

**EXAMPLE OF A CASE STUDY USING GIS IN AN  
ENERGY SYSTEM SITING DECISION:**

**SCGE&E Include here:**

*South Carolina Electric & Gas Company*

*Columbia, SC 29218*

*TRANSMISSION LINE SITING REPORT  
FOR THE PROPOSED  
WESTVACO – THOMAS ISLAND 115kV TRANSMISSION  
LINE  
BERKELEY AND CHARLESTON COUNTIES, S C*

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## **The SCE&G Transmission Line Siting Process: A Brief Overview**

The process used for this siting study utilizes cutting-edge technology in a comprehensive procedure that fully integrates environmental, engineering, real estate, socio-economic, and regulatory requirements at the onset of the projects and appropriately accounts for each throughout the siting effort. Key attributes of the process are the following:

- Flexibility, providing for a level of effort and detail appropriate for the project;
- A rational, objective decision-making framework leading to routing decisions that are defensible and traceable;
- Integration of real estate, engineering, environmental, land use, and community considerations, at appropriate levels and times, throughout the siting process;
- Rational progression from the “global” identification and consideration of all practical routing opportunities to a narrowing of candidate routes based on quantifiable and objective data;
- Cost and schedule efficiency. With years of experience on numerous transmission line siting projects, the siting staff leverages cutting edge technology during the execution of the siting process; and,
- A systematic process framework that provides for the identification of relevant issues affecting siting decisions and a mechanism to appropriately factor them into the siting process.

The process is designed to provide fairness and balance by the application of factors to siting decisions that ensures the final route selection will minimize affects to an array of environmental, cultural, aesthetic, and land use resources.

## **EXECUTIVE SUMMARY**

### **Project Need**

The Charleston area is one of the fastest growing areas in South Carolina. Growth has placed a strain on the region's electrical transmission and distribution systems, and it is projected that future growth will lead to the deterioration of electrical service reliability unless additional electrical capacity is provided with new facilities. An immediate need for additional electrical capacity exists in the Cainhoy, Thomas Island and Daniel Island areas.

SCE&G conducted electrical load studies and determined that immediate steps must be taken to ensure an adequate supply of reliable electrical energy in these areas. Presently, these areas are served from a single source, the Cainhoy 115/23kV Substation located approximately seven miles from Thomas Island. SCE&G system studies indicate that a new substation on Thomas Island is needed by December 2001.

The new Thomas Island Substation will be a vital part of SCE&G's public service mandate to provide a continuous supply of economical, reliable electrical energy and will provide the following benefits:

- The new Thomas Island Substation will increase service capacity to meet the rapidly increasing electrical load demand by providing a second supply of electrical energy to the Cainhoy, Thomas Island, and Daniel Island areas;
- The average length of distribution lines from substations to customers will be significantly reduced, thus increasing service reliability;
- The addition of the Thomas Island Substation will allow distribution circuit modifications that will connect existing radial lines to a back-up substation source. This will allow switching procedures to minimize the number and duration of customer service outages during storm events or when lines have to be taken out of service for equipment maintenance or repairs.

Ultimately, the Thomas Island Substation and 115kV Transmission Line become key links in planned transmission system network improvements that will provide service reliability benefits to North Charleston and the East Cooper area. Initially, the new substation will be connected to SCE&G's transmission system by a new 115kV line extended from the Westvaco Substation. Eventually, the line will continue to the Mt. Pleasant Substation. This will be a third independent 115kV source to the East Cooper Area and will provide a backup source for North Charleston in the event the primary 115kV source from Goose Creek is lost. When the line is eventually completed for the entire distance between Westvaco and Mt. Pleasant, the benefits of increased service reliability will extend from North Charleston to the Isle of Palms.

### **The Proposed Action**

SCE&G proposes to build a new 115kV transmission line from its Westvaco Substation to the new substation site on Thomas Island. *Figure 1* shows the location of the Westvaco Substation, the proposed route of the new line (identified as Route G), and the future Thomas Island Substation.

### **Alternative Solutions**

In addition to the proposed action, SCE&G evaluated upgrading the existing electrical distribution system as a solution designed to meet the demand for additional electrical capacity in the region. This alternative solution will not meet long-term electrical demand projections, will not pre-empt the need for an additional substation in the region beyond 2004, and will not be cost effective.

### **Transmission Line Route Selection**

SCE&G conducted a comprehensive siting study for this project. A 17.1 square mile **siting study area** was delineated that encompassed the full expanse of area through which any practical route for the proposed transmission line could pass (*Figure 2*). Environmental, land use, cultural resource, and aesthetic data were collected and developed that fully characterized the siting study area (*Figures 5-15*). This data was entered into a computerized Geographic Information System and weighted to account

for their sensitivity to transmission line routing (*Table 1*). The data were then combined and a single map of the siting study was developed that displayed the areas of least constraint to routing within the siting study area, the areas with highest constraint and the full range of constraint conditions between the least and highest (*Figure 16*). Eight alternate routes (*Figure 3*) that connected the proposed substation to the existing SCE&G 115kV power source at the Westvaco Substation were identified within the siting study area and evaluated. (SCE&G originally identified 7 alternate routes, but an 8<sup>th</sup> alternate – a minor adjustment to Alternate Route G – was identified and evaluated in response to Community suggestions). Each of the eight alternate routes traversed the distance between the proposed substation and the Westvaco Substation through areas determined to have the least effect on environmental resources and land use in the region.

Using information gathered during the siting study, during a community workshop, and from a community questionnaire, SCE&G identified eight route evaluation categories to quantitatively compare the eight alternate routes (*Table 2*). These categories are:

- Cultural and Natural Resource Factors
- Land Cover Factors
- Property Ownership Factors
- Land Use Factors
- Occupied Buildings Factors
- Public Visibility Factors
- Residential Visibility Factors
- Water Quality Factors

The comprehensive evaluation, summarized in *Table 3*, shows alternate Route G with the lowest total rank score (i.e., lowest overall environmental, cultural resource, aesthetic, and land use impacts). Route G originates at the Westvaco Substation and follows an existing SCE&G 115kV transmission line to the Interstate 526 corridor, approximately one-half mile southward. At that point it turns east and parallels

Interstate 526 (north side) for approximately 2.7 miles to the Interstate 526-Cainhoy road intersection where it turns south and parallels Cainhoy Road (following an existing electrical distribution line corridor) for approximately three-quarters of a mile to the Thomas Island Substation site (*Figure 1*).

Once the routes were ranked according to their effects on important resources, a cost estimate for each alternate route was prepared before making the final route selection decision. It is estimated that Route G is the second most economical of the alternate routes evaluated. The following chart displays various physical quantity factors about each alternate route and contains the estimated cost:

ROUTE								
	A	B	C	D	E	F	G	H
<b>Siting Study Rank</b>	<b>7</b>	<b>8</b>	<b>4</b>	<b>6</b>	<b>3</b>	<b>5</b>	<b>1</b>	<b>2</b>
Acres of R.O.W. to be Acquired	13.9	15.0	15.5	16.6	17.1	17.9	5.5	7.9
Miles of Existing Line Re-Build	3.0	3.0	3.0	3.0	3.0	3.0	0.0	0.0
Miles of New Construction	7.4	7.5	5.1	5.3	4.9	4.9	3.4	3.4
Miles of Distribution Over-Build	1.3	2.5	1.3	2.5	1.3	2.2	0.7	0.7
Acres of Clearing	26.2	24.6	22.5	20.8	17.0	15.6	5.4	7.5
R.O.W. Acquisition Cost	\$151,600	\$196,500	\$166,500	\$210,900	\$180,900	\$212,600	\$61,500	\$71,100
R.O.W. Preparation Cost	\$117,900	\$110,700	\$101,250	\$93,600	\$76,500	\$70,200	\$24,300	\$33,750
Federal & State Permits Costs	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000	\$20,000	\$20,000
Line Construction Cost	\$4,049,199	\$4,188,254	\$3,729,439	\$3,850,548	\$3,488,829	\$3,504,829	\$2,257,013	\$2,098,013
<b>Total Estimated Line Cost</b>	<b>\$4,343,699</b>	<b>\$4,520,454</b>	<b>\$4,022,189</b>	<b>\$4,180,048</b>	<b>\$3,771,229</b>	<b>\$3,812,629</b>	<b>\$2,362,813</b>	<b>\$2,222,863</b>

Following this comprehensive siting study, Route G was chosen for reasons including the following:

- (1) Route G minimizes impact over the eight evaluation categories.
- (2) Route G closely parallels the Interstate 526 bridge across the Cooper River, thus minimizing impacts to estuarine systems.



- (3) Visibility of the line along Route G from residential areas will be minimal in comparison to other routes. Approximately 0.6 miles of the line will be visible along Cainhoy Road through a residential area where it will be over-built on an existing distribution line. Because it will be overbuilt along an existing distribution line, residents will notice little change to existing conditions when construction is completed. This affect was a key concern of community workshop attendees and participants in the community questionnaire.
- (4) For 67% of its total length, Route G crosses commercial/industrial property, the Cooper River in an area primarily used for commercial shipping, and Clouter Island (used for dredge-spoil disposal)– thus, protecting sensitive environmental resources and residential land uses.
- (5) Although the total estimated cost for Route G is slightly higher than the estimated cost for the route that ranked second best in the siting study (Route H), SCE&G chose to select Route G. It offers fewer potential environmental impacts by avoiding undisturbed wetlands/marshland and minimizes clearing of wooded areas.

### **The Affected Environment**

The proposed Westvaco – Thomas Island 115kV transmission line will be located in southeastern Charleston County and northwestern Berkeley County, South Carolina. The proposed transmission line is approximately 3.98 miles long. It will be connected to SCE&G's existing 115kV transmission grid at the Westvaco Substation (at the Westvaco pulp and paper mill). From Westvaco, the line will run approximately 0.25 mile west to Virginia Avenue. The route then runs south for approximately 0.36 miles to the north side of the Interstate 526 bridge. It then runs east 2.6 miles across the Cooper River, Clouter Island, and Clouter Creek (paralleling the bridge) to a point near the I-526 Cainhoy Road Interchange. At this point, the line turns south and runs with Cainhoy Road to the Thomas Island Substation site (*Figure 1*).

A mix of rural, industrial, commercial and residential land uses characterizes the siting study area. Most of the rural areas, consisting of salt marsh, pine forest, and



mixed pine-hardwood areas, are located in the northeastern portion of the project area (i.e., Berkeley County), between the Cooper River and State Route 33 (Clements Ferry Road). This area is rapidly being developed for commercial and residential land uses. There are also several large, active dredge spoil storage sites (i.e., U. S. Army Corps of Engineers) located along the Cooper River. Wetland areas, especially salt marshes, are extensive along the eastern shore of the Cooper River.

SCE&G initially contacted the South Carolina Natural Heritage Trust Program (SC Heritage Trust 2001) concerning listed rare plant and animal species in the siting study area. The current U.S. Fish and Wildlife Service County List (USFWS 2000) was also reviewed. The Heritage Trust Program and USFWS currently list the following species and natural communities for this portion of Charleston and Berkeley Counties:

#### Animal

- Shortnose Sturgeon (*Acipenser brevirostrum*) (State Rare and Federal Endangered);
- Flatwoods Salamander (*Ambystoma cingulatum*) (State Endangered and Federal Threatened);
- Bald Eagle (*Haliaeetus leucocephalus*) (State Endangered and Federal Threatened); and,
- Red-cockaded woodpecker (*Picoides borealis*) (State Imperiled, Federal Endangered).

No other listed species or significant habitat area (e.g., waterbird colony) has been documented by the Heritage Trust as occurring within the siting study area. Additional species are listed by the Heritage Trust as occurring in Charleston and Berkeley counties. The list of these species is found in *Appendix B*.

The South Carolina Department of Archives and History and the Institute of Archaeology and Anthropology lists one historical district, one historic site, and 52 archaeological sites in the siting study area. These sites range from disturbed prehistoric sites to the North Charleston Historic District.

## **Environmental Consequences of the Proposed Action**

The proposed Thomas Island 115kV Transmission Line will have no significant long-term effects on the environment of the study area. The selected route (G) minimizes impacts to environmental resources, cultural resources, land use, and aesthetics. No known Rare, Threatened and Endangered (RTE) species or historic and archaeological resources will be affected by the project. Once the project is complete, the line will become essentially "dormant" in relation to the environment.

The proposed transmission line will cross a total of three creeks and the Cooper River. The creeks include Filbin Creek, Clouter Creek, and an unnamed tributary to Clouter Creek. The proposed line will span the three creeks, but several transmission line structures will be required in the Cooper River outside of the designated shipping channel. Construction of the proposed substation and transmission line will present the potential for erosion and runoff contributions to nearby streams and tidal wetlands, but SCE&G will minimize that potential impact through the use of prudent design, construction, and erosion control measures. SCE&G will comply with the stormwater management and sediment reduction regulations related to water-quality. 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 (BMP's) employed will be sufficient to prevent any sediment movement beyond construction limits during a 25-year storm event. Measures will also be taken to prevent sediment, trash, debris, and other man-made pollutants from entering sensitive areas and designated critical areas. Only those trees posing a current or potential safety problem ("danger trees") will be removed.

The Federal Emergency Management Agency National Flood Insurance Program maps (*Figure 5*) for Charleston and Berkeley counties were reviewed to determine the extent of flood-prone areas in the project area. The majority of the study area, including Route G, is in a documented 100-year floodplain area along the Cooper River and Clouter Creek. However, the proposed structures will not add measurable restriction to the flow of flood water.

Based on existing information such as the National Wetland Inventory maps and aerial photographs, there are wetlands affected by the proposed line. The wetlands crossed by the proposed transmission line consist of tidal salt marsh south of the Westvaco substation, along the Cooper River, and in the Clouter Creek area (*Figure 6*). Approximately 22 acres of salt marsh will be temporarily affected by the placement of pole structures and access roads.

No mechanized equipment will be allowed off the access roads. Barges and construction mats will be used in all practicable wetland situations, thus, only temporary impacts are anticipated. Vegetation in any affected wetland area will be hand cleared, if necessary. Minimal cutting will be required in emergent and scrub/shrub wetlands. Plan-and-profile drawings for the project will be given to the construction supervisors before any clearing and earthwork begins showing the locations of the structures and specific locations and requirements of any sensitive areas.

Crossing wetlands and the Cooper River will require a U. S. Army Corps of Engineers Permit (i.e., Section 10 Permit) and a permit from the SC Ocean & Coastal Resource Management (i.e., Critical Area Permit). Adhering to the special conditions required by these permits will minimize permanent impacts to wetlands. During the field survey associated with the preferred route, a wetland delineation effort will be conducted to determine the specific location and extent of any wetland areas within the proposed corridor. This wetland effort will follow the current delineation methodology (Environmental Laboratory 1987).

SCE&G carefully considered the visual affects of the proposed transmission. The siting study included two evaluation categories, Visibility Factors (Public) and Visibility Factors (Residential), to account for the lines affects on the aesthetic resources in the region. The selected route is the 6<sup>th</sup> best route in the Visibility Factors (Public) category and the 2<sup>nd</sup> best route in the Visibility Factors (Residential) category. The selected route scored 6<sup>th</sup> best in the Visibility Factors (Public) category because in parallels I-526 for approximately 2.7 miles and Cainhoy Road for approximately 0.75 miles; however, where parallel to I-526, the line will be viewed within the context of a heavily modified view shed. The bridge infrastructure, Westvaco industrial complex,

and SC Ports Authority Terminal will serve to mitigate the visual affects of the line from I-526 viewpoints. Where the line parallels Cainhoy road, the visual change it will impose on existing views will be significantly mitigated from residences and road views since it will be overbuilt onto an existing SCE&G distribution line.

To provide for public safety and protection, SCE&G will design and construct the proposed transmission line in such a way that it will comply with, or exceed, the latest National Electrical Safety Code in effect at the time of construction. Further, SCE&G commits to continue their long-standing tradition of operating and maintaining their facilities in a manner that will ensure public safety over the life of these facilities.

## **1.0 INTRODUCTION**

South Carolina Electric & Gas Company (SCE&G) based in Columbia, South Carolina, is a wholly owned subsidiary of SCANA Corporation, an energy-based holding company. SCE&G serves over one-half million customers in central and southern South Carolina.

This report documents a siting study SCE&G has conducted for a new 115kV transmission line to serve a new substation on Thomas Island, Berkeley County, South Carolina, near Charleston.

## 2.0 FACILITY DESCRIPTION

The proposed Westvaco–Thomas Island project consists of a new 115/23kV substation, to be known as the Thomas Island Substation, and a 115kV transmission line to connect the new substation to an existing 115kV power source at SCE&G's Westvaco Substation.

The proposed Thomas Island 115/23kV Substation will be located on a heavily wooded site west of Cainhoy Road, approximately one-half mile south of Interstate 526 in Berkley County, South Carolina. Except where necessary, the existing vegetation will be left for screening and noise abatement (*Figure 4*). Following construction, the substation will have no effects on the surrounding community.

The substation lot is approximately 2 acres. About 1 acre will be graded and approximately  $\frac{3}{4}$  acre will be fenced for the substation (*Figure 4*). The fence will be a seven-foot-tall chain link fence topped with three strands of barbed wire, which will extend the fence's height by one foot. The facility will utilize one 28 MVA transformer. The substation will include low-side metering and a 21' 6" x 9' 6" masonry or pre-cast concrete control building inside the substation fence. Initially, there will be 3 distribution circuits exiting the Thomas Island Substation. No additional circuits are planned at this time, but 3 additional circuits can be added as electrical load growth continues in the area.

The proposed 115kV transmission line will connect to SCE&G's existing transmission system at its Westvaco Substation in Charleston County, SC. The Westvaco Substation is in an industrial area approximately one-half mile north of Interstate 526 near the Cooper River. From the Westvaco Substation, the line will run east for approximately one-quarter mile to Virginia Avenue utilizing existing 115kV transmission line structures. At Virginia Avenue, the line turns and runs south parallel to the road for approximately four-tenths of a mile to a point near the Interstate 526 bridge over the Cooper River. This section of line will also utilize an existing 115kV transmission line structures.

At the Cooper River bridge, the line turns and runs parallel with Interstate 526 for approximately 2.7 miles across the Cooper River, Clouter Island, a narrow wooded area along Pinefield Road, and Clouter Creek. This section of line will be new construction. About 0.5 miles of this section will be constructed over salt-marsh, 0.6 miles will be over open water, 1.2 miles will be over an active dredge-spoil disposal area, and 0.4 miles will be through a wooded area in the vicinity of Pinefield Road.

Near the I-526-Cainhoy Road Interchange, the proposed line will turn south and run generally parallel along Cainhoy Road for approximately 0.7 miles to a point where it will turn west for approximately 800' to the Thomas Island substation site. The section of line along Cainhoy Road will be overbuilt along an existing SCE&G distribution line and the 800' section into the substation will be new construction with a new distribution double-circuit underbuild.

The proposed 115kV transmission line will use a mixture of single-pole and H-frame construction. Generally, single-pole construction will be utilized overland and water crossings will utilize H-Frame construction to maximize span lengths while minimizing structure height. Structures will either be direct embedded, installed in vibratory caissons, or built on top of pile-cap foundations, depending on soil and hydrological conditions. Structures may be laminated-wood, concrete, or steel (the final determination will be made during the line engineering phase of the project. Angle structure may be guyed or self-supporting. Structure height will typically range between 70 and 90 feet except where line clearance must conform to shipping channel requirements. It is anticipated that structures on either side of the Cooper River shipping channel will be in the 175-190 feet range. Structure spacing will range between 700 and 1,100 feet, depending on topography, and angle structure locations. Three conductors and two overhead ground wires or fiber optic cable (OPGW) will be utilized.



### **3.0 PURPOSE AND NEED FOR THE PROJECT**

The Charleston area is one of the fastest growing areas in South Carolina. Growth has placed a strain on the region's electrical transmission and distribution systems, and it is projected that future growth will lead to the deterioration of electrical service reliability unless additional electrical capacity is provided with new facilities. An immediate need for additional electrical capacity exists in the Cainhoy, Thomas Island and Daniel Island areas.

SCE&G conducted electrical load studies and determined that immediate steps must be taken to ensure an adequate supply of reliable electrical energy in these regions. Presently, these areas are served from a single source, the Cainhoy 115/23kV Substation located approximately seven miles from Thomas Island. SCE&G system studies indicate that a new substation on Thomas Island is needed by December 2001.

The new Thomas Island Substation will be a vital part of SCE&G's public service mandate to provide a continuous supply of economical, reliable electrical energy and will provide the following benefits:

- The new Thomas Island Substation will increase service capacity to meet the rapidly increasing electrical load demand by providing a second supply of electrical energy to the Cainhoy, Thomas Island, and Daniel Island regions;
- The average length of distribution lines from substations to customers will be significantly reduced, thus increasing service reliability;
- The addition of the Thomas Island Substation will allow distribution circuit modifications that will connect existing radial lines to a back-up substation source. This will allow switching procedures to minimize the number and duration of customer service outages during storm events or when lines have to be taken out of service for equipment maintenance or repairs.

Ultimately, the Thomas Island Substation and 115kV Transmission Line become key links in planned transmission system network improvements that will provide



service reliability benefits to North Charleston and the East Cooper area. Initially, the new substation will be connected to SCE&G's transmission system by a new 115kV line extended from the Westvaco Substation. Eventually, the line will continue to the Mt. Pleasant Substation. This will provide a third independent 115kV source to the East Cooper Area and will provide a backup source for North Charleston in the event the primary 115kV source from Goose Creek is lost. When the line is eventually completed for the entire distance between Westvaco and Mt. Pleasant, the benefits of increased service reliability will extend from North Charleston to the Isle of Palms.

## **4.0 ALTERNATIVES**

### **4.1 No Action**

The no-action alternative is not viable because of existing electrical load conditions and because of projected electrical load growth in the area. If electrical capacity in the area is not increased, voltage drops and, eventually, service interruptions will occur. This is unacceptable to SCE&G, their customers, and the State of South Carolina.

### **4.2 Conservation**

Although energy conservation efforts may affect power demand and may reduce some distribution needs at existing substations, conservation cannot meet the area's rapidly growing electrical energy requirements and, therefore, is not a viable option. Additionally, conservation cannot provide the additional reliability that a new 115kV transmission electrical energy source and substation will bring to the area.

### **4.3 Construction of Lower Voltage Facilities**

Upgrading the existing distribution system to a higher voltage system was considered and rejected. Upgrading the existing distribution system will not alleviate problems associated with customer service via lengthy radial lines with no back-feed capability from a second power source. While an improvement in electrical quality might be realized by a reduction in voltage drops, there would be no significant improvement in reliability. Additionally, upgrading the existing distribution system will not pre-empt the need for a new substation in the region beyond 2004.

### **4.4 Alternative Substation Sites**

SCE&G considered the following factors when selecting the substation site and determined that the selected site complies with each:

- System reliability – Substations are built within or as close as practical to the load center. This significantly improves service reliability since distribution line length

to load points are typically short, thus creating less exposure to elements, such as lightning, high winds, falling trees, etc. In this particular case, the distance of the lines serving communities throughout the Cainhoy, Daniel Island, and Thomas Island area will be minimized and, additionally, a portion of the electrical load now served by the Cainhoy Substation distribution circuit running along Clements Ferry/Cainhoy road will be served from the Thomas Island Substation. Thus, the length of the Cainhoy circuit will be reduced from its current 8-mile length to approximately 4-miles.

- **Future Growth** – As a utility regulated by the State of South Carolina, SCE&G is obligated to provide electric service to communities and businesses as they develop. The Cainhoy, Daniel Island, and Thomas Island areas are currently growing and this trend is expected to continue. It is SCE&G's responsibility to build a system capable of meeting future demand. System studies concluded that a substation located south of I-526, in conjunction with other existing substations, will serve the growing electrical needs of the Cainhoy, Daniel Island, and Thomas Island regions for the foreseeable future.
- **Long Range Planning** – Future electrical system additions and improvements are considered in choosing locations for new substations. In this case, it was determined that eventually a transmission line will need to be built from the new Thomas Island Substation to the existing Mt. Pleasant Substation. This will provide Mt. Pleasant with a third 115kV power source and the North Charleston region with an additional source. These redundant 115kV sources at Mt. Pleasant and Westvaco will increase the reliability of electrical service in the Thomas Island, Daniel Island, Cainhoy and North Charleston regions. The North American Electric Reliability Council sets forth guidelines that require an area the size of Mt. Pleasant and North Charleston to have alternate transmission feeds that could serve the area alone should one source be lost. SCE&G is committed to adhering to those guidelines.
- **Land Availability** – When selecting a new substation site, it is prudent to find property that can be acquired at a reasonable cost from a voluntary seller, will

meet all system requirements, and has minimal impact to the general public. The Thomas Island site met all of these requirements.

- **Appearance / Visibility** – It is SCE&G's practice to site substations, whenever possible, in locations where they will not be visible to the public. The proposed location for the Thomas Island Substation is heavily wooded. With the careful preservation of existing trees, it will pose little or no visual effects to surrounding areas.

#### **4.5 Alternative Transmission Line Routes**

SCE&G conducted a comprehensive siting study for the proposed Thomas Island 115kV Transmission Line. The proposed substation site, the location of any 115kV lines which could be tapped to provide 115kV voltage to Thomas Island, topography, and transportation corridors were considered in defining a 17.1-square-mile geographic area for analysis (*Figure 2*). The siting study area was delineated broadly to include a generous area through which any practical transmission line route between viable tap points and the site of the future substation would be located. Any route connecting SCE&G's lines to the substation site that extends beyond those boundaries would be inferior to those within the siting study area because of the increased impacts associated with excessive line length.

Aerial photographs, topographic maps, and field investigations using the latest in Global Positioning Systems (GPS) technology were used to gather data about land use, development, and infrastructure in the study area. Land cover was modeled from satellite imagery, using remote sensing software and supplemented by field reconnaissance. Federal, state, and local agencies were contacted to obtain land-use and environmental information and records.

All of the data locations and attributes were entered into a Geographic Information System (GIS) for evaluation. With the exception of Archaeological Sites and Natural Heritages Sites, the layers are mapped and included in this report (*Figures 5 through 15*). Maps showing Archaeological and Natural Heritages Sites are not published, by agreement with State agencies.

It was determined that, for evaluation, these data should be grouped into ten layers. Numeric weights (1 to 25) were assigned to the data within each group, or data layer, to represent their relative influence on transmission line routing (the more sensitive the factor to line construction, the lower the number assigned) (*Table 1; Page 1-4*). The layers are as follows:

1. Wetlands (Figure 6)
2. Hydrography (Figure 8)
3. Land Cover (Figure 9)
4. Historic Cultural Resources (Figure 10)
5. Visibility From Public Roads (Figure 11)
6. Occupied Buildings (Figure 12)
7. Existing Land Use (Figure 13)
8. Future Land Use (Figure 14)
9. Zoning (Figure 15)
10. Rare, Threatened, and Endangered Species Habitats (Figure not shown by agreement with State Agencies)
11. Archaeological Resources (Figure not shown by agreement by State Agencies)

The weighted data contained on these layers were combined in the GIS to produce a single map that displays the cumulative effect of all the data (*Figure 16*). This map, called a *Suitability Composite*, displays the areas of highest constraint to routing, the areas of least constraint, and the full range of conditions between the extremes. SCE&G used the suitability composite to identify eight possible route corridors (*Figure 17*) through relatively low constraint areas for further analysis and study. (Seven route corridors were developed initially, and an eighth – a minor deviation of one of the original seven – was developed as a result of public suggestions at and following the community workshop).

SCE&G mailed community workshop invitations to 462 residents and property owners in the siting study area. The mailing list included each property owner of record within the study area at the time of the workshop. Also mailed with the invitations were community questionnaires. The community workshop and questionnaire were designed

to allow SCE&G to inform the public about the project and the siting process and to solicit substantive information that might influence the evaluation of the alternative routes.

The community workshop was held on September 21, 2000, at the Omar Shrine Temple in Mount Pleasant, SC. Attendees were invited to visit project workstations and discuss the project with SCE&G project team members, offer comments, and/or gain information. The community workshop featured seven project workstations:

- Project Need and Engineering
- Route Selection
- Aesthetic Considerations
- Construction
- Environmental Practices
- Health and Safety
- Route Survey and Right-of-Way Acquisition

Twenty-four people signed the workshop registration list (several attendees who registered were accompanied by others who did not sign the register), and thirty-four questionnaires were completed and returned. The community questionnaire results were statistically analyzed and recorded. The results of questionnaire analysis was published in a report and is included in this report as *Appendix C*.

An 8<sup>th</sup> alternate route, Route H, was added as a result of the public comments received during the community workshop, on the returned questionnaires, and during meetings with individuals following the community workshop. Route H is a minor deviation in Route G.

The predominant concerns expressed by residents and property owners were impacts to residences and visibility of the line from residences and waterways. The community's concerns are reflected in groupings and numeric weights assigned to the data that were used to evaluate and compare the eight routes.

Eight evaluation categories were developed (*Table 2*). The categories are:

1. Cultural and Natural Resources Factors
2. Land Cover Factors
3. Property Ownership Factors
4. Land Use Factors
5. Occupied Building Factors
6. Public Visibility Factors
7. Residential Visibility Factors
8. Water Quality Factors

Within each category, criteria were selected to measure the potential impact of the line on the community and its resources. SCE&G then measured each criterion (e.g., acres of clearing, acres of clearing near streams, number of houses within 100 feet, number of houses from 100-200 feet, etc.) for each route. A multiplier from one to ten was then applied to each criterion, according to its sensitivity to the proposed transmission line. The most sensitive criterion within a category received a multiplier of 10, and less sensitive criteria were multiplied by a lower score reflective of their sensitivity. The results were then added to obtain a category score. These evaluation score results were normalized on a one to ten scale to allow for comparison among the categories that prevented any single category score from having unjustifiable influence on the overall route score (the total of all category scores). The route with the highest score within each category received a ten. Other routes' normalized scores were based on the percentage of their possible impacts compared to the highest score. These scores were then added to determine the route with the lowest overall impacts across all categories.

Route G proved to be superior to other routes under consideration. It had the lowest overall environmental and land-use impacts of the 8 routes under consideration (*Tables 3 and 4*).

Once the routes were ranked according to their effects on important resources, a cost estimate for each alternate route was prepared before SCE&G made the final route selection decision. It is estimated that Route G is the second most economical of



the alternate routes evaluated. The following chart displays various physical quantity factors about each alternate route and contains the estimated cost:

	ROUTE							
	A	B	C	D	E	F	G	H
Siting Study Rank	7	8	4	6	3	5	1	2
Acres of R.O.W. to be Acquired	13.9	15.0	15.5	16.6	17.1	17.9	5.5	7.9
Miles of Existing Line Re-Build	3.0	3.0	3.0	3.0	3.0	3.0	0.0	0.0
Miles of New Construction	7.4	7.5	5.1	5.3	4.9	4.9	3.4	3.4
Miles of Distribution Over-Build	1.3	2.5	1.3	2.5	1.3	2.2	0.7	0.7
Acres of Clearing	26.2	24.6	22.5	20.8	17.0	15.6	5.4	7.5
R.O.W. Acquisition Cost	\$151,600	\$196,500	\$166,500	\$210,900	\$180,900	\$212,600	\$61,500	\$71,100
R.O.W. Preparation Cost	\$117,900	\$110,700	\$101,250	\$93,600	\$76,500	\$70,200	\$24,300	\$33,750
Federal & State Permits Costs	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000	\$20,000	\$20,000
Line Construction Cost	\$4,049,199	\$4,188,254	\$3,729,439	\$3,850,548	\$3,488,829	\$3,504,829	\$2,257,013	\$2,098,013
Total Estimated Line Cost	\$4,343,699	\$4,520,454	\$4,022,189	\$4,180,048	\$3,771,229	\$3,812,629	\$2,362,813	\$2,222,863

Following this comprehensive siting study, SCE&G chose Route G for reasons including the following:

- (1) Route G minimizes impacts over the eight evaluation categories.
- (2) Route G closely parallels the Interstate 526 bridge across the Cooper River, thus minimizing impacts to estuarine systems.
- (3) Visibility of the line along Route G from residential areas will be minimal in comparison to other routes. Approximately 0.6 miles of the line will be visible along Cainhoy Road through a residential area where it will be over-built on an existing distribution line. Because it will be overbuilt along an existing distribution line, residents will notice little change to existing conditions after construction is completed. This effect was a key concern of community workshop attendees and participants in the community questionnaire.



- (4) For 67% of its total length, Route G crosses commercial/industrial property, the Cooper River in an area primarily used for commercial shipping, and Clouter Island (used for dredge-spoil disposal) – thus, protecting sensitive environmental resources and residential land uses.
- (5) Although the total estimated cost for Route G is slightly higher than the estimated cost for the route that ranked second best in the siting study (Route H), SCE&G chose to select Route G. It offers fewer potential environmental impacts by avoiding undisturbed wetlands/marshland and minimizes clearing of wooded areas.

## **5.0 THE AFFECTED ENVIRONMENT**

Information on the affected environment was compiled from a literature review, aerial photography, resource agencies, a field inventory of the project siting study area, and information solicited from the community. A Geographic Information System (GIS) was used to analyze and model the data. This process provided a quantitative description of the existing environment, which was used in the subsequent comparison of the environmental consequences of the alternative routes.

The proposed Westvaco – Thomas Island 115kV Transmission Line will be located in southeastern Charleston County and northwestern Berkeley County, South Carolina. The proposed transmission line is approximately 3.98 miles long. It will be connected to SCE&G's existing 115kV transmission grid at the Westvaco Substation (at the Westvaco pulp and paper mill). From Westvaco, the line will run approximately 0.25 mile west to Virginia Avenue. The route then runs south for approximately 0.36 miles to the north side of the Interstate 526 bridge. It then runs east 2.6 miles across the Cooper River, Clouter Island, and Clouter Creek (paralleling the bridge) to a point near the I-526 Cainhoy Road Interchange. At this point, the line turns south and runs with Cainhoy Road to the Thomas Island Substation site (*Figure 1*).

### **5.1 Land Use**

The siting study area is characterized by a mix of rural, industrial, commercial, and residential land uses. Most of the rural areas, consisting of salt marsh, pine forest, and mixed pine-hardwood areas, are located in the northeastern portion of the project area (i.e., Berkeley County), between the Cooper River and State Route 33 (Clements Ferry Road). This area is rapidly being developed for commercial and residential land uses. Residential development, in the form of subdivisions, is spreading along the secondary roads, such as State Route 33. Existing single family homes are also located along Cainhoy Road, south of Interstate 526. There are also several large, active dredge spoil sites managed by the U. S. Army Corps of Engineers located along the Cooper River. Wetland areas, especially salt marshes, are extensive along the eastern shore of the Cooper River.

Property in the northwestern part of the study area is under the jurisdiction of the Department of Defense (DOD). The majority of these DOD lands are associated with the U.S. Naval Weapons Station, north of Goose Creek. Most of the Naval Weapons Station property is covered with mixed hardwood and pine. The remainder of the property includes land uses specifically geared to military activities (e.g., barracks, training facilities, ship docks, research buildings, weapons storage areas, etc.). Areas south of Goose Creek and the naval property consist of commercial and industrial complexes associated with the South Carolina Ports Authority, the Westvaco pulp and paper mill facility, and several energy company petroleum tank farms. Most of the western portion of the study area is zoned for commercial and industrial development. *Figures 9, 12, 13, 14, and 15* display existing land use, future land use, land cover, occupied buildings, and zoning in the siting study area.

## **5.2 Topography**

Charleston and Berkeley Counties are situated in the southeastern portion of South Carolina, on the lower Atlantic Coastal Plain. This coastal plain area consists of nearly level to gently sloping soils on low lying flats that are intricately dissected by meandering drainageways that flow into the tidal rivers. Elevations range from approximately sea level to 70 feet above Mean Sea Level (MSL) (*Figure 2*).

## **5.3 Geology and Soils**

The underlying geology of the siting study area is characteristic of the Atlantic Coastal Plain and is associated with the Pleistocene Age (USDA 1971; USDA 1980). Unconsolidated and water-layered deposits of sands and clays, 6 to 20 feet in thickness, are underlain with thick beds of soft marine marl. The fine textured sediments found in the tidal marsh areas are of relatively recent origin due to the action of tidal waters such as the Cooper River.

In Charleston and Berkeley Counties, the soil parent materials are marine or fluvial deposits. The majority of these deposits are sand and loam, but there are also clays and marl (USDA 1971; USDA 1980). The study area consists of three general soil

associations (USDA 1980), these include the Wahee–Duplin–Lenoir Association; Bohicket–Capers Association; and the Chipley–Echaw–Pickney Association.

The Wahee-Duplin-Lenoir Association consists of somewhat poorly drained to moderately well drained soils that have a loamy surface layer and a clayey subsoil (USDA 1980). This association consists of strongly acidic and nearly level soils on broad low ridges. Many small streams typically dissect this association, which makes up approximately 26 percent of Berkeley County. These soils are found in the vicinity of North Charleston within the Ports Authority property and within the Naval Weapons Station boundary.

The Bohicket-Capers Association includes poorly drained soils with a non-acidic, loamy surface layer and a clayey subsoil (USDA 1980). Its broad, nearly level areas are intricately dissected by meandering drainageways and flooded by tidewater to a depth of 6 to 36 inches daily. Most of these areas are near mean sea level. These soils are associated with the tidal marsh areas and the low-lying flats along the Cooper River and the major tributaries such as Goose Creek and Yellow House Creek. This association makes up about 4 percent of the area's soils.

The Chipley-Echaw-Pickney Association consists of moderately well drained to very poorly drained soils that primarily consist of sand. This association is made up of nearly level soils on long narrow to broad ridges in areas roughly paralleling the coastline. The Cainhoy soil series is common in this association. This strongly acidic soil is found in the vicinity of the Clements Ferry Road corridor and much of the Thomas Island study area. This association makes up approximately 6 percent of the area's soils.

#### **5.4 Surface Water Hydrology**

Precipitation, the basic source of water resources in the siting study area, averages approximately 47 inches annually. Rainfall is fairly well distributed and plentiful throughout the year (USDA 1980). The annual rainfall distribution shows a maximum of about 7 inches in July and a minimum of about 2 inches in November. The period of April to September, which equates to most of the growing season, receives an

average of 31 inches of rain, or about 66 percent of the annual total (USDA 1980). Measurable snowfall in the area is rare.

The siting study area contains several tidal streams that are associated with the Cooper River Drainage. The major streams include Filbin Creek and Goose Creek in North Charleston; Yellow House Creek, and Clouter Creek. All the rivers and streams in the siting study area are classified as "SB" by the South Carolina Department of Health and Environmental Control (DHEC), Water Bureau. According to DHEC, Class SB waters are tidal saltwater suitable for primary and secondary recreation, fishing, and crabbing. These waters are also suitable for the survival and propagation of a healthy, indigenous aquatic community.

Through review of the National Wetland Inventory maps and a field reconnaissance, it was determined that areas of wetlands are generally associated with the Cooper River and the major tidal tributaries (*Figure 6*). There are large tidal emergent and scrub-shrub marsh areas along Clouter and Yellow House Creek, as well as Goose Creek. Several former areas of salt marsh have been affected by large dredge spoil operations. Areas of palustrine (freshwater) wetlands, such as forested wetlands, are uncommon in the study area.

The Federal Emergency Management Agency National Flood Insurance Program maps for The Thomas Island siting study area record 100-year floodplains along the Cooper River, Yellow House Creek, Clouter Creek, and adjacent lands (*Figure 5*). Most of the Naval Weapons Station and the Cainhoy Road area are also within the 100-year flood zone.

## **5.5 Land Cover**

An inventory of land cover in the study area was made through analysis of aerial photography and field investigations (*Figure 9*). The study area is characterized by a mix of rural, industrial, commercial, and residential land uses. Most of the rural areas, consisting of salt marsh, pine forest, cut-over area, and mixed pine-hardwood areas, are located in the northeastern portion of the project area (i.e., Berkeley County), between the Cooper River and Clements Ferry Road. This area is rapidly being developed for

commercial and residential land uses. Residential development, in the form of subdivisions, is spreading along the secondary roads, such as Clements Ferry Road. There are also several large, active dredge spoil sites located along the Cooper River in the vicinity of the Naval Weapons Station, Clouter Island, and the Yellow House Creek Island. Wetland areas, especially tidally influenced salt marshes, are extensive along the eastern shore of the Cooper River.

Industrial facilities including the South Carolina Ports Authority shipping/cargo terminal and the Westvaco Pulp and Paper Mill facility are located along the western edge of the Cooper River south of Goose Creek. Several large petroleum storage tank farms are also located in this area of North Charleston. There is also a large and active sand and gravel pit just west of Clements Ferry Road.

The northwestern part of the study is under the jurisdiction of the U.S. Department of Defense (DOD). The majority of the DOD lands are associated with the U.S. Naval Weapons Station, north of Goose Creek. Most of the Naval Weapons property is wooded (mixed hardwood-pines) or covered by various wetland types. The remainder of the property has been modified for various land uses specifically geared to military activities (e.g., barracks, training facilities, ship docks, research buildings, weapons storage areas, etc.).

Several vegetation communities are found along the proposed transmission line rights-of-way, at the proposed substation site, and in the study area in general. These communities range from Oak-Hickory Forest to cut-over pine flatwoods and salt marsh (Nelson 1986). In most cases, the natural plant communities within the siting study area represent remnants of natural communities that have been altered by land clearing, development or other activities such as the storage of dredge material.

One of the most common natural communities found within the study area consists of salt marsh along the Cooper River (Nelson 1986; Radford et. al., 1983). This tidal estuarine community consists almost entirely of smooth cordgrass (*Spartina alterniflora*). Needle-rush (*Juncus roemerianus*) is also present at the higher elevations. These areas are regularly flooded by salt water, thus accounting for the poor species



diversity. Salt scrub species, such as groundsel (*Baccharis halimifolia*), marsh elder (*Iva frutescens*), wax myrtle (*Myrica cerifera*), and sabal palm (*Sabal palmetto*) are also found in the drier areas of the marsh. Representative salt marshes are located along Filbin Creek and Clouter Creek. Several of the original salt marsh areas, such as Clouter Island, have been filled by dredge spoil operations.

The other natural community quite common in the study area consists of oak-hickory forest. This upland community would normally be found along lower slopes of the river and creeks (Nelson 1986; Radford et. al., 1983). This typically diverse community consists of trees such as northern red oak (*Quercus rubra*), white oak (*Q. alba*), blackjack oak (*Q. marilandica*), post oak (*Q. stellata*), pignut hickory (*Carya glabra*), tulip poplar (*Liriodendron tulipifera*), red maple (*Acer rubrum*), and loblolly pine (*Pinus taeda*). Red maple, flowering dogwood (*Cornus florida*), and black gum (*Nyssa sylvatica*) make up the sub-canopy. Scrub hardwoods such as sweet gum (*Liquidambar styraciflua*), tulip poplar, black cherry, and red maple colonize areas that have been recently logged. Blueberry species (*Vaccinium* spp.) are the most common shrubs in these areas. Representative areas of this natural community can be found in the vicinity of Clements Ferry Road and within the Naval Weapons Station boundaries.

Another community found in the study area is cut-over pine flatwood community. This community formerly consisted of longleaf pine (*Pinus palustris*), loblolly pine, and grasses, including broomsedge (*Andropogon virginicus*) and wiregrass (*Aristida stricta*) (Nelson 1986). Since the majority of the pines have been harvested, blackjack oak, sweet gum, sweetbay (*Magnolia virginiana*), and blueberry species are now the predominate land cover. Due to the clearcutting, very few pines, besides some small "grass" longleaf pine, exist in these areas. This community can be found west of Clements Ferry Road and just north of the active sand pit.

## **5.6 Wildlife**

Land use and natural plant communities strongly influence the wildlife of the area. Although fragmented, the hardwood woodlands, interspersed with pine stands, and salt marsh provide suitable habitat for quite a few species of wildlife. The *Spartina*

based salt marsh bordering the rivers and major tributaries in the project area provides food and habitat for several species of wildlife. Representative species include the Carolina diamondback terrapin (*Malaclemmys terrapin centrata*), American alligator (*Alligator mississippiensis*), killdeer (*Charadrius vociferus*), snowy egret (*Egretta thula*), great blue heron (*Ardea herodias*), clapper rail (*Rallus longirostris*), and seaside sparrow (*Ammodramus maritima*). These areas provide important nursery, breeding areas, and staging areas for a wide variety of finfish, shellfish (e.g., blue crabs), and birds (e.g., sandpipers and waterfowl). Other species, such as the laughing gull (*Larus atricilla*), osprey (*Pandion haliaetus*) and the brown pelican (*Pelecanus occidentalis*), are commonly observed feeding near the salt marsh and deeper water edges.

The oak-hickory forests of the area offer habitat for gray squirrels (*Sciurus carolinensis*), white-tailed deer (*Odocoileus virginianus*), and wild turkey (*Meleagris gallopavo*). Other representative species found in the forested areas include the southern flying squirrel (*Glaucomys volans*), white-footed mouse (*Peromyscus leucopus*), opossum (*Didelphis virginiana*), common flicker (*Colaptes auratus*), red-eyed vireo (*Vireo olivaceus*), Carolina wren (*Thryothorus ludovicianus*), great-crowned flycatcher (*Myiarchus cinerascens*), eastern wood pewee (*Contopus virens*), black and white warbler (*Mniotilta varia*), indigo bunting (*Passerina cyanea*), eastern box turtle (*Terrapene carolina*), green anole (*Anolis carolinensis*), oak toad (*Bufo quercicus*), and black rat snake (*Elaphe obsoleta obsoleta*).

Areas where most of the mature pine trees (i.e., long-leaf and loblolly) have been recently removed now consist of scrub brush and regenerating hardwoods—sapling oaks, hickory and red maple. The representative species found in these areas include the five-lined skink (*Eumeces fasciatus*), eastern garter snake (*Thamnophis sirtalis*), rough green snake (*Opheodrys aestivus*), red-tailed hawk (*Buteo jamaicensis*), Carolina wren, northern mockingbird (*Mimus polyglottos*), yellow-breasted chat (*Icteria virens*), eastern cottontail (*Sylvilagus floridanus*), golden mouse (*Peromyscus nuttalli*), and white-tailed deer.



## 5.7 Fisheries

Most of the area's creeks are typical of South Carolina's tidal waters, in that an abundance of finfish and shellfish are present. These waters are important spawning, nursery, and migratory areas. The tidal waters include the Cooper River and associated tributaries, such as Goose Creek, Filbin Creek, and Clouter Creek. Fish species representative of this system include the Atlantic sturgeon (*Acipenser oxyrinchus*), American shad (*Alosa sapidissima*), hickory shad (*Alosa mediocris*), blueback herring (*Alosa aestivalis*), spot (*Leiostomus xanthurus*), spotted seatrout (*Cynoscion nebulosus*), red drum (*Sciaenops ocellatus*), southern flounder (*Paralichthys lethostigma*), mummichog (*Fundulus heteroclitus*), and hardhead catfish (*Arius felis*). These species can range from the tidal marshes to the Cooper River channel.

## 5.8 Rare, Threatened, or Endangered Resources

SCE&G contacted the South Carolina Natural Heritage Trust Program (SC Heritage Trust 2001) concerning listed rare plant and animal species in the siting study area. The current U.S. Fish and Wildlife Service County List (USFWS 2000) was also reviewed. The following species and natural communities are currently listed by the Heritage Trust Program and USFWS for this portion of Charleston and Berkeley Counties.

### Animal

- Shortnose Sturgeon (*Acipenser brevirostrum*) (State Rare and Federal Endangered)

This sturgeon relatively short sturgeon (i.e., less than three feet long) is found in Atlantic Seaboard rivers from Canada to northeastern Florida (NMFS 1998). It inhabits the lower sections of larger rivers and coastal waters, spending most of the year in the natal tidal river system and then moves into freshwater only to spawn. River channels are important spawning areas in many rivers, including those in the south. Spawning usually begins in freshwater from late winter/early spring in the southern rivers when the water temperature increases to 8-9°C. In the Savannah River in Georgia, spawning was documented from early February to mid-March. The fish feeds on invertebrates and the leaves of plants. In Florida's Saint John River, the sturgeon foraged in sand/mud substrate with emergent vegetation in 5-10

meters of water in the summer and over-wintered in deep water with mud substrate (NMFS 1998). The species was reported just north of the Naval Weapons Station in the late 1980's at the Cooper River Bushy Park (Cooper River) (SC Heritage Trust 2001).

- Flatwoods Salamander (*Ambystoma cingulatum*) (State Endangered and Federal Threatened)

This unique salamander is known to occur from southern South Carolina to northern Florida and southwestern Alabama. The flatwoods salamander is primarily found in pine-wiregrass flatwood communities. Both slash pines (*Pinus elliotii*) and longleaf pine are the dominant habitat species. Breeding habitat has also been reported in shallow cypress ponds, cypress swamps, roadside ditches, and sweet gum and black gum swamps. This amphibious salamander spends most of the time underground in such areas as crayfish burrows. It is decreasing in number, possibly due to the loss of the specific habitat. In 1998, a flatwoods salamander survey was conducted in a portion of the study area (i.e., west of Clements Ferry Road) in association with a proposed railway corridor (Moulis and Williamson 1998). No flatwoods salamanders were identified in this area, although one individual was documented several miles to the northwest of the study area. The specific habitat for this species is lacking in the study area.

- Bald Eagle (*Haliaeetus leucocephalus*) (State Endangered and Federal Threatened)

This large conspicuous raptor is found throughout North America in riparian areas associated with the coasts, rivers, and lakes. The eagle usually nests near the bodies of water in which it feeds. When selecting a nest site, usually in a dominant pine, eagles look for a site within one-half mile of water; the largest tree in the area; and an open view of the surrounding area. The coastal areas of the Carolinas have the largest concentrations of eagles in the southeast. The nearest bald eagle nest area is just northwest of the study area along Goose Creek (Naval Weapons Station property). No bald eagle nests were found in the study area.

- Red-cockaded woodpecker (*Picoides borealis*) (State Imperiled, Federal Endangered)

This relatively small woodpecker is found primarily in the southeastern United States. This highly social woodpecker (i.e., clans of 2-6 members) is indigenous to mature longleaf pine forest. Suitable nesting habitat is provided in open pine stands with a minimum age of 80-120 years (Henry 1989; Hooper 1980). The birds prefer pine trees greater than 10 inches in diameter and with a sparse understory. Nesting and roosting cavities are excavated in living pines, which frequently are infected with red-heart disease. Active, completed cavity trees have numerous small "resin wells" around the cavities that are created by the woodpeckers to inhibit nest predators such as snakes. The average territory for a woodpecker group is approximately 200 acres. There are several colonies north of the project in both the Naval Weapons Station property and the Francis Marion National Forest (Sabine and Waters 1999). According to the Heritage Trust database, one colony with two active cavity trees was documented west of Clements Ferry Road and within the project area in 1992. However, during a field assessment of the area, it was found that this area had been recently logged. All the mature pine trees have been removed from this area, and only regeneration longleaf pine and hardwoods now exist. There is no evidence of any woodpecker nesting cavity trees or preferred habitat remaining. (Even though no evidence of the site was noted in the field, its location was considered during the siting study. The location map is not included in this report, at the request of the South Carolina Natural Heritage Trust Program.)

No other listed species or significant habitat area (e.g., waterbird colony) has been documented by the Heritage Trust as occurring within the study area. Additional species are listed by the Heritage Trust as occurring in Charleston and Berkeley counties. The list of these species is found in *Appendix B*.

## **5.9 Cultural Resources**

The South Carolina Department of Archives and History and the Institute of Archaeology and Anthropology lists one historical district, one historic site, and 52 archaeological sites in the siting study area. These sites range from disturbed

prehistoric sites to the North Charleston Historic District. (*Figure 10* shows the locations of all recorded historic sites in the study area. Archaeological site locations were considered during the siting study but are not mapped for this report, at the request of the Institute of Archaeology and Anthropology).

#### **5.10 Visual Resources**

SCE&G carefully considered the visual affects of the proposed transmission. The siting study included two evaluation categories, Visibility Factors (Public) and Visibility Factors (Residential), to account for the lines affects on the aesthetic resources in the region. The selected route is the 6<sup>th</sup> best route in the Visibility Factors (Public) category and the 2<sup>nd</sup> best route in the Visibility Factors (Residential) category. The selected route scored 6<sup>th</sup> best in the Visibility Factors (Public) category because in parallels I-526 for approximately 2.7 miles and Cainhoy Road for approximately 0.75 miles; however, where parallel to I-526, the line will be viewed within the context of a heavily modified view shed. The bridge infrastructure, Westvaco industrial complex, and SC Ports Authority Terminal will serve to mitigate the visual affects of the line from I-526 viewpoints. Where the line parallels Cainhoy road, the visual change it will impose on existing views will be significantly mitigated from residences and road views since it will be overbuilt onto an existing SCE&G distribution line.

## **6.0 ENVIRONMENTAL CONSEQUENCES**

The proposed SCE&G Westvaco – Thomas Island 115kV Transmission Line (Route G) will impact the area immediately around structure locations and areas where access roads to the line must be built. Other areas within the right-of-way will not be affected, except for the removal of trees where the route traverses woodlands. The line route was selected by SCE&G after the execution of a comprehensive siting process to ensure the selection of a route that minimizes effects on environmental resources, cultural resources, aesthetics, and land use. This chapter describes short and long-term impacts of the proposed transmission line.

### **6.1 Soils**

Because some of the soils within the corridor are erodible (e.g., sandy loams), the potential for erosion is increased – particularly where mineral soil must be cleared for substation grading, structure installation, and access roads. Prudent construction and erosion control measures will be used to avoid minor, short-term impacts. Extreme care will be taken to avoid impacts to low bearing-capacity tidal soils, such as Capers silty loam. Minimization measures may include the use of barges and construction mats in the installation of structures through the marsh areas. Grading and earthwork activities will comply with the South Carolina Storm Water Management and Sediment Reduction Act. SCE&G will use clearing, seeding, and erosion control procedures which meet or exceed the standards set forth in federal, state, and local requirements regarding protection of surface waters. Measures will also be taken to prevent sediment, trash, debris, and other man-made pollutants from entering sensitive areas such as creeks, rivers, and tidal marshes.

### **6.2 Water Resources**

The proposed transmission line will cross a total of three creeks and the Cooper River. The creeks include Filbin Creek, Clouter Creek, and an unnamed tributary to Clouter Creek. The proposed line will span the three creeks. Several structures will be required in the Cooper River, but none will be placed within 125 feet of the designated shipping channel.

Construction of the proposed substation and transmission line will present the potential for erosion and runoff to nearby streams and tidal wetlands. SCE&G will use prudent design, construction, and erosion control measures to avoid minor, short-term impacts and will comply with storm water management and sediment reduction regulations related to water quality. 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 (BMP's) employed will be sufficient to prevent any sediment movement beyond construction limits during a 25-year storm event. Measures will also be taken to prevent sediment, trash, debris, and other man-made pollutants from entering sensitive areas and designated critical areas.

Crossing of the Cooper River and the other navigable waters and wetlands will require a Section 10 Permit (Rivers and Harbor Act) from the U. S. Army Corps of Engineers in Charleston. Section 10 requires approval prior to the start of any work in or over navigable waters of the United States, or any work which affects the course, location, condition, or capacity of such waters. Typical activities requiring Section 10 permits include the following:

- Construction of piers, wharves, bulkheads, dolphins, marinas, ramps, floats intake structures, and cable or pipeline crossings; and,
- Dredging and excavation.

### **6.3 Flood-Prone Areas**

The Federal Emergency Management Agency National Flood Insurance Program (FEMA) maps (*Figure 5*) for Charleston and Berkeley counties were reviewed to determine the extent of flood-prone areas in the project area. The majority of the study area, including Route G, is located in a FEMA delineated 100-year floodplain area along the Cooper River and Clouter Creek. However, the proposed structures will not pose a significant obstacle for floodwaters and associated debris.



## **6.4 Wetlands**

Wetlands are defined by 33 CFR Part 328 and protected by Section 404 of the U.S. Clean Water Act. Based on information such as National Wetland Inventory maps and aerial photographs, there are wetlands affected by the proposed line. The wetlands crossed by the proposed transmission line consist of tidal salt marsh south of the Westvaco Substation, along the Cooper River, and in the Clouter Creek area.

No mechanized equipment will be allowed off the access roads. Barges and construction mats will be used in all practicable wetland situations, thus, only temporary impacts are anticipated. If necessary, vegetation in any affected wetland area will be hand cleared. Minimal cutting will be required at emergent and scrub/shrub wetlands. Plan-and-profile drawings for the project will be given to the construction supervisors before any clearing and earthwork begins. These drawings will provide the contractors with locations of the structures and specific locations and requirements of any sensitive areas.

Any wetlands and waterbodies crossed by the transmission line will require a U. S. Army Corps of Engineers Permit (i.e., Section 10 Permit) and a permit from the SC Ocean & Coastal Resource Management (i.e., Critical Area Permit). Adhering to the special conditions required by these permits will minimize permanent impacts to wetlands and waterbodies. During the field survey associated with the preferred route, a wetland delineation effort will be conducted to determine the specific location and extent of any wetland areas within the proposed corridor. This wetland effort will follow the current delineation methodology (Environmental Laboratory 1987).

## **6.5 Rare, Threatened, or Endangered Resources**

SCE&G contacted the South Carolina Natural Heritage Trust Program concerning listed rare plant and animal species in the siting study area (SC Heritage Trust Program 2001). The current U.S. Fish and Wildlife Service County list was also reviewed (USFWS 2000). The following species and natural communities are currently listed by the Heritage Trust Program and USFWS for this section of Charleston and Berkeley Counties.



## Animal

- Shortnose Sturgeon (*Acipenser brevirostrum*) (State Rare and Federal Endangered)
- Flatwoods Salamander (*Ambystoma cingulatum*) (State Endangered and Federal Threatened)
- Bald Eagle (*Haliaeetus leucocephalus*) (State Endangered and Federal Threatened)
- Red-cockaded woodpecker (*Picoides borealis*) (State Imperiled, Federal Endangered)

According to the databases, the only species that may be affected by the proposed project is the shortnose sturgeon. This fish species, or its foraging habitat, may be temporarily affected by the construction and installation of the pole structures in the Cooper River. The USFWS and National Marine Fisheries Service will be consulted (possible Section 7 consultation) when specific design and construction measures are available for the project and concurrent with the U. S. Army Corps of Engineers Section 10 permitting process.

The specific habitats for the other listed species are well north of the proposed transmission corridor. No other listed species or significant habitat areas (e.g., waterbird colony) have been documented by the Heritage Trust as occurring within the study area. A field survey will be conducted along the selected route that will include a protected species survey during the appropriate periods. Any recommended guidelines, such as those required for the red-cockaded woodpecker (Henry 1989), will be followed during this survey.

Another issue associated with rare, threatened, or endangered birds (e.g., the bald eagle and peregrine falcon, as well as other raptors) is their vulnerability to power line electrocution. Their large size and perching behavior during hunting make them susceptible to electrocution on certain transmission pole designs. Power poles with inadequate spacing between phases (i.e., less than 60 inches of separation between conductors and/or grounded hardware) can electrocute raptors.

With this in mind, the U.S. Fish and Wildlife Service has recommended, under authority of the Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act,

that all new poles be equipped with design features that prevent these electrocutions. These 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 metal poles) 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 115kV structures designed for this project are "raptor safe" and meet the guidelines recommended in *Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996* (Avian Power Line Interaction Committee 1996). The 115kV structures are designed with suspended phase conductors that provide adequate spacing between phases and allow for safe perching on the pole top and davit arms, and the spacing between the phases and ground-wires is greater than 60 inches. Thus, raptor electrocutions are not anticipated on this project.

## **6.6 Cultural Resources**

The South Carolina Department of Archives and History and the Institute of Archaeology and Anthropology lists one archaeological site (not eligible for National Register) along the preferred Route G. However, no adverse effect to cultural resources is expected from the construction route. If any archaeological resources are discovered during construction, the South Carolina Department of Archives and History will be contacted immediately. These sites will be clearly marked and protected during the construction period. SCE&G will forward complete documentation to the state and local agencies and will cooperate with them to develop appropriate and specific mitigation plans, if needed.

## **6.7 Visual Resources**

The visual implications of substations and transmission lines are influenced by several factors. These include their distance from the viewer, the number of structures viewed, whether visible structures are seen against backdrops (vegetation, terrain, man-made elements) or silhouetted against the skyline; the amount of vegetative modification which contrasts with surrounding landscapes, and the overall scenic

condition (landscape content or context) of the area in which the facility is seen. The potential visual implications of the project were carefully evaluated during the siting process.

Visual considerations are significant factors in developing and comparing alternative routes. When selecting the route for the proposed Thomas Island 115kV transmission line, SCE&G evaluated the effects of a new line on public roads and existing residences.

SCE&G conducted extensive field investigations, aided by topographical maps, aerial photographs, and perspective terrain models, to predict each alternate route's degree of visibility from public roads (*Figure 11*). The selected route scored 6<sup>th</sup> best in the Visibility Factors (Public) category because in parallels I-526 for approximately 2.7 miles and Cainhoy Road for approximately 0.75 miles; however, where parallel to I-526, the line will be viewed within the context of a heavily modified view shed. The bridge infrastructure, Westvaco industrial complex, and SC Ports Authority Terminal will serve to mitigate the visual affects of the line from I-526 viewpoints. Where the line parallels Cainhoy road, the visual change it will impose on existing views will be significantly mitigated since it will be overbuilt onto an existing SCE&G distribution line.

An extensive investigation was conducted to quantify and compare the visual effects of each route on residences. The visual conditions along the alternate routes were predicted by considering view distance to the line, landscape content, and degree of screening. The selected route scored 2<sup>nd</sup> best route in the Visibility Factors (Residential) category. The line will only be visible from residences where it runs generally parallel with Cainhoy Road. Along this segment of the line, the visual effects will be significantly mitigated by it being overbuilt onto an existing distribution line that currently runs along Cainhoy Road. Although it is predicted that 18 residences will have a view of the line that meets the Very High view probability criteria, the 18 residences now have a view of the existing distribution line that also would meet the Very High criteria. Although the transmission line with the distribution underbuild along Cainhoy Road will be readily visible from the nearby residences, it may offer aesthetic benefits when compared to the existing condition:

- The structures will be spaced farther apart than the existing structures;
- The structures will be self-supporting; therefore, existing guy wires will be eliminated; and,
- The structures will be clean silhouette steel, concrete, or laminated wood.

The following is a summary of the lines predicted affects on residential view points:

<b><u>Visual Probability*</u></b>	<b><u>Number of Residences</u></b>
Very High	18
High	0
Moderate-High	2
Moderate	3
Low-Moderate	1
Low	1
Very Low	4

\* The visual probability conditions are defined as follows:

*Very High:* Project element(s) will dominate the view because of proximity to the view point and/or the number of elements viewed, because their setting in the landscape commands strong visual attention, or a combination of these factors.

*High:* Project element(s) will dominate the view because of their perceived size from the view point or the number of elements viewed, because their setting in the landscape commands strong visual attention, or a combination of these factors. Natural landscape elements will continue to be a strong influence in the view shed.

*Moderate-High:* Project element(s) and the surrounding landscape character will command approximately equal visual attention in the view.

*Moderate:* Project element(s) will be visually subordinate to existing elements of the landscape and will not alter the landscape character.

*Low-Moderate:* Project element(s) will be easily recognized in the landscape but will command very little attention in the view.

*Low:* Project element(s) will be visible but will be completely dominated by the existing landscape.

*Very Low:* Project element(s) are not visually evident to casual viewers.

## **6.8 Aviation**

At its closest point, the proposed line (Route G) will be approximately 3.0 miles east of the Charleston International Airport/Charleston Air Force Base. No part of the facilities will exceed 200 feet above ground level. Once the final line design is completed, Federal Aviation Administration (FAA) guidelines associated with lighting and/or marking transmission line structures and conductors will be reviewed.

## **6.9 Noise, Radio, and Television Interference**

The proposed Thomas Island transmission line could, under severe weather conditions, operate with a low level of sound; however, this sound is normally not audible beyond the limits of the right-of-way. There will be some noise during the clearing and construction phases of the project, but it will be localized and temporary. Thus, noise generated by the line will cause no long-term adverse effects. No interference to the 2,000 foot communication towers approximately 6,500 feet north of the project area in Berkeley County (i.e., just west of Clements Ferry Road) is anticipated.

## **6.10 Safety**

To provide for public safety and protection, SCE&G will design and construct the proposed transmission line in such a way that it will comply with, or exceed, the latest National Electrical Safety Codes in effect at the time of construction. Further, SCE&G commits to continue their long-standing tradition of operating and maintaining their facilities in a manner that will ensure public safety over the life of these facilities. The proposed transmission line will parallel but not overlap the right-of-way associated with the Interstate 526 bridge over the Cooper River.

## **6.11 Electric and Magnetic Fields**

Electric and magnetic fields (EMF) exist anywhere there is electricity, whether that electricity is being produced, distributed, or consumed. Thus, EMF is created by power lines, residential wiring, appliances, and even by the earth itself. Since the early 1970's, hundreds of studies have debated the possible health effects of EMF. In 1996,

the National Academy of Sciences (NAS), National Research Council, completed its review of the literature on the possible health risks of residential exposure to power-frequency electric and magnetic fields. In 1999, the National Institute of Environmental Health Sciences (NIEHS) completed a comprehensive program of research and analysis to clarify the potential health risks from exposure to extremely low frequency electric and magnetic fields.

The NAS report stated, "Based on a comprehensive evaluation of published studies relating to the effects of power frequency electric and magnetic fields on cells, tissues, and organisms (including humans), the conclusion of the committee is that the current body of evidence does not show that exposure to these fields presents a human-health hazard." The NAS went on to say, "No conclusive and consistent evidence shows that exposures to residential electric and magnetic fields produce cancer, adverse neurobehavioral effects, or reproductive and developmental effects."

NIEHS concluded that the evidence for a risk of cancer and other human disease from the electric and magnetic fields around power lines is "weak." They stated that "(t)he results of the EMF-RAPID program do not support the contention that the use of electricity poses a major unrecognized public-health danger." NIEHS Director Kenneth Olden, Ph.D., said, "The lack of consistent, positive findings in animal or mechanistic studies weakens the belief that this association is actually due to EMF, but it cannot completely discount the epidemiological findings. For that reason, and because virtually everyone in the United States is routinely exposed to EMF, efforts to encourage reductions in exposure should continue."

The relationship between EMF and distance serves to minimize exposures. EMF levels drop sharply with increased distance from a power source. For the substation, the EMF level at the edge of the buffered property will probably be lower than the levels found around electrical appliances in a typical home. Similarly, the field levels at the edge of the right-of-way will be lower than many household electrical appliances. Therefore, since there will be relatively low field levels associated with this project and the consensus that EMF exposure does not pose a human health hazard, no adverse impact can be anticipated.



## **6.12 Ozone**

High-voltage transmission facilities may, under some conditions, produce small amounts of ozone as a consequence of corona discharge. This discharge is caused by abrasions on conductors or foreign-particle contamination of the insulators or hardware. SCE&G takes care to eliminate or minimize corona discharge from random arcing through careful design of the connections, fittings, hardware, and insulation.

Organizations such as the Illinois Institute of Technology have conducted extensive field tests under various weather conditions to detect ozone around high-voltage substations and 765kV lines. These tests showed no significant adverse effects on plants, animals, or humans from levels of ozone that may be produced in operating transmission facilities at voltages up to 765kV.

The proposed Thomas Island 115kV Transmission Line should not produce any detectable amount of ozone under any operating condition, and thus it poses no threat to environmental quality.



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## **Route Development Criteria Weighting Definitions**

### **(1) Exclusion Areas**

These areas (1) contain resources or land uses protected by legislation or administrative policy or (2) present a severe physical restraint to transmission line construction and operation. Because it would be extremely difficult to locate a transmission line in these areas, they are considered exclusion areas when developing alternative transmission line routes.

### **(2 – 5) Avoidance Areas**

These areas contain resources or land uses considered to be of high concern (as indicated by land-use plans, guidelines, etc.), or they present the potential for significant impacts that could not readily be mitigated. Locating a transmission line in these areas would require careful siting or special design measures; they are avoided whenever possible in developing alternative routes.

### **(6 – 10) Moderate Constraint Areas**

These are areas with resources or land uses that are moderately sensitive to disturbance or that present a moderate physical constraint to transmission line construction and operation. Resource impacts or physical constraints in these areas can be reduced using standard mitigation measures. These areas are generally not avoided in developing alternative routes when routing opportunities through areas with lower constraints are not available or practical.

### **(11 – 18) Low Constraint Areas**

These areas do not contain known sensitive resources or physical constraints, and consequently they are considered suitable locations when developing alternative transmission line routes.

### **(19 – 25) Opportunity Areas**

These areas do not contain known sensitive resources or physical constraints, and often they include existing transmission line right-of-way or land owned by SCE&G. They often include areas where the addition of a transmission line would have very little impact on existing land use and environmental resources.

South Carolina Electric and Gas Company  
Thomas Island Project

CRITERIA WEIGHTS

	1	2 - 5	6 - 10	11 - 18	19 - 25
	(EXCLUSION)	(AVOIDANCE)	(MODERATE CONSTRAINT)	(LOW CONSTRAINT)	(OPPORTUNITY)

CULTURAL RESOURCES

Archaeological - Site Eligible For The National Register					
Archaeological - Eligible 100' Buffer					
Archaeological - Site Not Eligible For The National Register					
Archaeological - Not Eligible 100' Buffer					
Historical - District Eligible For The National Register					
Historical - Site Eligible For The National Register					
Historical - Eligible 500' Buffer					
Historical - Eligible 1000' Buffer					
Historical - Site Not Eligible For The National Register					
Historical - Not Eligible 100' Buffer					
Historical - Not Eligible 500' Buffer					
Historical - Not Eligible 1000' Buffer					
No Known Sites					

HYDROGRAPHY

Stream/Waterway with < 50' Channel Width					
50' Buffer					
100' Buffer					
Stream/Waterway with 50'-200' Channel Width					
50' Buffer					
100' Buffer					
Stream/Waterway with 201'-500' Channel Width					
50' Buffer					
100' Buffer					
Stream/Waterway with 501'-1000' Channel Width					
50' Buffer					
100' Buffer					
Stream/Waterway with > 1000' Channel Width					
50' Buffer					
100' Buffer					
Lake/Pond					
50' Buffer					
100' Buffer					
No Delineated Water Body					

WETLANDS

Riverine (R)					
50' Buffer					
100' Buffer					
Palustrine Unconsolidated Shore (PUS)					
50' Buffer					
100' Buffer					
Palustrine Unconsolidated Bottom (PUB)					
50' Buffer					
100' Buffer					
Palustrine Scrub/Shrub (PSS)					
50' Buffer					
100' Buffer					
Palustrine Emergent (PEM)					
50' Buffer					
100' Buffer					
Lacustrine Littoral Unconsolidated Shore (L2US)					
50' Buffer					
100' Buffer					
Lacustrine Limnetic Unconsolidated Shore (L1UB)					
50' Buffer					
100' Buffer					
Estuarine Intertidal Scrub/Shrub (E2SS)					
50' Buffer					
100' Buffer					
Palustrine Forested (PFO)					
50' Buffer					
100' Buffer					
Estuarine Intertidal Forested (E2FO)					
50' Buffer					
100' Buffer					
Estuarine Intertidal Emergent (E2EM)					
50' Buffer					
100' Buffer					
Estuarine Subtidal Unconsolidated Bottom (E1UB)					
50' Buffer					
100' Buffer					
Upland (U)					

South Carolina Electric and Gas Company  
Thomas Island Project

CRITERIA WEIGHTS

	1	2 - 5	6 - 10	11 - 18	19 - 25
	(EXCLUSION)	(AVOIDANCE)	(MODERATE CONSTRAINT)	(LOW CONSTRAINT)	(OPPORTUNITY)

LAND COVER

Barren					
Transient Vegetation (Primarily on Active Dredge Spoil Areas)					
Herbaceous					
Impervious					
Mixed Hardwood and Pine Forest					
Pine Forest					
Scrub/Shrub (Primarily Cut-Over)					
Water					

EXISTING LAND USE

Cell Tower Property					
Cemetery Property					
Church Property					
Commercial Property					
Existing 46 kV Right-Of-Way					
Existing 115 kV Right-Of-Way					
Existing Naval Base Electric Right-Of-Way					
Existing Substation Property					
Fire Station Property					
Hazardous Waste Site					
High Density Residential					
Industrial Property					
Interstate 526 Right-Of-Way					
Multi-Family Residential					
Park					
Quarry Property					
Radio Tower Property					
Railroad Right-Of-Way					
SC State Port Authority Property					
SC Wetland Wildlife Production Project					
Secondary Road Right-Of-Way					
Shipping Channel					
Active Dredge Spoil					
U.S. Army Depot Property					
U.S. Government Property					
U.S. Naval Reserve Property					
U.S. Naval Reserve Industrial Area					
No Designated Land Use					

OCCUPIED BUILDINGS

Church					
Church 200' Buffer					
Church 500' Buffer					
Single-Family Residence					
SF Residence 100' Buffer					
SF Residence 500' Buffer					
Multi-Family Residence					
MF Residence 200' Buffer					
MF Residence 500' Buffer					
Commercial/Industrial					
Commercial/Industrial 200' Buffer					
Commercial/Industrial 500' Buffer					
Fire Station					
Fire Station 200' Buffer					
Fire Station 500' Buffer					
No Occupied Buildings					

VISIBILITY FROM PUBLIC ROADS

Visible (0-1/8 Mile)					
Visible (1/8-1/4 Mile)					
Visible (1/4-1/2 Mile)					
Visible (1/2-3/4 Mile)					
Visible (3/4-1 Mile)					
Visible (1-1+1/4 Mile)					
Visible (1+1/4-1+1/2 Mile)					
Visible (1+1/2-1+3/4 Mile)					
Visible (1+3/4-2 Mile)					
Visible (2-2+1/4 Mile)					
Visible (2+1/4-2+1/2 Mile)					
Visible (2+1/2-2+3/4 Mile)					
Visible (2+3/4-3 Mile)					
Visible (3-3+1/4 Mile)					
Visible (3+1/4-3+1/2 Mile)					
Visible (3+1/2-3+3/4 Mile)					
Visible (3+3/4-4 Mile)					
Visible (4-4+1/4 Mile)					
Not Visible					

ROUTE EVALUATIONS

Weight	ROUTE A Proposed Line Miles	ROUTE B Proposed Line Miles	ROUTE C Proposed Line Miles	ROUTE D Proposed Line Miles	ROUTE E Proposed Line Miles	ROUTE F Proposed Line Miles	ROUTE G Proposed Line Miles	ROUTE H Proposed Line Miles
1	5	4	1	2	0	1	0	0
2	30.0	26.0	6.0	12.0	0	4.0	0	0
3	1	0	1	0	1	0	0	0
4	4.0	1	1	4.0	0	0	1	4.0
5	0	1	0	1	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0
81	0	0	0	0	0	0	0	0
82	0	0	0	0	0	0	0	0
83	0	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0
86	0	0	0	0	0	0	0	0
87	0	0	0	0	0	0	0	0
88	0	0	0	0	0	0	0	0
89	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0
91	0	0	0	0	0	0	0	0
92	0	0	0	0	0	0	0	0
93	0	0	0	0	0	0	0	0
94	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0
96	0	0	0	0	0	0	0	0
97	0	0	0	0	0	0	0	0
98	0	0	0	0	0	0	0	0
99	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0
101	0	0	0	0	0	0	0	0
102	0	0	0	0	0	0	0	0
103	0	0	0	0	0	0	0	0
104	0	0	0	0	0	0	0	0
105	0	0	0	0	0	0	0	0
106	0	0	0	0	0	0	0	0
107	0	0	0	0	0	0	0	0
108	0	0	0	0	0	0	0	0
109	0	0	0	0	0	0	0	0
110	0	0	0	0	0	0	0	0
111	0	0	0	0	0	0	0	0
112	0	0	0	0	0	0	0	0
113	0	0	0	0	0	0	0	0
114	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0
116	0	0	0	0	0	0	0	0
117	0	0	0	0	0	0	0	0
118	0	0	0	0	0	0	0	0
119	0	0	0	0	0	0	0	0
120	0	0	0	0	0	0	0	0
121	0	0	0	0	0	0	0	0
122	0	0	0	0	0	0	0	0
123	0	0	0	0	0	0	0	0
124	0	0	0	0	0	0	0	0
125	0	0	0	0	0	0	0	0
126	0	0	0	0	0	0	0	0
127	0	0	0	0	0	0	0	0
128	0	0	0	0	0	0	0	0
129	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0
131	0	0	0	0	0	0	0	0
132	0	0	0	0	0	0	0	0
133	0	0	0	0	0	0	0	0
134	0	0	0	0	0	0	0	0
135	0	0	0	0	0	0	0	0
136	0	0	0	0	0	0	0	0
137	0	0	0	0	0	0	0	0
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139	0	0	0	0	0	0	0	0
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142	0	0	0	0	0	0	0	0
143	0	0	0	0	0	0	0	0
144	0	0	0	0	0	0	0	0
145	0	0	0	0	0	0	0	0
146	0	0	0	0	0	0	0	0
147	0	0	0	0	0	0	0	0
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149	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0
151	0	0	0	0	0	0	0	0
152	0	0	0	0	0	0	0	0
153	0	0	0	0	0	0	0	0
154	0	0	0	0	0	0	0	0
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156	0	0	0	0	0	0	0	0
157	0	0	0	0	0	0	0	0
158	0	0	0	0	0	0	0	0
159	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0
161	0	0	0	0	0	0	0	0
162	0	0	0	0	0	0	0	0
163	0	0	0	0	0	0	0	0
164	0	0	0	0	0	0	0	0
165	0	0	0	0	0	0	0	0
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167	0	0	0	0	0	0	0	0
168	0	0	0	0	0	0	0	0
169	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0
171	0	0	0	0	0	0	0	0
172	0	0	0	0	0	0	0	0
173	0	0	0	0	0	0	0	0
174	0	0	0	0	0	0	0	0
175	0	0	0	0	0	0	0	0
176	0	0	0	0	0	0	0	0
177	0	0	0	0	0	0	0	0
178	0	0	0	0	0	0	0	0
179	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0
181	0	0	0	0	0	0	0	0
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188	0	0	0	0	0	0	0	0
189	0	0	0	0	0	0	0	0
190	0	0	0	0	0	0	0	0
191	0	0	0	0	0	0	0	0
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194	0	0	0	0	0	0	0	0
195	0	0	0	0	0	0	0	0
196	0	0	0	0	0	0	0	0
197	0	0	0	0				

## ROUTE EVALUATIONS

[illegible]



### ROUTE EVALUATIONS

Widg#		ROUTE A		ROUTE B		ROUTE C		ROUTE D		ROUTE E		ROUTE F		ROUTE G		ROUTE H		
		Size	Height	Size	Height	Size	Height	Size	Height	Size	Height	Size	Height	Size	Height	Size	Height	
1		10	7	70	8	60	7	70	8	60	7	70	7	70	7	70	0	0
Number of single-family residences within the proposed line's right-of-way																		
Number of single-family residences outside of the right-of-way and within 200' of the proposed line's right-of-way and adjacent to an existing transmission line or over-building in an existing distribution line																		
10		10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of single-family residences outside of the right-of-way and within 200' of the proposed line's right-of-way and adjacent to an existing transmission line or over-building in an existing distribution line																		
7		7	7	48	26	132	7	48	26	132	7	48	21	140	7	48	0	0
Number of single-family residences outside of the right-of-way and within 200' of the proposed line's right-of-way and adjacent to an existing transmission line or over-building in an existing distribution line																		
7		7	3	21	1	7	3	21	1	7	3	21	0	42	3	35	6	56
Number of single-family residences outside of the right-of-way and within 200' of the proposed line's right-of-way and adjacent to an existing transmission line or over-building in an existing distribution line																		
4		4	10	40	27	108	10	40	27	108	10	40	21	66	4	14	0	0
Number of single-family residences between 200' and 500' of the proposed line where the proposed line is not parallel and adjacent to an existing transmission line or over-building in an existing distribution line																		
4		4	20	60	1	4	20	60	1	4	19	78	3	20	0	36	21	84
Number of single-family residences between 500' and 1000' of the proposed line where the proposed line is parallel and adjacent to an existing transmission line or over-building in an existing distribution line																		
2		2	12	24	25	50	12	24	25	50	12	24	24	48	8	16	0	0
8		8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of community buildings within the proposed line's right-of-way																		
5		5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of community buildings outside of the right-of-way and within 200' of the proposed line's right-of-way and adjacent to an existing transmission line or over-building in an existing distribution line																		
3		3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of community buildings outside of the right-of-way and within 200' of the proposed line's right-of-way and adjacent to an existing transmission line or over-building in an existing distribution line																		
3		3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of community buildings between 200' and 500' of the proposed line where the proposed line is not parallel and adjacent to an existing transmission line or over-building in an existing distribution line																		
1		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of community buildings between 500' and 1000' of the proposed line where the proposed line is parallel and adjacent to an existing transmission line or over-building in an existing distribution line																		
10		10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of school buildings within the proposed line's right-of-way																		
9		9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of school buildings outside of the right-of-way and within 200' of the proposed line where the proposed line is not parallel and adjacent to an existing transmission line or over-building in an existing distribution line																		
7		7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of school buildings outside of the right-of-way and within 200' of the proposed line where the proposed line is parallel and adjacent to an existing transmission line or over-building in an existing distribution line																		
5		5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of school buildings between 200' and 500' of the proposed line where the proposed line is not parallel and adjacent to an existing transmission line or over-building in an existing distribution line																		
6		6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of multi-family residences within the proposed line's right-of-way																		
8		8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of multi-family residences outside of the right-of-way and within 200' of the proposed line where the proposed line is not parallel and adjacent to an existing transmission line or over-building in an existing distribution line																		
6		6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of multi-family residences outside of the right-of-way and within 200' of the proposed line where the proposed line is parallel and adjacent to an existing transmission line or over-building in an existing distribution line																		
4		4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of multi-family residences between 200' and 500' of the proposed line where the proposed line is not parallel and adjacent to an existing transmission line or over-building in an existing distribution line																		
2		2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10		10	0	0	1	10	0	0	1	10	0	0	0	0	0	0	0	0
Number of church buildings within the proposed line's right-of-way																		
8		8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of church buildings outside of the right-of-way and within 200' of the proposed line where the proposed line is not parallel and adjacent to an existing transmission line or over-building in an existing distribution line																		
3		3	2	10	2	10	2	10	2	10	2	10	2	10	1	5	0	0
Number of church buildings outside of the right-of-way and within 200' of the proposed line where the proposed line is parallel and adjacent to an existing transmission line or over-building in an existing distribution line																		
5		5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of church buildings between 200' and 500' of the proposed line where the proposed line is not parallel and adjacent to an existing transmission line or over-building in an existing distribution line																		
3		3	0	0	1	3	0	0	1	3	0	0	1	3	0	0	0	0
Number of church buildings between 500' and 1000' of the proposed line where the proposed line is parallel and adjacent to an existing transmission line or over-building in an existing distribution line																		
8		8	0	0	3	24	0	0	3	24	0	0	1	6	0	0	0	0
Number of community buildings within the proposed line's right-of-way																		
6		6	1	6	0	0	1	6	0	0	1	6	1	6	0	0	0	0
Number of commercial buildings outside of the right-of-way and within 200' of the proposed line where the proposed line is not parallel and adjacent to an existing transmission line or over-building in an existing distribution line																		
3		3	4	20	11	55	6	30	15	85	4	20	7	35	1	5	0	0
Number of commercial buildings between 200' and 500' of the proposed line where the proposed line is not parallel and adjacent to an existing transmission line or over-building in an existing distribution line																		
3		3	4	13														

## GROUP EVALUATIONS

Table 2  
Page 4 of 5

South Carolina Electric and Gas  
Thomas Island Project

Route Evaluation Summary Sheet

	Route A	Route B	Route C	Route D	Route E	Route F	Route G	Route H
Cultural and Natural Resource Factors	9.02	10.00	3.17	4.15	0.73	1.46	0.98	0.98
Land Cover Factors	10.00	9.24	6.34	5.55	5.32	4.92	3.08	4.04
Property Ownership Factors	10.00	9.62	6.56	6.16	6.35	6.21	5.64	6.15
Land Use Factors	10.00	9.90	7.63	7.54	5.89	5.93	5.65	6.15
Occupied Buildings Factors	6.03	9.84	6.14	10.00	5.74	9.84	4.22	2.56
Visibility Factors (Public)	7.76	9.02	6.64	7.90	6.58	7.68	9.54	10.00
Visibility Factors (Residential)	4.13	10.00	4.13	10.00	4.26	9.80	3.81	0.75
Water Quality Factors	10.00	9.32	4.79	3.63	5.41	4.63	3.04	5.83
Total Of Normalized Category Scores	66.94	76.94	45.40	54.93	40.28	50.47	35.96	36.46
Route's Rank	7	8	4	6	3	5	1	2

Legend

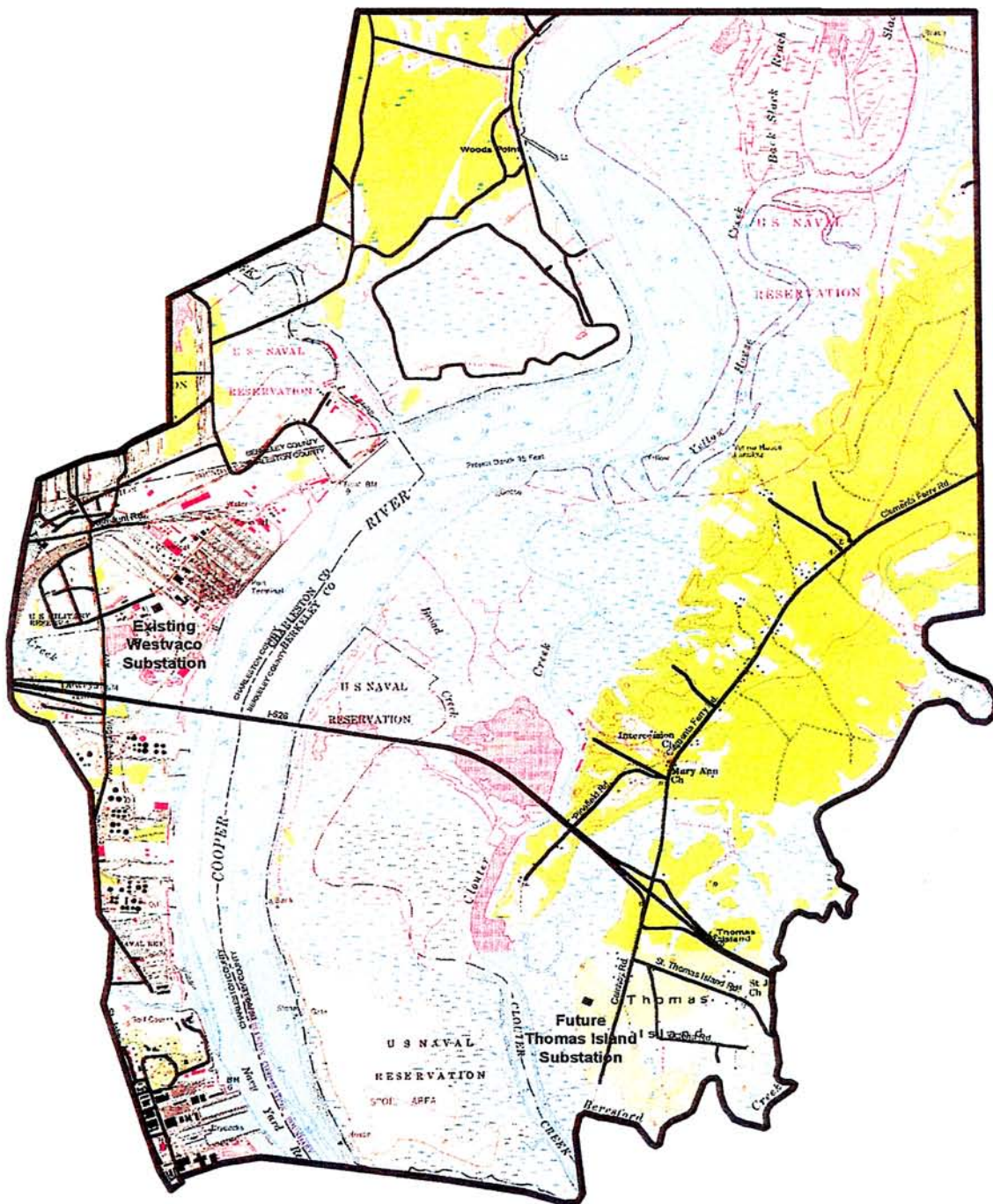
	Least Compliance (Scored in Highest 1/3 of Score Range)
	Second Best Compliance (Scored in Middle 1/3 of Score Range)
	Best Compliance (Scored in Lowest 1/3 of Score Range)





Aerial Photograph with Selected Route Corridor:  
Thomas Island Substation and  
Transmission Line Siting Project  
Berkeley and Charleston Counties, SC





SOURCE: U. S. Geological Survey 24K Quadangle Map (South Carolina Charleston and North Charleston Quadrangles 1979).



USGS Quadangle Map:  
Thomas Island Substation and  
Transmission Line Siting Project  
Berkeley and Charleston Counties, SC

4000 0 4000 Feet



Figure 2

LEGEND

- Study Area
- Substations (Existing and Future)

Prepared By:  
**Duke Engineering & Services**  
A Duke Energy Company





Aerial Photograph with Corridor Alternatives:  
 Thomas Island Substation and  
 Transmission Line Siting Project  
 Berkeley and Charleston Counties, SC



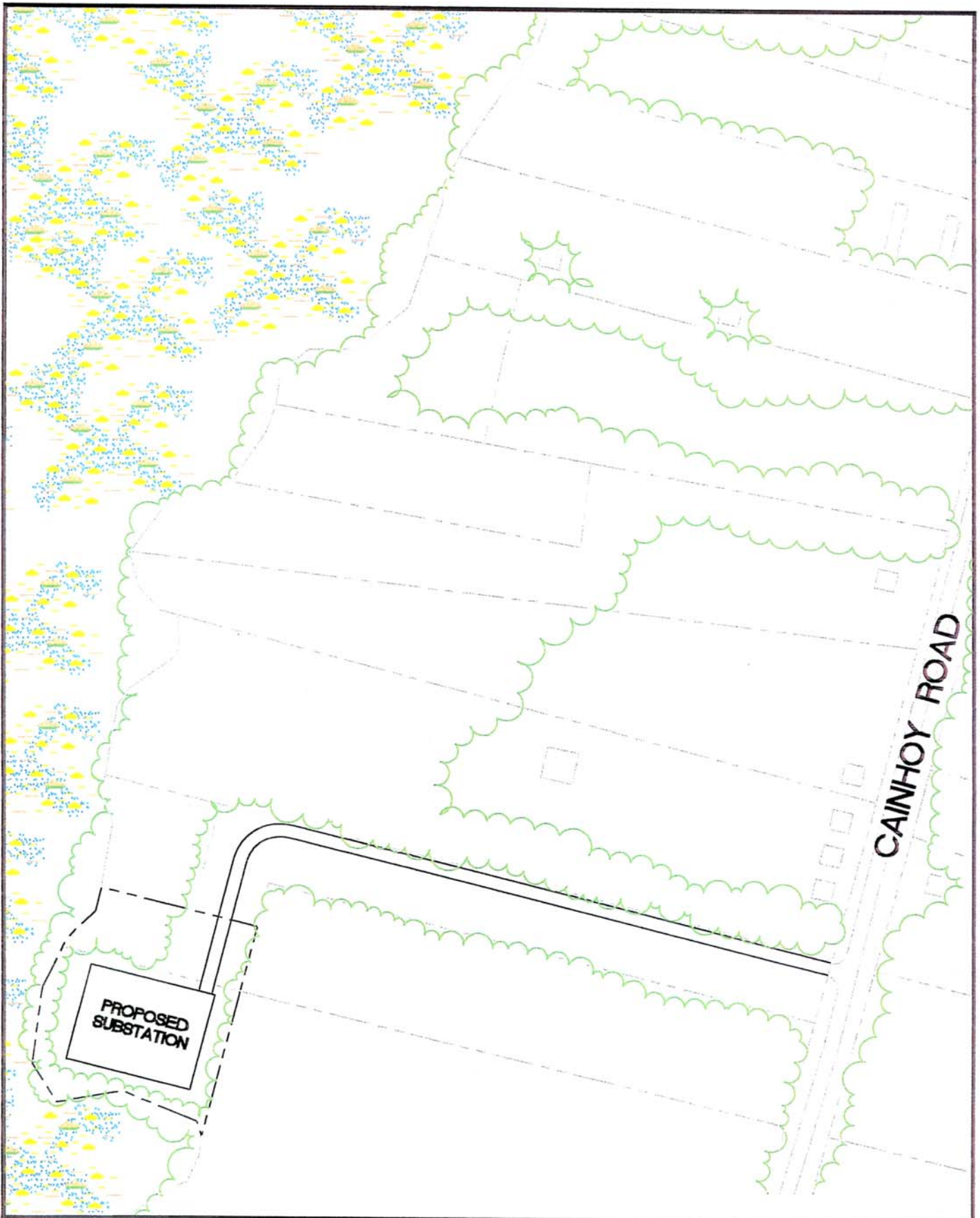
4000 0 4000 Feet



Prepared By:  
**Duke Engineering & Services**  
 A Halliburton Company

Figure 3





Substation Site Plan:  
Thomas Island Substation and  
Transmission Line Siting Project

Berkeley and Charleston Counties, SC

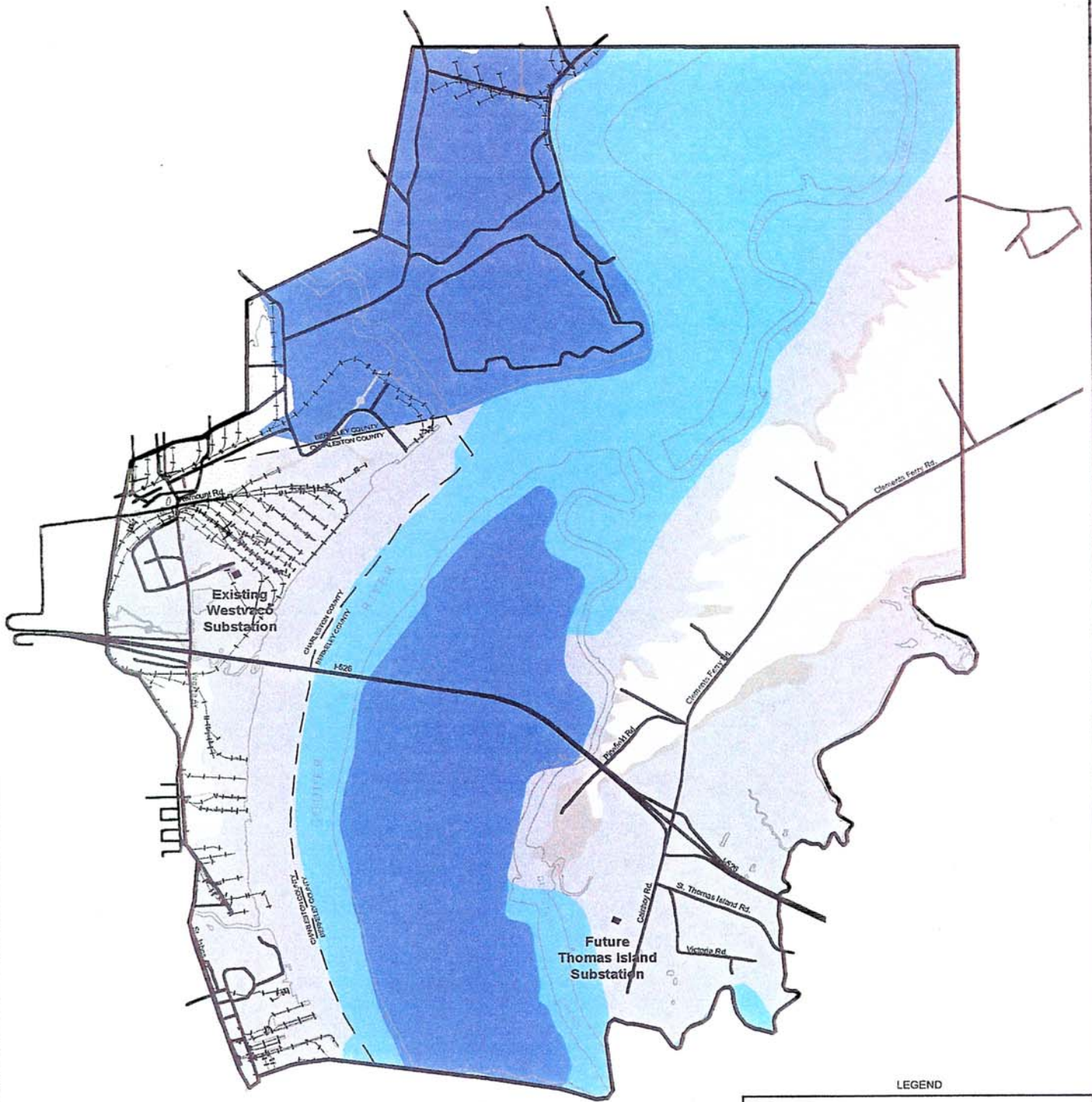
0 100 (ft) 200 400



Prepared By  
**Duke Engineering & Services**  
A Duke Energy Company

Figure 4





LEGEND

- Study Area
- Substations (Existing and Future)
- County Line
- Roads
- Railroads
- Existing 46 kV Transmission Line
- Existing 115 kV Transmission Line
- FEMA Flood Zones
  - 100 yr Flood Plain (Average Depth <1' ) or 500 yr Flood Plain
  - 100 yr Flood Plain (Base Flood Elevation Determined)
  - 100 yr Flood Plain (Velocity Hazard or Wave Action)
  - 100 yr Flood Plain (No Base Flood Elevation)
  - Area Outside 100 yr & 500 yr Flood Plains

SOURCE: Federal Emergency Management Agency National Flood Insurance Program September 1998.



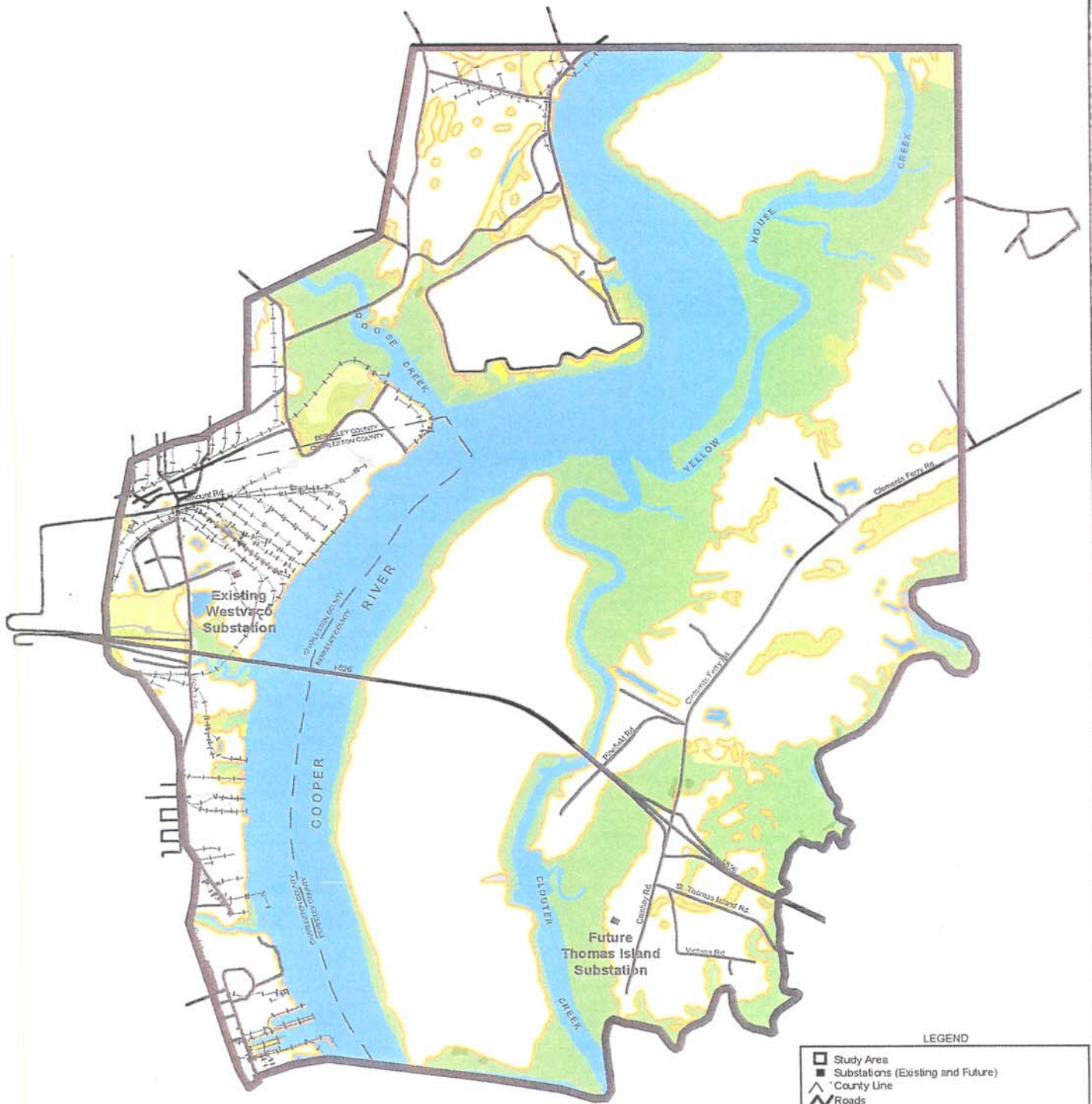
FEMA Flood Zones:  
Thomas Island Substation and  
Transmission Line Siting Project  
Berkeley and Charleston Counties, SC

4000 0 4000 Feet



Prepared By:  
**Duke Engineering & Services**  
A Duke Energy Company

Figure 5



LEGEND

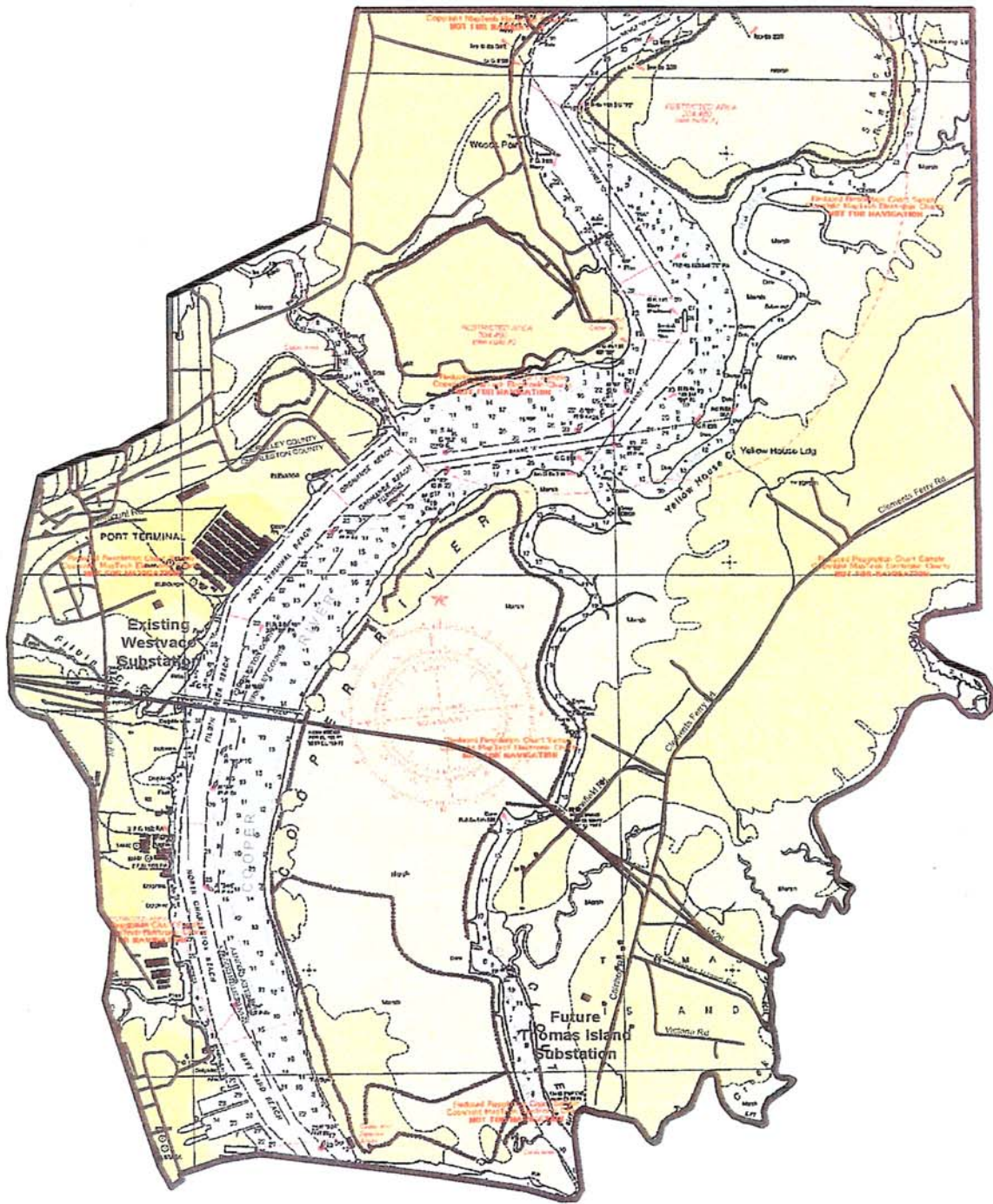
- Study Area
- Substations (Existing and Future)
- County Line
- Roads
- Railroads
- Existing 46 kV Transmission Line
- Existing 115 kV Transmission Line

Wetlands

- Riverine (R)
- Palustrine Unconsolidated Shore (PUS)
- Palustrine Unconsolidated Bottom (PUB)
- Palustrine Scrub/Shrub (PSS)
- Palustrine Emergent (PEM)
- Lacustrine Littoral Unconsolidated Shore (L2US)
- Lacustrine Littoral Unconsolidated Shore (L1UB)
- Estuarine Intertidal Scrub/Shrub (E2SS)
- Palustrine Forested (PFO)
- Estuarine Intertidal Forested (E2FO)
- Estuarine Intertidal Emergent (E2EM)
- Estuarine Subtidal Unconsolidated Bottom (E1UB)
- 50' Wetland Buffer
- 100' Wetland Buffer
- Upland (U)

SOURCE: U.S. Fish & Wildlife Service NWI, SC Department of Natural Resources State Wetlands, Aerial Photo Interpretation (NAPP 1999).





**LEGEND**

	Study Area
	Substations (Existing and Future)

SOURCE: NOAA United States - East Coast South Carolina Charleston Harbor Chart #11524 43rd Ed November 1997.



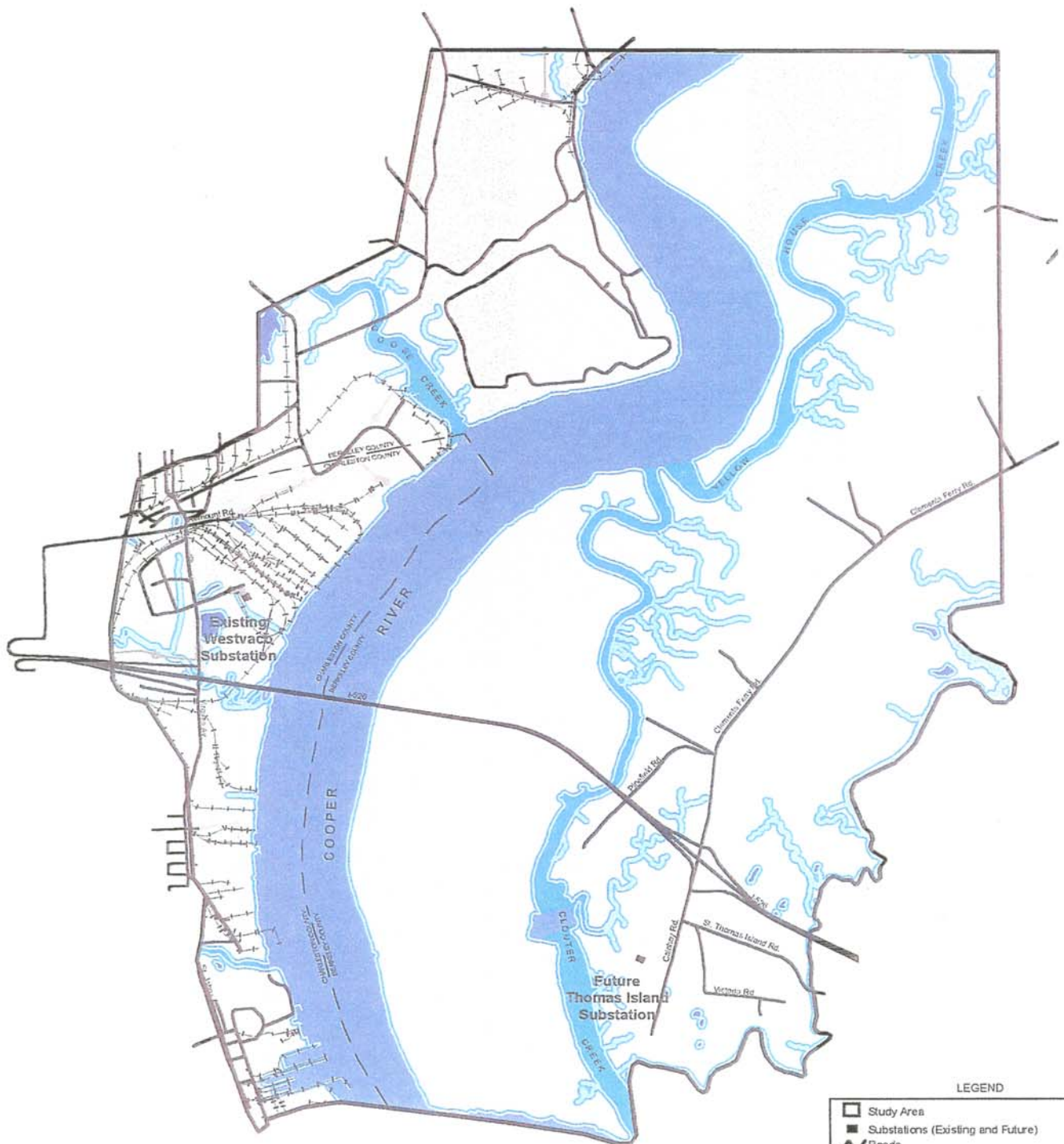
Charleston Harbor Nautical Chart:  
Thomas Island Substation and  
Transmission Line Siting Project  
Berkeley and Charleston Counties, SC

4000 0 6000 Feet



Prepared By:  
**Duke Engineering & Services**  
A Duke Energy Company

Figure 7



# LEGEND

- Study Area
- Substations (Existing and Future)
- Roads
- Railroads
- County Line
- Existing 46 kV Transmission Line
- Existing 115 kV Transmission Line
- Hydrography
  - Stream/Waterway With >1000' Channel Width
  - Stream/Waterway With 501'-1000' Channel Width
  - Stream/Waterway With 201'-500' Channel Width
  - Stream/Waterway With 50'-200' Channel Width
  - Stream/Waterway With < 50' Channel Width
  - Pond
  - Stream/Waterway/Pond 50' Buffer
  - Stream/Waterway/Pond 100' Buffer
  - No Delineated Water Body

Source: U.S. Geological Survey Digital Line Graph, Photo (1994) Interpretation 2000, Field Survey April 2000, Manual Channel Width Interpretation 2000.



## Hydrography: Thomas Island Substation and Transmission Line Siting Project Berkeley and Charleston Counties, SC

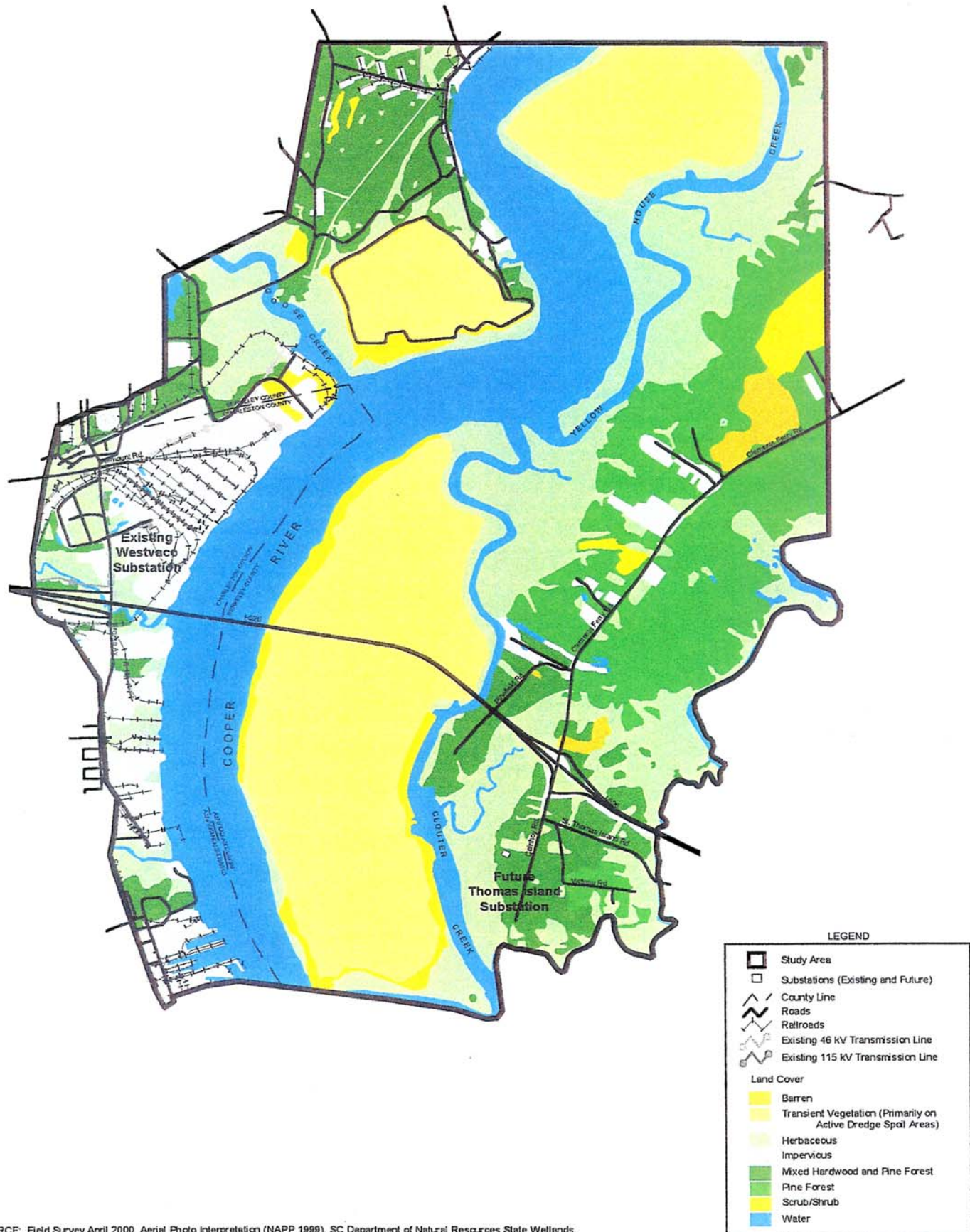
4000 0 4000 Feet



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Figure 8





SOURCE: Field Survey April 2000, Aerial Photo Interpretation (NAPP 1999), SC Department of Natural Resources State Wetlands.



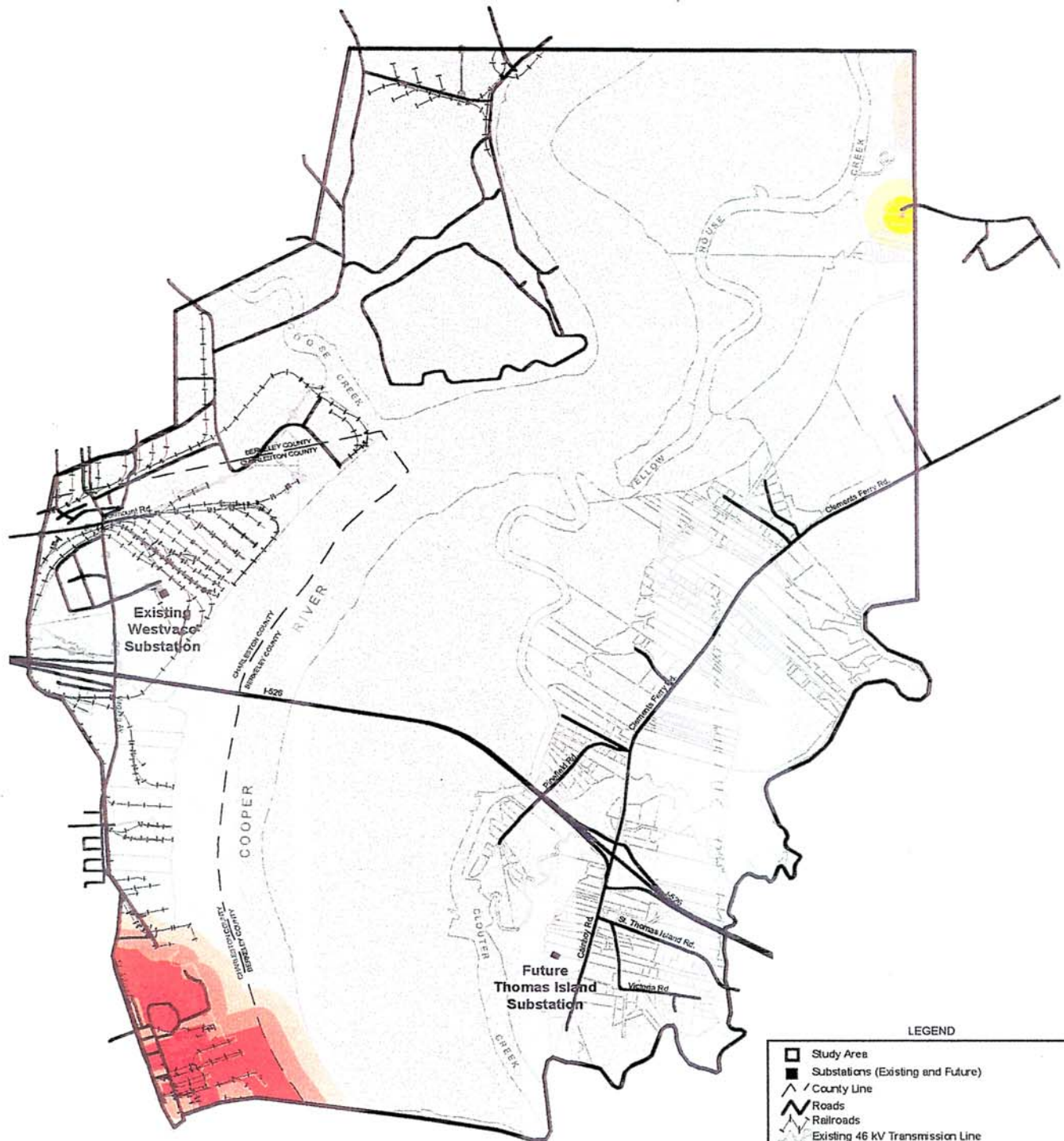
**Land Cover:**  
**Thomas Island Substation and**  
**Transmission Line Siting Project**  
 Berkeley and Charleston Counties, SC

4000 0 4000 Feet



Prepared By:  
**Duke Engineering & Services**  
 A Duke Energy Company

**Figure 9**



# LEGEND

- Study Area
  - Substations (Existing and Future)
  - County Line
  - Roads
  - Railroads
  - Existing 46 kV Transmission Line
  - Existing 115 kV Transmission Line
  - Property
- Cultural Resources**
- Historical - District Eligible for the National Register
  - Historical - Site Eligible for the National Register
  - Historical - Eligible 500' Buffer
  - Historical - Eligible 1000' Buffer
  - Historical - Site Not Eligible for the National Register
  - Historical - Not Eligible 100' Buffer
  - Historical - Not Eligible 500' Buffer
  - Historical - Not Eligible 1000' Buffer
  - No Known Sites

SOURCE: S. C. Department of Archives & History March 2000.



## Historic Cultural Resources: Thomas Island Substation and Transmission Line Siting Project

Berkeley and Charleston Counties, SC

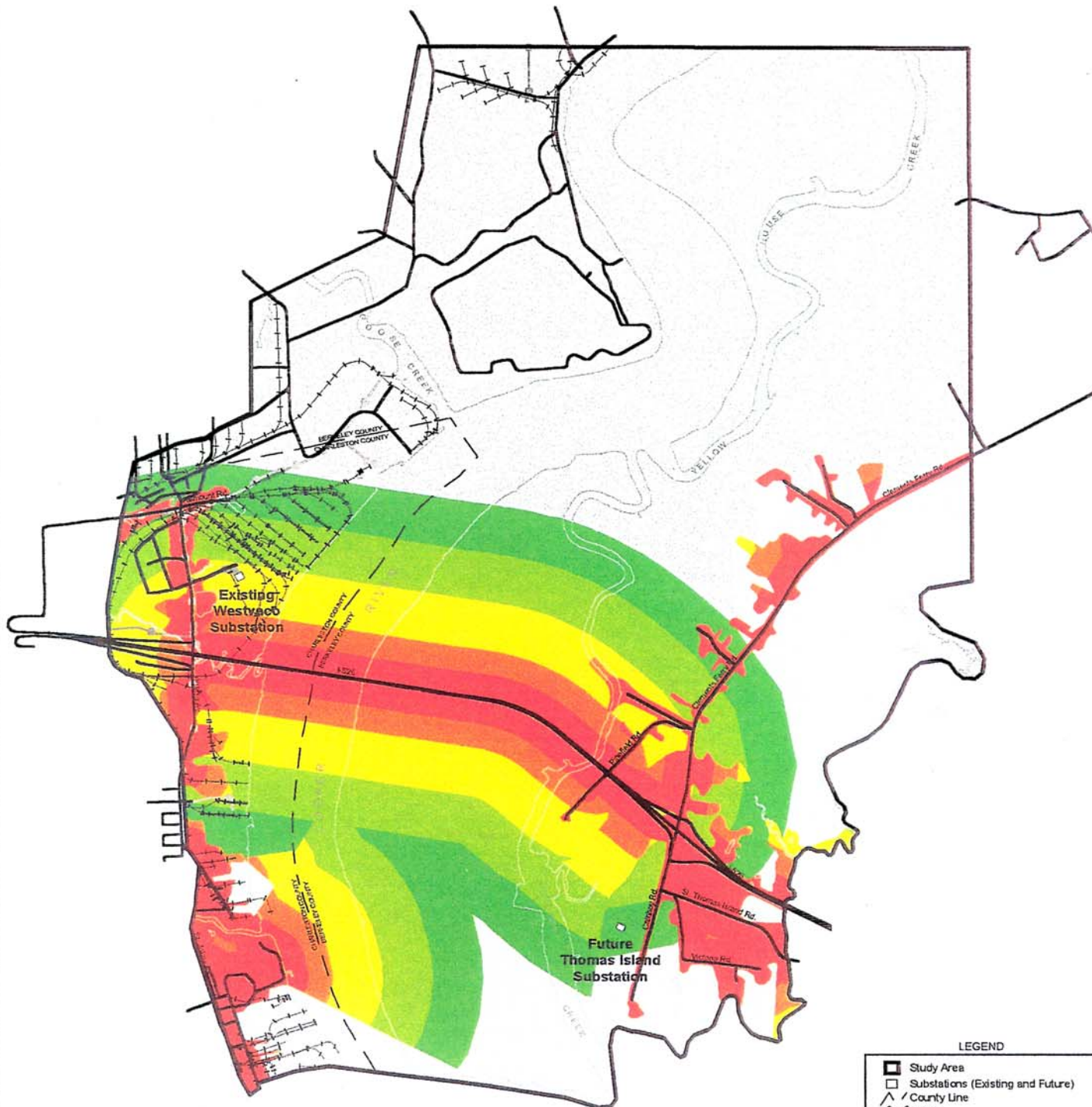
4000 0 4000 Feet



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Figure 10





**LEGEND**

- Study Area
- Substations (Existing and Future)
- County Line
- Roads
- Railroads
- Existing 46 kV Transmission Line
- Existing 115 kV Transmission Line

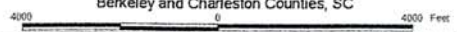
**Visibility From Public Roads**

- Visible (0 to 1/8 Mile)
- Visible (1/8 to 1/4 Mile)
- Visible (1/4 to 1/2 Mile)
- Visible (1/2 to 3/4 Mile)
- Visible (3/4 to 1 Mile)
- Not Visible

SOURCE: Field Survey April 2000.



**Visibility from Public Roads:  
Thomas Island Substation and  
Transmission Line Siting Project**  
Berkeley and Charleston Counties, SC

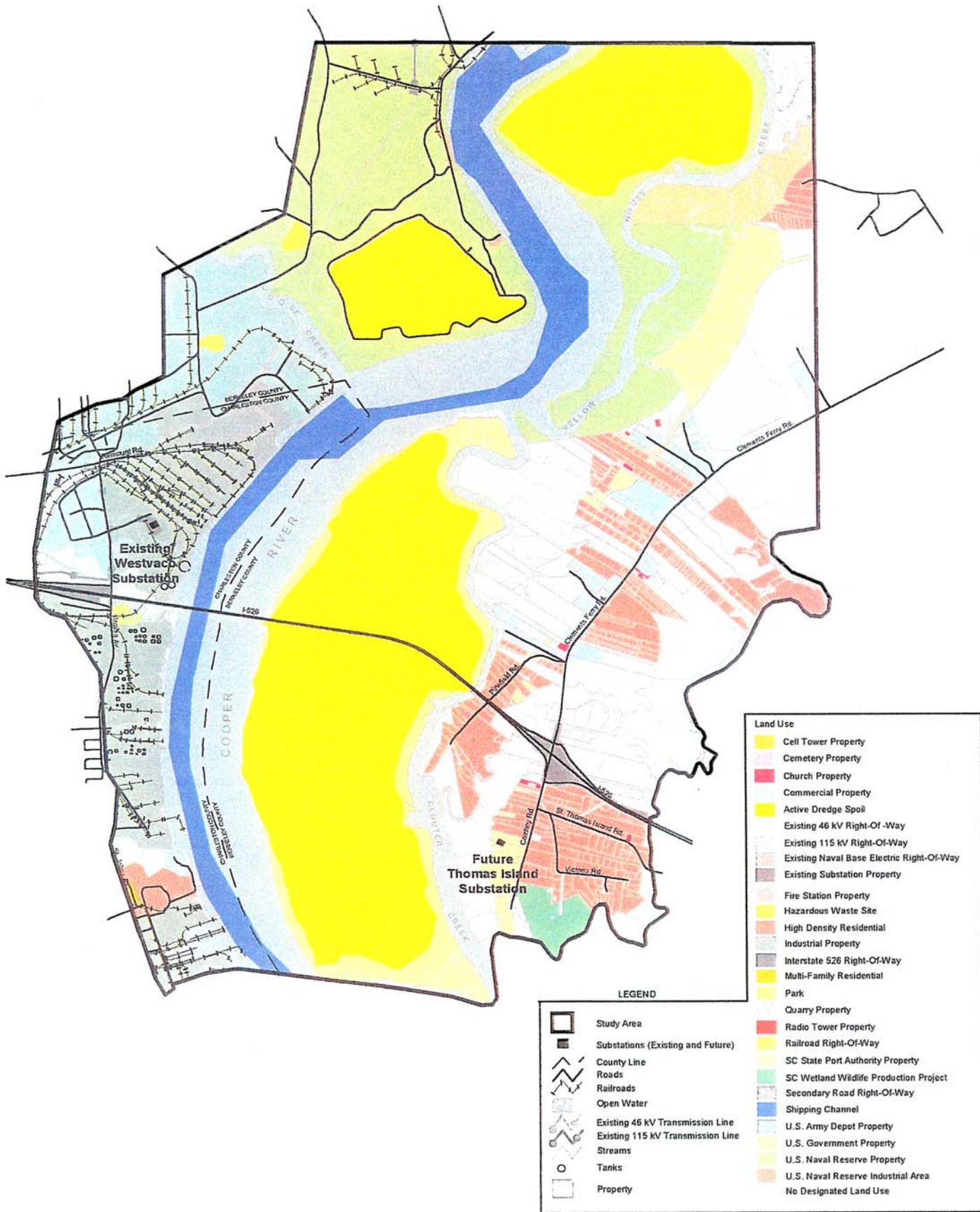


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A Duke Energy Company

Figure 11







SOURCE: Field Survey April 2000, Berkeley County Tax Records, Charleston County Tax Records, State Wetlands SC Department of Natural Resources, U.S. Naval Weapons Station GIS Data, SC Electric & Gas.

**Existing Land Use:**  
**Thomas Island Substation and**  
**Transmission Line Siting Project**  
 Berkeley and Charleston Counties, SC



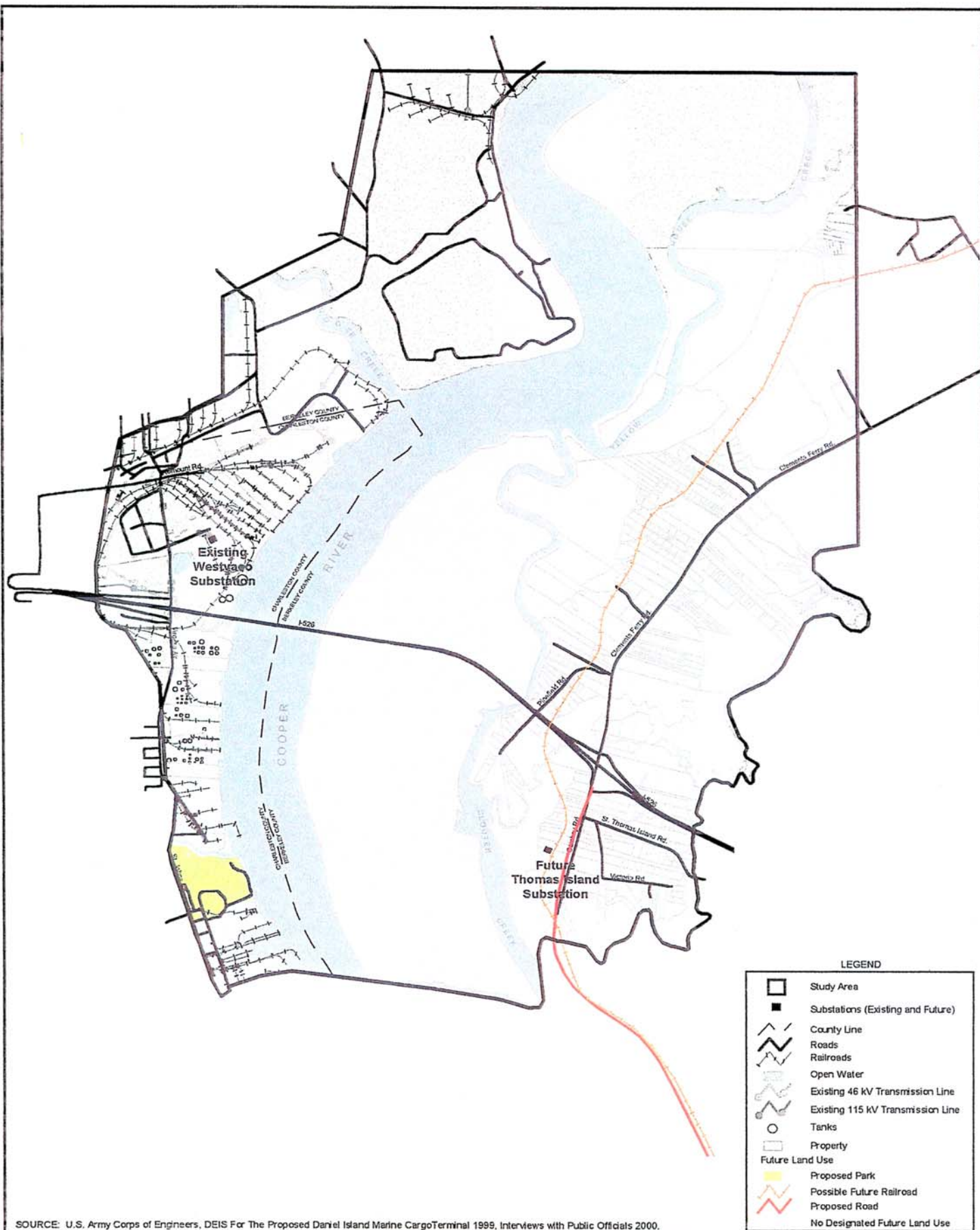
4000 0 4000 Feet



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 A Duke Energy Company

**Figure 13**





SOURCE: U.S. Army Corps of Engineers, DEIS For The Proposed Daniel Island Marine Cargo Terminal 1999, Interviews with Public Officials 2000.

**Future Land Use:**  
**Thomas Island Substation and**  
**Transmission Line Siting Project**  
 Berkeley and Charleston Counties, SC

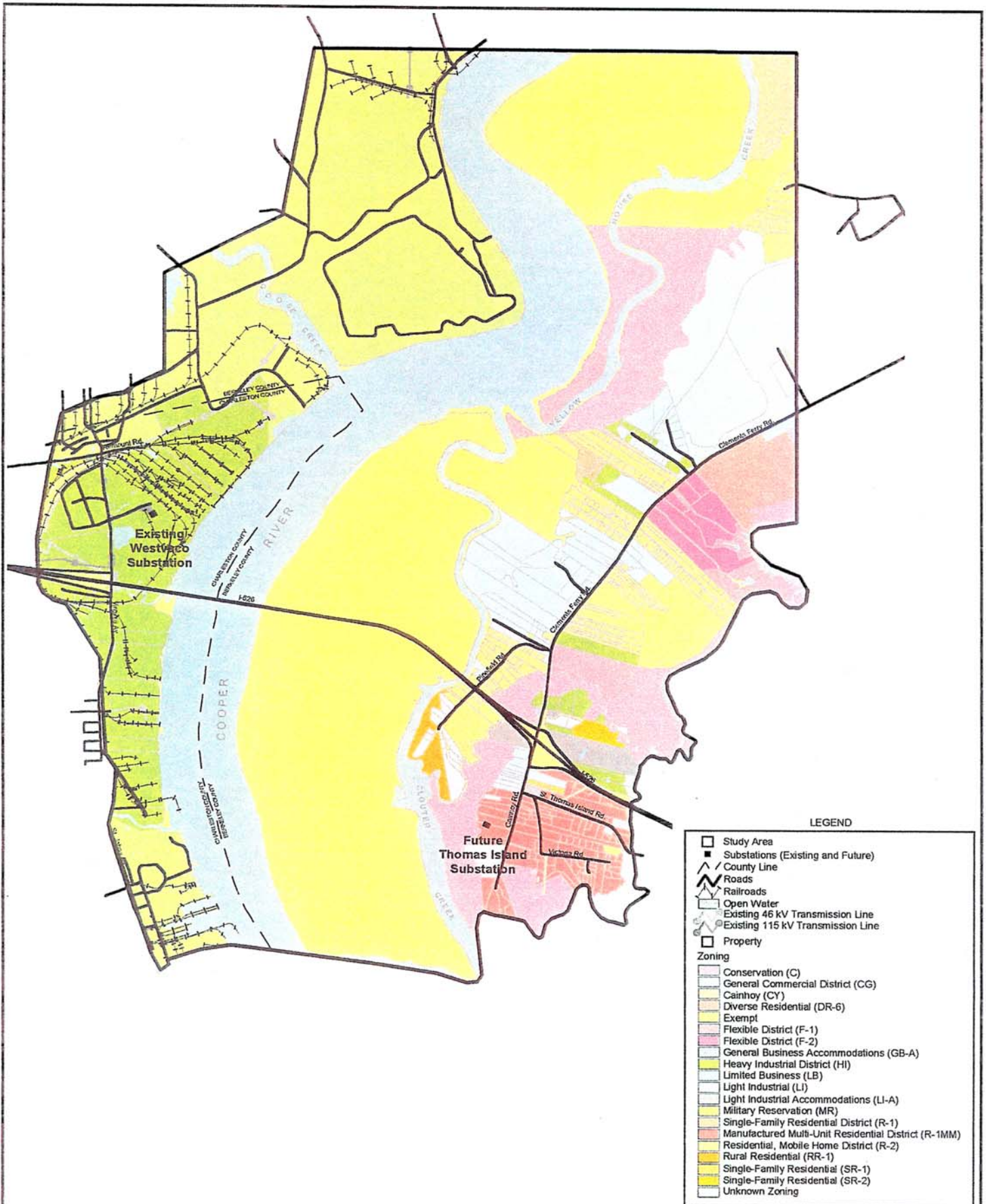
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Prepared By:

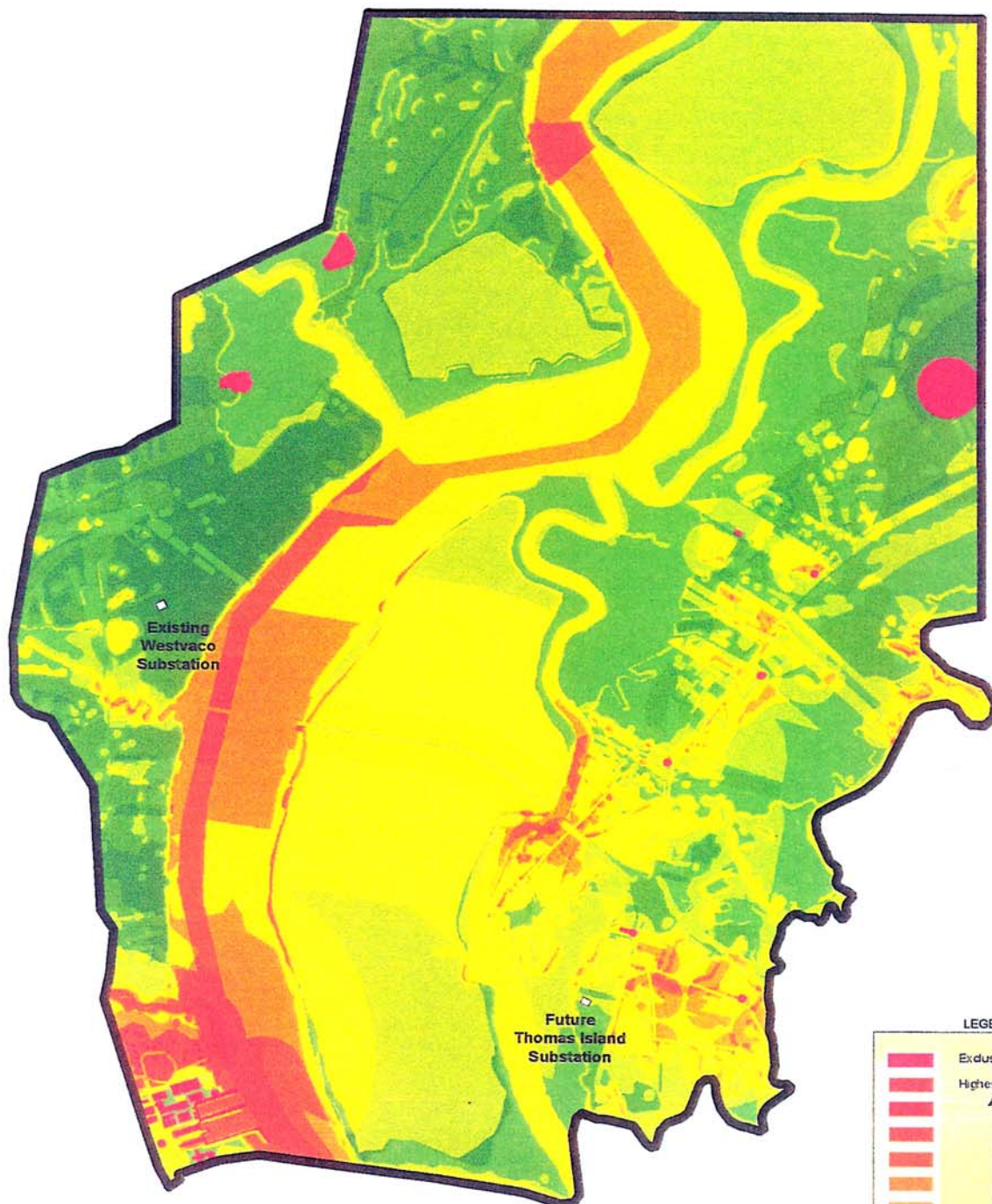
**Duke Engineering & Services**  
 A Duke Energy Company

**Figure 14**

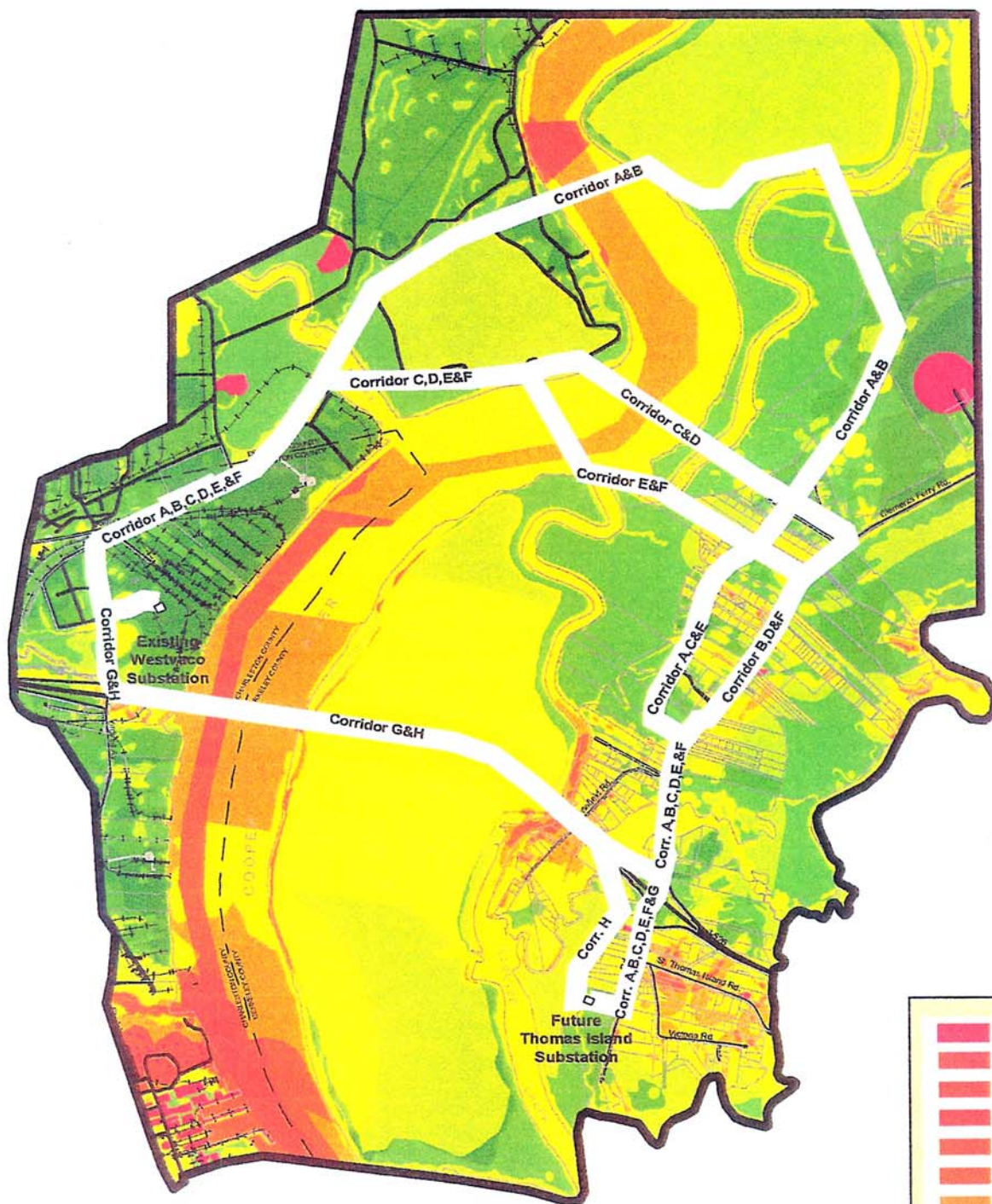


SOURCE: Berkeley County GIS 1999, City of North Charleston 2000 (verbal - planning area west of River), County of Charleston Property Information System 2000.

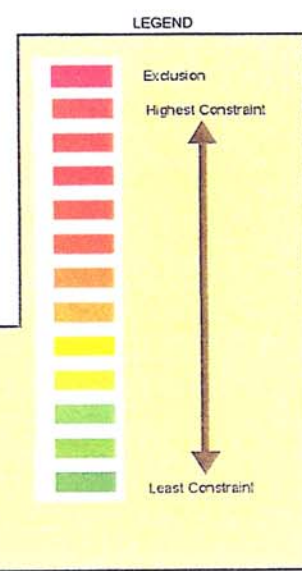








- LEGEND**
- Study Area
  - Substations (Existing and Future)
  - Proposed Corridor Alternatives
  - Property
  - County Line
  - Roads
  - Railroads
  - Existing 46 kV Transmission Line
  - Existing 115 kV Transmission Line



Suitability Composite With Corridor Alternatives:  
 Thomas Island Substation and  
 Transmission Line Siting Project  
 Berkeley and Charleston Counties, SC

## **AGENCIES CONSULTED**

Berkley County Engineering Department  
Berkley County Planning Department  
Berkley County Tax Assessors Office  
Brockington and Associates  
Charleston County Aviation Authority  
Charleston County Tax Department  
City of Charleston Department of Planning & Urban Development  
City of Charleston Department of Planning & Urban Development, Zoning Division  
City of Goose Creek Planning Department  
City of North Charleston Department of Planning and Management  
National Oceanic and Atmospheric Administration (NOAA), Charleston Office  
Preservation Consultants, Inc., Charleston, SC  
South Carolina Department of Archives and History  
South Carolina Department of Health and Environmental Control  
South Carolina Department of Highways and Public Transportation  
South Carolina Department of Natural Resources  
South Carolina Institute of Archaeology and Anthropology, University of South Carolina  
U.S. Army Corps of Engineers, Charleston District  
U.S. Department of Agriculture, Natural Resources Conservation Service  
U.S. Department of Interior, Fish and Wildlife Service  
U.S. Naval Weapons Station, Environmental Division

## **DATA SOURCES**

Berkley County GIS Department  
Charleston County GIS/Mapping Department  
City of North Charleston  
Federal Emergency Management Agency  
National Oceanic and Atmospheric Administration (NOAA), United States  
South Carolina Department of Archives & History  
South Carolina Department of Natural Resources  
U. S. Fish & Wildlife Service, NWI  
U. S. Geological Survey  
U. S. Naval Weapons Station



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## **APPENDIX B**

### **RTE SPECIES INVENTORY FOR CHARLESTON AND BERKELEY COUNTIES, SC**

# South Carolina Rare, Threatened & Endangered Species Inventory

## Species Found In Charleston County

June 2000

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	LEGAL STATUS
ACCIPITER COOPERII	COOPER'S HAWK	G5	S?	SC
ACIPENSER BREVIROSTRUM	SHORTNOSE STURGEON	G3	S3	FE/SE
ACRIS CREPITANS CREPITANS	NORTHERN CRICKET FROG	G5T5	S5	SC
AGRIMONIA INCISA	INCISED GROOVEBUR	G3	S1	NC
AIMOPHILA AESTIVALIS	BACHMAN'S SPARROW	G3	S3	SC
AMARANTHUS PUMILUS	SEABEACH AMARANTH	G2	S1	FT/ST
AMBYSTOMA CINGULATUM	FLATWOODS SALAMANDER	G2G3	S1	FT/SE
AMBYSTOMA TIGRINUM TIGRINUM	EASTERN TIGER SALAMANDER	G5T5	S2S3	SC
AMPHICARPUM MUEHLENBERGIANUM	BLUE MAIDEN-CANE	G4	S?	SC
ANTHAENANTIA RUFA	PURPLE SILKYSKALE	G5	S?	SC
ASCLEPIAS PEDICELLATA	SAVANNAH MILKWEED	G3?	S1	RC
BOTRYCHUM LUNARIOIDES	WINTER GRAPE-FERN	G4?	S?	SC
CALOPOGON BARBATUS	BEARDED GRASS-PINK	G4?	S?	SC
CANNA FLACCIDA	BANDANA-OF-THE- EVERGLADES	G4?	S4	SC
CARETTA CARETTA	LOGGERHEAD	G3	S3	FT/ST
CAREX DECOMPOSITA	CYPRESS-KNEE SEDGE	G3	S?	SC
CAROLINA BAY		G?	S?	SC
CHARADRIUS WILSONIA	WILSON'S PLOVER	G5	S3?	ST
CHASMANTHIUM NITIDUM	SHINY SPIKEGRASS	G3?	S?	SC
CLEMMYS GUTTATA	SPOTTED TURTLE	G5	S5	SC
COLONIAL WATERBIRD		G?	S?	SC
CONDYLURA CRISTATA	STAR-NOSED MOLE	G5	S3?	SC
COREOPSIS GLADIATA	SOUTHEASTERN TICKSEED	G3G5	S?	SC
CORYNORHINUS RAFINESQUII	RAFINESQUE'S BIG-EARED BAT	G3G4	S2?	SE
CYPERUS TETRAGONUS	PIEDMONT FLATSEDGE	G4?	S1	SC
DENDROICA VIRENS	BLACK-THROATED GREEN WARBLER	G5	S4	SC
DIONAEA MUSCIPULA	VENUS' FLY-TRAP	G3	S1	RC
ELANOIDES FORFICATUS	AMERICAN SWALLOW-TAILED KITE	G5	S2	SE
ELEOCHARIS VIVIPARA	VIVIPAROUS SPIKE-RUSH	G5	S?	SC
EUPATORIUM FISTULOSUM	HOLLOW JOE-PYE WEED	G5?	S?	SC
FORESTIERA GODFREYI	GODFREY'S PRIVET	G3	S?	SC
GALACTIA ELLIOTII	ELLIOTT'S MILKPEA	G5	SR	SC
HALIAEETUS LEUCOCEPHALUS	BALD EAGLE	G4	S2	FT/SE
HELENIUM PINNATIFIDUM	SOUTHEASTERN SNEEZEWEED	G4	S?	SC
HETERODON SIMUS	SOUTHERN HOGNOSE SNAKE	G2	S?	SC
ICTINIA MISSISSIPPIENSIS	MISSISSIPPI KITE	G5	S4	SC
IPOMOEA MACRORHIZA	LARGE-STEM MORNING-GLORY	G3G5	S1?	SC
IPOMOEA STOLONIFERA	BEACH MORNING-GLORY	G5?	S?	SC
IRIS HEXAGONA	WALTER'S IRIS	G4G5	S?	SC
LASIURUS CINEREUS	HOARY BAT	G5	S?	SC
LEPUROPETALON SPATHULATUM	SOUTHERN LEPUROPETALON	G5?	S?	SC
LIMNOTHLYPIS SWAINSONII	SWAINSON'S WARBLER	G4	S4	SC
LISTERA AUSTRALIS	SOUTHERN TWAYBLADE	G4	S?	SC
LITSEA AESTIVALIS	PONDSPICE	G3	S3	SC

<b>SCIENTIFIC NAME</b>	<b>COMMON NAME</b>	<b>GLOBAL RANK</b>	<b>STATE RANK</b>	<b>LEGAL STATUS</b>
LOBELIA BOYKINII	BOYKIN'S LOBELIA	G2G3	S?	SC
LUDWIGIA LANCEOLATA	LANCE-LEAF SEEDBOX	G3	SR	SC
LYSIMACHIA HYBRIDA	LANCE-LEAF LOOSESTRIFE	G5	S1	SC
MELANERPES ERYTHROCEPHALUS	RED-HEADED WOODPECKER	G5	S?	SC
MICROTUS PENNSYLVANICUS	MEADOW VOLE	G5	S4	SC
MICRURUS FULVIUS	EASTERN CORAL SNAKE	G5	S2	SC
MONOTROPSIS ODORATA	SWEET PINESAP	G3	S1	RC
MUHLENBERGIA FILIPES	BENTGRASS; HAIRGRASS	G?Q	S?	SC
MYCTERIA AMERICANA	WOOD STORK	G4	S1S2	FE/SE
MYOTIS AUSTRORIPARIUS	SOUTHEASTERN MYOTIS	G3G4	S2S3	ST
NEOTOMA FLORIDANA	EASTERN WOODRAT	G5	S3S4	SC
NEOTOMA FLORIDANA FLORIDANA	EASTERN WOODRAT	G5T5	S3S4	SC
OPHISAURUS COMPRESSUS	ISLAND GLASS LIZARD	G3G4	S1S2	SC
OROBANCHE UNIFLORA	ONE-FLOWERED BROOMRAPE	G5	S?	SC
OXYPOLIS CANBYI	CANBY'S DROPWORT	G2	S1	FE/SE
PASPALUM BIFIDUM	BEAD-GRASS	G5	S?	SC
PELECANUS OCCIDENTALIS	BROWN PELICAN	G4	S1S2	SC
PELTANDRA SAGITTIFOLIA	SPOON-FLOWER	G3G4	S?	SC
PHOCA VITULINA	HARBOR SEAL	G5	SA	SC
PHYSOSTEGIA LEPTOPHYLLA	SLENDER-LEAVED DRAGON- HEAD	G4?	S?	SC
PICOIDES BOREALIS	RED-CKOADED WOODPECKER	G3	S2	FE/SE
PIERIS PHILLYREIFOLIA	CLIMBING FETTER-BUSH	G3	S?	SC
PLANTAGO SPARSIFLORA	PINELAND PLANTAIN	G2G3	S?	SC
PLATANThERA INTEGRA	YELLOW FRINGELESS ORCHID	G3G4	S2	SC
PLEGADIS FALCINELLUS	GLOSSY IBIS	G5	S?	ST
PSEUDOBANCHUS STRIATUS	DWARF SIREN	G5	S2	ST
PSILOtUM NUDUM	WHISK FERN	G5	S1S2	SC
PTEROGLOSSASPIS ECRISTATA	CRESTED FRINGED ORCHID	G2	S2	SC
RANA CAPITO	GOPHER FROG	G3G4	S1	SC
RHEXIA ARISTOSA	AWNED MEADOWBEAUTY	G3	S2	SC
RHYNCHOSPORA CAREYANA	HORNED BEAKRUSH	G4?Q	SR	SC
RHYNCHOSPORA INUNDATA	DROWNED HORNEDRUSH	G3G4	S?	SC
SAGERETIA MINUTIFLORA	TINY-LEAVED BUCKTHORN	G4	S2	SC
SARRACENIA RUBRA	SWEET PITCHER-PLANT	G3	S1	SC
SCHWALBEA AMERICANA	CHAFFSEED	G2	S2	FE/SE
SCIURUS NIGER	EASTERN FOX SQUIRREL	G5	S4	SC
SCLERIA BALDWINII	BALDWIN NUTRUSH	G4	S1S2	SC
SEMINATRIX PYGAEA	BLACK SWAMP SNAKE	G5	S?	SC
SPIRANTHES LACINIATA	LACE-LIP LADIES'-TRESSES	G4G5	S1	SC
STERNA ANTILLARUM	LEAST TERN	G4	S3	ST
TRIPHORA TRIANTHOPHORA	NODDING POGONIA	G4	S2	SC
TYTO ALBA	BARN-OWL	G5	S4	SC
URSUS AMERICANUS	BLACK BEAR	G5	S3?	SC
XYRIS ELLIOTTII	ELLIOTT YELLOW-EYED GRASS	G4	SR	SC



# South Carolina Rare, Threatened & Endangered Species Inventory

## Species Found In Berkeley County

June 2000

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	LEGAL STATUS
ACIPENSER BREVIROSTRUM	SHORTNOSE STURGEON	G3	S3	FE/SE
AGALINIS APHYLLA	COASTAL PLAIN FALSE-FOXGLOVE	G3G4	S?	SC
AGRIMONIA INCISA	INCISED GROOVEBUR	G3	S1	NC
AMBYSTOMA CINGULATUM	FLATWOODS SALAMANDER	G2G3	S1	FT/SE
AMBYSTOMA TIGRINUM TIGRINUM	EASTERN TIGER SALAMANDER	G5T5	S2S3	SC
AMPHICARPUM MUEHLENBERGIANUM	BLUE MAIDEN-CANE	G4	S?	SC
ANDROPOGON MOHRII	BROOMSEDGE	G4?	S?	SC
ANDROPOGON PERANGUSTATUS	NARROW LEAVED BLUESTEM	G5T3T4	S1	SC
ANTHAENANTIA RUFA	PURPLE SILKYSCALE	G5	S?	SC
ARISTIDA BEYRICHIANA	BEYRICH'S THREE-AWN	G?	S?	SC
ASPLENIUM HETERORESILIENS	WAGNER'S SPLEENWORT	G2Q	S1	NC
ASPLENIUM RESILIENS	BLACK-STEM SPLEENWORT	G5	S1S2	SC
BACOPA CYCLOPHYLLA	COASTAL-PLAIN WATER-HYSSOP	G3G5	S1	SC
BURMANNIA BIFLORA	NORTHERN BURMANNIA	G4G5	S?	SC
CALOPOGON BARBATUS	BEARDED GRASS-PINK	G4?	S?	SC
CALOPOGON MULTIFLORUS	MANY-FLOWER GRASS-PINK	G3	SR	SC
CAREX BASIANTHA		G5	SR	SC
CAREX CHAPMANII	CHAPMAN'S SEDGE	G3	S1	NC
CAREX CHEROKEENSIS	CHEROKEE SEDGE	G4G5	SR	SC
CAREX GRANULARIS	MEADOW SEDGE	G5	S?	SC
CARYA MYRISTICIFORMIS	NUTMEG HICKORY	G4	S1	RC
CASTILLEJA COCCINEA	SCARLET INDIAN-PAINTBRUSH	G5	S2	RC
CHAMAEDAPHNE CALYCVLATA	LEATHERLEAF	G5	S?	SC
CLEMMYS GUTTATA	SPOTTED TURTLE	G5	S5	SC
COLONIAL WATERBIRD		G?	S?	SC
COREOPSIS GLADIATA	SOUTHEASTERN TICKSEED	G3G5	S?	SC
COREOPSIS INTEGRIFOLIA	CILIATE-LEAF TICKSEED	G1G2	SR	SC
CORYNORHINUS RAFINESQUII	RAFINESQUE'S BIG-EARED BAT	G3G4	S2?	SE
ELANOIDES FORFICATUS	AMERICAN SWALLOW-TAILED KITE	G5	S2	SE
ELEOCHARIS TRICOSTATA	THREE-ANGLE SPIKERUSH	G4	SR	SC
EPIDENDRUM CONOPSEUM	GREEN-FLY ORCHID	G4	S?	SC
ERYNGIUM AQUATICUM VAR RAVENELII	MARSH ERYNGO	G4TUQ	S?	SC
EUPATORIUM RECURVANS	COASTAL-PLAIN THOROUGH-WORT	G3G4Q	SR	SC
HABENARIA QUINQUESETA	LONG-HORN ORCHID	G4G5	S?	SC
HALIAEETUS LEUCOCEPHALUS	BALD EAGLE	G4	S2	FT/SE
HELENIVM PINNATIFIDUM	SOUTHEASTERN SNEEZEWEED	G4	S?	SC
HETERODON SIMUS	SOUTHERN HOGNOSE SNAKE	G2	S?	SC
IRIS HEXAGONA	WALTER'S IRIS	G4G5	S?	SC
LACHNOCAULON MINUS	SMALL'S BOG BUTTON	G3G4	SR	SC
LINDERA MELISSIFOLIA	PONDBERRY	G2	S1	FE/SE
LISTERA AUSTRALIS	SOUTHERN TWAYBLADE	G4	S?	SC
LITSEA AESTIVALIS	PONDSPICE	G3	S3	SC
LOBELIA BOYKINII	BOYKIN'S LOBELIA	G2G3	S?	SC

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	LEGAL STATUS
LYSIMACHIA HYBRIDA	LANCE-LEAF LOOSESTRIFE	G5	S1	SC
MELANTHIUM VIRGINICUM	VIRGINIA BUNCHFLOWER	G5	S?	SC
MENISPERMUM CANADENSE	CANADA MOONSEED	G5	S?	SC
MYRIOPHYLLUM LAXUM	PIEDMONT WATER-MILFOIL	G3	S2	RC
NEOTOMA FLORIDANA FLORIDANA	EASTERN WOODRAT	G5T5	S3S4	SC
NERODIA CYCLOPION	GREEN WATER SNAKE	G5	S2	SC
NERODIA FLORIDANA	FLORIDA GREEN WATER SNAKE	G5	S2	SC
OPHIOGLOSSUM PETIOLATUM	LONGSTEM ADDER'S-TONGUE FERN	G5	S?	SC
OXYPOLIS CANBYI	CANBY'S DROPWORT	G2	S1	FE/SE
PELTANDRA SAGITTIFOLIA	SPOON-FLOWER	G3G4	S?	SC
PHYSOSTEGIA LEPTOPHYLLA	SLENDER-LEAVED DRAGON-HEAD	G4?	S?	SC
PICOIDES BOREALIS	RED-COCKADED WOODPECKER	G3	S2	FE/SE
PILEA FONTANA	SPRINGS CLEARWEED	G5	S?	SC
PLANTAGO SPARSIFLORA	PINELAND PLANTAIN	G2G3	S?	SC
PLATANThERA INTEGRA	YELLOW FRINGELESS ORCHID	G3G4	S2	SC
PLATANThERA LACERA	GREEN-FRIDGE ORCHIS	G5	S1	SC
PONThIEVA RACEMOSA	SHADOW-WITCH ORCHID	G4G5	S?	SC
PTEROGLOSSASPIS ECRISTATA	CRESTED FRINGED ORCHID	G2	S2	SC
QUERCUS SIMILIS	BOTTOM-LAND POST OAK	G4Q	SR	SC
RANA CAPITO	GOPHER FROG	G3G4	S1	SC
RHEXIA ARISTOSA	AWNED MEADOWBEAUTY	G3	S2	SC
RHYNCHOSPORA CAREYANA	HORNED BEAKRUSH	G4?Q	SR	SC
RHYNCHOSPORA CEPHALANTHA VAR ATTENUATA		G5T3?	SR	SC
RHYNCHOSPORA HARPERI	HARPER BEAKRUSH	G4?	S?	SC
RHYNCHOSPORA INUNDATA	DROWNED HORNEDRUSH	G3G4	S?	SC
RHYNCHOSPORA OLIGANTHA	FEW-FLOWERED BEAKED-RUSH	G4	S?	SC
RHYNCHOSPORA PLEIANThA	BROWN BEAKED-RUSH	G2	S?	SC
RHYNCHOSPORA STENOPHYLLA	CHAPMAN BEAKRUSH	G4	S?	SC
RHYNCHOSPORA TRACYI	TRACY BEAKRUSH	G4	S?	SC
RUDBECKIA HELIOPSIDIS	SUN-FACING CONEFLOWER	G2	S1	NC
SARRACENIA RUBRA	SWEET PITCHER-PLANT	G3	S1	SC
SCHWALBEA AMERICANA	CHAFFSEED	G2	S2	FE/SE
SCLERIA BALDWINII	BALDWIN NUTRUSH	G4	S1S2	SC
SEMINATRIX PYGAEA	BLACK SWAMP SNAKE	G5	S?	SC
SPIRANTHES LACINIATA	LACE-LIP LADIES'-TRESSES	G4G5	S1	SC
SPOROBOLUS CURTISSII	PINELAND DROPSEED	G3	SR	SC
STERNA ANTILLARUM	LEAST TERN	G4	S3	ST
THALICTRUM SUBROTUNDUM	RECLINED MEADOW-RUE	G1G2Q	S1	SC
TRILLIUM PUSILLUM VAR PUSILLUM	LEAST TRILLIUM	G3T2	S1	NC
TRIPHORA TRIANTHOPHORA	NODDING POGONIA	G4	S2	SC
UTRICULARIA MACRORHIZA	GREATER BLADDERWORT	G5	SR	SC
XYRIS BREVIFOLIA	SHORT-LEAVED YELLOW-EYED GRASS	G4G5	S?	SC
XYRIS DIFFORMIS VAR FLORIDANA	FLORIDA YELLOW-EYED GRASS	G5T4T5	SR	SC
XYRIS ELLIOTTII	ELLIOTT YELLOW-EYED GRASS	G4	SR	SC



**G RANK** - the Nature Conservancy rating of degree of endangerment world-wide:

---

- G1** - Critically imperiled globally because of extreme rarity or because of some factor(s) making it especially vulnerable to extinction
- G2** - Imperiled globally because of rarity or factor(s) making it vulnerable
- G3** - Either very rare throughout its range or found locally in a restricted range, or having factors making it vulnerable
- G4** - Apparently secure globally, though it may be rare in parts of its range
- G5** - Demonstrably secure globally, though it may be rare in parts of its range
- GH** - Of historical occurrence throughout its range, with possibility of rediscovery
- GX** - Extinct throughout its range
- G?** - Status unknown

**S RANK** - the Nature Conservancy rating of degree of endangerment in South Carolina:

---

- S1** - Critically imperiled state-wide because of extreme rarity or because of some factor(s) making it especially vulnerable to extirpation
- S2** - Imperiled state-wide because of rarity or factor(s) making it vulnerable
- S3** - Rare or uncommon in state
- S4** - Apparently secure in state
- S5** - Demonstrably secure in state
- SA** - Accidental in state (usually birds or butterflies that are far outside normal range)
- SE** - Exotic established in state
- SH** - Of historical occurrence in state, with possibility of rediscovery
- SN** - Regularly occurring in state, but in a migratory, non-breeding form
- SR** - Reported in state, but without good documentation
- SX** - Extirpated from state
- S?** - Status unknown

**STATUS - legal status:**

---

**FE - Federal Endangered**

**FT - Federal Threatened**

**PE - Proposed for Federal listing as Endangered**

**PT - Proposed for Federal listing as Threatened**

**c - Candidate for Federal listing**

**NC -Of Concern, National (unofficial - plants only)**

**RC - Of Concern, Regional (unofficial - plants only)**

**SE - State Endangered (official state list - animals only)**

**ST - State Threatened (official state list - animals only)**

**SC - Of Concern, State**

**SX - State Extirpated**

**Data Source: SC Dept. of Natural Resources-Heritage Trust Program. June 2000**

## **APPENDIX C**

### **ROUTING STUDY QUESTIONNAIRE RESPONSE ANALYSIS**

# WESTVACO TO THOMAS ISLAND 100KV TRANSMISSION LINE

## Routing Study Questionnaire Response Analysis

December 2000

*South Carolina Electric & Gas  
Columbia, South Carolina*





September 8, 2000

Dear Area Property Owners and Residents:

The tri-county area is one of the fastest-growing regions in South Carolina. This rapid growth has placed a tremendous demand on the region's infrastructure of roads and utilities, including the demand for electricity. In fact, the residential and commercial growth in some areas of Charleston will soon exceed SCE&G's existing service capabilities.

One key project that will help SCE&G provide reliable power is the addition of a substation on Thomas Island. The project will require the construction of a new transmission line between North Charleston and Thomas Island. SCE&G is currently conducting a comprehensive transmission line siting study and has identified several possible transmission line corridors (see the enclosed map). One of these alternate corridors will be selected as the route for the future line. If you have information that should be considered when evaluating any of the corridors, we would like to discuss it with you at a community workshop on **September 21<sup>st</sup>**.

The community workshop will be held at **Omar Shrine Temple, 176 Bud Darby Blvd., Mount Pleasant, SC**. SCE&G personnel will be on hand between 4 p.m. and 8 p.m. to document any information you may have that should be considered in the siting process and to provide detailed information about the project.

We hope you will take a few minutes to complete the Community Survey Questionnaire, enclosed. Information you provide in the Questionnaire will assist SCE&G when it begins comparing and evaluating alternative line corridors. Please complete the Questionnaire and bring it with you to the workshop or return it in the self-addressed envelope. If you wish, you may bring it to the workshop and complete it after you have learned more about the project. However, we must have all completed Questionnaires by September 28<sup>th</sup> to ensure their consideration in the siting process.

If you know of neighbors or other interested property owners who are unaware of the workshop, please encourage them to attend. In the meantime, if you have any questions about this meeting or the proposed project, please call me at 843-576-8940.

Again, thank you in advance for being part of our "siting" effort. I hope to see you September 21<sup>st</sup>.

Sincerely,

Dan Kassir  
Manager  
Metro Charleston  
Distribution Services

Enclosures

U.S. Naval  
Weapons Station

Siting Study Area Boundary

Siting Study Area Boundary

South Carolina State  
Ports Authority

WESTVACO  
SUBSTATION

COOPER  
RIVER

DREDGE SPOIL

CORRIDOR G

DREDGE SPOIL

COOPER

THOMAS  
ISLAND

FUTURE  
THOMAS ISLAND  
SUBSTATION

CLOUTIER  
CREEK

DREDGE SPOIL

CORRIDOR A & B

CORRIDOR C, D, E & F

CORRIDOR C & D

CORRIDOR A & B

CORRIDOR E & F

CORRIDOR A, C & E

CORRIDOR A, B & F

CORRIDOR A, B, C, D, E & F

CORRIDOR A, B, C, D, E & F

CORRIDOR A, B, C, D, E & F

Legend

- Existing Westvaco Substation
- Future Thomas Island Substation
- ▬ Roads
- ▨ Alternate Route Corridors For Future Transmission Line
- ▭ Existing Transmission Right Of Way
- ▬ Siting Study Area Boundary

NORTH  
CHARLESTON

Siting Study Area Boundary

Corridor Alternatives:  
Thomas Island Substation and  
Transmission Line Siting Project  
Berkeley and Charleston Counties, SC



3000 0 3000 Feet



Prepared By:  
**Duke Engineering  
& Services**  
A Duke Energy Company

## Community Survey Questionnaire

### General Information

Thank you for taking time to complete this Community Survey Questionnaire. The Questionnaire is designed to let you document substantive information that SCE&G will consider when evaluating and comparing alternate transmission line route corridors. One route corridor will be selected as the route for the future transmission line and the information you provide will play a significant part in the final route selection decision.

If you have questions when completing the Questionnaire, please bring it with you to the Community Workshop on September 21<sup>st</sup>. SCE&G representatives will be on hand to answer questions and to offer any assistance you may need when completing it.

You may leave your completed Questionnaire at the Community Workshop, return it in the self-addressed envelope (attached), or FAX it to 704.382.9198. Please remember, however, that ***completed Questionnaires must be received no later than September 28, 2000*** to ensure their consideration in the transmission line siting study.

# Community Survey

## SCE&G

### Westvaco to Thomas Island 100kV Transmission Line

This Community Survey is designed to allow you to participate in the routing study for SCE&G's future transmission line that will run between the Westvaco Substation and a future substation on Thomas Island. Your responses will help SCE&G more clearly understand community concerns and will allow them to be factored into the evaluation of several possible route corridors for the future transmission line. A map of the study area is located on the back of this survey for your use in identifying any areas of concern.

#### I. Routing Information

1. An array of factors will be considered when selecting the route corridor for the future Westvaco to Thomas Island 115kV Transmission Line. These factors fall into the Categories listed below. Please review the factors carefully and **rate them according to their importance to you within each Category** (*1<sup>st</sup> = Most important, 2<sup>nd</sup>, 3<sup>rd</sup>, etc. within each Category*). You may designate as many factors as you choose as being equally important.

##### Category A: Environmental Factors (*1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup>*)

- ☐ Protection of *forests and other existing vegetation*
- ☐ Protection of *rare, threatened or endangered species (plants or animals)*
- ☐ Protection of *streams, creeks, rivers*
- ☐ Protection of *wetlands*
- ☐ Protection of *estuaries*

##### Category B: Community Factors (*1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup>*)

- ☐ The location of *residences* in relation to possible line routes
- ☐ The location of *schools* in relation to possible line routes
- ☐ The location of *churches and cemeteries* in relation to possible line routes
- ☐ The location of *hospitals* in relation to possible line routes
- ☐ The location of *nursing homes* in relation to possible line routes
- ☐ The location of *day care centers* in relation to possible line routes
- ☐ The location of *recreational areas/facilities* in relation to possible line routes
- ☐ The location of *scenic features or scenic viewpoints* in relation to possible line routes

##### Category C: Cultural and Historic Factors (*1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>*)

- ☐ The location of *historic structures* in relation to possible line routes
- ☐ The location of *historic districts* in relation to possible line routes
- ☐ The location of *archaeological resources* in relation to possible line routes

##### Category D: Visual Factors (*1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup>*)

- ☐ The degree to which possible line routes will be seen from *residences*
- ☐ The degree to which possible line routes will be seen from *public roads*
- ☐ The degree to which possible line routes will be seen from *public facilities* (schools, churches, nursing homes, commercial/industrial facilities, etc.)
- ☐ The degree to which possible line routes will be seen from *recreation areas (waterways, beaches, marinas, piers, fishing areas, etc)*
- ☐ The degree to which possible line routes will be seen from *unique scenic features* (marshlands, riverfront trail systems, parks, hiking trails, etc.)



**Category E: Land Use Factors** (1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup>)

- ☐ The effect possible line routes will have on *forests*
- ☐ The effect possible line routes will have on *crop and pasture land*
- ☐ The effect possible line routes will have on *commercial land use*
- ☐ The effect possible line routes will have on *institutional land use (churches, schools, libraries, etc.)*
- ☐ The effect possible line routes will have on *industrial land use*
- ☐ The effect possible line routes will have on *residential land use*
- ☐ The effect possible line routes will have on *public land use*
- ☐ The effect possible line routes will have on *recreational land use*

2. Please summarize what you consider to be the most important or outstanding qualities or resources of the study area (please see study area map on the back of questionnaire).

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3. Do you know of any building, family cemetery, or landmark in the study area which may be architecturally or historically important? If so, please give the location and the owner's name and address (if known) or visit the Route Selection Workstation at the Community Workshop and point out the location on maps provided.

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4. Are you aware of any feature or place in the study area with unique or special scenic quality? If so, please explain below and to the Route Selection Workstation representatives at the Community Workshop, if possible.

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5. Are you aware of any location in the study area that is frequently used for recreation? If so, please describe the location below and to the representative at the Route Selection Workstation, if you are able to attend the Workshop.

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6. Environmental scientists, engineers, real estate experts, and landscape architects will be considering an array of factors when selecting the preferred corridor for the Westvaco to Thomas Island 115kV Transmission Line. Do you have any suggestions or comments for them to consider during this evaluation process?

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### III. Demographic Information

1. Please check all that applies to you:

- ☐ Live within the study area
- ☐ Work within the study area
- ☐ Live outside the study area
- ☐ Own property in the study area
- ☐ Live in Berkeley County
- ☐ Live in Charleston County
- ☐ Other information that may be helpful: \_\_\_\_\_

2. Your name and address is optional, but could be very useful if the transmission line siting team needs to contact you about information provided.

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Phone: \_\_\_\_\_

E-Mail \_\_\_\_\_

3. If you have additional comments, please use the space below or attach comments on a separate sheet to this survey.

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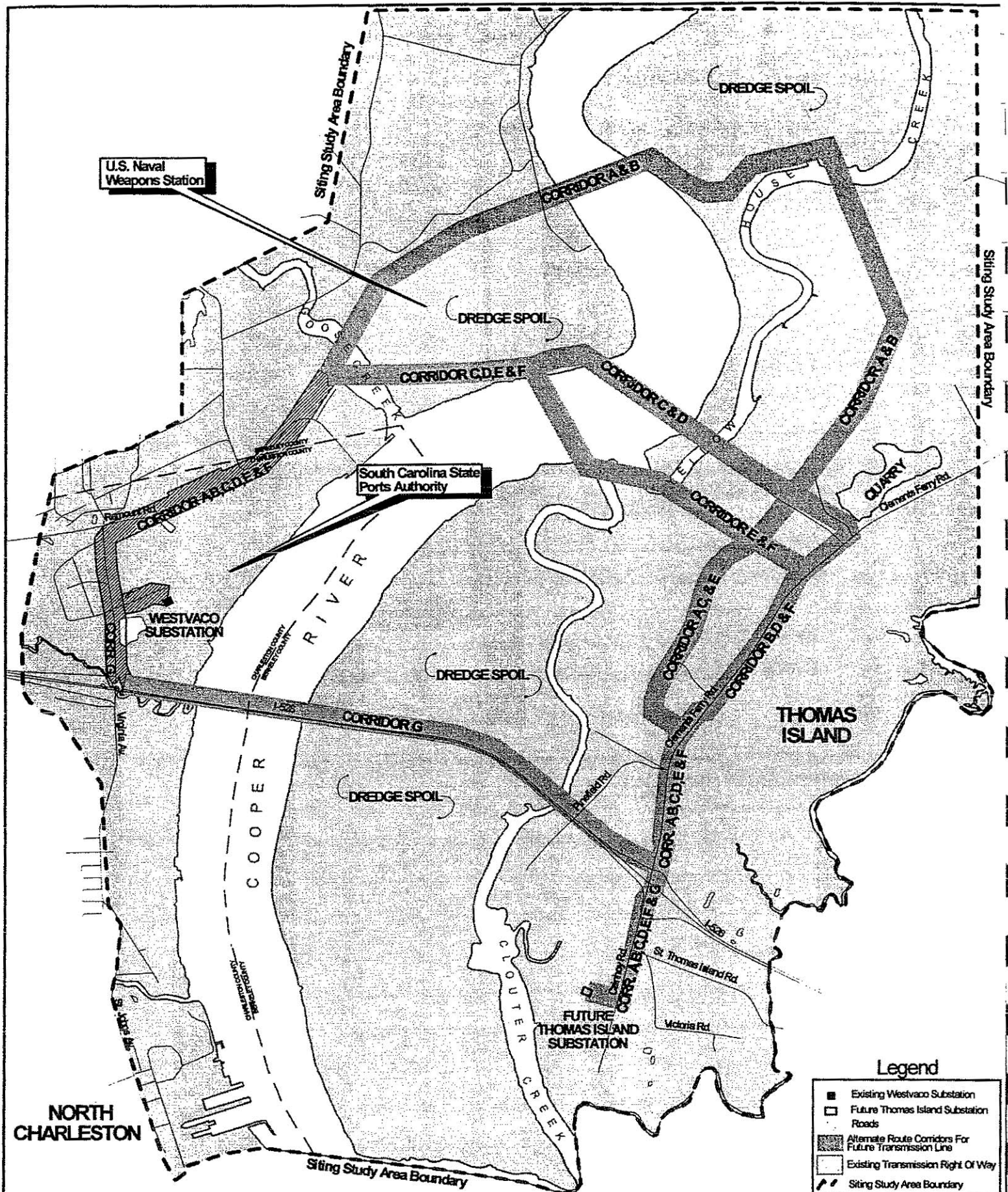
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NORTH  
CHARLESTON

Siting Study Area Boundary

Corridor Alternatives:  
Thomas Island Substation and  
Transmission Line Siting Project  
Berkeley and Charleston Counties, SC

3000 0 3000 Feet

**SCE&G**  
A SCANA COMPANY

Prepared By:  
**Duke Engineering  
& Services**  
A Duke Energy Company

**South Carolina Electric & Gas**  
**Westvaco to Thomas Island 100kV Transmission Line**  
**Questionnaire Summary**

**I. Routing Information**

**Category A: Environmental Factors**

- 1.65 Protection of *forests and other existing vegetation*
- 1.39 Protection of *rare, threatened or endangered species (plants or animals)*
- 1.48 Protection of *streams, creeks, rivers*
- 2.06 Protection of *wetlands*
- 1.88 Protection of *estuaries*

**Category B: Community Factors**

- 1.87 The location of *residences* in relation to possible line routes
- 3.79 The location of *schools* in relation to possible line routes
- 4.67 The location of *churches and cemeteries* in relation to possible line routes
- 4.31 The location of *hospitals* in relation to possible line routes
- 5.04 The location of *nursing homes* in relation to possible line routes
- 4.69 The location of *day care centers* in relation to possible line routes
- 3.75 The location of *recreational areas/facilities* in relation to possible line routes
- 3.26 The location of *scenic features or scenic viewpoints* in relation to possible line routes.

**Category C: Cultural and Historic Factors**

- 1.63 The location of *historic structures* in relation to possible line routes
- 2.07 The location of *historic districts* in relation to possible line routes
- 2.17 The location of *archaeological resources* in relation to possible line routes

**Category D: Visual Factors**

- 1.83 The degree to which possible line routes will be seen from *residences*
- 3.40 The degree to which possible line routes will be seen from *public roads*
- 3.61 The degree to which possible line routes will be seen from *public facilities (schools, churches, nursing homes, commercial/industrial facilities, etc.)*
- 2.60 The degree to which possible line routes will be seen from *recreation areas (waterways, beaches, marinas, piers, fishing areas, etc.)*
- 2.39 The degree to which possible line routes will be seen from *unique scenic features (marshlands, riverfront trail systems, parks, hiking trails, etc.)*

**Category E: Land Use Factors**

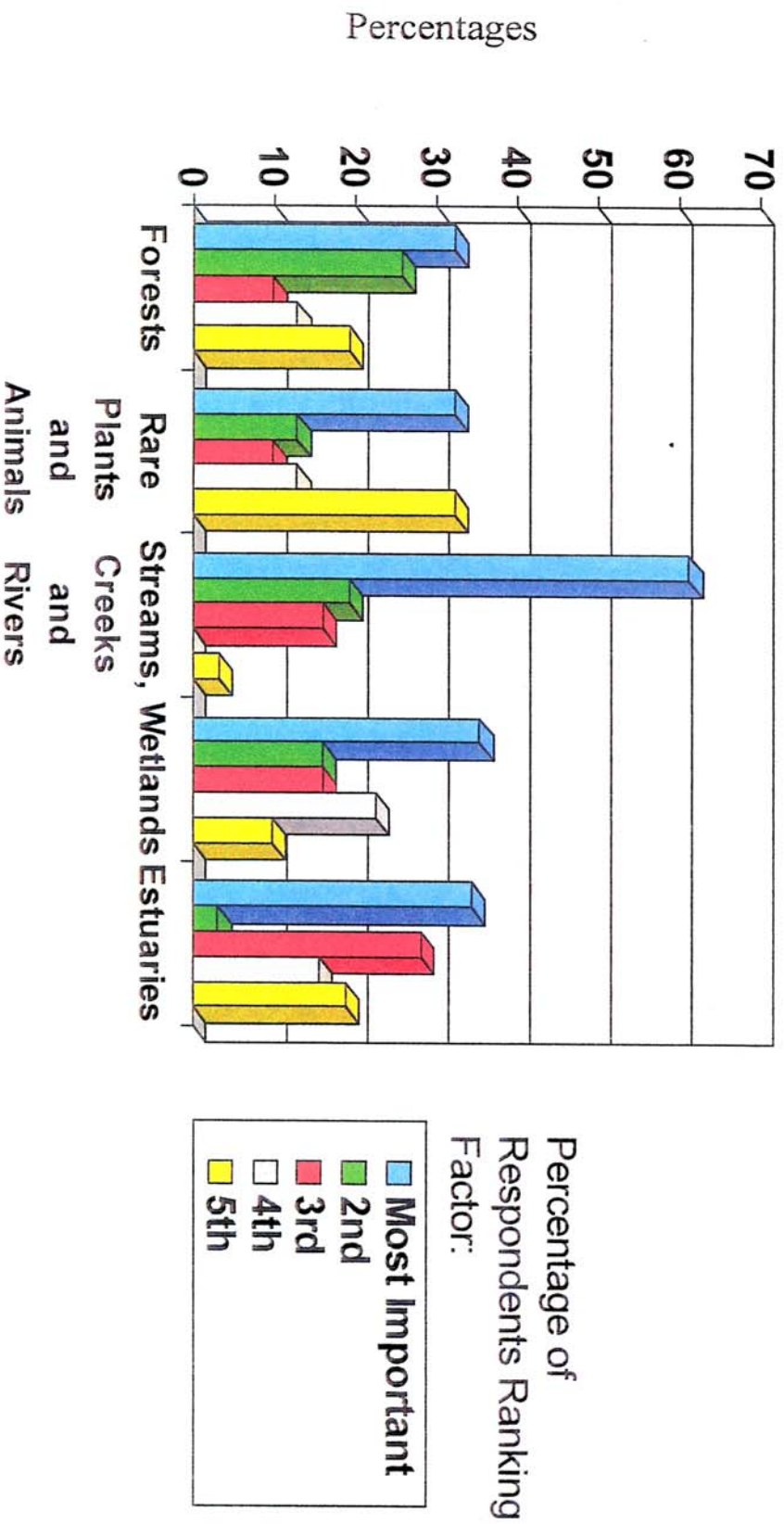
- 5.34 The effect possible line routes will have on *forests*
- 5.00 The effect possible line routes will have on *crop and pasture land*
- 5.67 The effect possible line routes will have on *commercial land use*
- 4.10 The effect possible line routes will have on *institutional land use (church, schools, libraries, etc.)*
- 6.08 The effect possible line routes will have on *industrial land use*
- 2.06 The effect possible line routes will have on *residential land use*
- 3.41 The effect possible line routes will have on *public land uses*
- 2.89 The effect possible line routes will have on *recreational land use*



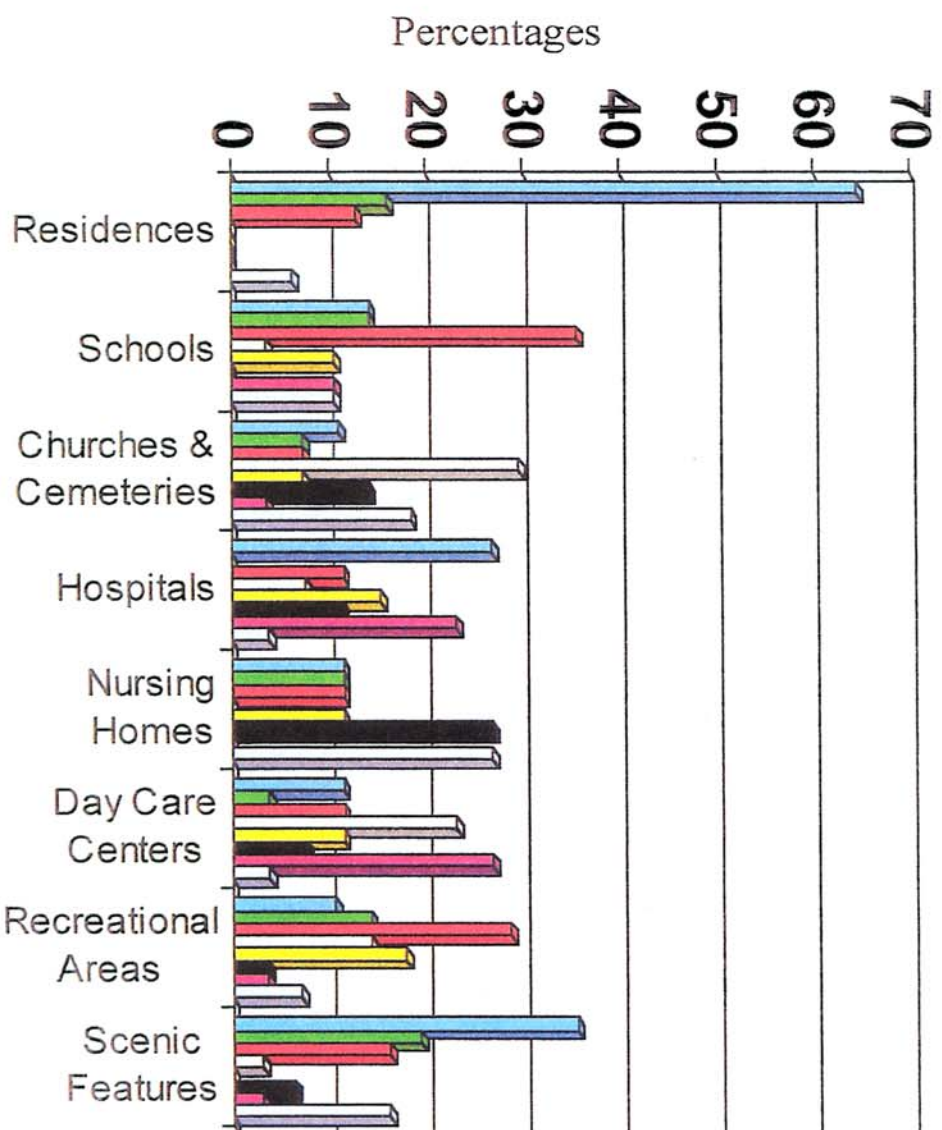
ROUTE EVALUATION

Weight	Description	ROUTE A			ROUTE B			ROUTE C			ROUTE D			ROUTE E			ROUTE F			ROUTE G			ROUTE H		
		Final Score	Proposed Score	Prop. of Maximum Score	Final Score	Proposed Score	Prop. of Maximum Score	Final Score	Proposed Score	Prop. of Maximum Score	Final Score	Proposed Score	Prop. of Maximum Score	Final Score	Proposed Score	Prop. of Maximum Score	Final Score	Proposed Score	Prop. of Maximum Score	Final Score	Proposed Score	Prop. of Maximum Score			
Visibility Factors (Residential)																									
1	Number of residences which may have very high (VH) visibility of the proposed line	24	240	500	56	560	24	240	500	56	560	24	240	500	54	540	18	180	0	0	0	0			
9	Number of residences which may have high (H) visibility of the proposed line	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
8	Number of residences which may have moderate (M) visibility of the proposed line	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	18	2	18	2	18			
6	Number of residences which may have low (L) visibility of the proposed line	1	6	12	2	12	1	6	12	2	12	1	6	12	3	18	3	18	2	12	2	12			
4	Number of residences which may have low to moderate (LM) visibility of the proposed line	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	1	4	1	4			
3	Number of residences which may have low (L) visibility of the proposed line	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	1	3	1	3			
2	Number of residences which may have very low (VL) visibility of the proposed line	1	2	4	7	14	2	4	7	14	2	4	7	14	8	16	4	8	5	10	5	10			
Normalized Total (On a 0 to 10 Scale)		248	4.13	10.00	801	10.00	348	4.13	10.00	865	10.00	256	4.18	689	9.80	228	3.81	422	5.83	3.81	5.83	5.83			
Adjusted Total (By Category Weight)																									
Water Quality Factors																									
1	Area of right-of-way requiring clearing to install substation (200' of any water feature (stream, river, lake, or pond))	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
7	Area of wetland-type P1B2, P1B3, P1B4, P1B5, P1B6, P1B7, P1B8, P1B9, P1C1, P1C2, P1C3, P1C4, P1C5, P1C6, P1C7, P1C8, P1C9, P1D1, P1D2, P1D3, P1D4, P1D5, P1D6, P1D7, P1D8, P1D9, P1E1, P1E2, P1E3, P1E4, P1E5, P1E6, P1E7, P1E8, P1E9, P1F1, P1F2, P1F3, P1F4, P1F5, P1F6, P1F7, P1F8, P1F9, P1G1, P1G2, P1G3, P1G4, P1G5, P1G6, P1G7, P1G8, P1G9, P1H1, P1H2, P1H3, P1H4, P1H5, P1H6, P1H7, P1H8, P1H9, P1I1, P1I2, P1I3, P1I4, P1I5, P1I6, P1I7, P1I8, P1I9, P1J1, P1J2, P1J3, P1J4, P1J5, P1J6, P1J7, P1J8, P1J9, P1K1, P1K2, P1K3, P1K4, P1K5, P1K6, P1K7, P1K8, P1K9, P1L1, P1L2, P1L3, P1L4, P1L5, P1L6, P1L7, P1L8, P1L9, P1M1, P1M2, P1M3, P1M4, P1M5, P1M6, P1M7, P1M8, P1M9, P1N1, P1N2, P1N3, P1N4, P1N5, P1N6, P1N7, P1N8, P1N9, P1O1, P1O2, P1O3, P1O4, P1O5, P1O6, P1O7, P1O8, P1O9, P1P1, P1P2, P1P3, P1P4, P1P5, P1P6, P1P7, P1P8, P1P9, P1Q1, P1Q2, P1Q3, P1Q4, P1Q5, P1Q6, P1Q7, P1Q8, P1Q9, P1R1, P1R2, P1R3, P1R4, P1R5, P1R6, P1R7, P1R8, P1R9, P1S1, P1S2, P1S3, P1S4, P1S5, P1S6, P1S7, P1S8, P1S9, P1T1, P1T2, 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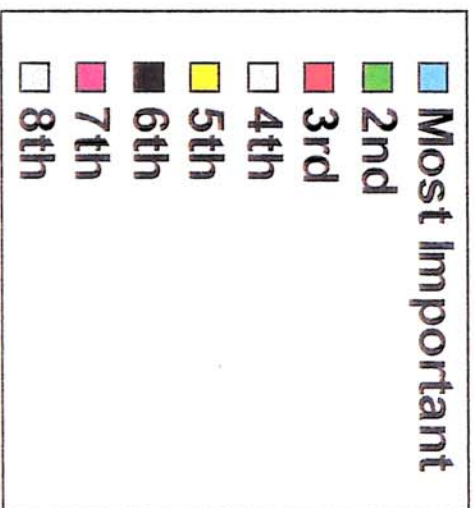
# Relative Importance of Environmental Factors to Questionnaire Respondents



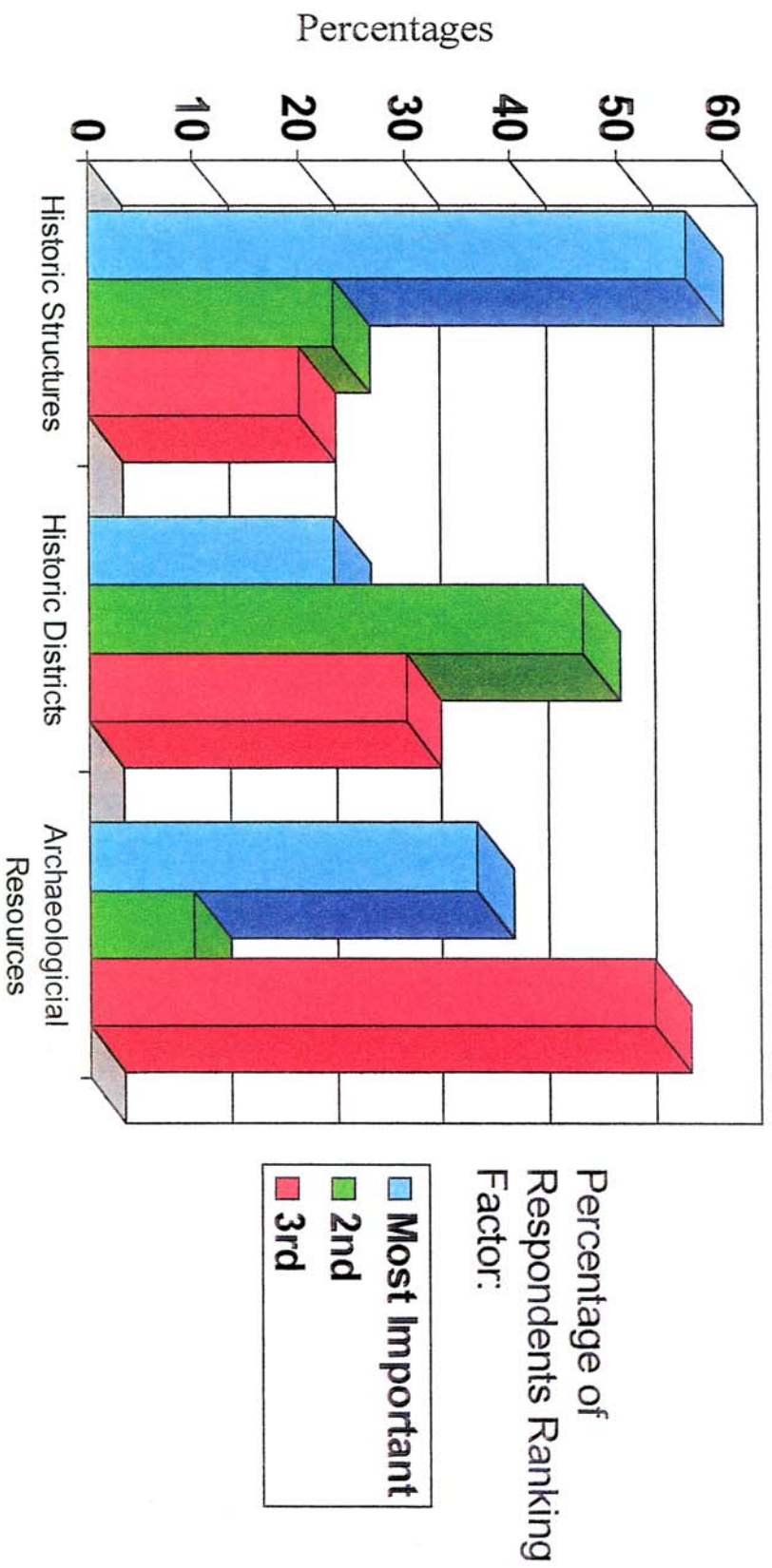
# Relative Importance of Community Factors to Questionnaire Respondents



Percentage of  
Respondents Ranking  
Factor:

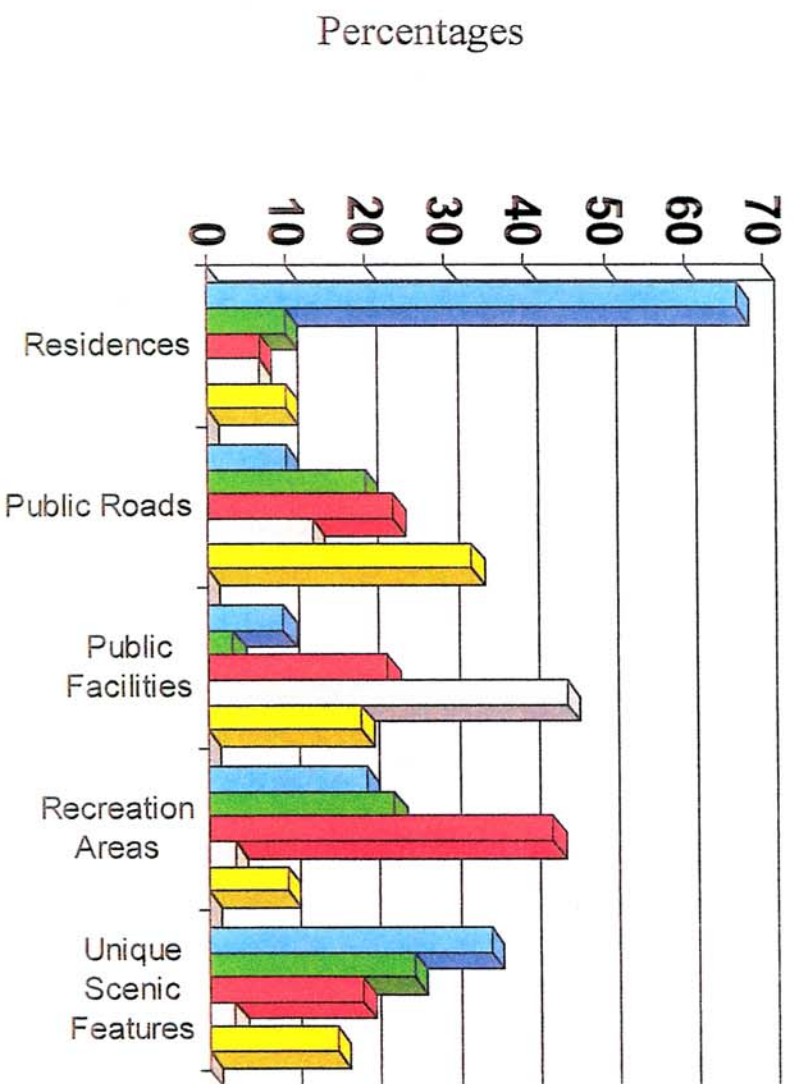


# Relative Importance of Cultural and Historic Factors to Questionnaire Respondents

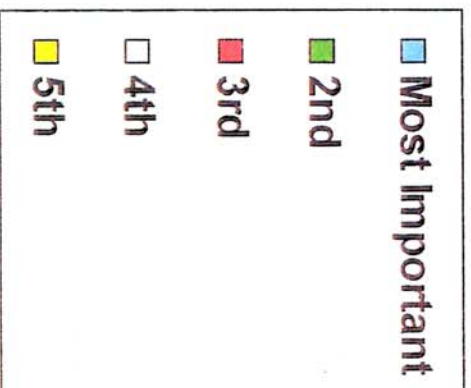




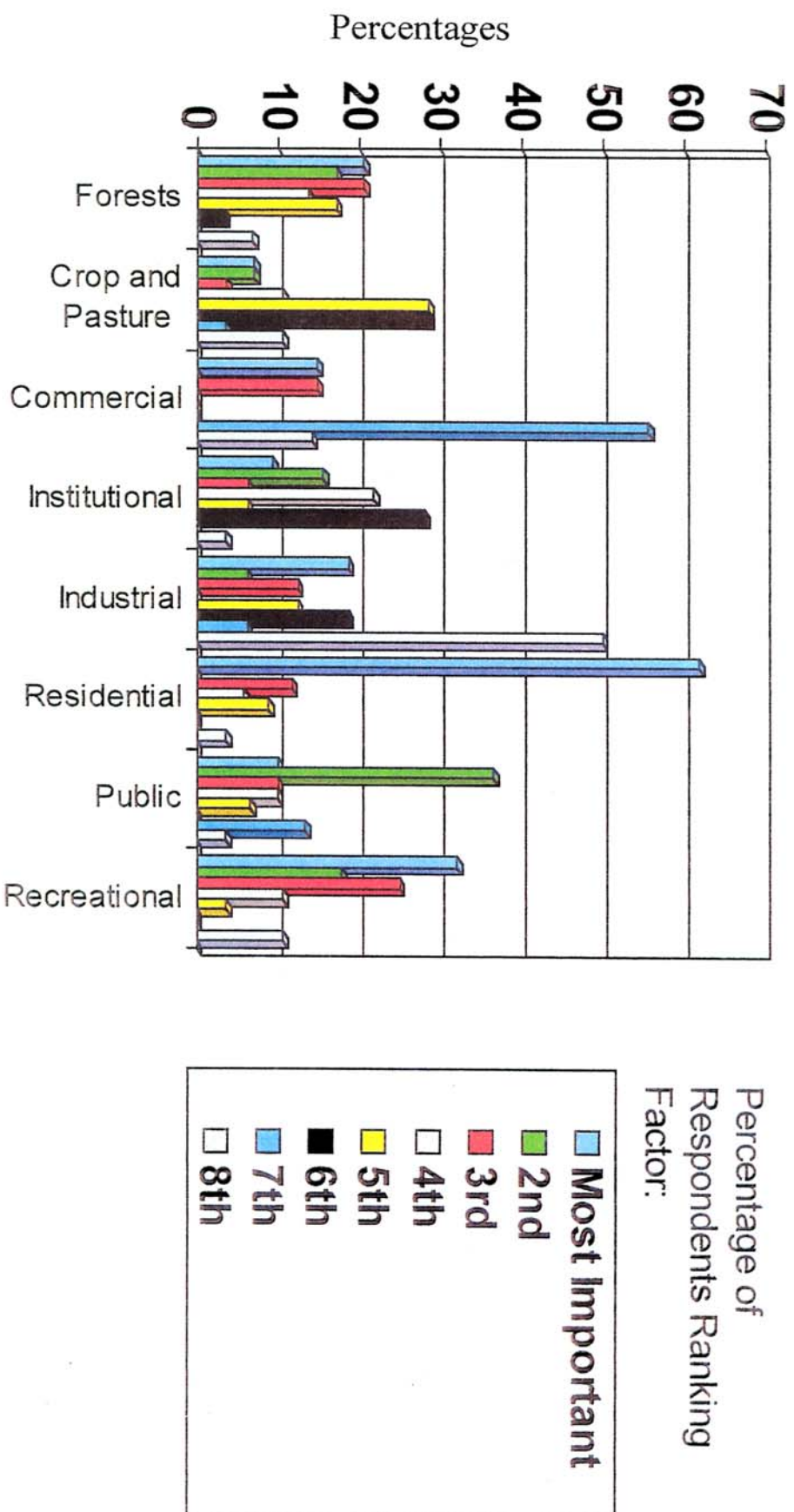
# Relative Importance of Visual Factors to Questionnaire Respondents



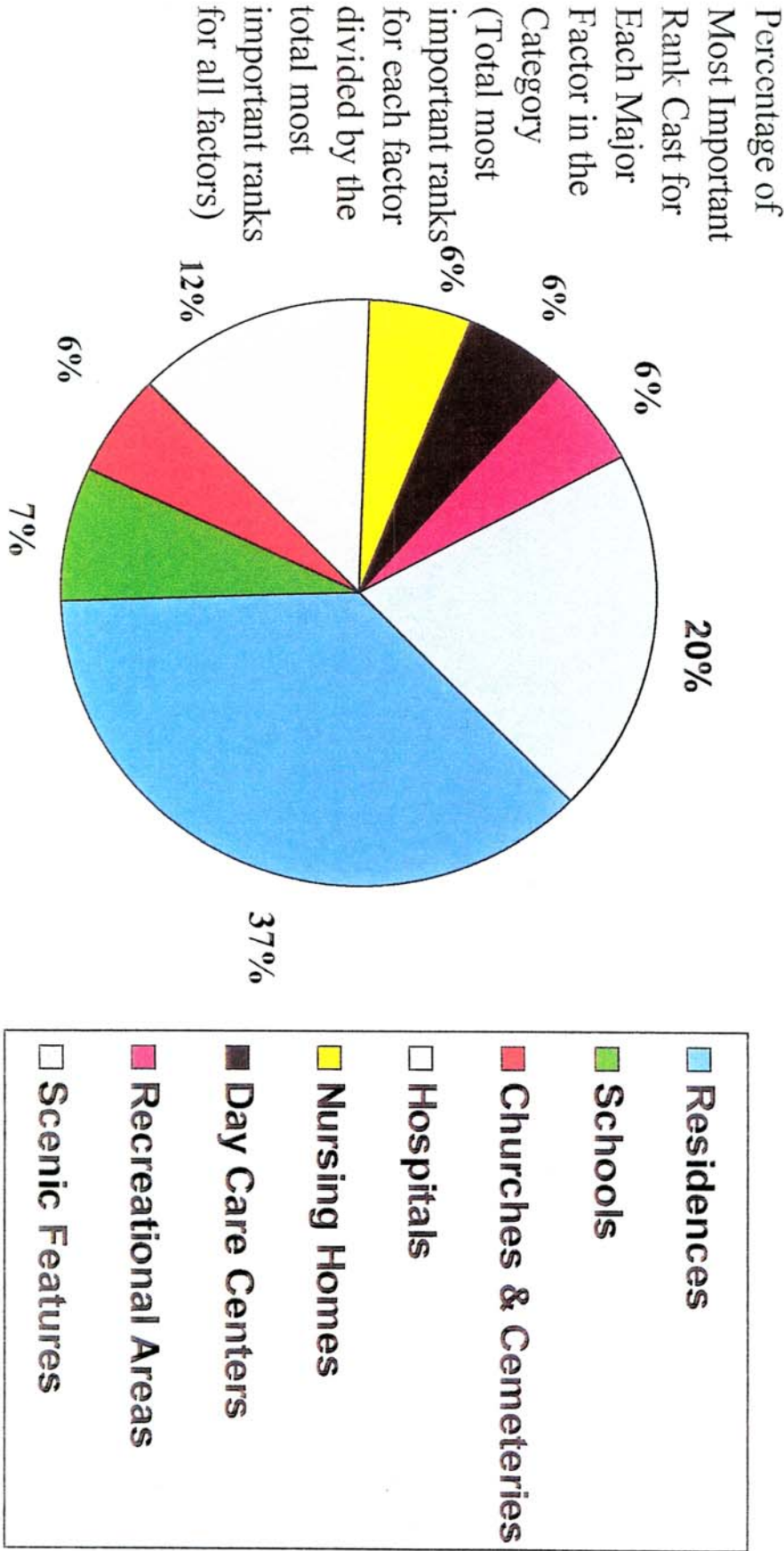
Percentage of  
Respondents Ranking  
Factor:



# Relative Importance of Effects on Land Use to Questionnaire Respondents

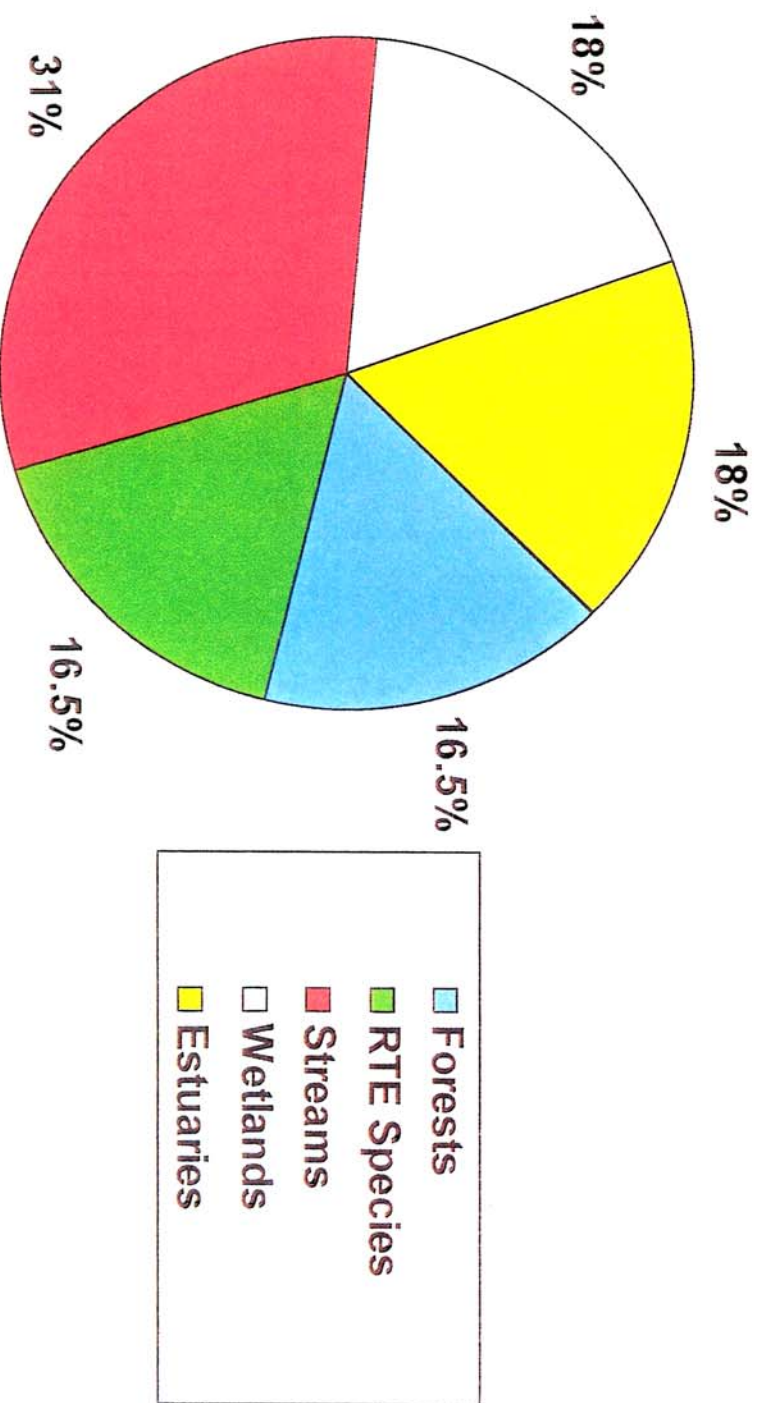


# Relative Importance of Community Factors to Questionnaire Respondents



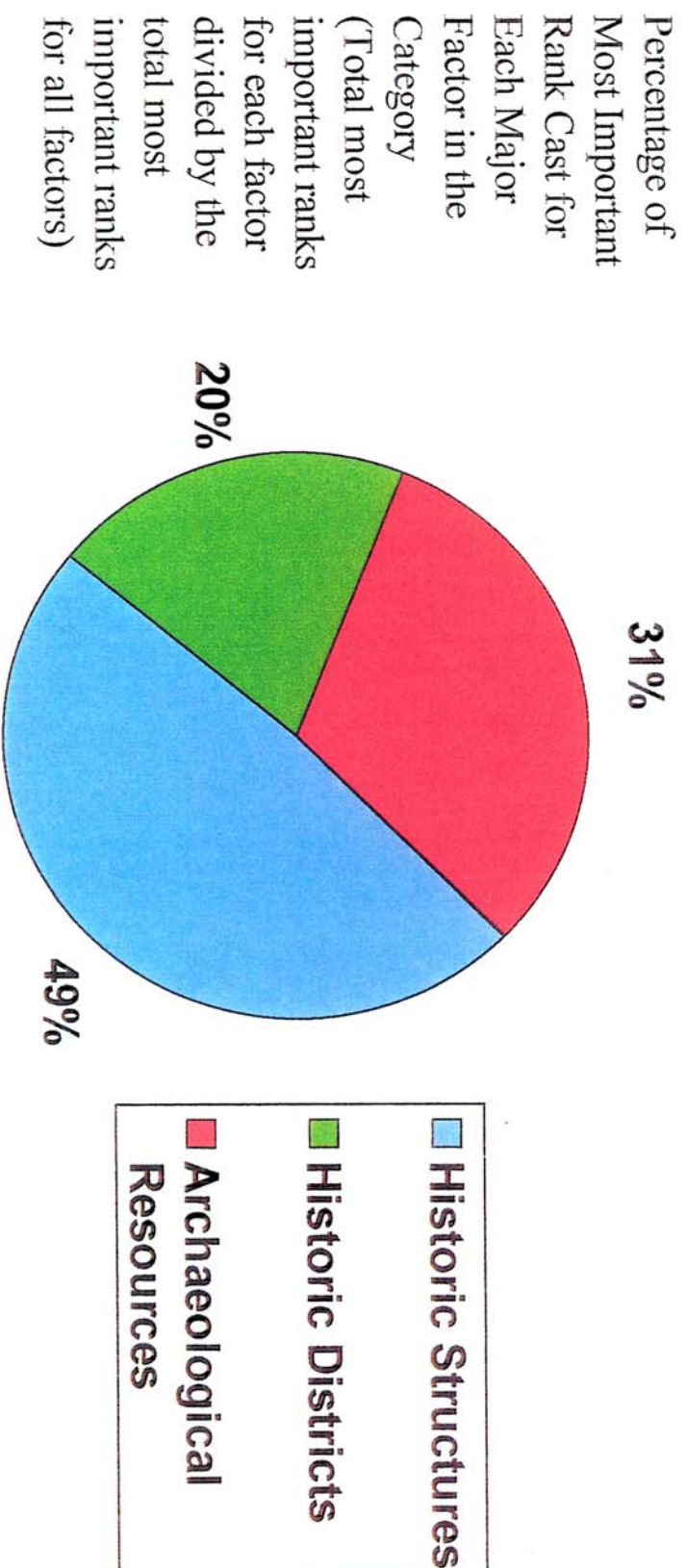
## Relative Importance of Environmental Factors to Questionnaire Respondents

Percentage of  
Most Important  
Rank Cast for  
Each Major  
Factor in the  
Category  
(Total most  
important ranks  
for each factor  
divided by the  
total most  
important ranks  
for all factors)

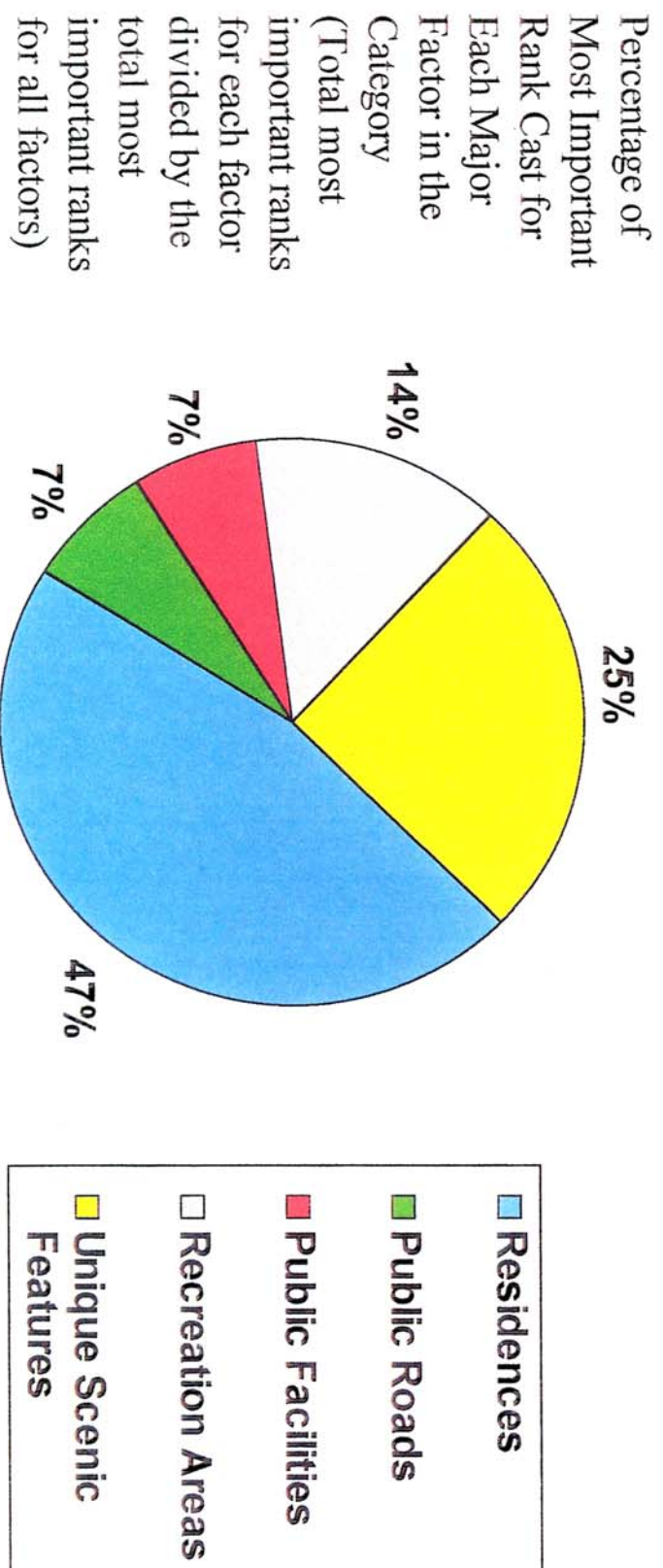




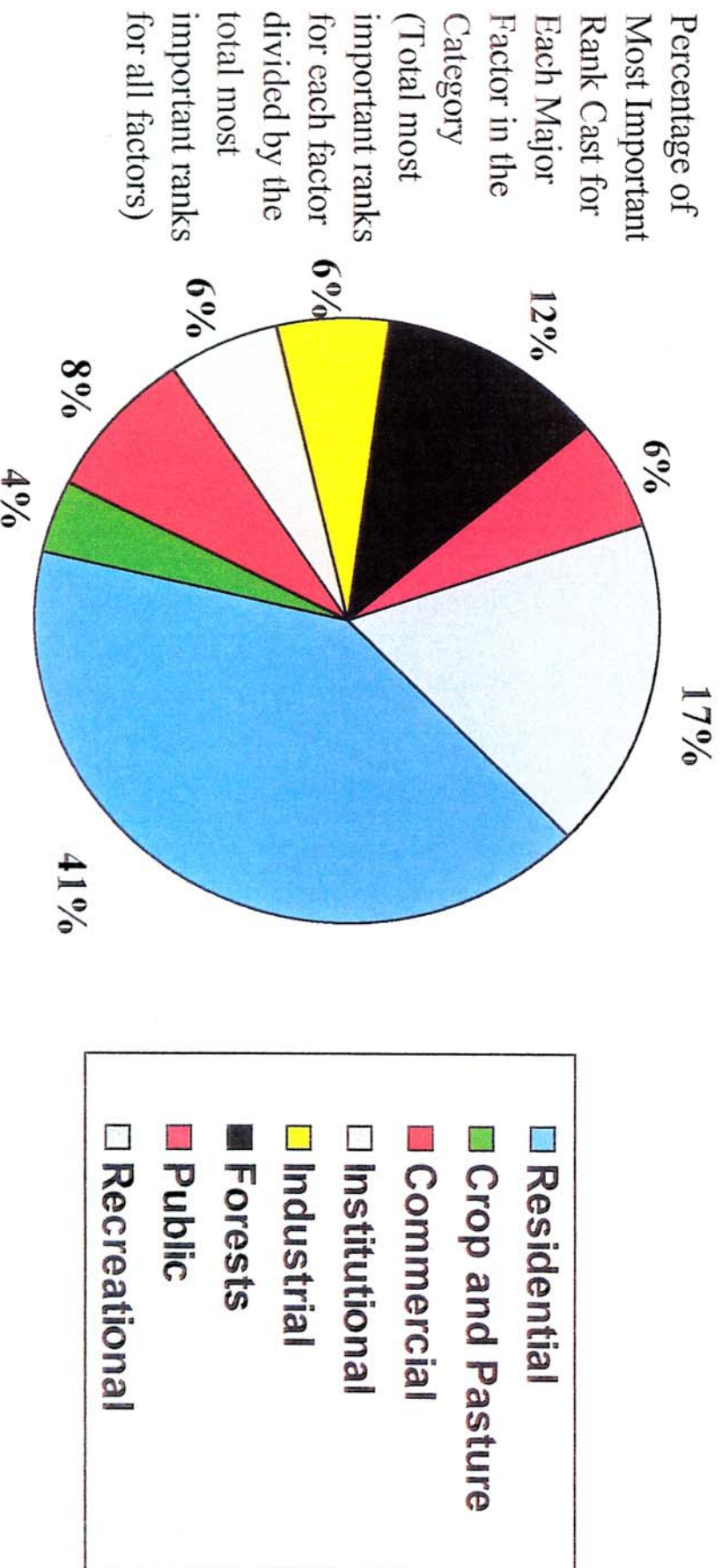
## Relative Importance of Cultural and Historic Factors to Questionnaire Respondents



## Relative Importance of Visual Factors to Questionnaire Respondents



## Relative Importance of Effects on Land Use to Questionnaire Respondents



The following is a compendium of responses to questions 2 through 6, demographic information and general comments. Each comment is referenced to specific questionnaires by a number in parenthesis. Two pages immediately following the compendium list those who completed questionnaires and provides the questionnaire number. Following these two pages is the complete list of residents who were invited to the September 21, 2000 workshop. Copies of completed questionnaires can be provided upon request.



**I. Routing Information**

**2. Please summarize what you consider to be the most important or outstanding qualities or resources of the study area.**

- Bury your lines and keep them out of sight. (1)
- No homes, no businesses, pristine land that should stay that way. (6)
- That the substation not be seen from waterways or public roads. (10)
- Wetlands and people. (11, 19, 24, 33)
- The undeveloped aspect of the area. There isn't very much of this left. (12)
- Habitat for wildlife and undeveloped wooded areas in general. We are making more people – we aren't making more land. (13)
- Navigable creeks, rivers, and marsh. (14)
- There are quite a few homes located on the water in this area. The least obtrusive route should be used to protect quality of life. (15)
- The site must not be an eye sore for future property owners and current owners. Keep it out of site from the waterways (all of them). Keep as much forest and natural growth to hide the sight of the station. (16, 24)
- Minimal impact on existing established areas. (17)
- The important river and marsh vistas should not be destroyed by unsightly power lines. (18)
- The natural beauty and natural landscape are unspoiled in land bordered by Clouter Creek, S26, and Cainhoy Road. (20)
- River views. (22)
- Quality of life for residences in the area. (23)
- The area should be considered rural and residential. (26)
- The many water resources, including estuaries, salt and freshwater wetlands. (34)

**3. Do you know of any building, family cemetery, or landmark in the study area which may be architecturally or historically important? If so, please give the location and the owner's name and address or visit the Route Selection Workstation and point out the location on maps provided.**

- Yes, there is a church and cemetery at the corner of Hwy 33 and I-526. (10)
- There is a family cemetery located on Yellow House Place. (15)
- St. James Church. (19, 33)
- The old Clements Ferry Landing on Beresford Creek. (34)

**4. Are you aware of any feature (waterfall, cove, rolling meadow, etc.) or place in the study area with unique or special scenic quality?**

- All rivers and waterways. (1)
- All of it. (6)
- All of the marsh front along creeks and rivers. (11)
- Areas unspoiled by industrial use (especially our rivers and wetlands) should not be compromised. (15)
- The unnamed creek that runs off of Clouter Creek; this is to be named after Elizabeth Rivers who owned the property and is to be developed with homes. (16)

- The entire Cooper River, Clouter Creek and Yellow House Creek view shed. The Hwy 33 corridor. (18)
- The end of Linefield Road toward the tributary of Clouter Creek – Pinefield Subdivision – has a unique view to the Cooper River bridges and unspoiled estuary. (20)
- Rivers and marsh views. (22)
- All of the wetlands, etc. that have not been spoiled by present industrial sites should be protected. (23)
- I think the forest and marshland are very unique because they are so unspoiled. (25)
- The Wando River should be protected as much as possible and not be visually obstructed. (33)

**5.0 Are you aware of any location in the study area that is frequently used for recreation?**

- Clouter and Yellow House Creeks. (12, 17)
- Yellow House and Clouter Creeks and portions of the Cooper River. (13)
- Clouter Creek and present road clearance should be maintained for sailing vessels. (14)
- The unnamed creek that runs off of Clouter Creek; this is to be named after Elizabeth Rivers who owned the property and is to be developed with homes. This creek is a big fishing creek for many people. (16)
- All navigable waterways in the Cooper River, Clouter Creek, and Yellow House Creek areas. (18)
- Beresford, Clouter Creek, and other creeks. (19, 34)
- I live in the area and have a dock and boat on the creek across the proposed substation site. (20)
- Wando River. (33)

**6. Environmental scientists, engineers, real estate experts, and landscape architects will be considering an array of factors when identifying possible routes and selecting the preferred one. Do you have any suggestions or comments for them to consider during this evaluation process?**

- Leave it alone. (6)
- Yes, safety of humans living in the area and value of land. (8)
- Clouter Creek and present road clearance should be maintained for sailing vessels. (14)
- Corridor 'G' seems to be the route that is not direct and will run along the bridge structure already in place. It would seem to have the least impact on environmental and real estate issues. (15)
- Keep it out of site – especially the station. (16)
- Parallel I-526. (17)
- Please keep it as concealed as possible. Can it be underground? (18, 26)
- Unobtrusive as possible. (19)
- Are the lines going to be above or underground? Will there be noise or harmful emissions from the facility? (20)
- We support Corridor G – seems to be the most direct and least offensive route. (23)
- I hope that they would consider not bringing through Corridor G because of the marshlands. (25)
- I prefer Corridor G. (33)

## **II. Demographic Information**

Live within the study area	10
Work within the study area	8
Live outside the study area	10
Own property in study area	20
Live in Berkeley County	13
Live in Charleston County	16

### **1. Other**

- Please use Corridor G I-526 (4)
- Own a home near the area. (6)
- I want to sell off approximately \$180,000 near Victoria Road. (7)
- Will be living on Beresford Creek off Clouter Creek (Felman Ct. off Victoria Rd). (14)
- Will be building a home off of Pinefield Plantation Road. (16)
- Manage and develop property within the study area. (18)
- Live on Daniel Island adjacent to study area. (19)
- Work closely with members/cities/residents of the study area. (33)

### **3. If you have additional comments, please use the space below or attach comments on a separate sheet to this survey.**

- Bury all new power lines. (1)
- If there is an interest in the property that I own, please write back. I am 18 years old and I have a sister 16. We have not had any support from our father from birth. The reason for the price of this land is because I want to buy my mother a house, put money up for my sister/my college. Please consider this and write back with an offer. (7)
- Suggest Corridor 'G' as having the least negative affects if Clouter Creek navigability is not impeded. 'G' should be most cost effective if bridge can b used for support. Thanks for asking! More than the SPA has done! (14)
- The plan is okay as long as the site is not visibly seen from the water. (16)
- I own 30 acres on Hwy 33 next to Cainhoy Park. I work for John Rivers who developed Cainhoy Park and still have sites available in the Park. (18)
- Cape Romain is a marine construction company with an equipment yard on Clouter Creek. We have large cranes on barges. We request and require any overhead lines over navigable waters be at least +75 MHW (the same as I-526 over Clouter Creek). (31)
- Where will the wires go after the substation is located on Thomas Island? (34)

South Carolina Electric & Gas  
Westvaco to Thomas Island 100kV Transmission Line

Cross Reference  
Questionnaire to Resident

- |                             |                                   |
|-----------------------------|-----------------------------------|
| 1. Anonymous                | 27. Patten, John                  |
| 2. Krauss, Howard           | 28. Green, Annie E.               |
| 3. Anonymous                | 29. Green Jr., Freddie            |
| 4. Limbaker, Sam            | 30. Green, Ida D.                 |
| 5. Anonymous                | 31. Cape Romain Contractors, Inc. |
| 6. Anonymous                | 32. Wise, Barbara                 |
| 7. Shaw Jr., Leon           | 33. Cohen, Juliet (Conservation)  |
| 8. Shaw, Jerome             | 34. Thornhill, Van N.             |
| 9. Anonymous                |                                   |
| 10. Anonymous               |                                   |
| 11. Anonymous               |                                   |
| 12. Anonymous               |                                   |
| 13. Detyens, Joseph W.      |                                   |
| 14. Joye, J. L.             |                                   |
| 15. Leopold, Lowell & Retta |                                   |
| 16. Oakes, Alex             |                                   |
| 17. Anonymous               |                                   |
| 18. Stoney Jr., Theodore D. |                                   |
| 19. Sieber, Fred & Mary     |                                   |
| 20. Bibb, Kathleen          |                                   |
| 21. Ouzts, Richard          |                                   |
| 22. Anonymous               |                                   |
| 23. Anonymous               |                                   |
| 24. Thomas III, R. Milton   |                                   |
| 25. Funnie, Rosalee         |                                   |
| 26. Stuhr, Richard          |                                   |



COLLIANS	CHRISTOPHER & DEE M		1344 TOPSAIL COURT	MT PLEASANT	SC	29494	
COMMISSIONERS OF PUBLIC WORKS OF THE CITY OF CHARLESTON	NATHANIEL A. MATHIA	PO DRAWER B	114 COLLINS HILL LN	WANDO	SC	29492-7855	
CONCO INC			103 ST RH	CHARLESTON	SC	29492	
COOPER	PATRICK H & VERA R		15 490 AVENUE	ISLE OF PALMS	SC	29491	
COTE FAMILY LIMITED PARTNERSHIP			4501 OLD PARK RD	NORTH CHARLESTON	SC	29495	
CRA FEDERAL CREDIT UNION			419 JESSEN LN	WANDO	SC	29492	
CROCHITTO	TERESA J		PO BOX 6229	CHARLESTON	SC	29492	
D A C A SC PARTNERSHIP	STEVE A & LINDA GAIL	CO LOUIS & GRACE DEMOLIFF	2933 ON-CHD PL RD	WANDO	SC	29492	
DANIEL ISLAND INVESTMENTS LLC			493 JESSEN LANE	WANDO	SC	29492	
DARLINGTON INC			53 WATERWAY ISLAND DR	ISLE OF PALMS	SC	29491	
DAVIS	SHIRLEY J		50 BROAD ST	CHARLESTON	SC	29491	
DEMNIS JR	BENJAMIN		489 JESSEN LN	WANDO	SC	29492	
DEMYENS	ALPHONZO JR & BEATRICE B		110 DEL ROME DR	WANDO	SC	29492	
DEMYENS	WILLIAM J		2932 CLEMENTS FERRY RD	WANDO	SC	29492-7747	
DEMYENS			60 LEE ST	CHARLESTON	SC	29493-5028	
DEMYENS			102 REBELLION FARMS PL	WANDO	SC	29492-7600	
DEMYENS	JOSEPH W		194 REBELLION FARMS PL	WANDO	SC	29492-7890	
DIDGINS	MARIE ALSTON		544 PUGSLEY AVE	BRONX	NY	10473	
DIMAY INC	MARY LEE	CO FORREST O CALVERT	2 LORD CALVERT DRIVE	CHARLESTON	SC	29497	
DOCTOR (ETAL)			2302 SUNNYSIDE AVE	CHARLESTON	SC	29495	
DOLPHIN PROPERTIES OF CHARLESTON LLC	LEROY		414 JESSEN LN	WANDO	SC	29492	
DORATON	ROBERT		1934 KIRKLESS ABBEY DR	CHARLESTON	SC	29497	
DUBOSE	ALEX		59 GEORGE CT	CHARLESTON	SC	29497	
DUDLEY	NANCY G	AKA ANNE C DUDLEY	174 KETFIELD RD	WANDO	SC	29491	
ELLIS	WILLIAM D		PO BOX 705	MT PLEASANT	SC	29491	
ELUSSER	ROSALIE B		2496 CLEMENTS FERRY RD	WANDO	SC	29492-7735	
EQUILON ENTERPRISE, LLC	ROSALIE B		59 W BIG SPRING AVE	HOUSTON	TX	77002-4453	
EVAN	MARTHA		PO BOX 4453	NEW YORK	NY	11438	
FARFAY	ROSALIE B		57-28 5TH AVE APT 4M	NEW YORK	NY	11438	
FIELDS	ROSALIE B		144-06 118TH AVENUE	NEW YORK	NY	11438	
FORDHAM	IRINE		1139 WALLINGTON AVE	NEW YORK	NY	11438	
FORDHAM (HIERO)	JERRY	CO MARY F MITCHELL	2321 CLEMENTS FERRY RD	WANDO	SC	29492	
FOREST (ETAL)	CELESTINE D		1728 WILSON AVE	WANDO	SC	29492	
FOY	JULIUS		1408 WOODVIEW LN	CHARLESTON	SC	29497-7592	
FOY	NATHANIEL & RUTH LEE		1973 SAINT THOMAS ISLAND DR	WANDO	SC	29492-7593	
FLUNIE	ROSALIE		3843 TOWER DR	MT PLEASANT	SC	29491-3116	
G & P TRUCKING INC	ROSALIE		53 RADCLIFFE ST	CHARLESTON	SC	29491	
GASKINS (ETAL)	ROSALIE		128 ACCESS RD	BRONX	NY	10472	
GEORGE A RHEMAN CO INC	HAROLD	60 MR W DON WELCH, EXEC DIR	1946 WATSON AVE 2ND FLOOR	HARLEVILLE	NY	10472	
GIBBS	CURTIS L		PO BOX 278	WANDO	SC	29492	
GIBBS	EDWARD		1094 SAINT THOMAS ISLAND DR	WANDO	SC	29492-7650	
GIBBS	ESTELLE M		528 ALBERTA LN	WANDO	SC	29492	
GIBBS	REBECCA S		106 FIDLER CROS LN	WANDO	SC	29492	
GIBBS FAMILY PARTNERSHIP	DAVID	CO HENRY RIVERS JR	1094 SAINT THOMAS ISLAND DR	WANDO	SC	29492-7650	
GIBSON	LINDA ANN		172 BELMONT LN	WANDO	SC	29492	
GIBSON (ETAL)	LINDA ANN		133 HORSE TRAIL ROAD	WANDO	SC	29492	
GLENN	JESTINE		171 HORSE TRAIL ROAD	WANDO	SC	29492	
GLENN	LEROY		875 YORK ST	WANDO	SC	29492	
GLENN JR	FREDIE		1117 CARVERWOOD LN	WANDO	SC	29492	
GLOVER	ROBERT BRIAN		1819 HIGHWAY 52	WANDO	SC	29492	
GOODS	MILDRD O		PO BOX 2804	WANDO	SC	29492	
GRAYHAM	LENTON P & KAY H BROWN		443 THORNGATE SHORES DR	WANDO	SC	29492	
GREEN	JESSIE		211 WHITEVILLE RD	WANDO	SC	29492	
GREEN	JAARON		121 ANDREWS LN	WANDO	SC	29492	
GREEN	ANNETTE		1008 SAINT JOHN'S CHURCH RD	WANDO	SC	29492	
GREEN	ANNIE E	JEANETTE GREEN	1771 HWY 17 NORTH	WANDO	SC	29492-7756	
GREEN	CALVIN		1771 HIGHWAY 17 N	WANDO	SC	29492	
GREEN	ELEANOR F		1008 SAINT JOHN'S CHURCH RD	WANDO	SC	29492-7756	
GREEN	EVELYN		1058 PINEFIELD RD	WANDO	SC	29492-7756	
GREEN	FLORETHA M		12106 298TH ST	WANDO	SC	29492	
GREEN	FREDIE LIDA D		1771 HIGHWAY 17 N	WANDO	SC	29492	
GREEN	HARVEY		1771 HIGHWAY 17 N	WANDO	SC	29492	
GREEN	IDA D & FLORETHA		1009 ST JOHN'S CHURCH RD	WANDO	SC	29492	
GREEN	IDA DELL		1771 HWY 17 NORTH	WANDO	SC	29492	
GREEN	JEANETTE		428 HABAKUK LN	WANDO	SC	29492	
GREEN	JEROME L		1771 HIGHWAY 17 N	WANDO	SC	29492	
GREEN	JEROME L & DOROTHY M		1771 HIGHWAY 17 N	WANDO	SC	29492	
GREEN			419 GREENMAN CT	WANDO	SC	29492	

Q13 / 643/861-0828  
jodely.en@no.co

Q13 / 643/723-0350

Rec'd by P.O. NS#

EN	JESSIE		PO BOX 1989		MOUNT PLEASANT	SC	29465		Reid by PO: Unknown Reid by PO: Vacant
EN	JAMIE & RENIA		120 ANDREW LN		WANDO	SC	29462-2800		
EN	JOE M		1771 HIGHWAY 17 N		MT PLEASANT	SC	29464-3348		
EN	LAURA		1008 SAINT JOHN'S CHURCH RD		WANDO	SC	29462-7768		
EN	LEON O		1771 HIGHWAY 17 N		MT PLEASANT	SC	29464-3348		
EN	ROBERT		1008 SAINT JOHN'S CHURCH RD		WANDO	SC	29462-7768		
EN (ETAL)	FLORENCE		1008 SAINT JOHN'S CHURCH RD		WANDO	SC	29462-7768		
EN JR	FREDRICK		1771 HIGHWAY 17 N		MT PLEASANT	SC	29464-3348		
EN JR	FREDDIE		1240 CLEMENTS FERRY RD		WANDO	SC	29462-7768		
EN SR	ERNEST		1008 SAINT JOHN'S CHURCH RD		WANDO	SC	29462-7768	Q-28	
ENE	ANTHONY MARVIN & MELVENIA		PO BOX 1447		MT PLEASANT	SC	29465		
ENWEAERS DEVELOPMENT INC			1468 WOODVIEW LN		CHARLESTON	SC	29412-3801		
ENWOOD DEVELOPMENT CORPORATION (ETAL)			PO BOX 1017		GREENWOOD	SC	29946		
LTD OF DANIEL ISLAND LLC			1036 JOHNNIE DODDS BLVD		MT PLEASANT	SC	29464		
L PARTNERSHIP	GENEVA S		P O BOX 1201		MT PLEASANT	SC	29465		
DY (ETAL)	RICHARD DANIEL		1841 HIGHWAY 41		MT PLEASANT	SC	29464-4904		
EDEBY PROPERTIES INC			PO BOX 150183		FL.		32221		
EL	KELVIN & JOCELYN		1208 MATTHEW FERRY ROAD		MT PLEASANT	SC	29464		
S OIL & CHEMICAL CORP			1314 N SHERRWOOD DR		CHARLESTON	SC	29407-4310		
WARD	MARTHA		#1 HESS PLAZA		WOODBRIDGE	NJ	7005		
WARD	LUCILLE		418 HAWKOLU LN		WANDO	SC	29462-7003		
(HEIRS)	MINGO	C/O JOSEPH SHAW	408 YELLOW HOUSE PL		WANDO	SC	29462		
H POINT ASSOCIATES II LTD PARTNERSHIP			2952 CLEMENTS FERRY RD		CHARLESTON	SC	29412-3801		
JPOLLIS	BARBARA C		1 CORORO STREET		CHARLESTON	SC	29401		
I, III	HOWARD W A & JOY D		202 BANK ST.		MT PLEASANT	SC	29464-4732		
Y ROCK TEMPLE OF GOD CHURCH			997 SCOTLAND FERRY ROAD		WANDO	SC	29464-3812		
KINGS	ROSINA		125 W 168TH ST APT 1-G		MT PLEASANT	SC	29462		
WARD SR	EDWARD M		PO BOX 1202		WANDO	SC	29462		
MELL	ALLEN P		PO BOX 45		BROOK	NY	10452		
ENGROSS INC			432 JESSEN LANE		MT PLEASANT	SC	29465-1202		
ERNATIONAL CENTER I LLC			PO BOX 242		MT PLEASANT	SC	29465		
M	MARATHA H	C/O FORD DEV ATTN R ROBERTSON	PO BOX 425		CHARLESTON	SC	29462		
KINS	EARL		1475 PRESTON RD - SUITE 130		DALLAS	TX	75240		
KINS	EMMA		PO BOX 425		RIDGFIELD	OH	44298-425		
KINS	ROBERT & CHARLOTTE		320 CONROY ST		CHARLESTON	SC	29403-3815		
KINS	GLORIA	ROSEMARY J VARELA	1448 N SHERRWOOD DR		CHAS	SC	29407-4821		
KINS	VANESSA		PO BOX 12		MT PLEASANT	SC	29465-2012		
KING (ETAL)	WILLIAM		1206 E WESTCHESTER DR		CHARLESTON	SC	29414		
KING (HEIRS)	ROBERT	C/O ALBERTA JEKINS	433 BRANDAM LN		WANDO	SC	29462-7008		
KING JR	JAMES		PO BOX 12		MT PLEASANT	SC	29462		
KING JR	HENRY ROBERT		127 JOSIE LN		WANDO	SC	29462-7008		
KINSON	EDWARD M		431 BRADHAM LN		WANDO	SC	29462		
KINSON	ISAAC		499 JESSEN LANE		WANDO	SC	29462-7811		
/E	JOHN L & JOAN S		115 AIR PARK DR		WANDO	SC	29462-7740		
NER	ERNESTINE W		4514 JOYNER LANE		WANDER ROBINS	GA	31082-2710	Q-14 / (B)2982-0913	
T ENTERPRISES A GENERAL PARTNERSHIP	HANEFRAHD		6346 HALFWAY CREEK RD		WANDO	SC	29462	pmlpy@pbisouthline	
T ENTERPRISES			1287 CLEMENS FERRY RD		HULDER	SC	29463-9133		
LEY & POSTON LLC			352 B OSCAR JOHNSON DR		N CHARLESTON	SC	29405		
G	HARRIETT B		PO BOX 439		LANE CITY	SC	29660		
LAW	FRANK		7632 LITTLE BRITTON RD		YOUNGS ISLAND	SC	29443-9210		
LOCK (HEIRS)	JOSEPH		2583 CLEMENT FERRY RD		WANDO	SC	29462-9801		
MON JOHNSTON PETER O AND	NAT		1225 WESTVADO DR		GOOSE CREEK	SC	29445		
AUD, SR	KENNETH	C/O FRANK KINLOCK	2583 CLEMENTS FERRY RD		WANDO	SC	29462-7746		
SPOLD	LOWELL E & LORETTA	C/O ELIZABETH GRIMES	MORGN GUAR TR CO OF NY		WANDO	SC	29462-7746		
BAKER	SAUEL G		121 CALAIS POINTE		345 PARK AVENUE N.Y.	NY	10164-1002		
COLN (ETAL)			509 YELLOW HOUSE PL		WANDO	SC	29462	Q-15 / (B)3084-0330	
COLN (ETAL)	LOUISE		1144 MEADOW CROFT		WANDO	SC	29462	Q-4	
COLN JR	LOUISE		1380 LACK FRANKS RD		MT PLEASANT	SC	29462		
CRWOOD	HAROLD	C/O BEATRICE SAMPSON	1540 102ND ST APT 6H		WANDO	SC	29482-7793		
LA ENTERPRISES A SC GENERAL PARTNERSH	LORRANNE Y		1800 CLEMENS FERRY RD		JAWADA	NY	11432		
OK			2933 CANYON LN		WANDO	SC	29462		
BATHON ASHLAND PETROLEUM LLC	ERTHA LEE		415 JESSEN LN		MT PLEASANT	SC	29462		
RYAN BAPTIST CHURCH	DAVID		607 SOLS LN		WANDO	SC	29462		
W BANK JR (ETAL)	ELIAS		539 SOUTH MAIN STREET		WANDO	SC	29482-7847		
			2533 CLEMENS FERRY RD		FINLAY	OH	45440		
			PO BOX 54		WANDO	SC	29482-7741		
			1536 MADISON AVE. APT B-C		CHARLESTON	SC	28402		
					NEW YORK	NY	10029		

WS - Attended Workshop  
NS# - No Such Number  
FOE - Forwarding Order Expired  
IA - Insufficient Address  
NFOF - No Forwarding Order On File

	JAMES & LOUISE		1081 SAINT THOMAS ISLAND DR	WANDO	SC	29482-7654	
	KENNY		1101 ST THOMAS ISL DR	WANDO	SC	29482	
	MELVIN		1028 VICTORIA RD	WANDO	SC	29482	
	RODNEY		1101 ST THOMAS ISLAND DR	WANDO	SC	29482	
	ROSA		1584 WICKFIELD CT	WANDO	SC	29482	
	TERRY A		1024 VICTORIA RD	WANDO	SC	29482-7655	
	THOMAS		568 ABEA WAY	WANDO	SC	29482-7639	
	VERGIL		1021 VICTORIA RD	WANDO	SC	29482	
	(HEIRS)		603 ABEA WAY	WANDO	SC	29482	
	(ETAL)		2533 CLEMENTS FERRY RD	WANDO	SC	29482-7740	WS / 884-3491
	THOMAS F		518 JAMETTA LN	WANDO	SC	29482-7811	Ret'd by PO: NFOF
	CLIPD		138 COLLINS HILL LN	WANDO	SC	29482-7854	
	GEORGE		811 ELIA LN	WANDO	SC	29482-7839	
	LEON		PO Box 245	HUGER	SC	29482	
	(HEIRS)		C/O LARAYE B ALLS	WANDO	SC	29482	Q-7 / (843)335-3393
	(SR		C/O GEORGE K SHAW	CHARLESTON	SC	29419	Ret'd by PO: FOE
	(HEIRS)		C/O GEORGE K SHAW	MT PLEASANT	SC	29483	
	PARD, JR		PO BOX 1500	N CHARLESTON	SC	29405	
	RICHARD JOSEPH		5719 PARKSIDE DRIVE	CHARLESTON	SC	29408	Q-24 / W 747-1200 mlhonses@wvdc.co
ELINE PARTNERS LLC			C/O R. MILTON THOMAS III				WS / C-19 / (843)956-9715 fcsbbsm@col.co
	FRED & MARY		119 CARTRIGHT STREET	CHARLESTON	SC	29482	
	HAROLD		822 SHARK ST	MT PLEASANT	SC	29484-2839	
	LAUVAL		607 SOLS LN	WANDO	SC	29484	
	ARTHUR		710 TAYLOR ST	CHAS	SC	29407-0628	
	BETTY		2808 CLEMENTS FERRY RD	WANDO	SC	29482	
	CAN		607 SOLS LN	WANDO	SC	29482-7647	
	LEROY		1455 HARROD AVE	BROOK	NY	10472-1448	Ret'd by PO: NFOF Apt #
	RAMLIN		810 SOLS LN	WANDO	SC	29482-7347	
	LEON		2536 CLEMENTS FERRY RD	WANDO	SC	29482	
	MICHAEL & SHIRLEY		447 JONKER LN	WANDO	SC	29482-7637	
	ILLIE		885 CALHOUN AVE 7-C	BROOK	NY	10485	
	EVA BERNICE GRAHAM		1147 BROOKSIDE DRIVE	HAYMAN	SC	29408	
	FRED & ELIZA MAE		2816 CLEMENTS FERRY RD	WANDO	SC	29482-7743	
	MARVIN & VIOLET GIRLAN		2816 CLEMENTS FERRY RD	WANDO	SC	29482	
	EDWARD & EVELYN		115 M 228TH ST	CAMBRIA HGTS	NY	11411	
	LOUISE W		1146 VICTORIA RD	WANDO	SC	29482-7842	WS / 881-3220
	RUTH		833 BOWMAN RD	MT PLEASANT	SC	29484	
	WILLIAM P		P.O. BOX 423	COLUMBIA	SC	29202	
	MARY		1346 WESTER AVE APT 12B	BROOK	NY	10499-1613	
			540 EAST BAY STREET	CHARLESTON	SC	29402	
			PO BOX 778	CHARLESTON	SC	29402	
			PO BOX 22287	CHARLESTON	SC	29401	
			60 MR W DON WELCH, EXEC DIR	CHARLESTON	SC	29402-8888	FOE - Resent 081330
			ATTN: DOUGLAS S TALBOT	CHARLESTON	SC	29402	
			1101 APLECROSS RD	PINELURST	NY	29374	
			1450 SAINT THOMAS ISLAND DR	HUGER	SC	29482	
			480 MATTHEW FERRY RD	MT PLEASANT	SC	29484	
			GENERAL DELIVERY	WANDO	SC	29482-8859	
			4451 HAWY 210	NORTH SPRING LAKE	NY	29389	Ret'd by PO: NSH
			511 YELLOW HOUSE RD	WANDO	SC	29482	
			1180 MANON LN	CHARLOT	SC	29484	
			162 REBELLION PL	MT PLEASANT	SC	29484	
			1688 SAINT THOMAS ISLAND DR	WANDO	SC	29482-7648	
			30 TRAD ST	CHARLESTON	SC	29401	
NEY, JR	THEODORE D		8 JUDITH STREET	CHARLESTON	SC	29401	Q-18 / (843)725-9800, Ext. 2
HR (ETAL)	WILLIAM S		2820 ATLANTIC AVE	BULLWANS ISLAND	SC	29482-8834	
FR	FREDERICK V		547 SANDERS PARK LN	CHARLESTON	SC	29482-7844	
IC	RICHARD C		547 SANDERS PARK LN	WANDO	SC	29482	Q-28 / 881-3179
			PO BOX 020074	TUSCALOOSA	AL	35402	
			6866 BEST FRIEND ROAD	BROOK	GA	30071	
			158 W 74TH ST APT 8B	WANDO	NY	10453-7598	
			1398 S WACAMAW DR	GAZDEN CITY	SC	29378-5928	
			1476 PRESTON RD - SUITE 830	DALLAS	TX	75240	
			317 HEIDE LN	WANDO	SC	29482-7800	
			PO BOX 386	BULLWANS ISLAND	SC	29482	
			PO BOX 70	GOOSE CREEK	SC	29443	



Smith, Council Member	Kouger S.		1100 Ann Edwards Land	PO Box 745	29465-0745	Town of Mt Pleasant	SC	
poone, Vice-Chairman	Judith K.		223 N. Live Oak Drive		29461	Berkley County	SC	
ernstias, Council Member	Leon E.		O.T. Wallace County	Office Bldg. #2	29401	Charleston County	SC	
ewart, President	Loy	Dalyan Shipyard	1670 Dry Dock Ave., Bldg. 236		29405-2114	N. Charleston	SC	
otes-Harrell, Council Member	Thomassena		1100 Ann Edwards Land	PO Box 745	29465-0745	Mount Pleasant	SC	
anney	Marys R. Keith	City of North Charleston	4600 LACross Road	PO Box 180016	29418-0018	N. Charleston	SC	CONTACT
lyer, Council Member	Paul		4600 LACross Road	PO Box 180078	29418-0016	N. Charleston	SC	City of N. Charleston
ader, Council Member	Kevin		86 Broad Street	PO Box 304	29402-0304	Charleston	SC	City of Charleston
sey, Council Member	Bobby		1100 Ann Edwards Land	PO Box 745	29465-0745	Mount Pleasant	SC	Town of Mt Pleasant
ughlin, Council Member	Slove M.		223 N. Live Oak Drive		29481	Berkley County	SC	
allace, Council Member	Charles T.		O.T. Wallace County	Office Bldg. #2	29401	Charleston County	SC	
aring, Council Member	Louis		80 Broad Street	PO Box 304	29402-0304	Charleston	SC	City of Charleston
haley	Representative Michael S		PO Box 62738		29418-2738	N. Charleston	SC	Representative
hipper	Representative Jackson S.		4592 Duralin Ave		29405	Charleston	SC	Representative
illiams, Council Member	Dorothy K.		4800 LACross Road	PO Box 180016	29418-0016	N. Charleston	SC	City of N. Charleston
edham, Jr. - Administrator	Roland			Courthouse Square	29401	Charleston	SC	CONTACT
odes-Florens	Mayor Cheryl N.	Town of Mt Pleasant	100 Ann Edwards Lane	PO Box 745	29465-0745	Mount Pleasant	SC	SCSEA MADE PERSONAL

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## STUDENT ACTIVITY: Introduction to ArcGIS courseware module:

This courseware module will introduce the student to ESRI ArcGIS software which will be used in the course.

1. Student access to courseware
2. Student access to ESRI software: Student versions of ArcGIS 9.3.1, ArcGIS 10(?), or access to PSU GIS Lab(?)
3. Timeframe for completion: One week
4. Success Metric: ESRI Diploma