NATURAL RESOURCES TECHNICAL MEMORANDUM

MARK CLARK EXPRESSWAY EXTENSION
FROM U.S. 17 TO SC 30
CHARLESTON COUNTY, SOUTH CAROLINA

PREPARED FOR

SCDOT
South Carolina Department of Transportation

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
COLUMBIA, SOUTH CAROLINA

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1.0 INTRODUCTION

1.1 Project Description

The proposed Mark Clark Expressway Extension project has been in planning since the 1970s. A Final Environmental Impact Statement was signed by the Federal Highway Administration in 1972. However, the proposed project has progressed off and on for the past 30 years with the most recent phase resulting in a Draft Supplemental Environmental Impact Statement (DSEIS) in 1995. Funding was not identified for the completion of the proposed project until a half-cent sales tax was approved by Charleston County voters in 2004, supported by funding from the South Carolina Transportation Infrastructure Bank (SIB) in 2006. Currently, SCDOT and Charleston County are moving forward with the proposed project by implementing a new Environmental Impact Statement (EIS).

The proposed project would generally extend from the current terminus of Mark Clark Expressway at U.S. 17 in Charleston (West Ashley), cross the Stono River onto Johns Island, cross the Stono River again onto James Island, and end at S.C. 30 (the James Island Connector). The project as proposed is to add approximately seven miles of new roadway.

The development of project alternatives began by presenting an initial 17 preliminary build alternatives or alignments to the public for review. Four of these had been analyzed in the 1995 Draft Supplemental EIS study, and 13 were designed based on preliminary project goals. Comments received during the Fall 2008 comment period following the first public information meeting resulted in the addition of several new alignments. This brought the total to 36 new location build or existing road improvements alternatives plus a No-Build Alternative, mass transit alternative, and transportation system management alternative. These alternatives were then brought forward for analysis to determine which met the need and purpose established for the proposed project. The result of the preliminary alternatives analysis was seven reasonable new location Build Alternatives (Alternatives A through G) plus the No-Build Alternative, the Mass Transit Alternative, and the Transportation System Management Alternative, which were selected based on public response and technical analysis, such as traffic performance, safety and environmental criteria. These ten alternatives went forward to be evaluated in the DEIS for impacts and potential benefits.

Alternatives A through F would continue Mark Clark Expressway as a four-lane divided interstate with controlled access from U.S. 17 to the James Island Connector (SC 30), bridging the Stono River two times. An additional new location alternative was added later in project development by looking at other reasonable routes for the parkway concept of Alternative F but addressing public concerns regarding the location of Alternative F, resulting in Alternative G. Alternatives F and G would be a parkway from U.S. 17 to SC 30, bridging the Stono River two times and containing reduced speeds, limited access, and a multi-use path.

The No-Build Alternative consists of the anticipated roadway network and forecast land use in 2035 without the completion of the build alternative. The Mass Transit Alternative would improve existing transit services and/or add rail transit service. The Transportation System
Management Alternative would make improvements within existing right of way with minimum capital expenditure. This would involve such items as adding turn lanes, signalization, signing, speed restrictions, or access control.

STV/Ralph Whitehead Associates (STV/RWA) has been contracted to provide an environmental review of the proposed expressway extension project study area, including documentation of existing natural resources. STV/RWA reviewed a project study area (PSA) encompassing approximately 934 acres located within portions of the city of Charleston, James Island and Johns Island. The PSA ranges in width from 200 to 1,000 feet and encompasses each proposed new location build alternative being considered; please see Appendix A, Figure 1 for the approximate location of the reviewed PSA.

This report provides an overall description of the proposed project vicinity, and specifically describes natural resources within the PSA, including wetlands, water resources, plant communities, essential fish habitat and protected species. The qualifications of STV/RWA personnel involved in the preparation of this report are summarized in Appendix B.

1.2 Purpose and Need

The purpose of the Mark Clark Expressway Extension project is to increase the capacity of the regional transportation system, improve safety and enhance mobility to and from the West Ashley, Johns Island and James Island areas of Charleston, in an environmentally sensitive manner.

The following needs have been identified in connection with the proposed federal action within the study area:

- Increase capacity – the traffic volume on several main thoroughfares in the area exceeds the capacity of the facilities during peak hours, resulting in congestion, delays, and crashes.

- Improve safety – congestion reduces safety on roadways and forecasts of population growth and future demand show congestion increasing in the coming years.

- Increase regional mobility – with limited and congested connecting routes between the regions in the study area, additional transportation linkages are needed to efficiently move people and goods.

1.3 Methodology

Prior to conducting field reviews, STV/RWA reviewed the following reference material:

- United States Geological Survey (USGS) 7.5 minute quadrangle maps Charleston, James Island, Johns Island, and Legareville (1983);

- South Carolina Department of Natural Resources (SCDNR), GIS Data Clearinghouse, Digital Orthophoto Quarter Quadrangle (DOQQ) Maps, Charleston, James Island, Johns Island, and Legareville (2006);
Field reviews were conducted from June 2009 to October 2009 and included the documentation of potential jurisdictional waters of the U.S., habitat communities and protected species habitat within the project study area (PSA). From October 5th to October 16th, 2009, environmental scientists from STV/RWA, Wilbur Smith Associates (WSA), and the U.S. Army Corps of Engineers (USACE) delineated the boundaries of jurisdictional waters of the U.S., including wetlands, streams and ponds within the PSA. The jurisdictional boundaries were also verified by the USACE in the field at this time. Wetlands in the PSA were determined using the Routine On-Site Determination Method as defined in the 1987 Corps of Engineers Wetland Delineation Manual (Environmental Laboratory, 1987) and the Atlantic and Gulf Coastal Plain Regional Supplement to the Manual (Environmental Laboratory, 2008). The delineated boundaries of potential jurisdictional waters of the U.S. were geo-referenced in the field using either Trimble GeoXT™ or GeoXH™ handheld Global Positioning System (GPS) units capable of sub-meter accuracy. The GPS units were used to collect point features, using a one- to five-second logging interval. The GPS settings used generally included a maximum HDOP of 4.0, a minimum elevation mask of 15-degrees and a minimum SNR of 12.0. The point features were validated using Trimble Pathfinder Office and ArcGIS 9.1 software.

2.0 PHYSICAL RESOURCES

2.1 Land Use

Human-influenced habitats or land uses within the project study area (PSA) include commercial development, residential development, agricultural development, recreational parks and preserves and man-maintained or disturbed areas. Based on aerial photography (SCDNR, 2006 and Photoscience, 2008) and field groundtruthing, the majority of human-influenced habitat or land use within the PSA is residential development, comprising approximately 35 percent of the PSA. Commercial development, agricultural development and recreational parks and preserves comprise approximately 10 percent, 5 percent and 10 percent of the PSA, respectively. The remainder of the PSA consists of undeveloped natural habitats including Low Salt Marsh, High Salt Marsh, Brackish Marsh, Freshwater Marsh, Maritime Forest, Mixed Hardwood Forest, Mixed Pine-Hardwood Forest, Pine Forest, Open Freshwater, Open Saltwater and human-influenced. The land use habitats are further discussed in Section 3.1 and 3.2 of this report. Impacts to human-influenced and natural habitat land uses are expected due to construction activities related to the proposed project.
2.2 Physiography and Topography

The project study area (PSA) is located within the Middle Atlantic Coastal Plains (63) Level III Ecoregion of the United States, and is specifically situated within the Sea Island/Coastal Marsh Level IV Ecoregion (75)) of the Southern Coastal Plain physiographic province (75) of South Carolina. The Sea Island/Coastal Marsh region contains the lowest elevations in South Carolina and is a highly dynamic environment affected by ocean wave, wind, and river action. The landscape is characterized by mostly flat plains, but also contains barrier islands, marshes, and lagoons. Mostly sandy soils are found on the barrier islands, while finer textured (i.e., silts and clays) and organic soils often occur in the brackish, salt, and freshwater marshes (Griffith, et al., 2002). Maritime forests, characterized by slow-growing, evergreen, salt-tolerant plant species, are the dominant terrestrial community found within the Sea Island/Coastal Marsh region.

According to USGS maps, elevations in the PSA range from sea level to approximately 20 feet above sea level (Appendix A, Figure 2). Various drainageways, including the Stono River, Pennys Creek, James Island Creek and unnamed tributaries to the Stono River are identified on the USGS map within the PSA. These drainageways and associated wetlands are further discussed in Sections 4.1.1 and 4.1.2.

2.3 Geology and Soils

Sediments of the Southern Coastal Plain were deposited during periodic transgressive-regressive cycles caused by sea level fluctuations. Sea level fluctuations were caused, in part, by the expansion and recession of glacial ice caps. Depositions created by fluctuating sea levels formed an uneven land surface that generally decreases in elevation seaward. As a result of these transgressive-regressive cycles, progressively younger sequences of deposits lie nearer the modern coast, and at lower elevations, than older sequences. Fluvial sediments from the Cretaceous and Tertiary periods overlay pre-Mesozoic basement rocks of the Coastal Plain (Horton and Zullo, 1991).

Eighteen soil map units are mapped within the project study area (PSA), as follows (Appendix A, Figure 3):

- Capers silty clay loam (Cg)
- Charleston loamy fine sand (Ch)
- Dawhoo and Rutlege loamy fine sand (Da)
- Edisto loamy fine sand (Ed)
- Hockley loamy fine sand, 0 to 2% slopes (HoA)
- Kiawah loamy fine sand (Ka)
- Leon fine sand (Le)
- Made land (Ma)
- Mine pits and dumps (Mp)
- St. Johns fine sand (Sa)
- Santee loam (Se)
- Seabrook loamy fine sand (Sk)
- Stono fine sandy loam (St)
- Tidal marsh, soft (Ts)
- Wadmalaw fine sandy loam (Wa)
- Wagam loamy fine sand, 0 to 6% slopes (WgB)
- Wando loamy fine sand, 0 to 6% slopes (WnB)
- Yonges loamy fine sand (Yo)

The following information pertaining to the soil map units was taken from the USDA SCS Soil Survey of Charleston County, South Carolina (USDA, 1971).

Cg is a very deep and very poorly drained soil found on broad level tidal flats and marshes and along the lower reaches of larger streams flowing into tidal flats. Permeability is very slow, and the water table fluctuates from one foot above the soil surface to one foot below the surface. Cg soils are flooded with brackish or salty water at least twice monthly to twice daily in some places. The surface layer of Cg is a loam, silty clay loam, silty clay, or clay, while the subsoil to a depth of approximately 40 inches is a clay or silty clay (USDA, 1971). One hundred percent of this map unit is considered hydric (USDA, 2009). An example of Cg soils is located in the west central portion of the PSA adjacent to Pennys Creek and SC 700 (Maybank Highway).

Ch soils are deep, moderately well drained soils located within flats and low divides at less than 25 feet above sea level (asl) in the lower coastal plain. Permeability is characterized as moderate, and water runoff is slow. The seasonal high water table ranges from 2.0 to 3.5 feet below the soil surface. The surface layer of Ch is loamy fine sand, and the subsoil to a depth of approximately 44 inches is a fine sandy loam (USDA, 1971). Three percent of the Ch map unit is considered hydric (USDA, 2009). An example of Ch soils within the PSA can be found along the south side of U.S. 17 in the northern portion of the PSA at the existing Mark Clark Expressway terminus.

Da soils are deep, poorly to very poorly drained soils consisting of Dawhoo or Rutlege soils or a combination of the two. Da soils are located on nearly level surfaces and depressions at 5.0 to 20 feet asl within narrow troughs between ridges in the lower coastal plain. Permeability is characterized as rapid, and water runoff is very slow. The seasonal high water table ranges from at the surface to 1.0 foot below the soil surface. The soil surface layers of Da consist of loamy fine sand and the subsoil to a depth of approximately 60 inches consist of loamy fine sand to sand (USDA, 1971). One hundred percent of the Da map unit is considered hydric (USDA, 2009). An example of Da soils within the PSA can be found in the southwestern portion of the PSA approximately 2,800 feet west-southwest of the intersection of Maybank Highway and River Road.

Ed soils are somewhat poorly drained soils located within the Pamlico Terrace of the lower coastal plain. Permeability is characterized as moderate, and water runoff is slow. The seasonal high water table ranges from 1.0 to 3.0 feet below the soil surface during the spring and winter months. The surface layer of Ed soils consists of loamy sand, loamy fine sand, sandy loam, or fine sandy loam and the subsoil to a depth of approximately 70 inches is a fine sandy loam to sandy clay loam (USDA, 1971). None of the Ma map unit is considered hydric (USDA, 2009). An example of Ed soils within the PSA can be found alongside River
Road in the western portion of the PSA, approximately 3,500 feet northwest of the intersection of River Road and SC 700 (Maybank Highway).

HoA soils are very deep, well drained soils typically found within nearly level to gently sloping uplands in the coastal plain. Permeability is characterized as moderate. The seasonal high water table ranges from 2.0 to 5.0 feet below the soil surface. The surface layer of HoA soils is fine sandy loam, while the subsoil to a depth of approximately 75 inches is sandy clay loam (USDA, 1971). Six percent of the HoA map unit is considered hydric (USDA, 2009). An example of HoA soils within the PSA can be found approximately 5,400 feet north-northwest of the intersection of Maybank Highway and River Road in the western portion of the PSA.

Ka soils are deep, somewhat poorly drained soils found within nearly level soils of the Pamlico Terrace in the lower coastal plain. Permeability is characterized as rapid but may be impeded by seasonal high water tables. The seasonal high water table ranges from 1.0 to 2.0 feet below the soil surface. The surface layer of Ka soils consist of loamy fine sand and the subsoil to a depth of approximately 72 inches consist of loamy fine sand loam to fine sand (USDA, 1971). Three percent of the Ka map unit is considered hydric (USDA, 2009). An example of Ka soils within the PSA can be found alongside Maybank Highway, northeast of the intersection of Maybank Highway and River Road, in the west central portion of the PSA.

Le soils are very deep, poorly to very poorly drained soils found within upland flats, depressions, stream terraces and tidal marshes in the Atlantic and Gulf coastal plain. Permeability is characterized as moderate to moderately slow. The seasonal high water table ranges from at the surface to 1.5 feet below the soil surface. The Le soil surface layers and subsoil to a depth of 108 inches consist of sand (USDA, 1971). One hundred percent of the Le map unit is considered hydric (USDA, 2009). An example of Le soils within the PSA can be found alongside River Road in the southwestern portion of the PSA, approximately 3,800 feet southeast of the intersection of River Road and Maybank Highway.

Ma are man-altered soils found primarily in and around the city of Charleston that have been excavated, filled, or otherwise disturbed by man. Ma soils consist of variable amounts of sand, silt and clay or mixtures of these textures. The soils also may contain seashells or fragments of seashells (USDA, 1971). An example of Ma soils within the PSA can be found in the northern portion of the PSA, approximately 3,500 south of the Mark Clark Expressway terminus at U.S. 17.

Mp soils consist of open pits that remain after the removal of phosphate, rock, soil material and sand or areas of spoil where soil material removed during mining operations has been dumped. Extensively mined areas have a ridge and trough type landscape, and the troughs or borrow pits may contain considerable amounts of standing water (USDA, 1971). Forty percent of the Mp map unit is considered hydric (USDA, 2009). An example of Mp soils within the PSA can be found in the east central portion of the PSA, approximately 4,500 feet south-southeast of the intersection of Maybank Highway and Riverland Drive.
Sa soils are very deep, poorly to very poorly drained soils found within broad flats and depressional areas within the lower coastal plain. The seasonal high water table ranges from at the surface to 2.0 feet below the soil surface. The Sa surface layer and subsurface layers to a depth of 80 inches consists of sand (USDA, 1971). One hundred percent of the Sa map unit is considered hydric (USDA, 2009). An example of Sa soils within the PSA can be found approximately 2,500 feet southwest of the intersection of Maybank Highway and River Road in the southwestern portion of the PSA.

Se soils are very poorly drained, slowly permeable soils found within broad depressional areas and drainageways in the lower coastal plain. The seasonal high water table ranges from at the surface to 2.0 feet below the soil surface. The surface layer of Se soils consists of a loam and the subsoil to a depth of approximately 71 inches consists of a clay loam to clay (USDA, 1971). One hundred percent of the Se map unit is considered hydric (USDA, 2009). An example of Se soils within the PSA can be found in the northern portion of the PSA alongside a drainageway located approximately 1,500 feet north-northwest of U.S. 17.

Sk soils are very deep, moderately well drained soils found within terraces at five to 120 feet asl within the coastal plain. The seasonal high water table ranges from 2.0 to 3.0 feet below the soil surface. The surface layer of Sk soils consists of loamy sand and the subsoil to a depth of approximately 81 inches consists of sand (USDA, 1971). Three percent of the Sk map unit is considered hydric (USDA, 2009). An example of Sk soils within the PSA can be found in the eastern portion of the PSA alongside Riverland Drive, approximately 1,000 feet north of the intersection of Riverland Drive and Camp Road.

St soils are deep, poorly drained soils found within nearly level low marine terraces at five to 25 feet asl within the lower coastal plain. The seasonal high water table ranges from at the surface to 3.0 feet below the soil surface. The surface layer of St soils consists of a fine sandy loam and the subsoil to a depth of approximately 54 inches consists of a fine sandy loam to sandy clay loam and loamy fine sand (USDA, 1971). One hundred percent of the St map unit is considered hydric (USDA, 2009). An example of St soils within the PSA can be found approximately 2,000 feet east of the intersection of Maybank Highway and River Road in the west central portion of the PSA.

Ts soils are located on the coast within broad, level tidal flats and marshes that are covered by six to 24 inches of saltwater at high tide and along tidal streams and rivers between the Atlantic Ocean and uplands. The soil surface layer is comprised of soft clay to clay loam, muck or peat, and subsoil is comprised of clay (USDA, 1971). Ts soils contain the chemical sulfide, producing the characteristic rotten egg odor. One hundred percent of the Ts map unit is considered hydric (USDA, 2009). Ts soils are typically located within the low salt marsh communities or estuarine wetlands located immediately adjacent to the Stono River in the PSA.

Wa soils are very deep, poorly drained soils found within nearly level broad flats and drainageways within the lower coastal plain. The seasonal high water table ranges from at the surface to 2.0 feet below the soil surface. The surface layer of Wa soils consists of a fine sandy loam and the subsoil to a depth of approximately 83 inches consists of a fine sandy loam to sandy clay loam (USDA, 1971). One hundred percent of the Wa map unit is
considered hydric (USDA, 2009). An example of Wa soils within the PSA can be found alongside the estuarine wetland boundary associated with the west side of the Stono River, approximately 5,000 feet east of the intersection of Maybank Highway and River Road in the west central portion of the PSA.

WgB soils are very deep, somewhat excessively drained soils found within uplands of the lower, middle and upper coastal plain. The depth to the seasonal high water table is greater than five feet below the soil surface. The surface layer of WgB soils consists of loamy sand and the subsoil to a depth of approximately 82 inches consists of a sandy loam to sandy clay loam and sandy loam (USDA, 1971). None of the WgB map unit is considered hydric (USDA, 2009). An example of WgB soils within the PSA can be found in the northern portion of the PSA, approximately 2,000 feet south of U.S. 17.

WnB soils are very deep, well drained soils found within terraces at seven to 25 feet asl in the lower coastal plain. The depth to the seasonal high water table is greater than four feet below the soil surface. The WnB surface layer and subsurface layers to a depth of 99 inches consists of fine sand (USDA, 1971). Three percent of the WnB map unit is considered hydric (USDA, 2009). An example of WnB soils within the PSA can be found alongside Folly Road in the eastern portion of the PSA, approximately 1,000 feet south of the intersection of Folly Road and SC 30.

Yo soils are very deep, poorly drained soils found within nearly level areas at five to 25 feet asl in the lower coastal plain. The seasonal high water table ranges from at the surface to 2.0 feet below the soil surface. The surface layer of Yo soils consists of loamy fine sand to fine sandy loam and the subsoil to a depth of approximately 80 inches consists of a fine sandy loam to sandy clay loam (USDA, 1971). One hundred percent of the Yo map unit is considered hydric (USDA, 2009). An example of Yo soils within the PSA can be found approximately 1,000 feet south of U.S. 17 in the northern portion of the PSA.

2.4 Water Resources and Water Quality

The project study area (PSA) is located within the Santee River Basin which is divided into the Santee River Basin and the Ashley River/Cooper River Basin (USGS Hydrologic Unit Code [HUC] 03050202). Overall, the Santee River Basin incorporates 26 watersheds and approximately 2.9 million acres in South Carolina. The Santee River Basin extends across the Upper and Lower Coastal Plain regions and into the Coastal Zone region. There are approximately 1,406 stream miles, 154,853 acres of lake waters, and 18,335 acres of estuarine areas in the basin. STV/RWA reviewed the Basinwide Watershed Water Quality Assessment Report for the Santee River Basin (SCDHEC, 2005) and the S.C. List of 303(d) Impaired Waters (SCDHEC, 2008). No quantitative water quality sampling was conducted.

The PSA is located within the Ashley River/Cooper River Basin (USGS Hydrologic Unit Code [HUC] 03050202). The Ashley River/Cooper River Basin is further subdivided into 15 watersheds or hydrologic units and includes the Cooper River as it flows from Lake Moultrie to the Charleston Harbor and its major tributaries, which include the Back River and the Wando River. Also included within the Ashley River/Cooper River Basin are the Ashley River and Stono River. The Ashley River Basin incorporates seven watersheds and 894
square miles, while the Cooper River Basin includes eight watersheds and 843 square miles. The Ashley River Basin contains approximately 240 miles of stream, 4,232 acres of lake water and 32,702 acres of estuarine areas. Of the approximate half a million acres in the Ashley River Basin, an estimated 47.6% is forested land, 15.1% is non-forested wetland, 7.8% is forested wetland, 9.8% is urban land, 9.0% is open water, 7.3% is scrub/shrub land, 3.1% is agricultural land and 0.3% is barren land (SCDHEC, 2005). The Cooper River Basin contains approximately 471 miles of stream, 60,189 acres of lake water and 13,059 acres of estuarine areas. Of the approximate half a million acres in the Cooper River Basin, an estimated 52.7% is forested land, 1.6% is non-forested wetland, 14.5% is forested wetland, 8.3% is urban land, 15.8% is open water, 4.1% is scrub/shrub land, 2.6% is agricultural land and 0.4% is barren land (SCDHEC, 2005). The Ashley River accepts drainage from several streams including Dorchester Creek and connects to the Stono River by way of Elliot Cut before draining into the Charleston Harbor and the Atlantic Ocean. The Cooper River accepts drainage from the Back River, Goose Creek and the Wando River before draining into the Charleston Harbor and the Atlantic Ocean (SCDHEC, 2005).

Specifically, the PSA is located within the Charleston Harbor/Stono River Watershed (HUC 03050202-070) and the Stono River Watershed (HUC 03050202-050). The Charleston Harbor/Stono River Watershed includes the Charleston Harbor and its tributaries and the Stono River and its tributaries from Wappoo Creek to the Atlantic Ocean. The watershed occupies 81,611 acres, of which an estimated 25.2% is forested land, 0.8% is forested wetland, 28.1% is non-forested wetland, 21.9% is open water, 10.1% is urban land, 9.0% is scrub/shrub land, 4.6% is agricultural land and 0.3% is barren land (SCDHEC, 2005). There are approximately 754 acres of lake waters and 13,852 acres of estuarine areas in the watershed. The Stono River Watershed is located in Dorchester and Charleston Counties and consists primarily of the Stono River and its tributaries from Log Bridge Creek to Wappoo Creek. The Stono River Watershed occupies 157,400 acres of the Lower Coastal Plain and Coastal Zone regions of South Carolina. Within the watersheds, the Stono River is classified as a SFH water or "shellfish harvesting" water and accepts drainage from the upper Stono River, flows between Johns Island and James Island, and ultimately flows through the Stono Inlet to the Atlantic Ocean. From Johns Island, the Stono River accepts drainage from a number of streams, including Pennys Creek, Hut Creek, Ababopola Creek, Alligator Creek and the Kiawah River. From James Island, the Stono River also receives drainage from various streams, including James Island Creek or Ellis Creek, Holland Island Creek, and Green Creek (SCDHEC, 2005). Within the Charleston Harbor/Stono River Watershed, the Ashley River is classified as a SA water and the Cooper River is classified as a SB water. Class SA waters are comprised of tidal saltwaters suitable for primary and secondary contact recreation, crabbing and fishing, but are not protected for shellfish harvesting. Class SA waters must maintain daily dissolved oxygen (DO) averages not less than 5.0 milligrams per liter (mg/l). Class SB waters are tidal saltwaters suitable for the same uses as Class SA but must maintain daily DO averages not less than 4.0 mg/l. The Charleston Harbor is classified as a SB water.

The 303(d) list is a State list of waters that are not meeting water quality standards or have impaired uses. The Section 303(d) list targets water bodies that do not meet water quality standards set by the state for water quality management, as well as identifying the cause(s) of the impairment and the designated use classifications. In accordance with federal guidelines,
SCDHEC evaluates waterbodies identified as impaired for appropriate inclusion on the Section 303(d) list. SCDHEC uses a watershed approach to perform its permitting and water quality monitoring. In formation on SCDHEC’s Watersheds Program can be found at http://www.scdhec.gov/water/.

There are six SCDHEC monitoring sites along the Stono River within the vicinity of the PSA. Four of the monitoring sites are shellfish monitoring stations (11-01, 11-02, 11-02A, 11-11) and two of the monitoring sites are water quality monitoring stations (MD-025 and MD-026). Recreational uses are fully supported at all sites. According to the SCDHEC 2008 Section 303(d) list, the Stono River (HUC 030502020202) at water quality monitoring station MD-026 is listed as impaired and aquatic life uses are not supported due to occurrences of low dissolved oxygen and copper excursions that exceed set limits. Monitoring station MD-026 is located at the Maybank Highway crossing of the Stono River. Significant decreasing trends in five-day biochemical oxygen demand, total nitrogen concentration and fecal coliform bacteria concentration suggest improving conditions for these parameters since the initial 303(d) listing (SCDHEC, 2005).

A TMDL, or Total Maximum Daily Load, is the amount of a single pollutant (e.g., bacteria, nutrients, metals) that can enter a waterbody on a daily basis and still meet water quality standards set forth by the State. “TMDL” refers to both a calculation of a pollutant entering a waterbody as well as a document which includes this calculation along with source assessments, watershed and land use information, reductions and allocations information, implementation and other relevant information, maps, figures and pictures (SCDHEC, 2009).

TMDLs are a requirement found in Section 303(d) of the 1972 Federal Clean Water Act (CWA). Once a site is included on the 303(d) list of impaired waters, a TMDL must be developed within two to thirteen years of initial listing. In South Carolina, TMDLs are developed and proposed by SCDHEC and then forwarded to EPA Region 4 for final approval.

TMDLs are calculated by adding all the point and nonpoint sources for the pollutant causing the impairment. After a TMDL is calculated, the amount of load entering from point and nonpoint sources is compared to the water quality standards for that waterbody. Then this total loading is reduced to the levels where the water quality standards can be met. This reduced loading is then divided among all the point and nonpoint sources.

The goal of a TMDL is to identify potential pollution sources, calculate and quantify the reduction of those sources, and provide general implementation information needed in order to meet water quality standards and improve water quality. After the approval of the TMDL, an implementation plan can be developed to realize the goals of the written TMDL document. Implementation of a TMDL has a potential to reduce sources of pollution within a watershed and a potential to restore the full use of the waterbody. No TMDLs have been established for any waterbodies located within the PSA.

Runoff pollution (technically known as nonpoint source pollution) occurs when rain or irrigation water flowing over hard surfaces, or loose soil, picks up pollutants and deposits
them into the nearest lake, creek, estuary or groundwater supply. In some areas, polluted runoff is also known as stormwater runoff. The SCDHEC Bureau of Water operates a stormwater regulatory program for certain categories of stormwater runoff.

Point source discharge means a discharge which is released to the waters of the State by a discernible, confined and discrete conveyance, including but not limited to a pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, vessel, or other floating craft from which waste is or may be discharged. The National Pollutant Discharge Elimination System (NPDES) Permit Program was created by Section 402 of the CWA. In 1975, the Bureau of Water received authority from the EPA to administer the NPDES Permit Program in South Carolina. The SCDHEC Bureau of Water is responsible for the permitting, compliance, monitoring and enforcement activities of the program.

Persons with point source discharges to surface waters are required to have NPDES permits. Typical regulated point source discharges are:

- discharges from wastewater treatment systems owned by municipalities, industries, private utilities, State and Federal government, etc.;
- discharges such as cooling water, boiler blow down, etc.;
- stormwater discharges from municipal separate storm sewer systems (MS4s);
- stormwater discharges associated with industrial activity; and,
- stormwater discharges from construction sites.

One NPDES facility has been identified within the Stono River watershed. A minor industrial discharge NPDES permit for the Ravenel Mine has been granted for a discharge to Middle Branch according to the SCDHEC Bureau of Water. This discharge is located approximately 14 miles upstream of the PSA.

Waterbodies located within the PSA include the Stono River, James Island Creek, Pennys Creek and unnamed tributaries to the Stono River. Tidal salt marshes or estuarine wetlands are located adjacent to all of the waterways listed above. Freshwater wetlands were also identified within the PSA. These jurisdictional waterbodies are further discussed in Sections 3.2 and 4.0.

The proposed project is not expected to have long term impacts to water quality within the Charleston Harbor/Stono River Watershed (HUC 03050202-070) or Stono River Watershed (03050202-050).

3.0 BIOTIC RESOURCES

3.1 Human-Influenced Terrestrial Habitat Communities

Based on the field review, five man-dominated terrestrial habitat communities, including commercial development, residential development, agricultural development, recreational parks and preserves and man-maintained or disturbed areas, were identified within the
project study area (PSA). A brief summary of the human-influenced terrestrial habitat communities follows:

**Commercial Development**
Approximately 10 percent of the land area within the PSA has been identified as commercial development, including retail stores, hotels/motels, churches and institutions (schools). These areas are primarily located immediately alongside U.S. 17, Maybank Highway and Folly Road. Associated with the commercial development are landscaped ornamental plantings and paved driveways and parking lots.

**Residential Development**
Approximately 35 percent of the land area within the PSA has been identified as residential development, including single family homes on large parcel lots, single-family homes in residential neighborhoods and multi-family apartment complexes. These areas are primarily located in the northern, southwestern and southeastern portions of the PSA. Associated with the residential development are fragmented natural wooded areas, landscaped lawns, ornamental plantings and paved or gravel driveways. Various cultivated grasses, including Bermuda grass (*Cynodon dactylon*) and Bahia grass (*Paspalum notatum*) are common in the landscaped lawn areas.

**Agricultural Development**
Agricultural development, including pastures, maintained fields, and crop fields, comprise approximately five percent of the PSA. These areas are primarily situated in the southern portion of the PSA on James Island and Johns Island.

**Recreational Parks and Preserves**
Recreational parks and preserves comprise approximately 10 percent of the PSA and include James Island County Park, located off Riverland Drive in the eastern portion of the PSA and the West Ashley Greenway, located between the Stono River and U.S. 17 in the northern portion of the PSA. James Island County Park is a 640-acre park owned and operated by the Charleston County Parks and Recreation Commission. The park consists of camp sites, a conference center, rental cabins, picnic shelters, playgrounds, bike paths, hiking trails, ponds and undeveloped natural habitats, including upland forests, forested wetlands and non-forested tidal marsh wetlands. The West Ashley Greenway runs parallel to U.S. 17 alongside an abandoned railroad right of way, located south of U.S. 17. The City of Charleston Commissioners of Public Works own (through leasing) and maintain the West Ashley Greenway, which includes a path used by pedestrians and bicyclists. A utility right of way is also located within the greenway.

Dill Sanctuary is a wildlife sanctuary and preserve owned and operated by the Charleston Museum. The Dill Sanctuary is approximately 580 acres in size and located within the southeastern portion of the PSA.

**Human-Influenced or Disturbed Areas**
Man-maintained and disturbed communities within the PSA include areas routinely maintained or disturbed by man, including berms and levees alongside excavated channels, roadside shoulders and utility rights of way. Most of the naturally-occurring plants associated
with these maintained or disturbed communities have been destroyed and replaced with cultivated grasses or taken over by naturally occurring opportunistic species characteristic of disturbed areas.

3.2 Natural Terrestrial and Aquatic Habitat Communities

Based on the field review, ten natural terrestrial and aquatic habitat community/land use types, including Low Salt Marsh, High Salt Marsh, Brackish Marsh, Tidal Freshwater Marsh, Maritime Forest, Mixed Hardwood Forest, Mixed Pine-Hardwood Forest, Pine Forest, Open Freshwater and Open Saltwater were identified within the project study area (PSA).

The determination of the biotic community types within the PSA was done through literature and field review. The literature review consisted of a review of various resources, including aerial photography (SCDNR, 2006 and Photoscience, 2008), U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) Mapping (USFWS, 2009) and U.S. Department of Agriculture (USDA) Soil Conservation Service (SCS) Soil Survey of Charleston County, South Carolina (USDA, 1971). A previous study, entitled “Natural Resources Technical Memorandum for the Mark Clark Expressway Supplemental EIS” (CZR Inc., 1995), examined natural resources within portions of the existing PSA and was also reviewed for pertinent information. Biotic communities were classified according to their major plant constituents, general species composition, and landscape position, and when possible, were described in accordance with The Natural Communities of South Carolina, Initial Classification and Description (Nelson, 1986). A description of the natural terrestrial and aquatic habitat communities and the plant and animal species associated with them follows.

Low Salt Marsh

Low salt marshes are located immediately adjacent to estuarine channels, including the Stono River, James Island Creek, Pennys Creek and unnamed tributaries to the Stono River, within the project study area. These salt marshes are typically flooded twice daily during high tide and are dominated almost purely by smooth cordgrass (Spartina alterniflora). Species composition and diversity in these marshes is very low, limited to salt-tolerant species. Other species common to low salt marshes include salt grass (Distichlis spicata), Virginia grasswort (Salicornia virginica) and sea lavender (Limonium sp.). These species are particularly found within pockets of the low salt marsh containing slightly higher elevation, less submergence and lower soil salinities. Elements of Salt Flat, Salt Marsh, and Salt Shrub Thicket habitats, as defined by Nelson in The Natural Communities of South Carolina, Initial Classification and Description (1986), were observed within the low salt marsh community.

Even though environmental stresses are high in the low salt marsh community, biological diversity and productivity are also high. These marshes are of great importance to many waterfowl, fishes and invertebrates dependent upon them. Some of the common species known to occur and/or observed within the low salt marsh include river otter (Lontra canadensis), great egret (Casmerodius albus), little blue heron (Egretta caerulea), tricolored heron (Egretta tricolor), green heron (Butorides striata), rails (Rallus sp.), marsh hawk (Circus cyaneus), redwinged blackbird (Agelaius phoeniceus), mud snail (Ilyanassa obsoleta), marsh fiddler crab (Uca pugnax), ribbed mussel (Gesneria demissa), periwinkle (Littorina irrorata), bay anchovies (Anchoa mitchelli) and sailfin molly (Poecilia latipinna).
High Salt Marsh

High salt marshes are located adjacent to/inland of the low salt marsh community along the Stono River and other tidal saltwater creeks located within the project study area. High salt marshes are on slightly higher ground than low salt marshes and are irregularly flooded by above average tides such as spring tides. Due to less exposure to saltwater, plant species composition tends to be more diverse than the low salt marsh. Dominant plant species within the high salt marsh community include black needle rush (Juncus roemerianus), sea oxeye (Borrichia frutescens), marsh-hay cordgrass (Spartina patens), Virginia glasswort, salt grass and saltwort (Batis maritima). The inland or outer fringe of the high salt marsh is also dominated by species less tolerant of saltwater, including saltmarsh fringe-rush (Fimbristylis castanea) and marsh elder (Itea frutescens). Elements of Salt Flat, Salt Marsh, and Salt Shrub Thicket habitats, as defined by Nelson in The Natural Communities of South Carolina, Initial Classification and Description (1986), were observed within the high salt marsh community.

Biological diversity and productivity are also high in the high salt marsh community, which includes the same faunal species as those described for the low salt marsh community. Other species known to occur within high salt marshes include great blue heron (Anhinga herodias), yellow-crowned night heron (Nyctanassa violacea), least bittern (Ixobrychus exilis), raccoon (Procyon lotor), marsh rice rat (Oryzomys palustris), leopard frog (Rana sphenophala) and sand fiddler crab (Uca pugilator).

Brackish Marsh

Brackish marshes are representative of an estuarine transition zone where a mixture of fresh and saltwater occurs, resulting in brackish water with lower salinity levels, and thereby allowing the presence of both fresh and saltwater plant species. As in the low and high salt marsh communities, plant species diversity is low with black needle rush often forming monocultures. Other species that may be found in the brackish marsh community include big cordgrass (Spartina angustifolia), narrow-leaf cattail (Typha angustifolia), marsh-hay cordgrass, saltmarsh fringe-rush, bulrush (Scirpus spp.), salt grass, annual wildrice (Zizania aquatica), southern wildrice (Zizaniopsis miliacea) and Jamaica sawgrass (Cladium jamaicense). Elements of Brackish Marsh and Salt Shrub Thicket habitats, as defined by Nelson in The Natural Communities of South Carolina, Initial Classification and Description (1986), were observed within the brackish marsh community.

Wildlife diversity within brackish marshes is considered to be lower than in the adjacent low and high salt marshes. Faunal species utilizing the brackish marsh community include some of the same species that occur in the low and high salt marsh communities with the addition of marsh rabbit (Sylvilagus palustris) and marsh hen (Rallus longirostris) or clapper rail.

Tidal Freshwater Marsh

Tidal freshwater marshes are located adjacent to the upper limit of tidal creeks within the project study area where average annual salinity is 0.5 parts per thousand (ppt) or less, except during periods of extreme drought. These marshes are generally flooded regularly by tides. The major controlling force in tidal freshwater marshes is rainfall, which floods the marshes
with freshwater and flushes out salinity levels to allow for a dominance of freshwater plant species. Plant species diversity is usually much higher in these tidal freshwater marshes than the previously described brackish marsh and low and high salt marshes. Dominant species observed or known to occur in the tidal freshwater marsh community include common reed (*Phragmites australis*), big cordgrass, narrow-leaf cattail, southern cattail (*Typha domingensis*), broad-leaved cattail (*Typha latifolia*), eastern false willow (*Bassarica halimifolia*), annual wildrice, southern wildricle, alligator weed (*Alternanthera philoxeroides*), grass-leaf arrowhead (*Sagittaria graminea*), broad-leaf arrowhead (*Sagittaria latifolia*), arrow arum (*Peltandra virginica*), pickerel weed (*Poreastera cordata*), smartweed (*Polygonum spp.*), seedbox (*Ludisia spp.*), and various species of rushes (*Scirpus spp.*). Elements of Tidal Freshwater Marsh and Brackish Marsh habitats, as defined by Nelson in *The Natural Communities of South Carolina, Initial Classification and Description* (1986), were observed within the tidal freshwater marshes located within the project study area (PSA).

Wildlife species utilizing tidal freshwater marshes include many of the same species that utilize the brackish marsh and/or high salt marsh. Species observed or known to occur within tidal freshwater marshes include American alligator (*Alligator mississippiensis*), mink (*Mustela vison*), cotton mouse (*Peromyscus gossypinus*), marsh rabbit, great blue heron, green heron, eastern kingbird (*Tyrannus tyrannus*), redwinged blackbird, least bittern, rails (*Rallus spp.*), raccoon, eastern cottonmouth (*Agkistrodon piscivorus*), green treefrog (*Hyla cinerea*), leopard frog, mosquito fish (* Gambusia affinis*) and various species of invertebrates.

**Maritime Forest**

Maritime forests are upland habitats dominated by slow-growing, salt-tolerant evergreen plant species and are typically found on islands surrounded by salt marshes. Maritime forests are located within the tidal salt marsh or estuarine emergent wetlands associated with the Stono River and Pennys Creek in the western portion of the PSA. Plant species diversity in the maritime forest community is usually limited due to severe environmental conditions, including high winds and salt spray. Plant species characteristic of the maritime forest community include Atlantic white cedar (*Chamaecyparis thyoides*), live oak (*Quercus virginiana*), laurel oak (*Q. laurifolia*), southern red cedar (*Juniperus silicicola*), red bay (*Persea borbonia*), loblolly pine (*Pinus taeda*), yaupon holly (*Ilex vomitoria*), cabbage palm (*Sabal palmetto*), rusty lyonia (*Lynia ferigna*), wax myrtle (*Myrica cerifera*), and saw greenbrier (*Smilax bona-nox*). Elements of Maritime Shrub Thicket and Maritime Forest habitats, as defined by Nelson in *The Natural Communities of South Carolina, Initial Classification and Description* (1986), were observed within the maritime forest community.

Wildlife abundance and diversity within maritime forests may be limited due to the location in which the community is found. Many of the maritime forest communities are located on small barrier islands separated from the biological diversity found on the mainland. Some of the fauna that may be found within maritime forests include white-tailed deer (*Odocoileus virginianus*), raccoon, opposum (*Didelphis virginiana*), eastern spadefoot (*Scaphiopus holbrookii*), southeastern five-lined skink (*Eumeces inexpectatus*), ground skink (*Scinella lateralis*), Carolina anole (*Anolis carolinensis*), green treefrog, barking treefrog (*Hyla gratiosa*), eastern diamondback rattlesnake (*Crotalus adamanteus*) and southern black racer (*Coluber constrictor*).
Mixed Hardwood Forest
Mixed hardwood forests are located throughout the PSA on both wetland and upland sites. Specifically, mixed hardwood forest can be found adjacent to Maybank Highway in the western portion of the PSA, east of River Road. The canopy of these forests is dominated by mature hardwood tree species and the sub-canopy/groundcover is dense to sparse depending on degree of moisture and sunlight penetration. Common vegetation found within the wetland portions of the mixed hardwood forest community include bald cypress (Taxodium distichum), swamp blackgum (Nyssa biflora), Carolina ash (Fraxinus caroliniana), American hornebean (Carpinus caroliniana), swamp chestnut oak (Quercus michauxii), sweetgum (Liquidambar styraciflua), red maple (Acer rubrum), American holly (Ilex opaca), water oak (Q. nigra), southern magnolia (Magnolia grandiflora), sweetbay magnolia (M. virginiana), red bay, laurel oak (Q. laurifolia), common winterberry (Ilex verticillata), yaupon holly (I. virens), wax myrtle (Myrica cerifera), Chinese privet (Ligustrum sinense), dwarf palmetto (Sabal minor), southern lady fern (Athyrium filix-femina), giant cane (Arundo donax), royal fern (Osmunda regalis), netted chain fern (Woodwardia areolata), cinnamon fern (Osmunda cinnamomea), slender spike grass (Chasmanthium laxum), supplejack (Berberis scandens), poison ivy (Toxicodendron radicans) and laurel-leaf greenbrier (Smilax laevifolia). Common vegetation found within the drier, upland portions of the mixed hardwood forest include sweetgum, red maple, water oak, southern magnolia, live oak (Q. virginiana), sweetleaf (Symphyotrichum tinctoria), wax myrtle, diamond leaf oak (Q. hemisphaerica), southern red oak (Q. falcata), Christmas fern (Polystichum acrostichoides), ebony spleenwort (Asplenium platyneuron), Indian sea-oats (Chasmanthium latifolium), common greenbrier (S. rotundifolia) and poison ivy. Elements of Bald Cypress-Tupelo Gum Swamp, Bottomland Hardwoods, Mesic Mixed Hardwood Forest, Non-Alluvial Swamp Forest, Southern Mixed Hardwood Forest and Spruce Pine-Mixed Hardwood Forest habitats, as defined by Nelson in The Natural Communities of South Carolina, Initial Classification and Description (1986), were observed within the mixed hardwood forest community.

Many wildlife species occur throughout the forested communities (mixed hardwood forest, mixed pine-hardwood forest and pine forest) located within the PSA and are summarized collectively since few species are restricted to one community and most are found in each. Wildlife common to the forested community types within the study area include white-tailed deer, raccoon, opossum, eastern gray squirrel (Sciurus carolinensis), eastern cottontail (Sylvilagus floridanus), cotton rat (Sigmodon hispidus), southeastern shrew (Sorex longirostris), gray fox (Urocyon cinereoargenteus), eastern kingbird, blue grosbeak (Guiraca caerulea), summer tanager (Piranga rubra), brown thrasher (Toxostoma rufum), osprey (Pandion haliaetus), red-tailed hawk (Buteo jamaicensis), common flicker (Colaptes auratus), downy woodpecker (Picoides pubescens), red-bellied woodpecker (Melanerpes carolinus), Carolina wren (Thryothorus ludovicianus), northern cardinal (Cardinalis cardinalis), tufted titmouse (Parus bicolor), Carolina chickadee (Parus carolinensis), blue jay (Cyanocitta cristata), oak toad (Bufo viridis), green treefrog, Carolina anole, southeastern five-lined skink, eastern glass lizard (Ophisaurusvectralis), southern black racer and eastern box turtle (Terrapene carolina).

Mixed Pine-Hardwood Forest
Mixed pine-hardwood forests are typically located in the transitional zone between upland pine forest and mixed hardwood wetland forest. Specifically, mixed pine-hardwood forest can be found in the western portion of the PSA, east of the intersection of River Road and
SC 700 (Meybank Highway). The canopy of the mixed pine-hardwood forest community is typically dominated by loblolly pine (*Pinus taeda*), spruce pine (*P. glabra*) and a variety of hardwoods, including live oak, water oak, sweetgum and red maple. As in the mixed hardwood forest community, the sub-canopy/groundcover is dense to sparse depending on degree of moisture and sunlight penetration. Vegetation common to the sub-canopy or understory include red bay, horse sugar, wax myrtle, ebony spleenwort, common greenbrier, poison ivy, and various species of blueberry (*Vaccinium* spp.). Elements of Southern Mixed Hardwood Forest and Spruce-Pine-Mixed Hardwood Forest habitats, as defined by Nelson in *The Natural Communities of South Carolina, Initial Classification and Description* (1986), were observed within the mixed pine-hardwood forest community.

**Pine Forest**

Pine forests comprise a small percentage of the overall study area and include areas that have been planted with pines for silviculture and areas that have been previously logged or cleared for agriculture resulting in pine dominated uplands. Specifically, pine forest can be found within the Dill Sanctuary in the southeastern portion of the PSA, approximately 2,000 feet southwest of the intersection of Riverland Drive and Camp Road. Dominant plant species within the canopy include loblolly pine. Other species observed or known to occur in these forests include sweetgum, red maple, water oak, Japanese honeysuckle (*Lonicera japonica*), muscadine grape (*Vitis rotundifolia*), and poison ivy. The understory and groundcover in the pine forest community is usually sparse due to the density of the pine trees. Elements of Pine Flatwoods habitat, as defined by Nelson in *The Natural Communities of South Carolina, Initial Classification and Description* (1986), was observed within the pine forest community.

**Open Freshwater**

Open freshwater communities within the PSA include man-made ponds and naturalized borrow pits. These areas typically consist of open, deepwater within the central portion and vegetated, shallow water along the outer portion. Man-made freshwater ponds are scattered throughout the study area and are usually hydrologically connected to other waters, including wetlands, creeks, and ditches. Specifically, an open freshwater area can be found in the east central portion of the PSA, approximately 6,000 feet south-southeast of the intersection of Riverland Drive and Maybank Highway. Plant species common to the shallow, vegetated portions of the ponds and borrow pits include Carolina willow (*Salix caroliniana*), wax myrtle, duckweed (*Lemna* sp.), and various species of cattail (*Typha* spp.).

**Open Saltwater**

Open saltwater or estuarine and marine deepwater includes rivers, creeks and man-excavated basins or impoundments that are permanently flooded or submerged with tidal water. Open saltwater communities within the PSA include the Stono River, Pennys Creek, James Island Creek, unnamed tributaries to the Stono River and James Island Creek and excavated basins.

The South Carolina Wildlife and Marine Resources Department (SCWMRD) have previously conducted macroinvertebrate and fish studies in the Stono River at Maybank Highway (Knott and Van Dolah, 1987). Results of these studies can be found in a report entitled *A Biological Assessment of the Stono River Bridge Replacement S.C. 700 Maybank Highway, Charleston County, S.C.* (CZR Incorporated, 1991). The most abundant fish species collected during the sampling was star drum (*Stellifer lanceolatus*), followed by blackcheek tonguefish
(Symphysodon pugnosa) and Atlantic spadefish (Chaetodipterus faber). Other abundant fish species collected during the studies included sea catfish (Ariopsis felis), whiting (Merluccius americanus), anchovies (Anchoa mitchelli), pigfish (Orthopristis chrysoptera), sheepshead (Arctosargus probatocephalus) and spot (Leiostomus xanthurus). The South Carolina Estuarine and Coastal Assessment Program (SCECAP) provided additional data on typical conditions observed in South Carolina estuarine habitats. The SCECAP data indicate fish common to tidal creeks to include silver perch (Bairdiella chrysoura), Atlantic croaker (Micropogonias undulatus), weakfish (Cynoscion regalis), Atlantic spadefish, Atlantic menhaden (Brevoortia tyrannus), summer flounder (Paralichthys dentatus), ladyfish (Elops saurus), spotted sea trout (Cynoscion nebulosus), southern flounder (Paralichthys lethostigma), white catfish (Ameiurus catus) and American shad (Alosa sapidissima) (Van Dolah, R.F., et al., 2002).

Shellfish and crustaceans common to estuarine habitats, including the tidal creeks and rivers located within the PSA, include eastern oyster (Crassostrea virginica), blue crab (Callinectes sapidus), penaeid shrimp (Penaeus spp.) and grass shrimp (Palaemonetes spp.) Aquatic reptiles that may occur in the study area include various species of federally protected sea turtles, including loggerhead sea turtle (Caretta caretta), green sea turtle (Chelonia mydas), leatherback sea turtle (Dermochelys coriacea) and Kemp’s ridley sea turtle (Lepidochelys kempi). However, occurrences of sea turtles within the PSA would be extremely rare due to the distance of the PSA from the ocean and the current low numbers of sea turtles found in the wild. Aquatic mammals that may occur within the PSA include West Indian manatee (Trichechus manatus), a federally protected species, and bottlenose dolphin (Tursiops truncatus). State and federal protected (endangered or threatened) species are further discussed in Section 5.0.

Per review of the National Marine Protected Areas Center (NMPAC) Marine Protection Areas Database, no Marine Protection Areas are located within the PSA.

3.3 Wetland Plant Communities

Wetland communities located within the project study area (PSA) include estuarine tidally-influenced wetlands and freshwater forested, scrub-shrub and/or herbaceous wetlands; reference Appendix A – Figures 4 through 7 for the location and extent of wetlands within the PSA. Representative photographs of the wetland communities are included in Appendix C.

Estuarine wetlands are located throughout the PSA in association with the Stono River, Pennys Creek, James Island Creek and unnamed tributaries to these drainageways. The estuarine wetlands are typically flooded twice daily with salt water during high tides and are dominated by salt-tolerant herbaceous vegetation. Freshwater wetlands are also located throughout the PSA within interstream divides and broad flats and depressions.

Wetland Functions

Estuarine and freshwater wetlands provide habitat and food for a variety of fish and aquatic terrestrial mammals, birds, reptiles and invertebrates. In addition, estuarine wetlands provide cover and nursery grounds for many marine species, including shrimp, crabs, shellfish, and fish. Additional functions provided by estuarine and freshwater wetlands include erosion and flood control by slowing and absorbing wind and wave action from storm surges.
Estuarine and freshwater wetlands also function as storage and filter areas, trapping excess sediment and pollutants from surrounding land uses during storm runoff. Estuarine and freshwater wetlands provide a wide variety of aesthetic and recreational benefits, including fishing, shellfishing and bird watching (SCDHEC, undated).

More information on the individual wetland areas, including approximate size, dominant vegetation, indicators of hydrology, etc., and jurisdictional status and project-related impacts, is included in Section 4.0—Jurisdictional Topics.

3.4 Aquatic Plant Communities

Aquatic plant communities, including submerged aquatic vegetation (SAV) or floating plants, were observed within deepwater wetlands located in the project study area. Dominant plant species within these aquatic communities included duckweed (*Lemna* spp.), alligator weed (*Alternanthera philoxeroides*), American lotus (*Nelumbo lutea*) and cow lily (*Nuphar lutea*). An example of an aquatic plant community within the PSA can be found in the northern portion of the PSA, approximately 1,500 feet south of the Mark Clark Expressway terminus at U.S. 17.

3.5 Essential Fish Habitat

As required by the National Oceanic and Atmospheric Administration (NOAA)-National Marine Fisheries Service (NMFS) and in conformance with the Magnuson-Stevens Fishery Conservation and Management Act of 1976 and associated 1996 Sustainable Fishery Act amendments, an essential fish habitat (EFH) assessment is included. Per this act and amendments, provisions have been set forth to identify and protect important habitats of federally-managed marine and anadromous fish species and report potential project-related impacts to these habitats, including EFH. Under these provisions, federal agencies that fund, permit, or undertake project activities that may adversely affect EFH are required to consult with the NOAA-NMFS regarding the potential effects of their actions on EFH. The NMFS works with the South Atlantic Fishery Management Council (SAFMC) to minimize adverse impacts to EFH in the southeast region of the United States. The SAFMC is headquartered in Charleston, South Carolina and is one of eight regional fisheries management councils in the United States responsible for the conservation and management of fish stocks within the federal 200-mile limit off the coast of North Carolina, South Carolina, Georgia, and eastern Florida. Also involved with the management of marine fisheries in South Carolina is the Atlantic States Marine Fisheries Commission (ASMFC), a collaboration of commissioners from 15 Atlantic coastal states, which focuses on policies including interstate fisheries management and habitat conservation.

As defined in the Magnuson-Stevens Act, EFH consists of those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (16 USC 1802, 50 CFR 600.10). EFH includes the water column and the underlying substrate (e.g., seafloor) and vegetation of waterbodies. Areas designated as EFH contain habitat essential to the long-term survival and health of our nation’s fisheries.
For the purpose of interpreting the definition of EFH, "waters" includes aquatic areas and their associated physical, chemical and biological properties that are utilized by fish. When appropriate this may include areas used historically. Water quality, including but not limited to nutrient levels, oxygen concentration and turbidity levels is also considered to be a component of this definition. Examples of "waters" that may be considered EFH include open waters, wetlands, estuarine habitats, riverine habitats and wetlands hydrologically connected to productive water bodies. In the context of this definition the term "substrate" includes sediment, hard bottom, underlying structures and associated biological communities. Associated biological communities include mangroves, tidal marshes, mussel beds, cobble with attached fauna, mud and clay burrows, coral reefs and submerged aquatic vegetation. Migratory routes such as rivers and passes serving as passageways to and from anadromous fish spawning grounds should also be considered EFH. Included in the interpretation of "substrate" are artificial reefs and shipwrecks (if providing EFH), and partially or entirely submerged structures such as jetties. EFH includes those habitats that support the different life stages of each managed species. A single species may use many different habitats throughout its life to support breeding, spawning, nursery, feeding and survivability of the species (SAFMC, 1998). EFH that is judged to be particularly important to the long-term productivity of populations of one or more managed species, or to be particularly vulnerable to degradation, are identified as Habitat Areas of Particular Concern (HAPC). No HAPC were identified within the project study area (PSA).

The SAFMC currently manages eight fisheries including snapper grouper complex, coastal migratory pelagics (mackerels), dolphin and wahoo, golden crab, shrimp, spiny lobster, sargassum, and coral and live bottom habitat. Within these fisheries are approximately 89 species, excluding coral and other live bottom species, managed by the SAFMC through fishery management plans (FMPs). The SAMFC also manages red drum, one of the most popular recreational fish in the South Atlantic. For a complete list of SAFMC managed fisheries, please refer to the following http:// internet address: http://www.safmc.net/Portals/6/Regulations/SAFMC_Managed%20Species_rev2009.pdf.

The ASMFC currently manages 24 species or species groups, including red drum, spot, summer flounder, spotted seatrout, herring, and Atlantic sturgeon, through the Commission's Interstate Fisheries Management Program (ISFMP). For a complete list of ASMFC managed species, please refer to the following http:// internet address: http://www.asmfc.org/.

The NMFS manages highly migratory species, including sharks, tuna, swordfish, and billfish. For a complete list of the highly migratory species managed by the NMFS, please refer to the following http:// internet address: http://www.nmfs.noaa.gov/sfa/hms/.

The estuarine deepwater channels located within the PSA, including the Stono River, James Island Creek, Pennys Creek, and unnamed tributaries to the Stono River, were determined to contain EFH for federally-managed marine species. Specifically, EFH associated with these waterways include estuarine emergent wetlands, estuarine water column, oyster reefs and shell banks, intertidal flats, and unconsolidated bottom, as designated by the SAFMC. These categories of EFH are discussed in detail below.
Estuarine Emergent Wetlands

Estuarine wetlands are described as tidal wetlands in low-wave-energy environments. Salinity levels within these wetlands are greater than 0.5 parts per thousand (ppt) and vary due to evaporation and the mixing of seawater and freshwater. Salt marshes are estuarine wetlands and can be defined as a “natural or semi-natural salt tolerant grassland and dwarf brushwood on the alluvial sediments bordering saline water bodies whose water level fluctuates either tidal or nontidally” (Beeflink, 1977). The flora within salt marshes is comprised of erect, rooted, herbaceous hydrophytes dominated by salt-tolerant perennial plants (Cowardin, et al., 1979). The structure and functions of salt marshes are greatly influenced by tide, salinity, nutrients, and temperature. Although species diversity may be lower than in other ecosystems, salt marshes are some of the most biologically productive ecosystems in the world (Teal 1962; Teal and Teal, 1969). The high primary productivity that occurs in tidal salt marshes or estuarine emergent wetlands, combined with the transfer of detritus into the estuary from the wetlands, provides the base of the food chain supporting many marine organisms (SAFMC, 1998).

Many estuarine wetlands are drained by an intricate network of tidal creeks. These creeks and the adjacent tidal marsh serve as nursery areas for larval and juvenile finfish, crustaceans, and mollusks, and provide critical habitat for adult fish species. The tidal marsh wetlands not only provide food, structure and refuge, but also regulate the amount of freshwater, nutrient and sediment inputs into the estuary. The position of salt marsh wetlands along the margins of estuaries and their dense stands of persistent plants make salt marshes valuable for shoreline stabilization and floodwater storage during coastal storms (SAFMC, 1998).

Smooth cordgrass (Spartina alterniflora) is the dominant plant species found within estuarine emergent wetlands in the South Atlantic. Smooth cordgrass is able to tolerate highly variable salinities from seawater to freshwater, as well as saturated soils that are characteristic of twice-daily tidal flooding. The second most common plant found in estuarine emergent wetlands in the South Atlantic is black needle rush (Juncus roemerianus). Black needlerush is typically found in the higher elevations of estuarine marsh wetlands due to the plant being less salt tolerant and not as well adapted to long durations of flooding as smooth cordgrass (SAFMC, 1998).

Within the PSA, estuarine emergent wetlands are located adjacent to the Stono River, James Island Creek, Pennys Creek and unnamed tributaries to the Stono River. Estuarine emergent wetlands within the PSA provide EFH for SAFMC managed fisheries, including red drum and peneaud shrimp.

Estuarine Water Column

Depending on the distance from the ocean, the estuarine water column may consist of four salinity categories, including oligohaline (< eight parts-per-thousand {ppt}), mesohaline (eight-18 ppt), polyhaline waters (18-30 ppt) and some euhaline water (>30 ppt) around inlets. The water column is composed of horizontal and vertical components. Within the horizontal gradient, salinity levels decrease landward which strongly influence the distribution of biota, and nutrient levels tend to decrease seaward, affecting primary productivity and the distribution of phytoplankton and the organisms utilizing this primary
productivity. Within the vertical gradient, the water column may be stratified by salinity with fresh water runoff overlaying heavier salt water and dissolved oxygen levels may be lower towards the bottom due to inadequate vertical mixing. Components commonly used to describe the water column are organic matter, dissolved inorganic nitrogen, dissolved oxygen, temperature, salinity and phytoplankton. Turbidity is also an important component, which can be adversely affected by natural and man-made disturbances. Changes to turbidity in the water column, reduces light levels and photosynthesis, which in turn, affects the distribution and productivity of submerged aquatic vegetation, nutrients and phytoplankton. Many marine-spawning species utilize the estuarine water column during larval stages. Larvae of several important commercial fishes (e.g., menhaden) and managed fisheries, including shrimp, red drum and snapper/grouper complex, are transported through inlets into the thermal environment of shallow estuaries, where they thrive on blooms of plankton and a relative lack of predators. The estuarine water column is the medium of transport for nutrients and migrating organisms between creeks and rivers and the open ocean (SAFMC, 1998).

Oyster Reefs and Shell Banks
Oyster reefs and shell banks in the South Atlantic can be defined as natural structures found between (intertidal) and beneath (subtidal) the low and high tidal limits. Both intertidal and subtidal populations are found in tidal creeks and estuaries of the South Atlantic. The American or eastern oyster (Crassostrea virginica) is the dominant shellfish species found within intertidal oyster reefs. Another commercially important bivalve, the northern quahog (Mercenaria mercenaria), which provides predator protection for juvenile clams, also shares the oyster reef habitat with the eastern oyster. Oyster reefs are found at varying distances up major drainage basins, dependent upon many variables, including topography, salinity and substrate. Habitat and environmental conditions are the limiting factors controlling oyster abundance. Optimal salinity levels and temperature ranges for the eastern oyster are 12 ppt to 25 ppt and 10°C to 26°C, respectively. Intertidal oysters have often been described as the “keystone” species in an estuary (Bahr and Lanier, 1981) and provide significant surface area as habitat. Oysters filter feed and remove large amounts of particulate matter from the water column, and then release large quantities of inorganic and organic nutrients into the estuarine system (SAFMC, 1998).

The ecological role of the oyster reef as structure and providing food and protection contribute to its value as a critical or essential fish habitat. Other species that are part of the oyster reef community include clams, mussels, anemones, polychaetes, amphipods, sponges and crabs. The invertebrates recycle nutrients and organic matter, and are prey for many finfish, including red and black drum, striped bass, sheepshead, weakfish, spotted seatrout, summer and southern flounder and oysteroads. Oyster reefs in high salinity waters are also an important habitat for juveniles of managed snapper/grouper fishes, including sheepshead (Arbacia punctulata), gag grouper (Mycteroperca microlepis) and various species of snapper (Lutjanus spp.) (Wenner, et al., 1996).

Intertidal Flat
Intertidal flats are created from the combined affect of wind and wave energy (tidal currents) which deposit sediments and create exposed flats within creeks and rivers. Tidal flats are critical habitats of coastal and estuarine systems that serve as benthic nursery areas, refuges
and feeding grounds for a variety of animals, thus providing essential fish habitat. Within the PSA, intertidal flats are located adjacent to and within the Stono River. In addition, tidal flats play an important role in the ecological function of South Atlantic estuarine ecosystems, particularly in regard to primary production and water quality. The benthic microalgal community of tidal flats consists of benthic diatoms, cyanobacteria, euglenophytes and unicellular algae. Primary productivity of this community can equal or exceed phytoplankton primary production in the water column and represents a significant portion of overall estuarine primary productivity. An important aspect of the function of tidal flats is the regular ebb and flood of tides over the flats. The flooding tide brings food and predators onto the flat, while the ebb provides permanent residents a temporal refuge from the mobile predators. Intertidal flats provide essential fish habitat as: 1) nursery grounds for early stages of development of many estuarine dependent benthic organisms, 2) refuges and feeding grounds for a variety of forage species and juvenile fishes and 3) feeding grounds for a variety of specialized predators. Fishes and invertebrates that utilize intertidal flats as nurseries include flounders, red drum, spotted seatrout, mullet, gray snapper, blue crab and penaid shrimp. Red drum, in particular, can be found hunting blue crabs on flats (SAFMC, 1998).

**Unconsolidated Bottom**

Unconsolidated bottom, or soft bottom, is another essential fish habitat of estuarine waterways, including the Stono River, which provides feeding grounds for various managed fisheries, including shrimp, red drum, spiny lobster and the snapper/grouper complex of fishes. The unconsolidated bottom within the direct impact area consists mainly of mud mixed with some sand. The bottom provides both nutrient and pollutant storage and supports many benthic organisms dependent upon the habitat for survival.

As identified on the NOAA Fisheries Essential Fish Habitat Mapper, federally managed fisheries containing essential fish habitat (EFH) within the PSA include red drum and penaeid shrimp. Other federally managed species, including spiny lobster and snapper/grouper complex, are identified as having EFH within the Stono River from approximately 4,000 feet south of the PSA south to the Atlantic Ocean. Spiny lobster and snapper/grouper complex are included in this discussion as EFH for these species may be indirectly affected as a result of the proposed project. As further defined on the NOAA Fisheries Essential Fish Habitat Mapper, no Habitat Areas of Particular Concern (HAPC) are located within the direct impact area.

**Red Drum (**_Sciaenops ocellatus_**)**

EFH for red drum includes all the following habitats to a depth of 50 meters offshore: tidal freshwater; estuarine emergent vegetated wetlands (flooded salt marshes, brackish marsh and tidal creeks); estuarine scrub/shrub (mangrove fringe); submerged rooted vascular plants (sea grasses); oyster reefs and shell banks; unconsolidated bottom (soft sediments); ocean high salinity surf zones; and artificial reefs. Red drum are distributed along the Atlantic Ocean coastline, in deep offshore waters, and within estuarine areas, depending upon their life cycle stage (SAFMC, 1998).

Red drum spawn in the ocean along beaches and in the vicinity of inlets and passes and potentially in high salinity estuaries. Red drum spawn at night and produce planktonic,
spherical eggs. Red drum eggs and larvae are carried through tidal and current movement into estuarine systems. Increased spawning activity is associated with new and full moon periods during the spawning season. Estuarine wetlands, including tidal marsh, are especially important to larval red drum. Juvenile red drum utilize quiet, shallow, protected waters with grassy or slightly muddy bottoms, including backwaters, tidal creeks, tidal flats and tidal marshes of estuaries, as nursery areas and feeding grounds. As temperatures drop in tidal creeks, juvenile red drum may move to the edges of deeper channels and deep holes in the estuary. Warmer water temperatures in the spring permit juveniles to feed in the tidal areas, continuing with maturation to the subadult stage. As subadults and adults, red drum utilize shallow bay bottoms or oyster reef substrates and move to deeper water portions of the estuary associated with river mouths, oyster bars and front beaches (SAFMC, 1998). The diet of juvenile red drum includes zooplankton and invertebrates such as small crabs and shrimp. Once adults, red drum expand their diet to include fish and larger invertebrates (ASMFC, 2006).

Shrimp
Four managed shrimp species are identified as having EFH within the PSA. These shrimp species include three commercially important peneaid shrimp, including white shrimp (*Litopenaeus setiferus*), brown shrimp (*Farfantepenaeus aztecus*) and pink shrimp (*Peneaus duorarum*) as well as the rock shrimp (*Sicyonia brevirostris*). EFH for peneaid shrimp includes inshore estuarine nursery areas, offshore marine habitats used for spawning and growth to maturity and all interconnecting waterbodies. Inshore nursery areas include tidal freshwater (palustrine), estuarine and marine emergent wetlands (e.g., intertidal marshes); tidal palustrine forested areas; mangroves; tidal freshwater, estuarine and marine submerged aquatic vegetation (e.g., seagrass); and subtidal and intertidal non-vegetated flats. Estuarine tidal creeks and salt marshes serve as protective cover and nursery and feeding grounds and are perhaps the most important habitats occupied by larval and juvenile peneaid shrimp. The major factor controlling the growth and production of peneaid shrimp is the availability of nursery habitat (SAFMC, 1998). Recruitment of postlarval peneaid shrimp into estuarine habitats typically begins in February and continues through April and May. As adults, peneaid shrimp move to more saline, deeper offshore waters to spawn.

White shrimp appear to prefer muddy or peaty bottoms rich in organic matter and decaying vegetation when in inshore waters. Offshore these shrimp are most abundant on soft muddy bottoms. Brown shrimp appear to prefer a similar bottom type and as adults may also be found in areas where the bottom consists of mud, sand and shell. Pink shrimp are found most commonly on hard sand and calcareous shell bottom. Both brown and pink shrimp generally bury in the substrate during daylight, being active at night. White shrimp do not bury with the regularity of pink or brown shrimp. In South Carolina most spawning occurs within about four miles of the coast. Some shrimp with spermatophores attached have been found inside Charleston harbor. Juvenile and adult peneaids are omnivorous (eating both plants and animals) bottom feeders with most feeding activity occurring at night although daytime feeding may occur in turbid waters. The diet of peneaid shrimp consists of various invertebrates, including polychaetes, amphipods, copepods, isopods and amphipods as well as organic debris. Peneaid shrimp are also preyed upon by a wide variety of species, including crabs and finfish, at virtually all stages of their life cycle (SAFMC, 1998).
Rock shrimp are very different in appearance than peneid shrimp and can be easily separated from peneids by their thick, rigid and stony exoskeleton. Rock shrimp live on sand bottoms from a few meters to 183 meters. However, the largest concentrations are found between 25 and 65 meters. EFH for rock shrimp consists of offshore terrigenous and biogenic sand bottom habitats from 18 to 182 meters in depth with highest concentrations occurring between 34 and 55 meters (SAFMC, 1998). EFH for rock shrimp within the Stono River is limited.

**Spiny Lobster**

Essential fish habitat for spiny lobster includes: near shore shelf/oceanic waters; shallow subtidal bottom; seagrass habitat; unconsolidated bottom (soft sediments); coral and live/hard bottom habitat; sponges; algal communities (*Lauvencia*); and mangrove prop roots. In addition, the Gulf Stream is an essential fish habitat because it provides a mechanism to disperse spiny lobster larvae (SAFMC, 1998). Specifically, within the PSA, EFH for spiny lobster includes unconsolidated bottom.

Spiny lobsters begin their existence in the Florida Keys as larvae that arrive via oceanic currents. Adults move to offshore reefs to spawn, and larvae are swept up the East Coast by the Florida Current (SAFMC, 1998).

**Snapper/Grouper Complex**

The federally managed snapper/grouper complex includes 73 species of fish within ten families, including sea basses and groupers, wreckfish, snappers, porgies, grunts, jacks, tilefishes, triggerfishes, wrasses and spadefishes. The snapper/grouper complex of fishes utilizes both pelagic and benthic habitats during their life cycle. For specific life stages of estuarine dependent and nearshore snapper/grouper species, EFH includes areas inshore of the 100-foot contour, such as: attached macroalgae; submerged rooted vascular plants (seagrasses); estuarine emergent vegetated wetlands (salt marshes, brackish marsh); tidal creeks; estuarine scrub/shrub (mangrove fringe); the estuarine water column; oyster reefs and shell banks; unconsolidated bottom (soft sediments); artificial reefs; and coral reefs and live/hard bottom. Estuarine dependent species in the snapper/grouper complex include gag, lane snapper and gray snapper. The estuarine water column, specifically, is utilized by planktonic larval stages of the snapper/grouper complex, which feed on zooplankton. Juveniles and adults are typically bottom-dwelling and usually associated with hard structures on the continental shelf of deep offshore waters that have moderate to high relief, i.e., coral reefs, artificial reefs, rocky hard-bottom substrates, ledges and caves, sloping soft-bottoms and limestone outcroppings. The association of snapper/grouper complex of fishes with coral or hard bottom structure during at least part of their life cycle, and their contribution to an interrelated reef fishery ecosystem is the primary criteria for inclusion within the snapper/grouper complex. There is considerable variation in specific life history patterns and habitat use among the snapper/grouper species complex. Seventeen of the 73 species in the NMFS Fisheries Management Plan (FMP) are identified as overfished with a Spawning Potential Ratio (SPR) of <30% according to the most recent NMFS stock assessments and SAFMC Scientific and Statistical Committee (SSC) analyses. The overfished species include ten groupers, two snappers, two porgies, one grunt, one temperate bass and one tilefish (SAFMC, 1998).
Project-Related Impacts to EFH

The potential for the proposed project to impact federally managed species would vary depending on the timing and duration of in-water construction work and the life cycle, habitat use, distribution and abundance of managed species within the proposed project vicinity. Federally managed species, including red drum, brown shrimp and white shrimp, all utilize the estuarine water column, emergent wetlands and intertidal flats located within the PSA at various stages in their life histories. Spiny lobster and fishes from the snapper-grouper complex and highly migratory species, including various species of sharks, also utilize the unconsolidated bottom and estuarine water column habitats located within the PSA.

Direct Impacts

Potential direct impacts to EFH associated with the proposed project include placement of fill and shading from bridge crossings associated with the Build Alternatives. Permanent fill of estuarine emergent wetlands may be necessary for the construction of access roads and roadway approach fill slopes. Permanent fill within the estuarine water column associated with the Stono River would be necessary for the construction of bridge piers. Permanent fill of estuarine emergent wetlands would likely result in the take of benthic organisms and larval and juvenile stages of fishes and federally-managed shrimp species. During construction activities, temporary siltation from the construction of access roads and roadway approach fill slopes may occur outside of the proposed fill limits within estuarine emergent wetlands and unconsolidated bottom habitats. Benthic communities may be impacted when suspended sediments begin to settle on the floor of the estuarine habitats, thereby smothering and burying organisms (Berry, et al., 2003). Impacts to benthic organisms and larval and juvenile fish and shrimp species may in turn affect the food chain and supply for federally-managed species which prey upon them. However, due to the abundance of similar habitat within the immediate vicinity and the dispersal effect of the tides, the impacts should not affect the productivity of the area. Access roads would be stabilized and best management practices, including silt fencing, would be utilized to minimize erosion and sedimentation.

The proposed project may require the installation of temporary structures within the Stono River and associated estuarine water column. Federally managed species, including brown and white shrimp and red drum, should be able to avoid injury from the placement of these structures by relocating to another similar area. Incidental take of these species, particularly early larval and juvenile stages, may occur, but these should be relatively few and not considerably reduce any species populations. Mortality of prey species for the federally managed species may also occur, but should not notably reduce populations and availability of food.

Another potential direct impact associated with construction activities would be temporary increases in the turbidity of the estuarine water column, but normal conditions should return upon project completion. The temporary increase in turbidity to the estuarine water column would be minor as tidally influenced estuaries of the southeast Atlantic coast often receive large sediment loads from rivers and turbidity levels are relatively high naturally. Displacement and redistribution of sediments and organisms from the construction of the bridge piers and columns and the uptake and release of ballast water may also occur but
would be localized and brief. Ballasted barges with cranes may be needed to facilitate the placement of spans. The intake and release of ballast water would likely result in the take of benthic organisms, ichthyoplankton and larval and juvenile fish and shrimp species. The volume of ballast water that may be needed for the project is not known at this time, but the resulting take of marine organisms should be minor due to the abundance of habitat within the project vicinity. If required, ballasting should be conducted between November 1 and March 31 when ichthyoplankton and larval shrimp are least abundant. Ichthyoplankton is a primary food source for larval and juvenile managed species. If ballasted barges are to be used outside of this period, there is the potential for impacts to ichthyoplankton populations. However, due to the abundance of availability of similar habitat within the project vicinity, the impacts should not notably affect ichthyoplankton productivity of the area.

Indirect Impacts
Indirect impacts, including siltation and shading of estuarine emergent wetlands, estuarine water column, and unconsolidated bottom, would likely result from the proposed project by affecting thermal loading in the environment. As a result of siltation, turbidity may increase and alterations in light attenuation in the estuarine water column may occur. The resulting decrease in light attenuation may decrease visibility for organisms and affect feeding and predator avoidance. Displacement of sediments from in-water construction work may also alter the nutrient distribution, dissolved oxygen levels and primary productivity of estuarine habitats within the proposed project vicinity. However, any changes to sediment loads and nutrient levels should be minimal and short-term.

Shading of estuarine emergent wetlands and the estuarine water column would result from the construction of the new bridge. An increase in shaded areas will decrease the availability of light which, in turn, will decrease the underlying productivity of benthic and vegetative communities (SAFMC, 1998).

4.0  JURISDICTIONAL TOPICS

4.1  Waters of the U.S.

Jurisdictional waters of the U.S. are defined by 33 CFR 328.3(b) and regulated by Section 404 of the Clean Water Act (33 U.S.C. 1344), which is administered and enforced in South Carolina by the U.S. Army Corps of Engineers (USACE), Charleston District. The term "waters of the U.S." is defined in 33 CFR Part 328 as:

1. All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
2. All interstate waters including interstate wetlands;
3. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:
   - Which are or could be used by interstate or foreign travelers for recreational or other purposes; or
Natural Resources Technical Memorandum
Mark Clark Expressway Extension from U.S. 17 to SC 30
Charleston County, South Carolina

- From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
- Which are used or could be used for industrial purpose by industries in interstate commerce;

4. All impoundments of waters otherwise defined as waters of the United States under the definition;
5. Tributaries of waters identified in paragraphs 1 – 4 above;
6. The territorial seas; and
7. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in 1 – 6 above.

Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of the Clean Water Act (other than cooling ponds as defined in 40 CFR 123.11(m) which also meet the criteria of this definition) are not waters of the United States. Waters of the U. S. do not include prior converted cropland. Notwithstanding the determination of an area’s status as prior converted cropland by any other federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with the Environmental Protection Agency.

Wetlands are defined as those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Jurisdictional wetlands are defined in the field as areas that display positive evidence of three environmental parameters including dominance of hydrophytic vegetation, wetland hydrology, and hydric soils (Environmental Laboratory, 1987).

The boundaries of jurisdictional waters of the U.S. were delineated by STV/RWA, WSA and the USACE from October 5th to October 16th, 2009. Jurisdictional wetland areas were determined using the Routine On-Site Determination Method as defined in the 1987 Corps of Engineers Wetland Delineation Manual (Environmental Laboratory, 1987) and the Atlantic and Gulf Coastal Plain Regional Supplement to the Manual (Environmental Laboratory, 2008). Jurisdictional determination and field verification of wetland boundaries was conducted by the USACE in concurrence with the delineation.

Jurisdictional waters of the U.S. identified within the PSA include the following (Appendix A, Figures 4 through 7):

- Tidal Salt Marsh or Estuarine Wetlands
- Freshwater Wetlands
- Stono River
- James Island Creek
- Pennys Creek
- Unnamed Saltwater Streams or Tributaries to the Stono River
- Unnamed Freshwater Streams or Tributaries
- Freshwater Ponds

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Representative photographs of the jurisdictional waters of the U.S. located within the PSA are included in Appendix C.

4.1.1 Wetlands

The USFWS *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin, et al., 1979) was reviewed to further define the wetlands located within the proposed project study area (PSA). Cowardin uses a coding classification system, which consists of a series of letters and numbers that categorize and distinguish the different types of marine and freshwater wetlands and deepwater habitats of the United States. The different categories or types of wetlands are further broken down by characteristics, including hydrology, vegetative composition and man-induced impairments (i.e., ditching). Prior to conducting fieldwork, STV/RWA reviewed National Wetlands Inventory (NWI) maps on the U.S. Fish and Wildlife Service (USFWS) NWI Wetlands Mapper via the internet (USFWS, 2007a). Wetlands depicted on the NWI Wetlands Mapper within the PSA include Freshwater Emergent Wetland, Freshwater Forested/Shrub Wetland, Freshwater Pond, Estuarine and Marine Wetland and Estuarine and Marine Deepwater. The Cowardin classification coding system and letters and numbers used to define the USFWS NWI wetland types and subtypes are summarized in Appendix D.

The various NWI wetland types and associated Cowardin Classification Codes of wetlands located within the PSA are listed below in Table 1.

<table>
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<th>NWI Wetland Subtype and Cowardin Code</th>
<th>Freshwater Emergent Wetland</th>
<th>Freshwater Forested/Shrub Wetland</th>
<th>Freshwater Pond</th>
<th>Estuarine and Marine Wetland</th>
<th>Estuarine and Marine Deepwater</th>
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<td>E2EMIN</td>
<td>E1UBL</td>
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Reference: NWI wetland areas obtained by overlaying the NWI layer and project study area layer in GIS. NWI GIS data layers provided by Wilbur Smith Associates (July 2009).

The Estuarine System includes deepwater habitats and adjacent tidal wetlands that are usually semi-enclosed by land but have some access to the open ocean. Ocean waters in estuarine areas are at least occasionally diluted by freshwater runoff from surrounding lands.
The Estuarine System extends (a) upstream and landward to a point where salinity measures less than 0.5 parts per thousand during average annual low flow, (b) to the imaginary line closing the mouth of a river, bay, or sound, and (c) to the seaward limit of wetland vegetation not included in (b). Estuarine water regimes and water chemistry may be affected by ocean tides, precipitation, runoff, evaporation and wind. Subtidal estuarine areas, including the Stono River, James Island Creek and Pennys Creek, are continuously submerged. Intertidal areas, including the tidal salt marshes or estuarine wetlands located within the PSA, are comprised of substrate that is regularly exposed and flooded by tides (Cowardin, 1979).

Approximately 312 acres of estuarine wetlands or tidal salt marsh are located within the PSA immediately adjacent to estuarine channels, including the Stono River, Pennys Creek and James Island Creek (Appendix A, Figures 4 through 7). Dominant vegetation within the estuarine wetlands consisted of smooth cordgrass (Spartina alterniflora). Other vegetation observed included saltmeadow cordgrass (S. patens), seashore saltgrass (Distichlis spicata), sea oxeeye (Borrichia frutescens), and Virginia glasswort (Salicornia virginica). Wetland hydrology indicators within the estuarine wetlands included drainage patterns and soils inundated to saturated within 12 inches of the surface. Hydric soil indicators, including low chroma soils and high organic content, were also observed throughout the salt marsh wetlands. Salt marsh wetlands typically contain soil categorized as a histic epipedon, which is defined in the 1987 Corps of Engineers Wetland Delineation Manual as “an 8- to 16-inch layer at or near the surface of a mineral hydric soil that is saturated with water for 30 consecutive days or more in most years and contains a minimum of 20 percent organic matter when no clay is present or a minimum of 30 percent organic matter when clay content is 60 percent or greater.” Elements of Salt Flat, Salt Marsh, and Salt Shrub Thicket habitats, as defined by Nelson in The Natural Communities of South Carolina: Initial Classification and Description (1986), were observed within the estuarine wetlands.

Approximately 69 acres of freshwater wetlands are located within the PSA. Three different freshwater wetland subtypes, including forested, scrub-shrub and emergent herbaceous, were identified within the PSA. Dominant vegetation within the freshwater wetlands varied depending on the wetland type, location, degree of wetness and dominant strata layer. Dominant vegetation within the forested wetland subtype included laurel oak, live oak, Atlantic white cedar, loblolly pine, red bay, swamp chestnut oak, swamp black gum, American holly, water oak, sweet gum, red maple, southern magnolia, sweetbay magnolia, fetterbush, wax myrtle, saw greenbrier, laurel-leaf greenbrier, Chinese privet, dwarf palmetto, southern lady fern, giant cane, royal fern, sensitive fern (Onoclea sensibilis), netted chain fern, cinnamon fern, slender spikegrass, supplejack, lizard's tail and poison ivy. Elements of Non-Alluvial Swamp Forest, Bald Cypress-Tupelo Gum Swamp, Bottomland Hardwoods, Mesic Mixed Hardwood Forest and Southern Mixed Hardwood Forest habitats, as defined by Nelson in The Natural Communities of South Carolina: Initial Classification and Description (1986), were observed within the forested freshwater wetland subtype. An example of the forested wetland subtype within the PSA can be found in the west central portion of the PSA, approximately 2,000 feet east-northeast of the intersection of SC 700 (Maybank Highway) and River Road.
Scrub-shrub freshwater wetlands have typically been logged within five to ten years and vegetation can be very dense. Tree saplings and shrubs are the dominant stratum within the scrub-shrub wetlands. Herbaceous groundcover within the forested and scrub-shrub wetland subtypes was sparse to dense depending on sunlight penetration. Dominant vegetation within the scrub-shrub wetland subtype included sweetgum, red maple, eastern false willow, marsh elder (*Iva frutescens*), wax myrtle, narrow-leaf cattail, black needle rush, soft rush, coastal-plain willow and sugar cane plume grass (*Eriachthus giganteus*). Elements of Non-Alluvial Swamp Forest, Mesic Mixed Hardwood Forest, Brackish Marsh and Salt Shrub Thicket habitats, as defined by Nelson in *The Natural Communities of South Carolina: Initial Classification and Description* (1986), were observed within the scrub-shrub freshwater wetland subtype. An example of the scrub-shrub wetland subtype within the PSA can be found in the southeastern portion of the PSA within a disturbed utility right of way, approximately 800 feet southwest of the intersection of Riverland Drive and Camp Road.

Dominant vegetation within the emergent herbaceous freshwater wetland subtype included soft rush, black needle rush, big-head rush (*Juncus regius*), smartweed, maidencane (*Phragmites australis*), narrow-leaf cattail, sugar cane plume grass, eastern false willow, wax myrtle and coastal-plain willow. Wetland hydrology indicators within the freshwater wetlands included water-stained leaves, sediment deposits, drainage patterns, and soils inundated to saturated within 12 inches of the surface. Hydric soil indicators, including low chroma soils and redox concentrations, were also observed throughout the freshwater wetlands. Elements of Tidal Freshwater Marsh and Brackish Marsh habitats, as defined by Nelson in *The Natural Communities of South Carolina: Initial Classification and Description* (1986), were observed within the emergent herbaceous freshwater wetland subtype. An example of the emergent herbaceous wetland subtype within the PSA can be found in the southwestern portion of the PSA within a linear ditch feature, located approximately 4,000 feet southwest of the intersection of SC700 (Maybank Highway) and River Road.

### 4.1.2 Streams and Deepwater Habitats

Streams and deepwater habitats within the proposed project study area (PSA) include the Stono River, James Island Creek, Pennys Creek and unnamed tributaries to the Stono River. These are discussed in detail below:

**Stono River**

The Stono River is a subtidal, estuarine deepwater and the main drainage located within the PSA. The Stono River crosses through the PSA twice and forms the boundary between James Island and Johns Island. The Stono River flows in a general east and west direction through the northwestern portion of the PSA and in a general north and south direction through the central and southeastern portion of the PSA for approximately 1,410 linear feet (49 acres). Within the PSA, the Stono River measures approximately 750 to 1,500 feet in width. The Stono River accepts considerable drainage from other tidally-influenced estuarine deepwater channels, including James Island Creek, Pennys Creek, and unnamed tributaries, within the PSA and drains south of the PSA out to the Atlantic Ocean. The mouth of the Stono River is located between Kiawah Island and Folly Beach.
Pennys Creek
Pennys Creek is a subtidal, estuarine deepwater located within the western portion of the PSA on Johns Island. Pennys Creek is a tributary to the Stono River and flows in a general east and west direction through the PSA for approximately 2,064 linear feet (3 acres). Within the PSA, Pennys Creek measures approximately 50 to 100 feet in width. The confluence of Pennys Creek with the Stono River is located approximately 750 feet south of the Maybank Highway bridge over the Stono River.

James Island Creek
James Island Creek is a subtidal, estuarine deepwater located within the eastern portion of the PSA on James Island. James Island Creek flows in a general northeast and southwest direction between the Stono River and the Ashley River, located east of the PSA. Within the PSA, James Island Creek flows for approximately 1,000 linear feet (1.5 acres) and measures approximately 25 to 150 feet in width. Key road intersections with James Island Creek within the PSA include Riverland Drive and Folly Road.

Unnamed Tributaries to the Stono River
As identified from the field reviews and on aerial photography, there are several unnamed subtidal, estuarine deepwater tributaries to the Stono River located within the PSA. Within the PSA, these unnamed tributaries measure approximately 7,611 linear feet (56 acres) and 25 to 100 feet in width.

4.1.3 Potential Impacts and Alternatives Analysis

Potential impacts to jurisdictional waters of the U.S., including wetlands and streams, would be unavoidable due to the nature and location of the Build Alternatives. Potential impacts to jurisdictional waters of the U.S. would include the temporary and permanent clearing of vegetation and the placement of structures and fill material. Only clean fill material would be used for the filling of wetlands for the construction of roadbeds, causeways and bridge abutments. Vegetation cleared from the wetlands would be permanent in areas where structures are proposed and temporary along roadsides and out to the location of sediment and erosion control silt fencing. Temporary cleared areas would be reseeded with native wetland plant species.

Some wetland areas may be permanently altered to a different wetland type to meet the maintenance requirements of the proposed roadways, culverts and bridges. The bridging of forested wetlands may necessitate the permanent removal of tree species from the wetland, since trees growing under or near a bridge could potentially cause damage to the structure. In this case, altering a forested wetland to an emergent herbaceous wetland would change the available wildlife habitat but still provide many of the wetland functions that benefit the environment.

To calculate potential impacts to jurisdictional waters of the U.S. associated with each of the build alternatives, the preliminary construction limits for each Build Alternative was overlain onto the delineated wetland boundaries within the proposed project study area (PSA). For purposes of this analysis, it was assumed that all of the wetlands within the construction corridor would be filled, unless the wetlands were part of a major channel or drainageway.
crossing which would be bridged (i.e., Stono River and associated estuarine wetlands). The use of bridges at the major drainageway crossings would minimize fill impacts to abutting wetlands and streams. Each of the Build Alternatives would require two crossings of the Stono River. Some of the alternatives would also require the crossing of James Island Creek and Pennys Creek. Wetlands are located throughout the PSA, and each of the build alternatives being considered would impact wetlands. Alternative B would have the greatest amount of total direct wetland impacts (29.39 acres), and Alternative F would have the least amount of wetland impacts (15.85 acres). Table 2 below summarizes the potential direct jurisdictional impacts associated with the construction of each proposed Build Alternative.

<table>
<thead>
<tr>
<th>Water of the U.S.</th>
<th>Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estuarine Wetlands (acres)</td>
<td>A  B  C  D  E  F  G</td>
</tr>
<tr>
<td>5.41</td>
<td>2.68  4.55  5.58  5.56  0.98  3.32</td>
</tr>
<tr>
<td>Freshwater Wetlands (acres)</td>
<td></td>
</tr>
<tr>
<td>11.14</td>
<td>25.95  12.34  20.64  17.81  14.54  13.33</td>
</tr>
<tr>
<td>Freshwater Ponds (acre)</td>
<td></td>
</tr>
<tr>
<td>0.24</td>
<td>0.26  N/A  0.14  0.14  N/A  0.35</td>
</tr>
<tr>
<td>Freshwater Streams or Tributaries (acre)</td>
<td></td>
</tr>
<tr>
<td>0.32</td>
<td>0.5  0.32  0.54  0.54  0.33  0.43</td>
</tr>
<tr>
<td>Total Waters of the U.S. Impacts (acres)</td>
<td></td>
</tr>
<tr>
<td>17.11</td>
<td>29.39  17.21  26.9  24.05  15.85  17.43</td>
</tr>
</tbody>
</table>

Reference: Direct impact areas calculated by overlaying the STV/RWA, WSA, and USACE delineation layers (October, 2009) onto the preliminary construction limits for each proposed new location Build Alternative in GIS (WSA, 2009).

Indirect impacts, including shading from bridges, would be expected to jurisdictional waters of the US., including open saltwater channels (Stono River, James Island Creek, Pennys Creek and unnamed tributaries) and estuarine and freshwater wetlands. Indirect impacts to wetlands and open water channels were estimated based on the proposed Build Alternative alignments and the wetland delineations conducted within the PSA. Alternative A would have the greatest amount of total indirect shading wetland impact (149.9 acres) and Alternative G would have the least amount of impact (88.74 acres). The following Table 3 summarizes the estimated shading impact to estuarine and freshwater wetlands associated with each proposed new location Build Alternative.
Table 3
Indirect Impacts (Shading) to Jurisdictional Waters of the U.S.
By Build Alternative

<table>
<thead>
<tr>
<th>Water of the U.S.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
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</thead>
<tbody>
<tr>
<td>Open Saltwater</td>
<td>20.81</td>
<td>18.85</td>
<td>20.58</td>
<td>20.69</td>
<td>20.69</td>
<td>15.64</td>
<td>15.82</td>
</tr>
<tr>
<td>(acres)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estuarine Wetlands</td>
<td>121.76</td>
<td>93.4</td>
<td>102.73</td>
<td>108.67</td>
<td>104.81</td>
<td>73.54</td>
<td>69.64</td>
</tr>
<tr>
<td>(acres)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freshwater Wetlands</td>
<td>7.33</td>
<td>3.9</td>
<td>6.18</td>
<td>5.46</td>
<td>5.43</td>
<td>3.01</td>
<td>3.28</td>
</tr>
<tr>
<td>(acres)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Waters of the</td>
<td>149.9</td>
<td>116.15</td>
<td>129.49</td>
<td>134.82</td>
<td>130.93</td>
<td>92.19</td>
<td>88.74</td>
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<td>U.S. Impacts (acres)</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Reference: Indirect impacts calculated by overlaying the STV/RWA, WSA, and USACE delineation layers (October, 2009) onto the preliminary bridge construction location/lengths for each alternative in GIS (WSA, 2009).

4.2 Permitting

A Department of the Army permit would be required for impacts to jurisdictional waters of the U.S., including wetlands, as well as to navigable waters of the U.S. associated with the proposed project. Section 404 of the Clean Water Act (CWA) is administered by the U.S. Army Corps of Engineers (USACE) and regulates the discharge of dredged or fill material into waters of the U.S. Under Section 404, the USACE also regulates/permits impacts to Section 10 Traditional Navigable Waters (TNWs). Section 10 TNWs located within the project study area (PSA) include the Stono River and associated estuarine tributaries and wetlands. Depending on the type and extent of jurisdictional waters of the U.S., including wetlands, to be impacted, Department of the Army permitting requirements can range from activities that are considered exempt or preauthorized, to those requiring pre-construction notification (PCN) for a Nationwide Permit (NWP) or requiring a Section 404 Individual Permit (IP) from the USACE. Section 10 of the Rivers and Harbors Act of 1889 requires approval prior to the accomplishment of any work in or over navigable waters of the U.S., or which affects the course, location, condition or capacity of such waters. Section 10 is also administered by the USACE.

In addition to the Department of the Army permit, a Section 401 Water Quality Certification (WQC) and Coastal Zone Management Act (CZMA) Consistency Determination from the South Carolina Department of Health and Environmental Control (SCDHEC) Office of Ocean and Coastal Resource Management (OCRM) would be required. The PSA is located in a 'Critical Area', which is defined by the SCDHEC OCRM as any of the following: 1) coastal waters; 2) tidelands; 3) beach/dune systems; and 4) beaches. Therefore, application to OCRM for a 'Critical Area' permit would also be required. Because the proposed project is in a 'Critical Area', the 'Critical Area' permit would also serve as the Section 401 WQC.

The coastal zone, as defined by SCDHEC OCRM, includes the coastal waters and submerged bottoms seaward to the state’s jurisdictional line as well as the lands and waters of the eight South Carolina coastal counties, including Charleston County. Also included in
the state’s CZMA program are Geographic Areas of Particular Concern (GAPC), which includes areas of such importance as to merit special consideration during the OCRM’s review of permit applications. GAPC’s consist of: 1) areas of unique natural resource value; 2) areas where activities, development, or facilities depend on proximity to coastal waters, in terms of use or access; and 3) areas of special historical, archeological or cultural significance. Identification of GAPC within the PSA would be conducted by the OCRM during the permitting phase of the proposed project. It should also be noted that the field delineated landward extent of tidal influence, also known as the critical area boundary, is pending field verification by the OCRM.

Pursuant to Section 9 of the Rivers and Harbors Act, Coast Guard bridge permits would be required for the two proposed bridge crossings over the Stono River. The bridge permits are obtained from the U.S. Department of Homeland Security, U.S. Coast Guard Seventh District, headquartered in Miami, Florida. Important considerations for proposed bridges over the Stono River, which comprises part of the Atlantic Intracoastal Waterway (AIWW), would be bridge heights and navigational clearances. Additionally, a State Construction in Navigable Waters permit from the SCDHEC would also be required for bridge construction over the Stono River as well as other navigable waters of the state in the PSA.

Additionally, a State Construction in Navigable Waters permit from the SCDHEC OCRM would also be required for bridge construction over the Stono River, as well as other navigable waters of the state in the PSA. State navigable waters are defined in South Carolina as “waters which are navigable, have been navigable, or can be navigable by removal of incidental obstructions by rafts of lumber or timber by small pleasure or sport fishing boats. These waters are below the mean high water line in tidally influenced areas or below the ordinary high water mark in non-tidal areas” (Article 14, Section 4 of the S.C. Constitution, 49-1-10 1976).

Based on the potential impacts identified above, an IP from the USACE would be required for the Project. The IP process involves a more rigorous, time-consuming review process and it is not uncommon for the regulatory processing of an IP application to take six months or more.

A state stormwater management permit for the proposed project would also be required by the SCDHEC. The permittee would comply with best stormwater management practices and provide a plan for the maintenance of stormwater runoff during construction of the proposed project and following project completion. The stormwater program requires the development and implementation of a plan in an effort to control stormwater runoff and sediment from entering water bodies of the State and adversely affecting water quality.

Specific permitting requirements and strategies for the proposed project would be determined once impacts to jurisdictional waters (i.e., wetlands, streams and/or critical areas) are quantified following establishment of proposed project construction limits. Pursuant to Section 404, regulated discharges would include, but are not necessarily limited to, the placement of fill material, riprap, pipes, culverts, etc., into waters of the U.S. The permit application would include a delineation of affected waters of the U.S., including wetlands, as
well as a description of impact avoidance and minimization strategies, and an extensive alternatives analysis.

Compensatory Mitigation
Compensatory mitigation is normally required to offset unavoidable losses of waters of the U.S. The Council on Environmental Quality (CEQ) has defined mitigation in 40 CFR Part 1508.20 to include: avoiding impacts, minimizing impacts, rectifying impacts, reducing impacts over time, and compensating for impacts. Three general types of mitigation include avoidance, minimization and compensatory mitigation. Compensatory mitigation consists usually of the restoration of existing degraded wetlands or waters, or the creation of wetlands/waters of equal or greater value than those to be impacted. This type of mitigation is only undertaken after avoidance and minimization actions are exhausted and should be undertaken, when practicable, in areas near the impact site (i.e., on-site compensatory mitigation). The USACE typically requires compensatory mitigation for any wetland impacts for which a Section 404 permit application is submitted. In addition, it is anticipated that mitigation would also be required for temporary construction-related impacts due to the expected duration of these impacts, as well as for permanent shading impacts associated with low-rise bridges/structures.

It is anticipated that compensatory mitigation for permanent project impacts will be attained through purchase of mitigation credits from an approved SCDOT mitigation bank and/or similar approved private mitigation bank. However, specific mitigation requirements will be established during the Section 404 permitting process.

5.0 THREATENED AND ENDANGERED SPECIES

The Federal Endangered Species Act (ESA) of 1973, as amended, is the federal regulatory tool that serves to administer permits, implement recovery plans, and monitor listed endangered and threatened species. Through federal action and by encouraging the establishment of state programs, the ESA provides for the conservation of ecosystems upon which threatened and endangered species of fish, wildlife, and plants depend. The ESA:

- authorizes the determination and listing of species as endangered and threatened;
- prohibits unauthorized taking, possession, sale, and transport of endangered species;
- provides authority to acquire land for the conservation of listed species, using land and water conservation funds;
- authorizes establishment of cooperative agreements and grants-in-aid to States that establish and maintain active and adequate programs for endangered and threatened wildlife and plants;
- authorizes the assessment of civil and criminal penalties for violating the Act or regulations; and
• authorizes the payment of rewards to anyone furnishing information leading to arrest and conviction for any violation of the Act.

The USFWS and the National Marine Fisheries Service administer the ESA. Additional protection for marine mammal species is afforded under the Marine Mammal Protection Act (MMPA) of 1972 as amended (16 U.S.C. 1361 et seq.). The MMPA is administered and enforced by the NOAA Office of Protected Resources and prohibits, with certain exceptions, the “take” of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the U.S.

Species with the federal classification of Endangered (E), Threatened (T) or Threatened due to Similarity of Appearance (T [S/A]) are federally protected under the ESA of 1973, as amended (16 U.S.C. 1531 et seq.). The term “endangered species” is defined as “any species which is in danger of extinction throughout all or a significant portion of its range”, and the term “threatened species” is defined as “any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range” (16 U.S.C. 1532). The term “proposed” is defined as “any species proposed for official listing as endangered or threatened.” “Federal species of concern” (FSC) are defined as “species that may or may not be listed in the future; or a species under consideration for listing for which there is insufficient information to support listing.” “Candidate” (C) species are taxons under consideration for which there is insufficient information to support a listing. The FSC and C designations provide no federal protection under the ESA but are included in this discussion.

Plant and animal species that are on the South Carolina state protected species list receive state protection under the South Carolina Nongame and Endangered Species Conservation Act (South Carolina Code, Title 50). Endangered species are defined as any species or subspecies of wildlife whose prospects of survival or recruitment within the State are in jeopardy or are likely within the foreseeable future to become so. It is unlawful for any person to take, possess, transport, export, process, sell or offer for sale or ship, and for any common or contract carrier knowingly to transport or receive for shipment any species or subspecies of wildlife appearing on the State list of protected species without appropriate authorization.

A search of the USFWS database provided existing information concerning the potential occurrence of threatened and endangered species, federal species of concern and candidate species within Charleston County. As of March 2009, this database identifies 17 federally threatened or endangered species that are known to occur or have formerly occurred in Charleston County (USFWS, 2009), as listed in Table 4. This list includes bald eagle (Haliaeetus leucocephalus) which is no longer protected by the Federal Endangered Species Act but is afforded protection through the Bald and Golden Eagle Protection Act (USFWS, 2007b). The West Indian manatee (Trichechus manatus), a federally endangered species listed for Charleston County, is also afforded protection under the MMPA.

The SCDNR Rare, Threatened, and Endangered Species Inventory database (last updated January 17, 2006) was also reviewed for information regarding protected species listed in Charleston County with state threatened or endangered status. As of January 17, 2006,
sixteen state protected species are currently listed in Charleston County (Table 4), including nine that are also federally protected (SCDNR, 2006). The SCDNR database of known protected species occurrences, last updated January 17, 2006, was also reviewed for the presence of known populations or individual sightings. This database revealed no known populations or individuals of protected species within the proposed project study area. Additionally, no other reported occurrences of protected species have been recorded within a one-mile radius of the proposed project study area. However, a population of nesting wood storks (Mycteria americana), a state and federal protected species, are known to be present south of the proposed project study area within Dill Sanctuary on James Island. The wood stork nests are located on small forested islands contained within a freshwater pond, located approximately 300 feet south of James Island Creek and 2,500 feet from the Stono River.
## Table 4
Charleston County Federal and/or State Listed Threatened or Endangered Species

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>State Status</th>
<th>Federal Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shortnose sturgeon</td>
<td>Acipenser brevirostrum</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>Seabean amaranth</td>
<td>Amaranthus pumilus</td>
<td>T</td>
<td>T</td>
</tr>
<tr>
<td>Flatwoods salamander</td>
<td>Ambystoma cingulatum</td>
<td>E</td>
<td>T</td>
</tr>
<tr>
<td>Loggerhead sea turtle</td>
<td>Caretta caretta</td>
<td>T</td>
<td>T</td>
</tr>
<tr>
<td>Piping plover</td>
<td>Charadrius melodus</td>
<td>-</td>
<td>T, CH</td>
</tr>
<tr>
<td>Wilson's plover</td>
<td>Charadrius wilsonia</td>
<td>T</td>
<td>-</td>
</tr>
<tr>
<td>Spotted turtle</td>
<td>Clemmys guttata</td>
<td>T</td>
<td>-</td>
</tr>
<tr>
<td>Green sea turtle</td>
<td>Chelonia mydas</td>
<td>-</td>
<td>T</td>
</tr>
<tr>
<td>Rafinesque’s big-eared bat</td>
<td>Corynorhinus rafinesquii</td>
<td>E</td>
<td>SC</td>
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<tr>
<td>Kirtland’s warbler</td>
<td>Dendroica kirtlandii</td>
<td>-</td>
<td>E</td>
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<tr>
<td>Leatherback sea turtle</td>
<td>Dermochelys coriacea</td>
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<td>E</td>
</tr>
<tr>
<td>American swallow-tailed kite</td>
<td>Elanoides forficatus</td>
<td>E</td>
<td>-</td>
</tr>
<tr>
<td>Bald eagle</td>
<td>Haliaeetus leucocephalus</td>
<td>E</td>
<td>BGEPA</td>
</tr>
<tr>
<td>Kemp’s ridley sea turtle</td>
<td>Lepidochelys kempii</td>
<td>-</td>
<td>E</td>
</tr>
<tr>
<td>Pondberry</td>
<td>Lindera melissifolia</td>
<td>-</td>
<td>E</td>
</tr>
<tr>
<td>Wood stork</td>
<td>Mycteria americana</td>
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<td>E</td>
</tr>
<tr>
<td>Canby’s dropwort</td>
<td>Oxypolis canyi</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>Red-cockaded woodpecker</td>
<td>Picoidees borealis</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>Dwarf siren</td>
<td>Pseudobranchus striatus</td>
<td>T</td>
<td>-</td>
</tr>
<tr>
<td>Gopher frog</td>
<td>Rana capito</td>
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<td>SC</td>
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<tr>
<td>Chaffseed</td>
<td>Schwaluca americana</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>Least tern</td>
<td>Sterna antillarum</td>
<td>T</td>
<td>-</td>
</tr>
<tr>
<td>West Indian manatee</td>
<td>Trichechus manatus</td>
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<td>E</td>
</tr>
<tr>
<td>Bachman’s warbler</td>
<td>Vermivora bachmani</td>
<td>-</td>
<td>E</td>
</tr>
</tbody>
</table>

Reference: List of federal and state protected species and associated protection status obtained from USFWS database (updated March 2009) and SCNR database (updated January 2006).

T = Threatened, E = Endangered, SC = Species of Concern, CH = Critical Habitat

BGEPA = Bald and Golden Eagle Protection Act

As of March 2009, the USFWS database identifies 30 federal species of concern and one candidate species for listing for Charleston County (USFWS, 2009). Additionally, the SCNR database identifies 82 species of state concern, regional concern, or national concern in Charleston County, including fifteen that are also federal species of concern (SCNR, 2006). These state and federal species of concern and candidate species are included in Appendix E.
Endangered and threatened species and their respective habitats are briefly described below:

**Shortnose sturgeon** (*Acipenser brevirostrum*) - The shortnose sturgeon is an anadromous fish species which spends most of the year in brackish or salt water and moves into fresh water only to spawn. Spawning season for the shortnose sturgeon occurs from late winter to early spring. The shortnose sturgeon is dark-colored on its dorsal side and light on the ventral side. This species of sturgeon has a wide mouth pointed downward beneath a short snout and can grow up to three feet long. The sides of its body contain five rows of sharp, pointed plates. The shortnose sturgeon inhabits the lower portions of large rivers and coastal rivers along the Atlantic Coast.

**Seabeach amaranth** (*Amaranthus pumilus*) - Seabeach amaranth is an annual herbaceous plant found on Atlantic barrier island beaches, where its primary habitat consists of overwash flats and the lower foredunes of beaches. The plant is intolerant of competition and does not occur in densely vegetated areas. The stems of seabeach amaranth are fleshy and reddish in color, while the leaves are small and round and approximately one inch in diameter. Seabeach amaranth grows in clumps up to a meter across in diameter. Flowers and fruits are relatively inconspicuous, borne in clusters along the stems. Flowering occurs in early summer, and fruits are produced in late summer.

**Flatwoods salamander** (*Ambystoma cingulatum*) - The flatwoods salamander is a small ambystomid salamander containing variable coloration, ranging from dark brown to black bodies with specks to grayish lines that resemble a frosted or lichen-like reticulated pattern. Habitat consists of wet pine flatwoods and pine savannas in the southern U.S. Traditionally, habitat consisted of sandy, seasonally wet longleaf pine communities but since European settlement, these areas have been replaced with slash pine or destroyed altogether. Adult flatwood salamanders are subterranean, living mainly underground in root channels or crayfish burrows. These salamanders are typically found under logs near small cypress ponds.

**Loggerhead sea turtle** (*Caretta caretta*) - The loggerhead sea turtle, South Carolina's state reptile, has a dark reddish-brown carapace and yellow plastron. The loggerhead has a large skull with strong jaw muscles for crushing conchs and crabs. The major nesting area for the loggerhead in the western Atlantic is open beaches of the southeastern United States, including South Carolina. In South Carolina, the primary nesting beaches are between North Inlet and Prices’ Inlet, but other beaches along the southern part of the state are also used in moderate densities. The nesting season runs from mid-May to mid-August. In the winter, loggerheads leave the cold coastal waters and are often seen along the western edge of the Gulf Stream.

**Piping plover** (*Charadrius melodus*) - The piping plover is a small and stocky sparrow-sized bird which reaches approximately seven to eight inches in height. The piping plover is pale or sandy white with a black breast band and yellow bill and legs. Breeding birds have a prominent black collar and black band that runs across the forehead. The piping plover inhabits sandy beaches, mudflats and sandbars along rivers and lakes. In South Carolina, the piping plover occurs from August to April and generally overwinters in the southern United States from North Carolina to the Gulf of Mexico. The breeding range of the piping plover
extends from Newfoundland to North Carolina where it lays nests in shallow depressions on
the beach near the dune line.

**Wilson’s plover** (*Charadrius wilsonia*) - The Wilson’s plover is a small, banded plover
with dull legs and a distinctive long, heavy, black bill. Its heavy black bill distinguishes this
species from the other similar looking plovers found in the same habitats. Breeding plumage
consists of a single complete black band across a white breast, a brown back and
predominately brown head, and a white collar separating the back from the head. Habitat is
strictly coastal including open sand or shell beaches and tidal mud flats where it forages
for fiddler crabs and other crustaceans. Nesting habitat includes areas near the beach
containing sand or bare soil and salt or brackish water nearby.

**Spotted turtle** (*Clemmys guttata*) - The spotted turtle is small, only reaching lengths of up
to five inches. The shell or carapace is black and sprinkled with numerous orange-yellow
dots. The head and neck also has orange-yellow blotches. The spots on the carapace of
juveniles may be less obvious or absent. The spotted turtle is a semi-aquatic species that
inhabits a variety of wetland types including small shallow ponds, small streams, swamps,
and flooded forests.

**Green sea turtle** (*Chelonia mydas*) - Green sea turtles, the second largest sea turtle, get
their name from the color of their fat. The shell, or carapace, of mature green sea turtles is a
grayish color. These turtles are herbivorous and forage on pastures of turtle grasses.
Primary nesting areas for the green sea turtle in the western Atlantic include Tortuguerro,
Costa Rica and south-central Florida. Juveniles, approximately 11 to 15 inches in length, are
found along the South Carolina coast in shallow creeks, bays, and salt marshes, where they
feed on epiphytic green algae such as sea lettuce.

**Rafinesque’s big-eared bat** (*Corynorhinus rafinesquii*) - Rafinesque’s big-eared bat is a
medium-sized bat up to five inches in length. This bat is brown in color with white-tipped
fur on its belly. The species gets its name from its large ears, approximately 1.25 inches long.
Two large, conspicuous glands are located on either side of the nose. The species can be
found in nearly all forest types within its range but tend to concentrate more heavily in
forested swamps. Roosting sites consists of artificial and natural habitats, including
unoccupied buildings or hollowed-out tree cavities, especially black gum trees, near water.
Occurrences of roosts under bridges have also been documented. In some areas,
hibernating bats can be found in caves, wells, and other similar habitats. Foraging habitat
includes the foliage and surrounding air space of swampland trees.

**Kirtland’s warbler** (*Dendroica kirtlandii*) - The Kirtland’s warbler is a rare bird found in
the fire-dependent Michigan state jack pine forests. Michigan state in the U.S. is the only
known breeding range for the Kirtland’s warbler where it nests in small jack pines. The jack
pine requires fire to open its heat-sensitive cones, which allows for seed dispersal. The bird
migrates to the Bahamas and other nearby Caribbean Islands for the winter. On its return to
Michigan in the summer, the Kirtland’s warbler travels through South Carolina where
sightings are rare. The bird is large for a warbler, growing up to seven inches in length. The
bird has a bluish gray face and back, yellow throat, chest, and belly, and black stripes down
the sides. Other distinguishing characteristics are white crescents above and below the eyes and two white wingbars.

Leatherback sea turtle (*Dermochelys coriacea*) – Leatherback sea turtles are the largest reptiles in the world, commonly exceeding 1,000 pounds with an average shell length of five feet. The leatherback is different from other sea turtles in that it has seven hard longitudinal ridges along the length of its back instead of scutes. These turtles have a rubber-like, black shell with white spots and a pinkish-white spot on the head. Leatherbacks have the most extensive geographic distribution of any reptile, typically occurring at low densities in the open ocean. Primary nesting beaches for the leatherback in the western Atlantic include Costa Rica, French Guiana, Panama, Surinam, Central/South America, south Florida and many islands in the Caribbean. Leatherbacks are common visitors throughout South Carolina's coastal waters during the spring while they feed on abundant numbers of cannonball jellyfish. Leatherbacks are also seen in the fall, although in lesser numbers.

American swallow-tailed kite (*Elanoides forficatus*) – Adult birds have a long, deeply forked tail and distinctive black and white plumage. The head and underparts are white, except for the black back, tail, and primary flight feathers. Immature birds are similar to the adults, but the tail is shorter and the primary feathers and tail are tipped white. Habitat includes wooded swamps, marshes, river bottoms, and glades in open forest. Nesting sites include the very tops of tall, slender trees, up to 200 feet high. The American swallow-tailed kite can be found in South Carolina during its breeding season, from March to June.

Bald eagle (*Haliaeetus leucocephalus*) – Adults tend to have a blackish-brown back and breast with a white head, neck, and tail and a yellow bill. Juveniles tend to be brown and white with a black bill. Female bald eagles are approximately 35 to 37 inches long while the male bald eagles are approximately 30 to 34 inches. This bird nests in mature live pines or cypress trees in the transition zone between mature forests and large bodies of water. Nests are very large, up to six feet in width, and constructed of large sticks and soft materials such as dead vegetation, grasses, and pine needles. Nesting trees are usually less than two miles from open water. Winter roosts are usually in mature trees, similar to nesting trees, but may be somewhat farther from water.

Kemp’s ridley sea turtle (*Lepidochelys kempii*) – Kemp’s ridley sea turtle, the smallest sea turtle, has a round grayish-black to olive colored shell which lightens as the turtle matures. The Kemp’s ridley only nests on the Gulf Coast of Mexico and Texas. Juveniles, approximately 11 to 26 inches in length, can be seen along the South Carolina coast during the summer where they feed on fast-swimming crabs, such as the blue crab.

Pondberry (*Lindera melissifolia*) – Pondberry is a deciduous shrub that grows up to six feet tall and spreads vegetatively by underground stolons. The leaves are ovately to elliptically shaped, thin, membranaceous and drooping and have a strong sassafras-like odor when crushed. The flowers are pale yellow and bloom in the spring before the appearance of leaves. Fruits are bright red and oval-shaped and mature in the fall. Pondberry generally occupies wetland habitats that are normally flooded or saturated during the dormant season, but infrequently flooded during the growing season for extended periods. The plant is typically associated with bottomland hardwoods in the inner coastal plain, and margins of
sinks, ponds, and other depressions in the outer coastal plain.

**Wood stork (Mycteria americana)** – Wood storks are the largest wading bird and only stork species that breeds in the United States. These birds are large, long legged with a head to tail length of up to 45 inches and a wingspan of up to 65 inches. Adult wood storks are white except for the primary and secondary wing feathers and the tail feathers, which are black with a greenish sheen. Adults also have an unfeathered head and neck with a long, thick black bill. The breeding range of the wood stork extends down the southeastern coast of the United States, including South Carolina. Wood storks typically nest in extensive forested wetlands within the upper branches of swamp black gum (Nyssa biflora) or bald cypress (Taxodium distichum) trees in standing water.

**Canby’s dropwort (Oxypolis canbyi)** – Canby’s dropwort is a perennial herbaceous plant with tuberous roots and pale, fleshy rhizomes and erect stems up to 39 inches tall. The stems may be purplish at the base, and the leaves resemble quills. The flowers are small and white with five petals and grow in umbels or flat-topped clusters. Canby’s dropwort grows in moist areas in the coastal plain and sandhills, including wet meadows, wet pine and hardwood savannas, ditches, sloughs, and around the edges of Cypress-pine ponds. The plant seems to be more prolific when the habitat has been burned.

**Red-cockaded woodpecker (Picoides borealis)** – Adult red-cockaded woodpeckers are approximately 18 to 20 cm long with a wingspan of 35 to 38 cm. Adults have a black cap, throat, and stripe on the side of the neck and white cheeks and underparts. The back is barred with black and white horizontal stripes. Adult males have a small red spot on each side of the black cap. The bird is native to southern pine forests and typically nests within open pine stands containing trees 80 years or older. Roosting cavities are excavated within live pines, which are often infected with a fungus which causes what is known as red-heart disease. Foraging may occur in pine and/or mixed pine/hardwood stands 30 years or older with trees 10” or larger in diameter at breast height.

**Dwarf siren (Pseudobranchus striatus)** – This siren is the smallest of its family and is a slender, eel and salamander-like amphibian that lives in dense, submerged vegetation along the bottom of freshwater ponds, swamps and ditches. The dwarf siren has only tiny forelimbs with three toes on each foot and no hind limbs. The dwarf siren also has external gills which are retained throughout their life. The dwarf siren is nocturnal and feeds on tiny invertebrates within plant debris on the bottom. During periods of drought, the dwarf siren is able to burrow into mud and survive for up to two months.

**Gopher frog (Rana capito)** – The gopher frog is a stout-bodied, highly secretive upland frog, often found in association with gopher tortoises using the tortoises burrows for shelter. The frog can also be found in moist meadows, prairie woodlands, and pine scrub habitats. The frog is brown or black in color with irregular dark spots on the back and sides, and its skin is smooth.

**American chaffseed (Schwalbea americana)** – American chaffseed is a perennial herbaceous plant with erect, densely hairy, unbranched stems up to 24 inches tall. The leaves are arranged in an alternate pattern around the stem and attach directly to the stalk.
without a leaf stem. The flowers are yellowish or purplish and grouped in a long terminal cluster. American chaffseed typically grows in open, moist pine flatwoods, fire-maintained pine savannas, ecotone areas between peaty wetlands and xeric sandy soils, and other open grass and sedge dominant areas. This plant is dependent on factors such as mowing, fire and fluctuating water tables for survival.

Least tern (Sternula antillarum) – The least tern is a migratory bird, wintering in Central America, the Caribbean, and northern South America and breeding in North America, including the South Carolina coast beginning in late April. This bird is a small tern, up to nine inches in length with a wingspan of up to 20 inches. The upper part of the body is pale gray, and the belly is white. The head is white with a black cap and line through the eye extending to the base of the bill. The bill is yellow with a small, black tip in the summer and all blackish in the winter. The wings are primarily pale gray with conspicuous black markings on the outmost primary feathers. The preferred habitat for the least tern is sandy, pebbly beaches along marine and estuarine shores and large rivers containing sand bar islands. The least tern is most likely to occur in large open areas, free of vegetation and human disturbance, with sand as the dominant substrate.

West Indian manatee (Trichechus manatus) – The West Indian manatee is a large gray to brown aquatic mammal, averaging about ten feet in length and 1,000 pounds in weight. This unusual mammal has no hindlimbs, and the forelimbs are modified flippers. West Indian manatees have flattened horizontal and rounded tails used for locomotion. Manatees are primarily herbivorous but will occasionally feed on fish. Manatees inhabit both fresh and salt water, including canals, rivers, estuarine habitats and saltwater bays, throughout their range. West Indian manatees concentrate in areas of warm water, primarily the Florida Gulf Coast waters, from October to April. In the summer months, the West Indian manatee will migrate as far north as coastal Virginia on the east coast and coastal Louisiana on the Gulf of Mexico.

Bachman’s warbler (Vermivora bachmanii) – This species of warbler is presumed to be extinct, historically occurring in the southeastern U.S. during its breeding season. Historically, the bird inhabited seasonally flooded swamp forests, especially with cane thickets and containing variable amounts of water, but usually with some permanent water. The Bachman’s warbler is a small bird with olive-green upperparts, yellow forehead, throat, and underparts, and a faint white eye-ring and black crown and bib. The bird was last observed in the U.S. in 1962 near Charleston, South Carolina.

The list of protected species known to occur in Charleston County was reviewed, and evaluations were performed regarding the likelihood of the presence of each species within the PSA. Field reviews were conducted from October 5th to October 16th, 2009, and areas in the PSA matching descriptions of preferred habitat for protected species listed in the above table were classified as potential protected species habitat.

The reviewed PSA includes corridors centered along each of the Build Alternatives. The corridors measure approximately 200 to 1,000 feet in width. Natural habitats or communities within the PSA include mainly undeveloped estuarine wetlands or tidal salt marsh, the Stono River, mixed hardwood-pine upland, forested wetlands and maritime forests. Also located
within the PSA are portions of James Island Creek, Pennys Creek, and unnamed tributaries to the Stono River. Commercial and residential development comprises approximately 10 and 35 percent of the PSA, respectively.

None of the state and/or federal listed protected species were observed within the PSA during the field reviews. Per review of the SCDNR Geographic Database of Rare and Endangered Species, no known populations of protected species are located within the PSA. No potential habitat for seabeach amaranth, Wilson’s plover, green sea turtle, Kirtland’s warbler, leatherback sea turtle, Kemp’s ridley sea turtle or gopher frog was identified within the PSA, therefore it is determined that the proposed project would have a biological conclusion of ‘no effect’ on these species. Based on literature and field reviews, potential habitat for shortnose sturgeon, flatwoods salamander, loggerhead sea turtle, piping plover, spotted turtle, Rafinesque’s big-eared bat, American swallow-tailed kite, bald eagle, pondberry, wood stork, Canby’s dropwort, red-cockaded woodpecker, dwarf siren, American chaffseed, least tern, West Indian manatee and Bachman’s warbler is present within the PSA. Concurrence with USFWS and NMFS regarding determinations of potential habitat and project-related impacts would be conducted during the permitting phase of the proposed project. Biological conclusions for the protected species determined to have potential habitat within the PSA follow.

Potential habitat for shortnose sturgeon exists within the Stono River within the PSA, particularly during spawning season from late winter to early spring. Reviews of the SCDNR Geographic Database of Rare and Endangered Species revealed no known occurrences of shortnose sturgeon within one mile of the PSA. Based on the field reviews and the SCDNR Geographic Database information, it is determined that the proposed project ‘may affect but not likely to adversely affect’ the shortnose sturgeon.

**BIOLOGICAL CONCLUSION: MAY AFFECT – NOT LIKELY TO ADVERSELY AFFECT**

Potential habitat for flatwoods salamander exists in wetland pine flatwoods located within the PSA. However, availability of this habitat within the PSA is minimal. Reviews of the SCDNR Geographic Database of Rare and Endangered Species revealed no known occurrences of flatwoods salamander within one mile of the PSA. Based on the field reviews and the SCDNR Geographic Database information, it is determined that the proposed project ‘may affect but not likely to adversely affect’ the flatwoods salamander.

**BIOLOGICAL CONCLUSION: MAY AFFECT – NOT LIKELY TO ADVERSELY AFFECT**
Potential seasonal migratory habitat for the loggerhead sea turtle may exist in the refined study area within the Stono River during the breeding seasons for these turtles, but the likelihood of occurrences is probably rare due to the distance of the Stono River within the refined study area from the Atlantic Ocean and the current small population numbers of loggerhead sea turtles in the wild. Additionally, reviews of the SCET Geographic Database of Rare and Endangered Species did not reveal any known occurrences of sea turtles within one mile of the refined study area. Based on the literature reviews and the SCET Geographic Database information, it is determined that the proposed project will have 'no effect' on the loggerhead sea turtle.

**BIOLOGICAL CONCLUSION: NO EFFECT**

Potential habitat for least tern may exist on open sandy, pebbly shores and sand bar islands of the Stono River within the PSA. Reviews of the SCET Geographic Database of Rare and Endangered Species revealed no known occurrences of least tern within one mile of the PSA. Based on the field reviews and the SCET Geographic Database information, it is determined that the proposed project 'may affect but not likely to adversely affect' the least tern.

**BIOLOGICAL CONCLUSION: MAY AFFECT – NOT LIKELY TO ADVERSELY AFFECT**

Potential habitat for piping plover may exist on mudflats and sandbars associated with the Stono River within the PSA. Reviews of the SCET Geographic Database of Rare and Endangered Species revealed no known occurrences of piping plover within one mile of the PSA. Based on the field reviews and the SCET Geographic Database information, it is determined that the proposed project 'may affect but not likely to adversely affect' the piping plover.

**BIOLOGICAL CONCLUSION: MAY AFFECT – NOT LIKELY TO ADVERSELY AFFECT**

Potential habitat for the American swallow-tailed kite exists within the Stono River and adjacent estuarine and forested wetlands located within the PSA. Reviews of the SCET Geographic Database of Rare and Endangered Species revealed no known occurrences of American swallow-tailed kite within one mile of the PSA. Based on the field reviews and the SCET Geographic Database information, it is determined that the proposed project 'may affect but not likely to adversely affect' the American swallow-tailed kite.

**BIOLOGICAL CONCLUSION: MAY AFFECT – NOT LIKELY TO ADVERSELY AFFECT**

The bald eagle was removed from the federal list of Threatened and Endangered Species, effective August 8, 2007. Potential habitat for the bald eagle exists within the Stono River and adjacent mature forested woodlands located within the PSA. Reviews of the SCET Geographic Database of Rare and Endangered Species revealed no known occurrences of bald eagle within one mile of the PSA. Additionally, no individuals or nests were observed in the PSA during field reviews. Based on the bald eagle's current protection status, a biological conclusion is not warranted.

**BIOLOGICAL CONCLUSION: N/A**
Potential habitat for pondberry exists within the freshwater depressional wetlands and along the margins of ponds located within the PSA. Reviews of the SCHT Geographic Database of Rare and Endangered Species revealed no known occurrences of pondberry within one mile of the PSA. Based on the field reviews and the SCHT Geographic Database information, it is determined that the proposed project 'may affect but not likely to adversely affect' pondberry.

**BIOLOGICAL CONCLUSION: MAY AFFECT – NOT LIKELY TO ADVERSELY AFFECT**

Potential habitat for the wood stork exists within forested wetlands surrounded by water located within the PSA. Reviews of the SCHT Geographic Database of Rare and Endangered Species revealed no known occurrences of wood storks within the PSA; however, an active nesting population has been sited within a freshwater pond at the Dill Sanctuary, a preserve located along one of the Build Alternatives in the southeastern portion of the PSA. Based on the field reviews and the SCHT Geographic Database information, it is determined that the proposed project 'may affect but not likely to adversely affect' the wood stork.

**BIOLOGICAL CONCLUSION: MAY AFFECT – NOT LIKELY TO ADVERSELY AFFECT**

Potential habitat for Canby’s dropwort may exist within wetland pine flatwoods, ditches and other open wet areas (i.e., grass and sedge meadows, fields, etc.) located within the PSA. Reviews of the SCHT Geographic Database of Rare and Endangered Species revealed no known occurrences of Canby’s dropwort within one mile of the PSA. Based on the field reviews and the SCHT Geographic Database information, it is determined that the proposed project ‘may affect but not likely to adversely affect’ Canby’s dropwort.

**BIOLOGICAL CONCLUSION: MAY AFFECT – NOT LIKELY TO ADVERSELY AFFECT**

Potential habitat for American chaffseed may exist within wetland pine flatwoods and other open moist areas (i.e., grass and sedge meadows, fields, etc.) located within the PSA. Reviews of the SCHT Geographic Database of Rare and Endangered Species revealed no known occurrences of American chaffseed within one mile of the PSA. Based on the field reviews and the SCHT Geographic Database information, it is determined that the proposed project ‘may affect but not likely to adversely affect’ American chaffseed.

**BIOLOGICAL CONCLUSION: MAY AFFECT – NOT LIKELY TO ADVERSELY AFFECT**

Potential habitat for the spotted turtle exists within shallow ponds, small freshwater streams and flooded freshwater forested wetlands located within one mile of the PSA. Reviews of the SCHT Geographic Database of Rare and Endangered Species revealed no known occurrences of spotted turtle within one mile of the PSA. Based on the field reviews and the SCHT Geographic Database information, it is determined that the proposed project 'may affect but not likely to adversely affect' the spotted turtle.

**BIOLOGICAL CONCLUSION: MAY AFFECT – NOT LIKELY TO ADVERSELY AFFECT**

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Potential habitat for Rafinesque’s big-eared bat may exist within unoccupied buildings and in hollowed out tree cavities in freshwater forested wetlands located within the PSA. Reviews of the SCHT Geographic Database of Rare and Endangered Species revealed no known occurrences of Rafinesque’s big-eared bat within one mile of the PSA. Based on the field reviews and the SCHT Geographic Database information, it is determined that the proposed project ‘may affect but not likely to adversely affect’ Rafinesque’s big-eared bat.

**BIOLOGICAL CONCLUSION: MAY AFFECT – NOT LIKELY TO ADVERSELY AFFECT**

Potential foraging habitat for red-cockaded woodpecker may exist within pine and mixed pine-hardwood forests located within the PSA. No nesting habitat, old-growth pine forest, was identified within the PSA. Reviews of the SCHT Geographic Database of Rare and Endangered Species revealed no known occurrences of red-cockaded woodpecker within one mile of the PSA. Based on the field reviews and the SCHT Geographic Database information, it is determined that the proposed project ‘may affect but not likely to adversely affect’ red-cockaded woodpecker.

**BIOLOGICAL CONCLUSION: MAY AFFECT – NOT LIKELY TO ADVERSELY AFFECT**

Potential habitat for Bachman’s warbler exists within seasonally flooded freshwater forested wetlands located within the PSA. These wetlands are preferable when containing some permanence of water and thickets of cane. Reviews of the SCHT Geographic Database of Rare and Endangered Species revealed no known occurrences of Bachman’s warbler within one mile of the PSA. The Bachman’s warbler was last observed in the U.S. near Charleston in 1962. Based on the field reviews, the SCHT Geographic Database information and the lack of sightings since 1962, it is determined that the proposed project would have ‘no effect’ on Bachman’s warbler.

**BIOLOGICAL CONCLUSION: NO EFFECT**

Potential habitat for the dwarf siren may exist within the PSA along the bottom of shallow freshwater ponds, ditches and within flooded freshwater forested wetlands with dense, submerged vegetation. Reviews of the SCHT Geographic Database of Rare and Endangered Species revealed no known occurrences of dwarf siren within one mile of the PSA. Based on the field reviews and the SCHT Geographic Database information, it is determined that the proposed project ‘may affect but not likely to adversely affect’ the dwarf siren.

**BIOLOGICAL CONCLUSION: MAY AFFECT – NOT LIKELY TO ADVERSELY AFFECT**

Potential habitat for the West Indian manatee exists in the PSA within the Stono River. Based on correspondence with Melissa Binbi of the USFWS, Charleston Field Office, West Indian manatees migrate into estuarine waters off the coast of South Carolina during the warm, summer months and early fall from May to September when water temperatures exceed 70 degrees Fahrenheit (Pers. Comm., January 16, 2009). A review of the SCHT Geographic Database of Rare and Endangered Species did not reveal the presence of any individuals of West Indian manatees within one mile of the PSA. Particular care and consideration should be taken during construction in summer months or early fall as this is
when the waterways provide potential habitat. In addition, the USFWS recommends implementing specific guidelines and *Standard Manatee Construction Conditions* during project construction (Melissa Binbi, USFWS, Pers. Comm., January 16, 2009). Based on USFWS correspondence, the field review, literature review, and availability of potential habitat within the PSA, it is determined that the proposed project 'may affect but not likely to adversely affect' the West Indian manatee.

**BIOLOGICAL CONCLUSION: MAY AFFECT - NOT LIKELY TO ADVERSELY AFFECT**
6.0. REFERENCES


CZR, Inc. 1995. Natural Resources Technical Memorandum for the Mark Clark Expressway Supplemental EIS.


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APPENDIX A

FIGURES
Note:
1. Jurisdictional waters of the U.S. were delineated by the combined efforts of STV/Ralph Whitehead Associates, Wilbur Smith Associates and representatives of the U.S. Army Corps of Engineers (USACE) Charleston District on October 6 – 10 and 12 – 16, 2009. Jurisdictional boundaries were marked in the field with surveyors tape and surveyed using a Trimble GEOXT or GEOXH hand-held GPS units capable of submeter accuracy. This map is intended for planning purposes only.
2. Jurisdictional waters of the U.S. boundaries have been field verified by the USACE.
Figure 6 Location Map

Note:
1. Jurisdictional waters of the U.S. were delineated by the combined efforts of STV/Ralph Whitefield Associates, Wilbur Smith Associates and representatives of the U.S. Army Corps of Engineers (USACE) Charleston District on October 6 – 10 and 12 – 16, 2009. Jurisdictional boundaries were marked in the field with surveyors tape and surveyed using a Trimble GEOXT or GE0XH hand-held GPS units capable of submeter accuracy. This map is intended for planning purposes only.
2. Jurisdictional waters of the U.S. boundaries have been field verified by the USACE.

Legend
- Alternative A
- Alternative B
- Alternative C
- Alternative D
- Alternative E
- Alternative F
- Alternative G
- Tributary/Waters of the U.S.
- Tidal Wetland
- Freshwater Wetland

FIGURE 6
WATERS OF THE U.S. AND WETLANDS MAP
JOHNS ISLAND
Figure 7 Location Map

Note:
1. Jurisdictional waters of the U.S. were delineated by the combined efforts of STV/Ralph Whitehead Associates, Willour Smith Associates and representatives of the U.S. Army Corps of Engineers (USACE) Charleston District on October 6 - 10 and 12 - 15, 2006. Jurisdictional boundaries were marked in the field with surveyor's tape and surveyed using a Trimble GEOXT or GEOKH hand-held GPS units capable of submeter accuracy. This map is intended for planning purposes only.
2. Jurisdictional waters of the U.S. boundaries have been field verified by the USACE.

Legend
- Alternative A
- Alternative B
- Alternative C
- Alternative D
- Alternative E
- Alternative F
- Alternative G
- Tributary/Waters of the U.S.
- Tidal Wetland
- Freshwater Wetland

FIGURE 7
WATERS OF THE U.S. AND WETLANDS MAP
JAMES ISLAND

Reference: SCDNR GIS Data Clearinghouse, 2006 Aerial Photography
APPENDIX B

QUALIFICATIONS OF STV/RWA PERSONNEL
The following STV/RWA employees were responsible for the preparation of this document:

**W. Steven Busbee, P.W.S., Project Environmental Scientist**  
**M.S. Forest Resources**  
**B.S. Aquaculture, Fisheries, and Wildlife Biology**  
Mr. Busbee has over eight years of experience in ecological studies and environmental assessment throughout the southeastern United States. He has a Master's Degree in Forest Resources and a Bachelor's Degree in Aquaculture, Fisheries, and Wildlife Biology from Clemson University. His experience includes stream and wetland determinations, delineations, functional assessments, natural resource and feasibility studies, preparation of Clean Water Act Section 404/401 permit documents, compensatory wetland mitigation design, planning and monitoring, protected plant and animal species surveys, invasive plant species management, water quality monitoring, and regulatory agency reporting and coordination.

**Michael A. Iignocco, P.W.S., Senior Environmental Scientist**  
**B.S. Biological Sciences**  
Mr. Iignocco has over 30 years of experience in performing environmental studies and managing the preparation of environmental documents, including assessments and impact statements, at federal and state levels. He earned a Bachelor of Science degree, with an emphasis in biological sciences, from the State University of New York at Oneonta. Mr. Iignocco also has extensive experience in wetland assessment, delineation, and permitting; the development of comprehensive mitigation plans involving restoration, creation, and enhancement; and natural resource inventories.

**Tony Nardo, Environmental Scientist**  
**B.A. Environmental Studies (Geography)**  
Mr. Nardo has two years of experience in environmental assessment studies. He earned his Bachelor's Degree in Environmental Studies (Geography) from Edinboro University of Pennsylvania. Mr. Nardo has experience in wetland and stream delineation, stream classification, Section 401 and 404 permitting, GPS and GIS mapping, stream geomorphology studies, endangered species surveys, stream habitat and water quality assessment, and invasive plant species management. He was also a research assistant for The Uncomphagre Small Mammal and Habitat Project in southwest Colorado.

**Brandon J. Phillips, C.H.M.M., Senior Environmental Specialist**  
**B.S. Biology**  
Mr. Phillips has 19 years of experience in performing ecological studies, environmental assessments, wetlands permitting, and hazardous materials identification/sampling/remediation throughout the Eastern United States and Canada. Mr. Phillips has a Bachelors Degree in Biology from Virginia Tech and has taken numerous Professional Education courses at Rutgers University in New Jersey. His experience includes providing natural resource inventories and wetland delineations on hundreds of properties from Massachusetts to Florida, preparation of Clean Water Act Section 404 permit documents, and hazardous material remediation and restoration projects from
Ontario, Canada to Florida. Mr. Phillips has designed and built wetland systems to satisfy mitigation requirements throughout New York, New Jersey, and North Carolina.
APPENDIX C

REPRESENTATIVE PHOTOGRAPHS
Photograph 1. Typical view of the Stono River and associated estuarine wetlands at the location of the proposed bridge crossing in the northern portion of the PSA.

Photograph 2. Typical view of the Stono River and the location of the proposed bridge crossing in the central portion of the PSA.
Photograph 3. Typical view of James Island Creek and estuarine wetlands (low salt marsh) within the PSA.

Photograph 4. Typical view of Pennys Creek and estuarine wetlands (low salt marsh) within the PSA.
Photograph 5. Typical view of estuarine wetlands (high and low salt marsh) and adjacent mixed hardwood forest within the PSA.

Photograph 6. Typical view of an estuarine wetland (high salt marsh) and adjacent pine forest within the PSA.
Photograph 7. Typical view of a freshwater forested wetland located adjacent to estuarine wetlands within the PSA.

Photograph 8. Typical view of a mixed hardwood freshwater forested wetland with little to no understory or groundcover within the PSA.
Photograph 9. Typical view of a mixed hardwood freshwater forested wetland with a dense understory and groundcover within the PSA.

Photograph 10. Typical view of a mixed hardwood freshwater forested wetland with sparse groundcover vegetation within the PSA.
Photograph 11. Typical view of a pine flatwoods forested wetland within the PSA.

Photograph 12. Typical view of a scrub-shrub freshwater wetland within the PSA.
Photograph 13. Typical view of a deepwater freshwater wetland within the PSA.

Photograph 14. View of freshwater pond and potential wood stork nesting site located in the Dill Sanctuary within the southeast portion of the PSA.
Photograph 15. Typical view of a freshwater tributary/stream within the PSA.
APPENDIX D

USFWS NWI COWARDIN CLASSIFICATION CODING SYSTEM
The following summarizes the Cowardin classification coding system and the letters and numbers used to define the USFWS NWI wetland types and subtypes:

**Freshwater Wetlands and Ponds**

**System:**
(P) Palustrine – The Palustrine System includes all nontidal wetlands dominated by trees, shrubs, emergents, mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean derived salts is below 0.5 ppt. Wetlands lacking such vegetation are also included if they exhibit all of the following characteristics:
- are less than eight hectares (20 acres);
- do not have an active wave-formed or bedrock shoreline feature;
- have at low water a depth less than two meters (6.6 feet) in the deepest part of the basin; and
- have a salinity due to ocean-derived salts of less than 0.5 ppt.

**Class:**
(EM) Emergent – Characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants.

(FO) Forested – Characterized by woody vegetation that is six meters (20 feet) or taller.

(SS) Scrub-Shrub – Includes areas dominated by woody vegetation less than six meters tall. The species include true shrubs, young trees (saplings) and trees or shrubs that are small or stunted because of environmental conditions.

(UB) Unconsolidated Bottom – Includes all wetlands and deepwater habitats with at least 25 percent cover of particles smaller than stones (less than six to seven cm diameter) and a vegetative cover less than 30 percent.

(AB) Aquatic Bed – Includes wetlands and deepwater habitats dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years. Aquatic beds generally occur in water less than two meters (6.6 feet) deep.

**Subclass: (under Emergent Class)**
(1) Persistent – Dominated by species that normally remain standing at least until the beginning of the next growing season in most years. This subclass is found only in the Estuarine and Palustrine systems.

**Subclass: (under Forested and Scrub-Shrub Class)**
(1) Broad-leaved deciduous – Woody angiosperms (trees or shrubs) with relatively wide, flat leaves that are shed during the cold or dry season.

(2) Needle-leaved Deciduous – Woody gymnosperms (trees or shrubs) with needle-shaped or scale-like leaves that are shed during the cold or dry season.
(3) Broad-leaved Evergreen – Woody angiosperms (trees or shrubs) with relatively wide, flat leaves that generally remain green and are usually persistent for a year or more.

(4) Needle-leaved Evergreen – Woody gymnosperms with green, needle-shaped, or scale-like leaves that are retained by plants throughout the year.

Subclass: (under Aquatic Bed Class)

(4) Floating Vascular – Beds of floating vascular plants occur mainly in the Lacustrine, Palustrine, and Riverine Systems and in the fresher waters of the Estuarine System. The plants float freely either in the water or on the water surface and are found primarily in protected portions of slow-flowing rivers. These plants are moved about by wind or water currents and cover a large area of water, particularly in the southeast.

Water Regime:

(A) Temporarily Flooded – Surface water is present for brief periods during the growing season, but the water table usually lies well below the soil surface. Plants that grow both in uplands and wetlands may be characteristic of this water regime.

(B) Saturated – The substrate is saturated to the surface for extended periods during the growing season, but surface water is seldom present.

(C) Seasonally Flooded – Surface water is present for extended periods especially early in the growing season, but is absent by the end of the growing season in most years. The water table after flooding ceases is variable, extending from saturated to the surface to a water table well below the ground surface.

(F) Semipermanently Flooded – Surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the land's surface.

(H) Permanently Flooded – Water covers the land surface throughout the year in all years.

(R) Seasonal-Tidal – No definition given (as stated).

(S) Temporary-Tidal – No definition given (as stated).

Special Modifiers:

(d) Partly Drained/Ditched – The water level has been artificially lowered, but the area is still classified as wetland because soil moisture is sufficient to support hydrophytes. Drained areas are not considered wetland if they can no longer support hydrophytes. This modifier is also used to indicate extensive ditch networks in wetlands where, due to the extreme number and narrow width of the ditches, individual delineation is impossible.

(h) Diked/Impounded – Created or modified by a man-made barrier or dam which obstructs the inflow or outflow of water.
(x) Excavated – Lies within a basin or channel excavated by man.

**Estuarine and Marine Wetlands and Deepwater**

**System:**
(E) Estuarine – The Estuarine System describes deepwater tidal habitats and adjacent tidal wetlands with low energy and variable salinity, influenced and often semi-enclosed by land.

**Subsystem:**
(1) Subtidal – These habitats and associated substrates are continuously submerged, even during extreme low water.
(2) Intertidal – This is defined as the area from extreme low water to extreme high water and associated splash zone.

**Class:** (under Subtidal Subsystem)
(UB) Unconsolidated Bottom – Includes all wetlands and deepwater habitats with at least 25 percent cover of particles smaller than stones (less than six to seven cm in diameter) and vegetative cover less than 30 percent.

**Class:** (under Intertidal Subsystem)
(EM) Emergent – Characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants.

(US) Unconsolidated Shore – Includes all wetland habitats having the following three characteristics:
- unconsolidated substrates with less than 75 percent aerial cover of stones, boulders, or bedrock;
- less than 30 percent aerial cover of vegetation other than pioneering plants; and
- any of the following water regimes: irregularly exposed, regularly flooded, irregularly flooded, seasonally flooded, temporarily flooded, intermittently flooded, saturated, seasonal-tidal, temporary-tidal, or artificially flooded.

*Intermittent or intertidal channels of the Riverine System or Intertidal channels of the Estuarine System are classified as Streambed. Landforms such as beaches, bars, and flats are included in the Unconsolidated Shore class.

(SS) Scrub-Shrub – Includes areas dominated by woody vegetation less than six meters (20 feet) tall. The species include true shrubs, young trees (saplings) and trees or shrubs that are small or stunted because of environmental conditions.

**Subclass:** (under Emergent Class)
(1) Persistent – Dominated by species that normally remain standing at least until the beginning of the next growing season. This subclass is found only in the Estuarine and Palustrine systems.
Subclass: (under Scrub-Shrub Class)
(1) Broad-leaved Deciduous – Woody angiosperms (trees or shrubs) with relatively wide, flat leaves that are shed during the cold or dry season.

Water Regime:
(L) Subtidal – The substrate is permanently flooded with tidal water.

(N) Regularly Flooded – Tidal water alternately floods and exposes land surface at least once daily.

(P) Irregularly Flooded – Tidal water floods the land surface less often than daily.

Special Modifiers:
(x) Excavated – Lies within a basin or channel excavated by man.

(s) Spoil – Wetland or deepwater habitat where the substrate is a result of the deposition of spoil materials.
APPENDIX E

CHARLESTON COUNTY STATE AND FEDERAL SPECIES OF CONCERN
AND CANDIDATE SPECIES FOR LISTING
<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>State Status</th>
<th>Federal Status</th>
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<td>Red knot</td>
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<td>Bearded grass-pink</td>
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<td>Cypress-knee sedge</td>
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<td>Shiny spikegrass</td>
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<td>Star-nosed mole</td>
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<td>Timber rattlesnake</td>
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<td>Piedmont flatsedge</td>
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<td>Florida thoroughwort</td>
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<td>Carolina St. John's wort</td>
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<td>Mississippi kite</td>
<td>Ictinia mississipiens</td>
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# TABLE 5
CHARLESTON COUNTY FEDERAL AND/OR STATE LISTED SPECIES OF CONCERN AND CANDIDATE SPECIES

<table>
<thead>
<tr>
<th>Common Name</th>
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<th>Scientific Name</th>
<th>State Status</th>
<th>Federal Status</th>
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<td>Beach morning glory</td>
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<td>Walter's iris</td>
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<td>Loggerhead shrike</td>
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<td>Hoary bat</td>
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<td>Gopher frog</td>
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<td>Black swamp snake</td>
<td>Seminatrix pygaca</td>
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<td>Lace-lip ladies’ tresses</td>
<td>Spiranthes laciniaea</td>
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<td>Gull-billed tern</td>
<td>Sterna nilotica</td>
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<td>Carolina fluff grass</td>
<td>Tridens carolinianus</td>
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<td>Chapman’s redtop</td>
<td>Tridens chapmanii</td>
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<tr>
<td>Nodding pogonia</td>
<td>Triphora trianthonphora</td>
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<td>Tyto alba</td>
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<td>Black bear</td>
<td>Ursus americanus</td>
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<td>Florida yellow-eyed grass</td>
<td>Xyris difformis var. floridana</td>
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<td>Elliott yellow-eyed grass</td>
<td>Xyris eliottii</td>
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<td>Pineland yellow-eyed grass</td>
<td>Xyris stricta</td>
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Reference: List of federal and state protected species, candidate species and species of concern obtained from USFWS database (updated March 2009) and SCDNR database (updated January 2006).

Federal Status: T = Threatened, E = Endangered, SC = Species of Concern, C = Candidate Species for Listing
State Status: T = Threatened, E = Endangered, SC = Of State Concern, N = Of National Concern, RC = Of Regional Concern