South Carolina farms produce crops and livestock valued at over $1.4 billion annually.[88] Dillon and Marlboro Counties produce crops and livestock valued at almost $92 million, representing six percent of South Carolina's overall crop and livestock value.[89] The main crops grown in the two counties are soybeans, all cotton, wheat for grain, and corn for grain (refer to Table 3.33). Hog and poultry farming are also important elements of South Carolina's agricultural industry in Dillon and Marlboro Counties. Dillon County ranks first among counties in South Carolina for hog livestock inventory, and seventh in broilers and other meat-type chickens inventory while Marlboro County ranks eighth for hog livestock inventory and 11th for broilers and other meat-type chickens.[90]

Table 3.33
Top Crops Grown in Dillon, Marlboro, Richmond, and Scotland Counties in 2002, in acres

Crops	Dillon County	Marlboro County	Richmond County	Scotland County
Soybeans	36,710	20,347	--	10,961
All cotton*	23,554	28,805	4,784	14,898
All wheat for grain**	20,945	6,624	815	2,525
Corn for grain***	8,153	2,991	--	1,281
Forage****	--	2,315	4,398	3,403

* All cotton includes both upland and pima cotton.
** All wheat for grain includes Durum, winter, and spring wheat other than Durum.
*** Corn for grain means for grain and silage in the US as livestock feed.
**** Forage includes all hay, haylage, grass silage, and greenchop.

Source: USDA, 2002 Census of Agriculture

Farming in North Carolina produces crops valued at over $6.9 billon annually.[91] Richmond and Scotland Counties produce crops valued around $112 million, representing two percent of North Carolina's overall crop value.[92] The main crops grown in the two counties are all cotton, forage, and wheat for grain (refer to Table 3.33). Hog and poultry farming are also important parts of North Carolina's agricultural industry in Richmond and Scotland Counties. Richmond County ranks 28th among counties in North Carolina for hog livestock inventory, while Scotland County ranks 25th. For broilers and other meat-type chickens, Richmond County ranks ninth among counties in the state for inventory, and Scotland County ranks 15th.

[88] USDA, 2002 Census of Agriculture.
[89] *Ibid.*
[90] *Ibid.*
[91] *Ibid.*
[92] *Ibid.*

3.10.2 How is farmland protected?

Congress recognized the importance of farmlands and passed the *Farmland Protection Policy Act* in 1981. The purpose of this statute is to prevent the conversion of farmlands to non-agricultural uses by minimizing the impacts that federal programs have on farmlands. Prior to farmlands being used for a federal project, an assessment must be completed to determine if prime, unique, or statewide or locally important farmlands would be converted to non-agricultural uses. If the assessment determines the use of farmland is in excess of the parameters defined by the NRCS, then the federal agency must take measures to minimize the impacts to these farmlands.

3.10.3 What are the different types of protected farmlands?

The NRCS is the lead agency that determines the suitability of farmlands. NRCS characterizes eligible farmland as being "prime", "unique", or of "statewide or local importance". The designations are based on NRCS soil types and are protected by federal legislation.

Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, or oil-seed and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor without intolerable soil erosion (7 U.S.C. §4201(c)(1)(A)). Prime farmland includes land that possesses the above characteristics and may include land currently used as cropland, pastureland, rangeland, or forestland. Prime farmland does not include land already in or committed to urban development or water storage.

Prime, Unique, and Statewide or Locally Important Farmlands

Prime farmlands are those that produce normal crops and require the least amount of inputs (i.e. fertilizer, pesticides, and labor).

Unique farmlands are those other than farmland used for production of specific high-value food or fiber crops such as nuts, fruits, or vegetables.

Statewide or Locally Important farmlands are those designated by state or local agencies as important for the production of crops in the area.

Unique farmland is land other than prime farmland that is used for production of specific high-value food and fiber crops (7 U.S.C. §4201(c)(1)(B)). It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce high quality or high yields of specific crops when treated and managed according to acceptable farming methods. Examples of such crops include lentils, nuts, annually cropped white wheat, cranberries, citrus and other fruits, olives, and vegetables.

Statewide or locally important farmland is land that has been designated of state or local importance for the production of food, feed, fiber, forage, or oil-seed crops, but is not of national significance (7 U.S.C. §4201(c)(1)(C)).

3.10.4 What are the types and the amounts of farmland in the project study area?

The project study area is comprised of 399,792 acres of land within Dillon, Marlboro, Richmond, and Scotland Counties. Of these acres, 125,393 acres are prime farmland soils and 137,148 acres are farmland soils of statewide importance. Together they account for 66 percent of the land within the project study area.[93] No unique farmland soil types exist in the project study area. Table 3.34 lists the number of soil types and amount of acreages of prime and statewide important farmland soils in the project study area, by county.

3.10.5 What types of soils are in the project study area?

NRCS has determined the types of soils found within the project study area. Lists of prime and statewide important farmland soils are found in Tables 3.35 and 3.36 (refer to pages 3-141 and 3-142, respectively). Dillon County has 11 prime farmlands soils, while Marlboro County has 14,

Table 3.34
Summary of Prime and Statewide Importance Farmland Soils in the Project Study Area

	Prime Farmland	Statewide Important Farmland
DILLON COUNTY		
Number of Soil Types	11	15
Acreage	29,818	37,625
MARLBORO COUNTY		
Number of Soil Types	14	23
Acreage	86,476	98,856
RICHMOND COUNTY		
Number of Soil Types	13	11
Acreage	9,087	390
SCOTLAND COUNTY		
Number of Soil Types	16	10
Acreage	12	277

Source: GIS data from NRCS, 2006

[93] NRCS, GIS data, (2006).

Table 3.35
Prime Farmland Soil Types in Project Study Area, by County

Soil Type	Location (by county)			
	Dillon	Marlboro	Richmond	Scotland
Brogdon	X			
Chewacla			X	
Clarendon	X			
Clayham		X		
Creedmoor			X	
Davidson			X	
Dothan	X			
Duplin	X			X
Emporia		X		
Enunola		X		
Faceville	X	X	X	
Goldsboro		X		X
Gritney				X
Hornsville		X		
Johns*	X			X
Kalmia				X
Lumbee*				X
Lynchburg*	X	X		X
Mantachie*				X
Marlboro		X		
Maxton				X
Mayoden			X	
McQueen			X	
Noboco		X		X
Norfolk		X	X	X
Orangeburg	X	X	X	
Pantego				X
Paxville**				X
Peawick			X	
Pelion			X	X
Persanti	X	X		
Rains*				X
Riverview**		X	X	
Summerton	X			
Thursa				X
Tubeville			X	
Uwharrie			X	
Varina	X			
Wickham		X		

*only considered prime farmland if it is drained
**only considered prime farmland if protected from flooding or not frequently flooded during the growing season.
Source: USDA, NRCS Soil Surveys for Dillon, Marlboro, Richmond, and Scotland Counties

Table 3.36
Types of Farmland Soils of Statewide Importance in Project Study Area, by County

Soil Type	Location (by county)			
	Dillon	Marlboro	Richmond	Scotland
Ailey		X	X	X
Autryville		X		X
Badin			X	
Bonneau		X		
Byars	X	X		
Candor		X		
Cantey	X			
Chewacla		X		
Clayham		X		
Coxville	X	X		X
Davidson			X	
Dunbar	X			X
Emporia		X		
Enon-Wynott			X	
Fuquay	X			
Gritney				X
Hornsboro			X	
Hornsville		X		
Kenansville	X			X
Lucy	X	X		
Lumbee	X			
Masada			X	
Mayoden			X	
McColl	X	X		
Nankin		X		
Noboco		X		
Norfolk		X		
Ocilla		X		X
Ogeechee		X		
Pacolet			X	
Pantego	X			
Pasvile	X			
Paxville		X	X	
Pelion		X	X	
Pocalla	X			
Ponzer	X			
Rains	X	X		
Smithboro	X	X		
Uchee		X		X
Uwharrie-Badin			X	
Vaucluse				X
Wagram		X		X

Source: USDA, NRCS Soil Surveys for Dillon, Marlboro, Richmond, and Scotland Counties

Richmond County has 13, and Scotland County has 16 (refer to Table 3.35, page 3-141). In terms of farmland soils of statewide importance, Dillon County has 15, Marlboro County has 23, Richmond County has 11, and Scotland County has 10 (refer to Table 3.36, page 3-142).

3.10.6 What are the typical farm sizes in Dillon, Marlboro, Richmond, and Scotland Counties?

The Census of Agriculture data was used to characterize the project study area, while aerial photography of the project study area was used to assess the agricultural land uses. Approximately 25 percent of South Carolina's total land area is in farms. As shown in Table 3.37, 43.3 percent of Dillon County's land area is in farms, well above the average for South Carolina, while 29.8 percent of Marlboro County's land is in farms, just above the state average. In North Carolina, approximately 29 percent of its total land area is in farms. A total of 16.2 percent of Richmond County's land area is in farms, while 28.5 percent of Scotland County's land is farms, both of which are below the state average.

The USDA classifies all farms into size groups according to the total land area of the farm. The land area of a farm is an operating unit concept and includes land owned and operated as well as land rented from others. Land that was rented to or assigned to a tenant was considered part of the tenant's farm and not part of the owner's. In the four-county region, farm size ranges from as small as one acre to 1,000 acres or more. In 2002, the majority of farms in the four-county region ranged between 50 to 179 acres in size.

The trends in the size and number of farms within the four-county area from 1992 to 2002 show the number of farms in Dillon and Richmond Counties have decreased by 14 and 13 percent respectively, while the number of farms in Marlboro and Scotland Counties have increased by five and 10 percent respectively.

The amount of land in farms has increased in Dillon and Scotland Counties between 1997 and 2002. In fact, the four-county area experienced an increase in land acres in farm use, despite the reductions in Marlboro and Richmond Counties (refer to Chart 3.2). Dillon County's land area in farms has increased by almost 17,200 acres (18 percent) between 1997 and 2002, while Scotland County's land area in farms increased by approximately 4,800 acres (nine percent). The amount of land area in farms decreased in both Marlboro and Richmond Counties by approximately four and nine percent, respectively.

3.10.7 What methodology was used to determine farmland impacts?

In accordance with the *Farmland Protection Policy Act*, the NRCS was formally consulted for the proposed project. Farmland Impact Conversion Rating Forms for Corridor Type Project (NRCS-CPA-106) were completed for the Preferred Alternative. The NRCS required that a separate form

Table 3.37
Agricultural Land Use in Four-county Area in 2002

	Dillon County	Marlboro County	Richmond County	Scotland County	4-County Area Total
Number of Farms	197	222	257	145	821
Land in Farms (acres) (total area)	112,262 (43.3%)	114,963 (37.4%)	49,293 (16.2%)	58,313 (28.5%)	334,831 (31.2%)
Approximate Land Area (acres)	259,099	307,011	303,347	204,252	1,073,619
Average Size of Farm (acres)	570	518	192	367	412
Median Size of Farms (acres)	200	231	105	112	648
Average Value of Land and Buildings (farms), dollars	$768,990	$658,729	$471,183	$825,124	$681,006

Source: USDA, 2002 Census of Agriculture.

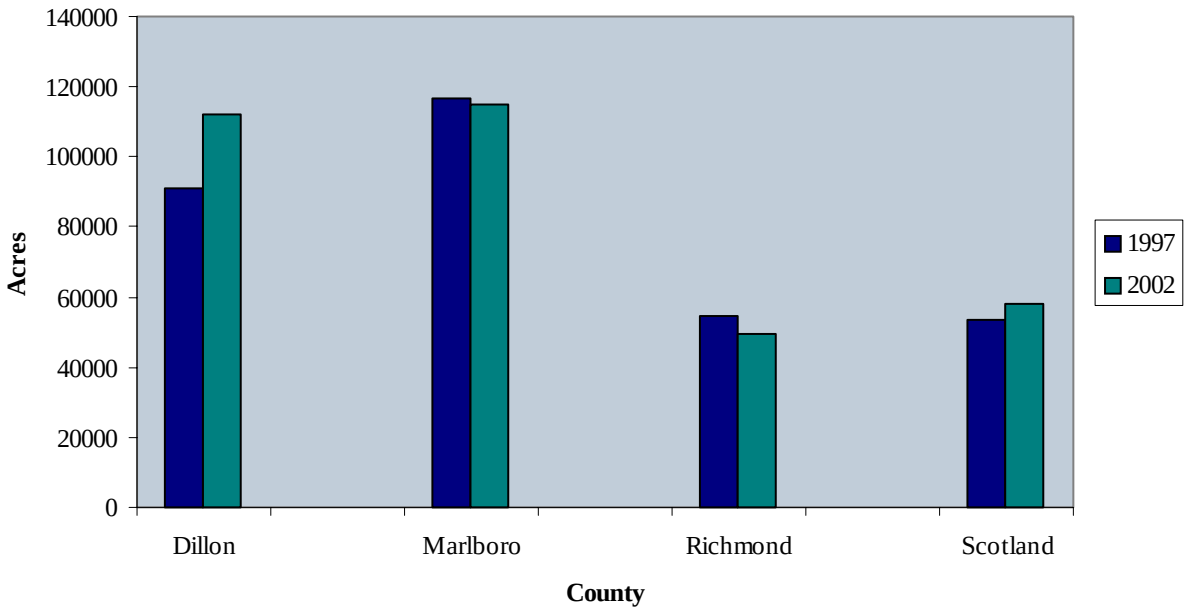

Chart 3.2 Total Acres of Farmland in Project Study Area

be submitted for each county, since each county has different ratings for prime farmland soils and farmland of statewide important soils. The purpose of the Farmland Impact Conversion Rating Form is to help identify and approximate the amount of farmland that would be converted by the Preferred Alternative.

Potential impacts to farmlands were quantitatively assessed for the Preferred Alternative based on the four counties' prime farmland soils and farmland soils of statewide importance. As previously mentioned, no unique farmland soils exist within the project study area.

3.10.8 How would the No-build Alternative directly impact farmlands?

The No-build Alternative would have no direct effect on farming operations since existing conditions would remain unchanged.

3.10.9 How would the Preferred Alternative directly impact farmlands?

Two values, the relative value and the corridor assessment value, were determined using the Farmland Impact Conversion Rating Forms for Corridor Type Projects (NRCS-CPA-106). The relative value assessment is the relative value of farmland to be converted by the Preferred Alternative, on a scale of zero to 100 points. The relative value ranged from 22.6 points in Scotland County to 84 points in Dillon County (refer to Table 3.38). The corridor assessment value is on a scale of zero to 160 points, and pertains to the land use, the availability of farm support services, investments in existing farms, and the amount of land that could be rendered unfarmable due to the construction of the Preferred Alternative. The corridor assessment value for the Preferred Alternative ranged from 40 to 85 points, depending on county (refer to Table 3.38). By totaling the relative value and the corridor assessment value, it was determined that the total threshold, 160 points overall, set by NRCS, was not exceeded by the Preferred Alternative in any of the four counties (refer to Table

Table 3.38
NRCS Farmland Conversion Evaluation
Point Total for the Preferred Alternative

	Relative Value	Corridor Assessment Value	Total
Dillon County	84	68	152
Marlboro County	73	85	158
Richmond County	36	57	93
Scotland County	22.6	40	62.6

3.38). The highest total value was 158 points in Marlboro County, while the lowest value was 62.6 points in Scotland County. Since the 160-point threshold was not exceeded for the Preferred Alternative, mitigation actions that could reduce adverse impacts associated with the construction of I-73 would not be required. The Farmland Impact Conversion Rating Forms can be found in Appendix H.

Construction of the Preferred Alternative would result in the direct conversion of 1,578 acres of prime and statewide important farmland soils to a transportation facility (refer to Table 3.39). This conversion of farmland to right-of-way would result in 0.005 percent of the total amount of agricultural land in the project study area being rendered unfarmable, which is not expected to be detrimental to agricultural activities in the project study area.

The Preferred Alternative may also result in other impacts, such as divided farm parcels. Losses may result if farm buildings or fields were separated from the rest of the farming operation by the new interstate facility. If access was affected, the farm operator may experience increased time requirements and expenses in order to conduct normal farming operations. The increased expenses could result from the need of the farm operations to move equipment, feed, and livestock between the divided parts of the farm.

Table 3.39
Direct Impacts to Prime Total and Statewide Important Total Soils, in Acres

	Preferred Alternative
Dillon County	**244**
Prime	93
Statewide Important	151
Marlboro County	**1,289**
Prime	750
Statewide Important	539
Richmond County	**19**
Prime	0
Statewide Important	19
Scotland County	**26**
Prime	6
Statewide Important	20
Alternative Total	**1,578 acres**

Farmland parcels were obtained from the USDA's Farm Service Agency (FSA) to identify parcels that may be potentially divided by the Preferred Alternative. Since farm sizes in the project study area range from one acre to 1,000 acres or more, it was determined that no parcel would be too small to farm. For every parcel that the Preferred Alternative traversed, three areas were calculated: the area within the right-of-way and the two remaining areas on either side of the right-of-way. The area within the right-of-way was calculated as a direct impact. It was assumed that the parcels divided could be kept in production or acquired by a neighboring farm, so even though the farmland may be split, it would not necessarily be removed from active production. The Preferred Alternative would impact a total of 332 acres by dividing 74 farmland parcels, with the majority, 306 acres from 64 parcels, being in Marlboro County (refer to Table 3.40).

Table 3.40
Divided Farmland Parcels in the Project Study Area by the Preferred Alternative, in Acres

	Acres
Dillon County	17 acres/ 8 parcels
Marlboro County	306 acres/ 64 parcels
Richmond County	11 acres/ 2 parcels
Scotland County	--
Total	334 acres/ 74 parcels
Total Acres in Corridor	2,261 acres

In addition to identifying the impacts to parcels of farmland being used, the number of individual farms that would be impacted by the Preferred Alternative was evaluated. Since the identification of active farms along the Preferred Alternative presented several challenges, including changes to active farm tracts as crops are rotated and changes in land ownership or leases, tax parcel data was used to determine the number of individual farms potentially impacted.

Impacts to the number of farms were calculated using GIS. Spatial data layers containing acreages of land currently being used as cropland were overlain onto tax parcel data along the Preferred Alternative. The acreages of cropland parcels that fell within individual tax parcels were identified, combined, and calculated to create an individual farm. Along the Preferred Alternative, farm size ranges from 0.44 acre to 165.34 acres. A total of 304 farms would be impacted along the Preferred Alternative, and of those, 83 would be divided by the Preferred Alternative.

Within the project study area, there are numerous hog and poultry concentrated animal feeding operations (CAFOs). During the alternative development process, CAFOs were avoided when possible. No CAFOs would be displaced by the Preferred Alternative.

Overall, farming operations would be directly impacted by the construction of the proposed project. No farm acreage, besides that acquired for right-of-way, would be rendered unfarmable and access to divided parcels will be addressed during the right-of-way acquisition process. The conversion of farmland to right-of-way due to construction should not cause a significant disruption of agricultural activities in the project study area.

3.10.10 What would be the potential indirect and cumulative impacts on farmland?

Impacts from induced development and cumulative impacts were calculated with the use of GIS. Spatial data layers containing acreages of projected growth by the Preferred Alternative (which were determined in the land use study, refer to Land Use, Section 3.1, page 3-1) were overlain onto the soils data (obtained from the NRCS) within the project study area. The acreages of projected growth that fell within prime farmland or farmland of statewide importance were identified and calculated.

3.10.10.1 How would development that is expected to occur with the No-build Alternative impact farmlands?

Development that would be expected under the No-build Alternative would impact approximately 55 acres of farmlands by 2030, including prime farmland and farmland of statewide importance. This would include impacts to 23 acres of prime farmland and 16 acres of farmland of statewide importance in Dillon County, 16 acres of prime farmland in Richmond County, and no impacts to prime farmland or farmland of statewide importance in Marlboro or Richmond Counties (refer to Table 3.41, page 3-149). The No-build Alternative was used as a baseline to compare development that was projected from the construction of I-73.

3.10.10.2 What would be the potential impacts from induced development on farmland by the Preferred Alternative?

In addition to impacts already assessed on the Farmland Impact Conversion Rating Form for Corridor Type Projects (NRCS-CPA-106), indirect impacts from induced development would occur due to the presence of I-73 in the project study area. Table 3.41 (refer to page 3-149) lists the amount of acres indirectly impacted from induced development to prime farmlands or farmlands of statewide importance in the project study area by 2030, based on land use modeling.

Table 3.41
Indirect and Cumulative Impacts to Prime & Statewide Important Farmland Soils in the Project Study Area by the Preferred Alternative, in Acres

		No-build Alternative	Direct Impacts	Indirect Impacts	Cumulative Impacts
Dillon County	Prime	23	93	57	173
	Statewide Important	16	151	32	199
	County Total	*39*	*244*	*89*	*372*
Marlboro County	Prime	0	750	614	1,364
	Statewide Important	0	539	163	702
	County Total	*0*	*1,289*	*777*	*2,066*
Richmond County	Prime	16	0	19	35
	Statewide Important	0	19	0	19
	County Total	*16*	*19*	*19*	*54*
Scotland County	Prime	0	6	0	6
	Statewide Important	0	20	0	20
	County Total	*0*	*26*	*0*	*26*
Project Study Area Total	Prime	39	849	690	1,578
	Statewide Important	16	729	195	940
OVERALL TOTAL		**55**	**1,578**	**885**	**2,518**

The Preferred Alternative would have the potential for 885 acres of indirect impacts from induced development, with a total of 89 acres in Dillon County, 777 acres in Marlboro County, and 19 acres in Richmond County. No indirect impacts to prime farmlands or farmlands of statewide importance are projected in Scotland County from induced development.

3.10.10.3 What would be the potential cumulative impacts on farmland from the Preferred Alternative?

Cumulative effects on farmland are caused by the aggregate of past, present and reasonably foreseeable future actions. Cumulative impacts would include development in the project study area that would be expected under the No-build Alternative, development that may result from the project, as well as other development in the project study area that may affect farmlands.

The No-build Alternative would be expected to have 55 acres of impacts to prime and statewide important farmland soils due to anticipated development by 2030. The Preferred Alternative is anticipated to directly impact 1,578 acres and indirectly impact 885 acres of prime and statewide important farmlands soils by 2030 (refer to Table 3.41). The total cumulative impact from the No-build Alternative and Preferred Alternative to prime and statewide important farmland soils in the project study area would be projected to be 2,518 acres.

In addition to projected growth and land use changes, other transportation projects have been constructed, are under construction, or are in the planning stages. These projects would contribute to the cumulative impacts on farmlands. In 2000, construction of 28.5 miles of S.C. Route 22 from U.S. Route 501 in Conway to U.S. Route 17 in North Myrtle Beach was completed. Also in 2000, approximately 17 miles of I-74 in North Carolina was completed southwest of Hamlet, North Carolina, impacting 50 acres of prime, unique, or statewide important farmland soils. The S.C. Route 22 and U.S. Route 17 projects were both on new location and traversed predominately rural areas, which directly impacted farmlands as well as bisected parcels, which created access problems for some farm owners. The widening of S.C. Route 38 from I-95 to Marion is currently under construction. This project widened an existing route from two to four lanes, which is anticipated to impact approximately 22 of acres prime, unique, or statewide important farmland soils adjacent to the roadway.

Three projects are reasonably foreseeable future actions, but are dependent upon funding that is currently unavailable. The S.C. Route 9/S.C. Route 38 project would widen the existing roadway from two to five lanes in Marlboro County, South Carolina, which would impact farmlands adjacent to the existing facility. I-73 South is 44 miles of new location roadway extending from I-95 to Myrtle Beach region through Dillon, Marion, and Horry Counties, which had a total of 794 acres of cumulative impacts to prime and statewide important soils in Dillon County. The Southern Evacuation Lifeline is approximately 20 miles extending from the interchange at U.S. Route 501 and S.C. Route 22 to the vicinity of U.S. Route 17. When these projects are constructed, they would impact farmlands directly by taking farmland out of production and indirectly by bisecting farm parcels. Access issues for farm owners would be addressed in the final planning stages to reduce these types of impacts as much as possible.

3.10.11 What Federal/USDA farmland programs are active or found in the project study area and how would they be impacted by the Preferred Alternative?

In addition to prime, unique, and statewide or locally important farmlands, the NRCS and USDA have developed other programs for farmlands that provide incentive for landowners to protect, enhance, or conserve their properties. Table 3.42 (refer to page 3-151) lists the different types of programs in the four counties.

Table 3.42
Land Enrolled in Federal Conservation Programs by Acres

	Conservation Reserve Program	Farm and Ranch Lands Protection Program	Wetland Reserve Program
Dillon County	2,902	60	409
Marlboro County	4,126	0	419
Richmond County	2,253	0	0
Scotland County	1,344	0	0

Source: USDA, NRCS South Carolina Office, NRCS North Carolina Office

3.10.11.1 Conservation Reserve Program

The Conservation Reserve Program was established in 1985 and takes land prone to erosion out of production for 10 to 15 years and devotes it to conservation. In return, farmers receive an annual rental payment for carrying out approved conservation practices on the acreage. Under Conservation Reserve Program contracts, farmers are compensated for planting permanent covers of grass and trees on land subject to erosion, where vegetation can improve water quality or wildlife habitat. The FSA administers this voluntary program.

There are over 1,500 Conservation Reserve Program easements in the project study area (refer to Figure 3-30). The Preferred Alternative would intersect 10 easements, which contain approximately 14 acres of land (refer to Table 3.43). The remainder of the land in the impacted parcels would remain in the program and no mitigation would be required for the Preferred Alternative.

Table 3.43
Impacts to Land in the Conservation Reserve Program by the Preferred Alternative

	Number of Sites Impacted
Dillon County	2
Marlboro County	8
Richmond County	0
Scotland County	0
Total Number of Sites	**10**
Total Acres	**14**

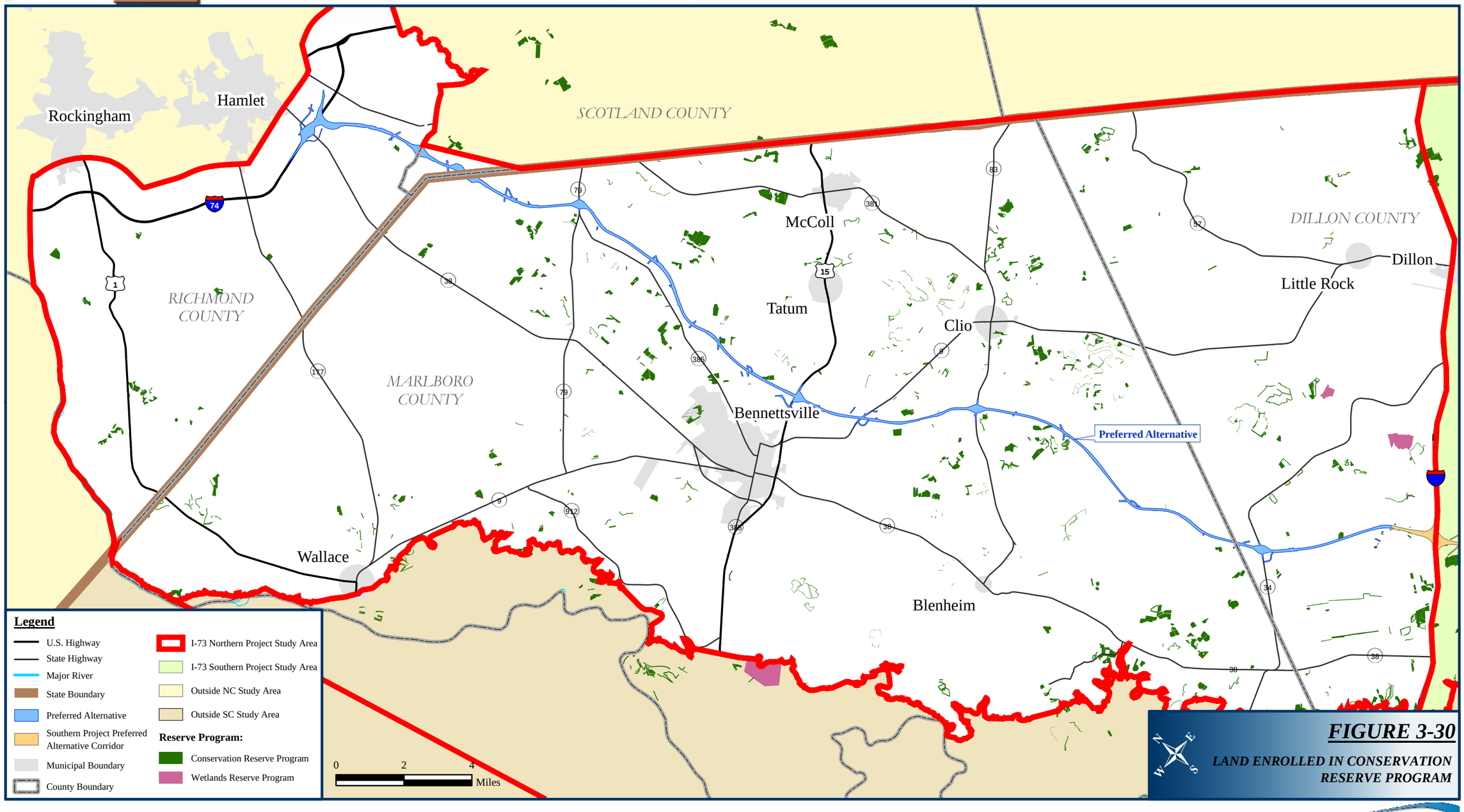

FIGURE 3-30

LAND ENROLLED IN CONSERVATION RESERVE PROGRAM

3.10.11.2 Farm and Ranch Lands Protection Program

The Farm and Ranch Lands Protection Program is a voluntary program managed by NRCS that helps farmers and ranchers keep their land in agriculture. Matching funds are provided by the program to State, Tribal, or local governments and non-governmental organizations with existing farm and ranchland protection programs to purchase conservation easements. The Farm and Ranch Lands Protection Program was reauthorized in the Farm Bill to protect working agricultural land from conversion to non-agricultural uses.[94]

Even though there is enrolled land in the Farm and Ranch Lands Protection Program within the project study area, none of these easements would be impacted by the Preferred Alternative.

3.10.11.3 Wetlands Reserve Program

The Wetlands Reserve Program is a voluntary program administered by the NRCS, which offers landowners financial incentives to enhance wetlands by retiring marginal agricultural land. To be eligible, land must be restorable and provide significant wetland and wildlife habitat. The program offers landowners three options: restoration cost-share agreements of a minimum 10-year duration, 30-year easements, or permanent easements.

Although there is land enrolled in the Wetland Reserve Program within the project study area, no easements would be impacted by the Preferred Alternative (refer to Figure 3-30, page 3-152).

3.11 Uplands

3.11.1 What are uplands?

Upland communities generally are lands not characterized by the presence of streams or wetlands. These areas support plant and animal species that are adapted for survival in dry conditions, such as plants that have developed long tap roots to reach deep water tables and burrowing mammals that make their homes underground. The Coastal Plain of the Carolinas contains many types of natural upland communities. Each community is characterized by its vegetative composition, landscape position, soil type, and hydrologic regime. To gather baseline data for potential impacts to natural communities, uplands were identified in a 600-foot wide corridor (Preferred Alternative study corridor) along the Preferred Alternative extending from I-95 to I-74.

[94] Farm Bill, 2002.

3.11.2 Why are uplands important?

Upland communities can provide a variety of benefits for both the human and natural environments. Based on a review of the aerial photography, vast amounts of uplands within the project study area are currently used for crop and timber production. Most types of development occur on uplands, especially so since the advent of the Section 404 permitting program. Furthermore, naturally vegetated uplands serve as recreational areas for outdoor activities such as hunting, hiking, camping, bird watching, and nature photography.

While natural, unaltered upland communities are sparsely scattered throughout the project study area, they provide essential habitat for wildlife to nest, raise young, forage, and provide cover from predators. Forested areas along the major waterways provide safe corridors for animal species that move frequently in search of food sources. Continuous or un-fragmented natural corridors are the most beneficial to mobile species. Upland communities also provide resting and foraging habitat for migratory bird species that move through the Carolinas on their way to northern summer nesting areas or southern over-wintering areas.

Forested and other permanently vegetated upland habitats located adjacent to wetlands and streams also provide water quality enhancement. Stormwater runoff from roadways, farm fields, and parking lots filters through these areas before reaching the water bodies, which helps trap sediments and other pollutants. These vegetated buffer areas also stabilize the soils adjacent to wetlands and streams, reducing the likelihood of erosion that degrades or destroys aquatic species habitat. In addition, shading from upland communities along streams allows for cooler water temperatures, which some aquatic species require.

3.11.3 How were uplands identified in the Preferred Alternative study corridor?

Initially, the SCDNR's GAP data and the NWI maps were used to identify the upland community types within the project study area. The 2006 false-color infrared aerial photography was reviewed within a 600-foot wide corridor along the Preferred Alternative (Preferred Alternative study corridor) and the GAP database was updated based on the current land use conditions depicted. Upland biotic communities identified within the Preferred Alternative study corridor were classified based on their vegetative composition as described in *The Natural Communities of South Carolina*[95] and *Classification of the Natural Communities of North Carolina*.[96] The modified mapping was verified

[95] Nelson, John B. 1986. *The Natural Communities of South Carolina: Initial Classification and Description.* Columbia, SC: South Carolina Wildlife and Marine Resources Department Division of Wildlife and Freshwater Fisheries.

[96] Schafale, Michael P. and Alan S. Weakley. 1990. *Classification of the Natural Communities of North Carolina*. Raleigh, NC: North Carolina Natural Heritage Program Division of Parks and Recreation & N.C. Department of Environment, Health, and Natural Resources.

during the wetland delineation and protected species surveys and the GAP data was corrected to correlate the GAP habitat designations with the Nelson habitat descriptions. Modifications made to the mapping included updating agricultural fields that were previously converted to pine plantations or housing developments, changing former pine dominated forests that have transitioned to mixed pine/hardwood forests, updating areas previously identified as wetlands, and revising forested areas that have been clear-cut and are in early successional condition.

3.11.4 What upland natural community types were identified within the Preferred Alternative study corridor?

During the review of GAP data, NWI maps, aerial photography, and results of the field surveys, the following natural upland communities were identified in the Preferred Alternative study corridor:

- Mesic mixed hardwood forest;
- Oak-hickory forest;
- Pine flatwoods; and,
- Upland pine-wiregrass woodland.

Definition

An overstory is composed of plants that are mature trees and are typically the top layer of leafy growth.

The shrub layer consists of plants that are small woody species or saplings of larger trees.

The herbaceous layer includes plants that are not made up of woody material and include herbs and grasses.

3.11.4.1 Mesic mixed hardwood forest

Mesic mixed hardwood forests are moist upland woods common in the Piedmont, but also occur in the Coastal Plain. The canopy and understory is composed of a rich variety of hardwoods, and the shrub and herbaceous species are numerous. The diversity of trees and other plants is great and there may be no dominant species. The mesic mixed hardwood forests identified in the Preferred Alternative study corridor had the typical overstory species, including tulip-poplar (*Liriodendron tulipifera*), sweet-gum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), black gum (*Nyssa sylvatica*), white oak (*Quercus alba*), black oak (*Quercus velutina*), and beech (*Fagus grandifolia*). The understory had arrow-wood (*Viburnum dentatum*), hornbeam (*Carpinus caroliniana*), American holly (*Ilex opaca)*, horse-sugar (*Symplocos tinctoria*), and flowering dogwood (*Cornus florida*). The herbaceous layer included partridgeberry (*Mitchella repens*), heartleaf (*Hexastylis arifolia*), and pipsissewa (*Chimaphila maculata*).

Mesic mixed hardwood forest

3.11.4.2 Oak-hickory forest (Dry or Dry-mesic oak-hickory forest[97])

Oak-hickory forest

Oak-hickory forests are uplands dominated by a canopy of oaks and hickories in combination with other hardwoods and pines. Those identified within the Preferred Alternative study corridor during the wetland delineation were dominated by several oaks including water oak (*Quercus nigra*), willow oak (*Quercus phellos*), southern red oak (*Quercus falcata*), white oak, and post oak (*Quercus stellata*). Mockernut (*Carya tomentosa*) and pignut hickory (*Carya glabra*) were also present in the canopy, along with co-dominants such as loblolly pine (*Pinus taeda*), sweet-gum, red maple, and the occasional tulip-poplar. The understory of the oak-hickory forests in the Preferred Alternative study corridor were comprised of sapling canopy species, plus horse-sugar, American holly, dogwood, sweet pepperbush (*Clethra alnifolia*), and black cherry (*Prunus serotina*). Woody vines were common, and included muscadine (*Vitis rotundifolia*), yellow jessamine (*Gelsemium sempervirens*), Virginia creeper (*Parthenocissus quinquefolia*), poison ivy (*Toxicodendron radicans*), Japanese honeysuckle (*Lonicera japonica*), and trumpet vine (*Campsis radicans*). The herbaceous layer was sparse, with partridgeberry, ebony spleenwort (*Asplenium platyneuron*), blackberry (*Rubus* spp.), and the occasional pipsissewa, and elephant's foot (*Elephantopus tomentosus*).

3.11.4.3 Pine flatwoods (Mesic pine flatwoods[98])

Pine flatwoods

Pine flatwoods are uplands with dry, sandy soil, and usually flat topography. These communities have a canopy of pines and a relatively open sub-canopy of sapling hardwood trees, scrub oaks, shrubs, and vines. Pine flatwoods often represent an early stage of an old field succession to woods, or abandoned pine plantation, and frequently succeed into oak-hickory or other hardwood-dominated forest.[99] Those identified within the Preferred Alternative study corridor were dominated by loblolly pine, water oak, black gum (*Nyssa sylvatica*), red maple, black cherry,

[97] *Ibid.*
[98] *Ibid.*
[99] Nelson, John B. 1986. *The Natural Communities of South Carolina: Initial Classification and Description*. Columbia, SC: South Carolina Wildlife and Marine Resources Department Division of Wildlife and Freshwater Fisheries.

and sweet-gum in the canopy or near-canopy layer, with the occasional willow oak, blackjack oak, and post oak, mockernut and pignut hickories, longleaf pine, red-cedar (*Juniperus virginiana*), and winged elm (*Ulmus alata*). The near-canopy layer consisted of horse-sugar, sourwood, American holly, and persimmon. The understory consisted of wax-myrtle (*Myrica cerifera*), highbush blueberry (*Vaccinium corymbosum*), Chinese privet, inkberry, and sweet pepperbush, with the occasional winged sumac, sassafras (*Sassafras albidum*), beauty-berry (*Callicarpa americana*), St. Andrews-cross (*Hypericum hypericoides*), and devil's-walkingstick (*Aralia spinosa*). Woody vines in the pine flatwoods communities included briers (*Smilax rotundifolia, S. smallii,* and *S. glauca*), yellow jessamine, muscadine, Virginia creeper, poison-ivy, Japanese honeysuckle, and trumpet-vine. The herbaceous layer was dominated by bracken fern (*Pteridium aquilinum*), blackberry, pipsissewa, and ebony spleenwort.

3.11.4.4 Upland pine-wiregrass woodland

Upland pine-wiregrass woodlands occur in the fall-line sandhills, or on sand ridges associated with rivers in the Coastal Plain, and have deep, well-drained sands. Pines dominate the canopy, and several scrub oak species dominate the understory layer.[100] The herb layer is usually sparse, while the pine species present are usually longleaf pine *(Pinus palustris)*, and some pond pine *(Pinus serotina)*. According to Nelson,

> "a dense layer of *Aristida stricta* is usually present. This community is drier than flatwoods, is never flooded and usually never wet. Organisms within it are generally very much adapted to occasional fires, the absence of which leads to the rapid invasion of additional hardwood species and numerous shrubs."[101]

Upland pine-wiregrass communities identified within the Preferred Alternative study corridor during the wetland delineation were dominated by loblolly and longleaf pines, mockernut hickory, water oak, blackjack oak, turkey oak (*Q. laevis*), post oak, southern red oak, and sweet-gum in the canopy layer. The understory was comprised of sassafras, American holly, and dogwood of various heights, with sweet-bay (*Magnolia virginiana*) and red-bay (*Persea borbonia*) occurring on the edges of wetlands. Dense thickets of sparkleberry (*Vaccinium arboreum*), and deerberry (*Gaylussacia dumosa*) grew beneath the understory. Vines within these communities included yellow

Upland pine-wiregrass woodland

[100] *Ibid.*
[101] *Ibid.*

jessamine, catbrier, and muscadine, while the herb layer was dominated by wiregrass, reindeer moss (*Cladonia* sp., a lichen), bracken fern, ebony spleenwort, pipsissewa, and trailing arbutus (*Epigaea repens*). Sandhills wild indigo (*Baptisia cinerea*), and blazing-star (*Liatris squarrosa*) were two wildflowers observed occasionally in this habitat.

In addition to the natural areas above, the Preferred Alternative study corridor contained other upland areas, including agricultural fields and timberlands, and developed areas. Although timberlands have been altered from the natural forest, they continue to provide wildlife habitat and recreational opportunities as described earlier. Selective harvesting of trees from forested areas provides openings in the overstory, which allows sunlight to reach the ground. This promotes growth of herbaceous and shrub plant species, thereby making the forest habitat more diverse, which in turn provides additional nesting and foraging opportunities for wildlife such as small mammals and birds.

3.11.4.5 Agricultural fields and timberlands

Agricultural fields and timberlands are not natural communities. However, these upland communities are significant elements in the project study area, and therefore have been included in this discussion. Agricultural fields include those currently planted with crops or fallow fields that have not yet succeeded to another community type. Pastureland and hedgerows/fencerows are also included in this category. Timberlands include pine plantations, and are managed primarily for pulpwood. Typically, these areas are planted with loblolly pine or slash pine (*Pinus elliottii*). The project study area contains some Carolina bays that have been drained and are now agricultural fields and/or managed timberlands.

Tobacco Farm Field

3.11.4.6 Developed areas

Developed areas are lands that have been built upon for residential or commercial purposes. These include maintained lawns, residences, parking lots, vacant lots, abandoned home sites, industrial yards, and commercial buildings, among others.

3.11.5 How would upland communities be impacted?

The amount of upland natural communities that would be impacted by the clearing and grubbing of vegetation within the construction limits of the Preferred Alternative were estimated. Excavation and/or the placement of fill material would also occur in order to construct the roadbed, resulting in impacts to natural upland communities. The Preferred Alternative would impact a total of 923.4 acres in five forested upland communities, including mesic mixed hardwood forests, oak-hickory forests, pine flatwoods, upland pine-wiregrass woodlands, and timberlands (refer to Table 3.44). While the majority of the upland impacts from the Preferred Alternative would occur to agricultural and developed lands, 45 percent of the total upland impacts would be to forested upland communities.

Upland community impacts would result in the removal of wildlife habitat as discussed in Section 3.14.4, (refer to page 3-206). Of the forested uplands that would be impacted, the mesic mixed hardwood forest supports the most wildlife diversity due to the presence of mast producing species, which are used by animal species such as turkey, squirrels, and white-tailed deer as food. The Preferred Alternative would impact 0.24 acre of mesic mixed hardwood forest.

The oak-hickory forest is the next most diverse upland community for wildlife when compared to the other forested upland communities present in the Preferred Alternative study corridor. It too harbors oaks and hickories, as well as other tree and shrub species that serve as food for many species of wildlife. The Preferred Alternative would impact 100.7 acres of oak-hickory forest.

Pine flatwoods and pine-wiregrass woodlands typically have a less diverse understory in terms of plant species when compared to the previous two communities, but provides cover and forage for

Table 3.44
Forested Upland Community Impacts, in Acres

Forest Type	Preferred Alternative
Mesic mixed hardwood forest	0.24
Oak-hickory forest	100.7
Pine flatwoods	32.4
Upland pine-wiregrass woodland	153.8
Timberlands	636.3
Total Upland Forest Impact	**923.4**

Source: THE LPA GROUP INCORPORATED, 2008

white-tailed deer and other wildlife. These communities also provide nesting and forage habitat for a variety of perching bird species. The Preferred Alternative would impact 32.4 acres of pine flatwoods and 153.8 acres of pine-wiregrass woodlands.

The largest portion of the upland forest impacts would occur to timberlands, or managed pine stands, which typically have low wildlife diversity when compared to the other upland forested communities found within the Preferred Alternative study corridor. These forested communities are frequently disturbed by logging operations that displace wildlife to adjacent upland communities. Timberlands may provide foraging habitat for red-cockaded woodpeckers; however, these forests are harvested before they become mature stands, which is required for suitable red-cockaded woodpecker nest colonies. The Preferred Alternative would impact 636.3 acres of timberlands.

3.11.6 What indirect and cumulative impacts to uplands could occur as the result of the project?

Projected land use maps were used to estimate the potential indirect impacts to forested upland habitats. Section 3.10.10, (refer to page 3-148), contains discussion on indirect and cumulative impacts to upland farmland. Potential forested upland indirect impacts that could occur along the Preferred Alternative, and those associated with the No-build Alternative, were calculated using GIS analysis of the projected development shape files and the GAP habitat data layer. Table 3.45 provides the results of the analysis. This analysis is based on projected impacts to tracts identified by the land use models and does not take into consideration the future changes that could take place in the study area due to ongoing agriculture and silviculture practices.

Cumulative impacts to forested uplands as the result of residential and commercial development, and road construction/improvement projects in the study area are assured due to the Section 404 permitting and mitigation requirements that tend to force development into uplands. With the exception of County and municipal land use plans, SCHEC's stormwater permitting program, and some farmland protection programs, development in uplands is not regulated.

3.12 Wetlands

3.12.1 What are wetlands?

The USACE and USEPA define wetlands as "those areas that are inundated or saturated by surface or groundwater 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

Table 3.45
Potential Indirect Forested Upland Impacts (in acres)

	Alternative	
	No-build Alternative	Preferred Alternative
UPLAND TYPE		
Mesic Mixed Hardwood	0	0.1
Pine Flatwoods	26.3	37.8
Oak-Hickory Forest	0.1	10.5
Timberland	19.5	93.7
Total Indirect Upland Impact	**188.0**	

Source: THE LPA GROUP INCORPORATED, 2008.

typically include swamps, marshes, bogs, and similar areas."[102] Wetlands are often transitional areas between uplands and aquatic communities.

The USACE, through Section 404 of the *Clean Water Act of 1977* (CWA), has regulatory authority over waters of the United States, including wetlands. This authority empowers the USACE to identify wetland/upland boundaries and to regulate alterations of jurisdictional wetlands. These boundaries are established in accordance with the methodology in the *1987 Corps of Engineers Wetlands Delineation Manual*.[103] An area must exhibit evidence of wetland vegetation, wetland soil, and wetland hydrology to be considered a wetland. Wetlands identified within the project study area are shown on Figure 3-31 (refer to page 3-163).

3.12.2 Why are wetlands important?

Wetlands are important because of the functions and values they provide. These functions and values are relative to:

- Hydrology (e.g., flood control, groundwater recharge and discharge, and dissipation of erosive forces);
- Water quality (e.g., removal of sediments, toxins, and nutrients);
- Food chain support and nutrient cycling (e.g., primary production and nutrient export/utilization);
- Wildlife habitat (e.g., breeding, rearing, and feeding grounds for fish and wildlife species); and,
- Socioeconomics (e.g., recreational, educational, aesthetic, and consumptive uses).

[102] U.S. Army Waterways Experimental Station Environmental Laboratory, *Corps of Engineers Wetlands Delineation Manual* (Washington, D.C.: Department of the Army, USACE, 1987) Technical Report Y-87-1; 33 CFR §328.3[b] and USEPA 40 CFR §230.3[t].

[103] *Ibid*

3.12.3 How were wetlands identified within the Preferred Alternative study corridor?

The following GIS data layers were obtained for the purpose of identifying wetlands within the Preferred Alternative study corridor:

- NWI Maps;
- Soil data layers;
- U.S. Geological Survey (USGS) topographic maps;
- 1999 false-color infrared aerial photography;
- 2003 true-color aerial photography;
- 2005 true-color aerial photography; and,
- 2006 false-color infrared aerial photography.

The NWI wetland layer was used to define the wetlands until the Build Alternatives were developed. After the Build Alternatives were identified, the NWI wetland boundaries were re-evaluated. For three Build Alternative corridors, NWI mapping was overlain onto the aerial photography and a desktop review was performed using the soil maps, NWI maps, and aerial photography. The USGS topographic maps, along with the SCDNR and NCDENR stream data layer, were used to map second and third order streams within the project study area. Questionable areas, those that were indicated as wetland on the NWI map, but did not exhibit typical wetland signatures on the aerial photography, or those that were indicated as upland on the NWI map, but appeared to be wetland, were identified. Field visits were then performed and the questionable areas were groundtruthed. During the field visits it was noted where some former wetland areas were effectively drained by ditches. These locations were revised on the project wetland map. Likewise, areas that were identified as upland on the NWI map but were found to be wetland during the field visits were revised on the wetland map. Additional information collected during the field visits included other impacts to wetland communities such as changes in the vegetation types (i.e., former forested wetlands that have been cut and are currently secondary growth communities) and areas that have been ditched, but still meet the three basic criteria of jurisdictional wetlands.

As discussed in Chapter 2, each NWI wetland type within the project study area was assigned a numerical value between 1 and 10 by the ACT. This value was based on the relative quality of each wetland type. Areas that had been previously impacted were given a lower value based on the severity of impact in accordance with the values assigned to wetland types by the ACT members and changes were made to the database accordingly. The values of the wetlands on the mapping were updated when observations from the field visits concluded that a particular wetland had been altered by practices such as conversion to maintained utility corridors or silviculture.

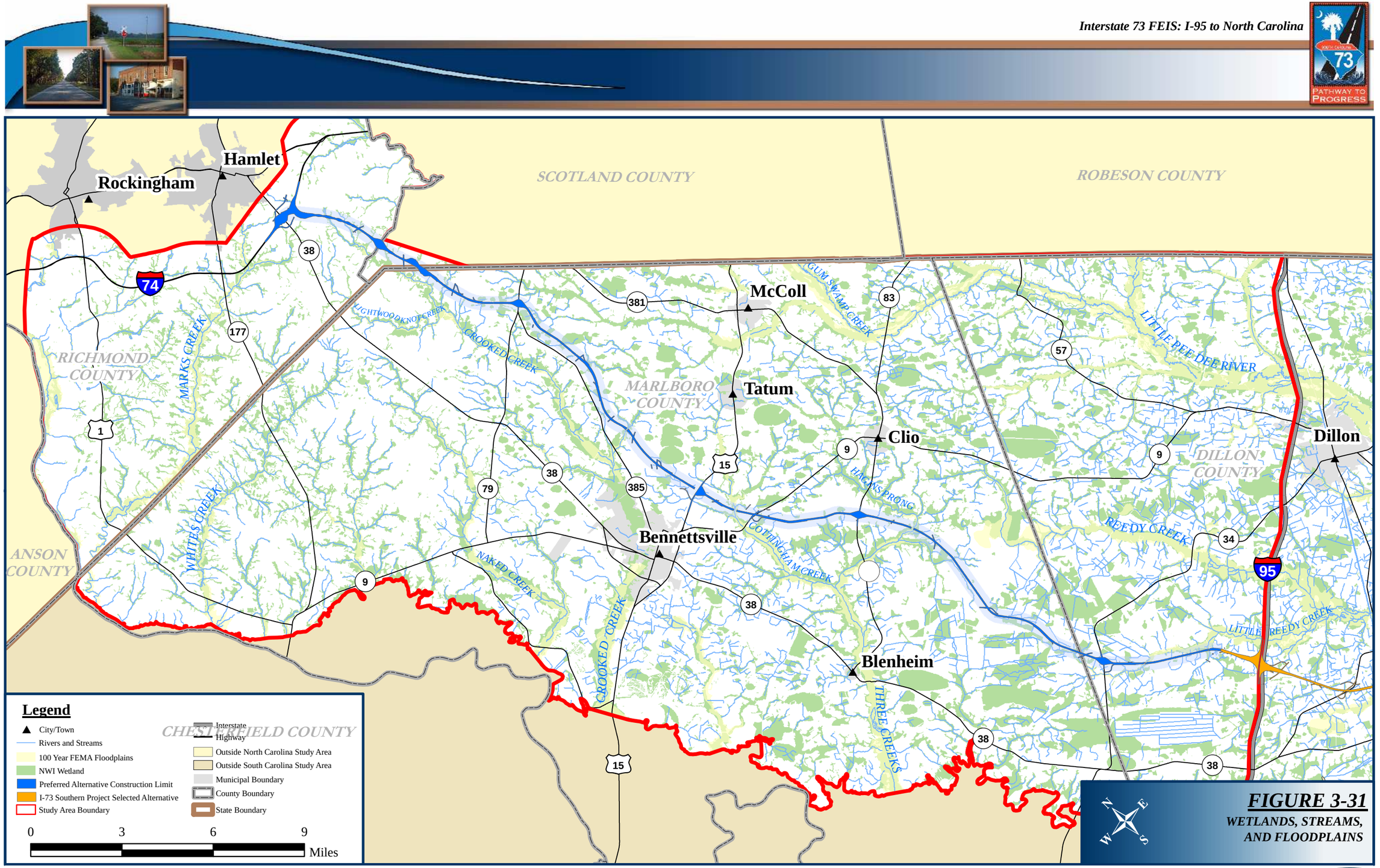

FIGURE 3-31
WETLANDS, STREAMS, AND FLOODPLAINS

A field delineation was performed within the Preferred Alternative study corridor between September 2007 and May 2008. The Preferred Alternative study corridor extends 300 feet on both sides of the proposed centerline for approximately 36.6 miles, the length of the Preferred Alternative. The proposed over/under passes for existing roads were included, and measured 100 feet in width from the centerline of the existing roadway on both sides of the existing roadway. Proposed interchanges with existing roads were also delineated. They were defined as the area encompassed by offsetting the centerline of the on and off ramps 100 feet to the outside of the interchange. Wetland boundaries were determined using the methodology described in the 1987 *Corps of Engineers Wetlands Delineation Manual*,[104] and marked with surveyors flagging labeled "Wetland Boundary". The wetland boundaries were mapped using sub-meter accuracy Global Positioning System (GPS) equipment. A wetland map for the Preferred Alternative study corridor was produced using these mapped wetland boundaries. The wetland map and supporting documentation have been submitted to the USACE Charleston and Wilmington Districts, and approvals for the wetland approximation were requested.

3.12.4 What wetland types were identified in Preferred Alternative study corridor?

Wetlands and waters of the United States were categorized by general types according to various standard classification systems found in *Classification of Wetlands and Deepwater Habitats of the United States*.[105] All of the wetlands and waters of the United States that occur within the project study area are palustrine (freshwater).

During the wetland delineation, the boundary between the wetland and upland was marked; however, the boundaries between different wetland types within the delineated area were not marked. For example, several large wetland areas would have aquatic beds, wooded swamp, and freshwater marsh within a single delineated area. The wetland community was identified by the dominant wetland community of the whole area. Therefore, although aquatic beds were present within the Preferred Alternative study corridor, they were present within larger, more dominant wetlands and not identified separately during the delineation. After the delineation was completed, these areas were identified and their limits estimated within the larger wetland using aerial photography.

Multiple wetland types can be found in association with each other to form wetland systems. Two major wetland systems found within the project study area are Carolina bays and riparian systems. Carolina bays are generally oval in shape, are oriented roughly northwest to southeast, and have a distinctive sand rim along the southeast edge. They are found in the Coastal Plain of North Carolina, South Carolina, and Georgia. Wetland types in Carolina bays can vary and often include evergreen

[104] *Ibid.*

[105] L.M. Cowardin, V. Carter, F.C. Golet, and E.T. LaRoe, *Classification of Wetlands and Deepwater Habitats of the United States*, prepared for the USDI-FWS. FWS/OBS-79/31, Washington, D.C., (1979).

shrub bogs/pocosins, deciduous shrub swamps, and/or bay forests. Fully functional Carolina bays were identified as constraints and were avoided during alternative development. The Preferred Alternative does not impact any intact fully functional Carolina bays.

Riparian wetlands are systems associated with rivers and streams, are considered higher value wetland systems, and are numerous throughout the project study area. During the development and refinement of the Preferred Alternative, efforts were made to avoid and minimize impacts to these systems by crossing on structure and aligning the roadway such that crossings are perpendicular where practicable. These systems consist of a variety of wetland types such as wooded swamps, bottomland hardwoods, aquatic beds, flooded swamps/beaver ponds, and deciduous shrub swamps. Streams typically do not have wide wetlands near their headwaters where riparian systems tend to be narrow, except in the sandhills region in the northern portion of the Preferred Alternative study corridor, where streamhead pocosin wetlands are often found at the headwaters of streams. Riparian wetlands in the project study area tend to be much wider than at the headwaters as they near the Great and Little Pee Dee Rivers. Riparian wetland systems within the Preferred Alternative study corridor were predominantly wooded swamp and flooded swamps/beaver ponds.

The following types of wetlands and waters of the United States identified within the Preferred Alternative study corridor are described in the following subsections:

- Aquatic beds;
- Bottomland hardwoods;
- Deciduous shrub swamp;
- Freshwater marsh;
- Ponds and borrow pits;
- Rivers and canals;
- Streamhead pocosin; and,
- Wooded swamp.

3.12.4.1 Aquatic beds

Aquatic beds are permanent to nearly-permanent bodies of freshwater such as ditches, pools, ponds and slow-moving streams, rivers and canals. The only plants that tolerate this inundation have modified structures to remain submerged or to float. Herbaceous species, predominately duckweeds (*Lemna* spp.), water-lily (*Nymphaea odorata*), parrot-feather (*Myriophyllum aquaticum*), and water-shield

Aquatic bed

(*Brasenia schreberi*), were the only plant types to occur in these conditions within the Preferred Alternative study corridor.

Aquatic beds often occur in association with perennial streams that flow through the project study area, and are usually located along the margin of flowing streams between the stream channel and the adjacent floodplain wetlands. Approximately 102 acres of aquatic beds are located throughout the project study area, and 10.3 acres were delineated within the Preferred Alternative study corridor.

3.12.4.2 Bottomland hardwoods

Bottomland hardwood

Bottomland hardwoods are typically associated with rivers, creeks, or other drainage systems. These low-lying bottomlands frequently serve as a holding area for flood waters from the main channel, especially after a heavy rain upstream. They may also occur in low areas and along small surface drainages and are temporarily flooded or saturated during the growing season. Typical tree species found within the Preferred Alternative study corridor during the delineation included red maple (*Acer rubrum*), sweet-gum (*Liquidambar styraciflua*), swamp tupelo, and loblolly pine (*Pinus taeda*). Shrubs consisted of red-bay, wax-myrtle (*Myrica cerifera*), dog-hobble (*Leucothoe axillaris*), and sweet-bay. Vines such as yellow jessamine (*Gelsemium sempervirens*), muscadine (*Vitis rotundifolia*), poison-ivy (*Toxicodendron radicans*), and several species of catbrier (*Smilax laurifolia*, S. *glauca*, and *S. rotundifolia*) were abundant within the Preferred Alternative study corridor. Herbaceous plants such as cinnamon fern (*Osmunda cinnamomea*), netted chain fern (*Woodwardia areolata*), royal fern (*Osmunda regalis*), false nettle (*Boehmeria cylindrica*), lizard's tail (*Saururus cernuus*), jack-in-the-pulpit (*Arisaema triphyllum*), and giant cane (*Arundinaria gigantea*) were common. An estimated 5,415 acres of bottomland hardwood wetlands are present in the project study area while 55.2 acres were delineated within the Preferred Alternative study corridor.

3.12.4.3 Deciduous shrub swamp

Deciduous shrub swamps are generally the result of a disturbance to a swamp, creek, or other natural wetland, either by clear-cutting, beaver activity, or other major physical change, but can also be stable communities.[106] If clear-cut, these areas quickly become a dense tangle of

[106] *Ibid.*

blackberries (*Rubus argutus*), cat briars (*Smilax* spp.), and weedy growth amid the debris left behind by the logging activities and stump sprouts of the more opportunistic tree species such as sweetgum, red maple, and sweet bay. Deciduous shrub swamps located within the Preferred Alternative study corridor were mostly clear-cut and contained these species. Short-lived woody species such as black and/or Carolina willow (*Salix nigra*, *S. caroliniana*), button-bush (*Cephalanthus occidentalis*), and elderberry (*Sambucus canadensis*) were also present, able to benefit from the open canopy. Marsh dwellers, such as soft rush (*Juncus effusus*) and bulrush (*Scirpus cyperinus*) were also present, taking advantage of the (temporarily) open sun in these clear-cut areas.

Deciduous shrub swamp

Deciduous shrub swamp is one of the least represented wetlands types within the project study area despite the fact that it is often the result of man-made disturbance. This wetland type appears to be predominantly associated with streams in the project study area. While there is an estimated 2,491 acres of deciduous shrub swamp in the project study area, only 0.6 acre were delineated within the Preferred Alternative study corridor.

3.12.4.4 Freshwater marsh

Freshwater marshes are open wetlands with a highly variable water level dominated by emergent grasses, sedges, and rushes. This type of wetland is usually associated with deep water wetlands, but can also be found where trees have been removed in utility and roadway corridors, and other places where man prevents succession into, or back into, wooded wetlands.[107] Freshwater marshes within the Preferred Alternative study corridor consisted of sedges (*Carex* spp.), rushes (*Juncus* spp.), sugar cane plume-grass (*Erianthus giganteus*), arrow-arum (*Peltandra*

Freshwater marsh

[107] Nelson, John B. 1986. *The Natural Communities of South Carolina: Initial Classification and Description.* Columbia, SC: South Carolina Wildlife and Marine Resources Department Division of Wildlife and Freshwater Fisheries.

virginica), smartweeds (*Polygonum* spp.), pickerelweed (*Pontederia cordata*), arrowhead (*Sagittaria latifolia*), and cattails (*Typha* spp.).

Like aquatic beds, some areas of freshwater marsh in the project study area are located along the margin of flowing streams between the stream channel and the adjacent floodplain wetlands. Several freshwater marshes found within the Preferred Alternative study corridor resulted from inundation of other wetland types caused by beaver activities, while others developed due to maintenance activities within utility corridors. The project study area has an estimated 564 acres of freshwater marsh while 20.3 acres were delineated within the Preferred Alternative study corridor.

3.12.4.5 Ponds and borrow pits

Ponds and borrow pits are typically manmade, open, freshwater communities, and are normally created by excavation activities, or altering stream or surface drainage flow. According to NWI mapping, and for purposes of this project, water bodies less than 20 acres in size fall into this category.[108] Other freshwater systems are often found associated with ponds and borrow pits in the form of fringe wetlands. Approximately 2,097 acres of ponds and borrow pits are found in the project study area and 1.3 acres were delineated within the Preferred Alternative study corridor.

Mill pond

3.12.4.6 Rivers and canals

Perennial streams and rivers are riverine systems that are permanently flooded. In general, the open water areas are either unvegetated, or include occasional beds of submerged or floating aquatic plants. Intermittent streams are riverine systems with streambeds that are seasonally flooded.

Rivers and canals within the project study area include meandering and channelized unnamed intermittent streams and perennial streams with their tributaries. Streams within the Preferred Alternative study corridor included Hagins Prong, Cottingham Creek, Reedy Creek, Crooked Creek, Little Reedy Creek, Beverly Creek, and their unnamed tributaries. All of the perennial and intermittent streams within the Preferred Alternative study corridor ultimately drain into

[108] L.M. Cowardin, V. Carter, F.C. Golet, and E.T. LaRoe, *Classification of Wetlands and Deepwater Habitats of the United States*, prepared for the USDI-FWS. FWS/OBS-79/31, Washington, D.C., (1979).

either the Little Pee Dee River or the Great Pee Dee River. There are an estimated 486 linear miles of perennial streams and 896 linear miles of intermittent streams located within the project study area. Approximately 10,036 linear feet of perennial and 17,891 linear feet of intermittent streams were identified within the Preferred Alternative study corridor.

3.12.4.7 Streamhead pocosin

Streamhead pocosins are seasonally to semipermanently saturated palustrine wetlands underlain by wet, acidic soils occurring along the headwaters of small streams in sandhill areas, and dominated by a thick shrub layer. Streamhead pocosin vegetation may expand uphill into the upland sandhill communities if not subjected to periodic fire. The absence of fires through fire suppression techniques has resulted in the streamhead pocosins in the study corridor being dominated by gallberry and bamboo-vine, completely shading out the more typical diverse ecotonal plant species. Downstream, they generally transition into bottomland hardwoods or wooded swamp communities.[109]

Streamhead pocosin

Shrubs dominating the streamhead pocosins found within the Preferred Alternative study corridor included gallberry, fetterbush, ti-ti, inkberry, red-bay, sweet pepperbush, highbush blueberry, coastal honeybells (*Leucothoe racemosa*), and dangleberry, among others. The evergreen bamboo-vine was abundant, and the canopy contained scattered to fairly dense trees such as tulip-poplar, red maple, sweet-bay, loblolly pine, pond pine, swamp tupelo, and sweet-gum. The herb layer was typically sparse, with netted chain fern, cinnamon fern, and cane dominating. Streamhead pocosins within the Preferred Alternative study corridor that graded into beaver ponds or marshes had more herbaceous plants such as grasses and sedges along the open margins. An estimated 2,065 acres of streamhead pocosins occur in the project study area and 29.8 acres were delineated within the Preferred Alternative study corridor.

3.12.4.8 Wooded swamp

Wooded swamps are wetlands generally associated with brownwater or blackwater rivers that may be flooded for several months during the growing season to nearly year round, and seldom dry out. The canopy of wooded swamps found within the Preferred Alternative study corridor

[109] Schafale, Michael P. and Alan S. Weakley. 1990. *Classification of the Natural Communities of North Carolina*. Raleigh, NC: North Carolina Natural Heritage Program Division of Parks and Recreation & N.C. Department of Environment, Health, and Natural Resources.

is dominated by bald cypress (*Taxodium distichum*) and/or pond cypress (*Taxodium ascendens*), and either swamp tupelo (*Nyssa sylvatica* var. *biflora*) in blackwater systems, or water tupelo (*Nyssa aquatica*) in brownwater systems. These tree species have adaptations for growing in water, including swollen and buttressed bases, and, in the case of the cypress species, "knees." Other common tree species included water ash (*Fraxinus caroliniana*), red maple, water hickory (*Carya aquatica*), overcup oak (*Quercus lyrata*), sweetgum, sweet-bay, red-bay, and willow oak (*Quercus phellos*).

Wooded swamp

Wooded swamps found within the Preferred Alternative study corridor were slow-moving drainages often with no distinct channel. While approximately 48,017 acres of wooded swamps are present in the project study area, only 4.2 acres were delineated within the Preferred Alternative study corridor.

3.12.5 What kind of impacts would occur in wetlands as a result of the proposed project?

Wetland impacts associated with the project would include the placement of clean fill material into wetlands, temporary clearing of vegetation within the construction limits of the project, and permanent clearing and grubbing of vegetation at bridge crossings. The fill material would be required to construct the roadbed and would result in the permanent conversion of the portion of the wetlands to uplands within the construction limits. Temporary clearing of wetlands would be required along the toe of the fill material to allow for maintenance of the required silt fencing which protects the adjacent wetlands from siltation during the construction period. The temporarily cleared areas would be reseeded with native wetland vegetation to reduce the risk of invasive plant species infestation once the side slopes of the road are stable and the silt fencing has been removed.

Permanent clearing of trees would be performed where wetlands would be bridged. This would be done to prevent trees from growing under the bridges and potentially damaging the structures. Trees would be removed for a width of approximately 30 feet along both sides of each bridge. The areas would be maintained to prevent trees from growing there. This type of impact does not destroy the wetland, but does change the wetland type. For example, if a bridge is constructed through a wooded swamp, the wooded swamp could become a deciduous shrub swamp or a fresh water marsh after the removal of the trees.

3.12.6 How were the potential wetland impacts calculated?

Upon completion of the delineation, the wetland acreage within the Preferred Alternative study corridor was less than what was originally calculated using the modified NWI mapping, resulting in less impacts than previously estimated. This discrepancy is due in part to the greater accuracy in mapping boundaries in the field when compared to the less accurate method of defining wetland boundaries using aerial photography. To calculate the potential impacts associated with construction of the Preferred Alternative, the conceptual construction limits and conceptual bridge designs were overlain onto the wetland mapping produced from the wetland delineation and the areas of the "footprint" of the road within wetlands were calculated. The conceptual construction limits included the main lines and associated frontage roads, the proposed interchanges, crossover roads, and other roads necessary to maintain access to properties. The current design is conceptual and based on USGS topographic mapping, not surveyed contours. To account for the potential inaccuracy of the mapping, fifteen feet of additional fill was added to the slope limits and the revised slope limits were used to calculate the fill impacts. A 10-foot wide clearing limit was added along the edge of the slope limits to calculate the temporary NPDES clearing impacts. Where streams with adjacent wetlands would be bridged, the bridge length and 30 feet beyond the outside edge of each bridge was used to estimate the potential permanent clearing impacts associated with bridges.

3.12.7 How many acres of wetlands would be impacted by the proposed project?

Table 3.46 provides the wetland types that would be impacted, the type of impact, the size of the impact area, and the wetland value for the Preferred Alternative. A total of 57.2 acres of wetlands would be impacted by the Preferred Alternative, including 4.3 acres of clearing/bridge impacts and 52.9 acres of fill impacts. The total wetland value for the impact by the Preferred Alternative was 285.9. The largest impact would occur to streamhead pocosins at 22.7 acres of total wetland impact, followed by bottomland hardwoods with 22.4 acres of total wetland impact.

Based on observations during the wetland delineation, most of the wetlands crossed by the Preferred Alternative have been previously impacted. Previous impacts observed within the Preferred Alternative study corridor included areas that had been clear cut, which created a temporary habitat change, permanent habitat conversion due to fire suppression that resulted in dense undergrowth in streamhead pocosins, and creation of monoculture pine stands in wetlands. Other previous impacts that were observed consisted of the use of drainage ditches, which affected the onsite hydrology of wetlands to the point that they barely met the criteria to be wetlands, as well as fill material in wetlands from existing roads and development adjacent to the proposed crossings.

South of Dunbar Highway (Road S-34-32), many of the wetlands that would be impacted by the Preferred Alternative consist of remnants of what were historically larger wetlands that have been

Table 3.46
Potential Wetland Direct Impacts by the Preferred Alternative, in Acres and Wetland Values

WETLAND ACRES	
Wetland Type	**Amount Impacted by Preferred Alternative**
Aquatic Beds (Total)	**4.1 ac**
Clear/Bridge Impact	0
Fill Impact	4.1 ac
Bottomland Hardwoods (Total)	**22.4 ac**
Clear/Bridge Impact	2.1 ac
Fill Impact	20.3 ac
Deciduous Shrub Swamps (Total)	**0**
Clear/Bridge Impact	0
Fill Impact	0
Freshwater Marshes (Total)	**7.0 ac**
Clear/Bridge Impact	0
Fill Impact	7.0 ac
Ponds and Borrow Pits (Total)	**0.2 ac**
Clear/Bridge Impact	0
Fill Impact	0.2
Streamhead Pocosins (Total)	**22.7 ac**
Clear/Bridge Impact	2.1 ac
Fill Impact	20.6 ac
Wooded Swamps (Total)	**0.8 ac**
Clear/Bridge Impact	0.1 ac
Fill Impact	0.7 ac
Total Wetland Impact	**57.2 ac**
Clear/Bridge Impact	4.3 ac
Fill Impact	52.9 ac
WETLAND VALUES	
Total Wetland Value Impact	285.9
Clear/Bridge Impact	20.4
Fill Impact	265.5

Source: The LPA Group Incorporated, 2008.

reduced in size by the installation of drainage ditches in or near the wetlands, and conversion to upland pine plantations. These remnant wetlands received lower values as decided in consultation with the ACT. However, riparian wetland systems located in the Preferred Alternative study corridor were considered to be higher value wetlands.

Major crossings of higher value riparian wetlands associated with Little Reedy Creek and its unnamed tributary would occur south of Dunbar Highway (Road S-34-32). However, most of the higher value riparian wetlands within the Preferred Alternative study corridor are located north of Dunbar Highway. The use of bridges at the major riparian crossings would help minimize wetland and stream impacts. The Preferred Alternative would cross on structure five major riparian wetland systems primarily on structure including Little Reedy Creek, an unnamed tributary to Little Reedy Creek, Hagins Prong, Cottingham Creek, and Beverly Creek. Hydraulic studies performed during the preparation of the final design will determine whether the minor crossings of ten unnamed tributaries to Crooked Creek would be piped or culverted.

3.12.8 What other impacts could occur from construction?

False-color infrared aerial photography (2006) was acquired from SCDNR for the Preferred Alternative study corridor as well as adjacent areas. GIS data layers, including soil survey data, topographic mapping and NWI mapping were used to evaluate the presence of sufficient uplands within a one-mile wide corridor centered on the Preferred Alternative for acquiring fill material. These materials, along with the 2006 aerial photography, were reviewed and the NWI wetland boundaries were updated for use in borrow pit evaluations.

Initial review of this material determined that available remote data gave a good general overview of the area to determine the presence of potential upland borrow sites. The Preferred Alternative study corridor and adjacent areas had been extensively surveyed during the initial groundtruthing site visits, potential shift investigations, and wetland delineation phase. Developed uplands were not included in the evaluation but may be an additional source of borrow material as well.

There are significant amounts of high quality wetlands associated with the Hagins Prong and Crooked Creek systems within and adjacent to the Preferred Alternative study corridor. These wetlands should not be used for sources of borrow materials if sufficient uplands areas are available. Based on a review of the soil maps, numerous areas adjacent to the Preferred Alternative contain hydric soils. However, many of these areas have been effectively drained by ditching and, therefore, appear to be suitable as a source for borrow materials. It should be noted that these areas may still contain low areas with wetland characteristics. Potential borrow sites in these areas should be evaluated for wetlands on a site-by-site basis. Other areas that are currently used as agricultural

fields and/or pastures also occur throughout and adjacent to the Preferred Alternative study corridor, and appear to be suitable as upland borrow area sites. Table 3.47 includes a breakdown of the potentially suitable borrow areas by current land use.

Table 3.47
Potential Borrow Pit Areas by Land Use Type

Land Use	Acres
Cropland/Pasture	7,368
Mesic Mixed Hardwood	3
Oak Hickory Forest	958
Orchard/Grove/Vineyard/Nurseries	15
Pine Flatwood Forest	166
Pine Scrub Oak Forest	714
Scrub Shrub Rangeland	411
Upland Planted Pine	7,263
Total Acres	16,898

Upon completion of this analysis, it was concluded that sufficient upland areas that could be utilized for borrow activities appear to be present in close proximity to the Preferred Alternative alignment. Therefore, it appears that impacts to wetlands due to the borrowing activities could be avoided. Wetland delineations would be performed at the borrow pit sites and potential impacts to federally listed species and cultural resources would be evaluated prior to beginning excavation, in accordance with the SCDOT Engineering Directive (EDM – *Borrow Pit Location and Monitoring*).

3.12.9 What kind of and how much impact would occur in streams as a result of this project?

The degree of stream impacts due to roadway crossings is dependent on the location of the crossing within the watershed and the width of the roadway. Impacts to smaller streams located at higher elevations of the watershed, nearer the headwaters, would likely consist of the installation of pipes or culverts to carry the water under the road. Whether a pipe or a culvert is used depends upon the size of the channel being crossed and the size of the watershed it drains. Unlike bridge crossings, pipe and culvert crossings prevent sunlight penetration, can affect flow and velocity characteristics, can prevent fish passage when improperly designed/installed, and prevent accumulation of food sources in the form of detritus due to scouring effects. In some instances streams identified within the construction limits may be realigned or relocated in order to provide a perpendicular crossing which would reduce the length of streams that would be impacted by pipes or culverts that the stream would flow through.

Wide streams that are typically located at lower elevations in the watershed, and closer to rivers, are typically bridged, as dictated by the presence of a regulated floodplain and/or floodway. Therefore, impacts to large streams with regulated floodways would generally be minimized by bridging. In many cases, the entire channel could be spanned by the bridge and no impacts would occur to the stream channel. However, for wide braided streams, bridge pilings might be required within the channels. For smaller streams where bridges may not be warranted, appropriately sized pipes or box culverts may be installed for the road crossings to prevent a restriction of flow. The use of pipes, culverts, and/or bridges would be determined by the results of hydraulic studies performed during the final design. The type of structure used is dependent on factors such as watershed size and the presence or absence of FEMA regulated floodplains and floodways.

Five perennial streams that have major riparian wetland systems associated with them would be crossed by the Preferred Alternative. However, each of these streams have been previously impacted by road crossings, railroad crossings and/or ponds. Table 3.48 provides a listing of the streams and the type and number of previous impacts to the main channel of each stream.

Table 3.48
Existing Stream/Riparian Wetland Crossings

	IMPACT TYPE			
	Road Crossings	Railroad Crossings	Ponds/Lakes	TOTAL
Beverly Creek	6	0	2	**8**
Cottingham Creek	6	1	2	**9**
Hagins Prong	9	0	0	**9**
Little Reedy Creek	4	0	0	**4**
Little Reedy Creek Tributary	3	0	0	**3**

Source: The LPA Group Incorporated, 2008.

Many of the tributaries to the streams that make up the watershed also have similar impacts. The Preferred Alternative would not cross any mainline channel more than once; therefore, I-73 would add one additional road crossing to the main channel of these streams.

For Section 404 and Section 401 permitting purposes, impacts to streams are measured in terms of the length along the centerline of the stream that would be affected. They are reported as linear feet of impact. As with the wetland impact calculations, the length of the stream sections that lay within the conceptual construction limits were measured. Table 3.49 provides the number of perennial

Table 3.49
Potential Direct Stream Impacts from the Preferred Alternative

	Preferred Alternative	Total Linear Feet Present in Project Study Area
Perennial Streams		
Number of Crossings	11	
Linear Feet	5,188	2,564,336
Intermittent Streams		
Number of Crossings	12	
Linear Feet	9,806	4,731,797
Total Number of Crossings	**23**	
Total Stream Impact	**14,994**	**7,296,133**

Source: The LPA Group Incorporated, 2008.

and intermittent streams crossed and the linear footage of impacted streams for the Preferred Alternative based on the results of the delineation. As described in Section 3.12.6, page 3-171, stream crossings that would have a pipe or culvert installed would represent a more severe impact to streams than would bridges that span larger streams.

As indicated in Table 3.49, the Preferred Alternative would have 23 stream crossings with 14,994 linear feet of potential impact. Streams with regulated floodplains and floodways would be bridged and it is anticipated that modifications to these channels would be minimal. Temporary modifications such as the installation of coffer dams in stream channels in order to construct footings for bridge pilings might be required in the braided streams. However, since these modifications would be temporary and would be removed upon completion of the bridge construction, minimal impacts would occur.

All jurisdictional streams were identified and mapped during the wetland delineation for the Preferred Alternative. Preliminary hydraulic studies were performed for the Preferred Alternative to determine the appropriate lengths of bridges and where the use pipes or box culverts would be appropriate. The installation of pipes or box culverts would require water body modification and could affect aquatic species movement. Where practicable, stream channels could be realigned or relocated outside of the fill limits of the roadway and cross pipes and culverts could be placed perpendicular to the roadway to reduce the length of pipe or culvert required. This would not only be a cost effective measure from a construction standpoint, but would also reduce the distance that aquatic

species would have to travel through the structures. Additionally, pipe and culvert bottoms would be recessed below the bottom of the perennial stream channels to help maintain movement of aquatic species through the structure.

3.12.10 What indirect impacts to wetlands and streams would occur as the result of the project?

Based on a review of the projected land use maps generated by the land use model, indirect impacts to wetlands and streams were estimated that could result from development of currently vacant lands along the Preferred Alternative. Similarly, indirect impacts associated with the No-build Alternative could also occur, according to the modeling. The areas of projected development were analyzed using the I-73 base mapping, and potential impacts to streams and wetlands were evaluated. Because these are projected developments and no site plans are available and no delineations have been performed, stream impacts are reported as the number of potential stream impacts instead of in linear feet. Table 3.50 provides the results of the analysis. This analysis is based on projected impacts to tracts identified by the land use models and does not take into consideration any avoidance

Table 3.50
Potential Indirect Wetland Acres and Stream Impacts

	Alternative	
	No-build Alternative	Preferred Alternative
WETLAND TYPE		
Bay Forests	0	0.2
Bottomland Hardwoods	2.4	5.2
Evergreen Shrub Bog/Pocosin	0	0.1
Pine Savannahs & Wet Flatwoods	0.1	1.6
Savannah & Wet Meadow	0	0.1
Wooded Swamp	0.6	2.5
Total Wetland Impact	**3.1**	**9.7**
STREAM TYPE		
Intermittent	0	22
Perennial	1	1
Total Stream Crossings	**1**	**23**

Source: The LPA Group Incorporated, 2008.

or minimization requirements that would be required for obtaining Section 404 permits and Section 401 water quality certifications prior to construction on the sites, so in that sense would be a worst-case analysis.

The No-build Alternative would have minimal indirect impacts to wetlands and streams as indicated in Table 3.50. The majority of the potential indirect stream impacts are anticipated to occur to intermittent streams.

Based on a review of aerial photography and the land use projections, indirect wetland impacts associated with the Preferred Alternative would not occur within the higher value riparian wetland systems described earlier, but would be adjacent to and in close proximity to them. Development along the edges of these systems could affect their water quality over time. It is not anticipated that induced development impacts would occur to intact Carolina bays within the project study area due to the availability of other suitable development sites, the effort needed to drain these sites to make them developable, and the high level of protection provided by regulatory agencies.

The results of the land use modeling showed that some of the projected development for the Preferred Alternative would occur in Blenheim, Bennettsville, Clio, McColl, and along S.C. Route 9 and S.C. Route 177 North, north of Bennettsville. Projected development outside of the town limits would be clustered around the proposed interchanges and would occur predominantly in agricultural fields and forested uplands. Wetland impacts would typically occur at the edge of wetlands. The projected development associated with the No-build Alternative would generally be in the vicinity of I-95 in the southern portion of the project study area and I-74 in North Carolina. Based on a review of aerial photography overlain with the projected development, it is anticipated that impacts to wetlands as the result of projected growth would be predominantly wetland habitat degradation, not direct loss or fragmentation of habitat.

3.12.11 What would cumulative impacts be to wetlands and streams in the project study area?

Cumulative impacts to wetlands and streams, such as loss and degradation of quality, could occur in the project study area, which contains a wide variety of wetland types. A GIS analysis of the wetlands indicated on the NWI maps within the project study area was performed to determine the magnitude of the potential wetland impacts compared with the total amount of each wetland type found in the study area. For the purposes of this analysis, the projected impacts were added to the direct impacts associated with each of the Preferred Alternative. The results of this analysis are presented in Table 3.51, (refer to page 3-179).

Table 3.51
Potential Cumulative I-73 Wetland Impacts Relative to Project Study Area Wetlands, in Acres

	Preferred Alternative	Project Study Area Total
WETLAND TYPE		
Aquatic Beds	4.3	102
Bottomland Hardwoods	30.0	5,415
Evergreen Shrub Bog/Pocosin	0.1	2,491
Pine Savannahs & Wet Flatwoods	1.7	10,824
Savannahs & Wet Meadows	0.1	1,551
Freshwater Marsh	7.0	564
Ponds & Borrow Pits	0.2	2,097
Streamhead Pocosins	22.7	2,065
Wooded Swamp	3.9	48,017
TOTAL	**70.0**	**73,126**

Source: THE LPA GROUP INCORPORATED, 2008.

The purpose of Table 3.51 is to put into context the acreage of impacts associated with the Preferred Alternative relative to the overall resource type present within the project study area. While none of the wetland types would be substantially diminished by the project in this context, there would be a decrease in acreage for all these listed wetland types.

Previously constructed road projects have contributed to cumulative stream and wetland impacts in the project study area. The construction of 17 miles of I-74 in North Carolina resulted in approximately 16 acres of wetland and 2,895 linear feet of stream impacts. Other constructed projects such as S.C. Route 22 resulted in a total of 110.5 acres of impacts to wetlands, and widening along S.C. Route 38 resulted in a total of 10.92 acres of impacts wetlands, 491 linear feet of perennial stream impacts and 480 linear feet of intermittent stream impacts. According to the I-73 South FEIS, the construction of the 44-mile long southern portion of I-73 would impact approximately 313.0 acres of wetlands, 3,155 linear feet of perennial streams and 705 linear feet of intermittent streams. Environmental documentation for the construction of the widening along S.C. Route 9/ S.C. Route 38 in Marlboro County has not been completed; therefore, potential wetland and stream impacts are not known at this time. However, it is anticipated to contribute to cumulative wetland and stream impacts within the project study area.

Each of the aforementioned projects involved or will involve the use of federal funding; therefore, NEPA documentation was or will be prepared for each project. Section 404 permits were or will be

obtained where required, and wetland mitigation was or will be provided to compensate for stream and wetland impacts. It is anticipated that the required alternative analysis for these projects would minimize impacts to the wetland systems within the project study area.

A planned, privately operated military training facility that could contribute to cumulative impacts to wetland and streams would be located near the town of Wallace in the northwestern portion of the I-73 North project study area. Approximately 1,800 acres of a 3,100-acre tract would be developed. The tract includes White Creek and several of its unnamed tributaries. A review of NWI maps and aerial photography indicates that riparian wetland systems primarily consisting of hardwood swamps occur along the onsite streams. Site development plans are not available for analysis of potential impacts.

Although cumulative impacts to wetlands and streams are anticipated, all public and private development projects that would impact greater than 0.1-acre of wetlands and/or greater than 100 linear feet of stream would require a Section 404 permit and a USACE approved mitigation plan to compensate for the impacts prior to beginning construction. Additionally, projects that disturb greater than one acre of land require an NPDES permit, also referred to as a Land Disturbance Permit. The permit is obtained through SCDHEC in South Carolina and the NCDENR Division of Land Resources, Land Quality Section in North Carolina. The NPDES permit requires that measures to contain/pre-treat stormwater runoff prior to discharging into receiving waters be implemented and requires that a Stormwater Pollution Prevention Plan be developed for the project which would minimize potential impacts during construction. For projects constructed in any region of South Carolina or in a coastal county in North Carolina that disturb greater than five acres of land, the development and approval of permanent water quality BMPs and a signed maintenance agreement to insure continued water quality protection are required.

3.12.12 What is mitigation?

Mitigation has been defined in NEPA regulations to include efforts which: a) avoid; b) minimize; c) rectify; d) reduce or eliminate; or e) compensate for adverse impacts to the environment (40 CFR 1508.20 [a-e]). Section 404(b) (1) Guidelines of the CWA stresses avoidance and minimization as primary considerations for protection of wetlands. Practicable alternatives analysis must be fully evaluated before compensatory mitigation can be discussed.

Federal Highway Administration policy stresses that all practicable measures should be taken to avoid and minimize impacts to wetlands which will be affected by federally funded highway construction. A sequencing (step-down) procedure is recommended in the event that avoidance is impossible. This step-down procedure includes impact avoidance, minimization, and finally, compensation for unavoidable impacts.

Compensation traditionally takes three basic forms: restoration, preservation, and creation, or can be a combination of the three. Restoration is the return of functions and/or values to a wetland that have been lost because of alteration of the natural vegetation, soil, and/or hydrology. Preservation refers to the protection without disturbance of existing wetlands that are particularly valuable. Creation is the making of wetlands from non-wetlands. Restoration and preservation are the preferred forms of mitigation due to the uncertainty of the success of wetland creation.

3.12.13 What was done to avoid and minimize wetland and stream impacts?

3.12.13.1 Avoidance

Due to the linear nature of the project and the large areas of wetlands and streams located within the project study area, total avoidance of wetlands and streams was not possible for the Preferred Alternative. Many riparian wetland systems associated with streams extend across the project study area, such as Crooked Creek and Marks Creek. As described earlier, efforts were made to avoid wetland and stream impacts during the development of the alternatives.

After the preliminary alternative corridors were developed, those that were suitable for further consideration (based on potential impacts) were further refined to avoid wetland impacts. A field review was conducted during which the ACT members were given the opportunity to view the wetlands that would potentially be impacted within the corridors and provide comments. A second field review was conducted with representatives of North Carolina state and federal resource and regulatory agencies, NCDOT, and FHWA in the North Carolina portion of the project study area and comments were solicited from them.

Centerlines were established and wetland impacts were calculated within construction limits obtained from the conceptual designs of the Build Alternatives. Requests for corridor modifications from the ACT and North Carolina participants were investigated that would further avoid wetland and stream impacts. A major concern identified by the federal and North Carolina state resource and regulatory agencies was the potential impact to Marks Creek that a western interchange with I-74 could cause. Alignment shifts, crossover segments, and design modifications were presented at the ACT meetings for discussion. Consensus was reached by the ACT on these and other modifications that resulted in a reduction of impacts.

Once the three Reasonable Alternatives were identified, they were additionally modified and evaluated to reduce environmental impacts. Sometimes shifts avoiding community or cultural resource impacts resulted in reduced wetland and/or stream impacts. The elimination of the western interchange with I-74 affected the Preferred Alternative by reducing the amount of wetlands impacted by approximately 44 acres. Other alignment shifts that affected the wetland

and stream impacts included a shift to avoid impacts to the Minturn community that reduced wetland impacts by 15.2 acres, and shifting the portion located north of S.C. Route 79 east of Crooked Creek, thereby eliminating the crossing of Lightwood Knot Creek resulting in a 15.5-acre reduction in wetland impacts.

Once the Preferred Alternative was identified, additional modifications were made that affected the total wetland impacts. At the request of the North Carolina resource agencies, the North Carolina portion of the Preferred Alternative was shifted entirely to the east of Crooked Creek. Additionally, at the request of the NCDOT, an interchange was added at Ghio Road (N.C. State Route 1803). These modifications resulted in a net increase of approximately 12.9 acres of wetland impacts. A shift of the I-73 interchange with S.C. Route 79 was made at the request of property owners, which resulted in an increased wetland impacts by approximately 0.2-acre.

Overall, there was a net reduction of 61.6 acres of wetland impacts due to alignment modifications during the development of the Preferred Alternative. Additional discussion of the design modifications to the Preferred Alternative can be found in Section 2.7.2 of this document, (refer to page 2-47).

3.12.13.2 Minimization

When possible, and where consistent with engineering standards and FHWA and SCDOT requirements, design modifications would be incorporated to further reduce impacts. Design modifications may include slight shifts in the alignment away from wetlands and the use of 2:1 side slopes where practicable. The use of 2:1 side slopes would reduce the impact footprint through wetlands and other sensitive areas and thus reduce the impacts. Detailed hydraulic studies would be performed during the final roadway design phase to determine the appropriate bridge lengths at stream crossings with higher quality wetland systems and floodplains, which would minimize wetland impacts. Properly sized pipes and culverts, as determined by the final hydraulic study would be installed under the roadway to maintain the historic hydrologic connections of wetlands and prevent the drainage or excessive flooding of jurisdictional areas. Additional cross pipes and culverts could be installed in new causeways through wetlands to maintain sheet flow through riparian wetlands during high water events.

Where appropriate, wetland impacts would be minimized by crossing wetlands with bridges. Each wetland crossing, where a bridge is warranted, would be evaluated on an individual basis to determine the most practical method for constructing bridges. This would be evaluated depending on the type and amount of wetlands to be impacted and the length, type, and geometry of the structure to be built. Although the vegetation would be cleared within the construction limits and there would be temporary impacts to the hydrologic function and soil of the affected

wetland, permanent impacts to bridged wetlands would be minimal. Permanent impacts would result from the decrease of vegetation beneath the bridge. Upon completion of the bridges, the temporary means of access would be removed and the area reseeded with a riparian seed mix of native species to reduce the risk of habitat degradation by colonization by invasive species. The hydrologic functions of the wetland would not be diminished.

Typical construction techniques considered as possible options for building bridges over wetlands are:

- Construction on existing grade;
- Temporary haul roads;
- Timber mats or barges;
- Temporary trestles; and,
- Top-down construction.

Construction on existing grade would be done in wetlands where the soil is stable enough to support construction equipment loads bearing directly on the ground surface. Typically, this method would be utilized in wetlands that are not saturated or inundated during a majority of the year. Temporary haul road(s) would be constructed parallel to a proposed structure in wetlands containing soils incapable of supporting heavy construction equipment without permanent damage to the wetlands. Upon completion of the bridge, the haul road(s) would be removed and the natural grade of the wetland restored and re-seeded with an herbaceous wetland vegetation seed mix. The use of timber mats or barges for constructing bridges in wetlands is similar in concept, and in resulting impacts, to using haul roads. This technique could be used in wetlands where standing water or saturated soil conditions would not support heavy construction equipment or temporary haul roads. The temporary trestle would be constructed adjacent to the proposed bridge location. The structure would be constructed on driven piles, either steel or timber, and a superstructure of steel girders and timber mats. The temporary trestle

Temporary haul road through wetland

Wetland 6 months after temporary haul road removed

Wetland 11 months after temporary haul road removed

would act as a work platform and haul road for materials and impacts would consist of temporary clearing of vegetation under the trestle.

Top-down construction technique would utilize components of the bridge already under construction to either support a temporary platform for building new spans or to serve as the work platform itself. The previously built substructure would support the temporary working platform, allowing piles to be driven for the next span. Simultaneously, the permanent structure's bridge deck would be formed and poured for the previous span, behind the work platform.

A variation of the top-down construction technique would use the previously built bridge deck as the working platform construction of the substructure and superstructure of subsequent bridge spans would be performed from the completed, permanent structure. Top-down construction would cause the least amount of temporary impact as no fill material or temporary structures would be required since the work would be performed from the permanent structure.

Efforts to minimize wetland impacts would also be incorporated in the construction phase of the project. Construction activities would be confined within the permitted limits to prevent the unnecessary disturbance of adjacent wetland areas. During construction, potential temporary impacts to wetlands would be minimized by implementing sediment and erosion control measures to include seeding of side slopes, silt fences, and sediment basins, as required by the NPDES permit. Other best management practices would be required of the contractor to ensure compliance with the policies of 23 CFR §650B.

Silt fencing and seeding of side slopes

3.12.14 How will compensation be determined for wetland and stream impacts?

Wetland mitigation was discussed at several ACT meetings and additional meeting were held specifically to discuss mitigation. The importance of in-kind mitigation and mitigation within the same watershed was emphasized. The SCDOT and the USACE, Charleston District, agreed that one Section 404 permit will be obtained for the entire I-73 project in South Carolina; therefore, one

mitigation plan will be prepared for the entire project. NCDOT will coordinate with the USACE, Wilmington District, to obtain necessary permits and provide mitigation for the North Carolina portion of the project.

The USACE has established guidance for calculating the number of impact credits that would be needed to compensate for unavoidable wetland and stream impacts. This guidance is contained in the Charleston District Compensatory Mitigation Guidelines (or Standard Operating Procedures). The number of mitigation credits required is based on several factors such as the type of wetland being impacted, the condition of the area to be impacted, the type of impact that will occur, and the duration of the impact (permanent vs. temporary).

The Standard Operating Procedures (SOP) also contains guidance for calculating the number of mitigation credits that a proposed mitigation site will generate. The number of credits received for a mitigation site is determined by several factors such as the net improvement to the area for proposed restoration or enhancement; the wetland type, existing condition, and the degree of threat to the area proposed for preservation; and the vegetation establishment (planted vs. natural re-vegetation) and the soil type present for the area proposed creation sites. The proximity of the mitigation site to the impact site, the type of protection the site will receive, and whether the mitigation wetland is the same type as the impacted wetland are considered regardless of the mitigation type that is proposed.

The ACT decided that the USACE mitigation SOP would provide a method for assuring that adequate mitigation would be provided for wetland and stream impacts associated with the construction of I-73. The members of ACT agreed that wetland and stream mitigation impacts will be calculated for each 11-digit Hydrologic Unit Code (HUC) in which the impacts occur. The SOP will then be used to calculate the required mitigation credits for the wetland and stream impacts in each group. Additional discussions by the ACT revolved around the use of riparian systems as well as landscape scale mitigation with linked upland/riparian systems and possibly isolated wetland systems, such as Carolina bays. The use of commercial wetland mitigation banks was brought up during the discussions and it was suggested that they be used only as a last resort. However, it was agreed that the balance of available Sandy Island Mitigation Bank credits will be used for the I-73 project.

As previously mentioned, a wetland delineation was completed for the I-73 Southern Project Selected Alternative, and USACE approval was received (SAC # 2007-1331-DJS). Upon completion and approval of the field delineation for the northern portion of I-73, the SOP guidance will be applied to the impacts and the number of required wetland and stream mitigation credits will be calculated. For the South Carolina portion of the project, the preliminary estimated impacts would require 345 wetland credits and 2,433 stream credits. The amount of credits needed for the North Carolina portion of the project would be negotiated by NCDOT with the USACE Wilmington District.

Conceptual Mitigation Plan

Based on a review of aerial photography, USGS topographic maps, and limited field visits, there are many opportunities for restoration mitigation for both wetland and stream impacts within and adjacent to the project study area. Many of the wetlands within the project study area consist of remnants of larger wetlands that have been drained or partially drained for agricultural or timber production purposes. Because their small size (five to ten acres) and the fact that they are isolated from wildlife movement corridors by agricultural fields, these areas would not necessarily be considered ideal wetland mitigation sites. However, large wetland areas and associated with the high quality riparian wetland systems would be considered as suitable for mitigation purposes.

As previously mentioned, Carolina bays are wetland systems that can consist of various wetland types, including those that would be impacted by I-73. Therefore, Carolina bay restoration/ preservation would be considered in-kind mitigation. There are several Carolina bays within the study area that appear to have a hydrologic connection to waters of the United States that could be used for wetland mitigation. Some of these bays, ranging in size from approximately 100 acres to 450 acres, appear to be intact and could be purchased and dedicated as preservation mitigation. The inclusion of the upland sand rim and other adjacent uplands would provide enhancement for the preserved wetland systems. Other Carolina bays are present that range in size from approximately 500 acres to 1,000 acres and have been impacted primarily by drainage and conversion to other uses. They could be restored for mitigation credit. Based on reviews of the aerial photography, restoration for these bays could range from simply filling drainage ditches and restoring the hydrology where soils and vegetation are already present, to restoring the hydrology by removing drainage tiles, blocking ditches, and planting the site with wetland vegetation. The issue of blocking drainage, thus "isolating" these wetlands from the surface water system, would need to be addressed.

The potential for large areas of preservation, enhancement, and restoration are available along the Little Pee Dee River, the Great Pee Dee River and other previously mentioned riparian wetland systems within the project study area. Tracts of land adjacent to Heritage Trust Preserves along the Little Pee Dee River, ranging from small 200-acre out-parcels located within the existing preserves to over 1,000-acre parcels could be purchased and incorporated into the existing Heritage Preserves in the I-73 South project study area. Enhancement for these sites could be in the form of including upland buffers and the removal of roads that are evident on the aerial photographs, from the wetlands.

Many of the streams within the project study area have been channelized and do not have vegetated buffers. These stream reaches are generally associated with agricultural operations.

Additionally, many of the channelized streams have limited contact with adjacent wetlands due to spoil piles left behind during the channelization effort. Restoration and enhancement of these impacted streams for mitigation credits can include reshaping stream channels and replanting native vegetation along a stream buffer. These vegetated areas provide movement corridors for wildlife. They also provide water quality enhancement by filtering pollutants from surface water runoff before it enters the receiving stream as well as providing shade which keeps the water cool, thereby promoting the health of aquatic animal species. Spoil piles can be removed from stream banks and in-stream structures could be installed within the channels to allow streams to overflow into the adjacent riparian wetlands during rain events. The latter stream restoration type is one that must be approached carefully such that flooding of adjacent property owners does not occur.

Another avenue for obtaining wetland and stream mitigation would be to provide monetary support to property acquisitions and habitat restoration for specific properties being sought by SCDNR. Members of the ACT indicated that sites such as this as mitigation that provides important habitat for wildlife and has an opportunity for wetland restoration, has good potential for acceptance by the agencies.

Because suitable mitigation for the I-73 wetland and stream impacts has not been identified to date, SCDOT has proposed that a mitigation fund be established which would be held in escrow until such time as a suitable mitigation site has been identified. This would allow for the issuance of a conditional Section 404 permit for the project. The mitigation fund would be used for the sole purpose of providing wetland and stream mitigation credit for the I-73 project. The total amount to be deposited in the fund would be determined by multiplying the required wetland and stream mitigation credits, as determined by the SOP worksheets, by the currently accepted cost per credit. The mitigation fund would be made immediately available for the acquisition, restoration, and/or enhancement of the mitigation site(s) that is proposed by SCDOT or an advisory board consisting of representatives from resource and regulatory agencies, and approved by the District Engineer and SCDHEC. Solicitation of private conservation groups such as the Audubon Society and The Nature Conservancy would also be a source of potential mitigation sites. Mitigation sites that would provide substantial enhancement and restoration components would be sought.

A Memorandum of Agreement (MOA) has been drafted that provides the guidelines as to how the fund would be established and administered. The importance of in-kind mitigation within the project study area watershed has been indicated as an important mitigation requirement for the I-73 project during the ACT meetings and subsequent mitigation meetings. Mitigation discussions have included the use of riparian wetland systems as well as landscape scale