JOHNS ISLAND – QUEENSBORO 115 KV TRANSMISSION LINE PRELIMINARY SITING STUDY

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TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

The South Carolina Public Service Authority (Santee Cooper) has prepared this report to document the findings of this Preliminary Siting Study for the Johns Island – Queensboro 115 kV Transmission Line. Santee Cooper has determined that it is necessary to construct a new 115 kV electric transmission line to link the existing Santee Cooper Johns Island Substation and the existing SCE&G Queensboro Switching Station (see Figure 2) to improve the reliability of Santee Cooper's power grid. These two stations are approximately 6.75 miles apart; however the total length of the actual transmission line could exceed that distance by up to 50% once the final route is determined. In order to minimize adverse impacts to the densely-populated, James Island area, including the James Island County Park, the historically significant Dill Sanctuary, and the environmentally sensitive Stono River, Santee Cooper negotiated an agreement with SCE&G to utilize the existing SCE&G transmission line (Church Creek – Ritter 230-115kV) right-of-way from the Queensboro Switching Station across the Stono River to Johns Island. Based on this agreement, SCE&G will be responsible for the power line upgrade within the existing right-of-way to the tie-in location on the Johns Island side of the Stono River. With this in mind, this siting study will explore routing options between the proposed SCE&G tie-in location and the Johns Island Substation. The project Study Area (see Figure 1) includes a variety of sensitive areas, including: James Island County Park, Dill Sanctuary, the Stono River, Angel Oak, Charleston Executive Airport, and Fenwick Hall Plantation.

In August of 2016, Santee Cooper contracted with Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler) to perform a Preliminary Siting Study to identify a minimum of three potential transmission line routes. Amec Foster Wheeler began the Preliminary Siting Study by collecting data within the Study Area including: Charleston County parcel boundaries (excluding property ownership), high resolution aerial photos, municipal boundaries, national and state parks, land stewardship, scenic corridors, existing transmission lines, high traffic areas, endangered species, National Wetland Inventory, LiDAR data, soils, South Carolina Historic Preservation Office (SHPO) datasets, South Carolina Institute of Archaeology and Anthropology (SCIAA) datasets, cemeteries, and many other databases.

The Preliminary Siting Study identifies a total of three potential transmission line routes plus a straight line route for comparison. The following basic criteria were used for the development of potential routes:

- Avoid environmentally sensitive areas defined on the features map to the extent possible (i.e. wetlands, historic sites);
- Use areas with limited or no development to the greatest extent possible (as identified by the aerial photography and windshield surveys);
- Use or parallel existing right of way and use individual parcels, as defined by Charleston County, to the greatest extent possible (staying within one tract or parcel rather than affecting multiple parcels); and

Based on these and other more detailed considerations explained in the study, the following potential transmission line routes were identified (see Figure 2):

- Pink Route
- Blue Route
- Green Route
- Yellow Route – Straight Line

2. PROJECT DESCRIPTION

2.1 INTRODUCTION

Santee Cooper operates a vertically-integrated electric utility system, including facilities for generation, transmission, and distribution of electric power and energy at retail and wholesale levels. Santee Cooper has a responsibility to ensure sufficient capacity to provide safe, reliable, and cost-efficient electrical energy to consumers within its established territory. In light of these responsibilities, Santee Cooper has determined that interconnectivity between the Johns Island Substation and the Queensboro Switching Station is necessary to provide reliable power service to its local customers. This preliminary siting study has been prepared to identify and evaluate transmission line routing options for the purposes of this project. The transmission line routes identified in this report have been found to be representative of various concepts for routing a new transmission line and will be further refined during the design and permitting phases. This report provides a preliminary desktop assessment of environmental impacts associated with each route to aid Santee Cooper in the selection of a proposed route.

2.2 PROJECT PURPOSE AND NEED

With the expanding demand for power in the James Island and Johns Island areas, Santee Cooper has determined that it must improve the reliability of its power grid in these areas, in accordance with the North American Electric Reliability Corporation (NERC) standards. To accomplish this, Santee Cooper has determined that it must connect its Johns Island 230/115 kV substation, located off of Comsee Lane on Johns Island, to SCE&G's Queensboro 115 kV Switching Station, located off of Ashworth Lane on James Island, with a 115 kV transmission line. A 115 kV interconnection between these two substations would allow Santee Cooper to decrease dependence on the one transmission line corridor used to serve Johns Island, thus increasing transmission reliability as well as providing a backup for failure of the existing 230/115 kV Transformation on Johns Island. At a minimum, the new transmission line should include 1272 ACSR (Aluminum Conductor Steel Reinforced) conductor, capable of 1,200 ampere continuous operation, a back-flash rating of four outages per 100 miles of line per year, and an importance factor of 1.0 in the National Electric Safety Code (NESC) calculation of extreme wind loading. Based on Santee Cooper's Right-of-way Utilization Plan, a right-of-way with a minimum width of 100' is required to accommodate the proposed transmission line. In keeping with its responsibility to provide reliable power service to its customers, Santee Cooper has a duty to make sure its construction projects are designed and constructed in a cost-efficient manner, so that it can continue to provide reliable power at reasonable rates to their customers.

2.3 STUDY AREA

For the purposes of this project, Santee Cooper provided Amec Foster Wheeler with a Study Area for the transmission line siting project. The Study Area is approximately 21.6 square miles focusing on Johns Island between the Johns Island Substation and the SCE&G tie-in near the Stono River (see Figure 1). Amec Foster Wheeler has identified three preliminary routes within the Study Area to connect Santee Cooper's existing Johns Island 230/115 kV substation to the proposed SCE&G's tie-in location on Johns Island. Once the proposed route is selected, the additional work will focus on the footprint of the route right-of-way and immediate surroundings.

2.4 TRANSMISSION LINE SITING PROCESS

Santee Cooper considers the following five factors when selecting a route for new transmission lines: economics, environmental impact, safety, system reliability and long range implications to the transmission system. Economic factors may include the cost of acquiring easements for new right-of-way, clearing the land, transmission line construction and construction of new substations. Environmental obstacles may include wetlands, protected species, cultural resources, wildlife, aesthetics, noise, geology, prime farmland, hydrology, land use, land cover, floodplains and air quality. Physical boundaries also help determine sensitive areas within the Study Area. Physical boundaries include municipal boundaries, parcels, building footprints, and subdivisions. Socioeconomic factors such as environmental justice and potential relocations are also considered when selecting a route for new transmission lines. The following sections describe the various strategies available for locating and constructing transmission lines.

2.4.1 UNDERGROUND

Although underground utilities may be desirable in highly congested, metropolitan areas, long distance transmission lines are rarely placed underground. This is primarily due to increased installation costs and the higher potential for maintenance complications that are associated with underground lines. The construction cost of locating an underground transmission line can be as much as 10 to 15 times greater per mile than locating the same transmission line aboveground on overhead structures. This does not include the cost of additional substations required for high voltage underground lines due to large line charging currents or the increased expenses over the life of the line associated with line losses and maintenance associated with underground transmission lines.

Although underground lines may be more preferable to certain public constituencies than overhead lines, the extremely high cost associated with the development and maintenance of underground transmission lines limit their development to locations where physical circumstances prevent overhead lines. Another benefit of underground lines is that they limit aesthetic impacts, but other environmental consequences remain. Installation and maintenance of underground utilities require greater disturbance to existing conditions and frequently require the construction of a permanent road along the right-of-way to allow for maintenance and repair. Although vegetation must be cleared for construction and maintenance activities for overhead lines, subsurface disturbance during installation of the line is concentrated at the location of the line's structures and low-growing vegetation is allowed to grow within the right-of-way. Reliability can

also be reduced with the installation of underground utilities, due to the length of time it takes to find and repair or replace damaged equipment.

2.4.2 OVERHEAD IN NEW RIGHT-OF-WAY

Of the three possible overhead routing alternatives, acquiring and developing a new right-of-way has the potential to cause the largest economic and environmental impacts. While developing a new right-of-way may be necessary when existing rights-of-way are not available, it is not the primary preferred siting methodology for Santee Cooper. Locating overhead transmission lines in a new right-of-way requires the acquisition of new right-of-way from current property owners. This process can be expensive and time consuming, and challenges of acquisition can often off-set the primary benefit of new right-of-way, which is the ability to design a new line in the most direct, shortest route possible. Once a right-of-way has been acquired, clearing the right-of-way is required, which may be difficult and expensive, depending on land cover. Of the four possible overhead routing alternatives, new right-of-way development has the potential for impacts on population, vegetation and natural habitats in the vicinity of the right-of-way because it constitutes entirely new disturbance. Development of new substations may also be required if the route does not pass by existing substations.

2.4.3 OVERHEAD IN NEW RIGHT-OF-WAY ADJACENT TO AN EXISTING RIGHT-OF-WAY

Locating overhead transmission lines parallel to an existing maintained right-of-way typically results in fewer impacts and less time and money than acquiring and developing a new right-of-way. Although it may still require the acquisition of new easements and new clearing and line installation, the impacts are generally less severe as there is already an existing right-of-way. Impacts to aesthetics and change in habitat are not as severe as developing a new right-of-way, as the existing right-of-way will effectively be widened. However, impacts to natural habitats and existing woody vegetation would be expected as new clearing would be necessary. New substations are generally not required as they should already exist along the route. Several existing Santee Cooper and SCE&G transmission lines are located within the project Study Area; however, due to proximity and alignment, only portions of these existing transmission lines warrant consideration for paralleling with the proposed route.

2.4.4 OVERHEAD WITHIN AN EXISTING RIGHT-OF-WAY

Routing new overhead transmission lines within an existing right-of-way significantly reduces the economic and environmental impacts of the new transmission lines. This option eliminates the need to acquire new easements and does not require new clearing. Development of new access roads and additional substations is unlikely, as the existing right-of-way is regularly maintained and already connected to substations. Impacts as a result of this option generally involve the replacement of existing transmission line structures. However, placement of structures would also be required in either of the other two overhead options. Several existing Santee Cooper and SCE&G transmission lines are located within the project Study Area; however, collocating in an SCE&G right-of-way is not common practice due to access, safety, and reliability issues, and due to proximity and alignment, only portions of the existing Santee Cooper transmission lines warrant consideration for upgrade in conjunction with the proposed route.

3. ALTERNATIVES CONSIDERED

The preliminary siting study identified a total of three alternatives, which were completed with no partiality to any areas or individuals. Additionally, a straight line route connecting the Johns Island Substation and the SCE&G tie-in location was considered as an alternate route for comparison purposes. While it is unrealistic to economically justify a straight line approach, the alternate route was added to the data analysis for discussion. Three preliminary routes that satisfied the project purpose and need were selected as "Equitable Siting Alternatives". These three routes included Points of Intersection (PI's), or turns, to avoid the aforementioned physical, environmental, and socioeconomic obstacles (see Figure 2).

A transmission line variables matrix was created (see Table 4.15.1) indicating known obstacles within the Study Area. The known variables helped determine necessary PI's on the Equitable Siting Alternatives.

The alternative development process included several steps. The project team evaluated alternatives based on how well they address the needs and purpose for the project as well as their social, economic and environmental impacts. The following criteria were established for developing the alternatives:

- Avoid environmentally sensitive areas defined on the features map to the extent possible (i.e. wetlands, historic sites);
- Use areas with limited or no development to the greatest extent possible (as identified by the aerial photography and a windshield survey); and
- Use or parallel existing right-of-way and use individual parcels, as defined by Charleston County, to the greatest extent possible (staying within one tract or parcel rather than affecting multiple parcels).

The following routes are analyzed in this study:

- Pink Route
- Blue Route
- Green Route
- Yellow Route – Straight Line

4. IMPACTS ANALYSIS

The following sections describe the various issues considered in this Preliminary Siting Study. Where specific issues have varying degrees of impact on different routes, quantified impacts for each route are provided.

4.1 LAND USE

According to the United States Geological Survey (USGS) Land Cover Institute (LCI) land uses within the Study Area include developed areas, croplands, shrublands, herbaceous areas, forests, wetlands, and open waters (USGS 2012). The land cover was reclassified into four main categories: developed, forested, wetlands or open water, and croplands and shrublands. In 2011 the Study Area was approximately 42 percent wetlands and open water, 26 percent forestry, 23 percent croplands and shrublands, and only 8 percent developed.

While developed areas in 2011 represents a small percentage of the Study Area, a study for the SCDOT and Federal Highway Commission estimated rapid population growth of nearly 70% in the next 15 years within the Charleston County (Wilbur 2009). Furthermore, the Study Area was outside of the 2000 United States Census urbanized area. The 2010 Census urbanized area is approximately 21 percent of the Study Area.

4.2 ENVIRONMENTAL JUSTICE

Environmental Justice (EJ) attempts to reduce adverse impacts on human health and the environment. EJ was formally and legally introduced on February 11, 1994 when President Clinton signed Executive Order (EO) 12898. The EO's directive is to identify any disproportionate or adverse impacts on minority and low-income populations resulting from development or laws (USEPA 2010a). Adverse impacts may occur if a project has negative effects on the nearby economy, disrupts community cohesion, loss of community facilities, increase emergency response times, or reduce transportation mobility. Unfortunately, direct guidelines for defining EJ populations does not exist (USEPA 1999a), including the state of South Carolina. However, the EPA Region 4 defines potential EJ communities by comparing benchmark reference areas where thresholds can be applied.

The recommended threshold for use in EPA Region 4 is 1.2 times the state average for aggregate minorities and low-income populations; however, the Council on Environmental Quality (CEQ) states potential EJ communities include aggregate minority populations of the affected area that exceed 50 percent (CEQ 1997). Low-income populations can be defined using either 1.2 times the state poverty level or 1.2 times the percentage of households below $15,000 annual income within the state (USEPA 1999a). Poverty data is not provided at the Census Block Group level; however, annual household income data is. The South Carolina aggregated minority threshold is 39.4 percent. In addition, the South Carolina threshold for percent households below $15,000 is 18.3 percent.

Amec Foster Wheeler compared aggregate minority populations and percent of households below $15,000 annual income at the Census Block Group and State level to define potential EJ communities. The Census Block Groups within the Study Area are Block Group 1 of Census Tract 21.01 (450190021011), Block Group 2 of Census Tract 21.01 (450190021012), Block Group 3 of Census Tract 21.01 (450190021013), Block Group 4 of Census Tract 21.01 (450190021014), Block Group 1 of Census Tract 21.03 (450190021031), and Block Group 1 of Census Tract 22 (450190022001).

According to the 2015 Census data Census Block Groups 450190021031 and 450190022001 have a higher aggregate minority population than the aforementioned South Carolina threshold. However, none of the Census Block Groups exceeded the low-income population threshold; therefore, it is expected no EJ communities will be disproportionately impacted from the construction of the proposed transmission route.

It is important to note all data used in the analysis came from the United States Census Bureau. Census Block Groups within the Study Area are rather large due to sporadic populations and can create errors in defining potential EJ communities. Lastly, the transmission routes do not necessarily directly impact an EJ community since an EJ community can be smaller than the Census Block Group.

4.3 RELOCATIONS

Relocations occur when an alternative transmission route directly impacts a residential home, church, or business. Amec Foster Wheeler examined potential relocations using high-resolution aerial imagery, GIS building footprints, and a limited windshield survey; therefore, all potential relocations listed below are approximated and should be used for preliminary planning purposes only. The analysis estimated all three alternatives would directly impact a very limited number of houses or associated structures. The relocations consist mostly of single-family homes. The Yellow Route (Straight-line route) would directly impact small commercial businesses as well.

The Blue Route spans over the congested heavily developed areas surrounding Maybank Highway and would potentially directly impact nine residential homes. The Green Route runs north of the major subdivisions within the Study Area and would potentially not directly impact any residences or commercial properties. The Pink Route runs south of the major subdivisions and would potentially directly impact three residential homes. The Yellow Route would potentially impact seventeen residential homes, and four relatively small commercial buildings. Table 4.15.1 lists the potential relocations from each alternative route.

It should be noted that at the time of this writing, the study area is being rapidly developing, and additional structures may be planned, platted, or built within the potential transmission line routes that are not accounted for by this study.

4.4 RECREATION

The only public parks and recreational facilities in the Study Area are Johns Island Park and Angel Oak Park. None of the transmission routes would directly impact parks or recreational facilities, including Section 6(f) properties. It is not expected that the transmission routes would impact recreational activities on navigable waters (see Section 4.11).

4.5 HISTORIC AND ARCHAEOLOGICAL RESOURCES

The historical resources in the study area consist of State Historic Preservation Office (SHPO) historic structures, which some are eligible for the National Register of Historic Places (NRHP), currently listed NRHP properties, Civil War earthworks, historic areas, and archaeological sites. Table 4.15.1 lists the direct impacts of historic resources from each alternative route.

The Yellow Route would directly impact one known historic structure, 5736, a non-eligible

structure. No other route would directly impact known historic structures in the Study Area. The Blue Route and Green Route would directly impact a known archaeological site. The Blue Route would directly impact site 38CH2046 and the Green Route would directly impact site 38CH1146.

Historic areas within the Study Area would be impacted by all of the transmission route options. All of the routes would directly impact River Road, a potentially eligible historic district for the NRHP. The Green Route would directly impact Fenwick Hall and Fenwick Hall Historic District, both eligible for the NRHP. Lastly, the Blue Route and Pink Route would directly impact two historic districts near the River Road crossing; however, SHPO has both listed as ineligible. All directly impacted known historic structures, historic areas, and known archaeological sites, are shown on Figure 3 and Figure 4.

4.6 AIR QUALITY

The Study Area will be located in attainment with the national standards for all six criteria pollutants (USEPA 2008c). Construction and operation of the transmission line will result in extremely limited emissions of nitrogen dioxide and ozone.

Extremely low levels of ozone have been documented around transmission lines due to corona discharge, which is an electrical discharge caused by the ionization of air around a transmission line, and which increases with high moisture content. Typically, concentrations of ozone due to corona discharge measured at ground level, even during heavy rain, are significantly less than the most sensitive instruments can measure (approximately one ppb) and are minimal (0 – 8 ppb) at the height of the transmission line (HDR 2008). Ozone is a very reactive form of oxygen and it combines readily with other elements and compounds in the atmosphere. Due to its reactivity, it is relatively short-lived.

As previously discussed, incremental concentrations of ozone due to corona are expected to be less than one-tenth of the NAAQS 8-hour ozone standard (75 ppb) near the transmission line, and insignificant at ground level (HDR 2008). Nitrogen oxide production due to corona is approximately one-fourth of the production of ozone due to corona. Therefore, nitrogen oxide levels are expected to be less than 2 ppb at an elevation near the transmission line (much lower than the NAAQS of 53 ppb) and insignificant at ground level.

Ozone and nitrogen dioxide production near the transmission lines are expected to have an insignificant impact on the environment. The transmission lines will have a minimal impact on the air quality of the immediately surrounding areas. Air quality is not expected to be a differentiating factor in comparing the routing alternatives.

4.7 HAZARDOUS MATERIALS

An assessment was performed to identify hazardous material and waste sites that are adjacent to or within the right-of-way of each new location alternative. A full literature and records was completed by using the Environmental Data Resources, Inc. (EDR) database within the Study Area. The Preliminary Siting Study only analyzed listed facilities within 100 feet of the preliminary transmission route right-of-ways.

Six listed facilities were identified within 100-feet of the preliminary transmission route right-of-ways. However, due to regulatory information these facilities are not expected to impact the preliminary transmission line right-of-ways.

Once a final proposed transmission route is selected further investigation of the EDR listed facilities within standard ASTM search radii is recommended.

4.8 NOISE

The World Health Organization (WHO) recognizes that, "noise in the form of a buzzing or humming sound may be heard around electrical transformers or high voltage power lines" (WHO 1998). Typical audible noise level under a 115kV transmission line during rain (audible noise is less when is not raining) is 18.7 dBA (USDA 2014). This expected noise level is less than the level of ambient noise in an average home. Although corona noise can be audible if someone is very close to the transmission lines, it quickly dissipates with distance and is often overshadowed by typical background noises. Bonneville Power Administration (BPA) has developed a general guideline based upon public response to transmission line audible noise. The guideline indicates that few complaints should be expected if audible noise is limited to less than 53 dBA (Lee, et all 1996). As the audible noise from a 115kV transmission line is expected to be much lower than this guideline and since no structures or buildings are allowed within the transmission line rights-of-way, it is unlikely that residents in adjacent properties will be significantly affected by the limited noise. There should be minimal impacts related to this noise from the operation of the Johns Island and Queensboro transmission lines.

Equipment used during project construction activities will temporarily increase short-term noise levels in the project area. The following table shows the typical noise levels from construction equipment.

Table 4.8.1: Noise level of construction equipment

Construction Equipment	**Noise Level (dBA at 50 feet)**
Truck	88
Drill Rig	98
Air Compressor	81
Dozer	85
Grader	85
Crane	83

Source: USDOT 2006

There are numerous available methods of mitigating construction noise. The easiest and most successful method is prohibiting construction work during sensitive nighttime hours. The use of well-maintained heavy equipment with quality exhaust mufflers can also reduce noise levels during construction (Thalheimer 2000). The impacts from construction activity are temporary and

will be minimal. Noise is not expected to be a differentiating factor in comparing the routing alternatives.

4.9 FARMLANDS, FOOD, AND FIBER PRODUCTION

The U.S. Department of Agriculture defines prime farmland as land that has the best combination of physical and chemical characteristics for producing crops. Land cover in the Study Area indicated minimal agricultural farmland and rapid development. Therefore, only existing large agricultural farms with pivot or traversing sprinkler systems were examined in the Study Area. Based on aerial review there are no large agricultural farms with irrigation systems within the Study Area. Farmlands, food, and fiber production are not expected to be differentiating factors in comparing the routing alternatives.

4.10 WETLANDS

Jurisdictional waters of the U.S., including streams and wetlands, are defined by 33 CFR Part 328.3(b) and are protected by Section 404 of the Clean Water Act (33 USC 1344). Certain activities, such as construction, dredging, filling or other alterations, in jurisdictional wetlands, streams or other waters of the U.S. may require a Section 404 Clean Water Act permit which is regulated by the United States Army Corps of Engineers (USACE).

According to the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory all alternative routes cross freshwater and saltwater wetlands. According to the USFWS, the Blue Route right-of-way has approximately 42 percent wetlands within it; the Green Route has approximately 54 percent wetland coverage; the Pink Route has approximately 32 percent wetland coverage; and the Yellow Route has approximately 23 percent wetland coverage. Table 4.15.1 lists the types of wetlands affected by each alternative route.

Necessary wetland impacts along the new right-of-way corridors will consist of clearing of vegetation. Following development of the proposed new corridors, Santee Cooper will maintain the right-of-way in accordance with their current Right-of-way Management Unit Plan.

Limits of jurisdictional wetlands and other waters of the U.S. will be field delineated prior to final design and permitting. The USACE recommended measures for protection of wetlands, streams and other waters will be followed during and after installation of the new 115kV transmission line, and will be used to mitigate temporary impacts from construction activities, such as rutting and destruction of vegetative cover. These measures generally are specified in Santee Cooper's SWPPP with DHEC. They include the use of mulches, hay bales, silt fences or other devices capable of preventing rutting, erosion and migration of sediments. Disturbed land surfaces will be stabilized upon project completion.

The total area of disturbance will be minimized and the destruction of vegetative cover from construction activities will be limited to the required footprint. Measures will include limiting the loss of topsoil, destruction of the existing seed bank, and the compaction of soils by heavy equipment. For unavoidable disturbances, engineering controls will be employed to prevent erosion and sedimentation, and disturbed or cleared areas will be seeded with native perennial

grasses and forbs during the appropriate season to succeed temporary erosion control vegetation.

Existing and future transmission line maintenance may involve vegetation management in wetlands. Ground crews may travel within wetlands using All Terrain Vehicles (ATVs). Foliar treatment using selective, low volume herbicide applications may also be used in wetland areas. Only EPA-approved herbicides registered for use on electrical transmission rights-of-way or in wetlands will be used, per Santee Cooper's Right-of-way Management Unit Plan. Thus, it is expected that only minor and temporary impacts to wetlands will be associated with development and maintenance of the transmission line.

4.11 STREAMS

Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403; 30 Stat. 1151) requires project approval by the USACE prior to the commencement of any work in or over navigable waters of the United States, or which affects the course, location, condition or capacity of such waters. Activities requiring Section 10 permits include the construction of cable or pipeline crossings. Navigable waters regulated by Section 10 are generally restricted to larger rivers and lakes; however, precise definitions of "navigable waters of the United States" or "navigability" are ultimately dependent on judicial interpretation and cannot be made conclusively by administrative agencies. A general definition of "Navigable waters of the United States" is those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce.

Navigable Waters of the U.S. are defined by 33 C.F.R. Part 329 and are protected by Section 404 and other applicable sections of the Clean Water Act (33 U.S.C.A. § 1344). Construction in a navigable waterway (see Section 4.11) of South Carolina, including cables and pipelines, are regulated by the SCDHEC under Section 404 of the Clean Water Act (33 USC 1344). State Navigable Waters are those waters which are now navigable, or have been navigable at any time, or are capable of being rendered navigable by the removal of accidental obstructions, by rafts of timber or by small pleasure or sport fishing boats. All of the alternative routes will cross navigable waters of the state. The transmission line associated with the final route will be designed and constructed in accordance with applicable DHEC and USACE regulations. Once the final route is selected and approved, Santee Cooper will advance the design of the proposed transmission lines and will file for the appropriate DHEC (including CZM certification by OCRM) permit(s), as necessary.

According to the USGS National Hydrology Dataset all of the alternative routes would cross minor streams and agricultural ditches (see Figure 4), while only the Green Route and Pink Route would cross a Navigable Water; the Green Route would cross Pennys Creek twice and the Pink Route would cross Church Creek once. Table 4.15.1 lists the number of stream and navigable waters crossings for each alternative route.

4.12 FLOODPLAINS

All of the transmission routes would cross regulated 100-year floodplains and associated floodways at numerous creek and river crossings. Santee Cooper will avoid locating new

transmission line structures in regulatory floodplains or the floodway wherever possible. Single and H-frame structures are not typically regulated by local floodplain ordinances. Although placement of some structures within the regulatory floodplain may be necessary, these types of structures do not typically present a substantial obstacle to floodwaters and floating debris.

4.13 WATER QUALITY AND WATER RESOURCES

Minimal impacts, primarily consisting of erosion and sedimentation, are likely to occur during land disturbing activities along the transmission line corridor. During construction activities along the transmission line right-of-way Santee Cooper will use Best Management Practices (BMPs) to minimize erosion/sedimentation impacts to adjacent properties and surface waters. These activities are not expected to contribute to the parameters measured by the SCDHEC for impaired water-bodies. The proposed project will not include new impervious areas; therefore, post-construction changes to water quality in stormwater runoff is not expected.

Preliminary planning indicates that installation and replacement of transmission structures at river and stream crossings can be accomplished by setting the transmission structures on the banks in such a way that runoff will be diverted, resulting in minimal impacts to adjacent streams and rivers.

4.14 ENDANGERED, THREATENED, AND OTHER LISTED SPECIES

A current list of federally endangered and threatened plant and animal species for Charleston County was compiled from the USFWS Endangered Species List (USFWS Information, Planning, and Conservation System [IPaC], Version 1.4) was reviewed on September 23, 2016. According to the literature and records review, twenty two federally protected plant and animal species occur within Charleston County (see Table 4.14.1). A search of the South Carolina Department of Natural Resources (SCDNR) Heritage Trust Database indicated that known Bald Eagle populations are located within one mile of the study area.

Table 4.14.1. Current list of federally endangered, threatened, and candidate species in Charleston County, South Carolina (USFWS 2016) and their habitat types.

Common Name	Scientific Name	Status	General Habitat Type
Bald eagle	*Haliaeetus leucocephalus*	BGEPA	coastlines, rivers, large lakes or streams
Bachman's warbler	*Vermivora bachmanii*	E	nest in mature forested wetlands near permanent water bodies and dense understories associated with openings in the forest canopy
Kirtland's warbler	*Setophaga kirtlandii*	E	densely vegetated woodlands, scrub, fencerows, and yards with vegetation less than 1.5 m in height
Piping plover	*Charadrius melodus*	T, CH	nest on coastal beaches, sandflats, and sand dunes above the high tide line; forage in intertidal zones of beaches, mudflats, sandflats, and shorelines of coastal ponds, lagoons, or salt marches
Rufa red knot	*Calidris canutus rufa*	T	Sandy beaches, tidal mudflats, salt marshes, and shallow lagoons with roosting above the high tide line on sandy shoals
Red-cockaded Woodpecker	*Picoides borealis*	E	mature pine forests
Wood stork	*Mycteria americana*	T	forage in fresh and brackish wetlands; nest in cypress or other hardwood swamps

Common Name	Scientific Name	Status	General Habitat Type
Fin whale	*Balaenoptera physalus*	E	coastal waters
Humpback whale	*Megaptera novaengliae*	E	coastal waters
Right whale	*Balaena glacialis*	E	coastal waters
West Indian manatee	*Trichechus manatus*	E, CH	coastal waters
Green sea turtle	*Chelonia mydas*	T, CH	coastal waters
Kemp's Ridley sea turtle	*Lepidochelys kempii*	E	coastal waters
Leatherback sea turtle	*Dermochelys coriacea*	E, CH	coastal waters
Loggerhead sea turtle	*Caretta caretta*	T	coastal waters
Frosted Flatwoods Salamander	*Ambystoma cingulatum*	T, CH	pine areas maintained in an open state by fire with isolated ponds for breeding sites
Atlantic sturgeon	*Acipenser oxyrinchus*	E	most major river systems along the eastern seaboard
Shortnose sturgeon	*Acipenser brevirostrum*	E	most major river systems along the eastern seaboard
American chaffseed	*Schwalbea americana*	E	fire maintained wet savannahs and edge of fire maintained woodlands; open pine forest
Canby's dropwort	*Oxypolis canbyi*	E	pond-cypress savannahs dominated by grasses, sedges or ditches next to bays; borders and shallows of cypress-pond pine ponds and sloughs
Pondberry	*Lindera melissifolia*	E	swamp and pond margins, sandy sinks, swampy depressions, wet flats
Seabeach amaranth	*Amaranthus pumilus*	T	sandy ocean beaches primarily between the high tide line and the toe of the primary dune

E Federally endangered
T Federally threatened
C Candidate
CH Critical habitat
BGEPA Federally protected under the Bald and Golden Eagle Protection Act

Due to the length of the proposed project, a field survey of the preferred alternative will be necessary as a component of the USACE regulatory permitting process. Should the project development have an adverse impact to known populations or individuals of protected species or their habitats, consultations with the USFWS may provide remedies during the USACE regulatory permitting process.

4.15 SUMMARY OF IMPACTS

Table 4.15.1. Johns Island Substation to Queensboro Switching Station - 115kV 100' right-of-way Routing Analysis

	Category	Unit of Measure	Blue Route	Green Route	Pink Route	Yellow Route
Engineering Criteria	Design Criteria					
	Total Length	miles	5.92	7.65	7.23	4.16
	ROW Area	acres	71.78	83.26	87.72	50.55
	Number of PIs	# of PIs	26	31	23	0
	Transmission Line Crossings	# of crossings	1	1	7	1
Environmental Features	Wetlands					
	Forested	acres	29.43	19.23	19.47	10.53
	Emergent	acres	0.56	2.94	0.01	0.00
	Shrub / Scrub	acres	0.00	0.79	0.00	0.00
	Pond / Lake	acres	0.31	0.87	0.00	0.88
	Estuarine & Marine	acres	0.17	19.98	8.29	0.14
	Estuarine & Marine Deepwater	acres	0.00	0.17	0.00	0.00
	Wetland Total	acres	30.47	43.97	27.76	11.55
	Navigable Waters Crossings	# of crossings	0	2	1	0
	Stream Crossings	# of crossings	1	9	7	1
	Water Quality					
	303(d) Impaired Waterbodies	# of crossings	0	0	1	0
	TMDL Waterbodies	# of waterbodies	0	0	0	0
	Floodplain Crossings	# of crossings	2	3	4	1
	Habitat					
	Known Threatened & Endangered Species	Present/Not Present	Present	Present	Present	Present
	Known Intertidal Shellfish Reefs	square feet	0	0	0	0
	Cultural Resources					
	National Register Properties	# of properties affected	0	0	0	0
	Historic Buildings	# of buildings affected	0	0	0	1
	Historical Areas	# of areas affected	2	3	2	1
	Known Archaeological Sites	# of sites affected	1	0	1	0
	Cemeteries	# of cemeteries affected	0	0	0	0
	Hazardous Materials within 100' of ROW	# of hazardous sites affected	0	1	1	3
Socioeconomic Issues	Environmental Justice	Affected/Unaffected	Unaffected	Unaffected	Unaffected	Unaffected
	Subdivision Impact	# of subdivisions affected	6	5	4	9
	Estimated Parcels Affected	# of parcels affected	60	59	52	157
	Potential Relocations (structures within ROW)					
	Residential	# of residential houses affected	9	0	3	17
	Apartment Buildings	# of apartment buildings affected	0	0	0	0
	Commercial	# of commercial buildings affected	0	0	0	4
	Churches	# of churches affected	0	0	0	0
	Total Buildings Affected		9	0	3	21
Critical Areas of Concern	Critical Areas					
	Parks/Preserves	# of parks affected	0	1	0	0
	Charleston Executive Airport & Buffer Area	Inside buffer? Yes/No	No	No	Yes	No
	Historic Sanctuaries / Plantations	# of historic santuaries affected	0	1	0	0
	Major Rivers	# of major rivers affected	0	2	1	0
	Scenic Roadways	# of scenic roadways affected	2	1	1	1
	Center Pivot / Traverse Irrigation Farms	# of farms affected	0	0	0	0
Boundaries	Boundaries					
	Municipal Boundaries	Boundaries affected	Charleston County / City of Charleston	Charleston County / City of Charleston	Charleston County / City of Charleston	Charleston County / City of Charleston
	Zoning Boundaries	# of zoning types affected	6	7	3	9
Costs	**Lines and Poles[1]**					
	Land Acquisition[1]					
	Mitigation[2]		$2,251,191	$1,518,387	$1,489,498	$710,645

[1]Cost estimates to be completed by Santee Cooper

[2]Please note that this project may not require wetlands permitting other than navigable waters crossing as there is no fill required. If land clearing can be conducted without significant soil disturbance, mitigation may not be required for converting forested wetlands, no salt marsh or other herbaceous wetlands are included. This estimate is based off of recent mitigation costs within the region and change based on supply and demand. This estimate is provided for information purposes only and is calculated on typical, not project specific conditions.

5. SUMMARY OF ROUTING ALTERNATIVES

5.1 BLUE ROUTE

Starting at the Johns Island Substation, the Blue Route runs north and then east to bisect the existing residential areas and new subdivisions near the intersection of Maybank Highway and Main Road. After moving away from the densely developed areas around the Maybank Highway, the Blue Route traverses several large parcels to cross River Road and tie into the existing SCE&G electric transmission line just west of the Stono River.

The Blue Route has a total length of 5.92 miles. It crosses an existing Santee Cooper transmission line (Johns Island – Seabrook 115kV) near the Johns Island Substation. With 30.47 acres of estimated wetland impacts and only 1 stream crossing, The Blue Route's environmental impacts are significantly higher than the other alternatives due to a high percentage of forested wetlands. It is important to note the wetland percentages are approximate and mitigation may not be required. The Blue Route alternative right-of-way intersects an estimated 60 parcels, and directly affects 9 residential homes. The feasibility of the Blue Route appears to be affected mostly by attaining new right-of-way within the heavily developed suburban residential subdivisions, located in the center of the Study Area surrounding Maybank Highway and Main Road.

5.2 GREEN ROUTE

Starting at the Johns Island Substation, the Green Route runs north along an existing Santee Cooper transmission line corridor to avoid the residential areas and new subdivisions near the intersection of Maybank Highway and Main Road. Where the Green Route parallels the existing Santee Cooper right-of-way, the new right-of-way width is reduced to 55' since the adjacent right-of-way provides the additional transmission line clearance needed for safety and maintenance. The Green Route then traverses east across mostly large parcels to the existing SCE&G transmission line located within the marsh of Penny's Creek. The Green Route then parallels the existing SCE&G line and eventually ties into the existing SCE&G electric transmission line just west of the Stono River.

The Green Route has a total length of 7.65 miles. It crosses an existing Santee Cooper transmission line (Johns Island – Seabrook 115kV), near the Johns Island Substation, and runs parallel to two separate existing Santee Cooper transmission lines (Stono Tap 115kV and Mateeba – Johns Island 230-115kV). The necessary right-of-way width along the existing Santee Cooper transmission lines is 55 feet instead of 100 feet. With 43.97 acres of estimated wetland impacts and 9 stream crossings, the Green Route has more environmental impacts compared to the other alternatives; however the majority of those impacts are located in the estuarine and marine wetlands associated with Pennys Creek and the Stono River, which are understood to have de minimis mitigation costs. The Green Route alternative right-of-way intersects an estimated 59 parcels, which is the latest readily available data provided by Charleston County GIS Department. The Green Route would not directly impact any residential homes or

commercial businesses. The Green Route appears to be feasible since the majority of the proposed route parallels existing transmission lines.

5.3 PINK ROUTE

Starting at the Johns Island Substation, the Pink Route takes a southern direction to avoid the residential areas and new subdivisions near the intersection of Maybank Highway and Main Road. Although the Pink Route runs near Angel Oak Park, it maintains a reasonable separation such that the viewshed and use of Angel Oak Park is likely unaffected. The Pink Route then runs along the edge of the marsh of Church Creek across primarily rural land. Lastly, the Pink Route runs north crossing Plow Ground Road and River Road and eventually ties into the existing SCE&G electric transmission line just west of the Stono River.

The Pink Route has a total length of 7.23 miles. It crosses multiple existing Santee Cooper transmission lines within the Johns Island Substation, and three existing Santee Cooper transmission lines (Stono Tap 115kV, Wadmalaw Tap 115kV, and Johns Island – Seabrook 115kV). With only 27.76 acres of estimated wetland impacts and 7 stream crossings, the Pink Route has similar environmental impacts compared to the other alternatives. The Pink Route alternative right-of-way intersects an estimated 52 parcels, and directly impacts three residential homes. The feasibility of the Pink Route appears to be affected mostly by attaining new right-of-way near Church Creek and north of Plow Ground Road and the direct impacts of the residential homes.

5.4 YELLOW ROUTE

The Yellow Route was created as a point of comparison to demonstrate the environmental and socioeconomic issues associated with a simple straight-line route. The Yellow Route has a total length of only 4.16 miles. However, the Yellow Route alternative right-of-way would intersect 157 parcels, far more than the other route alternatives, and require approximately 21 potential relocations, and run through the center of large subdivisions within the center of the Study Area. Although it only impacts an estimated 11.55 acres of wetlands and 1 stream crossing, the significant number of parcels affected, relocations, and adverse impacts to the existing subdivision communities likely makes this route impractical in light of the other alternatives.

6. REQUIRED PERMITTING

Based on the project scope, regardless of which route is selected, it is estimated that the following permitting actions will be required:

- Section 404 Clean Water Act Department of the Army permitting for wetland/stream impacts;
- Section 401 Clean Water Act Water Quality Certification;
- Section 7 (Endangered Species Act of 1973, as amended) compliance;
- Section 106 of the National Historic Preservation Act of 1966 compliance;
- Compliance with South Carolina Stormwater Management and Sediment Reduction Act;
- Coverage under the South Carolina Construction General Permit;

- Coastal Zone Management Act Consistency Determination with Critical Area permit from SCDHEC – Office of Coastal Resource Management;
- Section 9 of the Rivers and Harbors Act of 1899 coordination with the USCG; and
- Section 10 Navigable Water Permitting, Rivers and Harbors Act of 1899 compliance.

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FIGURES

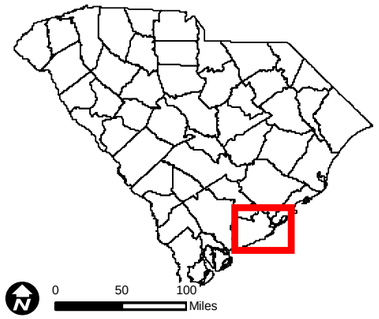

Figure 1. Site Location Map

115 kV Transmission Line Siting Study
Johns Island - Queensboro
Charleston County, South Carolina

Legend

Study Area

Santee Cooper

amec foster wheeler

Job No.	6250-16-0115
Drawn By:	BWS
Reviewed By:	WFL
Date:	04/11/2017

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Study Area

Johns Island

Charleston

Mt Pleasant

Isle of Palms

Sullivans Island

Folly Beach

Ravenel

Hollywood

Adams Run

Meggett

Wadmalaw Island

Rockville

Seabrook Island

Kiawah Island

Edisto Island

0 4 8 Miles

Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

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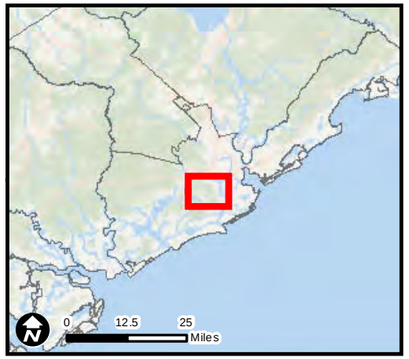

Figure 2. Route Alternatives Location Map

115 kV Transmission Line Siting Study
Johns Island - Queensboro
Charleston County, South Carolina

Legend

- Study Area
- Substation

Preliminary Routes

- Blue Route
- Green Route
- Pink Route
- Yellow Route

Existing Transmission Line

- South Carolina Electric and Gas
- Santee Cooper

Santee Cooper

amec foster wheeler

Job No.	6250-16-0115
Drawn By:	BWS
Reviewed By:	WFL
Date:	6/7/2017

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Green Route
Blue Route
Pink Route
Yellow Route
Pink & Blue Route
Pink Route
Johns Island Substation
Approximate SCE&G tie-in Location
Johns Island
Charleston Executive Airport
Stono River
Charleston Municipal Golf Course
Johns Island County Park

0 0.75 1.5 Miles

Esri, DeLorme, GEBCO, NOAA NGDC, and other contributors
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

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Figure 3. Siting Analysis Map

115 kV Transmission Line Siting Study
Johns Island - Queensboro
Charleston County, South Carolina

Legend

- Study
- Substation
- Preliminary Route PIs
- Blue Route
- Green Route
- Pink Route
- Yellow Route
- Cemeteries (Known)
- Impaired 303D Station
- Historic Structures, NRHP, Civil War earthworks
- EDR Listed Facilities
- SCDOT I-526 Alternative
- Parcels
- Building Outlines within ROWs
- Parks
- Historic Areas, NRHP, Archaeological Sites
- Shellfish Beds (Known)

Existing Transmission Line

- South Carolina Electric and Gas
- Santee Cooper

National Wetland Inventory

- Estuarine Marin
- Freshwater Forest, Emergent, Shrub/Scrub, Pond, Lake

Santee Cooper

amec foster wheeler

Job No.	6250-16-0115
Drawn By:	BWS
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Date:	6/7/2017

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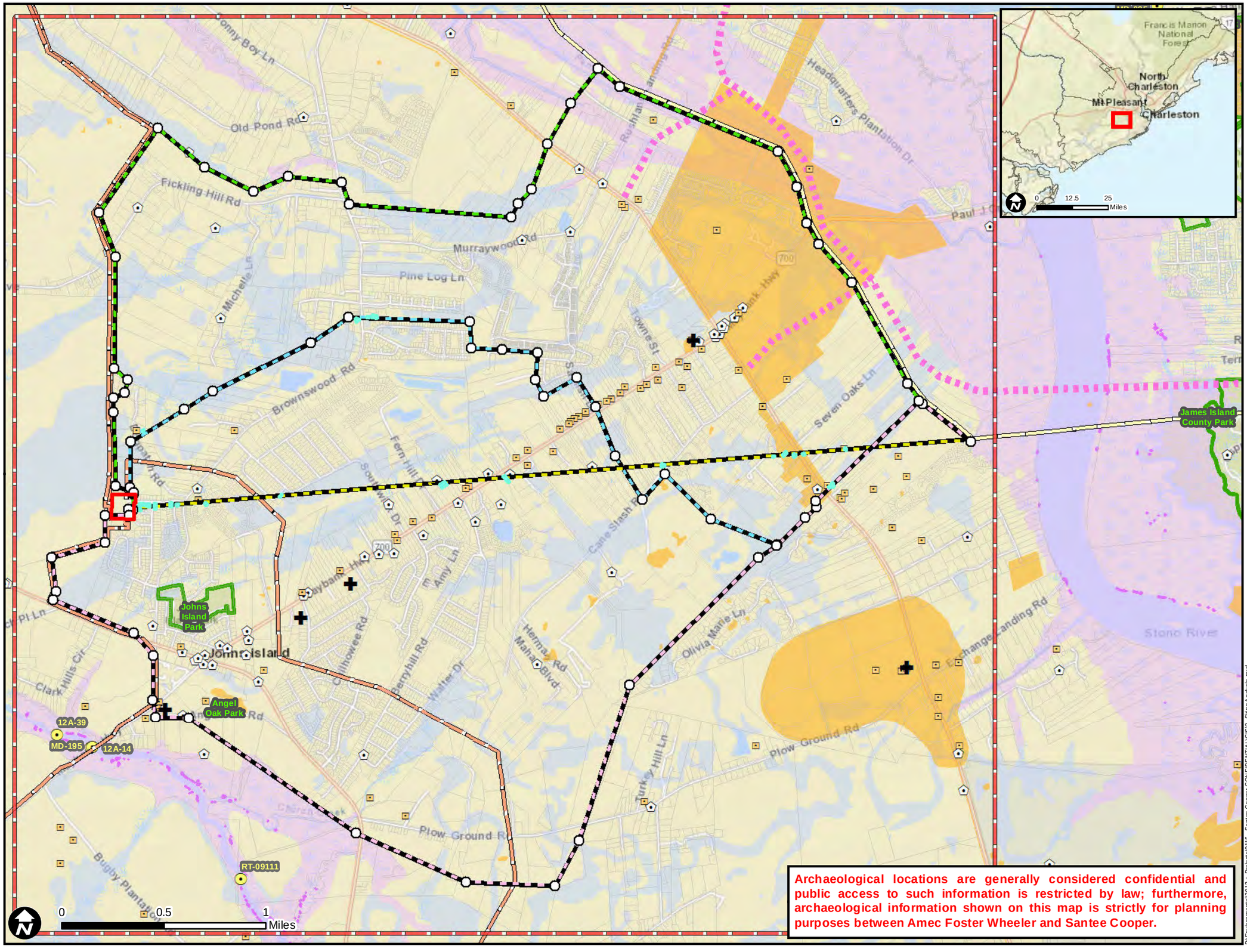

Archaeological locations are generally considered confidential and public access to such information is restricted by law; furthermore, archaeological information shown on this map is strictly for planning purposes between Amec Foster Wheeler and Santee Cooper.

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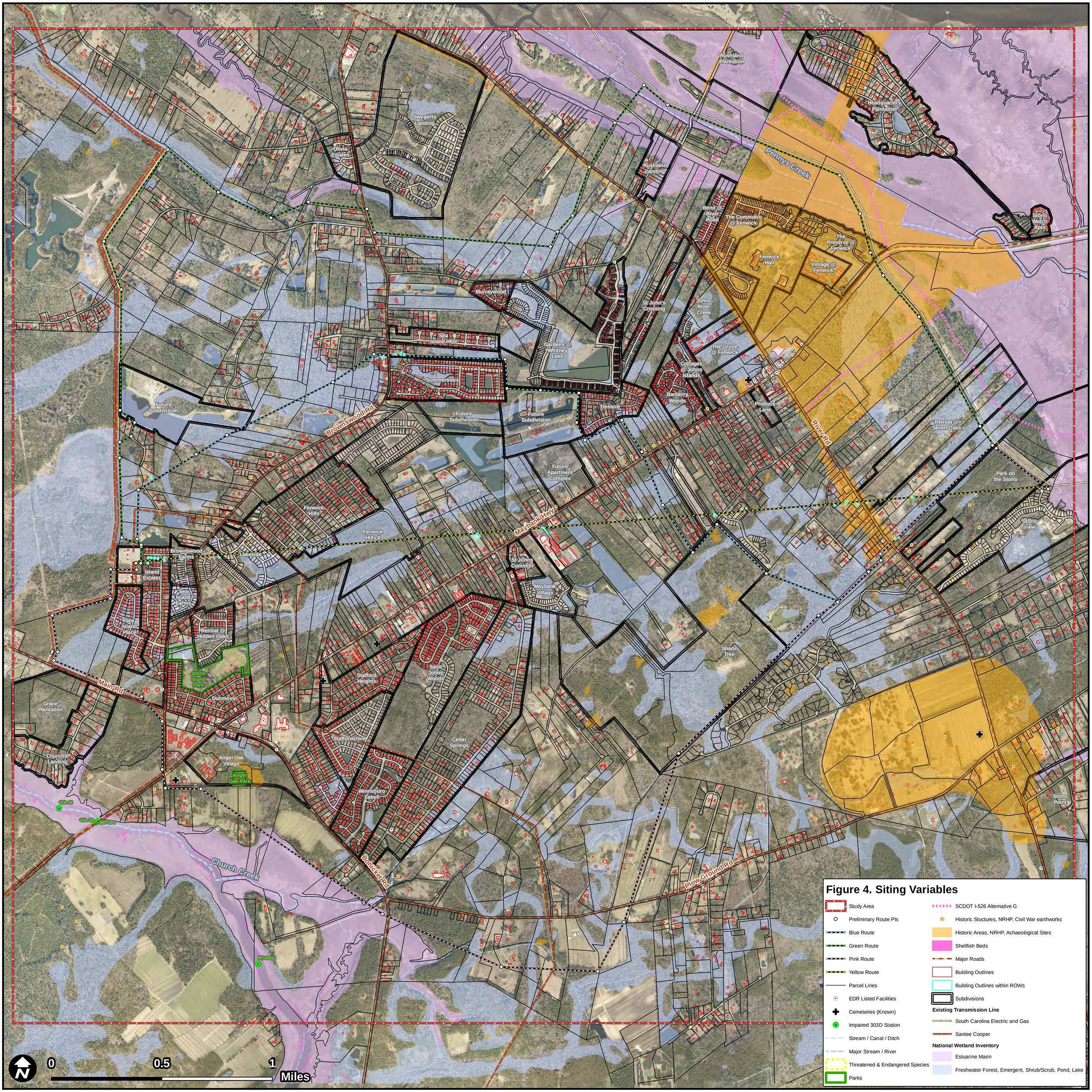

Figure 4. Siting Variables

- Study Area
- Preliminary Route PIs
- Blue Route
- Green Route
- Pink Route
- Yellow Route
- Parcel Lines
- EDR Listed Facilities
- Cemeteries (Known)
- Impaired 303D Station
- Stream / Canal / Ditch
- Major Stream / River
- Threatened & Endangered Species
- Parks
- SCDOT I-526 Alternative G
- Historic Stuctures, NRHP, Civil War earthworks
- Historic Areas, NRHP, Achaeological Sites
- Shellfish Beds
- Major Roads
- Building Outlines
- Building Outlines within ROWs
- Subdivisions

Existing Transmission Line

- South Carolina Electric and Gas
- Santee Cooper

National Wetland Inventory

- Estuarine Marin
- Freshwater Forest, Emergent, Shrub/Scrub, Pond, Lake