SOUTH CAROLINA ELECTRIC & GAS COMPANY

Columbia, South Carolina

V.C. SUMMER NUCLEAR STATION
UNITS 2 AND 3
TRANSMISSION LINE SITING STUDY
SCE&G

August 2008

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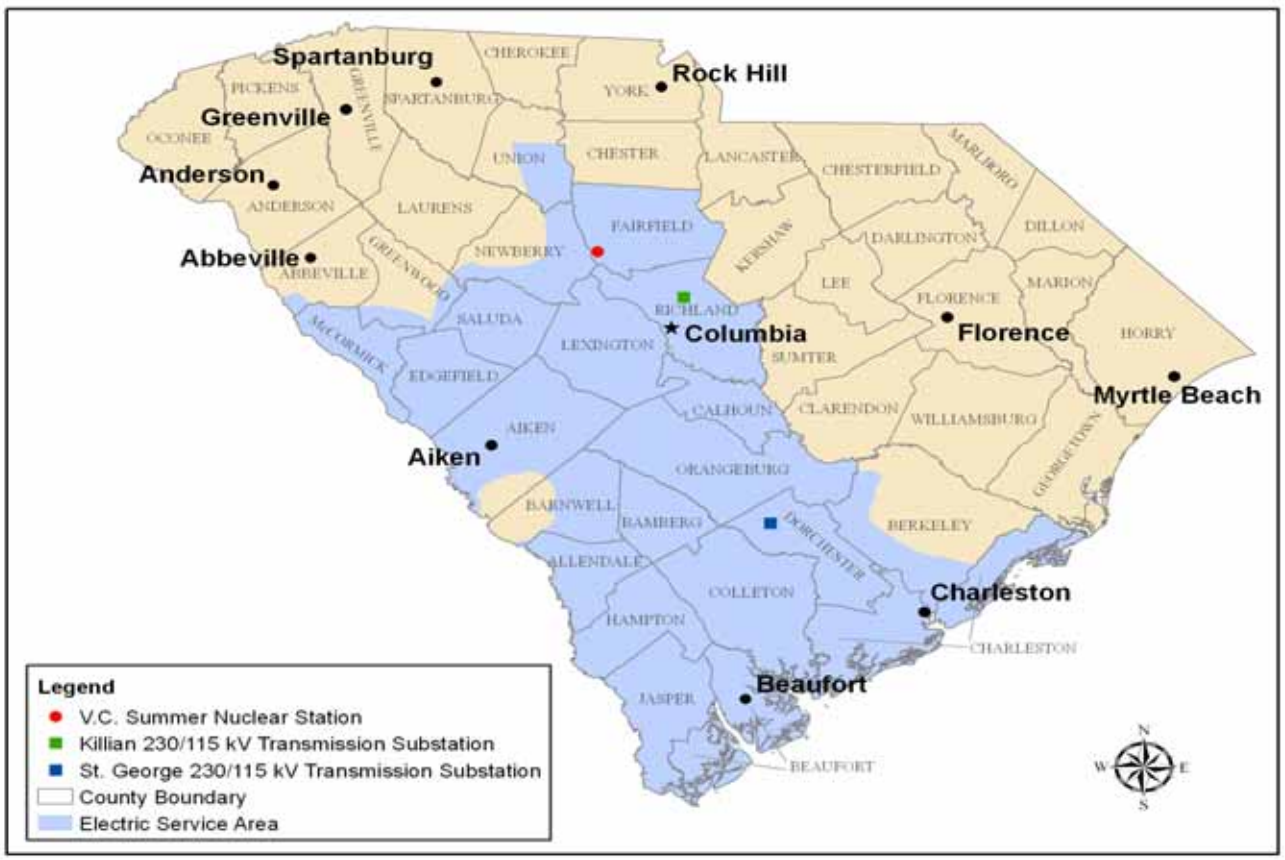
1.0 Introduction

1.1 Background Information

To maintain an adequate supply of reliable, electrical energy to serve the projected future demand throughout central and southern South Carolina, South Carolina Electric & Gas Company ("SCE&G") and the South Carolina Public Service Authority ("Santee Cooper") submitted an application on March 31, 2008 to the Nuclear Regulatory Commission ("NRC") for a combined construction and operating license ("COL") for two nuclear generating units, each having a net electrical output of 1117 megawatts. The COL, once approved, would authorize SCE&G and Santee Cooper to build and operate up to two additional nuclear generating units at the utilities' existing V.C. Summer Nuclear Station site in Jenkinsville, SC.

SCE&G, a subsidiary of SCANA Corporation, supplies electrical energy to more than 639,000 customers throughout its 13,050-square mile electric service area that includes all or portions of 26 counties in central and southern South Carolina (*Figure 1.1-1*).

Figure 1.1-1 SCE&G Electric Service Area



Santee Cooper distributes electrical energy to more than 160,000 residential and commercial customers in Berkeley, Georgetown, and Horry counties. Santee Cooper also generates electrical energy that is distributed by the 20 electric cooperatives in South Carolina to more than 685,000 customers in all 46 counties in South Carolina. All total, nearly 2 million South Carolinians receive their electrical energy directly or indirectly from Santee Cooper.

Throughout this report, the two new nuclear generating units, which will be called V.C. Summer Unit 2 and Unit 3, will be referred to as **VCSNS 2 and VCSNS 3**. The existing nuclear generating unit at the V.C. Summer Nuclear Station will be referred to as **VCSNS 1**.

1.2 Required New 230 kV Lines Associated with V.C. Summer Units 2 and 3

SCE&G and Santee Cooper have determined that six new 230 kV circuits originating at the V.C. Summer Nuclear Station will be required to add the generated capacity of VCSNS 2 and 3 to their electric transmission power grids. SCE&G plans to add four new 230 kV circuits by building three new 230 kV lines (one new single-circuit line; one new double-circuit line; and upgrading one existing single-circuit line to a new double circuit line); Santee Cooper will build two single-circuit lines. The following is a description of the new lines that will be required:

SCE&G Lines

1. VCSNS–Killian 230 kV Line

   This SCE&G single-circuit line will be routed between the existing VCSNS 1 switchyard and SCE&G's existing Killian Substation. The straight line distance is approximately 25-miles. This line will be called the **VCSNS-Killian Line** throughout this report.

2. VCSNS–Lake Murray #2 230 kV Line

   This SCE&G single-circuit line will be routed between the VCSNS 2 and 3 switchyard and SCE&G's existing Lake Murray Transmission Substation. SCE&G plans to upgrade an existing single-circuit 230 kV line that runs from the VCSNS 1 switchyard to the Lake Murray Transmission Substation (the Lake Murray #1 230 kV Line) to a double-circuit 230 kV line; therefore, the VCSNS-Lake Murray #2 230 kV Line will run with the existing VCSNS Lake Murray #1 230 kV Line on new double-circuit structures and will be built entirely within existing SCE&G transmission line right-of-way. The straight-line distance between the VCSNS 2 and 3 switchyard and the Lake Murray Transmission Substation is approximately 17.6-miles. In this report, the new 230 kV Line that will run from the VCSNS 2 and 3

switchyard to the existing Lake Murray Transmission Substation with the existing Lake Murray #1 230 kV Line is referred to as the **VCSNS-Lake Murray #2 Line**.

3. VCSNS–St. George #1 and #2 230kV Line

   The VCSNS 3-St. George #1 and #2 230 kV Line will be constructed as a single-pole, double-circuit line (circuits #1 and #2) running from the VCSNS 2 and 3 switchyard to a new 230/115 kV transmission substation that will be built on property currently owned by SCE&G near St. George, S.C. The straight-line distance is approximately 86-miles. This line is called the **VCSNS-St. George Line** in this report.

Santee Cooper Lines

1. Santee Cooper plans to build two new 230 kV Lines. One will be called the VCSNS-Flat Creek 230 kV Line and one will be called the VCSNS-Varnville 230 kV Line. These lines will be fully addressed in a separate transmission line report prepared by Santee Cooper.

In addition to the new SCE&G and Santee Cooper 230 kV lines discussed above, SCE&G will construct three tie lines to run between the Unit 1 and Units 2 and 3 switchyards. These short lines will be entirely on the V.C. Summer Nuclear Station site and are not addressed in this report.

1.3 Overview of the Siting Studies for the VCSNS-Killian and VCSNS-St. George Lines

SCE&G completed extensive transmission line siting studies to identify potential, viable corridors for both the VCSNS-Killian and VCSNS-St. George 230 kV Lines. The VCSNS-Lake Murray #2 Line will utilize existing right-of-way for its entire length; therefore, a comprehensive siting study was not necessary to determine a new line route for it. The potential effects associated with rebuilding the existing Lake Murray 230 kV Line #1 that runs from the VCSNS 1 switchyard to the Lake Murray Transmission Substation from single-circuit to double-circuit to accommodate the VCSNS-Lake Murray #2 Line are addressed in this report.

The siting studies for the VCSNS-Killian and VCSNS-St. George Lines were conducted by applying key parts of SCE&G's comprehensive, three-phase transmission line siting process that allows computerized, state-of-the-art data collection, mapping, analysis and application. The siting process enables the development of potential routes for new transmission lines that will avoid or minimize effects to environmental resources, cultural resources, scenic quality, and land uses.

The siting studies for the VCSNS-Killian and VCSNS-St. George Lines included the collection, weighting, and mapping of an array of environmental, cultural resources and land use data, and the development of "suitability mapping" over two "siting study areas". Siting study areas are broad geographic areas through which any reasonable route for a future transmission line will be located. Based on the array of data collected within each of the two siting study areas (data which is weighted according to each factor's sensitivity to transmission line construction), the suitability mapping displays the cumulative effect of the combined, overlapping data. The areas of least constraint to routing a new transmission line, the areas with highest constraint, and the full range of constraint conditions between the least and highest extremes are displayed. Using the suitability mapping, one potential route for the VCSNS-Killian 230 kV Line and one for the VCSNS-St. George 230 kV Line were developed through areas of relatively low constraint. Following a field inspection and verification of each route's current potential as a feasible route, SCE&G conducted a quantitative evaluation of the two potential routes to accurately determine effects each one would likely have on environmental resources, cultural resources, and land use.

The primary goal of the siting studies was to identify one potential route for the VCSNS-Killian Line and one for the VCSNS-St. George Line and document the magnitude of impacts that would likely result from construction of the lines over the potential routes. SCE&G plans to execute its comprehensive, three phase process to select final routes once the final decision is made to construct VCSNS 2 and 3. At that time, SCE&G will update the data within each siting study area and implement the public involvement steps in the siting process (community workshops). Based on the updated data, alternate routes will be developed for each of the future 230 kV lines and an alternative analysis will be conducted for each. A comprehensive evaluation and ranking of the routes will be completed before selecting the final routes. SCE&G is confident, however, that potential routes presented in this report for the VCSNS-Killian and VCSNS-St. George 230 kV Lines that were developed in the siting studies are representative of the actual routes that may be selected in the future. SCE&G believes it is reasonable to predict that precise environmental, cultural, and land use resource effects associated with the final, selected routes in the 2011-2012 and 2015-2016 timeframes for the VCSNS-Killian and VCSNS-St. George 230 kV Lines, respectively, will be very similar to the effects that are presented in this report for the potential routes.

These siting studies allowed the quantification of impacts that would result from construction of the VCSNS-Killian and VCSNS-St. George Lines over the potential routes that were developed following the mapping and weighting of an array of data. The suitability mapping

developed during the siting studies provides conclusive evidence that multiple routing opportunities currently exist within the VCSNS-Killian and VCSNS-St. George siting study areas that will allow development of multiple, alternate routes for evaluation and ranking prior to selecting the final routes. The potential routes presented in this report are representative, if not optimum ones through the siting study areas based on the application of current and comprehensive data.

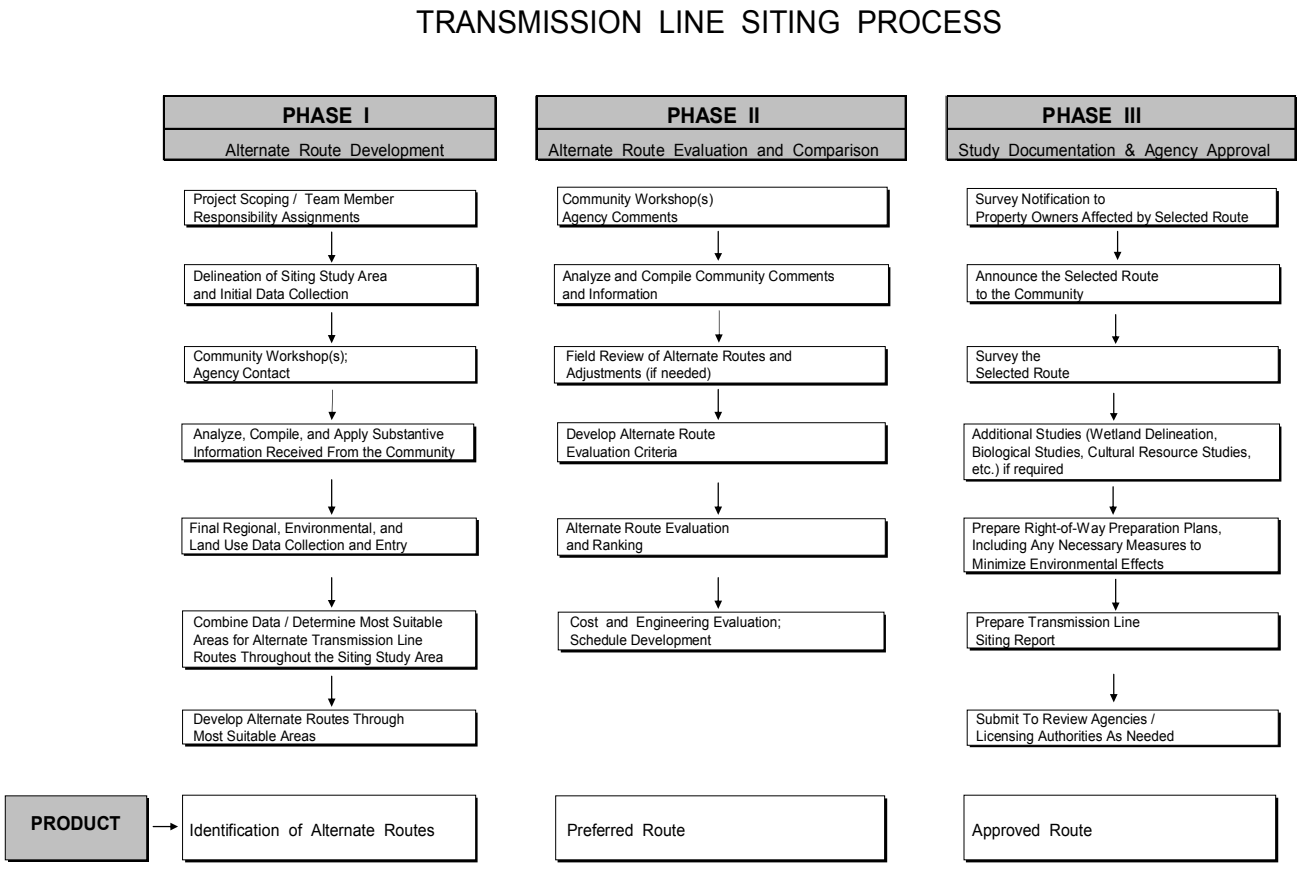
2.0 The SCE&G Transmission Line Siting Process

Development of SCE&G's transmission line siting process began in early 1989 and was completed in late 1990. The goal of the development effort was to develop a transmission line siting tool that would ensure appropriate consideration and application of the many important factors that should influence transmission line siting decisions. A thorough review of relevant statutory requirements applicable to siting transmission lines was completed during the siting process development so mechanisms could be incorporated to ensure compliance with the many state and federal regulatory requirements. SCE&G's siting process was modeled and based on criteria developed by a team of environmental experts, engineers, landscape architects, environmental professionals, and attorneys who hosted conferences in Atlanta, Denver, and San Francisco. These conferences included representatives of 23 electric utility companies from across the U.S. and Canada. The group discussed and documented siting practices that were working well, ones that were not, and issues (including emerging issues) that should be addressed when siting transmission lines. The 1½-year transmission line siting process development effort produced a comprehensive, three-phase transmission line siting process (*Figure 2.0-1*) that possesses the following key attributes:

- A rational, objective decision-making framework leading to routing decisions that are objective, defensible and traceable;
- Integration of real estate, engineering, environmental, land use, cultural resource, economic, and community considerations, at appropriate levels and times, throughout the siting process;
- Rational progression from the "global" identification and consideration of practical routing opportunities to a narrowing of candidate routes based on quantifiable and objective data;
- The application of state-of-the-art technology to collect, combine, and analyze an array of diverse data sets that are applied to siting decisions;
- A systematic process framework that provides for the identification of relevant issues that should affect siting decisions and a mechanism to appropriately factor them into the siting process; and,
- A procedural progression from the beginning of siting efforts to the selection of final routes that ensures fairness and balance by the application of factors to siting decisions that result in minimizing effects to an array of environmental, cultural, aesthetic, and land use resources.

Figure 2.0-1 displays SCE&G's adopted, comprehensive, three-phase transmission line siting process.

Figure 2.0-1 SCE&G Transmission Line Siting Process



Phase I of the transmission line siting process focuses on collecting all land use, environmental, cultural, and engineering data that should influence the development of alternate routes. It includes the delineation of a siting study area, collection of data within it, community workshops for the purpose of receiving information from the people within the siting study area, weighting of the data to reflect the individual data factor's sensitivity to line construction, and combining the weighted data to determine its cumulative influence on line siting. Phase I concludes with the development of alternate routes through areas of lowest constraint to the maximum practical extent.

Phase II of SCE&G's transmission line siting process is designed to evaluate and compare the alternate routes on a quantitative and qualitative basis. This phase of the siting process includes a second data weighting procedure and the application of data quantities relative to each

alternate route, such as the number of homes within 100' of potential routes, homes from 100-200' of each potential route, the acres of wetlands within right-of-way that would be associated with each alternate route, etc., and a second and final public workshop for public comments/input. Phase II includes scoring each alternate route to relate each route's affects to land use, environmental resources, cultural resources, and aesthetic resources. Phase II concludes with the selection of a final route that minimizes impacts to these discussed effects.

Phase III of SCE&G's transmission line siting process incorporates and/or includes property owner notification, surveying of the selected route, intensive field investigations along the selected route to determine the location and identification of any sensitive resources in the right-of-way that will need to be addressed, construction planning, agency contact (as appropriate), state and federal project permitting and/or licensing, formal documentation of the siting study, and right-of-way easement negotiation and procurement.

The application of SCE&G's transmission line siting process was customized to conduct the siting studies that led to the development of one potential route each for the VCSNS-Killian and VCSNS-St. George 230 kV Lines. Rather than developing multiple alternate routes for each line during Phase I of the transmission line process for evaluation and comparison in Phase II, only one potential route was developed for each line. The potential routes were developed after fully executing Phase I of the siting process, with exception of the public involvement steps. The potential routes are believed to be representative, if not optimum ones based on the array of data collected, weighted, and combined in the siting process to produce suitability mapping for the VCSNS-Killian and VCSNS-St. George 230 kV Lines siting study areas. Based on the collected and weighted data, the suitability mapping displayed the areas with highest constraint to routing, the areas with lowest constraint, and the full range of constraint conditions between the high and low extremes. In Phase II of the siting process, SCE&G quantified the predicted land use, environmental and cultural resource effects that would occur if the VCSNS-Killian and VCSNS-St. George Lines should be built over the potential routes that were developed for each line. This approach was taken since the final routes for the VCSNS-Killian and VCSNS-St. George Lines will not be selected until the 2011-2012 and 2015-2016 timeframes, respectively. Prior to the selection of the final routes, SCE&G will update the siting studies, develop multiple alternate routes for each new line, and fully execute Phases II and III of the transmission line siting process.

3.0 Project Description

3.1 Transmission Line Design and Right-of-Way Requirements

The existing V.C. Summer Nuclear Station Unit 1 switchyard is currently connected to the SCE&G and Santee Cooper power grid by eight 230 kV lines (eight 230 kV circuits). SCE&G has determined that four new 230 kV circuits will be required to provide electrical transmission capacity necessary to add the generated capacity of VCSNS Units 2 and 3 to its power grid. The four new circuits will be accommodated by constructing one new single-circuit line, upgrading one existing single-circuit line to a new double-circuit line, and constructing one new double-circuit line. The new single-circuit line will run from the VCSNS Unit 1 switchyard to the existing Killian 230/115 kV Transmission Substation (*Figure 3.1-1*); the existing single-circuit VCSNS-Lake Murray #1 230 kV Line that runs from the VCSNS Unit 1 switchyard to the Lake Murray Transmission Substation will be rebuilt as a double-circuit to accommodate the second 230 kV circuit that will originate at the VCSNS Unit 2 and 3 switchyard (*Figure 3.1-2*); and the new double-circuit 230 kV line will run from the VCSNS Unit 2 and 3 switchyard to a new 230/115 kV transmission substation that will be built near St. George, SC on property currently owned by SCE&G (*Figure 3.3-3*).

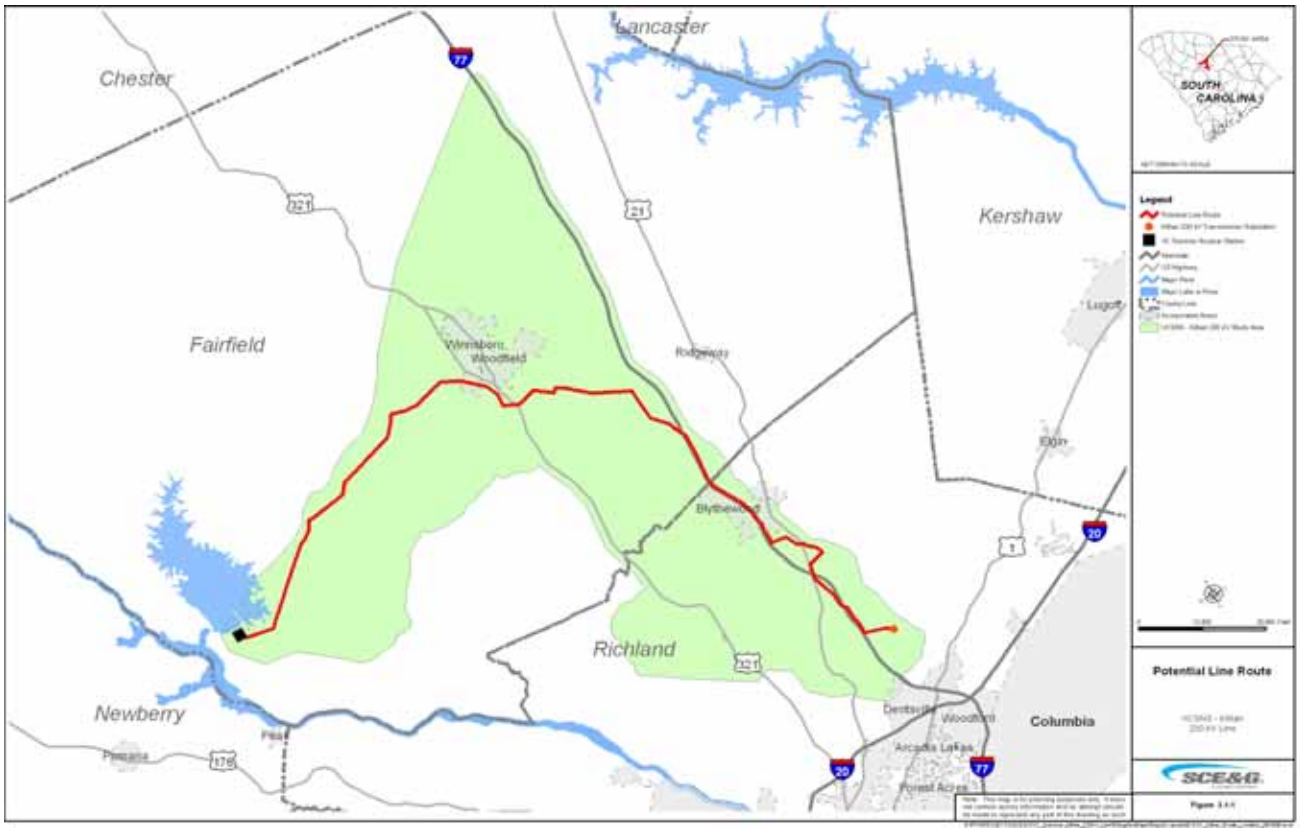


Figure 3.1-1 VCSNS-Killian 230 kV Line Potential Route Location

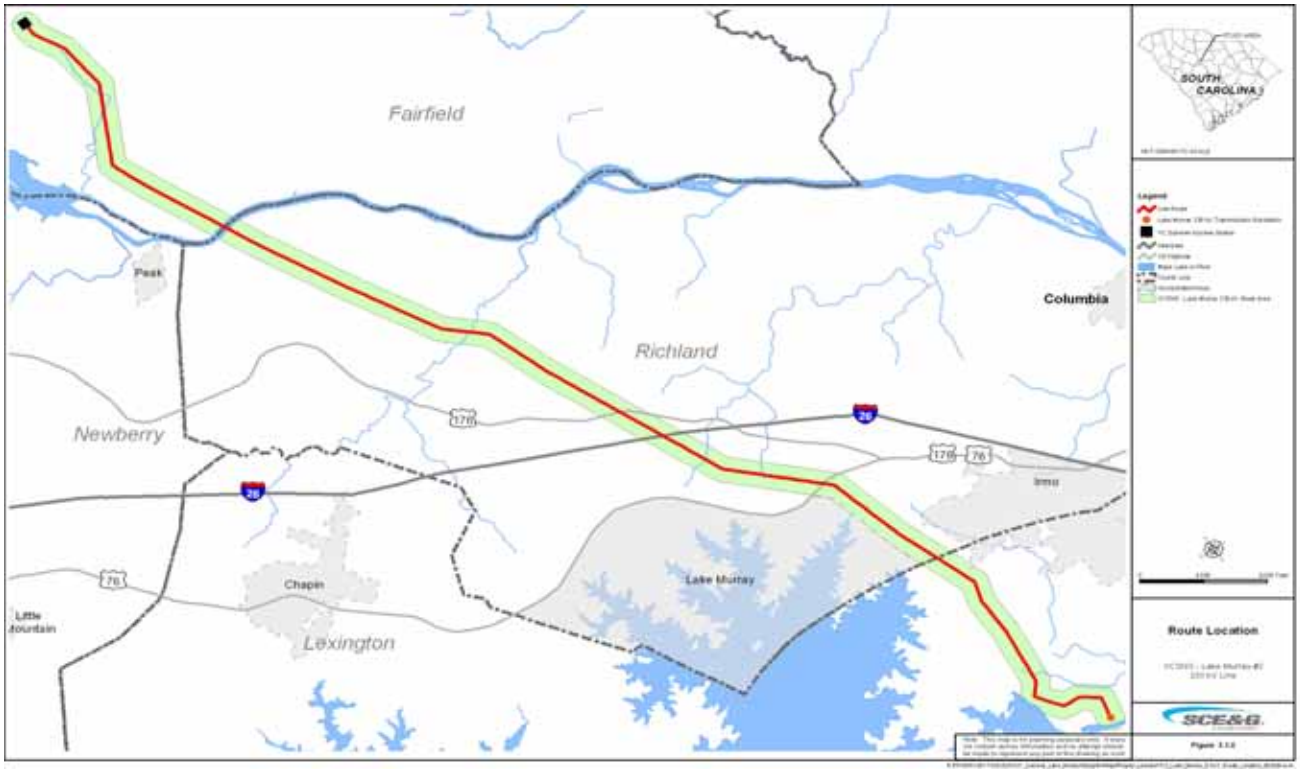


Figure 3.1-2 VCSNS-Lake Murray #2 230 kV Line Route Location

Figure 3.1-3 VCSNS-St. George 230 kV Line Potential Route Location

Across open country where the new SCE&G lines are not parallel to existing utility lines or roads, the right-of-way width will be 100-feet. Where the new VCSNS-Killian and VCSNS-St. George 230 kV Lines closely parallel existing SCE&G transmission lines, the existing right-of-way width will be increased by 70-feet to accommodate the new lines. Where they parallel existing transmission lines of other utilities, the right-of-way width will be 100-feet, and where they closely parallel road rights-of-way, the right-of-way width may be less than 100-feet depending on specific circumstances. No new right-of-way will be required for the VCSNS-Lake Murray #2 230 kV Line. An existing single-circuit 230 kV line, the VCSNS-Lake Murray #1 230 kV Line, that runs from the V.C. Summer Nuclear Station to the Lake Murray Transmission Substation will be upgraded to a double-circuit 230 kV line to accommodate the VCSNS-Lake Murray #2 Line on the existing right-of-way. Since it will occupy an existing right-of-way, a siting study was not conducted to determine its route.

SCE&G will use its standard 230 kV line structures, which consist of single steel or concrete poles, for the new single-circuit and new double-circuit lines. The pole structures will typically be spaced between 500 and 800' apart, depending on topographical conditions. The height of the poles will typically range from 85 to105-feet (*Figures 3.1-4 and 3.1-5 depict a typical delta and double-circuit configuration, respectively*).

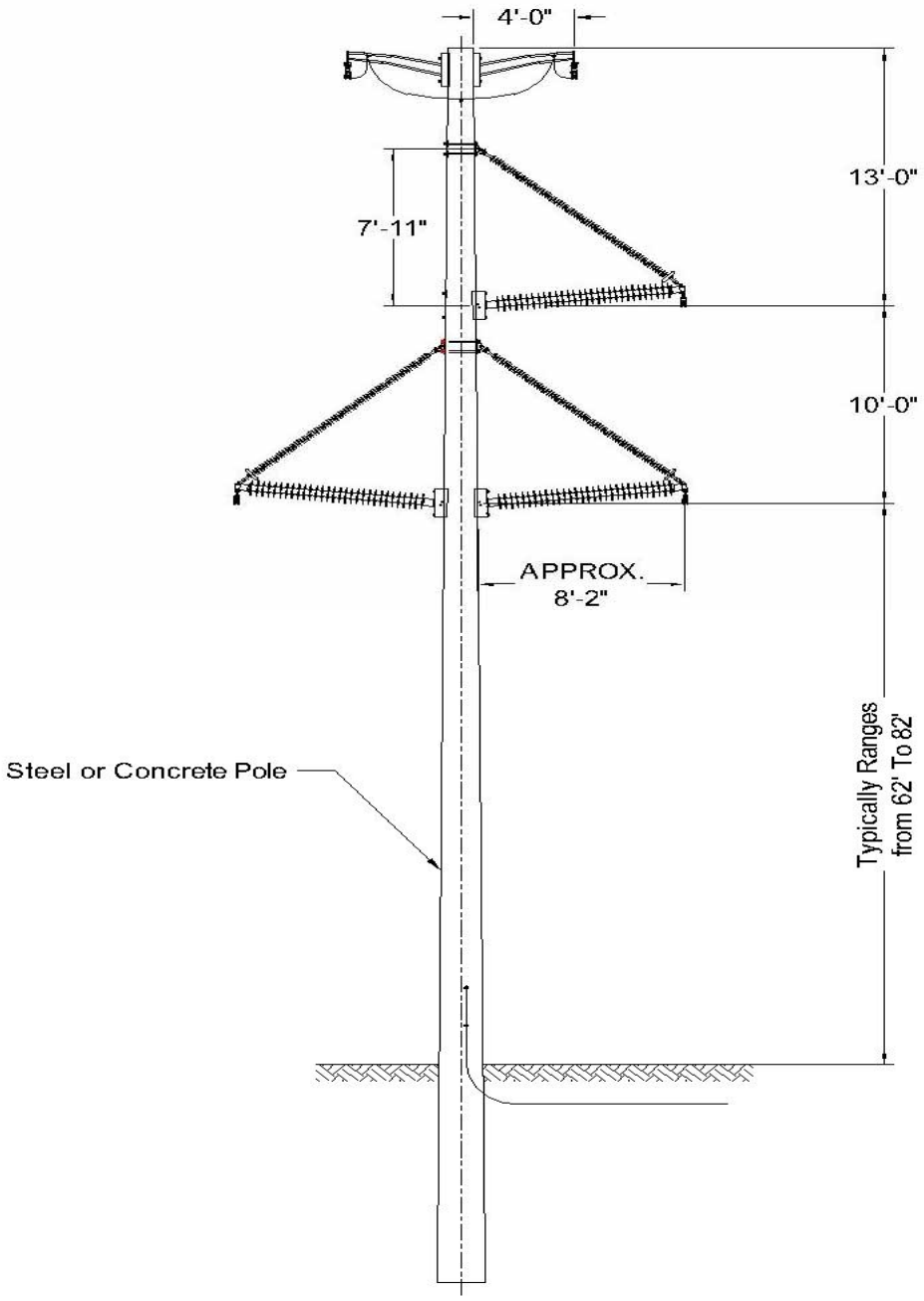


Figure 3.1-4 Typical SCE&G Single-Circuit 230 kV Delta Structure Configuration

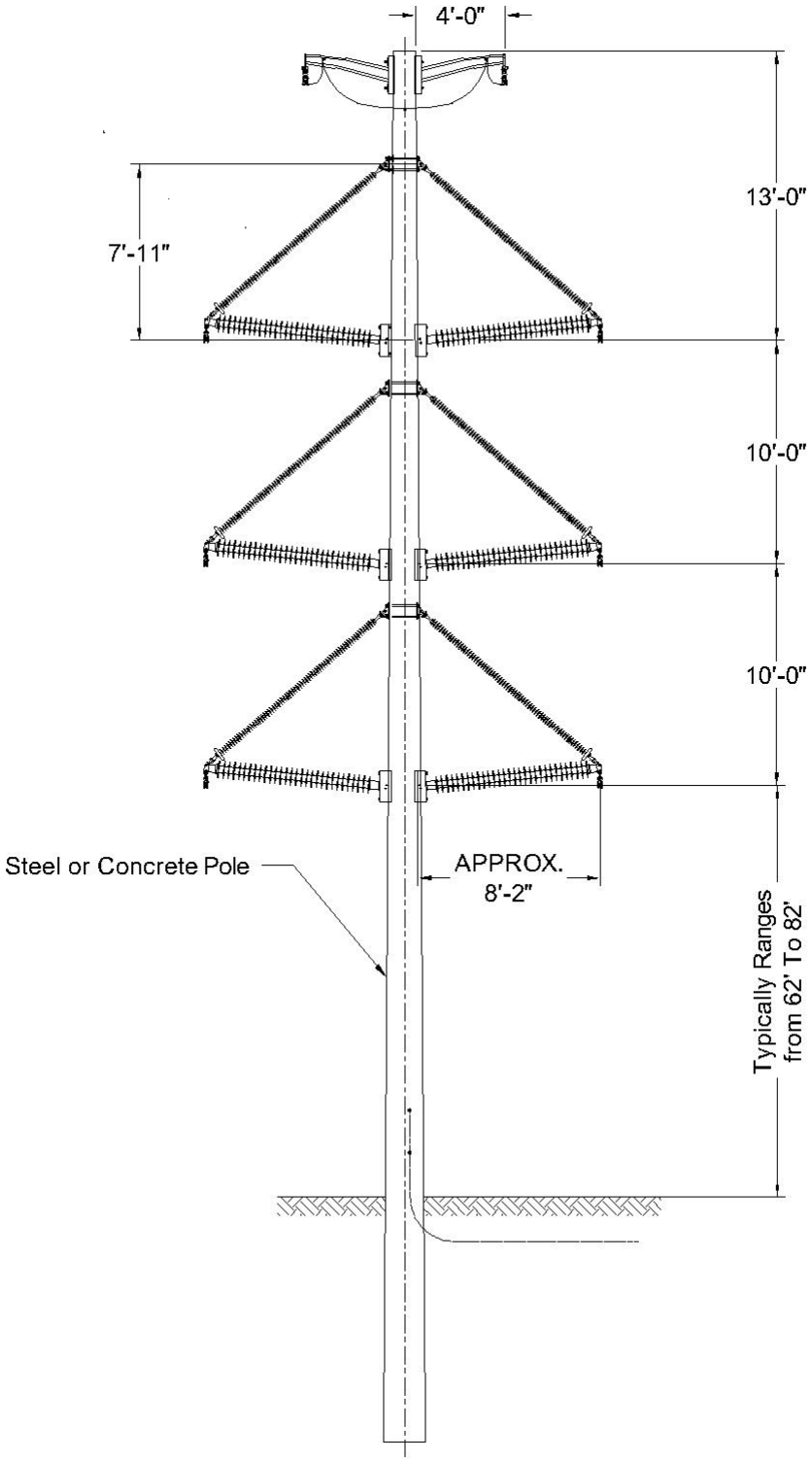


Figure 3.1-5 Typical SCE&G Double-Circuit 230 kV Structure Configuration

3.2 Siting Methodology

To accurately assess potential environmental, cultural resource, and land use effects associated with the new line routes that will be required by the VCSNS-Killian and VCSNS-St. George 230 kV Lines, SCE&G conducted extensive transmission line siting studies that led to the development of potential routes for each of the future lines. The siting studies were conducted by applying SCE&G's comprehensive, three-phase transmission line siting process that allowed the potential routes to be developed through areas of low constraint within defined geographic areas called "***siting study areas***". Prior to the selection of final routes for the two required lines at a future date, SCE&G will update the study, including execution of the public involvement steps of the siting process, identify alternate routes, and conduct a comprehensive quantitative and qualitative alternative analysis of all alternate routes prior to the selection of final routes.

A siting study was not required for the VCSNS-Lake Murray #2 Line since it will be built on existing right-of-way; however, the anticipated impacts associated with the line rebuild have been quantified and are included in this report.

3.3 Siting Study Areas

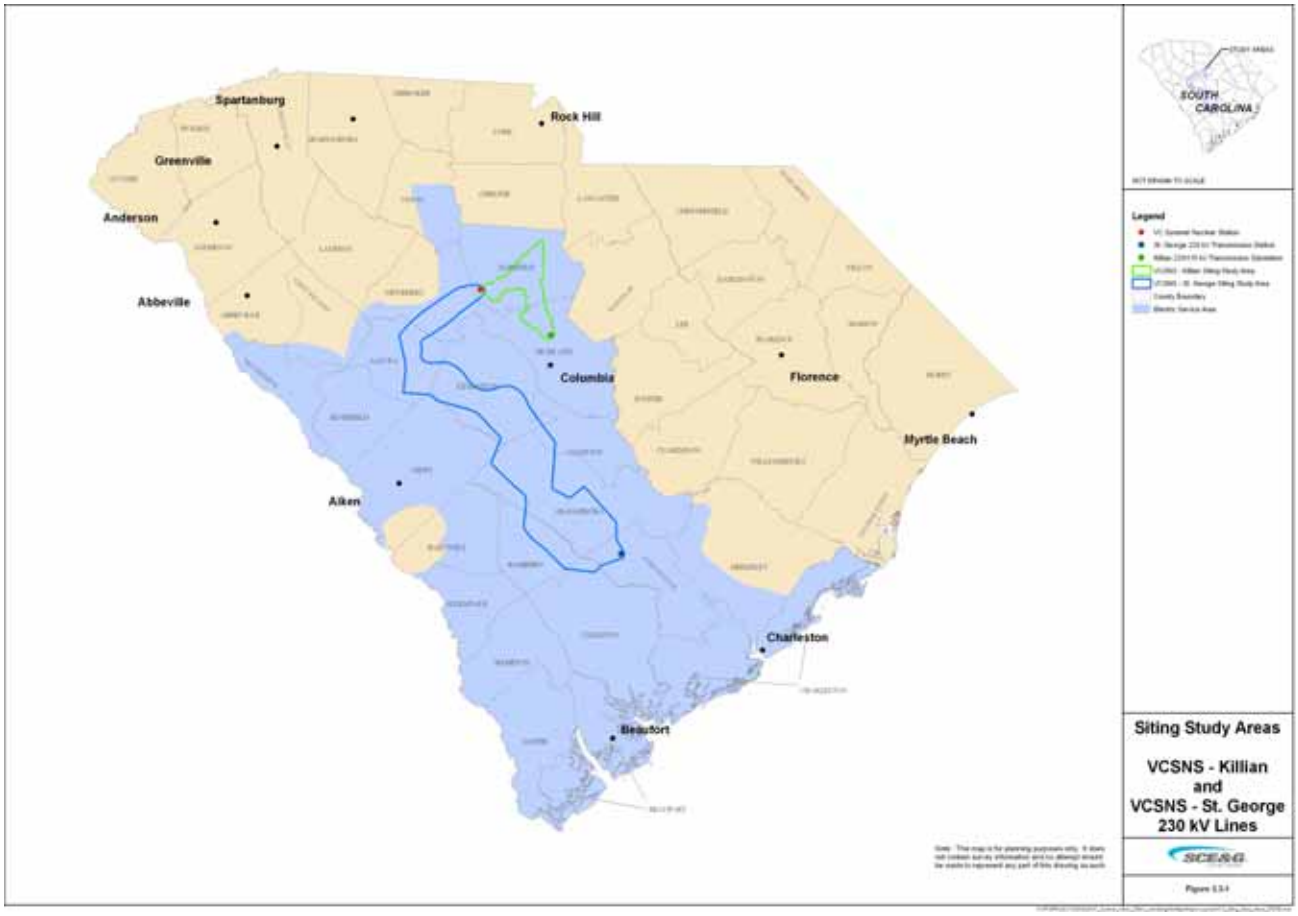
The VCSNS-Killian 230 kV Line siting study area encompasses 226-square miles in Fairfield and Richland Counties north of Columbia, SC (*Figure 3.3-1*). It extends from the VCSNS 1 switchyard in an east-northeast direction to Interstate Highway 77 east of the Town of Winnsboro and then runs south to the existing Killian 230/115 kV Transmission Substation just north of Columbia, SC. A significant factor considered when delineating the Killian siting study area included the location of existing electrical transmission lines that appeared to offer opportunities to run a new 230 kV line parallel with them for a significant distance between the VCSNS 1 switchyard and the existing Killian Transmission Substation (*Figure 3.3-2*). Other key factors considered were SCE&G's long-range projection that a new 230/115 kV transmission substation will be needed in the Winnsboro region, the plans for a new 230/115 kV transmission substation in the Blythewood area, and the location of Interstate Highway 77. Notable features in the Killian siting study area include the Town of Winnsboro, Winnsboro Airport, the community of Blythewood, and Interstate Highway 77 corridor.

The VCSNS-St. George 230 kV Line siting study area encompasses 1,367-square miles and extends from the VCSNS 2 and 3 switchyard to the site of a new 230/115 kV transmission substation that will be built on property owned by SCE&G near St. George, SC (*Figure 3.3-1*). It

resides in Fairfield, Newberry, Saluda, Lexington, Aiken, Calhoun, Orangeburg, Bamburg, Dorchester, and Colleton Counties. The most significant consideration that affected the St. George siting study area delineation was SCE&G's long-range transmission system planning projections regarding the locations of future transmission substations that will be needed along the VCSNS-St. George 230 kV Line and the long-range plan to fold the line into the switchyard at the Cope Generating Station. To provide load support on its electrical transmission system, SCE&G transmission system planners project the need for two new 230/115 kV transmission substations that will be served by the VCSNS-St. George Lines. One will be in the "Lexington West Load Center", which encompasses portions of western Lexington County, eastern Saluda County, and a very small portion of northern Aiken County in the Batesburg-Leesville, SC region. The need for a second 230/115 kV transmission substation is projected in the "Columbia South Load Center" that encompasses portions of eastern Lexington and northern Calhoun Counties in the region surrounding the Town of Gaston. To facilitate these projected electrical transmission system needs (including the fold-in to the Cope Generating Station), the St. George siting study area was delineated to include these areas within its boundaries. Also, when delineating the siting study area, the locations of existing transmission facilities (gas and electric) were taken into consideration (*Figure 3.3-3*).

Notable features in the St. George siting study area include the following towns and communities: Pomaria, Prospertiy, Batesburg-Leesville, Summit, Pelion, Gaston, Swansea, Woodford, North, Livingston, Neeses, Cordova, Cope, Bamberg, Rowesville, Bowman, Branchville, Reevesville, and the western portion of St. George.

Figure 3.3-1 VCSNS-Killian and VCSNS-St. George 230 kV Lines Siting Study Areas



4.0 General Characteristics of the Siting Study Areas

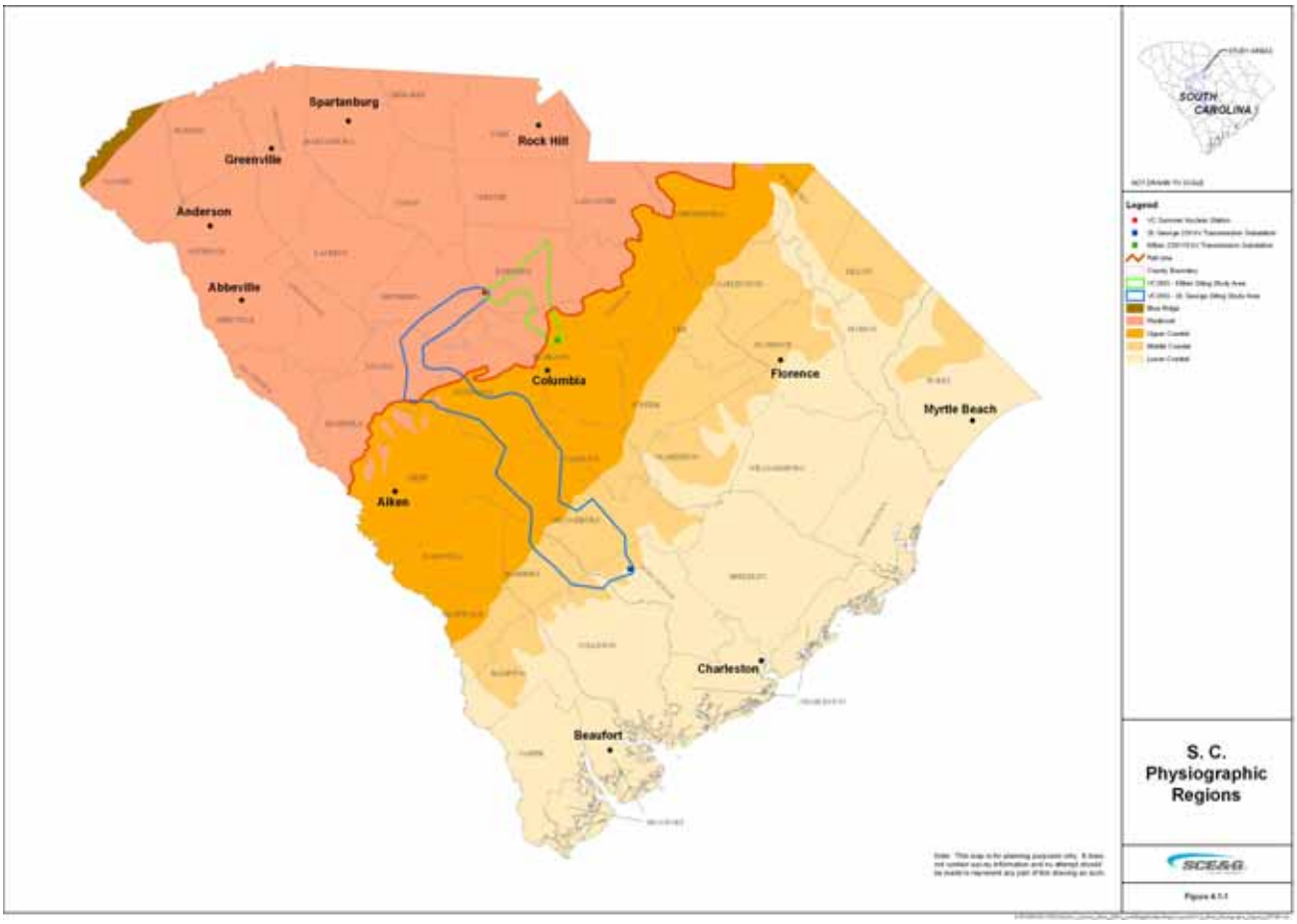
4.1 Physiography

South Carolina covers more than 32,000 square miles and is divided into three major physiographic provinces. A small area along the northwestern boundary of the State lies in the Blue Ridge physiographic province. The Piedmont physiographic province occupies the area between the Blue Ridge province and the Fall Line, and the area between the Fall Line and the Atlantic Ocean comprises the Coastal Plain physiographic province. The Coastal Plain province is comprised of three sub-regions: Upper Coastal, Middle Coastal, and Lower Coastal. The Blue Ridge and Piedmont provinces are composed of igneous and metamorphic rocks, mostly gneiss, schist, phyllite, and slate. Elevations are as high as 650 ft. msl (mean sea level) at the Fall Line and over 3,500 ft. msl in the Blue Ridge province. The Coastal Plain province consists of variations of sand, clay, and limestone that overlay the Piedmont rocks. Elevations range from mean sea level at the coast to as much as 650 ft. msl at the Fall Line.

The siting study area for the VCSNS-Killian 230 kV Line resides almost entirely in the Piedmont province. The extreme southern portion of the Killian siting study area projects into the Upper Coastal region of Richland County. The northern-most portion of the VCSNS-St. George 230 kV Line study area resides in the Piedmont province in Fairfield, Newberry, Saluda, and a small portion of Lexington Counties. From northern Lexington County southward, the St. George siting study area is within the Upper and Middle Coastal regions of Aiken, Calhoun, Orangeburg, Bamberg, and Dorchester Counties. Very small portions of the St. George siting study area reside within the Lower Coastal region in Dorchester and Colleton Counties (*Figure 4.1-1*).

The route of the VCSNS-Lake Murray #2 230 kV Line is entirely within the Piedmont province of southwestern Fairfield County, northwest Richland County, and northern Lexington County.

Figure 4.1-1 S.C. Physiographic Regions



4.2 Land Cover – Piedmont Physiographic Region

The rolling uplands of the Piedmont landscape are predominantly a mosaic of agricultural land and managed woodland, with a history of clearing and economic use that dates back to the earliest times of European settlement. Hardwood-dominated forests occupy relatively narrow floodplains and scattered upland sites, while pine and pine-hardwood forests occupy the majority of forested upland sites. To quantify the effects the potential routes the VCSNS-Killian and VCSNS-St. George 230 kV Lines will have on various land cover types, SCE&G mapped the land cover conditions within each of the siting study areas (*Figures 4.2-1 and 4.2-2*). The VCSNS-Lake Murray #2 Line will have no measurable affects on land cover because it will be built on an existing, cleared right-of-way; nevertheless, SCE&G mapped the existing land cover in the 2,000' corridor surrounding the existing right-of-way (*Figure 4.2-3*).

Included below are descriptions of the major land cover classifications in the Piedmont physiographic region.

Oak-hickory Forest

Occurring throughout the state but most characteristic of rolling uplands in the Piedmont, oak-hickory forest is a widely distributed community that varies from site to site. Occurring in highly fragmented stands, later successional stages tend to be made up of a diverse assemblage of hardwoods, primarily oaks and hickories, as co-dominants in combination with pines. Understory, shrub and herbaceous layers are present in varying degrees, represented by diverse woody and non-woody species. Vegetation on most sites consists of early- to mid-successional managed stands of pine and pine-hardwood forest. The understory in pure pine stands is often open, but in mixed or older stands, it is dominated by the hardwoods characteristic of the site. Common pine species of the Piedmont include shortleaf (*Pinus echinata*) and loblolly (*P. taeda*), with the former better adapted to dry, fine textured upland soils and loblolly achieving maximum growth on deep soils with good moisture and drainage.

Associated Wildlife Species (SC Department of Natural Resources Priority List)

Highest Priority: American Kestrel, Eastern Wood Pewee, Red-cockaded Woodpecker, Wood Thrush, Pine Snake

High Priority: Pine Woods Snake

Moderate Priority: Scarlet Tanager, Eastern Fox Squirrel

River Bottom Forest

River bottoms, or "bottomland forests", consist of hardwood-dominated woodlands with moist soils that are usually associated with major river floodplains. Characteristic trees include sweetgum (*Liquidambar styraciflua*), loblolly pine (*Pinus taeda*), water oak (*Quercus nigra*), willow oak (*Quercus phellos*), laurel oak (*Quercus laurifolia*), cherrybark oak (*Quercus pagoda*), and American holly (*Ilex opaca*). A subtype dominated by bald cypress (*Taxodium distichium*) and water tupelo (*Nyssa aquatica*) occurs on lower elevation sites, but is not as prevalent as in the broader floodplains of the coastal plain. Compared to the coastal plain, the floodplains of major rivers in the Piedmont are confined by topography to relatively narrow corridors.

Associated Wildlife Species (SC Department of Natural Resources Priority List)

Highest Priority: Black-throated Green Warbler, Kentucky Warbler, Little Blue Heron, Rusty Blackbird, Swainson's Warbler, Yellow-crowned Night Heron, Black Bear, Northern Yellow Bat

High Priority: Acadian Flycatcher, American Alligator, Black Swamp Snake, Gulf Coast Mud Salamander, River Cooter, Spiny Softshell Turtle, Striped Mud Turtle, Mink, Rafinesque's Big-eared Bat, Southeastern Bat, Star-nosed Mole

Moderate Priority: American Woodcock, Great Blue Heron, Great Egret, Louisiana Waterthrush, Wood Duck, Bird-voiced Treefrog, Common Snapping Turtle, Spotted Turtle, Eastern Woodrat, Eastern Fox Squirrel

Piedmont Small Stream Forest

Piedmont small stream forests are distinguished from forest communities on larger floodplains because of differences between the scales of the ecosystems. In smaller floodplains, the levees, sloughs and ridges are largely absent or poorly developed. Flooding regime is also more variable between small watersheds than larger ones. Soils are various alluvial types that are seasonally or intermittently flooded. The forest has an open to dense understory or shrub layer and a sparse to dense herb layer. The canopy has a mixture of bottomland and mesophytic trees including river birch (*Betula nigra*), sycamore (*Platanus occidentalis*), sweetgum (*Liquidambar styraciflua*), tulip tree (*Liriodendron tulipifera*), American elm (*Ulmus americana*), hackberry (*Celtis laevigata*), green ash (*Fraxinus pennsylvanica*), and red maple (*Acer rubrum*).

Associated Wildlife Species (SC Department of Natural Resources Priority List)

Highest Priority: Kentucky Warbler, Little Blue Heron, Rusty Blackbird, Wood Thrush, Yellow-crowned Night Heron, Tiger Salamander

High Priority: Acadian Flycatcher, River Cooter, Spiny Softshell Turtle, Yellowbelly Turtle, Mink, Swamp Rabbit

Moderate Priority: Great Blue Heron, Great Egret, Louisiana Waterthrush

Cove Forest

Cove forests are botanically diverse, well-developed hardwood forests occurring on scattered rich and generally small sites (less than 200 acre). Usually, these forests occur on protected bluffs in association with small stream forests or river bottoms. No single species tends to dominate. Shrub species are usually numerous and the herbaceous flora is fairly rich, with many spring ephemerals. Canopy and understory is composed of hardwoods including beech (*Fagus grandifolia*), tulip tree (*Liriodendron tulipifera*), black gum (*Nyssa sylvatica*), sourwood (*Oxydendrum arboreum*), white oak (*Quercus alba*), northern red oak (*Q. rubra*), black oak (*Q.velutina*), sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), southern sugar maple *saccharum*), basswood (*Tilia heterophylla*), ironwood (*Carpinus caroliniana*), flowering dogwood (*Cornus florida*), American holly (*Ilex opaca)*, witch-hazel (*Hamamelis virginiana),* and hop-hornbeam (*Ostrya virginiana*).

Associated Wildlife Species (SC Department of Natural Resources Priority List)

Highest Priority: Eastern Wood Pewee, Kentucky Warbler, Wood Thrush, Webster's Salamander

High Priority: Four-toed Salamander

Moderate Priority: Scarlet Tanager

Grassland and Early Successional Habitats

A variety of open habitats occupies a considerable portion of upland sites in the Piedmont, including agricultural land, recently abandoned farmland, recently cleared land, and a matrix of managed open pine forest and grassland. Golf courses, urban yards and open spaces are also included in this habitat type. The vegetation on most sites is oak-hickory forest, although many sites are maintained in early successional stages.

Associated Wildlife Species (SC Department of Natural Resources Priority List)

Highest Priority: Eastern Meadowlark, Field Sparrow, Grasshopper Sparrow, Loggerhead Shrike, Northern Bobwhite, Southern Hognose Snake

High Priority: Barn Owl, Meadow Vole

Moderate Priority: American Woodcock, Bewick's Wren

General Condition of Piedmont Land Cover Types

To a greater degree than in other regions, the vegetation in the Piedmont has been altered by human activity. Cotton agriculture changed much of the original hardwood and shortleaf pine (*Pinus echinata*) forests into fields. Fields eroded, often losing all topsoil. By the 1930's, various factors, including the Great Depression and boll weevil outbreaks as well as severe erosion, led to widespread farmland abandonment in the Piedmont.

Loblolly pine (*Pinus taeda*) was introduced to the Piedmont during the nineteenth century as a cash lumber crop; this pine now dominates much of the region. According to a U.S. Forest Service survey, loblolly-dominated pine forests occupy over two million acres in South Carolina's Piedmont region (Conner and Sheffield 2000). Although loblolly pine plantations are found throughout the region, they are much more prevalent in some areas, in particular the southwestern Piedmont.

4.3 Land Cover – Coastal Plain Physiographic Region

Eight major land cover classifications are defined for the coastal plain, of which six are either unique to the region or reach their greatest extent there. The predominant habitat types that most casual observers associate with the coastal plain are 1) grassland and early successional habitats, 2) pine woodland, and 3) river bottoms. Although the remaining types are less extensive, they provide habitat diversity that is important to a number of animals, especially wetland species.

Included below are descriptions of the major land cover classifications in the Piedmont physiographic region.

Pine Woodland

This classification is used to describe 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 pine (*Pinus taeda*), or longleaf (*Pinus palustris*), depending on elevation, soil type and silvicultural history. Dense shrub thickets of hollies (*Ilex* spp.) and wax myrtle (*Morella cerifera*) may be present. Higher elevation pine woodlands have abundant grasses and herbaceous cover, particularly when burning is frequent. Optimal habitat for priority species consists of open stands of longleaf pine, sparse understory and shrub layers, a ground cover of wiregrass (*Aristida* spp.), and diverse herbaceous species. Wet prairie, grass-sedge bog, herb bog or pitcher plant bog, is typically found in the outer coastal plain on flat sites with a high water table and soil that is saturated for at least part of the year. Vegetation consists of a thin canopy of pines, almost always longleaf (*Pinus palustris*), although loblolly and pond pine (*P. serotina*) may also be present. The understory is essentially absent or very scattered. Herbaceous flora is quite rich, consisting of many grasses and sedges. Pine flatwoods intergrade with pine savanna; like pine savanna, it is pine woodland situated on essentially flat or rolling terrain with sandy soil and a high water table. Unlike pine savanna, pine flatwoods features a well-developed subcanopy of several tall shrub species. Pine flatwoods is the principal forest type for much of the outer coastal plain.

Associated Wildlife Species (SC Department of Natural Resources Priority List)

Highest Priority**:** American Kestrel, Bachman's Sparrow, Brown-headed Nuthatch, Henslow's Sparrow, Northern Bobwhite*,* Red-cockaded Woodpecker, Black Bear, Northern Yellow Bat

High Priority: Eastern Diamondback Rattlesnake, Mimic Glass Lizard, Pine Woods Snake

Moderate Priority: Slender Glass Lizard, Eastern Fox Squirrel, Eastern Woodrat

Sandhill Pine Woodland

Sandhill pine woodland is a variation of pine woodland composed of species adapted to xeric, sandy soils. The type occurs principally in the sandhills but also on sand ridges in the coastal plain. Absent frequent fire, a canopy of longleaf pine and a subcanopy of turkey oak prevail, interspersed with scrub oak species and scrub / shrub cover. Frequent burning leads to development of longleaf pine-wiregrass communities.

Associated Wildlife Species (SC Department of Natural Resources Priority List)

Highest Priority: American Kestrel, Bachman's Sparrow, Brown-headed Nuthatch, Eastern Wood Pewee, Northern Bobwhite, Red-cockaded Woodpecker, Wood Thrush, Coral Snake, Gopher Tortoise, Pine Snake, Southern Hognose Snake

High Priority: Pine Woods Snake

Moderate Priority: Eastern woodrat, Eastern Fox Squirrel

Upland Forest

Vegetation composition of upland forest is similar to that of oak-hickory forest in the Piedmont, where it is a major vegetation type. Upland forest is rare in the coastal plain, typically occurring on fire-suppressed upland slopes near river floodplains or between rivers and tributaries. It intergrades with river slope communities. Representative canopy trees include white oak (*Quercus alba*), black oak (*Quercus velutina*), post oak (*Quercus stellata*), mockernut hickory (*Carya tomentosa*), pignut hickory (*Carya glabra*), loblolly pine (*Pinus taeda*), flowering dogwood (*Cornus florida*), and black gum (*Nyssa sylvatica*).

Associated Wildlife Species (SC Department of Natural Resources Priority List)

Highest Priority: Eastern Wood Pewee, Kentucky Warbler, Rusty Blackbird, Swainson's Warbler, Swallow-tailed Kite, Wood Thrush, Worm-eating Warbler, Chamberlain's Dwarf Salamander, Black Bear, Northern Yellow Bat

High Priority: Acadian Flycatcher, Bald Eagle, Southeastern Bat, Star-nosed Mole

Moderate Priority: Louisiana Waterthrush, Eastern Woodrat, Eastern Fox Squirrel, Southern Dusky Salamander

Grassland and Early Successional Habitats

A variety of open-land habitats occupy a considerable portion of upland sites in the Piedmont, sandhills and coastal plain, including agricultural land, recently abandoned farmland, recently cleared land, and a matrix of managed open pine forest and grassland. Golf courses, urban yards and open spaces are also included in this habitat type. Potential vegetation on most sites is pine woodland and oak-hickory forest, although many sites are maintained in early successional stages. Agricultural lands with surrounding forest edge habitat occur widely throughout the region and represent the prevailing cover type in the "agriculture belt" that composes most of the inner coastal plain.

Associated Wildlife Species (SC Department of Natural Resources Priority List)

Highest Priority: Common Ground-dove, Eastern Meadowlark, Field Sparrow, Grasshopper Sparrow, Loggerhead Shrike, Northern Bobwhite, Painted Bunting

High Priority: Barn Owl

Moderate Priority: American Woodcock, Bewick's Wren, Meadow Vole, Eastern Woodrat

Ponds and Depressions

Topographic depressions in the coastal plain support a variety of permanently and semi-permanently flooded isolated freshwater wetlands that have open or closed canopy forest cover. Vegetation cover varies with hydrology, substrate and fire frequency. Depression meadows, pond cypress ponds, swamp tupelo ponds, pocosins and limestone sinks are also included in this habitat type. Landforms include natural and artificial ponds dominated by cypress and/or swamp tupelo, limestone sinks, and Carolina bays. Shrub-dominated pocosins or grass-sedge-herb dominated depression meadows occur on peat- or clay-based substrates, typically in Carolina bays. Absent fire, vegetation in most of these habitats reverts to mixed floodplain hardwood and cypress-tupelo dominated forest. Upslope from these lowland habitats, the transition to well drained uplands supporting pine woodland is often abrupt.

Associated Wildlife Species (SC Department of Natural Resources Priority List)

Highest Priority: Little Blue Heron, Yellow-crowned Night-Heron, Flatwoods Salamander, Tiger Salamander, Carolina Gopher Frog, Broad-striped Dwarf Siren, Chamberlain's Dwarf Salamander

High Priority: Black Swamp Snake, Chicken Turtle, Florida Cooter, Florida Green Watersnake, Florida Softshell Turtle, Gulf Coast Mud Salamander, Yellowbelly Turtle, Upland Chorus Frog, Mink, Southeastern Bat

Moderate Priority: Great Blue Heron, Great Egret, Common Snapping Turtle, Spotted Turtle, Southern Dusky Salamander, Northern Cricket Frog

Hardwood Slopes and Stream Bottoms

A complex of hardwood and hardwood-pine communities occupy the floodplains of small streams, mesic bluffs and infrequently flooded flats in association with streams or rivers. Fire is infrequent, due either to the sheltered locations of these communities on bluffs or their isolation within a floodplain. Several mixed mesophytic subtypes characterized by the presence of American beech *(Fagus grandifolia)* occur in sheltered sites with moist soils, particularly on north-facing river bluffs and on slopes of drains and creeks. On upland flats within floodplains (hammocks), southern magnolia *(Magnolia grandiflora)* frequently shares dominance with American beech. The calcareous cliff and marl forest subtype occurs on circumneutral soils derived from limestone or unconsolidated calcareous substrates such as marl. Forest structure of all subtypes is diverse, with understory, shrub and herbaceous species varying according to soil moisture and chemistry. All subtypes intergrade with blackwater stream forest or river bottom forest on lowland sides and with upland forest on upland sides.

Associated Wildlife Species (SC Department of Natural Resources Priority List)

Highest Priority: Black-throated Green Warbler, Eastern Wood Pewee, Kentucky Warbler, Rusty Blackbird, Swainson's Warbler, Swallow-tailed Kite, Wood Thrush, Worm-eating Warbler, Chamberlain's Dwarf Salamander, Black Bear, Northern Yellow Bat

High Priority: Acadian Flycatcher, Bald Eagle, Southeastern Bat, Star-nosed Mole

Moderate Priority: Louisiana Waterthrush, Eastern Woodrat, Eastern Fox Squirrel, Southern Dusky Salamander

Blackwater Stream Systems

Tributary streams rising in the sandhills and coastal plain are commonly known as "blackwater streams" for the color of tannins leaching from decaying vegetation. Forests on the narrow floodplains formed by these streams typically have a canopy dominated by swamp tupelo *(Nyssa biflora)* and red maple *(Acer rubrum)*. On broader sites, bald cypress *(Taxodium distichum)* can become an important canopy species. Tulip poplar *(Liriodendron tulipifera)*, sweet gum *(Liquidambar styraciflua)*, pond pine *(Pinus serotina)*, loblolly pine *(Pinus taeda*), and laurel oak *(Quercus laurifolia)* are important associates. The shrub layer is open in areas subjected to the most flooding, or it can be fairly dense and pocosin-like in areas subject to infrequent flooding. Headwaters and wet flats immediately above the floodplain can support dense, pocosin-like shrub thickets or, under suitable fire conditions, pure stands of Atlantic white cedar (*Chamaecyperus thyoides*).

Associated Wildlife Species (SC Department of Natural Resources Priority List)

Highest Priority: Kentucky Warbler, Eastern Wood Pewee, Rusty Blackbird, Swainson's Warbler, Wood Thrush, Yellow-crowned Night Heron

High Priority: Acadian Flycatcher, Black Swamp Snake, Spiny Softshell Turtle, Mink, Rafinesque's Big-eared Bat, Southeastern Bat

Moderate Priority: American Woodcock, Louisiana Waterthrush, Wood Duck, Spotted Turtle

River Bottoms

River bottoms, or "bottomland forests", consist of hardwood-dominated woodlands with moist soils that are usually associated with the broad floodplains of major rivers rising in the Piedmont or Blue Ridge. Locally, the floodplains of major coastal plain rivers are significant components of the landscape. Characteristic trees include sweetgum (*Liquidambar styraciflua*), loblolly pine (*Pinus taeda*), water oak (*Quercus nigra*), willow oak (*Quercus phellos*), laurel oak (*Quercus laurifolia*), cherrybark oak (*Quercus pagoda*), and American holly (*Ilex opaca*). A subtype dominated by bald cypress (*Taxodium distichium*) and water tupelo (*Nyssa aquatica*) occurs on lower elevation sites interspersed and intergrading with oak-dominated woodlands. Dominant

trees are bald cypress (*Taxodium distichium*) and water tupelo (*Nyssa aquatica*), swamp gum (*Nyssa biflora*), Carolina ash (*Fraxinus caroliniana*), water elm (*Planera aquatica*), and red maple (*Acer rubrum*).

Associated Wildlife Species (SC Department of Natural Resources Priority List)

Highest Priority: Black-throated Green Warbler, Kentucky Warbler, Little Blue Heron, Rusty Blackbird, Swainson's Warbler, Yellow-crowned Night Heron, Black Bear, Northern Yellow Bat

High Priority: Acadian Flycatcher, American Alligator, Black Swamp Snake, Gulf Coast Mud Salamander, River Cooter, Spiny Softshell Turtle, Striped Mud Turtle, Mink, Rafinesque's Big-eared Bat, Southeastern Bat, Star-nosed Mole

Moderate Priority: American Woodcock, Great Blue Heron, Great Egret, Louisiana Waterthrush, Wood Duck, Bird-voiced Treefrog, Common Snapping Turtle, Spotted Turtle, Eastern Woodrat, Eastern Fox Squirrel

General Condition Floodplain Land Cover Types

The coastal plain has been predominantly used for agricultural purposes since settlement by Europeans in the 18th century. Uplands and the better-drained terraces were cleared for fields at the same time that extensive longleaf pine and swamp hardwood forests on mesic and wet sites were cleared to supply timber. Several cycles of short-rotation pine forest were favored, along with agricultural practices that often provided substantial edge habitat for game species such as quail, but also deep woods or swamp habitat for deer, turkey and waterfowl. By the late 20th century, economic conditions began to favor consolidation of land into larger holdings and the practice of clean field agriculture, along with shorter rotations of both upland and lowland timber. Several large public land holdings and privately held lands or conservation easements are distributed within the coastal plain, covering approximately 5 percent of the region's land area. By far, the largest is the Francis Marion National Forest near the coast. Most public lands in the region have a strong wildlife management focus, including emphasis on threatened and endangered species and other species of concern; for planning purposes the lands are considered protected.

Land cover types and quantities within the VCSNS-Killian and VCSNS-St. George siting study areas are presented in Charts 4.3-1 and 4.3-2. Land cover types and quantities within 1,000' of the VCSNS-Lake Murray #2 230 kV Line route are presented in Chart 4.3-3.

Chart 4.3-1 Land Cover Classifications and Quantities: VCSNS-Killian 230 kV Line Siting Study Area

Land Cover Classification	Total Acres	Percentage of Siting Study Area Acreage
Bottomland / Flood Plain Forest	4978.3	3.45
Closed Canopy Evergreen Forest / Woodland	30610.0	21.2
Cultivated Land	102.3	0.07
Dry Deciduous Forest / Woodland	7324.5	5.07
Dry Mixed Forest / Woodland	40833.4	28.28
Dry Scrub / Shrub Thicket	8345.1	5.78
Fresh Water	3242.5	2.25
Grassland / Pasture	18229.7	12.63
Marsh / Emergent Wetland	30.4	0.02
Mesic Deciduous Forest / Woodland	5112.2	3.54
Mesic Mixed Forest / Woodland	517.6	0.36
Needle-Leaved Evergreen Mixed Forest / Woodland	6486.9	4.49
Open Canopy / Recently Cleared Forest	6102.4	4.23
Urban Development	10086.2	6.99
Urban Residential	1648.1	1.14
Wet Scrub / Shrub Thicket	682.0	0.47
Swamp	45.8	0.03
Unclassified	16.0	0.01
Grand Total	**144,393.4**	**100.0**

Chart 4.3-2 Land Cover Classifications and Quantities: VCSNS-St. George 230 kV Line Siting Study Area

Land Cover Classification	Total Acres	Percentage of Siting Study Area Acreage
Bottomland / Flood Plain Forest	69759.5	7.97
Closed Canopy Evergreen Forest / Woodland	85890.0	9.82
Cultivated Land	36568.5	4.18
Dry Deciduous Forest / Woodland	19572.1	2.24
Dry Mixed Forest / Woodland	226099.3	25.84
Dry Scrub / Shrub Thicket	145595.7	16.64
Fresh Water	6105.6	0.70
Grassland / Pasture	202472.3	23.14
Marsh / Emergent Wetland	699.0	0.08
Mesic Deciduous Forest / Woodland	5025.8	0.57
Mesic Mixed Forest / Woodland	4932.7	0.56
Needle-Leaved Evergreen Mixed Forest / Woodland	7449.2	0.85
Open Canopy / Recently Cleared Forest	2159.1	0.25
Pine Woodland	4.8	0.01
Pocosin	1010.7	0.12
Unclassified Land Cover	773.6	0.09
Urban Development	51833.1	5.92
Urban Residential	3931.7	0.45
Wet Evergreen	3526.5	0.40
Wet Scrub / Shrub Thicket	1444.5	0.17
Grand Total	**874,853.7**	**100.0**

Chart 4.3-3 Land Cover Classifications and Quantities Within 1,000' of the VCSNS-Lake Murray #2 230 kV Line Route

Land Cover Classification	Total Acres	Percentage of Analysis Area Acreage
Bottomland / Flood Plain Forest	128.6	2.7
Closed Canopy Evergreen Forest / Woodland	530.8	11.3
Cultivated Land	0	0
Dry Deciduous Forest / Woodland	438.9	9.4
Dry Mixed Forest / Woodland	1193.0	25.5
Dry Scrub / Shrub Thicket	513.5	11.0
Fresh Water	76.5	1.6
Grassland / Pasture	821.6	17.5
Marsh / Emergent Wetland	0	0
Mesic Deciduous Forest / Woodland	113.3	2.4
Mesic Mixed Forest / Woodland	84.5	1.8
Needle-Leaved Evergreen Mixed Forest / Woodland	79.6	1.7
Open Canopy / Recently Cleared Forest	0	0
Pine Woodland	0	0
Pocosin	0	0
Unclassified Land Cover	9.1	0.2
Urban Development	617.3	13.2
Urban Residential	76.9	1.6
Wet Evergreen	0	0
Wet Scrub / Shrub Thicket	2.3	0.1
Grand Total	**4,685.9**	**100**

4.4 Water Resources

The siting study area for the VCSNS-Killian 230 kV Line is located in the Lower Broad River, Wateree River, and Congaree River drainage basins (*Figure 4.4-1*). The northeastern quarter of the VCSNS-Killian study area (approximately 60 square miles) drains northwesterly into Wateree Lake. The major tributaries, all in Fairfield County, are Big Wateree Creek and Little Wateree Creek. Associated secondary tributaries are Scabber Branch (Big Wateree Creek drainage), Minton Creek, McCulley Creek, and Horse Creek (Little Wateree Creek drainage).

Almost three quarters of the VCSNS-Killian study area (approximately 164 square miles) drains to the southeast into the Broad River. Major siting study area waterways in Fairfield County include the Little River and its tributaries, Mill Creek, Morris Creek, and Jackson Creek and its tributaries Winnsboro Branch and Sand Creek. Little Cedar Creek is in Fairfield County and Big Cedar Creek begins in Fairfield County, flows through Richland County, and includes tributaries Cedar Creek, Center Creek, Persimmon Fork, Horse Creek, Williams Branch, and Harmon Creek. Other drainages just inside Richland County include Crane Creek and its tributaries Roberts

Branch and Cumbess Creek, and North Branch Crane Creek and its tributaries Swygert Creek and Beasley Creek. The extreme southeastern tip of the Killian Study area (approximately 1.3 square miles) drains into the upper reaches of the Jackson Creek watershed. This water flows south-southwest and eventually into the Congaree River.

The VCSNS-St. George 230 kV Line siting study area is located in the Lower Broad, Saluda, Congaree, North Fork Edisto, South Fork Edisto, Salkehatchie, Four Hole Swamp, and Edisto, drainage basins (*Figure 4.4-2*). The following illustration is a hierarchy of the major drainage basins and associated secondary tributaries in the VCSNS-St. George siting study area:

Drainage Basin
Major Waterway
Key Secondary Tributaries
Drainages into Key Secondary Tributaries

Lower Broad

Broad River
Cannons Creek
Mud Creek
Crims Creek
Rocky Creek
Frees Creek

Saluda

Saluda River (Lake Murray #2)
Little Saluda River
Richland Creek
Big Creek *(there are two different ones)*
Indian Creek
Dailey Creek
Bush River
Timothy Creek
Camping Creek
Buffalo Creek
Clouds Creek
West Creek
Hollow Creek
Horse Creek

Congaree

Congaree River (the Congaree River is not actually in the study area)
Congaree Creek
Scouter Branch
First Creek
Second Creek
Bear Creek
Sandy Run
Little Sandy Run

North Fork Edisto

North Fork Edisto River

- Cooper Swamp
- Dry Swamp
- Whirlwind Creek
- Fourmile Creek
- Limestone Creek
  - *Little Limestone Creek*
- Great Branch
- Double Branch
- Long Branch
- Turkey Branch
  - *Gibson Branch*
- Bull Swamp Creek
  - *Little Bull Swamp Creek*
- Big Beaver Creek
  - *Little Beaver Creek*
- Penn Branch
- Salem Creek
- Pond Branch
- Hollow Creek
- Jackson Branch
- Cedar Creek
- Black Creek
  - *Little Black Creek*
- Lightwood Knot Creek
  - *Hellhole Creek*
- Chinquapin Creek
  - *Duncan Creek*

South Fork Edisto

South Fork Edisto River

- Isaac Jennings Canal (man made)
- Snake Swamp
  - *Sam Branch*
- Roberts Swamp
  - *Twomile Swamp*
- Sucksand Branch
- Willow Swamp
- Bolen Mill Creek
- Rocky Swamp Creek
- Tampa Creek
- Gin Branch

Salkehatchie

Salkehatchie River (The Salkhatchie River is not in the study area)

- Buckhead Creek
- Lemon Creek
  - *Colt Branch*
  - *Halfmoon Branch*

Four Hole Swamp

Four Hole Swamp (The Four Hole Swamp is not in the study area)

- Cow Castle Creek
  - *Buck Branch*
  - *Crum Branch*
- Middle Pen Swamp

Edisto

Edisto River

- Cattle Creek
  - *Sandy Run*
- Brickhouse Branch
- Bush Branch
- Pen Branch
- Brier Creek
- Betty Branch
  - *Mill Branch*
  - *Staley Branch*
- Polk Swamp
  - *Bear Branch*
- Indian Field Swamp
  - *Mill Branch*
  - *Snell Branch*

SCE&G analyzed a study corridor extending 1,000' on each side of the route for the VCSNS-Lake Murray #2 230 kV Line route, which is the route currently occupied by the single-circuit VCNS-Lake Murray #1 230 kV Line. The 2,000'-wide study corridor includes approximately 7.3 square miles and runs from the V.C. Summer Nuclear Station in a southerly direction approximately 19 miles to the existing Lake Murray Transmission Substation. The Lower Broad Basin drains the upper 5.1 square miles (approximately 70%) of the study corridor area. The corridor crosses the Broad River just over 4 miles south of the V.C. Summer Nuclear Station. Within the Lower Broad Basin, Mayo Creek and Wateree Creek, and several of their unnamed tributaries, drain a portion of the study corridor. Other named waterways that drain the study corridor within the Lower broad Basin include Metz Branch and Wildhorse Branch that, along with several smaller unnamed tributaries, form the upper reaches of the Hollinshead Creek Watershed. In addition, there are several smaller unnamed streams that drain directly into the Broad River. The Saluda Basin drains the lower 2.2 square miles (approximately 30%) of the study corridor, which terminates at just below the Lake Murray Dam. Yost Creek, the only named stream, and several unnamed streams drain the majority of the study corridor segment that is within the Saluda Basin. These waterways are part of the Rawls Creek watershed, which drains directly into the Saluda River (*Figure 4.4-3)*.

Virtually all waters in the VCSNS-Killian and VCSNS-St. George siting study areas and in the vicinity of the VCSNS-Lake Murray #2 Line route are classified by The South Carolina Department of Health and Environmental Control ("SCDHEC") as "freshwaters (FW)", which are defined as suitable for primary and secondary contact recreation, a source for drinking water after conventional treatment in accordance with the requirements of SCDHEC, suitable for fishing and the survival and propagation of a balanced indigenous aquatic community of fauna and flora, and suitable for industrial and agricultural uses. The Saluda River is classified a "trout put, grow, take (TPGT)" from the Lake Murray Dam to its confluence with the Broad River; the TPGT classification includes all of the requirements of FW, but are suitable for supporting growth of stocked trout populations. Stream water quality throughout the siting study areas and in the vicinity of the VCSNS-Lake Murray #2 Line route is generally good, and small farm ponds are abundant.

National Wetland Inventory maps indicate that jurisdictional wetlands are distributed throughout the VCSNS-Killian and VCSNS-St. George siting study areas and in the vicinity of the VCSNS-Lake Murray #2 Line route. In the VCSNS-Killian siting study area, the most significant jurisdictional wetlands are associated with the Little River, Mill Creek, Morris Creek, Little Wateree

Creek, North Branch Crane Creek and Crane Creek. Forested wetlands are the predominant wetland type found (*Figure 4.4-4*).

The most significant jurisdictional wetlands in the VCSNS-St. George siting study area are associated with Cannons Creek, Clouds Creek, Black Creek, Congaree Creek, Bull Swamp Creek, North Fork Edisto River, Roberts Swamp, South Fork Edisto River, Edisto River, Lemon Creek, and Cattle Creek (*Figure 4.4-5*). The occurrence of isolated jurisdictional wetlands in the St. George siting study area increases significantly in lower Orangeburg, Bamberg, Colleton, and Dorchester Counties as compared to the more northerly counties in the siting study area.

Along the VCSNS-Lake Murray #2 Line route, the most significant jurisdictional wetlands are associated with the Broad River and Saluda River bottomlands, Metz Branch, and an unnamed tributary of Boyd Branch. Forested wetlands are the predominant wetland type (*Figure 4.5-6*).

The Federal Emergency Management Agency National Flood Insurance Program maps were obtained for all counties within the VCSNS-Killian and VCSNS-St. George siting study areas, which included all counties affected by the VCSNS-Lake Murray #2 Line route. No broad, expansive flood zones are present in either siting study area or along the VCSNS-Lake Murray #2 Line route. Within the Killian siting study area, the most notable flood zones (100 and 500-year zones) are associated with Little River, Mill Creek, Morris Creek, Little Wateree Creek, Big Cedar Creek, Cedar Creek, Center Creek, North Branch Crane Creek and Crane Creek (*Figure 4.4-7*). Within the St. George siting study area, the most notable flood zones are associated with the Broad River, Cannons Creek, Bush River, Big Creek, Little Saluda River, Lightwood Knot Creek, Clouds Creek, Black Creek, Congaree Creek, Bull Swamp Creek, North Fork Edisto River, South Fork Edisto River, Edisto River, Cow Castle Creek, Polk Swamp and Cattle Creek (*Figure 4.4-8*). Along the VCSNS-Lake Murray #2 Line route, the most notable flood zones are associated with Lake Murray, Lake Monticello, Saluda River, Broad River, Wateree Creek, Yost Creek, and an unnamed tributary of Boyd Branch (*Figure 4.4-9*).

4.5 Cultural Resources

Brockington and Associates, Inc. (“Brockington”), a cultural resources consultant, conducted background research on SCE&G’s behalf to determine previously recorded architectural and archaeological resources in the VCSNS-Killian and VCSNS-St. George siting study areas and in the area surrounding the right-of-way upon which the VCSNS-Lake Murray #2 230 kV Line will be located (*Figures 4.5-1, 4.5-2 and 4.5-3; Appendix B*). Records were reviewed at the South

Carolina Department of Archives and History ("SCDAH") to determine recorded architectural resources in the siting study areas. The data, which is electronically digitized, include the following:

1. All above ground resources recorded after 1989, including their NRHP eligibility;
2. All cultural resources studies conducted since 1989;
3. All archaeological sites, structures, and districts that are listed on the National Register of Historic Places (NRHP).

Brockington conducted a search of the SCDAH Finding Aid. The Finding Aid is a printed document that lists all cultural resources projects that have occurred in a given county. Brockington also searched the records of the South Carolina Institute of Anthropology and Archaeology ("SCIAA") to determine the locations of recorded archaeological sites in the VCSNS-Killian and VCSNS-St. George siting study areas and along the route of the future Lake Murray #2 230 kV Line. Each recorded architectural and archaeological site was added to the siting databases (Cultural Resources layers for each project in the Geographic Information System) and applied in the siting studies for the VCSNS-Killian and St. George 230 kV Lines. The data was used to predict the cultural resource impacts that will occur as a result of upgrading the existing VCSNS-Lake Murray #1 230 kV Line from single-circuit to double-circuit to accommodate the VCSNS-Lake Murray #2 230 kV Line. Charts 4.5-1, 4.5-2 and 4.5-3 display the cultural resource data that was included in the siting study database for the VCSNS-Killian and VCSNS-St. George siting study areas and within 1.2-miles of the route of the future VCSNS-Lake Murray #2 230 kV Line as a result of the records search at the SCDAH and SCIAA:

Chart 4.5-1 Previously Recorded Cultural Resources: VCSNS-Killian Siting Study Area

Archaeological Resources	**Quantity**
Listed on the National Register of Historic Places ("NRHP")	0
Eligible for the NRHP	2
Potentially eligible for the NRHP	5
Not eligible for the NRHP	55
Eligibility for the NRHP undetermined	47
Total Recorded Archaeological Sites	**109**
Historic (architectural) Resources	
Listed on the NRHP	20
Eligible for the NRHP	6
Not eligible for the NRHP	82
Total Recorded Historic Resources	**108**
Historic Cemeteries	
Eligible for the NRHP	0
Potentially eligible for the NRHP	0
Not eligible for the NRHP	0
Total Recorded Historic Cemeteries	**0**
Historic Districts	
Listed on the NRHP	3
Total Recorded Historic Districts	**3**

Chart 4.5-2 Previously Recorded Cultural Resources: VCSNS-St. George Siting Study Area

Archaeological Resources	**Quantity**
Listed on the National Register of Historic Places ("NRHP")	3
Eligible for the NRHP	0
Potentially eligible for the NRHP	89
Not eligible for the NRHP	170
Eligibility for the NRHP undetermined	117
Total Recorded Archaeological Sites	**379**
Historic (architectural) Resources	
Listed on the NRHP	35
Contributes to an NRHP listed district	27
Eligible for the NRHP	32
Contributes to an eligible district	117
Potentially eligible for the NRHP	5
Not eligible for the NRHP	491
Total Recorded Historic Resources	**707**
Historic Cemeteries	
Eligible for the NRHP	0
Potentially eligible for the NRHP	3
Not eligible for the NRHP	20
Total Recorded Historic Cemeteries	**23**
Historic Districts	
Listed on the NRHP	10
Eligible for the NRHP	6
Not Eligible for the NRHP	3
Total Recorded Historic Districts	**19**

Chart 4.5-3 Previously Recorded Cultural Resources Within 1.2-Miles of the VCSNS-Lake Murray #2 230 kV Line Route

Archaeological Resources	**Quantity**
Listed on the National Register of Historic Places ("NRHP")	0
Eligible for the NRHP	0
Potentially eligible for the NRHP	3
Not eligible for the NRHP	48
Eligibility for the NRHP undetermined	13
Total Recorded Archaeological Sites	**64**
Historic (architectural) Resources	
Listed on the NRHP	2
Contributes to an NRHP listed district	0
Eligible for the NRHP	4
Contributes to an eligible district	0
Potentially eligible for the NRHP	0
Not eligible for the NRHP	73
Total Recorded Historic Resources	**79**
Historic Cemeteries	
Eligible for the NRHP	0
Potentially eligible for the NRHP	4
Not eligible for the NRHP	0
Total Recorded Historic Cemeteries	**4**
Historic Districts	
Listed on the NRHP	0
Eligible for the NRHP	0
Not Eligible for the NRHP	0
Total Recorded Historic Districts	**0**

4.6 Rare, Threatened and Endangered Species

Records of the United States Fish and Wildlife Service ("USFWS") and South Carolina Heritage Trust Program were reviewed to determine protected species that are documented in the VCSNS-Killian and VCSNS-St. George siting study areas and within 1,000' of the VCSNS-Lake Murray #2 230 kV Line route. SCE&G prepared mapping to accurately locate the position of each documented occurrence within the VCSNS-Killian and VCSNS-St. George siting study areas and in the area surrounding the VCSNS-Lake Murray #2 Line route (*Figures 4.6-1, 4.6-2, and 4.6-3*). Appendix C includes the S.C. Heritage Trust Program protected species lists for all counties affected by the VCSNS-Killian and VCSNS-St. George siting study areas and the VCSNS-Lake Murray #2 230 kV Line route. The list includes all species currently listed on the USFWS list.

4.7 Land Use and Population Distribution

Land use data for the VCSNS-Killian and VCSNS-St. George siting study areas and along the route of the VCSNS-Lake Murray #2 230 kV Lines were obtained from local governmental sources. Within the potential route corridor for the VCSNS-Killian Line, 85.41% has no designated land use; 89.65% in the VCSNS-St. George potential route corridor has no designated land use; and 79.23% of the area within the right-of-way in which the VCSNS-Lake Murray #2 230 kV Line will be located has no designated land use (*Figures 4.7-1, 4.7-2 and 4.7-3*).

Year 2000 U.S. Census Bureau population data were collected by census block for the portions of all SC counties included in the VCSNS-Killian 230 kV and VCSNS-St. George 230 kV Lines siting study areas and VCSNS-Lake Murray #2 230 kV Line route. When conducting the siting studies for the VCSNS-Killian and VCSNS-St. George Lines, the data were organized by the census blocks according to population per acre and weighted according to sensitivity to the introduction of a new 230 kV line within the census block (i.e., the greater the population within a census block, the higher the constraint weight). The highest constraint weight was assigned to census blocks where acreage per person was less than 0.5-acres. The lowest constraint weights were assigned to the census blocks with 10 or more acres per person. The application of population density by census block, and the resulting mapping that was developed to display the varying population patterns throughout the VCSNS-Killian and St. George siting study areas and along the route to the VCSNS-Lake Murray #2 230 kV Line, allowed SCE&G to carefully analyze population densities along the potential and actual routes for the future lines (*Figures 4.7-4, 4.7-5 and 4.7-6*). To further analyze population density patterns, SCE&G used aerial photography to locate all apparent occupied buildings in the VCSNS-Killian and VCSNS-St. George siting study

areas and within 1,000- of the VCSNS-Lake Murray #2 Line route (*Figures 4.7-7, 4.7-8 and 4.7-9*). The occupied buildings include all classifications.

A test was conducted in the VCSNS-Killian siting study to estimate the accuracy of locating occupied buildings from aerial photography compared to locating them in field studies. The occupied buildings were carefully located within a 20-square mile area during a field study and compared to the results of locating them within the same geographic area using aerial photography analysis techniques. The accuracy of the aerial photography methodology was 96.8%. When laying out the potential routes for the VCSNS-Killian and VCSNS-St. George 230 kV Lines, SCE&G avoided highly populated areas to the extent practical. Likewise, the potential route was carefully sited to avoid inclusion of occupied buildings in the right-of-way zone.

The census data for the counties within which the VCSNS1-Killian and VCSNS-St. George siting study areas and VCSNS-Lake Murray #2 Line route are located are displayed in Chart 4.7-1.

Chart 4.7-1 Year 2000 U.S. Census Data

Geographic area	Siting Study Area	Population	Housing units	Area in square miles			Population and Housing Density per square mile of land area	
				Total area	Water area	Land area	Population	Housing units
South Carolina Summary		**4,012,012**	**1,753,670**	**32,020.20**	**1,910.73**	**30,109.47**	**133.2**	**58.2**
COUNTY								
Aiken County	St. George	142,552	61,987	1,080.46	7.79	1,072.66	132.9	57.8
Bamberg County	St. George	16,658	7,130	395.47	2.22	393.25	42.4	18.1
Calhoun County	St. George	15,185	6,864	392.34	12.11	380.22	39.9	18.1
Colleton County	St. George	38,264	18,129	1,133.21	76.86	1,056.36	36.2	17.2
Dorchester County	St. George	96,413	37,237	576.69	1.96	574.73	167.8	64.8
Fairfield County	Killian and St. George	23,454	10,383	709.93	23.34	686.59	34.2	15.1
Lexington County	St. George	216,014	90,978	757.88	58.63	699.25	308.9	130.1
Newberry County	St. George	36,108	16,805	647.28	16.51	630.77	57.2	26.6
Orangeburg County	St. George	91,582	39,304	1,128.09	21.93	1,106.16	82.8	35.5
Richland County	Killian	320,677	129,793	771.72	15.30	756.41	423.9	171.6
Saluda County	St. George	19,181	8,543	461.78	9.30	452.48	42.4	18.9

5.0 Potential Route Development for the VCSNS-Killian and VCSNS-St. George 230 kV Lines

5.1 Methodology

SCE&G conducted comprehensive siting studies to identify and optimize potential corridors for the VCSNS-Killian and VCSNS-St. George 230 kV Lines. A siting study was not required to determine the route for the VCSNS-Lake Murray #2 Line since it will be built on existing right-of-way. The siting studies were conducted by applying SCE&G's comprehensive, three-phase transmission line siting process that allows computerized, state-of-the-art data collection, mapping, analysis, and application. The siting process enables the development of potential routes for new transmission lines that will avoid or minimize affects to environmental resources, cultural resources, scenic quality, and land uses.

SCE&G has determined that three new 230 kV lines (four new 230 kV circuits) will be required to provide electrical transmission capacity necessary to add the generated capacity of VCSNS 2 and 3 to its power grid. The VCSNS-Killian Line will be a single-circuit 230 kV line that will run from the VCSNS 1 switchyard to the existing Killian 230/115 kV Transmission Substation; The VCSNS-St. George Line will be a double-circuit 230 kV line that will run from the VCSNS 2 and 3 switchyard to a new 230/115 kV transmission substation that will be built on land owned by SCE&G near St. George, SC. The VCSNS-Lake Murray #2 Line will be a single 230 kV circuit that will run from the VCSNS 2 and 3 switchyard to the existing Lake Murray 230/115 kV Transmission Substation entirely within existing SCE&G right-of-way by upgrading the existing VCSNS-Lake Murray #1 230 kV Line from a single-circuit line to a double-circuit line on steel or concrete poles. Since the Lake Murray #2 Line route is established, the siting studies were conducted only for the VCSNS-Killian and St. George Lines.

The first step in each siting study was the delineation of ***siting study areas*** through which any practicable transmission line corridors, or routes, might be developed for each of the required new 230 kV lines (*Figure 3.3-1*). SCE&G defined separate geographic siting study areas for the VCSNS-Killian and VCSNS-St. George 230 kV Lines by considering existing transmission line corridors, transportation systems, land use and development patterns, population density and distribution, long-range transmission system planning factors, transportation corridors, and other factors. The siting study area for the VCSNS-Killian 230 kV Line contains 226-square miles, and its delineation considered a projected need for a 230/115 kV transmission substation in the Winnsboro, SC region to provide voltage support transfer capability in the northern portion of SCE&G's electrical service area. The siting study area for the VCSNS-St. George 230 kV Lines

encompasses 1,367-square miles and was delineated to facilitate two future 230/115 kV transmission substations that will eventually be needed, according to SCE&G transmission system planners, in the Batesburg-Leesville and Gaston-Pelion regions. Development of the VCSNS-St. George siting study area also accounted for plans to fold the VCSNS-St. George 230 kV Line (both circuits) into SCE&G's existing Cope Generating Station at a future date. After carefully analyzing all factors that were taken into consideration when delineating the siting study areas for the two new 230 kV lines, it was judged that any routes or combination of routes connecting the VCSNS switchyards to the Killian and St. George 230/115 kV Transmission Substations that extended beyond the boundaries of the siting study areas would be inferior to routes running within the siting study areas because of increased environmental and land-use impacts associated with added line length.

SCE&G used aerial photographs, topographic maps, field investigations and gathered an array of data from federal, state and local agencies to characterize the siting study areas with respect to land use, development patterns, population density patterns, cultural resources, water resources, protected species, land cover, transportation systems, and utility infrastructure within the siting study areas for the VCSNS-Killian and VCSNS-St. George 230 kV Lines.

All of the data locations and attributes were grouped into the following eleven (11) data layers in a computerized Geographic Information System ("GIS") for each of the two siting study areas:

1. Existing Electrical Transmission Systems;
2. Cultural Resources;
3. Rare, Threatened and Endangered Species ("RTE");
4. Land Cover;
5. Soils (Prime Farmland Soils and Soils of Statewide Importance);
6. Land Use;
7. Occupied Buildings;
8. Population;
9. FEMA Flood Zones;
10. Hydrography; and,
11. Wetlands.

Numeric weights were assigned to each of the individual data factors included on each of the eleven (11) data layers to represent each factor's relative influence on, and sensitivity to, transmission line routing (*Tables 1 and 2*).

The weighted data were combined in the GIS, and a single map was developed that represented the cumulative effect of all weighted, overlapping data to line routing. The map is called a *Suitability Map,* and it displays the combined, cumulative effects of the weighted data. It displays the areas of highest constraint to line routing, the areas of lowest constraint, and the full range of conditions between the highest and lowest within the 226 and 1,367-square-mile siting study areas for the VCSNS-Killian and VCSNS-St. George 230 kV Lines. SCE&G used the Suitability Map for each study area to develop one potential route for each of the new lines through low constraint areas to the extent practical for further analysis and evaluation (*Figures 5.1-1and 5.1-2*).

Using information gathered during the siting study for the future lines, SCE&G identified eight route evaluation categories that were used to define and quantify the impacts to environmental resources, cultural resources, and land use associated with the potential routes for the future VCSNS-Killian and VCSNS-St. George 230 kV Lines. These evaluation categories include the following:

1. Prime Farmland and Farmland of Statewide Importance
2. Water Resources
3. Flood Prone Areas
4. Land Use Factors (including proximity to occupied buildings)
5. Land Cover
6. Cultural Resources
7. Rare, Threatened and Endangered Species
8. Population Density Factors

When using the suitability maps to develop the potential routes for the VCSNS-Killian and VCSNS-St. George 230 kV Lines, emphasis was placed on closely paralleling existing utility corridors in addition to locating the potential routes in low constraint areas to the maximum practical extent. By closely paralleling existing utility corridors wherever practical, effects to resources included in the eight evaluation categories can be minimized. For example, paralleling an existing, cleared corridor through wooded tracts reduces forest fragmentation effects; visual effects are reduced where new lines parallel existing ones that currently pose modifications to

existing view conditions; paralleling existing SCE&G transmission lines reduced the required width on new right-of-way that must be acquired; and, land use effects are reduced when new transmission lines are consolidated with existing utility corridors. Chart 5.1-1 displays the utilization of existing utility corridors by the potential routes for the VCSNS-Killian and VCSNS-St. George 230 kV Lines. It also displays the utilization of existing right-of-way by the VCSNS-Lake Murray #2 230 kV Line.

Chart 5.1-1 Utilization of Existing Utility Corridors

Existing Corridor Utilization Condition	VCSNS-Killian 230 kV Line	VCSNS -St. George 230 kV Line	VCSNS-Lake Murray #2 230 kV Line
Miles of New Line Parallel to Existing SCE&G Transmission Line Corridors	17.5	36.7	0.0
Miles of New Line Parallel to Existing Santee Cooper / Central Electric Power Cooperative Transmission Line Corridors	1.4	10.1	0.0
Miles of New Line Parallel to Other Existing Utility Corridors (Water, Gas, Sewer, etc.)	0.0	19.0	0.0
Miles of New Line to Occupy Existing SCE&G Right-Of-Way (No Additional New Right-Of-Way Required)	0.0	0.0	19.0
Miles of New Line Not Parallel to Existing Utility Corridors	17.7	68.4	0.0
Total Line Length	36.6	134.2	19.0
Percent of Total Line Length Parallel to Existing Utility Corridors or Within Existing Rights-Of-Way	52%	49%	100%

6.0 ENVIRONMENTAL CONSEQUENCES

This chapter describes short- and long-term affects to environmental resources, land use, and cultural resources, based on the potential routes developed in the siting study that will result from the construction and operation of the VCSNS-Killian, VCSNS-St. George, and VCSNS-Lake Murray #2 230 kV Lines.

6.1 Soils

The potential for soil erosion exists where it will be necessary to expose mineral soils during grading associated with access road construction and augering for transmission structure erection. Prudent construction and erosion-control measures will be used to avoid potential minor, short-term impacts and disturbed soils will be stabilized with vegetation as construction progresses over the length of the rights-of-way. Grading and earthwork activities will comply with the S.C. Stormwater Management and Sediment Reduction Act. SCE&G will use clearing, seeding, and erosion-control procedures that meet or exceed the standards set forth in local, state, and federal requirements and will comply with agency recommendations regarding prevention of soil erosion and elimination of sediment movement.

6.2 Prime Farmlands and Farmlands of Statewide Importance

Prime farmland is comprised of soils (and slopes) that have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses. The land could be cropland, pastureland, rangeland, forestland, or other land, but not urban built-up land or water. Prime farmland has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed according to sound farming methods. In general, prime farmlands have an adequate and dependable moisture supply, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content, and few or no rocks. They are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for a long period of time. Typically they do not flood during the growing season or they are protected from flooding.

Farmlands of Statewide Importance are soils that are, in addition to prime farmland, important for the production of food, feed, fiber, forage, and oil seed crops. Generally, farmlands of statewide importance include soils that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some

may produce crop yields as high as prime farmlands if conditions are favorable. Chart 6.2-1 lists the acreage of prime farmland and farmland of statewide importance that occur in the rights-of-way for the potential routes for the VCSNS-Killian and VCSNS-St. George 230 kV Lines and in the existing right-of-way for the VCSNS-Lake Murray #2 Line (*Figures 6.2-1, 6.2-3, and 6.2-3*).

Chart 6.2-1 Affected Prime Farmland and Farmland of Statewide Importance

Class	VCSNS-Killian 230 kV Line	VCSNS-St. George 230 kV Line	VCSNS-Lake Murray #2 230 kV Line
Farmland of Statewide Importance (acres)	58.7	393.5	96.0
Prime Farmland (acres)	98.9	422.4	36.8
Prime Farmland if Drained	0.0	44.9	0.0
Prime Farmland if Drained and Protected From Flooding or Not Frequently Flooded (acres)	9.1	35.3	11.1
Prime Farmland If Protected from Flooding or Not Frequently Flooded	0.0	0.7	2.8
Not Farmland of Statewide Importance or Prime Farmland Soils (acres)	213.7	594.3	84.4
Total Acres	**380.4**	**1,491.1**	**231.1**

Although new rights-of-way for the VCSNS-Killian and VCSNS-St. George 230 kV Lines will encompass prime farmland and farmland of statewide importance, agricultural uses will only be affected where structures are located. Since construction of the VCSNS-Lake Murray #2 230 kV Line will result in the replacement of an existing single-circuit 230 kV Line on H-Frames with a new double-circuit line on single steel poles, a net reduction is anticipated in affects to soils classified as Prime Farmland and Farmland of Statewide Importance. Farming, including crop production, is a permitted use on SCE&G transmission line rights-of-way throughout its system.

6.3 Water Resources

The VCSNS-Killian, VCSNS-St. George and VCSNS-Lake Murray #2 230 kV Lines will cross numerous streams along their routes from the VCSNS switchyards to their respective terminal points (*Figures 4.4-1, 4.4-2 and 4.4-3*). Little or no clearing will be required by the VCSNS-Lake Murray #2 Line since it will be built within an existing, cleared right-of-way. At stream crossings along the VCSNS-Killian and VCSNS-St. George Lines, low growing vegetation will be left intact to the maximum practical extent in stream buffer zones, and root mats in any specified buffer zones will not be disturbed. The precise VCSNS-Killian and VCSNS-St. George rights-of-way locations will be carefully positioned to avoid closely paralleling streams in a manner that

would preclude the preservation of stream buffer zones between streams and the cleared right-of-way.

Construction of the new 230 kV lines will present the potential for erosion and runoff contributions to nearby streams and wetlands; however, SCE&G will carefully design measures and plan work to prevent any sediment-laden runoff beyond designed erosion-control devices (sediment basins, sediment traps, silt fences, etc.). SCE&G will comply with the S.C. Stormwater Management and Sediment Reduction Act related to water quality protection and will comply with the recommendations of various regulatory agencies, including the S.C. Department of Natural Resources, S.C. Department of Health and Environmental Control, the U.S. Army Corps of Engineers, etc. All activities will be conducted in a manner that will not jeopardize the State water quality standards and existing water uses. The erosion-control measures and Best Management Practices employed will be sufficient to prevent any sediment movement beyond construction limits during a 10-year storm event. Measures will also be taken to prevent sediment, trash, debris, and other man-made pollutants from entering sensitive areas.

It will not be possible to avoid crossing wetlands when constructing the VCSNS-Killian and VCSNS-St. George 230 kV Lines and rebuilding the existing single-circuit VCSNS-Lake Murray #1 230 kV line to a double-circuit line to accommodate the VCSNS-Lake Murray #2 230 kV Line (*Figures 4.4-4, 4.4-5 and 4.4-6*); however, no access roads will be built in wetlands; no wetland contours will be changed; and no wetlands will be converted to uplands. To the maximum extent practical, SCE&G will design the lines to avoid placement of line structures in wetlands. SCE&G will use selective clearing measures in the forested wetlands, leaving the root zone and as much low growing vegetation as possible in the wetlands and associated wetland buffers to prevent erosion. Only those trees that pose a current or potential safety problem (i.e., trees that would interfere with the reliable, safe operation of the line) will be removed. All clearing in forested wetlands will be done by hand-clearing methods or by high-flotation equipment designed to exert no more ground pressure than 5# per square inch when fully loaded.

Before construction begins on the VCSNS-Killian, VCSNS-St. George and VCSNS-Lake Murray #2 230 kV Lines, project supervisors will be given plan-and-profile drawings for the projects to provide them with locations of the structures and specific locations and requirements of any sensitive areas, including stream buffers and wetlands. All state and federal permits related to wetlands and water quality protection will be obtained before construction begins. Chart 6.3-1 lists

all right-of-way preparation activities that could potentially affect sensitive resources associated with the protection of water quality.

Chart 6.3-1 Affected Wetlands and Stream Buffers

Construction Activity	VCSNS-Killian 230 kV Line	VCSNS-St. George 230 kV Line	VCSNS-Lake Murray #2 230 kV Line
River, Stream, Lake or Pond in the Right-of-Way (Acres)	0.6	19.4	0*
Acres of right-of-way requiring hand clearing within 100' of any stream, river, lake, or pond	24.2	131.4	0*
Acres of right-of-way requiring hand clearing within 100' of any wetland	13.5	92.3	0*
Acres of wetland--type PSS, Palustrine Scrub / Scrub--impacted by clearing within the wetland	0.1	21.1	0*
Acres of wetland--type PEM, Palustrine Emergent--impacted by clearing within the wetland	1.6	5.2	0*
Acres of wetland--type PFO, Palustrine Forested--impacted by clearing within the wetland	4.4	95.4	0*
Acres of Upland in the Right-of-Way	336	1,126.3	204.5
Grand Total	**380.4**	**1,491.1**	**204.5***

* Although wetlands and streams occur in the VCSNS-Lake Murray #2 right-of-way, no clearing is required.

6.4 Flood-Prone Areas

SCE&G obtained the Federal Emergency Management Agency National Flood Insurance Program maps for all counties affected by the siting study areas for the VCSNS-Killian, VCSNS-St. George, and VCSNS-Lake Murray #2 230 kV Lines to determine the extent of flood-prone areas (*Figures 4.4-7, 4.4-8 and 4.4-9*). The data was added to the siting data base and is summarized in Chart 6.4-1.

Chart 6.4-1 Affects to FEMA Flood Zones

Condition	VCSNS-Killian 230 kV Line (Acres in the R/W)	VCSNS-St. George 230 kV Lines (Acres in the R/W)	VCSNS-Lake Murray #2 230 kV Line (Acres in the R/W)
Zone A - Areas of 100-Year Flood (No Base Flood Elevation Determined)	2.8	104.1	9.1
Zone AE - Areas of 100-Year Flood (Base Flood Elevation Determined)	1.3	0.0	0.2
Zone AE - Floodway	1.2	0.0	0.1
Zone X – Areas of 500-Year Flood	0.0	4.0	0.0
Zone X - Areas Outside 500-Year Flood Zone	375.1	1,383.0	221.7
Grand Total	**380.4**	**1,491.1**	**231.1**

SCE&G will avoid locating transmission line structures in flood zones wherever possible, but the limited mass of the single pole structures at the ground line will not pose significant obstacles to floodwater and floating debris if placing structures in flood zones cannot be avoided.

6.5 Land Use

The most significant effect the VCSNS-Killian and VCSNS-St. George 230 kV Lines will have on land use in the region will be the permanent restriction on structure erection and timber production in the right-of-way. Those restrictions are currently in effect along the existing right-of-way within which the VCSNS Lake Murray #2 Line will be built. Permitted uses in the right-of-way will include pastures, crop production, road construction, parking lots, and other uses that will not interfere with the safe, reliable operation of the future lines. Chart 6.5-1 lists the acreages of land uses within the rights-of-way for the potential line routes for the VCSNS-Killian and St. George 230 kV Lines and within the existing right-of-way along the route of the VCSNS-Lake Murray #2 230 kV Line:

Chart 6.5-1 Affected Land Use

Land Use Designation	VCSNS-Killian 230 kV Line (Acres in the R/W)	VCSNS-St. George 230 kV Line (Acres in the R/W)	VCSNS-Lake Murray #2 230 kV Line (Acres in the R/W)
Agricultural Land	0.0	43.8	0.0
Cemetery	0.0	0.6	0.0
Educational/Institutional	5.3	0.0	0.0
Electric Transmission Right-of-Way	9.9	25.4	0.0
Gas Transmission Right-of-Way	0.2	2.4	0.0
Major Roadway	10.9	2.2	1.0
Place of Worship	7.1	1.8	0.0
Power Facility	12.0	0.0	0.2
Power Generation	0.3	0.0	0.4
Railroad Right-of-Way	0.8	1.8	1.3
Secondary Roadway	8.2	3.8	10.5
Strip Mines, Quarries, Gravel Pits	0.8	0.0	0.0
Transportation, Communications, and Utilities	0.0	23.5	33.1
Water	0.0	49.2	1.5
No Designated Land Use	324.9	1,336.6	183.1
Total Acres in the Right-Of-Way	**380.4**	**1,491.1**	**231.1**

The locations of all occupied buildings in the siting study areas for the VCSNS-Killian and St. George 230 kV Lines and within 1,000' of the VCSNS-Lake Murray #2 230 kV Line route was added to the project data bases (*Figures 4.7-7, 4.7-8 and 4.7-9)*. Each building in the siting study areas was added to the geographic information system database for each line and applied to the development and evaluation of the potential routes for the VCSNS-Killian and St. George Lines in terms of proximity to them. Chart 6.5-2 displays the quantity of occupied buildings that will be within various distances of the VCSNS-Killian, VCSNS-St. George and VCSNS-Lake Murray #2 230 kV Lines out to a maximum distance of 1,000-feet.

Chart 6.5-2 Proximity of Occupied Buildings

Factor	VCSNS-Killian 230 kV Line	VCSNS-St. George 230 kV Line	VCSNS-Lake Murray #2 230 kV Line
Number of occupied buildings within the proposed line's R/W	0	0	0
Number of occupied buildings outside of the R/W and within 200' of the proposed line	21	10	125
Number of occupied buildings between 200' and 500' of the proposed line	159	264	324
Number of occupied buildings between 500' and 1000' of the proposed line	379	735	535
Total	**559**	**1,009**	**984**

6.6 Land Cover

An inventory of land cover in the VCSNS-Killian and VCSNS-St. George siting study areas and within 1,000' of the VCSNS-Lake Murray #2 Line route was made through the use of 2006 Satellite Imagery (GeoEye, Inc.) and digital data from the SC Department of Natural Resources (SC-GAP Project, "South Carolina 27-Class Land Cover") published on December 21, 2001 by the South Carolina Cooperative Fish and Wildlife Research Unit, USGS Biological Resources Division. The GAP Project classifications were used and augmented by ground-truthing and updates based on the 2006 imagery (*Figures 4.2-1, 4.2-2 and 4.2-3*). Most land cover associated with each of the lines consists of active pasture, hardwood forests, and pine forests. Chart 6.6-1 lists the quantity and types of land cover that will be affected by development the potential routes for the VCSNS-Killian and VCSNS-St. George 230 kV Lines and the actual route for the VCSNS-Lake Murray #2 230 kV Line (very minimum land cover effects are anticipated with constructing the VCSNS-Lake Murray #2 Line on the existing, cleared right-of-way).

Chart 6.6-1 Affects to Land Cover

Land Cover Classification	VCSNS-Killian 230 kV Line (acres affected)	VCSNS-St. George 230 kV Line (acres affected)	VCSNS-Lake Murray #2 230 kV Line (acres affected)
Bottomland / Flood Plain Forest	8.1	79.1	0.3
Closed Canopy Evergreen Forest / Woodland	50.2	93.1	0.7
Cultivated Land	0.0	87.8	0.0
Dry Deciduous Forest / Woodland	13.2	31.5	0.7
Dry Scrub / Shrub Thicket	41.8	200.4	7.8
Dry Mixed Forest/Woodland	100.2	379.1	2.3
Fresh Water	1.0	8.5	1.4
Grassland / Pasture*	86.9	511.0	203.4
Marsh / Emergent Wetland	0.2	2.2	0.0
Mesic Deciduous Forest / Woodland	7.1	10.6	0.1
Mesic Mixed Forest / Woodland	0.7	16.7	0.3
Needle-Leaved Evergreen Mixed Forest / Woodland	6.2	5.1	0.0
Open Canopy / Recently Cleared Forest	24.2	12.6	0.0
Pocosin	0.0	0.9	0.0
Urban Development	33.7	49.5	13.2
Urban Residential	5.4	0.0	1.0
Wet Scrub / Shrub Thicket	1.3	3.0	0.0
Swamp	0.2	0.0	0.0
Total	**380.4**	**1,491.1**	**231.2**

***** Classification will not be affected by clearing impacts. Affects will be limited to the actual footprint area of structures, which are estimated to be less than 1-acre within the area of the land cover classification.

The most significant impact to land cover that will result from construction of the VCSNS-Killian and VCSNS-St. George 230 kV Lines will be the clearing of approximately 713.0 acres of forests and the resulting affects to wildlife habitat (Section 6.7, below).

6.7 Wildlife

Various studies (Duke Power Company et al, 1976; Michael et al., 1976; Shreiber et al., 1976; Cavanagh et al., 1976) conclude that right-of-way clearing through forested areas will have an effect on the fauna of the immediate area. In the Duke Power study, which was conducted in the Piedmont section of South Carolina (Rock Hill-Lancaster region), it was found that herbaceous and brushy plant communities that become established in Piedmont transmission line corridors provide a habitat that:

1) Preclude use of the area by some of the pre-existing species such as some woodland birds and small mammals;
2) Enhance aspects of the area for some pre-existing species, providing them with certain beneficial factors associated with food and cover; and,
3) Encourage invasion by species previously absent in the area.

Species discouraged from inhabiting cleared areas of the corridor are those restricted to woodland habitats. Of the birds of the Piedmont, such species would include many warblers, woodpeckers, Carolina chickadee, tufted titmouse, yellow-billed cuckoo, crested flycatcher, brown-headed nuthatch, wood thrush, red-eyed vireo, and rose-breasted grosbeak, among others. Examples of mammals that would be discouraged from the area would be the white-footed mouse and golden mouse.

Species that would benefit from the new habitat provided by cleared areas include vultures, hawks, foxes, and possibly other predators. These species, though generally associated with other habitats, seem to concentrate portions of their activities in cleared corridors. Vultures and hawks (especially the red-tailed hawk) are commonly seen perched on transmission line towers or soaring over the corridors. Possibly these perches, in conjunction with the dense rodent populations of the corridors, provide better hunting areas. The fact that small mammal populations are denser in corridors than in woodlands may account for the use of corridors by foxes. Studies have shown that foxes commonly feed on the cotton rat and meadow vole in transmission line corridors. Thus, a typical woodland animal, such as the gray fox, may commonly venture into corridor habitats because of the accessible food supply.

Species previously absent or uncommon that move into an area following the establishment of a transmission line corridor, are those typically associated with open spaces or with herbaceous or brushy habitats. In the Piedmont, such species of birds would include various sparrows, meadowlark, red-winged blackbird, blue grosbeak, prairie warbles, yellow-throat, yellow-breasted chat, and indigo bunting, among others. Mammals include the rice rat, cotton rat, meadow vole, and harvest mouse. Certain amphibians (upland chorus frog, southern leopard frog) that prefer to breed in open grassy areas also benefit from transmission line corridors.

Among the birds that inhabit transmission line corridors, some actually live in the herbaceous vegetation of the corridor, while others inhabit areas along streams passing through the corridor or trees adjacent to the corridor. Examples of the former include the field sparrow, song sparrow, meadowlark, red-wing, and yellow-throat, among others. Species inhabiting trees on the immediate edge of a corridor or trees along a stream crossing are sometimes called “edge species”. These species, which include in part the indigo bunting, yellow-breasted chat, prairie warbler, and towhee, prefer to inhabit woodlands adjacent to open spaces. Thus, while they inhabit trees, their presence is due to the open nature of the corridor.

Also, transmission line corridors, as managed by SCE&G, support an assemblage of non-game species. The planted and invading native vegetation, in conjunction with the small trees left in selected locations, create a habitat for various species preferring open herbaceous habitats and edge habitats. These anticipated and predicted corridor clearing effects will occur over approximately 48.79% of the potential route for the VCSNS-Killian 230 kV Line and 32.79% of the potential route for the VCSNS-St. George 230 kV Line. No effects are anticipated along the VCSNS-Lake Murray #2 230 kV Line since it will be constructed entirely within an existing, cleared SCE&G transmission line right-of-way.

The areas that will be traversed by the VCSNS-Killian and VCSNS-St. George 230 kV Lines contain large tracts of woodlands. In these expansive forests, the corridors will represent openings that are in early stages of succession. The creation of such openings in heavily timbered areas is a standard wildlife management technique to increase the carrying capacity for woodland game. Thus, the open corridor segments of the future lines with invading herbaceous species should be advantageous to the larger game animals in the area (deer and wild turkey), as well as certain non-game species. No affects to wildlife will occur as a result of constructing the VCSNS-Lake Murray #2 230 kV Line since the right-of-way upon which it will be built is currently cleared.

6.8 Cultural Resources

The potential routes for the VCSNS-Killian and VCSNS-St. George 230 kV Lines and the route of the VCSNS-Lake Murray #2 Line will have minimal or no effects on cultural resources that are listed in the records of the South Carolina Institute of Anthropology and Archaeology ("SCIAA") and South Carolina Department of Archives and History ("SCDAH"). Chart 6.8-1 lists cultural resource factors that were included in the evaluation of the potential routes and shows the resources affected by each.

Chart 6.8-1 Affected Cultural Resources

Cultural Resource Factors	VCSNS-Killian 230 kV Line	VCSNS-St. George 230 kV Line	VCSNS-Lake Murray #2 230 kV Line
Number of Recorded Archaeological Sites in the R/W that may be disturbed by line construction (Listed on the NRHP, Eligible for NRHP, Potentially Eligible, Eligibility Undetermined)	1	10	1
Number of Recorded Archaeological Sites in the R/W that may be disturbed by line construction (Not Eligible for NRHP)	0	0	0
Number of Recorded Archaeological Sites within 100' of the R/W where low potential for disturbance exists (Listed on the NRHP, Eligible for NRHP, Potentially Eligible, Eligibility Undetermined)	4	5	0
Number of Recorded Archaeological Sites within 100' of the R/W where low potential for disturbance exists (Not Eligible for NRHP)	0	0	0
Number of Historic Sites in the R/W (Listed on the NRHP, Eligible for NRHP, Potentially Eligible)	0	0	0
Number of Historic Sites within 1/4 mile of the Line (Listed on the NRHP, Eligible for NRHP, Potentially Eligible)	1	3	3
Number of Historic Sites between 1/4 - 1/2 mile of the line (Listed on the NRHP, Eligible for NRHP, Potentially Eligible)	6	0	1
Number of Historic Sites between 1/2 and 1-1/4 mile of the line (Listed on the NRHP, Eligible for NRHP, Potentially Eligible)	5	13	6
Acres of Designated Historic District in the R/W	0.4	0	0
Acres of Designated Historic District within 100' of the R/W	0.9	0	0
Acres of Designated Historic District between 100' and 1/4 mile of the R/W	44.1	0	0
Acres of Designated Historic District between 1/4 and 1/2 mile of the R/W	60.1	2.1	0
Acres of Designated Historic District between 1/2 and 1-1/4 mile of the R/W	70.7	0	0

6.9 Rare, Threatened and Endangered Species

SCE&G imported the S.C. Heritage Trust Program digital database for protected species, including the locations of documented occurrences, and overlaid it onto the siting study areas for the VCSNS-Killian and VCSNS-St. George 230 kV Lines and the route of the VCSNS-Lake Murray #2 230 kV Line (*Figures 4.6-1, 4.6-2 and 4.6-3*). The Heritage Trust Program lists for all counties affected were compared with the U.S. Fish and Wildlife Service ("USFWS") databases for the counties, and it was confirmed that protected species listed in the USFWS data were accounted for in the Heritage Trust data. Using the electronic Heritage Trust database, Geographic Information System natural resources "data layers" were developed that include the locations of all documented occurrences of protected species in the siting study areas for the VCSNS-Killian and VCSNS-St. George 230 kV Lines and within the 2,000'-wide corridor surrounding the VCSNS-Lake Murray #2 230 kV Line route. After updating the siting studies at a future date and selecting the final routes for the VCSNS-Killian and VCSNS-St. George 230 kV Lines, SCE&G will conduct a comprehensive biological survey along the entire length of the selected routes following the centerline surveys. If any protected species are discovered, SCE&G will take appropriate action, which may include notifying appropriate the agencies, marking the species in the field for protection during construction and operation of the lines, relocating the plants, or other mitigation as may be warranted. The proximity of documented protected species included on the Heritage Trust Program and USFWS lists to the potential routes for the VCSNS-Killian, VCSNS-St. George and VCSNS-Lake Murray #2 230 kV Lines is shown in Chart 6.9-1.

Chart 6.9-1: Affects to Protected Species

Location of Protected Species	**VCSNS-Killian 230 kV Line** (number of documented occurrences)	**VCSNS-St. George 230 kV Line** (number of documented occurrences)	**VCSNS-Lake Murray #2 230 kV Line** (number of documented occurrences)
Number of Protected Species in the R/W	0	0	0
Number of Protected Species within 100' of the R/W	0	1	0
Number of Protected Species between 100' and 200' of the R/W	0	1	0
Number of Protected Species between 200' and 500' of the R/W	0	1	0
Total	**0**	**3**	**0**

An issue associated with large raptors is their vulnerability to power line electrocution. Their large size, wingspan, and perching make them susceptible to electrocution on certain transmission line designs. Transmission line structures with inadequate spacing between phases (i.e., less than 60 inches of separation between conductors and/or grounded hardware) can cause raptor electrocutions. With this in mind, the USFWS has recommended, under authority of the Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act, that all new transmission structures be equipped with design features that prevent these electrocutions. Such features typically include designs that (1) make the distance between phase conductors greater than the wingspread of the bird that is landing, perching, or taking off; and (2) increase the distance between grounded hardware (e.g., ground-wires) and an energized conductor to more than the largest bird's wingspread or the distance from the tip of the bill to the tip of the tail. The 230 kV structures that will be used on the VCSNS-Killian, VCSNS-St. George, and VCSNS-Lake Murray #2 230 kV Lines will be "raptor safe" and meet the guidelines recommended in Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 2006 (Avian Power line Interaction Committee 2006); therefore, raptor electrocutions are not anticipated on this project.

6.10 Population

Population distribution and density was considered when developing the potential routes for the VCSNS-Killian and VCSNS-St. George 230 kV Lines. The potential routes were developed through low density population areas to the extent practical. Chart 6.10-1 displays the length of each potential route in miles, including the VCSNS-Lake Murray #2 230 kV Line route, that passes through various population density areas based on Year 2000 Census data.

Chart 6.10-1: Population Density Along the VCSNS-Killian and VCSNS-St. George Potential Line Routes and Along the VCSNS-Lake Murray #2 Line Route

Population Density Area (Acres per Person)	**VCSNS-Killian 230 kV Line** (Miles within Population Density Area)	**VCSNS-St. George 230 kV Line** (Miles within Population Density Area)	**VCSNS-Lake Murray #2 230 kV Line** (Miles within Population Density Area)
0.5-1.0 Acres Per Person	0.1	0.0	2.5
1.1-2.0 Acres Per Person	1.3	0.5	0.9
2.1-4.0 Acres Per Person	1.9	0.4	0.8
4.1-10.0 Acres Per Person	3.8	15.4	5.1
Greater Than 10.0 Acres Per Person	29.5	117.9	9.8
Total Line Length (Miles)	**36.6**	**134.2**	**19.1**