human Services (NCDHHS), Division of Public Health. Duke consulted with this agency as to whether there is a concern about the potential existence and concentration of *N. fowleri* in the receiving waters for the plant cooling discharge waters. By letter dated June 12, 2000, the Division of Public Health summarized the agency's position and opinion regarding the risk to individuals using Lake Norman for recreational activities and found that only a small percentage of cases of PAME have been associated with thermally enhanced waters and the disease is exceedingly rare given the millions of swimming events in warm fresh water bodies in the United States, therefore, the NCDHHS feels the risk to individuals utilizing Lake Norman for recreational activities is extremely low.

There has been no known impact of operation of McGuire on public health related to thermophylic microorganisms and consultation with the NCDHHS. This data indicates that the impact of deleterious microbiological organisms during continued operation of the plant during the renewal term is low.

Based on its review of the above information, the staff concludes that the potential impacts to public health from microbiological organisms resulting from operation of the plant's cooling water discharge system to the aquatic environment on or in the vicinity of the site are SMALL, and additional mitigation is not warranted.

4.2 Transmission Lines

The McGuire ER (Duke 2001a) describes four transmission lines with a total length of 4.5 km (2.8 mi) that connect the McGuire plant to two substations within the local transmission system. These lines are situated on 2.2 km (1.4 mi) of corridor on approximately 22.8 ha (56.2 ac). Transmission corridor rights-of-way are generally maintained on a 3-year cycle. Mechanical mowing and selective herbicide application are the standard methods of corridor maintenance. Duke cooperates with the U.S. Fish and Wildlife Service (FWS) and North Carolina Natural Heritage Program to identify Federally and State-listed species, special habitats, new findings, and other pertinent factors. This information is used to establish new and review existing vegetation management programs for the rights-of-way so that adverse impacts to these may be avoided during corridor maintenance. As noted in Section 2.1.7, the NRC staff conducted a separate evaluation of the rights-of-way from the McGuire station to the Oconee Nuclear Station, in South Carolina, under the Supplemental Generic Environmental Impact Statement for Oconee Nuclear Station (NRC 1999a).

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to the McGuire transmission lines are listed in Table 4-3. Duke stated in its ER that "no new information existed for the issues that would invalidate the GEIS conclusions" (Duke 2001a). The staff has not identified any significant new information during its independent review of the McGuire ER (Duke 2001a), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of those issues, the GEIS concluded that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-3. Category 1 Issues Applicable to the McGuire Nuclear Station Transmission Lines During the Renewal Term

ISSUE - 10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
Terrestrial Resources	
Power line right-of-way management (cutting and herbicide application)	4.5.6.1
Bird collisions with power lines	4.5.6.2
Impacts of electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, and livestock)	4.5.6.3
Floodplains and wetlands on power line right-of-way	4.5.7
Air Quality	
Air quality effects of transmission lines	4.5.2
Land Use	
Onsite land use	4.5.3
Power line right-of-way	4.5.3

A brief description of the staff's review and GEIS conclusions, as codified in Table B-1, for each of these issues follows:

- Power line right-of-way management (cutting and herbicide application). Based on information in the GEIS, the Commission found that

  > The impacts of right-of-way maintenance on wildlife are expected to be of small significance at all sites.

The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, discussions with the FWS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of power line right-of-way maintenance during the renewal term beyond those discussed in the GEIS.

- Bird collisions with power lines: Based on information in the GEIS, the Commission found that

  > Impacts (of bird collisions with power lines) are expected to be of small significance at all sites.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, discussions with the FWS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of bird collisions with power lines during the renewal term beyond those discussed in the GEIS.

- Impacts of electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock): Based on information in the GEIS, the Commission found that

  > No significant impacts of electromagnetic fields on terrestrial flora and fauna have been identified. Such effects are not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of electromagnetic fields on flora and fauna during the renewal term beyond those discussed in the GEIS.

- Floodplains and wetlands on power line right-of-way: Based on information in the GEIS, the Commission found that

  > Periodic vegetation control is necessary in forested wetlands underneath power lines and can be achieved with minimal damage to the wetland. No significant impact is expected at any nuclear power plant during the license renewal term.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, discussions with the FWS, or its

evaluation of other available information. Therefore, the staff concludes that there are no impacts on floodplains and wetlands on the power line rights-of-way during the renewal term beyond those discussed in the GEIS.

- Air quality effects of transmission lines: Based on information in the GEIS, the Commission found that

  > Production of ozone and oxides of nitrogen is insignificant and does not contribute measurably to ambient levels of these gases.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no air quality impacts of transmission lines during the renewal term beyond those discussed in the GEIS.

- Onsite land use: Based on information in the GEIS, the Commission found that

  > Projected onsite land use changes required during ... the renewal period would be a small fraction of any nuclear power plant site and would involve land that is controlled by the applicant.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no onsite land-use impacts during the renewal term beyond those discussed in the GEIS.

- Power line right-of-way (land use). Based on information in the GEIS, the Commission found that

  > Ongoing use of power line right of ways would continue with no change in restrictions. The effects of these restrictions are of small significance.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts on use of power line rights-of-way during the renewal term beyond those discussed in the GEIS.

There is one Category 2 issue related to transmission lines, and another issue related to transmission lines is being treated as a Category 2 issue. These issues are listed in Table 4-4 and are discussed in Sections 4.2.1 and 4.2.2.

Table 4-4. Category 2 Issues Applicable to the McGuire Transmission Lines During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
HUMAN HEALTH			
Electromagnetic fields, acute effects (electric shock)	4.5.4.1	H	4.2.1
Electromagnetic fields, chronic effects	4.5.4.2	NA	4.2.2

4.2.1 Electromagnetic Fields—Acute Effects

In the GEIS (NRC 1996), the staff found that without a review of the conformance of each nuclear plant transmission line with *National Electrical Safety Code* (NESC) criteria, (Institute of Electrical and Electronic Engineers [IEEE] 1997) it was not possible to determine the significance of the electric shock potential. Evaluation of individual plant transmission lines is necessary because the issue of electric shock safety was not addressed in the licensing process for some plants. For other plants, land use in the vicinity of transmission lines may have changed, or power distribution companies may have chosen to upgrade line voltage. To comply with 10 CFR 51.53(c)(3)(ii)(H), the applicant must provide an assessment of the potential shock hazard if the transmission lines that were constructed specifically to connect the plant to the transmission system do not meet the recommendations of the NESC for preventing electric shock from induced currents.

Two 230-kV transmission lines and two 525-kV transmission lines connect the McGuire Nuclear Station to the transmission system. The 230-kV lines connect McGuire Unit 1 to a 230-kV switchyard and have a length of approximately 1200 m (4000 ft). Similarly, the 525-kV lines connect Unit 2 to a 525-kV switchyard and have a length of approximately 1000 m (3300 ft). The two switchyards are adjacent to each other.

The transmission lines were constructed to meet the 1973 NESC requirements. Duke (2001a) has compared the clearances calculated using the 1973 NESC with clearance requirements of the 1997 NESC and found the 1973 NESC clearance requirements to be greater. Duke further states that measured clearances from the sagged plan and profile of each bus line indicate that the designed clearances of the transmission lines exceed the 1997 NESC vertical clearance requirements and that there have been no changes in the design voltages of the lines. Therefore, the staff concludes that the impact of the potential for electric shock is SMALL, and additional mitigation is not warranted.

4.2.2 Electromagnetic Fields—Chronic Effects

In the GEIS, the chronic effects of 60-Hz electromagnetic fields from power lines were not designated as Category 1 or 2 and will not be until a scientific consensus is reached on the health implications of these fields.

The potential for chronic effects from these fields continues to be studied and is not known at this time. The National Institute of Environmental Health Sciences (NIEHS) directs related research through the U.S. Department of Energy (DOE). A recent report (NIEHS 1999) contains the following conclusion:

> The NIEHS concludes that ELF-EMF [extremely low frequency-electromagnetic field] exposure cannot be recognized as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard. In our opinion, this finding is insufficient to warrant aggressive regulatory concern. However, because virtually everyone in the United States uses electricity and therefore is routinely exposed to ELF-EMF, passive regulatory action is warranted such as a continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures. The NIEHS does not believe that other cancers or non-cancer health outcomes provide sufficient evidence of a risk to currently warrant concern.

This statement is not sufficient to cause the staff to change its position with respect to the chronic effects of electromagnetic fields. The staff considers the GEIS finding of “not applicable” still appropriate and will continue to follow developments on this issue.

4.3 Radiological Impacts of Normal Operations

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 that are applicable to McGuire Units 1 and 2 in regard to radiological impacts are listed in Table 4-5. Duke stated in its ER (Duke 2001a) that “no new information existed for the issues that would invalidate the GEIS conclusion.” The staff has not identified any significant new information during its independent review of the McGuire ER (Duke 2001a), the staff’s site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of these issues, the staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-5. Category 1 Issues Applicable to Radiological Impacts of Normal Operations During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
HUMAN HEALTH	
Radiation exposures to public (license renewal term)	4.6.2
Occupational radiation exposures (license renewal term)	4.6.3

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for each of these issues follows:

- Radiation exposures to public (license renewal term). Based on information in the GEIS, the Commission found that

  > Radiation doses to the public will continue at current levels associated with normal operations.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of radiation exposures to the public during the renewal term beyond those discussed in the GEIS.

- Occupational radiation exposures (license renewal term). Based on information in the GEIS, the Commission found that

  > Projected maximum occupational doses during the license renewal term are within the range of doses experienced during normal operations and normal maintenance outages, and would be well below regulatory limits.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of occupational radiation exposures during the renewal term beyond those discussed in the GEIS.

There are no Category 2 issues related to radiological impacts of routine operations.

4.4 Socioeconomic Impacts of Plant Operations During the License Renewal Period

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 that are applicable to socioeconomic impacts during the renewal term are listed in Table 4-6. Duke stated in its ER (Duke 2001a) that "no new information existed for the issues that would invalidate the GEIS conclusions." The staff has not identified any significant new information during its independent review of the McGuire ER (Duke 2001a), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS (NRC 1996). For all of those issues, the staff concluded in the GEIS that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-6. Category 1 Issues Applicable to Socioeconomics During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
SOCIOECONOMICS	
Public services: public safety, social services, and tourism and recreation	4.7.3; 4.7.3.3; 4.7.3.4; 4.7.3.6
Public services: education (license renewal term)	4.7.3.1
Aesthetic impacts (license renewal term)	4.7.6
Aesthetic impacts of transmission lines (license renewal term)	4.5.8

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for each of these issues follows:

- Public services–public safety, social services, and tourism and recreation. Based on information in the GEIS, the Commission found that

  > Impacts to public safety, social services, and tourism and recreation are expected to be of small significance at all sites.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts on public safety, social services, and tourism and recreation during the renewal term beyond those discussed in the GEIS.

- Public services–education (license renewal term). Based on information in the GEIS, the Commission found that

  Only impacts of small significance are expected.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts on education during the renewal term beyond those discussed in the GEIS.

- Aesthetic impacts (license renewal term). Based on information in the GEIS, the Commission found that

  No significant impacts are expected during the license renewal term.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no aesthetic impacts during the renewal term beyond those discussed in the GEIS.

- Aesthetic impacts of transmission lines (license renewal term). Based on information in the GEIS, the Commission found that

  No significant impacts are expected during the license renewal term.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no aesthetic impacts of transmission lines during the renewal term beyond those discussed in the GEIS.

Table 4-7 lists the Category 2 socioeconomic issues, which require plant-specific analysis, and environmental justice, which was not addressed in the GEIS.

Table 4-7. Environmental Justice Analysis and GEIS Category 2 Issues Applicable to Socioeconomics During the License Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
SOCIOECONOMICS			
Housing impacts	4.7.1	I	4.4.1
Public services: public utilities	4.7.3.5	I	4.4.2
Offsite land use (license renewal term)	4.7.4	I	4.4.3
Public Services, transportation	4.7.3.2	J	4.4.4
Historic and archaeological resources	4.7.7	K	4.4.5
Environmental Justice	Not Addressed[(a)]	Not Addressed[(a)]	4.4.6

(a) Guidance related to environmental justice was not in place at the time the GEIS and the associated revision to 10 CFR Part 51 were prepared. Therefore, environmental justice are to be addressed in the licensee's ER and the staff's EIS.

4.4.1 Housing Impacts During Operations

10 CFR Part 51, Subpart A, Appendix B, Table B-1 states that impacts on housing availability are expected to be of small significance at plants located in a high-population area where growth-control measures are not in effect. SMALL impacts result when no discernible change in housing availability occurs, changes in rental rates and housing values are similar to those occurring statewide, and no housing construction or conversion is required to meet new demand (NRC 1996). Increases in rental rates or housing values in these areas would be expected to equal or slightly exceed the statewide inflation rate. No extraordinary construction or conversion of housing would occur where small impacts are foreseen.

The impacts on housing are considered to be of MODERATE significance when there is a discernible but short-lived reduction in available housing units because of project-induced in-migration. The impacts on housing are considered to be of LARGE significance when project-related demand for housing units would result in very limited housing availability and would increase rental rates and housing values well above normal inflationary increases in the state. MODERATE and LARGE impacts are possible at sites located in rural and remote areas, at sites located in areas that have experienced extremely slow population growth (and thus slow or no growth in housing), or where growth control measures that limit housing development are in existence or have been recently lifted. Because impact significance depends on local conditions, housing is a Category 2 issue (NRC 1996).

The NRC has developed a method of characterizing population that is based on two factors: "sparseness" and "proximity" (NRC 1996). "Sparseness" measures population density and city size within 32-km (20-mi) of the site. “Proximity” measures population density and city size within 80 km (50 mi). In these calculations, the density is averaged over the land area covered by the ring; large water bodies are excluded. Each factor has categories of density and city size and a matrix is used to rank the population category as low, medium or high.

An analysis of the 2000 census data indicates that 781,783 people live within a 32-km (20-mi) radius of McGuire with an average population density of 240 persons/km^2 (622 persons/mi^2). There are also four communities of 25,000 or more in this area (Table 4-8). This population density and number of cities correspond to “sparseness” Category 4, “least sparse.” An analysis of the 2000 census data also indicates that 2,309,976 people live within 80 km (50 mi) of McGuire, with an average population density of 114 persons/km^2 (294 persons/mi^2). There is one city, Charlotte, with a population of 100,000 or more in this area. This population density and number of cities correspond to “proximity” Category 4 "in close proximity." According to the GEIS, these “sparseness” and “proximity” sources indicate that McGuire is located in a high-population area.

Table 4-8. Analysis of Population “Sparseness” and “Proximity” in the Vicinity of McGuire

Radial Distance from McGuire	2000 Census Population	Population Density persons/km^2 (persons/mi^2)	Communities of 25,000 or More Persons	Cities of 100,000 or More Persons
32 km (20 mi)	781,783	240 (622)	3	1
80 km (50 mi)	2,309,976	114 (294)	6	1

McGuire is located in northwestern Mecklenburg County, approximately 27 km (17 mi) north-northwest of Charlotte, North Carolina, within the rapidly developing Charlotte metropolitan area. There are no prohibitions on the development of residential housing within Iredell, Mecklenburg, Gaston, or Lincoln counties. In the McGuire ER, Duke made the case for considering no further employment increases for its operating Units 1 and 2 rather than the standard GEIS assumption of 60 new employees per unit (Duke 2001a). Adding full-time employees to the plant workforce for the license renewal operating term would have the potential indirect effect of creating additional jobs and related population growth in the community. Section 4.14.2 of Supplement 1 to Regulatory Guide 4.2 (NRC 2000) states: “If additional workers are not anticipated there will be no impact on housing and no further analysis is required.” McGuire has approximately 1370 full-time workers employed by Duke or site contractors during normal plant operations. Duke does not anticipate that additional full-time workers will be employed during the license renewal period. Therefore, no analysis is required for this issue.

Duke has concluded that the impact on housing from the continued operation of McGuire will be SMALL and that no mitigation is required. This conclusion is based on the following:

(1) Duke does not anticipate an increase in employment during the license renewal period.

(2) The number of McGuire employees will continue to be a small percentage of the population in the adjacent counties during the period of the extended license.

The staff reviewed the available information relative to housing impacts and Duke's conclusions. Based on this review, the staff concludes that the impact on housing during the license renewal period would be SMALL, and additional mitigation is not warranted.

4.4.2 Public Services: Public Utility Impacts During Operations

Impacts on public utility services are considered SMALL if there is little or no change in the ability of the system to respond to the level of demand, and thus there is no need to add capital facilities. Impacts are considered MODERATE if overtaxing of service capabilities occurs during periods of peak demand. Impacts are considered LARGE if existing levels of service (e.g., water or sewer services) are substantially degraded and additional capacity is needed to meet ongoing demands for services. In the GEIS, the staff concluded that, in the absence of new and significant information to the contrary, the only impacts on public utilities that could be significant are impacts on public water supplies (NRC 1996).

There are no identified increases in demand of the water supplied by the Charlotte-Mecklenburg Utilities District (CMUD) during the period of extended operation at McGuire. The current water use at McGuire, from water supplied by CMUD, is 0.03 percent of the average daily demand on the CMUD system. Duke does not anticipate that additional workers will be employed during the period of extended operations. Therefore, there will be no impact to public utilities from additional plant workers.

The staff reviewed the available information relative to public utility services impacts and Duke's conclusions. Based on this review, the staff concludes that the impact on public utilities during the license renewal period would be SMALL, and additional mitigation is not warranted.

4.4.3 Offsite Land Use During Operations

Offsite land use during the license renewal term is a Category 2 issue (10 CFR 51, Subpart A, Appendix B, Table B-1). Table B-1 of 10 CFR 51 Subpart A, Appendix B notes that "significant changes in land use may be associated with population and tax revenue changes resulting from license renewal."

The GEIS (NRC 1996) defines the magnitude of land-use changes as a result of plant operation during the license renewal term as follows:

SMALL – Little new development and minimal changes to an area's land-use pattern.

MODERATE – Considerable new development and some changes to the land-use pattern.

LARGE – Large-scale new development and major changes in the land-use pattern.

Based on predictions for the case study plants, the staff projected that all new population-driven land-use changes during the license renewal term at all nuclear plants will be small because population growth caused by license renewal will represent a much smaller percentage of the local area's total population than has operations-related growth. Also, any conflicts between offsite land use and nuclear plant operations are expected to be small (NRC 1996).

Duke concluded (Duke 2001a) that there will be no adverse impact to the offsite land use from plant related population growth because they do not anticipate that additional workers will be employed at McGuire during the period of extended operations.

Tax revenue can affect land use because it enables local jurisdictions to be able to provide the public services (e.g., transportation and utilities) necessary to support development. In the GEIS, the staff states that the assessment of tax-driven land-use impacts during the license renewal term should consider (1) the size of the plant's payments relative to the community's total revenues, (2) the nature of the community's existing land-use pattern, and (3) the extent to which the community already has public services in place to support and guide development (NRC 1996).

In general, if a plant's tax payments are projected to be small relative to the community's total revenue, new tax-driven land-use changes during the plant's license renewal term would be SMALL. If the plant’s tax payments are projected to be medium to large relative to the community’s total revenue, new tax-driven land-use charges would be MODERATE. If the plant’s tax payments are projected to be a dominant source of the community’s total revenue, new tax-driven land-use changes would be LARGE.

In the GEIS, the staff states that if tax payments by the plant owner are less than 10 percent of the taxing jurisdictions revenue, the significance level would be SMALL, MODERATE if the plant tax payments represent 10 to 20 percent, and LARGE if the payments are over 20 percent of the jurisdiction’s revenues.

The payments made by McGuire represented 7 percent of the property tax revenues and 4 percent of the total revenues collected by the town of Huntersville; the percentages are

2 percent and 1 percent for Mecklenburg County (Table 2.11). No major refurbishment activities are anticipated during the period of license renewal at McGuire. The relative importance of tax payments to Mecklenburg County would slowly decline as other development occurs.

The impacts from tax driven offsite land-use changes will be SMALL for the following reasons:

(1) The significance of tax payments made by Duke for McGuire to local governments will be continue to be SMALL.

(2) The area around McGuire has pre-established land patterns of development, such as land use plans and controls. McGuire is located within the town of Huntersville's planning zone.

(3) The area around McGuire has public services in place to support and guide development. Therefore, the impact to tax-driven land-use changes from the continued payment of property taxes at McGuire is SMALL and no mitigation is required.

The staff reviewed the available information relative to land use impacts and Duke's conclusions. Based on this review, the staff concludes that the impact on land use during the license renewal period would be SMALL, and additional mitigation is not warranted.

4.4.4 Public Services: Transportation Impacts During Operations

On October 4, 1999, 10 CFR 51.53(c)(3)(ii)(J) and 10 CFR Part 51, Subpart A, Appendix B, Table B-1 were revised to clearly state that "Public Services: Transportation Impacts During Operations" is a Category 2 issue (see NRC 1999 for more discussion of this clarification). The issue is treated as such in this Supplemental Environmental Impact Statement (SEIS).

Approximately 1345 workers are currently employed at McGuire during normal plant operations (non-outage periods). The workers employed at McGuire reside primarily in Mecklenburg County and in adjoining counties. An average of 1015 additional workers are onsite during plant outage periods. The plant outages last from 30 to 40 days and occur about every 18 to 24 months. There are no identified increases in the total number of employees that will be onsite during the term of the renewed license. As shown in Table 2-3, the workers employed at McGuire reside in locations that are well distributed geographically. Therefore, with the exception of travel along North Carolina Highway 73 (NC-73), the workers would travel to the plant along many different routes.

The North Carolina Department of Transportation classifies some of the segments of NC-73 in the vicinity of McGuire as having Level of Service (LOS) D. This is a regional growth and

transportation planning issue. However, Duke has taken the following steps to minimize the impacts to local traffic:

(1) The starting times for workers at the station has been staggered to minimize the impact of plant workers entering and leaving the site.

(2) Workers leaving the site and traveling east on NC-73 are requested to use the east entrance, and those workers traveling west on NC-73 are requested to use the west entrance.

(3) Turn lanes have been added on NC-73 for plant traffic. Traveling east to west on NC-73, there are right turn lanes into the plant site at both entrances. Traveling west to east on NC-73, there is a left turn lane at the east plant entrance.

There are no identified increases in the total number of employees that will be onsite during the term of the renewed license. Increases in traffic capacity will be required to accommodate the projected growth in the population in the areas adjacent to McGuire. The growth in population in the area near McGuire will not be attributed to increases in employment at McGuire. Therefore, the impact of continued operation of McGuire on any future degradation in traffic service will be SMALL, and no mitigation measures are warranted.

The staff reviewed Duke's assumptions and resulting conclusions. The staff concludes that any impact of McGuire on transportation service degradation is likely to be SMALL and would not require additional mitigation.

4.4.5 Historic and Archaeological Resources

The National Historic Preservation Act (NHPA) requires that Federal agencies take into account the effects of their undertakings on historic properties. The historic preservation review process mandated by Section 106 of the NHPA is outlined in regulations issued by the Advisory Council on Historic Preservation at 36 CFR Part 800. Renewal of an operating license (OL) is an undertaking that could potentially affect historic properties. Therefore, according to the NHPA, the NRC is to make a reasonable effort to identify historic properties in the areas of potential effects. If no historic properties are present or affected, NRC is required to notify the State Historic Preservation Officer (SHPO) before proceeding. If it is determined that historic properties are present, the NRC is required to assess the possible adverse effects of the undertaking.

On January 26, 2000, Duke wrote to the North Carolina SHPO, requesting its comment on the McGuire license renewal process and on the determination by Duke that the continued operation of McGuire will have no effect on historic properties (Huff 2000). In a response dated

January 31, 2000, the North Carolina SHPO stated that the extension of the operating license was not an undertaking that is likely to affect historic properties; thus, no further compliance with Section 106 was required (Brook 2000).

Due to disturbance by historic agriculture and the original construction of McGuire, it is unlikely that significant historic resources are present on the McGuire site. Major refurbishment of McGuire is not required during the license renewal period, and it is anticipated that there will be no need to utilize the few currently undeveloped portions of McGuire for operations during the renewal period. Continued operation of McGuire would have a beneficial effect on any potential unknown or undiscovered historic or archaeological resources in undisturbed areas for the duration of the license renewal period by protecting the natural landscape and vegetation and by providing restricted access to the plant.

However, care should be taken by the licensee while undertaking normal operational and maintenance activities to ensure that historic properties are not inadvertently impacted. These activities may include not only operation of the plant itself, but also land management-related actions such as recreation, wildlife habitat enhancement, or maintaining/upgrading plant access roads through the plant site.

Based on the staff's cultural resources analysis and consultation, the staff concludes that the potential impacts on historic and archaeological resources are SMALL, and no additional mitigation is warranted.

4.4.6 Environmental Justice

Environmental justice refers to a Federal policy that requires that Federal agencies identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its actions on minority[(a)] or low-income populations. The memorandum accompanying Executive Order 12898 (59 FR 7629) directs Federal executive agencies to consider environmental justice under the National Environmental Policy Act of 1969 (NEPA). The Council on Environmental Quality (CEQ) has provided guidance for addressing environmental justice (CEQ

(a) The NRC guidance for performing environmental justice reviews defines "minority" as American Indian or Alaskan Native; Asian; Native Hawaiian or other Pacific Islander; or Black races; or Hispanic ethnicity. "Other" races and multi-racial individuals may be considered a separate minority category as well as multi-racial individuals (NRC 2001).

1997). Although the Executive Order is not mandatory for independent agencies, the NRC has voluntarily committed to undertake environmental justice reviews. Specific guidance is provided in NRC Office of Nuclear Reactor Regulation (NRR) Office Instruction LIC-203, "Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues" (NRC 2001).

The environmental justice review involves identifying offsite environmental impacts, their geographic locations, minority and low-income populations that may be affected, the significance of such effects, and whether they are disproportionately high and adverse compared to the population at large within the geographic area, and if so, what mitigative measures are available and which will be implemented.

For the staff's review, a minority population is defined to exist if the percentage of each minority or aggregated minority category within the census block groups[(a)] potentially affected by renewal of the McGuire OLs exceeds the corresponding percentage of minorities in a comparison area, by convention, the state, by 20 percentage points, or if the corresponding percentage of minorities within the census block group is at least 50 percent. A low-income population is defined to exist if the percentage of low-income population within a census block group exceeds the corresponding percentage of low-income population in a comparison area, by convention the state, by 20 percentage points, or if the corresponding percentage of low-income population within a census block group is at least 50 percent. For McGuire, the minority and low-income status were calculated by comparing the census block groups with the states in which, they are located i.e., North Carolina and South Carolina.

Within a 80 km (50-mi) radius of McGuire, 24.5 percent of the population are minorities. Also within that 80 km (50-mi) radius, 284 block groups with minority populations meet the definition outlined in the NRC review guidance (NRC 2001). This represents 11.5 percent of the total number of block groups within the 80-km (50-mi) radius. These populations are shown in Figure 4-1. The majority of these block groups are located in urban areas associated with Charlotte, Gastonia, Statesville, and Salisbury, North Carolina and Rock Hill, South Carolina. There are no known environmental pathways by which these minority populations would be disproportionately and adversely affected by the renewal of the McGuire license.

(a) A census block group is a combination of census blocks, which are statistical subdivisions of a census tract. A census block is the smallest geographic entity of which the Census Bureau collects and tabulates decennial census information. A census tract is a small, relatively permanent statistical subdivision of counties delineated by local committees of census data users in accordance with Census Bureau guidelines for the purpose of collecting and presenting decennial census data. Census block groups are subsets of census tracts.

Low-income households comprise 11 percent of all households located within a 80-km (50-mi) radius of McGuire. Within the 80-km (50-mi) radius, there are 88 low-income block groups. This represents 5.5 percent of the total number of block groups within the 80-km (50-mi) radius. These populations are shown in Figure 4-2.[(a)] The majority of these block groups are located in the urban areas of Charlotte and Gastonia, North Carolina, and Gaffney, South Carolina. There are no known environmental pathways by which these low-income populations would be disproportionately and adversely affected by the renewal of the McGuire license.

As part of its environmental assessment of this proposed action, Duke has determined that no significant offsite environmental impacts will be created by the renewal of the McGuire OLs. This conclusion is supported by the review performed of the Category 2 issues defined in Section 51.53(c)(3)(ii) presented in the McGuire ER (Duke 2001a). As the NRC review guidance recognizes, if no significant offsite impacts occur in connection with the proposed action, then no member of the public will be substantially affected. Therefore, there can be no disproportionately high and/or adverse impacts or effects on any member of the public, including minority and low-income populations, resulting from the renewal of the McGuire licenses.

The staff found no unusual resource dependencies or practices, such as subsistence agriculture, hunting, or fishing, through which minority or low-income populations could be disproportionately adversely impacted. In addition, the staff did not identify any location-dependent disproportionately adverse impacts affecting these minority and low-income populations. The

(a) Figure 4-2 was prepared using 1990 income data because the 2000 census income data are not yet available.

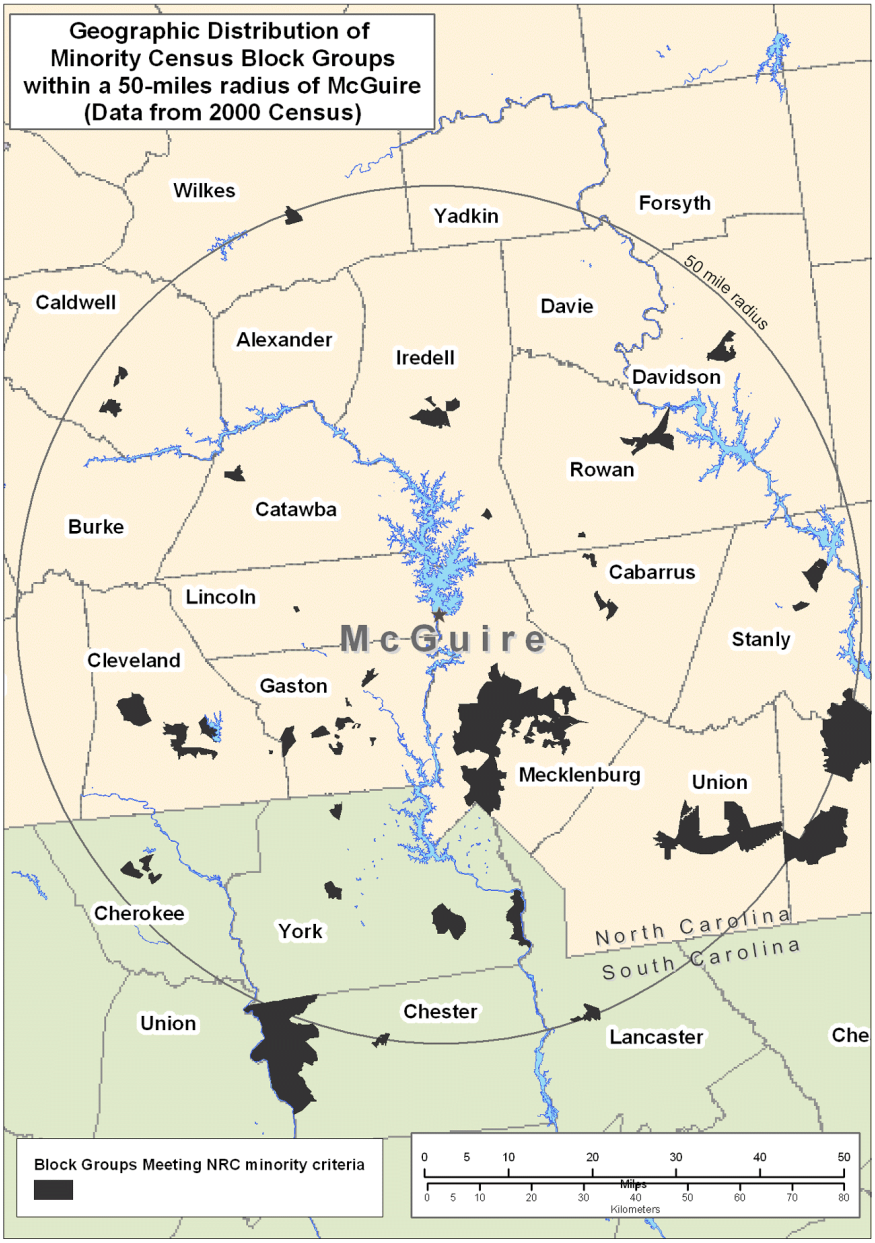

Figure 4-1.
Census 2000 Block Groups Identified as Meeting NRC Criteria for Minority Status in an 80-km (50-mi) Area Around McGuire

Figure 4-2. Census 2000 Block Groups Identified as Meeting NRC Criteria for Low-Income Status in an 80-km (50-mi) Area Around McGuire

staff concludes that offsite impacts from McGuire to minority and low-income populations would be SMALL, and no additional mitigation actions are warranted.

4.5 Groundwater Use and Quality

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 that are applicable to McGuire groundwater use and quality are listed in Table 4-9. Duke stated in its ER that "no new information existed for the issues that would invalidate the GEIS conclusions" (Duke 2001a). The staff has not identified any significant new information during its independent review of the McGuire ER (Duke 2001a), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to this issue beyond those discussed in the GEIS. For this issue, the GEIS concluded that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-9. Category 1 Issue Applicable to Groundwater Use and Quality During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
GROUNDWATER USE AND QUALITY	
Groundwater-use conflicts (potable and service water; plants that use [<]100 gpm).	4.8.1.1

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for each of these issues follows.

- Groundwater-use conflicts (potable and service water; plants that use <100 gpm).
  Based on information in the GEIS, the Commission found that

  > Plants using less than 100 gpm are not expected to cause any ground-water use conflicts.

  As discussed in Section 2.2.2, McGuire groundwater use is less than 0.068 m^3/s (100 gpm). The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no groundwater-use conflicts during the renewal term beyond those discussed in the GEIS.

  There are no Category 2 issues related to groundwater use and quality for McGuire.

4.6 Threatened or Endangered Species

Threatened or endangered species is listed as a Category 2 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. This issue is listed in Table 4-10.

Table 4-10. Category 2 Issue Applicable to Threatened or Endangered Species During the Renewal Term for McGuire

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
THREATENED OR ENDANGERED SPECIES (FOR ALL PLANTS)			
Threatened or endangered species	4.1	E	4.6

This issue requires consultation with appropriate agencies to determine whether threatened or endangered species are present and whether they would be adversely affected by continued operation of the nuclear plant during the license renewal term. NRC Staff initiated informal consultation with the FWS by letter requesting information on species protected under the Endangered Species Act that occur in the vicinity of the McGuire site. The FWS responded by letter (Cole 2001) indicating no known occurrences on the McGuire site. The presence of threatened or endangered species in the vicinity of the McGuire site is discussed in Sections 2.2.5 and 2.2.6.

4.6.1 Aquatic Species

As described in Section 2.2.5, the only Federally or State-listed threatened or endangered aquatic species with potential to inhabit waters near McGuire, the Carolina heelsplitter (*Lasmigona decorata*), is not present in the vicinity of the plant (Fridell 2001) and does not occur in impounded water. Thus, continued operation of the plant should not result in impacts to threatened or endangered aquatic species.

Based on these considerations, the staff has determined that the continued operation of McGuire and the continued maintenance of the transmission lines will not impact listed aquatic species.

4.6.2 Terrestrial Species

A field survey for species of concern was conducted within the McGuire exclusion area and on the related transmission line rights-of-way in summer and fall 2000. During this survey, no

Federally listed threatened or endangered species were located (Gaddy 2001). In a letter dated November 1, 2001, the FWS (Cole 2001) concurred with the findings of the survey report (Gaddy 2001).

However, the bald eagle is known to visit infrequently the shore of Lake Norman. Based on a preliminary review of the applicant's report and the staff's independent analysis, the NRC staff concluded that continued operation of the McGuire site and related transmission corridors under license renewal will not adversely impact the bald eagle.

Schweinitz's sunflower (*Helianthus schweinitzii*) (Federal endangered) occurs in relatively open habitats, such as road and power line rights-of-way, early successional fields, forest ecotonal margins, and forest clearings. Georgia aster (*Aster georgianus*) (Federal threatened) occurs in dry open woods along roadsides, woodland borders, old fields, and pastures (Cole 2001). Neither of these species is currently known to occur on the McGuire site nor is expected to colonize this area due to lack of appropriate soils (Gaddy 2001).

Based on a preliminary review of the applicant's report and the staff's independent analysis, the NRC staff concluded that continued operation of the McGuire site and related transmission corridors under license renewal will not adversely impact Schweinitz's sunflower and Georgia aster.

It is the staff's determination that the impact to threatened or endangered species of an additional 20 years of maintenance activities for the transmission lines would be SMALL, and additional mitigation is not required.

4.7 Evaluation of Potential New and Significant Information on Impacts of Operations During the Renewal Term

The staff has not identified new and significant information on environmental issues listed in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, related to operation during the renewal term. The staff reviewed the discussion of environmental impacts associated with operation during the renewal term in the GEIS and conducted its own independent review, including the public scoping meetings, to identify issues with significant new information. Processes for identification and evaluation of new information are described in Chapter 1.0 under License Renewal Evaluation Process.

4.8 Summary of Impacts of Operations During the Renewal Term

Neither Duke nor the staff is aware of information that is both new and significant related to any of the applicable Category 1 issues associated with the McGuire operation during the renewal term. Consequently, the staff concludes that the environmental impacts associated with these issues are bounded by the impacts described in the GEIS. For each of these issues, the GEIS concluded that the impacts would be SMALL and that "plant-specific mitigation measures are not likely to be sufficiently beneficial to warrant implementation."

Plant-specific environmental evaluations were conducted for 11 Category 2 issues applicable to McGuire operation during the renewal term and for environmental justice. For all 11 issues and environmental justice, the staff concluded that the potential environmental impact of renewal term operations of McGuire would be of SMALL significance in the context of the standards set forth in the GEIS and that mitigation would not be warranted. In addition, the staff determined that a consensus has not been reached by appropriate Federal health agencies that there are adverse effects from electromagnetic fields. Therefore, the staff did not conduct an evaluation of this issue.

4.9 References

10 CFR 51. Code of Federal Regulations Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

36 CFR 800. Code of Federal Regulations, Title 36, *Parks, Forests, and Public Property,* Part 800, "Advisory Council on Historic Preservation."

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