

Horry County, South Carolina Concept Study of a Flood Reduction Diversion Canal



Prepared for
Horry County
Conway, South Carolina

Prepared by Corps of Engineers
Charleston District

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Horry County, South Carolina

Concept Study of a Flood Reduction Diversion Canal

1. AUTHORITY. The study reported herein was conducted under the authority of Section 22 of the Water Resources Development Act (WRDA) of 1974, as amended. This authority allows the Corps of Engineers to provide technical assistance to support state preparation of comprehensive water and related land resources development plans, including watershed and ecosystem planning. This authority also allows the Corps of Engineers to assist in conducting individual studies to support the state plan. Assistance under Section 22 was requested by Horry County, and Horry County and the Charleston District signed a Planning Assistance to States Letter of Agreement on January 16, 2008. Section 22 only allows for providing technical assistance or planning support to the requesting party. The result of a Planning Assistance to States study does not obligate the Federal Government to any further commitments to the requesting party.

2. INTRODUCTION. This study is being conducted to analyze the feasibility of a previously proposed canal from the Waccamaw River to the Coast in order to provide flood control in the Conway area. The general area of this study is shown in Figure 1. This analysis is based on the reanalysis of the previous planning studies conducted by the Corps of Engineers in 1941, 1951, and 1965 respectively. The previous studies conducted had the diversion begin in North Carolina, but based on current development and natural topography a new footprint for the diversion canal is being proposed. A map showing the original and the proposed canals is shown in Figure 2.

3. EXISTING CONDITIONS. Horry County lies in the northeast corner of South Carolina and is the state's largest county in land area at 1,154 square miles (see Figure 1). The county was established in 1801. Conway, the county seat, is often called "The Gateway to the Grand Strand." The Waccamaw River proper has its source in Lake Waccamaw, a fresh water lake in Columbus County in southeastern North Carolina, 8 miles east of Whiteville. Lake Waccamaw covers an area of about 14 square miles, with depths up to 9.5 feet. Headwater creeks extend about 20 miles farther northward into Bladen County, North Carolina. The water level in the lake at normal stage is about 41 feet above mean sea level due to the presence of a trapezoidal concrete spillway placed across the outlet by local interests in 1943.

The Waccamaw River flows 140 miles in a southwesterly direction, generally parallel to and within 5 to 15 miles inland from the seacoast. The river eventually enters Winyah Bay at Georgetown, South Carolina, through which it flows into the Atlantic Ocean. The final 20 miles of the river is interconnected with the Pee Dee River to the west by a number of creeks, including Bull Creek, which is the only navigational outlet for the Pee Dee River. The total drainage area is 1,520 square miles, of which 570 are in South Carolina and 950 in North Carolina. The Waccamaw River has a maximum width of

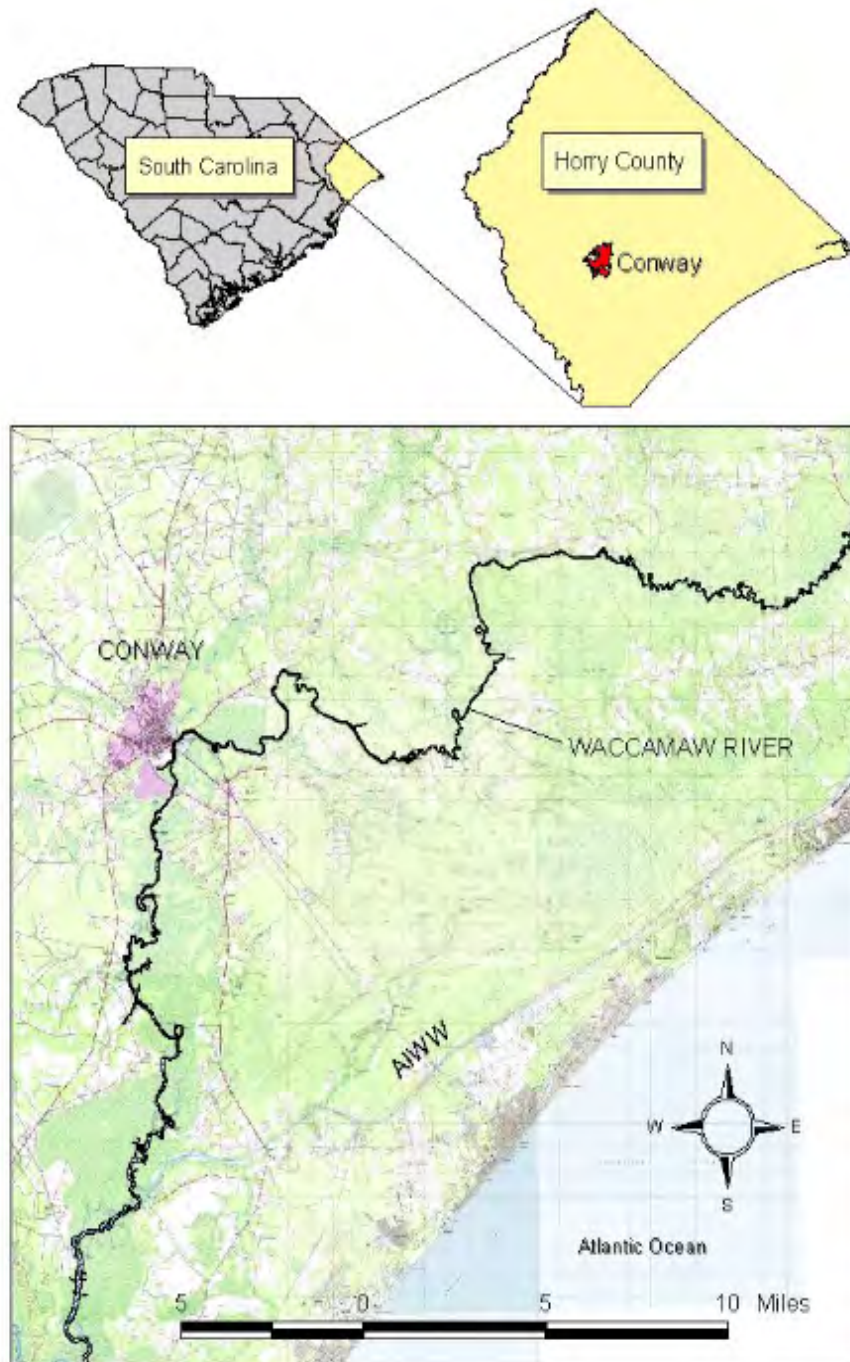


Figure 1. Location of Horry County and City of Conway, South Carolina



Figure 2. Proposed Canal Routes/ Green = Original Route and Blue = Route Used For this Review and proposed by Horry County.

4,000 feet in the tidal reaches of Winyah Bay, narrowing quickly (within two miles) to 2,000 feet and then narrowing gradually to 190 feet at Conway (mile 42). From Conway to Red Bluff (mile 67) widths range from 90 to 180 feet, and from Red Bluff to Lake Waccamaw (mile 140), the width gradually decreases to 35 feet. Tidal influence is felt as far upstream as Bellamy's Landing (mile 83).

The Waccamaw River floodplain is flat and swampy, averaging approximately 2 miles in width. The floodplains of the river and tributaries are broad and flat and subject to frequent and prolonged overflow. In the past, several structures have been flooded at events less than the 100-year flood. Urban flooding is compounded by the Waccamaw's flat gradient and the backwater effects from the Great Pee Dee and Little Pee Dee Rivers, which contribute to the extremely slow downstream movement of floodwaters. Flood stage usually lasts from a few days to as long as 4 to 5 weeks depending upon antecedent moisture conditions and the intensity and duration of rainfall throughout the area. Several tributaries to the Waccamaw are affected by backwater of the Waccamaw, particularly

when local rainfall events have raised the levels of the tributaries prior to the rising of the Waccamaw.

In addition to impacts to structures, flooding along the Waccamaw River causes a variety of other problems for the residents of the area. Several roads in the Conway area are susceptible to flooding and may be blocked for days to weeks. The long duration of flooding, particularly when it covers roads and prevents people from reaching their homes, brings with it safety concerns. People may try to reach their homes by boat, which can be dangerous in flooded areas due to unseen debris and the possibility of capsizing. People also may try to drive through flooded areas, not always realizing the depth of water present. A final safety issue is the floodwater itself. Water that sits for a long period of time can present a variety of water quality and health concerns. Among these health issues are waterborne and mosquito-borne diseases.

The City of Conway has experienced flooding in its downtown area, which has affected several businesses. Sewage treatment plants and lift stations are also at risk. During Hurricane Floyd in 1999, the Corps of Engineers under Public Law 84-99 provided sandbags to Horry County and assisted in flood fighting efforts to protect the sewage treatment plant, several lift stations and other public buildings throughout the city.

4. EXISTING CORPS OF ENGINEERS PROJECTS. Numerous flood control and navigation studies have been completed on the Waccamaw River. The River and Harbor Acts of June 14, 1880 and July 3, 1930 provide for a channel 12 feet deep at msl (mean sea level), with an 80-foot bottom width, from the mouth to Conway, South Carolina, 41.5 miles; then, 4 feet deep at msl and 50 feet wide to Red Bluff, South Carolina, 25.5 miles above Conway; then, a cleared channel to Lake Waccamaw, North Carolina, 139.9 miles above the mouth. The 12-foot channel to Conway was completed in 1923, and the 4-foot channel to Red Bluff was completed in 1930. The last maintenance work performed on the project was clearing and snagging in November 1976. The last condition survey was completed in 1992.

Studies, funded by continuing authority, that have been performed within the basin have led to construction as listed below. Many of these projects are past their project life.

- 1) Waccamaw River, Sec 208; 17.3 miles of clearing and snagging completed in 1955.
- 2) Simpson Creek, Section 208; 11.2 miles of channel clearing and snagging completed in 1957.
- 3) Cowpen Swamp, Section 208; 3 miles of channel improvement completed in 1959.
- 4) Waccamaw River and Tributaries PL875; clearing and snagging 125 miles completed in 1959.
- 5) Waccamaw River and Seven Creeks, Sec 208; clearing and snagging 10.9 miles of Waccamaw River and 2.5 miles of Seven Creeks, completed 1961.

- 6) Simmons Bay Watershed, DPR; 9.3 miles of channel improvement completed in 1963.
- 7) Todd Swamp, Section 208; 3.2 miles of channel improvement completed in 1964.
- 8) Crab Tree Swamp, Section 208; 5.1 miles of channel improvement, 1 mile of clearing and snagging completed in 1966.
- 9) Gapway Swamp, Section 205; 14 miles of channel improvement completed in 1968.
- 10) Buck Creek, Section 205; 18.94 miles of channel improvement including tributaries, completed in 1969.

5. FLOOD REDUCTION DIVERSION CANAL

Previous Studies – Numerous reports have been prepared in evaluating flooding events in the Waccamaw River Basin. The concept of a diversion canal to divert flood waters away from Conway appears to have surfaced in the late 1930's with the first report on such a canal being prepared in December 1941 (report not printed). The Corps of Engineers Charleston District prepared two subsequent reports addressing the feasibility of a diversion canal. The first was prepared in October 1951. This report re-evaluated the December 1941 report prepared in compliance with the provisions of Section 6 of the Flood Control Act of June 28, 1938. The plan presented in the October 1951 report presented a two-part flood risk reduction project described as follows:

Part 1. A diversion canal about 5.7 miles long, extending from a point on the Waccamaw River (mile 93.4) about 0.8 miles above the North Carolina – South Carolina state line and emptying into Mullet Creek, about 0.9 miles above its mouth at Little River. The basic design of the canal is shown in Figure 3. The canal would have a flared collection basin at the entrance on Waccamaw River, with a dike of proper height along the downstream side from the river to high ground to divert flood waters into the canal. A concrete weir or control structure with a crest elevation of 13.5 feet msl would be constructed on the canal about 1-3/4 miles from the Waccamaw River to bypass flood waters when the river stage at the point of diversion exceeds 13.5 feet. The canal would have a bottom width of 150 feet with 2 on 1 side slopes, designed for the conveyance of 5,000 cfs (cubic feet per second).

Part 2. The plan also proposed a series of 32 cut-offs upstream from the diversion canal (mile 93.4) to White Marsh (mile 130.7) were also proposed, with necessary clearing and snagging of the existing river to accelerate the discharge and lower the existing water-surface elevation. It was additionally proposed to widen that portion of the river between the point of diversion (mile 93.4) and the first proposed cut-off to 100 feet for the purpose of eliminating restrictions within that portion of the river.

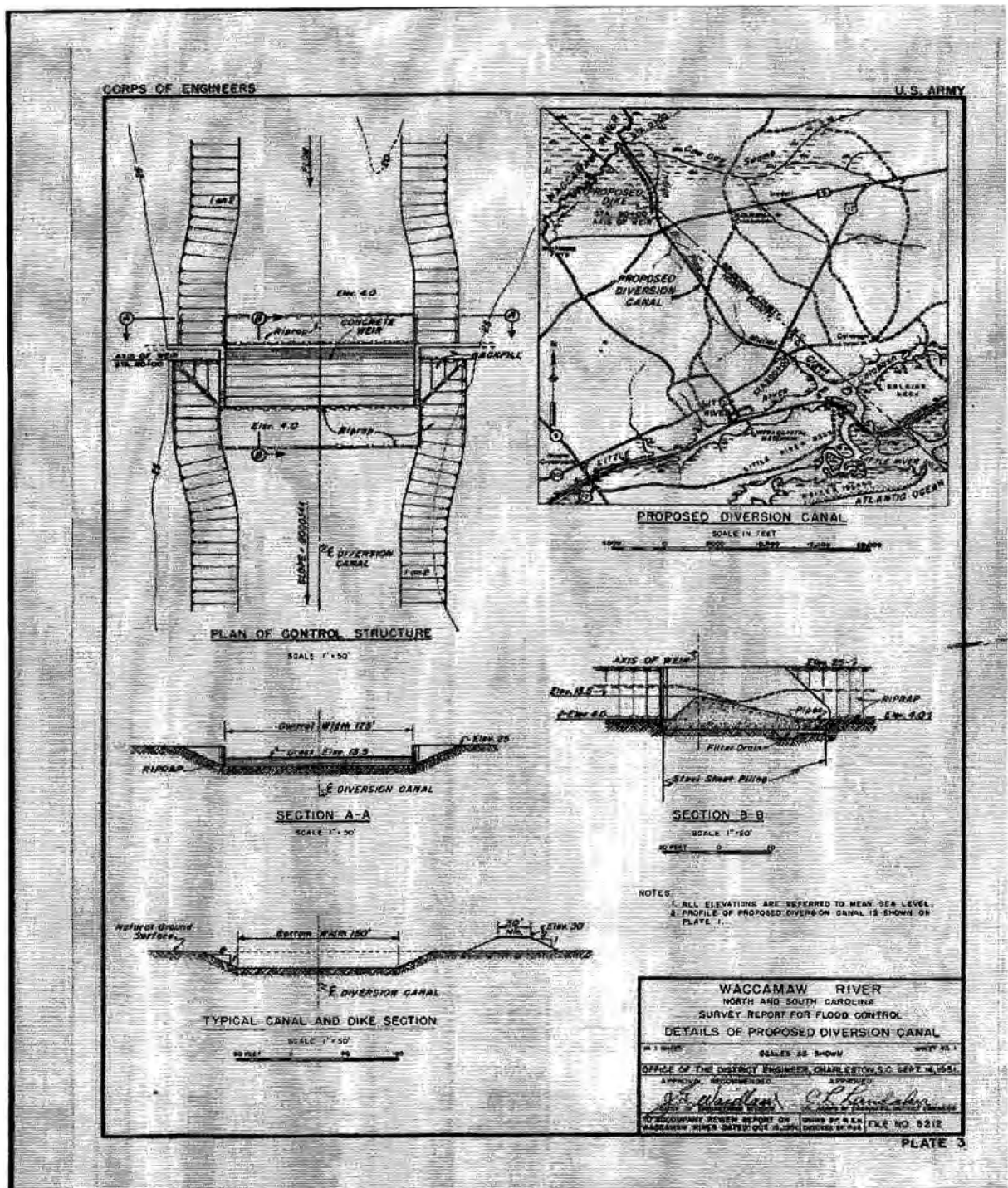


Figure 3. Plate 3 of October 1951 report

The Corps of Engineers Charleston District completed a second report evaluating flood reduction on the Waccamaw River in 1966. The 1966 report did not find the diversion canal to be economically justified. This report reviewed the previously prepared December 1941 report and several improvement alternatives were considered, including re-evaluation of the feasibility of the formerly proposed diversion canal. The other alternatives considered included the following:

- 1) Reservoirs,
- 2) Levees,
- 3) Channel improvement – clearing and snagging
- 4) Clearing, snagging, channel enlargement and cutoffs

It concluded that reservoirs and levees were impracticable due to the lack of topographic relief within the drainage basin. The other alternatives were not economically justified based on insufficient reduction of flood damages to agricultural and urban lands, on-farm improvements, roads, and timber logging operations.

Hydrologic and Hydraulic Analysis – The 1999/2003 Flood Insurance Study (FIS) for Horry County indicates the 100-year flood flow is 22,310 cubic feet per second (cfs) below Kingston Lake with a base flood water elevation of 11.6 feet National Geodetic Vertical Datum (NGVD) at the cross-section nearest to US Highway 501 Business. This analysis used regionalized regression equations developed by the US Geological Survey (USGS) to obtain peak discharge-frequency relationships for the Waccamaw River Basin. Using HEC-Statistical Software Package (HEC-SSP) and historic peak discharge records for the period of record measured by the gage at the Waccamaw River at Conway, SC, the expected flow for the one percent chance exceedance (100-year frequency event) is estimated at 20,282 cfs.

Using the historical data from the gage at Waccamaw River at Conway, SC a stage discharge rating curve was generated. Using this rating curve in conjunction with the 100-year frequency flow of 20,282 cfs generated by HEC-SSP, the 100-year flow elevation was estimated to be 11.4 feet NGVD. This is slightly lower than the FIS base flood elevation of 11.6 feet NGVD. If 5,000 cfs were to be diverted above Conway, the resultant flow would be 15,282 cfs with a 1.24 foot reduction for the 100-year base flood elevation. This 1.24 foot reduction in flood elevation would thus provide a 100-year flood elevation of 10.15 feet NGVD in Conway, South Carolina. In using the published FIS flow of 22,310 cfs and generated rating curve, the 100-year flood elevation becomes 11.9 feet NGVD. Assuming a 5,000 cfs diversion, the 100-year flood elevation would drop to 10.66 feet NGVD. A more detailed presentation of the hydrologic and hydraulic analysis of flow and elevation reduction with a 5,000 cfs diversion is contained in Appendix A.

Economic Analysis – The Corps of Engineers estimated that the impact of Hurricane Floyd in 1999 exceeded a 100-year flood event. Following the flood, the Federal

Emergency Management Agency (FEMA) offered a buyout of approximately 250 repetitive loss properties in Horry County of which approximately 50 were in the Waccamaw River floodplain. After the buyout, only fifteen structures remain in the floodplain that are still susceptible to flooding by a 100-year flood event. Current value of these structures is estimated to be \$1,689,648. Appendix B contains a more detailed description of the economic analysis.

Table 1 depicts a cost estimate for the construction of a diversion canal to alleviate flooding in the area of the City of Conway. The Corps of Engineers Charleston District prepared this estimate to provide a scope of the magnitude of such an undertaking. The cost estimate includes the cost of real estate acquisition and administration, the cost of obtaining required permits, the cost of designing the canal, and the cost of preparing an Environmental Impact Statement. The actual construction cost estimate assumes the canal would be approximately six miles in length with an average depth of eighteen feet and an average width of one hundred and fifty feet. The estimate includes all costs associated with contractor mobilization/demobilization, clearing and grubbing the affected areas, excavating, loading and hauling the material removed from the canal, in addition to forming and reinforcing slopes on the sides of the canal. The costs for the construction of five bridges to span the canal at existing road crossings and a concrete flow control weir were included in the construction estimate. Further, the estimated included costs to reroute known utilities due to the construction of the canal as well as costs to cleanup and landscape all affected construction areas. All of these project features, as well as real estate acquisition and environmental studies, totaled \$118,232,120.

Table 1 - Estimated Project Construction and Associated Costs

Construction	\$97,871,400
Construction Permits	172,600
Engineering & Design	1,725,700
Real Estate Acquisition	13,900,000
EIS & Associated Studies	4,562,500
Mitigation	TBD
Relocations / Demolitions	TBD
Total Cost	\$118,232,000
Average Annual Cost *	\$6,104,900

* Using a 50 year project life and the current USACE annual interest rate of 4.625%

However, as the project costs exist the actual number of any structural features that will require demolition within the project Right-of-Way are unknown at this time, such costs, as well as Public Law PL 91-646 relocation costs are not included in the project cost estimate. Additionally, any costs required for environmental mitigation are not known at

this time and thus not included. The magnitude of these costs would be substantial and would not be incidental; however, without extensive analysis a dollar figure would have no basis.

Real Estate Requirements. – The conceptual canal evaluated in this study, adjacent access roads and temporary work areas for construction would require a strip of land approximately 250 feet wide and 6 miles in length for an estimated acreage of 181.8 ± acres. It has been estimated that an additional 271 acres (approximate) would be required for disposal areas and another 29 acres would be required for staging and lay down areas. Thus, it is estimated that the acquisition of approximately 482 acres, not including any acreage that would be required for environmental mitigation purposes, would be necessary for this project. To acquire this amount of real estate, it is estimated that \$13.9 million would be required. In order to simplify the analysis, a decision was made by Horry County and the Corps of Engineers to modify the location of the diversion canal so that it lies completely in South Carolina. This change eliminated the need to obtain additional data from other counties and has no impact on the hydrology of economic analysis. The new proposed is depicted in Figure 3. Appendix C contains a more detailed description of real estate requirements necessary for the project.

Environmental Analysis – Several studies of the Waccamaw River Basin have been conducted in previous years. The most recent comprehensive study was conducted in the 1960's. The study evaluated water resource improvements for flood damage reduction, navigation, water supply, pollution control, irrigation, and hydropower. The only water resource issue identified during this study was flooding, specifically approximately 500 acres of improved agricultural land along the main stem of the Waccamaw River and urban flooding in the City of Conway. Due to the small amount of damages in the basin at that time and the high costs associated with the considered improvements, no economically justifiable project was identified.

In 1941 it was purported by local interests that a diversion canal be constructed that would intercept 5,000 cfs of flood waters from the Waccamaw River just upstream of the North Carolina-South Carolina state line during flood events and divert them to Mullet Creek near Little River, South Carolina where they would then be discharged through Little River Inlet into the Atlantic Ocean. While there were few environmental impacts identified in 1941, the construction of such a diversion canal today would be much more involved, especially with respect to potential environmental impacts. The original study was prior to current laws and regulations that require the Federal government, along with local governments, developers and private landowners to identify alternative solutions and their potential environmental impacts very early in the planning stage of the project. In order for such a diversion canal project to be constructed, one must adhere to the requirements of the National Environmental Policy Act (NEPA) of 1969.

To meet concerns of Federal and state agencies and interested non-profit organizations and to satisfy the requirements of NEPA, numerous comprehensive environmental studies and the preparation of an Environmental Impact Statement (EIS) must be conducted. These studies and reports are in addition to the engineering studies needed to

design a diversion canal project. Such studies are presented in Appendix D. Through coordination with Federal and state agencies and non-profit organizations during this study it has been estimated that the necessary environmental studies and preparation of an EIS will cost in the vicinity of \$3.2 million to \$4.2 million and take 9 years. A more detailed description of necessary environmental investigations and current positions of environmental resource agencies are contained in Appendix D.

6. CONCLUSION. This study, at the request of Horry County, South Carolina, was conducted as a preliminary analysis to determine the viability of constructing a diversion canal above Conway for the purpose of diverting upwards of 5,000 cfs of flood flows from the Waccamaw River to Little River, South Carolina. The study included the analysis of historical Waccamaw River stream gage records and associated stage reduction with the diversion of 5,000 cfs. Economic analysis indicated that construction of the diversion canal is not economically feasible, that it would be more economically justifiable to purchase the remaining 15 structures that are susceptible to flooding. Economic benefits were not sufficiently quantified in this study to determine a benefit-to-cost ratio (BCR), though economic justification would require average annual benefits to meet or exceed the average annual cost of the project of \$6,104,900 (see Table 1) plus; the annual cost of maintenance.

In order to construct the proposed diversion canal extensive environmental investigations and studies will be required including the preparation of an EIS. It has been estimated that such studies in themselves will require a \$4,562,500 investment. This coupled with \$97,871,400 in construction costs indicate that development of the proposed diversion canal will be a considerable undertaking that is not supported economically.

Appendix A

Hydrology and Hydraulics Appendix

Horry County Conceptual Diversion Canal

APPENDIX A

Waccamaw River PAS Hydrologic and Hydraulic Evaluation of Conceptual Diversion Canal

Under the Planning Assistance to States Program, Horry County has asked the Charleston District USACE to provide an evaluation of a diversion canal from the Waccamaw River to Little River Inlet at the mouth of Mullet Creek for the purpose of flood damage reduction. This evaluation is preliminary in nature and is based on available information from past investigations and does not involve developing detailed numerical hydraulic modeling, optimization of channel design or alignment. The hydraulic information will be used for economic and environmental evaluation and determination of further studies needed before final design.

DIVERSION CANAL

In 1951, USACE Charleston District prepared a Review Report for Flood Control on the Waccamaw River, which provided a general design of a diversion canal. The diversion canal would begin near the North Carolina –South Carolina state line. The optimum location of a canal would be determined after further detailed investigation of environmental, physical and societal impacts, but the sponsor provided a tentative alignment for general discussion. The final design of a diversion canal would be dependent on several factors, including optimum flood stage reduction benefits, final alignment of the canal and costs. Therefore, for the purposes of evaluating the potential benefits and impacts of any diversion canal, it was agreed that the 1951 canal design was acceptable.

The diversion canal was estimated at 5.7 miles long, a bottom width of 150 feet. The bottom of the canal at the discharge end into Mullet Creek, approximately 0.9 miles above the mouth of Little River Inlet, would be just above mean high tide. The slope of the canal was estimated at 0.182 foot per mile with a design capacity of 5000 cfs at bankfull stage at point of diversion. Near the Waccamaw River end of the canal a concrete weir or overflow structure would be constructed at designated flood stage. River levels above this stage would divert flows into the control structure. An intake or collecting basin from the control structure out to the main river would be constructed. The basin was estimated at 14 foot deep. Maximum velocity was estimated at 2 feet per second for 5000 cfs and concluding that scouring and erosion would not be excessive.

HYDROLOGIC ANALYSIS

The 1999/2003 FIS for Horry county indicates the 100 year flow is 22, 310 cfs below Kingston Lake and the base flood water elevation is 11.6 NGVD at the cross section nearest to 501 Business. The FIS indicates that the 1999 revision used regionalized regression equations developed by USGS to obtain the peak discharge-frequency relations for the Waccamaw River Basin.

Using HEC-Statistical Software Package (HEC-SSP) to perform statistical analyses of hydrologic data using the flood flow frequency analysis based on Bulletin 17B, “Guidelines for Determining Flood Flow Frequency” (1982), and the historic peak discharge records for the periods of record at the Waccamaw River at Conway SC gage, the expected flow for a one percent chance exceedance (100 year frequency event) estimated 20,282 cfs.

A stage discharge rating curve was generated using historical data, though it is tidally influenced and water elevations are influenced by tide and storm surge in addition to river hydrograph. Using the rating curve in conjunction with the 100 year frequency flow estimated by HEC-SSP of 20,282 cfs, the 100 year flood elevation is estimated to be 11.4 NGVD at the Conway gage. This is slightly lower than the FIS base flood elevation of 11.6 NGVD. It is estimated that a 1.24 foot reduction would occur for the 100 year flood in the Conway area if 5000 cfs were diverted. This results in a 100 year flow of 15,282 cfs and the 100 year flood water surface elevations would be about 10.15 NGVD. Using the FIS flows and the generated rating curve results in an 11.9 NGVD base flood elevation, slightly higher than the backwater model of the FIS indicates. Assuming 5000 cfs diversion, the 100 year flood elevation would drop to 10.66 NGVD.

For the economic analysis, the sponsor provided dates of flood events that corresponded to flood insurance claims. It was necessary to determine damages incurred for these flood events, so the period of record at the Conway gage was used to determine what flood elevations were reached on the dates provided. It was also necessary to relate those flood elevations to a specific probability of exceedance. The FEMA FIS did not provide any water surface profiles for any frequency event other than the 1 percent chance exceedance) or the 100-year event). Using the results of the HEC-SSP Flood Flow Frequency Analysis and the rating curve provided by the USGS for the General Investigation Study in 2000, approximate probability of exceedance estimates were made for various the flood events of record.

ADDITONAL STUDIES

In order to more accurately determine the reduction in water surface elevation that would be obtained by the construction of a diversion canal, more detailed analysis would be necessary. Analysis would include development of hydrologic watershed model and hydraulic riverine models to determine the diversion canal impact on flows and water surface elevations in the Waccamaw River, as well as impacts on surrounding wetlands. It would also be necessary to determine the flooding impacts along the alignment of the diversion canal. Additionally, because of the diversion into a coastal estuary, the impacts of storm surge would have to be addressed on the proposed canal. From a water quality standpoint, the analyses would have to include modeling to estimate salinity intrusion into the Waccamaw River and freshwater impacts on the coastal estuary. A general description of the modeling required for further justification of a diversion canal is listed as follows:

1. Coastal Storm Surge modeling, with post-processing analysis and statistical analyses:

Analysis will include the development of a 2- and 3-dimensional long-wave hydrodynamic model with the capability of simulating tidal circulation and tropical and extra-tropical storm surge propagation over large computational domains, while simultaneously providing high resolution in areas of complex shoreline and bathymetry. The model will use an unstructured grid, finite element model which represents all pertinent physics of the 3-dimensional equations of motion to include tidal potential, Coriolis, and nonlinear terms of the governing equations. The model will also have internal capabilities for solving the 2-dimensional transport equations to simulate the movement and fate of both conservative and non-conservative constituents such as temperature, salinity, cohesive, and non-cohesive sediment transport.

In conjunction with the coastal storm surge model, the analysis will include a statistical life-cycle model that simulates life-cycle sequences of non-deterministic multi-parameter systems such as storm events and their corresponding environmental impacts. The approach is based on a re-sampling-with-replacement, interpolation, and subsequent smoothing technique in which random sampling of a finite length database is used to generate a larger database. This procedure is repeated to generate a large population of life-cycle databases. These multiple databases of storm activity are post-processed to compute mean value frequency relationships with standard deviation error estimates. The model will be used in conjunction with coastal process models to generate storm impact versus frequency-of-occurrence relationships. Typical storm impacts include storm surge elevation, wave run-up, dune recession, shoreline erosion, disposal mound erosion, and bridge scour.

2. Salinity Modeling

The analysis will include a model to simulate water and water quality constituent transport in geometrically and dynamically complex water bodies, such as vertically mixed shallow estuaries, lakes, and coastal areas. The model will solve the three-dimensional, vertically hydrostatic, free surface, turbulent averaged equations of motion for a variable density fluid. Dynamically coupled transport equations for turbulent kinetic energy, turbulent length scale, salinity and temperature will be solved. The model may also simultaneously solve an arbitrary number of transport-transformation equations for dissolved and suspended materials. Multiple size classes of cohesive and non-cohesive sediments and associated deposition and re-suspension processes and bed geo-mechanics may be simulated.

3. Watershed and Riverine flooding Models

A Hydrologic model designed to simulate the precipitation-runoff processes of dendritic watershed systems will be developed to assess existing and proposed changes of the watershed. Hydrographs produced by the program will be used directly or in conjunction with other software for studies for evaluation of potential impacts.

The backwater riverine model will address one-dimensional river analysis components for such as: (1) steady flow water surface profile computations; (2) unsteady flow simulation; (3) movable boundary sediment transport computations; and possibly (4) water quality analysis. The effects of various obstructions such as bridges, culverts, weirs, and structures in the flood plain may be considered in the computations. Also, the model will be used for assessing the change in water surface profiles due to proposed channel improvements and diversion.

Appendix B

Economics Appendix

Horry County
Conceptual Diversion Canal

APPENDIX B

Waccamaw River PAS Economic Evaluation of Conceptual Diversion Canal

1.0 STUDY AUTHORITY

The study reported herein was conducted under the authority of Section 22 of the Water Resources Development Act (WRDA) of 1974, as amended. This authority allows the Corps of Engineers to provide technical assistance to support state preparation of comprehensive water related land resources development plans, including watershed and ecosystem planning. This authority also allows the Corps of Engineers to assist in conducting individual studies to support the state plan. Horry County and the Charleston District Corps of Engineers signed a Planning Assistance to States Letter Agreement on January 16, 2008. Section 22 only allows the Corps of Engineers to provide technical assistance or planning support to the requesting party. The result of a Planning Assistance to States study does not obligate the Federal Government to any further commitments to the requesting party.

2.0 INTRODUCTION

Horry County is located in the northeastern corner of South Carolina. It is the largest county in South Carolina in land area (1,134 square miles), and became a separate county in 1801. Myrtle Beach is its largest city, tourism is its largest industry, and Conway is its county seat. It is a diverse land of rivers, beaches, forests and swamps. Horry County is bordered on its eastern side by the Atlantic Ocean and on its western side by Georgetown County, the Great and Little Pee Dee Rivers and Drowning Creek, also known as the Lumber River, and on the north by North Carolina. The Waccamaw River runs through the eastern half of the county.

3.0 PROJECT LOCATION

Probably no other individual feature of Horry County has been as important to the history and development of the area as the Waccamaw River. The river has its source in Lake Waccamaw, a fresh water lake in Columbus County in southeastern North Carolina, 8 miles east of Whitesville. The river flows 140 miles southwesterly, entering Winyah Bay at Georgetown, S.C., through which it enters the Atlantic Ocean. The lower 20 miles is interconnected with the Pee Dee River to the West by a number of creeks. It drains an area of approximately 1154 sq miles in the coastal plain along the eastern border between the two states into the Atlantic Ocean.

Flooding along the Waccamaw River causes damage to structures as well as extended periods of time during which ingress from homes is impossible except by boats. The city of Conway experiences flooding in the downtown area which impacts businesses. Flooding also puts sewage plants and lift stations at risk. Figure B-1 shows the project location.



Figure B-1: Map of Pee Dee River Watershed showing the Waccamaw River
http://en.wikipedia.org/wiki/Waccamaw_River

4.0 PROBLEM STATEMENT

The Waccamaw River basin is subject to frequent inundation. Flood damages consist of tangible physical damage to urban property in the City of Conway, South Carolina, agricultural property and crops, public roads, losses to business and timber logging operations. Local interests purported in the 1930's that the most suitable and practical improvement to reduce flooding in the Conway area consists of a diversion canal for the quick bypassing of flood waters into the Atlantic Ocean in the vicinity of Little River Inlet.

Several studies have been done to evaluate flooding events in Waccamaw River Basin and to determine solutions for flood control. In October 1951, the Corps of Engineers Charleston District prepared a report to reevaluate the December 1941 report in compliance with the provisions of Section 6 of the Flood Control Act of June 28, 1938. The proposed plan presented in the October 1951 report consists of a two-part flood risk reduction project. The first part examined a diversion canal about 5.7 miles long with a bottom width of 150 feet with 2 on 1 side slopes, designed for 5,000 cfs with 14 foot depth of water and a velocity of about 2 feet per second. The canal would begin on Waccamaw River near the North Carolina-South Carolina state line and empty into Mullet Creek, about 0.9 miles above its mouth at Little River. The bottom of the canal at the discharge end would be just above mean high tide; it would have a slope of 0.488 feet per mile below the fixed concrete weir with design capacity to discharge 5,000 cfs at bank full stage (elevation 18.0) at point of diversion. An intake or collecting basin from the control structure out to the main river channel would be constructed with the excavated material placed in the dike

along the downstream side to divert the water above bank full stage into the diversion canal.

The second part consists of clearing and snagging in conjunction with channel enlargement. A series of 32 cut-offs in the river above the state line in conjunction with the clearing and snagging of existing river between cut-offs. The 32 cut-offs would considerably reduce the length of the river to be improved and maintained. It was estimated that the improvement would lower flood stages between White Marsh, North Carolina and point of diversion an average of about 1.7 feet during small floods and about 0.6 foot during large floods.

A second study conducted in 1966 by the Corps of Engineers Charleston District reviewed the December 1941 report. Several improvement measures were considered, among them: 1.) reservoirs, 2.) levees, 3.) channel improvement, 4.) clearing, snagging, channel enlargement and cutoffs. However, reservoirs and levees were found to be impractical for lack of topographic relief within the drainage basin. The other measures were found to be economically infeasible.

5.0 ECONOMIC ANALYSIS OF CURRENT FLOOD DATA IN THE WACCAMAW BASIN

Prior to Hurricane Floyd in 1999, there were about 250 repetitive loss structures in Horry County. Of that, 50 are estimated to fall within the Waccamaw floodplain. Following Hurricane Floyd in 1999, FEMA provided a buyout program to landowners within the 100-year floodplain. As result of this buyout roughly 15 of the 50 properties located in Horry County still remain subject to flooding. Prior to the 1999 flood there were 25 repetitive loss properties within the City of Conway, all of these properties were bought with FEMA funds and are now owned by the City and are restricted from being developed in the future. The estimated cost of constructing a diversion canal from the Waccamaw River to Little River Inlet is \$118, 232,120. The annual cost of protecting these properties is estimated to be \$6,104,891. The total average annual benefit for the 15 structures is estimated to be \$76,282. However data shows that damages occur on average every 2.6 years – 1981, 1983, 1987, 1993, 1994, 1996, 1998, and 1999. Therefore, the average annual benefit of protecting the structures is \$29,339.

It should be noted that the total property value for all 15 structures still subject to flooding is \$1,689,648. Therefore, the decision is either to buyout at the cost of \$1,689,648 or to protect those structures at an annual cost of \$6,104,891.

6.0 CONCLUSION

Based on the average annual construction exceeding the total value of the structures that are susceptible to flooding by the Waccamaw River construction of such a diversion canal is not justifiable.

Appendix C

Real Estate Appendix

Horry County
Conceptual Diversion Canal

Real Estate Appendix C
Waccamaw River Diversion Canal, Horry County, SC
Planning Assistance to States (PAS)

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THE REAL ESTATE REPORT

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THE REAL ESTATE REPORT

1.1 Statement of Purpose

Under the Planning Assistance to States Program (PAS), Horry County has requested the Charleston District, US Army Corps of Engineers, to assist in re-assessing the viability of a diversion canal from the Waccamaw River to Little River Inlet at the mouth of Mullett Creek for the purpose of flood damage reduction. The concept of the diversion canal dates back to 1941. Prior assessments have not considered the diversion canal economically justified for a federal cost share project. This report is tentative in nature and is to be used for planning purposes only. The report is written based on specific data from Charleston District, the tax assessor's office in Horry County, South Carolina, and on available information from past investigations. The Real Estate Appendix is intended to support the Waccamaw River PAS Study. Date of this report is November 2008.

1.2 Study Authority

The study authority comes from Section 22 of the Water Resources Development Act (WRDA) of 1974, as amended. This authority allows the Corps of Engineers to provide technical assistance to support state preparation of comprehensive water and related land resources development plans, including watershed and ecosystem planning. This authority also allows the Corps of Engineers to assist in conducting individual studies to support the state plan. The result of Planning Assistance to States study does not obligate the Federal Government to any further commitments to the requesting party.

1.3 Project Location

Horry County lies in the northeast corner of South Carolina and is the state's largest county at 1,154 square miles. The Waccamaw River proper has its source in Lake Waccamaw, a fresh water lake in Columbus County in southeastern North Carolina, 8 miles east of Whiteville. The river flows 140 miles southwesterly, generally parallel to and within 5 to 15 miles inland from the seacoast, entering Winyah Bay at Georgetown, South Carolina, through which it enters the Atlantic Ocean. The lower 20 miles is interconnected with the Pee Dee River to the west by a number of creeks. The total drainage area is 1,520 square miles, of which 570 are in South Carolina. Flooding along the Waccamaw River causes damage to structures as well as extended periods of time during which ingress and egress from homes is impossible except by small boats. The City of Conway experiences flooding in the downtown area which impacts businesses. Flooding also puts sewage plants and lift stations at risk. The project location is shown at Figure C-1.

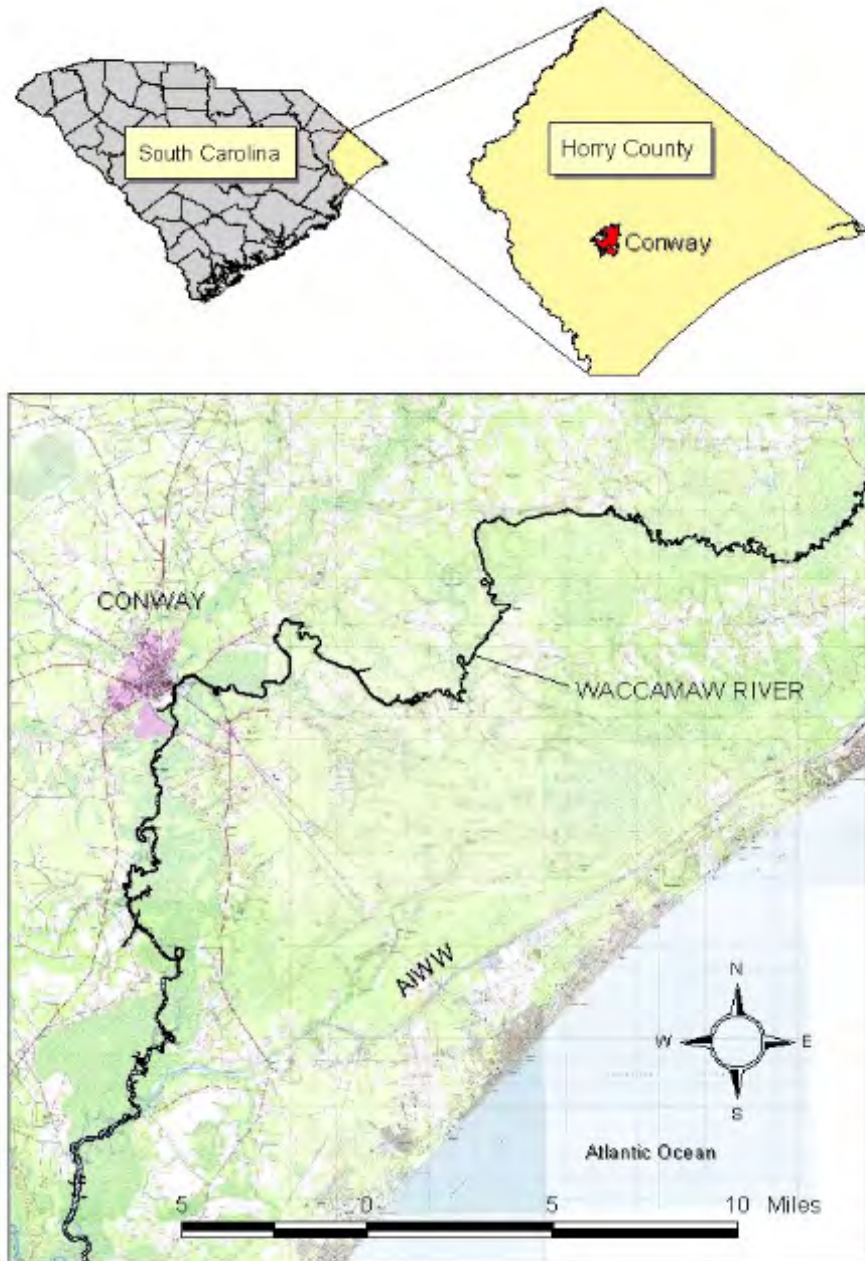


Figure C-1. Project Vicinity/Location Map

1.4 Project Description

Numerous reports have been prepared in evaluating flooding events in the Waccamaw River Basin. The concept of the diversion canal to divert flood waters away from Conway appears to have surfaced in the late 1930's with the first report on such a canal being prepared in December 1942. Two subsequent reports were prepared addressing the feasibility of a diversion canal. This report is based on a cursory reanalysis of the diversion canal as described in the two prior reports and summarized in the following paragraphs.

A report was prepared by the Corps of Engineers Charleston District in October 1951. This report reevaluated the December 1941 report in compliance with the provisions of Section 6 of the Flood Control Act of June 28, 1938. The proposed plan presented in the October 1951 report presented a two-part flood risk reduction project described as follows:

Part 1. A diversion canal about 5.7 miles long, extending from a point on the Waccamaw River (mile 93.4) about 0.8 miles above the North Carolina – South Carolina state line and emptying into Mullet Creek, about 0.9 miles above its mouth at Little River. The canal would have a flared collecting basin at the entrance on Waccamaw River, with a dike of proper height along the downstream side from the river to high ground to divert flood waters into the canal. A concrete weir or control structure with a crest elevation of 13.5 msl would be constructed on the canal about 1-3/4 miles from the Waccamaw River to bypass flood waters when the river stage at the point of diversion exceeds 13.5 feet. The canal would have a bottom width of 150 feet with 2 on 1 side slopes, designed for the conveyance of 5,000 cubic feet per second.

Part 2. A series of 32 cut-offs upstream from the diversion canal (mile 93.4) to White Marsh (mile 130.7) were also proposed, with the necessary clearing and snagging of the existing river to accelerate the discharge and lower the existing water-surface elevation. It was additionally proposed to widen that portion of the river between the point of diversion (mile 93.4) and the first proposed cut-off to the 100 feet for the purpose of eliminating restrictions within that portion of the river.

A second report evaluating flood reduction on the Waccamaw River was completed in 1966 by the Corps of Engineers Charleston District. This report reviewed the previously prepared December 1941 report. Several improvement alternatives were considered, including reevaluation of the feasibility of the formerly proposed diversion canal. The other alternatives considered included the following:

- 1) Reservoirs
- 2) Levees
- 3) Channel improvement – clearing and snagging
- 4) Clearing, snagging channel enlargement and cutoffs

Reservoirs and levees were found impracticable due to lack of topographic relief within the drainage basin. The other alternatives were found economically unjustified based on

reduction of flood damages to agricultural and urban lands, on-farm improvements, roads, and timber logging operations.

Figure C-2 shows the original canal line that was proposed in green. The line in yellow shows a modified line on which this current review is based. The revised route in yellow reduces the impact to businesses, homes and structures.

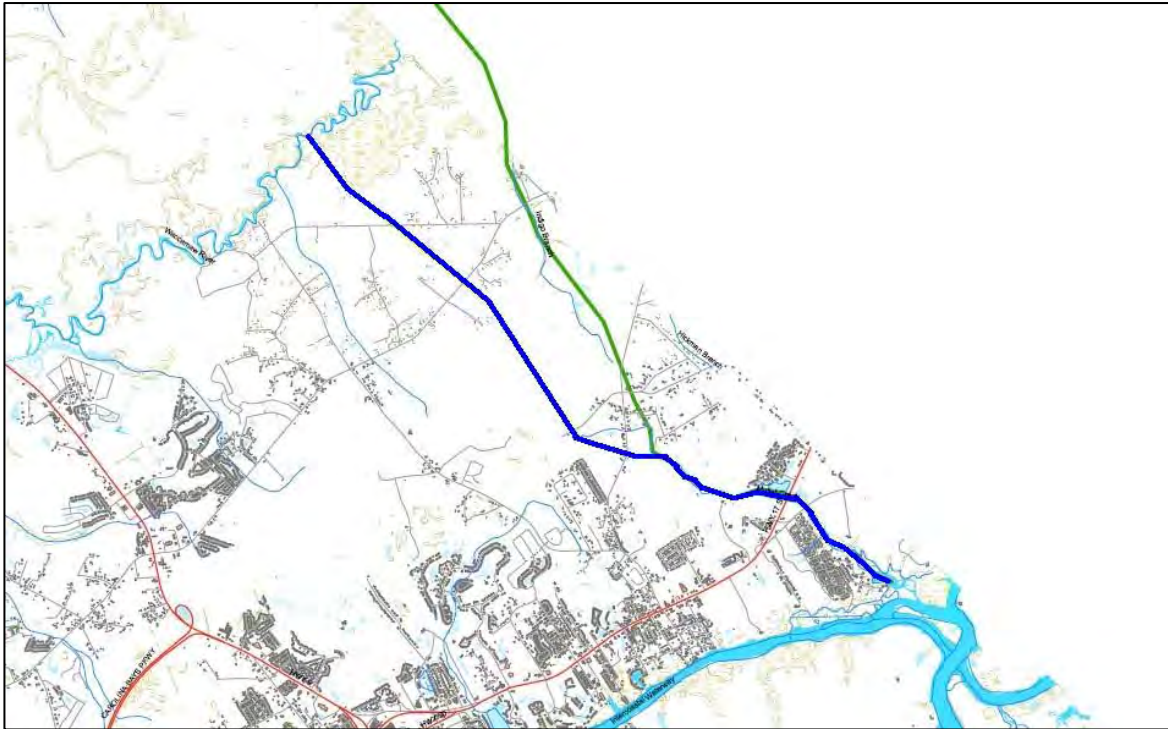


Figure C-2. Proposed Canal Routes/ Green = Original Route and Blue = Route Used For This Review

1.5 Real Estate Requirements

The requirements for lands, easements, rights-of-way and relocations, and disposal/borrow areas should include the rights to construct, maintain, repair, operate, patrol and replace a diversion canal and adjacent access roads. All components of the proposed canal can be constructed under the fee simple estate and the temporary work area easement. The proposed canal consists of a canal connecting the Waccamaw River, near the North Carolina State line, with a waterway leading into the Atlantic Intracoastal Waterway (AIWW). The canal would provide a bypass for floodwaters on the Waccamaw River within South Carolina. The proposed canal, adjacent access roads and temporary work areas for construction are approximately 250 feet wide and approximately 6 miles in length. The canal would be approximately 150 feet wide at the bottom and approximately 14 feet deep. The canal would have a 2:1 slope sidewalls and access roads of about 15 feet

along each side of the canal. The estimated total acreage is 181.8 ± acres. The neighborhood from the beginning of the canal on the Waccamaw River to the crossing of Highway 50 consists of woodland, agricultural and rural residential tracts with some subdivision tracts near Highway 50. Shortly after the proposed canal crosses Highway 50, it crosses lands currently utilized as a private golf course. It then crosses US 17 and Highway 179, entering into a creek connected to the AIWW. The immediate neighborhood at these crossings is woodland, subdivision and some highway commercial zoned lands. It appears that at least 32 parcels would be impacted by the proposed canal. However, due to the lack of detailed mapping to show the canal at scale, it is difficult to determine whether or not any structures might be impacted or if severance or other potential damages are applicable. Lands required for canal construction vary depending on land type from \$10,000 - \$170,000 per acre.

The locations required for temporary work areas and disposal areas have not been identified, but it is estimated that approximately 271 acres will be required for disposal areas and that another 29 acres will be required for staging and lay down areas. An average cost per acre has been estimated to be \$2,400 per acre per year for temporary work areas, and \$10,000 per acre for the disposal areas. Again, it is estimated that at least 8 landowners would be impacted by requirements for disposal and staging/lay down areas. Unknown are any additional land requirements that may be necessary for mitigation purposes.

1.6 Utility/Facility Relocation

The term "relocation" shall mean providing a functionally equivalent facility to the owner of an existing utility, cemetery, highway or other public facility or town when such action is authorized in accordance with applicable legal principles of just compensation or as otherwise provided by Federal statute or any project report or House or Senate document referenced therein. Providing a functionally equivalent facility may take the form of adjusting, altering, lowering, raising, or replacement and attendant removal of the affected facility or part thereof. It is important to note that relocation assistance under Public Law 91-646 relates specifically to displaced persons, and should be distinguished from the separate concept of facility or utility relocations.

The project would cross six public roads including US 17. This would require new or upgraded bridges, utilities, pipelines and roads. Due to limited information on these measures, the real estate requirements associated with these measures is unknown at time of this review. Any modifications to roads, bridges or utilities must be accomplished under a relocation contract with the appropriate entity and will increase the estimated real estate cost presented in Section 1.14.

1.7 Existing Projects

EXISTING FEDERAL NAVIGATION PROJECT - Numerous flood control and navigation studies have been completed on the Waccamaw River. The River and Harbor Acts of June 14, 1880 and July 3, 1930 provides for a channel 12 feet deep at msl (mean sea level), with an 80-foot bottom width, from the mouth to Conway, South Carolina, 41.5 miles; thence, 4 feet deep at msl and 50 feet wide to Red Bluff, South Carolina, 25.5 miles

above Conway; thence, a cleared channel to Lake Waccamaw, North Carolina, 139.9 miles above the mouth. The 12-foot channel to Conway was completed in 1923, and the 4-foot channel to Red Bluff was completed in 1930. The last maintenance work performed on the project was clearing and snagging in November 1976. The last condition survey was completed in 1992.

1.8 Environmental Impacts

Construction of the canal and access roads is expected to cause the destruction of bottomland hardwood forests and wetlands. It will also impact ecosystems and threaten certain species of fish and wildlife. See the Environmental Appendix for detailed information.

1.9 Government Owned Property

There are no known lands that are owned by the Federal Government within the proposed project.

1.10 Public Law 91-646, Relocation Assistance Benefits

Public Law 91-646, Uniform Relocation Assistance provides entitlement for various payments associated with acquisition of real property when acquired with publically funded monies. Title II makes provision for relocation expenses for displaced persons, and Title III provides for reimbursement of certain expenses incidental to transfer of real property. Should it be determined that homes or businesses must be acquired, those impacted owners or tenants may be eligible for relocation assistance payments under PL 91-646. This could be in the form of replacement housing payments, rental assistance payments, business relocation payments and reimbursement of cost for moving personal or business property. A decent, safe, and sanitary replacement dwelling must be provided to anyone displaced by the project prior to issuing any landowner a notice to vacant land acquired for the proposed canal.

1.11 Attitude of Property Owners

Attitudes of landowners are unknown.

1.12 Acquisition Schedule

It is projected that acquisitions will take approximately 18-24 months. This is based on the assumption that Horry County has staff experienced in real estate acquisition, or if they consider using the services of a contractor that specializes in real estate acquisition.

1.13 Estates for Proposed Project

The following estates are suggested for use in the project. The Fee Simple Interest and Temporary Work Area Easement will be used for construction of the canal and maintenance roads. The Temporary Work Area Easement will also be used for the staging areas and disposal areas.

FEE

The fee simple title to (and described in _____ Schedule A) (Tracts Nos. _____, _____ and _____), Subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines. ¹

TEMPORARY WORK AREA EASEMENT

A temporary easement and right-of-way in, on, over and across (the land described in Schedule A) (Tracts Nos. _____, _____ and _____), for a period not to exceed _____, beginning with date possession of the land is granted to the United States, for use by the United States, its representatives, agents, and contractors as a (borrow area) (work area), including the right to (borrow and/or deposit fill, spoil and waste material thereon) (move, store and remove equipment and supplies, and erect and remove temporary structures on the land and to perform any other work necessary and incident to the construction of the _____ Project, together with the right to trim, cut, fell and remove therefrom all trees, underbrush, obstructions, and any other vegetation, structures, or obstacles within the limits of the right-of-way; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

1.14 Real Estate Estimate

The estimated real estate costs generally include the land cost for acquisition of land, relocation costs, and administrative costs. Administrative costs are those costs incurred for verifying ownership of lands, certification of those lands required for project purposes, legal opinions, analysis or other requirements that may be necessary during Planning, Engineering and Design. A 25% contingency is applied to the estimated total for these items. An estimate is at Table C-1. This estimate does not include relocation payments for displaced landowners, facility/utility relocations, or possible acquisition of lands for mitigation purposes.

1.15 Potential Real Estate Issues

The number of impacted landowners is estimated at time of the report. Any increase or decrease in the number of impacted landowners will affect the cost.

No structures have been identified as being impacted at this review. However, it is very likely that some structures would be impacted. This would increase land cost, administrative cost and possible relocation payments to displaced landowners under PL 91-646.

It is possible that lands may need to be acquired for mitigation purposes. This, too, is a cost that would increase land cost and administrative cost.

Facility/Utility Relocation impacts are not fully known. Increased land requirements could be another factor that will increase the real estate cost.

Table C-1
Real Estate Cost Estimate

a. Lands and Improvements/Permits		
181.8 ac (Includes Fee & Temp Work Area)		7,440,000
Disposal Area 271 acres ac		2,710,000
Staging & Lay Down Area 29 ac		69,600
40 Ownerships Estimated	subtotal	10,219,600
b. Mineral Rights		
		0
c. Damages		
		0
d. P.L. 91-646		
		0
e. Administrative Cost		
		900,000
Sub-Total		11,119,600
Contingencies (25%)		2,779,900
TOTAL		13,899,500
ROUNDED		13,900,000

Appendix D

Environmental Appendix

Horry County
Conceptual Diversion Canal



Environmental Appendix

Horry County Waccamaw River Diversion Canal PAS Study

Environmental Appendix

Horry County Waccamaw River Diversion Canal PAS

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Attachment 3 - National Environmental Policy Act

**Basic Information
Submitting Environmental Impact Statements
Notice of Policy and Procedures for Voluntary
Preparation of NEPA Documents
Procedures for Implementing NEPA**

Attachment 4 - US Army Corps of Engineers, Regulatory

**Regulatory Program Overview
Joint Application Form
Mitigation SOP
Section 404(b) (1) Guidelines
Jurisdictional Determination Information Post *Rapanos*
*and Carabell***

Attachment 5 - SC Department of Health and Environmental Control

**SCDHEC Coastal Program
SCDHEC-OCRM Critical Area Permitting Regulations
SCDHEC-OCRM Critical Area Delineations
SCDHEC- Bureau of Water, Permits for Construction in
Navigable Waters
SCDHEC Bureau of Water, Water Quality Certification
SCDHEC Bureau of Water, Water Classification and
Standards
SCDHEC Bureau of Water, Erosion & Sediment Reduction
and Stormwater Management Regulations**

Attachment 6 - Environmental Laws, Regulations, and Websites

1.0 INTRODUCTION

Over forty years ago a study of the Waccamaw River basin was conducted to determine the needs for flood protection, navigation, water supply, pollution

control, irrigation, and hydroelectric power. The only water resource issue identified was flooding, specifically around 500 acres of improved agricultural land along the main stem of the Waccamaw River and urban flooding in the City of Conway. Due to the small amount of development in the basin and the high costs of the considered improvements, there were no projects economically justifiable at that time.

Although not considered economically justified for a federal cost share project, several flood control improvements were identified, including both structural and non-structural. The one that has gained the most attention has been a diversion canal that would intercept water from the Waccamaw River around the North Carolina-South Carolina state line during flood events and divert them to Mullet Creek and discharge through Little River Inlet. This idea of a diversion canal dates back to 1941, prior to most environmental laws and regulations. Under the Corps Planning Assistance to States program, Horry County has asked the Corps to assist in re-assessing the economic viability, determining environmental impacts and coordinating with agencies and interested stakeholders to compile concerns and identify impacts.

While there were a few environmental impacts identified in early reports, the construction of a diversion canal would be a much more involved process today, especially with respect to potential environmental impacts. The original study was prior to the laws and regulations which now require the Federal government, along with local governments, developers and private landowners, to identify alternatives and their potential impacts very early in the planning phase of a project before they can proceed to permitting. The National Environmental Policy Act (NEPA) of 1969 was considered the first law to focus environmental concerns within a comprehensive national policy and it mandates that Federal agencies consider the potential environmental consequences of their proposals, document the analysis, and make this information available to the public for comment prior to implementation. In addition to NEPA, there are a number of other environmental laws and regulations that were not in place at the time of the original analysis.

This report identifies the main environmental laws, regulations and issues that would pertain to the planning, design and construction of a diversion canal. It also identifies specific environmental issues of constructing a canal in a specific location. It is important to note that the revised location of the canal was used only as an example to assist in soliciting input from agencies. This location is slightly different than that originally identified and was selected because it appeared to

impact the least number of businesses, homes, and other structures. This location has not been proposed by the Corps of Engineers, nor is it recommended; it has been used only as an example. Other than the location, this assessment is based on the original design as described in previous reports.

This map illustrates the proposed and originally proposed diversion canals and a dike in the Brunswick, Georgia area. Key features include:

- Proposed Dike:** A thick black line labeled "PROPOSED DIKE" running from the "COLLECTING BASIN" area towards Brunswick Point.
- Proposed Diversion Canal (Revised):** A thick black line labeled "PROPOSED DIVERSION CANAL (REVISED)" running from the dike area towards the south.
- Originally Proposed Diversion Canal:** A dashed line labeled "ORIGINALLY PROPOSED DIVERSION CANAL" running parallel to the revised canal.
- Flood Lines:** Dashed lines labeled "APPROXIMATE 1964 FLOOD LINE" and "APPROXIMATE 1969 FLOOD LINE" showing the extent of flooding.
- Geographical Features:** Brunswick River, Brunswick Point, Brunswick, Columbus, Brunswick, and Little River.
- Infrastructure:** Roads (e.g., U.S. 17, U.S. 90, U.S. 170, U.S. 171, U.S. 172, U.S. 173, U.S. 174, U.S. 175, U.S. 176, U.S. 177, U.S. 178, U.S. 179, U.S. 180, U.S. 181, U.S. 182, U.S. 183, U.S. 184, U.S. 185, U.S. 186, U.S. 187, U.S. 188, U.S. 189, U.S. 190, U.S. 191, U.S. 192, U.S. 193, U.S. 194, U.S. 195, U.S. 196, U.S. 197, U.S. 198, U.S. 199, U.S. 200, U.S. 201, U.S. 202, U.S. 203, U.S. 204, U.S. 205, U.S. 206, U.S. 207, U.S. 208, U.S. 209, U.S. 210, U.S. 211, U.S. 212, U.S. 213, U.S. 214, U.S. 215, U.S. 216, U.S. 217, U.S. 218, U.S. 219, U.S. 220, U.S. 221, U.S. 222, U.S. 223, U.S. 224, U.S. 225, U.S. 226, U.S. 227, U.S. 228, U.S. 229, U.S. 230, U.S. 231, U.S. 232, U.S. 233, U.S. 234, U.S. 235, U.S. 236, U.S. 237, U.S. 238, U.S. 239, U.S. 240, U.S. 241, U.S. 242, U.S. 243, U.S. 244, U.S. 245, U.S. 246, U.S. 247, U.S. 248, U.S. 249, U.S. 250, U.S. 251, U.S. 252, U.S. 253, U.S. 254, U.S. 255, U.S. 256, U.S. 257, U.S. 258, U.S. 259, U.S. 260, U.S. 261, U.S. 262, U.S. 263, U.S. 264, U.S. 265, U.S. 266, U.S. 267, U.S. 268, U.S. 269, U.S. 270, U.S. 271, U.S. 272, U.S. 273, U.S. 274, U.S. 275, U.S. 276, U.S. 277, U.S. 278, U.S. 279, U.S. 280, U.S. 281, U.S. 282, U.S. 283, U.S. 284, U.S. 285, U.S. 286, U.S. 287, U.S. 288, U.S. 289, U.S. 290, U.S. 291, U.S. 292, U.S. 293, U.S. 294, U.S. 295, U.S. 296, U.S. 297, U.S. 298, U.S. 299, U.S. 300, U.S. 301, U.S. 302, U.S. 303, U.S. 304, U.S. 305, U.S. 306, U.S. 307, U.S. 308, U.S. 309, U.S. 310, U.S. 311, U.S. 312, U.S. 313, U.S. 314, U.S. 315, U.S. 316, U.S. 317, U.S. 318, U.S. 319, U.S. 320, U.S. 321, U.S. 322, U.S. 323, U.S. 324, U.S. 325, U.S. 326, U.S. 327, U.S. 328, U.S. 329, U.S. 330, U.S. 331, U.S. 332, U.S. 333, U.S. 334, U.S. 335, U.S. 336, U.S. 337, U.S. 338, U.S. 339, U.S. 340, U.S. 341, U.S. 342, U.S. 343, U.S. 344, U.S. 345, U.S. 346, U.S. 347, U.S. 348, U.S. 349, U.S. 350, U.S. 351, U.S. 352, U.S. 353, U.S. 354, U.S. 355, U.S. 356, U.S. 357, U.S. 358, U.S. 359, U.S. 360, U.S. 361, U.S. 362, U.S. 363, U.S. 364, U.S. 365, U.S. 366, U.S. 367, U.S. 368, U.S. 369, U.S. 370, U.S. 371, U.S. 372, U.S. 373, U.S. 374, U.S. 375, U.S. 376, U.S. 377, U.S. 378, U.S. 379, U.S. 380, U.S. 381, U.S. 382, U.S. 383, U.S. 384, U.S. 385, U.S. 386, U.S. 387, U.S. 388, U.S. 389, U.S. 390, U.S. 391, U.S. 392, U.S. 393, U.S. 394, U.S. 395, U.S. 396, U.S. 397, U.S. 398, U.S. 399, U.S. 400, U.S. 401, U.S. 402, U.S. 403, U.S. 404, U.S. 405, U.S. 406, U.S. 407, U.S. 408, U.S. 409, U.S. 410, U.S. 411, U.S. 412, U.S. 413, U.S. 414, U.S. 415, U.S. 416, U.S. 417, U.S. 418, U.S. 419, U.S. 420, U.S. 421, U.S. 422, U.S. 423, U.S. 424, U.S. 425, U.S. 426, U.S. 427, U.S. 428, U.S. 429, U.S. 430, U.S. 431, U.S. 432, U.S. 433, U.S. 434, U.S. 435, U.S. 436, U.S. 437, U.S. 438, U.S. 439, U.S. 440, U.S. 441, U.S. 442, U.S. 443, U.S. 444, U.S. 445, U.S. 446, U.S. 447, U.S. 448, U.S. 449, U.S. 450, U.S. 451, U.S. 452, U.S. 453, U.S. 454, U.S. 455, U.S. 456, U.S. 457, U.S. 458, U.S. 459, U.S. 460, U.S. 461, U.S. 462, U.S. 463, U.S. 464, U.S. 465, U.S. 466, U.S. 467, U.S. 468, U.S. 469, U.S. 470, U.S. 471, U.S. 472, U.S. 473, U.S. 474, U.S. 475, U.S. 476, U.S. 477, U.S. 478, U.S. 479, U.S. 480, U.S. 481, U.S. 482, U.S. 483, U.S. 484, U.S. 485, U.S. 486, U.S. 487, U.S. 488, U.S. 489, U.S. 490, U.S. 491, U.S. 492, U.S. 493, U.S. 494, U.S. 495, U.S. 496, U.S. 497, U.S. 498, U.S. 499, U.S. 500, U.S. 501, U.S. 502, U.S. 503, U.S. 504, U.S. 505, U.S. 506, U.S. 507, U.S. 508, U.S. 509, U.S. 510, U.S. 511, U.S. 512, U.S. 513, U.S. 514, U.S. 515, U.S. 516, U.S. 517, U.S. 518, U.S. 519, U.S. 520, U.S. 521, U.S. 522, U.S. 523, U.S. 524, U.S. 525, U.S. 526, U.S. 527, U.S. 528, U.S. 529, U.S. 530, U.S. 531, U.S. 532, U.S. 533, U.S. 534, U.S. 535, U.S. 536, U.S. 537, U.S. 538, U.S. 539, U.S. 540, U.S. 541, U.S. 542, U.S. 543, U.S. 544, U.S. 545, U.S. 546, U.S. 547, U.S. 548, U.S. 549, U.S. 550, U.S. 551, U.S. 552, U.S. 553, U.S. 554, U.S. 555, U.S. 556, U.S. 557, U.S. 558, U.S. 559, U.S. 560, U.S. 561, U.S. 562, U.S. 563, U.S. 564, U.S. 565, U.S. 566, U.S. 567, U.S. 568, U.S. 569, U.S. 570, U.S. 571, U.S. 572, U.S. 573, U.S. 574, U.S. 575, U.S. 576, U.S. 577, U.S. 578, U.S. 579, U.S. 580, U.S. 581, U.S. 582, U.S. 583, U.S. 584, U.S. 585, U.S. 586, U.S. 587, U.S. 588, U.S. 589, U.S. 590, U.S. 591, U.S. 592, U.S. 593, U.S. 594, U.S. 595, U.S. 596, U.S. 597, U.S. 598, U.S. 599, U.S. 600, U.S. 601, U.S. 602, U.S. 603, U.S. 604, U.S. 605, U.S. 606, U.S. 607, U.S. 608, U.S. 609, U.S. 610, U.S. 611, U.S. 612, U.S. 613, U.S. 614, U.S. 615, U.S. 616, U.S. 617, U.S. 618, U.S. 619, U.S. 620, U.S. 621, U.S. 622, U.S. 623, U.S. 624, U.S. 625, U.S. 626, U.S. 627, U.S. 628, U.S. 629, U.S. 630, U.S. 631, U.S. 632, U.S. 633, U.S. 634, U.S. 635, U.S. 636, U.S. 637, U.S. 638, U.S. 639, U.S. 640, U.S.

Numerous studies concerning re-occurring flooding of agricultural lands and developed areas in the greater Conway area along the Waccamaw River have been conducted over the years. Along with many other non-structural and

structural alternatives, the one that has gained the most attention over the past 40 years has been a diversion canal that would intercept water from the Waccamaw River around the North Carolina-South Carolina state line during flood events and divert them to Mullet Creek. This alternative has been thought to help alleviate flooding problems along the Waccamaw River, particularly in Conway.

While this alternative may have merit, a much more detailed study needs to be conducted before assuming that a diversion canal would resolve all problems. The flooding problem that could potentially be improved could actually cause other issues and have substantial environmental impacts. While there is a lot to take into consideration, including the economics, design, and construction associated with a project of this scale, there is a significant amount of information to obtain from an environmental perspective before the alternative could advance.

1.2 Study Area

The concept behind a canal involves diverting storm water from the Waccamaw River in order to reduce flood damages to the City of Conway. However, the study area involves more than just the Waccamaw River watershed since storm waters would be diverted to flow through Mullet Creek, Little River and eventually into the Atlantic Ocean. Therefore, those adjacent and downstream watersheds, within the Pee Dee River Watershed, would be impacted.

While the focus is often on damages to the human environment where problems occur, the environmental impacts derived from diverting storm water are sometimes overlooked. Flood waters can be beneficial for flushing out accumulated sediments or potentially detrimental if suddenly added to a saltwater system. The Atlantic Intracoastal Waterway (AIWW) watershed could be heavily impacted around Little River Inlet with an overabundance of freshwater being dumped into this saltwater system. The AIWW Watershed around Winyah Bay could be impacted due to the reduction of flows during flood events. Therefore, the study area for a project of this size should include all those areas that have the potential of being affected.

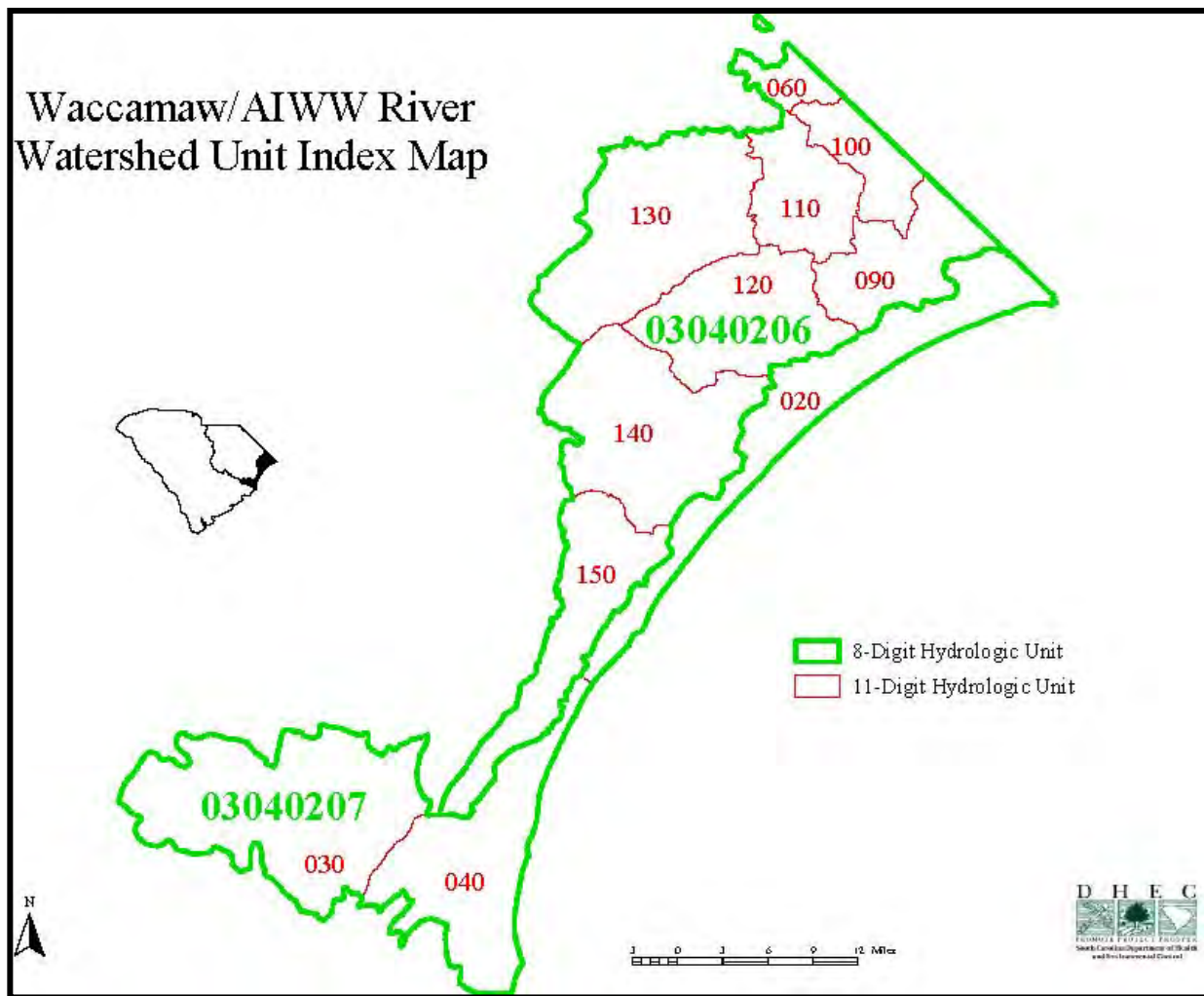


Figure 2. Watershed Map

Source: <http://www.scdhec.net/environment/water/shed/maps/waccamaw-index.pdf>

2.0 INFORMATION GATHERING

This project would require obtaining several state and federal permits. These require involvement with numerous resource agencies and the general public, including non-profit organizations. Regulatory agencies must ensure that the project is not contrary to public interest, does not violate any other federal or state law, and is the least damaging, practicable alternative. (More detailed information regarding the laws, rules and regulations pertaining to this project can be found in the Regulatory Section 3.0). Because the permitting process depends heavily on public input and expert knowledge from various agencies, comments were solicited from numerous organizations on the diversion canal concept.

Initial coordination letters were sent to state, federal, and non-profit agencies soliciting comments and concerns regarding the diversion canal. A brief description of the conceptual project and a location map were included in the meeting invitation. A copy of the initial letter can be found in Attachment1, along with the complete mailing list.

2.1 Meeting Attendees

The following is a list of all attendees from the meeting and the agency they represent:

Dennis Allen, USC, Baruch Marine Laboratories
Wendy Allen, USC, North Inlet-Winyah Bay National Estuarine Research Reserve
Derk Bergquist, SC Department of Natural Resources
Melissa Bimbi, US Fish and Wildlife Service, Threatened & Endangered Species
Sara Brown, USACE, Hydraulics, Hydrology & Coastal Section
Mark Caldwell, US Fish and Wildlife Service
Michelle Culbreath, SCDHEC, Bureau of Water
Susan Davis, SC Department of Natural Resources
Kay Davy, NOAA, National Marine Fisheries Service
Ed Eudaly, US Fish and Wildlife Service
Paul Gayes, Coastal Carolina University, Coastal Marine & Wetland Services
Ted Hauser, USACE, Planning Division
Elizabeth Jackson, USACE, Environmental Section
Erin Jones, SCDHEC- Bureau of Water
Curtis Joyner, SCDHEC, Office of Ocean and Coastal Resources Management
Clay McCoy, Coastal Carolina University, Coastal Marine and Wetland Services
Wilbur Pace, NOAA, National Marine Fisheries Service
Dave Pierce, SCDHEC, Office of Ocean and Coastal Resources Management
Craig Sasser, US Fish and Wildlife Service, Waccamaw National Wildlife Refuge
Rich Viso, Coastal Carolina University, Coastal Marine and Wetland Services

2.2 Agency Coordination

A letter was sent to numerous regulatory agencies and other entities regarding the proposal for a diversion canal. The purpose of the letter was to obtain information on any initial concerns and give notification of a meeting held on June 24, 2008. As a result of this coordination, several concerns and issues were identified, some very detailed (including research and experimental papers) and some were broad based. The information gathered from response letters and the meeting is listed in the Results Summary section. Official written correspondence was received from the following agencies:

US Fish and Wildlife Service, The Environmental Protection Agency, SC Department of Natural Resources, SC Department of Health and Environmental Control, SC Archives and History, Coastal Conservation League, Mr. Dennis Allen, The National Marine Fisheries Service, and the Waccamaw Riverkeeper.

2.3 Results

The concerns and questions raised by the agencies are summarized below under seven topic headings: Construction, Hydrology and Water Quality, Wetlands, Cumulative Impacts/ Ecosystem, Fish, Wildlife and Threatened and Endangered Species, Regulatory Issues, and Other Issues. Please note that while some points are summarized from concerns identified by several agencies, others are quoted verbatim. Copies of all response letters can be found in Attachment 1.

2.3.1 Construction

- The diversion structure on the Waccamaw River will fragment habitat and likely cause barriers to wildlife movements and migration of both aquatic and terrestrial organisms.
- Construction, along with flood surges, could cause scouring issues at the discharge point
- Flood surges will likely cause erosion of the banks and increase the potential for widening of the canal and an increase of downstream sedimentation
- There will be impacts associated with the excavation and displacement of the material regardless of the final disposal method or location
- Will require new or upgraded bridges, utilities, pipelines and roads
- Direct destruction of 30-50 acres of bottomland hardwood forests and wetlands for the canal and maintenance road. These habitats both provide ecological services including floodwater assimilation, natural pollutant filtering ability and biological diversity.
- Construction of a diversion canal creates conditions that favor the introduction and spreading of invasive species of both plants and animals.

2.3.2 Hydrology & Water Quality

- Diversion canal could cause flooding problems downstream along the banks of new canal
- Canal could alter current zoning for flood insurance

- Canal could intensify hurricane floods
- Modeling should be completed to determine the water level of the proposed canal and should account for groundwater seepage and spring tides flooding in from Mullet Creek.
- The deep canal is likely to alter groundwater from adjacent areas and cause chronic draining of wetlands and uplands especially during periods of drought. Affecting groundwater also has the potential to cause saltwater intrusion and could impact aquifer recharge and storage.
- Reduction on downstream water flow will significantly affect the hydrology, chemistry, and ecology of the Waccamaw River and its riparian corridor. These impacts include decreased ability to dilute and assimilate pollutants. When assimilative capacity is reduced, it could have a serious economic impact on the sewage treatment plants permitted to discharge into the Waccamaw River since it is likely that their waste load allocations would need to be reduced.
- Potential for serious economic impacts on the freshwater supply for drinking water supplies in the Waccamaw River and the Atlantic Intracoastal Waterway.
- The Waccamaw River has historically failed to meet SC's level of dissolved oxygen water quality standards. The diversion canal could potentially affect the DO concentrations in the Waccamaw and Little Rivers.
- Large impacts to include the changes and a reduction in water quality associated with the introduction of freshwater into the estuarine ecosystem of Mullet Creek and Little River Inlet.
- The creation of a new waterbody with low-flow will likely have water quality issues due to stagnation
- The canal will likely hold water at some level. The presence of a water source could encourage agricultural and residential development resulting in more draw-down and degradation of canal water.

2.3.3 Wetlands

- There will be unavoidable direct and indirect impacts on wetlands by dredge and fill activities associated with the construction of a canal.
- A canal will more than likely impact the hydrology of wetlands and how much water moves in and through them.

- A canal may affect wetlands' ability to provide ecosystem functions (water storage, aquifer recharge, habitat, etc.)
- Potential for the surrounding estuarine emergent wetlands and epifauna could undergo a species shift in response to changes in salinity resulting from freshwater pulses that would occur during flooding events on the Waccamaw River. The same can be said regarding wetlands in and around Winyah Bay as they will be starved of these freshwater pulses.
- 404(b) (1) Guidelines of the Clean Water Act are very specific regarding fill in wetlands. It is questionable if this diversion canal could comply with those guidelines.

2.3.4 Cumulative Effects/Ecosystem

- High sediment loads entering wetlands through channels, irrigation ditches and drainage ditches can smother aquatic vegetation, shellfish beds and tidal flats, fill in riffles and pools, and contribute to increased turbidity.
- Concerns exist that the long-term effect may result in sediment-related pollution dramatically impacting water quality, stream dynamics, and aquatic organisms, particularly in the Little River Inlet estuary system. Moreover sediments carry and store pollutants, e.g. nutrients, toxic metals and compounds, and pesticides/herbicides.
- Will project-related sedimentation issues detrimentally impact both the shelly and sandy bottoms areas and their associated ecosystems of the Little River Inlet? Little River Inlet is characterized by a sandy bottom in the lower portion of the estuary and is predominately shelly in the creeks and main channel toward the AIWW. Estuarine waters provide critical nursery habitat for many species of fish and shellfish. Shrimp, blue crab and oyster all are important commercial species and depend on estuarine wetlands or protection and food in the juvenile stages.
- The slow release of flood waters in the existing Waccamaw River system helps mitigate storm surges and salt water intrusion on the lower end of the Waccamaw. The diversion of floodwaters would allow a saline influence further inland, impacting the entire ecosystem and may adversely affect unique habitats, such as oxbow lakes that are important to many species including the rare (State protected) swallow tail kite. Oxbow lakes are dependent on periodic flooding as the major source of water influx providing nutrient transport into and out of the area.
- Long term effects on water quality

- The change in frequency and magnitude of periodic pulses/purges of the Waccamaw River are ecologically important and could be detrimental to the ecology of the River and Winyah Bay
- Reduced flow rates in the Waccamaw River below the diversion canal may result in debris accumulation leading to navigational hazards
- High potential for long term impacts resulting from diverting water from a low salinity area to a high salinity area. The increased freshwater inflow to Little River estuary through pulses of floodwaters added to the chronic movement of water from the river basin to tidal areas is likely to affect both water and habitat quality
- There is a potential for saltwater transport from the ocean into the canal and possibly into the River during a major hurricane surge causing serious short and long term impacts to these freshwater systems.
- Potential for long term and irreversible effects of salt water intrusion to groundwater, up the canal, and potentially into the Waccamaw River
- Could the drainage of project-related wetlands result in land subsidence below sea level. If so, how this, coupled with potential storm/hurricane and climate-change associated sea level raises, will affect the local area.
- Reductions in water quality will result in changes in water quality characteristics and eventual changes in the biotic potential of riverine ecosystem. Reductions in fluxes of marine chemistry have unknown consequences on ecosystem structure. Reduced flows could lead to more intense and prolonged periods of naturally occurring hypoxia, particularly in the summer when hurricanes and tropical storms tend to occur. Hypoxia, in addition to causing stress and mortality within fish, promotes the biomethylation of mercury. Fish advisories already exist for the Waccamaw River, indicating that the river has no ability to assimilate increased mercury within its food web. Significant changes in water quality and quantity will have both predictable and unpredictable consequences on the river's ecosystem. Documentation exists to identify the predictable consequences; however, unintended consequences are likely to occur and need additional study to avoid significant disruption to the riverine ecosystem as well as to the economic, cultural and social structure of the communities in and around the Waccamaw River.

2.3.5 Fish, Wildlife, Threatened & Endangered Species

- Impacts to the Waccamaw River may hinder the passage of American Black Bear
- Potential adverse effects to T& E species including dwarf fimbry, common hemicarpha, little burhead, Plymoth gentian and pink tickseed
- Concerns over whether the canal will become mosquito-habitat, realizing the proliferation of mosquito-borne diseases, e.g. West Nile, eastern equine encephalitis virus, and dog heart worm.
- The project area includes essential fish habitat (EFH) and managed species such as red drum, white shrimp, and brown shrimp. Tidal inlets are identified by the National Marine Fisheries Service as habitat areas of particular concern (HAPC) and are of special significance to managed species. The waters and fringing coastal marsh of the project area serves as nursery and forage habitat for black drum, Atlantic menhaden and blue crab. A detailed EFH assessment is needed if planning continues.
- The freshwater influx could cause permanent effects to habitat and dramatically reduce the diversity and quantity of federally managed fishery resources and their prey, particularly shrimp and blue crab. Both are commercially and recreationally important to the area.
- The effects of the canal could permanently effect habitats and dramatically reduce the diversity and quantity of federally managed fishery resources and their prey.
- Any degradation to the lands and waters falling in or through the Waccamaw River watershed will likely result in impacts on federal and state lands, including the Waccamaw National Wildlife Refuge, State Heritage Lands and state managed wildlife areas, as well as the Historic Ricefields properties that all provide critical habitat for migratory waterfowl.
- The canal would cause unknown amounts of freshwater to discharge into a saltwater environment at Mullett Creek and Dunn Sound in Little River, changing salinity levels and sedimentation patterns. Dunn Sound has been designated as a Shellfish Harvesting Waters (SFH) and the sedimentation and pollutants from existing uses surrounding (and in the vicinity) of the canal could result in degraded water quality negatively affecting shellfish resources. Dunn Sound contains one of the few shellfish resources open to harvesting in the entire Grand Strand area and is a Geographic Area of Particular Concern (GAPC).

2.3.6 Regulatory Issues to Consider

- If the canal has the effect of increasing a Section 10 Water, it may, in itself, become a navigable water of the US, under the jurisdiction of the US Army Corps of Engineers and potentially a State Navigable Water under the jurisdiction of SCDHEC- OCRM. This canal will also likely become a hydrologic connection for otherwise considered “isolated wetlands”.
- The effects of how the proposed canal will impact SCDHEC OCRM’s efforts need to be considered. The DHEC OCRM protects and enhances the State’s coastal resources by preserving sensitive and fragile areas while promoting responsible development in the eight coastal counties of South Carolina. Concerns exist that the proposed project will affect the implementation of both state’s Coastal Zone Management Plans, may require managed wetland alterations, storm water management-plan modification, and land-disturbance activities. Additionally, the proposed project may alter tidally-influenced critical-area lands, waters and beaches. Moreover, the project may affect sensitive natural, historic and cultural resources, and therefore significant technical expertise will be required to resolve complex coastal management issues. Last, projects in this area must demonstrate low impact and alternative development to preserve water quality and environmental integrity.
- DHEC does not recommend the project based on parts of the Coastal Zone Management Act, the Department’s Critical Area Regulations (for Mullett Creek), SC Coastal Zone Management Program, Water Quality rules, and Navigable Waters Regulations.

2.3.7 Other

- “Envision 2025” Program: It is a concern that the canal may conflict with Horry County’s community goals as expressed in their Envision 2025 Comprehensive Plan pertaining to current and future land use. It is thought that a project of this size and magnitude will have some direct impact on current and future land use, zoning, and the local highway system. Aside from right-of-way issues, new roads, bridges, and culverts will be required. Utility relocations and new easements for gas, power, water, sewer, etc may also be needed. If this type project is to be built, it should be made an integral part of the work being done by local planners and all agencies should be made partners in the planning of such a project.
- “All-Hazards Mitigation Plan”: It is a concern over how the canal will affect Horry County’s “All-Hazards Mitigation Plan”; particularly regarding storm evacuation routes should inland and coastal flooding all occur in one storm event and cause the canal to overflow potentially affecting major roads, drinking and wastewater treatment plants, hospitals, schools, etc.

- Long Term Maintenance of the proposed canal after construction must be integrated into the planning studies. Flood waters received by the canal will likely contain high sediment and debris loads and over time, negate the utility of the canal. In addition, after construction, locals owning property along the canal's pathway would likely push for a deeper canal with recreational access. If this occurs, how will this be handled?

Other comments were received suggesting that additional alternatives should be considered and weighed including:

- Improvements to roads and bridges to eliminate flooding or lessen flood damages.
- An underground "pipe" to allow water to only be pumped in and through in flood events. While many concerns will remain, it is thought that this alternative may eliminate many issues of draining surrounding wetlands and potentially effecting groundwater.
- A ditch or canal sinuous in shape, impervious v/s pervious and with and without flood gates
- Relocate affected property owners to upland areas and restrict development within the floodplain. The floodplain could then be reserved as open space and natural areas and allowed to serve its natural functions of accommodating floodwaters, assimilating pollutants, and slowly releasing the waters as water level subsides.

2.5 Recommended Studies

This section gives a brief description of specific studies, surveys or models that were identified or recommended by the Agencies that would assist in identifying and calculating environmental impacts.

Jurisdictional Delineation- A jurisdictional determination (JD) is the process of identifying and locating jurisdictional waters of the United States, including wetlands, regulated by the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act. Waters of the United States include:

- All waters that are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
- All interstate waters including interstate wetlands;
- All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce.
- All impoundments of waters otherwise defined as waters of the United States under the definition;

- Tributaries of the above listed waters
- The territorial seas
- Wetlands adjacent to waters (other than waters that are themselves wetlands) identified above.

The delineation process establishes a line that separates and identifies the waters of the US from non-wetland (upland) areas. Anyone can initially identify waters of the US, but it is only valid when the Corps verifies the delineation. This verification is finalized with a letter from the Corps referencing a map or survey reflecting the wetland delineation that was verified.

Critical Area Delineation- A critical area delineation involves locating and marking, on the ground, the limits of tidelands, coastal waters, and the beach/sand dune system. A critical area line can initially be set by anyone, but the Office of Ocean and Coastal Resource Management (OCRM) must approve and certify this jurisdictional boundary. A professional surveyed map, depicting the critical area boundaries must be completed and signed by OCRM to finalize the delineation.

Cultural Resources Survey- To assist in meeting the requirements of Section 106 of the National Historic Preservation Act, the State Historic Preservation Office often requests cultural resource surveys to locate any potential historic properties within the project area and to assess their significance and potential eligibility for listing in the National Register of Historic Places. The research starts with a review of historic maps and the States' site file of the properties in and around the project area. A pedestrian survey is also often conducted in the initial phase. Depending on the results of the initial cultural resource review, more detailed surveys, including shovel testing, etc., may be required. The purpose of the survey is to identify any potential historic properties in the project vicinity.

Essential Fish Habitat (EFH) Assessment- An EFH Assessment should be completed to comply with the Magnuson-Stevens Fishery Conservation and Management Act. The assessment is an objective review of the impact an action may have on fish and their habitat. It will include a description of the action, an analysis of the potential adverse effects of the action, on EFH and the managed species, the agencies conclusions regarding the effects of the action and any proposed mitigation. The Winyah Bay area along with the Mullet Creek and Little River Estuary should be included.

Endangered Species Assessment- South Carolina is home to many endangered species of plants, wildlife, and fish which are protected under The Endangered Species Act of 1973. An endangered species assessment would include research to determine if any threatened or endangered species have been previously identified in or around the project area or would be affected by the project. It would also include a site assessment to determine if any threatened or endangered species or habitat is present within the project area.

Coastal Storm Surge Modeling, with post-processing analysis and statistical analyses-

Analysis will include the development of a 2- and 3-dimensional long-wave hydrodynamic model with the capability of simulating tidal circulation and tropical and extratropical storm surge propagation over large computational domains, while simultaneously providing high resolution in areas of complex shoreline and bathymetry. The model will use an unstructured grid, finite element model which represents all pertinent physics of the 3-dimensional equations of motion to include tidal potential, Coriolis, and nonlinear terms of the governing equations. The model will also have internal capabilities for solving the 2-dimensional transport equations to simulate the movement and fate of both conservative and non-conservative constituents such as temperature, salinity, cohesive, and noncohesive sediment transport.

In conjunction with the coastal storm surge model, the analysis will include a statistical life-cycle model that simulates life-cycle sequences of non-deterministic multi-parameter systems such as storm events and their corresponding environmental impacts. The approach is based on a resampling-with-replacement, interpolation, and subsequent smoothing technique in which random sampling of a finite length database is used to generate a larger database. This procedure is repeated to generate a large population of life-cycle databases. These multiple databases of storm activity are post-processed to compute mean value frequency relationships with standard deviation error estimates. The model will be used in conjunction with coastal process models to generate storm impact versus frequency-of-occurrence relationships. Typical storm impacts include storm surge elevation, wave run-up, dune recession, shoreline erosion, disposal mound erosion, and bridge scour.

Watershed and Riverine Flooding Models- A Hydrologic model designed to simulate the precipitation-runoff processes of dendritic watershed systems will be developed to assess existing and proposed changes of the watershed. Hydrographs produced by the program will be used directly or in conjunction with other software for studies for evaluation of potential impacts.

The backwater riverine model will address one-dimensional river analysis components for such as: (1) steady flow water surface profile computations; (2) unsteady flow simulation; (3) movable boundary sediment transport computations; and possibly (4) water quality analysis. The effects of various obstructions such as bridges, culverts, weirs, and structures in the flood plain may be considered in the computations. Also, the model will be used for assessing the change in water surface profiles due to proposed channel improvements and diversion.

Salinity Modeling - The analysis will include a model to simulate water and water quality constituent transport in geometrically and dynamically complex water bodies, such as vertically mixed shallow estuaries, lakes, and coastal areas. The model will solve the three-dimensional, vertically hydrostatic, free surface, turbulent averaged equations of motion for a variable density fluid. Dynamically

coupled transport equations for turbulent kinetic energy, turbulent length scale, salinity and temperature will be solved. The model may also simultaneously solve an arbitrary number of transport-transformation equations for dissolved and suspended materials. Multiple size classes of cohesive and noncohesive sediments and associated deposition and resuspension processes and bed geomechanics may be simulated.

2.6 Conclusions of Coordination

The purpose of soliciting input was to gather information regarding potential concerns, of both commenting and regulatory agencies regarding the planning and construction of a conceptual diversion canal. More specifically the intention was to outline the type of information the agencies believe they would need in order to evaluate a flood reduction type project like a diversion canal.

The information received focused around the canal concept of diverting water from the Waccamaw River, above the City of Conway, to Mullet Creek for the purpose of reducing flood damages within the City of Conway. Detailed comments could not be given as there is not enough specific information regarding potential impacts, construction techniques, existing conditions, and the need of the project. However, the comments received do give a very good summary of the information that will be needed in order to assist the regulatory agencies in making permit decisions.

3.0 REGULATORY

There are several laws that pertain to a diversion canal or any other flood reduction project and many of those key laws are listed below. This list is not intended to be all inclusive but to highlight those which will require a great deal of time, field work, and coordination with the regulatory agencies.

- National Environmental Policy Act
- Clean Water Act
- Rivers and Harbors Act
- Coastal Zone Management Act of 1972
- Endangered Species Act
- National Historic Preservation Act
- Magnuson-Stevens Fishery Conservation and Management Act
- Fish and Wildlife Coordination Act
- SC State Recreational Water Act

- State Safe Drinking Water Act
- Stormwater Management and Sediment Reduction Act
- Pollution Control Act

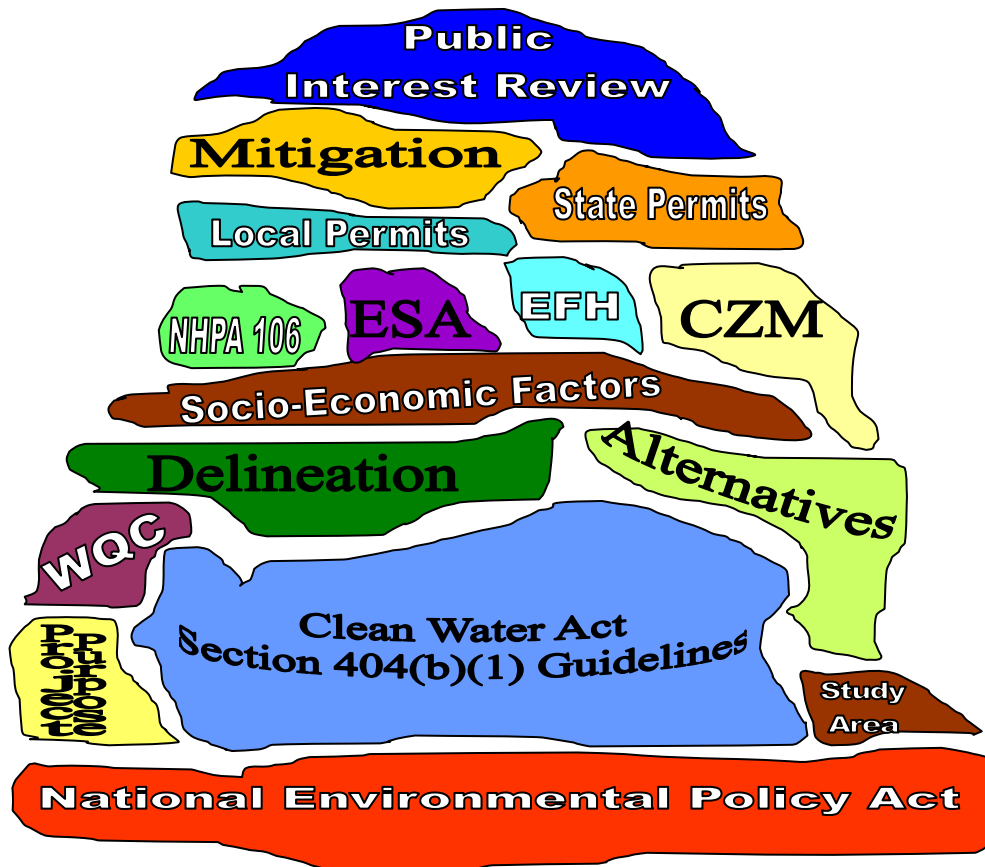


Figure 3. Regulatory Factors Involved with Permitting

The Clean Water Act, Rivers and Harbors Act and the Coastal Zone Management Act require permits, while many of the other environmental laws, regulations, and policies are pulled in under one of these permit processes. NEPA is a little different as it is an umbrella type law that does not require a permit but does require the federal government to identify and document all environmental impacts of their actions. These four laws steer the permitting process and will be described in detail while other applicable laws can be found in Attachment 6.

The two main permitting agencies responsible for compliance with these laws are the US Army Corps of Engineers' Regulatory Office (Corps) and The SC Department of Environmental Health and Environmental Control (SCDHEC). The Corps will more than likely be the lead federal agency and therefore, is mandated to comply with the National Environmental Policy Act (NEPA). NEPA plays a huge

part in federal permitting and often its requirements are intertwined with those of other laws.

3.1 NEPA

The National Environmental Policy Act (NEPA) of 1969 is considered to be the foundation of modern American environmental protection. It was established to set clear goals for agencies to foster “productive harmony” between “man and nature” to “fulfill the social, economic, and other requirements of present and future generations of Americans”. NEPA is not just a law but a process which includes strategic planning, public information and input, interagency coordination, applying a systematic, interdisciplinary approach, and monitoring and adaptive management. NEPA is intended to be used early in the planning stages to assist in decision making. There are three levels of analysis for complying with NEPA, depending on whether or not the project could significantly affect the environment. These three levels include: a categorical exclusion determination; preparation of an environmental assessment (EA)/finding of no significant impact (FONSI); and preparation of an environmental impact statement (EIS).

To comply with NEPA in planning a diversion canal project for flood damage reduction an EA or EIS will be required. As the lead federal agency, the Corps would ultimately determine which will be required. If there is any question whether an EIS will be required, an EA would be completed first. An EA provides evidence for determining whether the proposed action will cause significant impacts. If, in this case, the Corps determines that there are no significant impacts, a Finding of No Significant Impact (FONSI) document is prepared and compliance with NEPA has been fulfilled. If significant impacts are predicted, the EA facilitates the preparation of an EIS.

An EIS, in simplistic terms, covers the same information found in an EA, but in greater detail. It requires a rigorous and objective alternatives analysis, full public involvement, full interagency coordination, full disclosure and 3 phases of documentation and process - draft, final and record of decision (ROD), including a national announcement of each in the Federal Register. Based on comments from the Regulatory and commenting agencies, a great deal of initial information will be required to identify potential impacts. This will include surveys and modeling, which will take a great deal of time and can be very expensive. Horry County may elect to voluntarily begin the process with an EIS to potentially avoid time delays. The complete EIS process is described in Section 4.0.

The alternatives analysis, public involvement and the identification of environmental impacts, both direct, indirect and cumulative which are required under NEPA, are also used in fulfilling the requirements under the Clean Water Act.

3.2 RIVERS AND HARBORS ACT, SECTION 10

The Rivers and Harbors Acts of 1890 (superseded) and 1899 (33 USC 401, et seq.) are the legislative origin of the US Army Corps of Engineers (USACE) regulatory program. Various sections establish permit requirements intended to prevent unauthorized obstruction or alteration of any navigable water of the United States. Section 10 (33 USC 403) of the Rivers and Harbors Act covers construction, excavation, or deposition of materials in, over, or under such waters, or any work which would affect the course, location, condition, or capacity of those waters. Activities requiring Section 10 permits include structures (e.g., piers, wharfs, breakwaters, bulkheads, jetties, weirs, transmission lines) and work such as dredging or disposal of dredged material, or excavation, filling, or other modifications to the navigable waters of the United States.

The geographic jurisdiction of the Rivers and Harbors Act includes all navigable waters of the United States which are defined (33 CFR Part 329) as, "those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible to use to transport interstate or foreign commerce." This jurisdiction extends seaward to include all ocean waters within a zone three nautical miles from the coastline (the "territorial seas"). Limited authorities extend across the outer continental shelf for artificial islands, installations, and other devices (see 43 USC 333 (e)).

Source: <http://www.e-mdot.com/Planning/WaterQuality/Rivers%20and%20Harbors.doc>

3.3 Clean Water Act

In 1972, Section 404 of the Clean Water Act established a program to regulate the discharge of dredged or fill material into waters of the United States. Waters of the United States includes those navigable waters regulated under Section 10 of the Rivers and Harbors Act, plus their tributaries and adjacent wetlands and isolated waters where the use, degradation or destruction of such waters could affect interstate or foreign commerce. The fundamental rationale of the 404 program is that no discharge of dredged or fill material should be permitted if there is a practicable alternative that would be less damaging to the nation's aquatic resources or if significant degradation would occur to the nation's waters. In addition, public interest factors are weighed and balanced and the Corps must conclude that the project is not contrary to the public interest.

Section 401 of the Clean Water Act requires that all 404 permits obtain a 401 Water Quality Certification which ensures any discharges from the proposed action will comply with water quality standards and all other requirements of the Act. Without a 401 Certification, issued by SC DHEC, a Corps' permit cannot be issued.

3.4 South Carolina Coastal Tidelands and Wetlands Act (Coastal Zone Management Act)

In 1977, the South Carolina Coastal Tidelands and Wetlands Act (also known as the South Carolina Coastal Zone Management Act) was passed by the SC General Assembly. The Act gives DHEC-OCRM the duty to protect the quality of the coastal environment and to promote the economic and social improvement of the coastal zone. DHEC-OCRM must balance the public's desire to utilize South Carolina's natural resources while protecting Regulations, is to ensure that impacts to these resources are minimized.

Source: <http://www.scdhec.net/environment/ocrm/regs/>

The policy of the State of South Carolina in the Coastal Zone Management Act of 1977 is “to protect the quality of the coastal environment and to promote the economic and social improvement of the coastal zone and of all the people of this State.”

Source: <http://www.scstatehouse.net/code/t48c039.htm>

4.0 EIS PROCESS

The diagram below demonstrates a 7-step process of completing an EIS. Each step is described in detail.

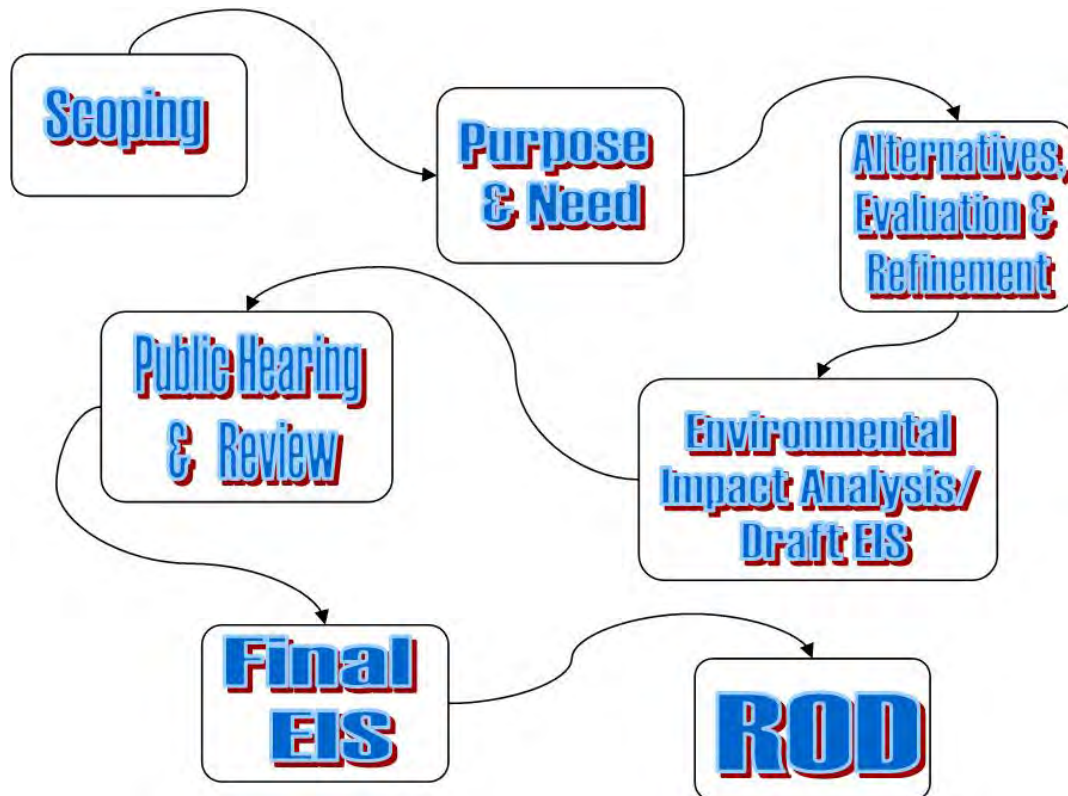


Figure 4. Diagram of EIS Process

4.1 Scoping

The first step in the EIS process is to announce to the public, by a Federal Register notice and press releases, that an EIS will be prepared and to ask for comments about what should be included. Scoping begins before any analysis of impacts is done, and it continues until the EIS is finished. Public participation is an integral part of scoping and will continue throughout the process with public meetings in the surrounding communities that might be affected by the project. The purpose of soliciting input is to properly identify as many relevant issues, alternatives, mitigation measures, and analytical tools as possible so they can be incorporated into the EIS. Getting input from as many affected and interested parties as possible is an important part of preparing an EIS. This usually includes:

- Communities who live, and work in the surrounding area.
- Public interest groups and native communities that have concerns about possible impacts to environmental, social, or economic resources

- Federal, state, and local government agencies that have responsibilities for managing public resources or services.
- Scientists and other technical experts with knowledge of the area's natural resources and the possible impacts.

An important objective of scoping is to identify specific elements of the environment that might be affected by implementation of the proposed project. The concerns about significant impacts associated with the proposal will be identified so that a detailed analysis can be conducted during the EIS. Environmental concerns usually fall within three categories: ecological, sociological and economical concerns.

4.2 Purpose and Need

Based on the information received during the initial scoping effort, the next step is to refine, if necessary, and document the purpose and need. At this time, the purpose of the project would be to reduce flooding in the City of Conway and the need is based on the continuous flood damages to residential and commercial structures. Information included in the EIS will always focus around the purpose and need for the project.

During the interagency meeting, one of the biggest issues raised was regarding the purpose and need. It is thought that many of the owners having properties affected by flooding have been previously bought out and the remaining need for reducing flood damages is minimal compared to the potential impacts of a diversion canal. Therefore, even before the initial notice to prepare an EIS is published, a great deal of effort should be given to do a thorough analysis and description documenting the need for a flood damage reduction project in the Waccamaw River basin.

4.3 Alternatives, Evaluation and Refinement

Once the purpose and need are adequately demonstrated, alternatives should be formulated that would address the documented problem(s). While many alternatives will be defined before the scoping meeting, others will likely be identified at that time. Alternatives would likely include proposals identified in previous Corps' studies including levees, floodwalls, impoundments, diversions and channel modifications. Other options for flood damage reduction identified by agencies include moving potentially affected structures to uplands and implementing broad, comprehensive flood damage planning to include low impact development techniques, protecting more natural impervious areas, proper zoning, best management practices in land development and establishing protected

riparian buffers along the river. Alternatives discussed in the meeting are listed in Section 2.3.7.

All alternatives derived during scoping should be listed in the EIS, but only those considered reasonable would need to be described in detail. In addition, the “no-action” alternative must be included as it is considered the alternative from which the others are measured with regards to environmental impacts. The “no action” alternative is not considered synonymous with the existing conditions, but is defined as the study area in the future if no project were built. Basically, it is the project area’s fate should no flood damage reduction take place. In addition to identifying alternatives, any reasonable measures suggested to mitigate possible impacts are considered for analysis in the EIS. After the alternatives to the proposal are determined, there will be a need to develop scenarios for the proposal and each alternative. Those are the basis for the analyses of possible impacts.

4.4 Environmental Impact Analysis and Draft EIS

The analysis of environmental impacts is potentially the most involved aspect of the EIS. The EIS analyzes the particular environmental concerns that were identified through scoping. The proposal and each reasonable alternative is then compared to the “no-action” alternative and a separate analysis for each is prepared and documented (keeping in mind the “no-action” alternative describes the conditions in the future, without the project) The objective of the analysis is to estimate the nature, severity, and duration of impacts that might occur in order to compare the impacts of the proposal and alternatives.

In order to identify impacts to the environment, a baseline must be described defining the current conditions. This baseline should be detailed and succinctly describe the environment of all areas to be affected. The impacts are identified by taking each alternative and describing what their effect is on the existing environment. For a flood reduction project, this section may include, but not be limited to the following:

- Land Use
- Wetlands
- Threatened and Endangered Species
- Floodplains
- Water Quality
- Coastal Zone Resources
- Wildlife Refuges
- Groundwater Table
- State or Federally Managed Lands
- Cultural Resources
- Hazardous Materials
- Air Quality
- Noise
- Farmlands
- Shore Erosion and Accretion
- Recreation
- Water Supply
- Food and Fiber Production
- Environmental Justice
- Communities
- Construction Impacts
- Energy
- Indirect and Cumulative Impacts

- Conservation
- Economics
- Fish and Wildlife Resources
- Navigation
- Essential Fish Habitat
- Habitat Areas of Particular Concern
- Affected Structures
- Sea Level
- Public Health and Safety
- Saltwater Intrusion

A great deal of information will need to be collected on the existing conditions so that the reasonable alternatives can be evaluated. Numerous technical aids are used in making the assessment, including ecological and socioeconomic studies and computer models that simulate the potential impacts within the study area.

The alternatives would then be evaluated with respect to the existing conditions. Direct, indirect and cumulative impacts on the environment should be included, along with both the positive and negative impacts of each alternative. In addition, any mitigative measures proposed to offset adverse environmental impacts would need to be included in this section. Feedback from initial agency contact indicates that the proposed diversion canal would need a great deal of surveying and modeling completed in order to adequately define potential environmental impacts.

The impact analysis is documented in a draft EIS which discusses all the alternatives studied and the potential impacts resulting from the project. The preferred alternative is usually documented in the Draft EIS.

4.5 Public Hearings & Review

The draft EIS is made available to the public for 60-to-90 days for review and comment, which is announced in a Federal Register notice and in press releases. Copies of the document are also made available to the public through individual mailings and through repositories such as public libraries. A public hearing should be held to provide the public an opportunity to review and discuss the findings of the draft EIS and the recommended preferred alternative. The public may either comment in writing or by voicing their concerns at one of the public hearings.

4.6 Final EIS/ROD

After the comments on the draft EIS are reviewed, the agency preparing the EIS revises the document to correct technical errors, add any relevant new information that became available since the draft EIS was published and to respond to all concerns. On occasion, a new alternative or mitigation measure will be added and evaluated. In addition, if more detailed studies are recommended during review of the draft EIS they would be conducted at this

time. A summary of the comments received on the draft EIS and the agencies response to those comments are also incorporated into the Final EIS. Once again, the availability of the final EIS is announced in a Federal Register notice and press releases.

The last step is the Record of Decision (ROD). The ROD documents the decision and summarizes the mitigation measures to be implemented into the project.

4.7 Format

The format of an EIS and its processes will vary depending on what agency and/or consultant will be handling the EIS. The outline below is a general format of an EIS. The goal is to illustrate the general format of a typical EIS.

1. Introduction
2. Need and Purpose of the Proposed Project
3. Alternatives Including the Proposed Action
4. Affected Environment
5. Environmental Consequences
6. The Proposed Project
7. Alternatives Formulation
8. Construction Methodology Alternatives
9. Cumulative Impacts
10. Integrated Mitigation Program
11. Public Involvement and Consultation
12. Comments
13. References
14. List of Preparers
15. List of Recipients

5.0 COST ESTIMATE

The costs associated with assessing alternatives and determining the environmental impacts of the project are very complex and there are many unknowns. The extent of the expenses involved is extremely hard to determine and will depend on the outcome of the agency coordination, the results of the studies and the complexity of the project. For general purposes, these costs are the best estimates available. Whether an EIS or an EA is required, the Charleston District's Regulatory Office would most likely be the lead federal agency, unless the project ends up involving another federal agency with a more vested interest. While they would be responsible in making the decision regarding specific requirements, Horry County would be responsible for funding all related studies for the EA and/or EIS.

Through informal consultation with the Corps' Regulatory office, it is unknown if an EIS will be required at this time. However, it was indicated that in order to determine if the project will have significant impacts to the environment, as required in an EA, the same studies will be necessary. Therefore, an EA or and EIS will both be extremely expensive. If the EA does determine that significant impacts will occur, the EIS process then begins and will require more time and coordination. The cost estimate is based on an EIS being conducted from the beginning of the project.

The estimate below represents a gross estimate to perform environmental studies associated with an Environmental Impact Statement or an EA and the administrative costs of the EIS. While an EA does not require the same extent of coordination and public review, it would require similar evaluation.

Costs will vary throughout the environmental process as results of the environmental studies/surveys become available. The lump sum estimated under the line item "Environmental Impact Statement" includes the enormous amount of coordination with the public and agencies through meetings, letters, phone, e-mail, etc. It also includes expert interpretation and summary of the studies and surveys, analysis for construction impacts (water quality, air, noise, etc.), evaluating environmental consequences of alternatives, technical writing required in the draft and final EIS along with other research involved with a large scale project. This is a gross estimate derived from previous Environmental Impact Statements for other projects. It does not account for any mitigation that may be involved as it has not been determined that a diversion canal would be considered a feasible project or the least-damaging practicable alternative to fulfill the purpose of the project. The costs associated with mitigation would depend on the specific impacts once those have been identified through the various studies and assessments required in the NEPA process.

Jurisdictional Delineation- Wetlands & Critical Areas	45,000
Cultural Resource Survey- prelim	50,000
Essential Fish Habitat Assessment	30,000
Endangered Species Assessment	50,000
Storm Surge Modeling	400,000
Riverine Watershed & Hydrologic Modeling	400,000
Salinity Modeling	500,000
Water Quality Monitoring (est. 4 gauges 5 yrs)	500,000
Ground Water Monitoring	?
Environmental Impact Statement	1,000,000 -2,000,000
Total	3,150,000-4,150,000

Table 1. Cost Estimate *

*This is a gross estimate and will increase with complexity and severity of impacts. It also assumes a “straight forward” EIS with no legal issues. No costs for mitigation have been included

ATTACHMENT 1

Sample Letter mailed on May 30, 2008:



**DEPARTMENT OF THE ARMY
CHARLESTON DISTRICT, CORPS OF ENGINEERS
69A HAGOOD AVENUE
CHARLESTON, SOUTH CAROLINA 29403-5107**

REPLY TO
ATTENTION OF

, 2008

Planning Branch
Environmental Section

Ms./Mr.

Dear:

Historical flooding within the Waccamaw River watershed has prompted many US Army Corps' studies to identify potential solutions for flood reduction. Although not considered economically justified for a federal cost share project, several flood control improvements have been identified, including both non-structural and structural. The one that has gained the most attention over the past 60+ years has been a diversion canal that would intercept water from the Waccamaw River around the North Carolina-South Carolina state line during flood events and divert them to Mullet Creek and discharge through Little River Inlet. The diversion canal originally proposed would be approximately 5.7 miles long with a bottom width of 150', 14-feet deep, and would discharge just above mean high tide. A weir or overflow structure would be placed on the Waccamaw River at flood stage elevation with design capacity to discharge 5,000 cfs. In essence, the canal would essentially be "dry" except in storm events. The original design did not take into account groundwater seepage into the canal.

This idea of a diversion canal dates back to 1941, prior to most environmental laws and regulations. Under the Corps Planning assistance to States program, which provides technical assistance to communities to support water resource planning, Horry County has asked the Corps' to assist in re-assessing the economic viability, determine environmental impacts and coordinate with agencies and interested stakeholders to compile concerns and identify impacts. **This is where we are requesting your assistance.**

We would like your help in identifying the main environmental laws, regulations and issues that would pertain to the planning, design and construction of a diversion canal for flood purposes and secondly, identify specific environmental issues of constructing a canal in a specific location. Please find enclosed maps for two alternate locations; one is the original layout while the second is the revised location. This revised footprint is slightly different than that originally identified and was chosen as it appeared to impact the least number of businesses, homes, and other structures. This location has not been proposed by the Corps of Engineers, nor is it recommended; it has only been identified as the alternative to be evaluated in detail. Other than

the location, this assessment is based on the original design. While there is a lot to take into consideration with this type of project, there is a significant amount of information and things to consider from an environmental perspective before the idea of a diversion canal could advance. **Please provide any information you feel is relevant to this type of project and also any comments, concerns, or suggestions you have with the revised canal footprint.** We would like to identify any potential direct, indirect and cumulative impacts that the diversion canal would have.

We are hosting a very informal meeting at our office, located at 69A Hagood Avenue, Charleston, SC in the 3rd floor conference room on June 24 at 1:00pm to discuss potential concerns and to identify the impacts of this proposed project. Please send , via mail or e-mail, any initial thoughts you have on the diversion canal by Wednesday, June 18, 2008 so we can be sure to cover those topics in the meeting. We will have open discussion but will cover the ideas identified prior to the meeting first. If you cannot attend this meeting, send in your comments, concerns, or suggestions no later than July 31, 2008.

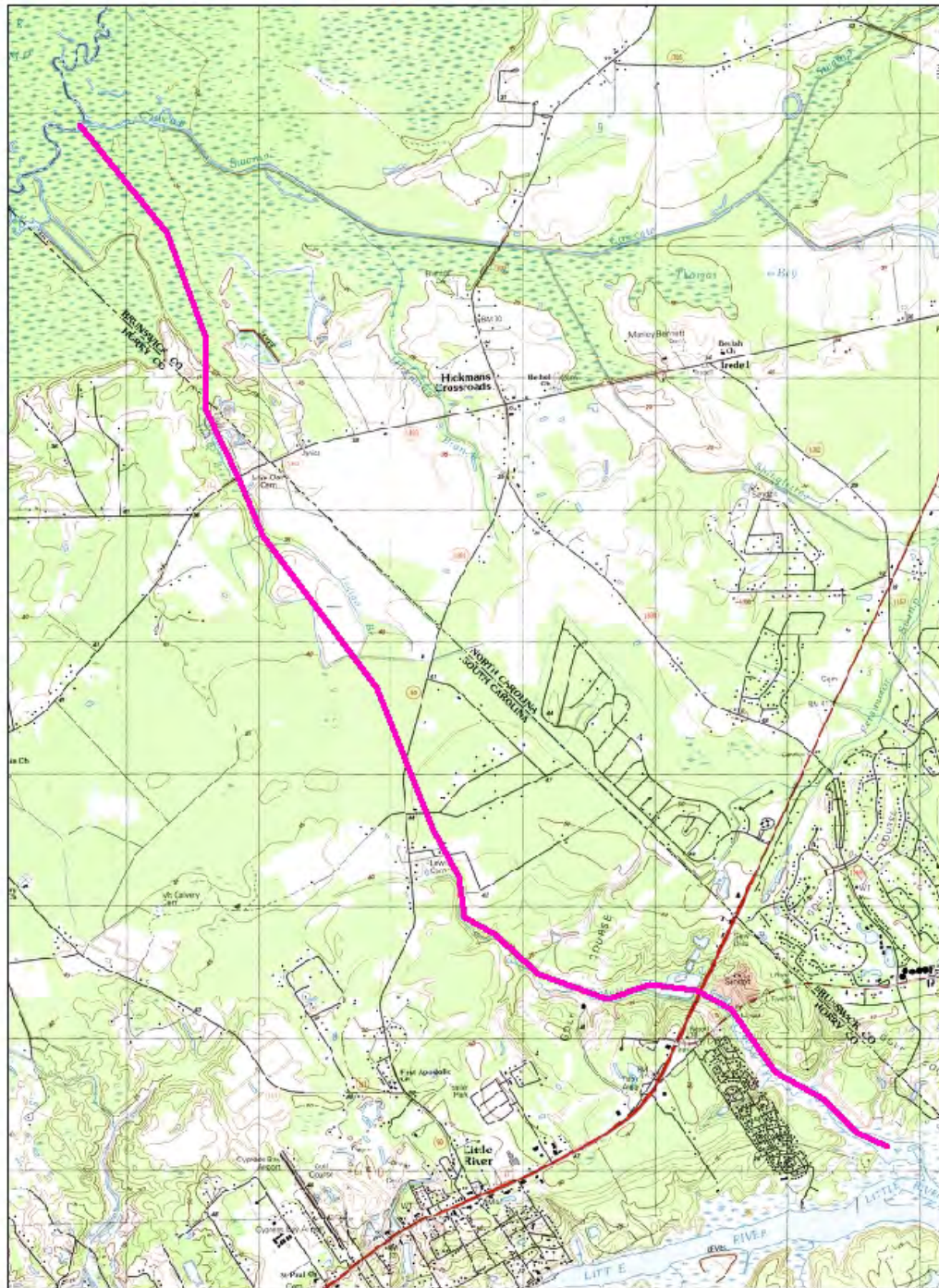
If you have any questions, please contact Elizabeth Jackson at 843-329-8099 or elizabeth.g.jackson@usace.army.mil. We look forward to hearing from you.

Respectfully,

Joseph A. Jones
Chief, Planning Branch

encl.

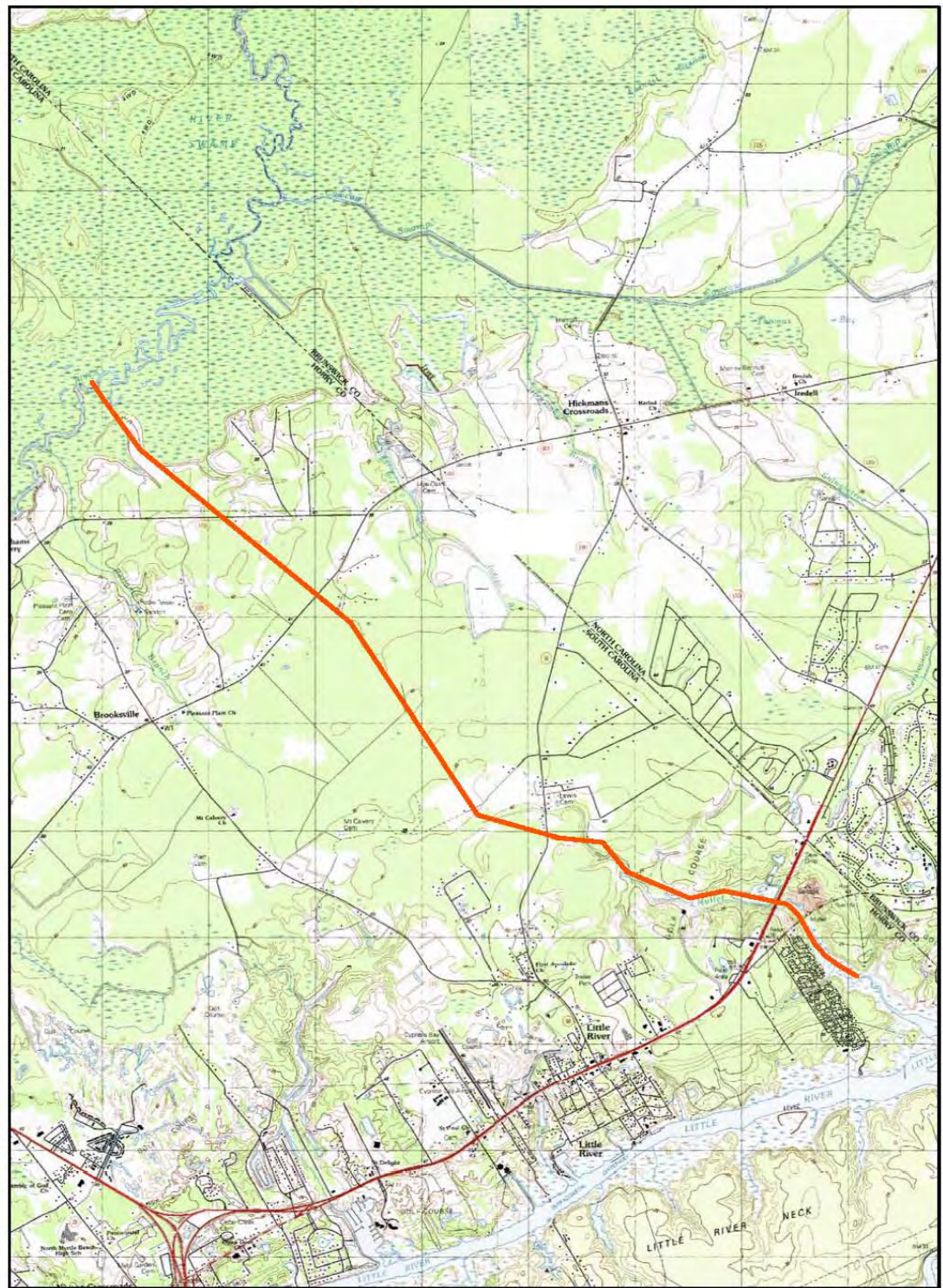
Diversion Canal, (original '50's footprint)



Diversion Canal, (original '50's footprint)



Proposed Diversion Canal, (revised 2008 footprint)



Proposed Diversion Canal, (revised 2008 footprint)



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PO Box 12559
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Dr. Gerald Miller
EPA - Region IV
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Atlanta, GA 30303

Mr. Sam Ward
SC Department of Natural Resources
1949 Industrial Park Rd, Room 125
Conway, SC 29526

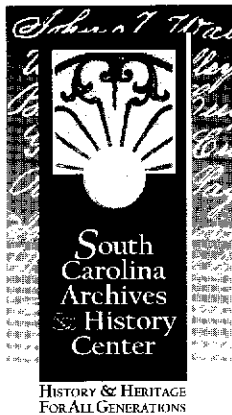
Mr. Craig Watson
US Fish and Wildlife Service
176 Croghan Spur Road, Suite 200
Charleston, SC 29407

Ms. Sally Murphy
SC Dept. of Natural Resources
PO Box 12559
Charleston, SC 29422-2559

Dr. Gerald Miller
EPA- Region IV
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Atlanta, GA 30303

Ms. Melissa Bimbi
US Fish and Wildlife Service
176 Croghan Spur Road, Suite 200
Charleston, SC 29407

AGENCY COMMENT LETTERS



July 2, 2008

Mr. Joseph Jones
Chief, Planning Branch
Corps of Engineers, Charleston District
69A Hagood Ave.
Charleston, SC 29403-5107

Re: Waccamaw River Diversion Canal
Horry County, South Carolina
SHPO Project No. 08-RD0298

Dear Mr. Jones:

Thank you for your letter of May 30, which we received on June 3, regarding the preliminary planning stages for the proposed diversion of the Waccamaw River. The State Historic Preservation Office (SHPO) is providing comments to the Corps of Engineers pursuant to Section 106 of the National Historic Preservation Act and its implementing regulations, 36 CFR 800.

Our office recommends that the Corps of Engineers conduct a cultural resources survey to identify any potential properties within the project's Area of Potential Effects (APE) that may be listed in or eligible for listing in the National Register of Historic Places. The SHPO and Horry County have recently completed an above-ground architectural survey of historic properties that may also be consulted for this project. The APE should consider both the direct effects of the canal and the alternative as well as any indirect effects that may result from the diversion of the Waccamaw River.

We also recommend that the Corps begin consultation with appropriate Native American tribes that may have an interest in this project area to receive their comments on any potential tribal sites of concern or how the project may affect any tribal practices.

If you have any questions, please contact me at (803) 896-6169 or dobrasko@scdah.state.sc.us.

Sincerely,

Rebekah Dobrasko

Rebekah Dobrasko
Review and Compliance Coordinator
State Historic Preservation Office



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
(727) 824-5317; FAX (727) 824-5300
<http://sero.nmfs.noaa.gov/>

July 14, 2008

F/SER47:KD/pw

Lt. Colonel J. Richard Jordan, III
District Engineer
Department of the Army
Charleston District Corps of Engineers
69A Hagood Avenue
Charleston, South Carolina 29403-5107

Attention: Elizabeth Jackson

Dear Colonel Jordan:

NOAA's National Marine Fisheries Service (NMFS) attended the interagency meeting on June 24, 2008, to discuss a proposal to construct a canal that would intercept water from the Waccamaw River and divert the water into Little River Inlet. This diversion canal was first proposed in 1941 for flood protection. Under the Corps' Planning Assistance to States Program, Horry County requested assistance in re-assessing the economic viability and environmental impacts from construction of the diversion canal. The Charleston District convened the meeting to request assistance from resource agencies in identifying potential environmental concerns. Accordingly, informal comments are provided below, and we thank the Charleston District for allowing NMFS to participate in this early development phase.

Project Description

The upper entrance to the canal would be on the Waccamaw River near the South Carolina/North Carolina state line, and the canal would terminate within Mullet Creek along the Atlantic Intracoastal Waterway near Little River Inlet. As proposed in 1941, the diversion canal would be 5.7 miles long, a 150 feet wide (bottom width), and 14 feet deep. While these dimensions have not been modified from the 1941 proposal, the upper end of the canal was shifted southwestward to keep the entire canal within South Carolina. A weir or another overflow structure would be placed on the Waccamaw River at flood stage elevation with a design capacity to discharge 5,000 cfs. The discharge would be just above mean high water. In 1941, it was assumed that the canal would be dry except during storm events; however, this assumption did not consider groundwater seepage into the canal or spring tide flooding from Mullet Creek. Approximately 5.2 mcy of material would be excavated to construct the canal. The 1941 plan called for sidecasting the excavated material onto adjacent properties; no new plans for disposal



have been proposed.

Essential Fish Habitat

The South Atlantic Fisheries Management Council (SAFMC) designates habitats within the project area as essential fish habitat (EFH) and managed species occur within the project area; hence NMFS recommends development of a detailed EFH assessment if planning continues. EFH that occurs in Mullet Creek and Little River Inlet includes estuarine salt marsh, intertidal mud flats, and a tidal inlet. In addition, the lower Waccamaw River, which would be affected by the upstream diversion of freshwater, also contains these habitats. Estuarine salt marsh and intertidal mud flats are EFH for postlarval and juvenile red drum (*Sciaenops ocellatus*), white shrimp (*Litopenaeus setiferus*), and brown shrimp (*Farfantepenaeus aztecus*) because larval and juveniles concentrate and feed extensively within these habitats. Tidal inlets are identified as a habitat area of particular concern (HAPC) for penaeid shrimp and red drum. HAPCs are areas of special significance to managed species (i.e., significant or critical areas, regions or habitats which serve as spawning, nursery, feeding, or refuge areas). The waters and fringing coastal marsh of the project area also serve as nursery and forage habitat for other species, including black drum (*Pogonias cromis*), Atlantic menhaden (*Brevoortia tyrannus*), and blue crab (*Callinectes sapidus*), that serve as prey for species managed by SAFMC (e.g., mackerels, snappers, and groupers) or for highly migratory species managed by NMFS (e.g., billfishes and sharks).

SAFMC provides detailed information on red drum, shrimp, and other federally managed fisheries and their EFH in the 1998 Amendment of the Fishery Management Plans for the South Atlantic. The amendment and its supporting material provide information integral to completing the EFH assessment. However, we should note that SAFMC is developing a Fishery Ecosystem Plan (scheduled for completion during 2009) that will update EFH and species descriptions and may lead to Comprehensive Ecosystem Amendments that revise EFH designations. Please let us know if you have any questions about the best sources of material for completing the EFH assessment.

Project Impacts

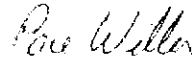
There are a number of significant environmental impacts that would be associated with the construction of the diversion canal. The largest impact would likely be the changes and reduction in water quality associated with the introduction of freshwater into the estuarine ecosystem of Mullet Creek and Little River Inlet. The habitats and fishery resources found in the estuarine waters surrounding the lower end of the proposed canal would be significantly impacted by the large volume of water that would be released by flooding events. NMFS is concerned that the effects could permanently affect habitats and dramatically reduce the diversity and quantity of federally managed fishery resources and their prey. Of particular concern is the potential for impacts to shrimp and blue crab, which are commercially and recreationally important to the area. In addition to problems associated with periodic increased sedimentation and the potential introduction of contaminants from flood waters, the surrounding estuarine emergent wetlands and the epifauna associated with these habitats could undergo a species shift in response to changes in salinity resulting from the introduction of freshwater pulses that would occur during flooding events on the Waccamaw River. Species unable to tolerate a wide range of salinities would leave the area, if they are able, or die-off and eventually be replaced with

species that were more tolerant. The diversion of freshwater from the upper reaches of the Waccamaw River could also impact the salinity of the lower Waccamaw River causing higher salinity to move further up the river impacting vegetation found in the area. In addition, freshwater species diverted into the upper portion of the canal during flooding events would be relocated to the downstream estuarine system where they may not be able to survive. Numerous simulation models would need to be generated to demonstrate how and to what degree the construction of the diversion canal and the resulting freshwater inflow would affect water quality and the vegetation and fauna associated with the project area.

The potential for the proposed diversion canal to cause significant irreversible harm to the estuarine wetlands and the managed fisheries that utilize these habitats leads NMFS to conclude that construction of the diversion canal should not be pursued and that a less damaging alternative for flood control should be identified.

We appreciate the opportunity to provide these comments. Please direct related questions or comments to the attention of Ms. Kay Davy at our Charleston Area Office. She may be reached at (843) 953-7202 or by e-mail at Kay.Davy@noaa.gov.

Sincerely,



/ for

Miles M. Croom
Assistant Regional Administrator
Habitat Conservation Division

cc: (via electronic mail)

F/SER4

F/SER47 Kay.Davy@noaa.gov



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

19 June 2008

Mr. Joseph A. Jones
Chief, Planning Branch
Department of the Army
Charleston District, COE
69A Hagood Avenue
Charleston, SC 29403-5107

SUBJECT: Waccamaw River Diversion Canal request for assistance with environmental issues identification.

Dear Mr. Jones:

Thank you for the opportunity to assist in the identification of environmental laws, regulations, and issues associated with the planning, design, and construction of the proposed action: construction of a weir and diversion canal to divert inland flood waters from the Waccamaw River to the Atlantic coast at a mean high-tide discharge point located at the Little River Inlet.

Enclosed is a summary chart of environmental issues we believe should be included in the Corps environmental analysis of the planning, design, and construction of the proposed action. The enclosed issues are not unique to location.

In response to your request for "*specific environmental issues of constructing a canal in a specific location*," our comments are limited, at this time, to the information we can glean from the copies of topographic maps enclosed with your letter, which may be insufficient information for us to fully meet your request. Consequently our site specific comments are limited to the following three items: 1) the original proposed footprint falls with two states, each having their own respective environmental requirements, e.g., water quality standards, 2) the original foot print appears from the provided map to impact more wetlands than the proposed revision, and 3) the original footprint appears from the map to incorporate more of Mullet Creek into its design than does the proposed revision. Each design will have its own unique environmental impacts that will need to be analyzed and the enclosed comments are relevant to both.

In summary, our biggest concern is that changes in land use that reduce or eliminate the water-absorbing functions associated with the natural environment will intensify Horry County's existing high vulnerability to flooding, particularly in the lowland areas, e.g., the coast. In our opinion, the proposed construction of a weir within Waccamaw River and the construction of a 5.7 mile, 150-foot wide, 14-foot deep canal with a 5,000 cfs discharge represents a significant land-use change to the affected portions within Horry County, SC, (and potentially Brunswick County, NC).

In response to your invitation to attend the information meeting at your office on June 24th, we request the opportunity to conference call into these meetings in order to maximize our limited travel budget. This request is seconded for your information-meeting invitation sent under a separate letter regarding the Georgetown Dredge Material Management Plan.

In response to your 30 May 2008 letter addressed to Dr. Gerald Miller, please be advised the Dr. Miller has retired from the Agency. Consequently if you have any questions, please contact Beth Walls, of my staff, at 404-562-8309 or walls.beth@epa.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Mueller", with a stylized flourish at the end.

Heinz J. Mueller, Chief
NEPA Program Office

Enclosure - 1

Background

Historical flooding in the Waccamaw River watershed has prompted many Corps studies to identify solutions.

- Although not considered economically justified from a federal cost share project, several flood control improvements have been identified.
- The one gaining the most attention has been a diversion canal (5.7 miles with a bottom width of 150' and 14' deep) that would intercept water from the Waccamaw River and divert it to Mullet Creek and discharge (just above mean high tide) through the Little River Inlet.
- A weir or overflow structure would be placed on the River at flood stage elevation with design capacity to discharge 5,000 cfs.
- The canal would essentially be dry except during storm events.
- The original layout affected both Horry (SC) and Brunswick (NC) Counties and the original design did not take groundwater seepage into account.
- The revised footprint lies solely in Horry County and was chosen because it would impact the least number of businesses, homes, and other structures. It has not been proposed by the Corps nor is it recommended. It has been identified as the alternative to be evaluated in detail.

Horry County requested the Corps to assist in re-assessing the economic viability, determine environmental impacts and coordinate with agencies and interested stakeholders to compile concerns and identify impacts. This is where the Corps is requesting our assistance. Assistance with:

- Identifying the main environmental laws, regulations, & issues pertaining to the planning, design, and construction of a diversion canal for flood purposes,
- Identifying specific environmental issues of constructing a canal in two locations (i.e., alternatives): the original layout and the proposed revised footprint.

Potential Environmental Issues/Concerns

Alternatives to be considered: in addition to canal location alternatives, whether various canal designs will also be considered as alternatives, e.g., linear versus sinuous in shape, impervious versus pervious lining, with or without flood gates, etc.

Bridge Upgrades: it appears a significant number of bridges will be affected by the proposed action. Whether these bridges will require upgrades or modifications to maintain their integrity to deal the proposed 5,000 cfs flow, e.g., piling and/or abutment improvements, or possibly new box culverts. This is potentially a cumulative effects issue.

Canal Design: whether the proposed canal design will prevent scouring issues at the final discharge point.

Construction (canal and weir) activities: whether project-related construction activities will detrimentally affect the American Black Bear, who makes its home along the Waccamaw and travels the intra-Carolina borders.

Construction (canal and weir) activities: whether project-related construction activities will detrimentally affect any federally

and/or state listed endangered or threatened species, e.g., several plants (dwarf limbry (<i>Fimbristylis perpusilla</i>), common hemicarpha (<i>Hemicarpha micrantha</i>), little burhead (<i>Echinordus tenellus</i> var. <i>parvulus</i>), Plymouth gentian (<i>Sbaitia kennediana</i>) and pink tickseed (<i>Coreopsis rosea</i>) are perennials that inhabit more upland sites) on the SC list of rare, threatened, and endangered species are found within the Waccamaw near where it crosses SC Hwy 9.
Cumulative effects: whether past, present, and future wetlands ditching and draining activities, ongoing coastal erosion, climate-change related impacts, salinity and sediment-related issues in conjunction with all projects in the area, e.g., the Little River Navigation Project, will have cumulative and incremental detrimental impacts to the Waccamaw River ecosystem and wetlands, the Little River Inlet's ecosystems and estuary, and the public drinking-water demands on the affected aquifer.
CWA 401 WQ Certification: the Clean Water Act requires state certification for a federal license or permit to conduct any activity including, but not limited, to the construction or operation of facilities which may result in any discharge into navigable waters.
Downstream flooding: whether the proposed defensive measure taken upstream (e.g., proposed weir) will serve to only heighten or cause a flooding problem for development downstream, i.e., along the banks of the proposed canal and in the vicinity of the discharge.
Dredged materials disposal: whether there is an environmentally preferred disposal site or a beneficial reuse opportunity for the dredged materials expected to be generated from such a extensive project.
Ecosystem: whether the proposed diversion canal will serve to drain the Waccamaw River wetlands in the vicinity of the canal, potentially lowering the ground-water table, breaking the existing vegetative cover, and leading to surface sediment erosion. High sediment loads entering wetlands through channels, irrigation ditches and drainage ditches can smother aquatic vegetation, shellfish beds and tidal flats, fill in riffles and pools, and contribute to increased turbidity. Concerns exist that the potential long-term effect may result in sediment-related pollution dramatically impacting water quality, stream dynamics, and aquatic organisms, particularly in the Little River Inlet estuary system – the proposed eventual discharge point. Moreover, sediments carry and store pollutants, e.g., nutrients, toxic metals and compounds, and pesticides/herbicides.
Ecosystem: whether project-related sedimentation issues will detrimentally impact both the sandy and shelly bottoms areas and their associated ecosystems of the Little River Inlet. Little River Inlet is characterized by sandy bottom in the lower portion of the estuary and is predominantly shelly in the creeks and the main channel toward the Atlantic Intracoastal Waterway. The estuarine waters and wetlands of South Carolina provide critical nursery areas for many species of fish and shellfish. Shrimp, blue crab, and oyster, the most important commercial species, all depend on estuarine wetlands for protection and food when they are juveniles. (see: http://www.nmfs.noaa.gov/habitat/habitatconservation/publications/habitatconnections/num2.htm10).
Ecosystem: whether the proposed diversion canal will serve to connect low-salinity areas to high-salinity areas, resulting in saltwater intrusion upstream and associated species change and mortality of salt-intolerant vegetation.
Ecosystem: whether the proposed diversion canal will divert too much fresh water at the wrong time into the Little River estuary to the detriment of the estuary and its ecosystems.

<p>"Envision 2025" program: whether the proposed action may conflict with Horry County's community goals as expressed in the Envision 2025 Comprehensive Plan pertaining to current and future land use plans. The County created the "Envision 2025" program to "develop Horry County into a flagship community with a passion for sharing our rich heritage and conserving natural resources while promoting economic prosperity." To further this goal, a "Comprehensive Plan" was adopted, consisting of maps and written policy statements, including goals and objectives, addressing issues relating to growth, housing, economic development, transportation, environment, parks and open space conservation, aesthetics, community character, and neighborhood and historic preservation. For example, the construction of the proposed major diversion/flood control channel is not shown on the Envision 2025 Future Land Use Map (see: http://www.horrycounty.org/depts/econdev/Planning/Zoning/Maps/FutureLandUse.pdf)</p> <p>Whether a project of this scope and magnitude may have a direct impact on current and future land use, zoning, and the local highway system. Aside from the significant hurdles of acquiring sufficient right-of-way (ROW) to build such a channel (which may involve condemnation proceedings in locations where property owners will not sell), new roads, bridges, and culverts will probably be required. Utility relocations and new easements/ROWs for gas, power, water, etc. may also be necessary.</p> <p>The Horry County Planning Steering Committee currently is working to update all of the elements in their Comprehensive Plan. If the project is to be built, then such a project should be made an integral part of the work done being done by the local planners. Additionally, the multiple agencies that will potentially be affected need to be made partners in the planning of such a project.</p> <p>Fisheries: whether the construction and use of the proposed canal will affect South Carolina fisheries, particularly the estuaries ability to serve as nursery habitat for young fish. For example, over 90 percent of the commercial fishes harvested in North Carolina are dependent upon wetlands as nursery habitat for young fish and commercial harvest of fish has already fallen dramatically in recent years -- nearly 50 percent between 2000 and 2005. The dockside value of commercial landings of fish and shellfish at Charleston, Beaufort, Port Royal, Hilton Head, Georgetown, Myrtle Beach, and other South Carolina seafood centers exceeded \$37 million in 1995. Recreational fisheries also contribute substantially to the state's economy, generating more than \$18 million in state sales tax in 1991. During that same year, about 842,000 anglers spent more than \$366 million on recreational fishing in South Carolina. This activity supported 13,550 jobs with more than \$216 million in earnings. (see: http://www.jmfs.noaa.gov/habitat/habitatconservation/publications/habitatconnections/num2.htm10)</p> <p>Ground water: whether the proposed canal will alter local ground-hydrology to the detriment of the surrounding wetlands (e.g., drain them) and to the detriment of drinking water supplies, (e.g., issues concerning impacts to both aquifer recharge and storage, and facilitating salt-water intrusion.</p> <p>Ground water: whether the presumption that canal would essentially be dry except during storm events is accurate, especially in light of the fact that the original design did not account for groundwater seepage.</p> <p>Hurricane-related flooding: whether the proposed diversion canal will intensify hurricane-related flooding. For example before Hurricane Katrina, concerns existed that the confluence of the MRGO and the Gulf Intracoastal Waterway would create a funnel that would direct storm surges into the New Orleans Industrial Canal and into St. Bernard Parish. Whether the proposed canal would similarly divert storm surges from coastal storms inland causing new and aggravating existing coastal flooding hazards and</p>

any associated impacts to development, evacuation routes, ecosystems, communities, and waste water and drinking water treatment plants.

All-Hazards Mitigation Plan: Concerns over how the proposed diversion canal will affect Horry County's "All-Hazards Mitigation Plan," particularly regarding storm evacuation routes should inland and coastal flooding all occur in one storm event and cause the canal to overflow potentially affecting major roads, drinking and waste water treatment plants, hospitals, schools, etc.

Land subsidence: whether any project-related wetlands drainage results in land subsidence below sea level. Whether any project-associated land subsidence coupled with potential storm/hurricane and climate-change associated sea level rise raises any important issues to the local area.

Little River system: whether the proposed diversion canal will affect the Little River system (i.e., the receiving water), which is important to the economy of the Greater Myrtle Beach area because of its significance to recreational and commercial fisheries. Potential concerns include: water quality impacts associated with increased nutrients, turbidity, pathogens, and pesticides are associated with flooding events. The Little River estuary which serves as an important nursery area for penaeid shrimp, blue crabs and fin fish, and is a productive shell fish growing area, which is presently closed to shellfishing because of water pollution. Moreover the Little River is listed on South Carolina's impaired waters list for pathogens.

Ocean & Coastal Resource Management (OCRM): the effects of the proposed river diversion/new channel project on South Carolina's and North Carolina's Ocean & Coastal Resource Management (OCRM) efforts will need to be considered. The DHEC Office of Ocean and Coastal Resource Management protects and enhances the State's coastal resources by preserving sensitive and fragile areas while promoting responsible development in the eight coastal counties of South Carolina. Concerns exist that the proposed project will affect the implementation of both state's Coastal Zone Management Plans, may require manage wetland alterations, storm-water management-plan modifications, and land-disturbance activities. Additionally, the proposed project may alter tidally-influenced critical-area lands, waters and beaches. Moreover, the project may affect sensitive natural, historic and cultural resources, and therefore significant technical expertise will be required to resolve complex coastal management issues. Last, projects in this area must demonstrate low impact and alternative development to preserve water quality and environmental integrity.

Precipitation: whether the presumption that canal would essentially be dry except during storm events is accurate, especially in regard to routine precipitation events.

Precipitation: whether the proposed canal design will become mosquito-habitat realizing the proliferation of mosquito-borne diseases, e.g., West Nile virus, eastern equine encephalitis virus, and dog heart worm.

Routine precipitation events: whether the presumption that canal would essentially be dry except during storm events is accurate, especially in regard to normal precipitation events.

Sea-level rise: whether the proposed diversion canal will intensify "sea-level rise" associated saltwater inundation of low-lying areas and rivers, which could lead to changes in wetlands services, riparian-systems services, mosquito and mosquito predator reservoirs, storm-buffering capacity, real-estate values, land use and development pattern and process, recreation and tourism

opportunities, and saltwater intrusion into freshwater aquifers and riparian systems, which could lead to changes in drinking water resources agricultural and industrial water resources.

Special Flood Hazard Area designations: whether the proposed diversion canal may physically alter the current existing Special Flood Hazard Area (SFHA) designations (i.e., the 100-year flood plain) and thereby create new SFHAs and creating conflicts with existing local floodplain management ordinances, required to meet minimum federal requirements. Additionally, whether the proposed canal may affect flood insurance rates requiring public involvement from affected private property owners, municipal, and county governments, and the National Flood Insurance Program. And whether federal financial investments and assistance used for acquisition and construction purposes within NFIP participating communities may be affected.

(<http://www.civofhmytlebeach.com/flood.html>)

Waccamaw River: whether the proposed project will impact the hydraulics of the Waccamaw River (peak discharge/flow rates) downstream of the proposed weir and canal to the detriment of the downstream communities and ecosystems.

Waccamaw River Heritage Preserve: whether the proposed action will detrimentally impact this 5,347-acre Preserve protecting 30 miles of river wetlands, bottomland hardwood forests, and home to the rare Atlantic white cedar. Potential issues include impacts to flow rates and associated recreational use of the Preserve.

Water Quality: The Waccamaw River has Clean Water Act 303(d) listed impaired segments for copper and mercury. Whether the proposed the diversion of flow could potentially increase relative concentrations of these pollutants downstream of the diversion.

Another important issue that should be considered regarding the construction of a diversion/flood control channel for the Waccamaw River is the potential to adversely affect the "impaired" segments of the river, which is currently featured on both the approved 2006 and draft 2008 Section 303(d) lists for a copper impairment in segment 030402060704 and a mercury impairment in segment 030402060704. Both of these segments are in Horry County, and diversion of flow could potentially increase relative concentrations of these pollutants downstream of the diversion. The designated use of segment 030402060704 is aquatic life, while segment 030402060704 currently has fish consumption advisory.

Section 303(d) of the Clean Water Act and EPA's Water Quality Planning and Management Regulations (40 CFR Part 130) require the State of South Carolina to develop total maximum daily loads (TMDLs) for the water bodies that are not meeting designated uses under technology-based controls for pollution. The TMDL process establishes the allowable loading of pollutants or other quantifiable parameters for a waterbody based on the relationship between pollution sources and instream water quality conditions, in order that South Carolina Department of Health and Environmental Control (DHEC) can establish water-quality based controls to reduce pollution from both point and nonpoint sources and restore and maintain the quality of water resources.

TMDLs for mercury and copper will be developed by DHEC in the next few years, while the State has already developed a

Biochemical Oxygen Demand (BOD) TMDL for the Waccamaw River/Atlantic Intracoastal Waterway. The Waccamaw River is designated by the State as freshwater suitable for primary and secondary contact recreation and as a source for drinking water supply after conventional treatment. The river should be suitable for fishing and the survival and propagation of a balanced indigenous aquatic community of fauna and flora. The river should also be suitable for industrial and agricultural uses. To achieve these goals, the river needs to maintain a minimum Dissolved Oxygen (DO) concentration of 4 mg/l, with a daily average of 5 mg/l in the Atlantic Intracoastal Waterway. The river has historically not been meeting the minimum DO requirements, and any proposed diversions of flow will need to be carefully studied to avoid adversely affecting DO.

Water Quality: The Waccamaw River has historically failed to meet South Carolina's minimum dissolved oxygen (DO) water quality standards. Whether the proposed action will adversely affect DO levels in both the Waccamaw and Little Rivers.

Weir Construction impacts: whether the proposed action will detrimentally impact migratory fish, e.g., diadramous fish: American Eel, American and Shortnosed (endangered species) sturgeon, and American and Hickory shad, and/or other federally and/or state listed threatened and endangered aquatic species.

Weir Construction impacts: whether the proposed action will be detrimentally impact by sediment accumulation on the upstream side.

Weir Construction impacts: whether the weir will intensify flooding damages associated with a flood event exceeding the proposed project design.

Wetlands loss: whether the proposed diversion canal will intensify the incremental loss of the nation's wetlands. Since the 1970's, the most extensive losses of wetland acreages have occurred in Louisiana, Mississippi, Arkansas, Florida, South Carolina, and North Carolina (Dahl and Johnson 1991, see: <http://www.water.nesu.edu/watersheds/info/wetlands/wetloss.html>). By the mid-1980's, South Carolina had lost approximately 27% of its estimated original wetlands acreage. From 1982-89, according to the U.S. Fish & Wildlife Service, SC lost 2,920 acres a year of wetlands, about 20,000 acres of wetlands in seven years --roughly the size of the federally protected swamp southeast of Columbia. By comparison, the state lost about 6,100 acres a year from 1972 to 1982, or about 61,000 acres, the wildlife service says. (see: http://findarticles.com/p/articles/mi_hb5553/is_200008/ai_n22479660 and <http://www.fws.gov/news/historic/1990/19901003.pdf>)

The Clean Water Act and the state's coastal wetlands statute have slowed the state's wetland loss rate, but wetlands in coastal states continue to be lost to development at a higher rate than is occurring in inland wetlands, particularly in the southeast United States. (see: <http://www.nmfs.noaa.gov/habitat/habitatconservation/publications/habitatconnections/num2.htm10>)

Wetlands: concern exists over the potential impacts to the 5,347-acre Waccamaw River Heritage Preserve protecting 30 miles of river wetlands, bottomland hardwood forests, and home to the rare Atlantic white cedar. Potential impacts include impacts to flow rates and associated recreational use of the Preserve.

Wetlands: whether the proposed canal will change the hydrology of the affected wetlands and increase the speed with which water moves into and through these wetlands resulting in altered patterns of sedimentation and detrimentally affect the wetland

functions and values dependent upon the normal slow flow of water through a wetland. High sediment loads entering wetlands through channels, irrigation ditches and drainage ditches can smother aquatic vegetation, shellfish beds and tidal flats, fill in riffles and pools, and contribute to increased turbidity.

Wetlands: whether the proposed canal will detrimentally affect the affected wetlands' ability to provide certain ecosystem services, e.g., denitrification services and surface & ground water storage and aquifer recharge, CO₂ storage, etc.

Waccamaw National Wildlife Refuge: concern exists over the proposed project's potential impact on the hydraulics (peak discharge/flow rates) of the Waccamaw River and the surface/subsurface hydrology for the downstream, recently established Waccamaw National Wildlife Refuge. Currently this Refuge consists of about 6,000 acres with approved plans for a total of 50,000 acres. The Refuge was founded to preserve valuable undeveloped coastal wetland and adjacent uplands that provide habitats for many species of wildlife. Over 400 species of animals, including four endangered species, large concentrations of wintering waterfowl, wading birds and neo-tropical migratory songbirds, and serves the northern most nesting area for swallow tailed kites, are supported by the variety of habitats in this refuge.

Lake Waccamaw and the Green Swamp, NC: whether the proposed would potentially impact the surface and/or subsurface hydrology of this upstream 8,840 acre lake and the region known as the Green Swamp. Lake Waccamaw's limestone bluffs cause it to be unique among the many similar Carolina lakes with naturally high levels of acid, as these bluffs neutralize the lake's acidity so that Lake Waccamaw is suitable for many species of plants and animals. Near Lake Waccamaw lies the Green Swamp, an area of major biological significance in North Carolina. The 15,722-acre Green Swamp Preserve protects pine savannas, bay forests and pocosins containing hundreds of different plant species, including the endangered red-cockaded woodpecker, the eastern diamondback rattlesnake, Bachman's sparrow and the American alligator.

Potential Project Environmental Impacts Information Resource

EPA ORD's Carolina's Ecosystem research project: EPA's Office of Research & Development is conducting a research project to evaluate the wetlands of the Coastal Carolinas for location and type in order to evaluate services and impact of climate change and demographic change on the services. ORD's research focus is on: storm surge protection potential in relation to wetland change, water storage potential of wetlands and within agricultural landscapes, and the application of a Willamette Basin Nitrogen Removal Model to the wetlands of the coastal Carolinas. ORD contact is Dorsey Worthy, worthy.dorsey@epa.gov or (919) 541-3075.



United States Department of the Interior

FISH AND WILDLIFE SERVICE

176 Croghan Spur Road, Suite 200
Charleston, South Carolina 29407



July 22, 2008

Mr. Joseph A. Jones
Chief, Planning Branch
Charleston District, Corps of Engineers
69A Hagood Avenue
Charleston, SC 29403-5107

Attn: Elizabeth Jackson

Re: Waccamaw Diversion Canal, Planning Assistance Study, Horry County, SC
FWS Log No. 42410-2008-FA-0254

Dear Mr. Jones:

Personnel from the U.S. Fish and Wildlife Service (Service) recently attended a meeting at the U.S. Army Corps of Engineers (COE), Charleston District to discuss a planned diversion canal in Horry County, SC. Under the Planning Assistance to States Program, Horry County requested technical aid from the COE to assess the environmental issues pertaining to the planning, design and construction of the canal. This proposed canal was originally proposed in 1941; however, cost to benefit studies at the time prevented the project from moving beyond planning stages. A re-assessment of the canal's viability is now under consideration, particularly in light of land use changes and in consideration of environmental laws and regulations that did not exist as the time of the first proposal.

The canal is proposed as an approximately 5.7 mile long flood control activity to divert flood waters from the Waccamaw River to Mullet Creek, ultimately draining into the Atlantic Intracoastal Waterway (AIWW) near Little River Inlet. The canal would be 14' deep with a bottom width of 150'. A weir structure would be placed on the Waccamaw River at an elevation which would only allow flow into the canal during flooding events. The discharge point at Mullet Creek would be located above the mean high water elevation.

If this plan evolves into an official proposal, inclusive of specifications, locations and resource impact acreages, the Service will provide detailed comments on environmental issues at that time. As the current plan is conceptual in nature the Service submits the following general concerns regarding potential resource impacts.

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Direct Impacts

A significant amount of forested floodplain wetlands adjacent to the Waccamaw River and the tidal wetlands of Mullet Creek would be lost as a direct result of this canal's construction. In addition, the area between the projected canal termini is interspersed with palustrine-forested and emergent wetlands, all of which support a diverse assemblage of flora and fauna. Freshwater influx from the canal into the salt marshes of Mullet Creek will dilute the creek's saline content and may impact salt tolerant vegetation and faunal inhabitants.

Indirect Impacts

The slow release of flood waters in the existing Waccamaw system helps to mitigate storm surge and salt water intrusion associated with storm events on the lower end of the Waccamaw. Diversion of floodwaters from the Waccamaw River would allow a saline influence further inland and may adversely affect unique habitats, such as oxbow lakes that are important to many species including the rare (State protected) swallow tail kite. Oxbow lakes are dependent on periodic flooding as the major source of water influx providing nutrient transport into and out of the area. Reduced flow rates in the Waccamaw River below the diversion canal may also result in debris accumulation leading to navigational hazards. In addition, canal construction is likely to reduce the surrounding water table and cause drainage of the adjacent wetland resources.

Cumulative Impacts

Long-term impacts to adjacent lands and wildlife through future adjacent development must be considered, particularly if the canal retains a navigable water depth outside flood events. Stormwater discharges from adjacent developments may lead to ground water and surface water quality impacts.

Habitat Fragmentation

The proposed canal will present a barrier to local wildlife migration and movement, particularly the black bear as they may travel long distances during mating season or in search of food. The study area for the proposed canal spans an important black bear migration corridor, one of the last remaining corridors between coastal North and South Carolina. Canals such as the one proposed may also impede traditional wetland crossings. Similar canals in Florida and other states have become clogged with floating vegetation over time. As a result crossing these canals will become difficult, if not impossible, for the black bear and other wildlife species.

Spoil Disposal

As described this project would (conservatively) generate over 60 million cubic yards of spoil material. Disposal of this material, whether it is side cast or transported offsite, must be thoroughly analyzed.

Demonstrated Need

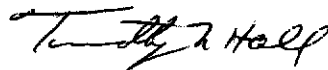
The Service understands that the purpose of this project is to alleviate flooding in portions of Conway, SC, located downstream on the Waccamaw River; however, a demonstrated need for the project was not provided. We believe it is imperative that Horry County demonstrate a need for the diversion canal.

Long-Term Maintenance

Maintenance of the proposed canal after construction must be integrated into the planning studies. Flood waters received by the canal will likely contain high sediment and debris loads and, over time, negate the utility of the canal. In addition, the canal may serve as a conduit for invasive flora and fauna into adjacent water bodies.

The Service appreciates the opportunity to provide comments on this project. If you have any questions or require additional information, please contact Mark Caldwell of the Charleston Field office. He may be reached at (843) 727-4707 ext. 215.

Sincerely,



Timothy N. Hall
Field Supervisor

TNH/MAC

cc: Mr. Ed EuDaly, U.S. Fish and Wildlife Service, Charleston, SC
Mr. Marshall Sasser, Waccamaw National Wildlife Refuge, Georgetown, SC



C. Earl Hunter, Commissioner

Promoting and protecting the health of the public and the environment.

July 25, 2008

Mr. Joseph Jones
Chief, Planning Branch
U. S. Army Corps of Engineers
69A Hagood Avenue
Charleston, S. C. 29403-5107

Re: Waccamaw River diversion canal, Horry County

Dear Mr. Jones:

The Department is offering the following comments for the Waccamaw River Diversion canal in Horry County, S. C. According to the map attached to your letter dated May 30, 2008, would extend from Mullet Creek in Little River to the Waccamaw River in a location upstream of Conway and would be 5.7 miles long, 14 feet deep, and would have a 150' wide bottom channel. As your letter stated, the project is not economically justified for a federal cost share project, however the Corps is providing technical assistance to Horry County to support water resource planning. The Department understands that the Conway area has experienced localized flooding and this issue has been studied intermittently for the last 50 years.

Though periodic flooding is a serious matter when it is experienced, the Department would not recommend this project based upon the parts of the Coastal Zone Management Act, the Department's Critical Area Regulations (for Mullett Creek), S. C. Coastal Zone Management Program (CZMP), Water Quality rules and Navigable Waters Regulations. The following comments are not necessarily offered in any particular order, but are broadly offered for purposes of efficiency.

The impacts of a 5.7-mile long canal present multiple concerns that begin with the initial excavation. The potential loss of jurisdictional and non-jurisdictional wetlands along the entire stretch of the canal would be significant though it is unknown at this time how many acres would be impacted. It is also unknown where the excavated material would be deposited and if it could be beneficially reused which would introduce additional questions related to deposition. The excavation would cause unknown amounts of fresh water to discharge into a saltwater environment at Mullett Creek and Dunn Sound in Little River, changing salinity levels and sedimentation patterns. Dunn Sound has been designated as Shellfish Harvesting Waters (SFH) and the sedimentation and pollutants from existing uses surrounding (and in the vicinity) of the canal could result in degraded water quality negatively affecting shellfish resources. Dunn Sound contains one of the few shellfish resources that are open to harvesting in the entire Grand Strand area and is a Geographic Area of Particular Concern (GAPC). Shellfish resources are highly valued as a habitat of significant living marine resources for the purpose of public consumption and pollutant cleansing. The canal would result in the decrease in the Dissolved Oxygen (DO) content in Mullett Creek/Dunn Sound and could also result in the death of aquatic life because of these impacts. A change in sedimentation patterns could smother shellfish resources and could cause new navigational impediments to the entire Mullett Creek/Dunn Sound and possibly the Little River Inlet complex.

Mr. Joseph Jones
July 25, 2008
Page 2

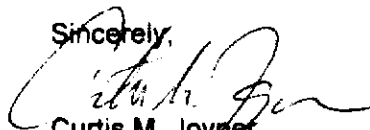
The canal could have negative effects on water circulation patterns and movement as rain and overflow from flooding in the Waccamaw River. During "dry" times, the lack of adequate levels of water could create a stagnant water condition in the canal and possibly in downstream areas of the connection point of the canal and the Waccamaw River. A dry canal would also be an invitation to indirect impacts. Though the canal would be designed to be dry in those times when flooding is not present, surrounding property owners might be presented with the temptation to demand more utility of the canal desiring adequate water depths at all times. Docks or other access structures could follow and the original intent of the canal would become secondary. The excavation could possibly draw down the existing water table along its 5.7-mile route and erosion along the banks of the canal could occur. The surrounding property owners would then want to seek some level of protection and eroded material would increase sedimentation in the downstream environments exacerbating the initial sedimentation load from the first flow of floodwaters into Mullett Creek.

The Department is also concerned that diverting flood waters to the canal would present a perception or a belief that areas currently prone to periodic flooding would no longer be prone to flooding providing a false sense of security. With that security, the pressure to develop low-lying areas would be significant, resulting in numerous indirect impacts not fully contemplated by the plan.

In conclusion, there are a wide variety of environmental implications with this project that would have severe consequences for the entire canal length. The Department recommends that the County consider alternatives to the flooding issue.

Thank you for the opportunity to provide your Agency comments with regard to the Waccamaw River diversion canal. Should you have any questions, please call me at 843-953-0232.

Sincerely,



Curtis M. Joyner
Manager, Wetland Permitting and Certification
Regulatory Programs Division

cc: Ms. Barbara Neale
Mr. David Pierce
Ms. Tanitra Marshall
Ms. Erin Jones, BOW

Elizabeth G. Jackson
U.S. Army Corps of Engineers
Wilmington District in Charleston
Environmental Section
69A Hagood Ave.
Charleston, SC 29403

July 30, 2008

Dear Elizabeth,

Thank you for the opportunity to participate in the meeting of the proposed Waccamaw Diversion Canal at your offices on June 24, 2008. The Corps of Engineers and other agency representatives provided facts, observations, and comments about the proposed project, and, based on our discussion that day and my subsequent reading and evaluation, I offer the following comments for your consideration. Please note that these are my personal comments and do not constitute an opinion of the Baruch Institute for Marine and Coastal Sciences or University of South Carolina. My comments are based on 30 years of field-based ecological research in the Winyah Bay and its associated rivers and estuaries.

The proposed plan to create a canal to divert 'above flood stage' water from the Waccamaw River would certainly result in major structural and functional changes to the landscape and hydrology of the river basin. The following is a list of some of the environmental concerns associated with the construction and operation of the diversion canal:

- direct destruction 30-50 acres of bottomland hardwood forests along the canal path and maintenance road
- secondary impacts due to new roads, bridges, utilities, pipelines
- likely widening of the canal and destabilization of the banks from erosion during flood surges
- impacts associated with the excavation and displacement of an estimated 5 million tons of sediment
- potential for that fill to be used to fill low lying areas, impacting wetlands and surface water flow patterns
- creation of a new, low-flow waterbody (partially flooded canal); water quality issues associated with stagnation, water withdrawal, stormwater input
- the deep canal is likely to draw groundwater from adjacent areas, chronic draining of wetlands and uplands especially during droughts/ impacts of forested wetlands
- presence of a water source could encourage agricultural and residential development resulting in more draw-down and degradation of canal water
- the structure would fragment habitat and likely to create barriers to wildlife movements and migration
- creation of conditions that favor invasive species (plant, animal, etc)

I am very concerned about potential impacts on estuarine systems. These include:

- increased freshwater inflow to Little River estuary; pulses of river/swamp water plus the chronic movement of water from the river basin to tidal areas is likely to affect both water and habitat quality
- creation of a new source of sediments; siltation of the ICW and other navigable waters
- impacts to tidal marshes and associated fish and wildlife resources at the estuary
- dewatering of the aquifer at the eastern end of the canal and saltwater penetration
- saltwater transport from the ocean into canal and possibly into the river during a major hurricane surge; potentially major impact of these freshwater systems
- change in the frequency and magnitude of periodic pulses/purges of the Waccamaw River which are ecologically important to the ecology of the river and Winyah Bay

Any changes that result in a decrease in the amount of freshwater inflow to Winyah Bay could have adverse effects on the estuary. Several threatened, endangered, and other species of concern depend on the dynamic physical environment and associated habitats in the lower river systems and low salinity areas downstream. In addition, the nursery function of the lower estuary for economically important fisheries species including the blue crab and white shrimp is closely tied to the both the continuous and episodic introduction of freshwater from the Waccamaw River. I call your attention to a special issue of the professional journal *Estuaries* which focuses on the many issues associated with freshwater inflow to estuaries (*Estuaries* volume 25, number 6B, December 2002).

I am unable to identify any potential significant environmental benefits associated with the proposed project. The long and far-reaching negative consequences identified above and others which are likely to emerge with closer study convince me that this proposed project should not be supported.

Please let me know if you would like clarification on any of my points, or if you have any questions. Thank you for the opportunity to comment.

Dennis M. Allen, Ph.D.
1194 Third Ave.
Georgetown, SC 29440



Waccamaw RIVERKEEPER®
A Program of Winyah Rivers Foundation
Coastal Carolina University
Center for Marine & Wetland Studies
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Conway, SC 29526
843-349-4007
wrk@coastal.edu
www.winyahrivers.org



Wednesday, July 30, 2008

Ms. Elizabeth G. Jackson
U.S. Army Corps of Engineers
Wilmington District in Charleston
Environmental Section
69A Hagood Avenue
Charleston, SC 29403

Dear Ms. Jackson,

Re: Comments on the Proposed Waccamaw River Diversion Canal

The Waccamaw RIVERKEEPER® is a program of Winyah Rivers Foundation, a 501(c)(3) not for profit organization whose mission is to protect, preserve, monitor and revitalize the health of the lands and waters of the greater Winyah Bay watershed.

As the primary spokesperson and advocate for the Waccamaw River in both North and South Carolina, we are eager to submit comments relative to the proposed Waccamaw River diversion canal. We have previously submitted comments opposing the proposal, most recently in November 2006 at a meeting held in Horry County. Our opposition to the proposal is briefly summarized below:

- **Water Quantity and Water Quality Issues**

Reduction in downstream water flow and quantity of water will significantly affect the hydrology, chemistry and ecology of the Waccamaw River and its riparian corridor. These impacts include; decreased ability to dilute and assimilate pollutants, increased potential for saltwater intrusion further upstream along the river and contamination of groundwater aquifers, and habitat modifications that would stress and/or cause mortality of both aquatic and terrestrial organisms.

When assimilative capacity is reduced, it could have a serious economic impact on the sewage treatment plants permitted to discharge into the Waccamaw Rivers since it is likely that their waste load allocations would need to be reduced. It could also have

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serious economic impacts on the freshwater supply for drinking water supplies in the Waccamaw River and the Atlantic Intracoastal Waterway.

Diverting floodwaters from the Waccamaw River to the proposed diversion canal will have impacts on the human and natural communities within Little River, Waties Island and North Myrtle Beach, including increased potential for flooding, coastal erosion and pollutant loading from upstream sources as well as impacts of freshwater inputs on the estuarine environment.

Reduced flows in the Waccamaw will reduce recharging of groundwater aquifers. In addition, groundwater will likely seep into the diversion canal, especially when no surface water flow is flowing in the canal.

- **Destruction of Wetlands and their Ecological Functions**

Decreased water flow along the Waccamaw will have significant impacts on the wetlands that occur along the river corridor. Rather than accepting the loss of more wetlands, which is contrary to federal mandate, we need to preserve the ecological services wetlands provide, including floodwater assimilation, functions, natural pollution filtering ability, and biological diversity.

- **Impacts on Preserved Lands and Historic Ricefields Properties**

Any degradation in water quality and quantity will likely result in impacts on federal and state protected lands, including the Waccamaw National Wildlife Refuge, State Heritage Lands and state managed wildlife areas, as well as areas such as the Historic Ricefields properties that provide critical habitat for migratory waterfowl.

- **Diversion Structure Impacts**

The placement of a diversion structure on the Waccamaw River would impede passage to both human and other fauna, including impeding the migration of both aquatic and terrestrial organisms and habitat fragmentation. In addition, impacts would be felt on humans and their recreational opportunities. Potential impacts of a diversion structure on upstream and downstream properties would require significant management to meet and balance these needs.

- **Entire Ecosystem Effects**

Reductions in water quantity will result in changes in water quality characteristics and eventual changes in the biotic potential of the riverine ecosystem. Reductions in fluxes of marine chemistry have unknown consequences on ecosystem structure. Reduced flows could also lead to more intense and prolonged periods of naturally occurring hypoxia, particularly in the summer when hurricanes and tropical storms tend to occur. Hypoxia, in addition to causing stress and mortality within fish, promotes the biomethylation of mercury. Fish advisories already exist for the Waccamaw River, indicating that the river has no additional ability to assimilate increased mercury within its food web. Significant changes in water quality and quantity will have both predictable and unpredictable consequences on the river

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ecosystem. Documentation exists to identify the predictable consequences; however, unintended consequences are likely to occur and need additional study to avoid significant disruption to the riverine ecosystem as well as to the economic, cultural and social structure of the communities in and around the Waccamaw River.

It is our view that control of flooding of personal properties, estimated to be in the order of a few hundred residences along the Waccamaw River, is more easily and economically accomplished by relocating affected property owners to upland areas and restricting development within the floodplain. Accurate flood zone maps are accessible to developers, builders and buyers. We are proponents of implementing County zoning requirements and developers incentives to promote development in upland areas and restrict development in the floodplain. The floodplain can then be reserved as open space and natural areas and allowed to serve its function of accommodating floodwaters, assimilating pollutants and slowly releasing the waters as water level subsides.

We also are proponents of low impact development techniques to decrease the amount of impervious surfaces resulting from rapid development along the Waccamaw River. Impervious surfaces increase flooding intensity and frequency, resulting in impaired water quality. Retaining more natural areas with pervious surfaces is essential to reducing the quantity and quality of storm water that enters the river system. Proper zoning control, best management practices in land development and natural buffers along the river corridor represent a more environmentally sound methodology to prevent the economic impacts associated with flooding of personal property.

The Waccamaw River is historically, culturally and biological significant within our local communities, within our state and nationally as a watershed within the Cape Fear Arch, an area of significant biodiversity and home to many species of plants and animals that are either endemic or rare. Rather than changing its natural hydrology and the biological communities that have developed within this riverine system, we need to preserve and protect it and where necessary revitalize its biological functions. We must protect the Waccamaw River and its watershed as an important source of drinking water, as a natural system supporting a diverse biota and as a place of natural beauty, history and enjoyment.

We strongly recommend that the US Army Corps of Engineers reject the proposal for a diversion canal on the Waccamaw River and support other more economical and environmentally sustainable means of dealing with flooding.

Should you have questions or require clarification, please do not hesitate to contact me.

Sincerely,

Christine Ellis

Christine Ellis
Waccamaw Riverkeeper

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COASTAL
CONSERVATION
LEAGUE

Elizabeth G. Jackson
U.S. Army Corps of Engineers
Wilmington District in Charleston
Environmental Section
69A Hagood Ave.
Charleston, SC 29403

August 5, 2008

Dear Ms Jackson,

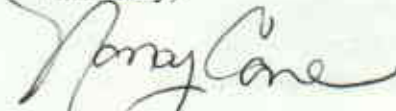
I am writing on behalf of the Coastal Conservation League in response to your request for comments on the Waccamaw Canal Study. I have reviewed the limited information I have on this project. My initial response is that such a project does not seem necessary or warranted.

If such a project would be proposed the Coastal Conservation League would recommend that before any permits are applied for, a preliminary engineering study and environmental assessment be conducted. The environmental assessment should include but not be limited to primary and secondary impacts of the project on wetlands, habitat, loss of contiguous lands and rerouted water flow. Both the preliminary engineering report and environmental assessment should be made available for public comment and these comments reviewed and responded to before the permitting process is initiated.

We would further recommend, because of the magnitude of this project, that the Corp of Engineers require an Environmental Impact Statement be conducted for a 401/404 Water Quality Permit. The EIS would necessitate defining the purpose and need of the project, the study of all feasible alternatives, indirect and cumulative impacts, along with a public participation and disclosure process.

We thank you for the opportunity to provide you with input on this project.

Sincerely,



Nancy Cave

North Coast Office Director

"Nature and Community in Balance"

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