**Central Electric Power Cooperative, Inc.**

# McClellanville

# 115 kV Transmission Project

## Draft Environmental Impact Statement

Prepared for:

**U.S. Department of Agriculture, Rural Utilities Service**

Cooperating Agencies:

**U.S. Army Corps of Engineers**

**U.S. Forest Service**

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# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ACSR | aluminum conductor steel reinforced |
| APE | area of potential effects |
| BA | biological assessment |
| Berkeley Electric | Berkeley Electric Cooperative |
| BMP | best management practices |
| Central Electric | Central Electric Power Cooperative Inc. |
| CEQ | Council on Environmental Quality |
| CFR | Code of Federal Regulations |
| $CH_4$ | methane |
| CO | carbon monoxide |
| $CO_2$ | carbon dioxide |
| $CO_2e$ | carbon dioxide equivalent |
| CWA | Clean Water Act |
| dBA | A-weighted decibel |
| EIS | environmental impact statement |
| EMF | electric and magnetic fields |
| ESA | Endangered Species Act |
| °F | degree Fahrenheit |
| FEMA | Federal Emergency Management Agency |
| FMNF | Francis Marion National Forest |
| GHG | greenhouse gas(es) |
| GIS | Geographic Information System |
| kV | kilovolt |
| McClellanville Project | McClellanville Transmission Project |
| McLCP | McClellanville Load Control Point |
| mG | milligauss |
| NAAQS | National Ambient Air Quality Standards |
| NEPA | National Environmental Policy Act of 1969 |
| NHL | National Historic Landmark |
| NHPA | National Historic Preservation Act |
| NLCD | National Land Cover Database |

| | |
|---|---|
| NOI | Notice of Intent |
| NOx | nitrogen oxide |
| NMFS | National Marine Fisheries Service |
| NPDES | National Pollutant Discharge Elimination System |
| NWI | National Wetlands Inventory |
| NRCS | National Resources Conservation Service |
| NRHP | National Register of Historic Places |
| OPGW | optical ground wire |
| PA | Programmatic Agreement |
| PCB | polychlorinated biphenyls |
| $PM_{2.5}$ | particles with a diameter less than or equal to a nominal 2.5 micrometers |
| $PM_{10}$ | particles with a diameter less than or equal to a nominal 10 micrometers |
| Project | McClellanville Transmission Project |
| psi | pounds per square inch |
| ROW | right(s)-of-way |
| RUS | U.S. Department of Agriculture, Rural Utilities Service |
| SAIDI | System Average Interruption Duration Index |
| SAIFI | System Average Interruption Frequency Index |
| SCADA | Supervisory Control and Data Acquisition |
| SCDHEC | South Carolina Department of Health and Environmental Control |
| SCDNR | South Carolina Department of Natural Resources |
| SCDOT | South Carolina Department of Transportation |
| SCE&G | South Carolina Electric and Gas |
| SCPSA | South Carolina Public Service Authority |
| SC SHPO | South Carolina State Historic Preservation Office |
| SMS | Scenery Management System |
| $SO_2$ | sulphur dioxide |
| SUP | special use permit |
| TCP | Traditional Cultural Properties |
| TMDL | total maximum daily load |

| | |
|---|---|
| USACE | U.S. Army Corps of Engineers |
| USC | United States Code |
| USDA | U.S. Department of Agriculture |
| USEPA | U.S. Environmental Protection Agency |
| USFS | U.S. Department of Agriculture, Forest Service |
| USFWS | U.S. Fish and Wildlife Service |
| WMA | Wildlife Management Area |

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# 1. INTRODUCTION

Central Electric Power Cooperative Inc. (Central Electric) is an electrical transmission cooperative located in Columbia, South Carolina. Central Electric serves 20 member cooperatives throughout South Carolina, including Berkeley Electric Cooperative (Berkeley Electric), with service areas located in Berkeley, Charleston, and Dorchester counties.

Central Electric and Berkeley Electric propose to construct, operate, and maintain a new 115 kilovolt (kV) electrical transmission line and substation in eastern South Carolina near the town of McClellanville (hereinafter referred to as the McClellanville Transmission Project or Project). This chapter presents an overview of the Project and describes the McClellanville Transmission Line and Substation (Section 1.1), the purpose and need for the Project (Section 1.2), and the regulatory framework and authorizing actions that are pertinent to the Project (Section 1.3).

## 1.1 Project Overview and Description

Central Electric proposes to construct, operate, and maintain a new 115 kV electrical transmission line that would bring service to the proposed McClellanville Substation and would serve Berkeley Electric's members in the McClellanville area. The new transmission line would originate at one of two potential locations near the Winyah Generation Station. The first location is at the Belle Isle Substation on U.S. Highway 17 and the second possible location is a tap point along the existing Winyah-Belle Isle 115 kV transmission line. The transmission line would terminate at the proposed McClellanville Substation, located in McClellanville, South Carolina. Approximately 15 to 20 miles of new 115 kV transmission line would need to be constructed along with a new 115 kV substation. The overall Project Area identified encompasses parts of Georgetown and Charleston counties in South Carolina. The overall existing Project elements and Project area are shown on Figure 1-1.

Central Electric has requested financial assistance from the U.S. Department of Agriculture (USDA), Rural Utilities Service (RUS) to construct the Project. RUS has determined that the agency's decision to finance the Project would constitute a major federal action that may have a significant impact upon the environment within the context of the National Environmental Policy Act of 1969 (NEPA). The USDA RUS is the lead federal agency for the Project with the U.S. Forest Service (USFS) and the U.S. Army Corps of Engineers (USACE) serving as cooperating agencies. RUS has prepared this environmental impact statement (EIS) in compliance with the requirements of NEPA and the Council on Environmental Quality (CEQ) regulations for

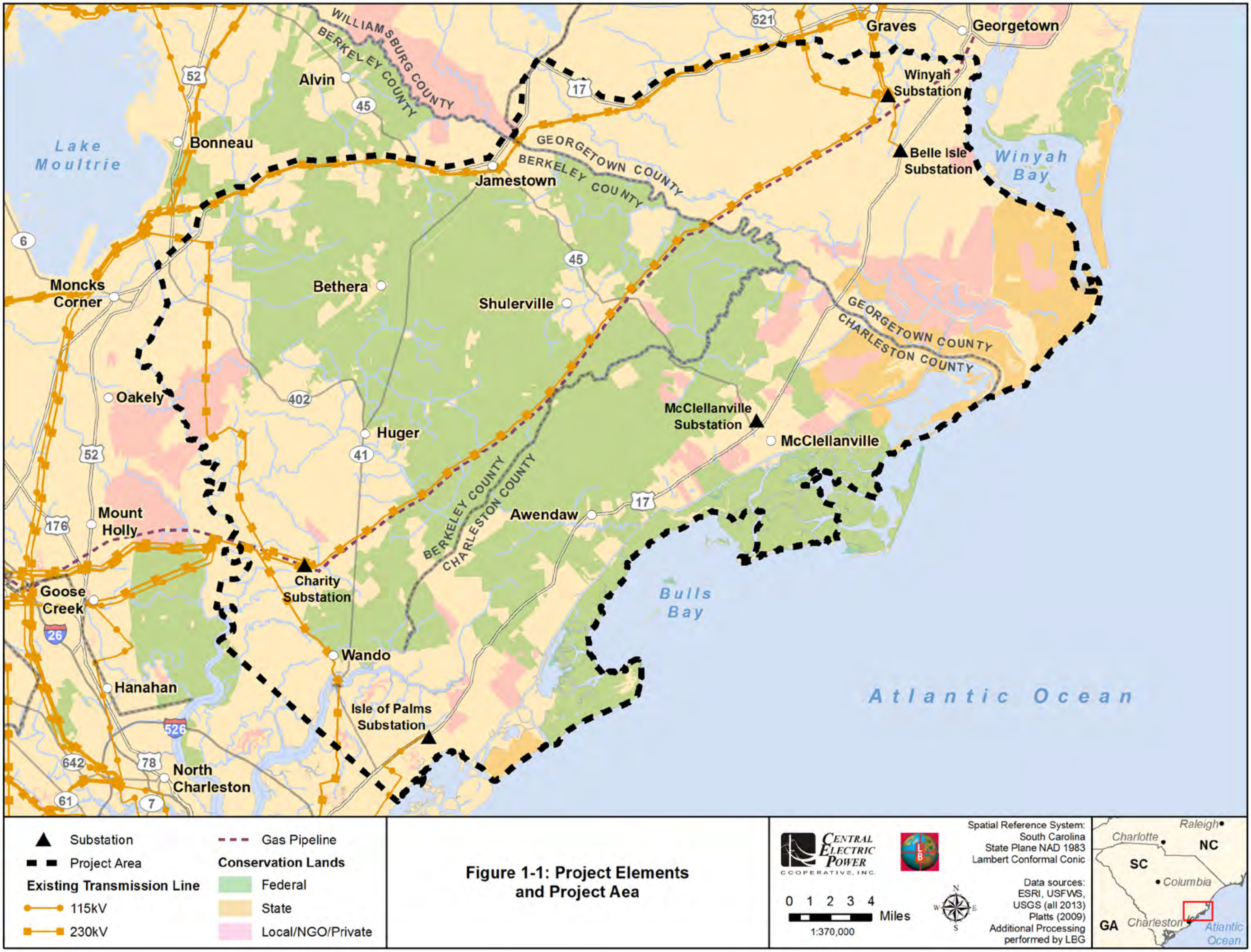



**Figure 1-1: Project Elements and Project Aea**

implementing NEPA (40 Code of Federal Regulations [CFR] §§1500–1508). RUS is serving as the lead federal agency for compliance with Section 106 of the National Historic Preservation Act (NHPA) for historic properties and consultation for Section 7 of the Endangered Species Act (ESA) for threatened and endangered species.

In addition to compliance with all applicable federal regulations, permits may be required by the state of South Carolina, such as National Pollution Discharge Elimination System (NPDES) permits. The Coastal Zone Management law states it is policy to site energy conversion facilities and to route transmission facilities in an orderly manner compatible with environmental preservation and the efficient use of resources, including existing rights-of-way (ROWs) (South Carolina Department of Health and Environmental Control [SCDHEC] 1979).

RUS has notified and invited the South Carolina State Historic Preservation Office (SC SHPO), Native American tribes, federal and state agencies, and the general public to participate in Section 106 consultation. The following groups, including Native American tribes, have agreed to participate as consulting parties:

- Catawba Indian Nation
- USFS, Francis Marion National Forest (FMNF)
- USACE, Charleston Regulatory District
- National Park Service
- Gullah Geechee Cultural Heritage Corridor Commission
- Lowcountry Rice Project
- Fairfield Plantation
- Hopsewee Plantation
- Oaks Plantation
- White Oak Forestry Corporation

This draft EIS was prepared to meet the following key objectives:

- Identify and assess potential impacts on the natural and human environment that would result from the construction and operation of the Project

- Describe and evaluate reasonable alternatives, including a no-action alternative, for the Project that would avoid or minimize adverse effects on the environment

- Identify specific mitigation measures to minimize environmental impacts

## 1.2 Purpose and Need for Action

The following section describes the purpose and need for the McClellanville Project. The purpose and need is described with reference to the entities involved in developing the Project. Central Electric and Berkeley Electric, RUS, USFS, and USACE will use this analysis as a factor in making decisions related to approving, authorizing or permitting various components of the Project. RUS, the lead agency, will determine whether or not to provide financial assistance for the Project. The USFS and USACE are cooperating agencies on the EIS. The USFS has primary responsibility to issue special use authorizations for construction, operation, and maintenance of a transmission line on National Forest System lands. The USFS will use this analysis to make decisions related to requirements for special use permits (SUPs), which may be submitted to construct, maintain, and operate a transmission line through lands administered by USFS in the FMNF. USACE has primary responsibility to issue permits for work in, over, or otherwise affecting navigable waters of the United States as well as authorization to discharge dredged or fill material into jurisdictional wetlands.

### 1.2.1. Central Electric Purpose and Need

Central Electric, an electric transmission cooperative, provides transmission service from the bulk transmission system to South Carolina's 20 retail electric cooperatives. Central Electric was incorporated and organized in 1948 with offices in Columbia, South Carolina. Central Electric designs and builds transmission lines that connect the state's bulk transmission system (the coordinated and integrated Central Electric/South Carolina Public Service Authority [SCPSA] system) and member system substations. Central Electric owns 725 miles of transmission lines, which are maintained by either Santee Cooper or New Horizons Electric Cooperative.

Berkeley Electric, a member distribution electric cooperative of Central Electric, was formed in 1940 to bring electric service to rural areas of coastal South Carolina. Berkeley Electric owns and operates more than 5,000 miles of distribution line serving more than 80,000 accounts in Berkeley, Charleston, and Dorchester counties.

Berkeley Electric currently takes electric service from a pole-mounted, metering point near the town of McClellanville. The metering point is on a 22-mile long, 25 kV distribution line owned and operated by South Carolina Electric and Gas (SCE&G). From the McClellanville metering point, Berkeley Electric's own distribution line then runs an additional 18 miles. Together, SCE&G and Berkeley Electric distribution lines constitute approximately 40 circuit miles. This one circuit provides service to 1,100 of Berkeley Electric's cooperative members (Figure 1-2).

The existing 40-mile-long circuit suffers from issues related to poor reliability and power quality, resulting in substandard electric service for Berkeley Electric's cooperative members in the McClellanville area. Additionally, the current levels of demand cannot readily accommodate future load growth in this area. Studies of system reliability (RUS 2010a) indicate that a new 115 kV transmission line and associated substation is needed to serve the long-term needs of this area of coastal South Carolina by increasing capacity to distribute electricity and enhance the reliability of the delivery system. The purpose of the proposed Project is to identify which alternative would be most appropriate, while minimizing potential impacts. The need for the Project is to address system reliability and power quality issues resulting from the current use of the aging distribution line, as detailed below.

### Project Area Reliability Issues

System reliability can be measured in two ways, the System Average Interruption Duration Index (SAIDI) and the System Average Interruption Frequency Index (SAIFI). SAIDI measures, in minutes, the average duration of an outage by the average customer. SAIFI measures the frequency of those outages by the average customer. SAIDI and SAIFI figures reported by Central Electric (2010) indicate that Berkeley Electric's cooperative members located north and west of McClellanville experience the greatest frequency and duration of outages in the service territory, resulting in inadequate and unreliable electric service.

The reliability of electric service at Berkeley Electric's McClellanville source is worse than at any other service point owned and operated by Berkeley Electric. Table 1-1 shows that the SAIDI and the SAIFI for the McClellanville circuit are almost two times worse than the typical Berkeley Electric source. This means that customers served by the McClellanville circuit experience twice as many outages, and those outages last twice as long compared to other Berkeley Electric customers. It also should be noted in 2012, the most recent year where data are available, the McClellanville Circuit experienced the worst reliability numbers in recent history, while the Berkeley Electric Circuits as a whole experienced the best years.

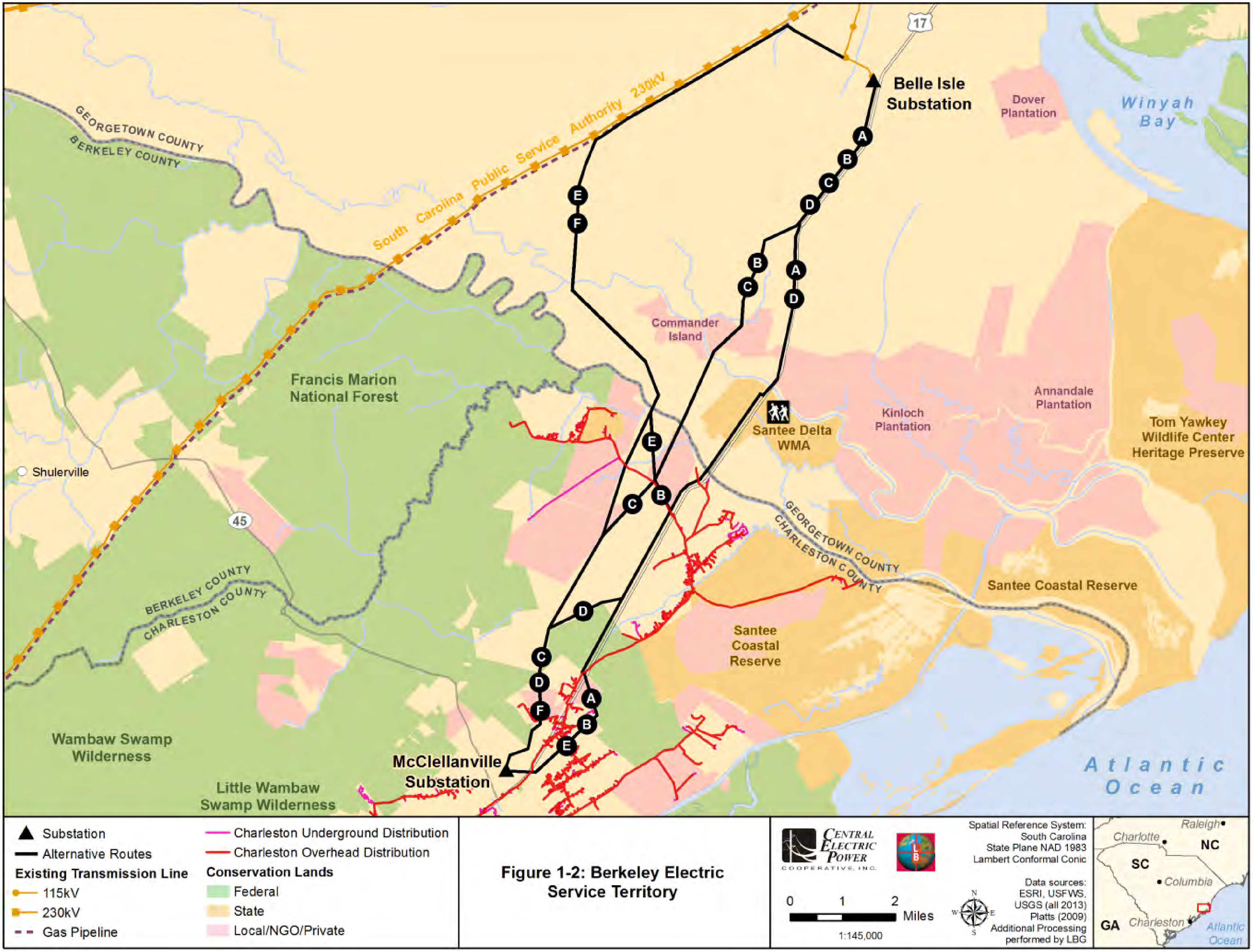



Figure 1-2: Berkeley Electric Service Territory

### Table 1-1: Berkeley Electric Reliability Indices — McClellanville Circuit

| | McClellanville Circuit | | Average Berkeley Electric Circuit[a] | |
|---|---|---|---|---|
| **Year** | **SAIDI** | **SAIFI** | **SAIDI** | **SAIFI** |
| 2012 | 532 | 7.69 | 110 | 1.46 |
| 2011 | 341 | 3.64 | 161 | 1.73 |
| 2010 | 370 | 6.19 | 167 | 2.04 |
| 2009 | 256 | 5.29 | 185 | 2.38 |
| 2008 | 510 | 9.31 | 387 | 4.79 |
| 2007 | 358 | 6.01 | 219 | 3.39 |
| 2006 | 291 | 3.97 | 200 | 2.64 |
| **2006–2012 average** | **379** | **6.01** | **204** | **2.63** |

[a] AW-01 Circuit excluded

Replacing the McClellanville metering point with a new substation served by a new 115 kV transmission line would improve the reliability of electric service provided to cooperative members in this area to a level comparable to that experienced by other Berkeley Electric cooperative members.

There are three ways to improve the reliability indices: 1) reduce the duration of the outages; 2) reduce the number of outages that occur; or 3) reduce the number of cooperative members affected. The proposed Project would deliver power via the proposed 115 kV transmission line to the proposed McClellanville Substation. At the proposed McClellanville Substation, Berkeley Electric would be able to separate the existing distribution line into three circuits to serve the customers in the McClellanville area. Serving the same area with three circuits versus one circuit would reduce the number of customers affected by an outage on average and bring the frequency and duration of outages more in line with other circuits on Berkeley Electric's system.

This reduction would be possible for several reasons. First, because electric service to this area would be from the new 115 kV transmission line, it is expected that this alone should bring an increase in reliability. Transmission lines are typically designed to a higher standard than distribution circuits; therefore, they should experience fewer outages than a typical distribution line. Second, because customers would be served by one of three new distribution circuits from the new substation, any outage on a single distribution circuit would not affect the remaining circuits, effectively reducing the impacted number of customers by two-thirds for distribution related outage events. Third, the length of distribution line would be significantly less than the existing 40-mile-long line, enabling a quicker identification of the problem area and, therefore, a significantly quicker response.

### Voltage Levels

Berkeley Electric is responsible for providing voltage levels within industry standards to its cooperative members. The most recent standard is American National Standards Institute C84.1-2006, the American National Standard for Electric Power Systems and Equipment—Voltage Ratings (60 Hertz). Berkeley Electric uses voltage regulators—electrical devices that automatically step voltages up or down to help keep voltages within the required ranges for members served from one of their distribution lines.

Typically, Berkeley Electric has one set of voltage regulators installed on each circuit at its substations. In the case of the McClellanville metering point and distribution line, two sets of voltage regulators installed by SCE&G and Berkeley Electric boost line voltages to acceptable levels. This use of additional voltage regulators will become less effective with even the smallest amount of load growth in the McClellanville area. In this service area, load growth on both Berkeley Electric's and SCE&G's distribution lines directly affects the voltage level delivered to both utilities' customers.

A new transmission line would provide the needed voltage support so that the use of voltage regulators should be significantly reduced, if not eliminated, after construction. This would eliminate concerns regarding potential future reduction of effectiveness of these devices.

### Voltage Sags

Voltage sags can occur when an object, such as a tree limb, makes contact with the distribution line. While every reasonable effort is made to keep distribution line ROWs as clear as possible, the number and magnitude of voltage sags are directly proportional to the length of the distribution line. This is due to the increased amount of "exposure" of the line to the environment and the technical characteristics of the conductor. When voltage sags occur, lights can either dim or go out, motors can stall or overheat, and computers can shut down or fail. As customers continue to add newer, more sensitive electronic equipment, voltage sags and power quality become greater concerns.

As stated above, a new transmission circuit would provide the needed voltage support so voltage sags, although still possible under certain outage scenarios, should be significantly reduced.

### Load Forecast

Since 2000, the population of the McClellanville area has grown by about 3.5 percent. The estimated annual growth rate for the next 20 years is approximately 2.2 percent (Table 1-2).

**Table 1-2: McClellanville Substation Projected Loads**

| Year | Historical Peaks (kW) (plus estimated load with new cut point) | Future Estimates (kW) (based on 2001 peak)[a] |
|---|---|---|
| 2010 | 7,428 | -- |
| 2011 | 7,059 | -- |
| 2012 | 7,103 | -- |
| 2013 | -- | 8,940 |
| 2014 | -- | 9,144 |
| 2015 | -- | 9,353 |
| 2016 | -- | 9,566 |
| 2017 | -- | 9,785 |
| 2018 | -- | 10,008 |
| 2019 | -- | 10,237 |
| 2020 | -- | 10,470 |
| 2021 | -- | 10,709 |
| 2022 | -- | 10,954 |
| 2023 | -- | 11,204 |
| 2024 | -- | 11,460 |
| 2025 | -- | 11,721 |
| 2026 | -- | 11,989 |
| 2027 | -- | 12,263 |
| 2028 | -- | 12,543 |
| 2029 | -- | 12,829 |
| 2030 | -- | 13,122 |
| 2031 | -- | 13,421 |
| 2032 | -- | 13,728 |
| 2033 | -- | 14,041 |

[a] Based on traditional load growth. Does not account for possible Sewee bubble growth.

Although the system is able to accommodate the existing load, Central Electric (2010) estimates that even a low growth rate would exceed the existing power line’s capacity to serve the future load. This exceedance would be most prevalent during hot summer or cold winter periods when customers are attempting to cool or heat their homes, respectively.

**Transmission Line Efficiency**

In 2013, the Secretary of Energy stated the most important energy issue to resolve in the United States was the wasting of energy. He proposes that energy efficiency be a top priority when designing new projects. The use of higher voltage lines to serve the customers of McClellanville would reduce line losses (energy lost during transmission) along the length of the line[1] and increase the efficiency of power delivery to existing customers. Other operational advantages and efficiencies would be derived by adding the proposed substation. These advantages include the ability to shift load from other circuits or substations during outages or to handle growth in other areas.

### 1.2.2. Rural Utilities Services

RUS is authorized to make loans and loan guarantees to finance the construction of electric distribution, transmission, and generation facilities, including system improvements and replacements required to furnish and improve electric service in rural areas, as well as demand side management, energy conservation programs, and on-grid and off-grid renewable energy systems. Central Electric is requesting financing assistance from RUS for the proposed 115 kV transmission line. Financing for the purchase of the McClellanville Substation property was requested separately and approved in 2003 prior to the initiation of the proposed transmission line. RUS' proposed federal action is to decide whether to provide financing assistance for the Project. Completing the NEPA process is one requirement, along with other technical and financial considerations, in processing Central Electric's application.

The Rural Electrification Act of 1936, as amended (7 United States Code [USC] §901 et seq.), generally authorizes the Secretary of Agriculture to make rural electrification and telecommunication loans, including specifying eligible borrowers, references, purposes, terms and conditions, and security requirements. RUS' agency actions include the following:

- Provide engineering reviews of the purpose and need, engineering feasibility, and cost of the proposed Project,

[1] A certain portion of electric power is lost to resistance that is transformed in to heat during power delivery. This portion can be reduced when power is delivered at higher voltages.

- Ensure that the proposed Project meets the borrower's requirements and prudent utility practices,
- Evaluate the financial ability of the borrower to repay its potential financial obligations to RUS,
- Review and study the alternatives to mitigate and improve transmission reliability issues,
- Ensure that adequate transmission service and capacity are available to meet the proposed Project needs, and
- Ensure that NEPA and other environmental requirements and RUS environmental policies and procedures are satisfied prior to taking a federal action.

### 1.2.3. U.S. Forest Service

All of the alternative routes cross a portion of USFS' FMNF. However, the acreage of USFS property crossed is small for all the alternative routes and ranges from less than 1 acre to approximately 11 acres. USFS has primary responsibility to issue special use authorizations for ROWs on National Forest System lands under the Federal Land Policy Management Act. USFS will use this analysis to make a decision related to the approval of any SUP application submitted by Central Electric to construct, maintain, and operate a transmission line through lands administered by USFS on the FMNF.

The FMNF Forest Supervisor will issue a decision on whether or not to authorize an SUP to Central Electric if the proposed Project crosses National Forest System lands. The USFS proposed action is to authorize and subsequently issue an SUP with terms and conditions for the construction, maintenance, and operation of the proposed Project through lands administered by USFS on the FMNF.

### 1.2.4. U.S. Army Corps of Engineers

USACE has primary responsibility to issue permits for work in, over, or otherwise affecting navigable waters of the United States as defined at 33 CFR §322.2 as well as authorization responsibility for applicants to discharge dredged or fill material into jurisdictional wetlands (defined under 33 CFR §323.3). USACE could use this analysis to make any decisions related to the issuance of a Section 10 permit under the Rivers and Harbors Act of 1899 (33 USC §403) or a Section 404 permit under the Clean Water Act (CWA) (33 USC §1251 *et seq*. (1972). Section 10 or 404 permit applications, if needed, would be submitted to USACE once final design of the Project is completed. USACE, Charleston District Regulatory Division, would process permit applications.

## 1.3 Regulatory Framework/Authorizing Actions

This section summarizes federal, state, and local laws, regulations, associated permits, approvals, and coordination that are applicable to the proposed Project. Table 1-3 summarizes the permits, regulations, or consultations and other required actions that would be necessary for the Project.

**Table 1-3: Permits, Regulations or Consultations Needed for Listed Agencies and Required Actions Necessary for the Project**

| Agency | Law or Regulation | Agency Action |
|---|---|---|
| Rural Utilities Service (RUS) | National Environmental Policy Act (NEPA) | - Review and approve NEPA documentation.<br>- Ensure that all actions associated with the proposed Project are in compliance with all applicable federal, state, and local regulations.<br>- Decide whether to approve financing assistance for the Project.<br>- Sign Record of Decision. |
| | RUS Environmental Policies and Procedures | - Consult with appropriate agencies to provide decision makers with information to ensure that decisions and actions are based on an understanding of environmental consequences. |
| | Executive Order 11988, *Floodplain Management* | - Avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of flood plains. |
| | Executive Order 11990, *Protection of Wetlands* | - Ensure that short- and long-term impacts on wetlands are avoided where practical alternatives exist. |
| | Executive Order 13112, *Invasive Species* | - Do not authorize, fund, or carry out actions that are likely to cause or promote the introduction or spread of invasive species in the United States.<br>- Implement all feasible and prudent measures to minimize risk of harm from introduction or spread of invasive species. |
| U.S. Army Corps of Engineers | Clean Water Act, Section 404 | - Regulate and provide permits for the discharge of dredged or fill material in jurisdictional wetlands of waters of the United States. |

| Agency | Law or Regulation | Agency Action |
|---|---|---|
| | Rivers and Harbors Act Section 10 | - Regulate and provide permits for structures or work in, over, or otherwise affecting navigable waters of the United States. |
| U.S. Forest Service | Federal Land Policy Management Act | - Implement operating plans.<br>- Grant easement for the right-of-way across lands within the FMNF. |
| | National Forest Management Act | - Grant a special use permit for location of transmission line under the Revised Land and Resources Management Plan Francis Marion National Forest. |
| | Executive Order 13007<br>Indian Sacred Sites on Federal Lands | - Avoid adverse effects to sacred sites.<br>- Provide access to sacred sites to Native Americans for religious practices. |
| U.S. Fish and Wildlife Service/National Marine Fisheries Service | Endangered Species Act Section 7 | - Avoid/minimize impacts to threatened and endangered species and critical habitat.<br>- Provide Section 7 consultation.<br>- Review the biological assessment.<br>- Provide a biological opinion, if necessary. |
| | Migratory Bird Treaty Act | - Avoid/minimize impacts to migratory birds and habitat. |
| | Bald and Golden Eagle Protection Act | - In accordance with the permitting program established by the Division of Migratory Bird Management, if activities require the removal or relocation of an eagle nest, a permit is required from the Regional Bird Permitting Office. |
| | Fish and Wildlife Conservation Act | - Ensure that mitigation measures conserve wildlife and wildlife habitat. |
| | Fish and Wildlife Coordination Act | - In coordination with South Carolina Department of Natural Resources (SCDNR), provide consultation if it is determined that the proposed Project would affect water resources. |
| | Clean Water Act, Section 404 | - Work with USACE and the U.S. Environmental Protection Agency (USEPA) to ensure regulation of discharge of dredged or fill material in jurisdictional wetlands of water of the United States. |
| | National Invasive Species Act | - Prevent the introduction and spread of nonnative invasive species as a result of Project activities. |

| Agency | Law or Regulation | Agency Action |
|---|---|---|
| | Magnuson-Stevens Fishery Conservation and Management Act | - Provide consultation if the Project may adversely affect Essential Fish Habitat. |
| USDA-Natural Resources Conservation Service | Farmland Protection Policy Act | - Identify and quantify adverse impacts that the Project may have on farmlands.<br>- Minimize contribution to the unnecessary and irreversible conversion of agricultural land to non-agricultural uses. |
| | Farmland Conversion Impact Rating | - Provide consultation to minimize farmland conversion impacts.<br>- Issue an Impact Rating. |
| Department of Transportation, Federal Highway Administration | Encroachment Permits | - Issue road crossing permits.<br>- Issue state highway crossing permits; Issue state utility occupancy permits. |
| U.S. Department of Labor | Occupational Safety and Health Act | - Ensure that Occupational Health and Safety Administration standards are met during the construction, maintenance, and operation of the proposed Project. |
| Federal Aviation Administration | Determination of No Hazard to Air Navigation | - Issue a determination stating whether the proposed Project would be a hazard to air navigation. |
| U.S. Environmental Protection Agency | NEPA | - Provide NEPA document review and rating. |
| | Federal Insecticide, Fungicide, and Rodenticide Act | - Ensure that the use of insecticides, fungicides, and rodenticides is done in compliance with federal Insecticide, Fungicide, and Rodenticide Act regulations. |
| | Pollution Prevention Act | - Ensure that the Project is designed to comply with national policies for waste management and pollution control. |
| | Resource Conservation and Recovery Act | - Ensure that the treatment, storage, and disposal of hazardous wastes associated with the Project would be handled in accordance with Resource Conservation & Recovery Act regulations. |
| | Noise Control Act | - Ensure that the Project is designed in a manner that furthers the national policy of promoting an environment free from noise that may jeopardize health and welfare. |

| Agency | Law or Regulation | Agency Action |
|---|---|---|
| | Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* | - Identify and address disproportionately high and adverse human health or environmental effects on minority populations and low income populations. |
| South Carolina Department of Natural Resources Wildlife and Freshwater Fisheries Biology & Management | Special Use Permit | - Issue permit for crossing state wildlife management area. |
| | State-listed species of concern | - Consultation and approval regarding state-listed species of concern. |
| | Noxious Weeds | - Consultation regarding noxious weeds. |
| | Fish and Wildlife Coordination Act | - In coordination with USFWS, provide consultation if it is determined that the proposed Project would affect water resources. |
| South Carolina Department of Health and Environmental Control Environmental Quality Control Regions | DHEC Rule 19-450: Permits for Construction in Navigable Waters | - Issue permit from construction in navigable waters. |
| South Carolina Department of Archives and History | NHPA Section 106 | - Section 106 consultation |
| South Carolina Department of Health and Environmental Control Division of Water Quality | Federal Water Pollution Control Act of 1972 (PL 92-500) as amended by the Clean Water Act of 1977 (PL 95-217) as amended by the Water Quality Control Act of 1987 (PL 100-4). [USC 1251 et. seq. ], the Pollution Control Act (South Carolina Code of Laws, 1976, Title 48, Chapter 1) | - Ensure that the applicant has a Storm Water Pollution Prevention Plan as required under the South Carolina Pollutant Discharge Elimination System. |
| South Carolina Department of Health and Environmental Control - Bureau of Water | South Carolina Coastal Management Act of 1977 and Federal Coastal Zone Management Act | - Coastal Zone Consistency Certification |
| South Carolina Department of Highways and Public Transportation | Encroachment Permits | - Issue road crossing permits.<br>- Issue state highway crossing permits.<br>- Issue state utility occupancy permits. |
| Charleston and Georgetown Counties | Local Issuing Authority for National Pollutant Discharge Elimination System and Storm water Pollution Prevention Plan permit | - Issue Storm water Pollution Prevention Plan permits. |

## 1.4 Scope of the Environmental Impact Statement

NEPA requires that agencies responsible for preparing environmental review documents involve the public in environmental review of projects. Prior to development of the EIS, the responsible agencies determine what information is to be evaluated in the EIS. A "scope" is a determination of what issues need to be assessed in the environmental review in order to fully inform decision makers and the public about the possible impacts of a project or potential alternatives. In part, these issues are identified during the scoping process for the Project. Through the scoping process, RUS invited federal, state, and local units of government; Native American tribes; organizations; and individuals interested in the Project to comment on the Project and to identify issues and concerns to be addressed in the EIS. This section summarizes the scoping process and issues raised that will be addressed in the EIS. Chapter 2 of this document describes the alternatives analyzed in the EIS as well as alternatives considered, but not evaluated.

### 1.4.1. Agency Consultation

In accordance with §1501.7 and 1508.22 of the CEQ regulations, RUS published a Notice of Intent (NOI) to hold a public scoping meeting and prepare an EIS in the *Federal Register* on September 17, 2010. In addition to the *Federal Register* notice, RUS notified federal, state, and local agency representatives about the proposed Project by mail and invited them to attend an agency scoping meeting. A list of federally recognized tribes near the Project Area was compiled, and tribal leaders and Tribal Historic Preservation Officers were also notified by mail and invited to attend the agency scoping meeting.

The agency scoping meeting was held on September 29, 2010, at the Sewee Visitor and Environmental Education Center, 5821 Highway 17 North, Awendaw, South Carolina 29429. Fifteen agency participants, representing USFS, South Carolina Department of Natural Resources (SCDNR), U.S. Fish and Wildlife Service (USFWS), South Carolina Forestry Commission, and the town of McClellanville, attended the meeting. No representatives of federally recognized tribes attended; however, representatives of the Catawba Indian Nation requested to be a consulting party under Section 106 of the NHPA, and the Eastern Shawnee Tribe requested to be informed if cultural materials are encountered as the Project progresses.

### 1.4.2. Public Scoping

The purpose of the public participation process was to gain input about any potential concerns and identify issues that need to be addressed in the EIS. During this public participation scoping process, contact was made with federal agencies, tribal representatives, state agencies, local officials, and the general public. More detail about public participation can be found in the McClellanville 115-kV Transmission Project Scoping Report (RUS 2011a [February]) and Scoping Addendum (RUS 2011b [October]).

### Public Scoping Meetings

Letters, public service announcements, and newspaper advertisements announcing the proposed Project and the scoping meeting location and times were distributed prior to the public scoping meetings. One meeting was conducted at the St. James-Santee Elementary School in McClellanville, South Carolina, on September 29, 2010.

### Comments

A total of 750 comments were received during the scoping comment period that began on September 29, 2010, and ended on January 14, 2011. Of these comments, 260 were a count of check boxes asking the public to indicate issues of concern. Several of the comment sheets and letters identified multiple topics that were recorded in the categories identified below. The number of comments each category received is noted in parenthesis for each of the following topics:

- Biological resources (17)
- Construction (6)
- Cultural and historic resources (59)
- Health and safety (49)
- Land use (68)
- Land rights (13)
- NEPA process (30)
- Proposed Project alternatives (32)
- Public involvement process (36)
- Purpose and need (52)
- Recreation (5)
- Route alternatives (23)
- Socioeconomics (39)
- Threatened and endangered species (23)
- Vegetation (22)
- Biological resources (17)
- Visual and aesthetics (49)

- Water resources and wetlands (53)
- Wildlife (31)

The key issues identified during the comment process were primarily related to land use (with about one-third of those related to land rights), water resources and wetlands, cultural and historic resources, purpose and need, and visual resources. The comment sheets and issues to be addressed in the EIS are included in the McClellanville Project Scoping Report (RUS 2011a) and Scoping Report Addendum (RUS 2011b).

### 1.4.3. Issues Considered but Eliminated from Further Consideration

Issues and potential concerns covering a wide range of natural and human resources for the proposed Project were identified and discussed, as summarized in the Scoping Report (RUS 2011a). Upon review and consideration of the comments received and resources identified, all issues were deemed appropriate for consideration and evaluation as part of the EIS process. Therefore, none of the issues and concerns raised during the scoping process was dismissed from further evaluation. This EIS contains a comprehensive review of the issues raised during scoping, as well as others not raised but are typical for a project of this nature.

# 2. PROPOSED ACTION AND ALTERNATIVES

Chapter 2 describes the alternatives considered for the construction and operation of the McClellanville Transmission Line. Project alternatives were screened to determine their ability to meet the purpose and need of the proposed Project and to provide a comparison of impacts. The following sections describe the general process and key terminology used in the development of the alternatives, as well as the specific formulation of the alternatives and the alternatives evaluated in detail in this document.

## 2.1 Electrical Alternatives Considered But Eliminated From Further Consideration

Several electrical and system alternatives were considered early in the Project to meet the purpose and need. These alternatives included generation, distribution, and energy conservation. From the analysis completed in the Alternative Evaluation Study, it was determined a new transmission line was the preferred alternative to provide the necessary power to the McClellanville area. Below is a brief discussion of the alternatives considered in the Alternative Evaluation Study that were not carried forward for further analysis. The complete Alternative Evaluation Study is found in Appendix B.

### 2.1.1. New Generation at McClellanville Substation Site

Installing onsite generation at the proposed McClellanville Substation was considered in lieu of building a new transmission line. Three 2-megawatt diesel generators were considered for installation. These generators would be capable of serving up to 6 megawatts. Additional generator units would be installed as needed to serve load growth and so that existing individual units could be taken out of service temporarily for maintenance and repair.

The use of diesel generators would introduce a new stationary source of air pollution in the McClellanville area, requiring state permitting under the Clean Air Act and requiring set limits on duration and frequency of operations in a new stationary source permit.

Additionally, the largest expense associated with onsite generation is the cost of fuel, which is not only expensive for generation purposes but, as a commodity, fluctuates in price. Onsite generation is not an economical alternative for the identified electrical problem. This alternative would not guarantee or eliminate the need for a future transmission line to provide reliable service to the McClellanville area.

### 2.1.2. Rebuild Existing Distribution Line

Rebuilding the existing distribution system serving the McClellanville area was evaluated. For planning purposes, the McClellanville Load Control Point (McLCP) was identified at the intersection of U.S. Highway 17 and Tibwin Road. The McLCP represents the point where rebuilt distribution lines supplying power to the McClellanville area from the Commonwealth and Jamestown substations converge and from which distribution lines branch out to serve the electrical load in the McClellanville area.

The distribution line rebuild alternative would require capital cost improvements associated with both rebuilding existing distribution line segments and constructing new distribution line segments serving the McLCP. This alternative would also require capital cost improvements at the existing Commonwealth and Jamestown substations. Improvements at both substations would be required so that the McClellanville area could be served from Jamestown whenever an outage occurs either at Commonwealth Substation or somewhere along the distribution line connecting Commonwealth Substation with the McLCP.

A 30-year load growth projection was used to evaluate the requirements of the distribution line rebuild alternative. Specific design features of this alternative would include:

- Installation of a second power transformer in both the Commonwealth and Jamestown substations to isolate the McLCP load and avoid disruptions to existing customers served from the Jamestown and Commonwealth substations.

- Installation of approximately 2 miles of new underground distribution line (D/C 1000MCM UG) through the FMNF to extend the existing Jamestown circuit to U.S. Highway 17.

- From the Jamestown Substation, rebuilding by Berkeley Electric of 18 miles of S/C 4/0 aluminum conductor steel reinforced (ACSR) OH conductor to D/C 477 ACSR OH conductor, with additional voltage regulators, electronic re-closers with Supervisory Control and Data Acquisition (SCADA) operability, and switches needed to address contingencies at the McLCP.

- From the Commonwealth Substation, rebuilding by Berkeley Electric 4 miles of D/C 477 ACSR OH conductor to T/C 477 ACSR OH conductor, convert 14.5 miles of S/C 477 ACSR OH conductor to D/C 477 ACSR OH conductor, and construct 1.5 miles of new D/C 1000MCM UG conductor needed to complete the circuit along U.S. Highway 17. As with the Jamestown circuit, additional voltage regulators, electronic re-closers with SCADA operability, and switches needed to address contingencies at the McLCP would be required.

Because this alternative would cost significantly more to implement over the transmission line alternative and would not guarantee or eliminate the need for a future transmission line to provide reliable service to the McClellanville area, it was removed from further consideration.

### 2.1.3. Energy Conservation

Central Electric is working with Berkeley Electric and its other member distribution systems in South Carolina to promote and improve energy efficiency and conservation. Central Electric has in place a statewide load management program, which allows utilities to reduce demand for electricity during peak usage times by temporarily limiting the use of electric power by members who agree to participate in the load management program. Load management is desirable because it can delay the need to construct additional peaking power plants and manage loading on transmission facilities.

Central Electric and its member distribution cooperatives have distributed more than 1.9 million compact fluorescent light bulbs by the end of 2010 and have in place a pilot weatherization program for residential consumers. Central Electric and its member distribution systems are also working with the South Carolina Energy Office to provide grants to improve more than 1,200 homes with various energy efficiency measures and determine which ones are the most effective. The member distribution systems plan to weatherize 20 to 30 percent of residential homes over the next 10 years. This is a large effort that will reduce annual energy consumption by 180 to 270 million kilowatt-hours, saving from 1.1 to 1.6 percent of total 2010 system load.

Central Electric and Berkeley Electric are also developing renewable resources. Central Electric's renewable energy program includes the purchase of qualified green energy through its net metering program. Net metering allows the customer to put additional power generated from individually-owned solar panels, windmills, and other distributed generation equipment back into the distribution power lines. Central Electric pays the customer for this localized distributed generation of power.

Central Electric and Berkeley Electric will continue to pursue and promote energy efficiency improvements, increased conservation, and use of renewable resources. These efforts will reduce and better manage load growth, which strains the existing system. However, energy conservation alone cannot reliably meet the forecasted load requirements of the McClellanville area. In addition, reliability remains an issue. The existing 40-mile distribution line will continue to experience outages, will require voltage regulators, and will still be susceptible to voltage sags.

## 2.2 Development of Alternatives Routes

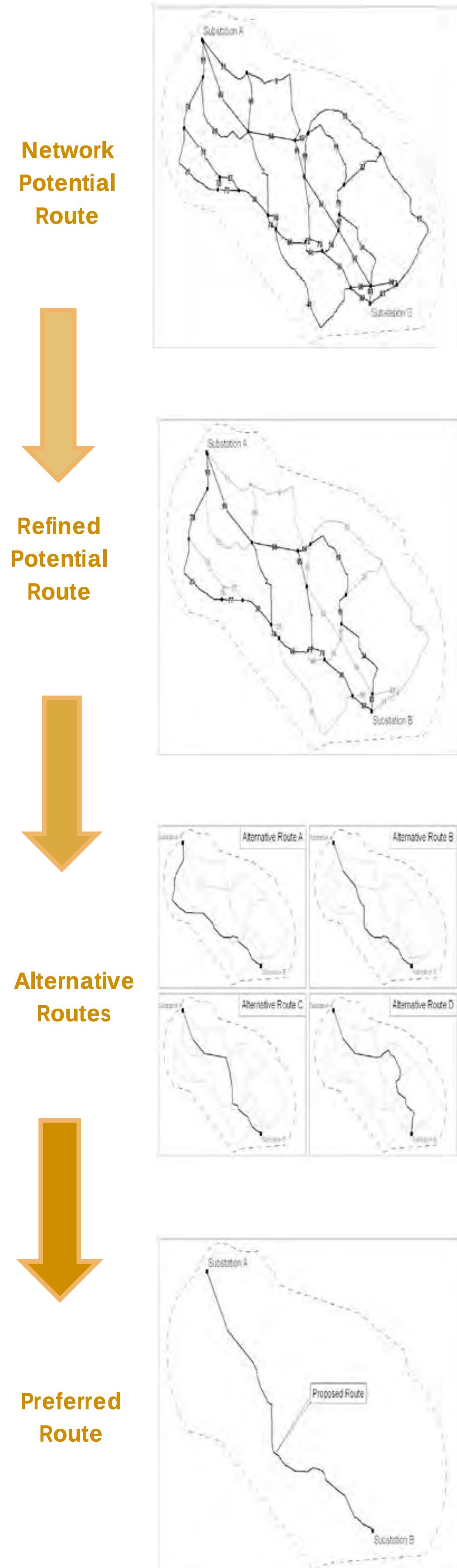
Once the Alternative Evaluation Study was complete and the transmission alternative was selected as the best method to meet the purpose and need, a Macro-Corridor Study was completed looking at potential areas of opportunities and constraints within the Study Area. Below is an overall description of the process used to develop macro-corridors and eventually potential routes analyzed in this EIS.

### 2.2.1. Overview of the Development of Alternative Routes

The route development process is inherently iterative with frequent additions or deletions to existing alignments as new constraints, opportunities, and inputs are received. Because of the evolutionary nature of the route development process, specific vocabulary is used to describe the routes at different stages of development.

Initial route development efforts start with the identification of large area constraints and opportunity features within the **Study Area**, which encompasses the endpoints of the Project and areas in between. These areas are typically identified using a combination of readily available public data sources.

The Project Team uses this information to develop **macro-corridors**. Efforts are made to develop macro-corridors throughout the Study Area to ensure that all reasonable alignments are considered. The corridors are approximate at this stage, but they are revised after ongoing review and analysis and with input from the public, regulators, and stakeholders. During this step, public scoping meetings are held to get feedback from the public on the Project.




As the Project team continues to collect information, coordinate with regulatory agencies, and gather additional site-specific information, corridors are refined, added, or eliminated. The revised corridors are then used to develop **potential routes** within each macro-corridor.

Where two or more potential routes intersect, a **node** is created, and between two nodes, a **link** is formed. Together, the potential routes and their interconnected links are referred to as the **potential route network**. The links are numbered for identification, and evaluated independently and collectively for refinements.

As the Project team continues to gather information and review the links of the potential route network, links are modified, removed, or added. After an iterative process, a**lternative routes** are developed using the remaining links.

Alternative routes are routes that begin and end at similar locations for direct comparison. Potential impacts associated with each alternative route are then analyzed in the EIS.

Ultimately, through analysis and comparison of the alternative routes, a **preferred route** is identified. The preferred route minimizes the effect of the Project on the natural and human environment, while avoiding circuitous routes, extreme costs, and non-standard design requirements.

### 2.2.2. Macro-Corridors

Central Electric used a Geographic Information System (GIS) based model approach to identify macro-corridors within which a transmission line could reasonably be sited. The initial set of siting alternatives was documented in the Revised Macro-Corridor Study Report for the McClellanville 115 kV Transmission Project (RUS 2010b) (Appendix A). The siting model identified 10 macro-corridors suitable for siting a transmission line based on values assigned to different landscape and built environment features (e.g., natural and cultural resources) as well as engineering considerations (Figure 2-1). These corridors are referred to as Charity (four separate corridors known as Charity 1, Charity 2, etc.), Jamestown, Honey Hill, Belle Isle (three separate corridors known as Belle Isle 1, Belle Isle 2, etc.), and Britton Neck. Additional information on creation of the model and constraints used in the analysis can be found in the Macro-Corridor Study (RUS 2010b).

Ten macro-corridors were presented to the public during scoping. Following scoping, three additional corridors (i.e., Commonwealth, Modified Britton Neck, and Belle Isle No. 4) were also evaluated by RUS, USFS, and Central Electric. Representatives from these groups conducted an alternatives evaluation of each of the electrical alternatives and transmission siting alternatives, which is documented in the Addendum to the Scoping Report dated October 2011. From this evaluation, the Belle Isle corridors 1, 3, and 4 and the Modified Britton Neck corridors were carried forward for further consideration. In addition, links between the corridors were created to add for additional siting opportunity. The remaining corridors were eliminated from further consideration. Section 2.2.3. briefly discusses the elimination of each corridor. Further information can be found in the Addendum to the Scoping Report (RUS 2011b).

### 2.2.3. Macro-Corridors Eliminated from Further Consideration

#### Honey Hill and Britton Neck Corridors

The Honey Hill and Britton Neck corridors considered in the Macro-Corridor Study (RUS 2010a) would require the construction of a new 230/115 kV transmission substation along the existing Winyah-Charity 230 kV transmission line. New 115 kV service cannot be taken directly from a 230 kV source without “stepping down” the voltage, which is the purpose of the transformer and associated equipment installed in a 230/115 kV transmission substation. A new 230/115 kV substation would require land clearing and

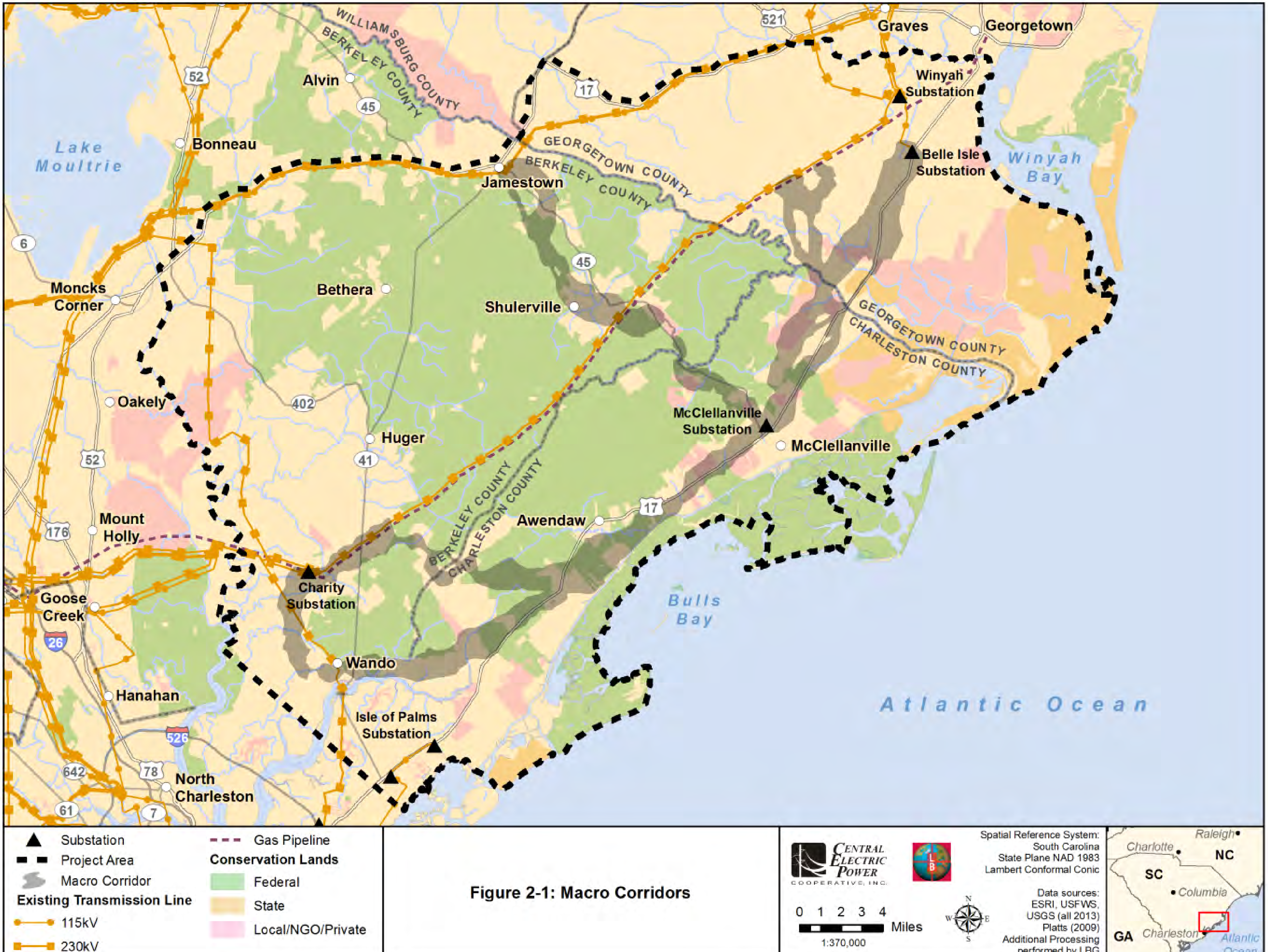



Figure 2-1: Macro Corridors

grading from 6 to 9 acres of land adjacent to the Winyah-Charity 230 kV transmission line. For both corridors, a new 230/115 kV transmission substation constructed to energize one new 115 kV transmission line and to serve one new 115/25 kV distribution substation is an expensive and unreasonable alternative that violates normal utility practice. A 230/115 kV transmission substation normally serves several networked 115 kV substations, not just one. Furthermore, a new 230/115 kV substation would require an additional 6 to 9 acres of land clearing and land disturbance as compared to the minimal footprint of one or several single pole structures needed to tap an existing 115 kV transmission line or substation. Alternative corridors involving the construction of a new 230/115 kV transmission substation were eliminated for these reasons.

### Belle Isle No. 2 Corridor (Underground)

The Belle Isle No. 2 corridor presented in macro-corridor study involved the option of an underground crossing of the North and South Santee rivers and the Santee Delta adjacent to U.S. Highway 17. Underground transmission lines are often recommended by the public or by resource agencies as a solution to potential visual impacts. During the scoping process, commenters recommended siting the new McClellanville Transmission Line underground due to the wide spread damage incurred by the power grid during Hurricane Hugo, a Category 4 hurricane that came ashore in Charleston Harbor during September of 1989. The most devastating wind and storm surge came ashore on the storm’s northwestern quarter between the towns of Awendaw and McClellanville. The Santee Delta Wildlife Management Area (WMA) also recommended building any transmission line crossing the Santee Delta underground to minimize potential avian interaction (e.g., collision) issues.

Underground transmission lines are very expensive to construct. Underground distribution lines, in contrast, are more affordable and thus widely found today in suburban and residential settings where concerns about aesthetics are high. Distribution lines, however, are not the same as transmission lines, and more readily lend themselves to underground construction. Underground transmission is almost always found in severely constrained environments, such as the downtown business districts of large cities where there is simply insufficient room for overheard lines and their ROWs. Depending on the design, system operations requirements, and spatial issues, preliminary design of underground transmission suggests that costs can range from 8 to 15 times the cost of typical overhead construction. In its Macro-Corridor Study, Central Electric (RUS 2010a) estimates that building underground at the Santee Delta would involve approximately 10 times the expense of typical overhead construction.

While it is true that a hurricane, tornado, or other contingency could damage an overhead transmission line easier than it can damage an underground line, it is relatively easy to repair an overhead line compared to an underground one. Over time, underground conductors deteriorate; it is time-consuming and labor-intensive to locate underground faults and then to mobilize the right personnel and equipment at the site to repair and restore service. This would also be the case if an underground transmission line were built across the Santee Delta. Furthermore, Central Electric staff are not trained or equipped to maintain underground transmission lines and an outside contractor would have to be hired to complete any of the repairs on the underground transmission line. For cost and maintenance reasons, the underground construction alternative for the Belle Isle No. 2 and other corridors was not carried forward.

**Jamestown Corridor**

The Jamestown corridor (20.6 miles long) was determined to be acceptable from a general engineering perspective but would have constructability issues where the line crosses management area 29, a management area connector for adjacent federally designated wilderness areas within the FMNF. The ability to clear an additional and sufficient ROW at this location may not be available. This corridor crosses 7.28 miles of the FMNF, including some sensitive areas and would require extensive biological surveys. Finally, this corridor generated the most public opposition during scoping due to its potential impacts to wildlife and vegetation including threatened and endangered species as well as other natural and cultural resources. This alternative was eliminated from further evaluation due to these concerns.

**Charity Corridors**

The Charity corridors would involve the construction of a long transmission line originating at a tap point adjacent to the existing Charity Substation. All Charity corridors use U.S. Highway 17 for some portion of their alignment. Charity corridors Nos. 1 and 2 (+/- 28.5 to 28.7 miles long) leave the Charity area by paralleling the Winyah-Charity 230-kV transmission line for about 4 miles, and then angles cross-country toward U.S. Highway 17 and the McClellanville Substation. These corridors cross 9.34 and 8.55 miles, respectively, of FMNF lands, requiring extensive biological surveys.

Charity corridors Nos. 3 and 4 (+/- 33.0 to 33.2 miles long) appear to have a relatively smaller effect on the natural environment because a larger portion of their alignment parallels U.S. Highway 17. They leave the Charity Substation area cross-country, heading more directly toward U.S. Highway 17, avoiding much of the FMNF lands crossed by Charity Nos. 1 and 2 corridors. However, the Charity Nos. 3 and 4 corridors are approximately 5 miles longer than the Charity Nos. 1 and 2 corridors.

All of the Charity corridors options would be 28 to 33 miles and would cost substantially more in terms of ROW, materials, and construction and maintenance costs than the much shorter alternatives available. As with the Commonwealth corridor, a new radial transmission line that originates from the Mt. Pleasant area exposes both the new transmission line and the back-up distribution line to a common outage contingency such as a hurricane or tornado. Primarily for these engineering, reliability, and cost issues, the Charity alternatives were eliminated from further consideration in the EIS.

### Commonwealth Corridor

The Commonwealth corridor alternative was suggested, during the scoping process, by several stakeholders who recommended that a new transmission line be co-located with existing distribution corridors and major roads (specifically, U.S. Highway 17) to minimize effects on the natural environment. In addition to sharing similar engineering concerns (relatively long line and contingency concerns) with the Charity corridors, the Commonwealth corridor also originates from a less reliable power source (SCG&E's Hamlin Substation). The existing distribution line serving the McClellanville area originates from the Hamlin Substation, and a new transmission line originating from the same area exposes both the new transmission line and what would become the back-up distribution line to a common outage scenario (e.g., a hurricane or tornado). This alternative also has a greater potential to affect structures and residences. For these reasons, the Commonwealth alternative was eliminated from further consideration in the EIS.

### 2.2.4. Macro-Corridors Carried Forward for Route Development

The Belle Isle corridors 1, 3, and 4 and the Modified Britton Neck corridors were carried forward for further route development. The Belle Isle corridors originate at the Belle Isle Substation and generally follow alignments south to the McClellanville Substation near or parallel to U.S. Highway 17. The Modified Britton Neck corridors originate at a tap point northwest of Belle Isle Substation and follow a general alignment along the Winyah-Charity 230 kV transmission line before angling to the southeast toward the McClellanville Substation (Figure 2-2). Within these remaining corridors, potential routes were developed, as discussed in detail below.

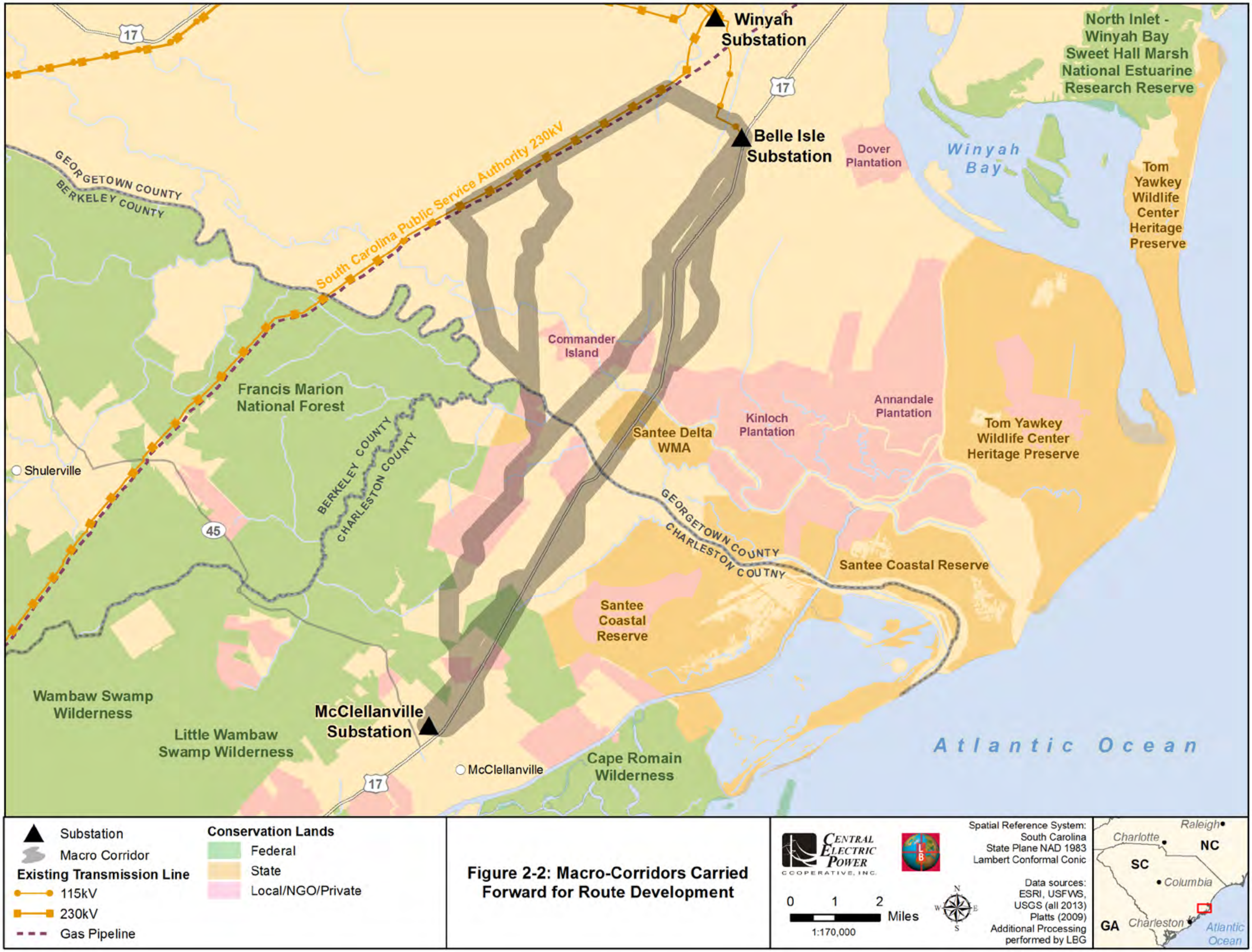



**Figure 2-2: Macro-Corridors Carried Forward for Route Development**

### 2.2.5. Alternative Route Development

Potential routes were developed along the remaining corridors using GIS data sets, aerial photography, and a diverse routing team, which included representatives from Central Electric, RUS, The Louis Berger Group, Inc., and DiGioia Gray Associates. The potential routes were developed to minimize impacts to residences, sensitive habitats, conservation lands, and cultural and historical resources, while at the same time maximize paralleling of existing linear infrastructure and avoid circuitous paths.

Where two or more potential routes intersect, a node was created. Between two nodes, a link was formed and numbered for identification. Twenty-one links were developed within the remaining corridors (Figure 2-3). These links included a 600-foot buffer around each route. These links were analyzed, and three links were ultimately removed from further consideration (see Section 2.2.6 for discussion on the removed links). From the remaining 18 links, six alternative routes were assembled and carried forward for evaluation in the EIS (Figure 2-4). These alternative routes are discussed below in Section 2.3.

### 2.2.6. Potential Route Links Removed from Consideration

Three links (Links 6, 9, and 19) were removed from consideration prior to forming alternative routes. Link 6 crosses U.S. Highway 17 twice over a short (<1 mile) distance just north of the McClellanville Substation to avoid residences in the area. Close proximity to these residences and other associated outbuildings along this stretch of U.S. Highway 17 ultimately served as the reason for removal of this route from further consideration.

Link 9 was developed from the tap point on the Winyah-Belle Isle 115 kV transmission line and traversed south, and was ultimately removed from further consideration. Link 9 crossed approximately 114 acres of forested wetlands in an area that currently does not have any existing linear infrastructure. Link 9 provided no benefit from a routing and environmental perspective when compared to Link 1 or 20, which both follow linear infrastructure and minimize new fragmentation and impacts.

Similarly to Link 9, Link 19 does not parallel any existing linear infrastructure, crosses through heavily forested areas, and is in close proximity to several residences (six residences within the 600-foot corridor). Link 19 also crosses the North Santee River at a location that would require special engineering design in order to accommodate the longer span. Link 19 was removed from further consideration.

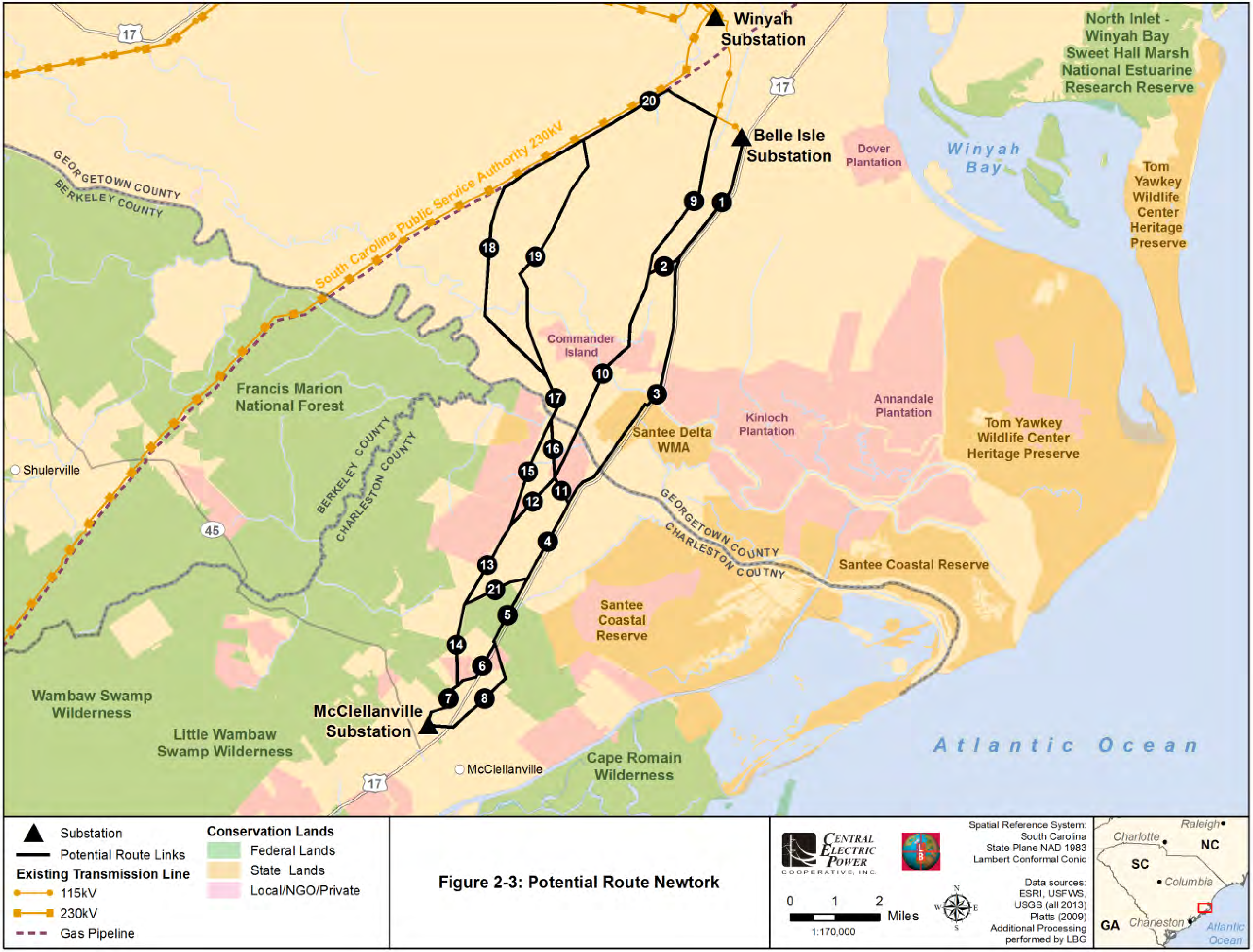



Figure 2-3: Potential Route Newtork

## 2.3 Alternatives Evaluated in the EIS

### 2.3.1. No-Action Alternative

Under the no-action alternative, the McClellanville Transmission Line would not be constructed. The existing environment within the Project Area would remain the same, and no land would be used for transmission lines, facilities, or a substation. The customers of Berkeley Electric in the McClellanville area would continue to have reliability issues and outages. In addition, future growth will add additional constraint to a strained electrical system. The no-action alternative does not meet the identified purpose and need for the Project.

### 2.3.2. Proposed Action

The proposed action considers six possible route locations. These route locations were selected for further analysis because they reduce impacts to residences, sensitive habitats, conservation lands, and cultural and historic resources. Existing ROWs (roads and transmission lines) were used in in designing the proposal as much as possible.

**Alternative Route A**

Alternative Route A originates at the Belle Isle Substation. For the first 3 miles of the alignment, Alternative Route A parallels U.S. Highway 17 on the north side. The route then crosses the highway and parallels on the south side for another 3.5 miles, crossing the North Santee River. After the river crossing, the route crosses to the north side of U.S. Highway 17 to avoid an archaeological site located on the south side of the highway. The route maintains the parallel alignment on the north side of U.S. Highway 17 for another 6 miles. Alternative Route A then angles to the southeast for approximately 0.75 mile before angling back to the southwest for 1.5 miles to avoid residences located on the east side of U.S. Highway 17. Alternative Route A then turns west, crosses U.S. Highway 17, and terminates in the McClellanville Substation. Alternative Route A is 16.1 miles long.

**Alternative Route B**

Alternative Route B follows the same alignment as Alternative Route A out of the Belle Isle Substation for the first 3 miles. After 3 miles, the route angles to the southwest for approximately 0.5 mile before turning south. After approximately 1.5 miles, the route angles to the southwest to a narrow crossing of the North Santee River. Alternative Route B continues this alignment for approximately 2.5 miles, crossing the South Santee River. At this point, the route turns southeast until it reaches U.S. Highway 17. Alternative Route B then follows the same alignment as Alternative Route A into the substation. Alternative Route B is 16.3 miles long.

### Alternative Route C

Alternative Route C follows the same alignment as Alternative Route B up to the point where Alternative Route B turns back to U.S. Highway 17. At this point, Alternative Route C continues in a southwest–south direction for approximately 6 miles to the McClellanville Substation. Alternative Route C does not parallel any existing infrastructure for these 6 miles and angles between two parcels of land owned by FMNF. Alternative Route C is 15.6 miles long.

### Alternative Route D

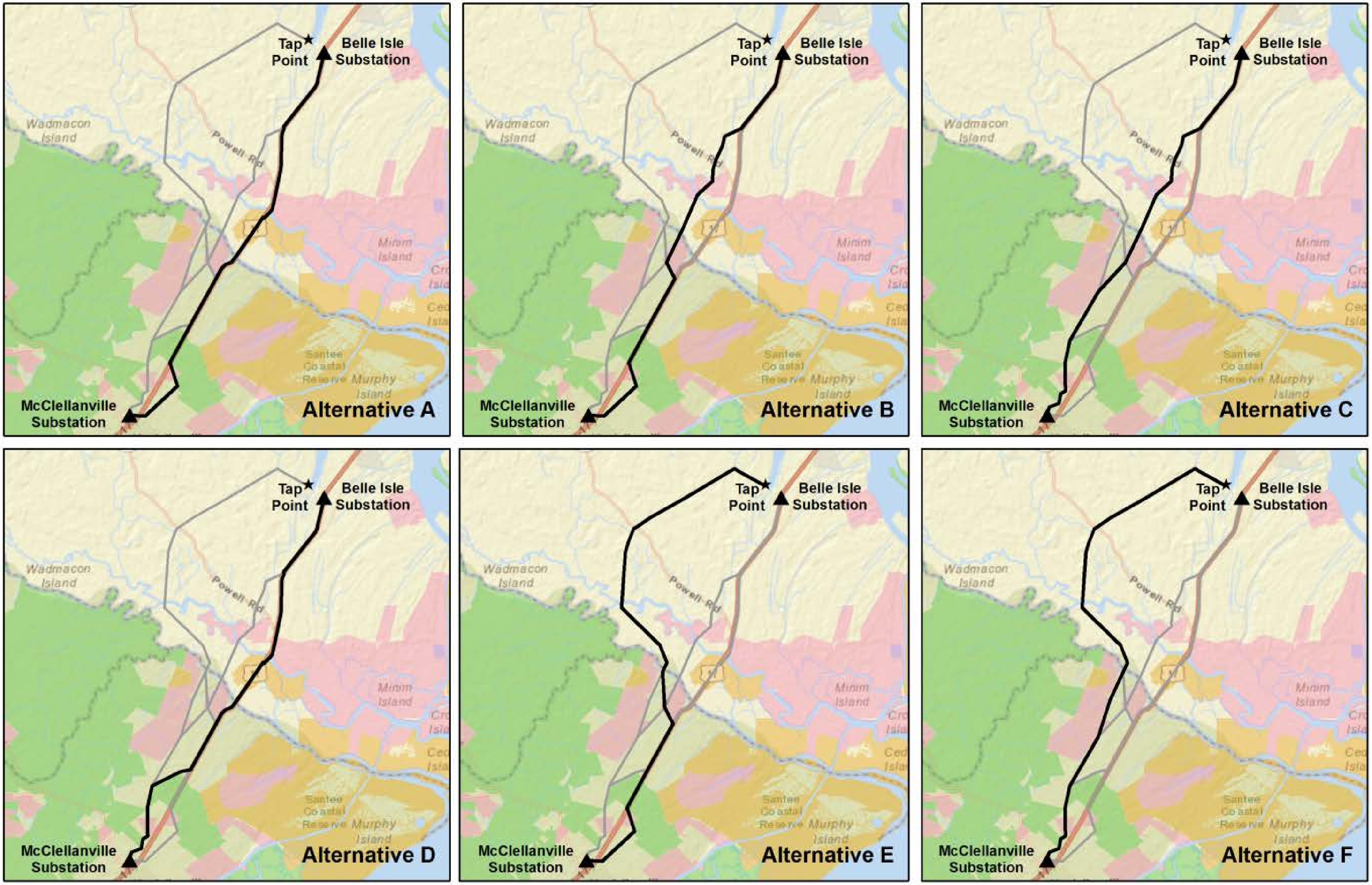
Alternative Route D follows the same alignment as Alternative Route A for the first 11 miles. Approximately 4 miles north of McClellanville, Alternative Route D angles to the southwest along the boundary of the FMNF before turning south to follow the same alignment as Alternative Route C to the McClellanville Substation. Alternative Route D is 16.1 miles long.

### Alternative Route E

Alternative Route E begins at the tap location on the Winyah-Belle Isle 115 kV transmission line and angles north along the south side of East CCC Road to meet the Winyah–Charity 230 kV transmission line. From this point, Alternative E parallels the existing transmission line and an existing gas line on the south side for approximately 4 miles. Alternative Route E then turns south to cross the North Santee River. The route then angles to the southeast for 2.5 miles before turning south to cross the South Santee River. Alternative Route E proceeds south for approximately 6.4 miles across forested areas before following the same alignment as Alternative Route D into the substation. Alternative Route E is 19.9 miles long.

### Alternative Route F

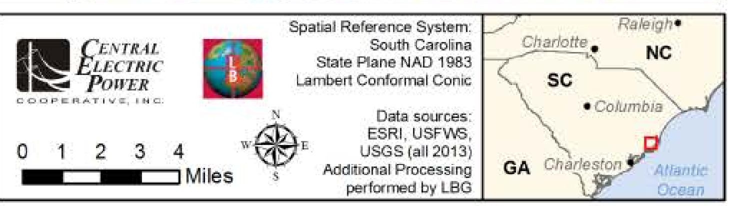
Alternative Route F follows the same alignment as Alternative Route E for the first 11 miles. After crossing the South Santee River, Alternative Route F continues south for approximately 6 miles. The route then follows the same alignment as Alternative Route C into the McClellanville Substation. Alternative Route F is 19.1 miles long.




Substations
Alternative Route

**Conservation Lands**
Federal
State
Local/NGO/Private

**Figure 2-4: Alternative Routes**




Spatial Reference System: South Carolina State Plane NAD 1983 Lambert Conformal Conic

Data sources: ESRI, USFWS, USGS (all 2013) Additional Processing performed by LBG

## 2.4 Proposed Action

The proposed action is for the construction of a new 115 kV transmission line needed to energize the new McClellanville Substation located near the McClellanville service area.

### 2.4.1. Preferred Route

The preferred route will be selected prior to the final EIS.

### 2.4.2. Substation

RUS approved an Environmental Report for the proposed McClellanville Substation, dated January 2000, prior to the substation site being purchased on April 7, 2000. The report documented that the preferred site would have no adverse effects on the human environment.

The preferred McClellanville Substation site is a 16.87-acre parcel near the intersection of U.S. Highway 17 and SC 45 near the town of McClellanville. The substation would require a 225-foot by 400-foot (2.1-acre) graded fenced area with gravel and ground grid. The substation would also require a 1,415-foot-long, 20-foot-wide graveled access road within a cleared 60-foot-wide access strip. Total land disturbance within the limits of clearing and grading would include about 4.4 acres. Figure 1-1 shows the location of the McClellanville Substation site in relationship to the overall Study Area.

A 115-14.4/24.9 kV, 15/28 megavolt ampere transformer and associated equipment would be installed within the substation fence. A high-side (transmission) frame would be installed within the substation to terminate the proposed McClellanville 115 kV Transmission Line. Three low-side distribution frames would be dedicated to Berkeley Electric, with an additional low-side position dedicated to SCE&G. Berkeley Electric anticipates a total of four 3-phase distribution lines would be brought out to U.S. Highway 17 from the substation low-side along the access strip.

The four distribution lines would exit the substation underground, and the conductors would likely be installed within conduit. Once the underground circuits reach the existing distribution lines owned by the respective utilities, the circuits would transition to overhead configuration by means of riser poles set within the existing distribution lines.

## 2.5 Elements Common to All Alternatives

There are several elements common to each of the alternative routes, including various transmission line components, construction techniques, and operation and maintenance procedures. These items are discussed in more detail below.

### 2.5.1. Transmission Line Characteristics

Transmission lines for all alternative routes would include the following characteristics:

- A 115 kV transmission line connection from either the Belle Isle Substation or at a tap point on the Winyah-Belle Isle 115 kV transmission line to McClellanville
- An ROW requirement of 75 feet (37.5 feet on either side of centerline)
- Single pole structures, typically 70 to 75 feet above ground and spaced 300 to 400 feet apart
- H-frame structures, typically 75-100 feet above ground, may be used to cross rivers or large wetlands.

Design features being considered include galvanized steel, COR-TEN "weathering steel," and/or concrete single pole structures carrying three 795 26/7 MCM ACSR electrical conductors (1.107-inch overall diameter) on horizontal polymer post insulators, with a single 0.565-inch diameter OPGW (optical ground wire) fiber optic shield wire overhead.

The basic overall configuration of the proposed transmission line would be similar to the structures shown in Photograph 1, Central Electric's Typical TP-115 Weathering Steel Pole.[2] The final design may use standard galvanized steel or concrete structures (see Photograph 2), instead of weathering steel, but the overall configuration of the transmission line would be as shown in the two photographs.

[2] Weathering steel is best-known under the trademark COR-TEN steel, sometimes written as "Corten steel."

**Photograph 1: Core-Ten Single Pole Structure with Horizontal Post Insulators**

**Photograph 2: Concrete Single Pole Structure with Horizontal Post Insulators**

### 2.5.2. Right-of-Way and Property Requirements

#### Transmission Line Right-of-Way

In cross-country transmission line segments, Central Electric would acquire a 75-foot-wide (37.5 feet to either side of the centerline) ROW in the form of an easement. In the typical road-side alignment, single pole transmission line structures are usually set about 5 feet outside the road ROW; therefore, roadside alignments would require 5 feet plus an additional 37.5 feet for a total of 42.5 feet of ROW in the form of an easement. In either case, the ROW would be cleared, including the trimming or removal of danger trees that are outside the ROW (danger trees are trees or branches that are dead, weak, diseased, leaning toward the line, or otherwise capable of hitting the transmission line were they to fall). It would be necessary to maintain a cleared ROW and remove danger trees for the duration of the operational life of the proposed transmission line.

#### Substation

Berkeley Electric has purchased the McClellanville Substation site parcel. The substation parcel, as acquired, is in the form of a flag lot and includes a +/- 1,415-foot-long, 20-foot-wide graveled access road within a cleared 60-foot-wide access strip.

#### Distribution Line Right-of-Way

Three low-side distribution frames will be dedicated to Berkeley Electric with an additional low-side position dedicated to SCE&G. Therefore, Berkeley Electric anticipates a total of four 3-phase distribution lines will be brought out to U.S. Highway 17 from the substation low-side along the access strip. The four distribution lines would exit the substation underground, and the conductors would likely be installed within conduit.

At U.S. Highway 17, the MV-04/SCE&G circuit would transition to overhead at a riser pole and tie into the existing SCE&G distribution line. The three Berkeley Electric distribution lines would continue underground across U.S. Highway 17 and then follow an interior property line for an additional +/- 400 feet to arrive at an existing 3-phase distribution line. The MV-01, MV-02, and MV-03 circuits would transition from underground conduit via riser poles at this point. Circuit MV-03 would tie into the existing 3-phase distribution line running southeasterly toward Commonwealth Substation. Circuits MV-01 and MV-02 would transition overhead on a second riser pole, forming a double-circuited, 3-phase distribution line running northeasterly toward the intersection of River Road and State Highway S. At that intersection, Circuit MV-02 currently turns southeasterly, paralleling State Highway S, while Circuit MV-01 continues northeasterly along River Road.

### 2.5.3. Pre-Construction Activities

Central Electric and/or its contractors would perform engineering surveys prior to construction of the transmission line. These surveys would consist of centerline location, profile, and access surveys. Pre-construction surveys would likely coincide with other pre-construction activities.

Geotechnical studies would be conducted along the transmission line route to determine engineering requirements for structures and foundations. Truck-mounted augers would be transported to selected locations to drill small-diameter boreholes, and borehole cuttings would be analyzed to determine specific soil characteristics. Minimal land disturbance (approximately 400 square feet) would be anticipated for each geotechnical boring site. Additionally, small access trails may be required for some of the boring locations.

### 2.5.4. Transmission Line Construction

#### Right-of-Way Clearing

In upland areas, the ROW would be cleared using heavy equipment to fell trees and understory trees and shrubs. Equipment with a shearing blade attachment designed to sever tree trunks at or near ground level, such as a “KG” blade, may be used. Alternately, a “feller buncher,” a standard heavy equipment base with attachments consisting of a tree-grabbing device and a circular saw or hydraulic shear which cuts trees off at or near the base, may be used. Felled vegetation would be limbed up and removed or chipped. Stumps would be cut or ground down to a maximum height of 3 inches above the soil line. Slash, the coarse and fine woody debris generated during logging operations, would typically be chipped and broadcast as mulch or allowed to decompose on the ground.

On USFS lands, merchantable timber would be loaded onto forwarders, which are forestry vehicles that carry felled logs from the stump to a roadside landing where they can be loaded onto log trucks. On private property, timber may be treated similarly, or it may be chipped and broadcast across the ROW to serve as mulch. Slash would typically be chipped and broadcast as mulch.

In wetlands, land clearing of the easement would be accomplished by methods that remove trees and tall-growing vegetation above the soil line and do not disturb the native wetland soils. This may be accomplished by using low ground pressure equipment (10 pounds per square inch [psi] or less), or by similar equipment working from temporary load-dispersing mats to minimize rutting and mucking of wetland soils. Low-growing native plant materials that would not interfere with the installation, maintenance, and operation of the line would not be cleared. The purpose of using such methods is to avoid or minimize disturbance of native wetland soils and encourage the establishment of a scrub/shrub or emergent wetland within the proposed power line ROW.

Felled material would not be pushed or dragged across a wetland. Rather, felled trees would be lifted or carried from the wetland by low ground pressure equipment or equipment working from temporary load-dispersing mats. No material would be placed in stream channels or otherwise placed so as to interfere with stream flows or adjacent wetland hydrology.

A 30-foot upland buffer area would be established adjacent to all streams and at all jurisdictional wetlands. Wetland clearing methods would be used in these buffer areas to minimize the likelihood of upland soils being transported into wetlands. Appropriate soil erosion and sedimentation controls would be established at all wetland/upland and streambank boundaries.

Central Electric proposes to install fences and gates at road crossings in USFS lands to control public access down the proposed transmission line ROW. This kind of access control is often required to minimize trespass, especially with off-road vehicles. Central Electric may honor private landowner requests for similar fencing and gates at road crossings.

**Access Roads**

Off-ROW access roads are existing roads that are not within the proposed transmission line ROW but may be needed for construction and maintenance access. Off-ROW access may be acquired for construction and maintenance on existing roads and/or existing utility easements. No new permanent roads would be constructed as a result of the transmission line construction.

Improvements to existing off-ROW roads may be required if it is determined that heavy transport requires such improvements. Improvements would typically involve re-grading of dirt roads if wear and tear of traffic requires it or adding rock (or additional rock) to un-paved roads. Whether or not roads would require improvements or maintenance during construction depends on the nature of the existing transportation system in the area crossed by the preferred transmission line route. Any improvements to existing roads would require permitting with the federal, state, or county authorities that own and maintain the roads.

Depending on the preferred transmission line alignment selected, the use of private roads may be required to access the transmission line easement. The right to use private roads for temporary or permanent access would be acquired through negotiation with property owners in the same manner as acquisition of the actual transmission line ROW. Similar improvements to those discussed above may be required before heavy transport can use private roads.

### Construction Assembly Areas

A construction assembly area (or lay-down yard) would be identified and secured close to the Project Area. A 5- to 10-acre cleared area probably would be required. In all likelihood, the lay down yard would be leased for the duration of construction, and at least some portion of that area would be fenced and secured. A previously disturbed area is preferred for the construction lay-down yard. If one is not available, a site will be selected that minimizes vegetation clearing requirements, impacts to cultural resources, protected species, and jurisdictional wetlands.

### Structures

Central Electric anticipates that single pole structures—typically 70 to 80 feet above ground and spaced 300 to 400 feet apart would be used to build the proposed 115 kV transmission line. Design features being considered include galvanized steel, core-ten steel, and/or concrete single pole structures carrying three 795 26/7 MCM ACSR electrical conductors on horizontal polymer post insulators, with a single 0.565 OPGW fiber optic overhead shield wire overhead.

Central Electric may use 2 poles or H-frame structures capable of achieving longer spans between structures in areas such as the Santee Delta or other river crossings. Other types of structures that may be installed include minor angle single pole structures, three-pole major angle structures, self-supporting structures, and “dead end” structures (Figures 2-5 and 2-6). Dead end structures using horizontal strain insulators are required at the end points of lengths of conductor due to the technical limitation on conductor length (there is a limit to how many feet of conductor can be wound onto a large reel, necessitating splices at dead end structures). Conductors are connected at dead end structures by a short conductor cable under tension at both ends. Angle and dead end structures are typically guyed to counter and resolve vector forces that would otherwise cause angle structures and adjacent tangent structures to fail.

Finally, some angle structures which require guying cannot be guyed directly because the required angle(s) for guying would put the guy wires within roadways or other features (e.g., natural gas pipelines and water mains). In those cases, guyed stub poles (Figure 2-7) are set up on the other side of the road or feature and an overhead wire under tension is connected from the structure to the stub pole. The stub pole itself is then guyed to counter and resolve vector forces. Alternately, a self-supporting structure can be used in this type of situation, especially where both normal guying and use of stub poles is not practicable due to spatial considerations.

In order to tap the existing Winyah-Belle Isle 115 kV transmission line, Central Electric's contractors would set new single pole structures within the phases of the existing transmission line and jumper the existing line around the structure in the direction where the tap "pulls off." Pole mounted line switches are normally installed close to the tap in all three resulting directions so that portions of the line can be isolated from faults and sectionalized so that they remain in service while repairs are carried out on damaged structures and/or spans. Sectionalizing is also useful when a utility needs to de-energize portions of the line to facilitate maintenance. Figure 2-8 shows a typical line switch.

Central Electric anticipates that the transmission line would be built by directly embedding the single pole structures. Typically, an auger is used to excavate a hole that is 10 percent of overall pole length plus two additional feet deep. For example, a structure designed to stand 80 feet tall out of ground would require a single pole structure approximately 91 feet in overall length buried 11.1 feet deep (9.1 feet plus 2 feet). Crusher-run stone backfill may be placed at the bottom of the augured hole. Pole top assemblies are fitted with attachments and insulators while on the ground, and the poles are then lifted into position by a crane. The pole is placed in the hole and set plumb. Additional stone is placed and tamped to fill the void between the structure and the undisturbed earth.

Typically, wetlands are spanned by transmission lines. However, in coastal South Carolina, wetland crossings may be too wide to span, requiring structures to be installed within wetlands. In such cases, Central Electric anticipates that the transmission line would be constructed in a manner similar to construction on uplands, with several notable differences. Equipment used in wetlands would be low-ground pressure equipment with a 10 psi or less rating and/or equipment working on load-dispersing mats to minimize rutting and mucking of wetland soils. An environmentally benign, bio-degradable drilling mud that is reclaimed at each site and used for the next installation may be used to prevent deep augured holes from collapsing in soft, saturated wetland soils. Native wetland soils that have been removed by augur would be carried from the wetland, relocated to upland areas, and spread and stabilized. Depending on soil conditions within wetlands, holes may be augured somewhat deeper or somewhat wider depending on the specific soil engineering characteristics at each structure site. Such actions would be consistent with any guidance or permits from the USACE and any applicable state regulatory agency.

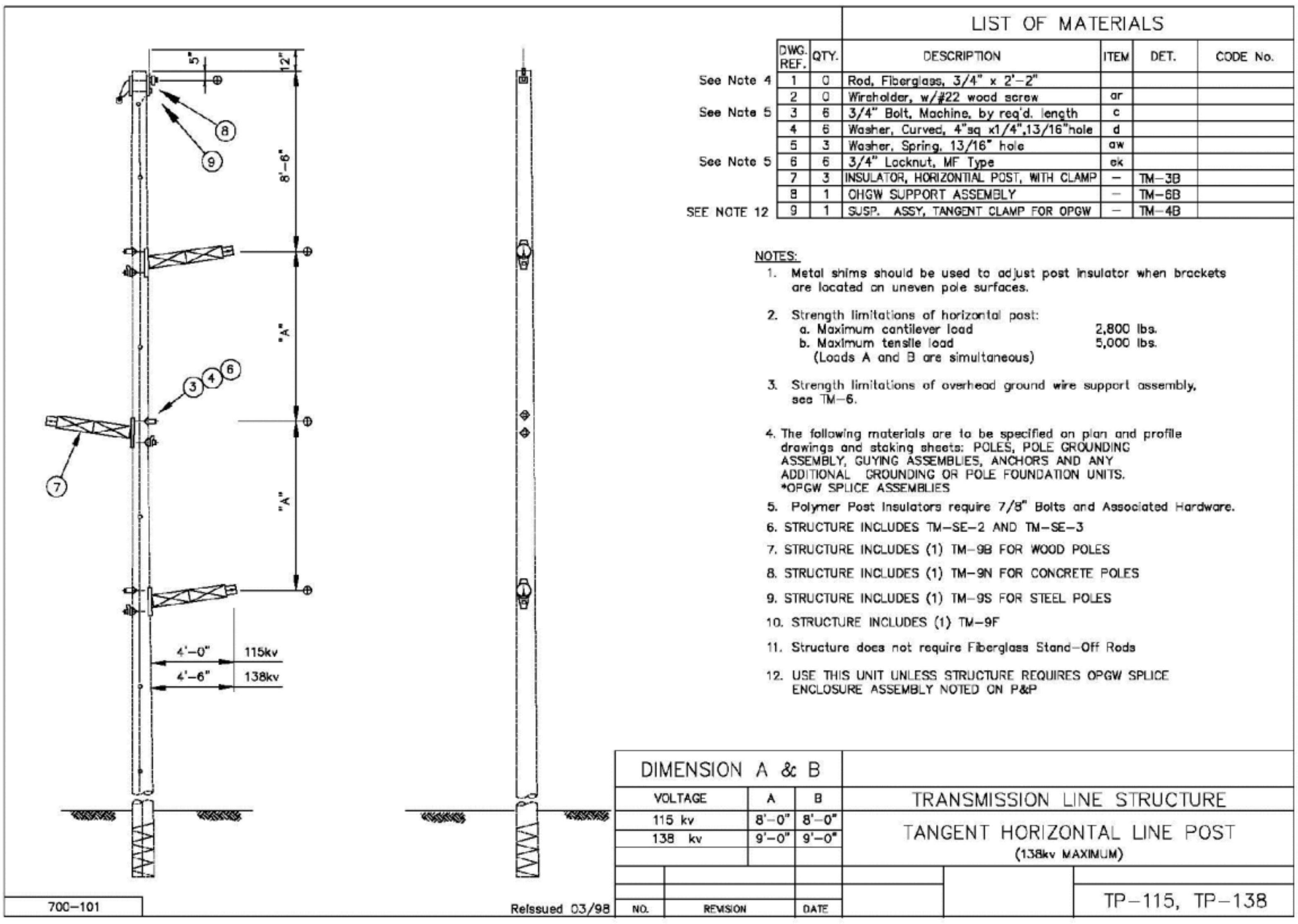



**Figure 2-5: Transmission Line Structure—Tangent Horizontal Line Post**

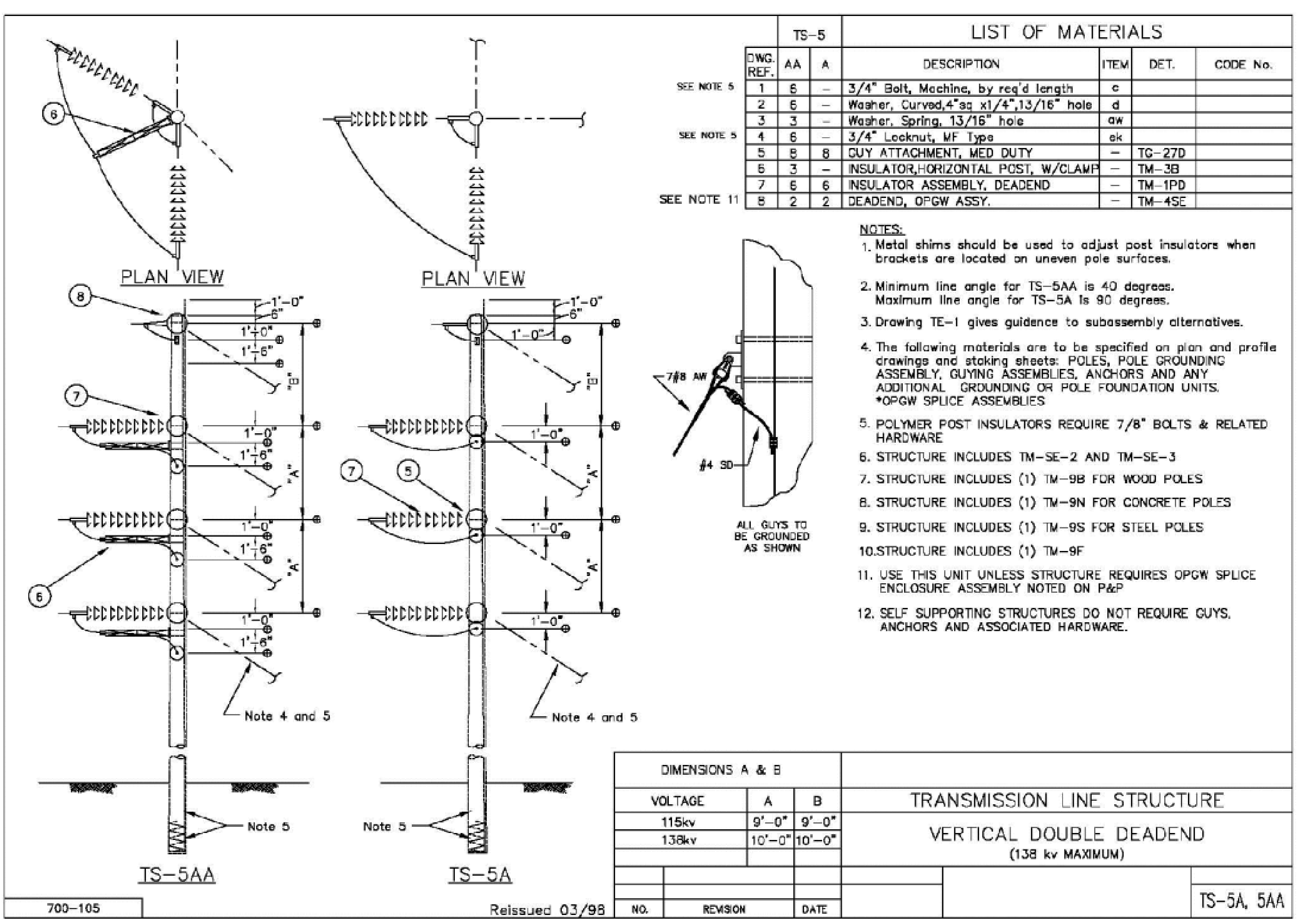



**Figure 2-6: Transmission Line Structure—Vertical Double Deadend**

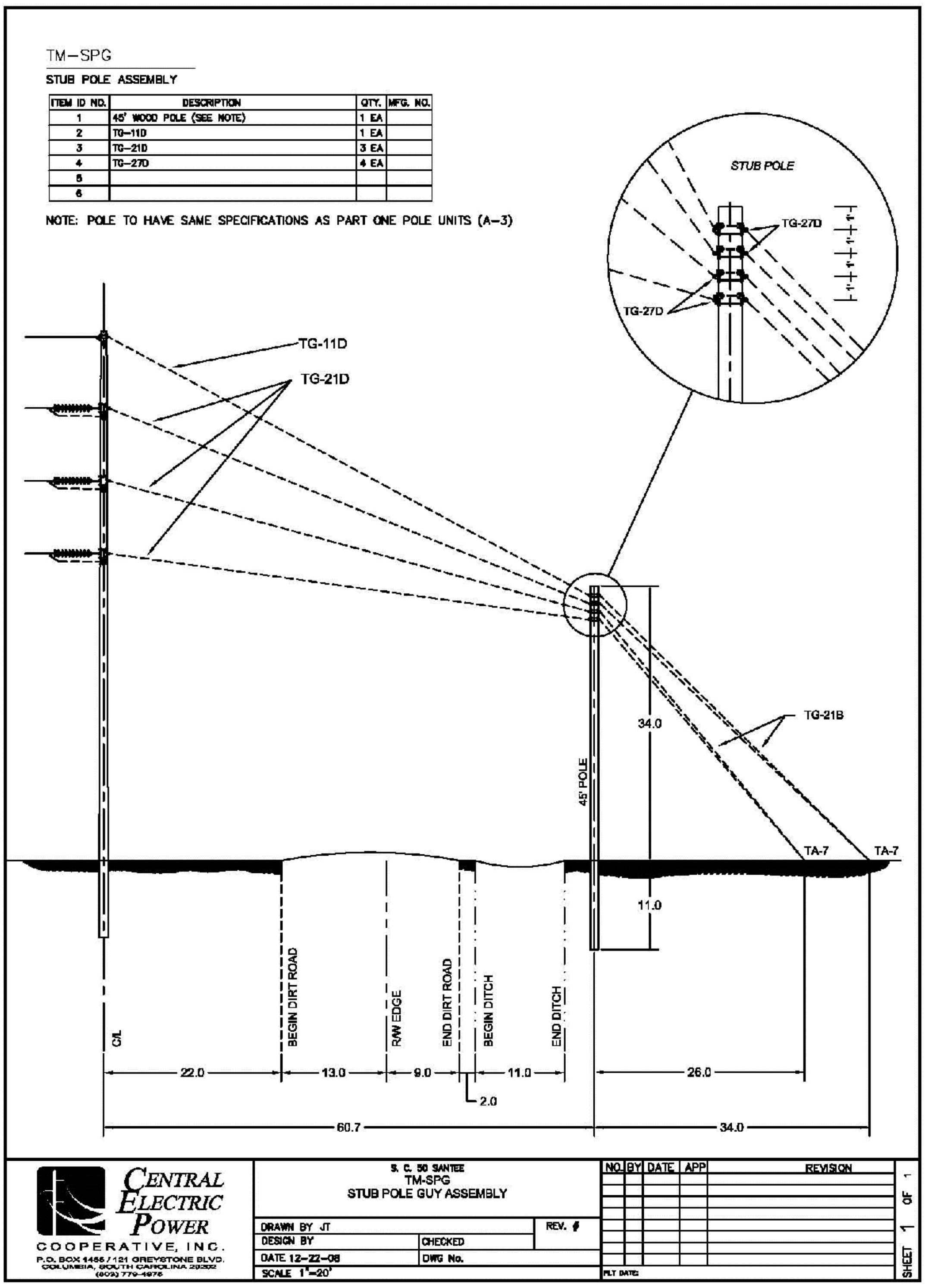



**Figure 2-7: TM-SPG – Stub Pole Guy Assembly**

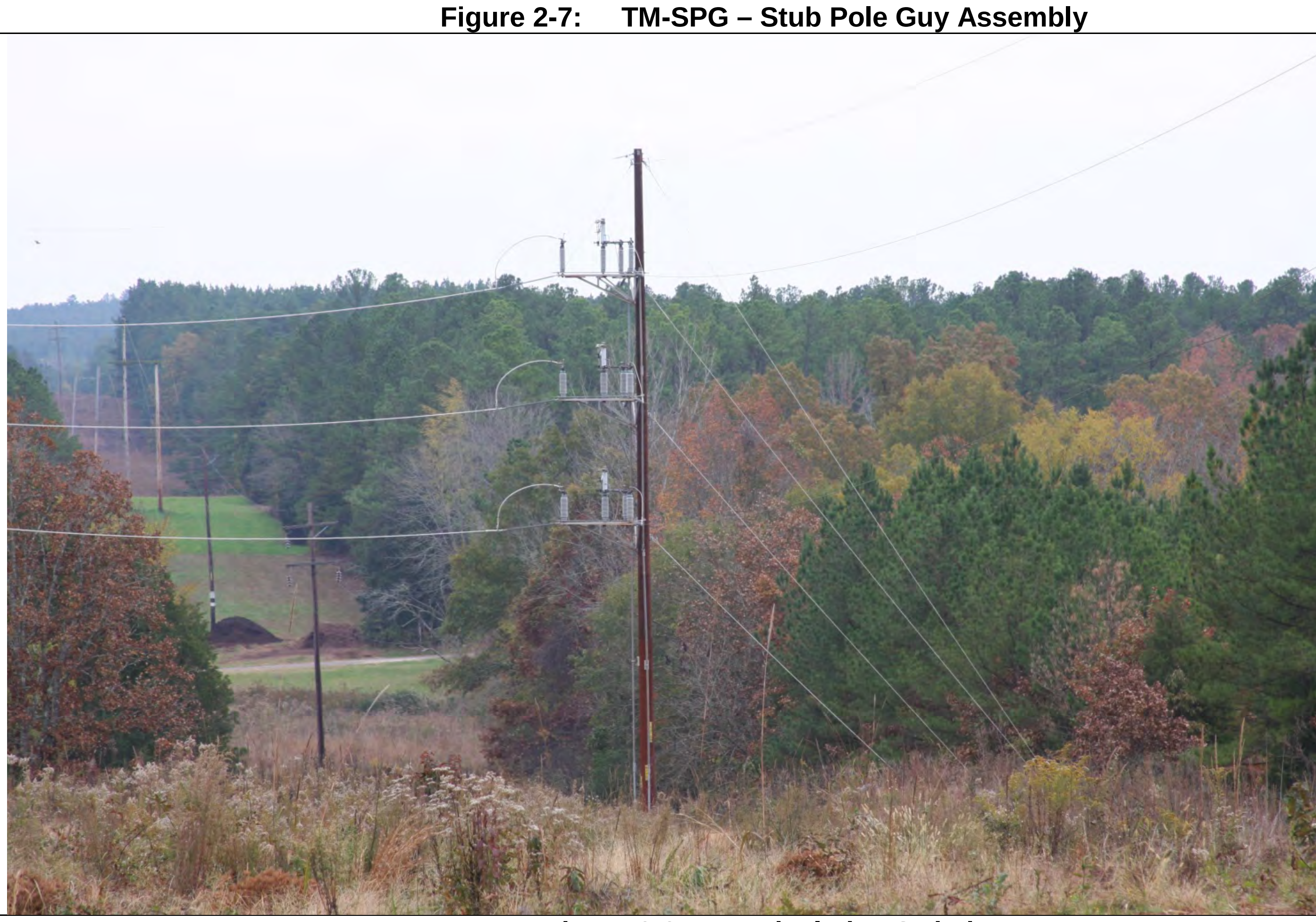


**Figure 2-8: Typical Line Switch**

Central Electric anticipates that dead-end structures may be installed atop a vibratory-driven hollow steel piling (also known as a caisson piling). The vibratory-driven caisson is a +/- 3/8-inch thick hollow steel piling that, once installed, extends about 6 feet above ground elevation and is set to a depth of about 40 feet. The top of this vibratory piling is typically fitted with a 2.5-inch-thick steel flange upon which the superstructure sections of the steel pole would be attached using steel bolts. If used in a wetland, equipment used to vibrate the dead-end structure caisson piling into place, attach the upper segment(s), and string conductors would be low ground pressure equipment or equipment working from temporary load-dispersing mats intended to minimize rutting and mucking of wetland soils.

### Conductor and Ground Wire Installation

Steel reinforced aluminum conductors would be strung and attached to the ends of the polymer post insulators using the tension method. Major equipment required for tension stringing includes reel stands, tensioner, puller, reel winder, pilot line winder, splicing cart, and pulling vehicle. Travelers are attached to the bottom of each insulator so the conductor can be pulled through multiple structures. At one end, a reel of conductor is staged in line with the structures. At the other end, a puller is stationed to pull the conductor from the reel through the travelers located on the structures. Once the proper tension on the conductor is achieved, the conductor is attached to the insulator and the travelers are removed. Similar methods are used for pulling the overhead shield wire into place along the length of the transmission line.

Guy wires are steel cables under tension designed to stabilize transmission structures. One end of the cable is attached to the structure, and the other is attached to steel helix anchors driven into the ground at some distance from the structure's base. The number of guy wires and their configuration are dependent on the design of the structure (e.g., single steel or concrete poles versus lattice towers), soil conditions, and whether the structures are tangent structures (several structures in a straight line) or angle structures (structures where the direction of the transmission line is changed). It is common to clear a small additional area, called a guy flare, to install the ground anchors for the guying system. The additional land disturbance area required for guy flares is not likely to be significant compared to the overall 75-foot wide easement. However, based on past experience with building transmission lines in South Carolina’s Coastal Plain, Central Electric anticipates that there may be +/- 2.1 dead-end structures per mile and +/- 1.4 swinging angle structures per mile.

Dead-end structures require ahead-and-back guying as shown in Figure 2-6. In that figure, guy flares are labeled as 20 feet wide and 100 feet long. The 100-foot measurement is taken from the center of the pole. With a 75-foot-wide ROW, as proposed for cross-country potions of this Project, a 100-foot-long guy flare would require an additional +/- 65 feet of cleared area (35 feet of the 100-foot cleared area being already within the 75-foot wide easement, an additional +/- 65 feet would make up the 100-foot dimension labeled in the figure). The additional area for each of the two guy flares would therefore be +/- 1,300 square feet, or +/- 2,600 square feet per dead-end structure.

Swinging angle structures require only one set of guy wires to support a small angle structure Figure 2-6. These guys are set up along the exterior angle bi-sector, and the flares would also be 100 feet long by 20 feet wide. The additional cleared area would be 65 feet by 20 feet or 1,300 square feet.

As with guying and guy flares, the number of stub poles is also unknown at this time. Stub poles are typically required when paralleling roads, and may require 20 feet wide and 100 feet long guy flares. For road-side alignments, Central Electric estimates that one stub pole and guy flare may be required every four miles along U.S. Highway 17. As much as 2,000 square feet of clearing may be required to install stub poles and guys.

### 2.5.5. Substation Construction

Substation construction would take place on a previously graded site. Backhoes would be used to dig holes at certain locations and depths as designed, steel re-bar cages would be placed within the holes, and concrete would be poured to create foundations needed to support the substantial weights of steel structures. These steel structures are needed to terminate the proposed transmission line and support the weights of the 115/25-kV electrical transformer, the switches, the bus work, and the low-side (distribution voltage) frames. Trenching excavators would be used for placement of conduit needed to operate switches and other equipment, as well as to bring the four distribution lines out from the low-side structures.

### 2.5.6. Construction Schedule and Projected Workforce

Survey, ROW acquisition, and construction of the transmission line will occur over a 36 month period after the selection of the preferred route. Table 2-1 below is a timeline of the anticipated duration of each task and the projected workforce required to complete the tasks.

**Table 2-1: Project Schedule and Projected Workforce**

| Task | Projected workforce | Duration | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Survey for Permitting | 6-8 | 4-6 months | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Engineering Survey | 6-9 | 4-6 months | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Transmission Line Design and Construction Permitting | 2-4 | 4-6 months | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Environmental Studies | 8-10 | 4-6 months | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Right-of-way acquistion | 8-10 | 8-12 months | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Right-of-way clearing and preparation | 10-15 | 6-8 months | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Transmission Construction | 20-25 | 12-16 months | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

### 2.5.7. Procedures for Minimizing Environmental Impact during Construction

The South Carolina Department of Health and Environmental Control manages the NPDES General Permit within the state for Storm Water Discharges from Large and Small Construction Activities. The NPDES general permit requires compliance with the provisions of the SC Pollution Control Act (South Carolina Code Sections 48-1-10 et seq., 1976) and with the provisions of the CWA, 33 USC §1251 et. seq., as amended by the Water Quality Act of 1987, PL 100-4. Central Electric would file a NOI[3] prior to commencing clearing and construction, to install and maintain soil erosion and sedimentation control best management practices (BMPs) during clearing and construction and to stabilize the easement areas with permanent cover following completion of work and prior to filing its NPDES Notification of Termination.

Following transmission line construction on privately-owned uplands, Central Electric anticipates the ROW would be seeded with a mixture of grasses and forbs suitable to the coastal South Carolina climate. Temporary mulch designed to provide cover and protect soils until the herbaceous vegetation is established may be used.

On USFS land uplands, following transmission line construction, Central Electric would seed the easement areas with a mixture of mutually agreed upon, native warm season grasses. The seed mixture also may be temporarily mulched to protect soils until the native warm season grasses are established.

[3] NOI referred to in this section is specific to the National Pollution Discharge Elimination System Permit under the Clean Water Act.

### 2.5.8. Transmission Line Maintenance and Operation

#### Inspection

Central Electric's transmission lines are inspected on a regular basis by Santee Cooper, South Carolina's state-owned electric and water utility, under a contractual relationship. Regular periodic inspection is required to ensure that structures, insulators, conductors, shield and guy wires, and all other components previously identified are maintained in good condition.

#### Vegetation Management

Transmission line ROWs owned by Central Electric or leased to Central Electric are also maintained by Santee Cooper. Santee Cooper's ROW management program is called Transmission Vegetation Management Program, and it includes a broad range of mechanical and chemical vegetation management. Santee Cooper's Vegetation Management Plan is included in Appendix C. The Mechanical Re-clearing Staff is responsible for the mechanical re-clearing and soil stabilization of selected transmission line ROWs. ROW management is responsible for herbicide-related vegetation maintenance, encroachment enforcement, and administering the POWER for Wildlife Program. Contract re-clearing is responsible for all tree related maintenance throughout the transmission system.

New Central Electric transmission ROWs are inspected by Santee Cooper to ensure that ROW conditions can be accepted by Santee Cooper's Operations and Maintenance staff. Danger trees, erosion, correct ROW widths, and stump levels are some of the major items that are inspected.

Transmission ROWs are re-cleared on a 2.5- to 3-year cycle, using medium to heavy 4-wheel drive tractors with associated mowing implements, to ensure that vegetation growth does not adversely affect system reliability. Also, re-clearing personnel use herbicides to control vegetation throughout their respective mow area. This includes applying granular herbicide at the base of selected transmission structures in order to reduce the potential of damage from wild fires and/or facilitate ground rot inspections by line personnel. Also, crews treat wetland areas (i.e., areas where mowing equipment cannot traverse) with a foliar herbicide application, using a Marsh Master or similar equipment, to control woody vegetation.

The goal of Santee Cooper's herbicide program is to control vegetation that could interfere with the normal transmission of electricity while promoting low-growing native vegetation. The current practice of applying herbicides is to selectively treat undesirable woody vegetation using a low volume methodology. Although the amount of herbicide applied is dependent on the species composition, density, and height of the vegetation that is present, the selective application approach results in less of the active ingredient being applied per acre, as compared to the broadcast method. Also, only herbicides approved by the U.S. Environmental Protection Agency (USEPA) are used within ROWs with each being applied in accordance with manufacturer labeling.

With respect to chemicals used, applications, and application rates, the following information has been submitted by Santee-Cooper.

- Backpack application—Mix containing 4 percent Rodeo and 0.5 percent Polaris (average of 10 gallons of mix per acre is applied)
- Large ATV application—Mix containing 4 percent Rodeo and 0.5 percent Polaris (average of 26 gallons of mix per acre is applied)
- Cut stump application—Mix containing 20 percent Triclopyr with the amount of mix applied dependent on the diameter of the stump because only the cambium layer is treated)
- Granular Application (applied by hand)—Two pounds or less per pole (dependent on the density of vegetation around the pole and the radius of control that is needed)

Glyphosate, Imazapyr, and Metsulfuron are the primary products Santee-Cooper uses in their foliar spray mix. These are USFS-approved herbicides. Santee-Cooper currently utilizes the following products that are commonly available on the market.

- Polaris (Imazapyr)—Labeled for upland and wetland/aquatic uses on utility ROWs, Polaris is delivered by backpack or ATV depending on ROW conditions.
- Rodeo (Glyphosate)—Labeled for upland and wetland/aquatic uses on utility ROWs, Rodeo is delivered by backpack or ATV depending on ROW conditions.
- Escort (Metsulfuron)—Used sparingly when vines and waxy vegetation require control. When used, it represents 3 to 5 ounces of a 100-gallon tank mix.

Granular applications are primarily used around poles to eliminate woody plants and vines. Santee-Cooper uses a special granular blend consisting of Topsite and SpraKil S-5 that is applied by hand. Tebuthiuron (SpraKil S-5) represents 5 percent of the active ingredient. Topsite is a blend of herbicides that includes Diuron (which represents 2 percent active ingredient) and Imazapyr (which represents 0.5 percent active ingredient).

Utilizing a selective low volume approach, personnel equipped with backpacks treat only undesirable vegetation along selected ROWs. Hardwoods such as sweetgum, red maple, black willow, and various oaks that are tall growing and prolific species like pines are targeted. By removing these trees, desirable plants (from an ROW perspective) such as grasses and forbs can better compete for nutrients and, once established, these low-growing species contribute substantially to long-term vegetation control in ROWs.

After initial herbicide application, Santee-Cooper would conduct a post application inspection (e.g., aerial and/or ground) to identify any areas that may require follow-up treatment. Maintenance would take place on a 3-year rotation. Because the density of undesirable vegetation would have been reduced, subsequent herbicide applications should require less herbicide to control vegetation.

In wetland areas, Santee-Cooper ground crews utilize backpacks and/or an ATV (Argo, Marsh Master, etc.) equipped with a hydraulic spray system to foliar treat only the undesirable vegetation present. Current procedures dictate a selective, low volume herbicide approach that minimizes the amount of active ingredient applied per acre. The herbicide products used during wetland area spraying are determined by the species present and to a great extent by the location. In areas that have standing water and are connected to a larger aquatic system (e.g., river or swamp), only USEPA-approved herbicides registered for use in wetland or aquatic sites are used. Wetland areas are scheduled on a three or four year rotation depending on the vegetation species that are present, densities of woody vegetation, and height of conductors. Vegetation densities should decrease with subsequent applications requiring less herbicide to be applied.

Future vegetation management activities on ROWs crossing USFS lands are expected to be similar to vegetation management as described above except for the use of herbicides. **Herbicides would not be used during land clearing or maintenance activities of the ROW crossing USFS lands**. In the future, Santee-Cooper may elect to undertake a risk assessment for the use of chemical management on the FMNF and secure permission from USFS to use chemicals on the ROW, but the use of chemicals on USFS lands is not contemplated at this time. Herbicide use for maintenance of the ROW on National Forest System lands would require environmental analysis and documentation under NEPA, following USFS regulations.

One exception to the use of chemicals on USFS lands is where FMNF policy permits it for the control of non-native invasive plant species. An environmental assessment prepared by USFS dated July 12, 2004, evaluated the use of chemical management to eliminate or control non-native invasive vegetation species such as Chinese privet

(*Ligustrum sinense*), tall fescue (*Schedonorus arundinaceus*), and Japanese honeysuckle (*Lonicera japonica*). For the purpose of controlling non-native invasive plant species, chemicals may be used if treatments follow the standards and guidelines identified in USFS' *Environmental Assessment: Non-Native Invasive Plant Control on the Francis Marion National Forest* (USFS 2004).

Transmission lines with tree limbs encroaching into the ROW that pose a problem for maintenance and operations are scheduled for side trimming. Maintenance options include removing encroaching limbs from the air or from the ground. Aerial operation consists of using a set of belt driven saws, suspended from a helicopter, to cut over-hanging limbs back to the edge of the ROW. Ground operation consists of using equipment such as a Jarraff or Skytrim to perform a similar function. These machines have an extendable boom with an attached circular saw that can reach and trim tree limbs high above the ground.

With respect to danger tree maintenance, maintenance personnel utilize an instrument called a clinometer that measures angles to determine whether a tree located off ROW is tall enough to hit the transmission line conductors if it were to fall. Depending on the species of tree, height, age, and site index, the tree would either be felled whole or topped. The decision to top or fell is made by a forester in charge of the operation based on his opinion of tree survivability after topping. Felled trees are de-limbed and decked between the spans in which they were cut. The resulting slash (tree tops and limbs) is left in the ROW to decay.

Reported erosion problems on the ROW are typically rated from low to extreme based on soil type, topography, and proximity of eroded area to a transmission structure. This information is used to prioritize and schedule erosion control measures that would provide long-term control and ensure system reliability. Corrective action measures include grading the eroded area and, if necessary, constructing earthen terraces to divert surface waters across the ROW. Crews then would plant the area with an appropriate seed mix for the season and soil characteristics. To enhance stability and ensure that the terraces and repaired ROWs are not impacted by rains before grasses are established, hay bales or other erosion control structures may be installed where appropriate to protect them.

### Structure Replacement

In the event that one or more of the structures fail, they would be replaced as described in Section 2.5.4 *Transmission Line Construction.* Damaged structures and components would be recycled or landfilled.

### 2.5.9. Substation Maintenance and Operation

#### Inspection

Substations are inspected on a regular basis to ensure that transformers, high-side and low-side structures, bus work, and all other components are maintained in good condition.

#### Spill Prevention, Control, and Countermeasures

Electrical transformers used for the proposed McClellanville Substation would be filled with non-polychlorinated biphenyl (PCB) dielectric fluids needed for cooling and insulating the equipment. No other additional bulk storage of oils will be required on-site. Non-PCB mineral and vegetable-based oils typically used in new transformers display low direct toxicity because they do not contain the water soluble and multi-ringed poly-nuclear aromatic hydrocarbons typically found in the older PCB/petroleum-based oils. Nevertheless, the transformer at the proposed McClellanville Substation would be installed within a concrete containment area with two foot high walls, forming a containment area with sufficient capacity to hold the transformer cooling/insulating fluids in the unlikely event of a leak or spill.

As required by the USEPA, Berkeley Electric has developed and maintains an oil Spill Prevention Control and Countermeasures Plan (SPCC), to identify the quantities of oil at each substation and procedures to follow, in the event of a spill. The SPCC plan will give all pertinent information needed to effectively initiate clean-up of the spill, including all agency contact information required for notification purposes.

Knowledge of a spill would be immediate, since the substation transformer would overheat and protective equipment would engage and shut down the power to the substation. Berkeley Electric would respond as quickly as practicable to assess the situation. Installation of a temporary or new transformer would become a very high priority, as well as recovery of the spilled fluids. The site cleanup crew would implement the Accidental Release Measures identified on the Material Safety Data Sheet for Mineral Oil as well as the SPCC plan. The containment area would prevent the spill from leaving the site and entering watercourses. The spilled dielectric fluid would be absorbed with appropriate inert materials, or recovered using vacuum pumps, shovels, buckets, or other means and placed in drums or other suitable containers. Recovered material would be delivered to a company that handles the responsible and approved disposal or recycling of used transformer oils.

### 2.5.10. Environmental Impact Mitigation Table

The selection of any of the alternative routes would require the implementation of mitigation measures to prevent or minimize both short- and long-term impacts on resources from construction and operation of the Project. Additional mitigation measures will be evaluated as further information becomes available on the actual route location. Central Electric would implement Standard BMPs in the construction and operation of the proposed Project. These BMPs are described in Appendix C. Mitigation measures for each resource area are summarized in Table 2-2, below.

Mitigation measures that would be required by federal agencies as loan or permitting conditions would be included in the Record of Decision issued by each federal agency.

**Table 2-2: Summary of Mitigation Measures**

| BMP No. | Mitigation Measure |
|---|---|
| **Water Resources** | |
| WR-1 | Construction equipment, fuels, chemicals, and materials will be stored outside of streams and wetlands. |
| WR-2 | Construction mats will be used for all wetland crossings. |
| WR-3 | Wetland areas will be identified and marked prior to construction along the right-of-way. |
| WR-4 | Wetland and riparian areas will be spanned, where feasible. Low-water crossings may be used to access the right-of-way during construction and will be designed so as not to inhibit fish passage or create discharges. |
| WR-5 | BMPs, such as silt fence or other appropriate measures, will be installed at all stream crossings and along the borders of wetlands to prevent sedimentation. |
| WR-6 | Structures will be located outside wetland areas, where feasible. |
| WR-7 | The Project will comply with all requirements of state permits for storm water discharges for construction activities. |
| WR-8 | A Storm water Pollution Prevention Plan will be developed prior to construction. |
| WR-9 | Construction activities will be conducted to prevent the accidental spillage of solid matter contaminants, debris, hazardous liquids, or other pollutants into streams, waterways, lakes, land, and underground aquifers. Such pollutants and waste include, but are not restricted to, refuse, garbage, cement, concrete, sanitary waste, industrial waste, oil, and other petroleum products, aggregate processing tailing, mineral salts, and thermal pollution. |
| WR-10 | A hazardous materials management and spill prevention plan will be developed to address storage, use, transportation, and disposal of hazardous materials. |
| WR-11 | An emergency response plan will be developed for accidental spills. |
| WR-12 | Spills or equipment leaks will be promptly cleaned up to prevent materials entering surface water. |
| WR-13 | Construction in river crossing areas will be scheduled during low water periods or during winter, if feasible. |

| BMP No. | Mitigation Measure |
|---|---|
| WR-14 | Culverts will be installed, where necessary, to accommodate the estimated peak flow of the stream. Disturbance to the stream banks will be minimized during construction and all disturbed areas will be regarded to original contours and vegetated in accordance with the mitigation measures listed for soil/vegetation resources. |
| WR-15 | Excavated material and other debris will be removed from flood prone areas to prevent introduction of debris that may lead to clogged culverts or bridges, resulting in changes to water flow and flood patterns. |
| WR-16 | Excavated materials will not be stockpiled near or on stream banks or other waterway perimeters unless the stockpile is protected from high water or storm water runoff. |
| WR-17 | Wastewater discharge from any construction operation will not be allowed to enter streams, waterways, or other surface waters without the appropriate permits. |
| WR-18 | The use of fertilizers, pesticides, or herbicides will be avoided in or near surface waterbodies. |
| **Biological Resources** | |
| BR-1 | Temporary access roads created during construction of the transmission line will be restored to the natural condition after construction is completed. |
| BR-2 | Holes drilled or excavated for foundation construction and left unattended overnight will be marked and secured with temporary fencing to reduce the potential for livestock and wildlife to enter the holes, and for public safety. |
| BR-3 | Construction operations will be conducted to prevent, to the extent practical, any unnecessary destruction, scarring, or defacing of the natural surroundings, vegetation, trees, and native shrubbery in the vicinity of the work. |
| BR-4 | A noxious weed management plan will be developed to address the potential spread of noxious weeds during construction activities. The plan would include strategies for prevention, detection, and control of noxious weeds. |
| BR-5 | Construction equipment will be inspected for seeds and thoroughly cleaned before mobilizing to the Project Area. |
| BR-6 | Raptor and migratory bird surveys will be conducted along and adjacent to the proposed transmission line route prior to construction. In the event a nest is located, USFWS will be coordinated with to minimize adverse effects during construction, if avoidance is not possible. |
| BR-7 | The Project will be designed in accordance with the Avian Power Line Interaction Committee's "Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006" (APLIC 2006) and protection from line strikes in accordance with recommendations contained in the most recent Avian Power Line Interaction Committee publication, "Reducing Avian Collisions with Power Lines, State of the Art in 2012" (APLIC 2012). |
| BR-8 | The results of the ESA Section 7 consultation will be included in the Final EIS and any mitigation measures that are required for federally listed species will be implemented. |

| BMP No. | Mitigation Measure |
|---|---|
| BR-9 | Upon completion of all work, all non-agricultural disturbed areas and construction staging areas not needed for maintenance access will be re-graded so that all surfaces drain naturally, blend with the natural terrain, and are reseeded to blend with native vegetation with a seed mixture certified as fee of noxious or invasive weeds. All destruction, scarring, damage, or defacing of the landscape resulting from construction will be repaired. |
| BR-10 | No tree removal within 300 feet of active swallow-tailed kite nests from April 1 through June 30 or until fledging is completed. |
| BR-11 | If the preferred alternative route is near a climbing heath, Carolina fluffgrass, and/or yellow fringeless orchid, a buffer will be placed around the location of the species to minimize impacts. |
| BR-12 | Mitigation measures discussed in the Biological Assessment for the Project will be implemented before, during, and after construction. |
| BR-13 | In consultation with USFWS, optical ground wire or bird flight diverters will be used to mitigate the potential collision risk in high bird use areas. |
| **Soils and Geology** | |
| SG-1 | Construction activities will be confined to the right-of-way and around structure locations for placement of the transmission structures. |
| SG-2 | Topsoil removed during construction will be stockpiled and used for reclamation following construction. |
| SG-3 | All disturbed areas will be re-graded, stabilized, and revegetated to pre-construction conditions. |
| SG-4 | Access roads will be designed to follow the contour of the land to the extent practical rather than in a straight line along the right-of-way where steep features would result in higher erosion potential. |
| SG-5 | Compacted soils will be sufficiently loosened after construction to minimize impacts on soil productivity and agricultural operations. |
| SG-6 | Water will be applied on roads and disturbed areas to minimize dust, as needed. |
| **Air Quality and Greenhouse Gas Emissions** | |
| AQ-1 | Speed limits will be enforced on local gravel roads to reduce dust. |
| AQ-2 | Staging areas and laydown yards will be located as close to the construction site as possible to minimize driving distance. |
| AQ-3 | All waste materials will be disposed of properly at permitted waste disposal areas or landfills. |
| AQ-4 | Waste materials will not be burned or buried on the right-of-way. |

| BMP No. | Mitigation Measure |
|---|---|
| **Cultural, Historical, and Paleontological Resources** | |
| CHP-1 | A cultural resource survey will be conducted within the right-of-way for archaeology and the area of potential effects for aboveground resources prior to construction and mitigation measures will be developed, where required as identified in the Programmatic Agreement (PA). |
| CHP-2 | Archaeological sites will be spanned and protected during construction when feasible, as identified in the PA. |
| CHP-3 | All workers will be briefed on the appropriate protocol in the event of a cultural resource discovery during construction. All workers are prohibited from removing artifacts from the Project Area, as identified in the PA. |
| CHP-4 | All construction activities will be suspended within a 50-foot radius if any paleontological resources are discovered, as identified in the PA. |
| **Land Use** | |
| LU-1 | A schedule of construction activities will be provided to all landowners who could be affected by construction. |
| LU-2 | Appropriate permits and easements for portions of the right-of-way traversing public lands will be acquired from the federal or state land management agencies. |
| LU-3 | Construction activities will be planned to minimize temporary disturbance, displacement of crops, and interference with agricultural activities. |
| LU-4 | Access road construction will be kept to the minimum width required for the passage of construction vehicles. |
| LU-5 | Fences, gates, and similar improvements that are removed or damaged during construction will be repaired or replaced. |
| LU-6 | Deep ruts that are hazardous to farming operations and equipment movement will be reclaimed after construction. Such ruts will be leveled, filled, and graded, or otherwise eliminated in an approved manner. Ruts, scars, and compacted soils from construction activities in productive hay or crop lands will be loosened and leveled by scarifying, harrowing, disking, or other appropriate methods. Damage to ditches, tile drains, terraces, roads, and other land features will be corrected. Land contours and facilities will be restored as nearly as practical to their original conditions. |
| LU-7 | Hedges and gates will be used to discourage access to the right-of-way. |
| **Socioeconomics** | |
| SE-1 | Landowners will be contacted during construction to minimize short-term impacts on agriculture. |
| **Transportation** | |
| T-1 | Conductor stringing across roadways will be coordinated with the State Department of Transportation. |
| T-2 | Coordination with the FAA may be required if the preferred route is near an airfield. Any required coordination will be completed prior to construction. |

| BMP No. | Mitigation Measure |
|---|---|
| **Health and Safety** | |
| HS-1 | A construction plan in accordance with the National Electrical Safety Code and the Occupational Safety and Health Administration's regulations will be prepared, as required by federal law, to ensure the safety of construction workers. The plan will include standards such as requirements for hearing protection, personal protective equipment, site access, chemical exposure limits, safe work practices, training program, and emergency procedures. The plan will also identify procedures should a spill occur or hazardous materials be discovered. The plan will be reviewed with fire department personnel and emergency services personnel to reduce risk of construction and operation activities interfering with emergency response or evacuation plans and procedures. |
| HS-2 | Existing utilities will be identified and coordinated with prior to construction in order to implement appropriate measures to protect both facilities and construction workers during crossings. |
| HS-3 | Fueling of vehicles will be conducted in compliance with established procedures designed to minimize fire risks and fuel spills. |
| HS-4 | All construction areas will be secured at the end of each work day to protect equipment and materials and discourage public access. |
| **Noise** | |
| N-1 | Equipment will be equipped with sound-control devices no less effective than those provided on the original equipment. |
| N-2 | All internal combustion engines used in connection with construction activities will be equipped with a muffler and spark arrester to avoid nuisance conditions due to construction noise. |
| N-3 | Construction activities will be conducted between the hours of 7am and 8pm in residential areas. |

## 2.6 Agency Preferred Alternative (Final EIS)

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# 3. ENVIRONMENTAL CONSEQUENCES

This chapter describes the existing environmental resources that could be affected by the Project and the potential impacts that the Project alternatives would have on those resources. Generally, the proposed action defines the Project Area considered; however, that area may change based on specific affected resource conditions—these resource-specific areas are referred to as Study Areas. The affected environment and potential impacts were determined through research and desktop analysis conducted by environmental specialists and from information provided in agency and public comments. For each resource, potential mitigation measures to reduce or avoid impacts are also identified as well as those impacts that are unavoidable even after implementation of mitigation. Finally, this chapter describes irreversible or irretrievable commitment of resources, and the relationship between short-term uses of the environment and long-term productivity.

## 3.1 Affected Environment

NEPA requires that the environment of the area to be affected or created by the alternatives under consideration is sufficiently described (40 CFR §1502.15). The affected environment section describes the resources that could be affected by the implementation of the proposed action. The resource descriptions provided in this section serve as the baseline from which to evaluate the potential impacts of the proposed action.

The resources that could be affected by the Project include the following:

- Water Resources
- Biological Resources
- Soils and Geology
- Air Quality and Green House Gas Emissions
- Cultural, Historical, and Paleontological Resources
- Land Use
- Visual Resources
- Socioeconomics

- Environmental Justice
- Transportation
- Health and Safety
- Noise

## 3.2 Environmental Effects

The environmental effects section analyzes both beneficial and adverse impacts that would result from implementing any of the alternatives. NEPA requires agencies to assess the direct, indirect, and cumulative impacts of a proposed action. Direct impacts are those that are caused by the proposed action and happen at the same location and time. Indirect impacts are those impacts that happen later in time and/or farther removed from the proposed action, but are still reasonably foreseeable. A cumulative impact is defined as the “impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions” (40 CFR §1508.7).

To determine whether an action has the potential to result in significant impacts, the context and intensity of the action must be considered. Context refers to area of impacts, timing, and the duration. Intensity refers to the severity of the impact. Intensity definitions have been developed to assess the magnitude of effects for all of the affected resource categories resulting from implementing the proposed action. Context in terms of duration of impact are estimated as either short term or long term. The definitions of intensity and duration are specific to each resource evaluated. Each affected resource impact analysis briefly describes the methodology used for analysis.

For purposes of this Draft EIS, impacts resulting from the Project have been quantified to the extent possible based on proposed route alignments and 75-foot-wide ROW associated with the alternative routes and a 600-foot buffer (300 feet on either side of the centerline) around the alternative routes. As route alignments become finalized, minor adjustments would be made based on constructability within this 600-foot buffer. These adjustments would include the locations for the placement of double-pole structures to cross rivers and the location for turn angles to provide a change in direction of the transmission line that would require temporary construction easements outside of the 75-foot-wide ROW in order to pull the conductor through at an angle. The impacts analysis will be revised during the preparation of the Final EIS.

## 3.3 General Description of the Study Area

The Study Area for the Project is bounded on the west by the Winyah-Charity 230 kV transmission line, on the north by the Winyah Generation Station, on the east by U.S. Highway 17, and on the south by the McClellanville Substation location. The Study Area encompasses a portion of the Santee River Delta and all alternatives cross both the North and South Santee rivers. The FMNF is located south of the South Santee River and is included in the Study Area.

For each of the resource areas below, a general description of the existing conditions is stated followed by an examination of each alternative and the potential effect on the resource. Six alternatives (as discussed in Section 2.3) and the no action alternative were carried forward for the resource analysis.

## 3.4 Water Resources

### 3.4.1. Affected Environment

The flat, low country region of the South Carolina's Atlantic Coastal Plain has abundant water resources. The Study Area includes extensive areas of swamps, bays, limestone sinks, tidal estuaries, freshwater streams, lakes, and reservoirs. Several perennial and intermittent streams are also present.

USACE has regulatory jurisdiction over waters of the United States including many lakes, rivers, streams, and wetlands pursuant to Section 404 of the CWA and jurisdiction over navigable waters of the United States pursuant to Section 10 of the 1899 Rivers and Harbors Act. The placement of transmission line pole structures, land clearing that involves soil disturbance, or placement of construction mats may be considered a discharge of fill material that would require a permit from USACE pursuant to CWA Section 404. Receipt of a Section 404 permit and adherence to the terms and conditions of the permit, including any associated compensatory mitigation and BMPs to reduce sedimentation and erosion control, would demonstrate the Project's compliance with the CWA. Field inspections of the Project would evaluate and verify compliance with permits and the CWA. In addition, the placement of a transmission line over a navigable waterbody would require a permit pursuant to Section 10 of the 1899 Rivers and Harbors Act.

Transmission lines that cross navigable waters of the United States, as defined by Section 10 of the 1899 Rivers and Harbors Act, must maintain a minimum height requirement above that required for bridges. For a 115 kV transmission line, the minimum height requirement is 20 feet above the required bridge height for a new fixed bridge or existing bridge in the vicinity, as stated in 33 CFR §322.5.

### Surface Water

Five named rivers and creeks are present within the Study Area, including the North Santee River, South Santee River, Pennyroyal Creek, Montgomery Creek, and Bonny Clabber Creek (Figure 3-1). Montgomery and Bonny Clabber creeks are tributaries to the North and South Santee rivers, whereas Pennyroyal Creek flows north from the Study Area into Turkey Creek. The named rivers and creeks are discussed in greater detail below. The remaining stream crossings and waterbodies are unnamed. Most of the streams crossed by the Study Area are either direct or indirect tributaries to the North and South Santee rivers. Streams that are not tributaries to the North and South Santee rivers are tributaries of the Sampit River, and they are located in the northern portion of the Study Area, in the vicinity of the Belle Isle Substation.

Alternative Route B has the greatest number of stream crossings, which includes all channels identified from the National Hydrography Dataset, and Alternative Route D has the fewest number of stream crossings. Alternative Route F crosses the greatest number of waterbodies and miles of waterbodies, whereas Alternative Route A crosses the fewest number of waterbodies. Table 3-1 quantifies the streams and waterbodies crossed by each alternative route. Figure 3-1 shows the location of the streams crossed by each alternative route.

**Table 3-1: Surface Water Crossed by Each Alternative Route**

| Hydrology | Alt. A | Alt. B | Alt. C | Alt. D | Alt. E | Alt. F |
|---|---|---|---|---|---|---|
| Stream crossings (count) | 7 | 15 | 10 | 5 | 14 | 10 |
| Waterbody crossings (count) | 4 | 10 | 15 | 7 | 13 | 19 |
| Waterbody crossing length (miles) | 2 | 2 | 3.5 | 3 | 5.5 | 7 |

Source: National Hydrography Dataset (USGS 2010)

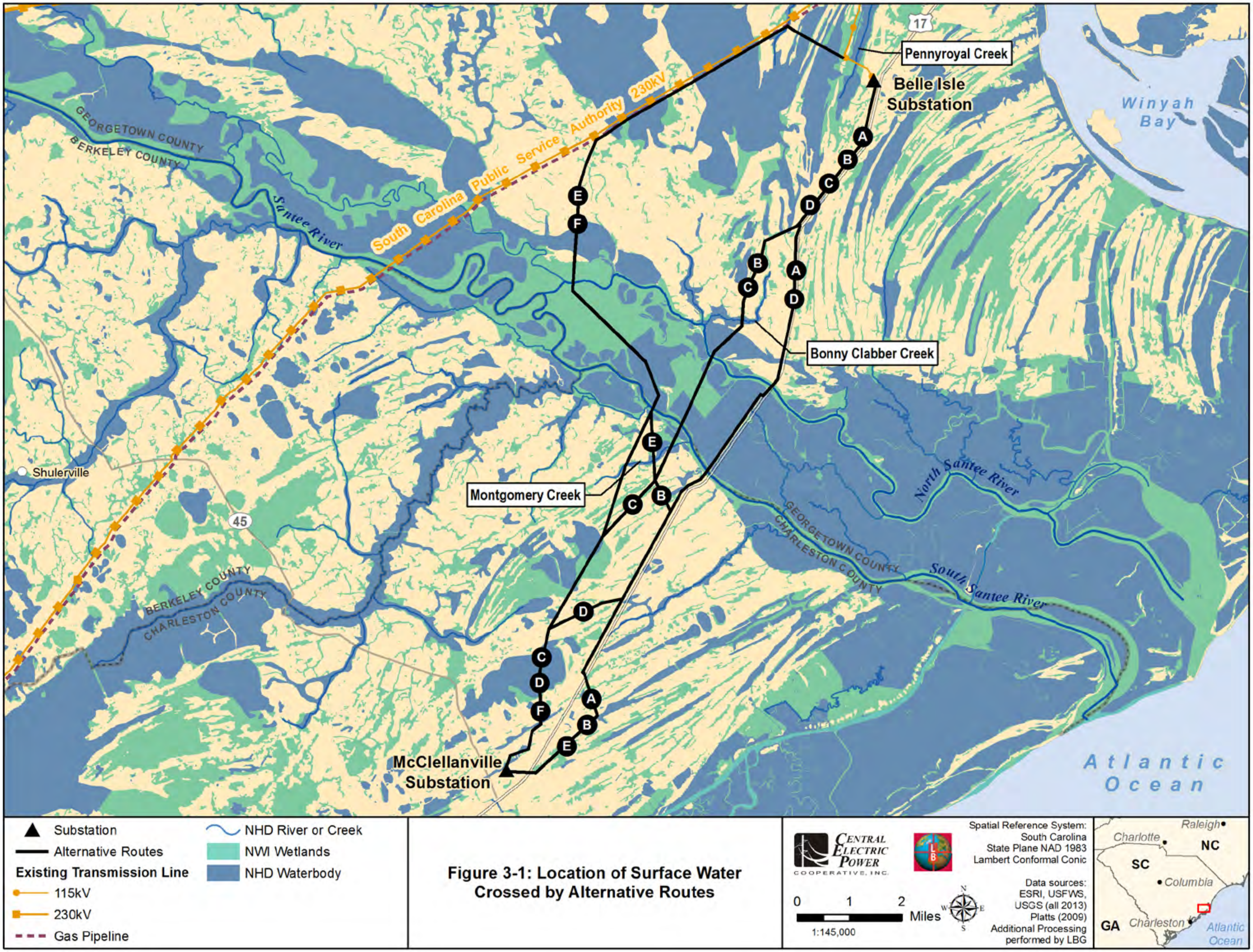



**Figure 3-1: Location of Surface Water Crossed by Alternative Routes**

*North and South Santee Rivers*

The Santee River Basin, along with associated coastal drainages, is an approximately 24,000-square-mile area in North and South Carolina (Hughes et al. 2000). This area encompasses the Blue Ridge Mountains, the Piedmont, and the Coastal Plain. Most of the Santee River Basin's several million residents live in urban areas.

The Santee River Basin, as defined more narrowly by SCDHEC, includes 11 watersheds and 1,279 square miles. It originates in the Upper Coastal Plain Region of South Carolina and flows southeast to the Lower Coastal Plain and the Coastal Zone regions.

Both the North Santee and South Santee rivers drain the central portion of the Study Area as they flow southeast from their divergence from the Santee River, west of Goat Island, approximately 0.5 mile west of Alternatives E and F. From the divergence, the North Santee River flows southeast through Georgetown County, the South Santee River flows southeast through both Charleston and Georgetown counties, and both rivers drain into the Atlantic Ocean. The North Santee River crosses the Study Area for approximately 5.3 miles, whereas the South Santee River only crosses the Study Area for approximately 2.0 miles.

*Pennyroyal Creek*

Pennyroyal Creek drains the northern portion of the Study Area in the vicinity of Alternative Routes E and F in Georgetown County. Pennyroyal Creek crosses Alternatives E and F approximately 1.3 miles northwest of the terminus of Alternative Routes E and F; this surface water flows across the survey area for approximately 0.2 mile in a northerly direction before draining into Turkey Creek, approximately 3.6 miles northeast of the Study Area.

*Montgomery Creek*

Montgomery Creek flows in a northeast direction across the central portion of the Study Area and is crossed by Alternative Routes B, C, E, and F in Charleston County. Montgomery Creek crosses the Study Area for approximately 1.6 miles and then continues to flow until it drains into the South Santee River.

*Bonny Clabber Creek*

Bonny Clabber Creek flows south and west across the central portion of the Study Area and is crossed by Alternative Routes B and C in Georgetown County. Bonny Clabber Creek crosses the Study Area for approximately 0.1 mile; after which, it flows west and then south to its confluence with the North Santee River.

Unnamed streams and waterbodies cross the remainder of the Study Area. Several of these unnamed streams are classified as ditches and are used to drain wet areas in the eastern portion of the Study Area.

## Water Quality

*Santee River*

As required by Section §303(d) of the federal CWA and federal regulation 40 CFR §130.7, states must establish water use classifications and water quality criteria to maintain, protect, and enhance public health, water uses, and water quality. SCDHEC, through South Carolina Regulation 61-68, *Water Classifications and Standards*, establishes these water uses and standards. Assessment of water quality is based on a comparison of monitoring data to state and federal standards and criteria for the classified use of the waterbody.

In accordance with federal and state regulations, the state also develops a list of waters that are impaired due to a failure to meet state water quality standards and to support one of the classified uses. In order for listed waterbodies to be removed from the 303(d) list, the water quality standard must be met, a total maximum daily load (TMDL) must be developed and accepted, or an error in the list must be discovered. A TMDL is the amount of a specified pollutant that is allowed in a waterbody without exceedance of the water quality criteria.

The state's most recent 303(d) list of impaired waters, *Integrated Report for 2012 Part I Section 303(d) List of Impaired Waters*, includes several locations close to the Study Area. Table 3-2 reports these 303(d) locations (SCDHEC 2012a). The first station (ST-005) is located in Georgetown County on the North Santee River immediately downstream of U.S. Highway 17. This location does not support aquatic life uses because of turbidity and fish consumption use due to mercury in fish tissue. TMDLs for both are not scheduled until 2025. The second station (ST-006) is located in Charleston County on the South Santee River at U.S. Highway 17. The waters at this location are impaired and do not support aquatic life use and fish consumption use because of turbidity and mercury, respectively. TMDLs are not scheduled for this location until 2022 for turbidity and 2025 for mercury. The Study Area for Alternatives A and D are within 200 feet or less of stations ST-005 and ST-006. The third station (CSTL-593) is located on a backwater approximately 775 feet from the main stem of the North Santee River and is located between upstream Alternatives E and F and downstream Alternatives A through D. This site does not support fish consumption because of mercury impairment. Fish consumption advisories due to elevated levels of mercury in fish tissue have been issued for the reaches of the North and South Santee rivers within the Study Area (SCDHEC 2005). Figure 3-2 shows the locations of the water quality monitoring stations where impairments were observed.

**Table 3-2: 303(d) Impaired Waters Locations**

| 303(d) Station | Use | Cause of Impairment |
|---|---|---|
| ST-005 | Aquatic life; fish consumption | Turbidity, mercury |
| ST-006 | Aquatic life; fish consumption | Turbidity, mercury |
| CSTL-593 | Fish consumption | Mercury |

Source: SCDHEC (2012a)

Pesticides are used for agricultural, commercial, and domestic purposes to control harmful or invasive plants, insects, fungi, or other organisms. In past sampling, pesticides have been detected in waterbodies within the Santee River Basin with several exceeding water quality criteria for aquatic life use and/or human health (Maluk and Kelley 1998). Recent data about monitoring to detect pesticide levels in waters within the Study Area were not found. The Santee Delta WMA, located on the south bank of the North Santee River and transected by Alternatives A and D, saw an increase in aquatic macrophytes, requiring the application of herbicides in 2004 and 2005 to control the growth of these invasive and noxious plants (SCDHEC 2005).

In addition to the turbidity and mercury issues found at locations within the Study Area, USGS identified several high priority regional water-quality issues of concern to state and local water-resource managers. Issues included nitrogen and phosphorus enrichment leading to reduced dissolved oxygen concentrations, sediment erosion, urban stormwater runoff polluted with toxic trace elements and synthetic organic compounds, the presence of pesticides in surface water and groundwater, and fecal coliform contamination (Hughes et al. 2000). However, most of these additional issues occur on the lower Santee River upstream of the Study Area, or downstream in the case of fecal contamination, and are associated with urban and/or agricultural land use.

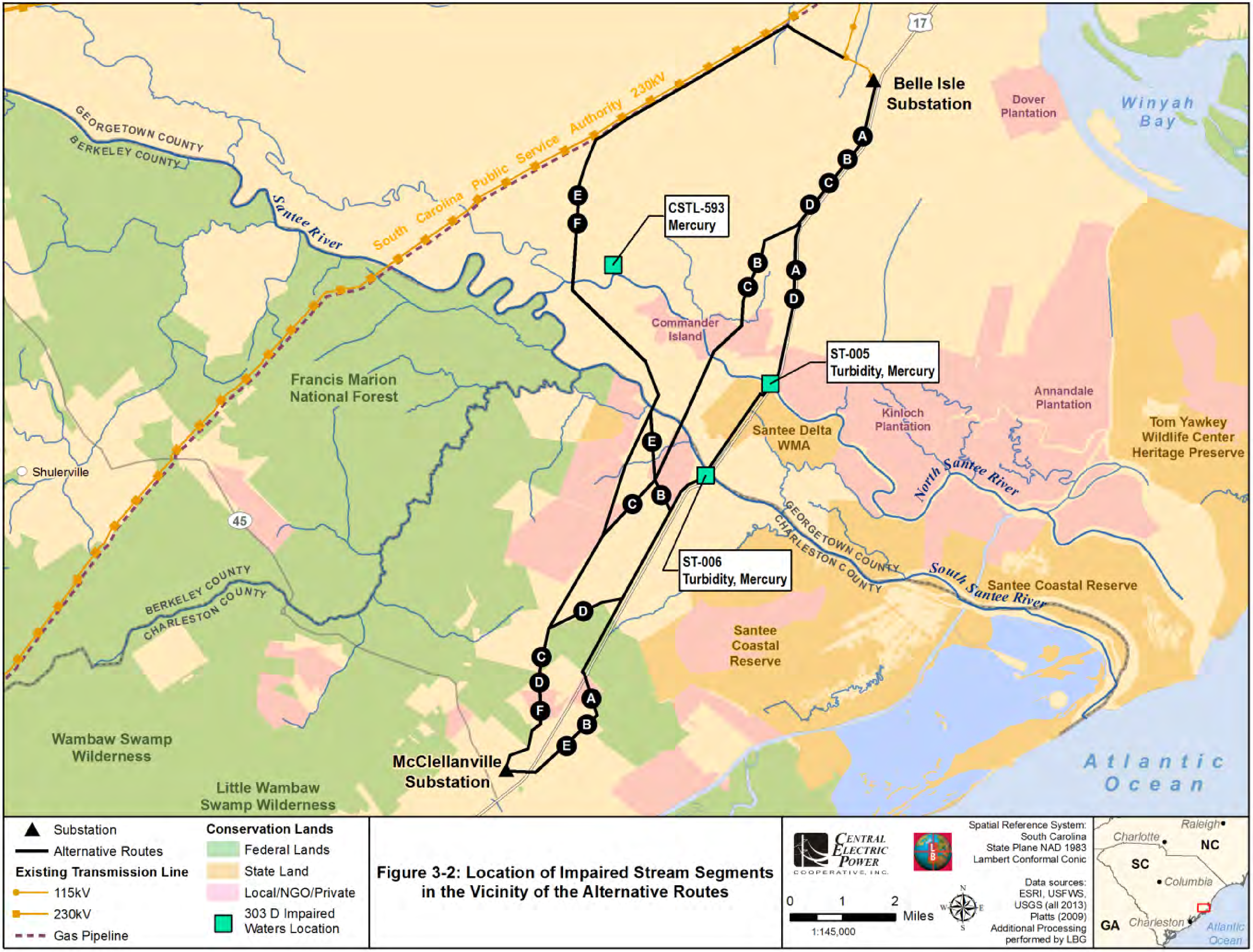



**Figure 3-2: Location of Impaired Stream Segments in the Vicinity of the Alternative Routes**

*Wetlands*

Wetlands are generally areas inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation. There are many different types of wetlands, including fresh and tidal marshes, swamps, fens, bogs, and wet prairie. Agencies, notably USACE and USFWS, define wetlands differently; however, both agencies generally agree that wetlands occur in saturated areas that support hydrophytic vegetation. USFWS, in its National Wetlands Inventory (NWI), has identified the potential location of wetlands throughout the United States.

The location of potential wetlands was determined by reviewing aerial photography, USGS topological maps, hydrography data, and Natural Resources Conservation Service (NRCS) soil surveys. USFWS does not groundtruth all of the wetlands surveyed; however, some level of effort to verify the desktop survey was conducted. Classification of wetlands in the NWI database is based on the Cowardin Classification System (Cowardin et al. 1979), which considers both vegetated and non-vegetated areas in its assessment of wetlands. The description of wetlands identified within the Study Area are based on NWI maps and GIS data; because NWI data are largely unverified by field surveys, it is expected that the acreage of wetlands identified is greater than what is present on the ground.

Wetland types identified within the Study Area using NWI data include estuarine and marine deepwater, estuarine and marine wetlands, freshwater palustrine emergent wetlands, freshwater palustrine forested/scrub shrub wetlands, freshwater palustrine unconsolidated bottom wetlands (ponds), and riverine wetlands. A brief description of each wetland type is provided below; Table 3-3 quantifies the acreage of each wetland type for each alternative route. Figure 3-3 shows the distribution of wetlands along the alternative routes.

*Estuarine and Marine Deepwater*—Estuarine and marine deepwater areas are dominated by brackish or salt water, which has a salinity of 0.05 percent or higher. Deepwater habitats are permanently inundated or submerged below water that is greater than 6 feet deep (Cowardin et al. 1979). Within the Study Area, these areas are located along small portions of Alternative Routes A and D at a point where the North and South Santee rivers transition from brackish water to freshwater. The remaining alternative routes do not cross any estuarine and marine deepwater habitat.

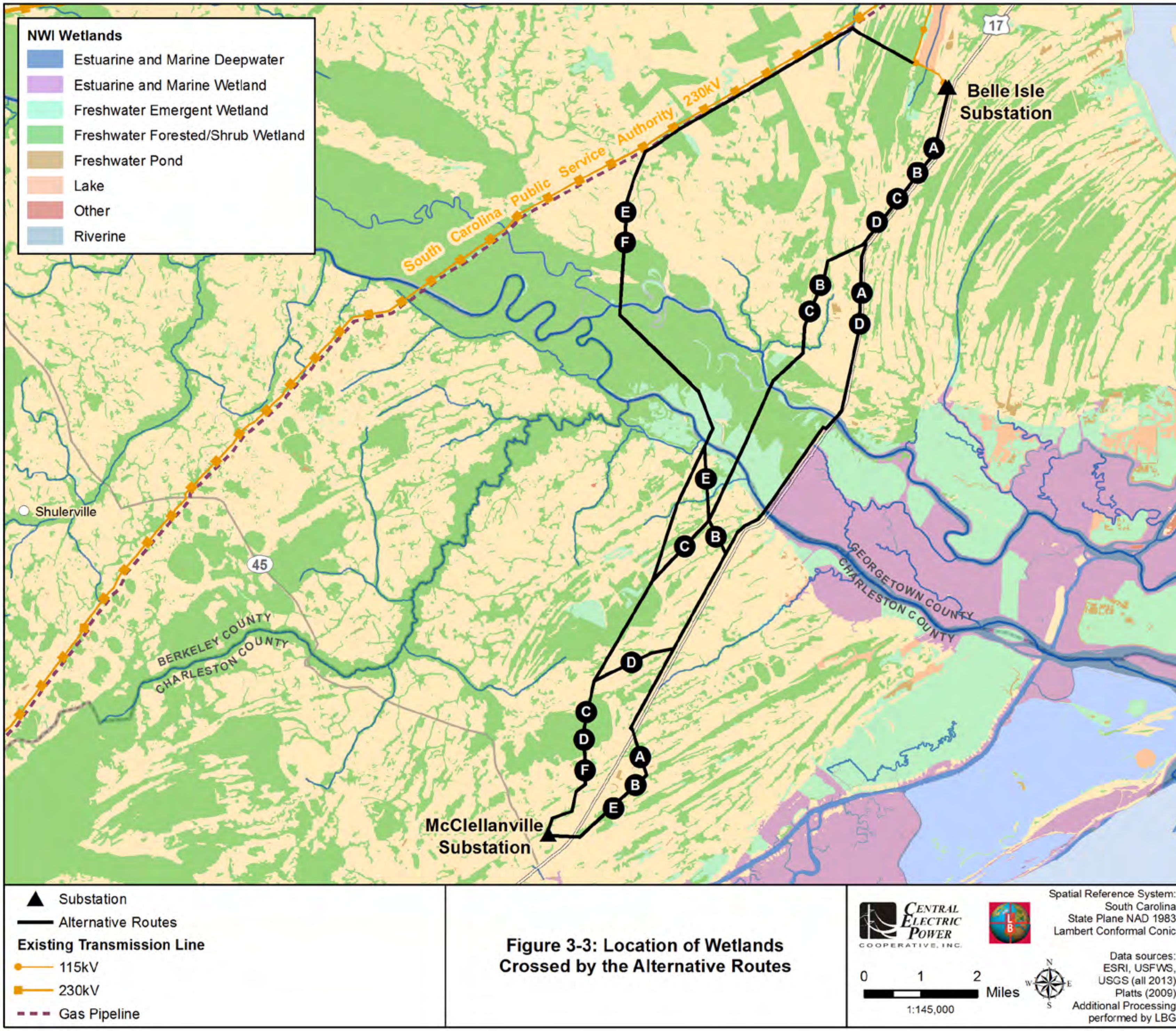




**Figure 3-3: Location of Wetlands Crossed by the Alternative Routes**

**Table 3-3: Acreage of Wetland Types for Each Alternative Route**

| | Alt. A | Alt. B | Alt. C | Alt. D | Alt. E | Alt. F |
|---|---|---|---|---|---|---|
| **NWI Wetlands (acres within 37.5-foot/75-foot right-of-way)** | | | | | | |
| Estuarine and marine deepwater | 1 | - | - | 1 | - | - |
| Estuarine and marine wetland | 1 | - | - | 1 | - | - |
| Freshwater palustrine emergent | 5.5 | 8.5 | 8.5 | 5.5 | 13.5 | 13.5 |
| Freshwater palustrine forested/shrub wetland | 27 | 33.5 | 45.5 | 28 | 56.5 | 66 |
| Freshwater pond | - | - | - | - | - | - |
| Riverine | 1 | 1.5 | 1.5 | 1 | 1 | 1 |
| **NWI Wetlands (acres within 300-foot/600-foot corridor)** | | | | | | |
| Estuarine and marine deepwater | 8.5 | - | - | 8.5 | - | - |
| Estuarine and marine wetland | 14.5 | - | - | 14.5 | - | - |
| Freshwater palustrine emergent | 33.0 | 69 | 70 | 34.5 | 100 | 102 |
| Freshwater palustrine forested/shrub wetland | 180.5 | 258.5 | 379.5 | 204.5 | 491.5 | 588 |
| Freshwater pond | 0.5 | - | <0.5 | 0.5 | - | <0.5 |
| Riverine | 9.5 | 13 | 13 | 9.5 | 10 | 10 |

Source: NWI (USFWS 2009)

*Estuarine and Marine Wetlands*—Estuarine and marine wetlands are areas that are frequently inundated by brackish or salt water; unlike deepwater habitats, these wetlands are generally submerged by water that is less than 6 feet deep (Cowardin et al. 1979). While deepwater habitats are dominated by submerged aquatic vegetation or unvegetated bottoms, estuarine and marine wetlands are dominated by both submerged aquatic vegetation and emergent plants that have adapted to a brackish or salt water environment. Within the Study Area, approximately 14.5 acres of estuarine and marine wetlands occur along Alternative Routes A and D, within the 600-foot corridor, between the estuarine and marine deepwater areas described above.

*Freshwater Palustrine Emergent Wetlands*—Freshwater palustrine emergent wetlands are characterized by erect, rooted, herbaceous hydrophytes (water-loving plants), excluding mosses and lichens. These plants are present for most of the growing season in most years. Freshwater emergent wetlands are usually dominated by perennial, non-woody plants. In areas with relatively stable climatic conditions, emergent wetlands maintain the same appearance and form for many years (Cowardin et al. 1979). Alternative Routes E and F cross the greatest acreage of freshwater palustrine emergent wetlands within the 75-foot ROW and the 600-foot study corridor.

Alternative Routes A and D cross the fewest acres of freshwater palustrine emergent wetlands when looking at both the ROW and the 600-foot corridor.

*Freshwater Palustrine Forested/Scrub-Shrub Wetlands*—Freshwater palustrine forested/scrub-shrub wetlands are characterized as having a mix of forested and scrub-shrub wetlands. These wetlands are dominated by perennial, woody plants; trees are defined as being greater than 20 feet tall and shrubs are shorter than 20 feet (Cowardin et al. 1979). Forested wetlands are at greatest risk of being affected by overhead transmission projects because the tall trees must be cleared, so they cannot contact the transmission wires. This wetland classification type represents the greatest acreage of wetlands within the entire Study Area. Alternatives E and F cross the greatest acreage of palustrine forested/scrub-shrub wetlands within both the 75-foot ROW and 600-foot study corridors. Alternatives A and D cross the fewest acres of palustrine forested/scrub-shrub wetlands within the 75-foot ROW and 600-foot study corridors. The portion of Alternative Routes A, B, and E that crosses the FMNF contains approximately 19 acres of palustrine forested/scrub-shrub wetlands within the 600-foot study corridor.

*Freshwater Palustrine Unconsolidated Bottom Wetlands*—Freshwater palustrine unconsolidated bottom wetlands, or ponds, are primarily open water systems that have less than 30 percent of their area covered by vegetation. Additionally, their bottom material is composed of material that is smaller than stones (less than 10 inches across). Palustrine unconsolidated bottom wetlands have less than 25 percent stones (Cowardin et al. 1979). Very few palustrine unconsolidated bottom wetlands are located within the Study Area; none are located within the 75-foot ROW of any of the Alternative Routes. Within the 600-foot study corridor, Alternative D crosses the greatest acreage of palustrine unconsolidated bottom wetlands (0.5 acre) and Alternatives B and E do not cross any wetlands of this type. All of the alternative routes that cross palustrine unconsolidated bottom wetlands do not do so for more than approximately 0.5 acre.

*Riverine Wetlands*—Riverine wetlands include all wetlands and deepwater habitats contained within a river channel with two exceptions: 1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens, and 2) habitats with water-containing ocean-derived salts in excess of 0.5 part per thousand. A channel is defined as "an open conduit either naturally or artificially created which periodically or continuously contains moving water, or which forms a connecting link between two bodies of standing water." Riverine wetlands are bordered on the landward side by upland habitat, by the channel bank (including natural and human-made levees), or by wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens (Cowardin et al. 1979). Within the 75-foot ROW, alternative routes are generally similar for the acreage of riverine wetlands. Within the 600-foot study corridor, Alternative Routes B and C cross the greatest acreage of riverine wetlands.

*Floodplains*

Floodplains are low-lying areas identified by the Federal Emergency Management Agency (FEMA) that are subject to inundation from heavy rains or storm surges. These areas are usually located near streams, rivers, coastal zones, and lakes and are a necessary component of water storage during flooding events. Placing structures in floodplains impairs a floodplain's ability to store water, which could cause flooding to occur beyond the natural extent of the floodplain.

Floodplains are classified by the potential to flood within a certain time frame and assigned a relevant identifying code. FEMA describes the various zones as follows:

- Zone A—Areas with a 1 percent annual chance of flooding and a 26 percent chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones. These areas represent the 100-year floodplain.

- Zone AE—Areas with a 1 percent annual chance of flooding. This is the base floodplain where base flood elevations are provided. These areas represent the 100-year floodplain.

- Zone VE—Coastal areas with a 1 percent or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26 percent chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones. These areas represent the coastal 100-year floodplain.

- Zone X—Area of minimal flood hazard, usually depicted on Flood Insurance Rate Maps as above the 500-year flood level. Zone C may have ponding and local drainage problems that do not warrant a detailed study or designation as base floodplain. Unshaded Zone X is defined to be outside the 500-year flood.

The central portion of all of the alternative routes is located within Zone AE of the North and South Santee rivers. The northwestern portion of Alternative Routes E and F is located within Zone A of the Sandip River Basin, and the southern portion of Alternatives Routes C, D, and F is located within Zone A of Jeremy Creek. The remainder of the Study Area is located in Zone X areas, thus they are outside of the 500-year flood area.

### 3.4.2. Environmental Effects

Impacts on water resources include how the proposed Project could potentially impact these resources from the construction and maintenance of the ROW, off-ROW access roads, and lay-down yards. The majority of the impacts would occur during construction and would likely be temporary; however, permanent impacts are anticipated if structures are placed in wetlands.

This section discusses the potential effects of the proposed Project on the various water resources throughout the Study Area. To determine whether the proposed Project would have the potential to result in significant impacts to water resources, it is necessary to consider both the duration and the intensity of the impacts. Definitions for duration and intensity of water resources impacts established for this Project are described in Table 3-4.

**Table 3-4: Water Resources Impact Context and Intensity**

| Context (Duration) | Low Intensity | Moderate Intensity | High Intensity |
|---|---|---|---|
| **Surface Water and Water Quality** | | | |
| Short term: During construction period<br><br>Long term: Life of the line (50 years or more) | The effect on surface waters would be measurable or perceptible but small and localized. The effect would not alter the physical or chemical characteristics of the surface water or aquatic influence zone resource. | The effect on surface waters would be measurable or perceptible and could alter the physical or chemical characteristics of the surface water resource to an extent requiring mitigation but not to large areas. The functions typically provided by the surface water or aquatic influence zone would not be substantially altered. | The impact would cause a measurable effect on surface waters and would modify physical or chemical characteristics of the surface water. The impact would be substantial and highly noticeable. The character of the surface water or aquatic influence zone would be changed so that the functions typically provided by the surface water or aquatic influence zone would be substantially altered. |
| **Wetlands** | | | |
| Short term: Lasting less than two growing seasons<br><br>Long term: Lasting longer than two growing seasons. | The effect on wetlands would be measurable or perceptible but small in terms of area and the nature of the impact. A small effect on size, integrity, or connectivity would occur; however, wetland function would not be affected and natural restoration would occur if | The impact would cause a measurable effect on one of the three wetlands indicators (size, integrity, connectivity) or would result in a permanent loss of wetland acreage over small areas. However, wetland functions would not be adversely affected. | The impact would cause a measurable effect on two or more wetlands indicators (size, integrity, connectivity) or a permanent loss of large wetland areas. The impact would be substantial and highly noticeable. The character of the wetland |

| Context (Duration) | Low Intensity | Moderate Intensity | High Intensity |
|---|---|---|---|
| | left alone. | | would be changed so that the functions typically provided by the wetland would be substantially altered. |
| **Floodplains** | | | |
| Short term: During construction period<br>Long term: Life of the line (50 years or more) | Impacts would result in a detectable change to natural and beneficial floodplain values, but the change would be expected to be small, of little consequence, and localized. No appreciable increased risk of flood loss would occur, including impacts on human safety, health, and welfare. | Impacts would result in a change to natural and beneficial floodplain values that would be readily detectable and relatively localized. Location of operations in floodplains could increase risk of flood loss, including impacts on human safety, health, and welfare. | Impacts would result in a change to natural and beneficial floodplain values that would have substantial consequences on a regional scale. Location of operations would increase risk of flood loss including impacts on human safety, health, and welfare. |

## No-action Alternative

Under the no-action alternative, the Project would not be constructed and no direct effects on surface waters, water quality, wetlands, or floodplains would occur.

## Proposed Action

*Surface Water and Water Quality*

Under the proposed action, there would be the potential for impacts to surface waters and water quality from the construction and maintenance of the Project. These potential impacts include: increased sedimentation into surface waters from stormwater runoff, increased sedimentation into USEPA-classified impaired waters from stormwater runoff or construction activities, and the possible introduction of contaminants into surface water resources during construction.

All of the alternative routes would cross streams and waterbodies; however, only Alternative Routes A and D would cross areas classified by USEPA as impaired waters; the North and South Santee rivers are both listed as impaired for mercury and turbidity at the locations where they are crossed by Alternative Routes A and D. It is not anticipated that construction or maintenance of the Project would contribute to further mercury contamination; however, there could be further turbidity contamination if sediments are not prevented from entering these waters. Furthermore, sediment pollution is a potential impact to all surface waters crossed by all of the alternative routes.

During construction of the ROW and access roads, and placement of the structures, soils will be disturbed which poses a potential sedimentation risk to surface waters. To minimize these potential impacts, Central Electric would implement several BMPs (see Section 2.5.11). These practices include storing equipment, fuels, and chemicals outside of surface waters, placing silt fences and other appropriate prevention devices along all stream crossings, developing a stormwater pollution prevention plan prior to construction, developing a hazardous materials management and spill prevention plan and emergency response plan to deal with accidental spills, and promptly cleaning up spilled material to prevent them from entering surface waters.

Additionally, excavated material would not be stockpiled in flood prone areas or near stream banks, unless this material is protected from high water or stormwater runoff. Trees that are removed would have their stumps left in place so that the soil around them remains in place. After construction, temporary access roads and other areas with exposed soil would be revegetated to avoid runoff. Finally, no structures would be allowed to be placed in surface waters, thus there should be no direct construction occurring in surface waters.

Maintenance would mostly include vegetation management within the ROW by Santee-Cooper; maintenance of the line would include normal inspections of equipment and hardware, minor maintenance activities to transmission structures, and emergency maintenance, as needed. Santee-Cooper would maintain a 2.5- to 3-year vegetation management cycle, and it would use selective treatment; therefore, the entire ROW would not receive an application of herbicides, only those areas where vegetation is posing a threat to the transmission lines. Santee-Cooper's Vegetation Management Plan is included in Appendix C.

Although Central Electric would implement a thorough plan to minimize impacts, accidents could happen; however, as long as the BMPs and prevention measures are maintained through the life of the Project, accidents should not lead to intense impacts. Thus, impacts to surface waters and water quality from construction and maintenance of the action alternatives would be short term and low intensity.

*Wetlands*

Impacts on wetland areas within the Project Area are expected to be moderate. Central Electric would avoid affecting wetlands when practicable. When impacts on wetlands cannot be avoided, Central Electric would minimize these impacts as much as possible. Any impacts on jurisdictional wetlands would be mitigated as appropriate in consultation with USACE. Wetland delineations would be conducted to identify wetlands after the final route is chosen. Any unavoidable impacts on wetlands, whether temporary or permanent, would be discussed with USACE, prior to construction, to determine the permitting requirements and conditions necessary for construction involving wetlands within the proposed Project ROW.

Short-term, moderate-intensity impacts on wetland vegetation may occur if construction crews need to access ROW areas through wetlands. Central Electric would implement BMPs similar to those described for surface water (see Section 2.5.11). All wetlands would be identified and marked prior to construction. During construction, construction equipment, fuels, and chemicals would not be stored in wetlands; construction mats would be used for all wetland crossings; clearing may be accomplished by using low ground pressure equipment (10 psi or less); and structures would be placed outside wetlands when possible.

Forested wetlands would need to be cleared of trees that are tall enough to interfere with the transmission wires. All trees would be cleared within the ROW, but the stumps would be left in place to stabilize the soils. Trees cleared in wetland areas would result in a conversion of forested wetlands to either scrub-shrub or emergent wetlands. As a result, the functions and values attributed to forested wetlands would be lost and altered to reflect the new habitat.

Other permanent impacts to wetlands would occur if it becomes necessary to place a structure in a wetland. However, each pole location in a wetland would likely impact no more than 0.001 acre, thus permanent impacts to wetlands from pole locations would likely be less than 0.05 acre for the entire Project.

Following completion of construction, disturbance to wetlands would cease, and these areas would be restored. During maintenance, impacts to wetlands would mostly derive from vegetation management activities. In wetland areas, ground crews would use backpacks and/or an all-terrain vehicle equipped with a hydraulic spray system to foliar treat only the undesirable vegetation present. All-terrain vehicles used would be specifically designed with low pressure tires to distribute the mass of the vehicle. Current procedures dictate a selective, low volume herbicide approach that minimizes the amount of active ingredient applied per acre. The herbicide products used during wetland area spraying would be determined based on the species present and, to a great extent, the location. In areas that have standing water and are connected to a larger aquatic system (e.g., river or swamp), only USEPA-approved herbicides registered for use in wetland or aquatic sites would be used. Wetland areas are scheduled on a 3- or 4-year rotation depending on the vegetation species that are present, densities of woody vegetation, and height of conductors. Vegetation densities should decrease with subsequent applications, requiring less herbicide to be applied.

Long-term, moderate- to high-intensity impacts on wetlands would be expected to only forested wetlands because trees and other woody vegetation would need to be removed within the ROW. Impacts would comprise 27.4 to 66.9 acres of forested wetlands most notably in Alternative Routes F and E. Impacts to non-forested wetlands would be short term and low intensity.

*Floodplains*

The ROW for all of the alternative routes contains areas located in FEMA-designated floodplains. These designated areas mostly consist of wide floodplains associated with the North and South Santee rivers; however, there are also smaller areas located along the northwestern portions of Alternative Routes E and F, and along the southern portions of Alternative Routes C, D, and F.

It is not possible to keep from placing structures in the floodplain of the North and South Santee rivers; the span across these areas is at least 2 miles for all of the alternative routes, thus structures would need to be placed within the 100-year floodplain. Central Electric proposes that each structure would use a temporary 400-square-foot construction area around each pole. The only permanent impacts to the floodplain would result from the presence of structure; however, the pole footprint rarely impacts more than 0.001 acre per pole, thus permanent impacts to the floodplain would be less than 0.05 acre for the entire Project. All temporary soil disturbances would be reclaimed by following the BMPs after construction (see Section 2.5.11).

During construction and maintenance, BMPs would be similar to those used to minimize impacts to surface waters. To the extent practicable, equipment, fuels, and chemicals would not be stored in the floodplain, construction would not occur during periods of high water, and the use of pesticides would be limited to target areas. Although Central Electric would implement a plan to minimize impacts, accidents could happen; however, as long as the BMPs and prevention measures are maintained through the life of the Project, accidents should not lead to intense impacts. Thus, impacts to floodplains from construction and maintenance of the action alternatives would be short term to long term and low intensity.

### 3.4.3. Unavoidable Adverse Effects

Although it is likely that there would be moderate-intensity, short-term impacts to surface waters and water quality, wetlands, and floodplains, these impacts would be minimized and mitigated. Long-term, permanent impacts to wetlands and floodplains are anticipated from the conversion of forested wetlands to scrub-shrub and/or emergent wetlands and from placing structures in wetlands and floodplains. The impacts from converting forested wetlands would be medium to high intensity, but it is anticipated that the impacts from the placement of poles in wetlands and floodplains would only be low intensity because of the minimal area occupied by each structure.

## 3.5 Biological Resources

### 3.5.1. Affected Environment

#### Vegetation

Agriculture and timber harvesting have influenced vegetation and wildlife habitat in the Project Area. Settlers and farmers cleared the uplands and better-drained terraces for fields, while extensive longleaf pine and swamp hardwood forests were cleared for timber. Timber harvesting still occurs throughout much of this area of South Carolina.

The Project Area is located primarily in the Coastal Plain Ecoregion, although a short portion of Alternative Routes A, B, D, and E are within the Coastal Zone Ecoregion where they are east of U.S. Highway 17 (SCDNR 2005). Within the Coastal Plain Ecoregion, the Project Area has three main types of habitats: grasslands and early successional habitats, pine woodlands, and river bottom (SCDNR 2005). The portions of the alternative routes within the Coastal Zone Ecoregion are mainly grasslands and pine woodlands, similar to those within the Coastal Plain Ecoregion. All of these habitat types are found within in the Study Area and support a number of diverse wildlife species. Table 3-5 presents brief descriptions of these habitat types.

Vegetation cover for all of the alternative routes was analyzed using land cover types defined by the 2006 National Land Cover Database (NLCD) (Fry et al. 2011). NLCD uses 16 land cover classifications for the United States and Puerto Rico at a 30-meter spatial resolution. Table 3-6 presents the percentage of the various land cover types within a 2,000-foot corridor around each alternative route (a 2,000 foot-corridor was used due to the spatial resolution of the data). Although not specific, the NLCD data show the general percentages of each of the previously described habitat types: evergreen forest in the Project Area is mostly pine woodlands; deciduous forest and woody wetlands are expected to be mostly river bottom, and grassland/herbaceous and pasture/hay are grasslands and early successional habitats. The remaining land cover types (developed land and cultivated crops) are not expected to provide much wildlife habitat. The primary land cover within all of the alternative routes is forest.

## Table 3-5: Habitat Types Found in the Coastal Plain Ecoregion

| Habitat Type | Brief Description |
|---|---|
| Grassland and early successional habitats | Grasslands or early successional fields with cover provided by grasses and/or weeds and with few, if any, trees. Also managed open areas such as meadows, pastures, golf courses, or expansive lawns with or without damp depressions. This habitat type occurs throughout the region; more extensively in the inner "agriculture belt." |
| Pine woodland | Pine woodlands includes all pine-dominated forests throughout the region, including those occupying a variety of soil moisture characteristics, except floodplains. The canopy is dominated by one or several species of pine, generally loblolly (*Pinus taeda*), or longleaf (*Pinus palustris*), depending on elevation, soil type, and silvicultural history. Dense shrub thickets of hollies (Ilex sps.) and wax myrtle (*Morella cerifera*) may occur. |
| River bottoms | Hardwood-dominated woodlands with moist soils are usually associated with major river floodplains and creeks. This habitat may contain small creeks or pools and may be seasonally flooded. Characteristic trees include: sweetgum (*Liquidambar styraciflua*), loblolly pine, water oak (*Quercus nigra*), willow oak (*Quercus phellos*), laurel oak (*Quercus laurifolia*), cherrybark oak (*Quercus pagoda*) and American holly (*Ilex opaca*). In the southern coastal counties on drier sites, spruce pine (*Pinus glabra*) may be an associate. The Cypress-tupelo swamp subtype occurs on lower elevation sites as seasonally flooded swamps. It is usually transected by tannic-acid rivers and creeks and contains oxbow lakes and pools. Dominant trees are bald cypress (*Taxodium distichium*), water tupelo (*Nyssa aquatica*), swamp gum (*Nyssa biflora*), Carolina ash (*Fraxinus caroliniana*), water elm (*Planera aquatica*) and red maple (*Acer rubrum*). |

Source: SCDNR (2005)

## Table 3-6: Percentage of Land Cover Types within 2,000-Foot Corridor

| National Land Cover Database Land Cover Category | Alt. A | Alt. B | Alt. C | Alt. D | Alt. E | Alt. F |
|---|---|---|---|---|---|---|
| Open water | 1.5% | 1% | 1.% | 1.5% | 1% | 1% |
| Developed (open) | 9% | 6% | 3.5% | 7.5% | 2.5% | 0.5% |
| Developed (low) | 3.5% | 1.5% | 0.5% | 3% | 1% | - |
| Developed (medium, high) | <0.5% | <0.5% | - | <0.5% | - | - |
| Forest | 54% | 52% | 46.5% | 54.5% | 50% | 45% |
| Shrub/scrub | 3.5% | 4% | 4% | 3.5% | 3% | 3.5% |
| Grassland/herbaceous | 4.5% | 5% | 4% | 3.5% | 3% | 2.5% |
| Pasture/hay | 0.5% | 1.5% | 1% | 0.5% | 0.5% | <0.5% |
| Cultivated crops | <0.5% | 0.5% | 0.5% | <0.5% | <0.5% | <0.5% |
| Wetlands | 24% | 29% | 38% | 26% | 39% | 47% |

### Non-Native Invasive Plant Species

A noxious weed is any plant designated by a federal, state, or county government as injurious to public health, agriculture, recreation, wildlife, or property. Under the South Carolina Noxious Weed Act, a noxious weed is defined as: any living stage of any plant including seed or reproductive parts thereof or parasitic plants or parts thereof which is determined by the Commissioner of Agriculture to be directly or indirectly injurious to public health, crops, livestock, or agriculture including but not limited to waterways and irrigation canals (South Carolina Legislature, Title 46, Chapter 23). Although noxious weed surveys were not conducted in the Project Area, 114 of the 163 species of noxious weeds are known to occur in Georgetown and Charleston counties, respectively (EDDMapS 2013).[4]

### Wildlife

The major wildlife habitat types in the Project Area within the Coastal Plain Ecoregion include longleaf and loblolly pine interspersed with Carolina bays and pocosins and bottomland hardwoods. Bird species dependent upon pine habitats include the red-cockaded woodpecker (*Picoides borealis*), Bachman's sparrow (*Peucaea aestivalis*), brown-headed nuthatch (*Sitta pusilla*), Henslow's sparrow (*Ammodramus henslowii*) and painted bunting (*Passerina ciris*). Bottomland forests support high breeding densities of many neotropical migrants including Acadian flycatcher (*Empidonax virescens*), white-eyed vireo (*Vireo griseus*), prothonotary warbler (*Protonotaria citrea*), hooded warbler (*Wilsonia citrina*) and northern parula (*Parula americana*). Species found in grassland habitats include the grasshopper sparrow (*Ammodramus savannarum*), loggerhead shrike (*Lanius ludovicianus*), painted bunting (*Passerina ciris*), and American woodcock (*Scolopax minor*) (SCDNR 2005). Migratory birds are discussed further below.

Mammal species found in the Coastal Plain Ecoregion include: black bear (*Ursus americanus*), northern yellow bat (*Lasiurus intermedius*), Appalachian cottontail (*Sylvilagus obscurus*), Carolina red-backed vole (*Clethrionomys gapperi*), eastern small-footed myotis (Myotis leibii), hairy-tailed mole (*Parascalops breweri*), meadow vole (*Microtus pennsylvanicus*), mink (*Neovison vison*), Rafinesque's big-eared bat (*Corynorhinus rafinesquii*), star-nosed mole (Condylura cristata), swamp rabbit (*Sylvilagus aquaticus*), eastern fox squirrel (*Sciurus niger*), eastern spotted skunk (*Spilogale putorius*), eastern woodrat (*Neotoma floridana*), and woodland jumping mouse (*Napaeozapus* sp.) (SCDNR 2005).

[4] A complete list of these species can be found online at http://www.eddmaps.org.

Important game species of South Carolina include big game species (bear, deer, and turkey), furbearers (bobcat, red fox, gray fox, opossum, raccoon, otter, mink, weasel, striped skunk, spotted skunk, muskrat and beaver), small game (dove), and others (alligator, coyote, and feral hog) (SCDNR 2011a).

According to SCDNR (2005), the Coastal Plain Ecoregion of South Carolina contains 113 of the 142 species of amphibians and reptiles that occur in the state occur in the coastal plain, and 50 of these species are endemic to this area with longleaf pine habitat playing a vital role in the life history of many species. One area of South Carolina's southern coastal plain supports more frog species (25) than any other place in North America. Isolated, temporary wetlands such as Carolina bays, flatwoods ponds and limesinks provide breeding habitat for numerous amphibians, including the frosted flatwoods salamander (*Ambystoma cingulatum*), tiger salamander (*Ambystoma tigrinum*) and gopher frog (*Rana capito*). Seeps and shrub bogs, embedded in xeric longleaf pine habitat in the fall line sand hills, are home to the pine barrens treefrog (*Hyla andersonii*).

### Aquatic Species

Aquatic species are also abundant in South Carolina with 146 fish species known to inhabit the freshwaters of South Carolina and/or are seasonally dependent on freshwater habitats to complete their life cycle. Within the Coastal Plain Ecoregion, large fertile piedmont rivers and the blackwater streams and bays are just a few of the aquatic habitats that contain numerous and diverse fish communities (SCDNR 2005). The Project Area crosses the FMNF as well as the North and South Santee rivers, along with several tributaries.

The results of backpack electrofishing surveys completed on streams in the FMNF are indicative of freshwater fish species expected to occur in tributaries in the Project Area. Appendix D lists aquatic species captured in 2002–2004, 2006, and 2010.

Several species of anadromous fish use the Santee River-Cooper system, of which the North and South Santee rivers are a part. These species include blueback herring, American shad, striped bass, hickory shad, shortnose sturgeon, and Atlantic sturgeon (SCDNR 2013a). Of these, the blueback herring and American shad are common, while the shortnose sturgeon is a federally listed endangered species. Special status species are discussed in greater detail below.

### Migratory Birds

As of 2001, 390 species of resident and migratory birds have been documented in South Carolina. Of those 390 species, 179 are classified as breeders (SCDNR 2005).

South Carolina supports a high diversity of birds during breeding, wintering and migration likely due to the state's varied environments and habitats. Because of their significance to migratory birds, the National Audubon Society, the FMNF, and the Santee Coastal Reserve have designated two areas in or nearby the Project Area as Important Bird Areas (National Audubon Society 2013a).

The FMNF provides essential stopover habitat for autumn and spring migrating birds, as well as critical breeding habitat. Three species known to occur regularly in the FMNF are state or federally-listed: the red-cockaded woodpecker, Bachman's sparrow, and swallow-tailed kite (*Elanoides forficatus*). Significant numbers of species with high conservation priority such as the black-throated green warbler (*Dendroica virens*), Swainson's warbler (*Limnothlypis swainsonii*), prothonotary warbler, worm-eating warbler (*Helmitheros vermivorus*), brown-headed nuthatch, chuck-will's widow (*Caprimulgus carolinensis*), wood duck (*Aix sponsa*), and northern parula have also been documented (USFS 2013).

The Santee Coastal Reserve, located to the east of the Project Area, is a large undeveloped coastal ecosystem hosting a diverse avifauna at all seasons. Several endangered and threatened species either breed or forage here, including the red-cockaded woodpecker, wood stork (*Mycteria americana*), bald eagle and many other special-concern species such as the painted bunting, Bachman's sparrow, and brown-headed nuthatch. The Santee Coastal Reserve is an important coastal migration corridor in the fall and large numbers of waterfowl winter on the property (National Audubon Society 2013b).

In addition to the two Important Bird Areas, there is an additional area within the Project Area that is conservation land managed for wildlife habitat and conservation, including migratory birds. The SCDNR-managed Santee Delta WMA provides quality habitat for wintering waterfowl and other wetland wildlife including wood storks, wading birds, ospreys and bald eagles. The WMA consists of Santee Delta East, which is predominately impounded remnant rice fields and Santee Delta West, which is impounded bottomland hardwood forest. The area also provides habitat for upland game and nongame species and provides recreational opportunities for the hunting and non-hunting public (SCDNR 2013b).

### State Species of Conservation Need

SCDNR developed a Comprehensive Wildlife Conservation Strategy Plan in 2005 to identify species in need of conservation. Species are listed as either "highest priority," "high priority," or "moderate priority." Table 3-7 below provides a list of the species identified for conservation by each of the habitat types in the Coastal Plain Ecoregion discussed above under vegetation.

### Table 3-7: Species in Need of Conservation in the Coastal Plain Ecoregion

| Species | Scientific Name | Priority based on Habitat Type | | |
|---|---|---|---|---|
| | | Highest Priority | High Priority | Moderate Priority |
| American kestrel | *Falco sparverius* | Pine woodland | | |
| Bachman's sparrow | *Peucaea aestivalis* | Pine woodland | | |
| Brown-headed nuthatch | *Sitta pusilla* | Pine woodland | | |
| Henslow's sparrow | *Ammodramus henslowii* | Pine woodland | | |
| Wood thrush | *Hylocichla mustelina* | Pine woodland | | |
| Northern bobwhite | *Colinus virginianus* | Pine woodland; Grassland | | |
| Red-cockaded woodpecker | *Picoides borealis* | Pine woodland | | |
| Black bear | *Ursus americanus* | Pine woodland; River bottom | | |
| Northern yellow bat | *Lasiurus intermedius* | Pine woodland; River bottom | | |
| Eastern Diamondback rattlesnake | *Crotalus adamanteus* | | Pine woodland | |
| Mimic glass lizard | *Ophisaurus mimicus* | | Pine woodland | |
| Pine woods snake | *Rhadinaea flavilata* | | Pine woodland | |
| Slender glass lizard | *Ophisaurus attenuatus* | | | Pine woodland |
| Eastern fox squirrel | *Sciurus niger* | | | Pine woodland; River bottom |
| Eastern woodrat | *Neotoma floridana* | | | Pine woodland; Grassland; River bottom |
| Common ground-dove | *Columbina passerina* | Grassland | | |
| Eastern meadowlark | *Sturnella magna* | Grassland | | |
| Field sparrow | *Spizella pusilla* | Grassland | | |
| Grasshopper sparrow | *Ammodramus savannarum* | Grassland | | |
| Loggerhead shrike | *Lanius ludovicianus* | Grassland | | |
| Painted bunting | *Passerina ciris* | Grassland | | |
| Barn owl | *Tyto alba* | | Grassland | |

| Species | Scientific Name | Priority based on Habitat Type | | |
|---|---|---|---|---|
| | | Highest Priority | High Priority | Moderate Priority |
| American woodcock | *Scolopax minor* | | | Grassland; River bottom |
| Bewick's wren | *Thryomanes bewickii* | | | Grassland |
| Meadow vole | *Microtus pennsylvanicus* | | | Grassland |
| Black-throated green warbler | *Dendroica virens* | River bottom | | |
| Kentucky warbler | *Oporornis formosus* | River bottom | | |
| Little blue heron | *Egretta caerulea* | River bottom | | |
| Rusty blackbird | *Euphagus carolinus* | River bottom | | |
| Swainson's warbler | *Limnothlypis swainsonii* | River bottom | | |
| Yellow-crowned night heron | *Nyctanassa violacea* | River bottom | | |
| Acadian Flycatcher | *Empidonax virescens* | | River bottom | |
| Black swamp snake | *Seminatrix pygaea* | | River bottom | |
| Spiny softshell turtle | *Apalone spinifera spinifera* | | River bottom | |
| American alligator | *Alligator mississippiensis* | | River bottom | |
| Gulf coast mud salamander | *Pseudotriton montanus* | | River bottom | |
| River cooter | *Pseudemys concinna concinna* | | River bottom | |
| Striped mud turtle | *Kinosternon baurii* | | River bottom | |
| Star-nosed mole | *Condylura cristata* | | River bottom | |
| Rafinesque's big-eared bat | *Corynorhinus rafinesquii* | | River bottom | |
| Southeastern bat | *Myotis austroiparius* | | River bottom | |
| Louisiana waterthrush | *Parkesia motacilla* | | | River bottom |
| Wood duck | *Aix sponsa* | | | River bottom |
| Spotted turtle | *Clemmys guttata* | | | River bottom |
| Great blue heron | *Ardea herodias* | | | River bottom |
| Great egret | *Ardea alba* | | | River bottom |

| Species | Scientific Name | Priority based on Habitat Type | | |
|---|---|---|---|---|
| | | Highest Priority | High Priority | Moderate Priority |
| Bird-voiced treefrog | *Hyla avivoca* | | | River bottom |
| Common snapping turtle | *Chelydra serpentina* | | | River bottom |

Source: SCDNR (2005)

### U.S. Forest Service Management Indicator Species

A wide variety of wildlife species are found throughout the FMNF. The forest represents one of the largest and most biodiverse forested landscapes in South Carolina. To complete the analysis of potential impacts to wildlife regarding issues and concerns from the Proposed Action and its alternatives, Management Indicator Species (MIS) are used to represent the diversity of habitats. Long-term changes in the populations of these species serve as a barometer of the overall health of ecosystems. These estimates are related to the habitats occurring in the area. Eight MIS were identified as potentially occurring in the Project Area and vicinity thereof (Table 3-8). All of these MIS have been documented within the analysis area. Detailed discussions of these species can be found in the *Management Indicator Species Population and Habitat Trends, Francis Marion and Sumter National Forests* (USDA), which is available upon request.

**Table 3.8: Management Indicator Species**

| MIS Species | Habitat Altered or Created | Direct/Indirect Effects | General Comments |
|---|---|---|---|
| Painted bunting (*Passerina ciris*) | Yes | No/Possible | Associated with maritime shrub-scrub and grassy habitats mixed in a woodland setting; most often found in largely forested areas with substantial edge and grassy forest openings and stands exhibiting structural diversity and large amounts of fleshy fruit; one of the most locally occurring, steepest declining, high priority species within the southeastern U.S.; migratory. |
| American swallow-tailed kite (*Elanoides forficatus*) | Yes | Possible/Possible | A tree top nester in predominantly forested landscapes typically with open canopy characteristics; most common in floodplain forests and other large tracts of forested wetlands/mixed pine habitats of the outer coastal plain; State listed as endangered; migratory. |

| MIS Species | Habitat Altered or Created | Direct/Indirect Effects | General Comments |
|---|---|---|---|
| Red-cockaded woodpecker (*Picoides borealis*) | Yes | Possible/Yes | A bird of the open pine woodlands and savannas of the coastal plain and sandhills; uses park-like mature pine woodlands and savannas with little mid-story and few broad-leaved hardwoods for nesting; federally listed as endangered; non-migratory. |
| Yellow-throated vireo (*Vireo flavifrons*) | No | No/Possible | A bird of open deciduous forests; most common in edge habitats of mature deciduous and mixed deciduous forests; migratory |
| Northern parula (*Parula americana*) | No | No/Possible | A bird of the upper canopy in primarily deciduous forests with well-developed mid-story and understory layers; migratory. |
| Prairie warbler (*Dendroica discolor*) | Yes | No/Possible | Frequents brushy old fields and open pine stands; population is common but declining; frequently host to cowbird parasitism; vulnerable to habitat loss that occurs with canopy closure of forests; neotropical migrant. |
| Awned meadow beauty (*Rhexia aristosa*) | No | No/No | A species of the pond margins and moist soils of the savannas of the coastal plains; more common in habitats with few woody species that are frequently burned. |
| Pine woods tree frog (*Hyla femoralis*) | Yes | Possible/Yes | Most common near bogs or swampy areas in pine flatwoods and savannas in the coastal plain; also found in hardwood forests and swamps. |
| Sweet pitcher plant (*Sarracenia rubra*) | Yes | Possible/Yes | A carnivorous perennial plant of the bogs and moist soil margins of pocosins, bays and cypress – tupelo ponds of the coastal plain. |
| Northern bobwhite quail (*Colinus virginianus*) | Yes | Yes/Yes | Favors fields, grasslands, brushy habitats and open woodland; significantly declining over most of its range due to habitat loss and changes in farming practices; non-migratory. |

### Special Status Species

The Project Area potentially contains several special status species, including federally listed and state-listed threatened and endangered species, species proposed for federal listing, and USFS sensitive species.

Federally listed species are designated by USFWS and the National Marine Fisheries Service (NMFS) and are managed under the authority of ESA (PL 93-205, as amended). USFS sensitive species are managed under the authority of the National Forest Management Act, requiring that National Forests manage for "viable populations of native and desirable non-native species." State-listed species are designated by the SCDNR and documented in a list available at www.dnr.sc.gov/species/index.html. State endangered and threatened species are protected under the State Code of Laws of South Carolina 1976 South Carolina Nongame and Endangered Species Conservation Act. In addition, the bald eagle is protected under the Bald and Golden Eagle Protection Act.

Table 3-9 includes special status species listed as occurring in Charlestown and Georgetown counties, South Carolina, and on the FMNF and whether or not the species or its habitat occurs within the Project Area. Figure 3-4 shows the distribution of select special status species within the Project Area.

## Table 3-9: Special Status Species in the Project Area

| Common Name *(Scientific Name)* | Protection Status[a] | Occurrence in Segments | Habitat in Segments? | Habitat Description (SCDNR 2013c, NatureServe 2013) |
|---|---|---|---|---|
| **Birds** | | | | |
| Wood stork (*Mycteria americana*) | LE, SE | Yes | Yes | Nests in the upper branches of black gum or cypress trees that are in standing water. In South Carolina, colony sites are surrounded by extensive wetlands, in particular palustrine forested wetlands. |
| Red-cockaded woodpecker (*Picoides borealis*) | LE, SE | Yes | Yes | Inhabits open, park-like mature pine woodlands and savannahs with large old pines for nesting and foraging habitat. The nesting cavity trees must be in open stands with little or no hardwood midstory and little or no hardwood in the canopy. |
| Bachman's warbler (*Vermivora bachmanii*) | LE, SE | No | Yes | Historically known from central Charleston County in bald cypress swamps and canebrakes, but it has not been seen in the county (or anywhere else) for decades and is presumed extirpated. |
| Red knot (*Calidris canutus rufa*) | PT | No | No | Roosts and forages in coastal wetland habitats as well as inland. Primarily uses beaches for roosting. |
| Piping plover (*Charadrius melodus*) | LT | No | No | Roosts and forages in coastal wetland habitats as well as inland. Primarily uses beaches for roosting. |
| Bachman's sparrow (Aimophila aestivalis) | FS | No | Yes | Ground nesters within dense cover. Traditionally, has been associated with mature pine forests, especially longleaf with bunch grass understories comprised of wiregrass. |
| American swallow-tailed kite (*Elanoides forficatus*) | SE | Possible | Yes | Inhabits floodplain forests and other large tracts of forested wetlands/mixed pine habitats of the outer coastal plain from South Carolina to east Texas. |
| Bald eagle (*Haliaeetus leucocephalus*) | ST, FS, BGEPA | Possible | Yes | Nests in large trees with an open limb structure for nesting and usually located on the forest/marsh ecotone within a kilometer (0.62 mile) of open water. |

| Common Name (Scientific Name) | Protection Status[a] | Occurrence in Segments | Habitat in Segments? | Habitat Description (SCDNR 2013c, NatureServe 2013) |
|---|---|---|---|---|
| Migrant loggerhead shrike (*Lanius ludovicia migrans*) | FS | No | No | Inhabits open lands consisting of expanses of short grass, old fields, orchards, grassy roadsides, cultivated fields and pasture. Nests in hedgerows, shrubs and trees, and notably red cedar but also uses loblolly pine and live oak. |
| Wilson's plover (*Charadrius wilsonia*) | ST | No | No | Nests on isolated coastal islands that are high enough to prevent over-washing and too small to support mammalian predators. |
| Least tern (*Sterna antillarum*) | ST | No | No | Nests on isolated coastal islands that are high enough to prevent over-washing and too small to support mammalian predators. |
| **Mammals** | | | | |
| West Indian manatee (*Trichechus manatus*) | LE | Yes | Yes | Found in marine and estuarine waters, but there are historical records for the mammal several miles up the Santee River (RUS et al. 2014). |
| Finback whale (*Balaenoptera physalus*) | LE | No | No | Marine mammal that does not occur in freshwater. |
| Humpback whale (*Megaptera novaeangliae*) | LE | No | No | Marine mammal that does not occur in freshwater. |
| Right whale (*Balaena glacialis*) | LE | No | No | Marine mammal that does not occur in freshwater. |
| Rafinesque's big-eared bat (*Corynorhinus rafinesquii*) | SE, FS | Yes | Yes | Coastal and southeastern plains and sandhills populations use T-beam and I-beam bridges, abandoned buildings, old bunkers, tunnels and cavity trees for roosting. |
| Southeastern myotis (*Myotis austroriparius*) | FS | No | Yes | Uses caves (including limestone sinks), mines, abandoned buildings and large hollow trees for roosting, maternity colonies and hibernation sites. Also uses forested bottomlands, forested swamps, Carolina bays, mesic deciduous forests and mixed forests. |

| **Common Name *(Scientific Name)*** | **Protection Status[a]** | **Occurrence in Segments** | **Habitat in Segments?** | **Habitat Description (SCDNR 2013c, NatureServe 2013)** |
|---|---|---|---|---|
| **Amphibians** | | | | |
| Flatwoods salamander (*Ambystoma cingulatum*) | LT, SE | No | Yes | Is closely associated with the longleaf pine savannas of the lower coast. These communities typically exhibit a sparse canopy of longleaf pine with a rich herbaceous layer. Breeds in isolated temporary ponds. Santee Cooper Coastal Reserve is a historic site and critical habitat, 1.5 miles from Alternatives A, B, D, and E. |
| Dwarf siren (*Pseudobranchus striatus*) | ST | No | Yes | Occurs in the coastal plain in natural communities associated with the longleaf pine ecosystem, including longleaf pine flatwoods, longleaf pine savanna and xeric longleaf pine sandhills. Breeding ponds are nested within the upland longleaf pine matrix of these communities. |
| Northern cricket frog (*Acris crepitans crepitans*) | FS | Yes | Yes | Occurs in the coastal plain in natural communities associated with the longleaf pine ecosystem, including longleaf pine flatwoods, longleaf pine savanna and xeric longleaf pine sandhills. Breeding ponds are nested within the upland longleaf pine matrix of these communities. |
| Carolina gopher frog (*Rana capito*) | SE, FS | No | Yes | Breeds in isolated temporary ponds that fill by mid-winter and that hold water continuously until May or June for successful larval metamorphosis to occur. Terrestrial in longleaf pine habitats, including the savanna. Also occurs in longleaf pine flatwoods. |
| **Reptiles** | | | | |
| Green sea turtle (*Chelonia mydas*) | LE | No | No | Marine/beach animal that does not occur in freshwater. |
| Kemp's ridley sea turtle (*Lepidochelys kempii*) | LE | No | No | Marine/beach animal that does not occur in freshwater. |
| Loggerhead sea turtle (*Caretta caretta*) | LE, ST | No | No | Marine/beach animal that does not occur in freshwater. |

| Common Name (*Scientific Name)* | Protection Status[a] | Occurrence in Segments | Habitat in Segments? | Habitat Description (SCDNR 2013c, NatureServe 2013) |
|---|---|---|---|---|
| Spotted turtle (*Clemmys guttata*) | ST | No | Yes | Inhabits a variety of wetland types including small ponds, small streams, swamps, flooded forests and other shallow bodies of water. |
| **Fish** | | | | |
| Shortnose sturgeon (*Acipenser brevirostrum*) | LE | Yes | Yes | Moves primarily from tidal estuarine or brackish channels into freshwater reaches to spawn. Spawns in freshwater channel habitats from tidal river reaches to at least as far inland as the fall line in large, unobstructed river basins. |
| Atlantic sturgeon (*Acipenser oxyrhinchus oxyrhinchus*) | LE, DPS | Yes | Yes | Adults migrate through nearshore Atlantic shelf waters and enter coastal sounds, bays and inlets to access the river basins in which they spawn. Spawns in freshwater channel habitats from tidal river reaches to at least as far inland as the fall line in large, unobstructed river basins. |
| Carolina pygmy sunfish (*Elassoma boehlkei*) | ST | Possible | Yes | Only a few populations of Carolina pygmy sunfish have been identified in South Carolina. One population is in the ditches of abandoned rice fields near Georgetown, South Carolina. |
| **Plants** | | | | |
| Pondberry (*Lindera melissifolia*) | LE | No | Yes | Occurs in seasonally flooded wetlands such as floodplain/bottomland hardwood forests and forested swales, on the bottoms and edges of shallow seasonal ponds in old dune fields, along the margins of ponds and depressions in pinelands, around the edges of sinkholes in coastal areas with karst topography, and along the borders of Sphagnum bogs. |
| Canby's Dropwort (*Oxypolis canbyi*) | LE | No | No | Occurs in Coastal Plain habitats prone to long periods of inundation, including pond cypress ponds, grass-sedge dominated Carolina bays, wet pine savannahs, shallow pineland ponds, and cypress-pine swamps or sloughs. |

| Common Name *(Scientific Name)* | Protection Status[a] | Occurrence in Segments | Habitat in Segments? | Habitat Description (SCDNR 2013c, NatureServe 2013) |
|---|---|---|---|---|
| American chaffseed (*Schwalbea americana*) | LE | No | Yes | Occurs in acidic, sandy or peaty soils in open pine flatwoods, pitch pine lowland forests, seepage bogs, palustrine pine savannahs, and other grass- and sedge-dominated plant communities. |
| Seabeach amaranth (*Amaranthus pumilus*) | LT | No | No | Occurs on barrier islands, mainly on coastal overwash flats at the accreting ends of the islands and lower foredunes and on ocean beaches above mean high tide (occasionally on sound-side beaches). |
| Incised groovebur (*Agrimonia incisa*) | FS | No | No | Occurs on sandy, dry-mesic, usually upland in the lower Coastal Plain; longleaf pine-deciduous scrub oak with sandy or sandy loam soils. Occasionally in open pine woods or mixed pine-oak woods, bluffs, small clearings and old roads, sometimes at the edge of more mesic habitats. |
| Carolina spleenwort (*Asplenium heteroresiliens*) | FS | No | No | Occurs on limestone sinks and rocky hammocks. |
| Many-flowered grass-pink (*Calopogon multiflorus*) | FS | No | No | Occurs in well-drained soils of open, damp to somewhat drier pine savannas-flatwoods and meadows. |
| Cypress-knee sedge (*Carex decomposita*) | FS | No | No | Found in undisturbed, organic-rich backwaters with plants occurring on floating or partially submersed rotting logs or stumps. |
| Pondspice (*Litsea aestivalis*) | FS | No | No | Found on margins of swamps, limesink ponds, bay heads, small ponds, pitcher plant savannas, natural doline ponds and in low wet woodlands. Occurs on wet, sandy or peaty, and quite acid soils. |
| Boykin's lobella (*Lobelia boykinia*) | FS | No | No | Found in cypress-gum depressions or ponds, wet pine savannahs and flatwoods. Some sites have continuous, shallow standing water; others are only seasonally very moist or inundated. |
| Loomis' loosestrife (*Lysimachia loomisii*) | FS | No | No | Found in moist to wet longleaf pine savannas and pocosin ecotones. |

| Common Name *(Scientific Name)* | Protection Status[a] | Occurrence in Segments | Habitat in Segments? | Habitat Description (SCDNR 2013c, NatureServe 2013) |
|---|---|---|---|---|
| Loose watermilfoil (*Myriophyllum laxum*) | FS | No | No | Found in shallow water of natural ponds (especially sinkhole ponds) and lakes, impoundments and beaver ponds, blackwater streams, backwaters, sloughs, drainage ditches, and canals. |
| Climbing heath (*Pieris phillyreifolia*) | FS | Yes | Yes | Found in ponds and depressions in flatwoods. It also occurs in pine woods and hammocks adjacent to ponds and occasionally in hammocks and is found where hydric, somewhat acidic soils predominate. |
| Pineland plantain (*Plantago sparsiflora*) | FS | No | No | Found in marshy/seasonally wet pine savannahs and adjacent roadsides and ditches. |
| Yellow fringeless orchid (*Platanthera integra*) | FS | Yes | Yes | Found in wet pine flatwoods, wet prairies, sunny seepage often on slopes, organic black sandy peat; depressions within pinelands; marshes, swamps, acid bogs, low pine barrens. |
| Crested fringed orchid (*Pteroglossaspis ecristata*) | FS | No | No | Found in numerous Coastal Plain habitats. Tolerates a relatively wide range of moisture conditions, from very xeric to seasonally inundated or almost permanently saturated soils, although most of the records of the plant are from dry, at least seasonally droughty sites. Habitats include scrub oak lands, pine rocklands, pine-palmetto flatwoods, and dry-mesic pine savannah. |
| Awned meadow beauty (*Rhexia aristosa*) | FS | No | No | Found in grass-sedge dominated Carolina Bays, also in vernal ponds, wet pinelands, acid bogs, pond-cypress savannas, and dried soil of cypress bottoms. |
| Shortbristle sedge (*Rhynchospora breviseta*) | FS | No | No | Found in wet pine savannas and wet pine flatwoods in which the shrub component is not dense. Longleaf pine and/or slash pine are the principal (often the only) canopy trees over a dense layer of wiregrass or other tussock grasses. |

| **Common Name *(Scientific Name)*** | **Protection Status[a]** | **Occurrence in Segments** | **Habitat in Segments?** | **Habitat Description (SCDNR 2013c, NatureServe 2013)** |
|---|---|---|---|---|
| Coastal beaksedge (*Rhynchospora pleiantha*) | FS | No | No | Found in exposed sandy shores of freshwater ponds and lakes, where the water level fluctuates naturally from rainfall cycles (e.g., from local water table rise and fall). Most ponds inhabited by this species are sinkhole ponds. |
| Pineland dropseed (*Sporobolus curtissii*) | FS | No | No | Found in mesic to more-or-less wet flatwoods dominated by longleaf pine, but by slash pine and longleaf at the wet end of the spectrum (ecotones of bayheads and streamheads). |
| Carolina dropseed (*Sporobolus pinetorum*) | FS | No | No | Found in wet to moist pine woodlands, in soils seasonally to semi-permanently saturated. |
| Carolina fluffgrass (*Tridens carolinianus*) | FS | Yes | Yes | Found in sandy woods, pinelands, and mesic swales in sandhills. |

Sources: SCDNR (2012a, 2012b), RUS et al. 2014)

[a] Status: LE = Federally listed as endangered; LT = federally listed as threatened; DPS = Distinct Population Segment; PT = proposed threatened; SE = state endangered; ST = state threatened; FS= USFS sensitive species; BGEPA = Bald and Golden Eagle Protection Act. Note that if a species is not listed on the state list for Charleston or Georgetown counties, it is not given a state-status in the table, even if it is listed elsewhere in the state.

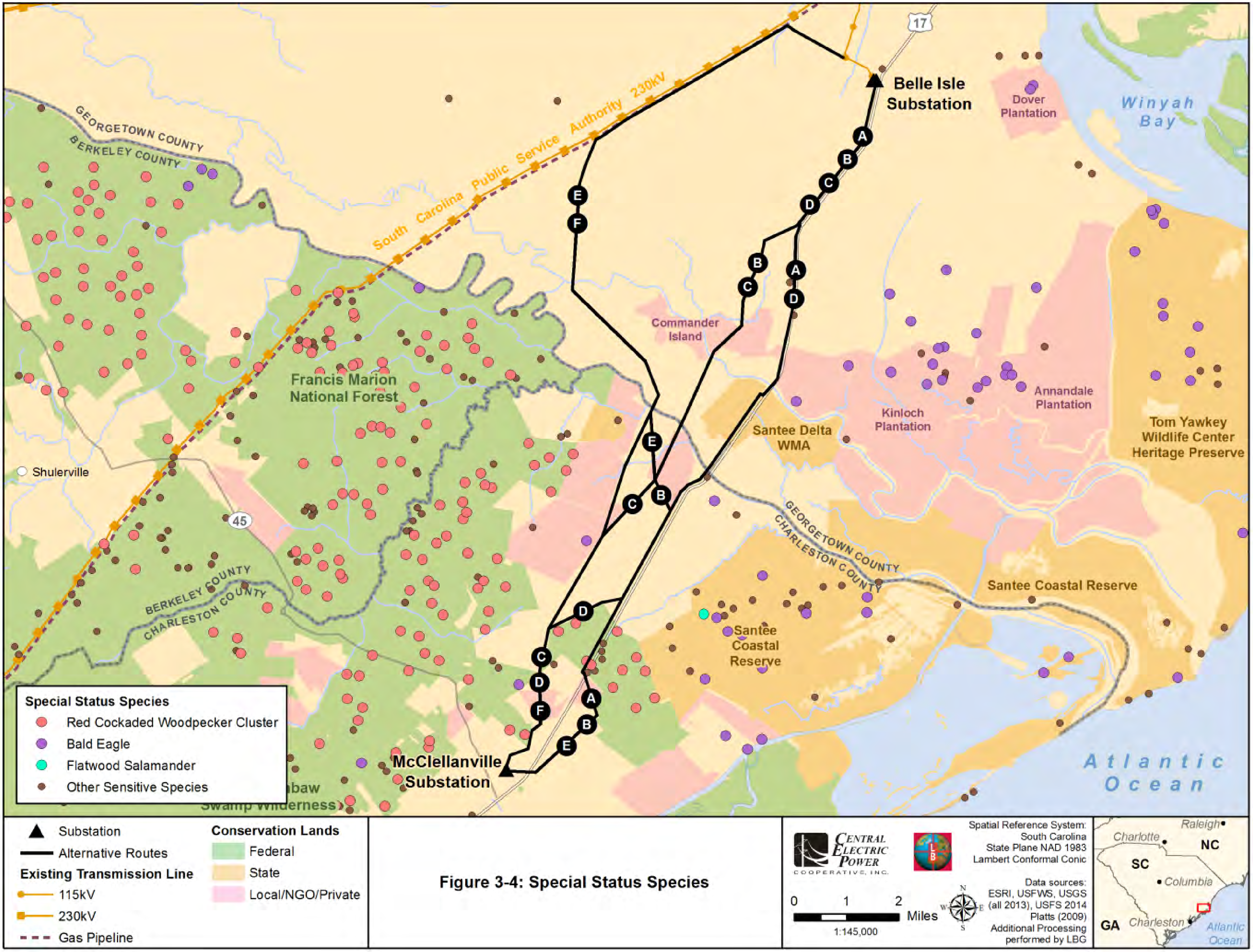



Figure 3-4: Special Status Species

### Federally Listed Threatened and Endangered Species

A biological assessment (BA) was completed in tandem with this EIS. The information below is a summary of the species that occur or have habitat in the Project Area. The BA, which can be found in Appendix E, provides a more detailed discussion.

*Red-cockaded Woodpecker*

In 2000, an estimated 14,068 red-cockaded woodpeckers were living in 5,627 known active clusters across 11 states; this number represents only 3 percent of the estimated abundance of the bird at the time of European settlement. In South Carolina, 133 groups were found on state-owned lands and another 524 groups were found on federal properties in 2000 (USFWS 2003).

The FMNF is home to the third largest red-cockaded woodpecker population and is 1 of 13 designated core recovery populations (USDA-FMNF 2002). In the 2013 nesting season, there were 457 active clusters (441 potential breeding groups, 16 single male groups, and 53 inactive clusters) on the FMNF. The bird requires open pine understories for nesting and foraging. Table 3-10 shows the number of clusters within proximity to the alternative routes. All of these clusters appear to harbor active red-cockaded woodpecker cavity trees.

**Table 3-10: Red-cockaded Woodpecker Cluster Locations within the Alternative Route Corridors on FMNF**

| | Alt. A | Alt. B | Alt. C | Alt. D | Alt. E | Alt. F |
|---|---|---|---|---|---|---|
| Red-cockaded woodpecker clusters within right-of-way (37.5-foot/75-foot corridor) | - | - | - | - | - | - |
| Red-cockaded woodpecker clusters within 300 feet/600-foot corridor | 1 | 1 | - | - | 1 | - |
| Red-cockaded woodpecker clusters within 500 feet/1,000-foot corridor | 2 | 2 | - | - | 2 | - |

*Wood Stork*

The wood stork has been reported from the Washo Reserve, a bald cypress-dominated wetland approximately 1.5 miles south of Alternative Routes A and D. The wood stork is not known to nest or forage within the proposed alternative routes; however, the species may use the North and South Santee rivers as travel corridors. Unofficial observations from the Cape Romain Bird Observatory state that the species flies from its night roosts and breeding colonies upriver down to feeding areas in the lower Santee Delta, Santee Coastal Reserve, Cape Romain National Wildlife Refuge, and other nearby areas. They “often cross [U.S. Highway 17] barely above the treetop level over the Santee Delta, or at even lower altitude[s] as they fly along the North Santee and

South Santee river corridors." All of the alternatives routes propose to cross the North and South Santee rivers.

*Bachman's Warbler*

Historically, the bird was known from central Charleston County in bald cypress swamps and canebrakes. The warbler spent its breeding season in the southeastern U.S. and wintered in Cuba and the Isle of Youth. The bird was last officially documented in the United States in 1961 and in Cuba in 1984.

*Flatwoods Salamander*

Frosted flatwoods salamanders historically have occurred at various sites in wet, grassy flatwoods and along the margins of pond cypress savannahs in the area. An historic site (salamanders last observed in 1987) is known at Santee Coastal Reserve, approximately 1.5 miles from Alternative Routes A, B, D, and E (south and east of U.S. Highway 17) in Charleston County. Another site is known outside of the Study Area in the FMNF along SC Highway 41 in Berkeley County. Both of these sites have been designated as critical habitat for the species. The salamanders range can extend up to 1 mile from their breeding sites.

*Shortnose Sturgeon*

The shortnose sturgeon inhabits rivers and estuaries. As an anadromous fish species, the shortnose sturgeon spawns in the coastal rivers along the east coast of North America from the St. John River in Canada to the St. Johns River in Florida. In the southern portion of the range, it is found in the St. Johns River in Florida; Altamaha, Ogeechee, and Savannah rivers in Georgia; and in South Carolina river systems that empty into Winyah Bay and into the Santee/Cooper River complex that forms Lake Marion.

*Atlantic Sturgeon*

The Atlantic sturgeon is a long-lived, estuarine-dependent, anadromous fish. Atlantic sturgeon anadromous adults spawn in freshwater in the spring and early summer and migrate into "estuarine" and marine waters where they spend most of their lives. In some southern rivers, a fall spawning migration may also occur. They spawn in moderately flowing water (46 to 76 centimeters per second) in deep parts of large rivers. Subadults and adults live in coastal waters and estuaries when not spawning, generally in shallow (10 to 50 meters deep) nearshore areas dominated by gravel and sand substrates. Long-distance migrations away from spawning rivers are common. Atlantic sturgeon are benthic feeders and typically forage on "benthic" invertebrates (e.g., crustaceans, worms, and mollusks). Historical records of the Atlantic sturgeon—mature and spawning fish—are known from the South Santee River in the general area of the proposed action.

*West Indian Manatee*

The West Indian manatee is primarily found in marine and estuarine waters, but there are historic records for the mammal several miles up the Santee River (Murphy and Griffin undated). The species was documented swimming up the Santee rivers west of the U.S. Highway 17 bridges. Several sightings have occurred in the Santee Delta east of the bridge (Murphy and Griffin, undated).

*Pondberry*

There are no records for this small shrub in or adjacent to the Project's Study Area. During reconnaissance fieldwork in the 2000s, habitat for the species was noted on private land near the intersection of Alternative Routes B, C, and E, southwest of the Santee Delta. No plants, however, of this species were located.

*American Chafseed*

American chaffseed is historically known (reported in 1974) in the FMNF approximately 2.5 miles northwest of Alternative Routes C, D, and F. The habitat for the species exists in the Project's Study Area; however, there are no records for the plant within the Study Area.

**State-Listed and U.S. Forest Service Sensitive Species**

Two state listed species that are also federally listed species are the wood stork and the red-cockaded woodpecker. These species are addressed above under the federally listed species. In addition to these two species, several other state-listed and USFS sensitive species are known to occur or have habitat in the Project Area. These are discussed in greater detail below.

*American Swallow-tailed Kite*

The swallow-tailed kite, which is a migratory bird that is state-listed as endangered, has the potential to occur within the proposed alternative routes. The kite is closely associated with large tracts of forested wetlands of the Coastal Plain, such as those found at the FMNF and along the lower Santee River (SCDNR 2013c). Important features of the kite's habitat include forested sites; tall, accessible trees for nesting; and open areas for foraging (NatureServe 2013, USFS 2008). This bird shows a strong preference for nesting in dominant or co-dominant loblolly pines growing within or on the edges of wetland forests.

*Bald Eagle*

In South Carolina, the nesting season of the eagle typically begins with courtship and nest building in September and continues through February. Eaglets fledge as early as January and as late as May. The non-nesting season occurs from June through August (USFWS 2007). Bald eagles typically nest near coastlines, rivers, and large lakes where they have an adequate food supply. USFWS (2007) recommends constructing utility lines at least 660 feet from active bald eagle nests. No known bald eagle nests are located within 660 feet of any alternative route.

*Rafinesque's Big-eared Bat*

The Rafinesque's big-eared bat has been observed from four sites within the boundaries of the FMNF (USFS 2008). All four sightings occurred more than 15 years ago with no recent observations made since then. This large bat has primarily been observed roosting and foraging in riparian areas, but it has also been seen foraging in the adjacent pine uplands. There is a historic record for the bat along one of the corridors just south of the Santee River near Hampton Plantation.

*Northern Cricket Frog*

Northern cricket frogs are found primarily in the Piedmont of the Carolinas where they live on the shores of marshes, streams, and rivers. They are active nearly year-round and call during mating and when temperatures exceed 80 degrees Fahrenheit (°F). The Coastal Plain populations of the upland chorus frog and northern cricket frog are both located near Charleston, South Carolina. These two species are common to relatively abundant throughout the Piedmont and Southern Appalachian ecoregions of South Carolina (SCDNR 2005). A historic record shows the northern cricket frog (SCHP 2005) is known to exist in Alternative Routes A and D on the South Santee River along U.S. Highway 17. It is possible, however, that this record is a misidentification of a southern cricket frog (*Acris gryllus*), which is not state listed.

*Spotted Turtle*

Spotted turtle lay eggs in well-drained soil of marshy pastures, in grass or sedge tussock or mossy hummocks, in open areas (e.g., dirt path or road) at edge of thick vegetation, or similar sites exposed to sun. Sandy, sparsely vegetated strips and washouts along agricultural field edges are favorable for nesting. According to NatureServe (2013), in South Carolina, gravid females spent a considerable amount of time on or at the edge of a power line ROW, and they nested on the edge of the power line and in relatively recent clearcuts.

*Carolina Pygmy Sunfish*

The Carolina pygmy sunfish, a freshwater species, is reported from the Santee River drainage, but no records are known for the lower Santee River, according to the SCDNR geographic database.

*Climbing Heath*

Climbing heath is a fetterbush that reaches the northern limits of its range in South Carolina. It is found in pond cypress ponds and pond cypress-swamp tupelo swamps on the bark of pond cypress trees. Several small populations of the vine are known on the FMNF. One historic population is known in one of the study corridors just east of U.S. Highway 17 in Alternative Routes A, B, and E, and a new population of the plant was found in the same area during 2011 field work (RUS et al. 2014).

*Carolina Fluffgrass*

Carolina fluffgrass is a perennial grass growing from long rhizomes. It is found in pinelands and sandy open woods. There are 12 sites recorded on the FMNF. In the alternative routes, there are two historic populations of the grass known from just east of U.S. Highway 17 in Alternative Routes A, B, and E.

*Yellow Fringeless Orchid*

Yellow fringeless orchid is a terrestrial orchid that is found in wet savannahs and in depressions in pine flatwoods. There is an historic record for the plant along U.S. Highway 17 in Georgetown County in Alternative Routes A, B, and E.

### 3.5.2. Environmental Effects

This section discusses potential effects on vegetation, wildlife, aquatic, and special status species resulting from construction and operation of the proposed Project, including the no-action alternative. Definitions for duration and intensity developed for this Project are described in Table 3-11.

### Table 3-11: Duration and Intensity Definitions for Biological Resources

| Context (Duration) | Low Intensity | Moderate Intensity | High Intensity |
|---|---|---|---|
| **Vegetation** | | | |
| Short term: Lasting less than two growing seasons<br><br>Long term: Lasting longer than two growing seasons | Impacts to native vegetation would be detectable but discountable and would not alter natural conditions measurably. Infrequent disturbance to individual plants could be expected but without affecting local or range-wide population stability. Infrequent or insignificant one-time disturbance to local populations could occur, but sufficient habitat would remain functional at both the local and regional scales to maintain the viability of the species. Opportunity for increased spread of noxious weeds would be detectable but discountable. There would be some minor potential for increased spread of noxious weeds. | Impacts to native vegetation would be detectable and/or measurable. Occasional disturbance to individual plants could be expected. These disturbances could affect local populations negatively but would not be expected to affect regional population stability. Some impacts might occur in key habitats, but sufficient local habitat would remain functional to maintain the viability of the species both locally and throughout its range. Opportunity for increased spread of noxious weeds would be detectable and/or measurable. There would be some moderate potential for increased spread of noxious weeds. | Impacts to native vegetation would be measurable and extensive. Frequent disturbances of individual plants would be expected with negative impacts to both local and regional population levels. These disturbances could negatively affect local populations and could affect range-wide population stability. Some impacts might occur in key habitats, and habitat impacts could negatively affect the viability of the species both locally and throughout its range. Opportunity for increased spread of noxious weeds would be measurable and extensive. There would be major potential for increased spread of noxious weeds. |
| **Wildlife** | | | |
| Short term: Lasting one to two breeding seasons, depending on length of breeding season<br><br>Long term: Lasting beyond two breeding seasons | Impacts to native species, their habitats, or the natural processes sustaining them would be detectable, but discountable, and would not measurably alter natural conditions. Infrequent responses to disturbance by some individuals could be expected but without interference to feeding, reproduction, resting, or other factors affecting population levels. Small changes to local | Impacts to native species, their habitats, or the natural processes sustaining them would be detectable and/or measurable. Occasional responses to disturbance by some individuals could be expected with some negative impacts to feeding, reproduction, resting, migrating, or other factors affecting local population levels. Some impacts might occur in key habitats. However, sufficient population numbers or habitat would | Impacts to native species, their habitats, or the natural processes sustaining them would be detectable, and would be extensive. Frequent responses to disturbance by some individuals would be expected with negative impacts to feeding, reproduction, or other factors resulting in a decrease in both local and range-wide population levels and habitat type. Impacts would occur during |

| Context (Duration) | Low Intensity | Moderate Intensity | High Intensity |
|---|---|---|---|
| | population numbers, population structure, and other demographic factors could occur. Sufficient habitat would remain functional at both the local and range-wide scales to maintain the viability of the species. | retain function to maintain the viability of the species both locally and throughout its range. | critical periods of reproduction or in key habitats and would result in direct mortality or loss of habitat that might affect the viability of a species. Local population numbers, population structure, and other demographic factors might experience large changes or declines. |
| **Special Status Species** | | | |
| Short term: Lasting one breeding season<br>Long term: Lasting beyond one breeding seasons | Impacts to sensitive species, their habitats, or the natural processes sustaining them would be detectable, but discountable, and would not measurably alter natural conditions. Infrequent responses to disturbance by some individuals could be expected but without interference to feeding, reproduction, resting, or other factors affecting population levels. Small changes to local population numbers, population structure, and other demographic factors might occur. However, some impacts might occur during critical reproduction periods or migration for a species but would not result in injury or mortality. Sufficient habitat would remain functional at both the local and range-wide scales to maintain the viability of the species. No take of federally listed species or impacts to designated critical habitat is expected to occur. Impacts would | Impacts to sensitive species, their habitats, or the natural processes sustaining them would be detectable and/or measurable. Some alteration in the numbers of sensitive or candidate species, or occasional responses to disturbance by some individuals could be expected with some negative impacts to feeding, reproduction, resting, migrating, or other factors affecting local population levels. Some impacts might occur in key habitats. However, sufficient population numbers or habitat would remain functional to maintain the viability of the species both locally and throughout its range. No mortality or injury of federally listed species is expected; however, some disturbance to individuals or impacts to potential or designated critical habitat could occur. Impacts would likely result in a may affect, unlikely to adversely affect determination. | Impacts to sensitive species, their habitats, or the natural processes sustaining them would be detectable and would be permanent. Substantial impacts to the population numbers of sensitive or candidate species, an impact to the population numbers of any federally listed species, or interference with their survival, growth, or reproduction would be expected. There would be direct or indirect impacts on candidate or sensitive species populations or habitat, resulting in substantial reduction to species numbers, take of federally listed species numbers, or the destruction or adverse modification of designated critical habitat. Impacts would like result in an adverse effect determination. |

| Context (Duration) | Low Intensity | Moderate Intensity | High Intensity |
|---|---|---|---|
| | likely result in a may affect, unlikely to adversely affect determination. | | |

### No-action Alternative

Under the no-action alternative, the proposed Project would not be constructed, and there would be no new effects on biological resources.

### Proposed Action

The proposed Project would encompass a variety of terrain, vegetative communities, and habitat types used by a variety of wildlife. Construction, operation, and maintenance of the proposed Project would have effects on vegetation and wildlife. Appropriate mitigation measures would reduce the severity of these adverse effects. Potential effects would include the following:

- Disturbance or change to vegetative communities as a result of clearing and construction within the ROW.
- Introduction and spread of noxious weeds during construction of the transmission line.
- Removal of forested wetland vegetation within the ROW.
- Removal of wildlife habitat within the ROW.
- Fragmentation of wildlife habitat.
- Temporary disturbance to wildlife from human presence and disruption to habitat.
- Disturbance to aquatic habitats from construction activities.
- Changes in predator-prey relationships due to habitat changes (e.g., increased predation by raptors due to the presence of transmission structures for perching).
- Effects on special status species (federally listed or state-listed or proposed species, USFS sensitive species) or their habitat.

### Vegetation

*Construction Effects*

Potential adverse effects on vegetation from Project-construction would include short-term and long-term effects varying in intensity from low to moderate to high. The ROW would be cleared of trees to a minimum of 75 feet wide, including the trimming or removal of danger trees that are outside the ROW (danger trees are trees or branches that are dead, weak, diseased, leaning toward the line, or otherwise capable of hitting the transmission line were they to fall). In upland areas, the ROW would be cleared using heavy equipment to fell trees and understory trees and shrubs and cut at ground level. Felled vegetation would be limbed up and removed or chipped. Stumps would be cut or ground down to a maximum height of 3 inches above the soil line. Slash, the coarse and fine woody debris generated during logging operations, would typically be chipped and broadcast as mulch or allowed to decompose on the ground.

Within wetlands, land clearing of the easement would be accomplished by methods that remove trees and tall-growing vegetation above the soil line and do not disturb the native wetland soils. This may be accomplished by using low ground pressure equipment (10 psi or less) or similar equipment working from temporary load-dispersing mats to minimize rutting and mucking of wetland soils. Low-growing native plant materials that would not interfere with the installation, maintenance, and operation of the transmission line would not be cleared. Central Electric would establish a 30-foot upland buffer area adjacent to all blue line streams and at all jurisdictional wetlands. Wetland clearing methods would be used in these buffer areas to minimize the likelihood of upland soils being transported into wetlands. Appropriate soil erosion and sedimentation controls would be established at streambank boundaries. Wetlands are further discussed in Section 3.4

Within the ROW, permanent long-term vegetation loss would occur at the structure locations. The foundation size of the transmission line structures would not be known until engineering is farther along; however, it is expected they would be relatively small in size with less than an 8-foot diameter per structure. As such, permanent effects from vegetation loss due to structures would be long term yet low intensity. During construction, a 20-foot by 20-foot area of vegetation around each structure would be disturbed for the placement of temporary construction pads. Additional vegetation clearing (5 to 10 acres) could occur if a construction lay-down area is located in an uncleared location; however, Central Electric would prefer to find a site that is already developed or disturbed. Central Electric and/or Berkeley Electric would construct the proposed McClellanville Substation on a developed parcel; therefore, it would have no effect on vegetation.

Effects from vegetation clearing of the ROW would vary depending upon the type of vegetation to be cleared. As shown in Table 3-6, all six alternative routes are predominantly forested habitat, both upland and wetland. Alternative Routes A and D are the most developed of the alternative routes with 12.1 and 10.3 percentage, respectively, whereas Alternative Route F is almost entirely undeveloped and uncultivated vegetation. As such, Project effects on vegetation would be the greatest for Alternative Route F.

Construction through forested areas would require the removal of any trees or large shrubs that would interfere with line safety, equipment access, and operation. Clearing forested areas would have a long-term, high-intensity effect on vegetation because it would result in a permanent conversion. Conversion of forested wetland (bottomland hardwoods) to emergent or scrub-shrub wetlands would have greater impacts because of the various functions and values, including wildlife habitat, provided by this habitat type. Louis Berger digitized forest cover for each alternative route using aerial photography. As shown in Table 3-12, Alternative Routes E and F have the most acres of forest cover within both the 75-foot ROW and a greater 600-foot corridor, whereas Alternative Route A is the least forested. Therefore, permanent effects on vegetation from ROW clearing would be greatest for Alternative Routes E and F.

**Table 3-12: Acres of Forest Cover**

| | Alt. A | Alt. B | Alt. C | Alt. D | Alt. E | Alt. F |
|---|---|---|---|---|---|---|
| Forest cover within the 75-foot right-of-way (acres) | 110 | 114 | 120 | 119 | 134.5 | 133.5 |
| Francis Marion National Forest | 5 | 5 | <0.5 | <0.5 | 5 | <0.5 |
| Santee Delta Wildlife Management Area | 12 | - | - | 12 | - | - |
| Forest cover within the 600-foot corridor (acres) | 768 | 868 | 911 | 817 | 1,073 | 1,082 |

The proposed Project alternative routes would result in permanent forest conversion in both the FMNF and the Santee Delta WMA, depending upon the constructed route. Alternative Routes A, B, and E cross the greatest amount of FMNF; however, they cross while paralleling U.S. Highway 17. If the ROW is permitted to overlap with the highway ROW, less forest clearing would be required for these alternatives. Alternative Routes A and D would also result in permanent forest conversion in the Santee Delta WMA; however, as with the FMNF, these routes parallel U.S. Highway 17 for this crossing, limiting the quantity of habitat affected.

Only short-term, low-intensity effects on vegetation are anticipated within the ROW in grassland, cropland, and hayland areas because these vegetation types would be restored within the ROW upon completion of construction. Shrub/scrub vegetation would be cleared within the ROW where necessary, depending on height and terrain; however, shrub/scrub vegetation does not make up a large percentage of any of the alternative routes. As shown in Table 3-6, shrub/scrub vegetation is only between 3 and 4 percent for all of the Alternative Routes. Clearing of shrub vegetation would have a long-term, low-intensity effect on vegetation.

In addition to ROW clearing, construction effects would include localized disturbance to vegetative communities caused by construction equipment and vehicles during site preparation, such as trampling damage to vegetation from vehicle tires, placement of timber mats in wetlands, and minimal grading. Damage to vegetation in the ROW from construction equipment and vehicles would be considered a short-term, low-intensity effect in areas that are not being permanently developed. Upon completion of all work, all non-agricultural disturbed areas and construction staging areas not needed for maintenance access would be re-graded so that all surfaces drain naturally, blend with the natural terrain, and are reseeded to blend with native vegetation with a seed mixture certified as free of noxious or invasive weeds. All destruction, scarring, damage, or defacing of the landscape resulting from construction would be repaired.

During construction, off-ROW access may be necessary. Off-ROW access may be acquired for construction and maintenance on existing roads and/or existing utility easements. Improvements to existing off-ROW roads may be required and improvements would typically involve re-grading of dirt roads if wear and tear of traffic requires it or adding rock (or additional rock) to un-paved roads. No new permanent roads would be constructed as a result of the transmission line construction and any new temporary access roads would be minimal; therefore, effects on vegetation from access road improvement or construction is expected to be negligible. If any new temporary access roads are required, they would be restored to the natural condition after construction is completed. Therefore, effects on vegetation from the construction of access roads would be short term and low intensity.

The introduction and spread of noxious weeds as a result of construction of the proposed Project would be possible through ground disturbance and transfer of seeds by construction equipment. Precautions would be needed during construction and reclamation to prevent the introduction and spread of noxious weeds, such as re-vegetation of disturbed areas using certified seed and mulch that contains no viable noxious weed seeds, as well as the use of standard BMPs related to construction and re-vegetation practices within disturbed areas. Central Electric would develop a noxious weed management plan to address the potential spread of noxious weeds during construction activities. The plan would include strategies for prevention, detection, and control of noxious weeds. Construction equipment would be inspected for seeds and thoroughly cleaned before mobilizing to the Project Area.

*Operation and Maintenance Effects*

Following construction, vegetation management would continue within the ROW. Transmission ROWs would be re-cleared on a 2.5- to 3-year cycle (4 to 5 years in wetlands), using medium to heavy four-wheel drive tractors with associated mowing implements to ensure that vegetation growth does not adversely affect system reliability. Re-clearing personnel would use herbicides to control vegetation throughout their respective mow area. On non-federal lands, this includes applying granular herbicide at the base of selected transmission structures to reduce the potential of damage from wild fires and/or facilitate ground rot inspections by line personnel. Also, crews would treat wetland areas (i.e., areas where mowing equipment cannot traverse) with a foliar herbicide application, using a Marsh Master or similar equipment, to control woody vegetation.

The goal of Santee Cooper's herbicide program is to control vegetation that could interfere with the normal transmission of electricity while promoting low-growing native vegetation. The current practice of applying herbicides is to selectively treat undesirable woody vegetation using a low volume methodology. Although the amount of herbicide applied depends on the species composition, density, and height of the vegetation that is present, the selective application approach results in less of the active ingredient being applied per acre, as compared to the broadcast method. Only herbicides approved by USEPA are used within ROWs with each being applied in accordance with manufacturer labeling.

Future vegetation management activities on ROWs crossing USFS lands are expected to be similar to vegetation management as described above, except for the use of herbicides**. Herbicides would not be used during land clearing or maintenance activities of the ROW crossing USFS lands.** One exception to the use of chemicals on USFS lands is where FMNF policy permits it for the control of non-native invasive plant species. Overall, vegetation maintenance would have a long-term low impact on vegetation community health.

### Wildlife

*Habitat*

The proposed alternative routes would cross a variety of different habitat areas used by a diverse assemblage of wildlife species. All alternative routes would cross very similar habitat communities, resulting in similar effects on wildlife populations. The primary long-term effect from Project construction would be the permanent conversion of forested upland and wetland habitat to grassland or shrub habitat. Grassland and pasture habitat, and the wildlife species that rely on that habitat, may be temporarily disturbed during Project construction, but would return following Project construction. Project effects on wildlife that use grassland and pasture habitat would be short-term and low in intensity. Central Electric would establish a 30-foot upland buffer around all streams and wetlands to retain riparian habitat.

Species dependent on woodland habitat would experience a permanent loss of habitat within the ROW. This would result in a long-term, low to moderate impact to wildlife. Although the amount of forest that would be converted is relatively small, with plentiful comparable habitat available nearby for species to use, habitat fragmentation can cause a more severe impact than the actual loss of habitat. Habitat fragmentation occurs when formerly continuous tracks of habitat, particularly forest, are broken up into smaller parcels.

Forest-interior species that rely on forested vegetation would lose nesting habitat and be replaced by early successional wildlife species. Forest conversion and fragmentation can lead to an increased likelihood of starvation and an increased likelihood of predation due to an increase in songbird predators and a reduction in protective covering. Bottomland hardwood forests are an important habitat for many bird species during the critical over-wintering period. While fragmentation of the larger area is unavoidable and some habitat types would be removed, other habitat types would be created. ROWs may actually provide a potential reservoir of shrubland habitat for wildlife species, especially birds that breed in this habitat type (King and Byers 2002). In addition, raptors would likely have increased foraging habitat in areas where forested habitats are converted to low-growing vegetation.

Limiting the amount of interior forest fragmented by avoiding large tracks of forest and paralleling existing linear features, such as roads or other utility lines, reduces the effects of habitat fragmentation. Table 3-13 shows the percentage of each alternative route that is parallel to another linear feature. Overall, Alternative Routes A and D are parallel to other features for greater than 70 percent of the route; it is expected that these routes would have long-term, low impacts on forest fragmentation, whereas Alternative Routes B, C, E, and F would have long-term, moderate impacts. None of the alternative routes would result in a high intensity impact to forest fragmentation because, overall, the Project Area does not include expansive continuous tracks of forest.

**Table 3-13: Percentage of the Alternative Routes Parallel to Other Linear Features**

| | Alt. A | Alt. B | Alt. C | Alt. D | Alt. E | Alt. F |
|---|---|---|---|---|---|---|
| Total parallel percentage | 81.4% | 45.3% | 20.4% | 71.5% | 53% | 33.6% |

As discussed under vegetation, above, following construction, the ROW would be maintained every 2.5 to 3 years (4 to 5 years in wetlands) through mowing and herbicide application. Wildlife habitat would be maintained in a grassland/shrub state, continuing to provide habitat to wildlife species that use these habitat types. During maintenance, it is expected that wildlife would temporary leave the area, using adjacent habitat for temporary shelter. Because the duration of vegetation maintenance in any one area is relatively short, wildlife would move back into the ROW following maintenance. Santee Cooper would apply herbicides following USEPA guidelines and would use a low volume, selective treatment approach to application. As such, it is unlikely that herbicides would affect wildlife populations and would have a long-term, low intensity impact. Herbicides would not be used during land clearing or maintenance activities on the ROW crossing USFS lands.

*Wildlife Species*

Short-term effects from Project construction on wildlife species would include temporary disturbance within and near the transmission ROW during construction and line maintenance due to human intrusion, noise, and construction activity. Project-related effects would be largely short-term, of low to moderate intensity, and typically limited to the construction period and times when workers and equipment are regularly present.

Construction noise and noise from other human activity can result in a variety of effects to wildlife species, including displacement from occupied habitats, interference with hearing ability in songbirds and mating and alarm calls in amphibians and ground squirrels, and disruption of raptor foraging activities (Madsen 1985, Van der Zande et al. 1980, Fyfe and Olendorff 1976). The effects of temporarily elevated noise levels can range from mild disturbance to severe auditory damage or death. Percussive sounds such as those typically involved with installation of piling or with blasting are typically the loudest construction-related sounds. The proposed Project is not expected to require piling or blasting.

Noise levels would be elevated within the Project corridor during the installation of transmission structures, but the sound levels would decrease to ambient conditions within a relatively short distance from the construction area. Some temporary displacement of wildlife from otherwise usable habitat would likely occur in the immediate vicinity of construction sites during the construction period. The degree of displacement would generally be proportional to the change in noise levels and the type of activity. If wildlife species were temporarily displaced at a critical time, such as during the breeding season, it could result in effects to reproductive success. For this reason, temporary construction-related noise effects would be expected to have a short-term, moderate effect on wildlife species.

Operation of heavy equipment and vegetation removal activities could result in direct mortality of less mobile species of wildlife that are present in the Project ROW. Larger, more mobile species that are able to leave the area, such as birds and medium and large mammals, would probably do so. Small mammals, amphibians, and reptiles that typically retreat to shallow burrows or other hiding places to escape danger would be most likely to suffer direct mortality. Additionally, wildlife species could fall into holes that have been drilled for structure placement. Holes are typically not left open with direct imbedded poles; however, when foundations are required, Central Electric would mark holes drilled for foundations that are left unattended overnight and would secure the area with temporary fencing to reduce the potential for livestock and wildlife to enter the holes, and for public safety.

*Migratory Birds*

Raptors, waterfowl, and migratory bird species may be affected by the construction of the proposed Project. The Migratory Bird Treaty Act (16 USC 703–712) makes it unlawful to take, kill, or possess migratory birds. Habitat disturbance or alteration, human disturbance, and collisions with transmission lines would affect migratory species.

Potential, temporary effects on raptors and waterfowl species may occur during construction of the proposed Project. Foraging areas for these species would be temporarily disturbed during ROW clearing and general construction activities. Effects on foraging areas due to construction activities would be short term and of low to moderate intensity. During ROW clearing and preparation, habitat loss may occur for grassland and forest bird species, causing temporary displacement of local populations. When construction is completed, grassland species would be expected to return to the area as grassland is restored and construction disturbance ceases. Therefore, effects related to temporary habitat loss and displacement for grassland species would be short term and of low to moderate intensity. Forest-dwelling species would likely move into neighboring forested areas adjacent to the ROW during construction and operation of the line. Species dependent on woodland habitat would experience a permanent loss of habitat within the ROW. Effects related to permanent loss of forest habitat would be long term and of moderate intensity. Raptor and migratory bird surveys would be conducted in high bird use areas along and adjacent to the preferred alternative prior to construction. Survey methods would be determined in consultation with USFWS. In the event a nest is located, Central Electric would coordinate with USFWS to minimize adverse effects during construction, if avoidance is not possible.

Operation of the proposed Project would present the potential for avian collisions with the transmission line, particularly for larger, less maneuverable species and in areas of dense bird congregations, such as the Santee Delta WMA and FMNF Important Bird Area crossed by Alternative Routes A and D. The Santee Delta WMA and surrounding area provides foraging, nesting, and wintering habitat to waterfowl, wading birds, and other bird species. Under various conditions, including high wind, fog, or poor light, avian collisions with the line (generally the overhead shield wire, which is smaller and less visible than the actual conductor) may occur. Migratory waterfowl would be especially susceptible to transmission line collisions where the proposed transmission line perpendicularly crosses the Santee River delta, as these waterways would tend to concentrate waterfowl and provide natural flight corridors. The proposed Project would be designed in accordance with the Avian Power Line Interaction Committee (APLIC)'s recommendations contained in the most recent APLIC publication, "Reducing Avian Collisions with Power Lines, State of the Art in 2012. Central Electric would use OPGW in place of a typical static wire. The diameter of OPGW is larger than that of the static wire and would increase the visibility of the transmission line to avian species. After further consultation with USFWS, Central Electric, as determined appropriate, would use OPGW or mark the shield wire(s) with flight diverters in areas showing high potential for avian collisions. Effects on birds related to line collisions during Project operation would be long term and of moderate intensity.

Electrocutions of large avian species, particularly raptors, have been known to occur from contact with energized lines. Electrocutions are primarily due to the close vertical or horizontal separation of conductors and other equipment often found in distribution lines. APLIC (APLIC 2006) states that transmission lines rarely electrocute birds because of the larger separation distance. The separation of conductors on transmission lines is well beyond the separation found in most distribution lines. APLIC (2006) recommends a separation of 60 inches on distribution and transmission lines. Because the proposed Project would be built in accordance with the APLIC's guidance document "Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006" (APLIC 2006), there would be no effects to birds from electrocution.

The presence of the utility line structures may also affect raptor predator-prey relationships by providing additional locations from which raptors can hunt (perches). However, the Project area already contains plentiful perching opportunities, so the utility line structures are not expected to increase predation. Changes to raptor predator-prey relationships are expected to be long term and of low intensity.

*Management Indicator Species*

As discussed previously, Alternative Routes A, B, and E cross approximately 1.2 miles of FMNF parallel to U.S. Highway 17, which would result in fewer than 5 acres of tree clearing. Alternative Routes C, D, and F cross fewer than 0.1 mile of the FMNF, which would result in fewer than 0.5 acre of forest clearing. Overall, direct effects to MIS species from any of the Alternative Routes would be expected to be minimal both because of the short distances of the routes within the FMNF (especially for Alternative Routes C, D, and F), as well as, in the case of Alternative Routes A, B, and E, the placement of the proposed ROW. Construction of any of the alternative routes could have a low, short-term indirect impact on any MIS species found in proximity to the constructed ROW from noise, human intrusion, and construction activities.

Alternative Routes A, B, and E could have an indirect low impact on forest-dwelling species, such as the painted bunting, yellow-throated vireo, northern parula, and the American swallow-tailed kite because of the loss of approximately 5 acres of forested habitat. This impact would be minimized, however, because these alternative routes would remove forest at the edge of the U.S. Highway 17 ROW. As a result, edge, not interior forest would be lost and the forest edge would be moved instead of new edge habitat created. In addition, any forested wetland habitat that occurs within the Project ROW would be converted to emergent marsh wetland that could have an indirect impact on forested wetland species such as the sweet pitcher plant and the pine woods tree frog. Because Alternative Routes C, D, and F cross such a short section of FMNF and would result in minimal forest clearing on FMNF, they would not be expected to have direct or indirect impacts on forest-dwelling species.

The alternative routes could have a direct impact on the northern bobwhite quail because, as discussed previously under migratory birds, utility line structures may affect raptor predator-prey relationships by providing additional locations from which raptors can hunt (perches). However, the Project area already contains plentiful perching opportunities, so the utility line structures are not expected to increase predation. In addition, clearing and maintaining a cleared ROW could benefit both species requiring early successional/open habitat conditions such as the quail and the prairie warbler, as well as provide foraging opportunities for the American swallow-tailed kite. The ROW would provide brood habitat for the quail.

Project impacts to the red-cockaded woodpecker are discussed below under federally-listed species.

### Aquatic Resources

Construction-related effects on fish and other aquatic species are not likely to occur because the Project would span all streams. Central Electric also plans to use existing access roads, which would limit the need for temporary culverts in streams. BMPs would be employed during construction and maintenance activities to prevent soil erosion and runoff; sedimentation; water quality changes; and contamination of water from herbicides, fuels, and other spills that could harm aquatic species.

If necessary, temporary low-water crossings or culverts would be installed at ditches, streams, or other watercourses to provide access to the ROW for construction vehicles. Installation of low-water crossings or culverts may require a permit from USACE and/or the state of South Carolina. Central Electric would coordinate with these entities prior to installing low-water crossings or culverts regarding permitting requirements and construction conditions. Structures would be designed and installed so as not to inhibit fish passage or create upstream or downstream habitat changes. Effects related to installation of these structures would be short term and of low intensity. Central Electric would establish a 30-foot upland buffer area adjacent to all blue line streams and at all jurisdictional wetlands. Wetland clearing methods would be used in these buffer areas to minimize the likelihood of upland soils transport into wetlands. Appropriate soil erosion and sedimentation controls would be established at streambank boundaries. As such, Project construction is expected to have a short-term, low intensity impact on aquatic resources.

During Project operation, vegetation maintenance would require the use of herbicide application. In areas that have standing water and are connected to a larger aquatic system (e.g., river or swamp), only USEPA-approved herbicides registered for use in wetland or aquatic sites would be used. As such, there would be negligible direct toxic effects to fish from herbicide applications because of the small size of the treatment sites; the precautions that would be taken to prevent runoff in rainwater; the lack of offsite drift from the backpack, hand, or ground-based boom sprayers that would be used; and the generally rapid degradation of the herbicides after application. Effects from Project operation on aquatic resources would be long-term, low intensity.

### Special Status Species

The proposed Project's effects on special-status species occurring in or nearby the constructed ROW would be similar to those discussed for general vegetation and wildlife; however, effects on special-status species could be magnified due to their relative rarity.

*Federally and Proposed Listed Species*

A BA was completed in tandem with this EIS. The following information summarizes the findings in that report. The BA, which can be found in Appendix E, provides a more detailed discussion.

Of the 19 federally listed or proposed species with the potential to occur in the Project area (see Table 3-9), only six are actually known to have historically occurred near the Project corridors (red-cockaded woodpecker, wood stork, flatwoods salamander, Atlantic sturgeon, short-nosed sturgeon, and the West Indian Manatee). The only species presently known to occur within the study corridors are the red-cockaded woodpecker and wood stork. The flatwoods salamander is known to occur within 1.25 miles of Alternative Routes A, B, D, and E. The remaining three species are marine/aquatic species with only historic records in the general area of the Project Area river crossings. These species have been known to pass through the area, but they do not permanently reside there.

*Red-cockaded Woodpecker*

Forest clearing for Project construction may cause some red-cockaded woodpecker colonies to relocate and/or may potentially affect the health of other colonies (by reducing the basal area of the foraging trees in the foraging habitat of adjacent colonies). To the maximum extent practicable, Central Electric would avoid cluster trees when siting the Project's ROW. If cluster trees cannot be avoided, Central Electric would coordinate with USFWS, RUS, and USFS to enter into formal consultation, and as appropriate, implement mitigation to minimize adverse effects to the species. Mitigation could include but is not limited to: relocating red-cockaded woodpeckers to nearby suitable habitat outside of the nesting and roosting seasons, enhancing cluster habitat where appropriate, and installing artificial cavities in suitable trees.

Additionally, noise and ground disturbance from construction activities could disturb woodpeckers during Project construction. If these activities take place during nesting season, it could disrupt nesting activities, decrease feeding and brooding rates, and cause nest abandonment. To minimize these impacts, Central Electric would avoid ROW clearing and construction activities within a 500-foot radius of cluster trees during the species nesting season (April through July).

*Wood Stork*

Because the alternative routes contain potential breeding habitat for the species, the Project has the potential to affect the wood stork through forest clearing, particularly in the Santee Delta area. Although previous surveys in the Project's Study Area do not show the wood stork nesting and foraging in the areas around the Project alternatives, Central Electric would survey the Project's ROW for wood storks prior to construction. If wood storks are found nesting in trees within the Project's ROW and the trees require removal, Central Electric would coordinate with USFWS and RUS to enter into formal consultation, and as appropriate, implement mitigation to minimize adverse effects to the species. After the creation of the Project's ROW, wood storks may use the transmission line ROW as travel corridors to access new foraging areas. This may benefit the species.

Wood storks have been observed using the North and South Santee rivers as travel corridors. After the proposed Project is constructed, there is potential for wood stork collisions with the transmission line. Alternative Routes A and D, which parallel U.S. Highway 17 at the Santee Delta crossing, have the greatest potential for this to occur. The line would cross both rivers perpendicularly. Central Electric would design the Project according to the guidelines in APLIC's "Reducing Avian Collisions with Power Lines: The State of the Art in 2012" (APLIC 2012). If determined necessary during consultation with USFWS, Central Electric would conduct surveys in areas determined to have a high potential for avian collisions (i.e., the river crossings). If determined necessary during consultation with USFWS, Central Electric would implement mitigation measures in these areas, including using a OPGW instead of a shield wire or marking the shield wire(s) with bird flight divertors.

*Flatwoods Salamander*

Previous surveys in the Project's Study Area do not show the flatwoods salamander using areas within the Alternatives Routes, but an historic site from 1987 is known in the Santee Coastal Reserve, approximately 1.25 miles south and east of U.S. Highway 17 (closest to Alternative Routes A, B, D, and E). Although the species is known to travel only up to 1 mile from breeding sites to forage and none of the alternative routes are within a mile of this historic site, the alternative routes may contain potential breeding habitat and foraging areas for the species. Because the species could occur in the Project area, prior to construction, Central Electric would survey the Project's ROW for signs of species presence and to document potential flatwoods salamander breeding habitat and foraging areas that could be affected by the Project.

*Remaining Species*

Because site-specific surveys have not been completed and the final preferred alternative has not yet been selected, Central Electric has assumed species presence in the study corridors for the five species listed above. From what is known at the present, any effects on the three marine/aquatic species would be minor and these species would not be adversely affected. After the selection of the final route, a more accurate determination would be made as to the precise effect of the proposed action on federally listed species (see Table 3-14). If there is an adverse effect to a species, Central Electric and RUS and would continue consultation with USFWS and/or NMFS.

### Table 3-14: Summary of Findings for Federally Listed or Proposed Species

| Federally Listed Species | Determination of Effect |
|---|---|
| *Acipenser brevirostrum* (Shortnose Sturgeon) | May affect, is not likely to adversely affect |
| *Acipenser oxyrhinchus oxyrhinchus* (Atlantic Sturgeon) | May affect, is not likely to adversely affect |
| *Amaranthus pumilus* (Seabeach Amaranth) | No effect |
| *Ambystoma cingulatum* (Flatwoods Salamander) | May affect, is not likely to adversely affect |
| *Balaena glacialis* (Right Whale) | No effect |
| *Balaenoptera physalis* (Finback Whale) | No effect |
| *Calidris canutus* (Red Knot) | No effect |
| *Caretta caretta* (Loggerhead Sea Turtle) | No effect |
| *Charadrius melodius* (Piping Plover) | No effect |
| *Chelonia mydas* (Green Sea Turtle) | No effect |
| *Lepidochelys kempii* (Kemp's Ridley Sea Turtle) | No effect |
| *Lindera melissifolia* (Pondberry) | May affect, is not likely to adversely affect |
| *Megaptera novaeangliae* (Humpback Whale) | No effect |
| *Mycteria americana* (Wood Stork) | May affect, is likely to adversely affect |
| *Oxypolis canbyi* (Canby's Dropwort) | May affect, is not likely to adversely affect |
| *Picoides borealis* (Red-cockaded Woodpecker) | May affect, is likely to adversely affect |
| *Schwalbea americana* (American Chaffseed) | May affect, is not likely to adversely affect |
| *Trichechus manatus* (West Indian Manatee) | May affect, is not likely to adversely affect |
| *Vermivora bachmanii* (Bachman's Warbler) | No effect |

#### *State-Listed and U.S. Forest Service Sensitive Species*

*American Swallow-tailed Kite*—Although possible, it is unknown if the American swallow-tailed kite occurs within proximity to any of the alternative routes. Several swallow-tailed kite sightings have occurred in or near the FMNF; however, the closest of these are more than 1 mile away from the closest routes (Alternative Routes E and F). Past decline of the U.S. population is attributed to habitat disturbance and degradation including prairie cultivation, wetland drainage, and logging of forests. Egg collecting and indiscriminate shooting have also contributed to the decline of this species. If American swallow-tailed kites are found within the selected alternative, the Project could have long-term, moderate adverse effects on this species if nesting habitat is lost due to the permanent conversion of forest to grassland. Managed grassland/shrublands created by the ROW could provide additional foraging habitat that would be beneficial for this species. If this species is found within the selected alternative, Central Electric would consider these locations when designing the final footprint and avoid these areas to the extent practicable. Central Electric would follow USFS Standard FW-79: No logging within 300 feet of active swallow-tailed kite nests from April 1 through June 30 or until fledging is completed.

*Bald Eagle*—Adverse indirect and direct effects on the bald eagle would be similar to effects discussed under general wildlife and migratory birds. Although no eagles have been found within the proposed segments, its habitat does occur there, particularly in the bottomland forest and picosins near the South and North Santee rivers. Central Electric would conduct raptor and migratory bird surveys along and adjacent to the proposed transmission line route prior to construction. In the event a nest is located, Central Electric would coordinate with USFWS to minimize adverse effects during construction, if avoidance is not possible. If a bald eagle nest or roosting area is located near the preferred alternative, Project construction noise and the permanent conversion of forested areas could result in a long-term, low to moderate impact to the bald eagle, depending upon the proximity of the nest or roost and the time of year. Bald eagles are particularly sensitive to human disturbance during the first few months of their nesting period. USFWS recommends constructing all utility lines at least 660 feet from an active bald eagle nest (USFWS 2005).

*Rafinesque's Big-eared Bat*—The Rafinesque's big-eared bat is known to occur within 0.5 mile of Alternative Routes E and F, within the Hampton Plantation State Park. Although the bat is known to roost in cavity trees, in the coastal plains they often roost in bridges; therefore, it is unlikely the proposed Project would result in a moderate or high impact to its habitat. Because the species forages in bottomland forest, the permanent conversion of forest to grassland would remove some habitat. It is likely, however, that the bat would use other nearby areas to forage and the local population would not be affected. If either Alternative Route E or F is chosen, or the species' habitat is affected, the Project could have long-term, low impacts to the bat.

*Northern Cricket Frog*—Although a historic record of the Northern cricket frog is known within Alternative Routes A and D adjacent to the South Santee River, there are no recent sightings. Because this frog generally prefers open, littoral habitats that lack forests, establishment of the clearing for the proposed ROW is anticipated to have negligible to low long-term adverse effects on this species. Short-term adverse effects could occur during the clearing and construction of the ROW due to direct mortality. Creating open, littoral habitat along the South Santee River could increase habitat for this species, having an overall beneficial effect.

*Spotted Turtle*—The spotted turtle is considered secure and can be common in appropriate habitat throughout the coastal plain (SCDNR 2005). Although not confirmed, the spotted turtle could occur within the proposed segments and has been found on the FMNF. Short-term effects could occur during the clearing and construction of the ROW due to direct mortality. Long-term effects include the conversion of forested wetland habitat to emergent marsh; however, spotted turtles are found in a wide variety of habitat types. Because the proposed Project would span wetlands, adverse effects to the spotted turtle would be short-term and low intensity.

*Dwarf Siren*—The dwarf siren is considered secure throughout its range but has begun to decline in South Carolina. Although not confirmed, the dwarf siren could occur within the proposed alternative routes because potential habitat is available. Short-term effects could occur during the clearing and construction of the ROW due to direct mortality. Long-term effects include the conversion of forested wetland habitat to emergent marsh. Because the proposed Project would span wetlands and there is available adjacent habitat, adverse effects to the dwarf siren would be short-term and low intensity.

*Carolina Pygmy Sunfish*—The Carolina pygmy sunfish, a freshwater species, is reported from the Santee River drainage, but no records are known for the lower Santee River. The proposed Project would not require any instream work, and BMPs would be installed to minimize any sedimentation, erosion, or introduction of pollutants to streams and wetlands. As a result, the proposed Project would have no effect on the Carolina pygmy sunfish.

*Climbing Heath, Carolina Fluffgrass, and Yellow Fringeless Orchid*—All of these species are found in wetlands along U.S. Highway 17. If either Alternative Route A, B, or E is the preferred alternative, clearing for the transmission ROW could have short-term moderate adverse effects on these species. If any of these alternative routes are selected, Central Electric would place a buffer around the location of these species to minimize adverse effects. When designing an appropriate buffer around these areas the species characteristics should be taken into account. For example, light entering pond cypress stands adjacent to the selected alternative corridors could directly affect populations of climbing heath by decreasing available quality habitat for this species (the species prefers shade in South Carolina). Although increased light could adversely affect climbing health plant species, increased light along the margins of the proposed ROW could increase the habitat quality for Carolina fluffgrass and yellow fringeless orchid in adjacent, undisturbed, burned pinelands.

### 3.5.3. Cumulative Effects Analysis

The proposed segments contain a combination of USFS land, residential communities, agricultural and cropland, and undeveloped areas. Additional vegetation removal and habitat fragmentation would contribute to adverse cumulative effects within the proposed 22 segments. According to the U.S. Census Bureau, the population in this region is anticipated to grow by more than one million from 2000 to 2030 (U.S. Census 2005). This is broadly consistent with the patterns of steady growth observed in Charleston and Georgetown counties in the decade just passed (2000-2010).

The increase in population could increase development in this area, which would remove additional vegetation and wildlife habitat. Significant adverse effects associated with habitat fragmentation could occur from residential development and associated infrastructure. If habitat fragmentation increased, there would be a reduction in interior wildlife and wildlife species dependent on large areas of undisturbed habitat. Nesting habitat within interior forests could be destroyed, and habitat that remained would be degraded. Wildlife composition could change within this area, and sensitive habitat and species would be affected the most.

In view of the above growth and development trends and institutional efforts to control their potential adverse effect on natural resources, the cumulative effect on biological resources from background development and population trends combined with the proposed action would likely be minor to moderate adverse. Any additional land development within or adjacent to known red-cockaded woodpecker clusters could have major adverse effects on this species.

### 3.5.4. Unavoidable Adverse Effects

Depending upon the alternative route chosen as the preferred alternative, between 110 (Alternative Route A) and 134 (Alternative Route E) acres of forest cover would be permanently converted to grassland. In addition, a small amount of vegetation would be permanently lost due to the placement of transmission line structures.

## 3.6 Soils and Geology

### 3.6.1. Affected Environment

#### Geology

The proposed Project is located entirely in the Coastal Plain physiographic province of the Atlantic Plain division. The Coastal Plain, which is the flattest of all of the physiographic provinces in the United States, is divided into the Upper and Lower Coastal Plain; however, the entire Project Area is located in the Lower (or Outer)

Coastal Plain. The Lower Coastal Plain is characterized by having low, flat topography with much less relief than the Upper Coastal Plain; this characterization of topography is reflected in the nearly level slopes within the Project Area (USDA-NRCS 2010a and 2011).

The Coastal Plain is underlain by material from three geologic periods, Cretaceous (65 to 144 million years ago), Tertiary (1.8 to 65 million years ago), and Quaternary (present to 1.8 million years ago) (McReynolds 2008). Although material from the Cretaceous and Tertiary periods has been carried by rivers to the Project Area, the dominant geology consists of Quaternary aged material (South Carolina Geological Survey 2005). This stratigraphy can be divided into two sedimentary units: Pleistocene and Holocene. The Holocene aged material is located primarily in the floodplains of the North Santee and South Santee rivers, where they are continuously being replenished by flood events. The older Pleistocene material is located north and south of the floodplains of the North Santee and South Santee rivers and partially comprises older Oligocene to Pliocene aged materials. The late Pleistocene unit ranges from 3 to 30 meters in thickness with an average thickness of 12 meters, whereas the Holocene unit ranges in thickness from 3 to 5 meters inshore and 7 to 10 meters offshore (USGS 2010).

### Topography

Topography refers to the physical features of a landscape, such as mountains and valleys, the steepness of slopes, and the shapes of landforms (Chernicoff and Whitney 2002). South Carolina is divided into two major regions: the upcountry, which lies within the Piedmont Plateau, and the Low Country which forms part of the Atlantic Coastal Plain. The Piedmont region is characterized by rolling hills and elevations ranging from 400 to 1,200 feet above sea level. The border between these two regions, which is called the “Fall line,” indicates where the upland rivers drain to the Atlantic Coastal Plain (Netstate 2011).

The Atlantic Coastal Plain region accounts for two-thirds of South Carolina. Land in this region rises gradually from the southeast to the northwest. The Lower Coastal Plain extends about 70 miles inland is considerably flat; the Project Area is located entirely within the Lower Coastal Plain. Topography within the Project Area is very low and extremely flat. Elevations range between approximately 26 feet and 0 feet above mean sea level (msl). The highest elevations occur in the northwestern portion of the Project Area and the lowest elevations occur in the floodplains of the North Santee and South Santee rivers. Average elevation is approximately 18 feet above msl (USGS 2013).

### Soils

Soil is the top layer of the earth's surface, consisting of rock and mineral particles mixed with organic matter. Soil contains both mineral and organic material (typically decaying vegetation) along with water and air. A soil's parent material and climate are factors important in determining the nature of an area's soil. A soil's parent material is the bedrock or sediment from which the soil develops. An area's climate – the amount of precipitation it receives and its prevailing temperature – controls the rate of chemical weathering (i.e., erosion) and consequently the rate of soil formation (Chernicoff and Whitney 2002). Topography and vegetation are also factors important to determining the nature of an area's soil.

Composition and texture are soil properties used to determine bearing capacity (a soil's resistance to penetration from a weighted object), internal drainage, erodibility, and slope stability. Composition refers to materials that make up soil, with four constituents: mineral particles, organic matter, water, and air. Texture is used to describe the composite sizes of particles in a soil sample (Marsh 2005).

*Major Soil Types*

More than 40 different soil map units are crossed by the alternatives in the Project Area. Most of these soil types comprise less than or equal to five percent of the total length of all of the alternatives. Predominant soil types, or those soils that represent more than five percent of the total length, include: Chipley loamy fine sand, Lakeland sand, Levy silty clay loam, Rutlege loamy fine sand, Wakulla sand, and Yauhanna loamy fine sand, and are described below. Soils along the alternative routes were assessed for their erodibility, hydric status, and whether or not they are considered prime farmland or farmland of statewide importance.

*Chipley Loamy Fine Sand (Cm)*—Soils in the Chipley loamy fine sand map unit formed in thick deposits of sandy marine sediments. This map unit consists of deep, moderately well drained, very rapid or rapidly permeable soils on uplands in the lower Coastal Plain. It occurs in areas where the slope ranges from 0 percent to 8 percent. These soils are moderately well drained, with very rapid or rapid permeability and slow runoff potentials. Natural vegetation consists of slash pine, longleaf pine, blackjack oak, turkey oak, post oak, several bluestem species, low panicums, and purple lovegrass. Major uses include cropland, pasture, and hay (USDA-NRCS 2007).

*Lakeland Sand (LaB)*—Soils in the Lakeland sand map unit formed in thick beds of eolian or marine sands, and its parent material consists of alluvium sediment. The map unit tends to occur in areas with a slope of 0 percent to 6 percent. It is well drained and has a rapid/very rapid permeability rate. The associated natural vegetation includes blackjack oak, turkey oak, post oak; scattered long leaf pine; and an understory of creeping bluestem, sandy bluestem, lopsided indiangrass, hairy panicum, fringeleaf paspalum, and native annual forbs. Peanuts, watermelons, peaches, corn, and tobacco are grown in this soil type. Areas with Lakeland series are also used for improved pasture (USDA-NRCS 2013a).

*Levy Silty Clay Loam (19)*—Soils in the Levy silty clay loam map unit formed in marshes and shallow floodplains. Its parent material consists of fluvial sediments. It tends to occur in areas with a slope between 0 percent and 2 percent. Soils in this map unit are very poorly drained, have slow permeability, and negligible surface runoff rates. The dominant vegetation associated with this soil includes water tupelo, sweetgum, and bald cypress (USDA-NRCS 2003a).

*Rutlege Loamy Fine Sand (Rg)*—Soils in the Rutlege fine loamy sand map unit formed in upland flats or depressions and floodplains, and its parent material consists of marine or fluvial sediments. These soils tend to occur in areas with a slope between 0 percent and 2 percent. Soils in this map unit are very poorly drained, have rapid permeability, and negligible surface runoff rate. The natural vegetation associated with this soil includes blackgum, Carolina ash, red maple, sweetbay, tulip popular, water oak, pin oak, pond pine, slash pine, and loblolly pine. The understory vegetation includes huckleberry, wax myrtle, greenbriar, grasses, and sedges. Some ponded areas consist entirely of grasses and sedges. Corn, soybeans, blueberries, and hay are cultivated in areas where this soil occurs (USDA-NRCS 2003b).

*Wakulla Sand (25A)*—Soils in the Wakulla sand map unit formed in uplands and stream terraces, and its parent material consists of Coastal Plain sediments. These soils tend to occur in areas with a slope between 0 percent and 2 percent. Soils in this map unit are somewhat excessively drained, have rapid permeability, and a negligible surface runoff rate. Native vegetation is primarily forests containing loblolly pine, longleaf pine, bluejack, white, post, and blackjack oaks with a few hickories, blackgum, and dogwood. Corn, peanuts, peas, soybeans, tobacco, watermelons, and coastal Bermuda grass are common crops (USDA-NRCS 2000).

*Yauhannah Loamy Fine Sand (12A)*—Soils in the Yauhannah loamy fine sand map unit formed in lowland flats from parent material consisting of Coastal Plain sediments. These soils tend to occur in areas with a slope between 0 percent and 6 percent. Soils in this map unit are moderately well to poorly drained, have moderate permeability, and a slow surface runoff rate. Forest vegetation consists of loblolly and longleaf pine intermixed with hardwoods. Cultivated lands are used for corn, soybeans, small grains, cotton, tobacco, and truck crops (USDA-NRCS 2002a).

### *Potentially Highly Erodible Soils*

NRCS identifies the erodibility of soils using what it defines as the K factor. The K factor can be expressed as that of the whole soil (Kw) or of the fine soil particles (Kf); in most cases, Kw and Kf are the same value, and Kw is chosen to express erodibility. Erodibility relates the effects of rainfall, soil characteristics, the length and steepness of slope, cover practices, and prevention measures to the soil's erosion rate. Soils with clay textures adhere to each other, thus they have a relatively low Kw factor. Soils with sandy textures also have low erosion rates; although they are easily detached, sandy soils have low erosion rates because of low runoff potentials. Medium-textured soils such as loams and silt loams have moderate erosion rates. Soils dominated by silt have the highest erosion rates because they do not adhere to each other and they are highly susceptible to runoff. Kw factors range between 0 and 0.69. For this analysis, the Kw factor for surface soils was reviewed; Kw factors between 0 and 0.2 were assigned a low risk of erosion, between 0.2 and 0.4 were assigned a moderate risk of erosion, and above 0.4 were assigned a high risk of erosion (USDA-NRCS, 2002b).

The majority of the entire Study Area is underlain by soils with a low risk of erosion, thus increased risks of soil erosion would not be anticipated with the Project. Alternatives B and C cross the greatest acreage of soils with a high risk of erosion, located within 1 mile of the South Santee River; however, the acres crossed would be only 34.5 acres which is relatively low in comparison to the acreage of the entire Study Area. Alternatives A and D do not cross any acres of soils with a high risk of erosion.

Figure 3-5 shows the distribution of erodible soils units along the alternative routes. Table 3-15 quantifies the distribution of erodible soils along the alternative routes.

**Table 3-15: Distribution of Prime Farmland, Hydric Soil, and Highly Erodible Soil within the Project Area (600-foot Corridor)**

| Soil Type | Alt. A | Alt. B | Alt. C | Alt. D | Alt. E | Alt. F |
|---|---|---|---|---|---|---|
| **Farmland (acres)** | | | | | | |
| Prime Farmland | 143 | 6.5 | 4 | 143 | 55.5 | 80.5 |
| Statewide Importance | 49 | 84 | 103.5 | 74 | 396 | 429.5 |
| Prime if Drained | <0.5 | 11 | 11 | <0.5 | 19 | 22.5 |
| **Hydric Soils (acres)** | 358.5 | 459.5 | 543 | 382 | 849 | 934 |
| **Erodibility (acres)** | | | | | | |
| Low risk of erosion | 969 | 896.5 | 826 | 941 | 722 | 628.5 |
| Moderate risk of erosion | 186 | 243.5 | 268 | 211 | 701.5 | 746 |
| High risk of erosion | - | 34.5 | 34.5 | - | 22 | 10 |

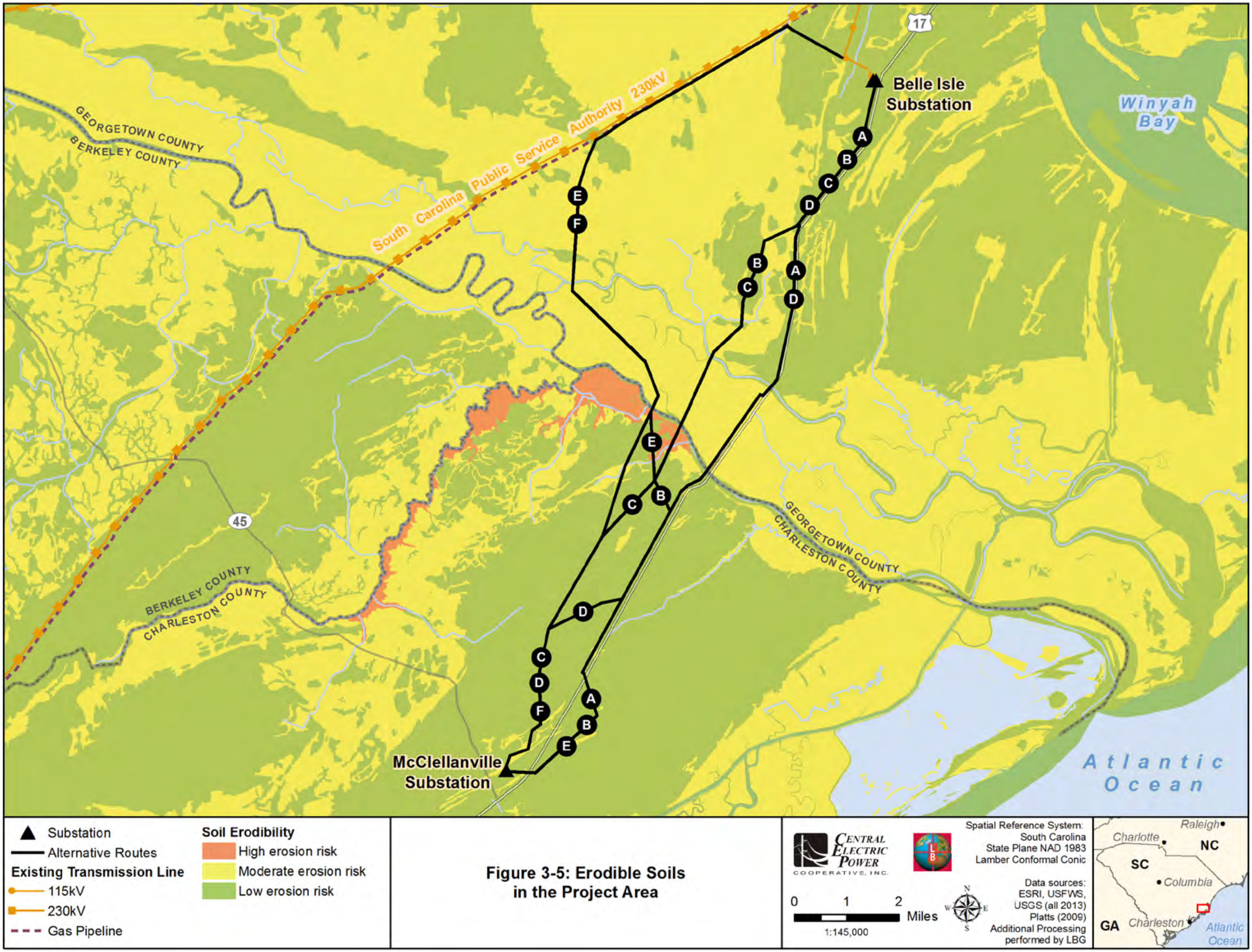



Figure 3-5: Erodible Soils in the Project Area

*Hydric Soils*

Hydric soils are soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part of the soil (USDA-NRCS 2010b). Hydric soils develop under conditions sufficiently wet to support the growth and regeneration of hydrophytic vegetation; however, the presence or absence of hydrophytic vegetation does not determine whether a soil is considered hydric. Soils that express hydric indicators because of artificial measures are also considered hydric soils; additionally, soils in which the hydrology has been artificially modified are hydric if the soil, in an unaltered state, was hydric in the upper part (USDA-NRCS 2010b). Some soil series, designated as hydric, have phases that are not hydric depending on the water table, flooding, and ponding characteristics.

The overall majority of soils within the entire Study Area are classified as hydric soils, thus the acreage of hydric soils crossed by the proposed line is dictated by each individual alternative. Alternative Routes E and F cross the greatest amount of acres of hydric soils (849 and 934 acres, respectively), within the 600-foot corridor. Table 3-15 quantifies the distribution of hydric soils along the alternative routes.

*Prime Farmland*

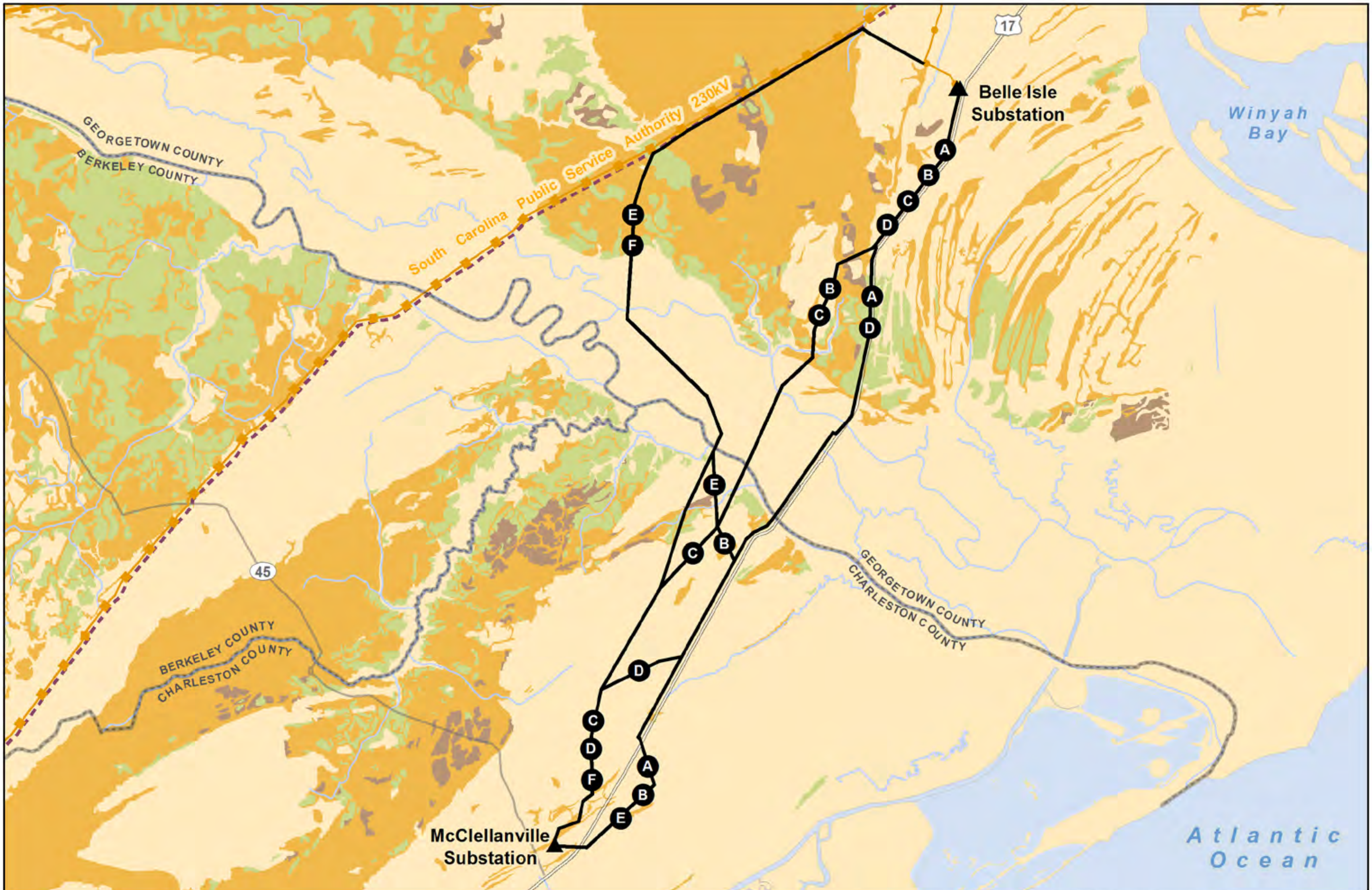
Prime farmland and farmland of statewide importance are special categories of highly productive cropland recognized by USDA. Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. In some cases, soils may not be considered prime farmland in their natural condition; however, with engineering practices that may be used to overcome limitations, these soils could become prime farmland. When this is the case, USDA places a caveat on the classification. Soils that do not meet the USDA prime farmland category may be important to states. Under these circumstances, soils that are agriculturally important to states are classified as farmland of statewide importance (USDA-NRCS 2013b).

Within the Study Area, prime farmland and farmland of statewide importance are located within each of the six alternatives. Alternatives A and D cross the most acres of prime farmland within the 600-foot corridors assessed at almost twice as many acres as the next closet alternative, Alternative Route F. Alternative Routes B and C cross the fewest acres of prime farmland.

Alternative Routes E and F cross the most acres of farmland of statewide importance by nearly four times as many acres as the next closest alternative, Alternative Route C. Alternative Route A crosses the fewest acres of farmland of statewide importance. A portion of Alternative Routes A, B, and E that crosses through the FMNF contains farmland of statewide importance; however, this area is dominated by forests and is not currently being used for row crops.

Agricultural practices on the prime farmland and farmland of statewide importance soils, as well as throughout the entire Study Area, are mostly pasture and hay for Alternatives B and C. Cultivated crops, pasture, and hay occur equally throughout the remaining alternatives.

Figure 3-6 shows the distribution of prime farmland and farmland of statewide importance soils units along the alternative routes. Table 3-15 quantifies the distribution of prime farmland and farmland of statewide importance soils along the alternative routes.




Substation
Alternative Routes

Prime Farmland
All areas are prime farmland
Farmland of statewide importance
Prime farmland if drained

Figure 3-6: Prime Farmland in the Study Area

Central Electric Power Cooperative, Inc.

0 1 2 Miles
1:145,000

Spatial Reference System: South Carolina State Plane NAD 1983 Lamber Conformal Conic

Data sources: ESRI, USFWS, USGS (all 2013) Platts (2009) Additional Processing performed by LBG

### 3.6.2. Environmental Effects

Impacts on soils and geology include how the proposed Project could potentially impact these resources from the construction and maintenance of the ROW, off-ROW access roads, and lay-down yards. The majority of the impacts would occur during construction and would likely be temporary; however, permanent impacts would be anticipated if structures are placed in prime farmland or farmland of statewide importance.

This section discusses the potential effects of the proposed Project on the soil and geological resources throughout the Study Area. To determine whether the proposed Project would have the potential to result in significant impacts, it is necessary to consider both the duration and the intensity of the impacts. Definitions for duration and intensity of soil and geological resources impacts established for this Project are described in Table 3-16.

**Table 3-16: Soils and Geology Impact Context and Intensity Definitions**

| Context (Duration) | Low Intensity | Moderate Intensity | High Intensity |
|---|---|---|---|
| Short term: During construction period<br><br>Long term: Life of the line (50 years) | Disturbance to geology or soils from construction and operation would be detectable but localized and discountable. Erosion and/or compaction would occur from construction and operation in localized areas. | Disturbance would occur over a relatively wide area from construction and operation of the Project. Impacts to geology or soils would be readily apparent and result in short-term changes to the soil character or local geologic characteristics. Erosion and compaction impacts would occur over a wide area. | Disturbance would occur over a large area from construction and operation of the Project. Impacts to geology or soils would be readily apparent and would result in short-term and long-term changes to the character of the geology or soils over a large area both in and out of the Project boundaries. Erosion and compaction would occur over a large area. |

#### No-action Alternative

Under the no-action alternative, there would be no construction or maintenance of an overhead transmission line. Direct and indirect impacts to geological formations and soils would not be anticipated.

#### Proposed Action

*Geology and Topography*

Construction of overhead transmission lines generally does not create a great disturbance to soils and geology. Although these types of projects often traverse long distances (15 to 19 miles for the proposed Project), the actual installation of structures only occurs sporadically across the length of the Project, and at predetermined locations where the construction or installation of facilities are required (such as for the construction of substations and switchyards). Towers are located approximately 300 to 400 feet apart, and access roads can be designed to cause the least amount of impacts practicable. Generally, Project construction would require little disturbance to surface soil and would neither be large enough or deep enough to have any type of impacts on geologic formations throughout the Study Area.

Consequently, impacts on surface geology would be limited to the sites selected for the erection of structures. At these locations, geologic impacts would be limited to minimal disturbances of subsurface rock during drilling and use of augers to prepare foundation holes. Potential impacts resulting from this activity include: displacement of soil and rock during construction activities, alteration of geologic features due to earth-moving activities during construction, alteration of topographical boundaries during construction, and an increased potential for erosion occurring to adjacent lands from either vehicle disturbances associated with construction activities or accelerated runoff resulting from the creation of impermeable surfaces.

Where possible, Central Electric would utilize existing access roads to minimize the impacts to geology and topography that would result from building all new access roads. The need for grading and excavation that is associated with constructing access roads would be minimized. Borings may be taken prior to construction to identify geologically sensitive areas; Central Electric would avoid placing structures in those areas to further minimize the effects on geology and topography. Thus, by incorporating these BMPs, impacts to geological resources would be short term and low-intensity.

*Erodible Soils*

As stated in the affected environment section, very few acres of the overall Study Area cross highly erodible soils; the majority of the soils within the Study Area have a low risk of erosion (Table 3-16). However, building the transmission line would require vegetation clearing from the proposed ROW and access roads, grading of structure sites for construction, equipment lay-down and vehicle access, and excavation for structure placement and installation of counterpoise. Vegetation removal may increase the erosion potential, even on soils with a low risk of erosion, because roots help to hold soil in place and low-lying vegetation impedes the velocity of surface flow of water. By minimizing the removal of grasses, forbs, and shrubs, and leaving the stumps of removed saplings and trees in place, erosion potential from vegetation removal would be minimized.

Central Electric would implement a wide array of BMPs to reduce soil erosion (see Section 2.5.11). The BMPs would be decided based on site conditions but would likely include silt fencing and hay bales, erosion control matting, minimizing the time soils are left bare, minimizing work time on wet soil, reclaiming topsoil, placing vegetation covers on loose piles of soil, revegetating bare areas, and grading the area to its original grade after construction. Additionally, Central Electric would use existing access roads, to the extent practicable, which would reduce the amount of soil that would need to be moved. Although impacts to soils from erosion are anticipated, implementing these BMPs would likely make them short term and low intensity.

*Hydric Soils*

Hydric soils are susceptible to compaction and erosion because they are often wet and, thus, more fluid. BMPs similar to those used in wetlands could be employed to reduce the amount of compaction and erosion that would occur during construction and maintenance. These practices could include leaving in place the stumps of cut trees so that soils are not disturbed, not working in saturated soils to avoid compaction and rutting, using load-dispersing mats and/or machinery with load-dispersing tires to reduce compaction and rutting, revegetating bare areas, and aerating compacted areas. Employing these BMPs would likely make impacts to hydric soils short term and low intensity.

*Prime Farmland*

It is likely that prime farmland and farmland of statewide importance would be impacted as a result of the proposed Project. Permanent loss of prime farmland at the location of the tower foundations is expected; additionally, temporary compaction impacts from heavy machinery are possible. Central Electric proposes that each structure would use a 400-square-foot construction area, but that this area would be reclaimed and re-seeded. The only permanent impacts to the prime farmland and farmland of statewide importance would come from the actual structure; however, because this type of construction rarely impacts more than 0.001 acre per pole, permanent impacts to the prime farmland and farmland of statewide importance would be less than 0.5 acre for the entire Project.

Based on the likelihood that each tower would not be located in prime farmland or farmland of statewide importance, the total area lost to the proposed Project would be less than 1 acre. To minimize impacts to prime farmland and farmland of statewide importance, Central Electric would implement BMPs such as reclaiming topsoil, aerating compacted lands, and utilizing existing access roads. The farming of low-growing vegetation would still be allowed in easements while there may be restrictions in farm operation practices within easements (e.g., no center pivot irrigation). Impacts to prime farmland and farmland of statewide importance would be both long term and short term, but would be low intensity.

### 3.6.3. Unavoidable Adverse Effects

Potential unavoidable effects on geology and soil resources would include the permanent loss of prime farmland and/or farmland of statewide importance. The permanent loss of these lands would lead to a reduced yield if they are currently being used for agricultural or silvicultural practices. Although landowners would be compensated, a permanent loss in production would still occur.

## 3.7 Air Quality and Greenhouse Gas Emissions

### 3.7.1. Affected Environment

#### Air Quality Conditions

*Regional Setting*

The proposed Project is in eastern South Carolina, stretching from the northeastern portion of Charleston County to the southwestern portion of Georgetown County. The Project Area is primarily rural, and the major existing contributing sources of emissions/criteria pollutants stem from fishing, shrimping, and oystering.

Other existing sources of air emissions result from infrastructure and include individual automobiles, trucks, and farm equipment; and residential emissions primarily from wood burning stoves. Vehicles are responsible for tailpipe emissions including nitrogen oxides ($NO_x$), carbon monoxide (CO), and sulfur dioxide ($SO_2$). The primary pollutant produced by farm equipment is $NO_x$ from the combustion of fuel. In addition to existing contributions to air emissions, farming, timber harvesting, and vehicles using unpaved roads are sources of fugitive dust.

*National Ambient Air Quality Standards/Attainment*

USEPA defines ambient air in 40 CFR §50 as: "that portion of the atmosphere, external to buildings, to which the general public has access." In compliance with the 1970 Clean Air Act and the 1977 and 1990 Clean Air Act Amendments, USEPA has promulgated National Ambient Air Quality Standards (NAAQS). NAAQS were enacted for the protection of public health and welfare, allowing for an adequate margin of safety. The Clean Air Act established two types of national air quality standards. Primary standards set limits to protect public health, including the health of "sensitive" populations such as children, the elderly, and those suffering from asthma. Secondary standards set limits to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. To date, USEPA has issued NAAQS for seven criteria pollutants: CO, $SO_2$, particles with a diameter less than or equal to a nominal 10 micrometers ($PM_{10}$), particles with a diameter less than or equal to a nominal 2.5 micrometers ($PM_{2.5}$), ozone, nitrogen dioxide ($NO_2$), and lead. Areas that do not meet NAAQS are called non-attainment areas. While ozone is monitored for ambient air quality levels, regulations limit $NO_x$ and volatile organic compound emissions, which are ozone precursors. Table 3-17 displays the primary NAAQS for each criteria pollutant as well as state standards for ambient air quality. All counties in South Carolina, with the exception of York County in the north-central portion of South Carolina near Charlotte, are currently in attainment for all criteria pollutants.

**Table 3-17: State and Federal Ambient Standards for Criteria Air Pollutants**

| Pollutant | Averaging Period | Federal Primary Standard | South Carolina State Standard |
|---|---|---|---|
| Ozone | 8-hour | 0.075 ppm | Same as federal |
| | 1-hour (daily maximum) | 0.12 ppm | Same as federal |
| $PM_{2.5}$ | Annual (arithmetic mean) | 15.0 μg/m$^3$ | Same as federal |
| | 24-hour | 35 μg/m$^3$ | Same as federal |
| $PM_{10}$ | Annual (arithmetic mean) | NA | Same as federal |
| | 24-hour | 150 μg/m$^3$ | Same as federal |
| CO | 8-hour (less than 5,000 feet above mean sea level) | 9 ppm | Same as federal |
| | 8-hour (greater than 5,000 feet above mean sea level) | 9 ppm | NA |
| | 1-hour | 35 ppm | Same as federal |
| $NO_2$ | Annual (arithmetic mean) | 0.053 ppm | Same as federal |
| | 1-hour | 0.100 ppm | Same as federal |
| $SO_2$ | Annual (arithmetic mean) | 0.03 ppm | Same as federal |
| | 24-hour | 0.14 ppm | Same as federal |
| | 3-hour | NA | 0.50 ppm |
| | 1-hour | 75 ppm | Same as federal |
| Lead | Rolling 3-month average | 0.15 μg/m$^3$ | Same as federal |
| | Quarterly average | 1.5 μg/m$^3$ | Same as federal |

Sources: USEPA (2012), SCDHEC (2012b)

Notes: ppm = parts per million, μg/m$^3$ = micrograms per cubic meter

Ambient air quality is monitored throughout South Carolina by stations meeting USEPA's design criteria for state and local air monitoring stations and national air monitoring stations. There are two monitoring stations near the Project Area, and yearly monitoring data for pollutants are presented by the SCDHEC. For 2012, all monitoring sites presented air quality data that were within federal and state standards (SCDHEC 2013).

To regulate the emission levels resulting from a project, federal actions located in non-attainment areas are required to demonstrate compliance with the general conformity guidelines established in Determining Conformity of Federal Actions to State or Federal Implementation Plans (40 CFR §93). Section 93.153 of this rule sets the applicability requirements for projects subject to it through the establishment of *de minimis* levels for annual criteria pollutant emissions. These *de minimis* levels are set according to criteria pollutant non-attainment area designations. Projects below the *de minimis* levels are not subject to the rule. Those at or above the levels are required to perform a conformity analysis as established in the rule. The *de minimis* levels apply to direct and indirect sources of emissions that can occur during the construction and operational phases of the action.

The proposed action is not located within a non-attainment area; therefore, a General Conformity Rule applicability analysis is not warranted.

Outside of the nonattainment areas, the Clean Air Act includes programs to maintain the air quality in attainment areas and ensure that new sources of criteria pollutants do not detrimentally affect air quality. Programs established include: New Source Performance Standards, National Emission Standards for Hazardous Air Pollutants, Prevention of Significant Deterioration (PSD), and Title V Operating Permits. None of these programs are likely applicable to the Project.

Congress set aside special land classifications where existing good air quality is especially important. These areas include, but are not limited to, national parks, and wilderness areas, all of which are defined as Class I areas. All other areas are designated as Class II areas. There is one Class I area in South Carolina, the Cape Romain Wilderness Area, located about 2 miles to the southeast of the Project.

PSD increments were established for Class I and Class II areas to ensure that air quality is maintained in attainment areas. If it is determined that a project is subject to PSD, the ground-level air concentrations from the project must be below these increment values in attainment areas. In addition, all facilities must meet NAAQS with an appropriate background value added to the source impact concentration.

*Greenhouse Gases*

There is broad scientific consensus that humans are changing the chemical composition of Earth's atmosphere. Human activities such as fossil fuel combustion, deforestation, and other changes in land use are resulting in the increase in greenhouse gas (GHG) emission rates above background levels and the accumulation of additional GHGs, such as carbon dioxide ($CO_2$), in our atmosphere above pre-industrial natural levels of those gases. An increase in human GHG emissions is said to result in an increase in the Earth's average surface temperature, commonly referred to as global warming or climate change. Climate change is expected in turn to affect weather patterns, average sea level, ocean acidification, chemical reaction rates, and precipitation rates. The Intergovernmental Panel on Climate Change estimates that the average global temperature rise between 2000 and 2100 could range from 1.1 (°F (with no increase in GHG emissions above year 2000 levels) to 9.2°F (with a substantial increase in GHG emissions). Even small increases in global temperatures could have considerable detrimental impacts on natural and human environments (IPCC 2007).

GHGs include water vapor, $CO_2$, methane ($CH_4$), nitrous oxide, ozone, and several hydrocarbons and chlorofluorocarbons. Each GHG has an estimated global warming potential, which is a function of its atmospheric lifetime and its ability to absorb and radiate infrared energy emitted from the Earth's surface. A gas's global warming potential provides a relative basis for calculating its carbon dioxide equivalent ($CO_2e$), which is a metric measure used to compare the emissions from various GHGs based upon their global warming potential. $CO_2$ has been assigned a global warming potential of 1, and is therefore the standard to which all other GHGs are measured (IPCC 2007).

Water vapor is a naturally occurring GHG and accounts for the largest percentage of the greenhouse effect. Next to water vapor, $CO_2$ is the second-most abundant GHG. Uncontrolled $CO_2$ emissions from power plants, heating sources, and mobile sources are a function of the power rating of each source, the feedstock (fuel) consumed, and the source's net efficiency at converting the energy in the feedstock into other useful forms of energy (e.g., electricity, heat, and kinetic). Because $CO_2$ and the other GHGs are relatively stable in the atmosphere and essentially uniformly mixed throughout the troposphere and stratosphere, the climatic impact of these emissions does not depend upon the source location on the earth (i.e., regional climatic impacts/changes will be a function of global emissions) (IPCC 2007, USEPA 2006a).

Other major human emissions contributing to increased global levels of GHGs include $CH_4$ and nitrous oxide and fluorocarbons. $CH_4$ is emitted during the production and transport of coal, natural gas, and oil; $CH_4$ is also emitted from livestock, agricultural processes, and organic waste decay and amounts to about 24 billion metric tons annually in the United States. Natural $CH_4$ emissions globally are from wetlands, oceans, hydrates, and fires. $CH_4$ accounts for approximately 15 percent of global manmade GHG emissions (USEPA 2006b).

Nitrous oxide emissions are emitted during the combustion of fossil fuels and solid wastes, as well as during agricultural and industrial activities. Nitrous oxide accounts for approximately 8 percent of global manmade GHG emissions (USEPA 2006b).

Fluorocarbon gases are unnatural and emitted from a variety of industrial process and include: perfluorocarbons, hydrofluorocarbons, and sulfur hexafluoride. Combined, these gases comprise 7 percent of GHG emissions (USEPA 2006b). Although they are emitted in small quantities, fluorinated gases have the ability to trap more heat than $CO_2$ and are considered gases with high global warming potential (USEPA 2006a).

While models predict that atmospheric concentrations of all GHG emissions will increase over the next century due to human activity, the extent and rate of change is difficult to predict, especially on a global scale. As a response to concerns over the predicted increase of global GHG levels, various federal and state laws address the need to reduce GHG emissions, including:

- USEPA is in the process of establishing regulations to control emissions from large generation sources such as power plants under the federal Clean Air Act for new sources emitting 100,000 $CO_2$e tons or more of GHGs. Other limited regulation of GHG emissions occurs through a review of new sources and regulatory requirements related to mobile sources.

- USEPA has issued the Final Mandatory Reporting of Greenhouse Gases Rule that requires reporting of GHG emissions from large sources. Under the rule, suppliers of fossil fuels or industrial GHGs, manufacturers of vehicles or engines, and facilities that emit 25,000 metric tons or more per year of GHGs are required to submit annual reports to USEPA (USEPA 2010); although no other action is required (40 CFR §§86, 87, 89).

- Executive Orders 13423 and 13514 require federal agencies to measure, manage, and reduce GHG emissions by agency-defined target amounts and dates.

The state of South Carolina currently does not cap GHG emissions nor is it part of a regional GHG emission cap agreement (IFER 2013). The state has primacy over the PSD program, including its GHG provisions.

*Regional Haze*

The Regional Haze Rule (Clean Air Act 169A and 169B, 40 CFR §51, Subpart P) was intended to protect and improve visibility in areas of the country known as federal Class I areas (primarily National Parks and National Wilderness areas). Several facilities in South Carolina were subject to a regional haze analysis per 40 CFR §51.308, known as the Best Available Retrofit Technology analyses. These analyses applied to facilities in 26 source categories (mainly power plants) that were constructed between approximately 1962 and 1977 (years prior to the Clean Air Act Amendments of 1977). Utilities are the most common facilities that met the requirements under the Best Available Retrofit Technology rules. Facilities constructed before or after the 1962 through 1977 period may be subject to reasonable progress requirements. South Carolina has developed a State Implementation Plan that includes controls and emission limits required by the Best Available Retrofit Technology and Reasonable Progress analyses to improve visibility in Class I areas.

There is currently only one Class I area within the vicinity of the Project Area, Cape Romain Wilderness Area. During construction, the proposed transmission line and substations have the potential to contribute to haze in this area. However, based on a USEPA memo, construction emissions are not a consideration in determining if PSD requirements apply to a source (Reich 1978). Because the construction of the proposed transmission line and associated structures is not a major stationary source, this Project does not come under PSD review. In addition, all emission limits established would be followed, and any contribution to visual haze would not be significant based on the proposed Project (SCDHEC 2007).

### 3.7.2. Environmental Effects

This section discusses potential impacts, their duration, and intensity on air quality and GHGs resulting from construction and operation of the proposed Project, including the no-action alternative. Definitions for context and intensity are described in Table 3-18.

**Table 3-18: Air Quality Impact Context and Intensity Thresholds**

| Context (Duration) | Low Intensity | Moderate Intensity | High Intensity |
|---|---|---|---|
| Short term: During construction period<br><br>Long term: Life of the line (50 years) | The impact on air quality associated with emissions from the operation, maintenance and construction is measureable, but localized and small such that emissions do not exceed USEPA's *de minimis* criteria for a general conformity analysis, or the USEPA mandatory reporting threshold for GHG emissions. | The impact on air quality would be measurable and primarily localized, but have the potential to result in regional impacts. Emissions of criteria pollutants associated with operation, maintenance and construction would be at the USEPA's *de minimis* criteria levels for general conformity analysis and the USEPA mandatory reporting threshold for GHG emissions. | The impact on air quality would be measurable on a local and regional scale. Emissions from operation, maintenance and construction are high, such that they would exceed USEPA's *de minimis* criteria levels for a general conformity analysis and the USEPA mandatory reporting threshold for GHG emissions. |

### No-action Alternative

Under the no-action alternative, the proposed Project would not be constructed, and current air quality conditions would remain. There would be no impacts on air quality or any contribution to GHGs as a result of this alternative.

### Proposed Action

Impacts on air quality would occur as a result of construction activities and operations. Potential impacts on air quality as a result of construction include increases in fugitive dust caused by construction activity, vehicles, and equipment and emissions from construction vehicles and equipment. The primary construction impact on air quality comes from fugitive dust. The footprint of the proposed Project occurs primarily on open ranges, undeveloped, or agricultural land, with transportation occurring primarily on dirt or gravel roads. Increases in traffic on these roads from construction-related workers, equipment, earthmoving activities, and wind action on disturbed areas would all lead to increases in the production of fugitive dust. Site-preparation for the proposed transmission line and associated projects would require earthmoving and grading activities, exposing soils and increasing the potential for wind erosion. In addition, as a result of grading activities, the transportation of soil and other construction debris in uncovered trucks could also contribute to fugitive dust. The primary concern over fugitive dust would occur during the warmer, drier months when soils are not as compacted and are more prone to dust generation. Impacts from fugitive dust are expected to be short term and only occurring during the construction period. Based on the relatively small size of the affected area and current air quality conditions, it is expected that this alternative will result in low impacts on air quality.

Other impacts on air quality as a result of construction activities come from emissions from construction vehicles and heavy equipment used in the construction process. Emissions stemming from these vehicles and equipment would emit hydrocarbons, particulate matter, and $CO_2$. Emissions resulting from the construction activities would be highly localized in the immediate Project Area and ROW and would be similar or less than to those created as a result of agricultural activities taking place in a majority of the Project Area. Air emissions as a result of construction are expected to be minimal as these activities are not excessive in nature. Estimated emissions are listed in Table 3-19. Therefore emissions stemming from the construction of this alternative would not reduce air quality in the Project Area and would not exceed USEPA *de minimis* thresholds and would not affect the current attainment status of South Carolina; resulting in short-term, low impacts.

Emissions potentially impacting air quality during operation of the transmission line and substation would only occur as a result of atmospheric interactions with the energized conductors. These minor emissions consist of ozone and NOx and occur near the conductor due to the development of a corona. These emissions relative to NAAQS would be negligible and not approach current *de minimis* standards, resulting in low impacts on air quality.

**Table 3-19: Transmission Line and Substation Construction Emissions Estimates and General Conformity *De Minimis* Thresholds**

| Pollutant | Emissions (tons) | Emissions (tons/year) | General Conformity De Minimis Threshold |
|---|---|---|---|
| NOx | 6.0 | 3.0 | 100 |
| Volatile organic compounds | 0.5 | 0.2 | 100 |
| $PM_{2.5}$ | 0.8 | 0.4 | 100 |
| $SO_2$ | 0.2 | 0.1 | 100 |
| CO | 2.1 | 1.1 | 100 |

A potential area of concern regarding proposed air quality impacts associated with this alternative is the proximity of the proposed transmission line to the Cape Romain Wilderness Area, a federal Class I airshed. The proposed transmission line would be approximately two miles from the Cape Romain Wilderness Area. Class I areas are sensitive areas with determined important visual qualities and are protected from air pollutants that can potentially cause visibility impairments. Visibility can be affected by several air pollutants including $PM_{10}$, $PM_{2.5}$, sulfates, nitrates, and sulfuric acid mist.

Potential pollutants occurring as a result of construction activities resulting from this alternative with the potential to impact visibility are both particulate matters. However, based on the limited amount of emissions resulting from construction activities, its highly localized short-term nature, and the implementation of BMPs to control emissions and fugitive dust, construction emissions would not cause visibility impairments to the Class I area.

GHG emissions resulting from the construction of the transmission line were calculated for two types of activities that produce GHG emissions: construction of the transmission line and ongoing annual operations and maintenance for its estimated 50-year-long operational life. GHG emissions associated with construction activities would occur over a period of approximately 2 years. Based on existing data, it is assumed that an average of 25 people located throughout the Project Area would work on the Project daily during peak construction (including road and structure installation) and non-peak construction (including installing and removing BMP measures and staging areas, site preparation and restoration work, and equipment and materials moving). The transportation components of GHG emissions were estimated based on the approximate number of vehicles that would be used during Project construction and the approximate distance those vehicles would travel. The number of round trips was conservatively estimated using the following assumptions.

- All workers would travel in separate vehicles to and within the Project Area each day.
- A maximum number of workers (25) would be required to construct the Project.
- The round trip distance in the Project Area is approximately 100 miles, depending on the exact location of workers within the Project Area.
- Fuel consumption is based on the average fuel economy for standard pickup trucks of 18 miles per gallon. This is likely an overestimate because more efficient vehicles may be occasionally used. Average helicopter fuel mileage is anticipated to be around 1 mile per gallon.

Fuel consumption and GHG emissions would also result from operation of on-site heavy construction equipment. Heavy construction equipment may include augers, bulldozers, excavators, graders, heavy-duty trucks, and front-end loaders. It is also expected that the majority of heavy construction equipment use would occur during peak construction. Assumptions included a maximum of 20 equipment machines would be in operation during peak construction and 10 equipment machines during off-peak. It was also assumed that the average size of equipment would not exceed 250 horsepower and would operate at max power for 8 hours per day 5 days a week, which is a significant overestimation because equipment commonly operate in idle or reduced power.

Implementation of any of the alternative routes would require the permanent removal of trees and other vegetation as a result of road construction of ROW clearing. Although permanent tree removal would not immediately emit GHGs, it would reduce the level of solid carbon storage in the area. Tree growth and future carbon sequestration rates are highly variable and dependent on several factors, including, the species of the tree, the age of the tree, climate, forest density, and soil conditions. In the South East Region, the average carbon storage associated with forest is 125,000 pounds per carbon acre (USFS 1992). The acres of forest that would be removed vary from 110 to 134 acres depending on the alternative route. Assuming each affected acre contains the average carbon content for the North Central Region, the net carbon footprint associated with the removal of forested area would be an estimated 6,236 and 7,597 metric tons. Given this estimate, the impact of vegetation removal on GHG emissions would be low.

During operation and maintenance of the transmission line, routine patrols, maintenance of roads and structures, and aerial inspections by helicopter would occur once per year. Emergency maintenance and natural resource review would occur on average once every 4 years, with all activities estimated to incur within 100 miles round trip. Operation and maintenance emissions are estimated for the 50-year life span of the transmission line.

Based on the above assumptions, all of the alternative routes would result in an estimated total of 6,510 metric tons per year of $CO_2$e emissions during construction and a total of an estimated 30 metric tons of $CO_2$e emissions for ongoing operations and maintenance activities over the 50-year lifespan of the line. To provide context for this level of emissions, the USEPA mandatory reporting threshold for large sources of GHGs is 25,000 metric tons of $CO_2$e emitted annually (74 Federal Register 56260). This threshold is approximately the amount of $CO_2$e generated by 4,400 passenger vehicles per year. Comparatively, the emissions during Project construction would be equivalent to the emissions generated by about 1,146 passenger vehicles per year. Operation and maintenance activities would translate into $CO_2$e emissions about equal to that of five passenger vehicles per year. Overall, contributions of construction, operation, and maintenance of the alternative routes on GHG concentrations would be low.

### 3.7.3. Unavoidable Adverse Effects

Potential unavoidable impacts on air quality and GHGs stem from emissions associated with construction and construction activities. Although BMPs would be incorporated to reduce the amount of emissions emitted, emissions would still occur.

## 3.8 Cultural and Paleontological Resources

This section of the EIS identifies known cultural and paleontological resources crossed by the alternatives in the Study Area. Cultural resources will continue to be identified as consultation under Section 106 of NHPA proceeds.

There is no legal or generally accepted definition of “cultural resources” within the federal government; however, the term is used to refer to historic, aesthetic, and cultural aspects of the human environment. Under NEPA, the human environment includes the natural and the physical (e.g., buildings) environment, and the relationships of people to that environment. Accordingly, a thorough NEPA analysis should address the human (social and cultural) and natural aspects of the environment, and the relationships between them. In meeting its requirements as the lead agency for NEPA, RUS must consider the impact of its actions on all aspects of the human environment, including “cultural resources.”

Cultural resources include archaeological sites, defined as locations “that contain the physical evidence of past human behavior that allows for its interpretation;” buildings; structures; and traditional resources and use areas (NPS 1997). Those cultural resources that qualify for listing in the National Register of Historic Places (NRHP) must meet one or more of the following criteria for evaluation.

The quality of significance in American history, architecture, archaeology, 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:

- Criterion A. that are associated with events that have made a significant contribution to the broad patterns of our history; or
- Criterion B. that are associated with the lives of persons significant in our past; or
- Criterion C. that 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

- Criterion D. that yielded, or may be likely to yield, information important in prehistory or history (NPS 1997).

In general, these resources must also be greater than 50 years in age. Properties less than 50 years of age must be exceptionally important to be considered eligible for listing, as outlined in NRHP Bulletin Number 22 (Sherfy and Luce 1998).

The NRHP is a commemorative listing of those resources significant to the American past. Those cultural resources listed on or eligible for listing on the NRHP are designated “historic properties.” Under NHPA, as amended 2006, “historic property” means “any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion on the National Register of Historic Places” including artifacts, records, and material remains related to such a property or resource (16 USC 470w). In accordance with Section 106 of NHPA, 16 USC §470f, RUS is required to take into account the effects of its undertakings on historic properties. The regulation, “Protection of Historic Properties” (36 CFR §800), implementing Section 106 establishes the process through which RUS and other federal agencies consider effects to historic properties in their decision making.

### 3.8.1. Affected Environment

Central Electric approached RUS for financial assistance to construct the Project, thereby making the proposed Project an undertaking subject to review under Section 106 of NHPA and its implementing regulation (36 CFR §800). As the lead agency, RUS is coordinating compliance between the Section 106 procedures and the steps taken to meet NEPA requirements as set forth in 36 CFR §800.3(b). As such, studies and analyses conducted to comply with NEPA, including this EIS, would be used and expanded as appropriate by RUS to meet the requirements of Section 106. Pursuant to 36 CFR §800.2(d)(3), RUS has used its NEPA procedures to meet its requirements for public involvement under 36 CFR §800.

Because the alternatives routes are linear corridors, RUS is identifying properties and assessing effects using a phased approach in accordance with 36 CFR §800.4(b)(2) and §800.5(a)(3). More detailed and extensive studies would be performed after Central Electric selects the final 75-foot ROW within the preferred 600-foot corridor identified in the Final EIS. The procedures for completion of the final identification and evaluation, assessment of effects, and, as appropriate, mitigation would be formally documented using a Programmatic Agreement (PA) that would be executed pursuant to 36 CFR §800.14(b). A draft of the PA is included in Appendix F.

### Geographic Scope

Pursuant to 36 CFR §800.16(d), the area of potential effects (APE) is defined as the area within which the proposed Project that has the potential to either directly or indirectly affect historic properties that may be present. RUS has identified the APE for direct effects as the 75-foot wide ROW location that Central Electric would select after the Final EIS identifies a preferred route. Given the height of the proposed structures and the requirement to maintain an alignment cleared of vegetation, the proposed Project could alter a historic property's integrity by diminishing its setting or feeling. Accordingly, the APE would be adjusted and refined as RUS learns more about the historic properties that might be present and the Project's specific effects on them. The APE for indirect or visual effects will initially be a 0.5-mile-wide buffer from the Project's transmission structures located within that final ROW. This standard for the geographic scope of visual effects is consistent with thresholds established by the Federal Communications Commission in its 2004 Nationwide Programmatic Agreement (2004). As more information is gathered, the APE for indirect effects will be further refined to take into account topography, vegetative screening, and other similar factors.

### Study Area

The Study Area includes the entire geographic area evaluated to develop all of the alternatives proposed in the *Macrocorridor Study* and *Alternatives Evaluation Study* (RUS 2010a, 2011b). As such, it encompasses the APE, but is much broader, extending for 300 feet from the ROW center line.

### Consultation

This section describes the consultation process for the proposed Project, which is ongoing. In addition to USFS which is already a participant, the SC SHPO; Indian Tribes, including the Catawba Indian Nation Tribal Historic Preservation Officer (Catawba); federal and state permitting agencies; and other yet to be identified agencies and organizations would be invited to participate in Section 106 consultation.

The required NEPA/Section 106 coordination effort provides information to assist in the selection of an alternative route to analyze in the EIS. In addition, these efforts help to determine the appropriate level of effort needed to identify and evaluate historic properties and resolve concerns about providing comparable information for analysis across alternatives.

### History of the Study Area

All of the alternative routes are located in Georgetown and Charleston counties. Of these two Coastal Plain counties, Charleston has probably experienced more cultural resource surveys as a result of the urbanization and the presence of the FMNF. The prehistory of the two counties is similar. The data on prehistoric adaptations in the Coastal Plain of South Carolina presented below are derived mainly from USFS archaeological research within the boundaries of the FMNF, with additional information from the research conducted on behalf of the South Carolina Department of Transportation (SCDOT). The historic background section draws on a variety of resources including county-wide historical properties surveys, cultural resources reports, and other publications housed at the South Carolina Institute of Archaeology and Anthropology and the South Carolina Department of Archives and History.

### Prehistoric Background

This summary of the region's Native American prehistory provides information on cultural chronology, typology, and interpretation of the Coastal Plain's Native American archaeological record.

Archaeologists divide South Carolina's prehistory into the following periods: Paleoindian (ca. 12,000–8000 BC), Early Archaic (ca. 8000–6000 BC), Middle Archaic (ca. 6000-3000 BC), Late Archaic (ca. 3000-1000 BC), Early Woodland (ca. 1000-500 BC), Middle Woodland (ca. 500 BC–AD 500), Late Woodland (ca. AD 500–1000), and Mississippian (ca. AD 1000–1540). These cultural divisions signal technological and social adaptations of Native American peoples to southeastern North America's changing natural environment since the end of the last glaciation, approximately 14,000 years ago (Adams and Young 2010; Anderson and Logan 1981, Anderson et al. 1982; Trinkley 1990).

Paleoindians represent the first known human populations to occupy the region that is presently South Carolina. Paleoindian populations have been characterized by archaeologists as small nomadic or seminomadic bands with settlement/subsistence strategies based on hunting and the collection of wild foods. Archaeological markers of the Paleoindian period (12,000 to 8000 BC) consist chiefly of distinctive projectile point types, such as Clovis, Cumberland, Dalton, Hardaway, Simpson, and Suwannee points (Coe 1964; Goodyear 1974, 1982). Goodyear et al. (1979) note that formal variability among Paleoindian point types may reflect chronological or spatial differences. A marked preference for high-quality cryptocrystalline lithic raw materials is also evident in Paleoindian toolkits.

The Archaic period (8000 to 1000 BC) is divided by archaeologists into three subperiods: Early Archaic (8000 to 7000 BC), Middle Archaic (7000 to 3000 BC), and Late Archaic (3000 to 1000 BC). As the southeastern climate moderated from late glacial conditions into more modern and temperate ranges, Archaic peoples developed a more diversified subsistence economy (Watts 1970, 1980; Whitehead 1965, 1973). They focused on seasonal hunting, fishing, and collecting wild plant foods. The increased efficiency in resource exploitation resulted in the gradual development of more complex societies, regional variability in cultures, trade and exchange networks, and population growth (Caldwell 1958). Paralleling this expansion of adaptive strategies was an enlargement and elaboration of material culture and sites occupied. A wider variety of raw materials were used in the production of both flaked-stone and groundstone tools.

The Early Archaic subperiod (8000 to 7000 BC) is interpreted as a continuation of the preceding Paleoindian period in terms of settlement and subsistence patterns. The period is marked primarily by adaptations to changing environmental circumstances and an increased use of smaller species of fauna. Diagnostic artifact types of the Early Archaic include Taylor, Big Sandy, Palmer, Kirk, LeCroy, and St. Albans projectile points (Chapman 1975, Coe 1964). The remainder of the Early Archaic toolkit includes a variety of scrapers, wedges, and perforators. Edgefield type side scrapers are regarded as a hallmark of the period.

Native populations and territoriality gradually increased during the Middle Archaic subperiod (7000 to 3000 BC). Stemmed projectile points of the Stanly, Morrow Mountain, and Guilford varieties are diagnostic of this subperiod, and locally available quartz was the most common lithic material utilized (Blanton and Sassaman 1989, Tippett 1992). Nonlocal lithic resources were not extensively used.

Relative to the preceding Early Archaic period, when settlement patterns encompassed broad linear territories that crosscut geophysical zones to exploit specific seasonal resources, Middle Archaic settlement patterns reflect limited movement between regions. In contrast to Early Archaic groups, Middle Archaic populations expanded their settlement ranges within geophysical regions and exploited more diverse resources. Settlement and artifact data from this period suggest “a strategy of small co-resident group size, frequent residential movements, generalized subsistence, low-investment technology, and social flexibility” (Sassaman et al. 1990). Sassaman (1988) and others assert that Middle Archaic populations were mobile and moved residential locations frequently to take advantage of specific resources as they became available. He suggests that tools used in resource procurement and processing were expedient forms manufactured from local materials. In the Piedmont one such local resource was quartz. This degree of mobility and expedient technology is reflected by sites that consist principally of quartz debitage scatter.

Trends toward increasing population, group size, organizational complexity, and sedentism characterize the Late Archaic subperiod (3000 to 1000 BC). Diagnostic artifacts of the period include Savannah River and Otarre stemmed projectile points (Coe 1964, Keel 1976). Perforated soapstone slabs, three-quarter–groove groundstone axes, and grinding basins are also common. Another hallmark of the period is the introduction of ceramic technology around 2500 BC. Stallings Island pottery represents the earliest ceramic type in the region. This variety is tempered with fiber and occasionally exhibits surface treatment, such as punctations and incising. Sand-tempered Thoms Creek pottery represents a later variety and displays the same kinds of surface treatments. In general, Stallings pottery is believed to pre-date the Thom's Creek but some investigators believe that the two pottery wares were produced by contemporaneous Coastal Plain peoples (Trinkley 1980a). Ceramic technology has important implications for social dynamics. Ceramic vessels provide an efficient means of storing food, thereby permitting lengthier occupations at residential camps and offsetting seasonal fluctuations in food availability.

Subsistence data from the Late Archaic period suggest that aquatic resources formed significant proportions of the Late Archaic diet. Sassaman (1993) notes that shellfish constituted a principal food source; as well as, turtles were important dietary resources during this period. Large shell middens and shell rings developed near tidal marsheds in the vicinity of the Project Study Area during this time. Deer and a variety of other terrestrial fauna were also consumed. Sassaman (1993) also cites evidence that marine resources were utilized along the Middle Savannah River. Such resources likely included anadromous fish that were obtained by inland populations, although it is possible that marine resources were acquired through trade with coastal populations. Wetmore and Goodyear (1986) suggest that the use of grasses, chenopodium, sumpweed, squash, gourds, and sunflowers by 2500 BC is evidence of incipient horticulture.

Beginning in the Woodland period (1000 BC to AD 1000), populations in the Coastal Plain adopted a mixed hunting, gathering, and farming subsistence strategy (Trinkley 1980a, 1990). Semi-permanent to permanent villages were established in riverine settings. The use of ceramics, introduced during the Late Archaic, became widespread for storage and cooking (Anderson et al. 1982; Sassaman 1993; Trinkley 1980b). A number of sequential cultural complexes or phases have been distinguished for the Early Woodland subperiod (1000 BC to AD 1). These cultures, which include the Refuge phase, the Deptford phase, and the Deep Creek phase, are known primarily from the coastal sections of the state and the Savannah River Valley (Trinkley 1990). There is evidence from Marlboro County and Sumter County (Blanton et al. 1986) that suggests that northern groups, who produced fabric-impressed and cordmarked pottery, interacted with southern groups of a carved-paddle tradition (Caldwell 1958). In general, the Early Woodland period is characterized by Yadkin series (quartz-tempered) ceramics (Coe 1964). Triangular points also appear during the period.

Subsistence strategies of the Early Woodland were expanded to include locally available floral and faunal resources. Shellfish, although still a part of the diet, were not exploited in such great quantities as during the Late Archaic. In the Coastal Plain, Early Woodland settlement is characterized by residential camps located on the coast. These camps are represented by shell middens located near tidal marshes, and ceramic and lithic scatters in a variety of environmental zones. Group organizations appear to be based on semi-permanent occupation of shell midden sites, with short-term use of Inner Coastal Plain sites (Gardner and Roberts 1993).

The Middle Woodland subperiod (AD 1 to 500) includes a continuation of Yadkin pottery, and Deptford pottery becomes more common during this subperiod (Caldwell and McCann 1941, Caldwell and Waring 1939). Specifically, ceramic decorative modes from outside locales were being incorporated into Deptford ceramics and may indicate expansion of groups into other areas (Caldwell 1958). In addition, McClellanville/Santee series pottery has been recovered from sites in the vicinity of the Project Study Area (Anderson et al. 1982, Trinkley 1981).

Sassaman et al. (1990) have suggested that an increased use of areas around small tributaries occurred during the period as a response to the decreased productivity of maturing river floodplains. Middle Woodland subsistence strategies continued to rely on wild foods; there is no clear evidence of the use of cultivated plants during the period. Food production intensified, supporting locally concentrated population aggregates. Large-scale storage is also evident (Sassaman et al. 1990). Mobility and settlement patterns resulted in numerous short term occupations across the Coastal Plain landscape.

The Late Woodland subperiod (AD 500 to 1000) in the Coastal Plain is poorly understood. Few sites of this period have been recorded or excavated, and there is little information on subperiod chronology. Moreover, the relationship between the Late Woodland and later periods is vague. Trinkley (1990) suggests that little change in adaptation occurred between the Middle Woodland period and the development of the South Appalachian Mississippian complex. Thus, the Late Woodland period may be considered an extension of the preceding era.

Stuart (1975) has developed a chronology for the Wateree Basin that is most applicable to this area. In this chronology, the Deptford/Yadkin pottery tradition gives way to the Camden ceramic series around AD 700. This series, produced until approximately AD 1100, is known by grit-tempered wares with check-stamped, simple stamped, or incised surface decorations. Anderson and Schuldenrein (1985) suggest that evidence of intensive use of floodplains first appears during the Late Woodland. Such occupations are marked by pits, hearths, posts, and scatters of shell. Trinkley (1990) states that there are few indications of agricultural activity during this period in South Carolina, and if domestic plants were at all available, they constituted an insignificant proportion of the subsistence base. Sassaman et al. (1990) note, however, that maize agriculture was being practiced locally by the Late Woodland.

During the Mississippian period (AD 1000-1540), South Carolina's native peoples developed into a complex chiefdom-level society. These new sociopolitical structures may have been imposed locally by elites immigrating into the region from the west (Sassaman et al. 1990). The Mississippian period is characterized by large village sites located on floodplains, as well as earthen mounds, settlement hierarchy, evidence of ranked social hierarchy, and an economy based on agriculture. The economic basis of these developments involved intensive maize agriculture. Sassaman et al. (1990) note that maize was being grown locally prior to the emergence of Mississippian polities in South Carolina. Corn, squash, and other cultigens were grown extensively in stream bottoms. Hunting and gathering of wild foods supplemented domesticated foods. Mississippian populations throughout the Southeast facilitated agricultural production and the exploitation of wild foods by settling in floodplains that combined the advantages of easily tilled soils and access to rich sources of fish and waterfowl in oxbow lakes. Mississippian sites in the region are most often situated along major drainages and appear to reflect these settlement-subsistence trends (Anderson 1989).

Hallmarks of Mississippian sites include ceramic types that are distinguished on the basis of elaborate decorative motifs and rim treatments. These complicated stamped ceramics contrast with the plain, cordmarked, fabric-impressed, and simple stamped ceramics that characterized the preceding Woodland period (Anderson 1989). Distinct Mississippian ceramic phases are recognized for the region (Anderson et al. 1982, Anderson 1989). In coastal South Carolina, the Early Mississippian period is marked by the presence of Jeremy-phase (AD 1100–1400) ceramics, including Savannah Complicated Stamped, Savannah Check Stamped, and Mississippian Burnished Plain types. Poplin et al.'s (1993) excavations at the Buck Hall Site (38CH644) produced radiocarbon dates around AD 1000 for complicated stamped ceramics similar to the Savannah series. This represents the earliest date for complicated stamped wares in the region and may indicate an earlier appearance of Mississippian types than previously assumed (Poplin et al. 1993).

Sites of the period in the region include shell middens, sites with apparent multiple- and single-house shell middens, and oyster processing sites (e.g., 38CH644 [Poplin et al. 1993]). Adaptation during this period apparently saw a continuation of the generalized Woodland hunting-gathering-fishing economy, with perhaps a growing importance on horticulture and storable foodstuffs. Anderson suggests that environmental unpredictability premised the organization of hierarchical chiefdoms in the Southeast beginning in the Early Mississippian period; the redistribution of stored goods (i.e., tribute) probably played an important role in the Mississippian social system (Anderson 1989). Maize was recovered from a feature suggested to date to the Early Mississippian period from 38BK226, near St. Stephen (Anderson et al. 1982).

Late Mississippian Period (AD 1400–1550). During this period, the regional chiefdoms apparently realigned, shifting away from the Savannah River centers to those located in the Oconee River basin and the Wateree-Congaree basin. As in the Early Mississippian, the Charleston Harbor area apparently lacked any mound centers, although a large Mississippian settlement was present on the Ashley River that may have been a “moundless” ceremonial center (South 2002). Regardless, it appears that the region was well removed from the core of Cofitachequi, the primary chiefdom to the interior (Anderson 1989; DePratter 1989).

### Historic Background

The early portion of the historic period (from AD 1540 to 1730), referred to by some researchers as the Protohistoric period, extends from the end of the Mississippian period, through the initial contact between Native Americans and Europeans and into, the Colonial period. The settlement patterns of the Native Americans living in the vicinity of the Project Study Area appear to have been a continuation from the Late Woodland and Mississippian periods. The ethnohistoric record from the South Carolina coast suggests that Native Americans continued to move in a seasonal pattern, involving summer aggregation in villages to plant and harvest domesticated crops and dispersal into small (one to three) family settlements for the rest of the year (Waddell 1980). The social framework and the occupation of particular regions by various tribes remained stable through the 1660s (Waddell 1980).

After 1670, however, British settlement of South Carolina caused many changes in Native American settlement patterns. Tribes that occupied areas desired by the British were displaced further inland. For example, three tribes (the Etiwan, the Wando, and the Sampa) that had lived near the site of Charles Town migrated north to occupy the Wando River; a fourth tribe (the Sewee) occupied the coast south of the Santee River (Waddell 1980). Additional social migration resulted when the Cherokee consolidated their control of the Piedmont during the late 1600s, forcing some tribes to move toward the coast (Waddell 1980). For this reason, when John Lawson traveled up the Santee River from the Atlantic Ocean in 1701 he encountered first the Sewee and then the Santee (Milling 1940). It appears that the Santee originally lived in areas much further inland (Waddell 1980), but had relocated upstream from the Sewee on the Santee River’s south side by the time of Lawson’s visit (Milling 1940).

During the seventeenth century, the British increasingly colonized areas of the New World as the Spanish empire waned. After the Spanish left South Carolina, the British established their first permanent settlement in South Carolina at Charles Town around 1670, which later became Charleston (Edgar 1998). The British were initially content with settling the coastal areas and made treaties with local tribes that yielded control of the back country to the Yemassees and other tribes. However, peace between the local Indians and new settlers did not last long. The need for grazing lands led many British cattlemen to encroach upon the territory legally controlled by the Yemassees. Deceived by the British colonists, the Yemassees led an uprising of Carolina Indians in 1715. After three years of bloody war, the British were able to remove the Yamassee and other tribes forcibly and open the entire upcountry to settlement in 1719 (Edgar 1998).

Trade between Native Americans and the British began in the 1670s, but mutual suspicion largely surrounding trade practices soon led to war between the two groups. The Tuscarora tribe and its Native American allies united in war against the English from 1711-1713. The South Carolina Assembly sent troops to aid North Carolina's British residents, bringing an end to the hostilities. Among these troops were approximately 500 Native Americans, including members of the Santee, Sewee, Wateree, and Winyah tribes (Milling 1940). Not long after the end of the Tuscarora War, the settlement of the Port Royal Sound region and years of abuse from traders led to the outbreak of the Yamassee War (1715-1727), which threatened the continuance of the British colony in South Carolina. Although the Yamassee, Apalachicola, and Apalachee were the primary tribes involved in this war, any southeastern Native American tribe that had been mistreated by the British took part to some extent. As a result of the conflict and under continuing military pressure from the English, the Yamassee, Apalachicola, and Apalachee tribes left the region.

The early colonial settlement of Charleston and Georgetown counties was guided by the Lord Proprietors (Edgar 1998). The proprietors were given vast power over the colony of Carolina by Charles II following his restoration to the English throne in 1660. Several of the proprietors owned plantations on the island of Barbados, and it is from that island that many of the earliest colonists and enslaved Africans originated. Under these conditions, the plantation system was quickly introduced to South Carolina. The labor necessary for the operation of the plantation system was initially supplied by Native Americans and enslaved Africans.

The slave trade operating through the port of Charleston supplied increasing numbers of Africans to the labor pool resulting in a black majority by the first decades of the eighteenth-century (Edgar 1998; Littlefield 1995). Colony-wide black to white ratios are believed to have been two blacks to every white after 1720. The black majority population of some parishes reached as high as 79 percent during the eighteenth-century. It is estimated that 40 percent of all African-Americans living in the United States today are decedents of enslaved Africans that entered North America through the port of Charleston (NPS 2005). These statistics form a basis for understanding the later development of the Gullah culture of South Carolina's low-country (Edgar 1998; Littlefield 1995; Pollitzer 2005).

The plantation economy of early South Carolina was based on production of naval stores, indigo, and rice. The development of inland rice fields was labor intensive due to the construction of fresh water rice field impoundments, dikes, canals, and other water control structures. Edgar (1998) notes that the importation of enslaved Africans from the rice growing regions of the Niger delta increased after 1730 as plantation owners expanded rice production and experimented with the cultivation of indigo. Sea Island cotton began to be cultivated during this period, displacing rice as the favored low-country cash crop after 1790 (Edgar 1998).

Charleston and Georgetown counties played important roles during the American Revolutionary War. Fort Moultrie guarding Charleston Harbor was attacked by British naval forces on June 28, 1776. This first attempt to subdue the patriot faction in South Carolina failed. While invasion threatened the coast, the back country of South Carolina was ablaze with war between loyalist and patriot armed bands. War returned to the low-country of coastal South Carolina in 1778 after the fall of Savannah to British forces. The fall of Savannah precipitated the Southern Campaign of 1778-1781. One of the important battles of that campaign was the surrender of the American army garrisoning Charleston to the British in April 1780. During the much of this period, British supply lines to interior bases at Camden and Ninety-Six were threatened by Francis Marion operating out of the inland swamps surrounding Charleston and Georgetown.

Rice cultivation experienced a limited renaissance after the Revolutionary War with the introduction of a new method of cultivation; particularly in what is now Georgetown County (Joseph et al. 2006). The change from inland swamp based rice cultivation to tidal cultivation changed the plantation settlement pattern in the low-country. Many inland plantations were abandoned during this period in favor of those located closer to the coast (Edgar 1998; Joseph et al. 2006). A formidable system of dikes, ditches, canals, and gates were required to irrigate the fields during the planting season and protect the fields from winter flood events and tropical storms (Agha et al. 2011). These engineered structures were built by enslaved African-Americans using only hand tools and whatever aid could be rendered by mule power. The rice fields located along the banks of the North and South Santee rivers are of the tidal variety.

By 1820, cultivation of rice in the low-country was in steep decline as a result of international competition. Planters in search of a replacement cash crop turned to the cultivation of cotton (Edgar 1998). After the invention of the cotton gin by Eli Whitney in 1793, cotton became the chief staple of the South. During the nineteenth-century, a mixed planter economy existed in what is today Charleston and Georgetown counties, with wealthy rice plantations that employed slave labor existing along with yeoman farmers. As the demand for cotton increased during the nineteenth-century, large plantations operated by slave labor dominated South Carolina's agricultural economy.

Most residents in the low country welcomed South Carolina's secession from the Union in December 1860. But the Civil War proved utterly disastrous for the area. Union forces occupied the Sea Islands within the first year of the war and used Beaufort and Hilton Head as the command base of the South Atlantic Blockading Squadron and headquarters for the U.S. Army, Department of the South (Edgar 1998). Despite this, most of what is now Charleston County remained under control of Confederate forces until late in the war defended by its formidable curtain of earthworks and fortifications.

Eventually, Charleston and Georgetown counties were abandoned by the Confederates, when the area found itself within the path of General William T. Sherman's army marching north from Savannah. Following his March to the Sea in Georgia, Sherman proposed a similar plan for South Carolina and received approval from General Grant and President Lincoln. On February 1, 1865, Sherman left Savannah with 60,000 troops and headed north. His march north had two singular strategic purposes: to destroy all resources within his path and to make his way through the Carolinas into Virginia, where he would converge on Robert E. Lee's Army of Northern Virginia, then besieged at Petersburg by Grant. A third non-strategic reason for the destructive march through South Carolina was to punish the state for its leading role in secession (McPherson 1988).

After the Civil War, the average size of farms began to decline. In 1860 the average farm in South Carolina encompassed about 570 acres, and by 1880 the average had dropped to 143 acres. By 1900, the average farm was only 90 acres in size. This average continued to decline during the first two decades of the twentieth century (Dodd and Dodd 1973). Smaller farms meant more intensive farming practices with little fertilization or crop rotation, which led to soil depletion and heavy erosion. In 1880, about one half of the state's farms were owner-operated, but by 1900 only 38 percent of the state's farmers owned their own land. This situation resulted in a vast class of tenants who fulfilled annual contracts with landowners.

Under the system of tenancy, landowners received either a share of the crops, with generally one third to one half claimed by the tenant, or cash rent. In most sharecropping cases, landowners provided a house on the parcel of land the tenant was to farm, implements, working livestock, feed, and seed, while the tenant provided all the labor. In 1910, the average tenant holding was 44 acres (Kovacik and Winberry 1987).

Historically, the overwhelming majority (78 percent) of tenants or sharecroppers was African-American (Edgar 1998). In many instances, the system fostered a lifestyle of poverty wherein the tenant became indebted to the landowner or local merchants but was prevented by law from abandoning the farm while indebted. World War I and the healthy business climate of the early 1920s brought agricultural prosperity by encouraging production and high prices for farm products. Many tenant farmers, however, having invested in livestock, machinery, and additional land, found themselves in debt in the late 1920s and 1930s, when agricultural prices plummeted because of a continued wartime production rate operating without the wartime demand (Bloomer 1993).

During the late nineteenth century and well into the twentieth century, the primary commercial enterprises in Charleston and Georgetown counties consisted of phosphate mining and timber harvesting. This economic base was augmented by the presence of the Charleston Naval Base. The rural population declined as agricultural pursuits centered on subsistence and truck farming. This economic pattern persisted into the post-World War II period after which Charleston and Georgetown Counties developed a strong tourism industry.

### Gullah Community History and Culture

The inland and tidal rice fields of Charleston and Georgetown counties were constructed by enslaved Africans from various ethnic groups from west and central Africa (Littlefield 1995; NPS 2005; Pollitzer 2005). Forced to work on South Carolina's coastal plantations, enslaved Africans met other enslaved Africans from many ethnic groups. The population of early colonial South Carolina included, among others, indentured European servants, enslaved Native Americans, French Huguenot refugees, and planters from the island of Barbados, as well as enslaved Africans. Faced with the challenges of life on the Carolina frontier, these communities borrowed cultural practices from each other to form a creole society.

The mixing of African cultures, languages, and religions on coastal plantations generated a culture that was African in origin but unique to the New World (NPS 2005). This culture and language represented by its decedent modern day low country communities is known as Gullah in South Carolina and Geechee in neighboring Georgia (Barnes and Steen 2012). The development of Gullah culture and language was made possible by the isolation of enslaved and then freed African-Americans in remote coastal areas separated from the mainland by marshes, creeks, and rivers.

The contributions of enslaved Africans and their Gullah decedents to the economy of coastal South Carolina during the ante-bellum period are difficult to estimate. The clearing of inland rice fields and the construction of water control structures during the tidal rice revolution involved extremely difficult and dangerous labor. Once the systems of dams, floodgates, ditches, dikes, and other hydraulic control structures had been built, they had to be maintained. These hydraulic systems were complex and required experience and skill to operate (Pollitzer 2005). Rice planters sought and obtained enslaved Africans from the rice growing regions of West Africa to create and manage the physical infrastructure of large-scale rice cultivation (Littlefield 1995).

Following emancipation and the collapse of the plantation system, the Gullah of coastal South Carolina turned to subsistence farming, timber harvesting, and fishing to sustain their families (NPS 2005). These activities augmented by hunting and gathering wild foods and medicinal plants ensured a strong sense of community inter-dependence and self-sufficiency (Barnes and Steen 2012). Since World War II, coastal South Carolina has experienced an influx of new residents with subsequent development of residential subdivisions, commercial enterprises, and golf course vacation resorts. These changes caused the NPS to undertake *The Low Country Gullah Cultural Special Resource Study*. A document designed to assist the public, state, and federal agencies, and most importantly the Gullah themselves in determining how best to preserve Gullah language and culture in the face of modern development pressures (NPS 2005). In 2006, Congress created the Gullah Geechee Cultural Heritage Corridor based on its *Special Resource Study*. The proposed Project is located within the boundaries of the corridor, which extends 30 miles inland along estuarine boundaries from the Cape Fear River in North Carolina to the Saint Johns River in Florida.

### Paleontology

The sedimentary stratigraphy of the South Carolina Coastal Plain was deposited during transgressive and regressive cycles of sea level change (Ward et al. 1991). Sedimentary sequences of Pliocene and Pleistocene (Plio-Pleistocene) age have been documented and mapped in South Carolina by analyzing the lithological characteristics of the deposits coupled with a biostratigraphic framework based primarily on invertebrate marine fauna like mollusks, ostracodes, and formminifers (Ward et al. 1991).

Cyclic sea level change in response to eustatic loading of continental land masses is a gradual process that allows for the development of Coastal Plain landforms like bays, estuaries, and barrier island chains. These landforms provided habitats for both marine and terrestrial vertebrates which have left a rich fossil record embedded in Coastal Plain sediments.

Marine fossils found in near-surface sedimentary deposits associated with the Cooper, Pee Dee, and Black Mingo formations in Charleston and Georgetown counties include but are not limited to extinct mollusks, whale skeletal elements, and sharks teeth. A variety of Plio-Pleistocene land mammals are included in the fossil record of the Coastal Plain, including but not limited to skeletal elements of extinct horses, camels, mastodons, mammoths, beavers, rodents, and various extinct predators. Near-surface disturbance of fossil bearing strata by dredging of drainage canals, excavation of borrow pits, road construction, and other ground disturbing activities frequently bring fossils to the surface. The South Carolina State Museum houses a large collection of fossils collected from the low country.

### Previously Recorded Cultural Resources and Cultural Resource Investigations

Louis Berger entered into a subscriber's agreement with SC SHPO and South Carolina Institute of Archaeology and Anthropology to access the state's on-line cultural resource information system. This allowed Louis Berger full access to sensitive information about the locations of previously recorded survey areas, archaeological sites, historic buildings, structures, objects, or districts. Information about these resources, including their NRHP eligibility status, is available on the ArchSite server. The Louis Berger GIS-based search was conducted along the length of each of the alternative routes for 300 feet on either side of each route's center line. These data were secured on the Louis Berger Project SharePoint site. Data access was restricted to a Louis Berger GIS analyst working under the direct supervision of a Louis Berger senior archaeologist who meets the *Secretary of the Interior's Standards and Guidelines* for conducting archaeological investigations.

The search had two objectives. One was to identify those previously recorded cultural resources within the Study Area including buildings, structures, sites, objects, or districts— as well as properties of religious and cultural significance to Native Americans. The second was to identify the cultural resource inventories that have been conducted within the Study Area. Identification of the cultural resources included, to the extent possible, establishing whether the resource has been determined eligible for inclusion or are already included in the NRHP. Both designations are considered to be historic properties (36 CFR §800.16[l][1]) and afford the same considerations/protections under NHPA and its implementing regulations, 36 CFR §800. The data generated by the search were compiled into two tables, which list all the recorded cultural resources and inventories and are included in Appendix G.

### Alternative Routes A, B, C, D, E, and F

The following summarizes the recorded cultural resources and cultural resource inventories. Some of the alternative routes overlap. Consequently, the resources are discussed collectively except for specific instances where the six alternative routes differ. Figure 3-7 illustrates the cultural resources found within the Study Area. The data sets have been organized for use in consultation under Section 106. These consultations will address the need for a Phase I cultural resource inventory of the final ROW that Central Electric selects within the preferred alternative route. After the inventory is complete, consultation will continue if there are effects to historic properties or to discuss impacts to lands of religious and cultural significance to the Catawba Indian Nation and other consulting parties such as the Gullah Geechee Cultural Heritage Corridor Commission and the Lowcountry Rice Culture Project. Consultation will continue until the Section 106 process is complete, which may include fulfilling stipulations of any agreement documents.

*The South Carolina Guidelines and Standards for Archaeological Investigations* (2009) recognize two classes of archaeological sites that are 50 years or older: sites and isolated finds. Sites are defined as “an area yielding three or more historic or prehistoric artifacts within a 30-meter radius and/or an area with visible or historically recorded cultural features (e.g., shell middens, cemeteries, rockshelters, chimney falls, brick walls, piers, earthworks). Isolated finds are defined as “no more than two artifacts found within a 30-meter radius”. SC SHPO recognizes buildings, structures, sites, objects, or districts—that are 50 years or older as historic resources.

Tables summarizing the cultural resources data for the six alternatives have been placed in Appendix G. The NRHP status of these cultural resources is as follows: Site 38CH0512 has not been evaluated for the NRHP; Site 38CH1132 has been determined not eligible for the NRHP; and Site 38GE0651 has not been evaluated for the National Register. Cultural resources that are historic properties include NRHP-listed Hopsewee Plantation and associated outbuildings which has the status of a National Historic Landmark (NHL), NRHP-eligible Old Georgetown Road, and NRHP-eligible Georgetown Rice Fields historic district. The Oaks Plantation, which the SC Department of Archives and History recognizes is more than 1,000 acres of rice fields, is a potentially eligible site that has not been evaluated, is located on the North Santee River near Hopsewee Plantation. The distribution of cultural resources and historic properties by alternative has been summarized in Table 3-20. Of these, archaeological sites 38CH0512, 38CH1132, and 38GE0651 are unique to Alternatives A, B, C, D, and E; the NRHP-listed Hopsewee Plantation NHL is unique to Alternatives A and D; the NRHP-eligible Old Georgetown Road is unique to Alternatives E and F; and the NRHP-eligible Georgetown Rice Fields historic district is intersected by all six alternatives.

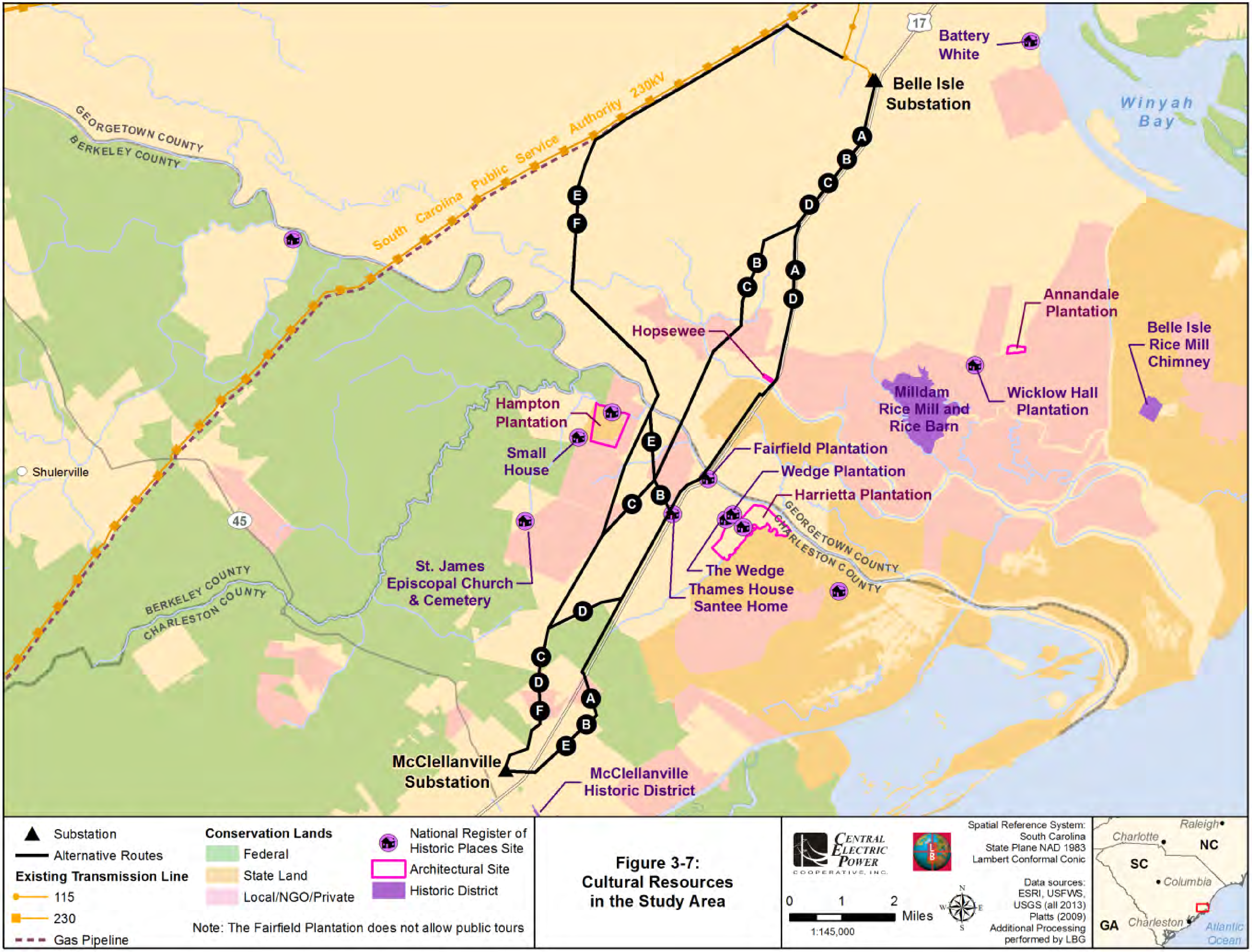



**Figure 3-7: Cultural Resources in the Study Area**

Appendix G identifies the sites unique to each corridor and the resource type for each alternative by county. Information is also included in Appendix G that identifies how many historic properties have been determined eligible or listed on the NRHP and how many cultural resources have been determined not eligible or have not been evaluated relative to NRHP eligibility.

**Table 3-20: Distribution of Cultural Resources and Historic Properties in the Project Study Area**

| Alternatives | Cultural Resources | | | | |
|---|---|---|---|---|---|
| | Archaeological Sites | Hopsewee NHL | Old Georgetown Road | Proposed Georgetown Rice Fields Historic District | Total |
| Alternative A | 3 | 1 | | 1 | **5** |
| Alternative B | 3 | | | 1 | **4** |
| Alternative C | 1 | | | 1 | **2** |
| Alternative D | 1 | 1 | | 1 | **3** |
| Alternative E | 2 | | 1 | 1 | **4** |
| Alternative F | | | 1 | 1 | **2** |

Note: All of these cultural resources and historic properties fall within the boundaries of the Gullah Geechee Cultural Heritage Corridor. With the exception of the prehistoric archaeological sites all of these resources could be considered as contributing features of the corridor.

### Previous Cultural Resource Investigations and Francis Marion National Forest Site Location Model

A total of three recorded cultural resources surveys have occurred in the Study Area since 1978 and are discussed briefly below. The earliest investigation represents an archaeological reconnaissance of a portion of Rutledge Road (S-857) conducted by SCDOT in 1978. This survey corridor is located between U.S. Highway 17 and the Old Georgetown Highway in Charleston County. The second cultural resources survey was conducted by Brockington and Associates in 2006 for South Carolina Public Service Authority. This work was conducted in Georgetown County for the purposes of identifying archaeological and architectural resources along the path of a proposed water line. The proposed waterline was intended to bring water from Wadmacon Creek to the Santee Cooper power generation station located on Winyah Bay. A part of the survey corridor for this Project runs parallel to the Study Area in the vicinity of Kilsock Island. TCR conducted an archaeological survey of the CRIS Tech Park in Georgetown County. In addition to these three Project-specific surveys, additional county-wide historical surveys have been conducted for both Charleston and Georgetown counties (Flick 1992, Joseph et al. 2006).

### Historic Properties

One of the historic properties within or contiguous to the alternative routes is Hopsewee Plantation, a listed NHL. Hopsewee Plantation an eighteenth-century plantation house and out buildings listed for its architecture. Hopsewee is intersected by Alternative Routes A and D. As set forth in 36 CFR §800.10(c), the Secretary of the Interior must be notified of any Section 106 consultation involving an NHL.

The Old Georgetown Road and the Georgetown Rice Fields are both historic properties that have been recommended eligible for the NRHP. The Old Georgetown Road located in Charleston County represents an eighteenth-century resource. This resource is intersected by Alternatives E and F. The Georgetown Rice Fields are being proposed as an addition to the Georgetown Rice Fields multiple properties NRHP nomination.

Although many historic properties associated with the cultivation of rice in South Carolina have been lost to time, growth, and development, many remain intact. These extant historic properties constitute contributing elements to the multiple property listing. They include plantation houses, out-buildings, cemeteries, and the archaeological remnants of slave cabins. Rice processing facilities such as, rice barns, rice mills, and chimneys also constitute important contributing elements.

Together these historic properties tell the story of the growth and development of tidal rice culture from 1750 to 1910 when rice production ceased. The infrastructure that formed the basis of rice culture in South Carolina was erected by enslaved Africans and African-Americans, and as such, these resources are directly and intimately associated with the Gullah community. All cultural resources and historic properties listed in the Georgetown Rice Fields NRHP nomination should be considered as contributing features of the Gullah Geechee Cultural Heritage Corridor.

All of the alternative routes intersect these tidal rice fields. The alternative routes may also intersect potential historic sites not identified on Figure 3-7. This includes the Oaks Plantation, Comander Island, Peachtree Plantation Ruins, and Peachtree Rice Mill. Several historic properties like Fairfield Plantation, Hampton Plantation, and Thames House/Santee Home may fall within the preliminary indirect APE of the alternative routes. Finally, archaeological site 38CH0512 is recommended potentially eligible for the NRHP. This site is intersected by Alternatives A, B, and E.

#### *Traditional Cultural Properties*

As mentioned above, consultation with the Catawba Indian Nation will take place to ensure that the Tribe has the opportunity to identify historic properties of religious and cultural importance that may be affected by the undertaking. This may include information on Traditional Cultural Properties (TCPs). NRHP Bulletin Number 19 defines a TCP as a historic property where "significance derived from the role the property plays in a community's historically rooted beliefs, customs, and practices" and that these resources may be eligible for inclusion in the NRHP because of their "association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community" (Parker and King 1998). In addition to local communities and stakeholders, RUS is consulting with the Gullah Geechee Cultural Heritage Corridor Commission and the Low Country Rice Culture Project regarding possible TCPs within the Study Area.

### 3.8.2. Environmental Effects

The results of the background research demonstrate that the construction of new transmission line facilities (e.g., pole locations, substation modifications, pull sites, access roads, and lay-down yards) could affect previously recorded historic properties and currently unidentified cultural resources. Once historic properties are identified, RUS, in consultation with the consulting parties, would determine if there are effects and if the effects are adverse (36 CFR §§800.4 and .5). If there are adverse effects, these must be resolved in accordance with 36 CFR §800.6.

The transmission line, with its pole installation and substation modification (excluding the substation that has already been surveyed), has the potential to have an effect on archaeological sites through ground-disturbing activities. Once the preferred alternative is selected, Central Electric would work with archaeologists, who meet or exceed the Secretary of the Interior's Guidelines and Standards, to identify and avoid known site boundaries within the archaeological APE. This action represents a good faith effort to minimize construction impacts to archaeological resources.

The proposed Project could also alter the setting and feeling of historic structures, districts, or landscapes as well as properties, including TCPs, important to the Catawba Indian Nation, Gullah Geechee Cultural Heritage Corridor Commission, and the Low Country Rice Culture Project, as well as other interested parties.

In areas not previously disturbed by construction or by extractive industries, and where archaeological potential is assessed to be high (e.g., near large lakes, river crossings, historic roads, and rice fields), unrecorded archaeological sites, landscapes, historic districts, or TCPs may be affected during construction of transmission line and associated infrastructure. Landscape character associated with historic buildings or other properties may be impacted by the height of the new transmission structures and infrastructure.

Possible impacts on archaeological resources that would apply to all of the route alternatives include: 1) subsurface excavations necessary to install structures; 2) disturbance to surface soils throughout the route as a result of heavy construction vehicle equipment operation; and 3) disturbance to surface soils through grubbing, stump removal, and grading.

### No-action Alternative

The no-action alternative would not impact existing cultural resources either directly or indirectly. This alternative would allow for existing conditions to remain. Archaeological and historic resources would neither be preserved in another manner nor damaged under the no-action alternative.

### Proposed Action

*Archaeological Sites*

A total of three archaeological sites have been identified within the 600-foot preliminary APE. Site 38CH1132 has been recommended as not eligible for the NRHP. This site is intersected by Alternative Routes A, B, and E. Because this site is not eligible for the National Register, the Project would have no impact on this resource. Site 38CH0512 has been not been evaluated for the NRHP. This site is intersected by Alternatives A, B, and E. Should one of these alternatives become the preferred alternative, additional archaeological testing would be necessary to evaluate its eligibility for the NRHP. Site 38GE0651 is recommended for further work. This site is intersected by Alternative Routes A, B, C, and D. Should one of these alternatives become the preferred alternative, additional archaeological testing would be necessary to evaluate its eligibility for the NRHP. In the event that unevaluated sites are encountered along the preferred alternative, Central Electric would flag and avoid impacts to these sites.

*National Historic Landmark*

The Hopsewee Plantation house and its out-buildings are listed as a NHL. The parcel of land on which the buildings are situated within the boundaries of this NHL would be intersected by Alternative Routes A and D; however, the alternatives would be within the existing ROW of U.S. Highway 17, which also bisects the parcel. Should either of these alternatives become the preferred alternative, then RUS and the consulting parties would work together to minimize visual impacts to the historic property. Minimization of visual impacts could be accomplished by using the existing vegetative screening of the highway and careful placement of transmission line structures on the site and/or spanning the property if feasible. Additional mitigation measures could include planting of trees to serve as visual buffers.

*Landscape and Transportation Resources*

The SC SHPO and other interested parties propose to expand the Georgetown Rice Fields NRHP multi-property nomination to include some of the tidal rice fields lining the banks of the North and South Santee rivers between Wadmacon Creek and the Santee River Delta. This area of expansion of the existing NRHP property has been determined eligible for listing in the NRHP. This tidal rice field complex would be intersected by all of the proposed alternative routes. After a preferred alternative and the final ROW are selected, RUS and the consulting parties under Section 106 would work together to minimize and mitigate adverse physical and visual impacts.

Minimization measures for physical impacts may include use of BMPs for installation of transmission line structures in wetlands; avoidance of dikes, embankments, and other associated water control structures when placing towers; and minimization of ground disturbance. Minimization of visual adverse impacts may be through the careful placement of transmission line structures near the edges of woods, topographic depressions, or near the toe of the slope of the rice field dike. RUS and Central Electric would explore alternative mitigation strategies with the SC SHPO and consulting parties if adverse impacts are unavoidable.

The NRHP-eligible Old Georgetown Road, linking coastal plantations and settlements with Georgetown and Charleston, has been in existence since the eighteenth century. The section of the road located in Charleston County has been determined eligible for listing in the NRHP. Alternative Routes E and F intersect a portion of this road near its juncture with Rutledge Road (S-857). The alignment of these proposed alternatives as presently configured crosses but does not parallel this historic property. If adverse impacts occur, they would be visual and would be mitigated by careful placement of transmission line structures outside the roads' existing ROW. This would minimize impacts to existing trees which line portions of the Old Georgetown Road. If necessary, adverse visual impacts could be further mitigated by planting additional trees to serve as visual buffers. Construction of the proposed transmission line could impact the setting of the Old Georgetown Road. The setting of above-ground historic properties is an attribute of their historical significance.

*Gullah Geechee Cultural Heritage Corridor*

As noted earlier, all above-ground resources that constitute contributing elements of the Georgetown Rice Fields multiple properties NHR listing that fall within the APE for the alternatives could be TCPs. These historic properties are significant cultural resources for the interpretation of the Gullah Geechee Heritage Corridor (Gullah Geechee Heritage Corridor Commission 2012). Some of the Gullah Geechee communities referenced in the Cultural Heritage Corridor Management Plan (e.g., South Santee, Germantown, Tibwin, Buck Hall, and Awendah) are communities that would benefit directly from the operation of the proposed Project.

*Paleontological Resources*

Fossilized marine and terrestrial skeletal elements may be encountered along any of the alternative routes during the course of transmission line construction. If fossilized animal remains are encountered during construction, Central Electric construction inspectors would be notified immediately. Upon notification, Central Electric project managers may wish to inform the South Carolina State Museum of the discovery so that the staff paleontologist may assess its significance. In addition, the PA has provisions for the treatment of unanticipated discoveries.

### 3.8.3. Cumulative Effects

The Gullah Geechee Cultural Heritage Corridor Commission’s Cultural Heritage Corridor Management Plan (Gullah Geechee Cultural Heritage Corridor Commission 2012) provides an overview of past, present, and reasonably foreseeable threats to traditional lands and cultural sites used by the Gullah Geechee. This information was extrapolated in a general context to assess potential cumulative effects to cultural resources in the Study Area. In accordance with the stipulations of the PA, which would be developed to conclude Section 106 review and must be executed prior to the issuance of any Record of Decision, an effects assessment to historic properties would occur after Central Electric selects the proposed Project’s ROW.

In the late twentieth century, “modern plantations” developed in the coastal southeastern U.S. in the form of resorts, subdivisions, golf courses, golf communities, and recreational facilities. The Study Area contains a combination of public land, residential communities, agricultural and cropland, and undeveloped areas. According to the U.S. Census Bureau, the population in this region is anticipated to grow by more than one million from 2000 to 2030 (U.S. Census 2005). This is broadly consistent with the patterns of steady growth observed in Charleston and Georgetown counties in the decade just passed (2000 to 2010). The increase in population and its associated development may have resulted in loss of lands and sites of cultural importance. Within and adjacent to the proposed alternative routes, however, there is a substantial amount of public and private lands held in conservation easements. These areas were established to conserve natural and cultural resources and have been effective in protecting these resources from development.

Some of the Gullah Geechee communities referenced in the Cultural Heritage Corridor Management Plan (e.g., South Santee, Germantown, Tibwin, Buck Hall, and Awendah) are communities that would benefit directly from the operation of the proposed Project.

By supplying adequate levels of power reliably, the proposed Project has the potential to contribute to the preservation and maintenance of these traditional communities located in the Study Area.

### 3.8.4. Unavoidable Adverse Effects

Potential unavoidable adverse effects on cultural and paleontological resources would include diminution of the setting of Hopsewee Plantation and the Old Georgetown Road, diminution of the setting and integrity of the Georgetown tidal rice fields, and loss of integrity to eligible NRHP sites along the preferred alternative.

## 3.9 Recreation and Land Use

### 3.9.1. Affected Environment

#### Regional Setting

The proposed Project Area is situated in the low country of South Carolina and includes portions of Georgetown and Charleston counties. The region surrounding the proposed Project is largely rural, undeveloped lands characterized as low-lying topography covered in forest, with smaller areas of croplands and pockets of residential development (Figure 3-8). The Santee River delta, the confluence of the North and South Santee rivers, is the largest delta on the east coast and flows west to east through the proposed Project Area. The delta floodplain was converted to rice fields by early plantation owners, and it now provides quality habitat for wintering birds and other wetland wildlife as well as recreational opportunities. Lands throughout the delta consist of impounded, remnant rice fields and bottomland hardwood forest.

#### Recreation

Popular outdoor recreation activities in low country South Carolina include fishing, hunting, swimming, picnicking, boating, hiking, camping, and wildlife observation. The FMNF, South Carolina DNR, and private conservation groups provide the greatest amount of lands for public recreational use. The Santee River is a popular local recreational destination, providing fishing, motorized and non-motorized boating, and waterfowl hunting opportunities. Figure 3-9 shows the locations of the major recreation opportunities in proximity to the proposed Project.

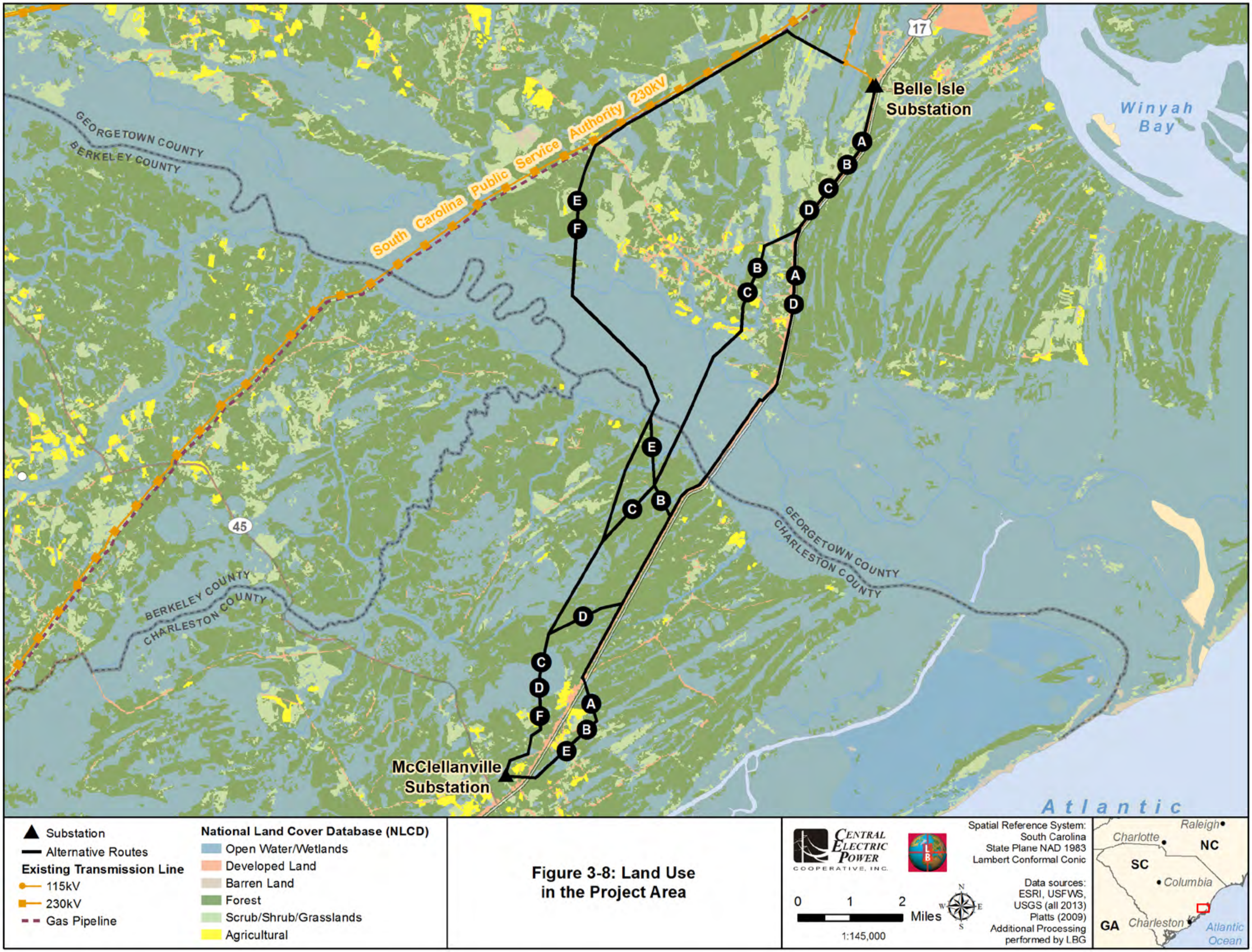



Figure 3-8: Land Use in the Project Area

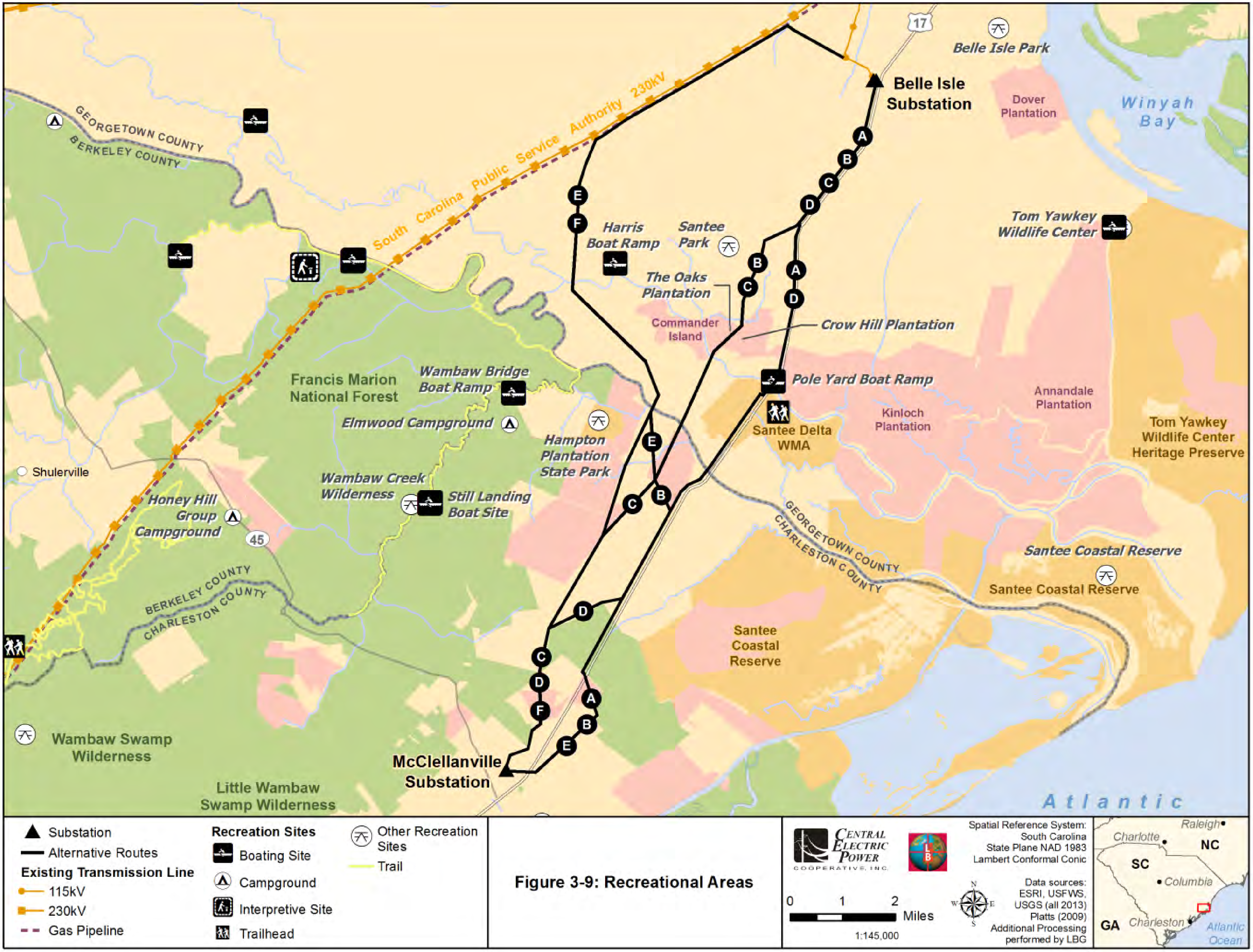



Figure 3-9: Recreational Areas

*Federal*

The FMNF is located in the coastal plain of South Carolina and is bounded to the north by the Santee River and the Intracoastal Waterway and the Atlantic Ocean to the east. The 258,000-acre national forest is situated mostly to the west of McClellanville with a small area crossing U.S. Highway 17 sharing a border with the Santee Coastal Reserve (discussed in detail below). The FMNF has nearly 120 miles of recreational trails: canoe, hiking, horseback riding, motorcycling, mountain biking, interpretive trails, and boat launches. Seven recreation areas provide camping, picnicking, and boating opportunities within the forest. Cape Romain is an area located outside the forest and managed by USFWS. Wambaw Swamp, Little Wambaw Swamp Wilderness Area, Wambaw Creek, and Hellhole Bay Wildernesses are designated within the FMNF. The 1,900-acre Wambaw Creek Wilderness Area, within the FMNF, was created in 1980 and hosts the 5-mile Wambaw Creek Wilderness Canoe Trail. The trail traverses Wambaw Creek, a blackwater tributary of the South Santee River.

Cape Romain National Wildlife Refuge is about 66,300 acres encompassing a 20-mile segment of the Atlantic coast and includes barrier islands, salt marshes, intricate coastal waterways, sandy beaches, and maritime forests. The refuge is located south of McClellanville near Awendaw. Facilities accessible by automobile are the refuge office, the Sewee Visitor and Environmental Education Center, and Garris Landing.State

*Santee Delta Wildlife Management Area*—The Santee Delta WMA, managed by the SCDNR, provides habitat for wintering waterfowl and other wetland wildlife including wood storks, wading birds, ospreys, and bald eagles. The WMA is divided into two areas: Santee Delta East is mostly impounded remnant rice fields, and Santee Delta West is impounded bottomland hardwood forest. Nine miles of dikes, accessible by foot, provide access to visit the area and observe wildlife such as waterfowl, bald eagles, wading birds, shorebirds, and song birds.

The Santee Delta Waterfowl Area is located within Santee Delta WMA and is a Category I waterfowl area, a high quality intensively managed habitat. The 1,721 acres of wetlands (1,135 acres managed) are home to large concentrations of waterfowl. Hunting is allowed after selection in the special waterfowl hunt drawing system.

*Boat Access*—Boat ramps in the area provide access to the Santee River and include Pole Yard and Harris. Pole Yard is on the north bank of the North Santee River directly across from the Santee Delta WMA (see Photographs 3 and 4). The site has a two-lane ramp, courtesy dock, and paved parking for about 23 vehicles with trailers. Harris boat ramp is also in Georgetown County on the north bank of the Santee River about 3 miles upriver of Pole Yard. The single-lane, gravel ramp provides parking for about 20 vehicles with trailers.

**Photograph 3: Pole Yard Boat Ramp**

**Photograph 4: North Santee River**

*Private/Non-Government Organization*

*Hopsewee Plantation*—The Hopsewee Plantation is a privately owned, National Historic Landmark, located 13 miles south of Georgetown on U.S. Highway 17. The plantation overlooks the North Santee River and the old rice fields that produced the wealth for the previous families that have owned the property for the last 150 years (Photograph 5). Tours of the plantation house, the grounds, and original slave cabins are available (Hopsewee 2013). In 2011, the plantation had about 10,000 visitors, with March and April being its busiest months (Beattie 2012).

**Photograph 5: View of Hopsewee Plantation from Santee River**

*Hampton Plantation*—The Hampton Plantation State Historic Site, also a National Historic Landmark, occupies about 275 acres in Charleston County just north of McClellanville. The plantation's Georgian-style mansion sits on Wambaw Creek, where fishing, a 2-mile nature trail, and tours of the mansion and its grounds are available. In 2011, the Hampton Plantation gave tours to on average 100 visitors per week; however, this figure fluctuates by season with more people visiting in the spring and summer than in the fall and winter (Mikulla 2011).

## Land Use

The Study Area is located in the southern portion of Georgetown County and the northern portion of Charleston County. Based on the 2012 Census of Agriculture, about 9 percent (99,350 acres) of the total land area in Charleston and Georgetown counties is farmland with an average farm size of 170 acres (USDA 2007). Charleston, with a population of approximately 125,000 (U.S. Census 2013a) is the largest city in either county, but it is just over 30 miles south of McClellanville. Several small towns and unincorporated communities are scattered throughout the Project Study Area. The town of McClellanville is the only municipality whose jurisdiction may fall within the boundaries of the proposed Project. Developed infrastructure in the vicinity of the proposed Project includes federal, state, county, and township roads and utility ROWs (e.g., gas, water, electric).

USGS land cover data are publically available and useful as a proxy for the types of land uses in an area. NLCD files were reviewed for the 2,000-foot study corridor (a 2,000 foot-corridor was used due to the spatial resolution of the data). Given the similarities among a number of the land cover categories and the application of the dataset as a surrogate for land use, combining categories, as shown in Table 3-21, is sufficient to convey the nature of the land use near proposed Project alternative routes. Figure 3-8 shows aggregated land cover data for the area. Lands within the 2,000-foot corridors are predominately forested followed by the open water/wetland type habitats, which is expected given the location of the Santee River delta in the middle of the proposed line. Much smaller amounts of the land are developed or shrub/scrub, grassland, or herbaceous ground cover. There is a negligible amount of cultivated crops grown in the area.

**Table 3-21: Land Cover Acreages within Alternative Routes**

| National Land Cover Database Land Cover Categories (acres within 2,000-foot corridor) | Alt. A | Alt. B | Alt. C | Alt. D | Alt. E | Alt. F |
|---|---|---|---|---|---|---|
| Forest | 2,133 | 2,088 | 1,799 | 2,147.5 | 2,442.5 | 2,123 |
| Open water and wetlands | 1,000 | 1,202 | 1,519 | 1,081.5 | 1,961 | 2,240 |
| Developed (open, low, medium and high) | 489 | 298 | 157 | 415 | 167 | 23 |
| Shrub/scrub and grassland/herbaceous | 305.5 | 348 | 322 | 284 | 299 | 291 |
| Pasture/hay and cultivated crops | 33 | 71 | 58.5 | 21 | 30 | 18 |
| Totals | 3,960.5 | 4,007.5 | 3,855.5 | 3,948.5 | 4,899.5 | 4,693 |

South Carolina Forestry Commission estimates that Charleston County is about 50 percent forested and Georgetown County is about 70 percent forested (South Carolina Forestry Commission 2013). Statewide, the South Carolina Forest Service estimates that 59 percent of the state's 12.8 million acres of forest land are owned by private individuals. Within the estimated 75-foot ROWs for the various alternatives, the conversion of forest cover to ROW could have an impact on the land values, land uses, and other secondary factors like property taxes and income. To evaluate the potential conversion of forest cover, the forest cover within each alternative ROW was digitized from aerial photography. Table 3-22 summarizes the amount of forest cover that would be converted into ROW.

**Table 3-22: Acres of Forest Cover within the 75-Foot Right-of-Way by Land Owner Type**

| Digitized Forest Cover (acres within 75-foot ROW) | Alt. A | Alt. B | Alt. C | Alt. D | Alt. E | Alt. F |
|---|---|---|---|---|---|---|
| Forest cover total | 110 | 114 | 120 | 119 | 134 | 133 |
| Federal lands[a] | 5 | 5 | <0.5 | <0.5 | 5 | <0.5 |
| State lands | 11.5 | - | - | 11.5 | - | - |
| Private conservation lands | 8 | 22.5 | 21.5 | 8 | 12 | 9.5 |
| Privately owned land | 85.5 | 86.5 | 98 | 99 | 117 | 123 |

[a] This table represents the maximum area impacted if the entire ROW is located on National Forest System lands

Not readily apparent on Figure 3-8 or within Table 3-21 is the amount and distribution of various infrastructure (e.g., roadways, gas lines, and overhead transmission and distribution lines) throughout the area. Infrastructure to support everyday needs like water intakes, treatment plants, pipelines, electrical distribution lines, etc. is necessary for current life styles. Many of these lines and ROWs are visible throughout the proposed Project Area. South Carolina coastal policies prefer the siting and placement of new infrastructure within or adjacent to existing ROWs so as to minimize new corridors that can contribute to sprawl, bisecting property and the diminishment of cohesive planning blocks and cumulative impacts to coastal resources. Infrastructure visible within the alternative routes includes water intakes, electrical supply lines, and cleared vegetation adjacent to the Pole Yard boat ramp (Alternative Routes A and D), which parallels U.S. Highway 17 and crosses the roadway about 0.5 mile north of the boat ramp; South Carolina Public Service 230 kV lines and cleared ROWs (Alternatives E and F); and local distribution lines throughout all of the alternatives. Roadways are discussed in Section 3.13, *Transportation*, and the visual resources from these roadways in Section 3.10, *Visual Resources*.

### Land Ownership

Land ownership and jurisdiction within the alternative routes varies by route but includes predominantly private lands followed by state of South Carolina and federal lands. Federal and state lands within proximity to the proposed routes include the FMNF, Santee Delta WMA, Santee River, and Santee Coastal Reserve. Private lands set into conservation easements are also identified on Figure 3-8 and include a number of plantations. Table 3-23 summarizes land ownership within the Project Study Area by the linear distance each alternative route would cross.

**Table 3-23: Length of Lands Crossed by the Centerline and Respective Owner**

| Land Owner (miles) | Alt. A | Alt. B | Alt. C | Alt. D | Alt. E | Alt. F |
|---|---|---|---|---|---|---|
| Federal | 1.2 | 1.2 | <0.1 | <0.1 | 1.2 | <0.1 |
| State land | 1.3 | - | - | 1.3 | - | - |
| NGO/private in conservation | 1.3 | 3.1 | 2.7 | 1.3 | 1.7 | 1.3 |
| Regional/local | - | - | - | - | - | - |
| Private land | 9.3 | 12 | 12.8 | 13.3 | 15.9 | 17.7 |
| **Total miles** | **16.1** | **16.3** | **15.6** | **16.0** | **19.9** | **19.1** |

### Conservation Easements

Ducks Unlimited holds the Oaks (204 acres), Crow Hill (274 acres), and Commander Island (373 acres) Plantations in conservation easements. These privately owned and neighboring plantations encompass about 850 acres along the North Santee River in Georgetown County west of U.S. Highway 17. The easements restrict the type and amount of development that may take place on the property and are also tailored to the needs and interest of the landowner. Ducks Unlimited states the plantations are managed in cooperation with the goals of the North American Waterfowl Management Plan. Ducks Unlimited’s Lowcountry Initiative targets the conservation of the area for its outstanding ecological value. The easements’ long-term protection will conserve large, undeveloped upland and wetland ecosystems for the benefit of water birds, other wildlife, and the threatened and endangered species that occur in the low country of South Carolina. The Nature Conservancy protects numerous parcels throughout the low country, including 494 acres of lands owned by White Oaks Forestry Corporation along the South Santee River in Charleston County and about 1,160 acres surrounding the Hampton Plantation. The Low Country Openspace Trust, is another non-profit, land preservation focused group that controls conservation easements throughout South Carolina’s low country including lands associated with Fairfield Plantation.

## Zoning

Counties and towns organize development within their jurisdictions through a number of tools based on land use planning and zoning classifications. Zoning is used to separate uses that are thought to be incompatible with surrounding uses and as a means to prevent new development from interfering with lesser uses, such as an industrial use constructed near existing residential uses. Zoning is also used to preserve the character of a community. Often these regulations dictate the types of uses allowed on a lot, the height of buildings, the amount of space structures may occupy, the location of a structure on a lot, set-backs, and other factors related to land uses. Table 3-24 shows the types of zoning classifications common to the areas near the proposed routes.

**Table 3-24: Zoning Classifications in the Study Area**

| Georgetown County | Charleston County | Town of McClellanville |
|---|---|---|
| Forest Agriculture (FA) | Community Commercial | Highway Commercial |
| Heavy Industrial (HI) | Agricultural Preservation | |
| Conservation Preservation (CP) | Agricultural/Residential | |
| General Commercial (GC) | Resource Management | |
| Rural General Residential (RG) | | |

### 3.9.2. Environmental Effects

Impacts on recreation and land use resources include how the proposed Project could potentially affect elements of the human and land use environments, such as recreation activities and overall use levels and personal enjoyment, and for land use include the types of allowable uses. The effects from the proposed Project on many of these factors are mostly limited to the clearing of the ROW, construction of the towers, stringing the lines, and the maintenance of the cleared ROW for the life of the Project.

This section discusses the potential effects of the proposed Project on the various recreation and land uses throughout the Study Area. The intensity of the impacts on recreation and land use can be described through the thresholds shown in Table 3-25.

**Table 3-25: Recreation and Land Use Impact Context and Intensity Definitions**

| Context—Duration | Low intensity | Moderate Intensity | High Intensity |
|---|---|---|---|
| Short term: During construction period<br>Long term: Life of the line (50 years) | Other than at the footprint of Project features (transmission tower structures, access roads, etc.) previous land uses would continue without interruption. Existing land uses such as agriculture, grazing, timber, or agricultural uses may experience temporary construction-related disturbances and intermittent, infrequent interruptions due to operation and maintenance. There would be no conflicts with local zoning. | Previous land uses (e.g., agriculture, grazing, and timber management) would be diminished or required to change on a portion of the Project Area to be compatible with the Project. Only a few parcels within the Project Area would require zoning changes to be consistent with local plans. Some parcels within the Project Area (transmission right-of-way, access roads, etc.) may require a change in land ownership through purchase or condemnation. | More than 25 percent of the Project Area (transmission right-of-way, access roads, etc.) would require a change in land ownership through purchase or condemnation. All land use (e.g., agriculture, grazing, and timber management) on these parcels would be discontinued. Most parcels of land within the Project Area would require zoning changes to be consistent with local plans. |

## No-action Alternative

Under the no-action alternative the proposed Project would not be constructed, and there would be no direct impacts on land use as a result of the Project. The no-action alternative would have indirect impacts for failing to meet the stated Project purpose, and not provide dependable electrical supply to area residences and businesses.

## Proposed Action

### *Private Property*

The majority of the lands within the Study Area and the alternative 75-foot ROWs are privately owned and dominated by forest cover. Impacts on private lands would include temporary loss of use for landowners within the ROW during construction, and the permanent loss of uses that are incompatible with the ROW, such as the location and farming of timber. Disturbances from heavy equipment would result in forest cover losses within the ROW during construction and operations. The proposed Project would require ROW easements from private property owners, which could encumber the ROW area with land use restrictions. Each transmission line easement would specify the present and future right to clear the ROW and to keep it clear of all trees, whether natural or cultivated, all structure-supported crops, other structures, brush, vegetation, and fire and electrical hazards. Non-structure-supported agricultural crops less than 10 feet in height would still be allowed within the ROW.

As Table 3-26 shows substantial portions of Alternative Routes A and D parallel existing ROWs minimizing the overall impact because the proposed ROW would expand an existing ROW clearing, reducing the intensity of changes along these areas. Conversion of land use already neighboring ROW clearings would have a marginal change in overall property land use compared to a new ROW clearing through the middle of a parcel or property.

Central Electric would coordinate with landowners to obtain easements for the preferred transmission line ROW. As a result, the anticipated short- or long-term impacts on land use for the alternatives would be low.

*Waterbodies*

Although all of the alternative routes cross several waterbodies in the central portion of the Study Area in the vicinity of the North and South Santee rivers, many of the features are classified as ditches in the U.S. Geological Survey's (USGS) National Hydrography Dataset (USGS 2010). These features are generally associated with historical rice fields in and around the Santee Delta WMA, which is crossed by Alternative Routes A and D; existing rice operations; and other agricultural practices.

**Table 3-26: Length and Percentages of the Alternative Routes that Parallel Existing Linear Right-of Way**

| Rights-of-Way Parallel | Alt. A | Alt. B | Alt. C | Alt. D | Alt. E | Alt. F |
|---|---|---|---|---|---|---|
| Total length of alternative (miles) | 16.1 | 16.3 | 15.7 | 16.1 | 19.9 | 19.1 |
| 115 kV (miles) | - | - | - | - | - | - |
| Pipeline/230 kV (miles) | - | - | - | - | 4.3[a] | 4.3[a] |
| Pipeline/Transmission parallel percentage | - | - | - | - | 21.4% | 22.4% |
| US highway (miles) | 13.1 | 6.7 | 3.2 | 11.5 | 3.5 | - |
| Local road (miles) | - | 0.7 | - | - | 2.8 | 2.1 |
| Railroad (miles) | - | - | - | - | - | - |
| Total parallel percentage | 81.4% | 45.3% | 20.4% | 71.5% | 53.0% | 33.6% |

[a] The gas pipeline and the 230 kV transmission line are in the same corridor and reflect the same amount of parallel opportunity.

*Private Property in Conservation Easement*

About 4,000 feet of both Alternatives B and C would cross through The Oaks Plantation. It is not clear when the Oaks Plantation was first established although it likely dates back to the late 1700s; however, the SC Department of Archives and History recognizes the entire plantation is more than 1,000 acres with rice as the primary crop. The remnant rice fields now provide valuable waterfowl habitat under a conservation easement. About 5,400 feet of Alternatives B and C would cross White Oaks Forestry Corporation lands managed by The Nature Conservancy, while about 1800 feet of Alternative Route E would cross this parcel and an additional 3,400 feet would parallel Rutledge Road along the same parcel. Similarly, about 2,900 feet of both Alternative Routes A and D would parallel the White Oaks Forestry Corporation conservation easements along U.S. Highway 17.

*U.S. Forest Service*

USFS administers 258,000 acres of publically owned lands in the FMNF. Within the Project vicinity, portions of the FMNF are located throughout Charleston County. In addition to providing recreational opportunities, these lands also provide timber resources. The FMNF is managed according to the Revised Land and Resource Management Plan (USFS 2008). Alternative Routes A, B, and E would cross FMNF lands parallel to where U.S. Highway 17 crosses through the forest about 3 miles north of the McClellanville Substation. The ROW would occupy the eastern shoulder of the highway requiring the removal of about 5 acres of forest cover between the edge of highway and the interior edge of the ROW. Alternatives C, D, and F would cross at a corner of two FMNF parcels north of the McClellanville Substation; however, clearing of ROW would only alter less than half an acre of FMNF lands because the route is designed to cross the smallest amount of FMNF lands possible at the parcel corners. Development of utility ROWs is generally consistent with the stated management goals and objectives for the FMNF under the Land and Resource Management Plan (USFS 2008), if the proper permits are obtained.

*State of South Carolina*

Alternative Routes A and D would cross 1.3 miles of Santee Delta WMA lands along U.S. Highway 17. The ROW would occupy the eastern side of the highway requiring the removal of about 11.5 acres of forest cover between the edge of highway and the interior edge. The same alternatives would also cross adjacent to the Pole Yard boat launch (managed by SCDNR) on the north shore of the North Santee River at the U.S. Highway 17 bridge abutment. No other routes would cross state lands.

*Comprehensive Plans and Zoning Ordinances*

The Georgetown County Comprehensive Plan, adopted August 21, 2007, establishes a vision for future development of the county and includes general goals and objectives for land use, transportation, housing, economic development, community facilities, transportation, natural resources, and population (Georgetown County Planning Commission 2007). The Charleston County Comprehensive Plan Update (Charleston County Planning Commission, 2008), Amended most recently May 8, 2012, also establishes a vision for the county and includes goals and objectives for land use, economic development, natural resources, cultural resources, population, housing, transportation, community facilities, and energy. The town of McClellanville also has zoning ordinances in place. All the alternatives would extend through the same county and municipal jurisdictions and cross lands located in zoning districts where transmission line ROW is not prohibited. Under the applicable zoning ordinances and comprehensive plans, transmission lines are either a permitted or conditional use in all jurisdictions crossed by the ROW. All applicable zoning and land use approvals would need to be obtained prior to construction.

Nuisances could indirectly conflict with surrounding land uses during the construction phase, especially with residential or recreational facilities. Nuisances such as construction noise, dust, and additional traffic not typically associated with the existing land would increase; however, these impacts would only last for the duration of the construction period. Impacts to property owners and recreational use from dust generation are expected to be low and short term.

Creation of the Project ROW may increase public access to private lands, increasing the potential for trespassing. Central Electric could install hedgerows and gates along the ROW to discourage public access and trespassing. Because new construction access roads are not anticipated, trespassing and unauthorized use of lands would be minimized. Enforcement of private land use and trespassing laws would be the responsibility of local law enforcement.

### 3.9.3. Unavoidable Adverse Effects

The conversion of forest cover to maintained (cleared) ROW would permanently change the land use along each alternative. Total amounts of forest cover that would be converted are shown above in Table 3-22. Similarly, the ROW would forever alter the land uses for other types of lands, and the amount of adverse effect would be a function of the alternative route that is selected.

## 3.10 Visual Resources

### 3.10.1. Affected Environment

The USFS' *Landscape Aesthetics: A Handbook for Scenery Management*, defining a Scenery Management System (SMS) (USFS 1995) is the specific manual for evaluating existing landscape character and assessing potential impacts to visual resources. The SMS was developed to provide a standard approach and vocabulary for determining the value, importance, and management of scenery and landscapes within national forests (USFS, 1995). The SMS replaced the Visual Management System (VMS), which was completed in 1974 by USFS. Given that the FMNF is within the proposed Study Area, this section will reference and follow SMS principles and concepts to analyze visual impacts throughout the Study Area.

The FMNF Land and Resource Management Plan was last updated in 1996 (USFS 1996). The timing of the release of the Land and Resource Management Plan did not allow for the Land and Resource Management Plan to include new terminology provided in the SMS (USFS 2008). The description and the analysis of the visual resources will incorporate aspects from both the SMS and the VMS to link the existing FMNF inventory to the current SMS terminology.

As described in the SMS, there are three main components to scenery management, which include: landscape character (including scenic attractiveness), scenic integrity, and visual sensitivity (USFS 1995). Scenic attractiveness is typically mapped and classified as Class A (Distinctive), Class B (Typical), and Class C (Indistinctive). The landscape character of a given area consists of the landforms, vegetation, water features, and cultural modifications (physical changes caused by human activities) that impart an overall visual impression of the area's landscape. Scenic integrity is the degree to which the landscape character deviates from a natural-appearing landscape in line, form, color, and texture of the landscape. In general, natural and natural-appearing landscapes have the greatest scenic integrity. As man-made incongruities are added to the landscape the scenic integrity diminishes. Visual sensitivity incorporates the concept of "viewer groups", including the frequency and distance from which a landscape is viewed and the distance from which elements can be seen. While an area may have a high scenic attractiveness value, if it is not visible to anyone or if the scenic integrity is low, then its visual resource value may not be as high.

### Francis Marion National Forest

FMNF Land and Resource Management Plan specifies the Visual Quality Objectives (VQOs) that will be replaced with scenic integrity objectives, per the SMS. As stated in the Land and Resource Management Plan: "Scenic integrity objectives include very high, high, moderate, low, very low and unacceptably low." These terms will replace the VQO terms, preservation, retention, partial retention, modification and maximum modification" (USFS 2008).

VQOs (and anticipated scenic integrity objectives levels) are as follows:

- Preservation (very high to high)—Management activities are generally not allowed in this setting. The landscape is allowed to evolve naturally.
- Retention (high to moderate)—Management activities are not evident to the casual Forest visitor.

- Partial Retention (moderate to low)—Management activities may be evident, but are subordinate to the characteristic landscape.
- Modification (low to very low)—Management activities may dominate the characteristic landscape but will, at the same time, use naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed as middleground.
- Maximum Modification (very low to unacceptably low)—Management activities may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.

As listed in the Land and Resource Management Plan, the FMNF includes VQOs listed as Preservation (13,812 acres), Retention (24,785 acres), Partial Retention (34,954 acres), Modification (172,078 acres) and 0 acres of Maximum Modification. As such, the largest portion of the park is classified as VQO Modification or low to very low scenic integrity level. Portions of the FMNF with VQOs and within the Study Area are classified as Modification.

**Santee Delta Wildlife Management Area**

The Santee Delta WMA is owned by and management by the SCDNR and is located between the North and South Santee rivers. Primary recreational uses are hunting and bird watching, with 9 miles of hiking or walking trails along the historic rice field dikes. U.S. Highway 17 is the only major roadway that crosses the WMA; smaller two track roads are located within the WMA to provide accessibility for hunting and other recreational activities.

**Description of Landscape Character**

Visual character encompasses the patterns of landform (topography), vegetation, land use, and aquatic resources (i.e., lakes, streams, and wetlands). The visual character is influenced both by natural systems, human interactions, and use of land. In natural settings, the visual character attributes are natural elements such as forested hillsides, open grasslands, or scenic rivers and lakes, whereas rural or pastoral/agricultural settings may include manmade elements such as fences, walls, barns and outbuildings, and occasional residences. In a more developed setting, the visual character may include commercial or industrial buildings, manicured lawns, pavement, and other infrastructure. The most scenic or visually sensitive areas within the Study Area include the North and South Santee rivers and associated boat ramps, U.S. Highway 17, the Santee Delta WMA, and residential communities.

The Study Area is located in the Coastal Plain Ecoregion with three main natural environments (grasslands, pine woodlands, and river bottom) (SCDNR 2005). Given the coastal location of the Project, the Study Area has little topographic relief, which allows for wide views of the landscape, however given the dense forest cover (including forested wetlands) throughout the Study Area, long views are typically not offered due to intervening vegetation, which limits views from a viewer standing at ground level. Places where the viewshed is greatest are areas where there is a natural break in the vegetation (rivers and waterways), areas where forest cover has been cleared (agricultural clearings, residential, or commercial uses), or a human created ROWs (roads, bridges, or utility infrastructure).

Patches of agricultural and residential development exist throughout the Study Area, with two areas of higher concentration north of the North Santee River, immediately adjacent to U.S. Highway 17, and north of the proposed McClellanville Substation. The remainder of the Study Area is primarily evergreen forests, forested wetlands, and coastal marshes. Visually sensitive areas typically include areas of high visitor use, such as popular recreation areas, areas of high visibility, such as major roadways or residential areas, and natural undisturbed settings, such as wilderness areas.

U.S. Highway 17 is often referred to as the “Coastal Highway” and provides north south connectivity along the entire coast of South Carolina and beyond, connecting Myrtle Beach and points north and Charleston and points south. U.S. Highway 17 bridges offer scenic views of the North and South Santee rivers (Photograph 6). Additionally, the North and South Santee rivers are popular destinations for boaters with access provided at a number of locations discussed in detail in Section 3.8, *Recreation and Land Use*. Photograph 7 shows the view from the Pole Yard boat ramp located on the north side of the North Santee River, immediately adjacent to U.S. Highway 17.

**Photograph 6: View from U.S. Highway 17 over the North Santee River, Facing West**

**Photograph 7: View from Boat Ramp on North Santee River, Facing Southeast**

## Scenic Integrity

Some landscapes have a greater ability to absorb alterations with limited reduction in scenic integrity. The character and complexity, as well as environmental factors, influence the ability of a landscape to absorb changes in landscape. A new transmission line next to an existing line provides less contrast, and therefore can be absorbed into that visual landscape better than introducing a transmission line as a new feature in a previously undeveloped area. Scenic integrity refers to the degree of intactness and wholeness of the landscape character. New transmission and substation facilities in areas where existing facilities already exist are more consistent with the scenic integrity. The siting of new transmission lines adjacent to existing lines allows the new lines to “blend-in” with its surroundings.

### Visual Sensitivity and Viewer/User Groups

The viewer and visual distance zones are two factors that influence the potential visual impact of a new route. A viewer is defined as not only the person who is viewing the line, but also as their expectations, activities, and frequency of viewing the line. Three types of viewers were identified within the Study Area.

*Local Residents*

Local residents are those people who live in the area of the proposed transmission line. Residents may view the line from their yards or homes, while driving on local roads, or during other activities in their daily lives. The sensitivity of local residents to the visual impact of the line may be mitigated by frequent exposure to existing transmission lines and other dissonant features already within the viewshed.

*Commuters and Travelers*

Commuters and travelers are people who travel by the transmission line on their way to other destinations. Typically, drivers would have limited views of the transmission line where vegetation or buildings provide screening and where the line crosses high above the road surface. Under these conditions, the visual perception of the line for commuters and travelers is anticipated to be relatively low because they are typically moving and have a relatively short duration of visual exposure to the line. When new visual features persist in the immediate vicinity or directly parallel to the road over long distances, longer visual exposure can be expected.

*Recreational Users*

Recreational users include primarily local residents involved in recreational activities at the North and South Santee rivers, the Santee Delta WMA, and others listed above in Section 3.8, *Recreation and Land Use*. Scenery and visual quality may or may not be an important recreational experience for these viewers. For some recreational users, scenery may be an important part of their experience because their activities may include attentiveness to views of the landscape for long periods. Such viewers also may have a high appreciation for visual quality and high sensitivity to visual change.

To provide an additional level of interpretation to this analysis, impacts to visual resources were also considered with respect to visual distance zones (as described in the USDA *Forest Service Landscape Aesthetics Manual* [USFS 1995]). Distance zones are described below:

- Immediate foreground—This distance zone is 0 to 300 feet from the viewer. At this distance, viewers can discern individual elements of plants (leaves, twigs, and flowers), small mammals and birds, and slight movement. At this level, details are important, and all elements of a transmission line would be visible.

- Foreground—This distance zone is 0 to 0.5 mile from the viewer. At this distance, viewers can discern masses of plant elements (clusters of leaves, tree trunks, large limbs, and masses of flowers), medium-sized mammals, and larger birds. At this level, movement from the wind is discernible at tree boughs and treetops. Individual forms are important, and the conductors, insulators, and structures of the transmission line would be visible.

- Middleground—This distance zone is 0.5 to 4.0 miles from the viewer. At this distance, viewers can discern silhouettes of landscape elements such as tree forms, large boulders, fields of flowers, and small rock outcroppings. Form, texture, color, and pattern are important at this level. In addition, the silhouette of the transmission line structures and ROW clearing would be visible.

- Background—This distance zone is 4.0 miles and beyond to the horizon. At this distance, viewers can discern tree groves, large forest openings, and large rock outcroppings. At this level, vertical distinctions of landforms and horizon lines provide the controlling visual character. The ROW clearing could be visible and possibly the mass of the transmission line structures above the tree canopy in areas where there is no background behind the structure such as along ridge tops. Throughout most of the Study Area, this distance zone would not be visible due to vegetation cover.

- Seldom-seen areas—Seldom-seen areas are an important factor when discussing routing for transmission lines. Topography, vegetation, and lack of access prevent some areas from being seen by most viewers and user groups. People such as hunters, off-trail hikers, utility workers, and oil and gas personnel may occasionally view these areas while traveling off the beaten track.

### 3.10.2. Environmental Effects

#### No-action Alternative

Under the no-action alternative, the proposed Project would not be constructed and the purpose and need for the Project would not be met.

## Proposed Action

The level of visual intrusion created by the Project infrastructure will be described with respect to the different distance zones, types of observers, and observation points, as described above. Additionally, thresholds were used to assess the level of impacts each alternative would have on visual resources. The context and intensity definitions established for this Project are listed in Table 3-27.

**Table 3-27: Visual Resources Impact Context and Intensity Definitions**

| Context (Duration) | Low Intensity | Moderate Intensity | High Intensity |
|---|---|---|---|
| Short term: During construction period<br><br>Long term: Life of the line (50 years) | Proposed changes could attract attention but would not dominate the view or detract from current user activities. | Proposed changes would attract attention, and contribute to the landscape, but would not dominate. User activities would remain unaffected. | Changes to the characteristic landscape would be considered significant when those changes dominate the landscape and detract from current user activities. |

### *General Impacts*

There are six action alternatives as part of the proposed Project. Each alternative represents a different routing approach for the new transmission line between the Belle Isle Substation or a tap point on the Winyah-Belle Isle 115 kV transmission line and the proposed McClellanville Substation. As described in Section 2.5.1, *Transmission Line Characteristics*, the transmission line structures would be single pole and between 70 to 75 feet tall. Construction using COR-TEN "weathering steel" would reduce impacts to visual resources, allowing for the structures to blend into the natural setting because they weather to colors more associated with the surrounding natural environment. Initially, the color of COR-TEN "weathering steel" structures may be a rust orange color; however, after 2 to 3 years the structures will self-rust to a burnt orange to dark brown color. In the short-term, the towers may be more visually obtrusive due to the unnatural color introduced to the landscape; however, in the long term, the colors of the structures would be more consistent with the natural setting of pine and deciduous forests. Concrete and galvanized steel structures would have a greater impact on visual resources, since structures would be a tan or gray color and would contrast against the natural darker colored forested vegetation.

Pine forests in South Carolina typically grow between 60 and 120 feet in height. The proposed transmission structures would be on average 70 to 75 feet; largely below the tree line. If the transmission line is sited in a way that provides a tree buffer between highly visible areas such as roadways, and agricultural or residential areas, it is likely that the transmission lines would be blocked to viewers by intervening vegetation.

*Alternatives Comparison*

All Alternatives exit the Belle Isle Substation in a largely forested and remote area; however, Alternatives A through D exit to the south parallel to U.S. Highway 17 and Alternatives E and F exit to the west from the tap point on the Winyah- Belle Isle transmission line in an undeveloped area. Alternatives A, B, C, and D are immediately adjacent to U.S. Highway 17 for approximately 3 miles. The transmission line ROW would be cleared up to the edge of the road ROW, and no tree buffer would remain between the edge of the ROW and the roadway, resulting in high visibility of the transmission line to all viewers traveling on U.S. Highway 17. Alternatives A and D continue to parallel U.S. Highway 17 south on the east side of the highway. Again, the ROW would be cleared up to the edge of the road ROW, creating an area of high visibility to both users of the highway and a relatively dense area of residential development on the east side of the highway and north of the North Santee River. South of the residential area, Alternatives A and D continue to parallel U.S. Highway 17 and cross the North Santee River immediately adjacent to the Pole Yard boat ramp off U.S. Highway 17 (see Photograph 7). Given the limited number of bridges in the area, all viewers traveling north or south in the Study Area would use the U.S. Highway 17 bridge over the North and South Santee rivers. The view from the bridges offer a break from the confined near ground views typical of the highway through forested areas and provide longer, although brief due to the rate of travel, views up and down the rivers. Construction of Alternatives A and D would be clearly visible to recreation users at the Pole Yard boat ramp, since the transmission line would be in immediate foreground (within 100 feet) of the popular recreation area (see Photograph 7). Alternatives A and D would also cross the Santee Delta WMA immediately adjacent to U.S. Highway 17 as it is the only roadway through the conservation lands. Given the proximity to U.S. Highway 17 and lack of vegetation buffer between the road and new line ROWs, Alternatives A and D would be highly visible to local residents, recreational users, and commuters, resulting in long-term, high intensity impacts to visual resources in the northern portion of the Study Area.

Alternatives B and C would be about 1 mile west of U.S. Highway 17. Residents, recreational users, and commuters on U.S. Highway 17 through the Santee River area could have limited views of the transmission line, through breaks in vegetation. Users of U.S. Highway 17 may be able to see either the transmission structures or the wires as they cross the North and South Santee rivers to the west and in the middleground of the landscape; however, the transmission line features would not dominate the view in either direction and, due to the rate of travel, the viewings would be of very short duration. Alternatives B and C would be visible to the residents of the low density residential area north of the North Santee River. Alternatives B and C would be intermittently visible from the areas of high visual quality and highly traveled roadway, resulting in long-term low to moderate intensity impacts to key visual resource areas in the northern portion of the Study Area.

Alternatives E and F would exit the Belle Isle Substation to the west, and parallel the existing Winyah – Charity 230 kV transmission line for approximately 4 miles. Paralleling existing infrastructure is a standard and preferred routing practice and also helps to minimize impacts to visual resources by conserving the scenic integrity of the area. The new transmission line would be placed next to a previously impacted landscape. Building the new transmission line parallel to an existing transmission line ROW does not create a new ROW scar; it only incremental expands the existing visual impacts as opposed to creating new visual impacts. Additionally, Alternative Routes E and F are located well west of the major residential and visual sensitive areas in the northern portion of the Study Area, resulting in long-term, low-intensity impacts to visual resources.

The southern portion of the Study Area contains part of the FMNF of which all Alternatives cross some portion. All alternatives cross a portion of the FMNF with a VQO of Modification. Alternative Route D is located along U.S. Highway 17 for the majority of its length, however, slightly north of the FMNF Alternative D parallels the edge of USFS land and joins with Alternatives C and F. Alternatives A, B and E are located across USFS land for the longest distance as the route parallels the U.S. Highway 17 ROW, making these alternatives highly visible to travelers on the roadway. Alternatives C, D, and F cross a small portion of the FMNF and are located west of U.S. Highway 17 and not adjacent to any public roadways. Alternatives A, B, and E would have slightly greater visual impacts on the FMNF, since they are located along a well-travelled road and cross a larger portion of the forest; resulting in long-term low to moderate impacts on visual resources. Alternatives C and F would have the least impacts on visual resources within the FMNF due to the short crossing distance and the distance from U.S. Highway 17, resulting in low visual impacts on the FMNF lands.

Approaching the proposed McClellanville Substation, all alternatives would be located within small residential communities near McClellanville. To avoid the development along U.S. Highway 17, Alternatives A, B, and E cross over U.S. Highway 17 and divert from paralleling the roadway and would be sited behind the residential development, then cross U.S. Highway 17 again to enter the McClellanville Substation. Road crossings should be minimized to the extent possible in order to reduce impacts to visual resources. The northern crossing of U.S. Highway 17 would require the construction of an angle structure on either side of the roadway which would be within the viewshed of users of the road. Alternative Routes C, D, and F would be west of the residential development and not cross U.S. Highway 17.

Temporary impacts to visual resources would result during construction from the presence of large construction equipment in the vicinity and on roadways and brightly colored signage and flagging. Given the proximity to U.S. Highway 17, Alternatives A and D would have the short-term moderate to high intensity impacts to visual resources. Alternative Route F would have the lowest intensity, short-term impacts on visual resources since the transmission line would be located away from the major throughways in the Study Area (U.S. Highway 17) and across predominately private lands.

Overall, Alternative Route F would minimize long and short term impacts on visual resources by paralleling existing infrastructure through a forested area and minimizing visual exposure to the largest number of viewers (residential communities, U.S. Highway 17 recreation users on the Santee River, and Pole Yard boat ramp).

### 3.10.3. Unavoidable Adverse Effects

While impacts to visual resources can be minimized by locating the transmission line adjacent to existing infrastructure, away from scenic resources and residential areas, they cannot be completely avoided. Despite minimizing overall impacts to visual resources, the transmission line would be constructed and therefore visible to a portion of the population within the Study Area.

## 3.11 Socioeconomics

### 3.11.1. Affected Environment

The Project is located in a predominantly rural area of Charleston and Georgetown counties, South Carolina. The population that resides within the area of these routes is a small fraction of the overall population in these counties. Berkeley Electric services rural populations in Charleston, Berkeley, and Dorchester counties in South Carolina.

Because the proposed Project would be located within Charleston and Georgetown counties, these two counties, along with the cities of Charleston and Georgetown and the town of McClellanville, represent the primary focus for socioeconomic impacts that may be associated with implementation of the proposed action and the Study Area for the socioeconomic analysis. The county seat in Charleston County is the city of Charleston. The city of Charleston, located 40 miles southwest of McClellanville, does not fall in proximity to the alternative routes. The county seat in Georgetown County, South Carolina is the city of Georgetown. The city of Georgetown, located about 30 miles northeast of the Project, does not fall inside the boundaries of the proposed transmission line corridors.

### Population Characteristics

In 2010, the total population for the combined counties of Charleston and Georgetown was 410,367 residents. Between 2000 and 2010, this population increased by 44,601 or 12.2 percent. Statewide populations grew from 4,012,012 in 2000 to 4,625,364 in 2010, an increase of 612,352 residents or 15.3 percent (U.S. Census 2010a). As Table 3-28 shows, Charleston County has the higher population of the two counties and grew at a faster rate than did Georgetown County during this period. The city of Charleston experienced an even greater level of population growth compared to Charleston County during this period. However, Charleston County grew at a slower rate than the state of South Carolina. Georgetown County experienced a slower, although still positive, growth in comparison to Charleston and the state, while the city of Georgetown experienced the slowest rate of population growth among these areas during this period.

**Table 3-28: Population Change, 2000–2010**

| County/Town | 2000 Census | 2010 Census | Numeric Change 2000–2010 | Percent Change 2000–2010 |
|---|---|---|---|---|
| Charleston County | 309,969 | 350,209 | 40,240 | 13.0% |
| City of Charleston | 96,650 | 120,083 | 23,433 | 24.2% |
| Town of McClellanville | 459 | 499 | 40 | 8.7% |
| Georgetown County | 55,797 | 60,158 | 4,361 | 7.8% |
| City of Georgetown | 8,950 | 9,163 | 213 | 2.4% |
| **Two-County Study Area** | **365,766** | **410,367** | **44,601** | **12.2%** |
| South Carolina | 4,012,012 | 4,625,364 | 613,352 | 15.3% |

Source: U.S. Census (2000 and 2010a)

Overall, these counties are largely rural; in 2010, Charleston County had an average population density of 382.3 people per square mile, and Georgetown County an average of 73.9 people per square mile (U.S. Census 2010b).

The population of South Carolina is expected to increase from 4,625,364 in 2010 to 5,722,720 by 2035, as shown in Table 3-29, which would be a 25 percent increase in population. Over this same period, the population in the Study Area is anticipated to increase from 410,367 in 2010 to a total of 477,140 in 2035, a 15 percent increase in the total population (South Carolina Budget and Control Board 2011).

**Table 3-29: Projected Population Estimates, 2010–2035**

| County | Current | Projected Estimates | | | Numerical Change | Percent Change |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2035 | 2010–2035 | 2010–2035 |
| Charleston County | 350,209 | 366,380 | 386,660 | 396,640 | 49,659 | 14.3% |
| Georgetown County | 60,158 | 69,650 | 76,880 | 80,500 | 20,220 | 33.5% |
| **Total** | **410,367** | **436,030** | **463,540** | **477,140** | **61,161** | **14.7%** |
| South Carolina | 4,625,364 | 5,020,400 | 5,488,460 | 5,722,720 | 1,146,856 | 25.1% |

Source: South Carolina Budget and Control Board (2011)

## Employment and Income

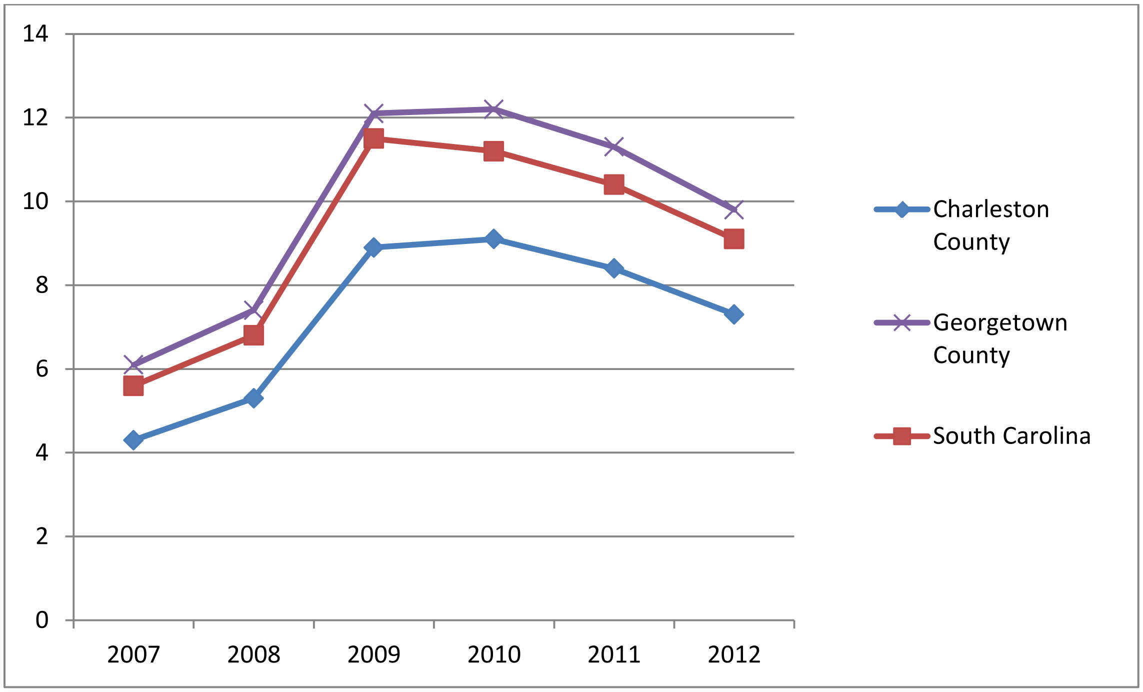
The annual employment levels in the two counties for the years 2007 and 2012 are shown as a comparison with state figures in Table 3-30. Charleston County, with the relatively larger metropolitan area of Charleston, has a larger number of employed persons in comparison to Georgetown County. Employment in Charleston and Georgetown counties has slightly declined between 2007 and 2012.

**Table 3-30: Annual Employment**

| Geography | Employment | | | |
|---|---|---|---|---|
| | 2007 | 2012 | Numeric Change 2007–2012 | Percent Change 2007–2012 |
| Charleston County | 166,348 | 166,172 | -176 | -0.1% |
| Georgetown County | 27,402 | 26,106 | -1,296 | -4.7% |
| **Total (Counties)** | **193,750** | **192,278** | **-1,472** | **-0.8%** |
| South Carolina | 2,010,252 | 1,970,112 | -40,140 | -2.0% |

Source: U.S. Bureau of Labor Statistics (2013)

Charleston County's annual unemployment rates have been consistently below those of both the state and Georgetown County. By contrast, Georgetown County has consistently had annual unemployment rates higher than the state and Charleston County. All geographic areas have had similar trends during this period, with a peak unemployment rates between 2008 and 2010 coinciding with the national economic downturn. Figure 3-10 shows unemployment trends in the Study Area and the state.




Source: U.S. Bureau of Labor Statistics (2013)

**Figure 3-10: Annual Unemployment Rates, 2007–2012**

Employment by industry is presented in Table 3-31. Top employing industries include government and government enterprises, retail trade, accommodation and food services, and health care and social assistance (in descending order) in 2011 in the Study Areas. Between 2010 and 2011, manufacturing increased by the largest percentage in the Study Area, at 13 percent, accounting for 5 percent of the employment in the Study Area in 2011.

The Joint Base Charleston, an amalgamation of the United States Air Force, Charleston Air Force Base, and the United States Navy Naval Support Activity Charleston, is the largest employer in the Charleston metropolitan area. The city of Charleston is home to the Medical University of South Carolina, College of Charleston, The Citadel, The Military College of South Carolina, and Charleston School of Law. Boeing South Carolina is the largest private industry employer in Charleston County (Center for Business Research 2013). The Georgetown County schools, International Paper Company, and county government are three of Georgetown County's major employers while the Georgetown Hospital System is the largest employer in Georgetown County (City of Georgetown 2011; Georgetown County 2013).

Per-capita personal income is the income received by all persons from all sources, including labor earnings, investment income, and transfer payments, divided by the total midyear population (U.S. Department of Commerce 2011a). Table 3-32 summarizes per capita personal income for the Study Area and South Carolina for the years 2000, 2005, and 2011. In 2011, Charleston County had a per capita personal income of $41,656, while that of Georgetown County was $38,403 and that of the state was $33,388. Georgetown County's annual per capita personal income grew by a rate of 20.3 percent between 2000 and 2011, 10 percent and 15 percent faster than Charleston County and the state, respectively.

## Table 3-31: Employment by Industry, South Carolina, Charleston and Georgetown Counties, 2010–2011

| Type of Employment | South Carolina | | | Charleston | | | Georgetown | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2010 | 2011 | % Change | 2010 | 2011 | % Change | 2010 | 2011 | % Change |
| Total employment | 2,451,224 | 2,481,658 | 1% | 292,738 | 301,966 | 3% | 36,610 | 36,440 | 0% |
| Farm employment | 29,025 | 28,889 | 0% | 477 | 478 | 0% | 389 | 390 | 0% |
| Forestry, fishing, and related activities | 10,381 | 10,467 | 1% | 494 | 480 | -3% | 519 | 556 | 7% |
| Mining | 3,581 | 3,894 | 9% | 172 | 186 | 8% | 97 | 105 | 8% |
| Utilities | 12,395 | 12,215 | -1% | 641 | 639 | 0% | (D) | 19 | 0% |
| Construction | 128,614 | 123,623 | -4% | 14,445 | 14,135 | -2% | 2,381 | 2,175 | -9% |
| Manufacturing | 214,780 | 223,359 | 4% | 11,748 | 13,389 | 14% | 1,995 | 2,225 | 12% |
| Wholesale trade | 70,888 | 71,701 | 1% | 6,872 | 6,671 | -3% | 596 | 553 | -7% |
| Retail trade | 269,083 | 270,538 | 1% | 29,689 | 30,438 | 3% | 3,988 | 3,993 | 0% |
| Transportation and warehousing | 62,239 | 63,498 | 2% | 9,363 | 10,116 | 8% | (D) | 490 | 0% |
| Information | 31,849 | 31,768 | 0% | 4,713 | 4,666 | -1% | 220 | 211 | -4% |
| Finance and insurance | 102,705 | 104,486 | 2% | 10,766 | 11,055 | 3% | 1,453 | 1,479 | 2% |
| Real estate and rental and leasing | 108,135 | 109,428 | 1% | 17,852 | 18,695 | 5% | 3,104 | 3,001 | -3% |
| Professional, scientific, and technical services | 119,228 | 123,939 | 4% | 20,643 | 21,260 | 3% | 1,649 | (D) | 0% |
| Management of companies and enterprises | 16,061 | 16,777 | 4% | 1,139 | 1,286 | 13% | 542 | (D) | 0% |
| Administrative and waste management services | 173,799 | 182,527 | 5% | 23,515 | 25,141 | 7% | 2,545 | 2,494 | -2% |
| Educational services | 39,009 | 40,394 | 4% | 4,913 | 5,104 | 4% | 291 | 280 | -4% |
| Health care and social assistance | 197,547 | 200,446 | 1% | 26,620 | 27,523 | 3% | 2,927 | 2,875 | -2% |
| Arts, entertainment, and recreation | 45,360 | 46,400 | 2% | 6,226 | 6,256 | 0% | 1,191 | 1,174 | -1% |
| Accommodation and food services | 195,865 | 198,879 | 2% | 27,265 | 28,000 | 3% | 3,317 | 3,473 | 5% |
| Other services, except public administration | 222,813 | 225,494 | 1% | 19,401 | 19,679 | 1% | 3,661 | 3,747 | 2% |
| Federal, civilian | 34,365 | 32,828 | -4% | 8,526 | 8,723 | 2% | 169 | 129 | -24% |
| Military | 54,501 | 54,069 | -1% | 11,519 | 11,854 | 3% | 305 | 295 | -3% |
| State and local | 309,001 | 306,039 | -1% | 35,739 | 36,192 | 1% | 4,764 | 4,609 | -3% |

Source: U.S. Department of Commerce (2011a) D: data not disclosed

**Table 3-32: Annual Per Capita Personal Income (in $1,000s, 2011 Dollars)**

| Geography | Income | | | |
|---|---|---|---|---|
| | 2000[a] | 2005[a] | 2011 | Percent Change 2000–2011 |
| Charleston County | $37,995 | $41,108 | $41,656 | 9.6% |
| Georgetown County | $31,914 | $36,355 | $38,403 | 20.3% |
| South Carolina | $31,897 | $33,326 | $33,388 | 4.7% |

Source: U.S. Department of Commerce (2011b)

[a] Adjusted for inflation to 2011 dollars

## Housing Resources

In 2013, there were approximately 7 hotels in the city of Georgetown and approximately 25 hotels east of the city of Charleston, in and around Mt. Pleasant, South Carolina.

In 2011, Charleston County had more housing units than Georgetown County, with a majority of the households residing outside the city of Charleston. Approximately 17 percent of all households in Charleston County were vacant, while Georgetown County had a vacancy rate of approximately 33 percent. McClellanville had a vacancy rate of 34 percent, while the cities of Charleston and Georgetown had vacancy rates of 14 and 26 percent, respectively (Table 3-33).

**Table 3-33: 2011 Household Characteristics**

| Geography | Total Housing Units | Vacant Housing Units | Percent Vacancy Rate |
|---|---|---|---|
| Charleston County | 168,768 | 29,506 | 17% |
| City of Charleston | 57,631 | 7,890 | 14% |
| Town of McClellanville | 275 | 94 | 34% |
| Georgetown County | 33,563 | 11,234 | 33% |
| City of Georgetown | 4,500 | 1,191 | 26% |
| South Carolina | 2,117,357 | 358,625 | 17% |

Source: U.S. Census (2011)

## Property Taxation

In South Carolina, each class of property is assessed at a ratio unique to that type of property. The assessment ratio is applied to the market value of the property to determine the assessed value of the property. Utility property, such as transmission lines, has an assessment ratio of 10.5 percent. Utility property is assessed by the South Carolina Department of Revenue, which applies a state mill levy to the assessed value to property taxes. For the 2010–2011 year, utility, pipeline, and railroads accounted for 6.9 percent of the assessed value for all types of property in the state (South Carolina Department of Revenue 2013). Charleston and Georgetown counties both had millage rates of 0.0530 in the year 2011 (South Carolina Association of Counties 2012).

### Timber

In 2011, there were approximately 13,120,508 acres of forestland in the state of South Carolina with a stumpage timber value of $351.9 million. There were approximately 303,505 acres of forestland in Charleston County and 417,106 acres of forestland in Georgetown County, representing 2.3 and 3.2 percent of the total forestland in the state of South Carolina, respectively. Stumpage timber had a value of $5,941,575 in 2011 in Charleston County and $15,053,158 in Georgetown County, which represented 1.7 and 4.3 percent of the total stumpage timber value in the state of South Carolina in 2011 (South Carolina Forestry Commission 2011). Table 3-34 summarizes these figures.

**Table 3-34: Value of Timber Delivered to Forest Product Mills in 2011**

| Geography | Acres of Forestland Acres (percent of state total) | Stumpage Timber Value Dollars (percent of state total) |
|---|---|---|
| Charleston County | 303,505 (2.3) | $5,941,575 (1.7) |
| Georgetown County | 417,106 (3.2) | $15,053,158 (4.3) |
| South Carolina | 13,120,508 | $351,928,961 |

Source: South Carolina Forestry Commission (2011)

## 3.11.2. Environment Effects

Impacts on socioeconomic resources include how the proposed Project could potentially affect elements of the human environment such as population, employment, income, property values, housing, and public services. The effects from the proposed Project on many of these factors are not limited to the ROW, but would result in impacts across the wider geographic area, affecting the two-county Study Area. However, some effects, such as property values, would likely only affect residences within proximity to the proposed Project. The majority of potential Project-induced impacts on social and economic conditions would occur during the construction stage of Project, and therefore, are generally short term and low when compared to all the activities distributed across the larger regional area.

This section discusses the potential effects of the proposed Project on the various social and economic characteristics throughout the Study Area. Economic impacts include impacts that individuals, groups, properties, and businesses would experience from a change in business and economic activity as a result of the proposed Project alternatives. Social impacts are borne by individuals or groups who could experience a change in their social structure and context.

The intensity of impacts on socioeconomic conditions can be described through the thresholds described in Table 3-35.

**Table 3-35: Socioeconomic Impact Context and Intensity Definitions**

| Context (Duration) | Low Intensity | Moderate Intensity | High Intensity |
|---|---|---|---|
| Short term: During construction period<br><br>Long term: Life of the line (50 years) | A few individuals, groups, businesses, properties, or institutions would be impacted. Impacts would be minor and limited to a small geographic area. These impacts are not expected to substantively alter social and/or economic conditions. | Many individuals, groups, businesses, properties, or institutions would be impacted. Impacts would be readily apparent and detectable across a wider geographic area and could have a noticeable effect on social and/or economic conditions. | A large number of individuals, groups, businesses, properties, or institutions would be impacted. Impacts would be readily detectable and observed; extend to a wider geographic area, possibly regionally; and would have a substantial influence on social and/or economic conditions. |

### No-action Alternative

Under the no-action alternative, the Project would not be constructed. There would be no change in socioeconomic conditions due to the construction of the Project under the no-action alternative because direct and indirect revenues and tax receipts from construction of the Project would not be realized (construction wages, spending in the communities, and property taxes, among others).

Under the no-action alternative, improved electric reliability and power quality in the Project Area would not be achieved. The transmission line would not be built, and the current aging distribution line would result in inadequate and unreliable electric service. The load growth would be capped at the projected 2015 load level, no new load growth could be accommodated, and transmission system reliability would decrease. The no-action alternative would indirectly impact existing socioeconomic conditions because local communities and the region would not benefit from the improved electric reliability and power quality anticipated from the Project. This could lead to increasing frequency and duration of power outages in the region.

### Proposed Action

Construction and operation of any of the altnerative routes would result in socioeconomic impacts, including:

- Improved electric reliability and increased capacity for existing and future customers.
- Temporary increase in population as a result of the influx of construction workers.
- Temporary increase in demand for temporary lodging facilities as a result of the influx of construction workers.
- Temporary increase in demand associated with spending on local goods, services, and construction materials.
- Potential changes to property values.
- Minimal reductions in timber production would occur from loss of land for structure placement and ROW clearing to maintain appropriate electrical clearances.

The continued reliability of electric service to the region is necessary to serve the current and future needs of businesses, housing, and infrastructure to allow the economy of the area to continue to operate.

An annual average workforce of approximately 21 workers would occur over the 3-year life of Project implementation, with a peak of 40 workers in the second year of the Project. The types of Project tasks and associated jobs include engineering surveys, permitting, environmental surveys and studies, ROW acquisition and easements, ROW clearing and preparation, and construction of the transmission line and substation. The actual construction activity would occur during the last 12 to 16 months of the 3-year Project implementation period.

The majority of Project workers are likely to temporarily relocate to the Project Area because transmission Project construction requires a specialized expertise and workforce. A small number of local construction workers could be retained for more general activities. Only a few workers would be hired locally, and permanent jobs are not anticipated to be introduced to the area as a result of the operation of the proposed Project.

Because the routes range from 16 to 20 miles, it is likely that workers would temporarily reside in the cities of Georgetown or Charleston during construction and commute to the various portions of the route as construction proceeds. Total earnings of the 21 construction workers would be approximately $1.1 million annually, based on average earnings for construction jobs in Study Area counties (U.S. Department of Commerce, Bureau of Economic Analysis 2013).[5] These earnings represent 0.01 percent of the earnings within Study Area counties, which were $16.4 billion in 2011(U.S. Department of Commerce, Bureau of Economic Analysis 2013).

Because construction workers spend their money in the local area, revenues would likely increase for some local businesses, such as hotels, restaurants, gas stations, and grocery stores, supporting jobs and incomes for these businesses and their employees. Because construction and other Project workers are not anticipated to be permanent residents of the Study Area, induced spending would be considerably less than locally residing employees because construction workers would send a portion of their earnings to their home area. Overall, the spending would be short term and is likely to have low socioeconomic impacts on the overall region with no detectible changes in socioeconomic conditions in the Study Area.

The Study Area has experienced an increase in population over the past decade with the addition of 44,601 new residents between 2000 and 2010, a 12.2 percent increase (U.S. Census 2000, 2010a). Over the 3-year construction period, there would be a temporary average population increase of 21 people with a peak of 40 workers in the Study Area as a result of the Project. Larger municipalities in proximity to the Project, including Charleston and Georgetown, are likely to house the temporary residents in housing rentals, hotels or motels, or other housing accommodations in these cities. Temporary population changes in local communities would be low, particularly compared to the total population in the Study Area.

During construction activities, short-term impacts on nearby residents as a result of the proposed Project would include increased noise, visual presence of construction equipment, and potential traffic resulting from the movement of heavy material haul trucks that would likely slow vehicular movements, and may close lanes during specific types of transmission line work. Long-term impacts on nearby residents as a result of operation of the proposed Project would include minor, infrequent disturbance during ROW maintenance or repair activities. Impacts on property values are discussed below.

New ROWs for the construction and maintenance of the action alternatives would be required to support the proposed Project. Existing access roads would be used where possible. Central Electric would pay market value to nonfederal landowners, as established through the appraisal process, for any new land rights and easements

[5] Average earnings for construction workers of $52,883.30 in 2011, the latest year for which employment data are available, was based on data available for Charleston and Georgetown counties.

necessary to support the development of the Project. The appraisal process considers all factors affecting land value, including the impact of transmission lines on property value. The appraisals may reference studies conducted on similar properties to support their conclusions. The strength of any appraisal depends on the individual analysis of the property, using neighborhood-specific market data to determine market value.

The impact of introducing a new ROW for transmission structures and lines can vary dramatically depending on the placement of the ROW in relation to the property's size, shape, and location of existing structures. A transmission line may diminish the utility of a portion of property if the line effectively severs this area from the remaining property and subsequently alters existing land use patterns. These factors as well as any other elements unique to the property are taken into consideration to determine any loss in value within the easement area, as well as outside the easement area in cases of severance.

Whenever land use changes, the concern is often raised about the effect the change may have on property values nearby. The question of whether nearby transmission lines can affect residential property values has been studied extensively in the United States and Canada over the last 20 years or so, with mixed results. In general, the impacts are difficult to measure, vary among individual properties, and are influenced by a number of interplaying factors, including:

- Proximity of residential properties to transmission line structures.
- Type and size of high-voltage transmission line structures.
- Appearance of easement landscaping.
- Surrounding topography (Jackson and Pitts 2010).

Pitts and Jackson (2007) summarize the following conclusions on the impacts of high-voltage transmission lines.

- When negative impacts are present, studies report an average decline of prices from 1 to 10 percent.
- Value diminution is attributable to the visual unattractiveness of the lines, potential health hazards, disturbing sounds, and safety concerns.
- Where property value impacts were present, the effect dissipated with time and distance.

- Impacts diminish as the distance between the high-voltage transmission lines and the affected properties increase, and generally disappear at a distance of 200 feet from the lines (when views are obstructed).
- Where views of transmission lines and towers are completely unobstructed, negative impacts can extend up to 0.25 mile.
- If high-voltage transmission-line structures are at least partially screened from view by trees, landscaping, or topography, any negative effects are reduced considerably.
- Value diminution attributed to high-voltage transmission-line proximity is temporary and usually decreases over time, disappearing completely in 4 to 10 years.

A recent study of sales of rural land parcels in central Wisconsin between 2002 and 2008 found small, but not statistically significant negative price effects on the sale of properties encumbered by a transmission line easement (Jackson 2010). Studies of impacts during periods of physical change, such as new transmission line construction or structural rebuilds, generally reveal greater short-term impacts than long-term effects. However, most studies have concluded that other factors (e.g., general location, size of property or structure, improvements, irrigation potential, condition, amenities, and housing supply and demand factors in a specific market area) are far more important criteria than the presence or absence of transmission lines in determining the value of residential real estate.

Some impacts on property values (and salability) might occur on an individual basis as a result of the new transmission line. Depending on the alternative, there are from 9 to 43 residences within 500 feet (approximately 1/10th of a mile), and from 32 to 121 residences within 0.25 mile of the action alternatives. Table 3-36 compares the number of residential structures within various proximities to the alternative routes.

**Table 3-36: Residences in Proximity to the Alternative Routes**

| Residence Distance | Alt. A | Alt. B | Alt. C | Alt. D | Alt. E | Alt. F |
|---|---|---|---|---|---|---|
| Residences within 300 feet | 22 | 5 | 2 | 19 | 4 | 1 |
| Residences within 500 feet | 48 | 9 | 9 | 43 | 8 | 8 |
| Residences within 0.25 mile | 121 | 68 | 51 | 98 | 56 | 32 |

Alternative Routes A and D have predominantly more residences located in proximity to the routes, which is due to their siting along U.S. Highway 17. As Figure 3-8 shows (Section 3.9), most of the residences along Alternative Routes A and D are located along the west side of U.S. Highway 17, not far off of the highway. The siting of Alternative Routes A and D is likely to occur on the east side of the highway. The transmission line will be visible from these houses along U.S. Highway 17, although the existing highway and its current developed character would diminish the visual effects associated with the transmission line. The remaining residences located off U.S. Highway 17 are primarily located in forested areas, which would also obstruct the views of the transmission lines from these residences.

As a result, the introduction of the proposed Project is anticipated to result in low adverse effects on property values. These impacts would be highly variable, individualized, and unpredictable. The majority of these losses would be temporary in nature because property value effects associated with transmission lines tend to dissipate with time.

The construction, operation, and maintenance of the proposed Project would generate additional property tax revenues to counties where the transmission line would be sited. There are between 16 and 20 miles of transmission lines associated with the proposed alternatives, depending on the final alternative chosen. The state of South Carolina would assess property taxes on the transmission line based on the value of the property, using the unit valuation method. Average construction costs for engineering, materials, equipment, and labor is estimated to be $457,000 per mile plus an additional $675,000 for each alternative for additional requirements for river crossings.

The unit valuation method includes a cost- and income-based assessment to determine property taxes. It is likely that the cost-based approach would be used for the first few years at the end of construction and initial operation of the line, and income-based and cost-based approaches (through reconciliation) would be used for the majority of the operation of the line (Ingram 2013). The cost-based approach to valuation would decrease as the constructed cost is depreciated over time. The first year’s property taxes would range from $45,000 to $55,000 depending on the alternative route. As the line becomes operational, the values would be depreciated, with annual decreases in property tax receipts, and eventually the annual receipts would approach those of the income-based approach. Table 3-37 summarizes these tax receipts to county governments that would be associated with the transmission line of the proposed Project. Additional property taxes would be associated with the substation.

Construction and operation of one of the action alternatives would result in both short- and long-term impacts on agricultural land. During construction, potential short-term impacts within the ROW would include crop damage (depending on the time of year for construction across specific fields), soil disturbance, and potential loss of production for one growing season as a result of construction activities and the transport of construction equipment and vehicles restricting or preventing planting of lands within or adjacent to the ROW.

**Table 3-37: Property Tax Revenues to Study Area Counties Associated with the Alternative Routes**

| Geography | Miles | Construction Period and Initial Operation (Annual) | Income-Based Approach (Annual) |
|---|---|---|---|
| **Alternative A** | | | |
| Charleston | 7.6 | $21,167 | $2,328 |
| Georgetown | 8.5 | $23,541 | $2,590 |
| Study Area Counties | 16.1 | $44,708 | $4,918 |
| **Alternative B** | | | |
| Charleston | 8.4 | $23,252 | $2,558 |
| Georgetown | 7.9 | $21,919 | $2,411 |
| Study Area Counties | 16.3 | $45,171 | $4,969 |
| **Alternative C** | | | |
| Charleston | 7.7 | $21,565 | $2,372 |
| Georgetown | 7.7 | $21,993 | $2,419 |
| Study Area Counties | 15.7 | $43,558 | $4,791 |
| **Alternative D** | | | |
| Charleston | 7.6 | $21,061 | $2,317 |
| Georgetown | 8.5 | $23,546 | $2,590 |
| Study Area Counties | 16.1 | $44,607 | $4,907 |
| **Alternative E** | | | |
| Charleston | 8.6 | $23,473 | $2,582 |
| Georgetown | 11.4 | $31,055 | $3,416 |
| Study Area Counties | 19.9 | $54,529 | $5,998 |
| **Alternative F** | | | |
| Charleston | 7.7 | $21,209 | $2,333 |
| Georgetown | 11.4 | $31,151 | $3,427 |
| Study Area Counties | 19.1 | $52,360 | $5,760 |

Source: Ingram (2013)

Note: Assumptions: Millage Rate: 0.0530; Assessment Ratio: 0.105; Capitalization Rate: 0.11.

Very little cultivated cropland exists within the ROW, with all alternative routes having 0.5 percent or less within the 2,000 foot corridor (a 2,000 foot corridor was used due to the spatial resolution of the data). The majority of impacts would be short term and occur during construction activities. Similarly, there is very little grassland and pasture/hay land in the Study Area. Construction activities are expected to have a short-term impact on cattle grazing activities because cattle may need to be moved during construction activities in areas where the ROW would cross grassland or pasture.

Between approximately 110 acres, for Alternative Route A, and 134.5 acres, for Alternative Route E, of the ROW would cross through forested areas and require tree clearing. Additional danger trees located outside of the ROW may also require clearing. All tall-growing vegetation would be cut to prevent vegetation from coming close enough to the conductor to cause an electric arc. There would be some positive economic effects associated with the timber harvest associated with the ROW clearing. However, it is likely that this effect would be minimal and short term. Where the ROW crosses private lands, Central Electric would compensate landowners for the reduced timber production at fair market value for the timber and other land values.

Impacts associated with the construction of the alternatives are anticipated to be short term and would cease once the line is in service. Because of the temporary nature of construction activities, few to no families are expected to accompany construction workers to the Study Area. As a result, there would be negligible impacts on schools and enrollment.

The action alternatives would provide an increase in the load-serving capacity to accommodate the long-term electrical needs of the region. Projected load growth would be accommodated, and the reliability of the regional transmission system would be maintained, continuing to serve the electricity needs of the area.

Capital expenditures for improvements to electric-utility infrastructure are investments made to serve customers. Central Electric's customers primarily include 20-member rural electric systems, all located in the state of South Carolina. Capital expenditures can be passed on to customers in the form of increased rates. However, as a regulated utility, Central Electric can increase rates only on approval by state utility commissions or FERC. FERC and state utility commissions must approve rates for sale of wholesale electricity and review rates set by the federal Power Marketing Administrations. Such rate-increase requests are subjected to rigorous analysis by regulators and others as well as a public process. At this time, not all costs for development of the proposed Project are known; therefore, Central Electric cannot predict what the rate increase may be as a result of this Project. In addition to electrical support for the area, Project construction would itself generate a certain amount of economic activity. While minimal when compared to the current sales throughout the region, the presence of approximately 21 construction workers over a 3-year period would generate additional sales of food, fuel, lodging, and services (primarily vehicle and equipment repairs).

Construction activity would also require concrete, aggregate, lumber, and hardware items. Many of these materials would likely be purchased locally, contributing further to local sales. Most materials for the transmission structures and conductors would be shipped from manufacturers outside the region. However, many of these materials would be subject to sales and taxes payable to local governments.

The action alternatives would not influence long-term employment in the Study Area. Non-residential construction workers would spend a portion of their earnings in the Study Area, contributing to jobs and income across the region. Because these workers will only be in the area temporarily and are likely to be primarily from outside the region, induced employment and income is expected to be short term and low. No long-term employment would be necessary to support the operation of the proposed Project. The local population would increase temporarily, with low and short-term impacts on socioeconomic conditions.

### 3.11.3. Cumulative Effects Analysis

Recently, U.S. Highway 17 was widened from Cooper River to Mt. Pleasant. However, this project is located approximately 30 miles south of the Study Area. Additionally, timber harvesting currently occurs and is expected to occur in the future in the area of the Project. Cumulative impacts associated with construction and timber harvesting traffic, road closures, and visual impacts are anticipated to be short term and minor in the Project Area. The contribution of the Project to these cumulative effects would be negligible.

### 3.11.4. Unavoidable Adverse Effects

Potential unavoidable impacts on socioeconomic resources would include the loss of farm production or grazing lands due to structure placement. Any timber resources within the ROW would also be lost. Although landowners would be compensated for the easements, a loss in farming or timber production would still occur.

## 3.12 Environmental Justice

### 3.12.1. Affected Environment

On February 11, 1994, President Clinton issued Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. Executive Order 12898 directs agencies to address environmental and human health conditions in minority and low-income communities so as to avoid the disproportionate placement of any adverse effects from federal policies and actions on these populations. The general purposes of this executive order are to:

- Focus the attention of federal agencies on human health and environmental conditions in minority communities and low-income communities with the goal of achieving environmental justice.
- Foster nondiscrimination in federal programs that substantially affect human health or the environment.
- Improve data collection efforts on the impacts of decisions that affect minority communities and low-income communities and encourage more public participation in federal decision-making by ensuring documents are easily accessible (e.g., available in multiple languages and made readily available).

As defined by the *Environmental Justice Guidance Under NEPA* (CEQ 1997), “minority populations” include persons who identify themselves as Asian or Pacific Islander, Native American or Alaskan Native, Black (not of Hispanic origin), or Hispanic. Race refers to census respondents’ self-identification of racial background. Hispanic origin refers to ethnicity and language, not race, and may include persons whose heritage is Puerto Rican, Cuban, Mexican, and Central or South American.

A potential environmental justice minority population exists where the percentage of minorities in an affected area either exceeds 50 percent or is meaningfully greater than in the general population. For the purposes of this analysis, meaningfully greater represents a population that is 10 percent higher than the benchmark or reference region; in this case, the reference or benchmark geographic area is the county within which the census block group or block resides.

Potential environmental justice low-income populations are identified using the Census Bureau’s statistical poverty threshold, which is based on income and family size. The Census Bureau defines a “poverty area” as a block or block group with 20 percent or more of its residents below the poverty threshold. A block group is a statistical division within a census tract, which is a small geographic subdivision of a county, and typically contains between 600 and 3,000 persons (U.S. Census 2013a). A census block is a division within census block group. A census block is defined as a statistical area bounded by visible features, such as streets and roads and nonvisible features, such as selected property lines and city limits. Census blocks nest within all other tabulated census geographic entities and are the basis for all tabulated data (U.S. Census 2013b).

The Study Area for the environmental justice analysis is defined by Census block group and blocks, which provides the finest level of analysis for the 2010 Census data, for any direct and indirect impacts on low-income or minority populations that may be associated with the implementation of the proposed action. The reference region, or region of comparison, for this analysis is Georgetown or Charleston counties.

There are 281 Census block groups within Charleston and Georgetown counties. In 2010, a total of 93 of these block groups had at least 20 percent of their population living below the poverty level. These 93 block groups represent approximately 33 percent of all block groups within these counties. Poverty data are only available by Census Block.

In 2010, both counties had a combined total of 117 block groups with minority populations where the percentage of respondents identifying themselves as a minority either exceeded 50 percent of the total population of the block group or made up a proportion of the block group population that was at least 10 percent or higher than the minority population at the respective county level. These 117 block groups represented approximately 42 percent of all block groups within the two counties.

Since racial and ethnicity characteristics are available at the Census block level, a block level analysis was also undertaken for these geographies. Charleston and Georgetown counties had a combined total of 18,457 census blocks in 2010; 5,785 had minority populations that meet the thresholds described above. These blocks represent approximately 31 percent of all blocks within the two counties.

### 3.12.2. Environmental Effects

Definitions for duration and intensity of impacts to environmental justice populations established for this Project are described in Table 3-35.

#### No-action Alternative

Under the no-action alternative, the proposed Project would not be constructed. As described in Chapter 1, the McClellanville Circuit experiences more reliability issues than does the average Berkeley Electric Circuit, adversely affecting populations in the Study Area. The no-action alternative would continue this condition and result in continued adverse impacts to the region. Therefore, because the service area of the McClellanville Circuit is made up of predominantly minority and low income communities, as described below, there would be a disproportionate adverse impact on minority and/or low-income populations as a result of the no-action condition resulting in a long-term environmental justice impact.

### Proposed Action

The alternative routes are located in five block groups in Charleston and Georgetown counties. One of these block groups contains a potential environmental justice minority population, while three contain both potential impoverished and minority environmental justice populations. One did not contain either a potential impoverished or minority environmental justice population. These block groups are identified in Table 3-38 and Figure 3-11.

As shown in Table 3-38, Alternative Routes A and D contain the highest number of residences within minority block groups while Alternative Route F contains the fewest number of residences residing within any block group.

**Table 3-38: Census Block Groups with Residences in the Study Area, Impoverished and Minority Populations, 2010**

| Block Groups with Counties | Population Status | Alt. A | Alt. B | Alt. C | Alt. D | Alt. E | Alt. F |
|---|---|---|---|---|---|---|---|
| **Residences within 500 feet/1,000 foot corridor** | | **43** | **9** | **9** | **43** | **8** | **8** |
| Charleston County | | | | | | | |
| 45.019.005000.4 | Minority Area | 8 | 8 | 8 | 8 | 8 | 8 |
| Georgetown County | | | | | | | |
| 45.043.920800.3 | Minority and Poverty Area | 35 | 1 | 1 | 35 | - | - |
| **Residences within 1,320 feet/2,640 foot corridor** | | **121** | **68** | **51** | **98** | **56** | **32** |
| Charleston County | | | | | | | |
| 45.019.005000.3 | Minority and Poverty Area | 1 | - | - | 1 | - | - |
| 45.019.005000.4 | Minority Area | 54 | 55 | 38 | 31 | 55 | 31 |
| Georgetown County | | | | | | | |
| 45.043.920800.2 | Minority and Poverty Area | 1 | - | - | 1 | - | - |
| 45.043.920800.3 | Minority and Poverty Area | 65 | 13 | 13 | 65 | 1 | 1 |

Source: U.S. Census (2010c, d)

Figure 3-12 identifies minority communities at the block level in the Study Area. Poverty data are not available at the block level. There are 29 blocks in the Study Area. Of these total blocks, 19 were identified as having potential minority environmental justice populations. Two were identified as not having potential minority environmental justice populations. Eight did not have enough data available to make a determination on the status of minority in these census blocks. Concurrent with the findings at the block group level, Alternative Routes A and D contain the highest number of residences within minority blocks while Alternative Route F contains the fewest number of residences residing within any block (see Appendix H for data by block).

Each of the alternatives would be assumed to contribute positively to all populations, including minority and low income communities, through additional fiscal receipts to counties. Additionally, these populations would benefit from improved electricity reliability and power quality. However, these populations also could be adversely affected by potential Project-induced impacts on additional resource areas (e.g., traffic, air quality, and visual resources).

Air quality, noise, and traffic impacts are anticipated to be short-term with air emission dispersion limited to the vicinity of construction activities. The 0.25-mile buffer for Alternative Routes A and D contains the highest number of residences among the alternatives while this same buffer for Alternative Route F contains the least number of residences. Therefore, Alternative Routes A and D have the highest potential for environmental justice impacts while Alternative Route F has the lowest potential for environmental justice impacts. Not all the residences that reside within the buffer and a block or block group that have statistically impoverished or minority populations would be considered an impoverished or minority household. It is therefore possible that fewer residences than those identified in the tables above would experience potential environmental justice impacts. Impacts resulting from the construction of the line would be temporary and occur only during the construction period. As portions of the transmission line are constructed, the area of impact would transition down the line to the next construction site, resulting in impacts that would be less than if the entire population along the line were impacted during the whole construction period. However, some short-term disproportionate adverse impacts as result of construction activities would still occur to minority and low income communities resulting in short-term environmental justice impacts.

Following construction, impacts would primarily be limited to land use restrictions within the ROW and the presence of the transmission line and structures on properties. It is possible that some residents would experience adverse visual impacts as a result of the construction of the new transmission line. Central Electric could mitigate these impacts with adjustments to alignment to provide a forested buffer between the highway and the transmission line and/or by providing landscaping or vegetation features.

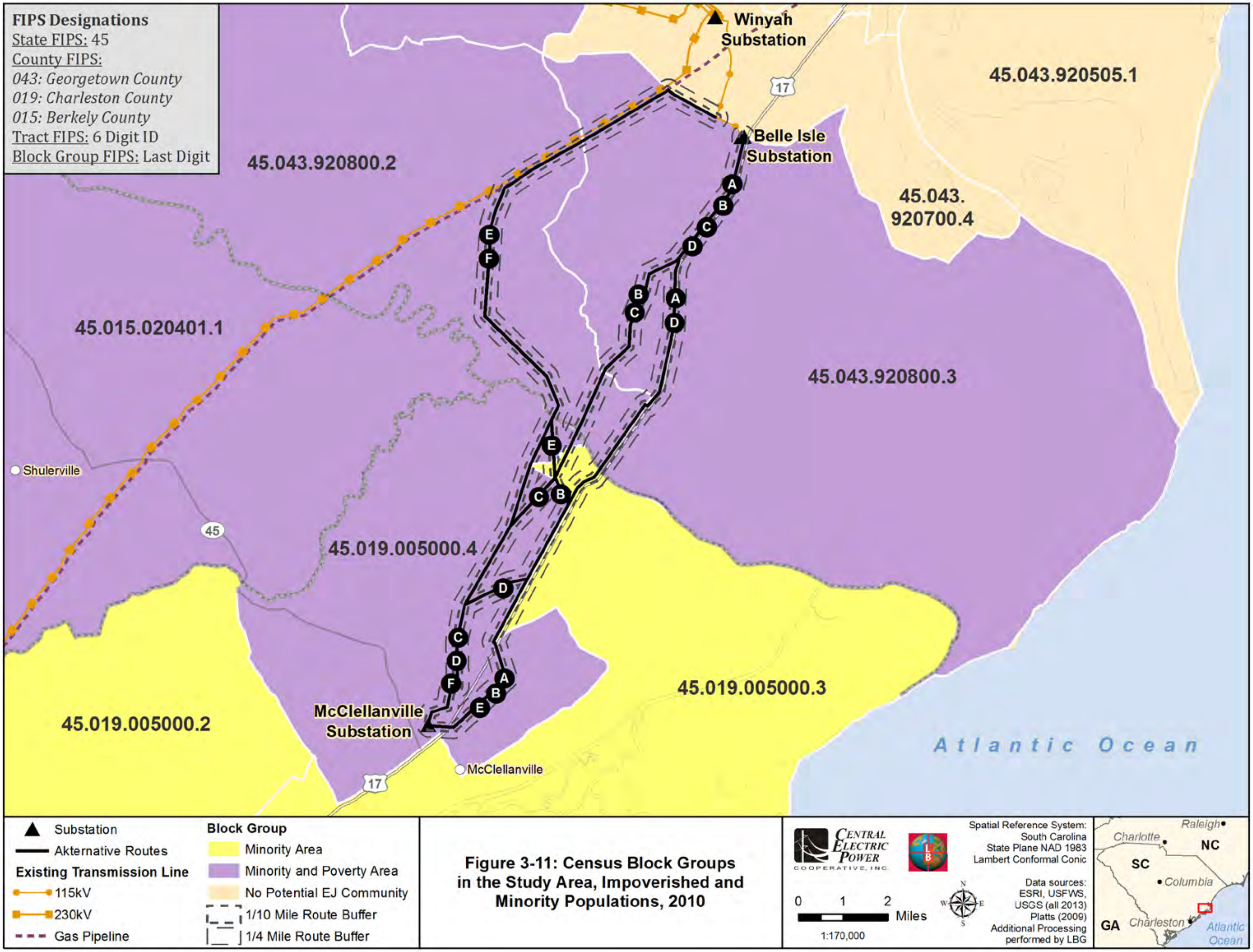



**Figure 3-11: Census Block Groups in the Study Area, Impoverished and Minority Populations, 2010**

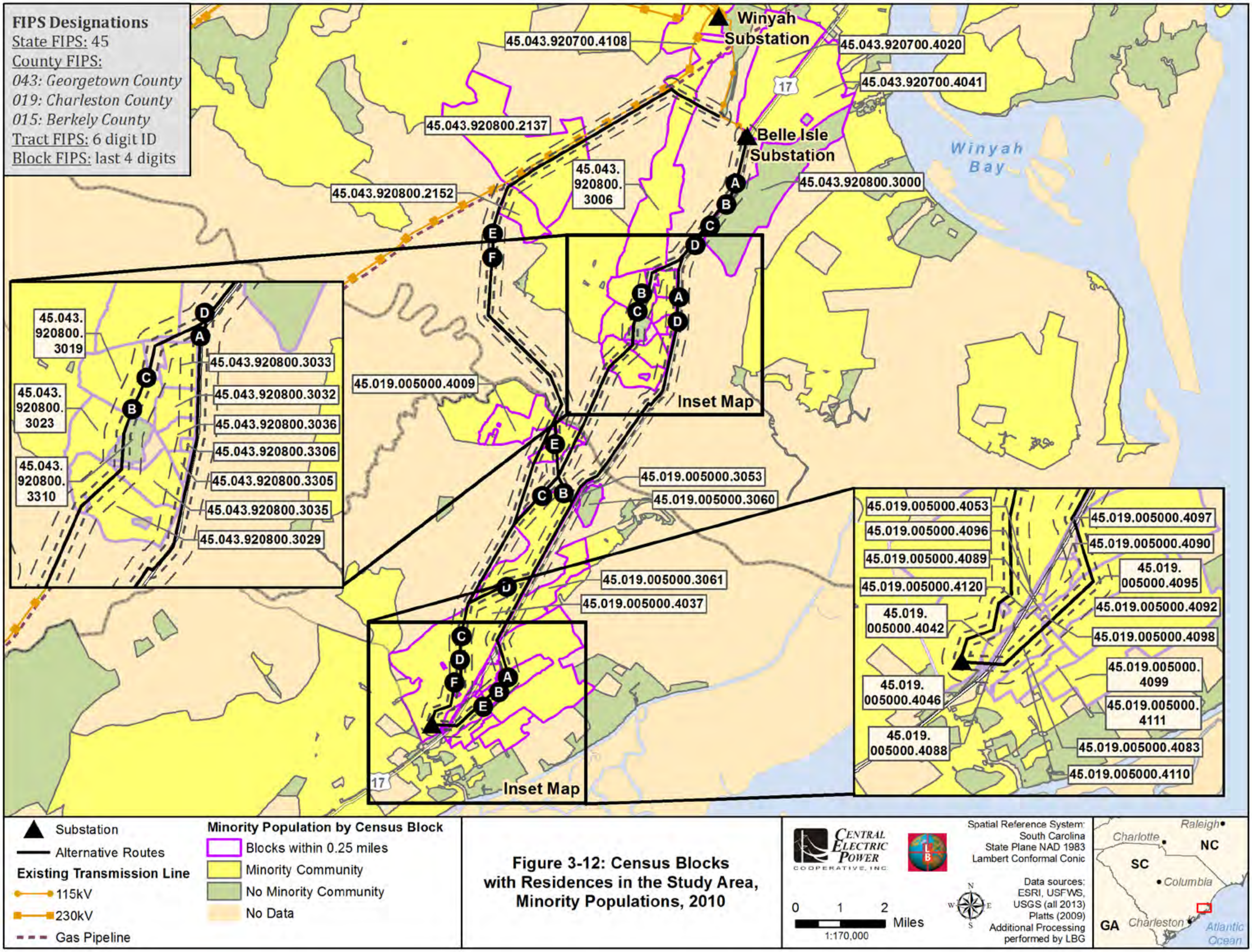



Figure 3-12: Census Blocks with Residences in the Study Area, Minority Populations, 2010

As identified in Section 3.11, *Socioeconomics*, the property value of residences within 0.25 mile of the alternative lines could be impacted as a result of the view of the transmission line from the residence. However, most of the visual impacts from residences would be obscured from forest and other dense vegetation along the routes. The transmission line will be visible from houses along U.S. Highway 17, although the existing highway and its current developed character would diminish the adverse visual effects associated with the transmission line. Therefore, disproportionate adverse impacts could occur to potential environmental justice populations, although these impacts are expected to be low and highly variable, individualized, and unpredictable. The majority of these losses would be temporary in nature because property value effects associated with transmission lines tend to dissipate with time.

### 3.12.3. Unavoidable Adverse Effects

Potential unavoidable impacts on environmental justice communities would include visual impacts from line placement and traffic, noise, and air quality impacts during construction. Although many of these impacts would be short term, adverse and disproportionate impacts to potential environmental justice communities within the Study Area could occur during the short term, although impacts are expected to be low. In the long term, visual impacts to properties and impacts to property values are anticipated to be low, adverse, and highly variable. Therefore, there could be disproportionate adverse effects to environmental justice communities in proximity to the transmission line associated with visual resources, property values, traffic, noise, and air quality.

## 3.13 Transportation

### 3.13.1. Affected Environment

Much of the traffic in the area is concentrated on primary and secondary roadways; however, area residents use smaller, more rural roadways. No off-highway vehicle routes occur in the Study Area. As demonstrated in Figure 3-13, many roadways are located relatively near the proposed Project.

Primary roadways within the Study Area include U.S. Highways 17, 17A, 521 (Georgetown Highway), and State Highway 45. U.S. Highway 17 generally runs north-south paralleling the coast connecting the major cities of Myrtle Beach and Charleston as well as Study Area towns Georgetown and McClellanville. U.S. Highway 17 is a four-lane, divided highway between McClellanville and Georgetown.

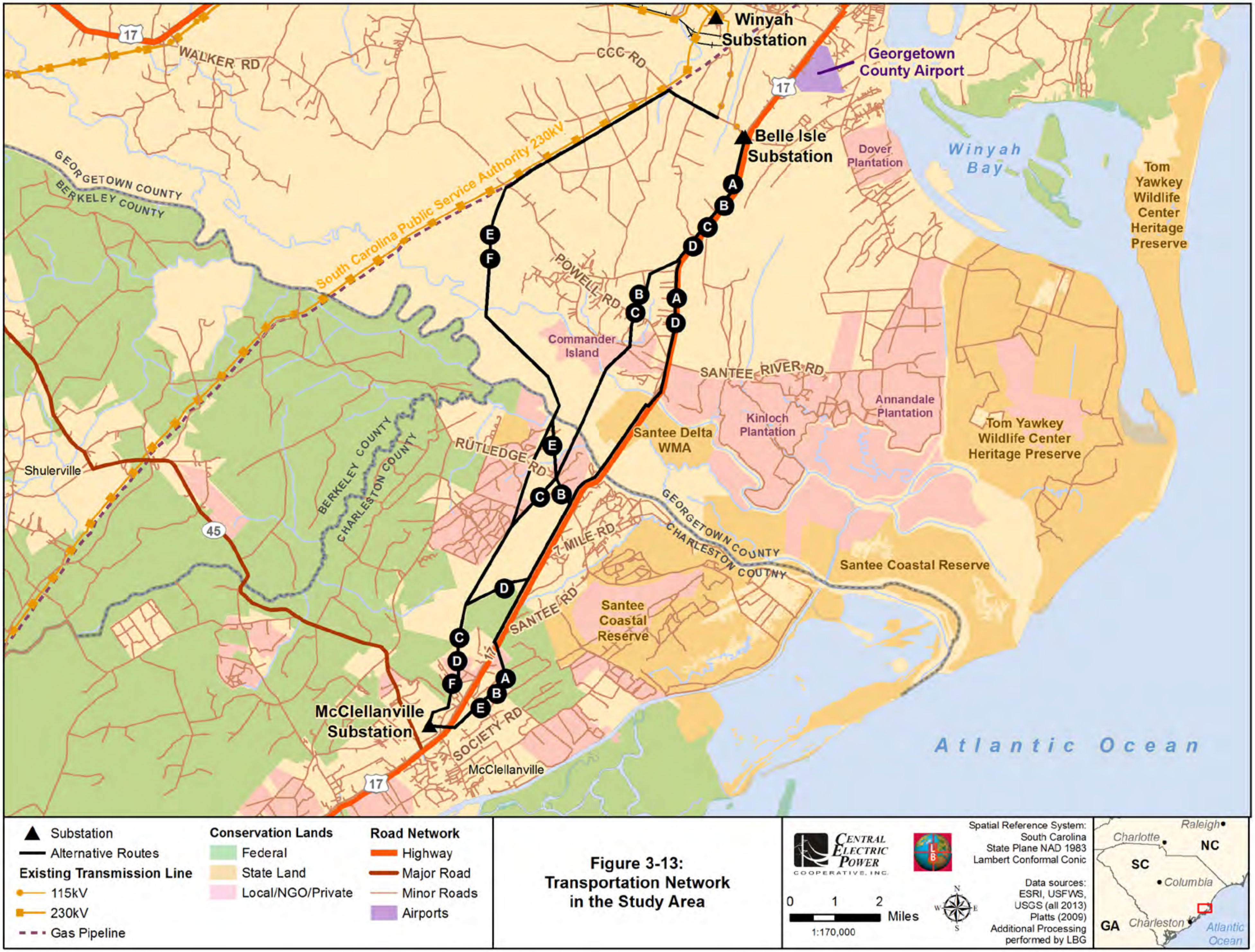



**Figure 3-13: Transportation Network in the Study Area**

U.S. Highway 521 originates in Georgetown and generally runs east-west through the city of Sumter in central South Carolina. State Highway 25 originates in the town of McClellanville and generally runs east-west connecting to the interior of South Carolina serving as the main thoroughfare in northern Berkeley County to the town of Jamestown.

Portions of some of the alternatives were designed to parallel roadways and other linear infrastructure (e.g., gas pipelines) in the Study Area to minimize potential new disturbances. U.S. Highway 17 is the major roadway in the Study Area that runs close to both the Belle Isle and McClellanville substations. Table 3-39 details the length and percentage of each alternative that would parallel U.S. Highway 17.

**Table 3-39: Miles and Percentage Parallel to U.S. Highway 17**

| U.S. Highway 17 | Alt. A | Alt. B | Alt. C | Alt. D | Alt. E | Alt. F |
|---|---|---|---|---|---|---|
| Miles of parallel | 13.1 | 6.7 | 3.2 | 11.5 | 3.5 | - |
| Percent of route parallel to U.S Highway 17 | 81.4% | 41.1% | 20.4% | 71.4% | 18.3% | - |

Most of the roads in the Study Area are rural roads and do not have average annual daily traffic (AADT) estimates available. Table 3-40 shows the roads in the Study Area with available AADT data. For comparison, U.S. Highway 17 a few miles north of Georgetown along the coast near the town of Murrells Inlet has AADT of more than 30,000 counts; comparison of these numbers illustrates the rural nature of the overall Project Area.

**Table 3-40: Average Annual Daily Traffic Volumes**

| County | Roadway | AADT |
|---|---|---|
| Charleston | U.S. Highway 17 (south of McClellanville near Awendaw) | 9,700 |
| Charleston | U.S. Highway 17 (just south of McClellanville) | 9,600 |
| Charleston | U.S. Highway 17 McClellanville to Georgetown Co. line | 8,000 |
| Charleston | SC 45 (just north of U.S. Highway 17 in McClellanville) | 800 |
| Charleston | SC 45 (2 miles west of U.S. Highway 17 in McClellanville) | 500 |
| Charleston | S. Pinckney St. (east of U.S. Highway 17 in McClellanville) | 1,900 |
| Georgetown | U.S. Highway 17 (Georgetown Co. line to SC 24/Powell Rd) | 8,400 |
| Georgetown | SC 24/Powell Road (between U.S. Highways 17 and 17A) | 1,000 |
| Georgetown | State Route 30/North Santee River Road | 125 |

Source: SCDOT (2012)

There are no railroads or airports in close proximity to be considered potentially affected by the proposed alternatives. The Georgetown airport is the closest airport, and the proposed ROW would be about 8,000-feet away; more than twice the amount from the existing line leaving the Santee Cooper steam plant across Turkey Creek from the airport.

### 3.13.2. Environmental Effects

This section discusses potential impacts, their duration, and intensity on transportation resulting from construction and operation of the proposed Project, including the no-action alternative. Definitions for duration and intensity developed for this Project are shown in Table 3-41.

**Table 3-41: Transportation Impact Context and Intensity Definitions**

| Context (Duration) | Low Intensity | Moderate Intensity | High Intensity |
|---|---|---|---|
| Short term: During construction period<br><br>Long term: Life of the line (50 years) | Negligible increase in daily traffic volumes resulting in perceived inconvenience to drivers but no actual disruptions to traffic.<br><br>Perceived inconvenience to drivers due to routine inspections by small vehicles or pickup trucks. | Detectable increase in daily traffic volumes (with slightly reduced speed of travel) resulting in slowing down traffic and delays, but no change in level of service.<br><br>Short service interruptions (temporary closure for a few hours) to roadway traffic. | Extensive increase in daily traffic volumes (with reduced speed of travel) resulting in an adverse change in level of service to worsened conditions.<br><br>Extensive service disruptions (temporary closure of one day or more) to roadways.<br><br>Permanent physical change in transportation system.<br><br>Permanent change in traffic patterns along primary roadways including U.S. Highway 17 with an adverse change in level of service to worsened conditions. |

The following provides an overview of potential impacts associated with the proposed Project alternatives.

#### No-action Alternative

No construction activities would be associated with the no-action alternative, and the proposed Project would not occur. However, traffic volumes are anticipated to continue to increase in areas experiencing growth. Without construction of the proposed Project, businesses and residences in the area would continue to be limited by lack of reliable electrical service.

### Proposed Action

*Construction*

During the construction of the proposed Project, there could be short-term impacts on the transportation network. Delivery of equipment and material and general construction traffic would increase wear and tear on area roads. There would not be any construction of new roadways to access the transmission line because existing roadways would be used. The potential short-term, direct, and adverse effects to traffic would include increased traffic volume and travel time. Construction of the transmission line could include temporary lane or road closures when the line is being constructed across a roadway. In addition to closures, increased travel time could occur from the movement of construction equipment and materials. On roads that currently have very little traffic an increase in traffic during construction could occur if workers use these roads as access roads. Long-term beneficial impacts to roadways and traffic would occur if improvements to roads are required.

Construction activities associated with the alternative routes would result in short-term impacts on the roadway network in areas where road and lane closures and traffic detours may be necessary. The extent to which such impacts would be experienced would depend on the location of the road, lane closures, and traffic detours and the duration of the closures or detours.

Because U.S. Highway 17 is the most travelled road in the Study Area, effects to traffic would be the greatest for alternative routes that parallel or cross this roadway. Powell Road is the second most-traveled route crossed by the proposed alternatives. Effects to traffic from alternatives that intersect or parallel Powell Road or U.S. Highway 17 would have greater adverse effects than those that do not given the level of us of these two most travelled roads. Table 3-42 shows the types of roads that would be crossed by the alternative routes.

**Table 3-42: Roadway Crossings by Various Routes**

| Roadway | Alt. A | Alt. B | Alt. C | Alt. D | Alt. E | Alt. F |
|---|---|---|---|---|---|---|
| Local Roads | 15 | 18 | 13 | 12 | 18 | 14 |
| State Highways | - | - | - | - | - | - |
| US Highways | 4 | 2 | | 2 | 2 | |
| Total | 19 | 20 | 13 | 14 | 20 | 14 |

Closures and detours may be necessary to string transmission lines across roads. Short traffic delays may occur to facilitate the movement of material haul trucks. Longer traffic delays would occur on higher volume roadways. Roadway closures would be planned well in advance and timed during off-peak travel times to minimize adverse effects.

Alternative Routes A, D, and B parallel U.S. Highway 17 for varying lengths, and the ROW would need to be expanded adjacent to this well-traveled roadway (summarized in Table 3-39). Alternative Routes E and F are routed through much more rural areas crossing more rural roadways than the other alternatives and having much lower percentages of their overall length parallel to major interstates or other well-travelled roads. Appropriate notification would be posted in and around affected areas to alert motorists of planned closures and detours.

As the proposed Project is further refined, Central Electric would work with the appropriate entities and municipal officials to minimize potential adverse impacts by identifying potential traffic routes, limitations, and improvements associated with the road network.

*Maintenance and Operation*

Long-term impacts on roadways in the Project Area are not anticipated as a result of the proposed Project. All crossings of roadways would be in compliance with National Electrical Safety Code clearance requirements. Central Electric would coordinate with agencies and obtain all necessary permits for road crossings. Once in operation, there would be periodic maintenance of the transmission line and supporting facilities; however, such activities are not anticipated to adversely affect roadway traffic volumes or patterns. According to the SCDOT accommodations policy, construction of the transmission line should be at least 30 feet from the pavement edge and outside of the clear roadside area (SCDOT 2011). As such, the line's existence should have no effect on the upkeep of the roadway ROW. Road or land closures are not anticipated during the routine operation and maintenance of the transmission line.

Once in operation, the alternative route is not anticipated to result in any long-term, adverse effects. Maintenance activities associated with the transmission line would occur primarily within the proposed Project ROW and avoid disrupting traffic patterns. While maintenance vehicles would need to access locations where repairs or other activities are necessary, these movements would not occur on a regular basis and are not anticipated to adversely affect traffic patterns over the long term.

### 3.13.3. Unavoidable Adverse Effects

Although it is likely that there would be low-intensity, short-term impacts to roadways and traffic patterns, these impacts would be minimized and mitigated. Once constructed, the new line would not result in new traffic or roadway congestion, closures or any adverse effects to transportation in the Study Area.

## 3.14 Health and Safety

### 3.14.1. Affected Environment

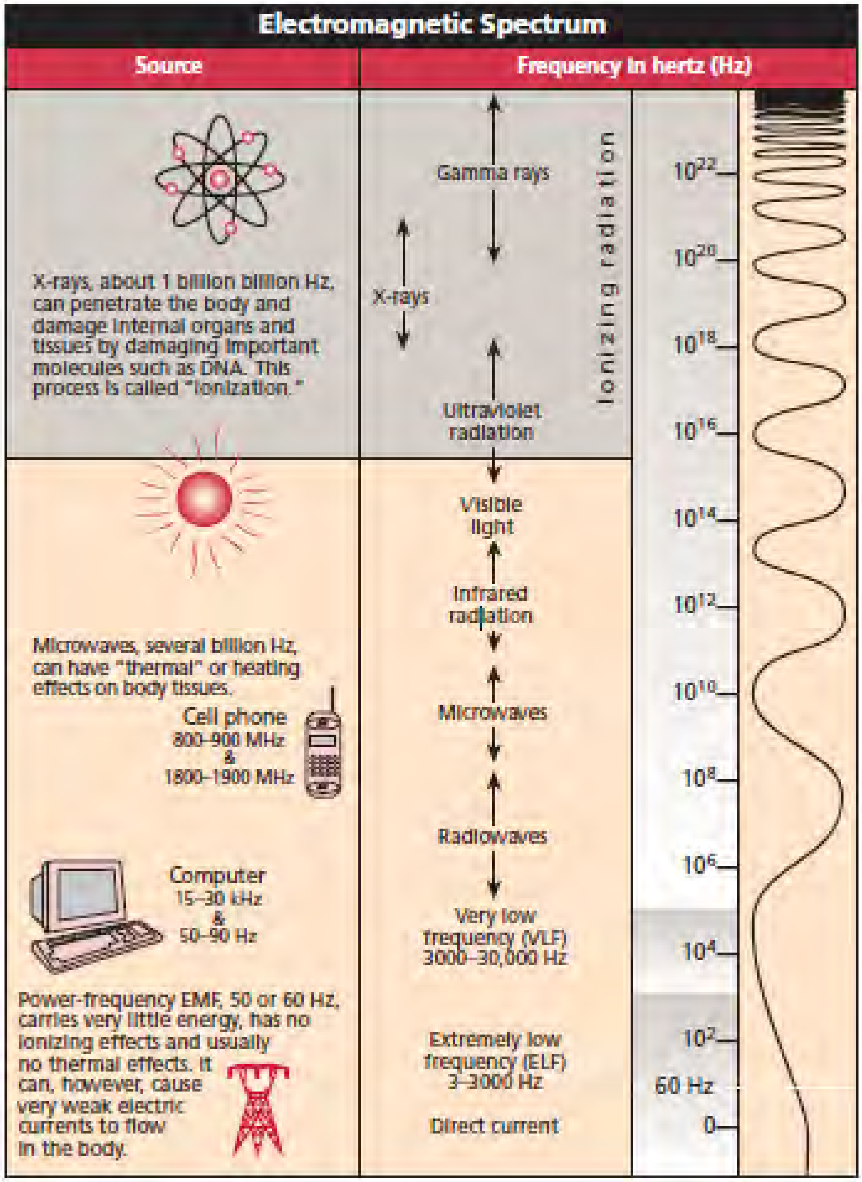
As discussed in Section 1.2, the Purpose and Need for the Project is to supply the McClellanville area with a reliable source of power and to supply the long-term needs of the area. Potential human health and safety impacts are related to the construction and operation of the Project. These impacts are confined to the area within 300 feet of centerline of the ROW.

**Electric and Magnetic Fields**

The following overview of electric and magnetic fields (EMF) has been obtained from the National Institute of Environmental Health Sciences (NIEHS) manual *Electric and Magnetic Fields Associated with the Use of Electric Power* (2002).

EMF is a type of energy associated with electric power that includes two fields: the electric field and the magnetic field. The electric field is produced by the voltage of the power source and increases as voltage increases. Magnetic fields are produced from the current flowing through the conductor and increase as the current increases. Both electric and magnetic fields decrease as distance from the source increases (NIEHS 2002). EMF, as it pertains to power lines is considered extremely low frequency electric and magnetic fields. Power frequency is in the range of 50-60 hertz (Hz) for transmission line facilities. Figure 3-14 from the NIEHS illustrates the different types of sources that emit EMF and their associated frequency. Power frequency is at the bottom of the spectrum.

EMF associated with transmission lines is emitted from a variety of equipment including the transmission lines coming into the substation, transformers, reactors, and capacitor banks. As such, EMF is strongest around substation facilities and decreases rapidly with distance from the source (NIEHS 2002).




Source: NIEHS (2002)

**Figure 3-14: EMF Sources and Frequencies**

The primary concern related to transmission lines and other electrical equipment is the potential negative health effects from exposure to EMF, in particular an increase in cancer, leukemia, and other diseases. Over the last several decades, several epidemiological studies have been conducted to assess potential impacts of EMF as it relates to cancer and other diseases. In 1998, Congress asked NIEHS to complete a study of the possible health effects associated with EMF. The following is an excerpt from that report:

> The NIEHS believes that the probability that EMF exposure is truly a health hazard is currently small. The weak epidemiological associations and lack of any laboratory support for these associations provide only marginal, scientific support that exposure to this agent is causing any degree of harm. The scientific evidence suggesting that extremely low frequency EMF exposures pose any health risk is weak. The strongest evidence for health effects comes from associations observed in human populations with two forms of cancer: childhood leukemia and chronic lymphocytic leukemia in occupationally exposed adults. While the support from individual studies is weak, the epidemiological studies demonstrate, for some methods of measuring exposure, a fairly consistent pattern of a small, increased risk with increasing exposure that is somewhat weaker for chronic lymphocytic leukemia than for childhood leukemia. In contrast, the mechanistic studies and the animal toxicology literature fail to demonstrate any consistent pattern across studies, although sporadic findings of biological effects (including increased cancers in animals) have been reported. No indication of increased leukemias in experimental animals has been observed (NIEHS 1999).

Additional organizations have also completed their own analysis. The findings from some of these studies are captured below

USEPA:

> Many people are concerned about potential adverse health effects. Much of the research about power lines and potential health effects is inconclusive. Despite more than two decades of research to determine whether elevated EMF exposure, principally to magnetic fields, is related to an increased risk of childhood leukemia, there is still no definitive answer. The general scientific consensus is that, thus far, the evidence available is weak and is not sufficient to establish a definitive cause-effect relationship (USEPA 2006c).

National Research Council:

An earlier National Research Council assessment of the available body of information on biologic effects of power-frequency magnetic fields (National Research Council 1997) led to the conclusion:

> …that the current body of evidence does not show that exposure to these fields presents a human health hazard. Specifically, no conclusive and consistent evidence shows that exposures to residential electric and

> magnetic fields produce cancer, adverse neurobehavioral effects, or reproductive and developmental effects. The new, largely unpublished contributions of the EMF-RAPID program are consistent with that conclusion. We conclude that no finding from the EMF-RAPID program alters the conclusions of the previous NRC review on the Possible Effects of Electromagnetic Fields on Biologic Systems.

In 1999, the National Research Council followed up by stating:

> In view of the negative outcomes of EMF-RAPID replication studies, it now appears even less likely that EMFs in the normal domestic or occupational environment produce important health effects, including cancer (National Research Council 1999).

Implantable Medical Devices:

Pacemakers are used to treat arrhythmias, which are problems associated with the rate or rhythm of the heartbeat. The pacemaker can relieve some of the irregular symptoms and sense abnormal heart rhythms and uses electrical pulses to prompt the heart to beat at a normal rate (U.S. Department of Health and Human Services 2012).

Pacemakers and other cardiac electronic devices rely on complex micro-circuitry and use electromagnetic waves for their communication with the programmers. As a result, they are susceptible to interference from surrounding electromagnetic fields. Electromagnetic interference can be defined as any signal, biological or not, that falls within a frequency spectrum that is being detected by the sensing circuitry of the pacemaker. This can interfere with the device's optimal function and is often a concern for patients (Lakshmanadoss et al. 2004).

At present, there is no standardized guidance regarding acceptable levels of EMF for pacemakers. However, the American Conference of Governmental Industrial Hygienists has prepared recommendations for occupational exposures including EMFs. These guidelines are designed to identify levels that nearly all workers may be exposed to repeatedly without adverse effect. For EMF, the recommendations suggest that persons with pacemakers or similar devices limit their exposure to electric fields to 1 kV/m and magnetic fields to 1,000 milligaus (mG) (American Conference of Governmental Industrial Hygienists 2011).

The expected EMF levels on this Project would be significantly below these recommendations.

### 3.14.2. Environmental Effects

This section discusses potential impacts, their duration, and intensity on health and safety of the public resulting from the construction and operation of the proposed Project. Definitions for duration and intensity associated with safety and public health developed for this Project are described in Table 3-43.

**Table 3-43: Health and Safety Impact Context and Definitions**

| Context (Duration) | Low Intensity | Moderate Intensity | High Intensity |
|---|---|---|---|
| Short term: During construction period<br><br>Long term: Life of the line (50 years) | Construction of the proposed Project would not result in: 1) exposure of contaminated media to construction workers and/or 2) incidents associated with the installation of the transmission line and supporting infrastructure.<br><br>Operation of the proposed Project would not result in an increase of EMF levels that would rise to a level of concern with regard to public health and safety. | Construction of the proposed Project may result in exposure of contaminated media by construction workers either through the disturbance of hazardous materials and/or chemical spills. The potential for incidents associated with the installation of the transmission line and supporting infrastructure would increase.<br><br>Operation of the proposed Project would increase EMF levels, but not to a level that would adversely affect public health and safety. | Construction of the proposed Project would result in exposure of contaminated media by construction workers either through the disturbance of hazardous materials and/or chemical spills. Incidents associated with the installation of the transmission line and supporting infrastructure would likely result.<br><br>Operation of the proposed Project would increase EMF levels to a level high enough to adversely affect public health and safety. |

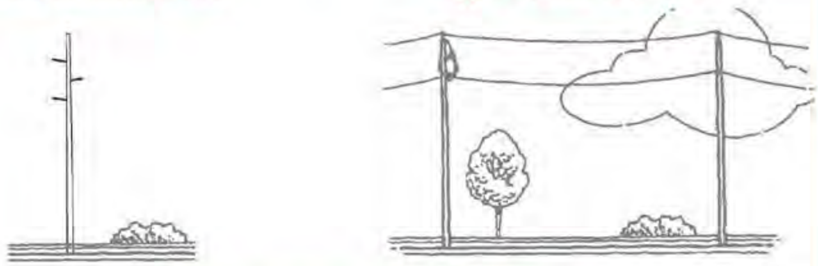
#### No-action Alternative

Under the no-action alternative, the transmission line would not be constructed. Therefore, there would be no increase in the amount of EMF or any related impacts on human health and safety.

#### Proposed Action

All alternative routes are anticipated to have similar EMF field values. The proposed ROW for the Project is 75 feet. Below is an illustration of the levels of EMF associated with various transmission line voltages. For this Project, the EMF range would be between 100 and 230 kV. At the edge of the ROW, the EMF level would be approximately 3.4 to 6.4 mG. At a distance of 50 feet from the ROW, the level would decrease to 1.9 to 3.5 mG. These levels are significantly below the thresholds set out by the International Commission on Non-Ionizing Radiation Protection, which revised its reference levels in 2010 to 2,000 mG. Therefore, the operation of any of the alternative routes would not result in an adverse impact on public health and safety as a result of the slight increase in EMF levels.

Typical Transmission Line | Typical Distribution Line



**TYPICAL MAGNETIC FIELD READINGS**

Typical 60 hertz magnetic fields measured at various distances.
Magnetic fields are measured in milligauss (mG).

| Transmission lines* | Under line | Edge of right of way | 50 ft. from edge |
|---|---|---|---|
| 44kV | 1.0 - 25.0 | 0.2 - 2.5 | 0.1 - 1.0 |
| 100kV | 2.1 - 19.3 | 0.6 - 3.4 | 0.3 - 1.9 |
| 230kV | 4.5 - 29 | 1.9 - 6.4 | 1.0 - 3.5 |
| 525kV | 17 - 40 | 6 - 15 | 2.4 - 4.0 |
| Distribution lines* | 0.1 - 35 | | |

Substation – Magnetic fields from the equipment in a substation, measured at the fence, are generally negligible. However, readings at the fence can reflect the magnetic fields from the power lines entering and exiting the substation and generally do not exceed readings in this table for distribution lines.

*These are typical readings under normal operating conditions at moderate load.

Source: CEPCI (2013)

**Figure 3-15: Typical EMF Levels for Transmission Lines**

### *Electrical Contact Safety*

Direct contact with an energized conductor poses the most serious risk of injury or death from a high-voltage transmission line. The transmission structures would be designed to prevent any accidental contact with an energized conductor. Poles would be designed to discourage and prevent climbing, which should also prevent accidental contact even during most acts of vandalism. By designing these structures to the requirements of the National Electrical Safety Code, there would be little danger from contact injuries.

In the event of an extreme event such as a catastrophic storm, which could drop a conductor, safety controls within the substations would immediately open circuit breakers, shutting down the line to prevent accidental exposure.

*Induced Voltage Safety*

Alternative Routes E and F are parallel to an existing 230 kV transmission line, and extra caution would be required during the construction and maintenance of these alternatives. Even with the new proposed 115 kV line shut down, induced voltage from a parallel transmission such as the adjacent 230 kV transmission line could induce unsafe conditions for utility workers when servicing the new line. Central Electric would coordinate with the owner of the transmission line (South Carolina Public Service Authority) for outages and safety protocols. With appropriate safety protocols in place, future maintenance could be performed safely on the new line.

*Construction Safety*

Heavy equipment would be used during the construction of the transmission line and include the use of oil and gas for fueling. At this time, no onsite storage of hazardous materials is planned, and, in the event of a spill, appropriate BMPs outlined in Table 2-2 would be implemented. Adherence to normal safety procedures associated with heavy construction would ensure no danger to utility construction or maintenance workers.

*Landowner Concerns*

Transmission lines are designed to automatically trip in the event the line comes in contact with trees or other surfaces. Typically, this occurs during storm events or when a tree falls into the transmission line. Santee-Cooper would be responsible for maintaining the transmission line ROW once the Project is constructed. A copy of its Vegetation Management Plan is included in Appendix C. In addition, herbicides may be used during the maintenance of the transmission line ROW (with the exception of USFS lands). Santee-Cooper would be responsible for complying with all federal and state laws for herbicide application.

All of the alternative routes cross some type of agricultural land. The presence of transmission poles in timber plantations or agricultural fields may be difficult to farm around in some locations and may present a hazard to farmers operating large equipment. Central Electric would work with affected landowners as the preferred alternative is identified to mitigate any potential effect on agricultural operations.

## 3.15 Noise

### 3.15.1. Affected Environment

Noise is generally defined as unwanted sound. Sound is all around; it becomes noise when it interferes with normal activities such as speech, concentration, or sleep. Noise associated with transmission lines is a factor during construction and operation of both the lines and substations. Noise emanates from vehicular traffic and crews associated with construction and maintenance of transmission lines and substations and noise coming from the transmission line itself once operational. Ambient noise (the existing background noise environment) can be generated by a number of noise sources, including mobile sources, such as automobiles and trucks; and stationary sources such as construction sites, machinery, or industrial operations. In addition, there is an existing and variable level of natural ambient noise from sources such as wind, streams and rivers, wildlife, and other sources.

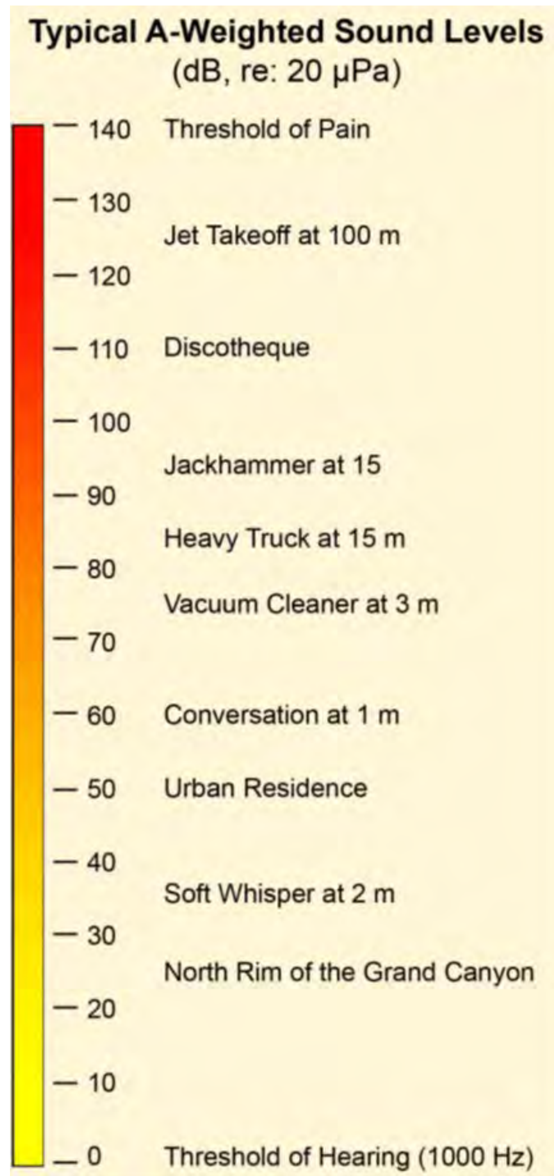



**Figure 3-16: Sound Levels of Typical Noise Sources and Noise Environments**

The standard measurement unit of noise is the decibel (dB), which represents the acoustical energy present. Noise levels are measured in A-weighted decibels (dBA), a logarithmic scale that approaches the sensitivity of the human ear across the frequency spectrum. The human ear responds to noise in the audible frequencies in a similar way in most individuals. A 3- to 5-dBA increase, which is equivalent to doubling the sound pressure level, is barely perceptible to the human ear. A 6-dBA is a readily perceptible change, and a 10-dBA is doubling of the apparent loudness. Figure 3-15 from the Occupational and Health Safety Administration provides examples of sound levels of typical noise sources and noise environments (U.S. Department of Labor, Occupational and Health Safety Administration 2013).

### Ambient Noise and Sources in the Project Area

Ambient noise within the Project Area can origniate from a variety of sources. Most of the Project Area is forested with some agricultrual lands and sparse rural development. Within the Study Area, there are numerous tracts of land that are used for timber harvesting. At any given time, timber may be logged and transported. This would include the use of logging equipment and large trucks moving the timber down U.S. Highway 17. Logging equipment can often operate at 80 dBA and above, depending on the specific type of equipment used. In the rural development areas, ambient noise would typically be less than 50 dBA (the level normally associated with urban development). In addition, U.S. Highway 17 traverses the Project Area and increases the noise level adjacent to the highway. Noise from the highway can vary due to the type of vehicles, speed at which the vehicles are traveling, and surrounding landscape that may impact noise. In general, an ambient noise level of approximatly 70 dBA.

## 3.15.2. Environmental Effects

Construction of the transmission line would have the greatest impact on noise levels for the Project. Construction equipment and vehicles would use highways and local roadways to access the Project ROW. Large equipment including, drill rigs, cranes, low boys, large trucks, bucket trucks, and pulling and tensioning equipment would be required to construct the transmission line. Table 3-44 gives the equipment noise levels for some of the equipment that may be used for the Project.

**Table 3-44: Typical Construction Equipment Noise Levels**

| Type of Equipment | Maximum Level (dBA) at 50 feet |
|---|---|
| Bulldozer | 85 |
| Heavy Truck | 88 |
| Backhoe | 80 |
| Pneumatic Tools | 85 |
| Craine | 85 |
| Combined Equipment | 89 |

Source: Thalheimer (1996)

Noise related to construction activities would occur along the length of the transmission line for the duration of construction, which is anticipated to take 12 to 16 months. The increase in noise from construction activities would only be an issue in areas with residences, schools, churches, libraries, or where there are sensitive noise receptors. The majority of the Project area is forested, with the majority of the residential development located along U.S. Highway 17. Existing ambient noise levels typically vary between 40 to 50 dB for areas that are not adjacent to U.S. Highway 17. This level is generally considered quiet. For purposes of anaylsis, decibel levels above 50 dBA would be considered moderate and below 50 dBA would be considered low. Alternative Route F is the only alternative that does not parallel U.S. Highway 17 for some portion of its length. Alternative Route F has one residence within the 600-foot corridor. No schools or churches are located within 1,000 feet of the route. Therefore, noise impacts for Alternative Route F would be moderate for this one receptor but short in duration. Alternative Routes A, B, C, D, and E all have similar receptors with several residences in proximity to the alternative route and all five alternatives parallel U.S. Highway 17 for a given length. Therefore, noise impacts for these alternatives would be be moderate but short in duration.

Noise impacts during the operation and maintenance of the Project are expected to be negligible. Noise from maintenance activities would only occur in the event a maintenance activity needs to be performed on the transmission line. Typically, maintenance activities are short in duration and can be accomplished with a bucket truck and several pick-up trucks. The impacts from maintenance activities are expected to be low and short in duration (Table 3-45).

**Table 3-45: Duration and Intensity Definitions for Project-related Noise**

| Context (Duration) | Low Intensity | Moderate Intensity | High Intensity |
|---|---|---|---|
| Short term: During the construction period<br><br>Long term: Life of the line (50 years) | Noise impacts could attract attention, but would not dominate the soundscape or detract from current user activities. | Noise impacts would attract attention, and contribute to the soundscape, but would not dominate. User activites would remain unaffected. | Impacts on the characteristic soundscape would be considered significant when those impacts dominate the soundscape and detract from current user activities. |

Operation of the transmission line may result in corona-generated noise from the conductors. Changes to local atmospheric pressure may result in a hissing or cracking sound that may be heard directly under or a few feet from the transmission line ROW. The noise generated depends on weather, altitude, and system voltage and dissipates with distance from the transmission line. No receptors are located within 100 feet of the transmission line. For all alternatives, there are several residences located within 300 feet of the transmission line. However, at this distance, impacts on noise from the corona are expected to be low and short term.

The level of corona generated noise at 115 kV is so low that it generally is not detectable to the human ear at ground level. Therefore, no corona noise impacts are anticipated during operation of this new line.

# 4. COMPARISON OF ALTERNATIVES

This section summarizes the comparative impacts of the no-action alternative and Alternative Routes A through F. The section summarizes potential mitigation for direct and indirect effects identified in Chapter 3 and the potential irreversible and irretrievable commitment of resources under the action alternatives. Finally, the section discusses the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity.

## 4.1 Comparative Impacts of Alternatives

**Table 4-1: Comparison of Impacts of Alternatives**

| | |
|---|---|
| **Water Resources** | |
| **No Action** | No effect. |
| **Alternative Route A** | |
| Permanent | No effects anticipated. 7 stream crossings by the right-of-way, but majority of these would be spanned. Crosses the 100-year floodplain. |
| Temporary | Potential sedimentation and runoff caused by construction which would be mitigated with BMPs. |
| **Alternative Route B** | |
| Permanent | No effects anticipated. 15 stream crossings by the right-of-way, but majority of these would be spanned. Crosses the 100-year floodplain. |
| Temporary | Same as Alternative Route A |
| **Alternative Route C** | |
| Permanent | No effects anticipated. 10 stream crossings by the right-of-way, but majority of these would be spanned. Crosses the 100-year floodplain. |
| Temporary | Same as Alternative Route A |
| **Alternative Route D** | |
| Permanent | No effects anticipated. 5 stream crossings by the right-of-way, but majority of these would be spanned. Crosses the 100-year floodplain. |
| Temporary | Same as Alternative Route A |
| **Alternative Route E** | |
| Permanent | No effects anticipated. 14 stream crossings by the right-of-way, but majority of these would be spanned. Crosses the 100-year floodplain. |
| Temporary | Same as Alternative Route A |
| **Alternative Route F** | |
| Permanent | No effects anticipated. 10 stream crossings by the right-of-way, but majority of these would be spanned. Crosses the 100-year floodplain. |
| Temporary | Same as Alternative Route A |

| Biological Resources (Vegetation, Wildlife, Sensitive Species, and Aquatic Resources) | |
|---|---|
| **No Action** | No effect. |
| **Alternative Route A** | |
| Permanent | Alternative Route A would require the clearing of 110 acres of forest cover within the right-of-way. This is the lowest amount of forest cover loss for all of the alternative routes.<br><br>Alternative Route A (along with Alternative Route D) have the most developed land of the alternative routes and would therefore have less impact on vegetation than the other alternatives. In addition, Alternative Route A is parallel to another linear feature (U.S. Highway 17) for more than 80 percent of the route and therefore, would have a long-term but low-intensity impact on forest fragmentation.<br><br>Changes in local aquatic habitats in areas where vegetation is cleared along shorelines may occur for all alternatives.<br><br>Climbing heath, Carolina fluffgrass, and yellow fringeless orchid are known to occur in Alternative Routes A, B, and E. These alternatives would result in a short-term, moderate intensity impact to these species.<br><br>Alternative Routes A, B, and E could have an indirect low impact on forest dwelling species such as the painted bunting, yellow-throated vireo, northern parula, and the American swallow-tailed kite due to the loss of approximately 5 acres of forested habitat. All the alternative routes could have a direct impact on the northern bobwhite quail because utility line structures may provide additional locations from which raptors can hunt (perches). All routes would benefit the quail and swallow-kite by maintaining open nesting and foraging habitat. Red-cockaded woodpecker is known to occur within 500 feet of Alternative Routes A, B, and E. These alternative routes may adversely affect the woodpecker; however, Central Electric would avoid cluster trees when siting the Project's right-of-way.<br><br>Wood stork may be adversely affected by Alternative Routes A and D because these routes perpendicularly cross the North and South Santee rivers, a flight path. The use of an OHGW or flight diverters would minimize potential impacts. |
| Temporary | Disturbance of vegetation within the right-of-way and along access roads during construction. Potential for sedimentation, runoff, and spills to aquatic resources during construction to be avoided by use of BMPs.<br><br>Construction of any of the alternative routes could have a low, short-term, indirect impact on any MIS species found in proximity to the constructed right-of-way from noise, human intrusion, and construction activities; however, Alternative Routes A, B, and E cross more acres of the FMNF and would have greater impacts. Alternative Routes A, B, and E may adversely affect the red-cockaded woodpecker during construction; however Central Electric would avoid construction within 500 feet of clusters. |
| **Alternative Route B** | |
| Permanent | Alternative Route B would require the clearing of 114 acres of forest cover within the right-of-way. Alternative Route B is parallel to Highway 17 for 41 percent of the overall length. Therefore, it would have a long-term and moderate intensity impact to forest fragmentation.<br><br>Changes in local aquatic habitats in areas where vegetation is cleared along shorelines may occur for all alternatives. |

| **Biological Resources (Vegetation, Wildlife, Sensitive Species, and Aquatic Resources)** | |
|---|---|
| | Climbing heath, Carolina fluffgrass, and yellow fringeless orchid are known to occur in Routes A, B, and E. These alternatives would result in a short-term, moderate-intensity impact to these species.<br><br>Impacts to MIS species and red-cockaded woodpecker are the same as those described for Alternative Route A. Alternative Route B's impacts to the wood stork would be less than Alternative Route A or D's because it does not perpendicularly cross the North and South Santee rivers. |
| Temporary | Same as Alternative Route A |
| **Alternative Route C** | |
| Permanent | Alternative Route C would require the clearing of 120 acres of forest cover. Alternative Route C has the lowest amount of linear feature parallel at only 20 percent. Therefore, Alternative Route C is expected to have long-term, moderate-intensity impact to forest fragmentation.<br><br>Changes in local aquatic habitats in areas where vegetation is cleared along shorelines may occur for all alternatives.<br><br>Alternative Routes C, D, and F only cross <0.1 mile of the FMNF and would not have an indirect or direct effect on forest-dwelling MIS species.<br><br>All the alternative routes could have a direct impact on the northern bobwhite quail because utility line structures may provide additional locations from which raptors can hunt (perches). All routes would benefit the quail and swallow-kite by maintaining open nesting and foraging habitat.<br><br>There are no known red-cockaded woodpecker clusters within 500 feet of Alternative Route C. Therefore, this route is less likely to impact this species than Alternative Routes A, B, or E.<br><br>Alternative Route C's impacts to the wood stork would be less than Alternative Route A or D's because it does not perpendicularly cross the North and South Santee rivers. |
| Temporary | Same as Alternative Route A except Alternative Routes C, D, and F cross fewer acres of the FMNF, so short-term construction impacts on MIS species would be less than Alternative Routes A, B, and E.<br><br>There are no known red-cockaded woodpecker clusters within 500 feet of Alternative Route C; therefore, this route is less likely to impact this species during construction than Alternative Routes A, B, or E. |
| **Alternative Route D** | |
| Permanent | Alternative Route D (along with Alternative Route A) has the most developed land of the alternative routes and would therefore have less impact on vegetation than the other alternatives.<br><br>Alternative Route D also parallels linear features (U.S. Highway 17) for 71 percent of its total length. Therefore, Alternative Route D is expected to have a long-term but low intensity impact on forest fragmentation. A total of 119 acres of forest cover would be cleared for Alternative Route D.<br><br>Changes in local aquatic habitats in areas where vegetation is cleared along shorelines may occur for all alternatives. |

| Biological Resources (Vegetation, Wildlife, Sensitive Species, and Aquatic Resources) | |
|---|---|
| | Impacts to MIS species and red-cockaded woodpecker would be the same as those described for Alternative Route C. Impacts to wood stork are the same as those described for Alternative Route A. |
| Temporary | Same as Route C |
| **Alternative Route E** | |
| Permanent | Alternative Route E would require 134 acres of forest cover to be cleared for the right-of-way. Alternative Routes E and F have the most forest cover of the alternative routes at 134 and 133 acres, respectively. Alternative Route E parallels existing linear features (transmission lines and U.S. Highway 17) for 53 percent of its total length. It is expected that Route E would have a long-term, moderate intensity impact on forest fragmentation.<br><br>Changes in local aquatic habitats in areas where vegetation is cleared along shorelines may occur for all alternatives.<br><br>Rafinesque's big-eared bat is known to occur within 0.5 mile of Alternatives E and F. Alternative Routes E and F may have a long-term, low-impact to the bat if the species habitat is affected.<br><br>Climbing heath, Carolina fluffgrass, and yellow fringeless orchid are known to occur in Alternative Routes A, B, and E. These alternatives would result in a short-term, moderate intensity impact to these species.<br><br>Impacts to MIS species and red-cockaded woodpecker are the same as those described for Alternative Route A. Alternative Route E's impacts to the wood stork would be less than Alternative Route A or D's because it does not perpendicularly cross the North and South Santee rivers. |
| Temporary | Same as Alternative Route A |
| **Alternative Route F** | |
| Permanent | Alternative Route F has the greatest amount of undeveloped and uncultivated vegetation. Therefore, effects to vegetation would be greatest on this route. Alternative Route F would require 133 acres of forest clearing for the right-of-way. Given that Alternative Route F parallels linear features (transmission line) for only 34 percent of its length, impacts to forest fragmentation are expected to be long-term, and of moderate intensity.<br><br>Changes in local aquatic habitats in areas where vegetation is cleared along shorelines may occur for all alternatives.<br><br>Rafinesque's big-eared bat is known to occur within 0.5 mile of Alternatives E and F. Alternative Routes E and F may have a long-term, low impact to the bat if the species habitat is affected.<br><br>Impacts to MIS species, red-cockaded woodpecker, and wood stork would be the same as those described for Alternative Route C. |
| Temporary | Same as Alternative Route C |

| **Soils and Geology** | |
|---|---|
| **No Action** | No effect. |
| **Alternative Route A** | |
| Permanent | Potential to displace a portion of the 358.5 acres of hydric soils located in the 600-foot corridor for the 75 foot right-of-way. Approximately 0.28 acre of soil (0.001-acre per structure) would be permanently removed. Alternative Route A crosses the most prime farmland soils (tied with Alternative Route D) within the 600-foot corridor at 143 acres but the lowest amount of farmland soils of statewide importance (49 acres). Farmland for non-timber crop production would be permanently impacted only at structure locations while the remainder of the right-of-way could still be farmed. |
| Temporary | Potential for erosion during construction would be minimized through use of construction BMPs. |
| **Alternative Route B** | |
| Permanent | Potential to displace a portion of the 459.5 acres of hydric soils located in the 600-foot corridor for the 75-foot right-of-way. Approximately 0.28 acre of soil (0.001-acre per structure) would be permanently removed. Alternative Route B crosses relatively few acres Prime Farmland soils at 6.5 acres but crosses more soils of statewide importance (84 acres) within the 600-foot corridor. Farmland for non-timber crop production would be permanently impacted only at structure locations while the remainder of the right-of-way could still be farmed. |
| Temporary | Same as Alternative Route A |
| **Alternative Route C** | |
| Permanent | Potential to displace a portion of the 543 acres of hydric soils located in the 600-foot corridor for the 75 foot right-of-way. Approximately 0.27 acre of soil (0.001-acre per structure) would be permanently removed. Alternaive Route C crosses the least amount of Prime Farmland soils at 4 acres and crosses 103.5 acres of soil of statewide importance within the 600-foot corridor. Farmland for non-timber crop production would be permanently impacted only at structure locations while the remainder of the right-of-way could still be farmed. |
| Temporary | Same as Alternative Route A |
| **Alternative Route D** | |
| Permanent | Potential to displace a portion of the 382 acres of hydric soils in the 600-foot corridor. Approximately 0.28 acre of soil (0.001-acre per structure) would be permanently removed. Alternative Route D crosses the most Prime Farmland soils (tied with Alternative Route A) at 143 acres and 74 acres of soils of statewide importance within the 600-foot corridor. Farmland for non-timber crop production would be permanently impacted only at structure locations while the remainder of the right-of-way could still be farmed. |
| Temporary | Same as Alternative Route A |
| **Alternative Route E** | |
| Permanent | Potential to displace a portion of the 849 acres of hydric soils in the 600-foot corridor. Approximately 0.35 acre of soil (0.001-acre per structure) would be permanently removed. Alternative Route E crosses 55.5 acres of Prime Farmland soils and 396.1 acres of soils of statewide importance within the 600-foot corridor. Farmland for non-timber crop production would be permanently impacted only at structure locations while the remainder of the right-of-way could still be farmed. |
| Temporary | Same as Alternative Route A |
| **Alternative Route F** | |

| **Soils and Geology** | |
|---|---|
| Permanent | Potential to displace a portion of the 934 acres of hydric soils in the 600-foot corridor. Approximately 0.33 acre of soil (0.001-acre per structure) would be permanently removed. Alternative Route F crosses 80.5 acres of Prime Farmland soils and 429.5 acres of soils of statewide importance (the greatest amount of any route) within the 600-foot corridor. Farmland for non-timber crop production would be permanently impacted only at structure locations while the remainder of the right-of-way could still be farmed. |
| Temporary | Same as Alternative Route A |

| **Air Quality and Greenhouse Gas Emissions** | |
|---|---|
| **No Action** | No effect. |
| **Alternative Route A** | |
| Permanent | Potential increase in GHG levels as a result of the operation of the transmission line; however, any increases would be negligible relative to NAAQS. |
| Temporary | Increases in fugitive dust caused by construction activity, vehicles, and equipment. Increased emissions from construction vehicles and equipment. |
| **Alternative Route B** | |
| Permanent | Same as Alternative Route A |
| Temporary | Same as Alternative Route A |
| **Alternative Route C** | |
| Permanent | Same as Alternative Route A |
| Temporary | Same as Alternative Route A |
| **Alternative Route D** | |
| Permanent | Same as Alternative Route A |
| Temporary | Same as Alternative Route A |
| **Alternative Route E** | |
| Permanent | Same as Alternative Route A |
| Temporary | Same as Alternative Route A |
| **Alternative Route F** | |
| Permanent | Same as Alternative Route A |
| Temporary | Same as Alternative Route A |

| **Cultural, Historical, and Paleontological Resources** | |
|---|---|
| **No Action** | No effect. |
| **Alternative Route A** | |
| Permanent | Alternative Route A intersects Site 38CH0512, Site 38GE0651, the portion of Hopsewee Plantation adjacent to U.S. Highway 17, and the proposed expansion of the Georgetown Rice Fields. Alternative Route A is within the Gullah Geechee Cultural Heritage Corridor. Once a final right-of-way is selected within the preferred route, coordination with the SHPO and other consulting parties would occur to identify, evaluate, and if needed, mitigate adverse effects to historic properties. |
| Temporary | The use of existing access roads may have a temporary impact on resources during construction. The use of geotextile and matting for wetland areas may also have a temporary impact on cultural resources. Temporary culverts inserted for construction purposes that do not result in ground disturbance may also have a temporary impact. |
| **Alternative Route B** | |
| Permanent | Alternative Route B intersects Site 38CH0512, Site 38GE0651, and the proposed expansion of the Georgetown Rice. Alternative Route B is within the Gullah |

| **Cultural, Historical, and Paleontological Resources** | |
|---|---|
| | Geechee Cultural Heritage Corridor. Once a final right-of-way is selected within the preferred route, coordination with the SHPO and other consulting parties would occur to identify, evaluate, and if needed, mitigate adverse effects to historic properties. |
| Temporary | Same as Alternative Route A. |
| **Alternative Route C** | |
| Permanent | Alternative Route C intersects Site 38GE0651 and the proposed expansion of the Georgetown Rice Fields. Alternative Route C is within the Gullah Geechee Cultural Heritage Corridor. Once a final right-of-way is selected within the preferred route, coordination with the SHPO and other consulting parties would occur to identify, evaluate, and if needed, mitigate adverse effects to historic properties. |
| Temporary | Same as Alternative Route A. |
| **Alternative Route D** | |
| Permanent | Alternative Route D intersects Site 38GE0651, the portion of Hopsewee Plantation adjacent to U.S. Highway 17, and the proposed expansion of the Georgetown Rice Fields. Alternative Route D is within the Gullah Geechee Cultural Heritage Corridor. Once a final right-of-way is selected within the preferred route, coordination with the SHPO and other consulting parties would occur to identify, evaluate, and if needed, mitigate adverse effects to historic properties. |
| Temporary | Same as Alternative Route A. |
| **Alternative Route E** | |
| Permanent | Alternative Route E intersects Site 38CH0512 and the proposed expansion of the Georgetown Rice Fields. Alternative Route E is within the Gullah Geechee Cultural Heritage Corridor. Once a final right-of-way is selected within the preferred route, coordination with the SHPO and other consulting parties would occur to identify, evaluate, and if needed, mitigate adverse effects to historic properties. |
| Temporary | Same as Alternative Route A. |
| **Alternative Route F** | |
| Permanent | Alternative Route F intersects the proposed expansion of the Georgetown Rice Fields. Alternative Route F is within the Gullah Geechee Cultural Heritage Corridor. Once a final right-of-way is selected within the preferred route, coordination with the SHPO and other consulting parties would occur to identify, evaluate, and if needed, mitigate adverse effects to historic properties. |
| Temporary | Same as Alternative Route A. |

| **Recreation and Land Use** | |
|---|---|
| **No Action** | No direct effect; indirect effect if future land uses were impeded by lack of increased electrical supply necessary to meet demands of development. |
| **Alternative Route A** | |
| Permanent | 146.3 acres of right-of-way would be required and would be restricted from some types of future development.<br><br>The right-of-way would cross 1.2 miles of federal, 1.3 miles of state lands, and 1.3 miles of private lands in conservation easement.<br><br>The right-of-way would include 10.5 acres of federal and 11.8 acres of the Santee Delta WMA. |
| Temporary | Increase in noise, dust, and potential traffic congestion in recreational areas. Temporary access restrictions during construction on or over public use areas |

| **Recreation and Land Use** | |
|---|---|
| | Loss of use for landowners within the right-of-way on private lands during construction.<br><br>Access restrictions and/or loss of use within the right-of-way during construction on state or federal properties.<br><br>Disturbance from heavy equipment may result in some crop/timber loss during construction. |
| **Alternative Route B** | |
| Permanent | 147.9 acres of right-of-way would be required and would be restricted from some types of future development.<br><br>The right-of-way would cross 1.2 miles of federal, no state lands, and 3.1 miles of private lands in conservation easement.<br><br>The right-of-way would include 10.5 acres of federal and 0 acres of state lands. |
| Temporary | same as Alternative Route A |
| **Alternative Route C** | |
| Permanent | 142.2 acres of right-of-way would be required and would be restricted from some types of future development.<br><br>The right-of-way would cross 94-feet of federal, no state lands, and 2.7 miles of private lands in conservation easement.<br><br>The right-of-way would include 0.2 acre of federal lands. |
| Temporary | same as Alternative Route A |
| **Alternative Route D** | |
| Permanent | 145.9 acres of right-of-way would be required and would be restricted from some types of future development.<br><br>The right-of-way would cross 94-feet of federal, 1.3 miles of state lands, and 1.3 miles of private lands in conservation easement.<br><br>The right-of-way would include 0.2 acre of federal and 11.8 acres of the Santee Delta WMA. |
| Temporary | same as Alternative Route A |
| **Alternative Route E** | |
| Permanent | 181.4 acres of right-of-way would be required and would be restricted from some types of future development.<br><br>The right-of-way would cross 1.2 miles of federal, no state lands, and 1.7 miles of private lands in conservation easement.<br><br>The right-of-way would include 10.5 acres of federal and 0 acres of state lands. |
| Temporary | same as Alternative Route A |
| **Alternative Route F** | |
| Permanent | 173.6 acres of right-of-way would be required and would be restricted from some types of future development.<br><br>The right-of-way would cross 91-feet of federal, no state lands, and 1.3 miles of private lands in conservation easement.<br><br>The right-of-way would include 0.16 acre of federal and 0 acres of state lands. |
| Temporary | Same as Alternative Route A |

| **Visual Resources** | |
|---|---|
| **No Action** | No direct effect or indirect effects |
| **Alternative Route A** | |
| Permanent | Alternative Route A has the greatest number of residences within the 600-foot corridor (22) which may change the viewshed of those residences, depending surrounding vegetation. In addition, Alternative Route A (like Alternative Route D) is parallel to U.S. Highway 17. Alternative Route A also crosses the Santee Delta WMA along U.S. Highway 17 with relatively little vegetation in this area. Therefore, Alternative Route A would be highly visible to local residents, recreational users, and commuters along the highway.<br><br>Alternative Route A (along with Alternative Routes B and E) would have a slightly greater visual impact on the FMNF because it parallels U.S. Highway 17 within the FMNF and has a greater distance within the forest. |
| Temporary | Visibility of construction vehicles and equipment along the right-of-way. |
| **Alternative Route B** | |
| Permanent | Five residences are located within the 600-foot corridor of Alternative Route B. Viewshed for these residences may be impacted depending on surrounding vegetation. Alternative Route B will be visible from users of U.S. Highway 17 in the northern portion of the study area before the Route shifts to the west. From this point, the transmission line may be visible through breaks in vegetation. At the crossing of the Santee Rivers, the transmission line may be visible to the west but would not dominate the view. Alternative Route B would be visible to users of U.S. Highway 17 south of the Santee Rivers as it parallels U.S. Highway 17.<br><br>Alternative Route B (along with Alternative Routes A and E) would have a slightly greater visual impact on the FMNF because they parallel U.S. Highway 17 within the FMNF and have a greater distance within the forest. |
| Temporary | Same as Alternative Route A |
| **Alternative Route C** | |
| Permanent | Alternative Route C has 2 residences within the 600-foot corridor. Viewshed for these residences may be impacted depending on surrounding vegetation. Alternative Route C may be visible from users of U.S. Highway 17 through breaks in vegetation. At the crossing of the Santee Rivers, the transmission line may be visible to the west but would not dominate the view.<br><br>Alternative Route C would cross a narrow section of the FMNF and is not close to any roads. Therefore, Alternative Route C (along with Alternative Routes D and F) would have the least impact on visual resources within FMNF. |
| Temporary | Same as Alternative Route A |
| **Alternative Route D** | |
| Permanent | Alternative Route D has the second greatest number of residences within the 600-foot corridor (19) which may change the viewshed of those residences, depending surrounding vegetation. In addition, Alternative Route D (like Alternative Route A) is parallel to U.S. Highway 17. Alternative Route D also crosses the Santee Delta WMA along U.S. Highway 17 with relatively little vegetation in this area. Therefore, Alternative Route D would be highly visible to local residents, recreational users, and commuters along the highway.<br><br>Alternative Route D would cross a narrow section of the FMNF and is not close to any roads. Therefore, Alternative Route D (along with Alternative Routes C and F) would have the least impact on visual resources within FMNF. |
| Temporary | Same as Alternative Route A |
| **Alternative Route E** | |
| Permanent | Four residences are located within the 600-foot corridor of Alternative Route E. |

| **Recreation and Land Use** | |
|---|---|
| | Viewshed for these residences may be impacted depending on surrounding vegetation. Alternative Route E parallels an existing transmission line for 4.3 miles. In this area, the visual impact is incremental to the existing condition and does not create a new visual impact. Alternative Route E is also located well west of the major residential and visually sensitive areas.<br>Alternative Route E (along with Alternative Routes A and B) would have a slightly greater visual impact on the FMNF because they parallel U.S. Highway 17 within the FMNF and have a greater distance within the forest. |
| Temporary | Same as Alternative Route A |
| **Alternative Route F** | |
| Permanent | Alternative Route F has the least number of residences within the 600-foot corridor (1). The viewshed for this residence may be impacted depending on surrounding vegetation. Alternative Route F, like Alternative E, parallels an existing transmission line for 4.3 miles. In this area, the visual impact is incremental to the existing condition and does not create a new visual impact. Alternative Route F is also located well west of the major residential and visually sensitive areas.<br><br>Alternative Route F would cross a narrow section of the FMNF and is not close to any roads. Therefore, Alternative Route F (along with Alternative Route C) would have the least impact on visual resources within FMNF. |
| Temporary | Same as Alternative Route A |

| **Socioeconomics** | |
|---|---|
| **No Action** | No direct effects; indirect effects may result from the loss of development opportunities with the existing constraints on the electrical system |
| **Alternative Route A** | |
| Permanent | Economic benefit to businesses and surrounding communities from increased electrical capacity and reliability.<br><br>Potential changes in property values.<br><br>Minimal reductions in timber production from loss of land for structure placement and the right-of-way.<br><br>Property tax revenues between $44,708 annually to study area counties. |
| Temporary | Economic benefit to local communities during construction as a result of construction crews generating local revenue. |
| **Alternative Route B** | |
| Permanent | Economic benefit to businesses and surrounding communities from increased electrical capacity and reliability.<br><br>Potential changes in property values.<br><br>Minimal reductions in timber production from loss of land for structure placement and the right-of-way.<br><br>Property tax revenues of $45,171 annually to study area counties. |
| Temporary | Same as Alternative Route A |
| **Alternative Route C** | |
| Permanent | Economic benefit to businesses and surrounding communities from increased electrical capacity and reliability. |

| **Socioeconomics** | |
|---|---|
| | Potential changes in property values.<br><br>Minimal reductions in timber production from loss of land for structure placement and the right-of-way.<br><br>Property tax revenues of $43,558 annually to study area counties. |
| Temporary | Same as Alternative Route A |
| **Alternative Route D** | |
| Permanent | Economic benefit to businesses and surrounding communities from increased electrical capacity and reliability.<br><br>Potential changes in property values.<br><br>Minimal reductions in timber production from loss of land for structure placement and the right-of-way.<br><br>Property tax revenues of $44,607 annually to study area counties. |
| Temporary | Same as Alternative Route A |
| **Alternative Route E** | |
| Permanent | Economic benefit to businesses and surrounding communities from increased electrical capacity and reliability.<br><br>Potential changes in property values.<br><br>Minimal reductions in timber production from loss of land for structure placement and the right-of-way.<br><br>Property tax revenues of $54,529 annually to study area counties. |
| Temporary | Same as Alternative Route A |
| **Alternative Route F** | |
| Permanent | Economic benefit to businesses and surrounding communities from increased electrical capacity and reliability.<br><br>Potential changes in property values.<br><br>Minimal reductions in timber production from loss of land for structure placement and the right-of-way.<br><br>Property tax revenues of $52,360 annually to study area counties. |
| Temporary | Same as Alternative Route A |

| **Environmental Justice** | |
|---|---|
| **No Action** | Electrical reliability issues would continue and would result in continued adverse impacts to the region. Because the service area of the McClellanville Circuit consists of predominantly minority and low income communities, there would be a disproportionate adverse impact on minority and/or low-income populations. |
| **Alternative Route A** | |
| Permanent | Minority and low income populations could be adversely affected by potential Project-induced impacts on additional resource areas.<br>Alternative Routes A and D have the highest number of residences (108 and 95, respectively) within minority blocks within ¼ mile of the routes. Therefore, |

| **Environmental Justice** | |
|---|---|
| | Alternative Route A, along with Alternative Route D has the highest potential for environmental justice impacts. |
| Temporary | Some temporary impacts during construction such as noise may occur to these populations. |
| **Alternative Route B** | |
| Permanent | Minority and low income populations could be adversely affected by potential Project-induced impacts on additional resource areas.<br>Alternative Route B has 59 residences within ¼ mile of the route that are within minority blocks. |
| Temporary | Same as Alternative Route A |
| **Alternative Route C** | |
| Permanent | Minority and low income populations could be adversely affected by potential Project-induced impacts on additional resource areas.<br>Alternative Route C has 50 residences within ¼ mile of the route that are within minority blocks. |
| Temporary | Same as Alternative Route A |
| **Alternative Route D** | |
| Permanent | Minority and low income populations could be adversely affected by potential Project-induced impacts on additional resource areas.<br>Route D has the second highest number of residences (95) in minority blocks within ¼ mile and has a higher potential for environmental justice impacts, along with Route A. |
| Temporary | Same as Alternative Route A |
| **Alternative Route E** | |
| Permanent | Minority and low income populations could be adversely affected by potential Project-induced impacts on additional resource areas.<br>Alternative Route E has 45 residences within minority blocks within ¼ mile of the route. |
| Temporary | Same as Alternative Route A |
| **Alternative Route F** | |
| Permanent | Minority and low income populations could be adversely affected by potential Project-induced impacts on additional resource areas.<br>Alternative Route F has the fewest residences within any block and therefore, has the lowest potential for environmental justice impacts. |
| Temporary | Same as Alternative Route A |

| **Transportation** | |
|---|---|
| **No Action** | No effect. |
| **Alternative Route A** | |
| Permanent | No long-term effects on transportation are anticipated.<br>Alternative Route A crosses U.S. Highway 17 twice. |
| Temporary | Some temporary road closures are likely during construction activities and may result in short-term adverse impacts. |
| **Alternative Route B** | |
| Permanent | No long-term effects on transportation are anticipated.<br>Alternative Route B crosses U.S. Highway 17 twice. |
| Temporary | Same as Alternative Route A |
| **Alternative Route C** | |
| Permanent | No long-term effects on transportation are anticipated.<br>Alternative Route C does not cross any state or US highways. |
| Temporary | Same as Alternative Route A |

| **Alternative Route D** | |
|---|---|
| Permanent | No long-term effects on transportation are anticipated.<br>Alternative Route D does not cross any state or US highways and crosses the fewest number of local roads. |
| Temporary | Same as Alternative Route A |
| **Alternative Route E** | |
| Permanent | No long-term effects on transportation are anticipated.<br>Alternative Route E crosses U.S. Highway 17 twice and State highway 24 once. |
| Temporary | Same as Alternative Route A |
| **Alternative Route F** | |
| Permanent | No long-term effects on transportation are anticipated.<br>Alternative Route F crosses State Highway 24 once. |
| Temporary | Same as Alternative Route A |

| **Health, Safety, and Noise** | |
|---|---|
| **No Action** | No effect. |
| **Alternative Route A** | |
| Permanent | EMF would be well below identified thresholds to protect the public.<br>The operation of farm equipment near proposed structures could result in unnecessary contact and/or damage to machinery and/or operators.<br>Standard operation and safety procedures would be employed to ensure the safe delivery of services.<br>Alternative Route A (along with Alternative Routes B, C, D, and E) would all have a moderate impact on noise given the close proximity to residences and U.S. Highway 17. |
| Temporary | Hazardous and/or potentially hazardous materials may be encountered during construction, or exposure to energized transmission lines.<br>Temporary increase in noise levels along the right-of-way from construction vehicles and equipment. These impacts are likely to be minor with the implementation of construction plans that ensure worker safety, proper handling of hazardous materials, and spill cleanup. |
| **Alternative Route B** | |
| Permanent | EMF would be well below identified thresholds to protect the public.<br>The operation of farm equipment near proposed structures could result in unnecessary contact and/or damage to machinery and/or operators.<br>Standard operation and safety procedures would be employed to ensure the safe delivery of services.<br>Alternative Route B (along with Alternative Routes A, C, D, and E) would all have a moderate impact on noise given the close proximity to residences and U.S. Highway 17. |
| Temporary | Same as Alternative Route A |
| **Alternative Route C** | |
| Permanent | EMF would be well below identified thresholds to protect the public.<br>The operation of farm equipment near proposed structures could result in unnecessary contact and/or damage to machinery and/or operators.<br>Standard operation and safety procedures would be employed to ensure the safe delivery of services.<br>Alternative Route C (along with Alternative Routes A, B, D, and E) would all have a moderate impact on noise given the close proximity to residences and U.S. Highway 17. |
| Temporary | Same as Alternative Route A |

| | |
|---|---|
| **Alternative Route D** | |
| Permanent | EMF would be well below identified thresholds to protect the public.<br>The operation of farm equipment near proposed structures could result in unnecessary contact and/or damage to machinery and/or operators.<br>Standard operation and safety procedures would be employed to ensure the safe delivery of services.<br>Alternative Route D (along with Alternative Routes A, B, C, and E) would all have a moderate impact on noise given the close proximity to residences and U.S. Highway 17. |
| Temporary | Same as Alternative Route A |
| **Alternative Route E** | |
| Permanent | EMF would be well below identified thresholds to protect the public.<br>The operation of farm equipment near proposed structures could result in unnecessary contact and/or damage to machinery and/or operators.<br>Standard operation and safety procedures would be employed to ensure the safe delivery of services.<br><br>Alternative Route E (along with Alternative Routes A, B, C, and D) would all have a moderate impact on noise given the close proximity to residences and U.S. Highway 17. |
| Temporary | Same as Alternative Route A |
| **Alternative Route F** | |
| Permanent | Alternative Route F would have the least impact on noise given the low number of residences and distance from U.S. Highway 17. |
| Temporary | Same as Alternative Route A |

## 4.2 Irreversible and Irretrievable Commitment of Resources

Irreversible commitment of resources refers to the loss of future options for resource development or management, especially of nonrenewable resources such as cultural resources. Construction and operation of the proposed Project would require the permanent conversion of 142 to 181 acres depending on the alternative selected. This potentially would include federal, state, and private lands. Most of these lands are forested with silviculture production. The introduction of new transmission lines would permanently change the visual landscape in some areas. The construction of the Project would require the irretrievable commitment of non-recycled building materials and fuel consumed by construction equipment.

## 4.3 Relationship Between Short-term Uses of the Environment and the Maintenance and Enhancement of Long-term Productivity

NEPA legislation requires that an EIS describe “the relationship between local short-term uses of man’s environment and the maintenance and enhancement of long-term productivity.” Construction of the Project would have short-term impacts on environmental resources associated with construction of the transmission line, including installation of poles, conductors, any use of construction laydown areas, and use of the area as a transmission line ROW during the life span of the transmission line and its associated facilities. As indicated in the discussion under the individual resources, the small permanent footprint of the transmission line and the limited resource impacts indicate that operation of the facility would not likely affect regional natural resources to any significant degree. However, the land occupied by transmission towers would be an impact for the life of the transmission line, possibly exceeding 50 years. The proposed Project would require development of 0.27 to 0.35 acre of land for the footprint of the transmission line towers. Additional land would be needed for transmission ROW and any needed access roadways.

Temporary impacts from construction activities are discussed in Chapter 3 and Table 4-1. The applicants would be required to restore the ROW, temporary work spaces, potential access roads, abandoned ROW, and other lands affected by construction of the Project. During the restoration process, the applicant would work with landowners, SCDNR, USFS, and local wildlife management programs to ensure that the ROW is restored.

**Table 4-2: Estimated Long-term Impacts (acres) on Resources within the 75-foot ROW**

| Resource | Alt A | Alt B | Alt C | Alt D | Alt E | Alt F |
|---|---|---|---|---|---|---|
| ROW (acres) | 146.3 | 148 | 142.7 | 146.3 | 181 | 173.6 |
| Forest cover (acres) | 110 | 114 | 120 | 119 | 134 | 133 |
| Soils and/or rock (cubic feet) | 97,558 | 98,649 | 94,829 | 97,315 | 120,962 | 115,808 |
| Wetlands (Freshwater emergent [acres]) | 5.5 | 8.5 | 8.5 | 5.5 | 13.5 | 13.5 |
| Wetlands (Forested/Shrub [acres]) | 27 | 33.5 | 45.5 | 28 | 56.5 | 66 |

Construction and operation of the Project would result in long-term impacts on vegetation, limited to the permanent conversion of vegetated lands to utility land uses (transmission structures, and any required access roads); conversion of forested or wooded vegetated cover to herbaceous cover; and disturbance related to maintenance activities (mowing, herbicide application, tree trimming, and dangerous tree removal). Long-term (permanent) impacts would also accrue to prime and important farmland soils where transmission line structures are placed within the proposed ROW. However, these losses would constitute a small fraction of total lands within the proposed Project ROW. These resources would not return to productive, pre-disturbance conditions until the transmission line and associated facilities are removed.

In the case of wetland conversion, impacts could be mitigated through reclamation, restoration, or permanently protecting other wetlands for an offset of wetland losses. For all other resource areas identified in the EIS, long-term impacts beyond the Project lifetime of 50 years are either not anticipated or expected to be avoided through mitigation measures.

# 5. REGULATORY AND PERMIT REQUIREMENTS

The regulatory framework and authorizing actions relevant to the proposed Project were introduced in Section 1.3 of this EIS. Table 1-2 provided a summary of the permits, regulations, consultations, and other actions that would be required for the Project for each agency involved. Table 5-1 describes potential Project requirements that should be considered including permits, approvals, and consultation, etc. required for the Project. Central Electric would obtain necessary permits from counties and/or municipalities along the route (such as permits for road, highway, and flood channel encroachment and crossings; and temporary use and occupancy permits). Central Electric would also obtain any necessary pipeline and utility crossing permits for crossings of natural gas pipelines and electrical transmission lines.

**Table 5-1. Potential Project Requirements**

| Requirement | Citation | Description |
|---|---|---|
| **Potential Federal Requirements** | | |
| Archaeological Resources Protection Act | 16 USC 470 | The Act secures, for the present and future benefit of the American people, the protection of archaeological resources and sites which are on public lands and Indian lands, and to foster increased cooperation and exchange of information between governmental authorities, the professional archaeological community, and private individuals having collections of archaeological resources and data which were obtained before October 31, 1979. |
| Bald and Golden Eagle Protection Act | 16 USC 668-668d | The Act prohibits anyone, without a permit issued by the Secretary of the Interior, from “taking” bald eagles, including their parts, nests, or eggs.<br><br>A permitting program was established by USFWS Division of Migratory Bird Management. If activities require the removal or relocation of an eagle nest, a permit is required from the Regional Bird Permitting office. |
| Clean Air Act | 42 USC 7401 | The Act establishes NAAQS for certain pervasive pollutants. The Act establishes limitations on $SO_2$ and NOx emissions and sets permitting requirements.<br><br>Authority for implementation of the permitting program is delegated to SCDHEC, Bureau of Air Quality. |

| Requirement | Citation | Description |
|---|---|---|
| Clean Water Act | 32 USC 1251 | The Act contains standards to address the causes of pollution and poor water quality, including municipal and industrial wastewater discharges, polluted runoff from urban and rural areas, and habitat destruction.<br><br>USEPA has delegated authority to the SCDHEC, Bureau of Water. |
| | | Section 401 – Water Quality Certification for Wetlands. Requires certification for any permit or license issued by a federal agency for any activity that may result in a discharge into waters of the state to ensure that the proposed project will not violate state water standards.<br><br>Permits are issued by the SCDHEC, Bureau of Water. |
| | | Section 404 – Permits for Dredged or Fill Material. Regulates the discharge of dredged or fill material in the jurisdictional wetlands and waters of the United States.<br><br>Permits are issued by USACE. |
| Determination of No Hazard to Air Navigation | 14 CFR §77 | Requires that the FAA issue a determination stating whether the proposed construction or alteration would be a hazard to air navigation, and will advise all known interested persons. |
| Endangered Species Act | 16 USC 1531 et seq. | Section 7 of the Act requires any federal agency authorizing, funding, or carrying out any action to ensure that the action is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of critical habitat of such species.<br><br>If the project is determined to be an activity that might incidentally harm (or “take”) endangered or threatened species, the applicants would be required to obtain an incidental take permit from USFWS or NMFS, which would be a part of the Biological Opinion issued by the USFWS or NMFS. |
| Farmland Protection Policy Act | 7 USC 4201 et seq. | The Act requires federal agencies to identify and quantify adverse impacts of federal programs on farmlands to minimize the number of federal programs that contribute to the unnecessary and irreversible conversion of agricultural land to non-agricultural uses. The Act designates farmland as prime, unique, of statewide importance, and of local importance. The Act is overseen by USDA’s NRCS. |
| Federal Highway Administration Encroachment Permits | | The Department of Transportation’s Federal Highway Administration requires encroachment permits for crossing federally funded highways. |

| **Requirement** | **Citation** | **Description** |
|---|---|---|
| Federal Insecticide, Fungicide and Rodenticide Act | 7 USC 136 et seq. | The Act registers and regulates pesticides. |
| Federal Land Policy Management Act | 7 USC 2801 et seq. | Requires that each federal land-managing agency have a program in place for controlling undesirable plant species and must implement cooperative agreements with the State. Requires that any environmental assessments or impact statements that may be required to implement plant control agreements must be completed within one year of the time the need for the document was established. |
| Federal Power Act | 16 USC Chapter 12 | Requires federal agencies to provide transmission service on non-discriminatory basis through compliance with established Tariffs. |
| Fish and Wildlife Conservation Act | 16 USC 2901 et seq. | The Act encourages federal agencies to conserve and promote conservation of non-game fish and wildlife species and their habitats. Mitigation methods should be designed to conserve wildlife and their habitats. |
| Fish and Wildlife Conservation Act | 16 USC 661 et seq. | The Act requires federal agencies to consult with USFWS and the state agency responsible for fish and wildlife resources if the project affects water resources. |
| Magnuson-Stevens Fishery Conservation and Management Act | 16 USC 1802 | The act, as amended by the Sustainable Fisheries Act, requires the establishment of Essential Fish Habitat descriptions in federal fishery management plans and requires all federal agencies to consult with National Oceanic and Atmospheric Administration, Fisheries on activities that may adversely affect essential fish habitat. |
| Migratory Bird Treaty Act | 16 USC 703 et seq. | The Act protects birds that have common migration patterns between the United States and Canada. Under the Act, taking, killing or possessing migratory birds or their eggs or nests is unlawful.<br><br>The Act requires a Special Purpose Permit when an applicant demonstrates a legitimate purpose to violate the Act. |
| National Environmental Policy Act | 42 USC 4321-4347 | The Act requires agencies of the federal government to study the possible environmental impacts of major federal actions significantly affecting the quality of the human environment. |

| Requirement | Citation | Description |
|---|---|---|
| National Forest Management Act | 16 USC 1600-1614 | The Act requires the Secretary of Agriculture to assess forest lands, develop a management program based on multiple-use, sustained-yield principles, and implement a resource management plan for each unit of the National Forest System.<br><br>It is the primary statute governing the administration of national forests. |
| National Historic Preservation Act | 16 USC 470 et seq. | Section 106 of the Act requires federal agencies to take into account the effects of its undertakings on properties listed in or eligible for listing in the NRHP, including prehistoric or historic sites, and districts, buildings, structures, objects, or properties of traditional religious or cultural importance.<br><br>The Act also requires federal agencies to afford the Advisory Council on Historic Preservation an opportunity to comment on the undertaking.<br><br>The South Carolina State Historical Preservation Office must also provide consultation. |
| National Invasive Species Act | P. L. 104-332 | The Act aims to prevent the introduction and spread of nonnative invasive species. The primary focus of the Act is on ballast water management. |
| National Trails System Act | 16 USC 1241 et seq. | The Act requires federal agencies to conduct consultations in order to promote the preservation of, public access to, travel within, and enjoyment and appreciation of the open-air, outdoor areas and historic resources of the nation. |
| National Wild and Scenic Rivers Act | 16 USC 1271-1287 | The Act requires that "In all planning for the use and development of water and related land resources, consideration shall be given by all federal agencies involved to potential national wild, scenic and recreational river areas." It further requires that "the Secretary of the Interior shall make specific studies and investigations to determine which additional wild, scenic and recreational river areas shall be evaluated in planning reports by all federal agencies as potential alternative uses of water and related land resources involved." |
| Noise Control Act | 42 USC 4901-4918 | The Act directs federal agencies to carry out programs in their jurisdictions “to the fullest extent within their authority” and in a manner that furthers a national policy of promoting an environment free from noise that jeopardizes health and welfare. |

| Requirement | Citation | Description |
|---|---|---|
| Occupational Safety and Health Act | 29 USC 651 et seq. | The Act established regulations for the protection of worker health and safety. The applicants would be subject to Occupational Health and Safety Administration general industry standards and construction standards. |
| Pollution Prevention Act | 42 USC 13101 et seq. | The Act establishes a national policy for waste management and pollution control. |
| Resource Conservation & Recovery Act | 42 USC 6901 et seq. | The Act regulates the treatment, storage, and disposal of hazardous wastes. The applicants would be required to manage hazardous wastes generated during construction or operation of the project in accordance with the Act. |
| RUS Environmental Policies and Procedures | 7 CFR §1794 | RUS must make decisions that are based on an understanding of environmental consequences, and take actions that protect, restore, and enhance the environment. In assessing the potential environmental impacts of its actions, RUS will consult early with appropriate federal, state, and local agencies and other organizations to provide decision-makers with information on the issues that are significant to the action in question. Applicants are responsible for ensuring that proposed actions are in compliance with all appropriate RUS requirements. Environmental documents submitted by the applicant shall be prepared under the oversight and guidance of RUS. RUS will evaluate and be responsible for the accuracy of all information contained therein. |
| **Potential Executive Orders (E.O.)** | | |
| E.O. 11593, Enhancement, Protection, & Management of the Cultural Environment | | The executive order gives the federal government the responsibility for stewardship of our nation's heritage resources and charges federal agencies with the task of inventorying historic and prehistoric sites on their lands. |
| E.O. 11988, Floodplain Management | | The executive order directs federal agencies to establish procedures to ensure that they consider potential effects of flood hazards and floodplain management for any action undertaken. Agencies are to avoid impacts to floodplains to the extent practical. |
| E.O. 11990, Protection of Wetlands | | The executive order directs federal agencies to avoid short- and long-term impacts to wetlands if a practical alternative exists. |

| Requirement | Citation | Description |
|---|---|---|
| E.O. 12898, Environmental Justice | | The executive order directs federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. |
| E.O. 13007, Indian Sacred Sites | | The executive order directs federal agencies, to the extent permitted by law and consistent with agency missions, to avoid adverse effects to sacred sites and to provide access to those sites to Native Americans for religious practices. |
| E.O. 13112, Invasive Species | | The executive order directs federal agencies to prevent the introduction or to monitor and control invasive non-native species and provide for restoration of native species. |
| E.O. 13175, Consultation and Coordination with Indian Tribal Governments | | The executive order directs federal agencies to establish meaningful consultation and collaboration with tribal governments to strengthen United States government-to-government relationships with Indian tribes. |
| E.O. 13186, Responsibilities of Federal Agencies to Protect Migratory Birds | | The executive order directs federal agencies to avoid or minimize the negative impacts of their actions on migratory birds, and to take active steps to protect birds and their habitats. |
| **Potential State Requirements** | | |
| State National Pollutant Discharge Elimination System (NPDES) Permit | | The applicant must obtain a NPDES permit from South Carolina Department of Health and Environmental Control for impacts greater than 1 acre in size. |
| State Road Crossing Permits | | The applicant must obtain permits from South Carolina DOT |
| State Highway Crossing Permits | | The applicant must obtain permits from South Carolina DOT |
| State Utility Occupancy Permits | | The applicant must obtain permits from South Carolina DOT |
| Permits to Cross State Wildlife Management Areas | | The applicant must obtain permits from SCDNR |

| Requirement | Citation | Description |
|---|---|---|
| Consultation/Approval regarding State-Listed Species of Concern | | The applicant must obtain permits from SCDNR |
| Consultation regarding Noxious Weeds | | The applicant must obtain permits from SCDNR |
| Construction Permits | | The applicant must obtain construction permits for crossing navigable waterways from the SCDHEC Water Bureau. |

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# 6. AGENCIES AND TRIBES CONTACTED

Consultation with tribes, federal, and state agencies has been ongoing. Various federal and state interagency meetings were conducted to share Project information and determine the scope of the EIS and throughout the development of the EIS.

## 6.1 Cooperating Agencies

RUS (lead agency) was assisted by USFS and USACE as cooperating agencies and by Central Electric and Berkeley Electric as Project proponents in preparing this EIS.

## 6.2 Federal Agencies Contacted

- USFS, FMNF
- USACE, Charleston Regulatory District
- USFWS
- NFMS
- NPS

## 6.3 South Carolina Agencies Contacted

- SCDNR
- SC SHPO
- South Carolina Forestry Commission

## 6.4 Tribes Contacted

- Catawba Indian Nation
- Eastern Shawnee Tribe

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# 7. LIST OF PREPARERS

| Name | Agency/Firm | Title | Education | Years of Experience | Responsibility |
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| Laurie Spears | Louis Berger Group | Project Manager | B.S. Biology, M.S. Environmental Science | 8 | Health and Safety |
| Holly Bender | Louis Berger Group | Senior Economist | B.A. Political Science and Economics/ Ph.D. Mineral Economics | 14 | Socioeconomics and Environmental Justice |
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| Name | Agency/Firm | Title | Education | Years of Experience | Responsibility |
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| Sue Davis | Louis Berger Group | Manager of Energy Permitting | B.S. Wildlife Management | 18 | |
| Chris Dixon | Louis Berger Group | Environmental Planner | M.U.R.P. Urban and Regional Planning; M.B.A. Business Administration; B.S. Environmental Economics and Management | 2 | Environmental Justice |
| Chris Flannagan | Louis Berger Group | Soil Scientist | B.S in Botany and Soil Conservation, M.S. in Soil Science | 16 | Water Resources and Soils |
| Rebecca Hott | Louis Berger Group | GIS Specialist | B.A. Environmental Studies M.S. Mineral and Energy Engineering | 1 | GIS and Mapping |
| Alan Fleissner PE | DiGioia Gray & Associates | Manager of Transmission Line Engineering | B.S. Civil Engineering M.S. Engineering Management | 30+ | Engineering and Health and Safety |

# 8. DISTRIBUTION LIST

a. Federal Agencies

U. S. Forest Service

U.S. Army Corps of Engineers

b. Tribal Governments and Agencies

Catawba Indian Nation

Eastern Shawnee Tribe

c. South Carolina State Agencies

South Carolina Department of Natural Resources

South Carolina State Historic Preservation Office

d. Local Units of Government

e. Local Libraries

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# Appendix A- Revised Macro-Corridor Study Report for the McClellanville 115 kV Transmission Project

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# CENTRAL ELECTRIC POWER COOPERATIVE
# (SC50)

## Revised Macro-Corridor Study Report

for the

## McClellanville 115kV Transmission Line Project

# Revised Macro-Corridor Study Report

**prepared for the**

# USDA Rural Utilities Service

**by the**

## Mangi Environmental Group, Inc.

## for the

## CENTRAL ELECTRIC POWER COOPERATIVE, INC.

## proposed

## McClellanville 115kV Transmission Line Project

## September 2010

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# Acronyms and Abbreviations

| | |
|---|---|
| CEPCI | Central Electric Power Cooperative Inc. |
| CFR | Code of Federal Regulations |
| DOE | Determinations of Eligibility |
| FEMA | Federal Emergency Management Agency |
| FMNF | Francis Marion National Forest |
| GIS | Geographic Information System |
| NEPA | National Environmental Policy Act |
| NRHP | National Register of Historic Places |
| NWR | National Wildlife Refuge |
| RCW | Red-cockaded Woodpecker |
| RFSS | Regional Forester Sensitive Species |
| ROW | Right of Way |
| RUS | Rural Utilities Service |
| SCDAH | South Carolina Department of Archives and History |
| SCDNR | South Carolina Department of Natural Resources |
| SCDPRT | South Carolina Department of Parks, Recreation, and Tourism |
| SCDOT | South Carolina Department of Transportation |
| SCIAA | South Carolina Institute of Archaeology and Anthropology |
| TES | Threatened and Endangered Species |
| USDA | United States Department of Agriculture |
| USFS | United States Forest Service |
| USFWS | United States Fish and Wildlife Service |
| USGS | United States Geological Survey |
| WMA | Wildlife Management Area |

# 1.0 Introduction

## 1.1 Basis for Macro-Corridor Study

The Electric Program of USDA's Rural Utilities Service (RUS) provides leadership and capital to upgrade, expand, maintain, and replace America's vast rural electric infrastructure. Under the authority of the Rural Electrification Act of 1936, RUS makes direct loans and loan guarantees to electric utilities to serve customers in rural areas. The Electric Program makes loans and loan guarantees to finance the construction of electric distribution, transmission and generation facilities, including system improvements and replacement required to furnish and improve electric service in rural areas, and for demand side management, energy conservation programs, and on-grid and off-grid renewable energy systems.

Central Electric Power Cooperative Inc. (Central Electric) has requested financing from RUS to construct a 115 kV transmission line to supply reliable power to the area surrounding the Town of McClellanville, SC. The need for additional reliable power and alternative means to provide that power are discussed in a separate report—the Alternative Evaluation Study, available for review at: http://www.usda.gov/rus/water/ees/eis.htm.

Federal agencies are required under the National Environmental Policy Act (NEPA) and Council on Environmental Quality's (CEQ) NEPA implementing regulations (40 CFR 1500-1508) to evaluate the environmental consequences of their actions. In addition, they are required to consider alternative ways of meeting a proposal's purpose and need before proceeding with a federal action that could significantly affect the human environment. RUS regulations at 7 CFR 1794 are the current agency-specific regulations for implementing NEPA. Agency guidance in RUS Bulletin 1794A-603 requires that two preliminary studies be prepared and approved for linear projects before scoping under NEPA is initiated—an Alternative Evaluation Study and a Macro-Corridor Study. When RUS approves those studies, the formal NEPA process can begin with the initiation of public and agency scoping and the subsequent preparation of an Environmental Assessment (EA) or an Environmental Impact Statement (EIS). RUS has decided to prepare an EIS for this proposal. The USDA Forest Service will serve as a cooperating agency in the preparation of the forthcoming EIS.

As required by RUS, the accompanying Alternative Evaluation Study explains the need for the proposal and discusses alternative methods that have been considered to meet that need. To the extent reasonable and appropriate, the Alternative Evaluation Study examines: the no action alternative; reducing load (or energy demand) in the McClellanville area through load management or energy conservation; rebuilding the existing distribution line infrastructure; constructing new on-site generation; and providing reliable power by constructing a new transmission line. The Alternative Evaluation Study explains each alternative in detail so that interested agencies and the public can gain a general understanding of each alternative. The study explains which alternative is considered the best for fulfilling the purpose and need for the proposal.

As required by RUS, the Macro-Corridor Study defines the proposal study area and shows the end points being considered for the proposed transmission line. Alternative corridor routes, varying in width from a few hundred feet up to a mile, were developed based on environmental, engineering, economic, land use, and permitting constraints. The use of existing rights-of-way or paralleling existing electric transmission lines were addressed as appropriate.

## 1.2 Basis for Revision of the Macro-Corridor Study

In November 2005, the first Macro-Corridor Study for the proposed McClellanville 115 kV transmission line and the accompanying Alternatives Evaluation Study were completed and made available to the public on the USDA Rural Utilities Service website. Potentially affected property owners were directly contacted by letter. Those individuals as well as federal, state, and local agencies, environmental groups, and the general public in the vicinity of McClellanville were notified about the proposal and invited to participate in scoping. Comments, concerns and opinions about the proposal were solicited through direct mailings as well as by local print and electronic media. Comments were received by RUS via mail, e-mail, phone, and facsimile communications and during an open-house format scoping meeting held in McClellanville in December 2005. The many steps outlined here were taken to widely disseminate information about the proposal to potentially affected property owners and the community as a whole so that all interested parties would have ample opportunity to voice their concerns and share ideas and relevant information they might have with respect to the alternatives and potential impacts of the proposal.

Following the public scoping period, the analysis team reviewed all comments, refined a number of study parameters and the analytical methodology, gathered updated and additional data, and conducted agency telephone meetings in a concerted effort to address all of the substantive issues raised during scoping. The comments and public outreach material compiled during the December 2005 – January 2006 scoping period are available for public review in a scoping report on the RUS website at: http://www.usda.gov/rus/water/ees/eis.htm. For example, one comment voiced by a number of individuals was concern regarding impacts to private lands in areas of concentrated residential development. In response to this concern, an additional mapped data layer was created for the analysis that characterized subdivisions and other residential clusters as higher risk areas. This change and a number of other methodological changes and data updates described in this document required re-running the GIS-based analytical models used to define the original alternative transmission line alignments and corridors. This revised Macro-Corridor Study discusses those analysis changes and data updates and presents a new set of path alignments and corridors that would serve as the basis for consideration of transmission line alternatives in the forthcoming EIS.

# 2.0 Project Description

McClellanville, South Carolina is located approximately 30 miles north of Charleston, SC along the U.S. Highway 17 corridor linking Charleston with Georgetown, SC (Figure 3-1). This rural area has no existing transmission infrastructure. The presence of the Francis Marion National Forest, Santee River delta and other nearby environmentally sensitive areas has limited the community's growth and allowed it to remain a relatively small electrical distribution load. Berkeley Electric Cooperative, a member of the Central Electric Coop System, has served the community from a long-distance distribution system with the longest circuits reaching almost 40 miles to the Santee River delta. In recent years, the community has begun to experience times of low voltage and frequent outages. The Alternative Evaluation Study determined that Central Electric's best options for addressing these reliability problems would involve construction of a transmission line that delivered power directly to the community with power distribution from a newly-constructed substation in McClellanville.

The proposed line would be a single-circuit 115 kV transmission line from a Santee-Cooper Network transmission line to a substation to be constructed by Berkeley Electric Cooperative that would range from 10 to 33 miles in distance depending on the selection of a source point and routing considerations. The construction will use single 75-foot high poles with three phase conductors and a single 0.565 OPGW fiber optic overhead shield wire. The right-of-way would be cleared to 75 feet in width (37.5 feet on either side of the centerline) and would include the removal of danger trees (hazardous trees that could fall on the line) that may be outside of the right-of-way.

This Macro-Corridor Study was conducted to determine what potential transmission line routing options were available for the McClellanville line, and in general terms, how they might be planned to avoid and minimize potential environmental, social, cultural, and economic effects. The results and findings of this report will serve as the foundation upon which more studies and analyses will be conducted for the EIS. For this study, five originating points for the transmission line—Charity, Jamestown, Honey Hill, Belle Isle, and Britton Neck were considered. The proposed transmission line would be routed from one of these five points to the proposed McClellanville substation (Figure 3-1).

# 3.0 Study Area Description

## 3.1 Study Area Location

The McClellanville 115 kV Transmission Line Project study area (Fig. 3-1) is located in the Atlantic coastal plain of South Carolina, within eastern Berkeley, northern Charleston, and southern Georgetown counties (Table 3-1). The study area encompasses approximately 1,008 square miles (645,363 acres) within a perimeter of 200 miles. The Francis Marion National Forest (FMNF) comprises 235,731 acres (37 percent) of the study area. The boundary of the study area follows U.S. Highway 17A from just east of Monck's Corner eastward, then along the Sampit River to Winyah Bay, then south along the west shore of the Bay and the Atlantic coastline at Mount Pleasant, then overland crossing Route 17 to the western boundary at the Cooper River and the West Branch of the Cooper River where it intersects Route 17A.

**Table 3-1: Analysis Acres by County**

| Counties | Total Acres | Acres of Study Area | % Of County in Study Area | FMNF Acres in Study Area |
|---|---|---|---|---|
| Berkeley | 786,236 | 290,741 | 37 | 169,352 |
| Charleston | 630,235 | 200,510 | 31.8 | 66,379 |
| Georgetown | 541,745 | 153,821 | 28.4 | 0 |
| Williamsburg* | 599,375 | 292 | 0.1 | 0 |
| **TOTAL** | 2,557,591 | 645,363 | - | 235,731 |
| * A negligible acreage of Williamsburg County is found within the study area boundary. This acreage exists in the northwest corner of the study area, and is found within the 300-foot buffer of Highway 17A. | | | | |

## 3.2 Study Area Characteristics

### 3.2.1 Physiography

The Atlantic Coastal Plain area – South Carolina's lowcountry – is comprised of extensive lowlands where elevations range from 0 to 80 feet above sea level (USFS, 1996). The terrain is characterized by a series of parallel ridges of sandy beach deposits with large areas of swamps, bays, and upland flats between the ridges. Limestone sinks are also found in the area, and are home for many rare plants, including the endangered pondberry (*Lindera melissaefolium*). Estuaries are common and are affected by tidal action and freshwater drainage from rivers and land. The winters are mild and the summers are hot, with average annual rainfall at about 48 inches (USFS, 1996).

**Study Area Depression Swamp (photo by L.L Gaddy)**

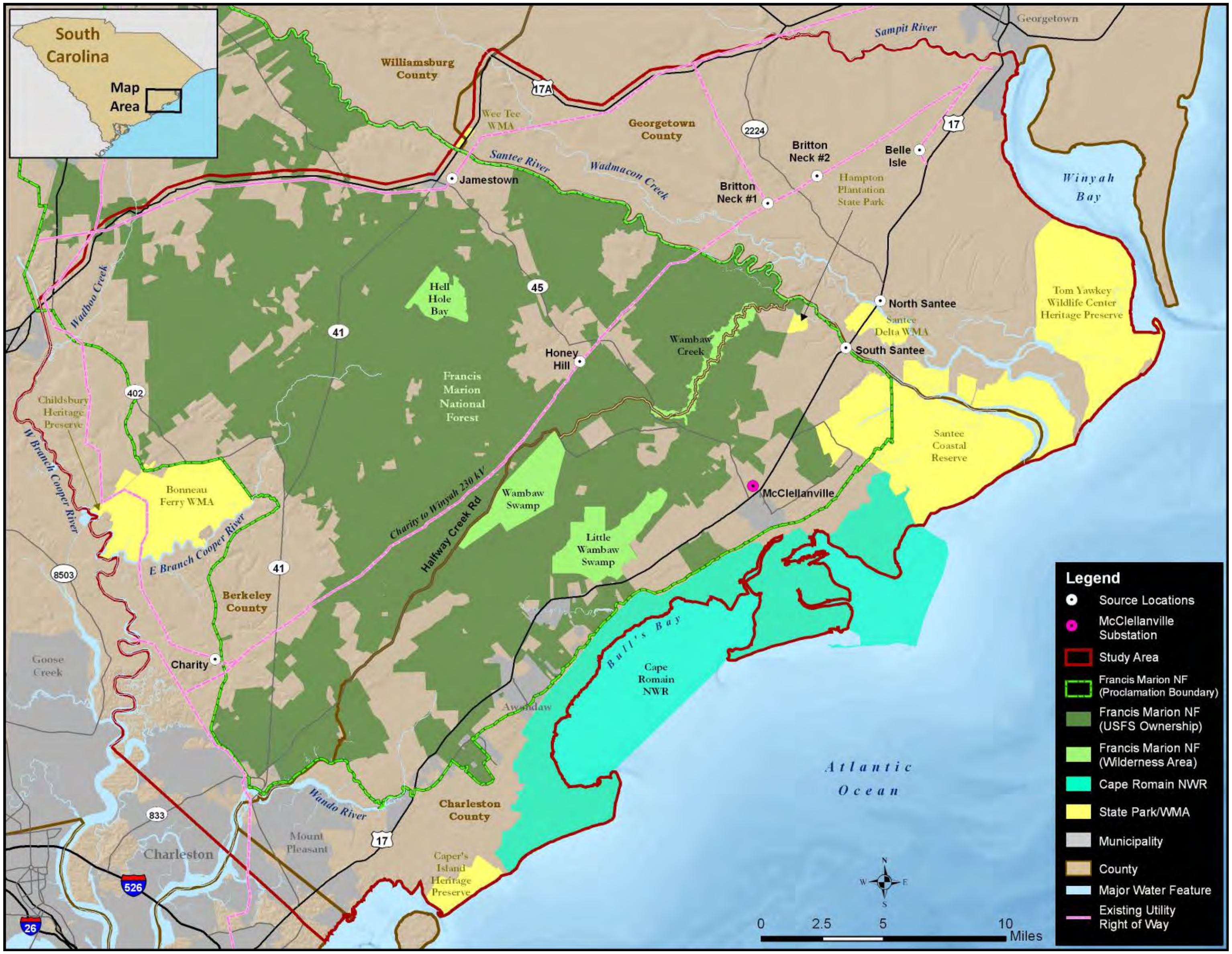



**Figure 3-1: Study Area**

The Santee River flows through the northern portion of the analysis area. The Santee River Delta is one of the largest deltas on the U.S. East Coast, formed from the deposition of eroded materials transported by the Santee River, and contains meandering creeks, marshes, and islands known for their aesthetic quality and biodiversity. The Delta includes diverse wetlands, ranging from grassy marshes to forested swamps.

### 3.2.2 Land Use/Land Cover

The study area is dominated by forest, with the majority of upland forested areas dominated by planted loblolly pine and some longleaf pine. On wetter sites, bottomland and swamp hardwoods dominate, with cypress also prominent. Maritime zones contain vegetation that is tolerant to wind and salt spray. Freshwater, brackish, and tidal marshes and their associated plant communities are found along coastal borders and throughout the Santee River Delta.

**Managed Upland Forest on the Francis Marion NF (photo by Tim Gaul)**

Urban land use is concentrated in the southern portion of the study area associated with Charleston and Mount Pleasant, with some development extending northward along the U.S. Highway 17 corridor to Georgetown.

Table 3-2 lists the land cover types/land uses that are found in the project study area (see USGS, 2001 for land cover type definitions).

**Table 3-2: Study Area Land Cover Characteristics**

| Land Cover Type | USGS Code | Acres | % of Area |
|---|---|---|---|
| Wetland | 90,95 | 302,927 | 47% |
| Forest | 41,42,43 | 232,559 | 36% |
| Open Water | 11 | 29,339 | 5% |
| Grassland/Herbaceous | 71 | 25,062 | 4% |
| Shrub/Scrub | 52 | 24,990 | 4% |
| Developed | 21,22,23,24 | 15,761 | 2% |
| Pasture | 81 | 8,868 | 1% |
| Cultivated Crop | 82 | 4,592 | 1% |
| Barren Land | 31 | 1,262 | <1% |
| **Total** | | **645,360** | **100%** |
| Source: USGS, 2001 | | | |

### 3.2.3 Socioeconomic Character

The low country of South Carolina, extending from the Sandhills east of Columbia to the coastline and coastal islands, has experienced a substantial population growth in the last decade. Table 3-3 lists the most recent available estimates of population and population change in the three low country counties of the study area between 2000 and 2006.

**Table 3-3: Population of the Study Area**

| County | Berkeley | Charleston | Georgetown |
|---|---|---|---|
| Population 2000 | 142,651 | 309,969 | 55,797 |
| Estimated Population 2007 | 163,622 | 342,973 | 60,499 |
| Population % Increase | 14.7 | 10.6 | 8.5 |
| Source: U.S. Census Bureau, 2009 | | | |

As the area continues to grow and provide employment opportunities, people living in communities within or adjacent to the study area are becoming less economically dependent on the traditional agricultural and forest-based industries. Though agricultural and forest-based industries remain important in the region, manufacturing has become one the largest expanding employment sectors in Berkeley and Georgetown Counties, while in Charleston County leisure and hospitality has become one of their largest growing employment sectors.

**Table 3-4: Percent Employment for Study Area Counties**

| Industry | Berkeley | Charleston | Georgetown |
|---|---|---|---|
| Educational, health, and social services | 17.1 | 22.7 | 16.6 |
| Manufacturing | 15.4 | 6.8 | 17.7 |
| Retail trade | 12.4 | 12.6 | 12.3 |
| Construction | 10.9 | 8.4 | 9 |
| Transportation and warehousing, and utilities | 7.8 | 4.9 | 3.9 |
| Leisure and Hospitality (Arts, recreation, entertainments, accommodation and food services) | 7.4 | 12.3 | 13.6 |
| Professional, scientific, management, administrative, and waste management services | 7 | 10 | 6.5 |
| Public administration | 6.5 | 5.6 | 3.5 |
| Finance, insurance, real estate, and rental and leasing | 5 | 6 | 6.1 |
| Other services (except public administration) | 4.8 | 5 | 4.2 |
| Wholesale trade | 3.1 | 2.9 | 2.8 |
| Information | 1.8 | 2.2 | 1 |
| Agriculture, forestry, fishing and hunting, mining | 0.7 | 0.6 | 2.7 |
| Source: U.S. Census Bureau, 2000 | | | |

Although portions of the City of Charleston and the Town of Mount Pleasant are within the boundaries of the study area, these urban areas are not indicative of the overall socioeconomic conditions that exist in this predominately rural study area. The following table lists the principal remaining three towns located within the study area (see Table 3-5).

**Table 3-5: Rural Towns in the Study Area**

| Town | County | 2000 Population |
|---|---|---|
| Town of Awendaw | Charleston | 1,195 |
| Town of Jamestown | Berkeley | 97 |
| Town of McClellanville | Charleston | 459 |
| Source: U.S. Census Bureau, 2000 | | |

### 3.2.4 Transportation

The major transportation corridors in the area include U.S. Highway 17, which parallels the Atlantic coast from Georgetown to Charleston and U.S. Highway 17A, which forms the northern boundary of the analysis area from Georgetown to the Charleston area. State highways in the area include Highway 41 from Jamestown to the Charleston area and Highway 45 from Jamestown to McClellanville. The Georgetown County Airport is located approximately three miles south of the Town of Georgetown. The Mount Pleasant Regional Airport, formerly known as the East Cooper Airport, is located nine miles northeast of the central business district of Mount Pleasant.

### 3.2.5 Water Resources

The study area includes large areas of swamps, bays, limestone sinks, tidal estuaries, and freshwater streams, lakes, and reservoirs. Numerous perennial and intermittent streams are found within the analysis area. Table 3-6 lists the major rivers and streams that are located in the analysis area.

**North Santee River, View Downriver from the Highway 17 Bridge (photo by T. Gaul)**

The Santee River traverses the northern half of the study area, and has one of the largest delta on the Atlantic Coast. The Santee Delta includes many acres of wetlands, from forested swamps, to grassy meadows, and tidal marshes. It harbors numerous species of birds including a variety of waterfowl and migratory species, as well as many sensitive fish, amphibian, and bird species.

**Table 3-6: Major Study Area Rivers and Streams**

| Major Rivers/Streams | Miles in Study Area |
|---|---|
| Santee River | 17.5 |
| North Santee River | 11.9 |
| Wadmacon Creek | 10 |
| Sampit River | 9.6 |
| South Santee River | 9.4 |
| East Branch Cooper River | 8.2 |
| Wadboo Creek | 7.2 |
| Cooper River | 7 |
| Nicholson Creek | 6.8 |
| Cedar Creek | 6.5 |
| West Branch Cooper River | 3.6 |
| Huger Creek | 3 |
| Tailrace Canal | 1.2 |
| Back River | 0.4 |
| **Total Miles** | **102.3** |

The U.S. Fish and Wildlife Service's (USFWS) National Wetland Inventory (NWI) maps were used to broadly identify wetlands areas. According to the NWI, the study area has 366,790 acres of wetland, comprising 57 percent of its total area. The apparent discrepancy between the NWI figure for total wetlands (366,790 acres or 57 percent of the study area) and the USGS figure presented in Table 3-2 (302,927 acres or 47 percent of the study area) is primarily because these inventories define the term "wetland" somewhat differently. For example, the NWI definition includes lakes and rivers (lacustrine and riverine wetlands) which are in the separate category of "open water" in the USGS classification. There are also differences in classification methodology and data formats (NWI data is vector-based polygon coverage, while the USGS data is a raster-based grid data format, consisting of cells that measure 30x30 meters). Table 3-7 lists wetland acreage by wetland type.

**Table 3-7: Wetland Acreage by Type (National Wetland Inventory)**

| Wetland Type | Acres |
|---|---|
| Estuarine | 120,013 |
| Lacustrine (lakes, reservoirs) | 5,263 |
| Riverine | 6,742 |
| *Palustrine* | |
| *Emergent* | 30,498 |
| *Forested* | 179,788 |
| *Scrub/Shrub* | 20,482 |
| *Other* | 4,003 |
| **Total** | **366,790** |

**Pond Cypress Wetland near Honey Hill (photo by L.L. Gaddy)**

### 3.2.7 Recreation Resources

The Francis Marion National Forest (FMNF) occupies a large portion of the study area and provides a wide range of recreational opportunities, both dispersed and developed. There are approximately 160 miles of trails for hiking, canoeing, horseback riding, bicycling and all-terrain vehicle (ATV) riding. Recreational facilities include boat ramps, horse camps, campgrounds, target shooting ranges, and canoe access areas. The public can also use the Forest for hunting, fishing, bird watching, or simply enjoying nature. The Sewee Environmental Education and Visitor Center is a joint venture between the Cape Romain National Wildlife Refuge (NWR) and the FMNF, and provides interpretive and environmental education programs.

Wildlife Management Areas (WMAs) managed by the South Carolina Department of Natural Resources (SCDNR) are also available for public recreational use, providing opportunities for hunting, camping, and wildlife viewing. WMAs in the study area include Santee Delta, Santee Coastal Reserve, Wee Tee, and Bonneau Ferry. Wildlife heritage preserves managed by SCDNR located in the study area include Tom Yawkey Wildlife Heritage Center Preserve, Childsbury Heritage Preserve, and Caper’s Island Heritage Preserve. Additionally, the Hampton Plantation State Park is located in the western region of the study area, near the U.S. Highway 17 crossing of the Santee River Delta.

The Santee River itself is a popular local recreational recourse, which provides fishing, canoeing, and waterfowl hunting opportunities.

### 3.2.8 Cultural Resources

The Native American presence in the study area began about 12,000 years ago, as evidenced by prehistoric archaeological sites ranging from approximately 10,000 BC-1550 AD. Additionally, the study area is rich in history with preserved coastal plantation properties dating back to the 18th century and numerous historical sites related to early colonization. Many of these prehistoric and historic sites are listed on the National Register of Historic Places (NRHP) and include prehistoric hunter-gather camps and village complexes, and historic buildings, structures, and archaeological sites. Archaeologists typically encounter these prehistoric and historic archaeological sites in areas of springs, river and stream terraces, environmental transition zones, and ridgetops with moderately well drained to well drained soils within 60 meters of a permanent water source.

### 3.2.9 Federal and State Lands

Table 3-8 lists Federal and State lands in the analysis area with their acreage and percent of analysis area. The Francis Marion National Forest (FMNF) is managed by the U.S. Forest Service (USFS) and serves many uses, including timber production, watershed protection and improvement, habitat for wildlife and fish species (including threatened and endangered species), wilderness area management, minerals leasing, and outdoor recreation (USFS, 2004). Almost the entire Forest (approximately 90 percent) is located within the boundaries of the analysis area.

Cape Romain National Wildlife Refuge (NWR), managed by the US Fish and Wildlife Service (USFWS), is located within the analysis area, in northeast Charleston County. Part of the Carolinian-South Atlantic Biosphere Reserve, the 64,229-acre Cape Romain NWR extends for 20 miles along the Atlantic Coast. It consists of 34,229 acres of beach and sand dunes, salt marsh, maritime forests, tidal creeks, fresh and brackish water impoundments, and 30,000 acres of open water. Headquarters for the NWR are located on seven acres of permitted lands within the FMNF (USFWS, No date).

**Table 3-8: State and Federal Land Ownership in the Study Area**

| Management Area | Managing Agency | Acreage in Analysis Area | % Of Analysis Area |
|---|---|---|---|
| Francis Marion National Forest | USFS | 235,731 | 36.50% |
| Cape Romain NWR | USFWS | 29,954 | 4.60% |
| Santee River Delta WMA | SCDNR | 1,524 | 0.20% |
| Santee Coastal Reserve WMA | SCDNR | 25,564 | 4% |
| Wee Tee WMA | SCDNR | 200 | 0.03% |
| Bonneau Ferry WMA | SCDNR | 10,439 | 1.60% |
| Tom Yawkey Preserve | SCDNR | 15,842 | 2.50% |
| Childsbury Preserve | SCDNR | 99 | 0.01% |
| Caper's Island Preserve | SCDNR | 2,178 | 0.30% |
| Hampton Plantation State Park | SCDPRT | 292 | 0.04% |
| Sources: SCDNR, 2008; USFS, 2004; GIS Data | | | |

Additionally, four federally designated wilderness areas, Hell Hole Bay, Little Wambaw Swamp, Wambaw Creek, and Wambaw Swamp, and approximately 11,450 acres of designated wilderness linkages (Management Area 29) that connect the wilderness areas, are located on the Francis Marion National Forest. About 28,000 acres of the Cape Romain NWR are preserved within the National Wilderness Preservation System. Table 3-9 presents their acreage within the analysis area.

**Table 3-9: Wilderness Areas in the Study Area**

| Wilderness | Acres |
|---|---|
| Hellhole Bay | 2,125 |
| Little Wambaw Swamp | 5,047 |
| Wambaw Creek | 1,825 |
| Wambaw Swamp | 4,815 |
| Cape Romain NWR Wilderness | 28,000 |
| Wilderness Linkages (MA 29) | 11,446 |
| **Total** | **53,258** |
| Sources: USFS, 1996 | |

### 3.2.10 Sensitive Wildlife Resources

The FMNF provides habitat (see text box) for one of the largest populations of the Federal-listed endangered red-cockaded woodpecker (RCW) in the United States. Poorly drained areas, such as swamps, floodplains, upland flats and coastal marshes provide wintering and breeding habitat for many species of waterfowl, osprey, and wading birds. These areas also provide foraging and nesting habitats for the bald eagle *(Haliaeetus leucocephalus)* and support viable populations of many amphibians, such as the federally threatened flatwoods salamander *(Ambystoma cingulatum)*, which has federally designated critical habitat on the Forest. Also found in this area is the northernmost established nesting population of the American swallow-tailed kite *(Elanoides forficatus).*

Since 1971, most of the FMNF has been cooperatively managed as the Francis Marion WMA (USFS, 1996). The Forest offers the largest and most consolidated area available for public hunting in the State. Wild turkeys *(Meleagris gallopavo)* found on the Forest are considered the purest strain of eastern wild turkey found in the United States. The FMNF provides many of the wild turkeys used for restocking other areas.

**RCW HABITAT:** The red-cockaded woodpecker makes its home in mature pine forests. Longleaf pines (Pinus palustris) are most commonly preferred, but other species of southern pine are also acceptable. While other woodpeckers bore out cavities in dead trees where the wood is rotten and soft, the red-cockaded woodpecker is the only one which excavates cavities exclusively in living pine trees. Cavities are excavated in mature pines, generally over 80 years old. The older pines favored by the red-cockaded woodpecker often suffer from a fungus called red heart disease which attacks the center of the trunk, causing the inner wood, the heartwood, to become soft. Cavity excavation takes one to six years. The aggregate of cavity trees is called a cluster and may include 1 to 20 or more cavity trees on 3 to 60 acres. The average cluster is about 10 acres. Cavity trees that are being actively used have numerous, small resin wells which exude sap. The birds keep the sap flowing apparently as a cavity defense mechanism against rat snakes and possibly other predators. The typical territory for a group ranges from about 125 to 200 acres, but observers have reported territories running from a low of around 60 acres, to an upper extreme of more than 600 acres. The size of a particular territory is related to both habitat suitability and population density. (Source: USFWS Red Cockaded Woodpecker Recovery at

The Santee River traverses the northern half of the study area, and has one of the largest deltas on the Atlantic Coast. The Santee River Delta includes many acres of wetlands, from forested swamps, to grassy meadows, and tidal marshes. It harbors numerous species of birds, including waterfowl, migratory birds, and some sensitive species (e.g., bald eagles, wood storks, and swallow-tailed kites). Other sensitive species inhabiting the Delta include the federally endangered short nosed sturgeon (*Acipenser brevirostrum*) and federally threatened flatwoods salamander.

**Red-cockaded Woodpecker Nest Tree (Photo T. Gaul)**

Cape Romain NWR habitat is barrier island/salt marsh, which consists of 34,229 acres of beach and sand dunes, salt marsh, maritime forests, tidal creeks, fresh and brackish water impoundments, and 30,000 acres of open water. The refuge provides habitat for over 337 species of birds, including waterfowl, shore birds, wading birds, and raptors. Cape Romain NWR boasts the largest nesting rookery for brown pelicans, terns, and gulls on the coast of South Carolina, as well as the largest nesting population of the federally threatened loggerhead sea turtle (*Caretta caretta*) outside the State of Florida. In addition, the NWR plays an integral role in the recovery of the federally endangered red wolf (*Canis rufus*) (USFWS, No date).

# 4.0 Suitability Analysis

The GIS modeling analytical methodology described here was initially based on the method used in the Georgia Transmission Corporation alternatives evaluation and power transmission study (GTC, 2001) and refined through application of the methods of Berry's *Map Analysis* (www.innovativegis.com/basis/). The resources to which this methodology were applied in the McClellanville study area and the rankings of sensitive resource risk and opportunity factors were reviewed extensively by RUS and the Forest Service as they were first identified and later refined. The methods, resources, and rankings were then subject to review and revision based on the public and agency scoping conducted by RUS in 2005 and through further agency review and refinements described here. Factors such as the parcel layer used for identifying developed and developable areas were included in the modeling analysis as a direct result of public input.

## 4.1 Suitability Maps

Planning and routing a transmission line requires consideration of how the line might affect a wide range of environmental, social, and cultural resources, as well as economic factors. These resources are commonly addressed during the planning of a transmission line by correlating the likelihood of impacts on the resources with specific locations on a set of maps. These maps, referred to as 'suitability maps', associate geo-referenced features, land cover types, or land uses with the likelihood of potential impacts from the proposed project – in this case, the construction and operation of a 115 kV transmission line to supply power to McClellanville.

Creating a suitability map begins with identifying study area resources that would likely be affected by transmission line construction, maintenance, and operation. Forested wetlands, for instance, may be affected by vegetation removal, resulting in modification of wetland structure, alteration of species composition, and disturbance to resident species. In many cases, impacts may affect multiple resources at the same location. For example, if an area is occupied by both a wetland and a recreational trail, there may be effects from construction on both the wetland community and the recreational value of the trail throughout the area.

In addition to identifying locations and areas of constraint where there is a greater risk of adverse effects, a suitability map also identifies areas of opportunity – that is, areas where activities of the proposed project would be more consistent with the current land use, the overall impacts of line construction are likely to be minimal, and the operation and management of the line would be more efficient. By identifying areas that are an opportunity for transmission line construction, other factors commonly considered, such as line accessibility, can be brought into the planning process. For example, constructing a transmission line adjacent to an existing road right of way may be anticipated to have reduced additional environmental impacts, and would allow for easy access and the use of existing management and maintenance strategies. In short, the study identified areas of constraint where risks or adverse impacts to valued resources were high and areas of opportunity where risks to resources were relatively low.

## 4.2 Rating Suitability Constraints and Opportunities

This study relied extensively on the use of Geographic Information Systems (GIS) data, analysis, and modeling techniques to identify possible transmission line corridors for the McClellanville project. GIS technology links information to its location (such as people to addresses, buildings to parcels, or streams to drainage networks) in a computer environment where it can be viewed, combined, and analyzed to identify relationships from a geographic perspective. Using this technology, a wide range of siting criteria were spatially integrated and used to compile a comprehensive suitability map that took into account multiple planning factors.

A wide range of GIS data sources were collected for the purposes of this analysis. Some data sources were used directly to identify areas of potential impact risk, whereas some were used only after modification or additional analysis steps. For the purposes of this report, once compiled and prepared for use in creation of the suitability map, data layers identifying the location and spatial extent of a specific transmission line siting factor (i.e., wetlands, road rights of way, sensitive species locations, etc.) were referred to as 'resource suitability layers'. The resource suitability layers, their sources and preparation are described in Sec. 4.3, 4.4, and 4.5.

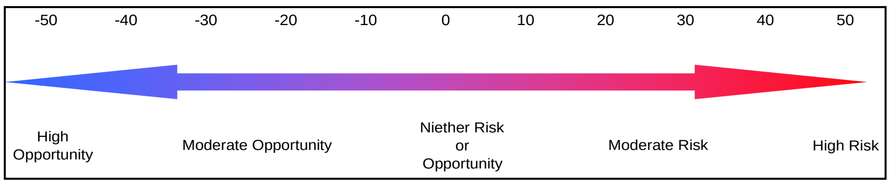
Once a resource suitability layer was compiled, its features were rated with a numeric suitability score that characterized the level of constraint (i.e., those areas that the transmission line should avoid) or opportunity (i.e., those areas that are most appropriate for a transmission line) that it provided for planning the transmission line route. The rating system used was designed to protect the most sensitive parts of the study area by identifying areas of potential impact risk, while highlighting areas best suited for construction of the transmission line, i.e. areas of opportunity.

Areas within each individual resource suitability layer were assigned *positive* numeric values, between +1 and +50, if constructing a transmission line within that area could result in increased risk of potential impacts to that layer's resource. For example, within the threatened and endangered species resource suitability layer (Section 4.4.3), areas within a 200 foot to 1/2 mile management zone buffer zone of a known red cockaded woodpecker colony were assigned a suitability factor of +50. This risk rating reflects the high likelihood of impacts associated with locating a transmission line within the management zone of a red-cockaded woodpecker colony.

In contrast, areas within a resource suitability layer were assigned *negative* numeric values, between -1 and -50, if constructing a transmission line within that area would be considered an appropriate use of that area resource, or more specifically, an opportunity for siting the proposed transmission line. For example, areas immediately adjacent to an existing transmission line corridor were assigned a suitability rating of -50 to identify these areas as a potential opportunity for planning the proposed transmission line corridor.

Areas within a given resource suitability layer that had no sensitive features were assigned a suitability value of zero. A rating of zero indicated that, for that specific resource, no sensitive features were identified in that area. For example, areas of upland in the wetland resource data layer, were attributed a value of zero because no impacts to wetlands would be anticipated in these areas. Although other impacts may occur in upland areas, these areas would be identified, and accounted for in other resource suitability layers, such as in the threatened and endangered species habitat resource layer.

Lastly, certain features within the study area were excluded from consideration for transmission line routing, and were removed from the transmission line path analysis and least-risk corridor delineation. These areas were excluded because of either regulatory restrictions or because adverse impacts associated with locating a transmission line through them would result in likely and potentially significant impacts on area resources. The following graphic summarizes the rating system. A list of the ratings for each layer is summarized in Table 4.1.




## 4.3 Exclusionary Resource Suitability Layers

The following data layers were used to identify areas that are considered unsuitable for transmission line construction. These areas were excluded from consideration for modeling potential transmission line paths and corridors. Brief descriptions of their origin and any additional modifications are provided below. A simplified graphic displaying the distribution and extent of the resource within the study area is provided for each description.

### 4.3.1 Historic/Archaeological Districts - *Excluded*

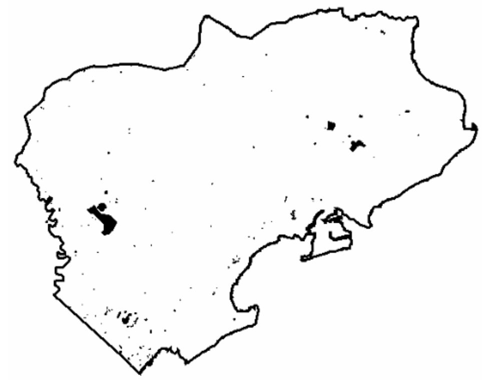
All areas within the boundaries of designated Historic or Archaeological Districts were excluded from consideration for transmission line corridor planning. Transmission line siting in these areas has a high potential to adversely impact cultural resources and/or the historic character being preserved in these areas.

Historic/Archeological District boundaries were obtained from Mr. Chad Long of the South Carolina Department of Archives and History (SCDAH) in Columbia, SC by Brockington and Associates, Inc. in January, 2005

**Table 4-1: Summary of Suitability Ratings**

| Suitability Layers | Rating |
|---|---|
| Historic /Archeological Districts | Excluded |
| Known Cultural Sites (Listed or Eligible for Listing on the NRHP) | Excluded |
| Airports | Excluded |
| Wilderness Areas | Excluded |
| Wilderness Linkages (MA 29) | Excluded |
| Francis Marion National Forest | +25 |
| State Wildlife Management Areas/Preserves | +25 |
| Areas of High Probability of a Cultural Site | +25 |
| Known Cultural Sites (Potentially Eligible for Listing on the NRHP) | +25 |
| Conservation Easements | +25 |
| Threatened, Endangered, and Sensitive Species | |
| *RCW Colony (200 ft Buffer)* | Excluded |
| *RCW Management Area (200ft- 1/2 mi)* | +50 |
| *Flatwoods Salamander (1/4 mile Buffer)* | Excluded |
| *Flatwoods Salamander Critical Habitat* | Excluded |
| *Potential Flatwoods Salamander Habitat* | +25 |
| *Bald eagle Primary Management Area (0-660 ft)* | Excluded |
| *Other State Listed Species (200 ft Buffer)* | +50 |
| *Francis Marion National Forest Botanical Habitat* | +25 |
| Recreation | |
| *Recreation Areas and Trails (with 300 ft Buffer)* | +50 |
| *North and South Santee Rivers* | +25 |
| Wetlands | |
| *Palustrine Forested, Lacustrine, and Estuarine* | +50 |
| *Palustrine Emergent and Riverine* | +30 |
| *Palustrine scrub shrub* | +15 |
| Migratory Bird Area | +25 |
| Vistas | |
| *Cultural Site Foreground (0-300ft)* | +50 |
| *Delta Foreground (0-300ft)* | +50 |
| *Delta Midground (300ft-1/2 mi)* | +30 |
| *Delta Background (Beyond 1/2 mile)* | +15 |
| Existing Transmission ROWs | -50 |
| Road ROWs | |
| *Major, Minor and Local Road "buildable areas"* | -25 |
| *Major and Minor Road central "non-buildable areas"* | +50 |
| Structures (with 300 ft Buffer) | +50 |
| Parcels | |
| *< .25 Acres* | +50 |
| *.26 - .75 Acres* | +40 |
| *.76 -1.5 Acres* | +30 |
| *1.6 – 3 Acres* | +20 |
| *3.1 – 6 Acres* | +10 |

### 4.3.2 Known Cultural Sites (Listed or Eligible for the NRHP) - *Excluded*

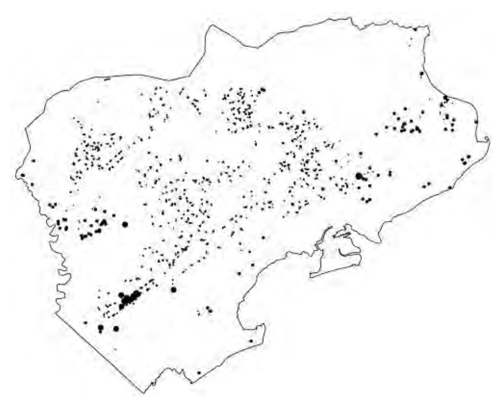


Areas in which transmission line construction could potentially impact known cultural sites were excluded from consideration for transmission line corridor planning. For this analysis, linear architectural features (historic roads or trails) and architectural structure sites (point locations) were buffered by 300 feet. All areas within these buffers were given exclusionary status. Cemeteries, archeological locations, and architectural property boundaries were also excluded.

Cultural sites identified in this data layer included sites listed on the National Register of Historic Places (NRHP) and sites on the Determination of Eligibility (DOE) list that were designated as eligible, potentially eligible, or those that have not yet been assessed for eligibility. Only sites designated as listed or eligible for the NRHP were included in this layer. Sites that were not eligible for the NRHP were not included, and were not excluded from consideration or otherwise considered for planning purposes. Potentially eligible sites are discussed in Section 4.4.1.

Literature was reviewed and data acquired on historic and archeological sites by Brockington and Associates, Inc. in 2005. Known site locations and their eligibility were obtained from the South Carolina Institute of Archaeology and Anthropology (SCIAA) and the SCDAH in Columbia, SC. Information concerning all currently digitized above-ground resources housed at the SCDAH was provided by Mr. Chad Long, SCDAH GIS Coordinator. This information included all above-ground resources including their eligibility recorded after 1989, all cultural resources studies conducted since 1989, and all archaeological sites and structures listed on the NRHP. All other recorded archaeological sites not on the NRHP were digitized from locations hand drawn on USGS topographic maps stored at the SCIAA. Eligibility status for digitized sites was obtained from DOE lists maintained by the SCDAH and the USFS-Witherbee Ranger District, as well as individual site forms and reports at the SCIAA for sites not included in the SCDAH's DOE list. Approximately 640 site forms were reviewed at the SCIAA.

### 4.3.3 Known Threatened and Endangered Species Locations - *Excluded*

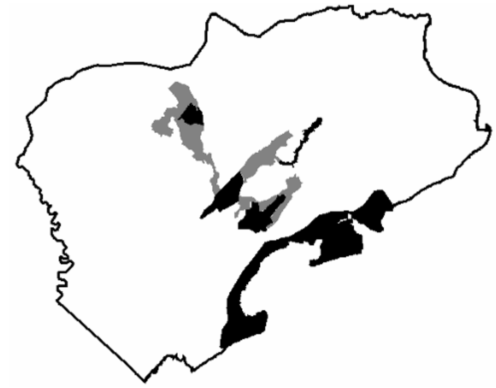


Threatened and endangered species locations for federally listed species were provided by the South Carolina State Natural Heritage Office and the USFS. On National Forest lands, the most recent locations (2008) for red cockaded woodpecker (*Picoides borealis*) colonies were also identified and mapped. All red cockaded woodpecker colonies were buffered by 200 feet and given exclusionary status.

Locations of known bald eagle (*Haliaeetus leucocephalus)* nest trees were buffered by 660 feet to protect the eagle's primary management zone (PMZ). Due to the risk of eagles abandoning nests if tree cutting were to occur with in the PMZ, the PMZ was given exclusionary status (USFWS, 2005). While the bald eagle has been "delisted" under the Endangered Species Act, it is still conferred special status by the Bald Eagle Protection Act of 1940, as amended.

All known flatwoods salamander (*Ambystoma cingulatum)* breeding ponds and a ¼ mile surrounding them were excluded because it is a critically imperiled species in South Carolina. Two areas in the study area designated as critical habitat by the USFWS for flatwoods salamander were also excluded.

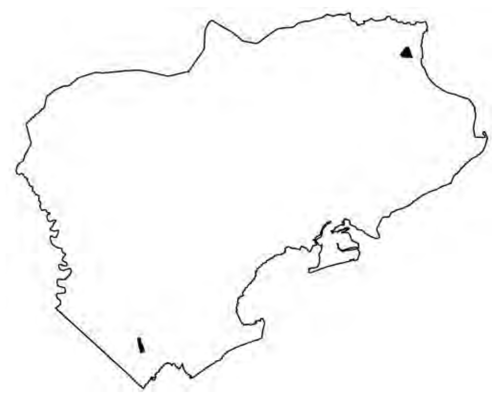
#### 4.3.4 Wilderness Areas and Linkages – *Excluded*



Four areas on the FMNF have been designated by federal statute as wilderness areas (i.e., included in the National Wilderness Preservation System): Hellhole Bay, Wambaw Swamp, Wambaw Creek, and Little Wambaw Swamp. In addition, 28,000 acres of the Cape Romain NWR are under wilderness area protection. These areas were removed from consideration for transmission line construction in this analysis. Any proposed transmission line development within a designated wilderness area requires Presidential and Congressional approval.

Forest Service Management Area (MA) 29 provides wilderness linkages between existing Wilderness Areas. The FMNF *Land and Resource Management Plan* emphasizes the minimization of breaks in the forest canopy, road constriction and limits issuance of special use permits. For this reason, MA 29 was excluded except for existing openings, such as existing roads and ROWs.

#### 4.3.5 Airports – *Excluded*



Two regional airports located within the study area, the Georgetown County Airport and the Mount Pleasant Regional Airport, were excluded in the analysis.

## 4.4 Risk Resource Suitability Layers

The following data layers were used to identify areas where there would be a risk of adverse impacts from transmission line construction and operation, i.e. areas of low suitability for transmission line planning. Brief descriptions of the origin of these data layers and their preparation are provided below.

#### 4.4.1 Known Cultural Sites (Potentially Eligible for the NRHP) - *Risk*

Cultural sites that have been designated as potentially eligible for the NRHP are included as a conservative measure and given a rating of +25. Sites that were not eligible for the NRHP were not included, and were not otherwise considered for planning purposes.

Literature review and data acquisition for historic and archeological site locations was conducted in January, 2005. Known site locations and their eligibility were obtained from the South Carolina State Historic Preservation Officer (SHPO).

### 4.4.2 Areas of High Probability of a Cultural Site – *Risk*

In addition to excluding areas with known cultural site locations, areas with a high potential for containing as yet unidentified cultural sites were used in the analysis. Construction of a transmission line within these areas would represent a potential risk to as yet unidentified cultural resources. Therefore, these areas were assigned a risk rating of +25.

In 2000 a Memorandum of Understanding (MOU) between the Forest Service, the Advisory Council on Historic Preservation, and the SC Department of Archives and History, regarding the Management of Heritage Resources on the Francis Marion and Sumter National Forests, was developed to comply with the terms of the 1992 Programmatic Agreement (PA) concerning the management of historic properties on national forest lands in the southern region between the Forest Service, the Council, and several State SHPOs from the southern region, including South Carolina.

A section of this document contains criteria for an archaeological probability model which predicts the potential for an area to contain cultural resource sites (prehistoric and historic). This model contains separate criteria for each of the different physiographic regions: mountains and foothills, piedmont, and coastal plain. The coastal plain model, used for this project, defines areas of high probability as ones that consist of springs, river and stream terraces, environmental transition zones and ridgetops with moderately well drained to well drained soils within 60 meters of a permanent water source. Areas of medium probability are ones that generally include locations situated on well-drained soils, but a distance greater than 60 meters from a permanent or intermittent water source and as areas having soils with moderately poor drainage characteristics adjacent to permanent water sources. Areas of low site probability consist of low-lying swampy areas with a soil drainage characteristic of poor to very poorly drained.

The model that was created for this project was based upon this coastal plain model. Below is a list of the exact criteria used to create the high probability areas:

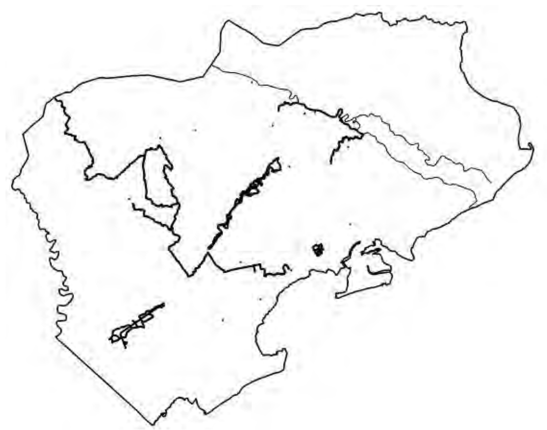
- Areas at a distance of 0 to 160 meters from the interface of moderate to well drained soils
- Areas of somewhat poorly drained to well drained soils within 160 meters of permanent water sources
- Areas within 70 meters of small ponds or bays

- Areas of moderate to well drained soils within 70 meters of current of abandoned roads
-

Since the results of this model were only one factor in the identifying routing alternatives, only areas of high probability were identified. The model was not created to determine what levels of effort are necessary when survey work begins, but to aid in locating least invasive routes.

### 4.4.3 Conservation Easements - *Risk*

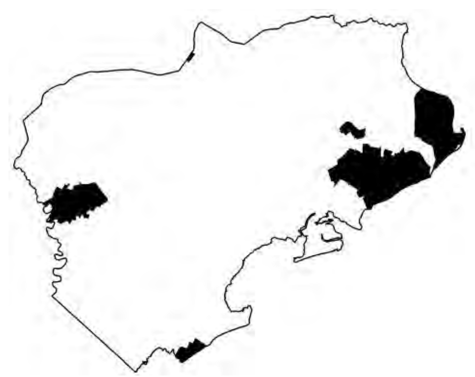
Construction of a transmission line through a conservation easement may be contrary to the intent of the conservation easement. Although this is not always the case, depending on the language set forth in the conservation easement agreement, a risk rating of +25 was assigned to all easement locations in this analysis as a conservative measure.



Boundaries for all conservation easements in the study area were obtained from the South Carolina chapters of The Nature Conservancy and the Lowcountry Open Land Trust, as well as tax parcel data provided by Charleston, Berkeley, and Georgetown Counties.

### 4.4.4 Outdoor Recreation - *Risk*

Construction of a transmission line within or adjacent to a developed recreation area on the FMNF may impact the recreational use and value of the site. For this reason, areas within 300 feet of developed recreation sites and trails were assigned a risk rating of +50.

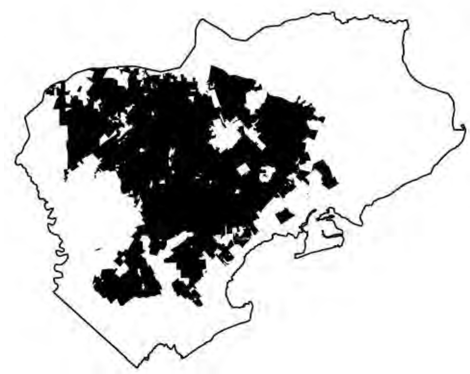


Location information for developed recreation areas was provided by the USFS. A total of 23 developed recreation sites were identified within the study area and approximately 155 miles of designated trails. The North and South Santee rivers are used locally for boating, fishing, and waterfowl hunting therefore, the rivers were included in the recreation layer with a risk rating of +25.

### 4.4.5 State Wildlife Management Areas/Preserves– *Risk*

The South Carolina Department of Natural Resources (SCDNR) owns and manages several wildlife management areas and natural heritage preserves in the study area, including the Santee Delta WMA and the Santee Coastal Reserve. These areas were rated +25 due to their unique character and state status.

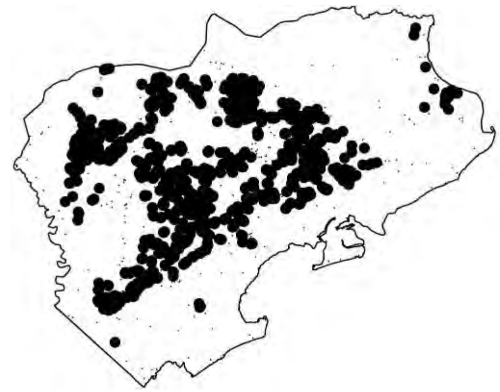
### 4.4.6 Francis Marion National Forest Ownership - *Risk*



Because of the Francis Marion National Forest's status as an important recreational and ecological resource, the 235,731 acres of land owned by the U.S. Forest Service within the analysis area were included as a resource suitability layer and given a rating of +25.

### 4.4.7 Threatened, Endangered, and Sensitive Species Habitat Buffers - *Risk*

Threatened and endangered species locations for both state and federally listed species were provided by the South Carolina State Natural Heritage Office and the USFS. All state listed species were buffered by 200 ft and given a rating of +50.



On National Forest lands, locations of Regional Forest Sensitive Species (RFSS) and the most recent locations (2008) for red cockaded woodpecker colonies were also identified and mapped. In addition to the 200 ft exclusion area for each red cockaded woodpecker colony, a buffer of ½ mile was added to locations and the zone between 200 feet and ½ mile of the colony site was assigned a risk rating of +50. This ½ mile zone is an approximation of the normal foraging range of the red cockaded woodpecker, within which, special restrictions are in place for operations requiring tree removals (USFWS, 2003).

Because of the dated nature of the locations used in the flatwoods salamander exclusion (most date to the 1950's), locations identified as potential habitat for the species were given a risk rating of +25. Some of these areas were identified during a survey for the presence of threatened and endangered species on private lands in proximity to the least-risk corridor alignments, while others were identified as habitat with similar characteristics to those found during the survey.

A final layer that was added to the analysis in relation to threatened, endangered, and sensitive species was a botanical habitat layer for the maintained by the Francis Marion National Forest. This layer identifies habitat that may potentially harbor special status plants and vegetation, such as Canby's dropwort *(Oxypolis canbyi)*, and was given a risk rating of +25.

### 4.4.8 Wetlands - *Risk*

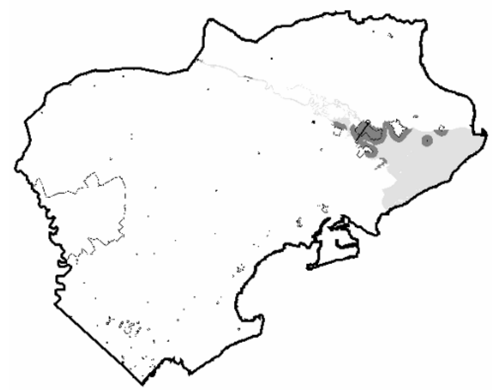
Construction of a transmission line within a wetland area may result in alterations to the structural character and vegetative composition of the wetland, and may disturb resident species and their habitats. For this reason, wetland areas identified in the National Wetlands Inventory, as well as the USFS, were assigned a risk rating.

Since different types of wetlands would likely be affected by transmission line construction in different ways and to different degrees, risk ratings varied by wetland type. Forested, lacustrine, and estuarine wetlands were all given risk ratings of +50. Forested wetlands were given this risk rating because clearing the forest canopy to construct a right of way would result in the conversion of these areas from a forested wetland type to a scrub shrub wetland type. Lacustrine wetlands (consisting of larger open water wetlands, such as lakes or reservoirs) were given a risk rating of +50 because construction of a transmission line through these wetlands may require poles at one or more points in the lake or reservoir, resulting in lake bed disturbance and alterations in the visual character of the site. Estuarine wetlands were rated as +50, due to the importance of these wetlands in the area for nesting waterfowl and migratory birds. Emergent and riverine wetlands in the analysis area were both assigned a risk rating of +30. The lower rating assigned to these wetlands is due to the fact that, for the majority of these wetlands, the transmission line could be constructed to span the wetland without pole construction within the wetland boundary. For larger riverine and emergent wetlands, however, impacts on sediments, vegetation, and aquatic biota may be observed. Lastly, palustrine scrub shrub wetlands were given a risk rating of +15. This rating was assigned due to the anticipation that the majority of these wetlands, typically smaller in size in the study area, would be able to be spanned by transmission line construction with little or no vegetation disturbance required.

### 4.4.9 Santee River Migratory Bird Area – *Risk*

The Santee River Delta has been identified as a critical area for migratory birds, particularly large concentrations of over wintering waterfowl. Construction of a transmission line within this area may impact migratory species that utilize wetland habitats in this area. For this reason, areas within the southern portion of the Santee River Delta were assigned a risk rating of +25.

The extent of the area of concern for migratory bird habitat was identified for the purposes of this modeling effort as the lower portion of the delta, which is dominated by herbaceous, riverine, and estuarine wetland types. With further progression northwest along the Santee River, forested wetlands become the dominant wetland cover type.



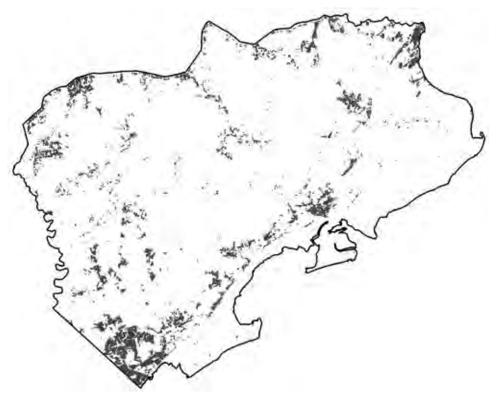
### 4.4.10 Scenic Vistas and Cultural Landscapes– *Risk*

The Santee River crossing, Santee-Delta WMA, and listed or eligible cultural sites are considered scenic resources. Construction of a transmission line through these areas may obstruct or degrade the quality of the scenic vista or cultural landscape, so risk ratings were assigned to the foreground, midground, and background views for these resources. Areas in the immediate foreground (within 300 feet) were assigned a risk rating of +50. Areas in the midground (from 300 ft to ½ mile) for the Santee-Delta WMA, Santee River crossing, and cultural sites along the delta were assigned a risk rating of +30, and areas in the background, (beyond ½ mile), were assigned a risk rating of +15. The dimensions of the scenic vistas were determined from aerial imagery interpretation of the Santee River and GIS analysis measures (buffers).

### 4.4.11 Road Travel Lanes and Medians - *Risk*

Transmission lines can be constructed along existing roads allowing for overlap between the two rights of way; however constructing the line within the road bed or between the traffic lanes of a divided highway is considered a risk. To account for the risk, the central "non-buildable" portions of major and minor roads were assigned a risk rating of +50. Local roads were not assigned this risk rating. The "buildable" sections of a road are discussed in Section 4.5.1

### 4.4.12 Structures and Developable Parcels – *Risk*



To minimize the risk of impact to residents and to other developed land uses, existing structure locations were identified, buffered by 300 feet, and assigned a risk rating of +50. The structure location data was a composite of information provided by Charleston and Georgetown counties and manually digitized locations from aerial imagery (Photo year 2007) for the rest of the study area. Aerial images were used to verify and revise structure locations in data provided by Georgetown County.
In addition, parcel boundaries provided by Charleston, Georgetown, and Berkeley Counties were used as an analysis layer to account for multi-structure developed and developable areas (housing subdivisions, clustered rural homes, concentrated business clusters) where the construction of a transmission line would be less suitable. To achieve this, parcel boundaries were given a descending rating scheme (see Table 4-1) so that the smallest and most closely grouped parcels were given the highest risk rating. Note, that this layer adds to the risk noted above where one or more structures occupy a parcel.

## 4.5 Opportunity Resource Suitability Layers

The following data layers were used to identify areas within which transmission line construction would have a reduced likelihood of additional impacts. Brief descriptions of the origin of these data layers, their preparation for use in the model, and rationale for inclusion are provided below.

### 4.5.1 Existing Transmission ROWs - *Opportunity*

Construction of a transmission line immediately adjacent to an existing transmission line right of way avoids or limits: the level of additional forest clearing necessary, new forest fragmentation effects, the creation of edge habitat, and conversion of areas to new land uses (i.e., to a utility corridor). For these reasons, areas immediately adjacent to an existing major transmission line corridor were assigned a suitability rating of -50.

Transmission line ROW information was obtained from the Census Bureau's TIGER database, and improved by correlation with satellite imagery (photo year 2007). Only the ROWs available from the TIGER database or immediately identifiable from satellite imagery sources were included. As a result, many smaller corridors were not included in this data layer.

Transmission line location data were available only as linear feature data, and therefore only identified the centerline of the right of way and not its width. To account for the corridor width, all linear features were buffered by 75 feet to account for an estimated 150 foot width of the right of way[1]. The resultant 150 foot right of way was buffered again by 70 feet on each side (for a total corridor width of 290 feet) to identify areas immediately adjacent to the right of way which could potentially be used to widen the existing right of ways to accommodate the additional proposed transmission line.

### 4.5.2 Road Rights-of-Way - *Opportunity*

Transmission lines can be constructed along existing roads allowing for overlap between the two rights of way. Construction of a transmission line within or immediately adjacent to an existing road right of way reduces the amount of forest clearing necessary for corridor construction, limits increases in forest fragmentation and in creation of edge habitat, reduces the overall amount of land converted to a new land use (i.e., to a utility corridor), and allows for ease and efficiency when accessing the line for maintenance or repairs. For the above reasons, road rights of way were assigned an opportunity rating of -25.

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[1] The 150-foot width is an approximation derived from aerial imagery assessment of the majority of identifiable corridors in the study area.

Road locations were obtained from the Census Bureau's TIGER line database. Census Feature Class Code's (CFCC) for each road in the database provided a means to roughly identify major, minor, and local roads and approximate the width of the road's right of way. Major roads, such as Highway 17, were buffered by 75 feet to account for a an estimated 150 foot right of way, minor roads, such as State Route 46, were buffered by 25 feet to account for an estimated 50 foot right of way, and local roads were buffered by 15 feet to account for an estimated 30 foot right of way. All of the road rights of way were then buffered again by 70 feet to account for the potential for constructing the proposed transmission line adjacent to, and overlapping with, the existing road ROW. Together, these buffers resulted in 290 foot, 190 foot, and 170 foot buffer zones for major, minor, and local roads (respectively) in the study area.

## 4.6 Data Revisions

Because of the time that has elapsed since the publication of the first macro-corridor report for this project in 2005, all data sources listed in the previous sections were reviewed for currency before the current report was compiled. In some cases, changes had occurred since 2005 and the data used in the modeling process were subsequently updated. In other cases, new data layers were added to the modeling process to account for agency concerns or comments heard at the first scoping meeting held in McClellanville in 2005. The following sections list some of the most pertinent changes.

***Structures***

The location of structures for the initial Macro-Corridor study report was primarily determined from the use of aerial photography of the study area. However, because the flight dates of these images were 1994 and 1999, the locations of structures needed to be updated utilizing more recent aerial photographs (2007). As with the tax parcel layers, changes between the two structure datasets primarily arose from new residential developments. In the initial macro-corridor study, 18,826 structures were identified. That number has increased 9.6% to 20,645.

***Tax Parcels***

In 2008, updated tax parcel information was acquired from Charleston, Berkeley, and Georgetown counties. The primary difference between the old and new data is that a number of previously large tax parcels in highly developed areas such as Mount Pleasant and Charleston had been subdivided into smaller lots for residential development, indicating the trend for continued growth. Including parcels owned by the U.S. Forest Service, in 2005 there were 28,720 individual parcels in the analysis area; based on the revised tax parcel data received from the counties, there are now 31,105 (an 8.5% increase).

Further, the addition of tax parcels as a risk resource layer in the modeling process is a new development since the first macro-corridor study report was published. In response to comments received during the 2005 McClellanville project scoping, it was decided that in addition to having a risk resource layer representing structures in the analysis, the boundaries of tax parcels would be included in the analysis in an effort to give greater protection to areas of high residential development. This was done because as parcels become smaller and density increases, there is less distance between the proposed transmission line and structures. To address this issue, all parcels below 6 acres in size were extracted from the parcel dataset and given a descending risk rating value by size, so that the smallest and most densely grouped parcels received the highest risk rating value (see Table 4-1). Parcels larger than 6 acres were not included in this risk resource layer (though any structures on those parcels would appear and be protected in the structures layer). Calculations showed that over 80 percent of identified structures were within parcels less than 6 acres. After the parcel boundaries less than 6 acres were selected, these data were then merged with the 300 foot buffers of identified structures to create a single risk resource layer representing human development.

***Conservation Easements***

Comments were received in 2005 from The Nature Conservancy and Low Country Open Land Trust concerning protection of conservation easements. Representatives of these organizations were contacted in 2008 and asked to provide updated data on locations of conservation easements. The first macro-corridor study identified 38 square miles of lands in conservation easements; this figure has increased to 80 square miles in the current analysis.

***State Wildlife Management Areas and Preserves***

In the first macro-corridor study, public lands owned by the state of South Carolina included the Santee Delta Wildlife Management Area and Hampton Plantation State Park. However, there are several other pieces of land managed by South Carolina DNR in the study area. These lands were added to the current analysis phase, and include Wee Tee WMA, Bonneau Ferry WMA, Childsbury Heritage Preserve, Caper's Island Heritage Preserve, Tom Yawkey Wildlife Heritage Center and Preserve, and Santee Coastal Reserve. The boundary of Bonneau Ferry actually was included in the previous analysis as a conservation easement, but was re-categorized as state-owned land in the current analysis because the state retains the title to the land.

***Francis Marion National Forest***

Francis Marion National Forest lands were added as a risk resource layer with a risk rating of +25 to account for USFS concerns that the entirety of the National Forest should be treated in the same capacity of other environmental lands such as state wildlife management areas and conservation easements.

***Threatened, Endangered, and Sensitive Species***

Modeling for the first Macro-corridor study report had used the cluster centers (a central point defined by the surrounding RCW cavity trees) for red-cockaded woodpecker locations rather than the locations of individual cavity trees because the latter information was not available at the time. However, the USFS recently created a layer of known red-cockaded woodpecker cavity tree locations on the FMNF. Therefore, modeling efforts for the current report included both the cluster centers and the cavity tree data, to give maximum protection to known red-cockaded woodpecker locations throughout the forest.

In February of 2007, the U.S. Fish and Wildlife Service designated two areas within the macro-corridor study area as critical habitat for the federally threatened flatwoods salamander. These areas were added to the modeling process as exclusion areas. It must be noted however, the locations of the critical habitat areas are not in proximity to the modeled least-risk corridors and least-risk paths, and thus had no effect on the modeled route alignments.

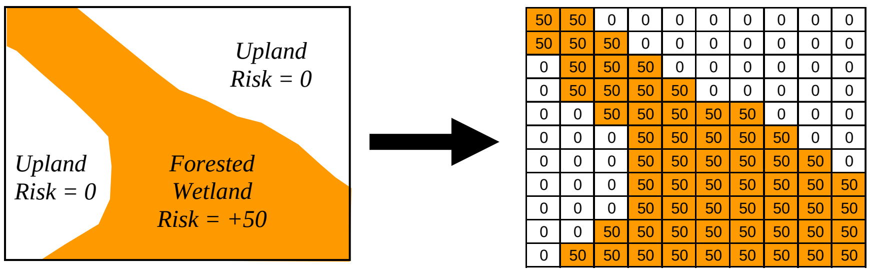
An additional habitat layer that was provided by the Forest Service in 2007 and used in the macro-corridor study was a dataset consisting of several polygons of known habitat for threatened and endangered species. This layer contained several polygons that identified potential habitat for listed plant species on the National Forest, including Canby's dropwort and pondspice. The layer was given a risk rating of +25 and added to the modeling process.

In September of 2008, Central Electric conducted a field survey of accessible portions of the macro-corridor study area on lands outside the FMNF for the occurrence of federally-listed threatened and endangered species (CEPCI, 2008). Results of the Central Electric T&E survey identified locations of three previously unrecorded red-cockaded woodpecker colony sites consisting of several active cavity trees. These sites were added to the macro-corridor study modeling efforts. Additional findings included several areas of potential habitat for red-cockaded woodpecker and multiple wetland locations which represented habitat for the flatwoods salamander.

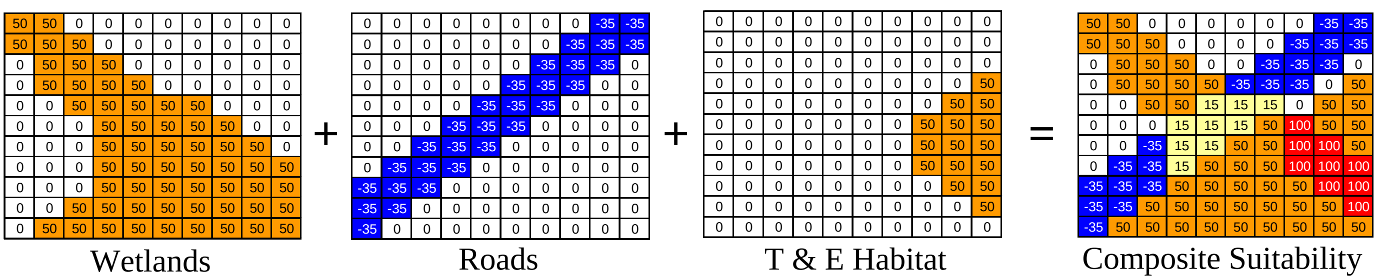
Because of the general lack of data on the locations of flatwoods salamanders in coastal SC, a habitat layer was created and added to the modeling process to characterize potential flatwoods salamander reproduction habitat. Comparison of the Central Electric T&E survey results to the forested wetland layer previously used in the modeling process revealed a strong correlation between small, isolated, generally circular, forested wetlands and the field surveyed areas that were considered by in the Central Electric T&E survey to be good potential habitat for flatwoods salamander. These isolated forested wetlands were delineated on the wetlands layer, given an additional risk rating of +25 and added to the analysis.

## 4.7 Compiling the Suitability Map

After all of the resource suitability layers were compiled and features within assigned their respective risk/opportunity ratings they were converted from polygon format to a grid-based format (10 x 10 meter cells). Through this conversion, all features in the resource data layers were converted to individual cells, the values of which denoted the risk/opportunity rating assigned to that resource. This conversion is commonly performed for GIS modeling efforts, and allowed for easier manipulation and combination of the suitability layers into one overall lands suitability map. The following graphic illustrates this process.




The resultant raster (grid) based resource layers were then summed in the GIS environment. This process resulted in an overall ‘composite suitability map’, within which, each grid cell represented the composite score of all risk and opportunity ratings for that particular location. The following graphic depicts a simplified version of this process with examples from three of the suitability criteria data layers.




The composite suitability map compiled for all of the data layers described in Section 4 is presented in Figure 4-1.

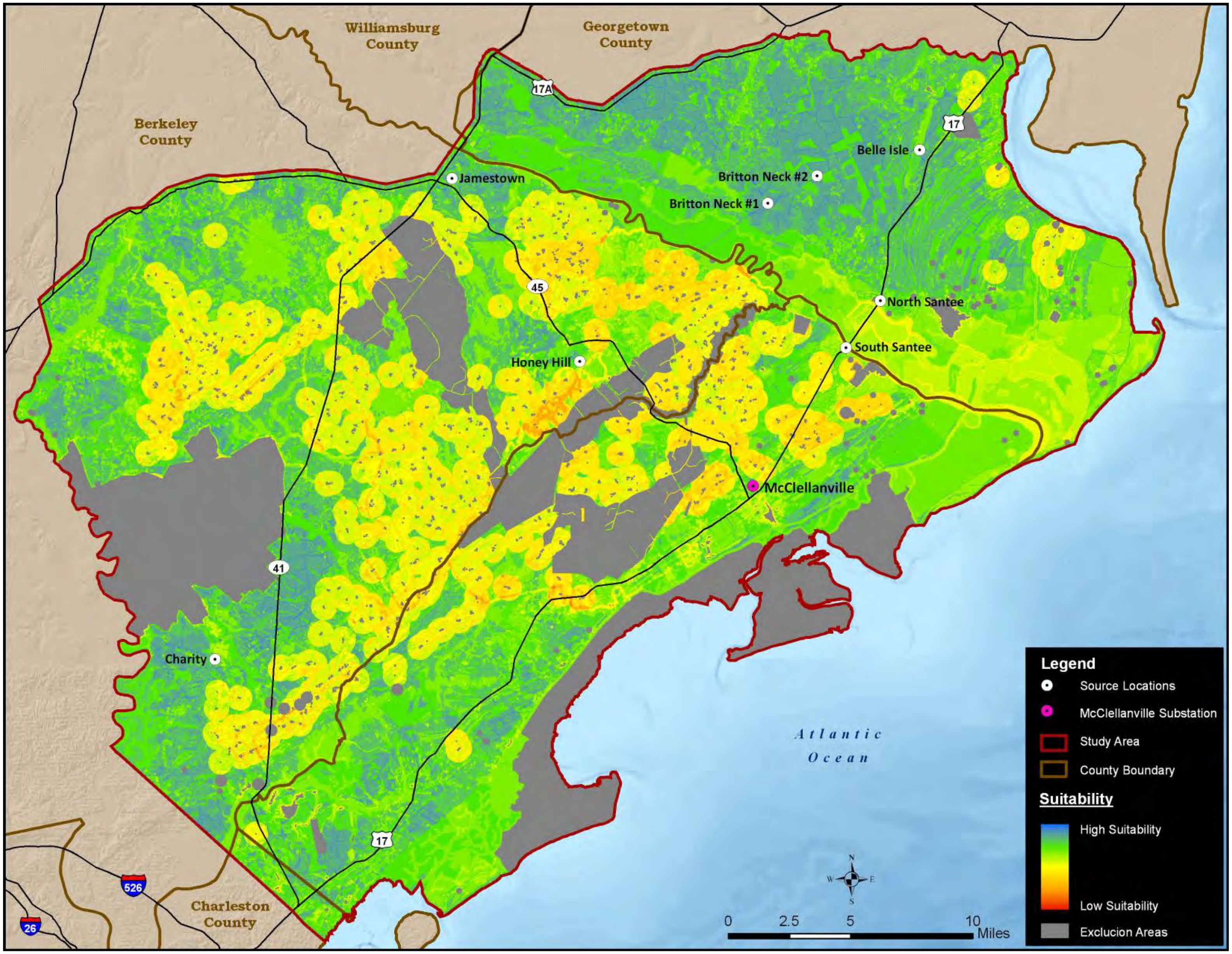



**Figure 4-1: Composite Suitability Map**

## 4.8 Modeling Paths and Identifying Least-Risk Corridors

### 4.8.1 Modeling Least Risk Paths

Once the composite suitability map was compiled, potential paths for the proposed transmission line were identified. This was done by using least risk path analysis algorithms included in ESRI's ArcGIS software (v. 9.2) to model paths between various proposed source points and the proposed McClellanville substation site.

Least risk path analysis methods utilize mathematical algorithms to identify a path of least accumulated risk from one point in the suitability map to the next. In simple terms, the process involves starting from one point in the suitability map (a grid cell representing the transmission line source location) and moving cell by cell toward a destination point (a grid cell representing the location of McClellanville) by following those cells that result in the lowest accumulation of risk scores along the way.

It is with this process in mind, that all risk ratings were assigned *higher numbers* and opportunities were assigned *lower numbers*. Cells with high cumulative risk ratings - the result of multiple resources data layers with positive risk ratings for that cell - would result in a higher accumulated risk if included in the path and would less likely be included in the least risk path. In contrast, cells with lower ratings (the result of either few resource data layers with positive risk ratings or a layer with opportunity value for that cell) would reduce the overall accumulated risk if included in the path, and have a greater likelihood of being included within the least risk path.

In reality, this process is not as mathematically or conceptually simplistic as presented here. For clarity and simplicity, a description of the algorithms used and various intermediate steps of this process (accumulated risk layer creation, back-link directional layer creation, etc.) are not presented here, but are available upon request. For a more thorough review of these concepts, see Berry (2005).

Least risk paths were calculated from the various proposed starting point substations, including Belle Isle, Jamestown, and Charity, as well as routing points in Honey Hill and Britton Neck, to their endpoint at the McClellanville substation (Figure 3-1). A set of least risk paths were also calculated for the Belle Isle to McClellanville route to account for the possibility for using either a directional bore or overhead line along the Highway 17 right of way to cross the Santee River delta. For this route two paths were generated, one from Belle Isle to a point next to the north end of the Highway 17 bridge, while the other was generated from a point on the south end of Highway 17 bridge to the McClellanville substation.

Additionally, optional paths were "directed", or forced to stay in one portion of the study area to examine the impacts of using that particular study area portion. For example, optional paths were created for Charity and Belle Isle by buffering the Highway 17 right of way by one mile. This buffer was then utilized as a mask in the least risk path analysis, so that the modeled path did not travel outside of the one mile buffer. A similar exercise was performed at the origin point of Charity, where the path was directed outside of the Francis Marion National Forest.

### 4.8.2 Corridor Delineation

Because the suitability map takes into account only a limited number of variables and treats these variables in a generalized manner, it is not expected that the modeled paths would be used directly as the proposed paths for the McClellanville transmission line. They do, however, serve as a useful guide for planning the general right-of-way alignment allowing flexibility to one side or the other of the map-generated path in each alternative corridor within which the proposed transmission line might be constructed.

Typically, a rough estimate of a proposed transmission line path is drawn on a map and buffered by ½ mile on either side to create a 1 mile wide corridor for the analysis. Though simple, this manner of corridor delineation does not take into account the suitability of the areas included within the buffer of the proposed path, and as a result, areas that should be excluded from consideration or large areas of high risk for potential impacts are once again included in the corridor boundary and brought to the next planning level.

To avoid this problem for the McClellanville 115 kV transmission line corridor delineations, the extent of the macro-corridor in the encompassing general study area for each of the modeled pathways was determined from the suitability map. By using the suitability map instead of a simple ½ mile buffer, areas that were considered exclusionary for transmission line construction were also excluded from the macro-corridor boundary, and areas with the highest composite risk ratings were generally avoided.

In some cases, specific paths and corridors were "directed", or forced, to travel in a specified direction by using an analysis mask. This was done to examine potential alternatives to the paths and corridors produced during the modeling phase of the project. For example, to examine the possibility of using the U.S. Highway 17 right of way corridor from Belle Isle to McClellanville, the highway was buffered by one mile on either side of the road. This buffer was then used as an analysis mask in the modeling process, so that the path and corridor did not travel outside of the ½ mile buffer. This process allowed the project team to look at alternative alignments, and similar processes were constructed for the Charity to McClellanville and Britton Neck to McClellanville alignments. A more detailed description of these alignments is presented in Section 5.

As with the methods used for calculation of the least risk paths, for clarity and simplicity, a description of the algorithms used and various intermediate steps involved in the calculation of the corridor boundaries are not included in this report, but are available upon request (see Berry, 2004 for more information on corridor calculation methods). Some general concepts, however, should be mentioned for interpretation of the results presented in Section 5:

- For each least cost path, a corridor was calculated with an area in square miles roughly equal to the length (in miles) of the path. This was done for two reasons. First, as described above, utility planners typically use a ½ mile buffer on each side of the proposed line to identify the corridor study boundary. This results in a corridor with 1 square mile of area for every linear mile. Second, because each modeled path has a different length, comparisons between corridors concerning land use breakdowns and suitability rankings would not be appropriate without some form of normalization.

- Calculating corridors derived from the suitability map with a unit area equivalent to the unit length of the least risk path is not exact. In most cases, there is a small difference between the length of the least risk path (in miles) and the area of the corridor (in square miles). This variance is due to the distribution of the suitability ratings across the suitability map and is unavoidable.

- Because the delineation of the corridor boundaries was dynamically responsive to the suitability scores in the composite suitability map, the corridor boundaries do not parallel the least risk path. Instead, the corridor boundaries expand and contract in response to the absolute value of the suitability score and the relative distribution of risk ratings within the area of the modeled paths.

# 5.0 Description of Modeled Alignments and Corridors

In total, ten (10) optional least risk paths (alignments) with associated corridors (Fig. 5-1) were model-generated to connect the various electric power origin points to the power destination point at the proposed McClellanville substation. The ten alignment-corridors are described in the following sections and mapped in Figures 5-2 through 5-6d. Specific characteristics of the corridors, including wetland acreage percentage, risk rating statistics, and land use/land cover are provided in Table 5-1.

## 5.1 Belle Isle to McClellanville

The Belle Isle to McClellanville corridors begin at the Belle Isle delivery point located approximately two miles southeast of the Winyah generator in Georgetown County. From this point, three separate corridors were created: Belle Isle 1, Belle Isle 2, and Belle Isle 3. Descriptions of each are presented in the following sections.

### 5.1.1 Belle Isle 1

From the Belle Isle delivery point, the Belle Isle 1 corridor follows along Highway 17 for approximately 4 miles and crosses SR 2224 before the reaching the North Santee River. The corridor crosses over the Santee River approximately 1 to 2 miles northwest of the Highway 17 bridge and continues to the proposed McClellanville substation along a path roughly parallel to Highway 17 (Figure 5-2a). Under this transmission line option, the Santee River Delta would be crossed using an overhead transmission line that follows the Highway 17 right of way. Detailed starting and ending points for this crossing would depend on NEPA and engineering analysis.

### 5.1.2 Belle Isle 2

As with the Belle Isle 1 corridor, the Belle Isle 2 alignment begins at the Belle Isle delivery point. However, with this option, the 2-mile wide Santee River Delta would be crossed by the utilization of directional boring technology to emplace the transmission line under the surface substrate of the Delta. The bore would start along the northern bank of the North Santee River in the pole yard east of Highway 17, and end on the southern bank of the South Santee River in a small clearing on the west of Highway 17 (Figure 5-2b). The corridor would then travel roughly parallel to and northwest of Highway 17 to the proposed McClellanville substation.

### 5.1.3 Belle Isle 3

To examine the suitability of utilizing the Highway 17 right of way from the Belle Isle delivery point to the proposed McClellanville substation, Highway 17 was buffered by one mile on either side in the GIS environment. The buffer which was created was then used as a “mask” in the least risk path analysis, so that the resulting path did not stray outside of the one mile buffer of Highway 17. The resulting corridor essentially follows Hwy 17 from the Belle Isle delivery point to the proposed McClellanville substation (Figure 5-2c).

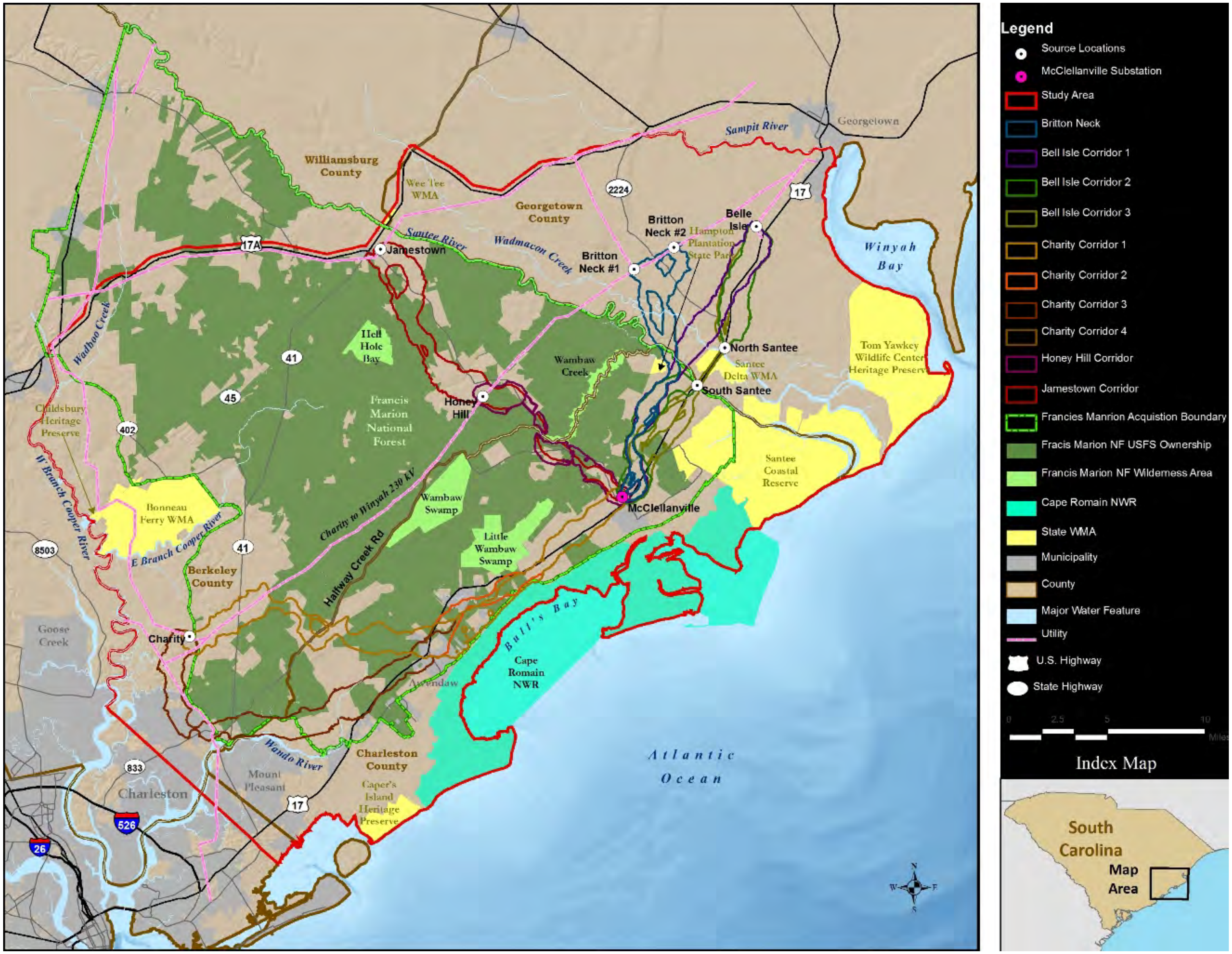



**Figure 5-1: Overview of ten optional model-generated least-risk transmission line alignments and associated corridors to supply power to McClellanville, SC**

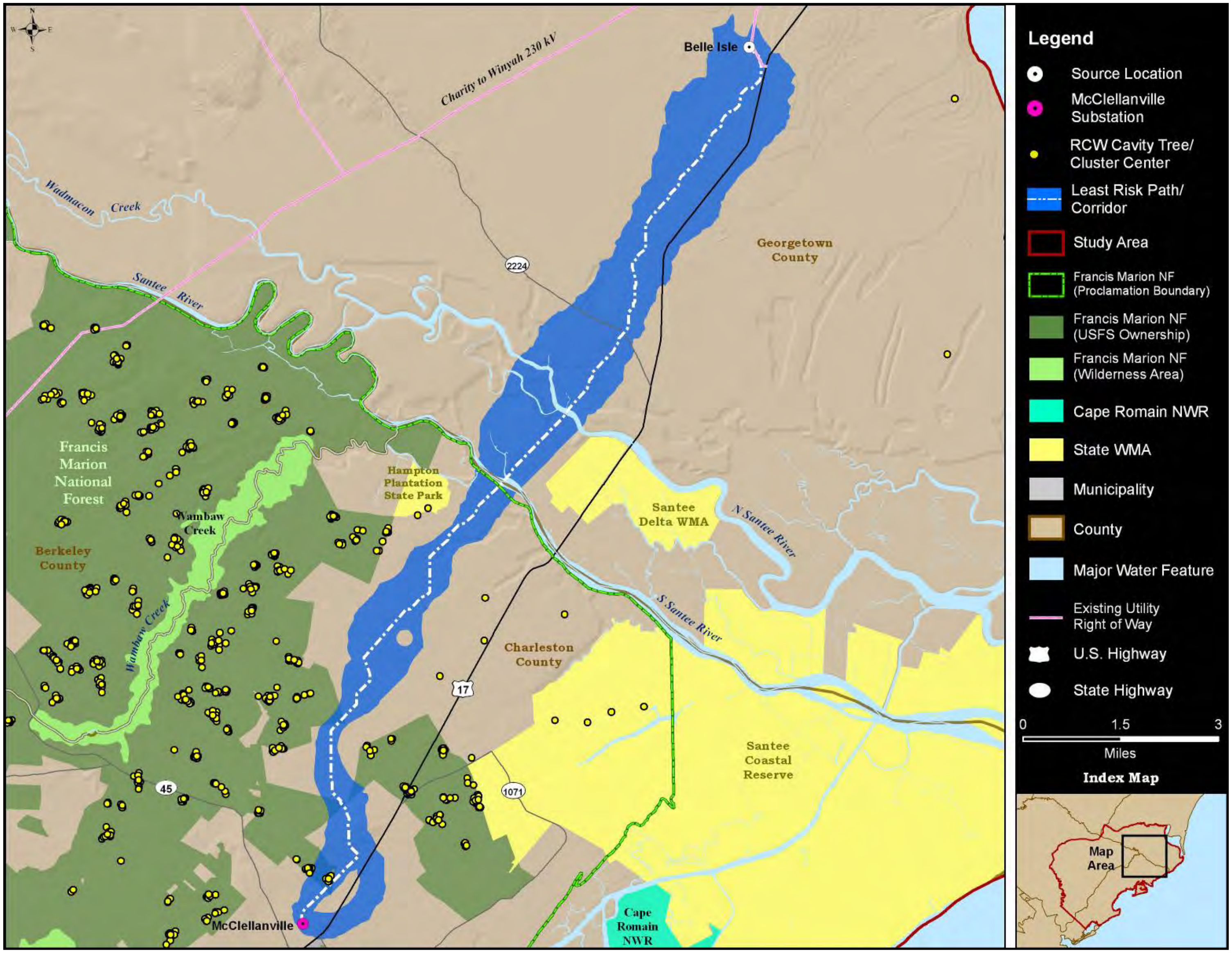



**Figure 5-2a: Belle Isle 1 Least Risk Path Alignment and Corridor**

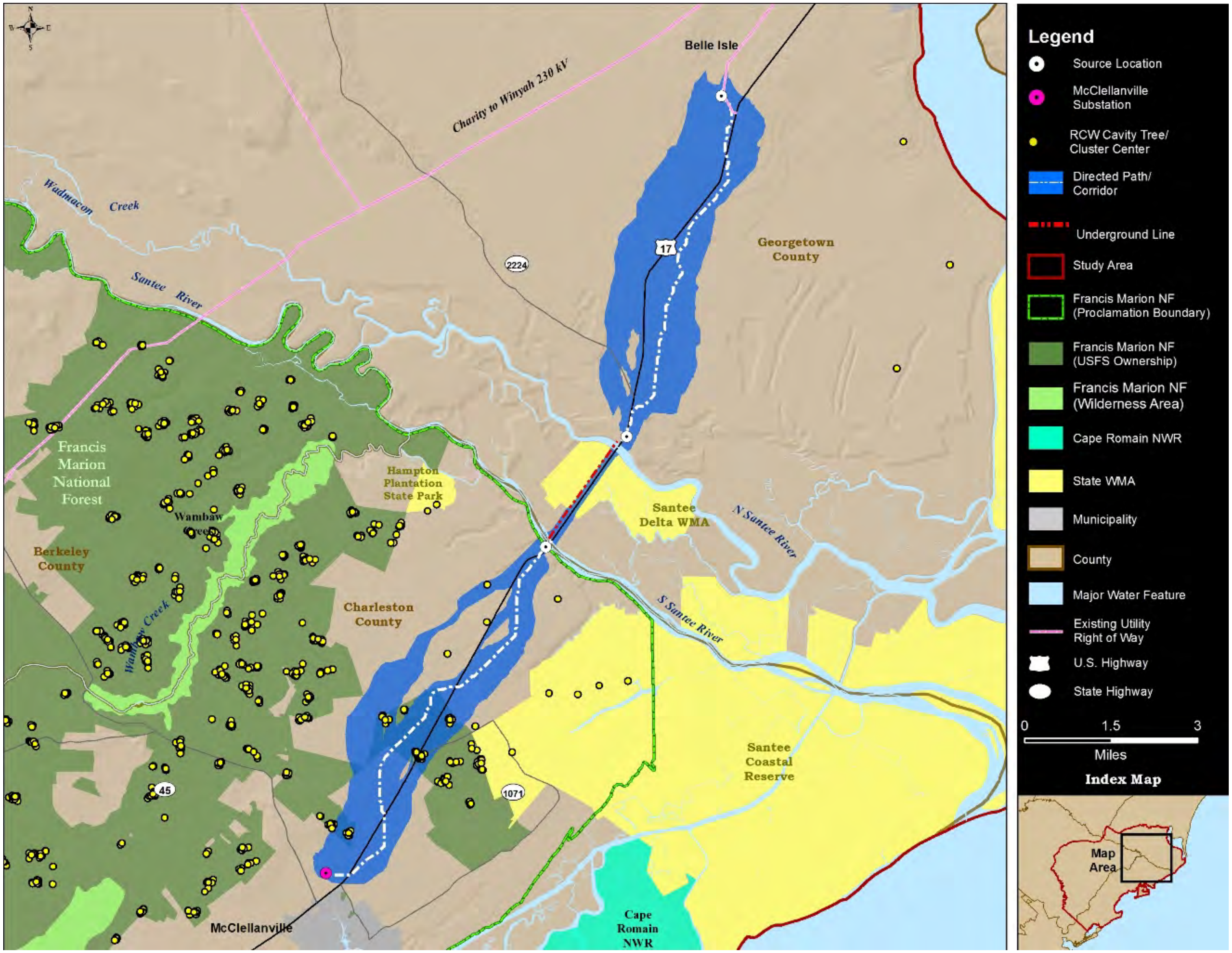



**Figure 5-2b: Belle Isle 2 Directed Path Alignment and Corridor**

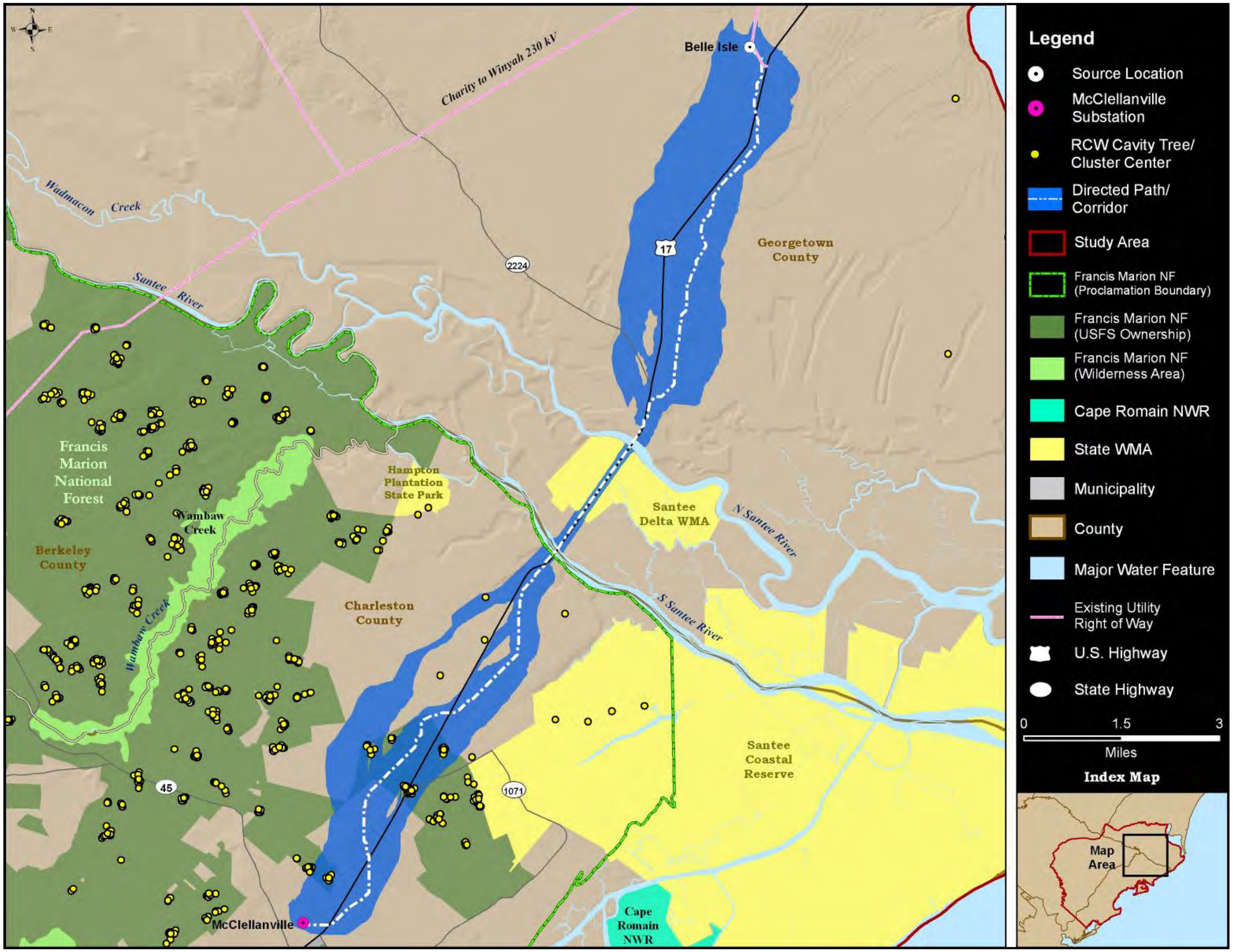



**Figure 5-2c: Belle Isle 3 Directed Path Alignment and Corridor**

## 5.2 Britton Neck to McClellanville

The Britton Neck to McClellanville corridor begins at the junction of rights-of-way of existing utility infrastructure and an existing 230kV transmission line that runs from the Winyah Generation Plant through the Francis Marion National Forest (Britton Neck 1). An additional origin point (Britton Neck 2) was placed approximately two miles northeast up the existing transmission line from the Britton Neck 1 point, to look at alternative placements. The final origin point at which a drop-down switching station would need to be constructed if this alternative was selected would depend on the environmental and engineering analyses.

Least risk paths and corridors were modeled from the Britton Neck 1 and 2 origin points. Because the alignments of the paths were identical at the point with which they merge as shown on Figure 5-3 (just west of State Highway 224 and north of the North Santee River), the paths were combined into a single route. A similar action was performed for the corridors. From the origin points on the existing 230kV line, the final corridor travels south across the North and South Santee Rivers, east of Hampton Plantation State Park, and across primarily private forests to the proposed McClellanville substation.

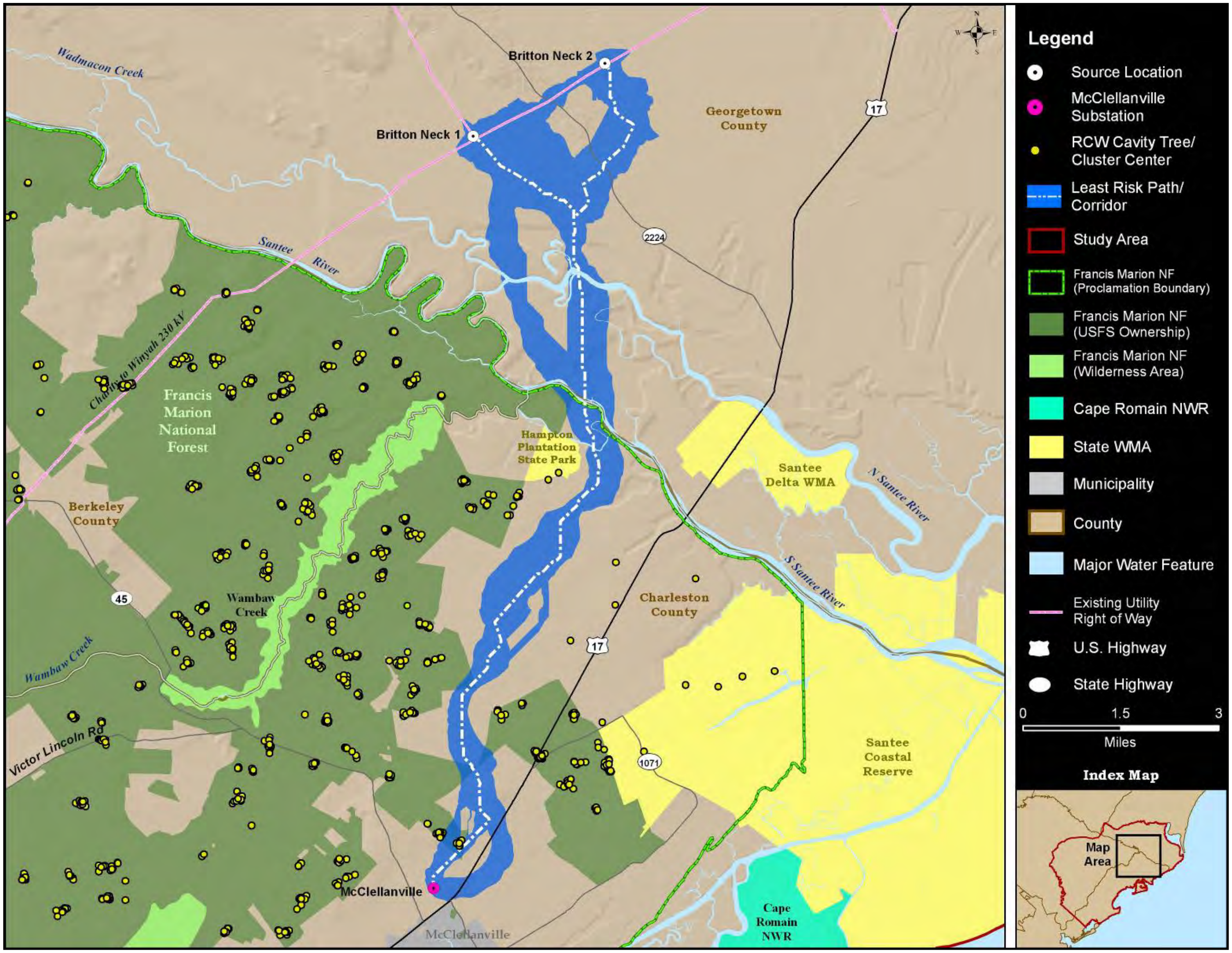



**Figure 5-3: Britton Neck Least Risk Path Alignment and Corridor**

## 5.3 Honey Hill to McClellanville

The Honey Hill to McClellanville path begins at a point along the existing Charity to Winyah 230 kV right-of-way approximately 1 mile southwest of the crossing with State Highway 45. From this point, a drop-down switching station would be constructed. Selection of the site would depend on environmental and engineering analyses. From this source, the corridor traverses southeast, joining State Highway 45 to cross the wilderness linkage management area (MA29), then passes just south of the Wambaw Creek Wilderness before continuing on to the proposed McClellanville substation (Figure 5-4).

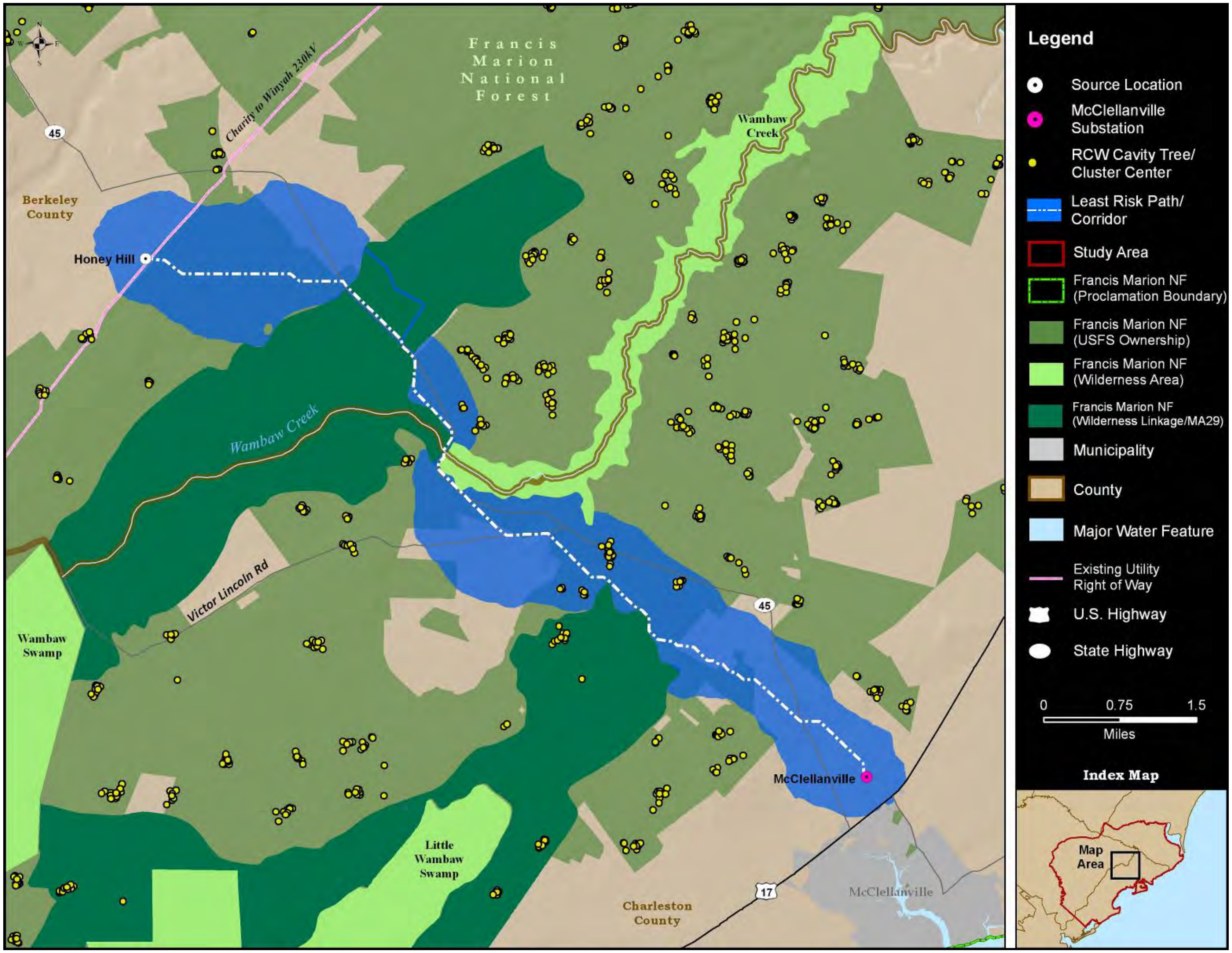



**Figure 5-4: Honey Hill Least Risk Path Alignment and Corridor**

## 5.4 Jamestown to McClellanville

The Jamestown to McClellanville path and corridor begins at the Jamestown delivery point and travels southeast through primarily National Forest land, roughly paralleling State Highway 45. It crosses the 230 kV transmission line near Honey Hill. One mile southeast of the transmission line, the corridor then follows State Highway 45 to cross a wilderness linkage management area (MA29), then passes just south of the Wambaw Creek Wilderness before continuing on to the proposed McClellanville substation (Figure 5-5).

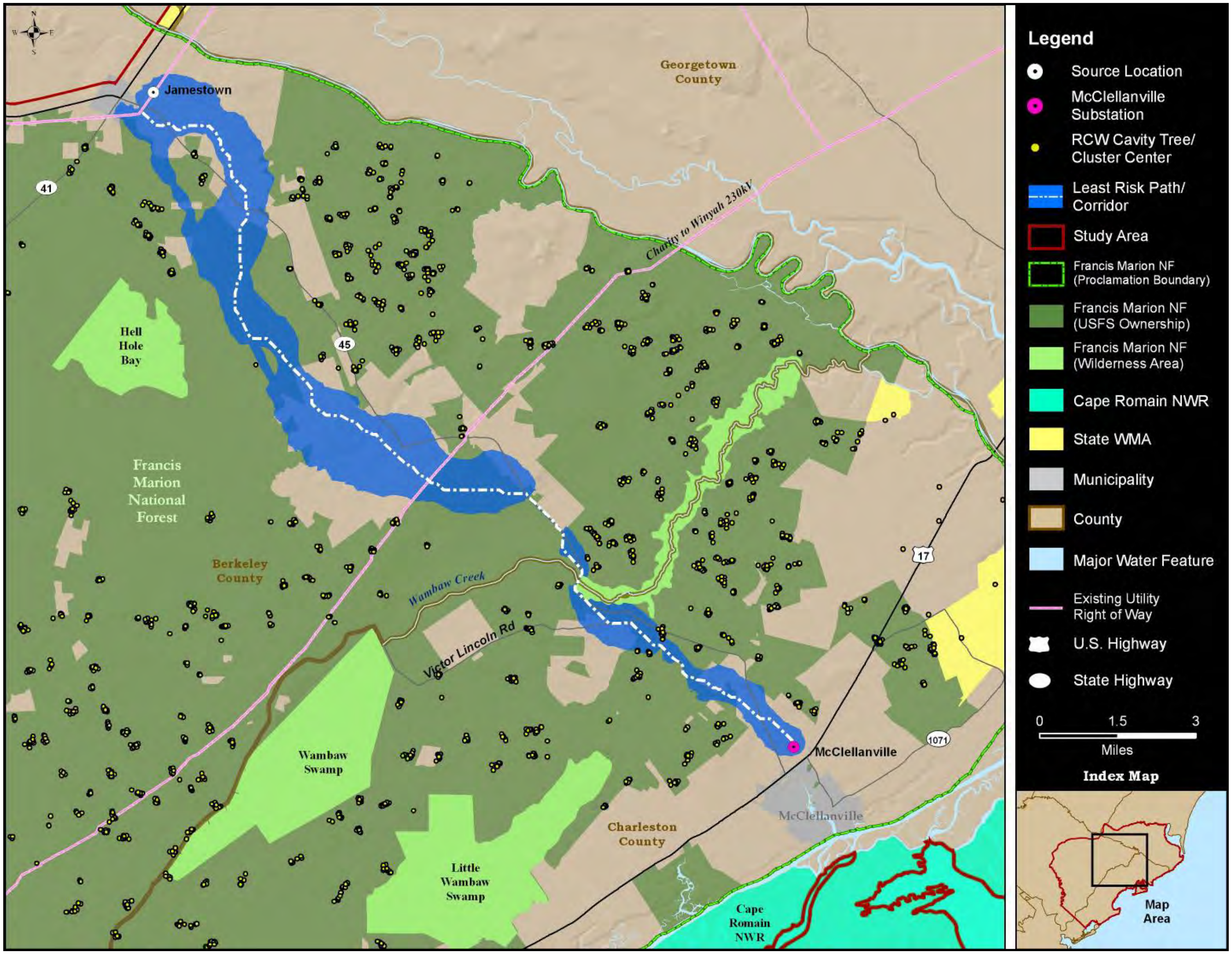



**Figure 5-5: Jamestown Least Risk Path Alignment and Corridor**

## 5.5 Charity to McClellanville

Four alternative path and corridor alignments were created from the Charity delivery point. Charity 1 represents the least risk path and corridor alignment created in the macro-corridor analysis, with no modeling masks. To evaluate the possibility of utilizing the Highway 17 right of way as a major portion of an alternative alignment, Highway 17 was buffered by one mile on either side (as was done for the potential alternative Belle Isle alignment). That buffer was utilized as a mask in the analysis, as described previously. A separate alternative directed-corridor alignment was created at the beginning of the Charity route that travels south and then west. This directed path and corridor was created to model an option that does not go directly through the Francis Marion National Forest and to avoid an area with a high density of red cockaded woodpecker cavity trees. Thus, there are two alternative corridor alignments west of Highway 17 and two alternative corridor alignments east of Highway 17. West of Highway 17, the two alternative corridors include the least risk corridor and the directed corridor that avoids the National Forest. East of Highway 17, the two corridor options include the least risk corridor and the directed corridor that is masked by the Highway 17 buffer.

### 5.5.1 Charity 1

The Charity 1 alignment (Figure 5-6a) starts at the Charity delivery point and parallels the existing Charity to Winyah 230kV transmission line for approximately four miles. The alignment then shifts to the southeast, travelling through the National Forest and into an area with numerous red-cockaded woodpecker cavity trees until it reaches Highway 17. The alignment then travels east to the proposed McClellanville substation, through the towns of Awendaw and McClellanville.

### 5.5.2 Charity 2

The Charity 2 alignment (Figure 5-6b) is a combination of the Charity 1 alignment west of the Highway 17 crossing point and the Highway 17 buffer alignment east of the highway. The route is exactly the same as described for Charity 1 west of Highway 17; east of Highway 17 it travels a similar path as Charity 1, except that it is generally closer to the highway than the Charity 1 alignment.

### 5.5.3 Charity 3

The Charity 3 alignment (Figure 5-6c) is a combination of a directed alignment west of the Highway 17 crossing point and the Charity 1 alignment east of the Highway 17 crossing point. This route travels south from the Charity delivery point and then west, generally around the National Forest. This directed route was created to have an alternative alignment that avoids an area on the National Forest with a high density of red-cockaded woodpecker cavity trees.

### 5.5.4 Charity 4

The Charity 4 alignment (Figure 5-6d) is a combination of the directed alignment west of the Highway 17 crossing point described for Charity 3, as well as the directed alignment east of the Highway 17 crossing point described for Charity 2.

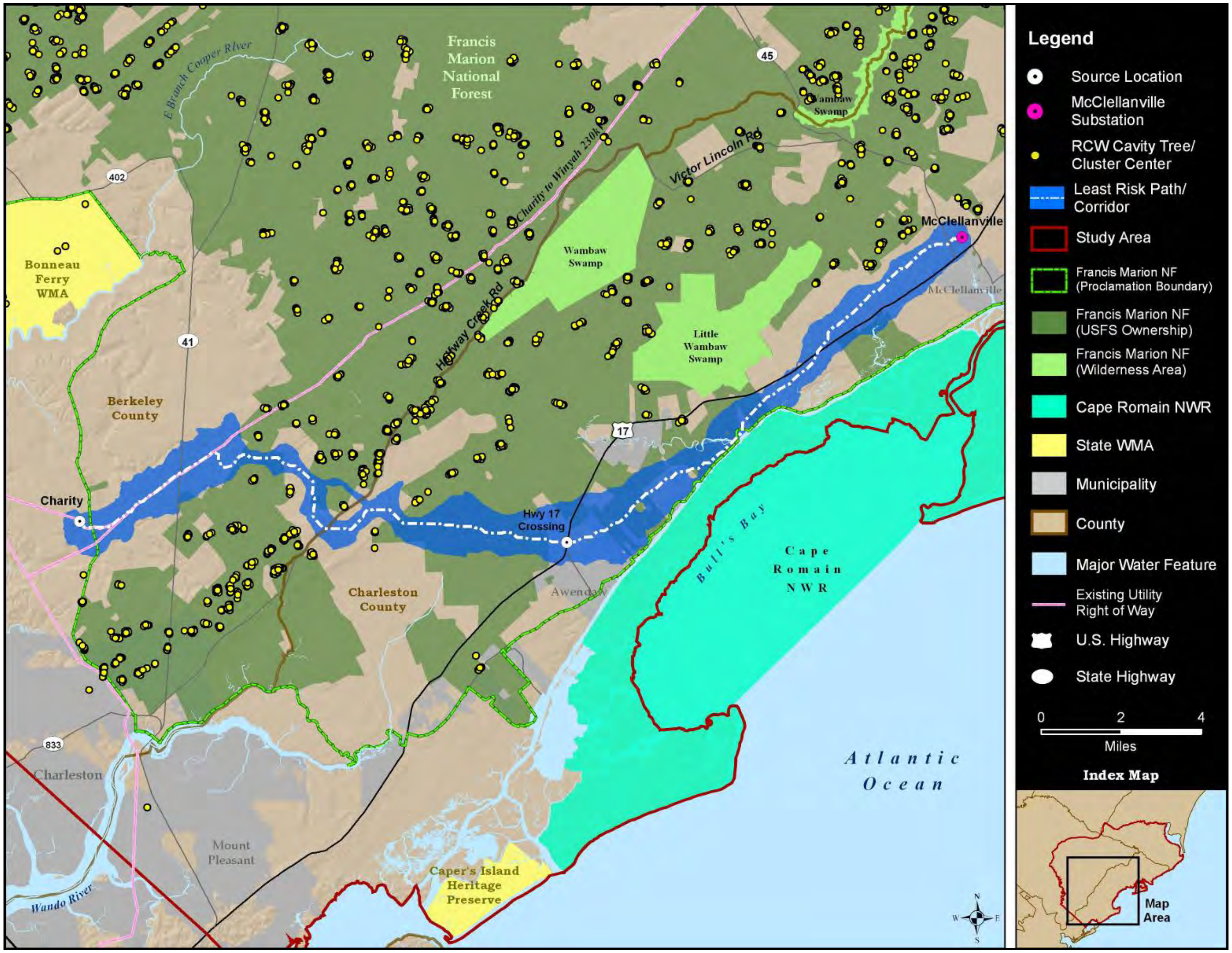



**Figure 5-6a: Charity 1 Least Risk Path Alignment and Corridor**

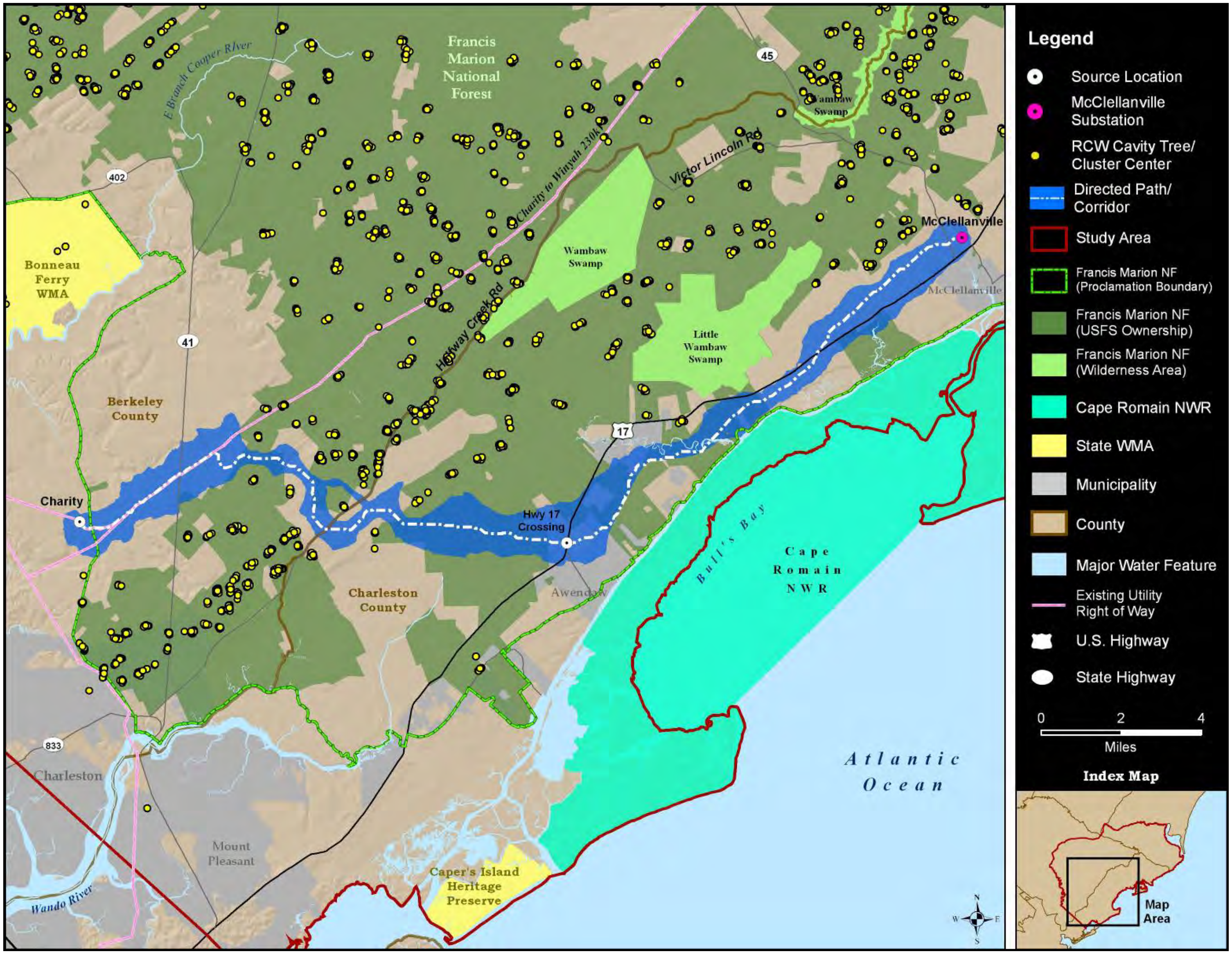



**Figure 5-6b: Charity 2 Directed Path Alignment and Corridor**

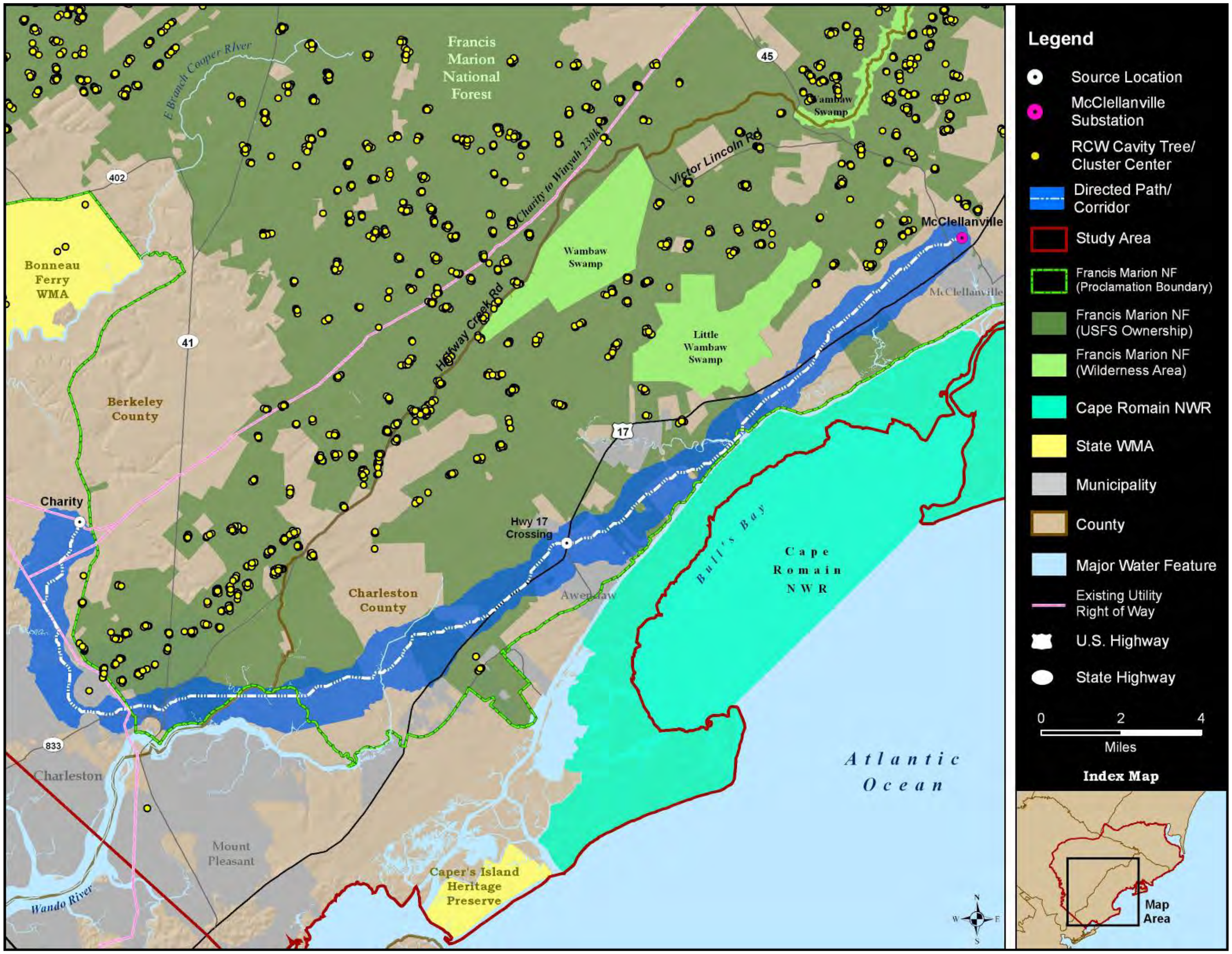



**Figure 5-6c: Charity 3 Directed Path Alignment and Corridor**

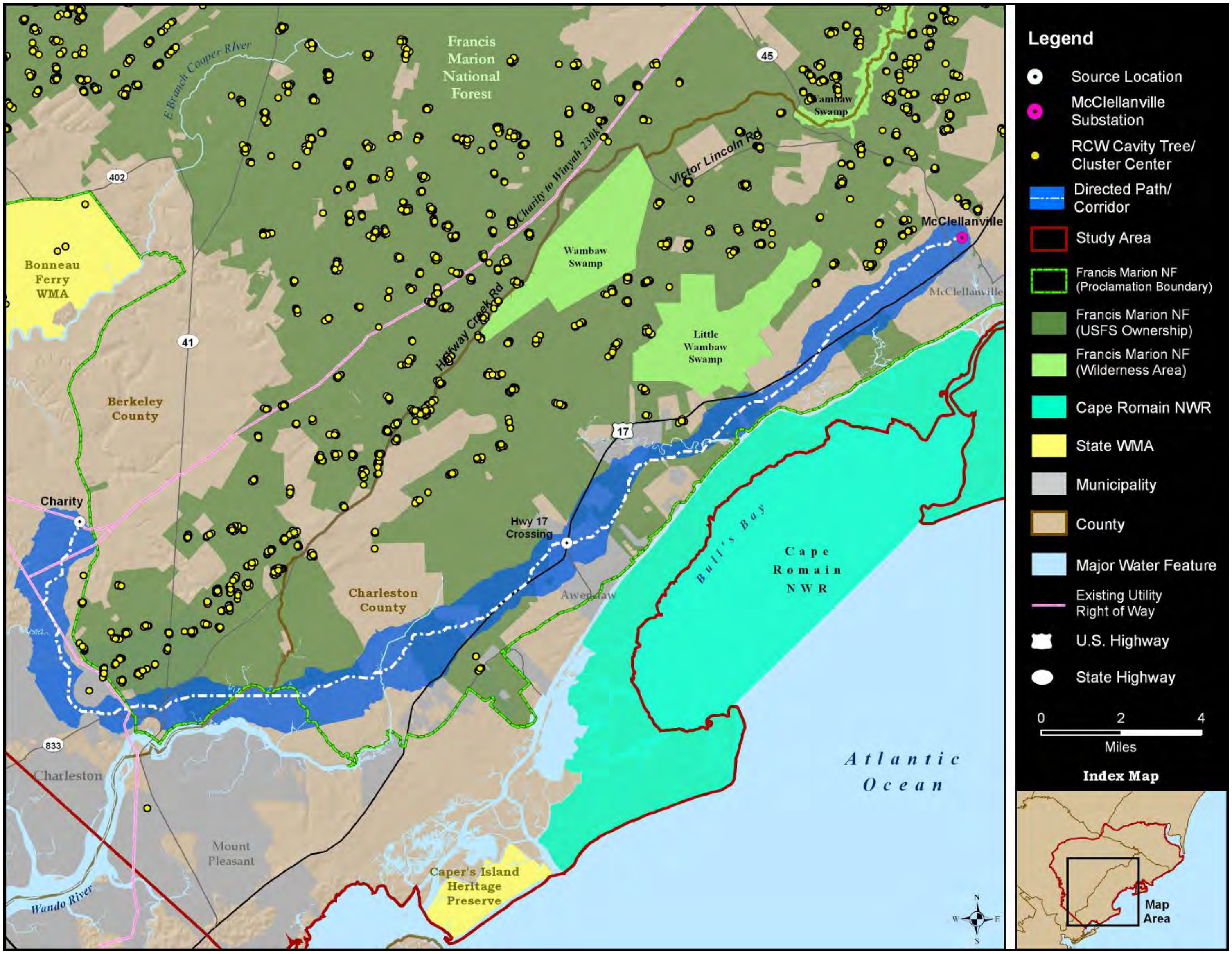



**Figure 5-6d: Charity 4 Directed Path Alignment and Corridor**

## 5.6 Alternative Corridor Comparison

A number of comparisons can be made between corridors from the three general origin locations (i.e., the Belle Isle/Britton Neck region vs. the Honey Hill/Jamestown region vs. the Charity region) A number of these comparative metrics can be viewed in Table 5.1. With respect to comparisons between the three general origin locations, the Charity alignments begin the furthest distance from the proposed McClellanville substation, and thus represent the longest alternatives in terms of distance as well as the largest corridors in terms of area. The four Charity alignments range from 28 to 33 miles long, approximately 8 to 13 miles greater than the next longest path (the Jamestown alignment) and approximately 13 to 18 miles longer than the Belle Isle alignments. A similar comparison can be made between the area (square mileage) of the alternative corridors.

With respect to the Francis Marion National Forest, the Charity alternative corridors contain on average approximately 9 square miles of National Forest land within the corridor boundaries, while the Belle Isle and Britton Neck corridors cross very little National Forest land (between .26 and 1.31 square miles). However, as a percentage of its corridor, the Honey Hill corridor crosses the highest percentage of National Forest land (approximately 55 percent, or 4.65 square miles).

Because of their proximity to the Francis Marion National Forest, the Honey Hill and Jamestown corridors contain a higher number of red-cockaded woodpecker cavity trees with the outer corridor perimeter in comparison to the other corridors; however, the Belle Isle 3 corridor contains the most cavity trees, located near the southern end of the corridor where it enters National Forest land. A similar comparison can be made for the amount of red-cockaded foraging area within each corridor.

Because the Charity corridors travel at length in proximity to developed areas along U.S. Highway 17, these corridors contain a great deal more structures and private land parcels in comparison to the other alternative corridors. The corridors originating from Charity contain approximately 800 structures, while the Belle Isle and Jamestown alternative corridors contain between 174 and 280 structures. The Britton Neck and Honey Hill corridors contain the least number of structures, 91 and 72 respectively.

With respect to overall risk scores derived from the suitability map, the alternative corridors originating from Charity are generally higher (i.e. more risk) because of their greater length/area, as well as their proximity to the more developed regions of the study area. The Belle Isle 1, Belle Isle2, and Britton Neck alternative corridors generally have the lowest suitability risk score, due to the fact that they are generally not in highly developed regions of the study area and do not contain a lot of National Forest land. However, these corridors, in addition to the Belle Isle 3 corridor, have the added concern of crossing the Santee Delta. The Honey Hill corridor, although it is the shortest route, is within the boundaries of the National Forest for a great length and contains a high percentage of wetlands, and correspondingly has a generally higher risk (accounting for distance and area).

## Table 5.1: Alternative Corridor Comparison

| | Belle Isle 1 | Belle Isle 2 | Belle Isle 3 | Britton Neck | Honey Hill | Jamestown | Charity 1 | Charity 2 | Charity 3 | Charity 4 |
|---|---|---|---|---|---|---|---|---|---|---|
| ***General Characteristics*** | | | | | | | | | | |
| Path Length (Miles) | 16.9 | 15.3 | 17 | 14 to 14.9 | 9.9 | 20.6 | 28.5 | 28.7 | 33 | 33.2 |
| Corridor Area (Miles$^2$) | 15.23 | 15.65 | 16.05 | 12.04 | 8.39 | 17.42 | 26.92 | 24.63 | 32.54 | 30.74 |
| National Forest Area (Miles$^2$) | 0.26 | 0.41 | 1.31 | 0.28 | 4.65 | 7.28 | 9.34 | 8.55 | 9.74 | 9.24 |
| National Forest Percentage | 1.74% | 2.62% | 8.17% | 2.35% | 55.39% | 41.77% | 34.71% | 34.72% | 29.94% | 30.06% |
| Corridor Risk Score* | 19.03 | 5.54 | 28.79 | 13.65 | 23.69 | 27.53 | 36.88 | 35.26 | 40.55 | 39.69 |
| Risk Score Per Miles$^2$* | 1.25 | 0.35 | 1.79 | 1.13 | 2.82 | 1.58 | 1.36 | 1.43 | 1.25 | 1.29 |
| ***Land Use/Land Cover (Percent of Corridor)**** | | | | | | | | | | |
| Urban/Developed | 2.7% | 4.2% | 5.5% | 0.8% | 2.8% | 2.4% | 3.8% | 4.1% | 4.9% | 5.2% |
| Agricultural | 0.4% | 0.4% | 0.5% | 1.1% | 0.7% | 2.0% | 1.1% | 1.1% | 1.0% | 1.0% |
| Grassland/Pasture | 6.8% | 5.9% | 6.0% | 5.5% | 5.4% | 7.7% | 9.1% | 8.0% | 7.4% | 6.3% |
| Forested | 39.5% | 53.7% | 55.2% | 45.1% | 53.5% | 50.3% | 44.6% | 45.1% | 43.6% | 44.3% |
| Scrub/Shrub | 4.8% | 4.4% | 3.9% | 4.6% | 5.6% | 4.2% | 5.1% | 4.5% | 4.2% | 3.6% |
| Wetland | 44.4% | 31.1% | 28.3% | 41.2% | 32.0% | 32.2% | 35.1% | 37.0% | 36.9% | 38.4% |
| Open Water | 1.4% | 0.3% | 0.6% | 1.7% | 0.0% | 1.2% | 1.2% | 0.2% | 2.0% | 1.2% |
| ***Wetlands Inventory (Percent of Corridor)***** | | | | | | | | | | |
| All Wetlands | 60.7% | 58.5% | 59.3% | 58.5% | 96.1% | 57.1% | 48.7% | 54.7% | 48.5% | 52.7% |
| Estuarine | 13.2% | 23.7% | 29.1% | 14.3% | 63.7% | 28.4% | 21.6% | 24.3% | 27.7% | 29.3% |
| Lacustrine | 0.3% | 0.2% | 0.3% | 0.0% | 0.0% | 0.2% | 0.0% | 0.0% | 0.0% | 0.0% |
| Palustrine Emergent | 5.9% | 1.5% | 1.3% | 5.4% | 0.0% | 0.3% | 0.4% | 0.5% | 1.0% | 1.1% |
| Palustrine Forested | 31.7% | 26.8% | 23.1% | 33.0% | 30.3% | 26.6% | 22.1% | 23.8% | 17.6% | 18.5% |
| Palustrine Scrub/Shrub | 7.9% | 5.9% | 4.9% | 5.8% | 2.0% | 1.3% | 2.5% | 3.0% | 1.7% | 1.9% |
| Palustrine Other | 0.2% | 0.3% | 0.3% | 0.0% | 0.1% | 0.3% | 0.2% | 0.3% | 0.2% | 0.2% |
| Riverine | 1.5% | 0.1% | 0.3% | 2.1.% | 0.0% | 0.0% | 1.9% | 2.8% | 0.3% | 1.7% |

* ‘Corridor Risk Scores’ were calculated by summing the suitability scores of each individual 10 x 10 meter cell that fell within the corridor boundary. Due to the large number created by this summation, it was then divided by 1,000,000 for the purposes of display.

** Land Use/Land Cover categories are derived from the USGS National Land Cover Database. Additional data concerning land use categories can be found at http://www.mrlc.gov/nlcd.php.

*** Wetland acreages were calculated based on the most recent and updated National Wetland Inventory analysis, as well as a wetland coverage maintained by the U.S. Forest Service for the Francis Marion National Forest. This is likely an over exaggeration of actual wetland acreage. Note: USGS National Land Cover Database analysis land use information was not used for this calculation.

## Table 5.1: Alternative Corridor Comparison (continued)

| | Belle Isle 1 | Belle Isle 2 | Belle Isle 3 | Britton Neck | Honey Hill | Jamestown | Charity 1 | Charity 2 | Charity 3 | Charity 4 |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Red-Cockaded Woodpecker*** | | | | | | | | | | |
| Number of National Forest RCW Cavity Trees Within Outer Perimeter of Corridor | 10 | 20 | 64 | 10 | 40 | 40 | 11 | 11 | 0 | 0 |
| Percentage of Corridor Within 1/2 Mile RCW Management Area/Foraging Buffer | 4.6% | 8.6% | 22.0% | 4.4% | 33.3% | 12.5% | 6.2% | 7.1% | 1.6% | 1.9% |
| ***Development*** | | | | | | | | | | |
| Number of Structures Within Corridor | 174 | 263 | 280 | 91 | 72 | 181 | 862 | 803 | 868 | 803 |
| Number of Private Parcels Within Corridor | 429 | 496 | 471 | 239 | 180 | 443 | 1,274 | 1,185 | 1,412 | 1,321 |
| Percentage of Corridor With Parcels Below 6 Acres | 4.8% | 5.9% | 6.2% | 2.7% | 3.9% | 4.0% | 8.6% | 8.4% | 7.1% | 6.6% |
| Miles of Road Within Corridor | 37.5 | 46.2 | 50.5 | 28.6 | 32.4 | 58.6 | 93.9 | 87.7 | 96.5 | 91 |

## 5.7 Estimated Corridor Costs

*Engineering and Construction*

Engineering and construction costs estimates were developed for each corridor (Table 5-2). All began with a common base cost per mile derived from Central Electric Engineering Department's tabulation of Construction Cost Projections. The projections were calculated based on historic data from all construction projects since 1980.

Due to developments following the establishment of the cost projections adjustments were made for this project. Considering the unique land values of the area, the right of way acquisition component of the cost projections (historically averaging 25%) was removed and was calculated separately (see below). Recent changes to the National Electric Safety Code dramatically increased the wind speeds used in calculating extreme wind loading, resulting in shorter spans between supporting structures and increased strength requirements for poles. On average, poles are spaced 300-400 feet apart. Pole class and ground clearance would determine the span between poles. The engineering and construction components remaining after removal of right of way acquisition were increased by 20% to reflect this. Construction through wetlands and National Forest land also required additions to the base cost per mile of the estimated cost and both were quantified for each corridor.

*Right of Way Acquisition and Wetland Mitigation Costs*

Right of way acquisition costs estimated for each corridor (Table 5-2) were based on the following information sources/investigations:

1) Review of county and local economic trends
2) Review of land use patterns, zoning and land use plans
3) Examination of public records for deeds and plans relating to the area
4) Interviews with realtors and appraisers familiar with the area
5) Consideration of Realtor's listings and expertise in specific areas

Land use and assigned cost estimates for the associated use were developed for the following general categories:

- Urban Development: those properties with development potential $25,000/ acre
- Urban Residential: residential development potential or use 7,500/acre
- Wetland Type Properties: limited use due to wetland characteristics 1,500/acre
- Forest/Timber-Recreation: in timber production/recreational assets 4,500/acre
- Agricultural: pasture lands or lands in cultivation 3,500/acre
- River Influenced: properties influenced by the Santee River 60,000/acre

Wetland mitigation estimates are based on Central Electric's previous experience with other projects as to credits per acre and costs of credits.

### Table 5.2: Economic Corridor Comparison Table

| | Belle Isle to McClellanville #1 | Belle Isle to McClellanville #2 | Belle Isle to McClellanville #3 | Britton Neck #1 230/115 to McClellanville | Britton Neck #2 230/115 to McClellanville | Honey Hill Junc. 230/115 to McClellanville | Jamestown to McClellanville | Charity to McClellanville #1 | Charity to McClellanville #2 | Charity to McClellanville #3 | Charity to McClellanville #4 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Line length (miles)** | 16.9 | 15.3 | 17 | 14 | 14.9 | 9.9 | 20.6 | 28.5 | 28.7 | 33 | 33.2 |
| **Engineering and Construction Cost per Mile[1]** | $444,675 | $454,575 | $444,118 | $464,286 | $457,383 | $511,616 | $427,670 | $406,140 | $405,749 | $398,485 | $398,193 |
| **Base Engineering and Construction Costs** | $7,515,000 | $6,955,000 | $7,550,000 | $6,500,000 | $6,815,000 | $5,065,000 | $8,810,000 | $11,575,000 | $11,645,000 | $13,150,000 | $13,220,000 |
| **Total Length in Wetlands (miles)** | 9.7 | 7.6 | 9.9 | 9.8 | 9.8 | 9 | 11.8 | 13 | 14.6 | 12.9 | 14.1 |
| **Additional Costs for Construction in Wetlands[2]** | $203,922 | $160,122 | $208,580 | $205,963 | $205,963 | $188,998 | $247,541 | $273,812 | $307,546 | $271,736 | $297,013 |
| **Total Length on National Forest Lands** | 0.5 | 1.5 | 1.5 | 0.5 | 0.5 | 7.7 | 12.8 | 15.2 | 13.9 | 15.8 | 15 |
| **Additional Costs for Construction on National Forest Lands[3]** | $13,527 | $40,581 | $40,203 | $13,527 | $13,527 | $225,974 | $347,380 | $405,200 | $370,544 | $421,193 | $399,914 |
| **Additional Cost of 230/115 switching / substation[4]** | 0 | 0 | 0 | $5,700,000 | $5,700,000 | $5,700,000 | 0 | 0 | 0 | 0 | 0 |
| **Additional Cost of 2 .5 Miles Directional Bored Cable[5]** | 0 | $8,000,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Additional Cost of 2 Miles Overhead Crossing Santee Delta[6]** | $675,000 | 0 | $675,000 | $675,000 | $675,000 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total estimated engineering & construction cost** | **$8,407,449** | **$15,155,703** | **$8,473,783** | **$13,094,490** | **$13,409,490** | **$11,179,972** | **$9,404,921** | **$12,254,012** | **$12,323,090** | **$13,842,929** | **$13,916,927** |

## Table 5.2: Economic Corridor Comparison Table (continued)

| | Belle Isle to McClellanville #1 | Belle Isle to McClellanville #2 | Belle Isle to McClellanville #3 | Britton Neck #1 230/115 to McClellanville | Britton Neck #2 230/115 to McClellanville | Honey Hill Junc. 230/115 to McClellanville | Jamestown to McClellanville | Charity to McClellanville #1 | Charity to McClellanville #2 | Charity to McClellanville #3 | Charity to McClellanville #4 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| **Total estimated engineering & construction cost** | **$8,407,449** | **$15,155,703** | **$8,473,783** | **$13,094,490** | **$13,409,490** | **$11,179,972** | **$9,404,921** | **$12,254,012** | **$12,323,090** | **$13,842,929** | **$13,916,927** |
| **Estimated Right of Way Acquisition Costs** | $1,139,508 | $1,004,919 | $1,120,835 | $937,850 | $998,960 | $363,000 | $900,124 | $1,555,289 | $1,278,173 | $1,847,088 | $1,493,300 |
| **Estimated Wetland Mitigation Costs** | $682,825 | $682,825 | $682,825 | $325,185 | $325,185 | $323,875 | $564,086 | $1,100,390 | $1,109,562 | $1,100,390 | $1,109,562 |
| **TOTAL COST** | **$10,229,782** | **$16,843,447** | **$10,277,443** | **$14,357,525** | **$14,733,635** | **$11,866,847** | **$10,869,131** | **$14,909,691** | **$14,710,825** | **$16,790,407** | **$16,519,789** |

[1] Taken from Engineering Department Cost Projections.
[2] Based on most recent unit cost of wetlands clearing.
[3] Estimated increase in base cost due to USFS restrictions on access and timing of activities.
[4] Station cost provided by Santee Cooper for a step down station with high side distance relays and circuit breakers integrated in the station.
[5] Estimate based on recent directional bore installations.
[6] Estimated cost of overhead installation with 35% increase over base cost due to requirement of self supporting angle structures.

# 6.0 List of Preparers

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# Appendix B- Alternative Evaluation Study

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# McClellanville Power Supply Alternatives Evaluation Study

## Central Electric Power Cooperative, Inc.

### September 2010

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# 1.0 Introduction

Central Electric Power Cooperative, Inc. (Central Electric) is proposing to construct a 115 kilovolt (kV) transmission line to Berkeley Electric Cooperative (Berkeley Electric)'s proposed McClellanville substation for the purpose of providing long-term reliable electric service to the McClellanville community and surrounding areas. This proposal would greatly reduce the number and length of extended outages in the area and the number of momentary interruptions (or blinks).

## 1.1 Description of Central Electric Power Cooperative

Central Electric is a wholesale power supplier owned by the twenty electric member distribution systems that it serves. Central Electric provides electricity to its member distribution systems in the state of South Carolina via a combination of the bulk electric system and its own transmission facilities. Central Electric owns approximately 668 miles of transmission lines.

Central Electric, founded in 1948 by its original member distribution systems, today serves more than 720,000 consumers in South Carolina. Central Electric's mission is to provide its member distribution systems a reliable and affordable supply of electricity while maintaining a sound financial position through effective use of human, capital, and physical resources in accordance with cooperative principles.

## 1.2 Purpose of the Alternative Evaluation Study

The U.S. Department of Agriculture's (USDA) Rural Utilities Service (RUS) provides capital loans and loan guarantees to electric cooperatives for the upgrade, expansion, maintenance, and replacement of the electric infrastructure in rural areas. Central Electric is pursuing financial support from the RUS for a new 115 kV transmission line to serve Berkeley Electric's proposed McClellanville substation. The transmission line would provide the power delivery infrastructure to increase the reliability and capacity of the existing electrical system serving the area.

RUS is required to evaluate potential environmental impacts of its federal actions in accordance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality's NEPA implementing regulations (40 Code of Federal Regulations [CFR] 1500–1508), and RUS's NEPA implementing regulations, Environmental Policies and Procedures (7 CFR 1794). RUS guidance regarding NEPA implementation for RUS actions requiring scoping (RUS Bulletin 1794A-603) requires that an Alternative Evaluation Study (AES) and a Macro Corridor Study (MCS) be prepared. RUS normally accepts these studies before starting the official NEPA process (i.e., issuing of a Notice of Intent [NOI] to prepare an Environmental Assessment or an Environmental Impact Statement). Central Electric has prepared this AES to evaluate electric system alternatives that best meet the purpose and need for the proposed project. Potential corridor alternatives are discussed in the associated MCS.

## 1.3 Purpose/Need for the Proposal

The purpose of the proposal is to provide long-term reliable electric service to the McClellanville community and surrounding areas by constructing a 115-kV transmission line to Berkeley Electric's proposed McClellanville substation. The McClellanville community is located in an area that currently has no existing transmission infrastructure. Transmission lines deliver power to the customer substations long distances away from generating plants at high voltages to ensure that power is transmitted much more efficiently with minimal power losses and voltage drops. These lines are also much more reliable than distribution lines because they: (1) have wider rights-of-way, (2) have more aggressive right-of-way clearing and tree trimming programs, (3) have wider spacing of wires (4) are constructed more solidly, and (5) are more solidly grounded.

### 1.3.1 Existing System vs. Proposed Project

A diagram, illustrating a complete power system, is included in this document as Figure 1. This diagram functionally represents what the electrical system would look like if the proposal were completed. A substation would be located in a load center (or an area where power is needed). A transmission line from the bulk electric system would then service or energize the load-serving substation. Distribution lines would then exit the substation and provide electric service to residents, commercial buildings, schools, farms, etc. This is a typical and universally desired method of providing electrical service to a substation because it results in a very reliable source for each of the distribution circuits leaving the substation.

Figure 2 is a map of the existing power system serving the McClellanville area. Berkeley Electric, a member Central Electric's system, serves the McClellanville area from a distribution system that is approximately forty (40) miles long from the nearest substation to the end of the distribution line. Geographically, this extends from the Mt. Pleasant area to the Santee River delta. The substation, identified as Hamlin, and approximately twenty-two (22) miles of distribution line, are owned and operated by South Carolina Electric & Gas Company (SCE&G). This SCE&G distribution line serves as the source to Berkeley Electric's McClellanville Metering Point, which serves the McClellanville community. Of all the delivery points provided to Berkeley Electric from Central Electric, this is the only one served by a long distribution line. Unlike transmission lines, the SCE&G distribution line serves other commercial and residential customers along the way and beyond Berkeley Electric's metering point. This 40-mile distribution line is difficult to maintain, creates voltage problems, and results in poor power quality/reliability to all the customers involved. Central Electric is Berkeley Electric's wholesale power provider and is therefore responsible for purchasing the power from SCE&G and reliably delivering it to Berkeley Electric to serve the McClellanville area.

### 1.3.2 Reliability and Its Measures

The reliability of the electric service provided to consumers is one of Berkeley's primary concerns. Likewise, one of Central's primary concerns is the reliability of electric service provided to Berkeley. Reliability to an electric utility is defined as an effort to keep the lights on as much as possible to as many customers as possible. Reliability of power systems is measured by industry standard indices that are calculated by the utility from actual data captured from electronic meters and/or controls.

Two of the most commonly used indices to measure system performance are the System Average Interruption Duration Index (SAIDI) and the System Average Interruption Frequency Index (SAIFI). SAIDI is the duration in minutes of interruption experienced by the average customer and is equal to the total customer interruption durations divided by the total customers served. . SAIFI is equal to the total number of customer interruptions divided by the total customers served. Please refer to Figure 3, titled SAIDI, 2004-2008 and Figure 4, titled SAIFI, 2004-2008. These charts show the SAIDI and SAIFI as calculated for the source for all of Berkeley's stations for the years 2004-2008. The reliability of the electric service being provided at the McClellanville Source is by far worse than any other station owned and operated by Berkeley, with the second being the Hamlin Metering Point that was replaced by a substation in 2008. As shown in Table 1 below, the SAIDI number for the McClellanville source is over 20 times greater than the typical source at Berkeley Electric. Replacing the McClellanville Metering Point with the McClellanville Substation and a transmission source would improve the reliability to customers in this area to a level equivalent to other customers on Berkeley Electric's system.

Table 1: Reliability Indices – McClellanville Source

| Berkeley Electric Reliability Indices | McClellanville Source 2004-2008 | Typical Berkeley Electric Source: 2004-2008[1] |
|---|---|---|
| SAIDI | 623.24 | 29.95 |
| SAIFI | 4.21 | 0.34 |

[1] Average SAIDI and SAIFI source values from Berkeley Electric distribution system (as seen in Figures 3 & 4) with the McClellanville and Hamlin Metering Points excluded.

In addition to being measured at the source, reliability is also measured on the distribution system owned and operated by Berkeley Electric. The proposed McClellanville Substation, as shown on Figure 2 is located at a point that is central to the McClellanville area. This area is now being served from one circuit out of the McClellanville Metering Point, whereas the proposed McClellanville Substation would serve this same area with three circuits. The following Table 2 shows SAIDI and SAIFI calculations for the times that the circuit has gone out in addition to when the source was out:

Table 2: Reliability Indices – McClellanville Circuit

| Berkeley Electric Reliability Indices | McClellanville Circuit 2004-2008 | Typical Berkeley Electric Circuit: 2004-2008[1] |
|---|---|---|
| SAIDI | 581.71 | 289.64 |
| SAIFI | 4.40 | 2.76 |

The SAIDI number is about twice as high as the typical circuit at Berkeley Electric. There are three ways to reduce this number: (1) reduce the duration of the outages, (2) reduce the number of outages that occur, or (3) reduce the number of customers affected. Since McClellanville is a remote area, it would be very difficult to decrease the duration as emergency response times would be above what is typical. However, serving the same area with three circuits versus one circuit would reduce the number of customers affected on many outages and bring the SAIDI more in line with other circuits on Berkeley Electric's system. The SAIFI number is also greater than the typical Berkley Electric circuit, and it is expected that this number would be reduced with the proposed project.

### 1.3.3 Voltage Levels

Berkeley Electric has a responsibility to provide voltage levels within industry standards to all of its customers. The most recent standard is the ANSI C84.1-2006 titled American National Standard for Electric Power Systems and Equipment - Voltage Ratings (60 Hertz). It is common for Berkeley Electric to use voltage regulators to help keep voltages within the specified ranges for all the customers served from a distribution line. A voltage regulator is an electrical device that automatically steps voltages up or down to maintain optimum voltage levels. Typically, Berkeley Electric has one set of voltage regulators installed on each circuit at its substations. In the case of the McClellanville Metering Point, two sets of voltage regulators are installed to boost voltages to acceptable levels. This is a "band-aid" solution that will become less effective with even the smallest amount of load growth in the area. Based on the loading on this equipment, another set of voltage regulators may be needed soon. In this case, growth on both Berkeley Electric's and SCE&G's distribution systems directly affects the voltage level delivered to Berkeley Electric's system.

### 1.3.4 Voltage Sags

Another concern related to voltages is voltage sags. These can occur when an object, such as a tree limb, makes contact with the distribution line. While every reasonable effort is made to keep distribution line rights-of-way as clear as possible, the number and magnitude of voltage sags are directly proportional to the length of the distribution line. This is due to the increased amount of exposure of the line to the environment and the technical characteristics of the wire (or conductor). When voltage sags occur: lights can either go dim or go out, motors can stall out or overheat, and computers can shut down or fail. As customers continue to add newer, more sensitive electrical and electronic equipment, this becomes a much greater concern.

# 2.0 Project Description

## 2.1 Proposed Action

The action being proposed by Central Electric is to build a single-circuit 115 kV transmission line from a Santee-Cooper Network transmission line to the proposed McClellanville substation to be constructed by Berkeley Electric. The transmission line macro-corridors from which a route would be selected range from 15 to 33 miles in length and vary in width from a few hundred feet to up a mile.

Current design features being proposed include: single pole structures with three phase conductors and a single 0.565 OPGW fiber optic overhead shield wire. The right-of-way would be cleared to 75 feet in width (37.5 feet on either side of the centerline) and would include the trimming or removal of danger trees (hazardous trees that could fall on the line) that may be outside of the right-of-way.

# 3.0 Alternative Evaluation

## 3.1 Alternatives Considered

In the sections below, the "no action" alternative, and other alternatives that address each aspect of the purpose and need for the proposal are discussed. As mentioned above, the most pressing need is to improve the reliability of the electrical service to the McClellanville community and surrounding area. However, each alternative that meets this purpose and need was also explored for its ability to support increased load or energy demand in the McClellanville area.

An economic power supply analysis of each source option was performed, at two different growth rates, by comparing the cost to upgrade the electrical system versus the preferred transmission alternative. Each alternative was evaluated over a 30-year timeframe. The *No Action Alternative* and the *Energy Efficiency/Conservation and Renewable Resources Alternative* are alternatives that require no changes to the existing distribution system, so there are no economic analysis comparisons for new construction.

### 3.1.1 No Action Alternative

Berkeley Electric has an assigned service territory that includes an area that is generally in the vicinity of the McClellanville community of Berkeley County, South Carolina. This is a unique coastal area that is effectively isolated by virtue of a number of natural boundaries, including the Atlantic Ocean to the east, the Santee River delta to the north and the Francis Marion National Forest to the west. As a result, electrification of the area meant providing service from the south. Long time environmental restrictions along with a relatively low population density in the area had created a situation where the existing power system either could not be expanded or it was not economically feasible.

Approximately twenty years ago, it became clear to the engineering and operations staff at Berkeley Electric that the existing facilities were not providing the community an acceptable level of service. The area is currently served by long distribution lines that extend over forty miles in length. These long lines pass through heavily wooded areas with relatively narrow right-of-way. These lines are difficult to maintain, create voltage problems, and thus result in poor power quality/reliability to all customers involved.

Electrical overload of the conductors causes the distribution lines to sag towards the ground and creates a public safety hazard. Also, the long distances that these circuits (or lines) have to reach presents a voltage problem where the existing equipment will not be capable of sustaining line voltages at acceptable levels, particularly at times when the usage in the area is at its maximum. This could cause appliances and motors to operate unacceptably or be damaged permanently.

While the system capacity and voltage levels are a concern for the near future, the area has already passed the point of unacceptable reliability with outages. Long distribution circuits (such as those that exist to serve the McClellanville area) are normally replaced with shorter circuits by locating a new substation as close to the load center as possible. A new substation requires a transmission line to serve it. Transmission lines are inherently more reliable than distribution lines due to their physical isolation from nearby vegetation and electrical isolation from consumers (i.e., the only loads are other substations).

Over the years, the population of the McClellanville area has minimally grown, resulting in a slightly increased electrical load. While the present system is still able to accommodate the existing load, even a very small growth rate (lower than what has been seen in recent years) would result in a situation where the existing power lines would not have the capacity to serve those growing loads, particularly at those times such as hot summer days or cold winter days when consumers are attempting to cool or heat their homes.

By failing to provide a more reliable source of power to the McClellanville community than presently exists, the community would continue to experience reliability issues. These issues will become even further aggravated by load growth (which would affect voltage and outage concerns). Berkeley Electric can continue to use a “Band-Aid” approach as long as it is necessary to attempt to maintain as high a level of service reliability as possible with the existing distribution lines. However, continuing to use such an approach would not solve the long-term reliability issues that are present in this area.

### 3.1.2 Energy Efficiency/Conservation and Renewable Resources

Central Electric is working with Berkeley Electric and its other member distribution systems in South Carolina to promote and improve energy efficiency and conservation. Central Electric has in place statewide load control, used at peak load times, and is developing renewable resources. On the energy efficiency side, Central Electric and its member distribution systems will have distributed over 1.9 million compact fluorescent light bulbs (CFLs) by the end of 2010 and has in place a pilot weatherization program for residential consumers. Central Electric and its member distribution systems are also working with the South Carolina Energy Office to provide grants to improve over

1,200 homes with various energy efficiency measures and determine which ones are the most effective. The member distribution systems plan to weatherize 20-30% of residential homes over the next 10 years. This is a huge effort that will reduce annual energy consumption by 180 to 270 million kilowatt-hours (kWh). Central Electric's renewable energy program includes the purchase of qualified green energy through our net metering program. Net metering allows the customer to put additional power generated from solar panels, windmills, or other distributive generation equipment back onto the distribution power lines. Central Electric pays the customer for this localized distributed generation of power.

Central Electric and Berkeley Electric will continue to pursue and promote efficiency improvements, increased conservation, and utilization of renewable resources with vigor, and these efforts should help reduce the load growth that is straining the existing system to some extent. However, these efforts do not provide relief to one of the main factors supporting construction of the transmission line, which is the poor electrical reliability experienced by the cooperative members in the McClellanville area compared to the members on the rest of Berkeley Electric's system.

### 3.1.3 Rebuild Existing Distribution System

This alternative evaluates rebuilding the existing distribution system to serve the McClellanville area. It requires an upgrade on the SCE&G system, including a new distribution substation at SeeWee, and a new 20 mile 795 SAC feeder from See-Wee to McClellanville. This alternative also requires a new 21 mile double-circuit 477 ACSR line from Jamestown.

With an aggressive growth rate of 4.88%, a capital cost of $6,900,000 would be invested in building an upgraded distribution system from the new SCE&G Seewee substation with the new double circuit distribution circuit from Jamestown for loads over 10 megawatts (MW). The system would be operated over 30 years and the cost of the system losses would be calculated and brought back to a value today of $80,051,850. The total system cost over the lifetime would be $86,951,850. The total system cost is the capital cost plus the value today of system loss cost.

For a more conservative 2.5% growth rate, a capital cost of $6,900,000 would be invested in building an upgraded distribution circuit from a new SCE&G Seewee delivery point with a second distribution circuit from Jamestown for loads over 10 MW. The system would be operated over 30 years and the cost of the system losses would be calculated and brought back to a value today of $62,004,970. The total system cost over the lifetime is $68,904,970.

### 3.1.4 On–Site Generation

This alternative evaluates the construction of the McClellanville substation with on-site generation initially capable of serving up to 6 MW. Banks of 2-MW diesel generator units were evaluated as an on-site generation alternative. Multiple generator units could be added as needed to serve the community where individual units could be temporarily taken down for repair. The initial capital cost of this project is $12,100,000. In the 4.88% growth case, the fourth generator would be added during the first year of operation due to the projected increase in load. The system is operated over 30 years and the cost of the system losses would be calculated and brought back to a value today of $89,842,364 for a 4.88% growth rate and $52,906,588 for a 2.5% growth rate. The total system cost over the lifetime is $101,942,374 and $65,006,588 respectively.

The analysis concluded that the on-site generation capacity for the McClellanville community is not an economical remedy to the reliability issues. The largest expense to on-site generation is the cost of fuel, which is not only expensive but as a commodity, has a large fluctuation in price.

### 3.1.5 Preferred Alternative: New Transmission System

The transmission line alternative was considered as the preferred alternative to provide reliable electric service to the McClellanville community. All of the transmission alternatives evaluated in the MCS would provide an alternative source of power into the McClellanville service area. They are evaluated using the same growth rates as the rebuilding existing distribution and on–site generation cases. In each of the cases the system is operated over 30 years and the cost of the system losses is calculated and brought back to today's equivalent value.

There are five basic transmission alternatives that have been considered. Each one of these provides transmission service from a bulk transmission source. The cost of constructing transmission to serve a growth rate of 4.88% in the McClellanville community produces a range from $63,632,903 to $72,329,266. The cost of constructing transmission to serve a growth rate of 2.5% in the McClellanville community produces a range from $48,299,553 to $57,127,599.

The first alternative is installing a switch in the Belle Isle area and constructing approximately 14-17 miles of 115 kV transmission line to the proposed McClellanville substation. The Santee Delta is included within the macro-corridor of this transmission line alternative.

The second transmission alternative is constructing a 230/115 kV switching station/substation in the Britton Neck area (Britton Neck 1 & 2) and constructing approximately 14-15 miles of transmission line to the proposed McClellanville substation.

The third transmission alternative is constructing a 230/115 kV switching station/substation near an existing 230 kV transmission line in the Honey Hill area (Honey Hill) and constructing approximately 10 miles of transmission line to the proposed McClellanville substation. The Frances Marion National Forest is included within the macro-corridor of this transmission line alternative.

The fourth alternative is tapping the existing Jamestown substation and constructing approximately 21 miles of 115 kV transmission line to the proposed McClellanville substation. The Frances Marion National Forest is included within the macro-corridor of this transmission line alternative.

The fifth alternative is tapping near the existing Charity Generation plant's substation at 115 kV and constructing approximately 28-33 miles of 115 kV transmission line to the proposed McClellanville substation. The Frances Marion National Forest is included within the macro-corridor of this transmission line alternative.

Table 3 presents an executive summary analysis of all possible future service alternatives to the McClellanville area. The capital cost of the installed facilities and the present value of the system loss cost were combined in the project total cost. Both a 2.5% load growth and a 4.88% load growth were assumed over the 30 year period. Load refers to the amount of power being used by all of the customers. The 4.88% load growth was forecasted in the area before the economic recession. A 2.5% load growth was used to evaluate the effects caused by the economic recession. Both growth rates band or bracket the 3.5 % growth rate used in the 2005 analysis.

Table 3: McClellanville Future Service Options Executive Summary

| Macro Corridor Routes | Load | Transmission Capital Cost | Distribution and Substation Costs | Total Lifetime Cost |
|---|---|---|---|---|
| Rebuilding existing distribution to serve the McClellanville area | 4.88% | $0 | $6,900,000 | $86,951,850 |
| | 2.50% | $0 | $6,900,000 | $68,904,970 |
| Building transmission from a new source to provide service to the McClellanville area | 4.88% | $10,229,722 to $16,843,447 | $2,156,900 | $73,862,510 to $85,276,185 |
| | 2.50% | $10,229,722 to $16,843,447 | $2,156,900 | $58,529,160 to $69,942,835 |
| On-site generation | 4.88% | $12,000,000 | $100,000 | $101,942,374 |
| | 2.50% | $12,000,000 | $100,000 | $65,006,588 |

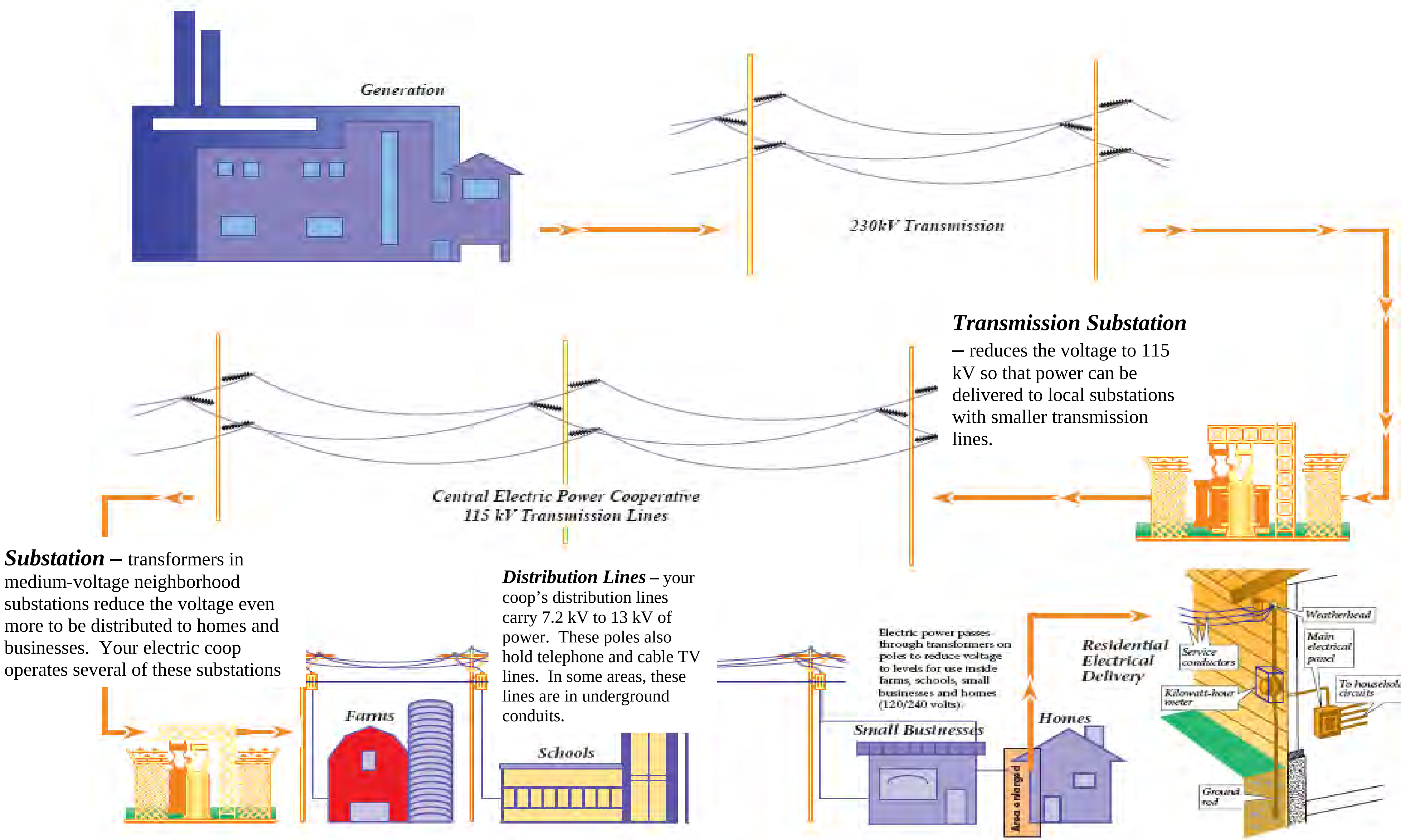


Figure 1: Diagram of a Complete Power System

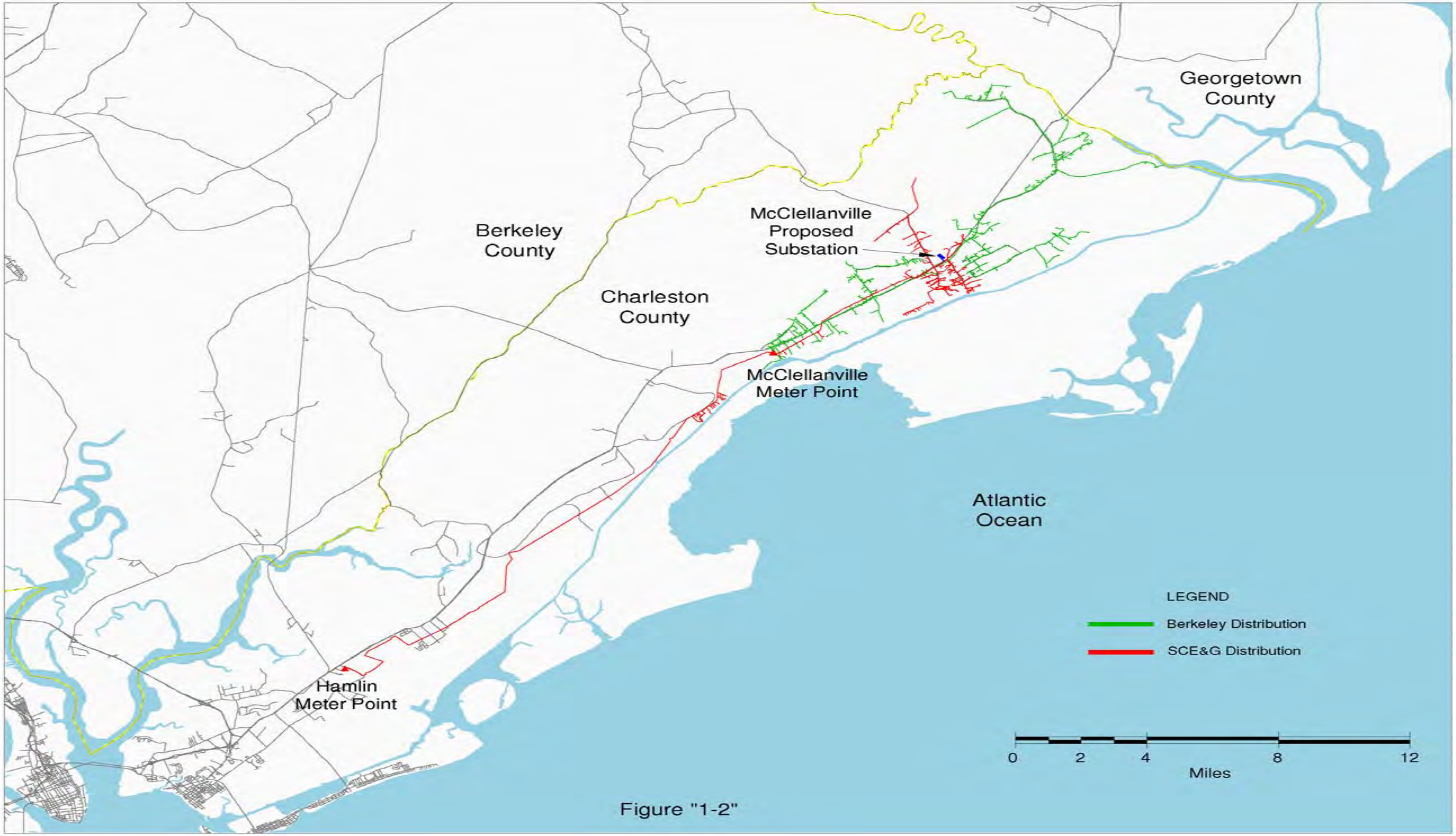


Figure 2: Map of the Power System Serving McClellanville

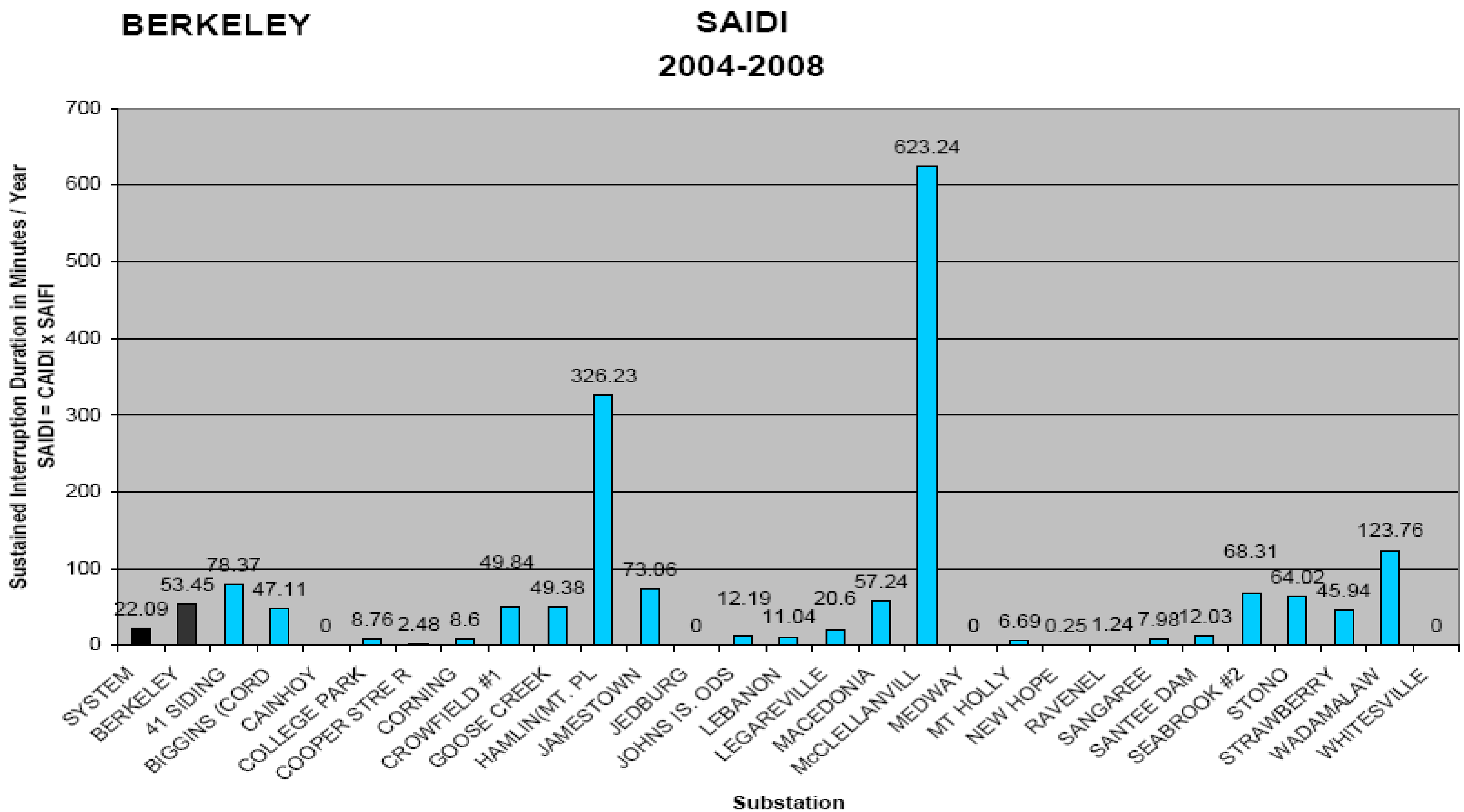


Figure 3: Source SAIDI Index for Berkeley Electric Cooperative from 2004-2008

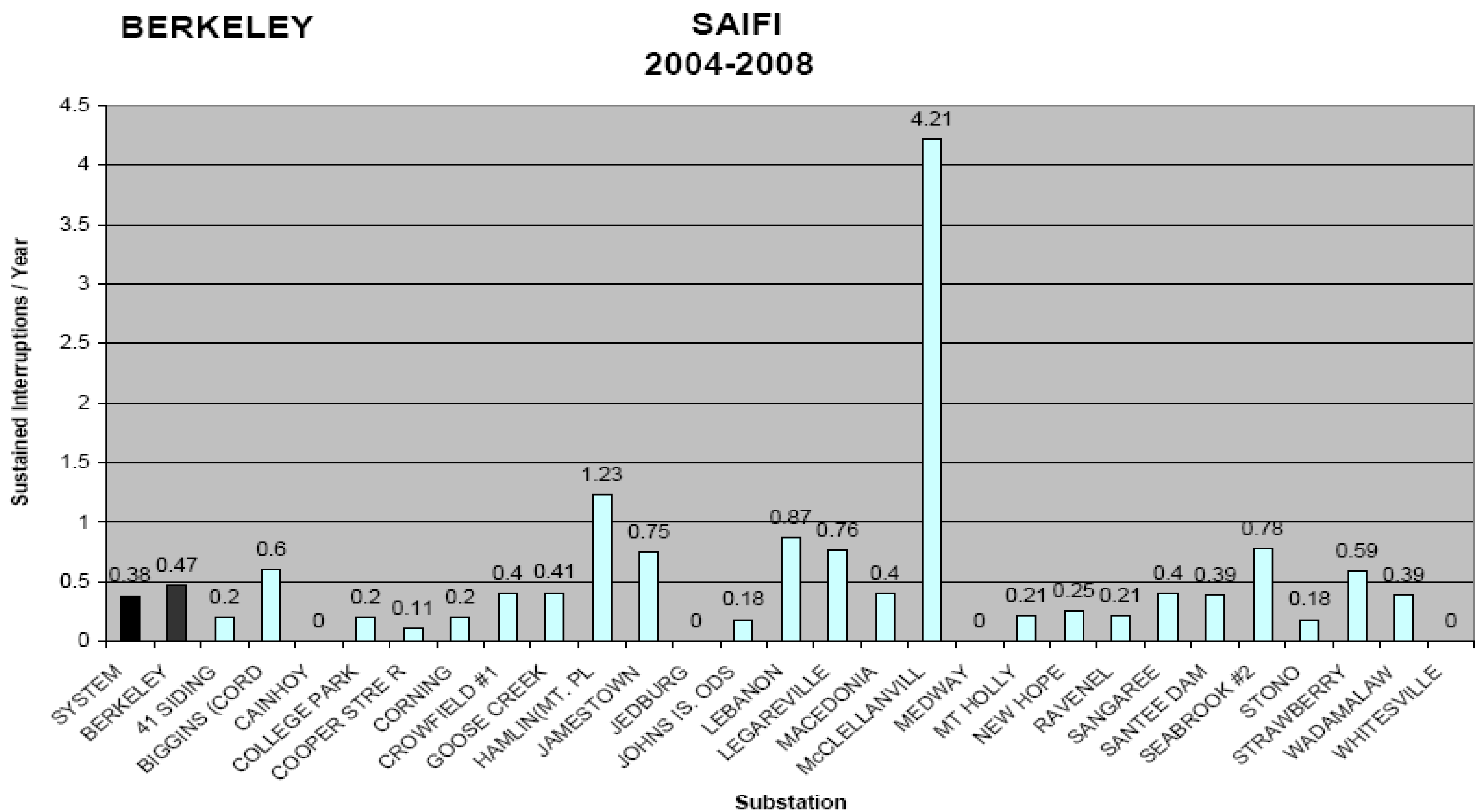


Figure 4: Source SAIFI Index for Berkeley Electric Cooperative from 2004-2008

# Appendix C- Santee Cooper Vegetation Management Plan

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# RIGHT-OF-WAY MANAGEMENT UNIT PLAN
# 2011

## I. OBJECTIVE

To provide a cost effective and integrated Transmission Vegetation Management Program (TVMP) that protects system availability from undesirable vegetation growth.

## II. GOALS

- Comply with NERC Standard FAC-003-1
- Ensure that undesirable woody vegetation growth does not interfere with the inspections and maintenance of transmission facilities by line personnel
- Utilize WMIS (Work Management Information System) to ensure that all appropriate maintenance items are scheduled and completed as designed
- Ensure that annual maintenance production totals are compatible with established maintenance cycles
- Promote a positive public image

## III. ORGANIZATION

The Right-of-Way Management section is comprised of three distinct units that are responsible for a variety of right-of-way related maintenance activities. *Mechanical Reclearing* is the largest of the three units with respect to the number of company personnel and is responsible for the mechanical reclearing and soil stabilization of selected transmission rights-of-way. This unit is made up of a Supervisor, two (2) crew leaders, ten (10) equipment operators. A second unit, *Right-of-Way Management*, is responsible for herbicide related vegetation maintenance, encroachment enforcement, and administering the POWER for Wildlife Program. This unit is made up of a Superintendent, Supervisor, Right-of-Way Specialist, Technical Associate, Administrative Associate, and an equipment operator. A third unit, *Contract Reclearing*, is responsible for all tree related maintenance throughout the transmission system and scheduling of right-of-way maintenance work through WMIS. This unit is made up of a Supervisor, Sr. Right-of-Way Specialist and a Right-of-Way Specialist.

The overall supervision and direction of this section is the responsibility of the Superintendent, Right-of-Way Management. Reporting directly to the Superintendent are supervisors from each of the maintenance units, a Right-of-Way Specialist, and an Administrative Associate.

## IV. CUSTOMERS

The majority of Right-of-Way Management programs support the daily operations and maintenance of Transmission Operations. However, the diversity of resources within this section, has allowed the customer base to increase over the years. Other customers include Project Management, Survey, Substation Maintenance, Distribution, and landowners along transmission rights-of-way. Services include side trimming, clearing of existing rights-of-way, facility spraying (e.g., substations, material storage sites, etc.), erosion control oversight (capital projects), and planting recommendations for POWER for Wildlife applicants. **Note: Mileage and acreage for the old New Horizons Territory is now included in this unit plan.**

## V. RESPONSIBILITIES

Right-of-Way Management is responsible for maintaining approximately 40,060 brush acres as well as problem trees along the periphery of 4,182 miles of the rights-of-way. Because the Santee Cooper transmission system is located throughout the state, a number of vegetation maintenance challenges are encountered due to the differing topography, soil types, and climates found throughout the state. In order to maintain an effective right-of-way maintenance program that can deal with any challenge, it is necessary to utilize an integrated, proactive approach that is cyclic in nature.

Current maintenance programs include mechanical reclearing, low volume herbicide spraying, and tree maintenance which are recognized industry wide as well as by the new NERC vegetation management standards as an effective means of controlling undesirable woody vegetation. Although each program is independent of the other, together they provide the basis of an integrated vegetation management program that can effectively manage vegetation while protecting system availability. Also, Right-of-Way Management administers several other programs that are included with the responsibilities listed below.

**A.** **Mechanical Reclearing:** Approximately 21,322 acres of transmission rights-of-way are recleared on a 2 ½ - 3 year cycle, using medium to heavy 4WD tractors and associated mowing implements, to ensure that vegetation growth does not adversely effect system reliability. Also, reclearing personnel utilize herbicides to control vegetation throughout their respective mow area. This includes applying granular herbicide at the base of selected transmission structures in order to reduce the potential of damage from wild fires and/or facilitate ground rot inspections by line personnel. Also, crews treat wetland areas (i.e., areas where mowing equipment can not traverse) with a foliar herbicide application, using a Marsh Master, to control woody vegetation.

Typically, the entire right-of-way will be recleared according to the easement specifications less any areas that are planted (i.e., agricultural lands and wildlife food plots will be skipped). An exception to this could include rights-of-way where steep topography creates areas with extreme relief and transmission structures are positioned at the two highest topographical points. As long as clearances are maintained naturally and operations and maintenance are not affected, it may be appropriate to leave this portion of the right-of-way undisturbed during reclearing operations.

1. **Manual Reclearing:** Manual reclearing plays a relatively small role in Santee Cooper's over-all vegetation management plan. Typically, the only two conditions that would initiate a manual reclearing operation is an easement restriction (i.e., any wording in the easement that would preclude the use of mechanical equipment and/or herbicides) or when a potential reliability issue is identified in a problem area (i.e., when a right-of-way inaccessible to mechanical equipment has vegetation growing at or near the conductor).

   Utilizing chain saws, brush saws, and/or bush axes, personnel reclear the right-of-way of any woody vegetation. Typically, low growing shrubs including waxy species are left uncut.

B. **Herbicide Spray Programs:** The goal of the herbicide program is to control vegetation that could interfere with the normal transmission of electricity while promoting low growing native vegetation. The current practice of applying herbicides is to selectively treat undesirable woody vegetation using a low volume methodology.

Although the amount of herbicide applied is dependent on the species composition, density, and height of the vegetation that is present, the selective application approach results in less active ingredient being applied per acre, as compared to the broadcast method. Also, only herbicides approved by the USEPA (United States Environmental Protection Agency) are used within rights-of-way with each being applied in accordance with manufacturer labeling.

1. **Whole Line Spraying:** Existing transmission rights-of-way that are treated from one substation to the next, without any skips, are considered to be whole line applications and are treated on a 3 year cycle. Currently, 15,875 acres of transmission rights-of-way have been designated for whole line work. New line sections selected for the Whole Line program are treated approximately 1 – 1 ½ years after initial clearing with resulting vegetation heights ranging from 2' to 6' feet at the time of treatment. This vegetation height provides adequate foliage for herbicide uptake and requires less active ingredient per acre to control undesirable vegetation as compared to treating taller vegetation. Also, as the vegetation begins to succumb to the effects of the herbicide, there is a less noticeable brownout.

Utilizing a **selective** low volume approach, personnel equipped with backpacks will treat only undesirable vegetation along selected rights-of-way. Hardwoods such as sweetgum, red maple, black willow, and various oaks that are tall growing and prolific sprouting species along with pines are targeted. By removing these trees, desirable plants such as grasses and forbs can compete for nutrients and, in the long term, provide substantial biological control. Selective spraying will result in a greater bio-diversity of plant life thus enhancing wildlife habitat for most game and non-game species.

After the initial herbicide application, there will be a post inspection (e.g., aerial & ground) to identify any areas that may require a follow-up treatment. Maintenance will then take place on a 3 year rotation. Because the density of undesirable vegetation will have been reduced, subsequent herbicide applications should require less herbicide to control the vegetation present.

2. **Wetland Area Spraying:** Wetland areas are defined as any area on a transmission right-of-way that is inaccessible to mechanized reclearing equipment due to poor soil conditions. Currently, approximately 2,863 acres of significant sized wetland areas have been identified within the transmission system. **Note: ~ 977 acres and ~1,886 acres of wetland areas are managed in the whole line and mow areas, respectively.**

   Ground crews (includes both contractors and in-house personnel) utilize backpacks and/or an ATV (Argo, Marshmaster, etc.) equipped with a hydraulic spray system to foliar treat only the undesirable vegetation present. Current procedures dictate a **selective,** low volume (10 - 40 gallons mix/acre) herbicide approach that minimizes the amount of active ingredient applied per acre.

   The herbicide products used during Wetland Area Spraying are determined by the species present and to a greater extent by the site location. In areas that have standing water and are connected to a larger aquatic system (e.g., river, swamp, etc.), only EPA approved herbicides registered for use in wetland or aquatic sites are used.

   Wetland areas are scheduled on a three or four year rotation depending on the vegetation species that are present, densities of woody vegetation, and height of conductors. As with whole line applications, vegetation densities should decrease with subsequent applications requiring less herbicide to be applied.

C. **Tree Maintenance Programs:** Trees growing outside the right-of-way boundaries provide the greatest potential threat to the transmission system. When these trees reach a sufficient height or have limbs extending into the right-of-way that are in close proximity to a conductor(s) (i.e., no closer than the minimum clearance that is set forth in the Institute of Electrical and Electronics Engineering

(IEEE) Standard 516-2003, section 4.2.2.3), they are considered problem trees. Three distinct operations that include side trimming, patrolling, and danger tree maintenance are used to remove and/or trim reported problem trees along approximately 4,182 miles of rights-of-way.

1. **Side Trimming:** Transmission lines with tree limbs encroaching into the right-of-way that create a problem for maintenance and operations are scheduled for side trimming. Typically, this occurs on narrow rights-of-way or when several lines have been stacked on a single transmission corridor. Maintenance options include removing encroaching limbs from the air and/or the ground. The aerial operation consists of using a set of belt driven saws, suspended from a helicopter, to cut the limbs back to the edge of the right-of-way. Ground operation consists of using a machine called a Jarraff or Skytrim to perform a similar function. This machine has an extendable boom with an attached circular saw that can reach and trim tree limbs high above the ground. Both options provide a cost effective method for ensuring that adequate clearances between transmission conductors and live trees are maintained.

2. **Patrolling:** Patrol crews (e.g., typically 3 men) are used throughout the system to remove trees reported through WMIS as dead, diseased, and/or leaning and pose a threat to system availability. Due to the crew size and required equipment, they are very mobile and able to deal with tree issues in remote locations.

3. **Danger Tree Maintenance:** Danger Tree maintenance is currently being completed on selected capital construction and/or special right-of-way reclamation projects. The establishment of a normal system-wide cycle for O&M operations is being considered. During these O&M operations, easements are researched and landowners are contacted approximately six months prior to this operation. Once this has been accomplished, maintenance personnel utilize an instrument (e.g., clinometer) that measures angles to determine whether a tree located off the right-of-way is tall enough to hit the transmission conductor if it were to fall. Depending on the species of tree, height, age, and site index, the tree will either be felled whole or topped. The decision to top or fell is made by the forester in charge of the operation based on his opinion of tree survivability after topping. However, the landowner may request that any or all trees be felled if a timber sale is planned. Felled trees are de-limbed and decked between the spans in which they were cut. Typically, the easement provides that any felled trees belong to the grantor and/or current landowner. The resulting debris (tree tops and limbs) are left in the right-of-way to decay.

D. **Erosion Control Program:** Reported erosion problems are rated from low to extreme based on soil type, topography, and proximity of eroded area to a transmission structure. This information is used to prioritize and schedule erosion control measures that will provide long-term control and ensure system reliability.

Corrective action measures include grading the eroded area and, if necessary, constructing earthen terraces to divert surface waters across the right-of-way. Crews then will plant the area with an appropriate seed mix for the season and soil characteristics. To enhance stability and ensure that the terraces and repaired rights-of-way are not impacted by rains before grasses are established, hay bales or other erosion control structures are installed to protect them.

E. **Wildlife Habitat Enhancement Program:** In an effort to reduce the overall number of right-of-way acres requiring maintenance and at the same time encourage wildlife habitat enhancement, Santee Cooper entered into a partnership in a state wide program called POWER (Protect Our Wildlife at Every Right-of-Way) for Wildlife. This Program originated in 2000 and provides monetary grants to approved landowners that were willing to maintain and enhance their rights-of-way for wildlife habitat. Individuals interested in the Program are required to submit an application along with a vegetation plan that shows a five-year commitment to right-of-way maintenance and wildlife habitat enhancement on owned or leased property. Applications are rated on several criteria including current soil conditions, benefit to the utility, and the ability of the landowner to maintain the right-of-way for the long term. To date, 904 acres along Santee Cooper’s transmission corridors have been maintained to enhance wildlife habitat. Also, maintained areas are marked with POWER for Wildlife signage that is provided by Santee Cooper.

F. **Flood Control Program:** This section inspects problem rights-of-way and schedules flood control activities, when necessary, to remove dam debris resulting from beaver activities. This protects transmission facilities such as switches, poles, and guy anchors from premature corrosion and rotting.

G. **Facility Spraying Program:** This section is responsible for herbicide treatments within transmission and distribution substations, communication sites, crew quarters, and material storage yards to control vegetation growth. This is done primarily for safety reasons and also for aesthetics. Individuals responsible for the grounds within substations and warehousing yards are contacted at the beginning and during the spray season to ensure that their needs are being adequately met. To date, approximately 410 acres are treated annually.

H. **Line Inspections:** New Central Electric transmission rights-of-way are inspected to ensure that right-of-way conditions are favorable for O&M acceptance by Santee Cooper. Danger trees, erosion, correct right-of-way widths, and stump levels are some of the major items that are inspected.

I. **Gate/Lock Program:** Right-of-Way Management is responsible for the budgeting, requisitioning, and supplying of gates and locks to support Transmission Operation requirements. The main goal of this Program is to help facilitate access to and along transmission rights-of-way for maintenance personnel.

**J.** **Encroachment Program:** All encroachments (structures, pools, utility crossings, etc.), both permissible and non-permissible, that are located within transmission rights-of-way will be processed through this section. The intent of this program is to identify, document, and remove any encroachment that interferes with transmission maintenance and operations or is a public safety issue. All other encroachments will require an agreement with the respective landowner or an assignee.

## VI. CONCLUSION

Right-of-Way Management continues to evaluate current maintenance programs to ensure that system reliability and right-of-way integrity are not compromised due to the lack of maintenance. The programs discussed in this plan continue to evolve as added maintenance responsibilities are presented due to the increasing size of the transmission system.

An integrated maintenance program will continue to be an integral part in keeping reclearing costs contained as new acres are added to the system. Also, Right-of-Way Management personnel will have to keep abreast of changing environmental regulations so landowner rights and natural resources are protected.

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# Appendix D- Fish Species Captured During FMNF Surveys

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## Fish Species Captured during Surveys in the Francis Marion National Forest 2002–2004, 2006, and 2010

| **Common Name** | ***Scientific Name*** |
|---|---|
| Swampfish | *Chologaster cornuta* |
| Bowfin | *Amia calva* |
| American eel | *Anguilla rostrata* |
| Pirate perch | *Aphredoderus sayanus* |
| Creek chubsucker | *Erimyzon oblongus* |
| Mud sunfish | *Acantharchus pomotis* |
| Flier | *Centrarchus macropterus* |
| Bluespotted sunfish | *Enneacanthus gloriosus* |
| Banded sunfish | *Enneacanthus obesus* |
| Redbreast sunfish | *Lepomis auritus* |
| Pumpkinseed | *Lepomis gibbosus* |
| Warmouth | *Lepomis gulosus* |
| Bluegill | *Lepomis macrochirus* |
| Dollar sunfish | *Lepomis marginatus* |
| Spotted sunfish | *Lepomis punctatus* |
| Largemouth bass | *Micropterus salmoides* |
| Eastern silvery minnow | *Hybognathus regius* |
| Golden shiner | *Notemigonus crysoleucas* |
| Coastal shiner | *Notropis petersoni* |
| Redfin pickerel | *Esox americanus* |
| Chain pickerel | *Esox niger* |
| Everglased pygmy sunfish | *Elassoma evergladei* |
| Banded pygmy sunfish | *Elassoma zonatum* |
| Golden topminnow | *Fundulus chrysotus* |
| Banded killifish | *Fundulus diaphanous* |
| Yellow bullhead | *Ameiurus natalis* |

| Common Name | ***Scientific Name*** |
|---|---|
| Brown bullhead | *Ameiurus nebulosus* |
| Tadpole madtom | *Noturus gyrinus* |
| Swamp darter | *Etheostoma fusiforme* |
| Sawcheck darter | *Etheostoma serrifer* |
| Eastern mosquitofish | *Gambusia holbrooki* |
| Least killifish | *Heterandria Formosa* |
| Hogchocker | *Trinectes maculates* |
| Eastern mudminnow | *Umbra pygmaea* |

Source: USFS (2008)

# Appendix E- Biological Assessment

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# BIOLOGICAL ASSESSMENT

# MCCLELLANVILE 115 kV TRANSMISSION PROJECT

CHARLESTON AND GEORGETOWN COUNTIES,
SOUTH CAROLINA

*March 2014*

Lead Agency: **U.S. Department of Agriculture, Rural Utilities Service**
U. S. Forest Service
U.S. Army Corps of Engineers

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# 1.0 INTRODUCTION

Central Electric Power Cooperative, Inc., (Central Electric) is a transmission cooperative that provides service to rural electric distribution cooperatives in South Carolina. Central Electric is requesting financing from the U.S. Department of Agriculture (USDA), Rural Utilities Service (RUS) to construct an electric transmission line and associated facilities in Charleston and Georgetown Counties, South Carolina. RUS is required to complete an environmental analysis prior making a financing decision. In accordance the National Environmental Policy Act (NEPA), RUS is preparing an Environmental Impact Statement (EIS) for its proposed action due to the project's potential to significantly affect the quality of the human environment.

In addition to complying with NEPA, RUS must consult with the U.S. Fish and Wildlife Service (USFWS) and National Marine and Fisheries Service (NFMS) in accordance with Section 7 of the Endangered Species Act (ESA or the Act). Federally listed endangered, threatened, and candidate species are designated by the USFWS and the NMFS and are managed under the authority of the ESA. The Act requires Federal agencies to ensure that all actions that they "authorize, fund, or carry out" are not likely to jeopardize the continued existence of listed species or their designated critical habitat. Agencies are further required to develop and carry out conservation programs for these species.

Under 50 CFR Part 402 of the implementing regulations for Section 7 of ESA, RUS must submit a Biological Assessment (BA) to the USFWS and NMFS for "major construction activities," which are defined as major Federal actions that significantly affect the quality of the human environment (see 50 CFR § 402.12(b)(1)). This BA addresses the potential impacts of the proposed McClellanville 115 kV Transmission Project (Project) on federally-listed and candidate species occurring in or with the potential to occur within the proposed Project's area of potential effect (i.e., Alternative Routes; see **Figure 1**).

A preferred Alternative Route has not been selected yet for the Project; therefore, this BA lacks site-specific studies confirming species presence within the Project's area of potential effect. It relies heavily on previous survey efforts within the Project study area and on aerial imagery and drive-by surveys for assessing habitat suitability for federally listed and candidate species. **Conclusions included in this BA are preliminary**. After RUS identifies a preferred route and its associated 600-foot corridor in the Project's Final EIS and Central Electric begins to finalize the preferred route's right-of-way (ROW), site surveys will be conducted with the permission of landowners. RUS will subsequently update this BA and incorporate the additional analyses and conservation and mitigation measures needed to avoid or minimize effects to federally listed and candidate species.

RUS is the lead Federal agency facilitating the completion of NEPA for the proposed Project. RUS also is serving as lead in consulting with the USFWS and NMFS under Section 7 of the ESA. The U.S. Forest Service (USFS), Francis Marion National Forest (FMNF) and the U.S. Army Corps of the Engineers (USACE), Charleston Regulatory District are cooperating agencies with potential permitting actions.

## 1.1 Consultation History

By letter dated September 16, 2010, RUS initiated informal consultation with the USFWS during scoping under NEPA for the proposed Project. The USFS also has consulted with the USFWS on the Francis Marion Revised Forest Land Management Plan (1996) and the Final EIS for the Management of the Red-Cockaded Woodpecker in the Southern Region (1996). On October 28, 2010, the USFWS responded to RUS's scoping letter with information that should be discussed in the EIS (e.g., a discussion of migratory birds, cumulative impacts of the proposed transmission line, etc.) and also provided a list of federally listed and candidate species and designed critical habitat for Berkeley, Charleston, and Georgetown Counties, South Carolina. Additional activities that occurred following these letters include:

- Field visit to the study area in July 2011 with USFWS personnel
- EIS/BA update conference call in October 2011 with USFWS personnel

## 1.2 Project Development and Alternatives

Purpose and need and development of alternatives have been addressed in two supporting documents prepared for the Project:

- Alternatives Evaluation Study (2010)
- Revised Macro-Corridor Study (2010)

These documents are available for reviewing on the Project's website, located at: http://www.rurdev.usda.gov/UWP-Central-Electric-Power-Cooperative.html. Since the completion of scoping under NEPA, further refinement of project corridors has been completed, resulting in six Alternative Routes and the No Action Alternative (see **Figure 1**). Below is a description of the alternatives that will be evaluated in the EIS.

**No-Action Alternative**

Under the no-action alternative, the proposed Project would not be constructed. The existing environment within area of effect of the proposed Project would remain the same, and no land would be used for a transmission line, facilities, or a substation.

**Alternative Route A**

Alternative Route A originates at the Belle Isle Substation. For the first 3 miles of the alignment, Alternative Route A parallels U.S. Highway 17 on the north side. The route then crosses the highway and parallels on the south side for another 3.5 miles, crossing the North Santee River. After the river crossing, the route crosses to the north side of U.S. Highway 17 to avoid an archaeological site located on the south side of the highway. The route maintains the parallel alignment on the north side of U.S. Highway 17 for another 6 miles. Alternative Route A then angles to the southeast for approximately 0.75 mile before angling back to the southwest for 1.5 miles to avoid residences located on the east side of U.S. Highway 17. Alternative Route A then turns west, crosses U.S. Highway 17, and terminates in the McClellanville Substation. Alternative Route A is 16.1 miles long.

**Alternative Route B**

Alternative Route B follows the same alignment as Alternative Route A out of the Belle Isle Substation for the first 3 miles. After 3 miles, the route angles to the southwest for approximately 0.5 mile before turning south. After approximately 1.5 miles, the route angles to the southwest to a narrow crossing of the North Santee River. Alternative Route B continues this alignment for approximately 2.5 miles, crossing the South Santee River. At this point, the route turns southeast until it reaches U.S. Highway 17. Alternative Route B then follows the same alignment as Alternative Route A into the substation. Alternative Route B is 16.3 miles long.

**Alternative Route C**

Alternative Route C follows the same alignment as Alternative Route B up to the point where Alternative Route B turns back to U.S. Highway 17. At this point, Alternative Route C continues in a southwest–south direction for approximately 6 miles to the McClellanville Substation. Alternative Route C does not parallel any existing infrastructure for these 6 miles and angles between two parcels of land owned by FMNF. Alternative Route C is 15.6 miles long.

**Alternative Route D**

Alternative Route D follows the same alignment as Alternative Route A for the first 11 miles. Approximately 4 miles north of McClellanville, Alternative Route D angles to the southwest along the boundary of the FMNF before turning south to follow the same alignment as Alternative Route C to the McClellanville Substation. Alternative Route D is 16.1 miles long.

**Alternative Route E**

Alternative Route E begins at the tap location on the Winyah-Belle Isle 115 kV transmission line and angles north along the south side of East CCC Road to meet the Winyah–Charity 230 kV Transmission line. From this point, Alternative E parallels the existing transmission line and an existing gas line on the south side for approximately 4 miles. Alternative Route E then turns south to cross the North Santee River. The route then angles to the southeast for 2.5 miles before turning south to cross the South Santee River. Alternative Route E proceeds south for approximately 6.4 miles across forested areas before following the same alignment as Alternative Route D into the substation. Alternative Route E is 19.9 miles long.

**Alternative Route F**

Alternative Route F follows the same alignment as Alternative Route E for the first 11 miles. After crossing the South Santee River, Alternative Route F continues south for approximately 6 miles. The route then follows the same alignment as Alternative route C into the McClellanville Substation. Alternative Route F is 19.1 miles long.

## 1.3 Project Description

The preferred McClellanville Substation site is a 16.87-acre parcel near the intersection of U.S. Highway 17 and SC 45 near the town of McClellanville. The substation would require a 225-foot by 400-foot (2.1-acre) graded fenced area with gravel and ground grid. The substation would also require a 1,415-foot-long, 20-foot-wide graveled access road within a cleared 60-foot-wide access strip. Total land disturbance within the limits of clearing and grading would include about 4.4 acres. Figure 1-1 shows the location of the McClellanville Substation site in relationship to the overall Study Area.

A 115-14.4/24.9 kV, 15/28 megavolt ampere (MVA) transformer and associated equipment would be installed within the substation fence. A high-side (transmission) frame would be installed within the substation to terminate the proposed McClellanville 115 kV Transmission Line. Three low-side distribution frames would be dedicated to Berkeley Electric, with an additional low-side position dedicated to South Carolina Electric and Gas Co. (SCE&G). Berkeley Electric anticipates a total of four 3-phase distribution lines would be brought out to U.S. Highway 17 from the substation low-side along the access strip.

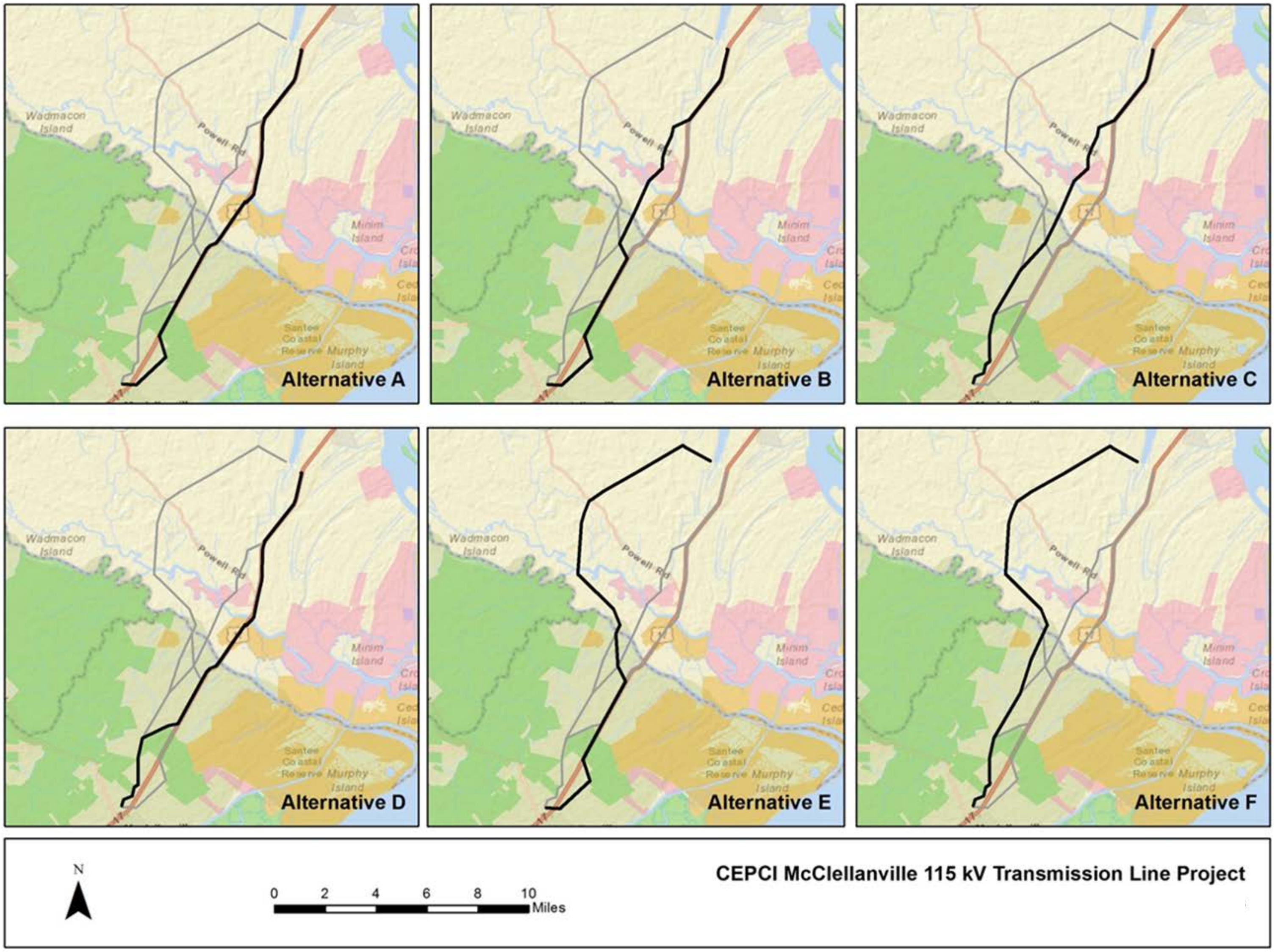



**Figure 1: Project Alternatives Routes**

The four distribution lines would exit the substation underground, and the conductors would likely be installed within conduit. Once the underground circuits reach the existing distribution lines owned by the respective utilities, the circuits would transition to overhead configuration by means of riser poles set within the existing distribution lines.

## Transmission Line Characteristics

Transmission lines for all alternative routes would include the following characteristics:

- A 115 kV transmission line connection from either the Belle Isle Substation or at a tap point on the Winyah-Belle Isle 115 kV transmission line to McClellanville
- An ROW requirement of 75 feet (37.5 feet on either side of centerline)
- Single pole structures, typically 70 to 75 feet above ground and spaced 300 to 400 feet apart
- H-frame structures, typically 75-100 feet above ground, may be used to cross rivers or large wetlands.

Design features being considered include galvanized steel, COR-TEN "weathering steel," and/or concrete single pole structures carrying three 795 26/7 MCM ACSR (aluminum conductor steel reinforced) electrical conductors (1.107-inch overall diameter) on horizontal polymer post insulators, with a single 0.565-inch diameter OPGW (optical ground wire) fiber optic shield wire overhead.

The basic overall configuration of the proposed transmission line would be similar to the structures shown in **Figure 2**, Central Electric's Typical TP-115 Weathering Steel Pole.[1] The final design may use standard galvanized steel or concrete structures (see **Figure 3**), instead of weathering steel, but the overall configuration of the transmission line would be as shown in the two photographs.

## Right-of-Way and Property Requirements

### Transmission Line Right-of-Way

In cross-country transmission line segments, Central Electric would acquire a 75-foot-wide (37.5 feet to either side of the centerline) ROW in the form of an easement. In the typical road-side alignment, single pole transmission line structures are usually set about 5 feet outside the road ROW; therefore, roadside alignments would require 5 feet plus an additional 35 feet for a total of 40 feet of ROW in the form of an easement. In either case, the ROW would be cleared, including the trimming or removal of danger trees that are outside the ROW (danger trees are trees or branches that are dead, weak, diseased, leaning toward the line, or otherwise capable of hitting the transmission

[1] Weathering steel is best-known under the trademark COR-TEN steel, sometimes written as "Corten steel."

line were they to fall). It would be necessary to maintain a cleared ROW and remove danger trees for the duration of the operational life of the proposed transmission line.

**Figure 2: Core-Ten Single Pole Structure with Horizontal Post Insulators**

**Figure 3: Concrete Single Pole Structure with Horizontal Post Insulators**

**Substation**

Berkeley Electric has purchased the McClellanville Substation site parcel. The substation parcel, as acquired, is in the form of a flag lot and includes a +/- 1,415-foot-long, 20-foot-wide graveled access road within a cleared 60-foot-wide access strip.

### Distribution Line Right-of-Way

Three low-side distribution frames will be dedicated to Berkeley Electric with an additional low-side position dedicated to SCE&G. Therefore, Berkeley Electric anticipates a total of four 3-phase distribution lines will be brought out to U.S. Highway 17 from the substation low-side along the access strip. The four distribution lines would exit the substation underground, and the conductors would likely be installed within conduit.

At U.S. Highway 17, the MV-04/SCE&G circuit would transition to overhead at a riser pole and tie into the existing SCE&G distribution line. The three Berkeley Electric distribution lines would continue underground across U.S. Highway 17 and then follow an interior property line for an additional +/- 400 feet to arrive at an existing 3-phase distribution line. The MV-01, MV-02, and MV-03 circuits would transition from underground conduit via riser poles at this point. Circuit MV-03 would tie into the existing 3-phase distribution line running southeasterly toward Commonwealth Substation. Circuits MV-01 and MV-02 would transition overhead on a second riser pole, forming a double-circuited, 3-phase distribution line running northeasterly toward the intersection of River Road and State Highway S. At that intersection, Circuit MV-02 currently turns southeasterly, paralleling State Highway S, while Circuit MV-01 continues northeasterly along River Road.

## Pre-Construction Activities

Central Electric and/or its contractors would perform engineering surveys prior to construction of the transmission line. These surveys would consist of centerline location, profile, and access surveys. Pre-construction surveys would likely coincide with other pre-construction activities.

Geotechnical studies would be conducted along the transmission line route to determine engineering requirements for structures and foundations. Truck-mounted augers would be transported to selected locations to drill small-diameter boreholes, and borehole cuttings would be analyzed to determine specific soil characteristics. Minimal land disturbance (approximately 400 square feet) would be anticipated for each geotechnical boring site. Additionally, small access trails may be required for some of the boring locations.

## Transmission Line Construction

### Right-of-Way Clearing

In upland areas, the ROW would be cleared using heavy equipment to fell trees and understory trees and shrubs. Equipment with a shearing blade attachment designed to sever tree trunks at or near ground level, such as a "KG" blade, may be used.

Alternately, a “feller buncher,” a standard heavy equipment base with attachments consisting of a tree-grabbing device and a circular saw or hydraulic shear which cuts trees off at or near the base, may be used. Felled vegetation would be limbed up and removed or chipped. Stumps would be cut or ground down to a maximum height of 3 inches above the soil line. Slash, the coarse and fine woody debris generated during logging operations, would typically be chipped and broadcast as mulch or allowed to decompose on the ground.

On USFS lands, merchantable timber would be loaded onto forwarders, which are forestry vehicles that carry felled logs from the stump to a roadside landing where they can be loaded onto log trucks. On private property, timber may be treated similarly, or it may be chipped and broadcast across the ROW to serve as mulch. Slash would typically be chipped and broadcast as mulch.

In wetlands, land clearing of the easement would be accomplished by methods that remove trees and tall-growing vegetation above the soil line and do not disturb the native wetland soils. This may be accomplished by using low ground pressure equipment (10 psi or less), or by similar equipment working from temporary load-dispersing mats to minimize rutting and mucking of wetland soils. Low-growing native plant materials that would not interfere with the installation, maintenance, and operation of the line would not be cleared. The purpose of using such methods is to avoid or minimize disturbance of native wetland soils and encourage the establishment of a scrub/shrub or emergent wetland within the proposed power line ROW.

Felled material would not be pushed or dragged across a wetland. Rather, felled trees would be lifted or carried from the wetland by low ground pressure equipment or equipment working from temporary load-dispersing mats. No material would be placed in stream channels or otherwise placed so as to interfere with stream flows or adjacent wetland hydrology.

A 30-foot upland buffer area would be established adjacent to all streams and at all jurisdictional wetlands. Wetland clearing methods would be used in these buffer areas to minimize the likelihood of upland soils being transported into wetlands. Appropriate soil erosion and sedimentation controls would be established at all wetland/upland and streambank boundaries.

Central Electric proposes to install fences and gates at road crossings in USFS lands to control public access down the proposed transmission line ROW. This kind of access control is often required to minimize trespass, especially with off-road vehicles. Central Electric may honor private landowner requests for similar fencing and gates at road crossings.

**Access Roads**
Off-ROW access roads are existing roads that are not within the proposed transmission line ROW but may be needed for construction and maintenance access. Off-ROW access may be acquired for construction and maintenance on existing roads and/or existing utility easements. No new permanent roads would be constructed as a result of the transmission line construction.

Improvements to existing off-ROW roads may be required if it is determined that heavy transport requires such improvements. Improvements would typically involve re-grading of dirt roads if wear and tear of traffic requires it or adding rock (or additional rock) to un-paved roads. Whether or not roads would require improvements or maintenance during construction depends on the nature of the existing transportation system in the area crossed by the preferred transmission line route. Any improvements to existing roads would require permitting with the federal, state, or county authorities that own and maintain the roads.

Depending on the preferred transmission line alignment selected, the use of private roads may be required to access the transmission line easement. The right to use private roads for temporary or permanent access would be acquired through negotiation with property owners in the same manner as acquisition of the actual transmission line ROW. Similar improvements to those discussed above may be required before heavy transport can use private roads.

**Construction Assembly Areas**
A construction assembly area (or lay-down yard) would be identified and secured close to the Project Area. A 5- to 10-acre cleared area probably would be required. In all likelihood, the lay down yard would be leased for the duration of construction, and at least some portion of that area would be fenced and secured. A previously disturbed area is preferred for the construction lay-down yard. If one is not available, a site will be selected that minimizes vegetation clearing requirements, impacts to cultural resources, protected species, and jurisdictional wetlands.

**Structures**
Central Electric anticipates that single pole structures—typically 70 to 80 feet above ground and spaced 300 to 400 feet apart would be used to build the proposed 115 kV transmission line. Design features being considered include galvanized steel, core-ten steel, and/or concrete single pole structures carrying three 795 26/7 MCM ACSR electrical conductors on horizontal polymer post insulators, with a single 0.565 OPGW fiber optic overhead shield wire overhead. Bird diverters or a similar device, may be installed on overhead static wires in areas of concern for avian interaction (such as the Santee Delta Crossing) to help birds see the power lines and minimize the risk of

collisions.  Also, Central Electric may use two poles or H-frame structures capable of achieving longer spans between structures in areas such as the Santee Delta or other river crossings.

Other types of structures that may be installed include minor angle single pole structures, three-pole major angle structures, self-supporting structures, and “dead end” structures.  Dead end structures using horizontal strain insulators are required at the end points of lengths of conductor due to the technical limitation on conductor length (there is a limit to how many feet of conductor can be wound onto a large reel, necessitating splices at dead end structures).  Conductors are connected at dead end structures by a short conductor cable under tension at both ends.  Angle and dead end structures are typically guyed to counter and resolve vector forces that would otherwise cause angle structures and adjacent tangent structures to fail.

Finally, some angle structures which require guying cannot be guyed directly because the required angle(s) for guying would put the guy wires within roadways or other features (e.g., natural gas pipelines and water mains).  In those cases, guyed stub poles are set up on the other side of the road or feature and an overhead wire under tension is connected from the structure to the stub pole.  The stub pole itself is then guyed to counter and resolve vector forces.  Alternately, a self-supporting structure can be used in this type of situation, especially where both normal guying and use of stub poles is not practicable due to spatial considerations.

In order to tap the existing Winyah-Belle Isle 115 kV transmission line, Central Electric’s contractors would set new single pole structures within the phases of the existing transmission line and jumper the existing line around the structure in the direction where the tap “pulls off.”  Pole mounted line switches are normally installed close to the tap in all three resulting directions so that portions of the line can be isolated from faults and sectionalized so that they remain in service while repairs are carried out on damaged structures and/or spans.  Sectionalizing is also useful when a utility needs to de-energize portions of the line to facilitate maintenance.  **Figure 4** shows a typical line switch.

**Figure 4: Typical Line Switch**

Central Electric anticipates that the transmission line would be built by directly embedding the single pole structures. Typically, an auger is used to excavate a hole that is 10 percent of overall pole length plus two additional feet deep. For example, a structure designed to stand 80 feet tall out of ground would require a single pole structure approximately 91 feet in overall length buried 11.1 feet deep (9.1 feet plus 2 feet). Crusher-run stone backfill may be placed at the bottom of the augured hole. Pole top assemblies are fitted with attachments and insulators while on the ground, and the poles are then lifted into position by a crane. The pole is placed in the hole and set plumb. Additional stone is placed and tamped to fill the void between the structure and the undisturbed earth. Typically, wetlands are spanned by transmission lines. However, in coastal South Carolina, wetland crossings may be too wide to span, requiring structures to be installed within wetlands. In such cases, Central Electric anticipates that the transmission line would be constructed in a manner similar to construction on uplands, with several notable differences. Equipment used in wetlands would be low-ground pressure equipment with a 10 psi or less rating and/or equipment working on load-dispersing mats to minimize rutting and mucking of wetland soils. An environmentally benign, bio-degradable drilling mud that is reclaimed at each site and used for the next installation may be used to prevent deep augured holes from collapsing in soft, saturated wetland soils. Native wetland soils that have been removed by augur would be carried from the wetland, relocated to upland areas, and spread and stabilized. Depending on soil conditions within wetlands, holes may be augured somewhat deeper or somewhat wider depending on the specific soil engineering characteristics at each structure site. Such actions would be consistent with any guidance or permits from the USACE and any applicable state regulatory agency.

Central Electric anticipates that dead-end structures may be installed atop a vibratory-driven hollow steel piling (also known as a caisson piling). The vibratory-driven caisson is a +/- 3/8-inch thick hollow steel piling that, once installed, extends about 6 feet above ground elevation and is set to a depth of about 40 feet. The top of this vibratory piling is typically fitted with a 2.5-inch-thick steel flange upon which the superstructure sections of the steel pole would be attached using steel bolts. If used in a wetland, equipment used to vibrate the dead-end structure caisson piling into place, attach the upper segment(s), and string conductors would be low ground pressure equipment or equipment working from temporary load-dispersing mats intended to minimize rutting and mucking of wetland soils.

**Conductor and Ground Wire Installation**

Steel reinforced aluminum conductors would be strung and attached to the ends of the polymer post insulators using the tension method. Major equipment required for tension stringing includes reel stands, tensioner, puller, reel winder, pilot line winder, splicing cart, and pulling vehicle. Travelers are attached to the bottom of each insulator so the conductor can be pulled through multiple structures. At one end, a reel of conductor is staged in line with the structures. At the other end, a puller is stationed to pull the conductor from the reel through the travelers located on the structures. Once the proper tension on the conductor is achieved, the conductor is attached to the insulator and the travelers are removed. Similar methods are used for pulling the overhead shield wire into place along the length of the transmission line.

Guy wires are steel cables under tension designed to stabilize transmission structures. One end of the cable is attached to the structure, and the other is attached to steel helix anchors driven into the ground at some distance from the structure's base. The number of guy wires and their configuration are dependent on the design of the structure (e.g., single steel or concrete poles versus lattice towers), soil conditions, and whether the structures are tangent structures (several structures in a straight line) or angle structures (structures where the direction of the transmission line is changed). It is common to clear a small additional area, called a guy flare, to install the ground anchors for the guying system. The additional land disturbance area required for guy flares is not likely to be significant compared to the overall 75-foot wide easement. However, based on past experience with building transmission lines in South Carolina’s Coastal

Plain, Central Electric anticipates that there may be +/- 2.1 dead-end structures per mile and +/- 1.4 swinging angle structures per mile.

Dead-end structures require ahead-and-back guying as shown in **Figure 4**. In that figure, guy flares are labeled as 20 feet wide and 100 feet long. The 100-foot measurement is taken from the center of the pole. With a 75-foot-wide ROW, as proposed for cross-country potions of this Project, a 100-foot-long guy flare would require an additional +/- 65 feet of cleared area (35 feet of the 100-foot cleared area being already within the 75-foot wide easement, an additional +/- 65 feet would make up the 100-foot dimension labeled in the figure). The additional area for each of the two guy flares would therefore be +/- 1,300 square feet, or +/- 2,600 square feet per dead-end structure.

Swinging angle structures require only one set of guy wires to support a small angle structure. These guys are set up along the exterior angle bi-sector, and the flares would also be 100 feet long by 20 feet wide. The additional cleared area would be 65 feet by 20 feet or 1,300 square feet.

As with guying and guy flares, the number of stub poles is also unknown at this time. Stub poles are typically required when paralleling roads, and may require 20 feet wide and 100 feet long guy flares. For road-side alignments, Central Electric estimates that one stub pole and guy flare may be required every four miles along U.S. Highway 17. As much as 2,000 square feet of clearing may be required to install stub poles and guys.

## Substation Construction

Substation construction would take place on a previously graded site. Backhoes would be used to dig holes at certain locations and depths as designed, steel re-bar cages would be placed within the holes, and concrete would be poured to create foundations needed to support the substantial weights of steel structures. These steel structures are needed to terminate the proposed transmission line and support the weights of the 115/25-kV electrical transformer, the switches, the bus work, and the low-side (distribution voltage) frames. Trenching excavators would be used for placement of conduit needed to operate switches and other equipment, as well as to bring the four distribution lines out from the low-side structures.

## Construction Schedule and Projected Workforce

Survey, ROW acquisition, and construction of the transmission line will occur over a 36 month period after the selection of the preferred route. **Table 1** below is a timeline of the anticipated duration of each task and the projected workforce required to complete the tasks.

## Table 1: Project Schedule and Projected Workforce

| Task | Projected workforce | Duration | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Survey for Permitting | 6-8 | 4-6 months | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Engineering Survey | 6-9 | 4-6 months | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Transmission Line Design and Construction Permitting | 2-4 | 4-6 months | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Environmental Studies | 8-10 | 4-6 months | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Right-of-way acquistion | 8-10 | 8-12 months | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Right-of-way clearing and preparation | 10-15 | 6-8 months | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Transmission Construction | 20-25 | 12-16 months | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

# 2.0 PROTECTECD SPECIES INFORMATION

Nine federally endangered, four threatened, and two candidate species are known or have the potential to occur in Charleston and Georgetown Counties, South Carolina. The USFWS has also designated critical habitat for the federally threatened Piping Plover in these counties. Below is a list of species that were excluded from this analysis due to their association with marine habitat, which is not present in the Project study area. RUS has determined that the Project would have no effect to these species and their designed critical habitat:

- **Finback Whale (*Balaenoptera physalus*), Humpback Whale (*Megaptera novaeangliae*), and Right Whale (*Balaena glacialis*)**: federally endangered marine mammals that do not occur in freshwater.

- **Green Sea Turtle (Chelonia mydas), Kemp's Ridley Sea Turtle (*Lepidochelys kempii*), and Loggerhead Sea Turtle (*Caretta caretta*)**: federally threatened and endangered reptiles that that does not occur in freshwater; reptiles nest on sandy beaches adjacent to salt water.

- **Piping Plover (*Charadrius melodus*) and its critical habitat**: a federally threatened, coastal shorebird. Roosts and forages in coastal wetland habitats as well as inland; primarily uses beaches for roosting. Species' designated critical habitat is outside of the Project's study area.

- **Red Knot (*Calidris canutus rufa*)**: a federal candidate, coastal shorebird. Roosts and forages in coastal wetland habitats as well as inland; primarily uses beaches for roosting.

- **Seabeach Amaranth (*Amaranthus pumilus*)**: a federally threatened plant species. Occurs on barrier islands, mainly on coastal overwash flats at the accreting ends of the islands and lower foredunes and on ocean beaches above mean high tide (occasionally on sound-side beaches).

The remaining federally listed and candidate species are the subject of this assessment and have the potential to occur in the Project's study area. **Table 2** provides a summary of each species' protection status, habitat requirements, and likelihood for occurrence in or near the Project's alternative routes. **Figure 5**, Special Status Species, provides location information on known sites or occurrences of protected species relative to the alternative routes.

**Table 2: Federally endangered, threatened, and candidate species potentially occurring in Project area**

| **Common Name *(Scientific Name)*** | **Protection Status[a]** | **Occurrence in Routes** | **Habitat in Routes?** | **Habitat Description (SCDNR 2013, NatureServe 2013)** |
|---|---|---|---|---|
| **Birds** | | | | |
| Bachman's Warbler (*Vermivora bachmanii)* | LE | NO | YES | Historically known from central Charleston County in bald cypress swamps and canebrakes, but it has not been seen in the county (or anywhere else) for decades and is presumed extirpated. |
| Red-cockaded Woodpecker *(Picoides borealis* ) | LE | YES | YES | Inhabits open, park-like mature pine woodlands and savannahs with large old pines for nesting and foraging habitat. The nesting cavity trees must be in open stands with little or no hardwood midstory and little or no hardwood in the canopy. |
| Wood Stork *(Mycteria Americana*) | LE | YES | YES | Nests in the upper branches of black gum or cypress trees that are in standing water. In South Carolina, colony sites are surrounded by extensive wetlands, in particular palustrine forested wetlands. |
| **Amphibians** | | | | |
| Flatwoods Salamander (*Ambystoma cingulatum)* | LT | NO[b] | YES | Is closely associated with the longleaf pine savannas of the lower coast. These communities typically exhibit a sparse canopy of longleaf pine with a rich herbaceous layer. Breeds in isolated temporary ponds. |
| **Fish** | | | | |
| Atlantic Sturgeon (*Acipenser oxyrhinchus oxyrhinchus*) | LE, DPS | YES | YES | Adults migrate through nearshore Atlantic shelf waters and enter coastal sounds, bays and inlets to access the river basins in which they spawn. Spawns in freshwater channel habitats from tidal river reaches to at least as far inland as the fall line in large, unobstructed river basins. |
| Shortnose Sturgeon (*Acipenser brevirostrum)* | LE | YES | YES | Moves primarily from tidal estuarine or brackish channels into freshwater reaches to spawn. Spawns in freshwater channel habitats from tidal river reaches to at least as far inland as the fall line in large, unobstructed river basins. |
| Carolina Pygmy Sunfish (*Elassoma boehlkei)* | FSC | POSSIBLE | YES | Only a few populations of Carolina pygmy sunfish have been identified in South Carolina. One population is in the ditches of abandoned rice fields near Georgetown, South Carolina. |

| Common Name *(Scientific Name)* | Protection Status[a] | Occurrence in Routes | Habitat in Routes? | Habitat Description (SCDNR 2013, NatureServe 2013) |
|---|---|---|---|---|
| **Mammals** | | | | |
| West Indian Manatee[c] *(Trichechus manatus)* | LE | YES | YES | Found in marine and estuarine waters, but there are historical records for the mammal several miles up the Santee River. |
| **Plants** | | | | |
| American Chaffseed (*Schwalbea americana*) | LE | NO | YES | Occurs in acidic, sandy or peaty soils in open pine flatwoods, pitch pine lowland forests, seepage bogs, palustrine pine savannahs, and other grass- and sedge-dominated plant communities. |
| Canby's Dropwort (*Oxypolis canbyi*) | LE | NO | NO[d] | Occurs in Coastal Plain habitats prone to long periods of inundation, including pond cypress ponds, grass-sedge dominated Carolina bays, wet pine savannahs, shallow pineland ponds, and cypress-pine swamps or sloughs. |
| Pondberry (*Lindera melissifolia)* | LE | NO | YES | Occurs in seasonally flooded wetlands such as floodplain/bottomland hardwood forests and forested swales, on the bottoms and edges of shallow seasonal ponds in old dune fields, along the margins of ponds and depressions in pinelands, around the edges of sinkholes in coastal areas with karst topography, and along the borders of Sphagnum bogs. |

Sources: SCDNR (2012a, 2012b), RUS et al. 2012)

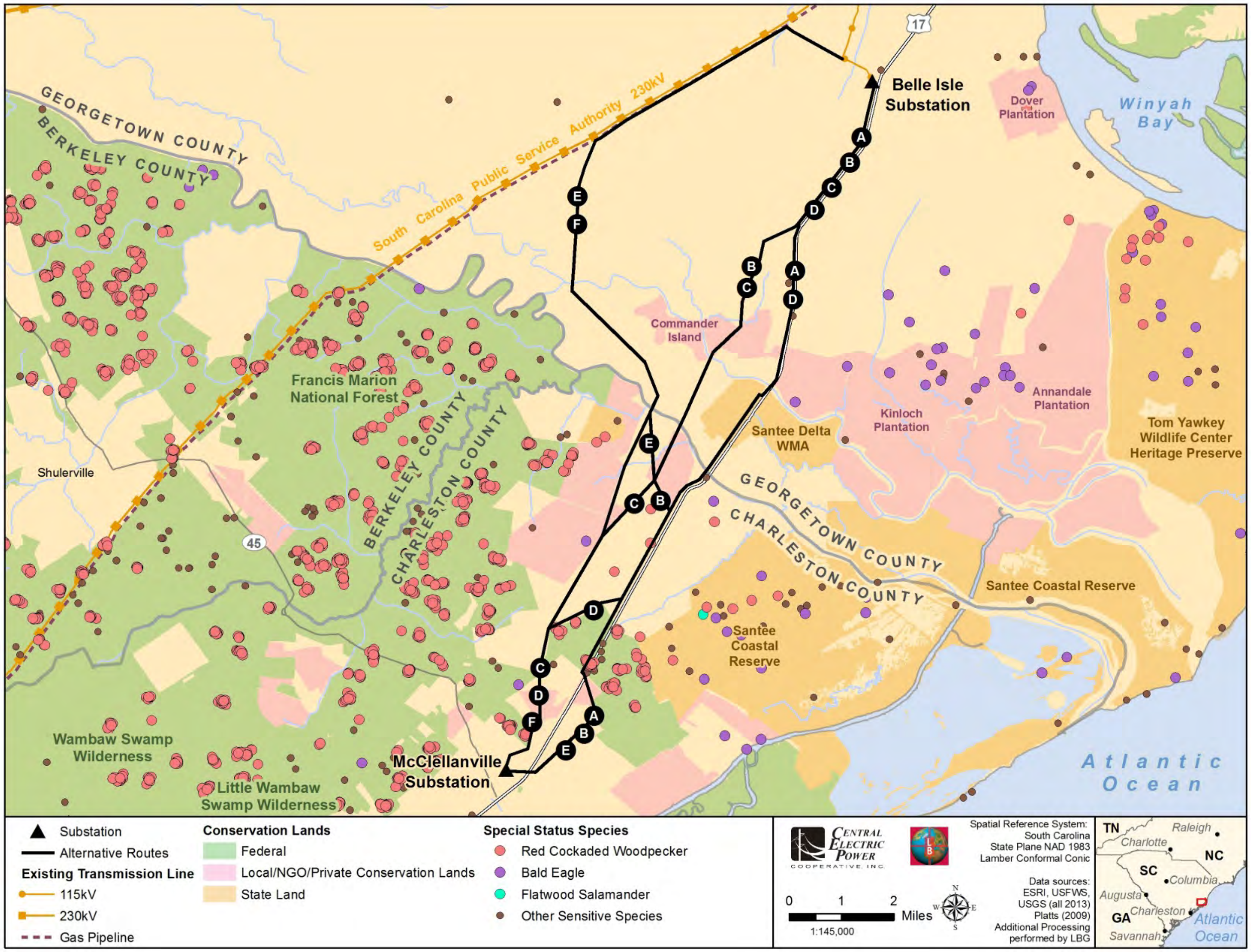
[a] Status: LE = Federally listed as endangered; LT = federally listed as threatened; DPS = Distinct Population Segment; FSC: Federal candidate species for listing

[b] A historic site, which has also been designated as critical habitat, for the Flatwoods Salamander is known from Santee Coastal Reserve, approximately 1.5 miles from Alternative Routes A, B, D and E (south and east of US Highway 17). The Flatwoods Salamander is known to forage up to 1 mile from breeding habitats. The listed salamander was last seen at this site in 1987. Areas adjacent to U.S. Highway 17 has similar to the Santee Coastal Reserve

[c] The West Indian Manatee is also protected under the federal Marine Mammal Protection Act.

[d] There are small isolated pond cypress depressions scattered throughout areas adjacent to the alternative routes. The species, however, is not known to occur in the alternative routes.

**Figure 5: Special status species**



## 2.1 Description of Study Area

The Project's study area is located primarily in the Coastal Plain Ecoregion, although a small portion is located within the Coastal Zone Ecoregion where the study area is east of U.S. Highway 17 (SCDNR 2005). Within the Coastal Plain Ecoregion, the Project's study area supports three main types of habitats: grasslands and early successional habitats, pine woodlands, and river bottom (SCDNR 2005). All of these habitat types support a number of diverse wildlife species. The portions of the alternate routes within the Coastal Zone Ecoregion are mainly grasslands and pine woodlands, similar to those within the Coastal Plain Ecoregion. **Table 3** presents brief descriptions of the three main habitat types.

**Table 3: Habitat Types Found in the Project Area**

| Habitat Type | Brief Description |
|---|---|
| Grassland and early successional habitats | Grasslands or early successional fields with cover provided by grasses and/or weeds and with few, if any, trees. Also managed open areas such as meadows, pastures, golf courses, or expansive lawns with or without damp depressions. This habitat type occurs throughout the region; more extensively in the inner "agriculture belt." |
| Pine woodland | Pine woodlands includes all pine-dominated forests throughout the region, including those occupying a variety of soil moisture characteristics, except floodplains. The canopy is dominated by one or several species of pine, generally loblolly (*Pinus taeda*), or longleaf (*Pinus palustris*), depending on elevation, soil type, and silvicultural history. Dense shrub thickets of hollies (Ilex sps.) and wax myrtle (*Morella cerifera*) may occur. |
| River bottoms | Hardwood-dominated woodlands with moist soils are usually associated with major river floodplains and creeks. This habitat may contain small creeks or pools and may be seasonally flooded. Characteristic trees include: sweetgum (*Liquidambar styraciflua*), loblolly pine, water oak (*Quercus nigra*), willow oak (*Quercus phellos*), laurel oak (*Quercus laurifolia*), cherrybark oak (*Quercus pagoda*) and American holly (*Ilex opaca*). In the southern coastal counties on drier sites, spruce pine (*Pinus glabra*) may be an associate. The Cypress-tupelo swamp subtype occurs on lower elevation sites as seasonally flooded swamps. It is usually transected by tannic-acid rivers and creeks and contains oxbow lakes and pools. Dominant trees are bald cypress (*Taxodium distichium*), water tupelo (*Nyssa aquatica*), swamp gum (*Nyssa biflora*), Carolina ash (*Fraxinus caroliniana*), water elm (*Planera aquatica*) and red maple (*Acer rubrum*). |

Source: SCDNR (2005)

Vegetation cover for all of the study area was analyzed using land cover types defined by the 2006 National Land Cover Database (NLCD) (Fry et al. 2006). NLCD uses 16 land cover classifications for the United States and Puerto Rico at a 30-meter spatial resolution. **Table 4** presents the percentage of the various land cover types within a 2,000-foot buffer around each alternative route (a 2,000 foot-corridor was used due to the spatial resolution of the data). Although not specific, the NLCD data shows the general percentages of each of the previously described habitat types, which includes: evergreen forest that is mostly pine woodlands; deciduous forest and woody wetlands that are expected to be mostly river bottom; and grassland/herbaceous and pasture/hay that are grasslands and early successional habitats. The primary land cover within the study area, and in particular, the alternate routes is forest. **Table 5** provides an estimate of the different kinds of wetlands in the Project's study area.

**Table 4: Percentage of Land Cover Types within 2,000-Foot Corridor**
(2,000 foot-corridor was used due to the spatial resolution of NLCD data)

| National Land Cover Database Land Cover Category | Route A | Route B | Route C | Route D | Route E | Route F |
|---|---|---|---|---|---|---|
| Open water | 1.3% | 1.3% | 1.4% | 1.3% | 1.1% | 1.3% |
| Developed (open) | 8.4% | 5.6% | 3.4% | 7.3% | 2.4% | 0.4% |
| Developed (low) | 3.5% | 1.6% | 0.6% | 2.9% | 0.8% | 0.0% |
| Developed (medium, high) | 0.2% | <0.1% | 0.0% | 0.1% | <0.1% | 0.0% |
| Forest | 53.4% | 51.2% | 45.6% | 54.1% | 48.5% | 43.6% |
| Shrub/scrub | 6.6% | 6.1% | 5.6% | 5.9% | 4.6% | 4.6% |
| Grassland/herbaceous | 3.7% | 4.6% | 4.5% | 3.3% | 4.4% | 4.4% |
| Pasture/hay | 0.6% | 1.6% | 1.5% | 0.5% | 0.4% | 0.3% |
| Cultivated crops | 0.3% | 0.5% | 0.56% | 0.4% | 0.3% | 0.4% |
| Wetlands | 22.2% | 27.6% | 36.8% | 24.3% | 37.6% | 45.0% |

**Table 5: Acreage of Wetland Types for Each Alternative Route**

| | Route A | Route B | Route C | Route D | Route E | Route F |
|---|---|---|---|---|---|---|
| **NWI Wetlands (acres within 37.5-foot/75-foot ROW)** | | | | | | |
| Estuarine and marine deepwater | 1.3 | 0.0 | 0.0 | 1.3 | 0.0 | 0.0 |
| Estuarine and marine wetland | 1.1 | 0.0 | 0.0 | 1.1 | 0.0 | 0.0 |
| Freshwater palustrine emergent | 9.6 | 15.4 | 15.5 | 9.7 | 32.6 | 23.5 |
| Freshwater palustrine forested/shrub wetland | 27.4 | 35.0 | 46.9 | 28.3 | 58.1 | 66.9 |
| Freshwater pond | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Riverine | 3.7 | 3.7 | 3.7 | 3.7 | 7.4 | 3.7 |

| | Route A | Route B | Route C | Route D | Route E | Route F |
|---|---|---|---|---|---|---|
| **NWI Wetlands (acres within 300-foot/600-foot corridor)** | | | | | | |
| Estuarine and marine deepwater | 8.5 | 0.0 | 0.0 | 8.5 | 0.0 | 0.0 |
| Estuarine and marine wetland | 14.5 | 0.0 | 0.0 | 14.5 | 0.0 | 0.0 |
| Freshwater palustrine emergent | 33.0 | 68.8 | 69.8 | 34.5 | 99.8 | 102.2 |
| Freshwater palustrine forested/shrub wetland | 180.4 | 258.5 | 379.4 | 204.6 | 491.5 | 587.7 |
| Freshwater pond | 0.4 | 0.0 | 0.2 | 0.6 | 0.0 | 0.2 |
| Riverine | 9.6 | 12.8 | 12.8 | 9.6 | 9.8 | 9.8 |

Source: National Wetland Inventory (USFWS 2009)

## 2.2 Environmental Baseline of Evaluated Species

**Bachman's Warbler**

Bachman's warbler is one of the rarest songbirds in North America (USFWS 2007a). The species breeds in palustrine forested wetlands with a dense understory of palmetto or cane. Historically, the bird was known from central Charleston County in bald cypress swamps and canebrakes. The warbler spent its breeding season in the southeastern U.S. and wintered in Cuba and the Isle of Youth. The bird was last officially documented in the U.S. in 1961 and in Cuba in 1984. Loss of breeding and wintering habitat is considered a primary factor in the species' presumed extinction.

**Red-cockaded Woodpecker**

The Red-cockaded woodpecker was among the first species to be listed as endangered and receive federal protection under the ESA. The bird was once common, but by 1970, the species had declined to fewer than 10,000 individuals (Jackson 1994; Ligon et al. 1986). Most populations of the endangered woodpecker are currently stable to increasing, due to advances in knowledge of its population dynamics and the use of highly effective management tools, such as artificial cavities and translocations. Population viability, however, is still threatened by the small, scattered and isolated nature of most Red-cockaded woodpecker populations. Delisting of the species is not expected until 2075, given current population status and expected rates of growth (USFWS 2003).

In 2000, there were an estimated 14,068 Red-cockaded woodpeckers living in 5,627 known active groups across eleven states. There were 133 groups on state-owned lands and another 524 groups on federal properties in South Carolina (USFWS 2003). The FMNF is home to the third largest population of Red-cockaded woodpeckers and is one of thirteen designated core recovery populations. In 1989, Hurricane Hugo killed 63% of the Red-cockaded woodpecker population, destroying 87% of the species' cavity trees and 59% of its foraging habitat across the FMNF. Due to the installation of over 1,000 artificial tree cavities, the population reached 361 groups by 1995. There was a minor decline in the population during the mid to late 1990s, which was attributed to lack of suitable cavity trees and increased mid-story vegetation conditions.

In the 2013 nesting season, there were 457 active clusters (441 potential breeding groups, 16 single male groups and 53 inactive clusters) on the FMNF. This population is currently expanding in areas and contracting in others due to lack of prescribed fire in the wildland-urban interface and lack of foraging and nesting habitat in the wake of Hugo. The bird requires open pine understories for nesting and foraging. Twenty-eight clusters have gone inactive from 2001-2004, and 10 clusters have been reduced from pairs to single males. A majority of these clusters are in the wildland-urban interface, which indicates the increased difficulty of managing these sites to provide suitable Red-cockaded woodpecker habitat.

**Wood Stork**

The Wood stork is a large, tall wading bird with long, broad wings (NatureServe 2014). In the U.S., the breeding-season range of the species includes coastal areas in Florida, Georgia, and North and South Carolina. The species nests in the upper branches of swamp tupelo or cypress trees that are in low, standing water. The species requires open access to nest trees and is frequently found adjacent to open water areas. In South Carolina, colony sites are typically found surrounded by extensive wetlands, in particular palestine forested wetlands. Wood storks are a wetland dependent species, and loss of breeding and foraging wetlands is the primary threat to the population.

Due to the successful increase in Wood stork nesting pairs, the USFWS proposed reclassifying the species' protection status from endangered to threatened in 2010 (USFWS 2010). To date, there has not been any action on this proposed reclassification. Since the species listing, the number of breeding colonies has increased substantially in the southeastern U.S. from 29 to 81 groups. In South Carolina, Wood stork nesting increased from 1 group with 11 nesting pairs to 13 groups with 2,010 nesting pairs from 1981 to 2006 (USFWS 2007b). The state has an estimated carrying capacity of 2,400 pairs. Groups in South Carolina averaged 2.08 young per successful nest. Nest abandonment is rare in South Carolina groups primarily due to the variety of wetland habitats in the coastal plain, which provide sufficient foraging habitat.

The Wood stork has been reported from the Washo Reserve, a bald cypress-dominated wetland approximately 1.5 miles south of Alternative Routes A and D. The Wood stork is not known to nest or forage within the proposed alternative routes; however, the species may use the North and South Santee rivers as travel corridors. Unofficial observations from the Cape Romain Bird Observatory (2011), state that the species flies from its night roosts and breeding colonies upriver down to feeding areas in the lower Santee Delta, Santee Coastal Reserve, Cape Romain National Wildlife Refuge, and other nearby areas. They "often cross [U.S. Highway 17] barely above the treetop level over the Santee Delta, or at even lower altitude[s] as they fly along the North Santee and South Santee river corridors." All of the alternatives routes propose to cross the North and South Santee rivers.

**Flatwoods Salamander**

Flatwoods salamanders are medium-sized salamanders, which occur throughout the lower southeastern coastal plain of Florida, Georgia, and South Carolina. The species prefers open, longleaf fine or slash pine flatwoods or savannahs with herbaceous cover. Adults live in upland areas but live mostly belowground. From October to December, they move to their wetland breeding sites, which include isolated pond cypress, swamp tupelo, or slash pine dominated depressions. A relatively open canopy is required to maintain herbaceous cover for the salamander's larvae (USFWS 2009).

In 2009, the USFWS determined that the Flatwoods salamander consisted of two distinct species: the Frosted flatwoods salamander (*Ambystoma cingulatrum*) and the Reticulated flatwoods salamander (*Ambystoma bishopi*) (USFWS 2009). The Reticulated flatwoods salamander (*Ambystoma bishopi*) was listed as endangered; the Frosted flatwoods salamander remains threatened. The two species are separated by a geographic barrier created by the Apalachicola River. Reticulated flatwoods salamanders are located west of the river, while the Frosted flatwoods salamanders, which are the subject of this assessment, are located east of the river.

Frosted flatwoods salamanders historically have occurred at various sites in wet, grassy flatwoods and along the margins of pond cypress savannahs in the area. An historic site (salamanders last observed in 1987) is known at Santee Coastal Reserve, approximately 1.5 miles from Alternative Routes A, B, D, and E (south and east of U.S. Highway 17) in Charleston County. Another site is known outside of the study area in the FMNF along SC Highway 41 in Berkeley County. Both of these sites have been designated as critical habitat for the species. The salamanders range can extend up to one mile from their breeding sites.

**Atlantic Sturgeon**

The Atlantic sturgeon is a long-lived, estuarine dependent, anadromous fish. The species is similar in appearance to the Shortnose sturgeon, but it is distinguished by its larger size, smaller mouth, different snout shape, and scutes. Spawning adults migrate upriver in spring, beginning in February-March in the south. In some areas, a small spawning migration may also occur in the fall. Sub-adults and adults live in coastal waters and estuaries when not spawning, generally in shallow near shore areas dominated by gravel and sand substrates (NFMS 2013a).

Historically, Atlantic sturgeon were present in approximately 38 rivers in the United States from St. Croix, Maine, to the St. Johns River in Florida. Of these, 35 rivers have been confirmed to have had a historical spawning population. Atlantic sturgeons are currently present in approximately 32 of these rivers, and spawning occurs in at least 20 of them. Within the last twenty years, Atlantic sturgeon have been observed in most South Carolina coastal rivers; it is unknown if spawning is occurring in these rivers (NMFS 2007; Collins and Smith 1997).

Historical records of the Atlantic sturgeon—mature and spawning fish—are known from the South Santee River in the general study area. In 2004, 15 subadult Atlantic sturgeon were captured in surveys performed within the Santee estuary. In 1997, 151 subadults were captured in the Santee rivers, upstream of the Project's study area.

**Shortnose Sturgeon**

The Shortnose sturgeon is the smallest of the three sturgeon species that occur in eastern North America. They are anadromous fish that spawn in the coastal rivers along the east coast of North America from the St. John River in Canada to the St. Johns River in Florida. They prefer the near shore marine, estuarine, and riverine habitat of large river systems. Shortnose sturgeon live primarily in slower moving riverine waters or near shore marine waters and then migrate periodically into faster moving freshwater areas to spawn (NMFS 2013b). A landlocked group may exist in Lake Marion on the Santee River in South Carolina.

In the southern portion of the species' range, they are found in the St. Johns River in Florida, Altamaha, Ogeechee, and Savannah Rivers in Georgia, and in South Carolina river systems that empty into Winyah Bay and into the Santee/Cooper River complex that forms Lake Marion.

One hundred collections of adults and juvenile Shortnose sturgeon were documented in the Winyah Bay system during the late 1970s to early 1980s (NMFS 1998; Dadswell et al.

1984). The Waccamaw, Pee Dee, and Black Rivers feed into the bay. In the Santee rivers, 7 shortnose sturgeon were documented in 1978. From 1979-1991, Shortnose sturgeon were recorded from Lake Marion (Collins and Smith 1997). No population dynamics data are available for either population segment.

**Carolina Pygmy Sunfish**

The Carolina Pygmy Sunfish, a freshwater species, lives in densely vegetated slow-moving acidic waters of ponds, ditches, and streams in the coastal plain of North and South Carolina (SCNDR 2013). The species' limited distribution has led to it being a federal species of concern. There are a few populations of the species in South Carolina, notably in Big Pine Tree Creek in the Santee River Basin near Camden. A few populations are known from the Waccamaw River with one to two populations in the Upper Waccama River in Horry County and another population in remnant rice field ditches near Georgetown. No records for the species are known for the lower Santee rivers.

**West Indian Manatee**

The Florida distinct population segment of the West Indian Manatee lives in freshwater, estuarine, and marine waters. It primarily lives off the coasts of Florida and southeastern Georgia, but it can travel as far north as Rhode Island and as far west as Texas in the summer. Key habitat types used by this species include: thermoregulation at warm-water refuges; feeding, reproduction and shelter; and travel and migration corridors (USFWS 2007c).

Although the West Indian manatee is primarily found in marine and estuarine waters, there are historic records for the mammal several miles upstream of the lower Santee rivers (Murphy and Griffin, undated). The species was documented swimming up the Santee rivers west of the U.S. Highway 17 bridges. Several sightings have occurred in the Santee Delta east of the bridge (Murphy and Griffin, undated).

**American Chaffseed**

American chaffseed is a perennial herb that mostly occurs in sandy, acidic, and seasonally moist to dry soils. It is generally found in open, moist pine flatwoods, fire-maintained savannas, transitional areas between peaty wetlands and dry sandy soils, and other open grass-sedge systems. Most of the surviving populations inhabit areas subject to frequent fire (SCDNR 2013).

American Chaffseed is historically known (reported in 1974) in the FMNF approximately 2.5 miles northwest of Alternative Routes C, D, and F. The habitat for the species exists in the Project's study area; however, there are no records for the plant within the study area.

**Canby's Dropwort**

Canby's dropwort is a perennial herb that has been found in a variety of coastal plain habitats, including: pond cypress savannahs, wet pineland savannas, wet meadows, Carolina bays, sloughs, and around the edges of cypress-pine ponds. The largest populations have been found in open ponds that are wet most of the year and have little to no canopy cover. Wetlands that support the species typically have loam or clay soils and a high water table (NatureServe 2014; SCDNR 2013).

There is a record for the plant several miles southwest of the study area in Tibwin Savannah in Charleston County. There are small, isolated pond cypress depressions scattered throughout areas adjacent to the alternative routes. The species, however, is not known to occur in any of the alternative routes.

**Pondberry**

Pondberry is a deciduous shrub mostly associated with the edges of ponds, swampy depressions, sandy sinks, and seasonally flooded wetlands. In South Carolina, the species also grows along the margins of limestone sinks and shallow depressions (NatureServe 2014; SCDNR 2013).

There are no records for this small shrub in or adjacent to the Project's study area. During reconnaissance fieldwork in the 2000s, habitat for the species was noted on private land near the intersection of Alternative Routes B, C, and E, southwest of the Santee Delta (Gaddy, 2011).

# 3.0 PROJECT EFFECTS ON EVALUATED SPECIES

Potential effects to existing habitat within the Project area would include:

- Disturbance or change to vegetative communities as a result of clearing and construction within the ROW;
- Introduction and spread of noxious weeds during construction of the transmission line;
- Removal of forested wetland vegetation within the ROW;
- Removal of wildlife habitat within the ROW;
- Fragmentation of wildlife habitat; and
- Disturbance to aquatic habitats from construction activities.

Of these, the most substantial effect would be from the permanent conversion of forested upland and wetland habitat to grassland or shrub habitat. **Table 6** shows the amount of forested cover that could be converted for each alternative route.

**Table 6: Acres of Forest Cover**

| | Alt. A | Alt. B | Alt. C | Alt. D | Alt. E | Alt. F |
|---|---|---|---|---|---|---|
| Forest cover within the 75-foot route (acres) | 110 | 114 | 120 | 119 | 134 | 133 |
| Forest cover within the 600-foot corridor (acres) | 768 | 868 | 911 | 817 | 1,013 | 1,082 |

RUS has assessed effects to federally listed and candidate species by considering the following:

- Location and nature of the proposed action relative to species occurrence records and the likelihood of the species to use areas directly affected by Project
- USFWS county records for federally-listed species present or historically occurring in Charleston and Georgetown Counties
- Previous biological surveys and other species accounts in the Project study area

Potential habitat for evaluated species was assessed using topographic quadrant maps, aerial photography, and the knowledge of Dr. L.L. Gaddy, USFS/FMNF personnel, and other experts familiar with the Project's study area and habitat requirements for evaluated species. Specific surveys considered in this analysis include those conducted on the FMNF, Glitzenstein (2007), and birds other USFS/FMNF personnel for red-cockaded woodpeckers (RCW), birds, and proposed, endangered, threatened, and sensitive (PETS) in the FMNF. Drive-by surveys for all federally listed and candidate species in the Project's study area were conducted in the spring of 2011 by Dr. L. L. Gaddy (2011). Databases reviewed include:

- the USFS database for Red-cockaded woodpeckers and other PETS species
- The Natural Conservancy database for Red-cockaded woodpeckers in Charleston County, SC
- South Carolina Department of Natural Resources (SCDNR) database for federally-listed and state-protected species

***This effects analysis is preliminary. This BA will be updated after site specific surveys for threatened and endangered species are conducted after Central Electric selects the Project's ROW. In the Project's Final EIS, RUS will select the preferred 600-foot corridor within which the 75-foot ROW will be located.***

## 3.1 Bachman's Warbler

The study area includes bottomland hardwoods that may be converted to shrub/scrub or other low-growing vegetative habitat. These bottomland hardwoods are suitable breeding habitat for the Bachman's warbler. However, because the species is presumed extirpated, RUS anticipates that the proposed Project would have no effects to the species.

## 3.2 Red-cockaded Woodpecker

**Table 7** identifies the number of Red-cockaded woodpecker clusters within the proposed alternative routes and associated 300-foot and 1000-foot corridors. Direct effects to the species could result from forest clearing for ROW establishment. Forest clearing also may potentially affect the health of other Red-cockaded woodpecker clusters by reducing the basal area of trees in the foraging habitat of adjacent clusters. To the maximum extent practicable, Central Electric will avoid cluster trees when siting the Project's ROW. If cluster trees cannot be avoided, Central Electric will coordinate with the USFWS, RUS, and the USFS to enter into formal consultation, and as appropriate, implement mitigation to minimize adverse effects to the species. Mitigation may include but is not limited to: relocating Red-cockaded woodpeckers to nearby suitable habitat outside of the nesting and roosting seasons, enhancing cluster habitat where appropriate, and installing artificial cavities in suitable trees.

**Table 7: Red-cockaded Woodpecker Cluster Locations within and near the Alternative Routes**

| | Alt. A | Alt. B | Alt. C | Alt. E | Alt. D | Alt. F |
|---|---|---|---|---|---|---|
| Red-cockaded woodpecker within right-of-way (37.5-foot/75-foot corridor) | 0 | 0 | 0 | 0 | 0 | 0 |
| Red-cockaded woodpecker within 300 feet/600-foot corridor | 1 | 1 | 0 | 0 | 1 | 0 |
| Red-cockaded woodpecker within 500 feet/1,000-foot corridor | 2 | 2 | 0 | 0 | 2 | 0 |

Other disturbances to the species could result from construction noises and ground disturbance while establishing the Project's ROW, particularly during the nesting season. These activities may disrupt nesting activities, decrease feeding and brooding rates, and cause nest abandonment (USFWS 2003). To minimize these impacts, Central Electric would avoid ROW clearing and construction activities within a 500-foot radius of cluster trees during the species nesting season (April through July).

Because RUS is uncertain if the Project's ROW may require the removal of active cluster trees or may alter foraging areas potentially being used by the species, RUS has determined that the Project ***may adversely affect the Red-cockaded woodpecker***.

## 3.3 Wood Stork

Previous surveys in the Project's study area do not show the Wood stork using areas within the alternatives routes for nesting and foraging. However, before Project construction, Central Electric would hire a professional biologist to survey the Project's ROW and document to what degree and magnitude Wood storks may use the preferred alternative corridor and how construction and operation of the Project could affect the species.

Because the alternative routes contain potential breeding habitat for the species, the Project does have the potential to affect the Wood stork through forest clearing, particularly in the Santee Delta area. If Wood storks are found nesting in trees within the Project's ROW and the trees require removal, Central Electric will coordinate with the USFWS and RUS to enter into formal consultation, and as appropriate, implement mitigation to minimize adverse effects to the species. After the creation of the Project's ROW, Wood storks may use the transmission line ROW as travel corridors to access new foraging areas. This may beneficially affect the species.

After the proposed Project is constructed, there is potential for Wood stork collisions with the transmission line. Alternative Routes A and D, which parallel U.S. Highway 17 at the Santee Delta crossing, have the greatest potential for this to occur. The Cape Romain Bird Observatory (2011) has observed the Wood stork using the North and South Santee Rivers as travel corridors. The line would cross both rivers perpendicularly. Central Electric proposes to the design the proposed Project following the recommendations for the protection of avian species from collision with overhead lines, according to the guidelines in the APLIC's "Reducing Avian Collisions with Power Lines: The State of the Art in 2012" (APLIC 2012). In coordination with and if recommended by the USFWS, Central Electric will hire a professional biologist to conduct avian flyover surveys in areas determined to have a high potential for avian collisions (i.e., the river crossings). In areas determined to have a high potential for avian collisions, Central Electric would implement measures to make the transmission line's shield wire (the uppermost wire on a transmission line that may be difficult for birds to visually detect) more visible. Such measures may include: using a fiber optic cable or marking the shield wire(s) with bird flight divertors. If it is determined that such measures are needed, Central Electric will provide the USFWS with written confirmation of the locations where the mitigation measure will be implemented.

Because RUS is uncertain if the Project's ROW may require the removal of nesting trees for the species, RUS has determined that the Project ***may adversely affect the wood stork***.

## 3.4 Flatwoods Salamander

Previous surveys in the Project's study area do not show the Flatwoods salamander using areas within the alternatives routes. An historic site from 1987 is known in the Santee Coastal Reserve, approximately 1.5 miles south and east of U.S. Highway 17 (closest to Alternative Routes A, B, D, and E). The species is known to travel up to one mile from breeding sites to forage. None of the alternative routes are within a mile of this historic site. However, the alternative routes may contain potential breeding habitat and foraging areas for the species. For these reasons, the Project does have the potential to affect the Flatwoods salamanders. Central Electric would hire a professional biologist to survey the Project's ROW for signs of species presence and to document potential Flatwoods salamander breeding habitat and foraging areas that could be affected by the Project. Because none of the alternative routes are within a mile of the historic site for the species, RUS has determined preliminarily that the Project ***would not adversely affect the Flatwoods salamander***.

## 3.5 Aquatic Species and Marine Mammals (*Atlantic Sturgeon, Shortnose Sturgeon, Carolina Pygmy Sunfish, and West Indian Manatee*)

Previous surveys in the Project's study area include observations of the Altantic Sturgeon, Shortnose Sturgeon, and the West Indian Manatee the Flatwoods salamander using the North and South Santee Rivers as migration routes to inland waters. No records of the Carolina Pygmy Sunfish are known in the study area; however, a population of the species was observed in remnant rice field ditches near Georgetown, South Carolina.

No construction activity will take place in the North and South Santee Rivers or in any other blue line streams. Central Electric will implement standard erosion-control construction practices (such as the use of soft-tired vehicles, silt fences, etc.) where poles are placed along the North and South Santee Rivers and in wetlands associated with the Santee Delta. They would also implement conservation measures that would prevent contamination of water from herbicides, fuels, and other spills that could harm aquatic species.

If necessary, temporary low-water crossings or culverts would be installed at ditches, streams, or other watercourses to provide access to the ROW for construction vehicles. Installation of low-water crossings or culverts may require a permit from USACE and/or the state of South Carolina. Central Electric would coordinate with these entities prior to installing low-water crossings or culverts regarding permitting requirements and construction conditions. Structures would be designed and installed so as not to inhibit fish passage or create upstream or downstream habitat changes. Effects related to installation of these structures would be minor. Central Electric would establish a 30-foot upland buffer area adjacent to all blue line streams and at all jurisdictional wetlands. Wetland clearing methods would be used in these buffer areas to minimize the likelihood of upland soils transport into wetlands. Appropriate soil erosion and sedimentation controls would be established at streambank boundaries.

During Project operation, vegetation maintenance would require the use of herbicide application on private lands. In areas that have standing water and are connected to a larger aquatic system (e.g., river or swamp), only USEPA-approved herbicides registered for use in wetland or aquatic sites would be used. As such, there would be negligible direct toxic effects to fish from herbicide applications because of the small size of the treatment sites; the precautions that would be taken to prevent runoff in rainwater; the lack of offsite drift from the backpack, hand, or ground-based boom sprayers that would be used; and the generally rapid degradation of the herbicides after application.

For these reasons, RUS as determined that the proposed Project ***would not adversely affect the Atlantic Sturgeon, Shortnose Sturgeon, Carolina Pygmy Sunfish, and West Indian Manatee***. With the implementation of the above conservation measures, RUS will not require Central Electric to conduct in-water surveys for these species.

## 3.6 Plants (*American Chaffseed, Canby’s Dropwort, and Pondberry*)

Previous surveys in the Project’s study show no known records of American Chaffseed, Canby’s Dropwort, or Pondberry being present within any of the Alternative Routes. Reconnaissance fieldwork conducted in the 2000s (Gaddy, personal communication) noted suitable habitat for Pondberry on private land on near the intersection of Alternative Routes B, C, and E, southwest of the Santee Delta. Accordingly, Central Electric would hire a professional biologist to survey the Project’s ROW for habitat and likely presence of the three federally listed plant species.

The proposed Project would require the clearing of tall, woody vegetation to establish the Project’s ROW. All of the alternative routes contain predominantly forested habitat, both upland and wetland. Thus, the Project has the potential to remove potential habitat for Pondberry, while increasing potential habitat for American chaffseed.

Following Project construction, vegetation management would continue within the ROW. The Project's ROW would be re-cleared on a 2.5- to 3-year cycle (4 to 5 years in wetlands), using medium to heavy four-wheel drive tractors with associated mowing implements to ensure that vegetation growth does not adversely affect system reliability. Re-clearing personnel would use herbicides on private lands to control vegetation throughout their respective mow area. This includes applying granular herbicide at the base of selected transmission structures to reduce the potential of damage from wild fires and/or facilitate ground rot inspections by line personnel. Also, crews would treat wetland areas (i.e., areas where mowing equipment cannot traverse) with a foliar herbicide application, using a Marsh Master or similar equipment, to control woody vegetation. Future vegetation management activities on the Project's ROW that crosses USFS lands are expected to be similar to vegetation management as described above, except for the use of herbicides.

The goal of the herbicide program is to control vegetation that could interfere with the normal transmission of electricity while promoting low-growing native vegetation. The current practice of applying herbicides is to selectively treat undesirable woody vegetation using a low volume methodology. Although the amount of herbicide applied depends on the species composition, density, and height of the vegetation that is present, the selective application approach results in less of the active ingredient being applied per acre, as compared to the broadcast method. Only herbicides approved by the USEPA will be used within the Project's ROW with each being applied in accordance with manufacturer labeling.

The introduction and spread of noxious weeds as a result of construction of the proposed Project is possible through ground disturbance and transfer of seeds by construction equipment. Central Electric would develop and implement a noxious weed management plan to address the potential spread of noxious weeds during construction activities. The plan would include strategies for prevention, detection, and control of noxious weeds. Construction equipment would be inspected for seeds and thoroughly cleaned before mobilizing to the Project area.

Because there is potential habitat for American Chaffseed and Pondberry within the Alternative Routes and there is also habitat adjacent to the alternative routes for Canby's dropwort, RUS will require surveys for the plant species after Central Electric selects the Project's ROW. If federally listed plants are found within the Project's ROW and will be disturbed, Central Electric will coordinate with the USFWS, RUS, and USFS (as appropriate) to enter into formal consultation. Because there are no known records of federally listed plants occupying the alternative routes, RUS has determined preliminarily that the proposed Project ***would not adversely affect the American Chaffseed, Canby's Dropwort, and Pondberry***.

# 4.0 CUMULATIVE EFFECTS

Cumulative effects are defined by the as "incremental impacts of reasonably foreseeable, future actions on a species or its habitat." The study area contains a combination of USFS land, residential communities, agricultural and cropland, and undeveloped areas. According to the U.S. Census Bureau, the population in this region is anticipated to grow by more than one million from 2000 to 2030 (U.S. Census 2005). This is broadly consistent with the patterns of steady growth observed in Charleston and Georgetown counties in the decade just passed (2000-2010). The increase in population could increase development in this area, which could remove additional vegetation and wildlife habitat. This could impact federally listed species evaluated in this assessment. However, within and adjacent to the alternative routes, there is a substantial amount of public land and private lands held in conservation easements. These areas were established to conserve natural resources, and accordingly, assist in protecting and promoting the continued existing of these species.

As mentioned in **Section 2.2**, most populations of the Red-cockaded woodpecker are currently stable to increasing, due to advances in knowledge of its population dynamics and the use of highly effective management tools. The FMNF is home to the third largest population of the species. In the 2013 nesting season, there were 457 active clusters (441 potential breeding groups, 16 single male groups and 53 inactive clusters) on the forest. This exceeds this core recovery population's recovery goal by three active clusters. This population is currently expanding in areas and contracting in others due to lack of prescribed fire in the wildland-urban interface and lack of foraging and nesting habitat in the wake of Hugo. Twenty-eight clusters have gone inactive from 2001-2004, and 10 clusters have been reduced from pairs to single males. A majority of these clusters are in the wildland-urban interface, which indicates the increased difficulty of managing these sites to provide suitable Red-cockaded woodpecker habitat. Construction and operation of the proposed Project may adversely affect the species if removal of nesting, roosting, and foraging trees is required. However, the action when considered with past, present, and reasonably foreseeable actions, is not expected to jeopardize the continued existence of the species. After Central Electric selects the Project's ROW, RUS and the USFS will continue to coordinate with the USFWS to minimize effects that the proposed Project may have to the species.

Wood storks are a wetland dependent species, and loss of breeding and foraging wetlands is the primary threat to the population. Since the species listing, the number of breeding colonies has increased substantially in the Southeastern U.S. from 29 to 81 colonies. In South Carolina, wood stork nesting increased from 1 group with 11 nesting pairs to 13 groups with 2,010 nesting pairs from 1981 to 2006 (USFWS 2007). The state has an estimated carrying capacity of 2,400 pairs. Nest abandonment is rare in South Carolina groups primarily due to the variety of wetland habitats in the coastal plain, which provide sufficient foraging habitat. The study area may provide nesting habitat and foraging habitat for the species. The proposed Project may also serve as a new travel corridor for the species and thus provide access to new foraging areas. This may beneficially affect the species. After Project construction, there is potential for Wood stork collisions with the transmission line, as it would perpendicularly cross the North and South Santee Rivers which are used as travel corridors for the species. Alternative Routes A and D have the highest potential for avian collisions. As discussed in **Section 3.3**, Central Electric proposes to the design the Project following the recommendations for the protection of avian species from collision with overhead lines, according to the guidelines in the APLIC's "Reducing Avian Collisions with Power Lines: The State of the Art in 2012" (APLIC 2012). This should minimize the likelihood of avian collisions with the transmission line. These actions when considered with past, present, and reasonably foreseeable actions, is not expected to jeopardize the continued existence of the species.

In view of the growth and development trends in the study area and institutional efforts to control their potential adverse effect on natural resources, the cumulative effect from background development and population trends combined with the proposed Project is not likely to be significant.

# 5.0 PRELIMINARY CONSERVATION MEASURES

To avoid and minimize direct and indirect effects to federally protected species, the following conservation measures may be incorporated into the project design and implemented by Central Electric:

*Red cockaded woodpecker*

- Hire a professional biologist to perform a habitat and species presence survey to document Red-cockaded woodpecker clusters, cavity trees, and foraging areas within the Project's ROW and access Project effects to the species.
- Restrict construction in areas surrounding Red cockaded woodpecker clusters/cavity trees to outside of the species' nesting season, which lasts from April through July.
- To the maximum extent practicable, Central Electric will avoid cluster trees under active use by the species. When trees cannot be avoided, Central Electric will coordinate with the USFWS and the USFS (as appropriate) to mitigate adverse effects to the species. This includes but is not limited to: relocating colonies to nearby suitable habitat, enhancing colony habitat where appropriate, and installing artificial cavities in suitable trees.

*Wood stork*

- Hire a professional biologist to perform a survey, documenting to what degree and magnitude Wood storks may use the preferred alternative corridor (breeding, foraging, and travel) and how construction and operation of the Project could affect the species.
- Design the proposed transmission line to meet the recommendations for protection of avian species from electrocution, according to the guidelines in the Avian Power Line Interaction Committee's (APLIC) "Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006" (APLIC 2006).
- Design the proposed transmission line to meet the recommendations for the protection of avian species from collision with overhead lines, according to the guidelines in the APLIC's "Reducing Avian Collisions with Power Lines: The State of the Art in 2012" (APLIC 2012).
    - In coordination with the USFWS, conduct avian flyover surveys in areas determined to have a high potential for avian collisions.
    - If determined appropriate, use a fiber optic cable or mark the shield wire(s) of a transmission line with bird flight divertors in areas with high potential for avian collisions. Central Electric will provide the USFWS with written confirmation of line locations where this will take place.

*Amphibians, aquatic species, and marine mammals*

- Hire a professional biologist to survey the Project's ROW for Flatwoods salamander presence and to document potential species breeding habitat and foraging areas that could be affected by the Project.
- Avoid placing structures within the flowing waters of the North Santee and South Santee Rivers. Where pole placement is necessary along the river and in its floodplain, erosional and wetland construction practices such as the use of rubber-tired vehicles and the establishment of extensive silt fences will be employed to minimize impacts on breeding populations of the Shortnose and Atlantic sturgeon in the Santee River.
- Avoid refueling vehicles within 100-feet of the edge of water features to minimize the potential for hazardous-materials spills reaching a waterway.
- Grade and/or level areas to approximate preconstruction conditions to minimize erosion runoff.
- Adhere to potential USACE permits, pursuant to the Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act, including the use of best management practices to minimize potential erosion into waterways.
- Use only USEPA-approved herbicides registered for use in wetland or aquatic sites in areas that have standing water and are connected to a larger aquatic system (e.g., river or swamp).

*Plant species*

- Hire a professional biologist to perform a habitat and species presence survey of federally listed species.
- Re-seed disturbed areas with native species.
- Use special vehicles with low psi on ground surfaces during clearing and construction in wetlands.
- Develop and implement a noxious weed management plan to address the potential spread of noxious weeds during construction activities.

# 6.0 SUMMARY OF FINDINGS

In **Table 7**, a summary of the preliminary findings of this BA. Site-specific surveys will be completed after Central Electric selects the Project's ROW. This will occur after RUS has selected a preferred corridor in the Final EIS. After site-specific surveys and evaluations are preformed, RUS, Central Electric, and the USFS may enter formal consultation with the USFWS and/or the NMFS if the Project may have an adverse effect to a federally listed species.

**Table 7: Potential effect of proposed action on evaluated species**

| **Common Name *(Scientific Name)*** | **Protection Status[1]** | **Determination of Effect** |
|---|---|---|
| **Birds** | | |
| Bachman's Warbler (*Vermivora bachmanii)* | LE | No effect |
| Red-cockaded Woodpecker *(Picoides borealis* ) | LE | May affect, is likely to adversely affect |
| Wood Stork *(Mycteria Americana*) | LE | May affect, is likely to adversely affect |
| **Amphibians** | | |
| Flatwoods Salamander (*Ambystoma cingulatum)* | LT | May affect, is not likely to adversely affect |
| **Fish** | | |
| Atlantic Sturgeon (*Acipenser oxyrhinchus oxyrhinchus*) | LE, DPS | May affect, is not likely to adversely affect |
| Shortnose Sturgeon (*Acipenser brevirostrum)* | LE | May affect, is not likely to adversely affect |
| Carolina Pygmy Sunfish (*Elassoma boehlkei)* | FSC | May affect, is not likely to adversely affect |
| **Mammals** | | |
| West Indian Manatee *(Trichechus manatus)* | LE | May affect, is not likely to adversely affect |
| **Plants** | | |
| American Chaffseed (*Schwalbea americana*) | LE | May affect, is not likely to adversely affect |
| Canby's Dropwort (*Oxypolis canbyi*) | LE | May affect, is not likely to adversely affect |
| Pondberry (*Lindera melissifolia)* | LE | May affect, is not likely to adversely affect |

[1] Status: LE = Federally listed as endangered; LT = federally listed as threatened; FSC: Federal candidate species for listing

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# Appendix F- Programmatic Agreement

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Cumulative Effects Discussion for Section 3.8.2

The Gullah Geechee Cultural Heritage Corridor Commission's Cultural Heritage Corridor Management Plan (GGCHCC 2012) provides an overview of past, present, and reasonably foreseeable threats to traditional lands and cultural sites used by the Gullah Geechee. This information was extrapolated in a general context to assess potential cumulative effects to cultural resources in the study area. In accordance with the stipulations of the PA, which will be developed to conclude Section 106 review and must be executed prior to the issuance of any Record of Decision, an effects assessment to historic properties will occur after Central Electric has selected the proposed Project's ROW.

In the late twentieth century, "modern plantations" developed in the coastal southeastern U.S. in the form of resorts, subdivisions, golf courses, golf communities, and recreational facilities. The study area contains a combination of public land, residential communities, agricultural and cropland, and undeveloped areas. According to the U.S. Census Bureau, the population in this region is anticipated to grow by more than one million from 2000 to 2030 (U.S. Census 2005). This is broadly consistent with the patterns of steady growth observed in Charleston and Georgetown counties in the decade just passed (2000-2010). The increase in population and its associated development may have resulted in loss of lands and sites of cultural importance. Within and adjacent to the proposed alternative routes, however, there is a substantial amount of public land and private lands held in conservation easements. These areas were established to conserve natural and cultural resources and have been effective in protecting these resources from development.

Some of the Gullah Geechee communities referenced in the Cultural Heritage Corridor Management Plan (e.g., South Santee, Germantown, Tibwin, Buck Hall, and Awendah) are communities that would benefit directly from the operation of the proposed Project. By supplying adequate levels of power reliably, the proposed Project has the potential to contribute towards preserving and maintaining these traditional communities located in the study area.

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# Appendix G- Cultural Resources Data

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**Central Electric Power Cooperative, Inc.**

# McClellanville
# 115 kV Transmission Project

**Preliminary Draft Environmental Impact Statement**

## APPENDIX G

## CULTURAL RESOURCES DATA

**November 15, 2013**

**Table G-1: Cultural Resources Identified in the Alternative Routes Study Area**

| Property Name/Site Number | County | Resource Type | Components | NR Eligibility Status |
|---|---|---|---|---|
| Hopsewee Plantation | Georgetown | Buildings | Eighteenth-Nineteenth-centuries | Listed National Historic Landmark |
| Georgetown County Rice Fields District | Georgetown | Historic Landscape | Eighteenth-Nineteenth-centuries | Eligible |
| Old Georgetown Road/6330 | Charleston | Historic Road | Eighteenth-Nineteenth-centuries | Eligible |
| 38CH0512 | Charleston | Archaeological Site | Eighteenth-Twentieth-centuries | Not Evaluated |
| 38CH1132 | Charleston | Archaeological Site | Twentieth-century | Not Eligible |
| 38GE0615 | Georgetown | Archaeological Site | Twentieth-century | Further Work Recommended |
| National Heritage Area | Charleston and Georgetown | Historic Area | Eighteenth-Nineteenth centuries | Listed National Heritage Area |
| Oaks Plantation | Georgetown | Buildings | Eighteenth-Nineteenth centuries | not evaluated |
| Commander Island | Georgetown | Historic Landscape | Eighteenth-Nineteenth centuries | not evaluated |
| Peachtree Plantation Ruins and Rice Mill | Charleston | Buildings | Eighteenth-Nineteenth centuries | not evaluated |

Note: All of these cultural resources and historic properties fall within the boundaries of the Gullah Geechee Cultural Heritage Corridor. With the exception of the prehistoric archaeological sites all of these resources could be considered as contributing features of the corridor.

**Table G-2: Distribution of Cultural Resources and Historic Properties by Alternative**

| | Alternative Routes | | | | | |
|---|---|---|---|---|---|---|
| **Cultural Resources** | **A** | **B** | **C** | **D** | **E** | **F** |
| Hopsewee Plantation | X | | | X | | |
| Georgetown County Rice Fields District | X | X | X | X | X | X |
| Old Georgetown Road/6330 | | | | | X | X |
| 38CH0512 | X | X | | | X | |
| 38CH1132 | X | X | | | X | |
| 38GE0615 | X | X | X | X | | |
| Oaks Plantation | | X | X | | | |
| Commander Island | | X | X | | | |
| National Heritage Area | X | X | X | X | X | X |
| Peachtree Plantation Ruins and Rice Mill | X | X | X | X | X | |

Note: All of these cultural resources and historic properties fall within the boundaries of the Gullah Geechee Cultural Heritage Corridor. With the exception of the prehistoric archaeological sites all of these resources could be considered as contributing features of the corridor.

**Table G-3. Cultural Resources and Historic Properties Within the APE with Views of the Alternative Routes.**

| | Alternative Routes | | | | | |
|---|---|---|---|---|---|---|
| **Cultural Resources** | **A** | **B** | **C** | **D** | **E** | **F** |
| Hopsewee Plantation | X | | | X | | |
| Georgetown County Rice Fields District | X | X | X | X | X | X |
| Old Georgetown Road/6330 | | | | | X | X |
| 38CH0512 | X | | | X | | |
| 38CH1132 | X | | | X | | |
| 38GE0615 | X | X | X | X | | |
| Oaks Plantation | | X | X | | | |
| Commander Island | | | | | | |
| National Heritage Area | X | X | X | X | X | X |
| Peachtree Plantation Ruins and Rice Mill | X | X | X | X | X | |
| Hampton Plantation | | | | | | X |
| Fairfield Plantation | X | | | X | | |

Note: All of these cultural resources and historic properties fall within the boundaries of the Gullah Geechee Cultural Heritage Corridor. With the exception of the prehistoric archaeological sites all of these resources could be considered as contributing features of the corridor.

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# Appendix H- Census Block Data for Minority Populations

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## Census Blocks with Residences in the Study Area, Minority Populations, 2010

| | Minority Status | Alt. A | Alt. B | Alt. C | Alt. D | Alt. E | Alt. F |
|---|---|---|---|---|---|---|---|
| **Residences within 500 feet/1,000 foot corridor** | **Total** | **48** | **11** | **10** | **48** | **9** | **8** |
| 45.019.005000.3053 | Not Minority | 1 | 1 | 0 | 1 | 1 | 0 |
| 45.019.005000.4037 | Minority | 2 | 2 | 8 | 8 | 2 | 8 |
| 45.019.005000.4042 | Minority | 1 | 1 | 0 | 0 | 1 | 0 |
| 45.019.005000.4046 | Minority | 1 | 1 | 0 | 0 | 1 | 0 |
| 45.019.005000.4088 | Minority | 1 | 1 | 0 | 0 | 1 | 0 |
| 45.019.005000.4095 | Minority | 3 | 3 | 0 | 0 | 3 | 0 |
| 45.043.920800.3019 | Minority | 0 | 1 | 1 | 0 | 0 | 0 |
| 45.043.920800.3032 | Minority | 4 | 0 | 0 | 4 | 0 | 0 |
| 45.043.920800.3033 | Minority | 9 | 0 | 0 | 9 | 0 | 0 |
| 45.043.920800.3035 | Minority | 4 | 0 | 0 | 4 | 0 | 0 |
| 45.043.920800.3036 | Minority | 11 | 0 | 0 | 11 | 0 | 0 |
| 45.043.920800.3211 | (X) | 1 | 0 | 0 | 1 | 0 | 0 |
| 45.043.920800.3233 | (X) | 1 | 0 | 0 | 1 | 0 | 0 |
| 45.043.920800.3304 | (X) | 1 | 0 | 0 | 1 | 0 | 0 |
| 45.043.920800.3305 | Minority | 5 | 0 | 0 | 5 | 0 | 0 |
| 45.043.920800.3306 | Minority | 3 | 0 | 0 | 3 | 0 | 0 |
| 45.043.920800.3310 | Not Minority | 0 | 1 | 1 | 0 | 0 | 0 |
| **Residences within 1,320 feet/2,640 foot corridor** | **TOTAL** | **108** | **59** | **50** | **95** | **45** | **29** |
| 45.019.005000.3038 | (X) | 1 | 0 | 0 | 1 | 0 | 0 |
| 45.019.005000.3053 | Not Minority | 2 | 2 | 0 | 2 | 2 | 0 |
| 45.019.005000.4020 | (X) | 0 | 1 | 4 | 0 | 1 | 0 |
| 45.019.005000.4037 | Minority | 9 | 9 | 30 | 27 | 9 | 27 |

| | Minority Status | Alt. A | Alt. B | Alt. C | Alt. D | Alt. E | Alt. F |
|---|---|---|---|---|---|---|---|
| 45.019.005000.4042 | Minority | 4 | 4 | 1 | 1 | 4 | 1 |
| 45.019.005000.4046 | Minority | 2 | 2 | 0 | 0 | 2 | 0 |
| 45.019.005000.4083 | Minority | 2 | 2 | 0 | 0 | 2 | 0 |
| 45.019.005000.4088 | Minority | 1 | 1 | 0 | 0 | 1 | 0 |
| 45.019.005000.4089 | Minority | 1 | 1 | 0 | 0 | 1 | 0 |
| 45.019.005000.4090 | Minority | 1 | 1 | 0 | 0 | 1 | 0 |
| 45.019.005000.4095 | Minority | 11 | 11 | 0 | 0 | 11 | 0 |
| 45.019.005000.4098 | Minority | 5 | 5 | 0 | 0 | 5 | 0 |
| 45.019.005000.4110 | Minority | 5 | 5 | 0 | 0 | 5 | 0 |
| 45.043.920800.2209 | (X) | 1 | 0 | 0 | 1 | 0 | 0 |
| 45.043.920800.3018 | (X) | 0 | 0 | 0 | 0 | 1 | 1 |
| 45.043.920800.3019 | Minority | 0 | 3 | 3 | 0 | 0 | 0 |
| 45.043.920800.3023 | Minority | 0 | 1 | 1 | 0 | 0 | 0 |
| 45.043.920800.3029 | Minority | 3 | 0 | 0 | 3 | 0 | 0 |
| 45.043.920800.3032 | Minority | 4 | 0 | 0 | 4 | 0 | 0 |
| 45.043.920800.3033 | Minority | 10 | 4 | 4 | 10 | 0 | 0 |
| 45.043.920800.3035 | Minority | 9 | 0 | 0 | 9 | 0 | 0 |
| 45.043.920800.3036 | Minority | 18 | 0 | 0 | 18 | 0 | 0 |
| 45.043.920800.3037 | (X) | 1 | 0 | 0 | 1 | 0 | 0 |
| 45.043.920800.3211 | (X) | 1 | 0 | 0 | 1 | 0 | 0 |
| 45.043.920800.3233 | (X) | 1 | 0 | 0 | 1 | 0 | 0 |
| 45.043.920800.3304 | (X) | 1 | 0 | 0 | 1 | 0 | 0 |
| 45.043.920800.3305 | Minority | 8 | 0 | 0 | 8 | 0 | 0 |
| 45.043.920800.3306 | Minority | 7 | 0 | 0 | 7 | 0 | 0 |

| | Minority Status | Alt. A | Alt. B | Alt. C | Alt. D | Alt. E | Alt. F |
|---|---|---|---|---|---|---|---|
| 45.043.920800.3310 | Not Minority | 0 | 7 | 7 | 0 | 0 | 0 |

Source: U.S. Census (2010e)

Note: (X) = Data were not available for these geographies.

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