ADMINISTRATIVE ACTION DRAFT ENVIRONMENTAL IMPACT STATEMENT

US Department of Transportation

Federal Highway Administration

and

North Carolina Turnpike Authority

a division of the

North Carolina Department of Transportation

MID-CURRITUCK BRIDGE STUDY

NORTH CAROLINA
Turnpike Authority

Submitted Pursuant to the National Environmental Policy Act
42 USC 4332(2)(c)

March 2010

The proposed project calls for transportation improvements in the Currituck Sound area, with focus on consideration of a Mid-Currituck Bridge over Currituck Sound. This Draft Environmental Impact Statement (DEIS) documents the purpose of and need for the project; describes existing and projected conditions in the project area; identifies five build detailed study alternatives; and presents an assessment of the direct, indirect, and cumulative impacts of these alternatives. Variations included in the five alternatives are two hurricane evacuation improvement options and two mainland bridge approach options.

This DEIS includes all of the sections specified by the President's Council on Environmental Quality in sections 1502.10 to 1502.18 of Title 40 of the *Code of Federal Regulations*. These sections are presented in a manner that is intended to facilitate the reading and understanding of this document's findings by all readers, including the public, environmental resource and regulatory agency representatives, non-government environmental organizations, and decision-makers. The main body focuses on key findings, including purpose and need, alternatives, and characteristics of the affected environment and environmental consequences. The findings of affected environment and environmental consequences are presented in a single chapter so the reader does not have to shift between chapters to locate findings related to a specific aspect of the environment. Sections not directly related to the project and its impact are included in this DEIS as appendices. A detailed table of contents and summary also are included, as well as a list of project commitments. For readers interested in the details of the studies and activities associated with the preparation of this DEIS, a series of technical reports has been published. They are available to reviewers on the compact disc (CD) that accompanies this DEIS, at public review locations listed in Appendix C as a printed copy, and on the NCTA web site athttps://www.ncdot.gov/projects/mid-currituck-bridge/. A list of these reports and their tables of contents are listed in Appendix D of this document.

The following persons may be contacted for additional information concerning this DEIS:

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Comments on this DEIS are due by June 7, 2010 and should be sent to Ms. Jennifer Harris, P.E., at the above address.

FHWA-NC-EIS-10-01-D
Federal Highway Administration
North Carolina Division

Mid-Currituck Bridge Study
Currituck and Dare Counties, North Carolina

Federal-Aid Project No. BRSTP-000S(494)
WBS Element: 34470.1.TA1
STIP Project No. R-2576

Administrative Action
Draft Environmental Impact Statement

Submitted Pursuant to the National Environmental Policy Act
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US Department of Transportation
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Cooperating Agencies
US Army Corps of Engineers
US Coast Guard

3·10·2010
Date

Steven D. DeWitt, P.E.
Chief Engineer
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3·10·2010
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Preface

What is the purpose of a Draft Environmental Impact Statement?

The North Carolina Turnpike Authority (NCTA), a division of the North Carolina Department of Transportation (NCDOT), in cooperation with the Federal Highway Administration (FHWA), is evaluating proposed transportation improvements in the Currituck Sound area, including consideration of a Mid-Currituck Bridge.

This Draft Environmental Impact Statement (DEIS) is an important milestone in the project planning process. The objective of this DEIS is to provide the public and decision-makers with the appropriate and relevant information to make an informed decision on which transportation improvement alternative to select for implementation. This process is intended to provide all interested parties with the opportunity to contribute to the decision-making process.

The development and evaluation of the transportation improvement alternatives assessed in this DEIS was an iterative process that included coordination with public agencies, elected officials, stakeholders, and members of the public. Alternatives were evaluated for environmental impacts (including the human and natural environments), engineering constraints, transportation benefits, and cost.

What does this DEIS include?

The table of contents presents the overall organization of this DEIS and can direct you to the appropriate page numbers in various chapters and sections in the document. Key findings are presented in the summary section. A full discussion of findings is presented in three chapters:

- Chapter 1 – Purpose of and Need for Action describes the transportation improvement needs in the project area and identifies related project objectives.
- Chapter 2 – Alternatives describes the characteristics of the alternatives being considered for implementation, the "detailed study alternatives." This chapter also summarizes other alternatives considered and the reasons why they were not selected for detailed study. The No-Build Alternative also is described.
- Chapter 3 – Affected Environment and Environmental Consequences describes the existing and forecast future environmental conditions, as well as potential short- and long-term beneficial and adverse effects (if any) of the detailed study alternatives on these conditions. Possible mitigation measures are identified, where appropriate.

Also included with this DEIS are several appendices. Attached to the printed version of this DEIS is a compact disc (CD) that contains this DEIS, as well as the supporting

technical documentation, including methods and assumptions that provided the basis for the technical analyses and findings presented in this DEIS. A list of the technical documentation included on the CD and the table of contents for each document is included in Appendix D.

Printed copies of this DEIS and supporting technical documentation are available for public review at public locations listed in Appendix C. Additional copies of the CD are available from the NCTA upon request (see the contact information in the summary of this DEIS). All documentation is posted on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/.

What happens next?

A public and agency review period for this DEIS began with the circulation of this DEIS and will end on the date specified in the summary of this DEIS. The minimum review period is 45 days. The public can submit comments in writing to the address at the beginning of the summary and/or attend and comment at one of three public hearings being held during the review period. The hearing locations, days, and times will be published in local newspapers, in a newsletter sent to NCTA's current mailing list for the project, and on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/.

After the review period, NCTA, in cooperation with FHWA, will prepare a Final Environmental Impact Statement (FEIS). It will include responses to comments on this DEIS and revisions to document findings based on those comments. The FEIS will document the Preferred Alternative. Following the release of the FEIS, FHWA will issue a Record of Decision (ROD) that finalizes its decision on what alternative to build if a build alternative is selected. The ROD can be released no sooner than 30 days after the release of the FEIS, which provides readers an opportunity to comment on the FEIS. With the release of the ROD, the planning process is complete, and final design, right-of-way acquisition, and construction of the Selected Alternative may begin if a build alternative is selected. NCTA expects to continue to have periodic Citizens Informational Workshops and other public involvement opportunities as the project progresses after the release of the ROD.

Summary

Federal Highway Administration
Administrative Action Environmental Impact Statement

(x) Draft ( ) Final ( ) Draft Section 4(f) Evaluation

The proposed project calls for transportation improvements in the Currituck Sound area, with focus on the consideration of a Mid-Currituck Bridge over Currituck Sound. This Draft Environmental Impact Statement (DEIS) documents the purpose of and need for the project; describes existing and projected conditions in the project area; identifies five build detailed study alternatives; and presents an assessment of the direct, indirect, and cumulative impacts of these alternatives. Variations included in the five alternatives are two hurricane evacuation improvement options and two mainland bridge approach options.

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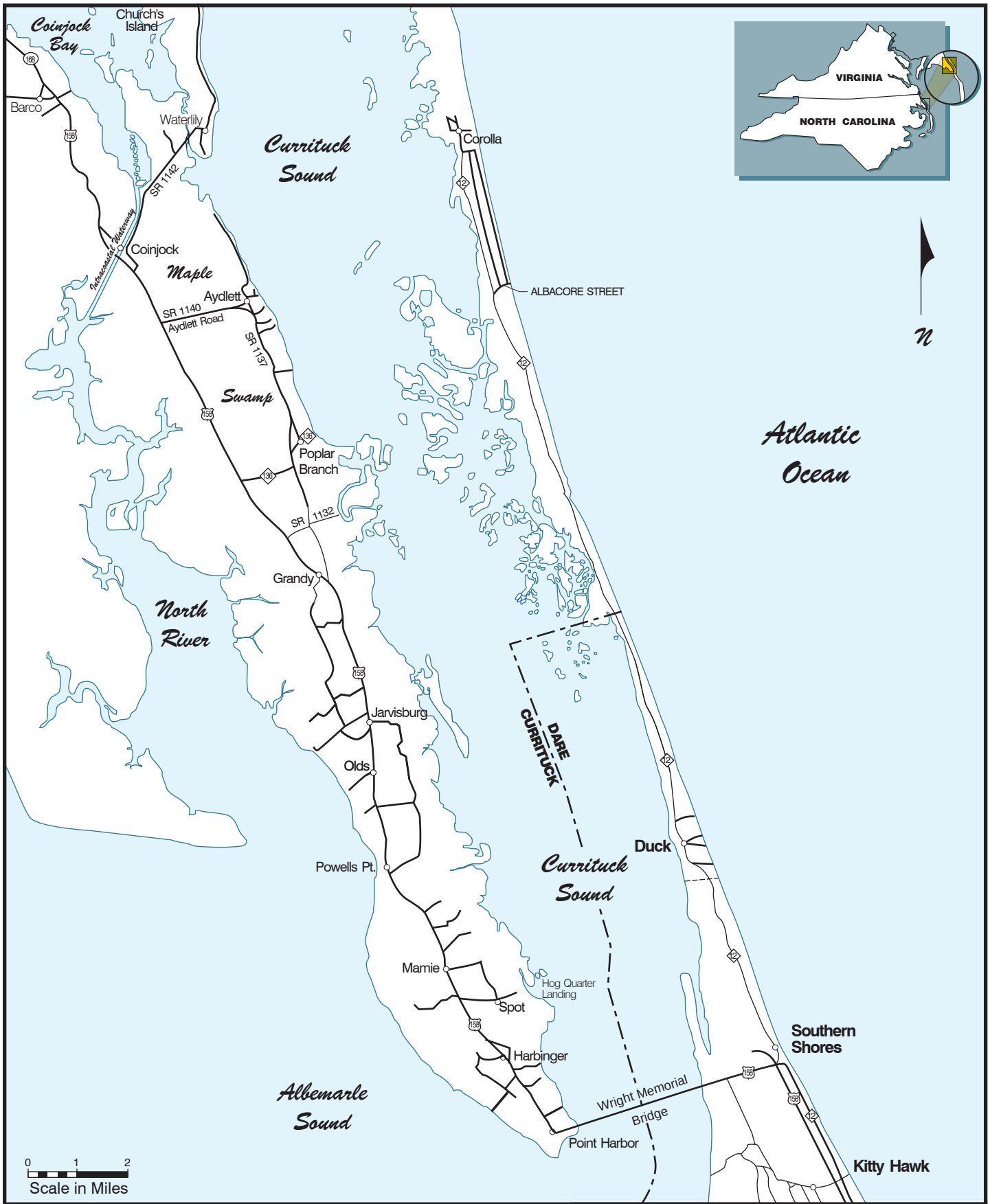
What is being proposed and where is it?

The North Carolina Turnpike Authority (NCTA), a division of the North Carolina Department of Transportation (NCDOT), in cooperation with the Federal Highway Administration (FHWA), is evaluating proposed transportation improvements in the Currituck Sound area. The proposed action is included in NCDOT's *2009 to 2015 State Transportation Improvement Program* (STIP), the North Carolina Intrastate System, the *North Carolina Strategic Highway Corridor Plan*, and the *Thoroughfare Plan for Currituck County*. In those plans, the proposed action is defined as a bridge in Currituck County across Currituck Sound from the mainland to the Outer Banks. When considering the construction of a major transportation investment, decision-makers are required to examine multiple options under the requirements of the National Environmental Policy Act (NEPA) and associated regulations. Thus, the detailed study alternatives evaluated in this DEIS include options that involve improvements to the existing road network, both with and without a Mid-Currituck Bridge. The project area encompasses US 158 between its intersection with NC 168 and its intersection with NC 12, and NC 12 from its intersection with US 158 north to where it terminates in the community of Corolla. The project area is shown on Figure S-1.



LEGEND

— - — County Boundaries

Project Area

Figure

S-1

What need would the project meet, and what is the project's purpose?

The proposed project responds to three project area needs:

- The need to substantially improve traffic flow on the project area's thoroughfares (US 158 and NC 12);
- The need to substantially reduce travel time for persons traveling between the Currituck County mainland and the Currituck County Outer Banks; and
- The need to reduce substantially evacuation times from the Outer Banks for residents and visitors who use US 158 and NC 168 as an evacuation route.

Given the needs described above, the purposes of the proposed project are:

- To substantially improve traffic flow on the project area's thoroughfares. Thoroughfares in the project area are NC 12 and US 158;
- To substantially reduce travel time for persons traveling between the Currituck County mainland and the Currituck County Outer Banks; and
- To reduce substantially hurricane clearance time for residents and visitors who use US 158 and NC 168 during a coastal evacuation.

Purpose and need of the project is discussed in Chapter 1 of this DEIS and in greater detail in the *Statement of Purpose and Need* (Parsons Brinckerhoff, 2008). This report is on the CD that accompanies this DEIS, at public review locations listed in Appendix C, and on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/.

What alternatives are under consideration?

Five detailed study alternatives are under consideration for implementation, as well as the No-Build Alternative. The detailed study alternatives are named:

- ER2;
- MCB2/C1 (MCB2 using bridge corridor C1);
- MCB2/C2 (MCB2 using bridge corridor C2);
- MCB4/C1 (MCB4 using bridge corridor C1); and
- MCB4/C2 (MCB4 using bridge corridor C2).

The "ER" in ER2 stands for "Existing Roads." A Mid-Currituck Bridge is not included in this alternative, but only widening existing US 158 and NC 12. The "MCB" stands for Mid-Currituck Bridge. Alternatives MCB2 and MCB4 both include a Mid-Currituck Bridge and different amounts of improvements to existing US 158 and NC 12. For MCB2 and MCB4, there are two variations of the proposed bridge corridor in terms of its terminus on the Outer Banks. Bridge corridor C1 would connect with NC 12 at an intersection approximately 2 miles north of the Albacore Street retail area, whereas bridge corridor C2 would connect with NC 12 approximately 0.5 mile south of this area. The "C" stands for "Central," as opposed to other corridor possibilities further north (N) and south (S).

For the four MCB2 and MCB4 alternatives, two design options also are under consideration for the mainland approach to the bridge over Currituck Sound (between US 158 and Currituck Sound), Option A and Option B. The design options differ in regards to the location of the toll plaza, whether Maple Swamp is crossed by a bridge or fill, and whether drivers traveling between US 158 and the community of Aydlett would use existing Aydlett Road or the bridge approach road (without paying tolls). No access to and from the Mid-Currituck Bridge would be provided at Aydlett with either option.

When MCB2 or MCB4 is discussed in this DEIS without specification of a bridge corridor (C1 or C2), it means that the discussion applies to MCB2 or MCB4 with either corridor. The same is true when MCB2 and MCB4 are discussed in this DEIS without specification of a mainland bridge approach option or a hurricane evacuation option. When impacts differ between the mainland approach road design options (Option A and Option B), the names of the alternatives are augmented with an additional suffix. For example, MCB2 with mainland design Option B and the C1 corridor is referred to as MCB2/B/C1.

For all five alternatives, two hurricane evacuation options are under consideration. The first option is to add a third outbound lane to US 158 for evacuation use only. The second option is to reverse the existing center turn lane on US 158 to create a third outbound lane during an evacuation. When a third outbound lane is needed on the Wright Memorial Bridge or Knapp (Intracoastal Waterway) Bridge, one existing inbound lane would be reversed.

The characteristics of these alternatives are described in Section 2.1 of this DEIS.

The No-Build Alternative also is under consideration. The No-Build Alternative assumes that the proposed project would not be implemented, but includes other reasonably foreseeable improvements contained in NCDOT's 2009 to 2015 STIP.

How were the alternatives selected for detailed study?

An alternatives screening study was conducted for the project. Its findings were discussed with federal and state environmental resource and regulatory agencies in a series of Turnpike Environmental Agency Coordination (TEAC) meetings in 2006, 2007, 2008, and 2009. Based on study findings, discussions at TEAC meetings, and written

comments received from the agencies and public, the detailed study alternatives were selected. Factors used to screen the potential alternatives included:

- Ability to meet purpose and need and the level of benefit offered in relation to those purposes;
- Ability to improve system efficiency;
- Economic feasibility (cost and funding capacity); and
- Potential impacts on communities and natural resources.

The other road widening and bridge alternatives considered during the screening were:

- ER1, which was identical to ER2 except NC 12 was assumed to be widened to four lanes instead of three lanes from US 158 to Albacore Street;
- MCB1, which was identical to MCB2 except NC 12 was assumed to be widened to four lanes instead of three lanes from US 158 to the Mid-Currituck Bridge terminus on the Outer Banks; and
- MCB3, which was identical to MCB4 except it did not include a third outbound lane on US 158 between the Wright Memorial Bridge and NC 12.

Other alternative concepts also were considered but were not carried forward as detailed study alternatives. These were: (1) shifting rental times; (2) transportation systems management; (3) bus transit; and (4) a ferry service across Currituck Sound as an alternative to a Mid-Currituck Bridge.

Several additional bridge corridors were considered and evaluated. They were C3, C4, C5, and C6, all in the Aydlett area but south of Aydlett Road. Alternatives north of the community of Aydlett and near the Intracoastal Waterway (N1 and N2) and further south in the Poplar Branch area (S) also were considered over the course of alternatives studies.

The alternatives screening study and its findings are presented in detail in the *Alternatives Screening Report* (Parsons Brinckerhoff, 2009). This report is on the CD that accompanies this DEIS, at public review locations listed in Appendix C, and on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/.

What other alternatives were examined and then eliminated from further consideration?

Other alternatives evaluated included three additional road and/or bridge alternatives, lower cost alternatives that attempted to make more efficient use of the available road capacity on US 158 and NC 12 (shifting vacation housing rental times, minor improvements to the road system, and bus transit), ferry alternatives, and multiple Mid-

Currituck Bridge corridor alternatives. The alternatives and the reasons why they were not selected for detailed study are presented in Section 2.5. Additional detail can be found in the *Alternatives Screening Report* (Parsons Brinckerhoff, 2009).

What comments or concerns were expressed by the public and environmental resource and regulatory agencies during the selection of detailed study alternatives?

Agency and public comments were solicited on multiple occasions during the alternatives study process. These comments were considered in the development and comparison of alternatives and in the selection of the detailed study alternatives.

Agency and public comments focused on traffic improvement benefits, hurricane clearance times, capital costs, potential impacts to communities and natural resources, and potential economic impacts. The bridge portion of this project would be a toll facility; the public commented on tolling as a financing tool. The public also commented on pedestrian and bicycle access or accommodations.

Pubic and agency comments associated with selection of the detailed study alternatives are summarized in the *Alternatives Screening Report* (Parsons Brinckerhoff, 2009). The *Stakeholder Involvement for Draft Environmental Impact Statement Technical Report* (Parsons Brinckerhoff, 2009) also is included on the CD, at public review locations listed in Appendix C, and on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/. It describes agency and public involvement opportunities during development of the *Statement of Purpose and Need* (Parsons Brinckerhoff, October 2008), and the alternatives screening and their outcomes.

What other transportation projects are proposed in the project area?

The following are additional major transportation improvement projects listed in NCDOT's 2009 to 2015 STIP associated with the network that serves or feeds the project area in Dare, Currituck, and adjoining counties:

R-4457 Convert the existing at-grade intersection of US 158 and NC 12 at Southern Shores to an interchange. The planning and design for this project are currently underway. The project, however, is not funded for either right-of-way acquisition or construction.

R-2545 Widen US 64 to multi-lanes east of Columbia to east of the Alligator River. Planning and design for the project are currently underway, and right-of-way acquisition, mitigation, and structures related work are scheduled for Federal Fiscal Year (FFY) 2012. Construction is unfunded.

R-2544 Widen US 64 to multi-lanes east of the Alligator River to US 264. Right-of-way acquisition is scheduled for FFY 2012. Construction is unfunded. Planning and design are underway.

R-2574 Widen US 158 to multi-lanes east of NC 34 at Belcross in Camden County to NC 168 in Currituck County. The project is not funded for right-of-way acquisition or construction.

R-4429 Upgrade SR 1222 from NC 168 to north of SR 1232 and from SR 1213 to SR 1216. This project is partially complete, and construction is underway for the rest of the project.

Except for R-4457, all of these projects are included in the No-Build Alternative described in Section 2.1.2.5 and shown on Figure 2-11 in Chapter 2. The interchange proposed as R-4457 is not a part of the No-Build Alternative because the interchange is included as a component of detailed study alternatives ER2 and MCB2. The interchange is included in ER2 and MCB2 because an interchange is needed to reach a desirable level of service (LOS) on the summer weekday in 2035.

What are the major differences between the alternatives that are considered important to selecting an alternative for implementation?

Four factors are important to the selection of an alternative for implementation. They are:

1. Minimizing impacts to communities, cultural resources, and natural resources;

2. Effectiveness in meeting the project's purpose and need;

3. Cost and affordability; and

4. The ability to meet a variety of state and federal regulatory requirements.

This section compares the detailed study alternatives from the perspective of these four factors.

What environmental impacts are expected with each alternative, and how do the alternatives compare?

This DEIS considers a broad range of potential impacts, including direct impacts to the community, cultural resources, natural resources, other physical characteristics (noise, air quality, energy use, accelerated sea level rise, visual quality, hazardous materials and underground storage tanks, and floodplains), as well as construction impacts and indirect and cumulative effects. The key findings of these assessments, along with descriptions of the existing setting, are contained in Chapter 3 of this DEIS. Detailed discussions of the affected environment and environmental consequences are presented in the technical reports contained on the CD that accompanies this DEIS, at public review locations listed in Appendix C, and on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/.

In some cases impacts were found to be minor. In other cases, substantial impacts were identified. Table S-1 identifies substantial and other impacts considered important to the selection of an alternative for implementation. The No-Build Alternative would not involve construction of the proposed project and, therefore, would have no direct impacts to the environment.

How effective would each alternative be in meeting the project's purpose and need?

All of the detailed study alternatives would meet the project's purpose and need to varying degrees. Key differences are:

- MCB2, which includes both a Mid-Currituck Bridge and substantial improvements to existing roads, would have the greatest traffic flow benefits. It would cut congested travel in year 2035 in the project area by 52 percent. MCB4 would cut congested travel by 39 percent. ER2 would cut congested travel by 22 percent.

- Both MCB2 and MCB4 with the Mid-Currituck Bridge would offer substantial travel time savings for many travelers between the Currituck County mainland and the Outer Banks. MCB2 would offer the best summer travel time savings overall for those using US 158 and NC 12 via the Wright Memorial Bridge. Even without improvements to existing roads, MCB4 would offer better travel time savings for those using the Wright Memorial Bridge than ER2 by reducing traffic on US 158 and NC 12 in Dare County.

- The construction of a third outbound lane on US 158 would offer the greatest reductions in hurricane evacuation clearance time with any alternative, bringing the projected 2035 clearance time (in 2035 with 75 percent tourist occupancy) down to 22 hours from 36 hours with the No-Build Alternative. The 22-hour clearance time is 4 hours above the state clearance time standard of 18 hours. Times are also substantially reduced (to 27 hours) when reversing the center lane to serve outbound traffic during the evacuation; however, this reduction is not as much as with a third outbound lane because traffic would also continue to use the lane as a turn lane, thereby slowing travel. A third outbound lane and the associated clearance time reduction could be achieved with any of the detailed study alternatives. Reversing the center turn lane would be practical only with MCB2 and MCB4.

Additional detail on the travel benefits of the detailed study alternatives is presented in Table 2-3 in Section 2.2.

Table S-1. Comparison of Key Impacts

	ER2	MCB2/C1		MCB2/C2		MCB4/C1		MCB4/C2	
Community Impacts									
Loss of Neighborhood or Community Cohesion									
• Mainland	Minor	Visual barrier to cohesion in Aydlett				Visual barrier to cohesion in Aydlett			
• Outer Banks	Minor	Physically divides Corolla Bay subdivision.		None		Physically divides Corolla Bay subdivision.		None	
Relocations with and (without) a third outbound lane for hurricane evacuation[1]									
		Option A	Option B	Option A	Option B	Option A	Option B	Option A	Option B
• Homes	6 plus 10 vacation rental units (1 plus 10 vacation rental units)	6 plus 10 vacation rental units (6 plus 10 vacation rental units)	8 plus 10 vacation rental units (8 plus 10 vacation rental units)	6 plus 10 vacation rental units (6 plus 10 vacation rental units)	8 plus 10 vacation rental units (8 plus 10 vacation rental units)	5 (5)	7 (7)	5 (5)	7 (7)
• Businesses	5 (2 with no third outbound lane for hurricane evacuation)	7 (5 with no third outbound lane for hurricane evacuation)		8 (6 with no third outbound lane for hurricane evacuation)		5 (3 with no third outbound lane for hurricane evacuation)		6 (4 with no third outbound lane for hurricane evacuation)	
• Outdoor Advertising Signs	29 (none with no third outbound lane for hurricane evacuation)	6 (3 with no third outbound lane for hurricane evacuation)	16 (13 with no third outbound lane for hurricane evacuation)	6 (3 with no third outbound lane for hurricane evacuation)	16 (13 with no third outbound lane for hurricane evacuation)	6 (3 with no third outbound lane for hurricane evacuation)	16 (13 with no third outbound lane for hurricane evacuation)	6 (3 with no third outbound lane for hurricane evacuation)	16 (13 with no third outbound lane for hurricane evacuation)
• Gravesites	66 (none with no third outbound lane for hurricane evacuation)	36 (20 with no third outbound lane for hurricane evacuation)	35 (19 with no third outbound lane for hurricane evacuation)	36 (20 with no third outbound lane for hurricane evacuation)	35 (19 with no third outbound lane for hurricane evacuation)	36 (20 with no third outbound lane for hurricane evacuation)	35 (19 with no third outbound lane for hurricane evacuation)	36 (20 with no third outbound lane for hurricane evacuation)	35 (19 with no third outbound lane for hurricane evacuation)
Land Use Plan Compatibility	Inconsistent in that widening roads are not in land use plans or rejected in land use plans; but bridge is compatible					Compatible		Compatible	

[1] The first number indicates the impact assuming the construction of a third outbound lane for hurricane evacuation. The number in parentheses is the impact if improving hurricane clearance times is accomplished by reversing the existing center turn lane.

Table S-1 (continued). Comparison of Key Impacts

	ER2	MCB2/C1	MCB2/C2	MCB4/C1	MCB4/C2
Access Changes					
• Neighborhoods	Super-street would reduce number of 4-way intersections and limit direct access across US 158 in Dare County. Along NC 12, four street intersections would be closed to through traffic but not emergency vehicles (Widgeon Drive, Wood Duck Drive, Canvas Back Drive, and Old Squaw Road). Alternate access exists. Left turns limited at Crown Point and Orion's Way on the Outer Banks with provisions for U-turns.	Same as ER2. Plus, with Option B, Aydlett traffic would use the Mid-Currituck Bridge approach road to travel to and from Aydlett, and Narrow Shore Road would be relocated to pass over a toll plaza. Access road that connects NC 12 to the north end of Harbor View on the Outer Banks would be closed.	Same as ER2. Plus, with Option B, Aydlett traffic would use the Mid-Currituck Bridge approach road to travel to and from Aydlett, and Narrow Shore Road would be relocated to pass over a toll plaza.	With Option B Aydlett traffic would use the Mid-Currituck Bridge approach road to travel to and from Aydlett, and Narrow Shore Road would be relocated to pass over a toll plaza. Left turns limited at Crown Point and Orion's Way on the Outer Banks with provisions for U-turns. Access road that connects NC 12 to the north end of Harbor View on the Outer Banks would be closed.	With Option B Aydlett traffic would use the Mid-Currituck Bridge approach road to travel to and from Aydlett, and Narrow Shore Road would be relocated to pass over a toll plaza. Left turns limited at Crown Point and Orion's Way on the Outer Banks with provisions for U-turns.
• Business	Substantial changes in business access at the US 158/NC 12 interchange; notable parking loss at Home Depot (40 spaces/ 10 percent).	Substantial changes in business access at the US 158/NC 12 interchange, but less than ER2; substantial changes in business access in the Albacore Street area in Currituck County Outer Banks. With Option B, direct access from US 158 would be lost for customers of a gas station near the end of a frontage road.	Substantial changes in business access at the US 158/NC 12 interchange, but less than ER2. With Option B, direct access from US 158 would be lost for customers of a gas station near the end of a frontage road.	Substantial changes in business access in the Albacore Street area in Currituck County. With Option B, direct access from US 158 would be lost for customers of a gas station near the end of a frontage road.	Minor except with Option B, direct access from US 158 would be lost for customers of a gas station near the end of a frontage road.

Table S-1 (continued). Comparison of Key Impacts

	ER2	MCB2/C1		MCB2/C2		MCB4/C1		MCB4/C2	
Natural Resource Impacts									
Water Quality Impact	Increased levels of highway runoff with 89.0 acres of increased impervious surface (53.4 acres without construction of a third outbound lane for hurricane evacuation).	Increased turbidity levels during Currituck Sound bridge construction; increased levels of bridge and highway runoff with 120.4 to 126.8 acres for Option A and 120.0 to 126.4 acres for Option B of increased impervious surface (115.2 to 121.6 acres for Option A and 114.8 to 121.2 acres for Option B without construction of a third outbound lane for hurricane evacuation).				Increased turbidity levels during Currituck Sound bridge construction; increased levels of bridge and highway runoff with 81.0 to 86.6 acres for Option A and 80.6 to 86.2 acres for Option B of increased impervious surface (74.4 to 80.0 acres for Option A and 74.0 to 79.6 acres for Option B without construction of a third outbound lane for hurricane evacuation).			
Natural Upland Biotic Communities Impact for Option A and Option B									
		Option A	Option B	Option A	Option B	Option A	Option B	Option A	Option B
• Fill in Natural and Naturalized Upland Communities[2]	85.3 acres	113.4 acres	121.7 acres	110.0 acres	118.4 acres	44.1 acres	52.4 acres	40.8 acres	49.1 acres
• Clearing Natural and Naturalized Upland Communities[2]	0.0 acre	2.7 acres	0.5 acres	2.5 acres	0.4 acres	2.7 acres	0.5 acres	2.5 acres	0.4 acres
Land Wildlife Habitat Impact	Least invasive	Removal and alteration of wildlife habitat (both by habitat use and bridging) and habitat edge effects							
Aquatic Bottom Shaded (water depths < 6 feet)	0.1 acre	14.5 acres		17.8 acres		14.5 acres		17.8 acres	
Water Wildlife Habitat Impact	Minor	Altered light levels and the introduction of piles as a hard substrate in Currituck Sound; localized noise, turbidity, and siltation during construction							

[2] Includes mixed pine-hardwood forest, hardwood forest, maritime shrub-grassland, and maritime forest.

Table S-1 (continued). Comparison of Key Impacts

	ER2	MCB2/C1		MCB2/C2		MCB4/C1		MCB4/C2	
Submerged Aquatic Vegetation (SAV) Impact									
• Existing SAV Shaded	0.0 acre	4.3 acres		5.5 acres		4.3 acres		5.5 acres	
• Existing and Potential (water depths < 6 feet) SAV Shaded	0.1 acre	14.5 acres		17.8 acres		14.5 acres		17.8 acres	
Permanent Wetland Impacts for Option A and Option B with and (without) a third outbound lane for hurricane evacuation[3]									
		Option A	Option B	Option A	Option B	Option A	Option B	Option A	Option B
• Fill	5.1 (4.6) acres	12.8 (12.4) acres	42.9 (42.4) acres	10.2 (9.8) acres	40.3 (39.9) acres	8.5 (8.1) acres	38.6 (38.2) acres	5.9 (5.5) acres	36.0 (35.6) acres
• Pilings	0.0 acre	0.0 acre	0.0 acre	0.0 acre	0.0 acre	0.0 acre	0.0 acre	0.0 acre	0.0 acre
• Clearing	0.0 acre	25.7 acres	0.3 acres	30.6 acres	5.1 acres	25.8 acres	0.3 acres	30.6 acres	5.1 acres
Total Permanent Impacts	5.1 (4.6) acres	38.6 (38.2) acres	43.2 (42.8) acres	40.7 (40.3) acres	45.3 (44.9) acres	34.4 (34.0) acres	38.9 (38.5) acres	36.5 (36.1) acres	41.0 (40.6) acres
Temporary Wetland Impacts	2.1 acres	1.7 (0.0) acres	1.7 (0.0) acres	1.7 (0.0) acres	1.7 (0.0) acres	2.1 (0.0) acres	2.1 (0.0) acres	2.1 (0.0) acres	2.1 (0.0) acres
Total Wetland Impacts	7.2 (4.6) acres	40.3 (38.2) acres	44.9 (42.8) acres	42.4 (40.3) acres	47.0 (44.9) acres	36.6 (34.0) acres	41.1 (38.5) acres	38.7 (36.1) acres	43.2 (40.6) acres
Total Coastal Area Management Act (CAMA) Wetland Impacts	0.7 acre	0.7 acre		2.2 acres		0.0 acre		0.0 acres	
CAMA Areas of Environmental Concern Affected—with construction of a third outbound lane for hurricane evacuation (without third outbound lane, if different)									
• Fill	0.9 (0.8) acre	0.9acre		0.9 acre		0.0 acre		0.0 acre	
• Pilings	0.0 acre	0.1 acre		0.2 acre		0.1 acre		0.2 acre	
• Clearing	0.0 acre	0.0 acre		1.5 acres		0.0 acre		1.5 acres	
Essential Fish Habitat Affected									
• Fill	1.8 acres	1.8 acres		1.8 acres		0.0 acre		0.0 acre	
• Pilings	0.0 acre	0.1 acre		0.2 acre		0.1acre		0.2 acre	
• Shading (water depths < 6 feet)	0.1 acre	14.5 acres		17.8 acres		14.5 acres		17.8 acres	
• Clearing	0.0 acre	0.0 acre		3.2 acres		0.0 acre		3.2 acres	

[3] The first number or numbers indicate the impact assuming the construction of a third outbound lane for hurricane evacuation. The number or numbers in parentheses is the impact if improving hurricane clearance times is accomplished by reversing the existing center turn lane.

Table S-1 (continued). Comparison of Key Impacts

	ER2	MCB2/C1	MCB2/C2	MCB4/C1	MCB4/C2
Threatened and Endangered Species Habitat Affected	May affect but is not likely to adversely affect two species. Habitat does not occur in the project area for other species in the counties.	May affect but is not likely to adversely affect nine species. Habitat does not occur in the project area for other species in the counties.			
Other Physical Features					
Noise Impact	Increased noise levels (up to 9 dBA) on NC 12 from US 158 to Albacore Street with pavement closer to homes, particularly in four lane sections where more motor vehicles could travel the speed limit.	Increased noise levels (up to 10 dBA) on NC 12 from US 158 to Mid-Currituck Bridge terminus with pavement closer to homes, particularly in four lane sections where more motor vehicles could travel the speed limit.		Increased noise levels (up to 10 dBA) on NC 12 from Seashell Lane to Mid-Currituck Bridge terminus with four lanes of pavement closer to homes and because more motor vehicles could travel the speed limit.	
Accelerated Sea Level Rise	Existing roads affected by sea level rise.	Existing roads would be affected by sea level rise. A Mid-Currituck Bridge would be a useful asset in reducing the impact of sea level rise on the project area's road system. Under all sea level rise scenarios considered, the entire barrier island would be inundated at the Dare/Currituck County Line, creating a breach in the island and making a Mid-Currituck Bridge the only way off the Currituck County Outer Banks.			

Table S-1 (concluded). Comparison of Key Impacts

	ER2	MCB2/C1	MCB2/C2	MCB4/C1	MCB4/C2
Visual Impact	Interchange introduced into views in Kitty Hawk; changes in views along NC 12 from US 158 to Albacore Street.	Mid-Currituck Bridge features introduced into views along US 158 and in Aydlett (including views of Currituck Sound); would adversely affect views of Currituck Sound from the Corolla Bay subdivision; interchange introduced into views in Kitty Hawk; changes in views along NC 12 from US 158 to bridge terminus.	Mid-Currituck Bridge features introduced into views along US 158 and in Aydlett (including views of Currituck Sound); would adversely affect views from the outdoor recreation area at TimBuck II commercial area; interchange introduced into views in Kitty Hawk; changes in views along NC 12 from US 158 to bridge terminus.	Mid-Currituck Bridge features introduced into views along US 158 and in Aydlett (including views of Currituck Sound); would adversely affect views of Currituck Sound from the Corolla Bay subdivision; changes in views along NC 12 from Seashell Lane to bridge terminus.	Mid-Currituck Bridge features introduced into views along US 158 and in Aydlett (including views of Currituck Sound); would adversely affect views from the outdoor recreation area at TimBuck II commercial area; changes in views along NC 12 from Seashell Lane to bridge terminus.
Floodplains	No impact	No impact except with the use of mainland approach road Option B, which would result in a significant encroachment on the floodplain (as a significant alteration to a water course) by the fill placed in Maple Swamp. If selected, additional studies would be needed to determine how to avoid or minimize the associated maximum 0.2-foot increase in the 100-year storm's water surface elevation just north of the fill.			
Indirect and Cumulative Effects	Forecast development would be the predominant contributor to cumulative impacts, irrespective of whether a detailed study alternative is implemented.	Forecast development would be the predominant contributor to cumulative impacts, irrespective of whether a detailed study alternative is built. The improved accessibility to Currituck County Outer Banks with the bridge would cause the order of future development to change such that development occurs first in Currituck County and later in Dare County. However, the extent of development on the Outer Banks by 2035 would be the same with or without the bridge. In addition, in terms of indirect impacts, the presence of the bridge could result in business development in proximity to the bridge's interchange with US 158 and associated use of farmland and visual change. This development, however, is desired by Currituck County.			

How much would each alternative cost, and how would those costs be funded?

The total cost (in year of expenditure dollars) for the detailed study alternatives, including the cost of construction, environmental mitigation, bridge drainage treatment, pedestrian and bicycle features (lighted path and parking lots at bridge ends) on the Mid-Currituck Bridge, right-of-way, and utility relocation would be:

- ER2: $416.1 to $523.4 million;
- MCB2/A/C1: $884.2 to $1,062.4 million;
- MCB2/B/C1: $800.1 to $970.2 million;
- MCB2/A/C2: $888.1 to $1,065.1 million;
- MCB2/B/C2: $802.4 to $973.5 million;
- MCB4/A/C1: $685.3 to $816.2 million;
- MCB4/B/C1: $600.7 to $724.1 million;
- MCB4/A/C2: $680.3 to $808.6 million; and
- MCB4/B/C2: $595.5 to $716.4 million.

If a Mid-Currituck Bridge is a part of the alternative selected for implementation, it is anticipated that the initial cost of the proposed Mid-Currituck Bridge would be paid for through North Carolina's first venture into the world of Public Private Partnerships (PPP) for major transportation infrastructure. PPPs are formal collaborations between public agencies and private concessionaires that capture the advantages of private sector participation while maintaining public accountability to develop new infrastructure. These partnerships can be an effective way to deliver much needed infrastructure while minimizing costs and risks to the public. A partnering team was selected in December 2008. The services provided by the partner will focus on the evaluation of the bridge alternative during the environmental study process and support the negotiation of a long-term construction, financing, and operating and maintenance agreement. As per the requirements of Title 23 *Code of Federal Regulations* Section 636.109, the partner did not prepare this DEIS or have any decision-making responsibility with respect to the NEPA process. Additional information on PPP and the procurement of the partnering team is presented in Section 2.3.

For funds, bond financing would be used by the PPP. Transportation Infrastructure Finance and Innovation Act (TIFIA) financing (federal government loans) could be used in addition to bonds. This financing would be repaid primarily through toll revenues. Also in 2008, the North Carolina General Assembly appropriated $15 million per year for repayment of bonds or payment of debt service not covered by toll revenues, which

also could contribute to covering any shortfalls that might be associated with toll bridge financing costs.

If ER2 were selected as the Preferred Alternative, the project would have to be implemented with traditional financing rather than NCTA since ER2 has no component that could be funded by the financing mechanisms described above. The Pre-Development Agreement would be dissolved since only motor vehicle and fuel taxes could be used to build ER2. Also, the $15 million per year made available by the General Assembly could not be used since there would be no bonds or debt to repay. If MCB2 were selected, the project would need to be implemented as a joint effort of NCTA and NCDOT, with NCDOT providing funds for components that could not be funded by the financing mechanisms described above.

What state and federal regulatory requirements must be considered when comparing the alternatives?

In addition to the National Environmental Policy Act (NEPA), with its requirements being met by the preparation and release of this DEIS (as well as a future Final Environmental Impact Statement [FEIS] and Record of Decision [ROD]), several other environmental laws must be considered when comparing alternatives. The following paragraphs briefly note those laws and how the detailed study alternatives relate to their requirements. The only differences between the detailed study alternatives as they relate to these laws is the extent of their impact to waters under the regulatory jurisdiction of the US Army Corps of Engineers (including wetlands) and the need for a bridge permit from the US Coast Guard with MCB2 and MCB4.

Environmental Justice

Executive Order 12898, issued in 1994, requires that each federal agency, to the greatest extent practicable and permitted by law, administer and implement its programs, policies and activities that affect human health or the environment so as to identify and address, as appropriate, "disproportionately high and adverse" impacts on minority and low income populations. Concentrations of minority and low income populations do not occur in the project area.

Although there are no concentrations of low income households in the project area that would be directly affected by construction of the detailed study alternatives, there are such persons in Currituck County. MCB2 and MCB4 would create a second means to reach the Outer Banks from Currituck County; however, it would be tolled. With these alternatives, low income households may choose not to pay the toll or to use the bridge less frequently. They could, however, continue to use existing roads (US 158 and NC 12) and would benefit from less congestion on those roads. In addition, mainland low income persons who choose to use the new bridge to the Outer Banks would benefit from reduced travel distances (and associated costs) to many Outer Banks service jobs. There would be no tolls with ER2, and all users would benefit without a direct out-of-pocket cost for their travel. An indirect cost would exist, however, in the form of motor vehicle and fuel taxes.

Based on the above, it is concluded that there would be no disproportionately high and adverse direct impacts associated with any of the detailed study alternatives to minority or low income populations.

Section 106 Historic Resource Impacts

Section 106, a provision of the National Historic Preservation Act of 1966, requires federal agencies to consider the effects of their projects on historic properties and to provide the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on those effects. This opportunity to comment is often delegated to a state's State Historic Preservation Office (HPO). This is the case for this project. The HPO has concluded that the detailed study alternatives would have no adverse effect on historic properties in the project area.

Floodplain Impacts

Protection of floodplains and floodways is required by EO 11988, *Floodplain Management*. The US Department of Transportation Order 5650.2, titled "Floodplain Management and Protection," prescribes policies and procedures for ensuring that proper consideration is given to the avoidance and mitigation of adverse floodplain effects. ER2, MCB2/A, and MCB4/A would involve no significant encroachment on the 100-year floodplain in the project area. Nor would there be a significant potential for interruption or termination of a transportation facility that is needed for emergency vehicles or that provides a community's only evacuation route. ER2, MCB2/A, and MCB4/A would not create a significant risk beyond risks associated with development on the Outer Banks and the mainland that exist today. ER2, MCB2/A, and MCB4/A would not have a significant adverse impact on natural and beneficial floodplain values.

MCB2/B and MCB4/B would involve a significant encroachment on the 100-year floodplain (as a significant alteration to a water course) in the project area and would create significant risk. The fill in Maple Swamp also would raise the 100-foot flood water surface elevation by a maximum of 0.2 feet north of the fill. If MCB2/B or MCB4/B is selected for implementation, detailed hydraulic studies would be conducted as part of final design to determine mitigation measures necessary to avoid or minimize impacts to properties north of the Maple Swamp fill and impacts on natural and beneficial floodplain values.

Section 404 Jurisdictional Waters Impacts

Waters of the US, including wetlands, are regulated under Sections 401 and 404 of the Clean Water Act (CWA). Section 404 of the CWA regulates the discharge of fill material into waters of the US. Section 401 requires that the state provide certification that any activity authorized under Section 404 is in compliance with effluent limits, the state's water quality standards, and any other appropriate requirements of state law. Executive Order 11990, *Protection of Wetlands*, also calls for minimizing the destruction, loss, or

degradation of wetlands and for enhancing their beneficial values. Key jurisdictional impacts are:

- Fill in wetlands would be the least for ER2 and MCB4/A/C2 (5.1 to 5.9 acres with construction of a third outbound lane for hurricane evacuation on US 158, or 4.6 to 5.5 acres without construction of a third outbound lane). The largest fill in wetland using Option A would be 12.8 acres with MCB2/C1 with construction of a third outbound lane for hurricane evacuation on US 158. Option B (with any of the MCB alternatives) would place fill in Maple Swamp with the total fill in wetlands over the entire project area ranging from 36.0 to 42.9 acres with the third outbound hurricane evacuation lane) and 35.6 to 42.4 acres without the third outbound hurricane evacuation lane.

- Clearing of wetlands would be greatest with MCB2/C2 and MCB4/C2 because of the Mid-Currituck Bridge (with or without construction of a third outbound lane for hurricane evacuation on US 158).

- Shading of open water less than 6 feet deep would be greatest with MCB2/C2 and MCB4/C2 because of the Mid-Currituck Bridge (with or without construction of a third outbound lane for hurricane evacuation on US 158).

- There would be no fill placed in streams. If a third outbound lane is added for hurricane evacuation on US 158 over Jean Guite Creek with MCB4, a single piling would be installed in the creek, and the existing bridge over the creek would be widened by 18 feet. With ER2 and MCB2, the bridge over Jean Guite Creek would be widened by 36 feet for the widening of US 158. MCB2/C2 and MCB4/C2 also would result in a small amount of shading over a single stream on the Outer Banks.

Steps were taken during project planning and would continue to be taken to avoid and minimize impacts to jurisdictional resources. Several mitigation opportunities are available. With MCB2/B and MCB4/B, 9.1 acres of the Aydlett Road right-of-way in Maple Swamp would be restored to wetland.

Threatened and Endangered Species Impacts

Section 7 of the Endangered Species Act, Title 16 *United States Code* Section 1536(a)(2), requires all federal agencies to consult with the National Marine Fisheries Service (NMFS) for marine and anadromous species, or the US Fish and Wildlife Service (USFWS) for freshwater and wildlife species, if they are proposing an "action" that may affect listed species or their designated habitat. There is habitat present for nine federally protected species in the project area. For all nine species, the Biological Conclusion for MCB2 and MCB4 is "May Affect – Not Likely to Adversely Affect." The Biological Conclusion for ER2 is "May Affect – Not Likely to Adversely Affect" for two of the species and "No Effect" for the remaining seven species. All construction would follow USFWS guidelines for the protection of bald eagles.

Section 4(f) Resource Impacts

Section 4(f) of the US Department of Transportation Act of 1966 requires that the proposed use of land from a publicly-owned park, recreation area, wildlife and/or waterfowl refuge, or any significant historic or archeological site, by a transportation project is permissible only if there is no feasible and prudent alternative to the use. The hurricane evacuation option of constructing a third outbound lane on US 158 for evacuating traffic would use land from one or two historic Section 4(f) properties: the Samuel McHorney House (all alternatives) and the Dexter W. Snow House (ER2 only). These homes are eligible for inclusion in the National Register of Historic Places. However, because the impact to both the McHorney House and the Snow House would not adversely affect the activities, features, and attributes that qualify these properties for protection under Section 4(f), the FHWA, by publishing this DEIS, is requesting comments on a proposed finding of *de minimis* (minimal) impact for both properties for the hurricane evacuation option of constructing a third outbound lane on US 158 for evacuating traffic. The final determination regarding these properties will be included in the FEIS. With ER2 only, a temporary construction easement would be needed at three additional historic Section 4(f) properties. Since there would be no adverse effect at these three properties and the occupancy would be temporary, there would be no Section 4(f) use.

Conformity with Air Quality Plans

The US Environmental Protection Agency (USEPA) publishes a list of all geographic areas that are in compliance with the National Ambient Air Quality Standards (NAAQS), as well as those areas not in compliance with the NAAQS. The proposed project is in Currituck and Dare counties, which have been determined to comply with NAAQS and, therefore, are in compliance. This project is not anticipated to create any adverse effects on the air quality of this geographic area.

Other Federal Actions Required for the Proposed Project

The following permits would be required from federal agencies for implementation of the detailed study alternatives:

- US Coast Guard Bridge Permit for the Mid-Currituck Bridge component of MCB2 and MCB4; and
- US Army Corps of Engineers Section 404 permit for fill in jurisdictional waters, including wetlands.

What alternative do NCTA and FHWA recommend at this time?

Based on information available to date (including this DEIS), NCTA and FHWA have identified MCB4 as the Recommended Alternative. This recommendation is made taking into account cost and design considerations; travel benefits; community, natural resource, and other impacts; and public involvement comments. At this time, NCTA

has no recommendation related to the two bridge corridor alternatives (C1 and C2), the mainland bridge approach design options A and B, or a hurricane evacuation option.

The Recommended Alternative is only a recommendation; it is not a Preferred Alternative, and it is not a final decision. NCTA and FHWA have identified a Recommended Alternative as a way of giving readers of this DEIS an indication of the agencies' current thinking. After the DEIS comment period ends, NCTA and FHWA will identify a Preferred Alternative based on consultation with local transportation planning agencies, and state and federal environmental resource and regulatory agencies, as well as consideration of agency and public comments received on this DEIS and at the public hearings. The Preferred Alternative will specify all project components including, as applicable, the bridge corridor, mainland bridge approach design option, and hurricane evacuation option.

The Preferred Alternative may be developed further in the FEIS. The NEPA process will conclude with a ROD, which will document the Selected Alternative to be constructed if a build alternative is selected.

Mid-Currituck Bridge Study

Currituck and Dare Counties, North Carolina

Federal-Aid Project Number. BRSTP-000S(494)
WBS Element: 34470.1.TA1
STIP Project No. R-2576

Project Commitments

1. NCTA will coordinate with the US Coast Guard to determine appropriate horizontal and vertical navigation clearances for the Mid-Currituck Bridge if MCB2 or MCB4 is selected for implementation (see Section 2.1.3).

2. NCTA will evaluate opportunities for bicycle and pedestrian accommodations, including low-level lighting that could be used with a separated bicycle/pedestrian path, on a Mid-Currituck Bridge during design if MCB2 or MCB4 is selected for implementation (see Section 2.1.11). Such features are included in the project construction cost presented in Section 2.3.

3. NCTA will examine cost-effective options for treating the first inch of Mid-Currituck Bridge runoff during development of a design, if MCB2 or MCB4 is selected for implementation (see Section 2.1.7.2).

4. NCTA will coordinate with environmental resource and regulatory agencies on finalizing the design of wildlife crossings in Maple Swamp if MCB2 or MCB4 with Option B is selected for implementation (see Section 3.3.3.2).

5. During final design for MCB2 or MCB4, NCTA will evaluate bridge construction techniques in order to determine the most appropriate technique for constructing structures in Currituck Sound. Final construction methods will be selected as part of the permitting process (see Section 3.3.4.4).

6. NCTA will make final design decisions on road and bridge elevations needed to accommodate potential sea level rise, in addition to current storm surge and flooding elevations, if either MCB2 or MCB4 is selected for implementation (see Section 3.4.4).

7. If MCB2/B or MCB4/B is selected for implementation, NCTA will conduct additional studies during final design so adverse floodplain impacts on properties north of the Maple Swamp fill could be avoided or minimized, as well as effects on the groundwater hydrology, hydrologic characteristics of Maple Swamp, and supported ecological functions (see Section 3.4.7).

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1.0 Purpose of and Need for Action

This statement of purpose and need explains why improvements to the transportation system in the project area should be considered and implemented. Additional details related to project purpose and need are contained in a technical report, *Statement of Purpose and Need* (Parsons Brinckerhoff, 2008). The public and environmental resource and regulatory agencies were given the opportunity in April 2008 to review and comment on a draft of this report (see Appendix A). Their comments are summarized in the *Stakeholder Involvement for Draft Environmental Impact Statement Technical Report* (Parsons Brinckerhoff, 2009). These two reports are on the compact disc (CD) that accompanies this DEIS, at public review locations listed in Appendix C, and on the NCTA web site at http://www.ncturnpike.org/projects/Mid_Currituck.

1.1 What do you propose to build and where?

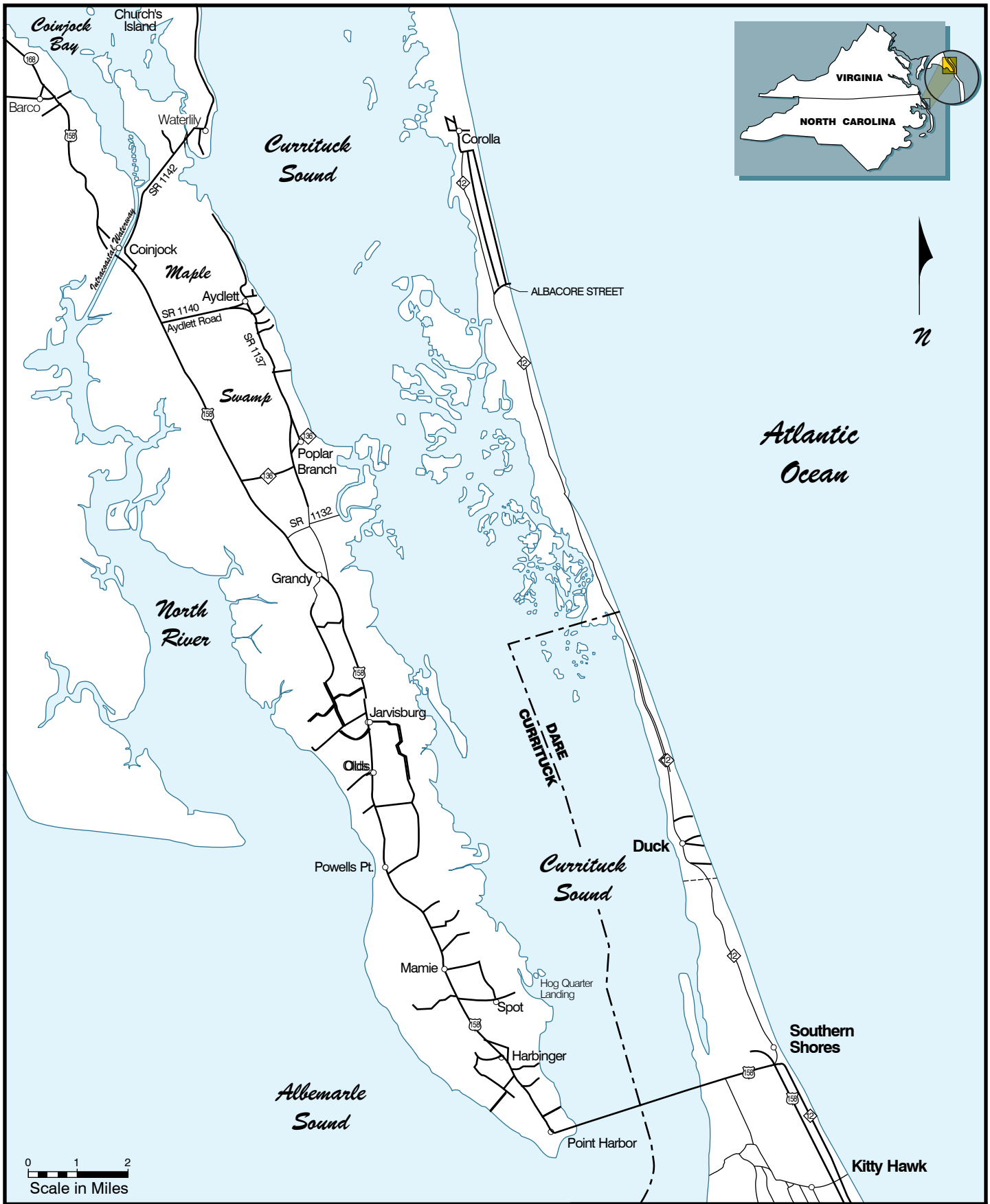
The North Carolina Turnpike Authority (NCTA), a division of the North Carolina Department of Transportation (NCDOT), in cooperation with the Federal Highway Administration (FHWA), is evaluating proposed transportation improvements in the Currituck Sound area. The project area is shown on Figure 1-1.

1.1.1 We propose to build a bridge across Currituck Sound from the mainland to the Outer Banks. Improvements to existing roads also are under consideration, both without a bridge and in association with a bridge.

The proposed action is included in NCDOT's *2009 to 2015 State Transportation Improvement Program* (STIP), the North Carolina Intrastate System, the *Strategic Highway Corridors Concept Development Repor*t (NCDOT, 2005), and the *Thoroughfare Plan for Currituck County* (NCDOT, 1999). In those plans, the proposed action is defined as a bridge across Currituck Sound from the mainland to the Outer Banks. When considering the construction of a major transportation investment, it is appropriate to review a range of reasonable alternatives. Thus, the detailed study alternatives evaluated in this DEIS include alternatives that involve improvements to the existing road network. The No-Build Alternative also is evaluated. These alternatives are described in Chapter 2.

1.1.2 The project area is in Currituck and Dare counties, North Carolina, and includes two existing thoroughfares, US 158 and NC 12.

The project area is in northeastern North Carolina and includes the Currituck County peninsula on the mainland and its Outer Banks, as well as a portion of the Dare County Outer Banks (see Figure 1-1). The project area encompasses two thoroughfares, US 158 from NC 168 to NC 12 (including the Wright Memorial Bridge) and NC 12 north of its



LEGEND

— - — County Boundaries

Project Area

Figure
1-1

intersection with US 158 to its terminus in Corolla. US 158 is the primary north-south route on the mainland. NC 12 is the primary north-south route on the Outer Banks. The Wright Memorial Bridge connects the mainland with the Outer Banks south of the proposed Mid-Currituck Bridge.

1.2 What needs is the project trying to meet?

The proposed action responds to three underlying needs in the project area:

- The need to substantially improve traffic flow on the project area's thoroughfares (US 158 and NC 12);
- The need to substantially reduce travel time for persons traveling between the Currituck County mainland and the Currituck County Outer Banks; and
- The need to reduce substantially hurricane evacuation times from the Outer Banks for residents and visitors who use US 158 and NC 168 as an evacuation route.

An improvement is considered substantial as opposed to minor if the improvement is great enough to be largely noticeable to typical users of the transportation system and if the improvement offers some benefit across much of the network, as opposed to offering only a few localized benefits. Alternatives that provide only minor or no improvement, as opposed to substantial improvement, would not meet the above needs.

These needs were identified through an iterative process that included several rounds of agency coordination and public involvement. These needs are based on the following travel conditions and planning activities:

The project area's main thoroughfares (US 158 and NC 12) are becoming increasingly congested, and congestion will become even more severe in the future.

The extent of the existing and expected congestion problems on US 158 and NC 12 in the project area can be summarized as follows:

- In the base year (2006), congestion occurs on almost all of NC 12 in the project area. The worst current congestion occurs on NC 12 just south of Southern Shores and Duck and on US 158 east of the Wright Memorial Bridge.
- In the design year (2035), travel demand will exceed the capacity of the road to handle that demand on almost all project area segments of NC 12 and US 158 east of the Wright Memorial Bridge during summer weekday and summer weekend conditions (approximately 29 miles). On the summer weekend, travel demand also will exceed road capacity on all US 158 segments between NC 168 and the eastern end of the Wright Memorial Bridge (an additional approximately 27 miles). When

demand exceeds capacity, heavy congestion occurs, and congestion occurs over more hours in the day.

- In 2035, on the summer weekday, on US 158 east of the Wright Memorial Bridge and NC 12 in Southern Shores and parts of Duck, travel demand is expected to be notably greater than the capacity of these roads for 6 to 7 hours per day. Demand is expected to be 81 percent above the capacity of US 158 and as much as 54 percent above the capacity of NC 12. Travel demand is how many vehicles want to travel on a road in an hour. Capacity is the number of vehicles a road can actually carry in an hour. If, for example, a road has the capacity to carry 10,000 vehicles in an hour and demand is 15,400 vehicles in an hour, then demand is 54 percent over capacity.

- In 2035, on the summer weekend, US 158 in Currituck County between NC 168 and the Wright Memorial Bridge will be congested for 10 to 11 hours a day, with demand 16 to 19 percent above the capacity of US 158.

- In 2035, on the summer weekend, US 158 east of the Wright Memorial Bridge and NC 12 in Dare County will be congested for 15 to 18 hours per day, with demand 117 percent of the capacity of US 158 and as much as 162 percent of the capacity of NC 12.

From the perspective of the thoroughfare network in 2035, the above factors will combine to result in an increase in the annual vehicle-miles of travel under congested conditions on US 158 and NC 12 from 5.4 million (2006) to 66.1 million (2035). Miles of road with travel demand at or exceeding road capacity in the summer is expected to increase from a weighted average (summer weekday versus summer weekend) of 3.9 miles to 22.9 miles between 2006 and 2035. For the same period, the weighted average miles where demand exceeds capacity by more than 30 percent in the summer is also expected to rise from zero to 6.3 miles.

Increasing congestion is causing travel time between the Currituck County mainland and the Currituck County Outer Banks to increase, especially during the summer.

As an example of travel time between the Currituck County mainland and the Currituck County Outer Banks, the 40.9-mile trip between Aydlett Road (SR 1140) at US 158 (on the Currituck County mainland) and Albacore Street (SR 1402) at NC 12 (on the Currituck County Outer Banks) was evaluated. This trip was selected as a representative trip from the Currituck County mainland to the Currituck County Outer Banks. Not all trips have this origin or destination.

The uncongested travel time for this representative trip, allowing for stops at signalized intersections, is approximately 1 hour. Under base year (2006) conditions, this trip takes approximately 1 hour and 8 minutes on a summer weekday, and approximately 1 hour and 42 minutes on a summer weekend. In 2035, travel time for this trip is expected to be just over 2 hours on the summer weekday and more than 3 hours and 53 minutes on the summer weekend. Increases in travel time would result from increasing peak period

congestion. These travel times would be even longer when accidents occur or if back-ups occur at signalized intersections.

Hurricane evacuation times for residents and visitors who use US 158 and NC 168 as a hurricane evacuation route far exceed the state-designated standard of 18 hours.

North Carolina's statewide hurricane evacuation clearance time standard is 18 hours (NC General Statutes § 136-102.7, "Hurricane Evacuation Standard"), which is applied to a Category 3 storm with 75 percent tourist occupancy. Clearance times begin when the first evacuating vehicle enters a roadway segment in a given evacuation corridor and ends when the last vehicle leaving the corridor reaches a point of safety.

The state standard was already exceeded at 27 hours in 2007 for evacuees leaving the Outer Banks via NC 168 and US 158. The 2035 clearance time is forecast to be approximately 36 hours with the No-Build Alternative, which is double the 18-hour standard.

1.3 What purpose will the project serve?

Given the needs described above, the purposes of the proposed action are:

- To substantially improve traffic flow on the project area's thoroughfares. Thoroughfares in the project area are NC 12 and US 158;
- To substantially reduce travel time for persons traveling between the Currituck County mainland and the Currituck County Outer Banks; and
- To reduce substantially hurricane clearance time for residents and visitors who use US 158 and NC 168 during a coastal evacuation.

The definition of "substantial" presented for the needs in Section 1.2 also applies to the three purposes.

2.0 Alternatives

This chapter describes the detailed study alternatives and the No-Build Alternative, as well as other alternatives considered but not selected for detailed study. It names a Recommended Alternative (MCB4) and explains why it is recommended. This recommendation could change; a preference will be identified related to several corridor or design options associated with the detailed study alternatives as a result of comments received from the public and regulatory agencies on this DEIS. This chapter is divided into the following sections:

- Description of the detailed study alternatives, beginning on page 2-2;
- Description of how the detailed study alternatives differ in their ability to meet the project's purpose and need, beginning on page 2-34;
- Description of the cost of each alternative and how each would be financed, beginning on page 2-35;
- Description of when and how each alternative would be built, beginning on page 2-38;
- Description of other alternatives considered but not selected for detailed study and why they were not selected, beginning on page 2-39; and
- An indication of the Recommended Alternative and why it is recommended, beginning on page 2-41.

Five detailed study alternatives are under consideration for implementation. They are named:

- ER2;
- MCB2/C1 (MCB2 using bridge corridor C1);
- MCB2/C2 (MCB2 using bridge corridor C2);
- MCB4/C1 (MCB4 using bridge corridor C1); and
- MCB4/C2 (MCB4 using bridge corridor C2).

The "ER" in ER2 stands for "Existing Roads." A Mid-Currituck Bridge is not included in this alternative, but only widening existing roads. The "MCB" stands for Mid-Currituck Bridge. MCB2 and MCB4 both include a Mid-Currituck Bridge and different amounts of improvements to existing roads. The bridge components of alternatives MCB2 and MCB4 are evaluated with two bridge corridor alternatives (C1 and C2). The "C" stands for "Central," as opposed to other corridor possibilities further north (N) and south (S).

For all five alternatives, two hurricane evacuation options are under consideration. For the four MCB2 and MCB4 alternatives, two design options also are under consideration for the mainland approach to the bridge over Currituck Sound (between US 158 and Currituck Sound).

The information included in this chapter is considered important to understanding the general characteristics of the detailed study alternatives and how they were selected. For readers desiring additional information on a particular topic, items contained on the compact disc (CD) that accompanies this DEIS, at public review locations listed in Appendix C, and on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/ are referenced in the text.

2.1 Describe the alternatives under consideration.

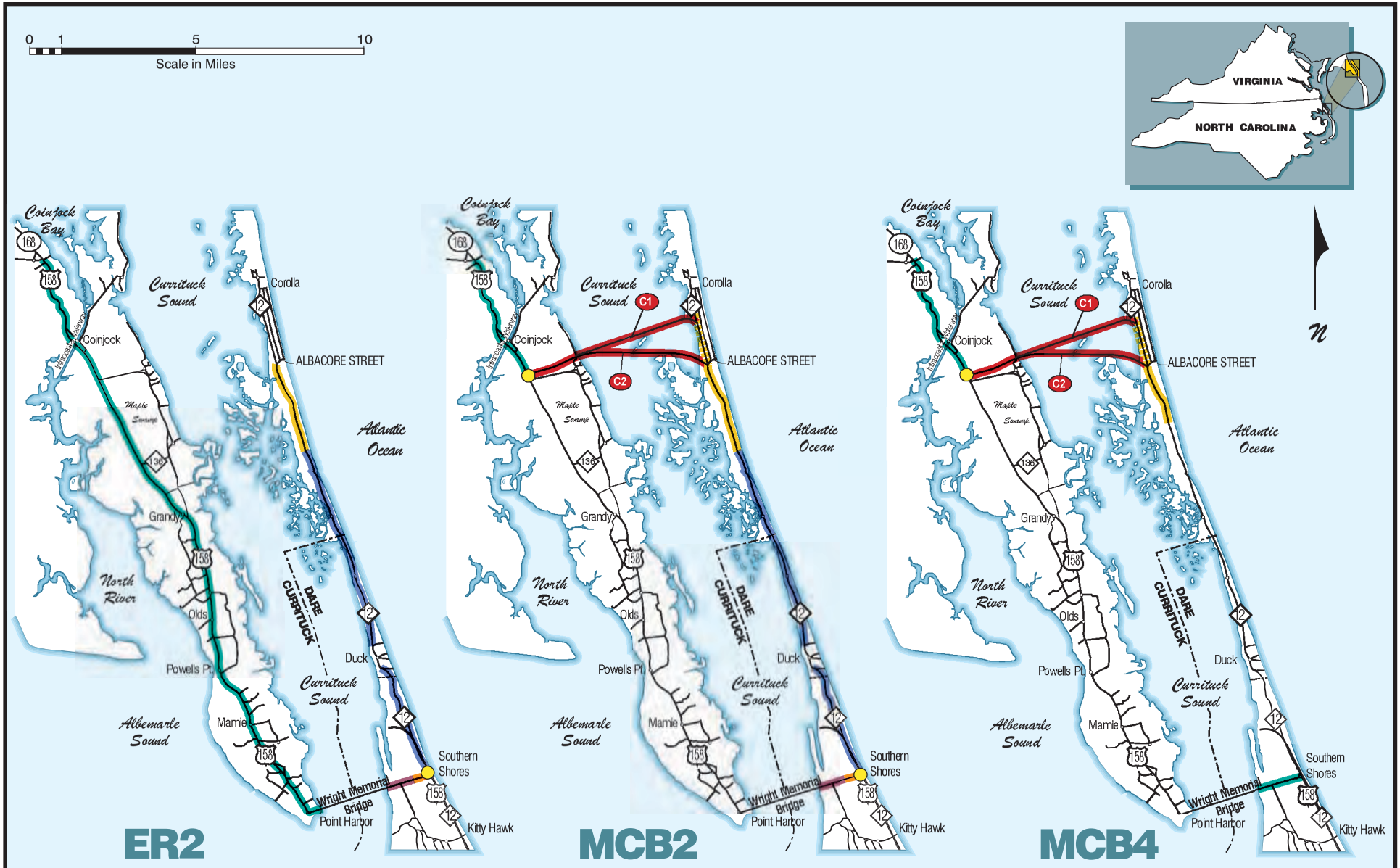
2.1.1 What alternatives are under consideration?

Five detailed study alternatives are under consideration for implementation. They are named ER2, MCB2/C1, MCB2/C2, MCB4/C1, and MCB4/C2. The No-Build Alternative also is under consideration. The detailed study alternatives are shown on Figure 2-1. The alternatives screening process used to determine these detailed study alternatives is described in the *Alternatives Screening Report* (Parsons Brinckerhoff, 2009).

For all five alternatives, two hurricane evacuation options are under consideration. For the four MCB2 and MCB4 alternatives, two design options (Option A and Option B) also are under consideration for the mainland approach to the bridge over Currituck Sound (between US 158 and Currituck Sound). When impacts differ between the mainland approach road design options (Option A and Option B), the names of the alternatives are augmented with an additional suffix. For example, MCB2 with mainland design Option B and the C1 corridor is referred to as MCB2/B/C1.

2.1.2 Where would the alternative transportation improvements occur and what would they include?

The location and key components of the five detailed study alternatives are shown on Figure 2-1. The following paragraphs describe these alternatives. The CD includes the combined corridor/design public hearing maps for each alternative. These maps will be displayed at the public hearings and are available at the public review locations listed in Appendix C and on the NCTA web site at http://www.ncturnpike.org/projects /Mid_Currituck. They present the design features of each detailed study alternative and were used to assess the impacts of the detailed study alternatives. A list of these maps is included in Appendix D.



LEGEND

- Eight Lanes (Super-street)
- Six Lanes (Super-street)
- Four Lanes
- Four Lanes (Only with C1)
- Three Lanes
- Mid-Currituck Bridge
- Third Outbound Lane (Contraflow of an existing lane is an option)
- C1 / C2 Bridge Corridor Alternatives
- Interchange

NOTE: Existing 3-lane segment of NC 12 in Duck is unchanged.

Detailed Study Alternatives

Figure

2-1

2.1.2.1 ER2

ER2 was developed to achieve maximum transportation benefits using the existing roadways, while minimizing impacts to communities along those roads. The basic features of ER2 are:

- Adding for evacuation use only, a third outbound evacuation lane (Figure 2-2) on US 158 between NC 168 and the Wright Memorial Bridge as a hurricane evacuation improvement or using the existing center turn lane as a third outbound evacuation lane; in either case one inbound lane on the Wright Memorial Bridge and on the Knapp (Intracoastal Waterway) Bridge would be used as a third outbound evacuation lane;

- Widening US 158 to a six-lane super-street (Figure 2-3) between the Wright Memorial Bridge and Cypress Knee Trail that widens to eight lanes between Cypress Knee Trail and the Home Depot driveway (both locations indicated are just west of the existing US 158/NC 12 intersection);

- Constructing an interchange (Figure 2-3) at the current intersection of US 158, NC 12, and the Aycock Brown Welcome Center entrance, including six through lanes on US 158 starting at the Home Depot driveway and returning to four lanes just south of Grissom Street (which is just south of the existing US 158/NC 12 intersection); and

- Widening NC 12 to three lanes (two travel lanes and a center lane for left turns; Figure 2-4) between US 158 and a point just north of Hunt Club Drive in Currituck County (except for the existing three-lane section in Duck, which will be unchanged) and to four lanes with a median from just north of Hunt Club Drive to Albacore Street (Figure 2-5).

As illustrated on Figure 2-3, the unique characteristic of a super-street is the configuration of the intersections. Side-street traffic wishing to turn left or go straight must turn right onto the divided highway where it can make a U-turn through the median a short distance away from the intersection. After making the U-turn, drivers can then either go straight (having now accomplished the equivalent of an intended left turn) or make a right turn at their original intersection (having now accomplished the equivalent of an intention to drive straight through the intersection).

2.1.2.2 MCB2

MCB2 involves construction of a Mid-Currituck Bridge, as well as improvements to existing NC 12 and US 158. MCB2 was developed to examine the travel benefits of combining a Mid-Currituck Bridge with substantial NC 12 and US 158 improvements. Thus, MCB2 includes the existing road improvements similar to ER2, plus a Mid-Currituck Bridge. The basic features of this alternative are:

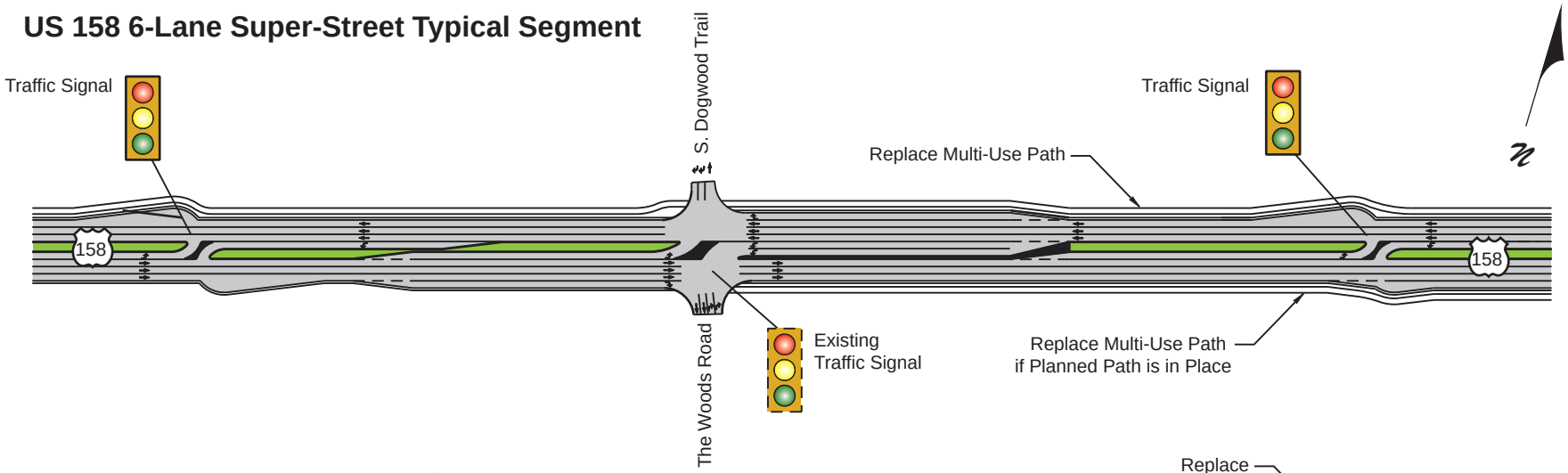
- Constructing a 7.0- to 7.5-mile-long two-lane toll bridge across Currituck Sound, with approach roads, in Currituck County;

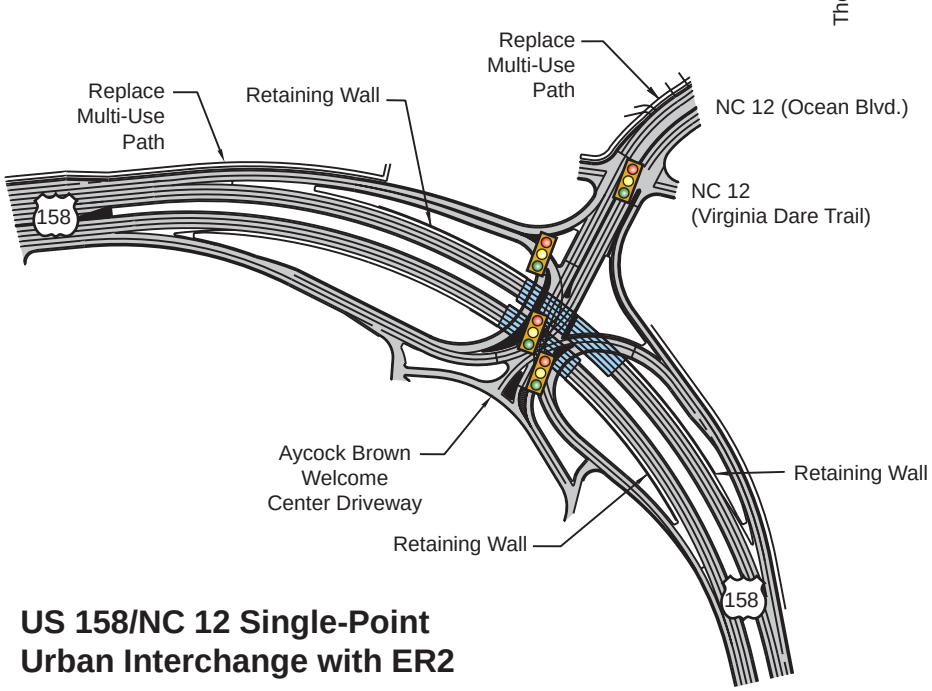
Existing/No-Build Alternative

Photo Simulation

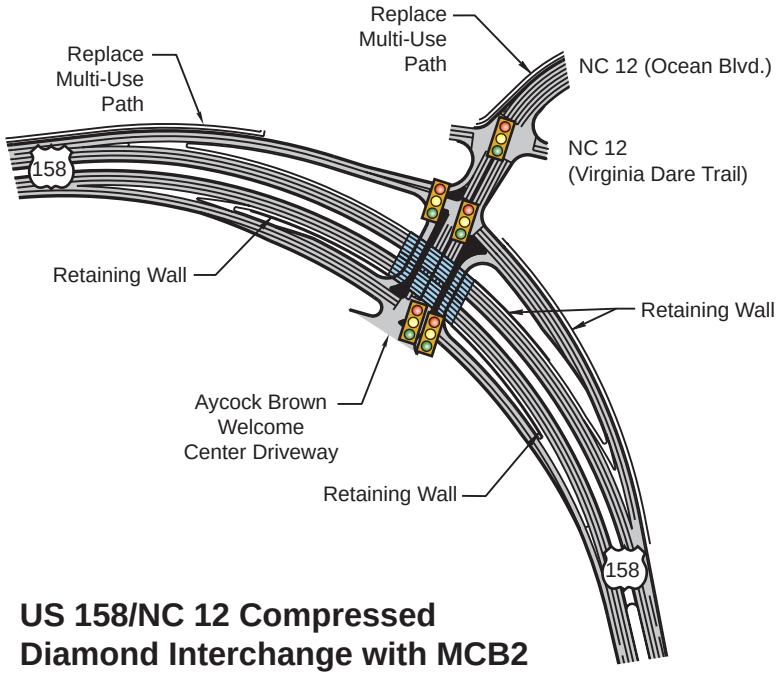
	US 158 Hurricane Evacuation Lane	**Figure** 2-2

US 158 6-Lane Super-Street Typical Segment





US 158/NC 12 Single-Point Urban Interchange with ER2



US 158/NC 12 Compressed Diamond Interchange with MCB2

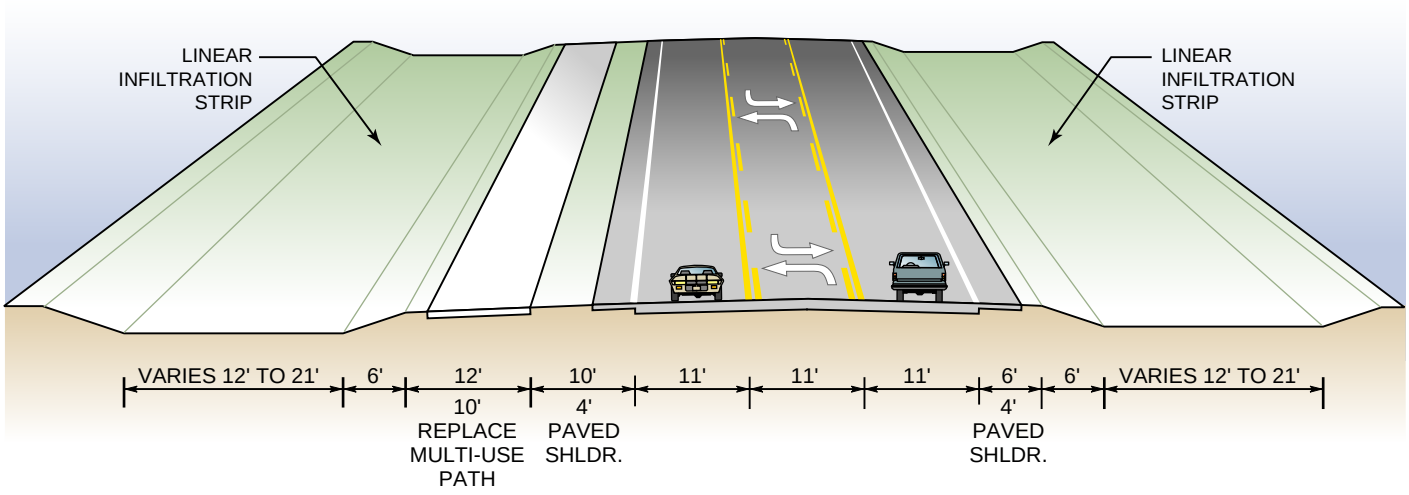
US 158 Super-Street and US 158/NC 12 Interchange

Figure 2-3

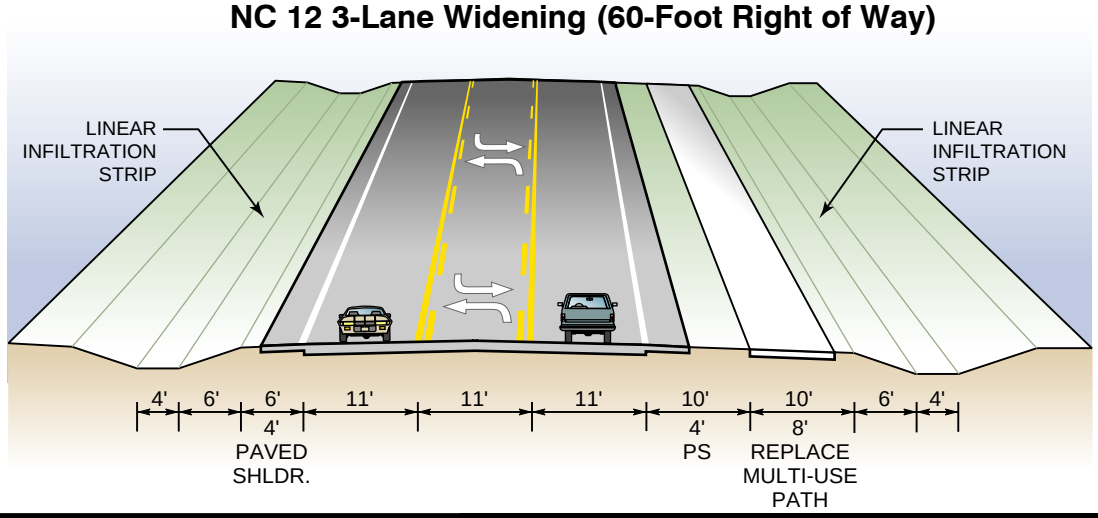
Existing/No-Build Alternative

Photo Simulation

NC 12 3-Lane Widening (90-Foot Right of Way)



NC 12 3-Lane Widening (60-Foot Right of Way)



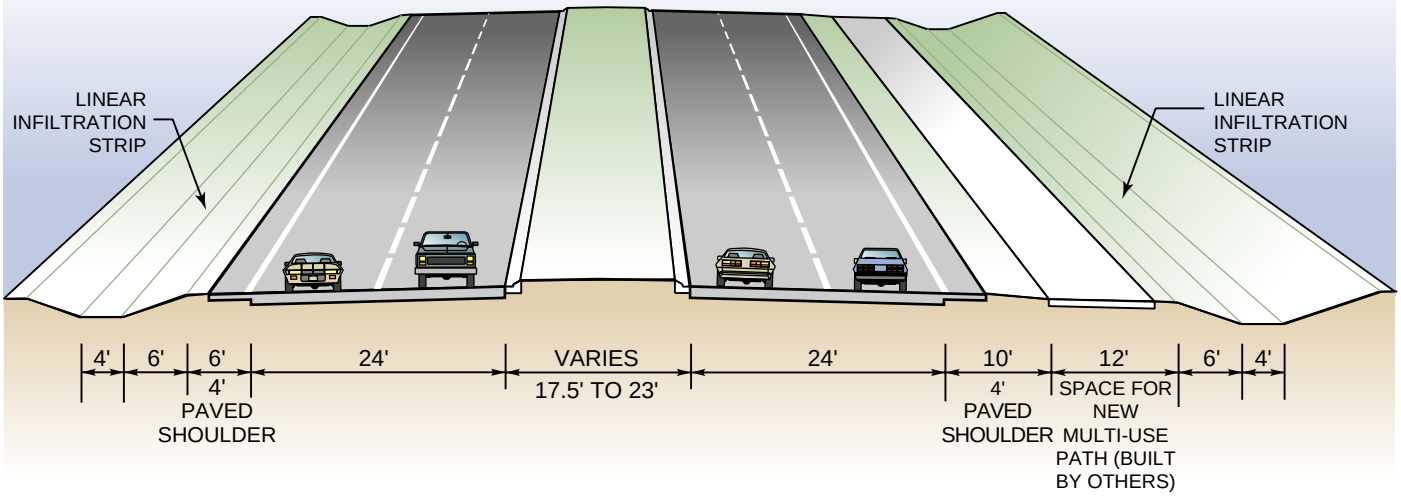
NC 12 Three-Lane Widening

Figure
2-4

Existing/No-Build Alternative

Photo Simulation

NC 12 4-Lane Widening



	NC 12 Four-Lane Widening	**Figure** 2-5

- Adding for evacuation use only, a third outbound evacuation lane on US 158 between NC 168 and the Mid-Currituck Bridge as a hurricane evacuation improvement (Figure 2-2) or using the existing center turn lane as a third outbound evacuation lane; in either case one inbound lane on the Knapp (Intracoastal Waterway) Bridge would be used as a third outbound evacuation lane;

- Widening US 158 to a six-lane super-street (Figure 2-3) between the Wright Memorial Bridge and Cypress Knee Trail and an eight-lane super-street between Cypress Knee Trail and the Home Depot driveway (both locations indicated are just west of the existing US 158/NC 12 intersection);

- Constructing an interchange (Figure 2-3) at the intersection of US 158, NC 12, and the Aycock Brown Welcome Center entrance, including six through lanes on US 158 starting at the Home Depot driveway and returning to four lanes just south of Grissom Street (which is just south of the existing US 158/NC 12 intersection); and

- Widening NC 12 to three lanes (two travel lanes and a center lane for left turns; Figure 2-4) between US 158 and a point just north of Hunt Club Drive in Currituck County (except for the existing three-lane section in Duck, which will be unchanged) and to four lanes with a median from just north of Hunt Club Drive to the NC 12 intersection with the Mid-Currituck Bridge (Figure 2-5).

2.1.2.3 MCB4

MCB4 involves construction of a Mid-Currituck Bridge, as well as limited improvements to existing NC 12 and US 158. MCB4 was considered in order to identify the extent to which network congestion and travel time could be improved, as well as other associated benefits, if only a Mid-Currituck Bridge were built. Limited existing road improvements were added to MCB4 to ensure that southbound traffic stopped at traffic signals on NC 12 would not queue back onto the bridge on the summer weekend. The basic features of this alternative are:

- Constructing a 7.0- to 7.5-mile-long, two-lane toll bridge across Currituck Sound, with approach roads, in Currituck County;

- Adding for evacuation use only, a third outbound evacuation lane on US 158 between NC 168 and the Mid-Currituck Bridge as a hurricane evacuation improvement (Figure 2-2) or using the existing center turn lane as a third outbound evacuation lane; in either case one inbound lane on the Knapp (Intracoastal Waterway) Bridge would be used as a third outbound evacuation lane;

- Adding for evacuation use only, a third outbound evacuation lane on US 158 between the Wright Memorial Bridge and NC 12 as a hurricane evacuation improvement or using the existing center turn lane as a third outbound evacuation lane; in either case one inbound lane on the Wright Memorial Bridge would be used as a third outbound evacuation lane; and

- Widening NC 12 to four lanes with a median (Figure 2-5) from Seashell Lane to the NC 12 intersection with the Mid-Currituck Bridge.

2.1.2.4 MCB2 and MCB4 Corridor Alternatives and Design Options

For MCB2 and MCB4, two bridge corridors were evaluated in detail. The locations of the two Outer Banks termini, C1 and C2 (see Figure 2-1 and Figure 2-6), are:

- Corridor C1 on the mainland would be between Aydlett Road (SR 1140) and approximately 500 feet north of the power line that parallels Aydlett Road. On the Outer Banks, C1 would end at the southern end of the Corolla Bay subdivision. C1 would connect with NC 12 at an intersection approximately 2 miles north of the Albacore Street retail area. The length of the proposed Mid-Currituck Bridge would be approximately 7.0 miles with C1.

- Corridor C2 on the mainland would include the same area as C1 and on the Outer Banks would end near Albacore Street (SR 1402). C2 would connect with NC 12 approximately 0.5 mile south of the Albacore Street retail area. The length of the proposed Mid-Currituck Bridge would be approximately 7.5 miles with C2.

For MCB2 and MCB4, two design options (Option A and Option B) also are under consideration for the mainland approach to the bridge over Currituck Sound (between US 158 and Currituck Sound). The options are shown on Figure 2-7.

- Option A would place a toll plaza within the US 158 interchange (see Figure 2-8). The mainland approach road to the bridge over Currituck Sound would include a bridge over Maple Swamp. Drivers traveling between US 158 and Aydlett would continue to use Aydlett Road. In Aydlett, the two-lane approach road would pass through Aydlett on fill (approximately 3 to 23 feet high) and bridge Narrow Shore Road.

- With Option B, the US 158 interchange would not include the toll plaza (see Figure 2-9). The approach to the bridge over Currituck Sound would be a road placed on fill within Maple Swamp. Wildlife passages would be incorporated into the fill. The preliminary design developed to assess impacts includes five wildlife passages: two bridges with 180-foot spans at the east and west sides of the swamp, a 12-foot by 8-foot box culvert at the center of the swamp, and two 43-inch by 68-inch pipes for passage of reptiles and amphibians. Exclusionary fencing along the road also is assumed.

  Also with Option B, Aydlett Road would be removed and its right-of-way restored as a wetland. Traffic traveling between US 158 and Aydlett would use the new bridge approach road. Within Aydlett:

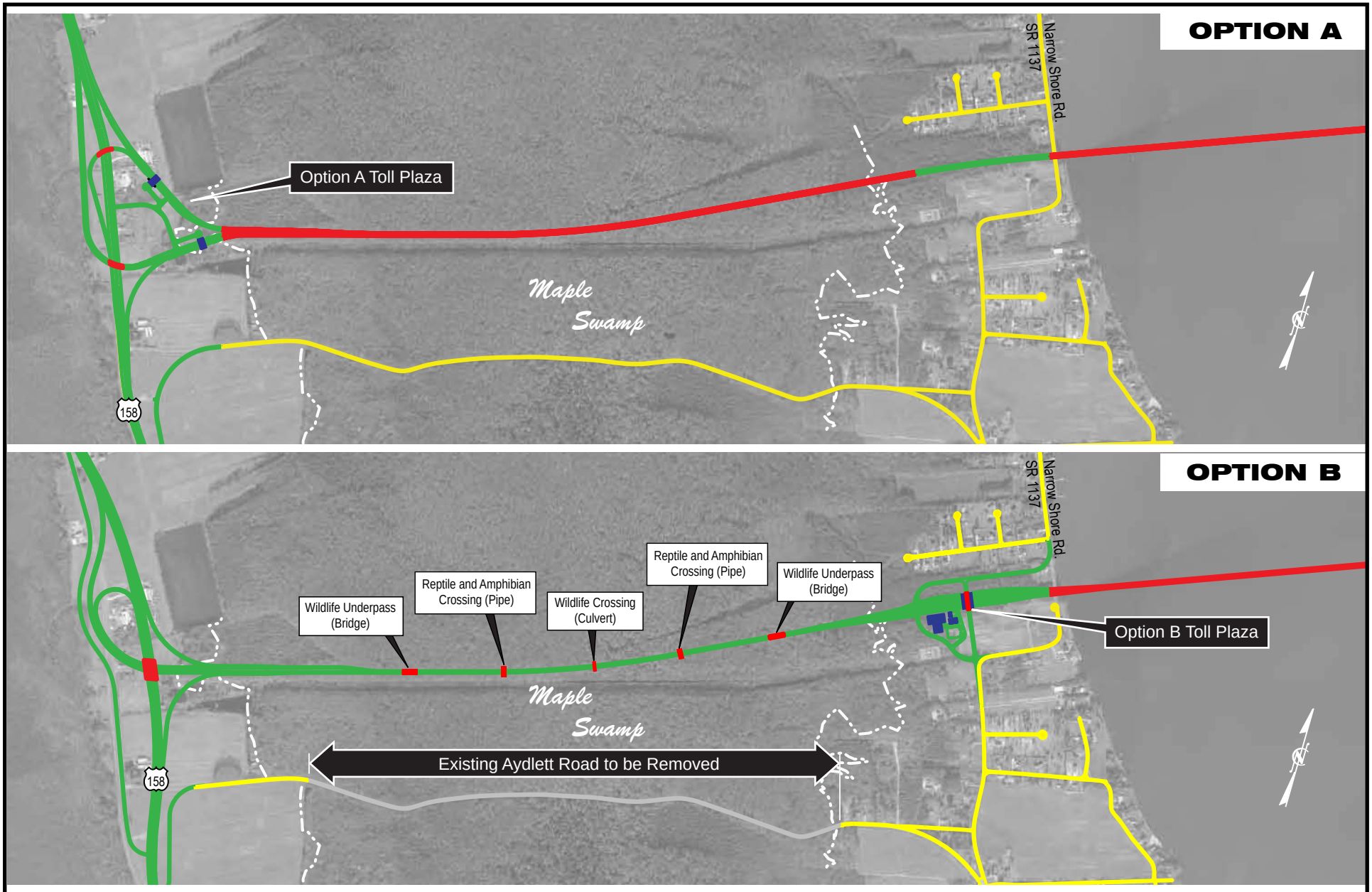
  – A local connection would be provided between the bridge approach road and the local Aydlett street system.

Bridge Corridor C1 Photo Simulation

Bridge Corridor C2 Photo Simulation

Outer Banks Terminus Alternatives

Figure
2-6



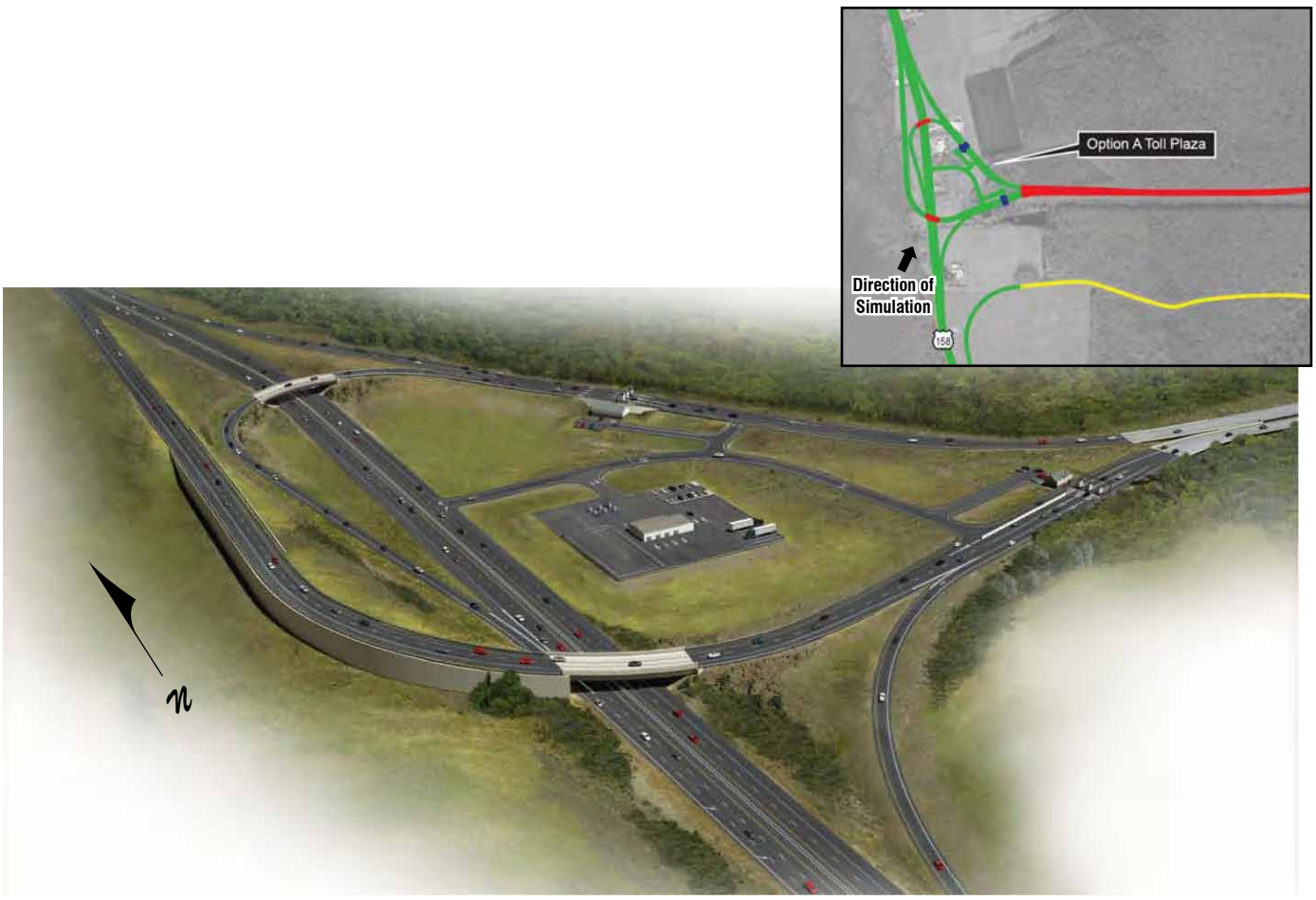
LEGEND

- Existing Road
- Proposed and Improved Existing Road
- Proposed Toll Plaza and Buildings
- Proposed Bridges and Other Structures
- Maple Swamp Boundary

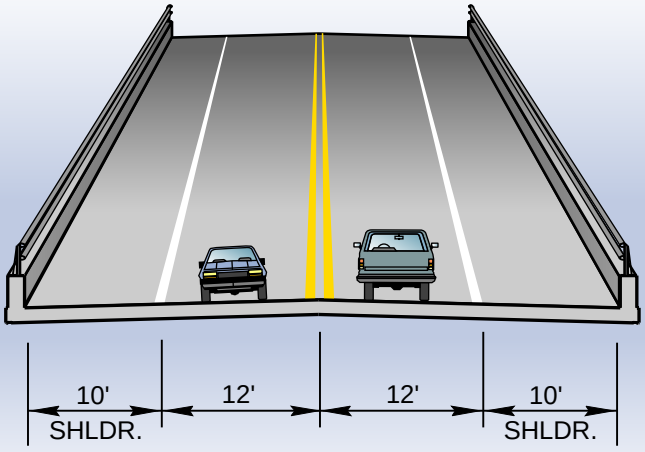
Design Options A and B

Figure

2-7



US 158/Mid-Currituck Bridge Option A Interchange Simulation



Mid-Currituck Bridge Typical Section

	US 158/Mid-Currituck Bridge Interchange (Option A) and Mid-Currituck Bridge Typical Section	**Figure** 2-8

US 158/Mid-Currituck Bridge Interchange (Option B)

Figure
2-9

- The local road system would be reconfigured, including dead-ending Narrow Shore Road at the point where the bridge begins and replacing it with an overpass over the toll plaza and a frontage road parallel to the north side of the toll plaza. The bottom of the bridge span for the overpass would be approximately 25.5 feet above existing ground at its highest point over the toll plaza. The frontage road would be approximately 21 feet above existing ground at its highest point where it would intersect with the overpass.

- The toll plaza would be placed in Aydlett east of the local road connection so that Aydlett traffic would not pass through the toll plaza when traveling between US 158 and Aydlett.

- No access to and from the Mid-Currituck Bridge would be provided in Aydlett.

The characteristics of Option A and Option B in Aydlett are shown on Figure 2-10.

The preliminary designs used for assessing impacts are designed to accommodate forecast travel demand so traffic is not congested during the summer weekday in 2035 with two exceptions:

1. As discussed in Section 2.2, three lanes on NC 12 (ER2 and MCB2) would not eliminate congestion on the summer weekday. However, as discussed in Section 2.5, four lanes in areas of Southern Shores, Duck, and Currituck County where NC 12 has only a 60-foot right-of-way would cause substantial displacement of homes and businesses. Such levels of displacement were not considered prudent or practicable by NCTA or environmental resource and regulatory agencies as discussed in the *Alternatives Screening Report* (Parsons Brinckerhoff, 2009).

2. The Mid-Currituck Bridge interchange at US 158 and its intersection with NC 12 are designed to operate at uncongested levels even on the summer weekend.

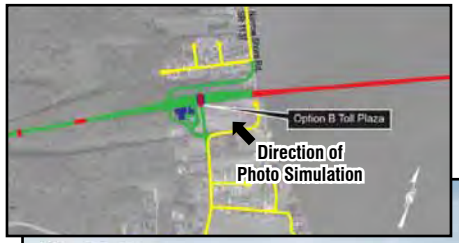
Traffic improvements are seldom designed to eliminate completely the worst hours of congestion. Thus, except for the second exception noted above, the detailed study alternatives were not designed to handle all summer weekend congestion in 2035, which will occur only 26 days a year on the 13 summer weekends.

2.1.2.5 No-Build Alternative

The No-Build Alternative assumes that the proposed project would not be implemented. However, the No-Build Alternative includes the following projects listed in NCDOT's 2009 to 2015 STIP within or near the project area because these projects are considered to be reasonably foreseeable planned improvements (i.e., improvements expected to occur independent of the alternatives being assessed for the proposed project):

- **Project No. R-2545**—Widen US 64 to multi-lanes from east of Columbia to east of the Alligator River;

Option A - Aydlett Area Photo Simulation



Option B - Aydlett Area Photo Simulation

Mid-Currituck Bridge at Aydlett (Option A and Option B)

Figure
2-10

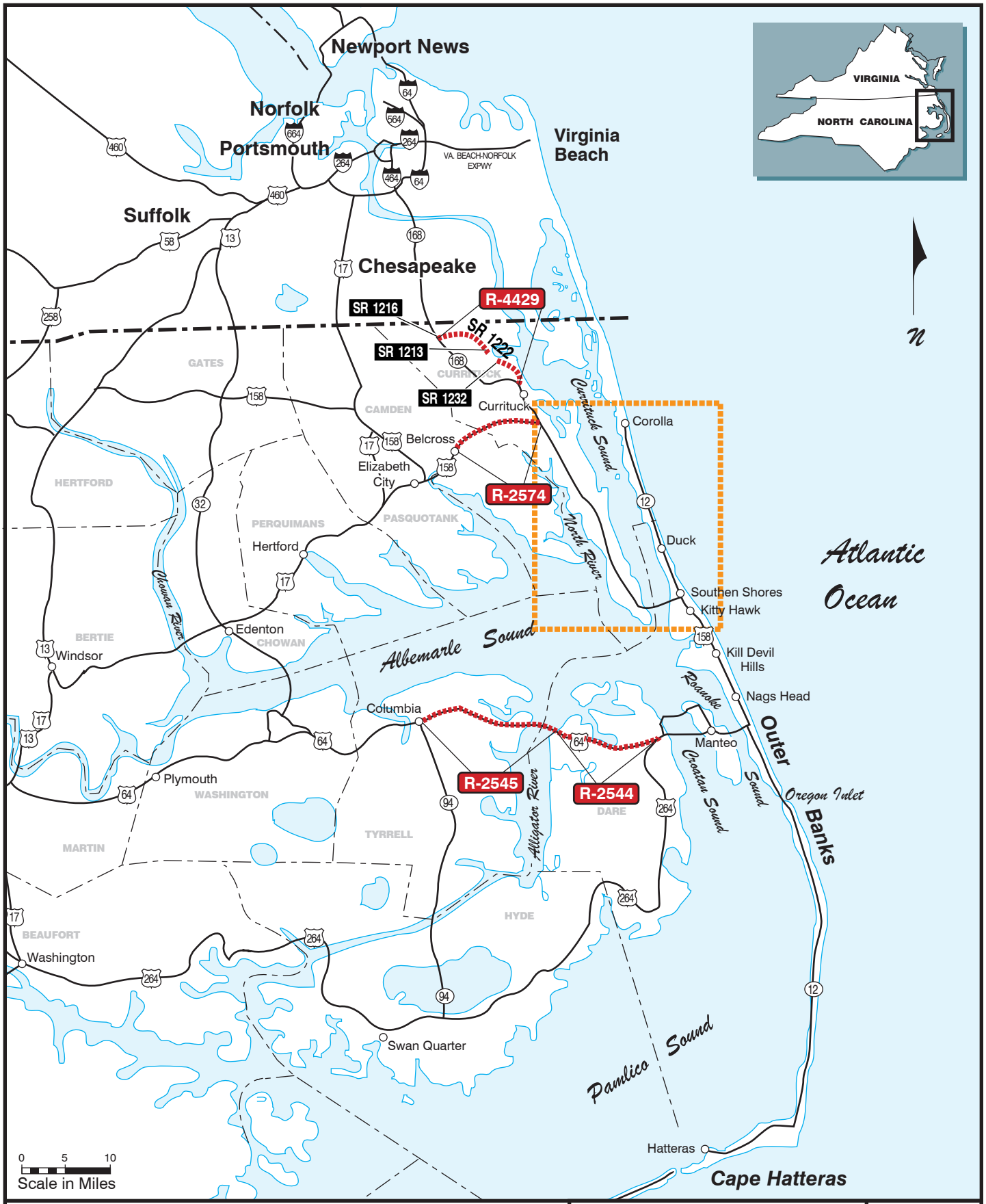
- **Project No. R-2544**—Widen US 64 to multi-lanes from east of the Alligator River to US 264;
- **Project No. R-2574** —Widen US 158 to multi-lanes from east of NC 34 at Belcross in Camden County to NC 168 in Currituck County; and
- **Project No. R-4429** —Upgrade SR 1222 from NC 168 to north of SR 1232 and from SR 1213 to SR 1216.

Figure 2-11 shows the locations of these STIP projects.

2.1.3 How many lanes would a Mid-Currituck Bridge include, and how tall would the bridge be?

The preliminary designs for MCB2 and MCB4 assume a two-lane Mid-Currituck Bridge. The typical section for such a bridge is shown on Figure 2-8. The decision to evaluate a two-lane bridge, rather than a four-lane or a three-lane bridge, was based on level of service, travel time, safety, and cost. Bridge lane studies (see the *Alternatives Screening Report;* Parsons Brinkerhoff, 2009) found that the 2035 travel time across a two-lane bridge would be 1.4 minutes greater than a four-lane bridge on the summer weekday at 10.1 minutes. Travel time on a two-lane bridge would be 2.2 minutes greater than with a four-lane bridge on the summer weekend at 11.1 minutes. This difference would not warrant the over $120 million in additional bridge cost for four lanes. A three-lane bridge would provide additional capacity by reversing the center lane during periods of peak demand. This procedure would be needed only on the 26 summer weekend days. The additional capital cost would be $80 million; lane reversing equipment would need to be stored, maintained and require a trained staff. It was found that 1.9 minutes would be saved, a time not substantial enough to warrant the cost and effort required. The preliminary designs, however, assume the purchase of sufficient right-of-way to allow additional lanes to be constructed, if needed, at some future date.

Both bridges over Maple Swamp and Currituck Sound, as well as fill across Maple Swamp with mainland approach road Option B, would be above the 100-year Base Flood Elevation or storm surge. At this time, it is assumed that a Mid-Currituck Bridge would have a single navigation span. Additional coordination with the US Coast Guard on this topic will occur after selection of the Preferred Alternative (see Project Commitment #1) to determine minimum horizontal and vertical clearances. The navigation span for a Mid-Currituck Bridge is currently assumed to be near the mainland where Currituck Sound tends to be deeper (9 feet), but the final location would be determined in association with the US Coast Guard.



LEGEND

- STIP Project Locations
- Mid-Currituck Bridge Project Area

STIP Projects in the No-Build Alternative

Figure

2-11

2.1.4 Why are interchanges included in the detailed study alternatives?

Two interchanges are included in the detailed study alternatives. MCB2 and MCB4 include an interchange where the Mid-Currituck Bridge and its toll plazas intersect with US 158 (Figure 2-8 and Figure 2-9). ER2 and MCB2 include an interchange at the intersection of US 158 and NC 12 (Figure 2-3).

Interchanges are needed at these locations because forecast year 2035 peak period traffic demand is great enough that, without an interchange, traffic on US 158 would back-up in queues. A signalized intersection was considered at both locations, but 2035 peak period demand is forecast to be great enough that not everyone on US 158 who would want to pass through the intersection could make it through during the time the light is green. When more people arrive at an intersection than can be passed through in a single green light cycle, those who do not get through must wait until the next green light cycle. As each green light cycle passes with demand exceeding green time, the vehicles that are waiting their turn to move through the intersection increase in number, and queues grow until demand drops below the capacity of the intersection.

The US 158/Mid-Currituck Bridge interchange preliminary design for MCB2 and MCB4 is sized to avoid queuing or back-ups from the toll plazas onto US 158, even on the 2035 summer weekend. The interchange configuration used for both Option A and Option B would provide desired capacity and minimize wetland impacts.

The two US 158/NC 12 interchange designs are sized to avoid queuing onto US 158 during the 2035 summer weekday. The US 158/NC 12 interchange with ER2 is designed to handle more traffic than the interchange with MCB2. This is because the Mid-Currituck Bridge associated with MCB2 would reduce traffic demand on US 158 by diverting travelers from US 158 to the Mid-Currituck Bridge. Thus, the US 158/NC 12 interchange would need to handle less traffic. MCB4 includes no interchange because its objective is to improve traffic flow in the project area with a Mid-Currituck Bridge and minimize existing road improvements.

MCB2 uses a compressed diamond interchange, as illustrated on Figure 2-3. It is called a diamond interchange because the combination of US 158 and its ramps form a diamond shape. Traffic signals are used at the ends of each set of ramps. ER2 uses a single point interchange. It is like a diamond except the four ramps are angled to come together at a single traffic signal. More traffic can pass through a single point interchange in one hour than a compressed diamond interchange. In either case, US 158 would pass over the connection to NC 12 and the Aycock Brown Welcome Center on an elevated structure with a minimum vertical clearance of 15.5 feet. Digging down into the ground to place US 158 under the connection to NC 12 is not feasible. The water table is only a few feet below ground, so a depressed road would easily fill with water. Also, during a storm, the storm surge would fill the depressed road with water, even if pumps were used to pump out rain water, potentially blocking travel during evacuation and then recovery after a storm.

2.1.5 What intersections would have traffic signals?

Existing traffic signals on US 158 and NC 12 would be retained at all locations except at a US 158/NC 12 interchange. With ER2 and MCB2, traffic signals also would be at U-turn locations on the US 158 super-street. Traffic signals also would be placed at the end of US 158/NC 12 interchange ramps where turns onto NC 12 would occur. Finally, with MCB2 and MCB4, traffic signals would be placed where a Mid-Currituck Bridge intersects with NC 12.

2.1.6 How would access to private property and subdivisions be changed?

The changes in local street and driveway access associated with the detailed study alternatives are shown in Table 2-1. The general locations of the streets and landmarks noted in Table 2-1 are shown on Figure 2-12. The least change in local street and driveway access would be with MCB4/C2. This is the case because this alternative would involve the least miles of capacity improvements to US 158 and NC 12. The capacity improvements that would reduce future congestion on these two thoroughfares (benefiting travelers on those roads) also would introduce changes to local street and driveway connections to those roads.

With Option A, there would be the potential for merging traffic from the US 158 interchange to wait to merge into US 158 until just before the intersection of US 158 and Waterlily Road. This would increase the challenge of turning left into or out of Waterlily Road during peak travel periods. An approach for resolving this complication without restricting Waterlily Road turning movements would be included in the final design. With Option B, the interchange ramp would end approximately 1,800 feet south of Waterlily Road, so there would be no impact to existing conditions at the Waterlily Road intersection.

As illustrated on Figure 2-3, the super-street included on US 158 with ER2 and MCB2 would alter left-turn patterns from side streets. For the NC 12 three-lane design, some intersections of NC 12 and state-maintained roads would be closed to reduce the number of locations where drivers would slow to make turns. This is only done at subdivisions with more than one state-maintained access point to NC 12. Provisions for emergency vehicles to continue to reach residents through the former intersections would be included. The four-lane preliminary designs for NC 12 include a median with breaks at approximately 1,200-foot intervals, varying somewhat depending on the spacing of existing intersections. The median's limiting of left turns at all but major intersections would greatly reduce traffic interferences associated with drivers stopping in the travel lanes to make left turns. The access changes listed are shown in detail on the public hearing maps included on the CD, at public review locations listed in Appendix C, and on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/. At locations where left turns would be prohibited, provisions would be made as needed for those desiring to make left turns to make instead U-turns at nearby intersections before or after a right turn. This is generally accomplished in the form of a

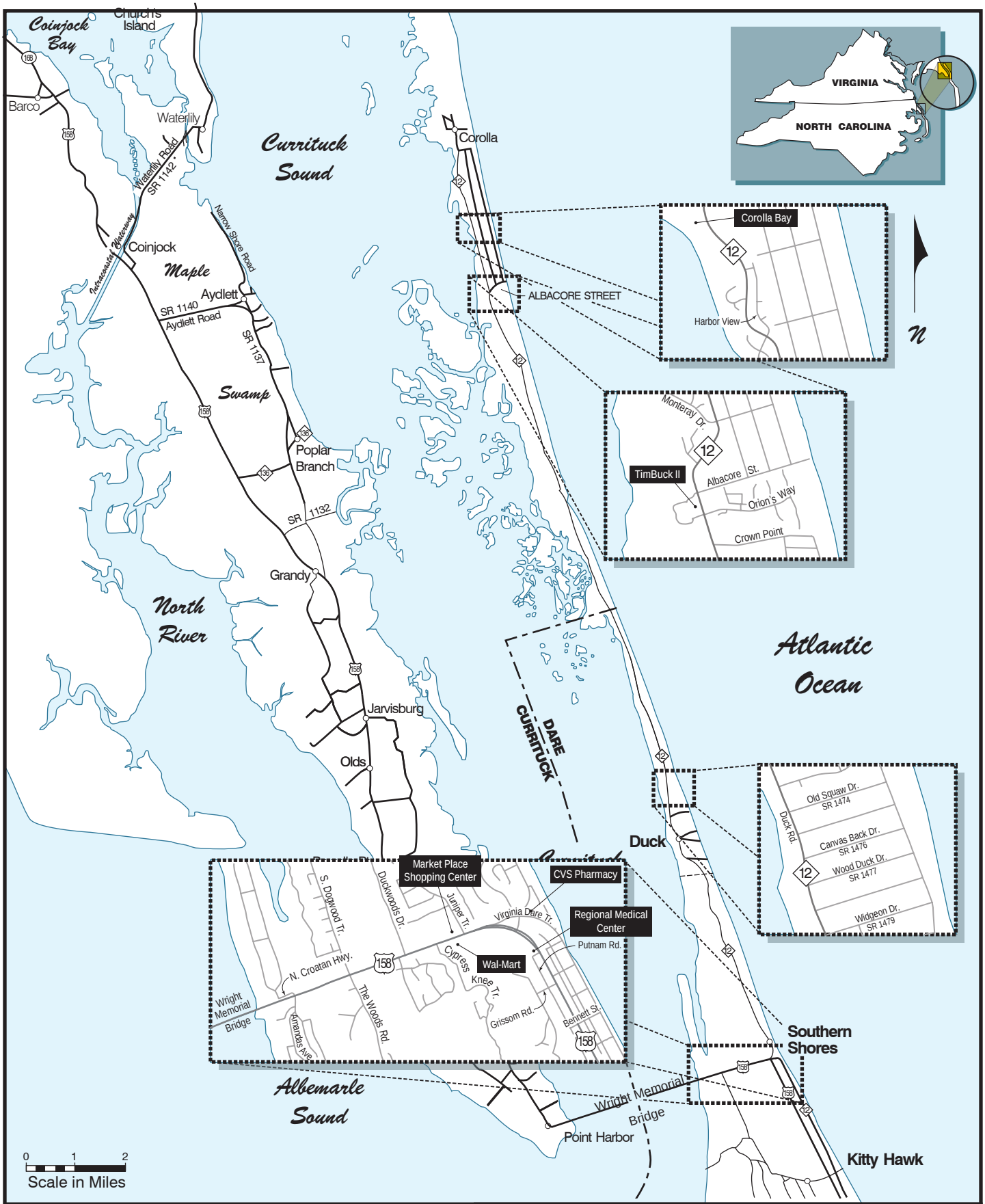
Table 2-1. Changes in Access

	Applicable Alternative				
	ER2	MCB2/ C1	MCB2/ C2	MCB4/ C1	MCB4/ C2
Mainland, US 158 Frontage Roads: For one house and one business along the eastern side of US 158 just south of Waterlily Road, access to US 158 provided via a frontage road to Waterlily Road instead of direct driveway access to US 158. With Option B only, a frontage road is provided along the western side of US 158 adjacent to the US 158/Mid-Currituck Bridge interchange to provide access to properties in this area that currently have direct access to US 158. Direct access from US 158 would be lost for customers of a gas station near the end of the frontage road. With Option A, no upland is available for a frontage road and thus properties west of US 158 that lose their access to US 158 would be purchased.		X	X	X	X
Mainland, US 158/Waterlily Road Intersection: With Option A, there would be the potential for merging traffic from the US 158 interchange to wait until just before the intersection to merge into US 158. This would increase the challenge of turning left into or out of Waterlily Road during peak travel periods. With Option B, the interchange ramp would end approximately 1,800 feet south of Waterlily Road, so there would be no impact to existing conditions at the Waterlily Road intersection.		X	X	X	X
Mainland in Aydlett: With Option B, existing Aydlett Road through Maple Swamp removed. Access between US 158 and Aydlett provided from the Mid-Currituck Bridge approach road. Narrow Shore Road altered to pass over the toll plaza, which would be in Aydlett with Option B only. With Option A, no changes to Aydlett access or the local street system. No access in Aydlett to and from the Mid-Currituck Bridge with either option.		X	X	X	X
Direct access to the Outer Banks (at NC 12) from the mainland (at US 158) via a Mid-Currituck Bridge.		X	X	X	X
Outer Banks, US 158 between the Wright Memorial Bridge and NC 12: Left turners from Amandas Avenue, North Croatan Highway, South Dogwood Trail, The Woods Road, Duck Woods Drive, Cypress Knee Trail, Juniper Trail, Wal-Mart Shopping Center, and the Market Place Shopping Center would need to turn right and make a U-turn at a signalized location.	X	X	X		

Table 2-1 (concluded). Changes in Access

	Applicable Alternative				
	ER2	MCB2/ C1	MCB2/ C2	MCB4/ C1	MCB4/ C2
Outer Banks, US 158 South of NC 12 to Bennett Street:: On the east side of US 158, the CVS pharmacy would only have access off of NC 12. With ER2, drivers would have to access CVS via NC 12 south of US 158/NC 12 interchange. For two other businesses and residential properties, driveway access to US 158 would be closed, with access only from an alley behind the properties. On the west side of US 158, the Regional Medical Center main access would be closed, with full access being allowed at Grissom Street via Putnam Road.	X	X	X		
Outer Banks, NC 12 at US 158: With ER2, from the eastbound off ramp of US 158 to NC 12 northbound, right turns to NC 12 south (Virginia Dare Trail) would be prohibited. Drivers would reach this part of Virginia Dare Trail via NC 12 south of US 158/NC 12 interchange.	X				
Outer Banks, NC 12 in Dare County: Since some subdivisions are served by more than one street, intersections with NC 12 would be closed at Widgeon Drive (SR 1479), Wood Duck Drive (SR 1477), Canvas Back Drive (SR 1476), and Old Squaw Drive (SR 1474) to facilitate NC 12 traffic flow.	X	X	X		
Outer Banks, NC 12 in Currituck County South of Albacore Street: No left turns to or from Crown Point. No left turn from southernmost entrance of TimBuck II to NC 12 with ER2, MCB2/C1, and MCB4/C1; no left turns to or from southernmost entrance of TimBuck II with MCB2/C2 and MCB4/C2. No left turns from Orion's Way to NC 12. Provisions made for left turners to make U-turns at adjoining intersections.	X	X	X	X	X
Outer Banks, NC 12 in Currituck County North of Albacore Street: Either no left turns from or no left turns to NC 12 from business driveways between Albacore Street and Monteray Drive. Provisions made for left turners to make U-turns at adjoining intersections. Corolla Bay subdivision divided with no direct access between the two parts. NC 12 would need to be used to travel between the two parts. The northern intersection of Harbor View with NC 12 closed. The southern intersection would remain open.		X		X	

Note: Access changes on the streets indicated are shown on the public hearing maps included on the CD, at public review locations listed in Appendix C, and on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/.



LEGEND

— - — County Boundaries

Streets and Landmarks Noted in Table 2-1

Figure

2-12

widened pavement (U-turn bulb) that would allow most U-turns to be made in a single movement. Opportunities to mitigate access changes further would be considered during final design.

2.1.7 What road and bridge drainage provisions would be included in the detailed study alternatives?

Existing road drainage patterns and typical road drainage systems are assumed in association with improvements to US 158 associated with the detailed study alternatives. The accommodation of drainage on NC 12 was a focus in developing the preliminary designs along NC 12, both because a wider NC 12 would generate more runoff and because road flooding would continue to occur on NC 12 during storm events without improvement. Consideration of means for handling drainage from the Mid-Currituck Bridge also received additional focus.

2.1.7.1 NC 12 Drainage

NC 12 is in a topographic (rise and fall of the land) depression along much of the roadway within the project area. To the east, the dune area along the coastline forms a ridge line. Similarly, to the west, the land generally rises near Currituck Sound. As a result, NC 12 is in a topographic "bathtub." In addition, there are no streams providing for water discharge, or other outlets for runoff, except in those locations where NC 12 is adjacent to Currituck Sound. Under existing conditions, stormwater runoff makes its way to low areas and eventually infiltrates into the ground. In some places the road itself is the low point, and thus there are parts of NC 12 that experience chronic flooding problems. Other complicating factors include the groundwater elevation, which is near the surface (in some places within 2 feet), and the extensive land development that has occurred along NC 12, particularly in the towns of Southern Shores and Duck.

The preliminary designs for NC 12 with the detailed study alternatives generally use infiltration strategies for the majority of the project, along with a limited number of outfalls to Currituck Sound. Infiltration strategies involve locations for water to be absorbed into the ground rather than be transported to and released into a water body like Currituck Sound. The infiltration strategies would include infiltration basins and linear infiltration strips (roadside ditches). Infiltration basins and linear infiltration strips would remain dry except during and after storms. These volume-based Best Management Practices (BMPs) would be sized to store temporarily the runoff from a 10-year storm. The infiltration strategies closely replicate existing drainage patterns, while improving storage capacity during the infiltration process. The specific approach to be taken varies along the roadway corridor for the NC 12 widening alternatives.

The typical sections shown on Figure 2-4 and Figure 2-5 illustrate the location of proposed linear infiltration BMPs along each side of the road. The wide infiltration strips illustrated on Figure 2-4 are only used in the southern part of Southern Shores (from just north of the US 158 interchange area to Ocean Boulevard). Here the adjoining properties drain to NC 12, and NC 12 is flat. Therefore, the infiltration strips would be

up to 21 feet wide on each side of the road to capture and store the water from both NC 12 and the surrounding properties during the infiltration process. Elsewhere, the linear infiltration strips are narrow, as illustrated on Figure 2-5. In Dare County where surrounding properties also drain to the road but NC 12 rises and falls with the terrain, these strips are designed to convey water to low points and new infiltration basins. Most of the basins or ponds could be put on currently vacant property. In Currituck County, development generally drains away from the road, so the infiltration strips only need to accommodate road drainage. Thus, infiltration would generally be accomplished in the strip without water being conveyed to new basins. In most cases, infiltration strips would be placed outside the NC 12 right-of-way in a permanent drainage easement, with the right to maintain the strip purchased from the land owner. The owner would retain all other ownership rights.

2.1.7.2 Bridge Drainage

The preliminary designs assume that bridges over Currituck Sound and Maple Swamp would drain directly into Currituck Sound and Maple Swamp. Drainage would not be captured and treated to remove motor vehicle pollutants. The water quality impact assessment in Section 3.3.1.4 takes this into account. If done, the first inch of runoff from the bridges could be captured and treated in one of two ways (described below). A third approach would capture and treat only runoff over coastal marshlands. All approaches would involve additional cost. Further consideration of capturing and treating the first inch of runoff would be accomplished when finalizing mitigation measures should MCB2 or MCB4 be selected for implementation (see Project Commitment #3). Considerations would include cost, practicality, affordability, NCDOT policy on stormwater treatment as applied to other projects, and the environmental benefits gained compared to the investment made.

Option 1

The first option would involve creating high points on the bridges over Maple Swamp (Option A) and Currituck Sound. This would allow the bridges to drain to the bridge termini via a pipe system where runoff from the bridge deck could be directed to stormwater treatment BMPs, such as stormwater wetlands or wet detention basins. To accomplish this using a uniform minimum 0.3 percent slope, the height of the Mid-Currituck Bridge's deck would need to be 71 to 79 feet at its highest point, compared to the 23-foot bridge deck height assumed in the preliminary design assessed in this DEIS. A piping system (with pipe sizes ranging from 15 to 24 inches in diameter) would need to be added to the bridges to carry water off the bridge and to the shore. If the first inch of runoff were captured and transported, resulting in the removal of 85 percent of the total suspended solids, the capacity of the piping system and on-shore treatment system would need to handle up to 144,000 cubic feet of water (for bridges over Maple Swamp [Option B] and Currituck Sound).

Stormwater wetlands would need to be constructed to replicate natural wetlands using physical, chemical, and biological processes to treat runoff and provide temporary storage of runoff in shallow pools to support vegetation. They would be approximately

2 acres in total size on the mainland and 2 acres on the Outer Banks. Wet detention basins of approximately 1 acre on the mainland and 1.2 acres on the Outer Banks also would be required.

The installation cost of the collection piping for the bridges over Maple Swamp and Currituck Sound, including the piping and support hardware, could exceed $10 million (in year of expenditure dollars). In addition to the costs for piping and piping support hardware, a substantial bridge cost increase would result because of the taller bridge piers required to achieve the 0.3 percent profile grade. Many of the piers in Currituck Sound would be as much as three times taller. As a result, the substructure costs would be considerably higher with Option 1. Finally, future maintenance of the collection system for this option would be complicated because access to the piping would be difficult.

Option 2

The second option would treat runoff from the bridge deck using filter devices on the bridge itself rather than conveying runoff to the ends of the bridges on the mainland and Outer Banks. The bridge design would need to be modified to allow a minimum longitudinal slope of 0.3 percent so that bridge deck runoff would find its way to the regularly spaced filter units. This would introduce periodic high and low points in the bridge profile, rather than creating a single high point as in the first option.

Catch basins would be required on approximately every other span. These basins would be made of fabricated thin steel plates and would remain partially full of water at all times. As a result, the self-weight of a single basin would be nearly 5,000 pounds. The basins would likely rest on an extension of the bent cap (i.e., the cap on top of the bridge support piles upon which the bridge spans are placed) and be in full view of persons viewing the bridge. Water would be piped to the basins. The catch basins would require routine cleaning, and the filters would require replacement on a regular basis.

Some of the piers would need to be taller with this option, but not to the extent of those used in the first option. Therefore, the structural costs for this option would be less than the first option, but more than with a flat bridge. Aside from the difference in structural costs associated with the height, there also would be an initial cost associated with the installation of the filter system. Based on a delivered cost estimate for 275 catch basins, as well as the cost of the additional structural components that would be required to support the basins, the estimated total cost to install the basins would be approximately $10 million (in year of expenditure dollars). Additionally, future maintenance of the catch basins would be required, including routine cleaning and replacement of the filters (performed every one to three years), as well as an annual inspection and inspection after every major storm. The annual cost of maintaining the catch basins on the bridge (including the cost for inspections, support equipment, personnel, traffic control, etc.) would be approximately $200,000 (in 2009 dollars). These rough cost estimates were based on conversations with a supplier of this system and would change based on a preliminary design and further research.

Option 3

This option would use the 0.5 percent slope of the bridge's Outer Banks approach span (i.e., the sloped bridge segment that brings the bridge down to grade) to allow bridge runoff over the sensitive coastal marsh on the Outer Banks (adjacent to the Currituck Sound shoreline) to be collected and transported to off-site treatment sites such as stormwater wetlands or wet detention basins. For C1, the sensitive coastal wetlands crossed by the bridge corridor would be completely under the bridge's approximately 590-foot-long Outer Banks approach span, so a runoff collection pipe matching the slope of the bridge approach span could be hung from the bridge to collect runoff. For C2, the length of the Outer Banks approach span would be approximately 773 feet, so a substantial portion of the sensitive coastal wetlands crossed by the bridge corridor would be under the sloped segment of the bridge where a runoff collection pipe matching the slope of the bridge could be used to collect the runoff. However, there are an additional approximately 452 feet of coastal wetlands (between the shoreline and the start of the approach span) that would be under a flat segment of the bridge. To collect the runoff in this area, the runoff collection pipe could be hung from the bridge with a slight slope (i.e., the hangers on the western end of the pipe would be shorter than those on the eastern end) until the pipe ties into the sloped pipe within the approach span.

For the balance of the bridge, bridge runoff would drop directly into Currituck Sound through bridge scuppers as is assumed in the preliminary design assessed in this DEIS. The installation cost of the collection piping in the area over the sensitive coastal wetlands, including the piping and support hardware, could be approximately $1 million (in year of expenditure dollars).

2.1.8 Where would additional right-of-way be required to widen existing roads?

All of the detailed study alternatives involve widening existing roads to some extent. Preliminary designs were developed for the super-street on US 158 between the Wright Memorial Bridge and NC 12, the interchange at US 158 and NC 12, three and four lanes on NC 12, and six lanes on US 158 with the intent to minimize the purchase of new right-of-way and the potential impact to adjoining land uses. Additional lanes and provisions for pedestrians and bicyclists generally would be confined to the existing right-of-way. The third outbound lane for hurricane evacuation generally would make use of existing rights-of-way. Some new right-of-way would be purchased:

- At two points along US 158 with ER2 and one point with MCB2 and MCB4, new right-of-way would be purchased with a third outbound lane for hurricane evacuation. In general, a temporary construction easement would be purchased along the full length of US 158, generally both sides of the road south of the Knapp (Intracoastal Waterway) Bridge and generally one side of the road north of the Knapp Bridge.

- At a few points along NC 12 in Dare County with ER2 and MCB2 behind retaining walls and for infiltration basins (see Section 2.1.7.1). In general, a permanent

drainage easement would be purchased along NC 12 in both counties as described in Section 2.1.7.1.

- On the south side of US 158 east of the Wright Memorial Bridge with ER2 and MCB2.

- North of the Knapp (Intracoastal Waterway) Bridge to accommodate construction of the third outbound emergency lane with all of the detailed study alternatives.

As mentioned above, some temporary construction easement would be purchased, giving NCTA the right to disturb private property contained within the easement. The area disturbed would be restored at the end of construction, and the owner would retain all property rights after construction is complete.

The relationship between pavement, multi-use paths, permanent drainage easements, and existing right-of-way is illustrated in the typical sections presented on Figure 2-3 through Figure 2-5. These relationships are shown in detail on the public hearing maps on the CD, at public review locations listed in Appendix C, and on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/.

2.1.9 How would bridges be designed to minimize impacts to wetlands on the mainland and Outer Banks?

The Option A preliminary design assumes that wetlands associated with Maple Swamp would be bridged. With Option B, fill would be placed in Maple Swamp, a wetland. Wildlife passages would be incorporated into the fill. Also with Option B, Aydlett Road would be removed and its right-of-way restored to a wetland to mitigate for the fill used to cross Maple Swamp with this option. With both the C1 and C2 alternative Outer Banks termini, wetlands along the sound side of the Outer Banks would be bridged.

2.1.10 Why are hurricane evacuation improvements needed on US 158, and how would they work?

US 158 between the Wright Memorial Bridge and NC 168 is the controlling road link or bottleneck when it comes to hurricane evacuation (as described in *Statement of Purpose and Need* [Parsons Brinckerhoff, 2008]). The only way to reduce hurricane clearance times in the project area is to add additional evacuation capacity on US 158.

The locations of hurricane evacuation capacity improvements associated with the detailed study alternatives are shown as green lines on Figure 2-1. As noted in Section 2.1.2, these improvements could be done in two ways, adding a third outbound lane for evacuation use or using the existing center turn lane on US 158 for outbound travel during an evacuation. Under either approach to providing additional evacuation capacity on US 158, the inner inbound lane would be reversed to create a third outbound lane at the Knapp (Intracoastal Waterway) Bridge (ER2, MCB2, and MCB4) and the

Wright Memorial Bridge (ER2 and MCB4). Because of the high cost, no new lanes would be added to those bridges.

ER2 includes 27 miles of new pavement for a third outbound hurricane evacuation lane or use of the center turn lane (including the Knapp Bridge and Wright Memorial Bridge); MCB2 includes 5 miles of new pavement (including the Knapp Bridge); and MCB4 includes 9 miles of new pavement (including the Knapp Bridge and Wright Memorial Bridge). Also, as noted in Section 2.1.2 and illustrated on Figure 2-1, a Mid-Currituck Bridge would eliminate the need for additional emergency outbound capacity between the Wright Memorial Bridge and the Mid-Currituck Bridge. This is the case because the Mid-Currituck Bridge would capture a substantial amount of evacuating traffic from the Currituck County Outer Banks, reducing the demands placed on US 158 between the Wright Memorial Bridge and the Mid-Currituck Bridge. This is why MCB2 and MCB4 would require fewer evacuation improvements than ER2. MCB2 would require less improvement specifically for evacuation than MCB4 because MCB2 includes a super-street east of the Wright Memorial Bridge that would provide additional evacuation capacity.

The addition of a third outbound lane would require a capital investment for the additional pavement. Reversing the existing center turn lane would require an investment in additional personnel during an evacuation and additional equipment to facilitate the evacuation. An estimate of required equipment and police squads with the two options for ER2, MCB2, and MCB4 is shown in Table 2-2.

Table 2-2. Equipment and Highway Patrol Squads

Alternative	Addition of Third Outbound Lane				Reversing Lane Operations			
	Cones	Drums	Changeable Message Signs	Highway Patrol Person-Hours	Cones	Drums	Changeable Message Signs	Highway Patrol Person-Hours
ER2	123	3,923	12	717	123	4,268	13	840
MCB2	167	519	5	57	167	864	6	180
MCB4	167	1.835	12	507	167	2,180	13	630

2.1.10.1 Third Outbound Lane Operations

As shown on Figure 2-2, the proposed third outbound lane for hurricane evacuation would be on the right edge of the roadway separated from the two existing outbound travel lanes by a solid white stripe (indicating that it is not an additional through lane). The hurricane evacuation lane would serve as a paved shoulder during normal traffic operations, and there would be periodic pavement markings indicating that it is for hurricane evacuation use only (a hurricane symbol is being considered as shown on Figure 2-2). In addition, a series of flip signs would be installed to indicate that the

hurricane evacuation lane is not for through traffic during normal traffic operations. If required in specific locations where regular parking is found to occur in the lane, "no parking" signs could be added.

During a hurricane evacuation, traffic would be allowed to utilize the paved shoulder as a through lane. The flip signs would be "flipped" to indicate that the third lane should be utilized. In addition to the three outbound evacuation lanes, the two inbound lanes and the existing center turn lane would remain open and fulfill their normal function. Highway patrol and other public safety officials would be needed (as well as cones, variable message signs, and other equipment) at transitions to reverse one inbound lane on the Knapp (Intracoastal Waterway) Bridge, one inbound lane on the Wright Memorial Bridge (see Section 2.1.10.3), and at signalized intersections.

2.1.10.2 Reversing Lanes Operations

With this option for hurricane evacuation, traffic cones or barrels would be placed on the left side of the center turn lane to reserve the lane for outbound traffic. In the inbound direction, a second set of cones would be placed between the two inbound lanes. The outermost inbound lane would remain open to traffic, but the inner lane would serve as a refuge for emergency vehicles or other equipment, as well as provide a buffer between outbound and inbound traffic.

Accomplishing this pattern of lane use would create traffic management challenges. These challenges would be the greatest with ER2 because the lane reversal would occur over a much longer distance (27 miles) than with MCB2 (5 miles) or MCB4 (9 miles in two sections). These challenges would include:

- Although designated for outbound traffic, traffic would still need to turn in and out of the turn lane, slowing and sometimes stopping outbound movements in the turn lane. This is why the clearance time benefits in year 2035 of reversing lanes are less than with adding a third outbound lane (see Section 2.2). In addition, at major intersections (both signalized and possibly high volume unsignalized intersections), highway patrol officers would be required to aggressively control traffic flow and allow for left turning vehicles.

- Compared to the third outbound lane option, the setup and takedown of this approach to evacuation would require higher levels of personnel to distribute and collect the cones, barricades, and other equipment needed to reverse the center turn lane. This could require placing some equipment prior to the official evacuation orders. Timing of the equipment takedown could be problematic for an extensive reversible lane system. Equipment and personnel must be evacuated prior to the onset of gale force winds.

These challenges are considered by local emergency evacuation officials to be important factors in considering using reversing lanes as a hurricane evacuation strategy (see Section 2.1.10.4).

2.1.10.3 Reversing Lanes on the Knapp and Wright Memorial Bridges

Both hurricane evacuation improvement options include the need for reversing one inbound lane on the Knapp (Intracoastal Waterway) Bridge to create the needed emergency roadway capacity. In addition, ER2 and MCB4 would require reversing a southbound lane on the Wright Memorial Bridge. This would not be needed with MCB2 because the combination of the six-lane super-street and the diversion of some evacuating traffic to a Mid-Currituck Bridge would permit the merging of traffic down from three to two outbound lanes east of the Wright Memorial Bridge.

Knapp Bridge

At the southern approach to the Knapp Bridge, the two right-most lanes would be directed to the existing two outbound lanes, and the left-most lane would be transitioned over to the inner inbound lane. This transition would require cones, variable message signs, and other equipment in addition to highway patrol and other safety management officials.

On what are normally the inbound lanes, cones (and/or barrels) would be closely spaced along the white dashed stripe to differentiate between outbound and inbound flow. Reduced speed limits would be imposed to reduce the possibility of high-speed head-on collisions. Because of narrow cross-sections on the bridge, highway patrol and tow trucks would be stationed at both ends of the bridge to respond to emergencies.

A similar transition to what occurred on the south end of the bridge would be applied on the north end beyond where an existing barrier separates the two directions of travel. Cones, variable message signs, and other equipment also would be provided in this transition area.

Wright Memorial Bridge

At the southern approach to the Wright Memorial Bridge, traffic would pass through a transition area where the existing lanes are split. The two right lanes would be directed to the existing outbound bridge, and the left-most lane would be transitioned over to the inbound bridge. This transition would require cones, barricades, variable message signs, and other equipment in addition to highway patrol and other safety management officials. Intersections near or within the transition areas would either be closed or manually controlled by the highway patrol.

On what is normally the inbound Wright Memorial Bridge, cones (and/or barrels) would be closely spaced to differentiate between outbound and inbound flow along the white dashed stripe. Like the Knapp Bridge, reduced speed limits would be imposed. Again, because of narrow cross-sections on the bridge, highway patrol and tow trucks would be stationed at both ends of the bridge to respond to emergencies.

A similar transition to what occurred on the south end of the bridge would be applied on the north end. Instead of splitting the traffic onto different bridges, traffic would be transitioned back into the three outbound evacuation lanes. Cones, barricades, variable message signs, and other equipment again would be provided in the transition area.

2.1.10.4 Observations by Local Emergency Management Officials

Conversations were held with local emergency management officials at meetings on May 8, 2008, and May 11, 2009, to discuss their current evacuation procedures and the hurricane evacuation alternatives. These meetings included representatives from Currituck and Dare counties, NCDOT Division 1, and the NC Highway Patrol. This group had the following observations:

- Some type of contraflow or a third outbound additional lane would be needed sometime in the future, although not necessarily at this time.

- At such time as a third outbound lane is needed, the addition of a third lane for emergency use rather than reversing the center turn lane was their preference.

- The 27-mile lane reversal associated with ER2 would be a massive undertaking that would be beyond what local personnel from the counties, NCDOT, and the Highway Patrol could handle in terms of:

  – Equipment set-up and take-down; and

  – Controlling traffic turning to and from intersecting roads such that turns could be made in a timely manner without disrupting outbound flow.

  Thus, reversing lanes for 27 miles is not a realistic option, leaving for ER2 only adding a third outbound lane as a reasonable strategy for reducing hurricane evacuation times by increasing road capacity along US 158.

- The shorter 5 miles with MCB2 and 9 miles in two segments with MCB4 could be accomplished and is a reasonable strategy for reducing clearance times. However, it would be a challenge and other options would be considered in addition to reversing lanes before making a decision to reverse lanes. Other options might include diverting some evacuees to US 64 (the only other route off of the Outer Banks) or ordering an evacuation earlier than would be preferred.

- Reversing lanes would create a constriction point for inbound travelers, who would then operate in one lane instead of two. This would be the case with both options because they both include reversal of an inbound lane on the Knapp Bridge and/or the Wright Memorial Bridge. The shorter the distance inbound travel would have available only one lane, the less of a potential challenge this would be.

2.1.11 How would the detailed study alternatives accommodate bicyclists and pedestrians?

As illustrated on Figure 2-4 and Figure 2-5 for NC 12, existing multi-use paths for bicyclists and pedestrians affected by any of the detailed study alternatives would be replaced in kind, along both US 158 and NC 12. The Town of Kitty Hawk plans to build (it is currently being designed) a multi-use path on the south side of US 158 in Kitty Hawk. This path is assumed to be displaced and replaced with ER2 and MCB2. In

Currituck County between Caldwell Road and the end of the project, there is currently no multi-use path. Space for a multi-use path in this area is provided in association with the NC 12 widening being considered in that area. Currituck County could provide the funds (or share in the cost per NCDOT pedestrian policy guidelines) to build the path in the context of NC 12 widening or choose to build it at a later date.

Existing marked pedestrian crossings of NC 12 in Southern Shores would be restored if NC 12 is widened in Southern Shores.

It is customary on bridges in North Carolina to assume that bicyclists and pedestrians would use the bridge shoulder. With this in mind, the Mid-Currituck Bridge typical section shown on Figure 2-8 shows a 10-foot wide shoulder on the bridge and a bicycle-safe rail. Potential additional provisions for bicyclists and pedestrians could include:

- Exclusive lane for pedestrians and bicyclists

  An exclusive lane or multi-use path for pedestrians and bicyclists has been suggested for the bridge. Such a lane could be provided in one of two ways. Both would involve widening the bridge piers and adding up to two additional lines of girders spanning the bridge piers. One option would be an integrated system where the added lane is part of the bridge deck. Essentially, the bridge would be built approximately 12 feet wider to accommodate a 10-foot-wide path and a barrier between the path and the rest of the bridge. A second option would be to mount decking and rails comprised of fiber reinforced recycled plastic lumber on the additional two lines of girders. Either option would increase bridge costs by approximately 25 percent (approximately $53 to $58 million in year of expenditure dollars) over costs with the typical section shown in Figure 2-8. The cost estimates presented in Section 2.3 for MCB2 and MCB4 include that higher cost.

- Bridge and bridge approach road lighting for pedestrians and bicyclists

  Lighting the bicycle and pedestrian accommodations also has been suggested. A potential option for lighting the bridge and its approaches appears to be the use of light emitting diode (LED) sources mounted at a low level on the bridge structure (integrated or adjacent to the rail and/or guardrail for lighting the pedestrian accommodations) or on low height poles (approximately 12 to 14 feet) for accommodations adjacent to bridge approach roads. Lighting of this type:

  – Is energy efficient;

  – Offers source variability, including spectral selection, dimming capabilities, and optical control; and

  – Is vibration tolerant and has a good operating life.

  Low-level lighting is desirable because it would not include lighting structures on the bridge, would minimize potential light spill (e.g., lighting trespass, sky glow, and

glare) and would minimize associated environmental impacts. Solar power panels could provide power. Such panels should be connected to the electrical grid to provide compensatory power as needed. The least expensive way to connect the panels to the grid would be to place them on the shore of Currituck Sound. At this location, the panels would comprise an area of approximately 6,000 square feet. Construction costs for such a lighting system would be approximately $6 million (in year of expenditure dollars), which includes all hardware, poles, wiring and distribution system. A conventional lighting system using, for example, high pressure sodium lights would cost approximately twice as much.

- Parking lot on the Outer Banks as a starting point for pedestrians and bicyclists using the bridge.

  A parking lot on the Outer Banks to serve those who want to bicycle or walk on the bridge has been suggested. The use of a permeable pavement system has been suggested for the lot. Permeable pavements produce less stormwater runoff and introduce fewer pollutants to the environment, minimizing impacts on water quality. Water falling on the lot would directly infiltrate into the soil. The use of permeable pavement is feasible. Several different designs are feasible, including porous asphalt or concrete, as well as interlocking block pavers (opening for drainage is created as the pavers are placed) or grid pavers (opening for drainage is cast into the paver). Two permeable pavement parking lots that would accommodate 20 to 30 vehicles (excluding the land) would cost approximately $250,000 (in year of expenditure dollars).

Should MCB2 or MCB4 be selected for implementation, the pedestrian and bicycle features described above would be considered further during project design, if adequate funds are available. (See Project Commitment #2.) The cost estimates presented in Section 2.3 include the cost of all of the special provisions listed above.

2.2 Describe how the detailed study alternatives differ in their ability to meet the project's purpose and need

All of the detailed study alternatives would meet the project purpose and need to varying degrees, as shown in Table 2-3. Key differences are:

- MCB2, which includes both the Mid-Currituck Bridge and substantial improvements to existing roads, would have the greatest traffic flow benefits and ER2 would have the least;

- MCB2 also would have the greatest travel time benefits because the Mid-Currituck Bridge (which is included in both MCB2 and MCB4), along with the substantial improvements to existing roads, would offer the greatest total travel time savings for many travelers between the Currituck County mainland and its Outer Banks; ER2 would have the least travel time benefits; and

Table 2-3. Travel Benefits of Detailed Study Alternatives

	No-Build	ER2	MCB2	MCB4
2035 Traffic Flow Benefits				
Congested Annual Millions of Vehicle-Miles Traveled (VMT)				
• Total Congested VMT (millions)	66.1	51.4	31.4	40.2
• VMT with Traffic Demand at or Above Road Capacity (millions)	60.6	44.4	5.3	17.7
• VMT with Traffic Demand 30 Percent or Above Road Capacity (millions)	15.8	8.9	0.0	4.9
Miles of Road Operating with Traffic Demand at or Above Road Capacity				
• Summer Weekday (SWD)	14.7	5.9	0.0	5.7
• Summer Weekend (SWE)	43.5	39.0	4.8	11.7
• Weighted Average of SWD & SWE	22.9	15.4	1.4	7.4
Miles of Road with Traffic Demand 30 Percent or Above Road Capacity				
• Summer Weekday (SWD)	5.7	3.7	0.0	0.8
• Summer Weekend (SWE)	7.9	5.9	0.0	2.0
• Weighted Average of SWD & SWE	6.3	4.3	0.0	1.1
2035 Travel Time Benefit Aydlett Road to Albacore Street (in minutes)				
Summer Travel Time via Wright Memorial Bridge (weighted average of SWD & SWE)	154	125	86	107
Summer Travel Time via Mid-Currituck Bridge (weighted average of SWD & SWE)	N/A	N/A	11	11
2035 Hurricane Evacuation Benefit				
Clearance Time with US 158 Reversing Center Turn Lane	36 hrs	27 hrs	27 hrs	27 hrs
Clearance Time with US 158 Third Outbound Lane		22 hrs	22 hrs	22 hrs

- The construction of a third outbound lane on US 158 would offer the greatest reductions in hurricane evacuation clearance time with any alternative, bringing the 2035 clearance time down to 22 hours, 4 hours above the state clearance time standard of 18 hours. Times are not reduced as much when reversing the center lane to serve outbound traffic because during the evacuation, traffic would also continue to use it as a turn lane, slowing travel. A third outbound lane and the associated clearance time reduction could be achieved with any of the detailed study alternatives. Reversing the center turn lane would be practical only with MCB2 and MCB4.

The findings in this section are taken from the *Alternatives Screening Report* (Parsons Brinckerhoff, 2009). Details related to the assessment of traffic flow and travel time benefits, as well as traffic forecasts for 2035, are presented in the *2035 Traffic Alternatives*

Report (Parsons Brinckerhoff, 2009). These reports are included in the CD that accompanies this DEIS, at public review locations listed in Appendix C, and on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/.

2.3 Explain how much each detailed study alternative would cost and how it would be paid for

Construction and right-of-way costs for the detailed study alternatives are shown in Table 2-4 in year of expenditure dollars. ER2 would be the least expensive alternative. Of the alternatives with a Mid-Currituck Bridge, MCB4 (which would involve the fewest improvements to existing roads) would be less costly than MCB2 by generally more than $200 million. Mainland approach road Option B would cost approximately$84 to $92 million less than Option A. Costs would be similar between bridge corridors C1 and C2, with C2 costing more than C1.

Table 2-4. Cost of the Detailed Study Alternatives

	ER2	MCB2/C1	MCB2/C2	MCB4/C1	MCB4/C2
		With Mainland Approach Road Option A			
Construction Cost (millions)[1]	$220.4 to $271.7	$700.1 to $824.4	$718.4 to $845.7	$619.3 to $731.0	$637.0 to $752.7
Environmental Mitigation (millions)	$0.2 to $0.3	$0.5 to $0.7	$0.4 to $0.6	$0.3 to $0.4	$0.2 to $0.3
Right-of-Way Cost (millions)	$154.0 to $200.4	$160.5 to $208.9	$147.5 to $192.3	$54.2 to $70.6	$33.2 to $43.4
Utilities (millions)	$41.5 to $50.9	$23.1 to $28.4	$21.7 to $26.6	$11.4 to $14.1	$9.9 to $12.2
TOTAL COST (millions)	**$416.1 to $523.4**	**$884.2 to $1,062.4**	**$888.1 to $1,065.1**	**$685.3 to $816.2**	**$680.3 to $808.6**
		With Mainland Approach Road Option B			
Construction Cost (millions)[1]		$594.4 to $704.2	$611.9 to $726.3	$513.4 to $610.7	$530.6 to $632.5
Environmental Mitigation (millions)		$1.0 to $1.4	$0.9 to $1.3	$0.7 to $1.1	$0.7 to $1.0
Right-of-Way Cost (millions)		$180.4 to $234.8	$166.7 to $217.7	$73.7 to $96.3	$52.6 to $68.7
Utilities (millions)		$24.3 to $29.9	$23.0 to $28.3	$13.0 to $16.0	$11.6 to $14.2
TOTAL COST (millions)		**$800.1 to $970.2**	**$802.5 to $973.5**	**$600.7 to $724.1**	**$595.5 to $716.4**

[1]Construction costs include bridge drainage treatment (Option 2 described in Section 2.1.7.2) and pedestrian and bicycle features on the Mid-Currituck Bridge (lighted path and parking lots at bridge ends described in Section 2.1.11).

It is anticipated that the initial cost of the proposed Mid-Currituck Bridge would be paid for through North Carolina's first venture into the world of Public Private Partnerships (PPP) for major transportation infrastructure. PPPs are formal collaborations between public agencies and private concessionaires that capture the advantages of private sector participation while maintaining public accountability to develop new infrastructure. These partnerships can be an effective way to deliver much needed infrastructure while minimizing costs and risks to the public. On November 14, 2007, the Board of the NCTA authorized NCTA to seek proposals from private sector firms interested in furthering the development of the Mid-Currituck Bridge Project. NCTA chose to use the procurement method known as a "Pre-Development Agreement" for this project. With a Pre-Development Agreement, NCTA procured a development partner consisting of investors, designers, and construction contractors prior to the completion of project development studies.

In June 2008, NCTA solicited statements of qualifications from teams interested in partnering with NCTA under the Pre-Development Agreement, and a partnering team was selected in December 2008. The services provided by the partner will focus on the evaluation of the bridge alternative during the environmental study process and support the negotiation of a long-term construction, financing, and operating and maintenance agreement in the event a bridge alternative is selected as the Preferred Alternative in the environmental study process. As per the requirements of Title 23 *Code of Federal Regulations* Section 636.109, the partner did not prepare this DEIS or have any decision-making responsibility with respect to the NEPA process. The private firm that assisted NCTA and FHWA in the preparation of this DEIS was selected by and subject to the exclusive direction and control of NCTA. The partner could and did provide information to NCTA about the potential project design and possible mitigation actions. The contract with the partner includes termination provisions in the event that the No-Build Alternative is selected. NCTA received FHWA concurrence prior to issuing the request for proposal for a partner. The request for proposals informed potential partners of the status of the NEPA process.

For funds, bond financing would be used by the PPP. Transportation Infrastructure Finance and Innovation Act (TIFIA) financing (federal government loans) could be used in addition to bonds. This financing would be repaid primarily through toll revenues. Also in 2008, the North Carolina General Assembly appropriated $15 million per year for repayment of bonds or payment of debt service not covered by toll revenues, which also could contribute to covering any shortfalls that might be associated with toll bridge financing costs.

If ER2 were selected as the Preferred Alternative, the project would have to be implemented by NCDOT rather than NCTA since ER2 has no component that could be funded by the financing mechanisms described above. The Pre-Development Agreement would be dissolved since only motor vehicle taxes could be used to build ER2. Also, the $15 million per year made available by the General Assembly could not be used since there would be no bonds or debt to repay. If MCB2 were selected, the project would need to be implemented as a joint effort of NCTA and NCDOT, with

NCDOT providing funds for components that could not be funded by the financing mechanisms described above.

2.4 Explain how each alternative will be built

If MCB4 were selected as the Preferred Alternative, final design and construction would be expected to begin as soon as possible after issuance of a Record of Decision (ROD), the report that ends the planning process. If ER2 were selected as the Preferred Alternative, the project would be implemented by NCDOT with traditional financing, as indicated in Section 2.3. If this were done, it is not known when the project would be implemented because there is no state funding for construction of road improvements in the project area listed in the *2009 to 2015 State Transportation Improvement Program* (STIP). The only component of ER2 listed in the STIP is the interchange at US 158/NC 12, but funds are provided only for planning. If MCB2 were selected as the Preferred Alternative, final design and construction would be expected to begin immediately after issuance of a ROD on the parts that could be funded by the available revenue sources described in Section 2.3 (those parts that MCB2 and MCB4 share in common). The timing for the implementation of the rest of MCB2 is not known for the same reasons it is not known for ER2; the portions of MCB2 that could not be funded by tolls would require state funding and there is no funding in the STIP for construction of road improvements in the project area.

Construction of the road and interchange components of the detailed study alternatives would follow typical road building practices. Access to adjoining properties would be maintained during the construction period. Lane closures would be avoided/minimized during peak travel periods.

The bridge over Currituck Sound could be built using the following types of construction methods. The methods involve:

- Construction of a temporary construction trestle (bridge). This trestle would be placed adjacent to the bridge. Bridge erection equipment would operate on the trestle to place the components of the bridge foundation and spans. For a bridge project this long, the builder would likely employ a leap-frog method of installing and removing the trestle as the permanent bridge progresses. Where the trestle has been removed, construction equipment access would be via the permanent bridge.

- Overhead gantry crane. The crane would operate on two parallel tracks, to place the bridge spans and a temporary trestle between the two gantry tracks. The temporary trestle would be used to place bridge foundations. Again, the gantry's tracks and the trestle would be removed as the permanent bridge progresses.

- A launching truss (framework of steel bars and beams). The truss would be secured to previously installed permanent foundations. Then, the launching truss would cantilever outward for use in the installation of the next foundation and span. It would be removed and moved forward as each span is completed.

- Low draft barges. Construction by transporting materials and erection equipment using low draft barges would allow construction to advance in multiple locations simultaneously. This would reduce the construction time and advance pile driving ahead of bridge span construction. With barges, limited dredging of the bottom of Currituck Sound could be needed adjacent to the bridge alignment.

  Should dredging be used during Mid-Currituck Bridge construction, it would occur in areas of shallow water less than 6 feet deep where there is no submerged aquatic vegetation (SAV). The bottom would be dredged to a depth of 6 feet. Dredging would occur parallel to the bridge. Dredging would primarily be along the west shore of Currituck Sound (2,000 feet for C1 or C2) and a section in the middle of the sound (5,100 feet for C1 and 2,600 feet for C2). The total dredging lengths would be approximately 7,100 feet for C1 (approximately 29 percent of the length of C1 over the sound) and 4,600 feet for C2 (approximately 17 percent of the length of C2 over the sound). The dredged area is anticipated to be 150 feet wide with roughly 3:1 side slopes beyond the dredged area to reach natural bottom. Given these assumptions, C1 would disturb approximately 25 acres of bottom area, and C2 would disturb approximately 17 acres. The volume of dredged material removed with these assumptions is estimated to be 53,000 cubic yards for C1 and 61,000 cubic yards for C2. Additionally, a temporary materials delivery dock could be placed on the west side of the sound adjacent to the proposed bridge or north of the bridge at a suitable staging area. Dredging may be necessary to construct and operate this dock, which would affect an additional approximately 4 acres of bottom area.

In Maple Swamp, if the water elevation is low, wooden crane mats could be used in the cleared right-of-way to distribute the crane loads and provide a suitable platform for erecting the bridge. If the water elevation is high and mats could not be used, any of the first three methods described above for the Mid-Currituck Bridge could be used.

The Mid-Currituck Bridge would likely be built beginning at both termini simultaneously, with construction meeting in the middle. If low draft barges are used, additional construction points may be started in the middle of the sound to expedite bridge construction. Material for building the bridges would be transported via both US 158 and NC 12.

2.5 Describe the other alternatives that were considered and explain why they are no longer under consideration

An alternatives screening study was conducted for the project. Its findings were discussed with federal and state environmental resource and regulatory agencies in a series of Turnpike Environmental Agency Coordination (TEAC) meetings in 2006, 2007, 2008, and 2009. Based on discussions at TEAC meetings, and written comments received from the agencies and public, the *Alternatives Screening Report* (Parsons Brinkerhoff, 2009) identified the detailed study alternatives described in Section 2.1. Alternatives were evaluated from the perspective of:

- Ability to meet the purpose and need and level of benefit offered in relation to those purposes;

- Improvement to system efficiency;

- Economic feasibility (cost and funding capacity); and

- Potential impacts on natural resources and communities.

The findings of the *Alternatives Screening Report* are summarized below. A description of the process followed and the specific numerical indications of benefit and environmental impact associated with the findings are included in that report. That report is included in the CD that accompanies this DEIS, at public review locations listed in Appendix C, and on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/.

The other road widening and bridge alternatives considered were:

- ER1, which was identical to ER2 except NC 12 was assumed to be widened to four lanes instead of three lanes from US 158 to Albacore Street;

- MCB1, which was identical to MCB2 except NC 12 was assumed to be widened to four lanes instead of three lanes from US 158 to the Mid-Currituck Bridge terminus on the Outer Banks; and

- MCB3, which was identical to MCB4 except it did not include a third outbound lane on US 158 between the Wright Memorial Bridge and NC 12.

It was decided not to study ER1 and MCB1 in detail because the additional four-lane widening on NC 12 would result in more than 200 total displacements (including over 50 businesses) with these two alternatives.

MCB3 was dropped because it could only achieve a 2035 hurricane clearance time with construction of a third outbound lane on US 158 of 27 hours compared to 22 hours with the other alternatives. Clearance times with reversal of the center turn lane would be identical for MCB3 and MCB4 (27 hours). Therefore, it was only the third outbound lane option that was relevant to the decision to drop MCB3.

Other alternative concepts also were considered but were not carried forward as detailed study alternatives. These were: (1) shifting rental times; (2) transportation systems management; (3) bus transit; and (4) a ferry service across Currituck Sound as an alternative to a Mid-Currituck Bridge. The first three considered whether there were opportunities to reduce congestion and travel time by:

- Making better use of existing road capacity by shifting peak travel demand (asking property managers to start and end additional vacation home rental times on days other than Saturday and Sunday);

- Making minor improvements to the road system, including optimizing traffic signal timing, improving major intersections, and restricting side-road access where duplicate side roads exist; and

- Providing bus transit.

None of these alternatives was found to make more than a minimal reduction in congestion and travel time; thus, all were eliminated from consideration.

Building a ferry across Currituck Sound was considered as an alternative to a bridge. This alternative was dropped because a ferry would not notably reduce congestion or travel times, would be costly, and would require substantial dredging in Currituck Sound, with resulting impacts to the natural environment.

Several additional bridge corridors were considered and evaluated. The two selected for detailed study (C1 and C2) were the two that appeared to best balance community and natural resource trade-offs while meeting the objectives of the project.

The No-Build Alternative was retained as a baseline for comparison with the detailed study alternatives. The selection of the No-Build Alternative as the Preferred Alternative could be an outcome of this project's decision-making process.

2.6 What alternative is recommended by NCTA and FHWA at this time?

Based on information available to date (including this DEIS), NCTA and FHWA have identified MCB4 as their Recommended Alternative. This recommendation is made taking into account cost and design considerations; travel benefits; community, natural resource, and other impacts; and public involvement comments. At this time, NCTA has no recommendation related to the two bridge corridor alternatives (C1 and C2), the mainland bridge approach design options A and B, or a hurricane evacuation option.

The Recommended Alternative is only a recommendation; it is not a Preferred Alternative and it is not a final decision. NCTA and FHWA have identified a Recommended Alternative as a way of giving readers of this DEIS an indication of the agencies' current thinking. After the DEIS comment period ends, NCTA and FHWA will identify a Preferred Alternative based on consultation with local transportation planning agencies, and state and federal environmental resource and regulatory agencies, as well as consideration of agency and public comments received on this DEIS and at the public hearings. The Preferred Alternative will specify all project components, including as applicable the bridge corridor, mainland bridge approach design option, and hurricane evacuation option.

The Preferred Alternative may be developed further in the FEIS. The NEPA process will conclude with a ROD, which will document the Selected Alternative to be constructed if a build alternative is selected.

MCB4 is identified as the Recommended Alternative based on the considerations that follow. This list is not in order of importance, but is organized by issues as they are presented in this DEIS. Also, this list does not represent all benefits or impacts of MCB4, just those elements that differentiated MCB4 when compared to the other detailed study alternatives. Quantities associated with the impact considerations are presented in Table S-1 in the Summary and the impact assessments in Chapter 3. Costs are also presented in Section 2.3.

Cost and Design Considerations

- MCB4 likely could be fully financed with bonds and other available financing mechanisms noted earlier under "How much would each alternative cost and how would those costs be funded?" The other detailed study alternatives would require motor vehicle and fuel tax revenues to fund or fully fund.

- MCB4 would have the fewest changes in current access to residential and business properties.

- With MCB4, hurricane evacuation improvements would be needed only for the 5 miles between the Mid-Currituck Bridge and NC 168 instead of the 25 miles with ER2, reducing cost and environmental impact.

Travel Benefit Considerations

- MCB4 would provide substantial congestion reduction and travel time benefits while minimizing the widening of NC 12, and also would not require widening of US 158 from the Wright Memorial Bridge to NC 12, or an interchange at the US 158/ NC 12 intersection.

- Should additional improvements to NC 12 and US 158 and a US 158/NC 12 interchange (e.g., the components of MCB2 not included in MCB4) be pursued in the future, they could be built without additional impact over that defined for MCB2. With the Mid-Currituck Bridge included in MCB4, a future interchange at NC 12 and US 158 would not carry as much traffic (traffic would divert to the Mid-Currituck Bridge), and the interchange configuration would result in fewer community and access impacts than without a Mid-Currituck Bridge (ER2).

Community Impact Considerations

- MCB4's neighborhood and community cohesion impacts would be confined to creating a visual barrier in Aydlett with either Option A or Option B. MCB2 also would interfere with neighborhood cohesion along NC 12. The use of the C1 corridor with MCB4 also would physically divide the Corolla Bay subdivision. Neighborhood and community cohesion impacts would be minor with ER2.

- MCB4 would have the fewest displacements and relocations.

- MCB4 is consistent with area land use plans in that it includes a Mid-Currituck Bridge and does not widen NC 12 in Dare County.

Natural Resource Impact Considerations

- MCB4 would have the least fill in natural upland communities.
- MCB4/C1 would have the least impact in upland and wetland maritime forest communities.
- With MCB4, the increase in impervious surface area (pavement and bridge deck) would be low in contrast to MCB2, but similar to ER2.

Other Physical Characteristics Considerations

- MCB4 would have the least number of homes that would experience an increase in traffic noise levels.
- The Mid-Currituck Bridge with MCB4 would reduce the impact of accelerated sea level rise on travel on the Outer Banks north of US 158.

Public Involvement

During the public review of a draft *Alternatives Screening Report* as part of the process for selecting the detailed study alternatives, those who expressed an opinion on the Outer Banks termini overwhelmingly indicated a preference for focusing the project on building a Mid-Currituck Bridge.

3.0 Affected Environment and Environmental Consequences

This chapter describes the findings of the impact assessment conducted for the detailed study alternatives. Key characteristics of the affected environment also are described. Additional information on the affected environment and the impacts of the detailed study alternatives is presented in a series of technical reports contained on the compact disc (CD) that accompanies this DEIS, at public review locations listed in Appendix C, and on the North Carolina Turnpike Authority (NCTA) web site at https:// www.ncdot.gov/projects/mid-currituck-bridge/. Those technical reports and their tables of contents are presented in Appendix D.

This chapter is divided into the following sections:

The text in italics answers the question posed by the subheading under which it appears, summarizing for the reader the findings of the longer discussion that follows.

3.1 Community Characteristics and Impacts

This section presents the key findings of the community impact assessment conducted for this DEIS. Additional detail is presented in the *Community Impact Assessment Technical Report* (Parsons Brinckerhoff, 2009), which is contained on the CD that accompanies this DEIS, at public review locations listed in Appendix C, and on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/. This section discusses the following:

- What is the general land use, and what community features are in the project area?
- How would neighborhood or community cohesion be affected?
- How would quality of life be affected by the detailed study alternatives?
- Would any homes, businesses, outdoor advertising signs, or gravesites be relocated?

- Would the detailed study alternatives be compatible with local land use plans?
- How would the existing business community be affected?
- How would access to neighborhoods and communities be changed?
- How would parks, recreation opportunities, and other community services and facilities be affected?
- How would pedestrian and bicycle provisions change?
- Could crime rates increase?
- How would farmlands be affected?

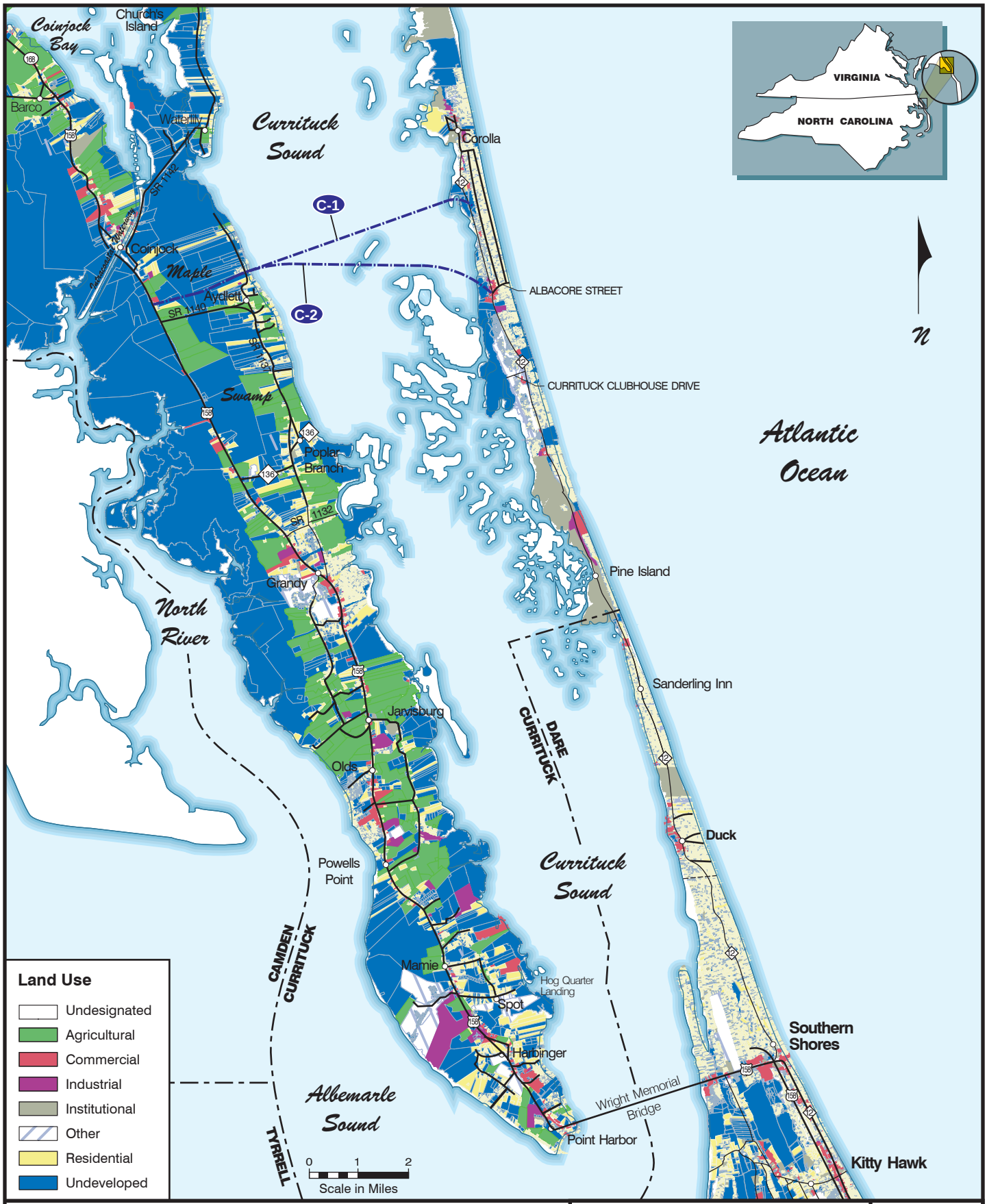
3.1.1 What is the general land use, and what community features are in the project area?

Figure 3-1 shows existing land use in the project area. The Currituck County mainland is within a predominantly rural area, with farms, forest, and scattered residences. Service-oriented businesses are in clusters that are scattered along US 158.

The Outer Banks is a vacation destination oriented to the waters of the Atlantic Ocean and Currituck Sound where the population is substantially greater during the summer season. Vacationers stay in hotel and motel rooms, condominiums, and single-family and multi-family homes. The commercial aspects of the Outer Banks cater to the needs of its vacationers, with restaurants, entertainment, and shops that sell beach-oriented vacation clothing and supplies.

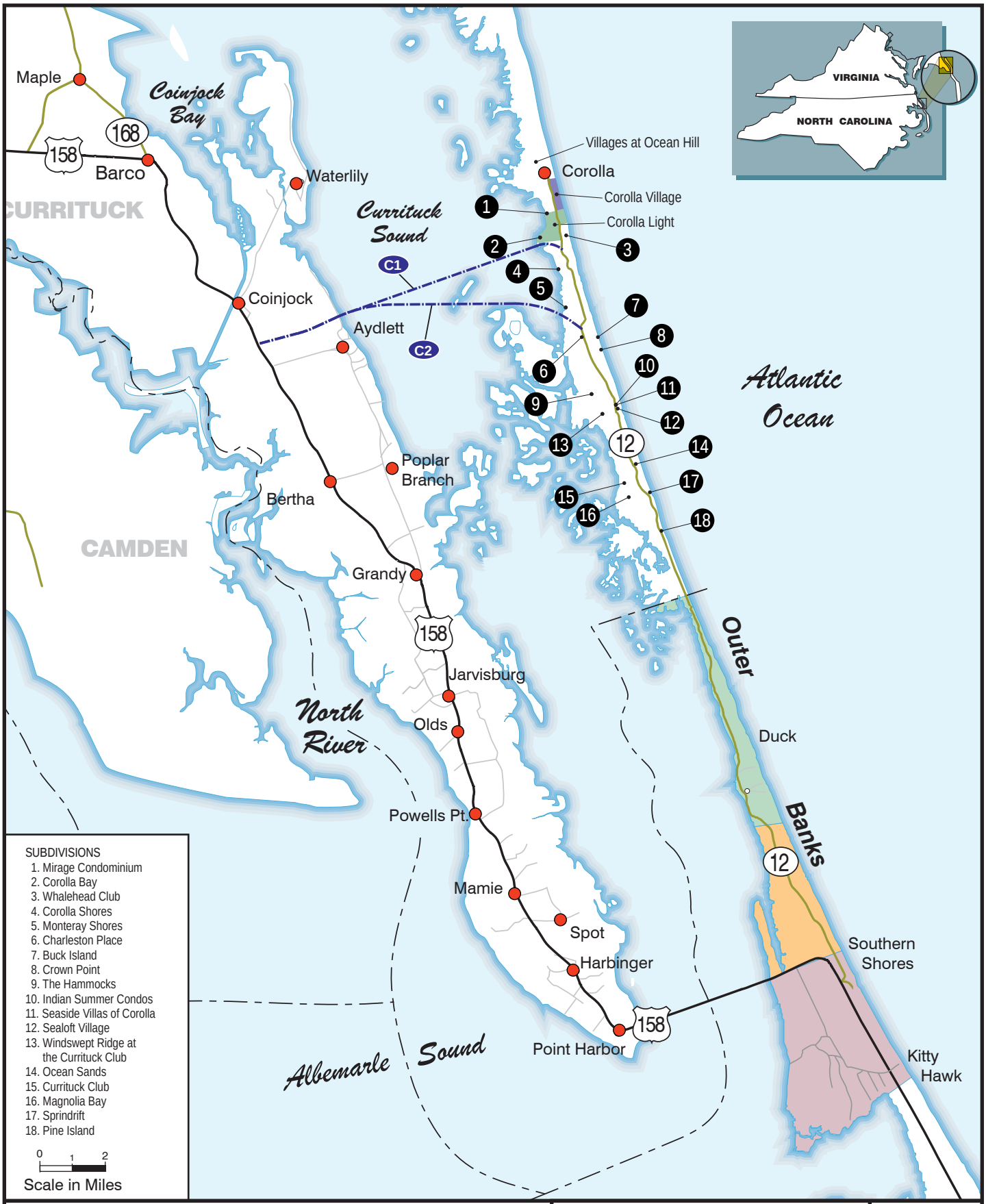
The communities in the project area are shown on Figure 3-2. The primary community of interest on the Currituck County mainland is Aydlett, as a portion of this relatively isolated collection of homes and farms is within the proposed right-of-way of the western approach to the Mid-Currituck Bridge. Aydlett is a shoreline development along Currituck Sound, approximately 2 miles east of US 158, where direct access is generally via just one road, Aydlett Road (SR 1140). Aydlett is within an area that is changing from rural farms to rural residential, with older homes that front Currituck Sound and newer ones being built along roads that are perpendicular to the sound. Community facilities within Aydlett include a post office, clubhouse, and several burial plots and cemeteries.

On the mainland in Currituck County, commercial uses scattered along US 158 are characterized by convenience stores, restaurants, tourism shops, and service businesses. Commercial development is concentrated in Coinjock, Grandy, Powells Point, and Point Harbor. On the Outer Banks, commercial uses line US 158 between the Wright Memorial Bridge and NC 12 and include shopping centers, a Wal-Mart, a Home Depot and, near the US 158/NC 12 intersection, hotels and restaurants. A tourist-oriented commercial center that connects to Currituck Sound is at the Duck town center



Existing Land Use

Figure 3-1



Project Area Communities

Figure 3-2

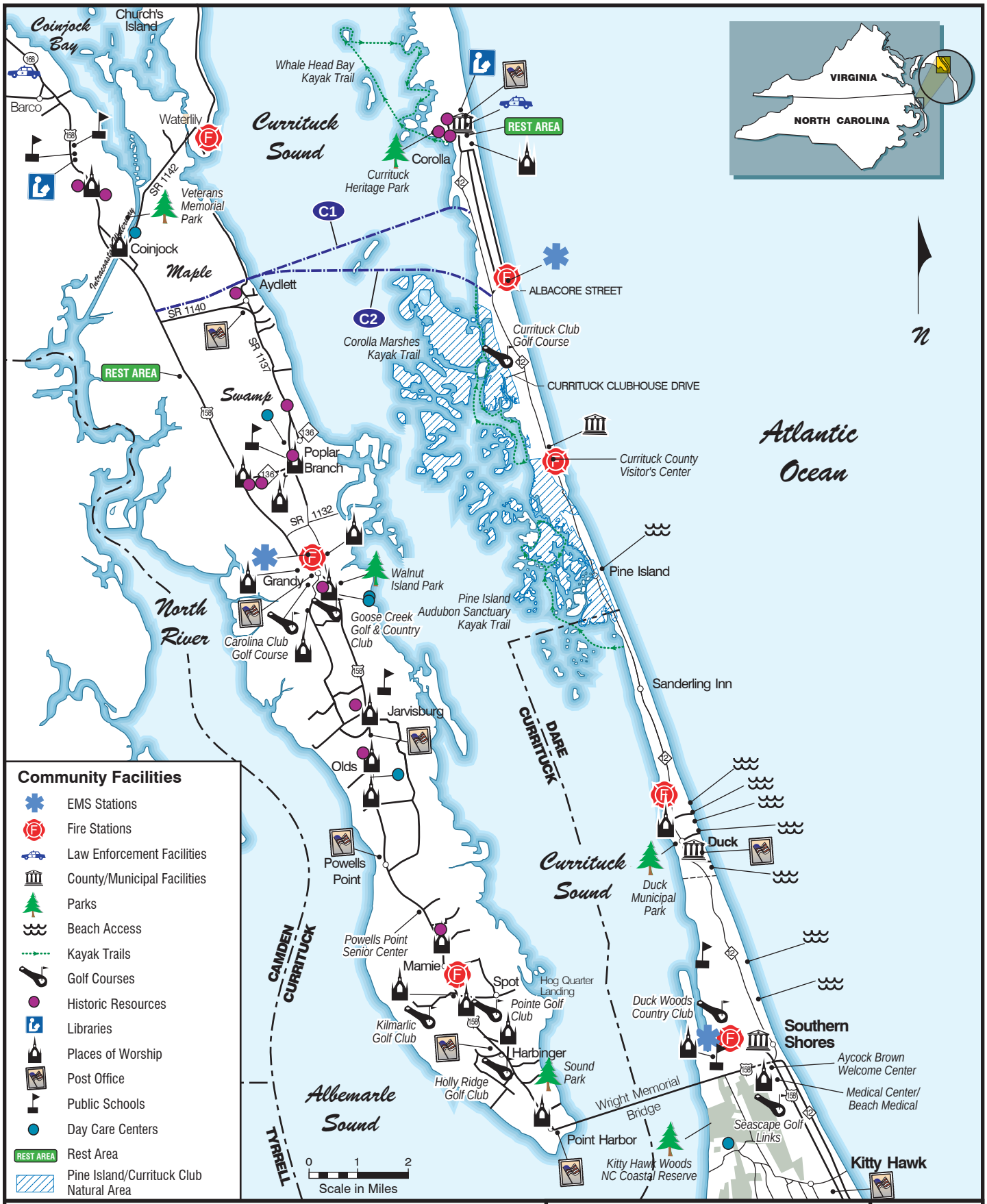
on NC 12. Other commercial development along NC 12 is generally comprised of stand-alone shops and small shopping centers that include restaurants and businesses related to tourist activities (Figure 3-1). The Aycock Brown Welcome Center is at the intersection of US 158 and NC 12.

The Outer Banks north of Dare County are in Currituck County, with similar development and land uses characterized by residential developments of single-family homes, townhomes, and condominiums. There also are resorts and commercial developments comprised of small stand-alone shops and shopping centers with grocery stores and restaurants to serve the tourist population. Larger centers are at Currituck Clubhouse Drive and Albacore Street in Currituck County.

The project area provides services and facilities consistent with an area that is primarily oriented to residential and recreational uses, including schools, churches, community centers, libraries, and post offices, as shown on Figure 3-3.

Public parks on the Currituck County mainland include Veterans Memorial Park on the Intracoastal Waterway in Coinjock, Walnut Island Park in Grandy, and Sound Park in Harbinger (which includes two public boat ramps). There are four public golf courses in the project area on the Currituck County mainland: Carolina Club Golf Course, Kilmarlic Golf Club, Pointe Golf Club, and Holly Ridge Golf Club (see Figure 3-3). Tennis courts at Currituck County High School on US 158 between the Knapp (Intracoastal Waterway) Bridge and NC 168 were built using funds provided under Section 6(f) of the Land and Water Conservation Fund Act. Goose Creek Golf and Country Club is a private golf course near US 158 in Grandy. Public recreation is primarily related to Currituck Sound and the Outer Banks beaches along the Atlantic Ocean. In the project area, Currituck Sound supports a variety of shallow-water recreation opportunities, such as fishing, kayaking, windsurfing, and duck hunting. There is one bird sanctuary in the project area, the Pine Island Audubon Sanctuary. Three kayaking trails in Currituck Sound include Corolla Marshes from TimBuck II (7 miles), Pine Island Audubon Sanctuary from Sanderling (8.5 miles), and Whale Head Bay to Monkey Island (7 miles) (Trails.com web site, May 2009). They also are shown on Figure 3-3.

On the Outer Banks, numerous public accesses are provided to the beaches in Southern Shores, the Town of Duck, and Pine Island. Parks and recreational facilities include two ball fields at the Kitty Hawk Elementary School that are available for public use, Duck Town Commons/Duck Municipal Park along NC 12 on Currituck Sound, and Currituck Heritage Park (which includes a public boat ramp). Seascape Golf Links is a public golf course near the US 158/NC 12 intersection. There are also two private golf courses on the Outer Banks in the project area: Duck Woods Country Club in Kitty Hawk and Currituck Club Golf Course on NC 12 in Currituck County (see Figure 3-3). Within the Town of Kitty Hawk, Kitty Hawk Woods is a 1,877-acre nature preserve that includes public hiking trails.



Community Facilities

Figure 3-3

There are no sidewalks or bicycle trails along US 158 on the Currituck mainland. On the Outer Banks, sidewalks, multi-use paths, and wide shoulders that are used by pedestrians and cyclists are along NC 12, and a multi-use path parallels NC 12 for much of its length. A multi-use path also is on the north side of US 158, and the town of Kitty Hawk plans a new multi-use path on the south side of US 158.

There are no public transportation services in the project area. Private transportation services include taxis, limousines, tour/charter service, and a van service that shuttles patrons between the Outer Banks and transportation hubs on the mainland, such as the Norfolk International Airport.

The Currituck County Airport is a general aviation airport in Maple, approximately two miles west of the US 158/NC 168 intersection. It can accommodate small private planes and small corporate jets. Dare County Regional Airport is a general aviation airport in Manteo that can accommodate most regional jets. One publicly owned airstrip for private aircraft is near the project area on the Outer Banks, the First Flight Airstrip next to the Wright Brothers Memorial in Kill Devil Hills. One privately owned airstrip, Pine Island Airport, is within the project area on the Currituck County Outer Banks. This airstrip serves private aircraft and is generally restricted to property owners and guests of the Pine Island community.

Law enforcement and emergency services in the project area are provided by the Currituck County Sheriff's Department, Currituck County Volunteer Fire Department and Emergency Medical Services, Dare County Police and Fire Departments, and the towns of Kitty Hawk, Southern Shores, Duck, and Corolla. The locations of their facilities in the project area are shown on Figure 3-3.

Health care is available at Regional Medical Center, a community hospital just south of the US 158/NC 12 intersection. Nearby Beach Medical specializes in family practice. The Outer Banks Hospital in Nags Head, approximately 8 miles south of the project area, is the only health care facility on the Outer Banks that provides trauma care. In the project area, the Outer Banks has two helipads that can be used to transport people to the mainland for medical care: one in Kitty Hawk and one in Duck.

The Direct Community Impact Area (DCIA) includes the communities and neighborhoods that could be directly affected by the proposed project and its detailed study alternatives. It encompasses the area within 1,000 feet of the centerline on both sides of US 158 and NC 12 in the project area, as well as the area within 2,500 feet of the centerline on both sides of the two bridge corridors.

3.1.2 How would neighborhood or community cohesion be affected?

Neighborhood or community cohesion would be affected in two primary locations with the detailed study alternatives: Aydlett on the mainland (with MCB2 and MCB4) by the creation of a visual barrier and Corolla Bay on the Outer Banks (with MCB2/C1 and MCB4/C1) by physically dividing the subdivision with the bridge. A Mid-Currituck Bridge with MCB2 or

MCB4 would provide connectivity between the Currituck County mainland and its Outer Banks. With ER2 and MCB2, pedestrians crossing NC 12 in Southern Shores and at the Sanderling Inn (two locations with notable pedestrian travel) would have to cross three lanes of pavement instead of two.

Neighborhood or community cohesion considers whether an alternative would divide the community by a physical barrier that prevents easy travel from one side of a neighborhood or community to another, by a visual barrier that blocks views across the community, or by a discomfort or safety barrier that inhibits passage from one side of a neighborhood or community to another.

With all detailed study alternatives, the introduction of a third emergency outbound lane for hurricane evacuation would introduce no barriers to community movement or views, so there would be no potential to isolate or divide existing communities along US 158.

On the Outer Banks east of the Wright Memorial Bridge, US 158 is a major thoroughfare. US 158 is a neighborhood boundary between the towns of Southern Shores and Kitty Hawk. Thus, widening this section of US 158 with ER2 and MCB2 to a six- to eight-lane super-street and constructing an interchange at US 158 and NC 12 would not affect community cohesion. A third outbound emergency lane in this area with MCB4 also would not affect community cohesion.

In Southern Shores and Duck, NC 12 often acts as a dividing point between neighborhoods. However, there are three locations that see notable pedestrian travel: in the southern half of Southern Shores where people walk across NC 12 to reach the beach, in the Duck commercial area, and in the Sanderling Inn area where inn facilities are on both sides of the road. None of the detailed study alternatives include improvements in the Duck commercial area. In the other two areas, pedestrians crossing a three-lane NC 12 with ER2 and MCB2 would have more pavement to cross and experience more times of day when vehicles can travel the speed limit. However, pedestrian crossing points in these areas would be marked, as they are marked presently.

MCB2 and MCB4 include a Mid-Currituck Bridge. The western bridge approach would pass through the community of Aydlett, which lies along Currituck Sound on the Currituck County mainland. The bridge approach would lie between the northern and southern portions of Aydlett and affect the community visually (see Section 3.4.5), which could affect the perceived cohesion of the community. The visual effects would vary between mainland approach road Option A and Option B. With Option A, the western end of the bridge would bridge Narrow Shore Road (the only road between the northern and southern parts of the community), so access between the two parts of the community would not be affected. With Option B, Narrow Shore Road would be relocated to pass over the toll plaza that would be placed in Aydlett. Like Option A, access between the two parts of the community by motor vehicles, bicycles, and pedestrians would be preserved. Pedestrians and bicyclists would, however, have to

walk or cycle to the top of the bridge over the toll plaza, a height of 25.5 feet above existing ground.

Residents of Aydlett have expressed concern about the potential impacts on their way of life related to the presence of a toll plaza in Aydlett and the revised local road system with Option B. Concerns expressed included the potential for drivers to change their minds about using the bridge just before the toll plaza and use roads in the Aydlett community to return to US 158, particularly during periods of high traffic congestion such as a crash on the approach road or the bridge. In this case, these drivers would add traffic to the Aydlett street system and introduce strangers with no business in this rural residential community. The possibility was raised that people might knock on doors seeking to use family bathrooms. Concern also was expressed that, at times of high traffic congestion, emergency vehicles coming from Waterlily to Aydlett and returning to the hospital would be slowed. However, the preliminary design of the MCB2/B toll plaza has adequate traffic capacity during normal peak conditions not to result in queuing from the toll plaza that would block access to and from Aydlett. But this issue could be of concern during unusual traffic situations that may occur, such as a crash on the approach road or the bridge. In addition, the night-time lighting of the toll plaza also was expressed as a concern, particularly as it relates to star gazing hobbyists who recognize Aydlett as an uncommon dark sky location. Finally, citizens also felt that MCB2/B contradicted previous promises that there would be no access between the bridge project and Aydlett.

Currituck Sound serves as a natural barrier between mainland Currituck County and the Outer Banks. With MCB2 and MCB4, the Mid-Currituck Bridge would remove this barrier and create, instead, a connection between the mainland and Outer Banks. This could result in improving accessibility between the Currituck County mainland and the Outer Banks. It would facilitate travel for service workers, county employees, emergency services, and school children that need to travel between the Currituck County mainland and the Outer Banks.

With MCB2/C1 and MCB4/C1, the Mid-Currituck Bridge would enter the Outer Banks through the Corolla Bay subdivision, physically dividing it into two parts and using six residential parcels. This would alter the planned organization and structure of the new community, affecting its cohesion even before it is completed. The new bridge also could create a visual barrier, as the bridge structure would limit the ability of persons on one side of the community to have clear views of the other side.

With MCB2/C2 and MCB4/C2, the bridge would enter the Outer Banks south of the TimBuck II commercial area, and NC 12 would be realigned. This alternative would pass through an undeveloped area and not affect community cohesion.

With the No-Build Alternative, there is no potential for changes to neighborhood or community cohesion. The benefit of a bridge connecting the Currituck County mainland with its Outer Banks would not be realized with either the No-Build Alternative or ER2.

3.1.3 How would quality of life be affected by the detailed study alternatives?

Aside from the community or neighborhood cohesion impacts noted above, quality of life in the community could be affected by noise and visual change. Noise impacts are discussed in Section 3.4.1, and visual impacts are discussed in Section 3.4.5.

3.1.4 Would any homes, businesses, outdoor advertising signs, or gravesites be relocated?

Some homes, businesses, outdoor advertising signs, and gravesites would be relocated with all of the detailed study alternatives. The largest number of these relocations would occur when adding a third outbound emergency lane for hurricane evacuation along US 158 compared to reversing the existing center turn lane during an evacuation.

Relocations of homes, businesses, outdoor advertising signs, and gravesites for the detailed study alternatives are presented in Table 3-1. Appendix A of the *Community Impact Assessment Technical Report* (Parsons Brinckerhoff, 2009) includes the Relocation Reports.

Table 3-1. Relocations

Location and Alternative	Homes	Businesses	Outdoor Advertising Signs	Gravesites
Currituck County Mainland				
ER2	5 (0)[1]	3 (0)	29 (0)	66 (0)
MCB2/A and MCB4/A	5 (5)	5 (3)	6 (3)	36 (20)
MCB2/B and MCB4/B	7 (7)	5 (3)	16 (13)	35 (19)
Outer Banks				
ER2	1 plus 10 vacation rental units	2	0	0
MCB2/C1	1 plus 10 vacation rental units	2	0	0
MCB2/C2	1 plus 10 vacation rental units	3	0	0
MCB4/C1	0	0	0	0
MCB4/C2	0	1	0	0

[1] The number in parentheses is the number of relocations that would occur if reversing the center turn lane on US 158 were implemented to reduce hurricane evacuation clearance times rather than constructing a third outbound lane for hurricane evacuation.

3.1.4.1 Relocations

Assuming a third outbound lane is built to facilitate hurricane evacuation on the mainland, ER2 would result in the fewest business and home relocations (two fewer business displacements than MCB2 and MCB4). Outdoor advertising sign and gravesite

impacts, however, would be substantially greater with ER2. If the option of using the center turn lane for outbound travel to reduce hurricane evacuation times were chosen, there would be no mainland relocations with ER2. The relocations associated with MCB2 and MCB4 would be associated with the US 158/NC 12 interchange. Option B would increase residential relocations by two, one in Aydlett and one on US 158. Option B also would result in the same number of business relocations, six more outdoor advertising sign relocations, and one fewer gravesite relocation compared to Option A.

On the Outer Banks, home relocations would occur along NC 12 with ER2 and MCB2 and would be primarily associated with providing drainage detention basins along parts of NC 12 in Dare County. The two business relocations would be associated with the interchange at the intersection of US 158 and NC 12. Also MCB2/C2 and MCB4/C2 would result in one business relocation in Currituck County, a water sports business that relies on the dock extending into Currituck Sound from TimBuck II. Bridge corridor C2 could displace or relocate the dock. Displacements of vacation rental units are noted separately in Table 3-1 since no permanent residents would need to be relocated. No relocations of homes and businesses would occur on the Outer Banks with MCB4. However, if additional vacation homes are built in the Corolla Bay subdivision, through which MCB2/C1 and MCB4/C1 pass, the number of vacation homes displaced could increase for these two alternatives. No outdoor advertising signs or gravesites would be affected on the Outer Banks with any of the detailed study alternatives.

No relocations would occur with the No-Build Alternative.

3.1.4.2 Relocation Assistance for Homes and Businesses

It is the policy of NCTA to ensure that comparable replacement housing will be available prior to the construction of state and federally-assisted projects. Furthermore, the North Carolina Board of Transportation has the following three programs to minimize the inconvenience of relocation:

1. Relocation Assistance Program;

2. Relocation Moving Payments Program; and

3. Relocation Replacement Housing Payments or Rent Supplement Program.

With the Relocation Assistance Program, experienced staff will be available to assist displacees with information such as availability and prices of homes, apartments, or businesses for sale or rent and financing or other housing programs. The Relocation Moving Payments Program, in general, provides for payment of actual moving expenses encountered in relocation.

Where displacement will force an owner or tenant to purchase or rent property of higher cost or to lose a favorable financing arrangement (in cases of ownership), the Relocation Replacement Housing Payments or Rent Supplement Program will compensate up to

$22,500 to owners who are eligible and qualify and up to $5,250 to tenants who are eligible and qualify.

The relocation program for the proposed action will be conducted in accordance with the Federal Uniform Relocation Assistance and Real Property Acquisitions Act of 1970 (Public Law 91-646), and the North Carolina Relocation Assistance Act (GS-133-5 through 133-18). The program is designed to provide assistance to displaced persons in relocating to a replacement site in which to live or do business. At least one relocation officer is assigned to each highway project for this purpose.

A relocation officer will determine the needs of the displaced families, individuals, businesses, non-profit organizations, and farm operations for relocation assistance advisory services without regard to race, color, religion, sex, or national origin. The work will be scheduled to allow ample time, prior to displacement, for negotiations and possession of replacement housing that meets decent, safe, and sanitary standards. The displacees are given at least a 90-day written notice after their property is purchased. Relocation of displaced persons will be offered in areas not generally less desirable in regard to public utilities and commercial facilities. Rent and sale prices of replacement property will be within the financial means of the families and individuals displaced, and will be reasonably accessible to their places of employment. A relocation officer will also assist owners of displaced businesses, non-profit organizations, and farm operations in searching for and moving to replacement property.

All tenant and owner residential occupants who may be displaced would receive an explanation regarding all available options, such as (1) purchase of replacement housing, (2) rental of replacement housing, either private or public, or (3) moving existing owner-occupant housing to another site (if possible). The relocation officer will also supply information concerning other state or federal programs offering assistance to displaced persons and will provide other advisory services as needed in order to minimize hardships to displaced persons in adjusting to a new location.

The Moving Expenses Payment Program is designed to compensate the displacee for the costs of moving personal property from homes, businesses, non-profit organizations, and farm operations acquired for a highway project. Under the Replacement Program for Owners, NCTA will participate in reasonable incidental purchase payments for replacement dwellings, such as attorney's fees, surveys, appraisals, and other closing costs and, if applicable, make a payment for any increased interest expenses for replacement dwellings. Reimbursement to owner-occupants for replacement housing payments, increased interest payments, and incidental purchase expenses may not exceed $22,500 (combined total), except under the Last Resort Housing provision.

A displaced tenant may be eligible to receive payment, not to exceed $5,250, to rent a replacement dwelling or to make a down payment, including incidental expenses, on the purchase of a replacement dwelling. The down payment is based upon what the state determines is required when the rent supplement exceeds $5,250.

It is a policy of the State of North Carolina that no person will be displaced by state or federally-assisted construction projects unless and until comparable replacement housing has been offered or provided to each displacee within a reasonable period of time prior to displacement. No relocation payment received will be considered as income for the purposes of the Internal Revenue Code of 1954 or for the purposes of determining eligibility or the extent of eligibility of any person for assistance under the Social Security Act or any other federal law.

Last Resort Housing is a program used when comparable replacement housing is not available, or when it is unavailable within the displacee's financial means, and the replacement payment exceeds the federal/state legal limitation. The purpose of the program is to allow broad latitudes in methods of implementation by the state so that decent, safe, and sanitary replacement housing can be provided. This program would be implemented, if necessary, as mandated by state law.

3.1.4.3 Outdoor Advertising Sign Relocation

Most signs, including outdoor advertising signs, are classified as personal property. When a sign is in a proposed acquisition area, a moving payment would be made for relocating the physical structure. Payment for value in place also could be made. Like other private lands purchased, payment would be made for the land where the sign is located.

3.1.4.4 Gravesite Relocation

The relocation of gravesites would take place under North Carolina General Statute 65-106, *Removal of Graves*. As required by that law, descendants would be contacted, to the extent possible, prior to moving the graves. The graves would be relocated to a perpetually maintained cemetery.

3.1.5 Would concentrations of low income, minority populations, or limited English proficiency populations suffer disproportionately adverse human health or environmental effects?

There would be no disproportionately high and adverse direct impacts associated with any of the detailed study alternatives to minority populations, low income populations, or limited English proficiency populations.

Based on US census data, field observations, and discussions with local officials, there are no concentrations in the DCIA of minority, low income, and limited English proficiency populations that could be directly affected by construction or operation of the detailed study alternatives. Although there are no concentrations of low income households in the project area that would be directly affected by construction of the detailed study alternatives, there are such persons in Currituck County. MCB2 and MCB4 would create a second means to reach the Outer Banks from Currituck County; however, it would be tolled. With these alternatives, low income households may choose not to pay the toll or use the bridge less frequently. They could, however,

continue to use existing roads and would benefit from less congestion on those roads. In addition, mainland low income persons who choose to use the new bridge to the Outer Banks would benefit from reduced travel distances (and associated costs) to many Outer Banks service jobs. There would be no tolls with ER2, and all users would benefit without a direct out-of-pocket cost for their travel. An indirect cost would exist, however, in the form of motor vehicle and fuel taxes.

3.1.6 Would the detailed study alternatives be compatible with local land use plans?

The No-Build Alternative and ER2 would be inconsistent with area land use plans in that these alternatives do not include construction of a Mid-Currituck Bridge. ER2 and MCB2 include substantial widening of NC 12; the towns of Southern Shores and Duck specifically reject widening of NC 12 through their communities.

The North Carolina Coastal Area Management Act (CAMA) requires each of the 20 coastal counties in North Carolina to have a local land use plan that meets guidelines established by the North Carolina Coastal Resources Commission (NCCRC). Further, municipalities within coastal counties may establish land use plans independent from their respective counties. The North Carolina Department of Environment and Natural Resources, Division of Coastal Management (NCDENR-DCM), uses approved plans when making CAMA permit decisions. Proposed development must be consistent with the local land use plan, or the NCDENR-DCM will not permit a planned development to be implemented.

The detailed study alternatives would generally be consistent with land use plans of the affected jurisdictions (Currituck County and the Dare County towns of Kitty Hawk, Southern Shores, and Duck). However, they would be inconsistent with some specific provisions, including:

- The No-Build Alternative and ER2 do not include a Mid-Currituck Bridge. A bridge is widely supported and included in the land use plans of the affected jurisdictions.
- The Southern Shores long-range plan specifies a Mid-Currituck Bridge as the means for reducing traffic on NC 12 in their town.
- ER2 and MCB2 would be inconsistent with the Town of Duck land use plan since it opposes NC 12 widening.
- MCB2 and MCB4 would be inconsistent with the Currituck County Land Use Plan, as the western bridge approach traverses a designated "Conservation Area." However, the land use plan does include a Mid-Currituck Bridge in the general area proposed for MCB2 and MCB4.
- The US 158/Mid-Currituck Bridge interchange would be within a "Limited Service Area," a designation that provides for primarily low-density residential development. Nonresidential uses, including businesses designed to serve the

tourist industry, are not prohibited, provided they are consistent with the character of the surrounding area. In addition, the Currituck County economic development strategy indicates commercial development at the Mid-Currituck Bridge terminus at US 158.

3.1.7 How would the existing business community be affected?

Overall, the business community would not be affected by any of the detailed study alternatives, although individual businesses may experience changes in access and, in some locations, changes in parking and visibility. The greatest changes to business access would be in the US 158/NC 12 interchange area with ER2 and MCB2 and in the business area at Albacore Street on the Currituck County Outer Banks with MCB2/C1 and MCB4/C1. Some businesses would be relocated, as discussed in Section 3.1.4.

With all detailed study alternatives, the introduction of a third emergency outbound lane for hurricane evacuation would introduce no barriers to business access or views.

MCB2/B and MCB4/B would change access to a gas station on the west side of US 158 in the US 158/Mid-Currituck Bridge interchange area. It currently has direct access to US 158. These alternatives would place the gas station near the end (4,000 feet) of a long (5,000 feet) frontage road that connects to US 158 at a single point. This change would make it inconvenient for customers to reach the gas station, particularly drive-by customers who would not likely associate the frontage road intersection with the gas station access. The gas station would be displaced with MCB2/A and MCB4/A.

On the Outer Banks east of the Wright Memorial Bridge, the super-street and the US 158/NC 12 interchange could affect businesses in several ways. As a result of the differences in projected traffic, the interchange would be larger with ER2 than with MCB2 and thus have greater impact. A third outbound emergency lane in this area with MCB4 also would not affect businesses. Impacts to businesses with ER2 and MCB2 in this area would include:

- Reduced visibility from US 158 in the interchange area;
- Changes in access as listed in Table 2-1; and
- With ER2 only, displacing approximately 10 percent of the Home Depot parking, making it non-conforming (does not meet current requirements) according to Kitty Hawk development requirements.

No effects on businesses would occur along NC 12 with any of the detailed study alternatives except with the C1 terminus for alternatives MCB2 and MCB4. Here NC 12 would be widened to four lanes through this business area. Between TimBuck II and Monteray Drive, access to business driveways (except at the Albacore Street intersections) would be altered as listed in Table 2-1.

With ER2, MCB2/C2, and MCB4/C2, changes in business access would be confined to not allowing left turns in or out of the secondary driveway of TimBuck II. Some parking spaces in the southeast corner of TimBuck II would be lost with MCB2/C2 and MCB4/C2.

These changes can be viewed in detail on the public hearing maps contained on the CD that accompanies this DEIS, at public review locations listed in Appendix C, and on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/.

3.1.8 How would access to neighborhoods and communities be changed?

Few changes in neighborhood or community access would occur with the detailed study alternatives.

The changes that would occur are listed in Table 2-1. No changes would occur along the third outbound hurricane evacuation lane.

With MCB2/A and MCB4/A, there would be the potential for merging traffic from the US 158 interchange to wait to merge onto US 158 until just before the intersection of US 158 and Waterlily Road. This would increase the challenge of turning left into or out of Waterlily Road during peak travel periods. An approach for resolving this complication without restricting Waterlily Road turning movements would be included in the final design. With Option B, the interchange ramp would end approximately 1,800 feet south of Waterlily Road, so there would be no impact to existing conditions at the Waterlily Road intersection.

With MCB2/B and MCB4/B, Aydlett traffic would use the Mid-Currituck Bridge approach road to travel to and from Aydlett instead of Aydlett Road, which would be closed, and Narrow Shore Road would be relocated to pass over a toll plaza (see Figure 2-10). Travel distances to and within Aydlett would be minimally changed by these local street alterations.

With ER2 and MCB2, some local streets along NC 12 would be closed to facilitate NC 12 traffic flow, but only when a subdivision has two state-maintained intersections with NC 12. Provisions would be made so that emergency vehicles could continue to have access by all existing means. With any of the detailed study alternatives, left turns to or from Crown Point and Orion's Way, two streets intersecting NC 12 in Currituck County, would be prohibited.

3.1.9 How would parks, recreation opportunities, and other community services and facilities be affected?

Parks, recreation opportunities, and other community services and facilities (including emergency services) would not be affected by the detailed study alternatives with one exception. The platform from where the kayaks are launched for the Corolla Marshes from TimBuck II kayak

trail would be removed with MCB2/C2 or MCB4/C2. The remainder of the kayak trail would be unaffected. No parks or recreation facilities built with funds provided under Section 6(f) of the Land and Water Conservation Fund Act would be affected. There would be no use of lands from public parks and recreation facilities to which Section 4(f) of the US Department of Transportation Act applies.

As noted in the previous section, where a few local street intersections along NC 12 would be closed with ER2 and MCB2 in association with widening NC 12, provisions would be made so that emergency vehicles could continue to have access by all existing means.

If MCB2 or MCB4 is selected for implementation with the C2 bridge design, TimBuck II would be compensated for the displacement of their platform which is used for launching kayaks for the Corolla Marshes from TimBuck II trail. They could choose to replace it and continue to allow kayak launching.

3.1.10 How would pedestrian and bicycle provisions change?

Existing pedestrian and bicycle multi-use paths at the time of construction would be retained with all detailed study alternatives. The detailed study alternatives do not include the construction of new pedestrian or bicycle multi-use paths except the possibility of including special pedestrian and bicycle provisions on the Mid-Currituck Bridge. Existing marked pedestrian crossings would be retained or replaced as a part of the detailed study alternatives. See Section 2.1.11 *for a complete description of pedestrian and bicycle provisions.*

3.1.11 Could crime rates increase?

Crime rates are not anticipated to increase with any of the detailed study alternatives, including MCB2 and MCB4, which would provide a direct connection between the mainland and the Currituck County Outer Banks.

Table 3-2 shows crime rates for Currituck County, Dare County, and North Carolina from 1993 to 2007. As shown, crime rates in Currituck County have decreased since 1997 and in Dare County and North Carolina since 1993.

Table 3-2. Crime Rates per 100,000 Population

Year	Currituck County	Dare County	North Carolina
1993	3,337	9,385	5,792
1997	4,056	6,786	5,591
2002	3,047	6,703	4,771
2007	2,453	4,687	4,659

Source: North Carolina State Bureau of Investigation

Bicycle and pedestrian paths are generally along or adjacent to thoroughfares within the Outer Banks and, although not lighted, they would continue to be visible to motor vehicle traffic and/or from homes.

None of the detailed study alternatives would introduce new population or activities into the project area or affect the existing patterns of land use or human activities. One concern expressed during citizens meetings was that shorter travel time to the Outer Banks offered by a Mid-Currituck Bridge would make it more convenient for thieves from urbanized areas to burglarize homes during the off season. Travel time savings to the Outer Banks would not be great enough to attract thieves from urbanized areas. For example, the uncongested travel time from Norfolk, Virginia, to Kitty Hawk (the nearest point on the Outer Banks) is approximately 103 minutes. With the Mid-Currituck Bridge, the uncongested travel time from Norfolk, Virginia, to Corolla (the new nearest point on the Outer Banks) via that bridge would be 80 minutes, a 23-minute savings. Thus, none of the detailed study alternatives is anticipated to affect crime rates on the Outer Banks.

3.1.12 How would farmlands be affected?

The greatest impact on farmland would be associated with the US 158/Mid-Currituck Bridge interchange with MCB2 and MCB4, but that effect would be less than 0.01 percent of all farmland soils in Currituck County.

The US Department of Agriculture, Natural Resource Conservation Service (NRCS), has identified three general categories of important farmland soils—prime, unique, and state and locally important. Prime farmland soils are best suited for producing food, forage, fiber, and oilseed crops. Farmland of state and local importance consists of soils that do not meet all of the requirements for prime farmland because of steepness of slope, permeability, susceptibility to erosion, low available water capacity, or some other soil property. Soils that have a special set of properties unique to producing certain high-value crops meet the requirements for unique farmland.

Most of the farmland soils in the project area exist on the Currituck County mainland. There are no farmland soils of any type on the Outer Banks in Currituck County. Although there are state and locally important farmland soils on the Outer Banks in Dare County, these soil types are present in developed areas and thus are not considered farmland. There are no unique farmland soils in the project area.

ER2 would affect less than 2 acres of prime farmland soils and less than 2 acres of state and locally important farmland soils. MCB2/A and MCB4/A each would affect approximately 37 acres of prime farmland soils and 72 acres of state and locally important farmland soils, primarily in the US 158/Mid-Currituck Bridge interchange area. MCB2/B and MCB4/B each would affect approximately 76 acres of prime farmland soils with its larger use of land in the Aydlett area and 41 acres of state and locally important farmland soils with its smaller US 158/Mid-Currituck Bridge interchange area.

According to the NRCS, this is less than 0.01 percent of all farmland soils in Currituck County. With the No-Build Alternative, no farmland would be affected.

The *Community Impact Assessment Technical Report* (Parsons Brinckerhoff, 2009) provides further detail and includes a copy of the Farmland Conversion Impact Rating form (Form CPA-106).

3.2 Cultural Resources Characteristics and Impacts

This section considers the impacts of the detailed study alternatives on cultural resources in the project area. It asks:

- Would historic resources be affected?
- Would archaeological resources be affected?
- Would resources that are protected by the requirements of Section 4(f) of the Department of Transportation Act of 1966 be used?

3.2.1 Would historic resources be affected?

In consultation with the State Historic Preservation Office (HPO), it was determined that no adverse effect on historic properties would result from the detailed study alternatives.

Surveys for historic resources were conducted in December 2007 and March 2009. The results are documented in two historic resource survey reports (NCDOT, 2008 and 2009). These reports are included on the CD that accompanies this DEIS, at public review locations listed in Appendix C, and on the NCTA web site at http://www .ncturnpike.org/projects/Mid_Currituck. The historic resource Area of Potential Effects (APE) for the Mid-Currituck Bridge Study is shown on Figure 3-4.

The two surveys identified 36 historic properties within the APE. NCDOT and the HPO agreed that 14 properties in or near the APE were listed in or eligible for inclusion in the National Register of Historic Places. Letters associated with that agreement are included on the CD under "Historic Architectural Resources Supplemental Materials" and are posted on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/. The locations of these properties are listed in Table 3-3. They are shown on Figure 3-4.

On March 24, 2009, and September 15, 2009, representatives of NCTA, NCDOT, the Federal Highway Administration (FHWA), and HPO met to determine whether the detailed study alternatives would have an Adverse Effect on any historic property in the APE. The results are presented in Table 3-3 by alternative. None of the detailed study alternatives would have an Adverse Effect on historic properties. The "Concurrence Forms for Assessment of Historic Resource Effects" signed by NCDOT, FHWA, and representatives from the HPO are included on the CD under "Historic Architectural

Table 3-3. Historic Resources and Effects Determination

	ER2	MCB2	MCB4
Coinjock Colored School (DOE)	No Effect	No Effect	No Effect
Samuel McHorney House (DOE)[1]	No Adverse Effect	No Adverse Effect	No Adverse Effect
Daniel Saunders House (DOE)	No Effect	No Adverse Effect[2]	No Adverse Effect[2]
Currituck Sound Rural Historic District (DOE)	No Effect	No Effect	No Effect
Dr. W. T. Griggs House (DOE)	No Effect	No Effect	No Effect
Ellie and Blanton Saunders Decoy Workshop (DOE)	No Effect	No Effect	No Effect
Christian Advocate Baptist Church (DOE)	No Effect	No Effect	No Effect
(Former) Grandy School (DOE)[1]	No Adverse Effect	No Effect	No Effect
C. W. Wright Store (DOE)[1]	No Adverse Effect	No Effect	No Effect
Jarvisburg Colored School (DOE)[1]	No Adverse Effect	No Effect	No Effect
Dexter W. Snow House (DOE)[1]	No Adverse Effect	No Effect	No Effect
Whalehead Club (NR)	No Effect	No Effect	No Effect
Currituck Beach Light Station (NR)	No Effect	No Effect	No Effect
Corolla Historic District (DOE)	No Effect	No Effect	No Effect

Note: NR=Listed in the National Register of Historic Places and DOE=Determined eligible for inclusion in the National Register.

[1]Determinations of No Adverse Effect for these resources only apply with the addition of a third outbound lane for hurricane evacuation along US 158. The finding would be No Effect for reversing the center turn lane during an evacuation since that option would involve no new construction along US 158.

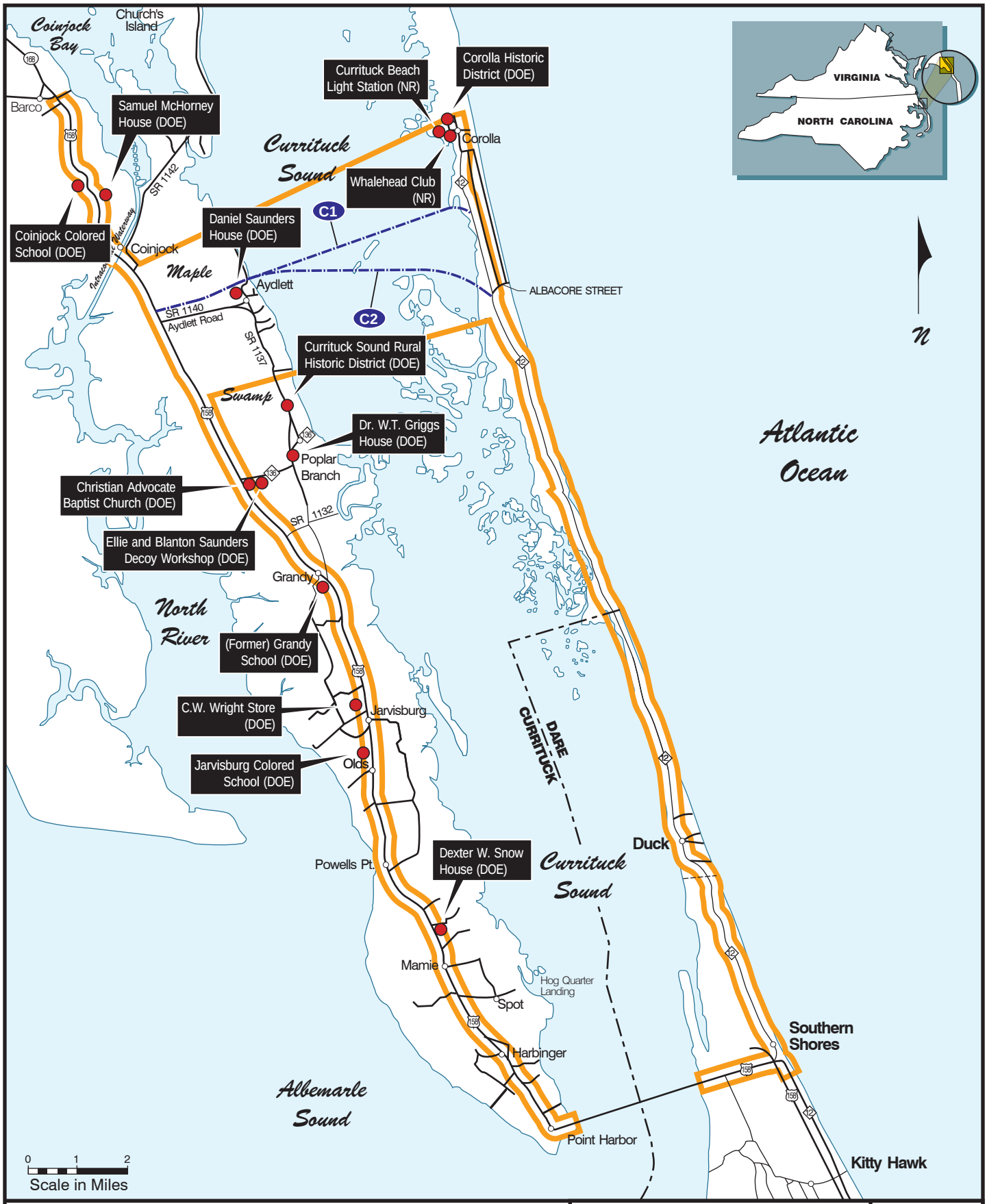
[2]The Daniel Saunders House is the only historic resource near mainland approach design Options A and B. The effects determination indicated applies to both options.

Resources Supplemental Materials." They also are posted on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/.

3.2.2 Would archaeological resources be affected?

The potential exists for archaeological resources to be affected by the detailed study alternatives. Additional studies would be conducted after selection of an alternative for implementation.

Phase I terrestrial and underwater archaeological background studies were conducted for the project (Panamerican Consultants, Inc., 2008 and 2009). These two studies are on the CD included with this DEIS, at public review locations listed in Appendix C, and on



LEGEND

- Alternative Bridge Corridors
- County Boundaries
- Area of Potential Effect (APE)
- Resource listed (NR) on or eligible (DOE) for inclusion in the National Register of Historic Places

Historic Resources

Figure 3-4

the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/. The archaeological APE for the Mid-Currituck Bridge Study encompasses those areas that could be directly disturbed by construction of any of the detailed study alternatives.

Numerous terrestrial archaeological surveys have been conducted in or adjacent to the APE. Surveys of the APE found eight recorded archaeological sites (five prehistoric, two historic, and one multi-component) and 36 historic cemeteries. A single reported site and two "old missile test sites" also were noted within the APE. While only a few submerged cultural resources surveys have been conducted within or adjacent to the project area, no underwater sites are listed within the APE. However, there are several notable shipwreck sites adjacent to the APE, and the Currituck Sound portion of the project area has a long maritime history suggesting the possibility of additional sites.

The potential for additional, as yet unidentified, cultural resources sites in the project area is indicated by the presence of known sites within the APE and the extensive and continued use of the area from prehistoric times. Therefore, following the receipt of comments on this DEIS and finalizing the selection of a Preferred Alternative, additional archaeological surveys may be conducted on both land and water to identify the presence or absence of additional resources. Also, an assessment would be conducted of the NRHP eligibility of sites within the APE of the Preferred Alternative if they would be jeopardized by impacts from project construction.

3.2.3 Would resources that are protected by the requirements of Section 4(f) of the Department of Transportation Act of 1966 be used?

The hurricane evacuation option of constructing a third outbound lane on US 158 for evacuating traffic would use land from one or two historic Section 4(f) properties, the Samuel McHorney House (all alternatives) and the Dexter W. Snow House (ER2 only). However, because the impact to both the McHorney House and the Snow House would not adversely affect the activities, features, and attributes that qualify these properties for protection under Section 4(f), the FHWA, by publishing this DEIS, is requesting comments on a proposed finding of de minimis (minimal) impact for both properties for the hurricane evacuation option of constructing a third outbound lane on US 158 for evacuating traffic. The final determination regarding these properties will be included in the FEIS. With ER2 only, a temporary construction easement would be needed at three additional historic Section 4(f) properties. Since there would be no adverse effect at these three properties and the occupancy would be temporary, there would be no Section 4(f) use.

No publicly-owned park, recreation area, or wildlife and/or waterfowl refuge would be affected by the detailed study alternatives.

Five properties determined eligible for inclusion in the National Register of Historic Places, all located along US 158, were identified as being affected by one or more of the detailed study alternatives as follows:

- For three of these properties, (Former Grandy School, C.W. Wright Store, and Jarvisburg Colored School), a temporary construction easement would be required with ER2 for re-grading the pavement with the hurricane evacuation option of providing a new third outbound lane on US 158 for evacuating traffic.

- For the fourth property, the Dexter W. Snow House, additional right-of-way would be required with ER2 with the hurricane evacuation option of providing a new third outbound lane on US 158.

- For the fifth property, the Samuel McHorney House, additional right-of-way would be required with all of the detailed study alternatives with the hurricane evacuation option of providing a new third outbound lane on US 158.

None of these properties would be affected if reversing the center turn lane on US 158 were chosen as the means to reduce hurricane evacuation times. The HPO has made a determination of no adverse effect for all five properties. The location of all five properties is shown on Figure 3-4.

3.2.3.1 Three Properties Affected by a Temporary Construction Easement

In the case of the three historic properties affected by a temporary construction easement, Section 4(f) does not apply. The temporary occupancy of land is so minimal that it does not constitute a use within the meaning of Section 4(f) because the following conditions from Title 23, Section 771.135(p)(7) of the *Code of Federal Regulations* are satisfied:

1. The duration would be temporary, i.e., less than the time needed for construction of the project, and there would be no change in ownership of the land;

2. The scope of the work would be minor, i.e., both the nature and magnitude of the changes to the Section 4(f) resource would be minimal;

3. There would be no anticipated permanent adverse physical impacts, nor would there be interference with the activities or purpose of the resource, on either a temporary or permanent basis;

4. The land being used would be fully restored, i.e., the resource would be returned to a condition which is at least as good as that which existed prior to the project; and

5. There is a documented agreement with the HPO and FHWA regarding the above conditions.

The agreement noted in item 5 is contained on the CD that accompanies this DEIS, at public review locations listed in Appendix C, and posted on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/.

3.2.3.2 Samuel McHorney House

The Samuel McHorney House is a rare, intact, unaltered example of a two-story, single-pile dwelling. This house is a well-preserved example of a traditional regional form. It is on a 0.92-acre parcel that contains the house and the large trees that surround it. The Samuel McHorney House possesses integrity of location, as it remains at the original site on which it was constructed. The setting has been compromised by modern residential and commercial development directly across US 158. Integrity of design, materials, and workmanship is very much intact, with the only major alteration the loss of porches on the side elevations. The Samuel McHorney House is eligible for National Register listing under Criterion C (Design/Construction).

At the location of the Samuel McHorney House, there is insufficient right-of-way along US 158 to accommodate the hurricane evacuation option for all of the detailed study alternatives of constructing a third outbound lane for evacuating traffic. The additional right-of-way would not be needed if it is decided to meet hurricane evacuation needs by using the existing center turn lane as the third outbound evacuation lane. The benefits and limitations of the two options for reducing hurricane evacuation clearance times are discussed in Section 2.1.10.

The detailed study alternatives would require use of an approximately 8-foot-wide strip along the property frontage (approximately 0.02 acre of right-of-way and easement), which includes a grassed area adjacent to the roadway. The proposed right-of-way line would be approximately 120 feet from the front of the structure. No trees would be displaced either by the project or the relocation of telephone lines adjacent to the existing right-of-way.

Concurrence was requested and received from the HPO that the detailed study alternatives would not adversely affect the activities, features, and attributes that qualify the Samuel McHorney House for protection under Section 4(f). That effects determination is included under "Historic Architectural Resources Supplemental Materials" on the CD that accompanies this DEIS, at public review locations listed in Appendix C, and on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/. Thus, it appears there are grounds for a finding of *de minimis* (minimal) effect, and NCTA intends to seek a *de minimis* finding from FHWA if a third outbound lane for hurricane evacuation is included in the Preferred Alternative. Section 4(f) property may be used when the FHWA determines that the use of the property, including any measure(s) committed to in order to minimize harm (such as any avoidance, minimization, mitigation, or enhancement measures), would have a *de minimis* impact on the property (as defined in Title 23 *Code of Federal Regulations* Section 774.17). A *de minimis* impact determination under Title 23 *Code of Federal Regulations* Section 774.3(b) considers the requirement for all possible planning to minimize harm by reducing impacts on the Section 4(f) property to a *de minimis* level (Title 23 *Code of Federal Regulations* Section 774.117[5]). By publishing this DEIS, FHWA is requesting comments on the proposed finding of *de minimis* impact for the Samuel McHorney House. The final determination regarding this property will be included in the FEIS.

3.2.3.3 Dexter W. Snow House

Built in 1908 by Currituck carpenter Melton Pugh for a local farmer, the Dexter W. Snow House is a modest two-story frame house with an asymmetrical plan and simple Victorian details. The Dexter W. Snow House was determined eligible for the National Register in 1989. As a result of the widening of US 158 from Point Harbor to Powell's Point, the house was moved back from the new road 80 feet on the same parcel and placed on a new foundation. The Dexter W. Snow House has been determined eligible for National Register listing under Criterion C in the area of architecture. It is a good, intact example of a rural farmhouse in Currituck County that dates to the early 1900s. The property has experienced few changes over time. Although the property was moved in 1989, it retains sufficient integrity to remain eligible for the National Register. The proposed National Register boundary is 0.8 acre.

At the location of the Dexter W. Snow House, the US 158 right-of-way is approximately 10 feet narrower than at adjoining properties and most of the US 158 right-of-way between the Wright Memorial Bridge and the Knapp (Intracoastal Waterway) Bridge. Thus, there is insufficient right-of-way to accommodate the hurricane evacuation option with ER2 of constructing a third outbound lane on US 158 for evacuating traffic, and the purchase of an additional 10 feet of right-of-way is proposed. The land that would be purchased contains no structures, upper story vegetation, or screening vegetation. The additional width would not be needed if it is decided to meet hurricane evacuation needs by using the existing center turn lane as the third outbound evacuation lane. The benefits and limitations of the two options for reducing hurricane evacuation clearance times are discussed in Section 2.1.10. In the case of ER2, emergency management officials have indicated that the 27-mile lane reversal associated with ER2 is not a realistic option.

Concurrence was requested and received from the HPO that the detailed study alternatives would not adversely affect the activities, features, and attributes that qualify the Dexter W. Snow House for protection under Section 4(f). That effects determination is included under "Historic Architectural Resources Supplemental Materials" on the CD that accompanies this DEIS, at public review locations listed in Appendix C, and on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/. Thus, it appears there are grounds for a finding of *de minimis* (minimal) effect, and NCTA intends to seek a *de minimis* finding from FHWA if ER2 is selected as the Preferred Alternative. Section 4(f) property may be used when the FHWA determines that the use of the property, including any measure(s) committed to in order to minimize harm (such as any avoidance, minimization, mitigation, or enhancement measures), would have a *de minimis* impact on the property (as defined in Title 23 *Code of Federal Regulations* section 774.17). A *de minimis* impact determination under Title 23 *Code of Federal Regulations* Section 774.3(b) considers the requirement for all possible planning to minimize harm by reducing impacts on the Section 4(f) property to a *de minimis* level (Title 23 *Code of Federal Regulations* Section 774.117[5]). By publishing this DEIS, FHWA is requesting comments on the proposed finding of *de minimis* impact for the Dexter W. Snow House. The final determination regarding this property will be included in the FEIS.

3.3 Natural Resource Characteristics and Impacts

This section considers the impacts of the detailed study alternatives on natural resources in the project area. It considers:

- How would water resources in the project area be affected?
- How would biotic resources be affected?
- How would wildlife on land be affected?
- How would aquatic wildlife be affected?
- How would invasive species be controlled?
- What impacts would occur to waters under the jurisdiction of the US Army Corps of Engineers?
- Would habitat used by threatened and endangered species be affected?
- Would Coastal Area Management Act Areas of Environmental Concern or Essential Fish Habitat be affected?

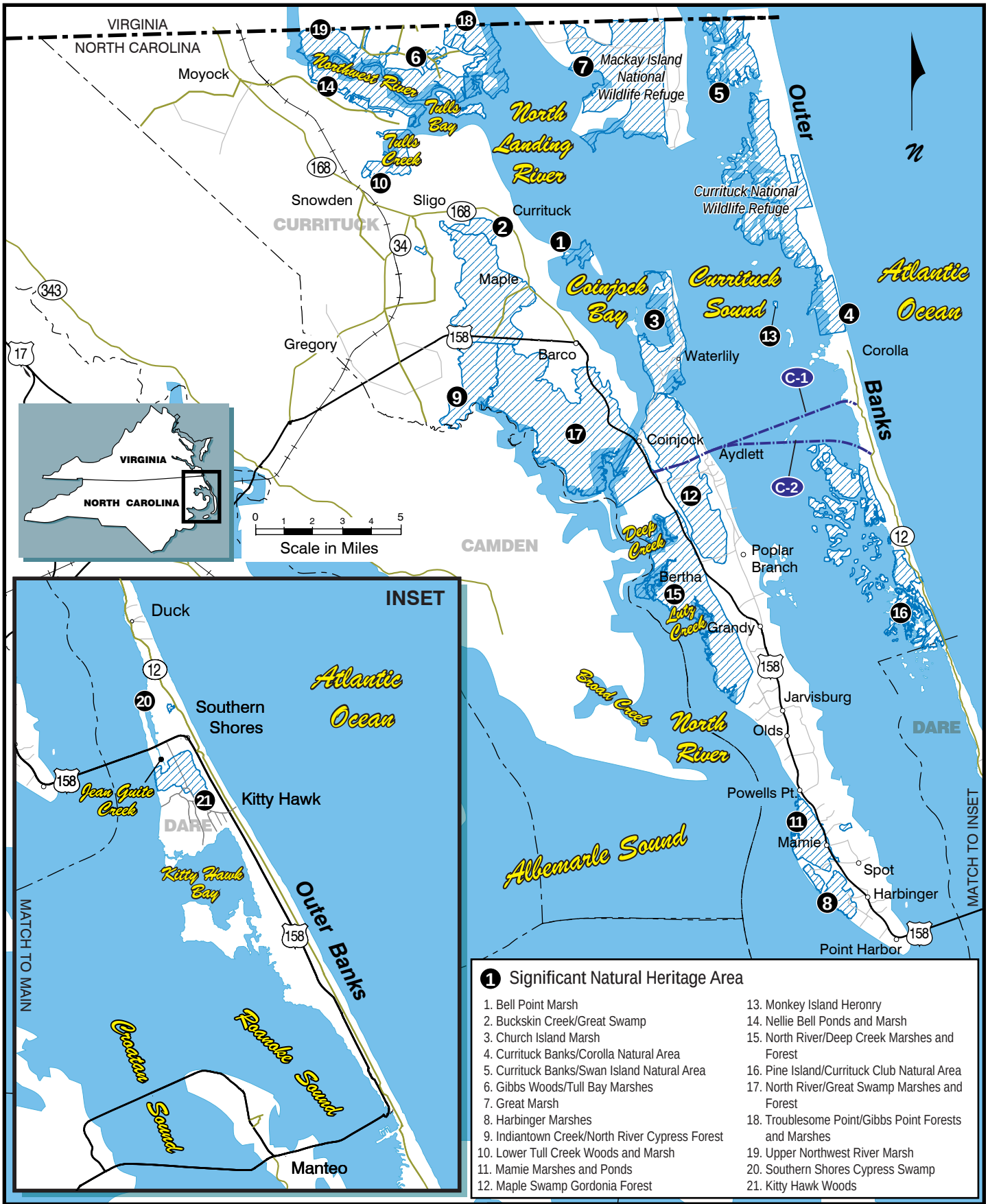
Natural characteristics and impacts associated with the detailed study alternatives are described in detail in the *Natural Resources Technical Report* (CZR, Incorporated, 2009), which is included on the CD that accompanies this DEIS, at public review locations listed in Appendix C, and on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/.

3.3.1 How would water resources in the project area be affected?

The most notable temporary impact to water quality would be increased turbidity levels produced during construction of the Mid-Currituck Bridge with MCB2 and MCB4. Permanent impacts to water quality are primarily associated with increased levels of bridge and highway runoff.

3.3.1.1 Water Resources

Surface waters of the project area are found primarily in association with Currituck Sound. The Atlantic Intracoastal Waterway and Jean Guite Creek are the only major drainages present. There are five additional jurisdictional unnamed drainages identified within the project area. These include two canals that connect to Maple Swamp and drain into Great Swamp and Deep Creek (North River), which are along the mainland portion of US 158. Two modified natural streams that drain into Currituck Sound were identified along US 158. There is also a small stream identified within the maritime swamp near the Outer Banks terminus of the C2 bridge corridor. The locations of these seven features are shown on Figure 3-5.



1 Significant Natural Heritage Area

1. Bell Point Marsh
2. Buckskin Creek/Great Swamp
3. Church Island Marsh
4. Currituck Banks/Corolla Natural Area
5. Currituck Banks/Swan Island Natural Area
6. Gibbs Woods/Tull Bay Marshes
7. Great Marsh
8. Harbinger Marshes
9. Indiantown Creek/North River Cypress Forest
10. Lower Tull Creek Woods and Marsh
11. Mamie Marshes and Ponds
12. Maple Swamp Gordonia Forest
13. Monkey Island Heronry
14. Nellie Bell Ponds and Marsh
15. North River/Deep Creek Marshes and Forest
16. Pine Island/Currituck Club Natural Area
17. North River/Great Swamp Marshes and Forest
18. Troublesome Point/Gibbs Point Forests and Marshes
19. Upper Northwest River Marsh
20. Southern Shores Cypress Swamp
21. Kitty Hawk Woods

LEGEND

- Water Bodies
- Significant Natural Heritage Area
- Bridge Alignment Corridors

Water Bodies and Other Natural Resource-Related Features

Figure

3-5

3.3.1.2 Classifications of Water Resources

All waters found within the project area are designated as "SC" under North Carolina's water quality classifications by the North Carolina Department of Environment and Natural Resources–Division of Water Quality (NCDENR-DWQ, 2008). This saltwater classification represents the minimum quality standards applicable to all saltwaters. Suitable activities for waters classified SC include "aquatic life propagation and survival, fishing, wildlife and secondary recreation" (NCDENR-DWQ, 2008a).

Most of Currituck Sound and all waters of the project area are closed to harvesting shellfish for direct marketing purposes or human consumption. There are no water bodies classified as High Quality Waters (HQW), Outstanding Resource Waters (ORW), or Water Supply Watersheds (WS-I, WS-II) within 1.0 mile downstream of the project area.

Primary Nursery Areas (PNAs) are low salinity, state-designated waters in the upper reaches of streams that are used by marine and estuarine fishes and invertebrates during early development. Jean Guite Creek is the only designated PNA in the project area.

Anadromous (fish that spawn) Fish Spawning Areas (AFSA) are low salinity, state-designated waters that contain the physical, chemical, and biological attributes necessary for anadromous fish to spawn successfully. No AFSA are crossed by the detailed study alternatives.

There is no specific statute or regulation that designates or references the waters of Currituck Sound as subject to a construction moratorium. However, there is a possibility that a moratorium could be imposed on the project via a permit condition during the US Army Corps of Engineers (USACE) Section 404 of the Clean Water Act and CAMA permitting review processes. The only state-designated fish nursery/ spawning area (primary, secondary, or anadromous spawning area) crossed by any alternative is Jean Guite Creek, which is a PNA and would be crossed by the widening of US 158 with ER2 and MCB2, as well as a third outbound lane hurricane evacuation improvement with MCB4. Although each project is reviewed on a case-by-case basis and coordinated with the NC Division of Marine Fisheries, the dates for a potential moratorium, depending on extent and type of impact, could range from February 15 through September 30.

3.3.1.3 Quality of Water Resources

Water quality of the Albemarle-Pamlico estuarine system is undergoing substantial degradation because of the area's increasing population, changes in agricultural practices, and urbanization and industrialization of the region. Point source pollution within the project area is limited. Local non-point source pollution is typical of developed areas and generally is in the form of stormwater runoff.

3.3.1.4 Impacts to Water Quality

The most notable temporary impact to water quality would be the increased turbidity levels produced during construction of the Mid-Currituck Bridge with MCB2 and MCB4. The duration and severity of this impact would vary based on the number of simultaneous construction sites, which is likely to be a minimum of two, one at each end of the bridge. If construction is done from low-draft barges, additional simultaneous construction sites could occur. Increased turbidity and sedimentation levels also would temporarily increase as a result of runoff from construction areas on land, until post-construction re-vegetation. Increases in turbidity and sedimentation can negatively affect aquatic flora and fauna by depressing light penetration, lowering dissolved oxygen levels, causing fluctuating nutrient levels, and limiting visibility. This could result in increased algal growth, which would be detrimental to aquatic life near the bridge. These impacts would likely be prolonged because of poor water circulation in the sound.

Permanent impacts to water quality would be primarily associated with increased levels of bridge and highway runoff, which is considered a non-point source discharge. The effects of runoff are highly site specific. The primary pollutants associated with bridge and highway runoff include particulates, organic compounds, nutrients, and heavy metals. These pollutants accumulate on impervious surfaces and are derived from automobiles and materials used in construction and maintenance of roadways. These substances have the potential to affect negatively aquatic life by directly or indirectly interfering with various biological processes and cycles.

Pollutants discharged into Currituck Sound from a bridge could dissipate slowly because of poor water circulation, and could result in bioaccumulation and higher sediment pollutant levels than in areas with higher flow and better water circulation. Thermal and turbidity differences in runoff also could affect water quality by depressing oxygen levels and light penetration.

Based solely on the increased amount of impervious surface area (Table 3-4), MCB2 would result in the greatest increase in runoff, whereas MCB4 would result in the least increase. ER2 would be similar to MCB4. The difference between mainland approach road Option A and Option B in terms of impervious surface would be minimal (0.4 acre). For the road widening portions of the detailed study alternatives, infiltration strips and ditches that would transport water to dry infiltration basins would be implemented to treat highway runoff along NC 12. Along US 158, ditches would be used to transport water to existing outfalls.

Additional impacts to water quality could occur from single pollution events such as hazardous spill incidents on proposed bridge structures or widened roadways. Impacts to salinity, water supply and wastewater treatment should not result from any of the detailed study alternatives.

Table 3-4. Existing and Proposed Impervious Surface Areas by Detailed Study Alternative

	ER2 (acres)	MCB2/C1 (acres)	MCB2/C2 (acres)	MCB4/C1 (acres)	MCB4/C2 (acres)
Option A					
Existing Impervious Surface	290.4	290.4	290.4	290.4	290.4
Proposed Impervious Surface	379.4 (344.7)	417.2 (412.0)	410.8 (405.6)	377.0 (370.4)	371.4 (364.8)
Increase in Impervious Surface					
• Road	89.0 (54.3)	87.3 (82.1)	77.8 (72.6)	47.1 (40.5)	38.4 (31.8)
• Bridge	0.0	39.5	42.6	39.5	42.6
Total/Percent Increase	89.0/30.6 (54.3/18.7)	126.8/43.7 (121.6/41.9)	120.4/41.5 (115.2/39.7)	86.6/29.8 (80.0/27.5)	81.0/27.9 (74.4/25.6)
Option B					
Existing Impervious Surface	NA	290.4	290.4	290.4	290.4
Proposed Impervious Surface	NA	416.8 (411.6)	410.4 (405.2)	376.6 (370.0)	371.0 (364.4)
Increase in Impervious Surface					
• Road	NA	96.8 (91.6)	87.3 (82.1)	56.6 (50.0)	47.9 (41.3)
• Bridge	NA	29.6	32.7	29.6	32.7
Total/Percent Increase	NA	126.4/43.5 (121.2/41.7)	120.0/41.3 (114.8/39.5)	86.2/29.7 (79.6/27.4)	80.6/27.8 (74.0/25.5)

The numbers in parentheses reflect the impact if reversing the center turn lane is used to reduce hurricane evacuation clearance times rather than constructing a third outbound lane. When there is no number in parentheses, the impact would be identical for either hurricane evacuation option. The removal of Aydlett Road (2.8 acres) is factored into Option B impervious surface area calculations.

3.3.2 How would biotic resources be affected?

The detailed study alternatives would affect a variety of natural and naturalized biotic communities. The impact on natural upland communities would be least with MCB4/A/C1 and MCB4/A/C2. The fill impact on wetlands would be least with ER2 and MCB4/A/C2. A Mid-Currituck Bridge would involve shading and clearing impacts in addition to fill impacts. A Mid-Currituck Bridge would affect aquatic bottom and submerged aquatic vegetation (SAV). All of

the detailed study alternatives would cause a minor amount of permanent shading impacts to streams in the project area, but there would be no fill placed in streams. In general, temporary impacts to biotic communities would be greatest with ER2.

3.3.2.1 Biotic Community Types

Twenty-one biotic community types occur within the project area. Of these 21 communities, seven communities are the result of direct human disturbance, including: man-dominated land, agricultural land, pine forest, shrub/scrub, wetland man-dominated land, wetland pine forest, and wetland shrub/scrub. Fourteen communities can be considered to be relatively natural systems: mixed-pine/hardwood forest, hardwood forest, maritime shrub/grassland, maritime forest, wetland mixed-pine/hardwood forest, wetland hardwood forest, wetland bay forest, wetland swamp forest, wetland maritime shrub/grassland, wetland maritime forest, wetland maritime swamp, wetland freshwater marsh, ponds, and open water. The characteristics and extent of these communities are described in detail in the *Natural Resources Technical Report* (CZR, Incorporated, 2009).

3.3.2.2 Rare and Threatened Communities

Rare and threatened natural community types within the state are identified by the North Carolina Natural Heritage Program (NCNHP) and ranked based on rarity or because of factors making a particular community especially vulnerable to degradation. Rare and threatened natural communities identified within the project area by the NCNHP (2008a) are: maritime dry grassland, maritime wet grassland, maritime shrub, maritime swamp forest, maritime evergreen forest, non-riverine wet hardwood forest, non-riverine swamp forest, bay forest, tidal cypress/gum swamp, and tidal freshwater marsh. The characteristics of these communities are described in detail in the *Natural Resources Technical Report* (CZR, Incorporated, 2009).

3.3.2.3 Natural Heritage Areas

The NCNHP designates Significant Natural Heritage Areas (SNHA). Those in the project area and areas immediately surrounding the project area are shown on Figure 3-5. Three SNHAs are in the project area. The Pine Island/Currituck Club Natural Area is on the Currituck Outer Banks and in Currituck Sound. It contains an extensive tidal freshwater marsh system along the eastern side of Currituck Sound. This area is given a "C" status, which indicates that it is an outstanding example of this marsh community, though this community may be represented by better examples in the state (NCNHP, 2005).

The Maple Swamp Gordonia Forest is an SNHA on the Currituck County mainland in the project area. It is assigned a "B" status, which indicates that it is a statewide significant site that is among the highest quality occurrences in North Carolina. The significant features associated with this site include an unusually extensive stand of loblolly bay forest, which may represent the largest stand in the state, and the most northern range of this community. On the mainland, large portions of the forests and marshes surrounding North River and Deep Creek, including Great Swamp, are

recognized by the NCNHP as SNHAs. These areas are also assigned a "B" status because of the extensive tidal freshwater marsh areas and what are thought to be natural and/or virgin stands of tidal cypress/gum swamp. Additional detail on SNHAs is included in the *Natural Resources Technical Report* (CZR, Incorporated, 2009).

All of the detailed study alternatives would affect the eastern fringe of Great Swamp. MCB2 and MCB4 would pass through Maple Swamp. The bridge corridor, however, was placed so that there would be no permanent loss or alteration of the unique loblolly bay forest found within the swamp. Drainage improvements along NC 12 with ER2 and MCB2 would affect the fringe of the Pine Island/Currituck Club Natural Area where it borders NC 12. Impacts resulting from these SNHA encroachments are discussed throughout the natural resource impact assessment in this DEIS.

3.3.2.4 Impacts to Biotic Communities

Permanent impacts to biotic communities include losses because of fill, bridge pilings, drainage easements, and cleared maintenance corridors. Shading from proposed bridge decks would primarily affect open water habitats, including SAV. Shading is shown for informational purposes; however, no permits or mitigation is required solely for shading impacts. Temporary impacts would result from fill and clearing during construction, but would likely return to natural conditions over time. The estimated amounts of permanent impacts to biotic communities within the project area are shown for each detailed study alternative in Table 3-5 and Table 3-6. The estimated amounts of temporary impacts to biotic communities are shown for each detailed study alternative in Table 3-7 and Table 3-8. Details on specific upland and wetland community types affected are presented in the *Natural Resources Technical Report* (CZR, Incorporated, 2009).

Table 3-5 and Table 3-6 indicate that:

- The total impact (i.e., fill, pilings, and clearing) on natural upland communities would be least with MCB4/A/C1 and MCB4/A/C2 (with or without construction of a third outbound lane for hurricane evacuation on US 158);

- The fill impact on wetlands would be least with ER2 and MCB4/A/C2. The fill impact on wetlands with Option B would be substantially more than Option A for each alternative;

- A Mid-Currituck Bridge would involve wetlands clearing impacts in addition to fill impacts (with or without construction of a third outbound lane for hurricane evacuation on US 158);

- A Mid-Currituck Bridge would affect aquatic bottom and SAV, primarily by shading; and

Table 3-5. Permanent Impacts to Biotic Communities by Detailed Study Alternative for ER2, MCB2/A, and MCB4/A

Biotic Community	ER2 (acres)				MCB2/A/C1 (acres)				MCB2/A/C2 (acres)				MCB4/A/C1 (acres)				MCB4/A/C2 (acres)			
	Fill	Pilings	Shading	Clearing	Fill	Pilings	Shading	Clearing	Fill	Pilings	Shading	Clearing	Fill	Pilings	Shading	Clearing	Fill	Pilings	Shading	Clearing
Upland Impact																				
Upland man-dominated land	35.7 (33.9)	0.0	0.0	0.0	78.0 (76.3)	0.0	0.1	0.1	74.5 (72.8)	0.0	0.2	0.3	49.0 (47.3)	0.0	0.1	0.1	45.5 (43.8)	0.0	0.2	0.3
Upland agricultural land	0.2 (0.0)	0.0	0.0	0.0	16.3 (16.1)	0.0	0.0	0.0	16.3 (16.1)	0.0	0.0	0.0	16.3 (16.1)	0.0	0.0	0.0	16.3 (16.1)	0.0	0.0	0.0
Upland natural or naturalized communities	85.3	0.0	0.0	0.0	113.4	0.0	0.9	2.7	110.0	0.0	1.4	2.5	44.1	0.0	0.9	2.7	40.8	0.0	1.4	2.5
Total upland	121.2 (119.2)	0.0	0.0	0.0	207.7 (205.8)	0.0	1.0	2.8	200.9 (199.0)	0.0	1.6	2.9	109.4 (107.5)	0.0	1.0	2.8	102.6 (100.7)	0.0	1.6	2.9
Wetland Impact																				
Wetland man-dominated land	0.2	0.0	0.0	0.0	1.2	0.0	0.0	0.1	1.2	0.0	0.0	0.1	1.0	0.0	0.0	0.1	1.0	0.0	0.0	0.1
Wetland natural or naturalized communities	4.9 (4.4)	0.0	0.0	0.0	11.6 (11.2)	0.0	10.1	25.6	9.0 (8.6)	0.0	12.4	30.4	7.5 (7.1)	0.0	10.1	25.7	4.9 (4.5)	0.0	12.4	30.4
Total wetland	5.1 (4.6)	0.0	0.0	0.0	12.8 (12.4)	0.0	10.1	25.7	10.2 (9.8)	0.0	12.4	30.6	8.5 (8.1)	0.0	10.1	25.9	5.9 (5.5)	0.0	12.4	30.6

Table 3-5 (concluded). Permanent Impacts to Biotic Communities by Detailed Study Alternative for ER2, MCB2/A, and MCB4/A

Biotic Community	ER2 (acres)				MCB2/A/C1 (acres)				MCB2/A/C2 (acres)				MCB4/A/C1 (acres)				MCB4/A/C2 (acres)			
	Fill	Pilings	Shading	Clearing	Fill	Pilings	Shading	Clearing	Fill	Pilings	Shading	Clearing	Fill	Pilings	Shading	Clearing	Fill	Pilings	Shading	Clearing
Pond Impact	0.3	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Aquatic Bottom Impact (total/<6 feet deep)	0.1/ 0.1	0.0/ 0.0	0.1/ 0.1	0.0 /0.0	0.1/ 0.1	0.2/ 0.1	28.2/ 14.5	0.0/ 0.0	0.1/ 0.1	0.2 /0.1	28.2/ 17.8	0.0 /0.0	0.1/ 0.0	0.1/ 0.1	28.1/ 14.5	0.0 /0.0	0.0/ 0.0	0.2 0.1	29.1/ 17.8	0.0/ 0.0
SAV Impact (known)	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.0	0.0	0.0	5.5	0.0	0.0	0.0	4.3	0.0	0.0	0.0	5.5	0.0
Stream Impact																				
Stream (acreage)	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stream (linear feet)	0.0	0.0.	36.0	0.0	0.0	0.0	36.0	0.0	0.0	0.0	136.0	0.0	0.0	0.0	18.0	0.0	0.0	0.0	118.0	0.0
TOTAL IMPACT	126.6 (124.2)	0.0	0.1	0.0	221.8 (219.5)	0.2	39.3	28.5	211.4 (209.1)	0.2	43.1	33.5	119.0 (116.7)	0.2	39.3	28.6	108.6 (106.2)	0.2	43.0	33.5

The numbers in parentheses reflect the impact if reversing the center turn lane is used to reduce hurricane evacuation clearance times rather than constructing a third outbound lane. When there is no number in parentheses, the impact would be identical for either hurricane evacuation option. Also, the numbers in this table were rounded to the nearest tenth, so minor rounding error exists when adding the individual numbers to get the totals. The aquatic bottom numbers include the portion of the bottom with SAV.

Table 3-6. Permanent Impacts to Biotic Communities by Detailed Study Alternative for MCB2/B and MCB4/B

Biotic Community	MCB2/B/C1 (acres)				MCB2/B/C2 (acres)				MCB4/B/C1 (acres)				MCB4/B/C2 (acres)			
	Fill	Pilings	Shading	Clearing	Fill	Pilings	Shading	Clearing	Fill	Pilings	Shading	Clearing	Fill	Pilings	Shading	Clearing
Upland Impact																
Upland man-dominated land	79.2 (77.4)	0.0	0.7	0.0	75.7 (74.0)	0.0	0.7	0.3	50.1 (48.3)	0.0	0.7	0.0	46.6 (44.8)	0.0	0.0	0.3
Upland agricultural land	35.7 (35.5)	0.0	0.0	0.0	35.7 (35.5)	0.0	0.0	0.0	35.7 (35.5)	0.0	0.0	0.0	35.7 (35.5)	0.0	0.0	0.0
Upland natural or naturalized communities	121.7	0.0	0.5	0.5	118.4	0.0	0.3	0.4	52.4	0.0	0.5	0.5	49.1	0.0	0.3	0.4
Total upland	236.6 (234.6)	0.0	1.2	0.6	229.8 (227.9)	0.0	1.0	0.7	138.2 (136.2)	0.0	1.2	0.6	131.4 129.4	0.0	0.3	0.7
Wetland Impact																
Wetland man-dominated land	2.4	0.0	0.0	0.0	2.4	0.0	0.0	0.0	2.2	0.0	0.0	0.0	2.2	0.0	0.0	0.0
Wetland natural or naturalized communities	40.5 (40.1)	0.0	0.4	0.3	37.9 (37.5)	0.0	2.9	5.1	36.4 (36.0)	0.0	0.4	0.3	33.8 (33.4)	0.0	2.6	5.1
Total wetland	42.9 (40.1)	0.0	0.4	0.3	40.3 (39.9)	0.0	2.9	5.1	38.6 (38.2)	0.0	0.4	0.3	36.1 (35.6)	0.0	2.6	5.1
Pond Impact	1.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Aquatic Bottom Impact (total/<6 feet deep)	0.1/0.1	0.1/ 0.1	28.2/ 14.5	0.0/0.0	0.1/0.1	0.1/ 0.1	28.2/ 17.8	0.0/ 0.0	0.1/ 0.1	0.1/ 0.1	28.1/ 14.5	0.0/0.0	0.0/ 0.0	0.2/0.1	29.1/ 17.8	0.0/ 0.0
SAV Impact (known)	0.0	0.0	4.3	0.0	0.0	0.0	5.5	0.0	0.0	0.0	4.3	0.0	0.0	0.0	5.5	0.0
Stream Impact																
Stream (acreage)	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stream (linear feet)	0.0	0.0	36.0	0.0	0.0	0.0	136.0	0.0	0.0	0.0	18.0	0.0	0.0	0.0	118.0	0.0
TOTAL IMPACT	280.9 (278.4)	0.1	30.5	0.9	270.5 (268.0)	0.2	33.5	5.7	178.1 (175.6)	0.1	30.4	0.9	167.5 (165.0)	0.2	32.8	5.7

The numbers in parentheses reflect the impact if reversing the center turn lane is used to reduce hurricane evacuation clearance times rather than constructing a third outbound lane. When there is no number in parentheses, the impact would be identical for either hurricane evacuation option. Also, the numbers in this table were rounded to the nearest tenth, so minor rounding error exists when adding the individual numbers to get the totals. The aquatic bottom numbers include the portion of the bottom with SAV.

Table 3-7. Temporary Impacts to Biotic Communities by Detailed Study Alternative for ER2, MCB2/A, and MCB4/A

Biotic Community	ER2 (acres)	MCB2/A/C1 (acres)	MCB2/A/C2 (acres)	MCB4/A/C1 (acres)	MCB4/A/C2 (acres)
Upland Impacts					
Upland man-dominated land	75.0 (1.7)	7.4 (1.5)	7.9 (2.0)	8.2 (0.0)	8.2 (0.0)
Upland agricultural land	29.9 (0.0)	1.7 (0.0)	1.7 (0.0)	1.7 (0.0)	1.7 (0.0)
Upland natural communities	8.3 (2.5)	0.3 (0.1)	0.3 (0.1)	0.1 (0.0)	0.1 (0.0)
Total upland	113.2 (4.2)	9.4 (1.6)	9.9 (2.1)	10.0 (0.1)	10.0 (0.1)
Wetland Impacts					
Wetland man-dominated land	0.5 (0.0)	0.3 (0.0)	0.3 (0.0)	0.7 (0.0)	0.7 (0.0)
Wetland natural communities	1.7 (0.0)	1.4 (0.0)	1.4 (0.0)	1.4 (0.0)	1.4 (0.0)
Total wetland	2.2 (0.0)	1.7 (0.0)	1.7 (0.0)	2.1 (0.0)	2.1 (0.0)
Pond Impact	0.0	0.0	0.0	0.0	0.0
Open Water Impact	0.1 (0.0)	0.0	0.0	0.0	0.0
SAV Impact	0.0	0.0	0.0	0.0	0.0
Aquatic Bottom	0.0	0.0	0.0	0.0	0.0
Stream Impacts					
Stream (acreage)	0.0	0.0	0.0	0.0	0.0
Stream (linear feet)	171.7 (clearing)	0.0	0.0	0.0	0.0
TOTAL IMPACT	115.5 (4.2)	11.1 (1.6)	11.6 (2.1)	12.2 (0.0)	12.2 (0.0)

The numbers in parentheses reflect the impact if reversing the center turn lane is used to reduce hurricane evacuation clearance times rather than constructing a third outbound lane. When there is no number in parentheses, the impact would be identical for either hurricane evacuation option. Also, the numbers in this table were rounded to the nearest tenth, so minor rounding error exists when adding the individual numbers to get the totals.

Table 3-8. Temporary Impacts to Biotic Communities by Detailed Study Alternative for MCB2/B and MCB4/B

Biotic Community	MCB2/B/C1 (acres)	MCB2/B/C2 (acres)	MCB4/B/C1 (acres)	MCB4/B/C2 (acres)
Upland Impacts				
Upland man-dominated land	7.9 (1.5)	7.9 (1.5)	8.7 (0.0)	8.7 (0.0)
Upland agricultural land	1.8 (0.1)	1.8 (0.1)	1.8 (0.1)	1.8 (0.1)
Upland natural communities	0.3 (0.2)	0.3 (0.2)	0.2 (0.0)	0.2 (0.0)
Total upland	10.0 (1.7)	10.0 (1.7)	10.7 (0.1)	10.7 (0.1)
Wetland Impacts				
Wetland man-dominated land	0.3 (0.0)	0.3 (0.0)	0.7 (0.0)	0.7 (0.0)
Wetland natural communities	1.4 (0.0)	1.4 (0.0)	1.4 (0.0)	1.4 (0.0)
Total wetland	1.7 (0.0)	1.7 (0.0)	2.2 (0.0)	2.2 (0.0)
Pond Impact	0.0	0.0	0.0	0.0
Open Water Impact	0.0	0.0	0.0	0.0
SAV Impact	0.0	0.0	0.0	0.0
Aquatic Bottom	0.0	0.0	0.0	0.0
Stream Impacts				
Stream (acreage)	0.0	0.0	0.0	0.0
Stream (linear feet)	171.7 (clearing)	0.0	0.0	0.0
TOTAL IMPACT	11.7 (1.7)	11.7 (1.7)	12.9 (0.1)	12.9 (0.1)

The numbers in parentheses reflect the impact if reversing the center turn lane is used to reduce hurricane evacuation clearance times rather than constructing a third outbound lane. When there is no number in parentheses, the impact would be identical for either hurricane evacuation option. Also, the numbers in this table were rounded to the nearest tenth, so minor rounding error exists when adding the individual numbers to get the totals.

- No fill would be placed in streams. If a third outbound lane is added for hurricane evacuation on US 158 over Jean Guite Creek with MCB4, a single piling would be installed in the creek, and the existing bridge over the creek would be widened by 18 feet. With ER2 and MCB2, the bridge over Jean Guite Creek would be widened by 36 feet for the widening of US 158. MCB2/C2 and MCB4/C2 also would result in a small amount of shading over a single stream on the Outer Banks.

Table 3-7 and Table 3-8 indicate that, in general, temporary impacts to biotic communities would be greatest with ER2 with construction of a third outbound lane for hurricane evacuation. These impacts are primarily associated with the third outbound hurricane evacuation lane and are minor for any detailed study alternative without the lane. Temporary impacts to biotic communities with MCB2 and MCB4 would range from 11.1 to 12.9 acres with construction of a third outbound lane for hurricane evacuation.

If dredging were used as a part of construction, additional temporary impacts to the Currituck Sound bottom would occur. If used, dredging would occur in areas of shallow water less than 6 feet deep where there is no SAV. Given the assumptions described in Section 2.4, dredging for C1 would disturb approximately 25 acres of bottom area, whereas dredging for C2 would disturb approximately 17 acres. Additionally, dredging may be necessary to construct and operate a temporary materials delivery dock which would affect approximately 4 additional acres of bottom area.

Openings in forested communities created by vegetation removal would lead to adverse effects including community fragmentation, introduction of shade-intolerant weedy species, and alteration of other environmental factors that affect biotic community dynamics. These "edge effects" would be most prominent in forest and swamp communities of Maple Swamp and the Outer Banks with MCB2 and MCB4. Impacts to Great Swamp and roadside communities associated with ER2 and the road-widening portions of MCB2 and MCB4 would be less severe since these areas are near existing road corridors.

3.3.3 How would wildlife on land be affected?

Each of the detailed study alternatives would result in the removal of existing vegetative habitats and the displacement of wildlife within the project construction limits. ER2 would be the least invasive to habitat. Removal and alteration of wildlife habitat would be greatest for MCB2 and MCB4. MCB2/B and MCB4/B would have a greater impact on wildlife than MCB2/A and MCB4/A because with MCB2/B and MCB4/B there would be a new road in Maple Swamp rather than a bridge. Although provisions would be made for wildlife passage, the fill would make it more difficult for wildlife to move across the project right-of-way.

3.3.3.1 Land Wildlife Characteristics

The project area encompasses a wide diversity of natural habitat types that support a great diversity of wildlife. The Mid-Atlantic region of the United States is an extremely important wintering habitat for waterfowl, and Currituck Sound has a long history of

attracting large concentrations of wintering waterfowl (North American Waterfowl Management Plan, Plan Committee, 2004). However, there have been substantial declines in waterfowl numbers since the 1980s.

The project area includes habitats used for nesting by a variety of birds. Maritime habitats that normally support nesting of colonial waterbirds are only present on the Outer Banks side of the project area, and no evidence of waterbird colonies was found in this area during field work. Cavity-nesting species potentially occur in bottomland habitats such as Maple Swamp. No species of passerine neotropical migrants (perching birds from south of the Tropic of Cancer) are listed in the NCNHP list of rare animal occurrences for Currituck County. However, appropriate breeding habitat for rare species such as black-throated green warbler is present in the project area.

The diversity of plant communities in the project area supports a wide variety of wildlife. Many amphibian and reptile species are found in association with the variety of wetland communities. Mammalian diversity is generally higher on the mainland compared to the Outer Banks. The Outer Banks represent an important corridor that is heavily used by migrating birds along the Atlantic flyway. Most of the wildlife species in the area are not restricted to one habitat type and are known to range through a variety of plant communities.

3.3.3.2 Impacts to Land Wildlife Habitat

Each of the detailed study alternatives would result in the removal of existing vegetative habitats and the displacement of wildlife within the project construction limits. Wildlife species are dependent upon the available resources in the habitats used. Wildlife inhabiting the construction area would either be temporarily displaced, permanently displaced, or lost.

ER2 would be the least invasive to wildlife habitat, since construction would occur in primarily man-dominated areas. Road widening would increase the role of existing roads as impassable barriers that restrict wildlife movement. Removal and alteration of wildlife habitat would be greatest for MCB2 and MCB4. These alternatives could permanently alter the wildlife species composition of the affected forest and swamp communities of Maple Swamp and the Outer Banks. Species requiring large areas of undisturbed habitat would likely disappear from areas near these corridors, whereas species attracted to edge communities would likely become more common. However, in order to minimize these impacts, the bridge corridors were placed adjacent to a cleared and actively maintained (cleared of trees) utility corridor through Maple Swamp.

With MCB2/A and MCB4/A, which include bridging Maple Swamp, the movement of terrestrial wildlife should not be restricted; however, movement of species away from and toward the edge communities of the project corridor could increase competition for limited resources. MCB2/B and MCB4/B, which include a road on fill through the swamp, would substantially affect the movement of wildlife. Wildlife can pass under a bridge much easier and safer than across a road. Provisions for wildlife passage in Maple Swamp would be made. The preliminary design used in this impact assessment

includes: two bridges with 180-foot spans at the east and west sides of the swamp, a 12-foot by 8-foot box culvert at the center of the swamp, and two 43-inch by 68-inch pipes for passage of reptiles and amphibians. Exclusionary fencing along the road also is assumed. The majority of literature on wildlife crossing structures has found that fencing substantially increases the effectiveness of crossing structures and further reduces the number of wildlife-vehicle collisions. Wildlife need to be funneled to the crossing structures; otherwise, it will be more difficult for them to find the bridge spans or culverts. NCTA will coordinate with environmental resource and regulatory agencies on finalizing the construction of wildlife crossings in Maple Swamp if Option B is selected for implementation (see Project Commitment #4).

While all of the detailed study alternatives are near existing road or utility corridors and are under the influence of associated edge effects, these alternatives would amplify those effects. This would be especially detrimental to maritime wildlife habitat on the Outer Banks, where existing habitat is already extremely sparse and fragmented. MCB2 and MCB4 would introduce noise disturbance to Maple Swamp.

With ER2, the road widening portions of MCB2 and MCB4, and the Maple Swamp fill with mainland approach road Option B, mammals, reptiles, amphibians, and avian species would all continue to be roadkill concerns. Because MCB2 and MCB4 include a new bridge structure across Maple Swamp and Currituck Sound, avian species would be a probable new roadkill concern.

The Mid-Currituck Bridge design used to assess impacts does not include the placement of lights on the bridge across Currituck Sound. However, during final design there would be consideration of the possibility of a bicycle path on the bridge that could include low (i.e., close to the bridge deck) lighting. A low level lighting system would not be likely to affect adversely wildlife over Maple Swamp or Currituck Sound. The most substantial effect of this type of bridge lighting would likely involve the attraction of insects into a traffic area.

3.3.4 How would aquatic wildlife be affected?

Fill, pile placement, shading, and clearing would result directly in the permanent loss or alteration of aquatic habitat and the wildlife that live there. Construction operations could result in temporary impacts. Aquatic impacts would be the greatest with MCB2 and MCB4 because they include the Mid-Currituck Bridge.

3.3.4.1 Aquatic Wildlife

Macroinvertebrate populations of Currituck Sound are composed primarily of burrowing amphipods near the shore, but there is a more diverse population in deeper areas. Currituck Sound has long been recognized as a nationally important area for freshwater recreational fishing. The decline of freshwater fisheries in Currituck Sound has been attributed to the increase in salinity and decrease in SAV during the 1980s. Commercial fishing activities with haul seines and gill nets have also decreased since the

1960s (Borawa et al., 1978). Currituck Sound is an important nursery area for migratory and resident fish.

In the past, nursery areas for two anadromous fish species, the blueback herring and alewife, were known to occur within Currituck Sound. Nursery areas for these species, including Whale Head Bay and Sanders Bay, were identified in the sound from 1980 to 1983. The status of the populations of these two species was identified as declining in the sound during 1980 (Copeland and Gray, 1989), and these areas are no longer officially recognized as anadromous fish spawning areas or primary nursery areas.

3.3.4.2 Submerged Aquatic Vegetation

The shallow waters (less than 6 feet deep) of Currituck Sound provide habitat for extensive beds of SAV. These SAV communities are included within the open water areas of Currituck Sound. For many juvenile and adult fish, the structural complexity of SAV habitat provides refuge from predators. These habitats are also rich in invertebrates and, therefore, serve as important foraging areas. Other SAV roles include stabilizing sediment, nutrient cycling, reducing wave energy, and providing organic matter that supports complex food webs (NCWRC, 2005). For these reasons, SAV communities are considered Habitat Areas of Particular Concern (HAPC) for several managed fish species. The distribution and composition of SAV communities are influenced by several factors; among the most important factors are light, salinity, wave action, and nutrient levels.

3.3.4.3 Water Habitat Impacts

Impacts on aquatic communities are listed in Table 3-5 to Table 3-8. Fill, pile placement, shading, and clearing would result directly in the permanent loss or alteration of aquatic habitat within the project area, as indicated in Table 3-5 and Table 3-6. Aquatic impacts would be the greatest with MCB2 and MCB4 because they include a Mid-Currituck Bridge. Impacts would result primarily from shading. Shading would affect 14.5 to 17.8 acres of aquatic bottom (known, probable, and potential SAV habitat in less than 6 feet of water) with MCB2 and MCB4 and 0.1 acre with ER2. Bridge foundations would affect 4.3 to 5.5 acres of SAV. Altered light levels and the introduction of piles as a hard substrate previously unavailable in the area would result in changes to the existing food web structure. Decreased autotrophic productivity (phytoplankton and aquatic vegetation) resulting from lower light levels could result in a decreased abundance of aquatic vegetative habitat (including SAV), heterotrophic grazers, and predators (zooplankton, benthic invertebrates, and fish). On the other hand, organisms could be attracted to bridge pilings as a reef structure.

Overall, ER2 and the widening components of the detailed study alternatives would result in minor impacts to aquatic habitat. Runoff from active construction areas could result in temporary increases in turbidity, siltation, and sedimentation in aquatic habitat areas, but these affects are expected to be minimal and cease after revegetation.

3.3.4.4 Impacts from Noise, Turbidity, and Siltation

Bridge construction associated with MCB2 and MCB4 would take place over Currituck Sound. The over water construction activities associated with these alternatives would produce noise, turbidity, and siltation, thereby creating localized, short-term impacts to aquatic habitat. Noise from open water construction activity would be a temporary, localized disturbance to fish. Construction related noise generated during pile driving could be of sufficient intensity to kill or injure marine organisms (reviewed in Hanson et al., 2004). At the ecosystem level, turbidity would result in a reduction in ecosystem productivity (i.e., ability of the system to produce and export energy) and nursery value by eliminating organisms that cannot readily move, and displacing mobile organisms. For individual organisms, turbidity can impair visual predation success, predator avoidance, and oxygen uptake by clogging respiratory structures. Siltation could generate increased water column turbidity, as well as smother or alter benthic vegetative and animal communities. These impacts likely would be prolonged because of poor water circulation in the sound. Because of the degraded habitat value, most mobile animals would avoid the area of construction for the duration of the construction phase, while non-mobile shellfish, such as clams, could suffer long-term impacts from construction-related siltation. Benthic organisms are expected to recover rapidly after construction ceases, as most soft bottom benthic communities are resilient and likely to re-colonize quickly. NCTA would take practicable measures to minimize turbidity generated during bridge construction.

For the detailed study alternatives involving bridge construction across Currituck Sound (MCB2 and MCB4), different potential construction techniques are listed in Section 2.4. During final design, NCTA will evaluate bridge construction techniques in order to determine the most appropriate technique for constructing structures in Currituck Sound. Final construction methods will be selected as part of the permitting process (see Project Commitment #5). The bridge replacement on US 158 over Jean Guite Creek associated with ER2 and MCB2 would be a clear-span design, so it would not involve pile placement within the creek. However, in order to add a third outbound lane on US 158 for hurricane evacuation with MCB4, the Jean Guite Creek bridge would need to be widened, which could involve pile placement within the creek. Use of the existing center turn lane on US 158 as a third outbound evacuation lane with MCB4 would not require improvements to the existing bridge over Jean Guite Creek. Temporary impacts for this portion of construction are similar to those listed previously.

3.3.4.5 Commercial Fisheries Impacts

Ongoing commercial fishing activity exists in the project area. The C1 and C2 bridge corridors with MCB2 and MCB4 should have little impact on commercial fishing operations. However, the presence of a bridge structure across Currituck Sound could disrupt fishing operations by reducing trawling area and restricting net and crab pot deployment.

3.3.5 How would invasive species be controlled?

The diversity, abundance and health of natural communities can be negatively affected by the introduction of exotic species. NCTA would follow NCDOT's Best Management Practices (BMPs) for the management of invasive plant species during project construction.

3.3.6 What impacts would occur to waters under the jurisdiction of the US Army Corps of Engineers?

All detailed study alternatives would result in placing fill in waters under the jurisdiction of the USACE. Fill in jurisdictional areas would be the least for ER2 and MCB4/A/C2. The largest area of fill in jurisdictional areas would be with MCB2/B and MCB4/B, which include crossing Maple Swamp on fill. Clearing of jurisdictional areas would be greatest with MCB2 and MCB4 because of the Mid-Currituck Bridge. Opportunities for mitigation are available. Efforts have already been made to avoid and minimize impacts to these resources. A permit for these impacts would be required.

3.3.6.1 Jurisdictional Features in the Project Area

As described in Section 3.3.1.1, seven jurisdictional streams were identified within the project area. Approximately 4,781 acres of wetlands and waters that are jurisdictional under Section 404 of the Clean Water Act were found in the project area. The majority of this acreage (approximately 3,897 acres) is Currituck Sound. Wetlands occur in 11 communities within the project area: mixed herbaceous (in man-dominated area), disturbed shrub/scrub, mixed-pine/hardwood forest, hardwood forest, bay forest, swamp forest, maritime shrub/grassland, maritime forest, maritime swamp, freshwater marsh, and open-water (includes SAV). These communities are described in the *Natural Resources Technical Report* (CZR, Incorporated, 2009).

3.3.6.2 Impacts to Jurisdictional Features

A summary of the jurisdictional impacts that would occur with each of the detailed study alternatives is shown in Table 3-9 and Table 3-10. Temporary impacts to jurisdictional areas include impacts to areas within temporary construction easements that would be disturbed during construction activities, but would return to their natural state after construction is completed. Permanent impacts include fill and piling placement, drainage easements, and permanently cleared areas under proposed bridge structures. A separate permanent impact calculation is included that calculates the fill area within the slope-stake line (edge of earth moving during construction), and within jurisdictional areas includes an additional 25-foot buffer. This calculation is included to provide an alternate estimate of impacts to wetlands resulting from topographical changes during construction.

Table 3-9 and Table 3-10 indicate that:

- Fill in wetlands would be the least for ER2 and MCB4/A/C2;

Table 3-9. Jurisdictional Impacts by Detailed Study Alternative for ER2, MCB2/A and MCB4/A

	ER2 (acres)	MCB2/A/C1 (acres)	MCB2/A/C2 (acres)	MCB4/A/C1 (acres)	MCB4/A/C2 (acres)
Wetlands					
Fill	5.1 (4.6)	12.8 (12.4)	10.2 (9.8)	8.5 (8.1)	5.9 (5.5)
Pilings	0.0	0.0	0.0	0.0	0.0
Clearing	0.0	25.7	30.6	25.8	30.6
Total Permanent Impacts	5.1 (4.6)	38.6 (38.2)	40.7 (40.3)	34.4 (34.0)	36.5 (36.1)
Temporary	2.1 (0.0)	1.7 (0.0)	1.7 (0.0)	2.1 (0.0)	2.1 (0.0)
Total Wetland Impacts	7.2 (4.6)	40.3 (38.2)	42.4 (40.3)	36.6 (34.0)	38.7 (36.1)
Open Water					
Fill	0.1	0.1	0.1	0.0	0.0
Pilings	0.0	0.2	0.2	0.2	0.2
Clearing	0.0	0.0	0.0	0.0	0.0
Total Permanent Impacts	0.1	0.3	0.3	0.2	0.2
Temporary	0.1 (0.0)	0.0	0.0	0.0	0.0
Total Open Water Impacts	0.1 (0.0)	0.3	0.3	0.2	0.2
Total Stream Impacts (acres/feet)	0.0/171.7 in temporary clearing (0.0/0.0)	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0
Total Pond Impacts (Fill)	0.3	1.2	0.2	1.1	0.1
Total Jurisdictional Impacts	7.6 (5.1)	41.9 (39.9)	42.8 (40.8)	37.8 (35.4)	39.0 (36.5)
Wetland within Slope-Stake Line, plus Additional 25-foot buffer					
Total Impact	12.6 (8.6)	21.1 (17.1)	16.5 12.5)	15.4 (10.6)	10.9 (6.0)

The numbers in parentheses reflect the impact if reversing the center turn lane is used to reduce hurricane evacuation clearance times rather than constructing a third outbound lane. When there is no number in parentheses, the impact would be identical for either hurricane evacuation option. Also, the numbers in this table were rounded to the nearest tenth, so minor rounding error exists when adding the individual numbers to get the totals.

Table 3-10. Jurisdictional Impacts by Detailed Study Alternative for MCB2/B and MCB4/B

	MCB2/B/C1 (acres)	MCB2/B/C2 (acres)	MCB4/B/C1 (acres)	MCB4/B/C2 (acres)
Wetlands				
Fill	42.9 (42.4)	40.3 (39.9)	38.6 (38.2)	36.0 (35.6)
Pilings	0.0	0.0	0.0	0.0
Clearing	0.3	5.1	0.3	5.1
Total Permanent Impacts	43.2 (42.8)	45.3 (44.9)	38.9 (38.5)	41.1 (40.6)
Temporary	1.7 (0.0)	1.7 (0.0)	2.1 (0.0)	2.1 (0.0)
Total Wetland Impacts	44.9 (42.8)	47.0 (44.9)	41.1 (38.5)	43.2 (40.6)
Open Water				
Fill	0.1	0.1	0.0	0.0
Pilings	0.1	0.0	0.1	0.0
Clearing	0.0	0.0	0.0	0.0
Total Permanent Impacts	0.3	0.1	0.2	0.0
Temporary	0.0	0.0	0.0	0.0
Total Open Water Impacts	0.3	0.1	0.2	0.0
Total Stream Impacts[1] (acres/feet)	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0
Total Pond Impacts (Fill)	1.2	0.2	1.1	0.1
Total Jurisdictional Impacts	46.4 (44.3)	47.3 (45.2)	42.3 (39.7)	43.3 (40.7)
Wetland within Slope-Stake Line, plus Additional 25-foot buffer				
Total Impact	47.1 (43.1)	42.5 (38.5)	41.4 (36.6)	36.9 (32.0)

The numbers in parentheses reflect the impact if reversing the center turn lane is used to reduce hurricane evacuation clearance times rather than constructing a third outbound lane. When there is no number in parentheses, the impact would be identical for either hurricane evacuation option. Also, the numbers in this table were rounded to the nearest tenth, so minor rounding error exists when adding the individual numbers to get the totals.

- Fill in wetlands would be substantially higher with MCB2/B and MCB4/B, which would include fill in Maple Swamp instead of the clearing that would occur under Option A in the swamp;

- Clearing of wetlands would be greatest with MCB2 and MCB4 because of the inclusion of a Mid-Currituck Bridge; and

- Temporary construction easements on US 158 on the mainland with ER2 would result in 171.7 linear feet of temporary clearing impacts to streams.

Also, as shown in Table 3-9, ER2 would involve 171.7 feet in temporary clearing along streams affected by the third outbound lane on US 158. Also, if a third outbound lane is added for hurricane evacuation on US 158 over Jean Guite Creek with MCB4, a single piling would be installed in the creek and the existing bridge over the creek would be widened by 18 feet (shade impact). With ER2 and MCB2, the bridge over Jean Guite Creek would be widened by 36 feet for the widening of US 158 (0.1 acre shade impact). MCB2/C2 and MCB4/C2 also would result in a small amount of shading (0.1 acre over 100 feet) of a single stream on the Outer Banks. (See Table 3-5.)

3.3.6.3 Clean Water Act and Coastal Area Management Act Permits

An Individual Permit from the USACE for the entire project would be required pursuant to Section 404 of the Clean Water Act (Title 33 *Code of Federal Regulations* Part 323) for discharges of dredge or fill material into Waters of the United States. The Clean Water Act provides for public notice and review of Section 404 permit applications, as well as review by local, state, and federal regulatory agencies.

A Water Quality Certification pursuant to Section 401 of the Clean Water Act would be needed from the NCDENR-DWQ. This permit is required in association with the USACE Section 404 permitting process.

A CAMA permit for impacts to Areas of Environmental Concern (AEC) under jurisdiction of the NC Division of Coastal Management (DCM) would be required.

3.3.6.4 Wetland and Stream Mitigation

Applications for USACE dredge and fill permits under Section 404 must meet mitigation requirements found in the "Memorandum of Agreement (MOA) Between the Environmental Protection Agency and the Department of the Army Concerning the Determination of Mitigation Under the Clean Water Act Section 404(b)(1) Guidelines" (February 1990). This MOA requires the applicant to utilize a sequencing process that includes avoidance of impacts, minimization of impacts, and, finally, compensation of unavoidable impacts to aquatic resource values. Executive Order 11990 requires action to be taken to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. If there is no practicable alternative to construction in wetlands and all practicable measures to minimize harm to wetlands have been provided, compensation of wetland impacts is required.

Avoidance and Minimization

Avoidance and minimization of considerable wetland impacts has already been accounted for in the bridge length designs for the detailed study alternatives that include a Mid-Currituck Bridge and would continue to do so as the project progresses. Substantial wetland impacts in northern Maple Swamp would be avoided by bridging over the swamp (MCB2/A and MCB4/A) as opposed to constructing a road on fill (MCB2/B and MCB4/B). With MCB2/B and MCB4/B, impacts of the road on wildlife movements would be minimized with wildlife crossing structures. As indicated in Section 3.4.7, additional studies would be conducted during final design to minimize the hydraulic impacts discussed in that section for MCB2/B and MCB4/B. Impacts to the more pristine loblolly bay forest in Maple Swamp were avoided by placing the bridge crossing to the north of the bay forest near a cleared and actively maintained utility corridor.

MCB2/A and MCB4/A also would result in the purchase of approximately 263 acres of land in Maple Swamp in addition to the project right-of-way. It would be approximately 612 acres with MCB2/B and MCB4/B. This is land that would no longer have direct highway access. Thus, these land-locked parcels would be purchased and protected from future logging. This land would be set aside as a conservation area and allowed to retain its natural state. MCB2/B and MCB4/B also would result in 9.1 acres of Aydlett Road right-of-way to be abandoned and restored to its natural state.

Construction of a Mid-Currituck Bridge would include use of a gantry, work bridge, launching truss, or low draft barges with associated dredging in parts of Currituck Sound without existing SAV and less than 6 feet deep. Different potential construction techniques are listed in Section 2.4. During final design, NCTA will evaluate bridge construction techniques in order to determine the most appropriate technique for constructing structures in Currituck Sound. Final construction methods will be selected as part of the permitting process.

A special study was conducted during the development of alternatives to design the US 158/Mid-Currituck Bridge interchange such that wetland impacts would be minimized (see Section 5.1 of the *Alternatives Screening Report* [Parsons Brinckerhoff, 2009]). A special study also was conducted related to the placement of the bridge terminus in the C1 and C2 bridge corridors such that impacts to wetlands and SAVs could be minimized (see Section 5.3 of the *Alternatives Screening Report* [Parsons Brinckerhoff, 2009]).

Compensatory Mitigation of Impacts

Compensatory mitigation options to offset wetland impacts could include the following: preservation of unique wetland communities; enhancement of existing wetlands; creation of new wetlands; and restoration of wetland areas. Considerations for candidate sites for wetlands mitigation include: proximity to affected wetlands; proximity to the drainage basin of impacted wetlands; topographic and hydrological characteristics; and chance of successful mitigation for lost wetland functions.

In-kind mitigation refers to replacement of a lost wetland with the same wetland type. Out-of-kind mitigation does not require any such similarities between mitigated wetland and affected wetland. Mitigation ratios are negotiable, and US Environmental Protection Agency (USEPA)/USACE guidelines suggest the following ratios (ratio of new wetland acres to the acres of wetland filled) by mitigation type: preservation at 5:1; enhancement at 2:1; creation at 3:1; and restoration at 2:1. Mitigation plans could include restoration of the wetlands on-site and/or the creation of wetland habitat adjacent to or within the construction limits through the use of swales, borrow pit areas, and drainage canals. If on-site mitigation is not acceptable or practical, off-site mitigation could be considered.

NCTA would investigate potential on-site stream and wetland mitigation opportunities once a final decision is developed for the Selected Alternative, if a build alternative is selected. If on-site mitigation is not feasible, mitigation would be provided by NCDENR's Ecosystem Enhancement Program (EEP). In accordance with the July 22, 2003, "Memorandum of Agreement Among the North Carolina Department of Transportation, and the US Army Corps of Engineers, Wilmington District," the Ecosystem Enhancement Program (EEP) would be requested to provide off-site mitigation to satisfy the federal Clean Water Act compensatory mitigation requirements for this project. The EEP is often utilized by the NCTA for the compensatory mitigation required for transportation projects. The Northwest River and Tull Creek watershed is recognized as having high potential for stream and wetland restoration (NCWRP, 2002), and is the probable location of future EEP mitigation projects.

3.3.7 Would Coastal Area Management Act Areas of Environmental Concern or Essential Fish Habitat be affected?

The greatest impact to Coastal Area Management Act (CAMA) resources, essential fish habitat, and SAV or potential SAV habitat (water depths less than 6 feet) would be associated with shading by a Mid-Currituck Bridge. However, no permits or mitigation are required for shading so the impact is not included in this section (see Section 3.3.2). Impacts (fill, pilings, clearing) to CAMA wetlands (wetland freshwater marsh) would range from 0.1 acre to 3.9 acres.

3.3.7.1 Coastal Area Management Act Areas of Environmental Concern

The North Carolina Division of Coastal Management issues CAMA permits for development in AECs. Four types of AEC occur within the project area: coastal wetlands, estuarine waters, coastal shorelines, and public trust waters. The shorelines and waters of Currituck Sound, as well as the marsh communities found within the project area, are all considered AECs under CAMA. This also includes Jean Guite Creek, which is a PNA. In addition, Jean Guite Creek, Currituck Sound, and the Intracoastal Waterway are considered public trust waters that fall under CAMA jurisdiction.

Table 3-11 identifies impacts to CAMA wetlands and AECs by the detailed study alternatives. MCB2/C2 would have the greatest impact to CAMA wetlands, with 2.2 acres of CAMA wetlands affected by fill and clearing. MCB2/C2 also would have the

Table 3-11. Impacts to CAMA Areas by Detailed Study Alternative

Type of Impact[1]	ER2 (acres)	MCB2/C1 (acres)	MCB2/C2 (acres)	MCB4/C1 (acres)	MCB4/C2 (acres)
CAMA Wetlands[2]					
Fill	0.7	0.7	0.7	0.0	0.0
Pilings	0.0	0.0	0.0	0.0	0.0
Clearing	0.0	0.0	1.4	0.0	0.0
Total Permanent Impacts	0.7	0.7	2.2	0.0	0.0
Temporary	0.0	0.0	0.0	0.0	0.0
Total Wetland Impacts	0.7	0.7	2.2	0.0	0.0
CAMA AEC[3]					
Fill	0.9 (0.8)	0.9	0.9	0.0	0.0
Pilings	0.0	0.1	0.2	0.1	0.2
Clearing	0.0	0.0	1.5	0.0	1.5
Total Permanent Impacts	0.9 (0.8)	1.0	2.5	0.1	1.6
Temporary	0.0	0.0	0.0	0.0	0.0
Total CAMA AEC Impacts	0.9 (0.8)	1.0	2.5	0.1	1.6

Note: The numbers in parentheses reflect the impact if reversing the center turn lane is used to reduce hurricane evacuation clearance times rather than constructing a third outbound lane. When there is no number in parentheses, the impact would be identical for either hurricane evacuation option. Also, the numbers in this table were rounded to the nearest tenth, so minor rounding error exists when adding the individual numbers to get the totals.

[1] Equivalent to the wetland freshwater marsh biotic community.

[2] Includes CAMA wetlands, Currituck Sound, and Jean Guite Creek.

greatest impact to CAMA AECs, with 2.5 acres of mainly fill and clearing impacts. ER2 and MCB4/C1 would result in a minimal effect (less than 1 acre of impacts) on CAMA resources. A CAMA major permit would be required for all of the detailed study alternatives.

3.3.7.2 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (Title 16 *United States Code* Section 1801 *et seq.*) requires the US Secretary of Commerce to develop guidelines assisting regional fisheries management councils in the identification and

creation of management and conservation plans for essential fish habitat (EFH). The National Marine Fisheries Service (NMFS), the South Atlantic Fishery Management Council (SAFMC), and the Mid-Atlantic Fishery Management Council (MAFMC) currently manage eight fish species that are known to occur within the project area (MAFMC, 2008; SAFMC, 2008).

These agencies have identified the SAV, intertidal flats, palustrine emergent and forested wetlands, aquatic bed (tidal freshwater), and estuarine water column of Currituck Sound as EFH for these species. Jean Guite Creek (a PNA) is also designated as EFH. Information on these habitats is included in the *Natural Resources Technical Report* (CZR Incorporated, 2009). Impacts to essential fish habitat communities and SAVs are shown in Table 3-12. The greatest impact to essential fish habitat (in water less than 6 feet deep) would be associated with shading by a Mid-Currituck Bridge (14.5 acres to 17.8 acres). Fill impacts would be greatest with ER2 and MCB2 (1.8 acres). Shading associated with a Mid-Currituck Bridge would be the greatest impact to SAV or potential SAV (water depths less than 6 feet) at 4.3 to 5.5 acres and 10.2 to 12.3 acres, respectively. The greater impact to SAV and potential SAV would be with the C2 bridge corridor.

Permanent loss or alteration of palustrine emergent and forested areas, SAV, intertidal flats, and tidal freshwater aquatic beds would result directly from shading and pile placement with the bridge structure associated with MCB2 and MCB4. The effects of this use are described in Section 3.3.2.4.

In addition, ER2 and MCB2 would involve permanent loss of palustrine emergent and forested areas through the construction of permanent drainage easements along NC 12, and also would result in increased shading of Jean Guite Creek (a PNA and probable SAV habitat). MCB4 would also result in permanent shading. Bridge widening would only include pile placement within the creek if the hurricane evacuation lane is added with MCB4.

The detailed study alternatives likely would result in short-term and long-term adverse effects to EFH and managed species and measures would be considered to minimize those effects. The detailed study alternatives would not have a substantial long-term adverse impact on EFH or managed species given the small permanent (0.1 to 2.0 acres) and clearing impact (0.0 to 3.2 acres) and small shading impact of the Mid-Currituck Bridge (28.1 to 30.7 acres) compared to the total area of Currituck Sound (97,920 acres). Bridge pilings could provide additional habitat for some managed species. The aquatic substrate generally would be expected to recover after construction.

During final design, NCTA will evaluate bridge construction techniques to determine the most appropriate technique for constructing structures in Currituck Sound. Final construction methods will be selected as part of the permitting process. NCTA would examine cost-effective options for treating the first inch of bridge runoff during development of a Mid-Currituck Bridge design if MCB2 or MCB4 is selected for implementation. A more detailed discussion of EFH and the potential for impact is presented in the *Essential Fish Habitat Technical Report* (CZR Incorporated, 2009). This

Table 3-12. Permanent Impacts to Essential Fish Habitat by Detailed Study Alternative

Community[1]	ER2 (acres)				MCB2/C1 (acres)				MCB2/C2 (acres)				MCB4/C1 (acres)				MCB4/C2 (acres)			
	Fill	Pilings	Shading	Clearing	Fill	Pilings	Shading	Clearing	Fill	Pilings	Shading	Clearing	Fill	Pilings	Shading	Clearing	Fill	Pilings	Shading	Clearing
Palustrine forested wetland	1.0	0.0	0.0	0.0	1.0	0.0	0.2	0.0	1.0	0.0	0.9	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.6	1.8
Palustrine emergent wetland	0.7	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.7	0.0	0.6	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.9	1.4
Aquatic bottom (tidal freshwater) (total/<6 feet)[2]	0.1/ 0.1	0.0/ 0.0	0.1/ 0.1	0.0/ 0.0	0.1/ 0.1	0.1/ 0.1	28.2/ 14.5	0.0/ 0.0	0.1/ 0.1	0.2/ 0.1	28.2/ 17.8	0.0/ 0.0	0.0/ 0.0	0.1/ 0.1	28.1/ 14.5	0.0/ 0.0	0.0/ 0.0	0.2/ 0.1	29.1/ 17.8	0.0/ 0.0
TOTAL EFH IMPACT[3]	1.8	0.0	0.1	0.0	1.8	0.1	28.4	0.0	1.8	0.2	30.7	3.2	0.0	0.1	28.1	0.0	0.0	0.2	30.6	3.2
Primary nursery areas[4] (acres/linear ft)	0.0/ 0.0	0.0/ 0.0	0.0 36.0	0.0/ 0.0	0.0/ 0.0	0.0/ 0.0	0.0/ 36.0	0.0/ 0.0	0.0/ 0.0	0.0/ 0.0	0.0/ 36.0	0.0/ 0.0	0.0/ 0.0	0.0/ 5.0	0.0/ 18.0	0.0/ 0.0	0.0/ 0.0	0.0/ 5.0	0.0/ 18.0	0.0/ 0.0
SAV																				
Confirmed SAV	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.0	0.0	0.0	5.5	0.0	0.0	0.0	4.3	0.0	0.0	0.0	5.5	0.0
Probable SAV habitat (<4 feet)	0.1	0.0	0.1	0.0	0.1	0.0	3.4	0.0	0.1	0.0	7.0	0.0	0.0	0.0	3.4	0.0	0.0	0.0	7.0	0.0
Potential SAV habitat (4-6 feet)	0.0	0.0	0.0	0.0	0.0	0.0	6.8	0.0	0.0	0.0	5.3	0.0	0.0	0.0	6.8	0.0	0.0	0.0	5.3	0.0
Unlikely SAV habitat (>6 feet)	0.0	0.0	0.0	0.0	0.0	0.1	13.7	0.0	0.0	0.1	11.3	0.0	0.0	0.1	13.7	0.0	0.0	0.1	11.3	0.0

Note: Impacts are the same with and without construction of a third outbound lane on mainland US 158 for hurricane evacuation.

[1] Communities that have not been mapped include intertidal flats and oyster reef/shell bank.

[2] Includes all SAV sub-categories < 6 feet and is equivalent to estuarine water column (volume not calculated).

[3] Includes palustrine forested, emergent wetlands and aquatic bottom.

[4] Area in association with Jean Guite Creek (>0.05) and already included in probable SAV habitat totals which are included in Total EFH Impact.

report is on the CD that accompanies this DEIS, at public review locations listed in Appendix C, and on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/.

3.3.8 Would habitat used by threatened and endangered species be affected?

There is habitat present for nine federally protected species in the project area. For all nine species, the Biological Conclusion for MCB2 and MCB4 is "May Affect – Not Likely to Adversely Affect." The Biological Conclusion for ER2 is "May Affect – Not Likely to Adversely Affect" for two of the species and "No Effect" for the remaining seven species. All construction would follow USFWS guidelines for the protection of eagles.

3.3.8.1 Federally-Protected Species

As of February 24, 2009, the US Fish and Wildlife Service (USFWS) identified 13 federally-protected species as occurring in Currituck and Dare counties (USFWS, 2009). These protected species, along with information on the presence of habitat in the project area and a Biological Conclusion for each species, are listed in Table 3-13. More information is included in the *Natural Resources Technical Report* (CZR, Incorporated, 2009). Construction contracts would require compliance with the USFWS's *Guidelines for Avoiding Impacts to the West Indian Manatee: Precautionary Measures for Construction Activities in North Carolina Waters* (USFWS, 2003).

3.3.8.2 Bald Eagle and Golden Eagle Protection Act

Habitat for nesting bald eagles primarily consists of mature forest in proximity to large bodies of open water for foraging. Large, dominant trees are utilized for nesting sites, typically within 1.0 mile of open water. One bald eagle nest occurs approximately 2.3 miles south of the proposed bridge corridor on the western shore of Currituck Sound, near the Poplar Branch community. This nest was last active in 2007. It is possible the nesting pair built a new nest in the same vicinity in 2008, but this was not verified. A second nest is an active nest located approximately 1.8 miles south of the US 158 area in Dare County on the northern side of Kitty Hawk Bay. All construction would follow USFWS guidelines for the protection of bald eagles as described in the *National Bald Eagle Management Guidelines* (USFWS, 2007).

3.3.8.3 Endangered Species Act Candidate Species

Seven species occurring in North Carolina are identified by the USFWS as "candidate" species (USFWS, 2009). These species are not protected by federal law, but may be elevated to listed status in the near future. Information on candidate species potentially included in the project area is included in the *Natural Resources Technical Report* (CZR, Incorporated, 2009).

Table 3-13. Potential Effects on Federally-Protected Species

Scientific Name	Common Name	Federal Status[1]	Habitat Present	Biological Conclusion[2]	
				MCB2 and MCB4	ER2
Canis rufus	Red wolf	E-EXP	Yes	No Effect	No Effect
Trichechus manatus	West Indian manatee	E	Yes	MA-NLAA	No Effect
Charadrius melodus	Piping plover	T	Yes	MA-NLAA	No Effect
Picoides borealis	Red-cockaded woodpecker	E	Yes	No Effect	No Effect
Sterna dougallii	Roseate tern	E	No	No Effect	No Effect
Alligator mississippiensis	American alligator	T(S/A)	Yes	NA	NA
Chelonia mydas	Green sea turtle	T	Yes	MA-NLAA	No Effect
Eretmochelys imbricata	Hawksbill sea turtle	E	No	No Effect	No Effect
Lepidochelys kempii	Kemp's ridley sea turtle	E	Yes	MA-NLAA	No Effect
Dermochelys coriacea	Leatherback sea turtle	E	No	No Effect	No Effect
Caretta caretta	Loggerhead sea turtle	T	Yes	MA-NLAA	No Effect
Acipenser brevirostrum	Shortnose sturgeon	E	No	MA-NLAA	No Effect
Amaranthus pumilus	Seabeach amaranth	T	Yes	No Effect	No Effect

Source: NCNHP, 2008; USFWS, 2009.

[1] T – Threatened
T(S/A) – Threatened because of similarity of appearance to American crocodile
E – Endangered
E-EXP – Endangered and population is experimental

[2] MA-NLAA – May affect – Not likely to adversely affect
NA-Not applicable; no biological conclusion required

3.4 Other Physical Characteristics and Impacts

This section considers the impacts of the detailed study alternatives on a variety of other physical characteristics of the project area. Section 3.1 addresses community characteristics and impacts. Section 3.2 addresses cultural resources impacts. Section 3.3 addresses natural resources impacts. This section asks:

- How would traffic noise levels change?

- Would air quality be affected?
- How would the detailed study alternatives affect energy use?
- How would potential accelerated sea level rise resulting from climate change affect long-term use of the detailed study alternatives?
- How would visual quality be changed?
- Are there hazardous materials and underground storage tank sites that could affect the project?
- Would floodplains be affected?

3.4.1 How would traffic noise levels change?

Each of the detailed study alternatives would cause some increased noise. Mainland approach road Option A and Option B with MCB2 and MCB4 would have similar noise impacts. Noise abatement measures would not be cost-effective at sites on the Currituck County mainland. Noise mitigation would be cost-effective at some locations on the Outer Banks. However, the visual impacts and impacts of barriers on drainage and flooding on the Outer Banks would be substantial.

Sounds exist in the human and natural environment at all times. Some sounds are necessary or desirable for communication or pleasure, some are unnoticed, and some are unwanted or disturbing. Noise is basically defined as unwanted sound. It can be emitted from numerous sources, including airplanes, factories, railroads, power generation plants, trucks, and automobiles. Automobile noise is primarily comprised of noises from engine exhaust, drive train, and tire/roadway interaction. The level of noise generated by roadway traffic depends on the volume of traffic, the speed of traffic, and the number of trucks in the flow of the traffic. Generally, heavier traffic volumes, higher speeds, and larger numbers of trucks increase the loudness of traffic noise.

In addition, there are other more complicated factors that affect the loudness of traffic noise. For example, as a person moves away from a highway, traffic noise levels are reduced by distance, terrain, and natural and human-made obstacles. Traffic noise is not usually a serious problem for people who live more than 500 feet from heavily traveled freeways or more than 100 to 200 feet from lightly traveled roads.

The following sections describe the findings of the noise impact assessment. Additional information is provided in the *Traffic Noise Technical Report* (Parsons Brinckerhoff, 2009) on the CD included with this DEIS, at public review locations listed in Appendix C, and on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/.

3.4.1.1 FHWA Noise Abatement Criteria

The FHWA has developed noise abatement criteria (NAC) and procedures to be used in the planning and design of highways. These NAC and procedures are based in Title 23 *Code of Federal Regulations* Part 772, *Procedures for Abatement of Highway Traffic Noise and Construction Noise*. A listing of the FHWA NAC for various land uses is presented in Table 3-14.

Table 3-14. Noise Abatement Criteria

Activity Category	L_{eq}(h) (dBA)	Description of Activity Category
A	57 Exterior	Lands on which serenity and quietness are of extraordinary significance, serve an important public need, and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 Exterior	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 Exterior	Developed lands, properties, or activities not included in Categories A or B.
D	--	Undeveloped lands.
E	52 Interior	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: Title 23 *Code of Federal Regulations* Part 772, *Procedures for Abatement of Highway Traffic Noise and Construction Noise*.

When predicted traffic noise levels approach or exceed the NAC, or when predicted traffic noise levels increase substantially from existing levels, the FHWA requires that noise abatement measures be considered. The NCDOT uses an "approach value" of 1 dBA less than the NAC (e.g., 66 dBA for land use Activity Category B).

3.4.1.2 Sensitive Receptors

A noise-sensitive site is any property (owner-occupied, rented, or leased) where human activity occurs (typically outdoors) and where a lowered noise level would be of benefit. The noise-sensitive sites adjoining the detailed study alternatives consist mostly of the exterior areas of low density and medium density residential areas. These coincide with the FHWA land use category B where the peak-hour traffic noise level locations were calculated.

The noise impact assessment revealed 1,877 noise-sensitive sites that are either within or in proximity to the detailed study alternatives. Noise-sensitive sites adjacent to US 158

consist of isolated homes adjacent to the roadway right-of-way, commercial properties, a visitor center, churches, and a library. Noise-sensitive sites adjacent to NC 12 include isolated single family homes (adjacent to the roadway right-of-way), single family homes in new and established subdivisions, hotels, apartments, and condominiums.

3.4.1.3 Noise Levels and Descriptors

To assess the existing conditions within the project area, noise measurements were conducted during 2008 near noise-sensitive land uses along the detailed study alternatives. Receptor locations were selected to provide thorough geographic coverage and to be representative of existing and future land uses in the project area, and were used to characterize conditions in the general vicinity of that location.

The most commonly used measure of noise level is the A-weighted sound level (dBA). From many experiments with human listeners, scientists have found that the human ear is more sensitive to midrange frequencies than it is to either low or very high frequencies. At the same sound level, midrange frequencies are therefore heard as louder than low or very high frequencies. This characteristic of the human ear is taken into account by adjusting or weighting the spectrum of the measured sound level for the sensitivity of human hearing. The A-weighted sound level is a measure of sound intensity with frequency characteristics that correspond to human subjective response to weighted noise.

3.4.1.4 Existing and Predicted Noise Levels

To identify sites potentially affected by noise, predicted noise levels for the detailed study alternatives in 2035 were calculated and compared to the existing noise levels and the noise levels predicted in 2035 with the No-Build Alternative. The term "affected" is defined as the sites that are predicted to experience noise levels that approach or exceed the NAC with the detailed study alternatives.

All predicted noise levels were produced using FHWA's computer prediction model for highway traffic noise – Traffic Noise Model® (TNM) Version 2.5, February 2003.

All noise levels were predicted for the maximum amount of traffic each road could carry traveling the speed limit. When this happens, traffic is at its noisiest. As indicated above, traffic noise is a combination of vehicle type, speed, and the number of vehicles. Thus, even though traffic volumes are greater, congested traffic has lower noise levels because traffic is traveling slower. Thus, in this analysis, it was found that a four-lane NC 12 would be noisier than a two-lane or a three-lane NC 12 because a four-lane road can carry more traffic at the speed limit. Adding lanes to existing roads also puts vehicles closer to sensitive receptors, thereby increasing noise levels at those locations.

With MCB2/B and MCB4/B, two noise analyses were conducted in Aydlett, one with the toll plaza and one without the toll plaza. After 2023, it is expected that all tolls would be collected electronically with no need for vehicles to stop at a toll plaza. In both cases, noise levels were predicted for the maximum amount of traffic each road could carry

traveling the speed limit. Noise associated with traffic slowing and accelerating at the toll plaza was considered. It was found, however, that using the maximum amount of traffic the road could carry traveling the speed limit and assuming that it operated at the speed limit produced the highest noise levels.

The noise analysis found that:

- With ER2, noise is predicted to approach or exceed NAC at 337 sites on the Currituck County mainland and 355 noise-sensitive sites on the Outer Banks.
- With MCB2, noise is predicted to approach or exceed NAC at 27 sites on the Currituck County mainland, 411 sites on the Outer Banks with bridge terminus C1, and 348 sites on the Outer Banks with terminus C2.
- With MCB4, noise is predicted to approach or exceed NAC at 27 sites on the Currituck County mainland, 146 sites on the Outer Banks with bridge terminus C1, and 83 sites on the Outer Banks with terminus C2.

These results would be the same for MCB2 and MCB4 with either Option A or Option B, and in the case of Option B, with or without the toll plaza.

The number shown as approaching or exceeding NAC on the Currituck County mainland is substantially higher on the mainland with ER2 (with the construction of a third outbound emergency lane) than with MCB2 and MCB4. This is because, with ER2, the relationship of the travel lanes to surrounding receptors would be changed for more than 20 miles with the wider pavement needed to provide for a third outbound emergency lane. This does not mean, however, that noise levels in this area would be substantially higher with ER2 and a third outbound emergency lane than with the No-Build Alternative. They would not be substantially higher; they would be imperceptibly (no more than 1 dBA) different. Instead, the high number of affected sites means that, because the location of travel lanes would be being altered, by policy FHWA requires that noise mitigation be considered, even though the noise impact would exist without the project.

The detailed study alternatives would increase noise levels on the Outer Banks compared to the No-Build Alternative because the wider roads could carry more traffic at the speed limit, and lanes would be closer to receptors. Noise levels on NC 12 would be up to 10 dBA higher than with the No-Build Alternative. The NAC would not be exceeded in the community of Aydlett on the mainland with any alternatives, including with a toll plaza in Aydlett (Option B). The assessment found noise levels in Aydlett of less than 60 dBA at sensitive receptors with a Mid-Currituck Bridge. No locations in the project area would receive a substantial increase in noise levels over existing levels. "Substantial" is defined in Table 3-15.

Table 3-15. NCDOT Definition of Substantial Increase in Noise Levels

Existing Average Noise Level (dBA)	Increase (in decibels) from Existing Noise Levels to Future Noise Levels Defined as a Substantial Increase
≥55	10 or more
54	11 or more
53	12 or more
52	13 or more
51	14 or more
≤50	15 or more

Source: NCDOT *Traffic Noise Abatement Policy*, September 2004.

3.4.1.5 Noise Abatement

Because noise levels at locations along the study corridor were determined to approach or exceed the NAC for Activity Category B and C, the feasibility and reasonableness of noise abatement measures were evaluated. These measures may include vegetative buffers, transportation system management, alignment modifications, and noise barriers. Vegetative buffers, transportation system management, and alignment modifications were found not to be feasible and reasonable, so the study focused on barriers.

Noise barriers reduce noise levels by blocking the sound path between a roadway and noise-sensitive sites. To be effective in reducing traffic-induced noise, a noise barrier must be relatively long, continuous (with no intermittent openings), sufficiently dense, and high enough to provide the necessary reduction in noise levels. For a barrier to be considered feasible and reasonable, it should meet specific criteria. The primary criteria are:

- Provide a minimum insertion loss (noise reduction) of at least 5 dBA for first row receptors.
- Cost must not exceed $35,000 per benefited receptor plus an incremental increase of $500 per dBA average increase in the predicted exterior noise levels of the impacted receptors of the area.
- The visual impact on adjoining receptors. A high noise wall alongside low, single-family residences could have a severe adverse visual effect. Thus, the height of a noise wall above the ground should not exceed 25 feet or 7.5 meters. Furthermore, the horizontal distance between the noise wall and receptors should be greater than four times the height of the noise wall.

A complete listing of these criteria is found in the NCDOT's Traffic Noise Abatement Policy in Appendix D of the *Traffic Noise Technical Report* (Parsons Brinckerhoff, 2009).

Extent of Barrier Benefits

Barriers were found to be economically reasonable at a few locations along NC 12 in Dare County and along NC 12 in Currituck County. The noise reduction benefit of noise barriers would be sporadic on NC 12 in the three-lane sections of NC 12 (with ER2 and MCB2) because the large numbers of driveways and street intersections limit the locations where effective barriers could feasibly be considered. In this area, 232 homes would be adversely affected by noise levels. Of those 232, three (one percent) would benefit from noise barriers. Those same barriers would lower noise levels for an additional 11 homes not adversely affected.

In the four-lane sections of NC 12 (with all detailed study alternatives), there are fewer street intersections and driveways, so the benefit of noise barriers would be more extensive. MCB2 or MCB4 with C1 would see 146 homes adversely affected. Of those 146, 111 (76 percent) would benefit from noise barriers. Those same barriers would lower noise levels for an additional 100 homes not adversely affected. With C2, the four-lane section of NC 12 would see 83 homes adversely affected. Of those 83, 67 (81 percent) would benefit from noise barriers. Those same barriers would lower noise levels for an additional 58 homes not adversely affected. The NC 12 noise results for ER2 are similar to those for MCB2/C2.

Visual Dominance of Barriers

The barriers would create a visual impact. When one applies the NCDOT visual dominance criteria listed above, the three homes that would benefit from barriers along three-lane sections of NC 12 with ER2 and MCB2 would not be reasonable. In the four-lane sections of NC 12, the 111 homes benefited by noise barriers that would be economically reasonable for MCB2 or MCB4 with C1 would drop to 68 homes benefited by noise barriers that are both economically and visually reasonable. The 67 homes benefited by noise barriers that would be economically reasonable for MCB2 or MCB4 with C2 would drop to 25 homes benefited by noise barriers that are both economically and visually reasonable.

Also, from the perspective of those using vacation homes, any barrier would block views of the road, but also the landscape across the road from vacation homes. For locations such as Monteray Shores where NC 12 is close to Currituck Sound and the subdivisions are narrow, a barrier would be confining. A barrier in Monteray Shores would block views to the east of the larger Outer Banks, leaving long distance views from this narrow subdivision confined to those of Currituck Sound to the west.

In addition to visual dominance from homes, barriers along NC 12 would block views of the adjoining landscape for motorists including, depending on the location, vacation homes, Currituck Sound, and ocean-front dunes. The appearance of the barriers would not complement the character of the Outer Banks along NC 12.

Barriers also would affect views of pedestrians and bicyclists using the multi-use paths that line US 158 and NC 12 on the Outer Banks, blocking views of natural features and vacation homes with a wall on one or both sides of the road.

US 158 on the Outer Banks is more of a commercial corridor, so the visual impacts described along NC 12 would occur, but would be less notable.

Barriers would require frequent maintenance to collect debris, particularly following major storm events.

Finally, all of the barrier locations would be along surface roads where access to the right-of-way is not limited. People would have unlimited access to barriers along NC 12 and US 158, making them attractive targets for graffiti.

Drainage and Flooding Impacts of Barriers

Barriers would disrupt the drainage patterns along NC 12 in two ways. First, along NC 12 in Dare County and southern Currituck County, the surrounding properties generally drain to the road or sound, so a barrier along NC 12 in that area would block normal drainage from surrounding properties. Drainage features would need to be built behind the wall (adding to the impacts and perhaps, in some cases, displacing homes that the wall would be designed to protect). In addition, road drainage systems would be designed to handle a 10-year storm. In more severe storms, water would collect behind the walls, altering flooding patterns, and potentially increasing the risk of property damage.

Second, during severe storms, walls would be an impediment to flood flow. They would interfere with the storm surge (both from ocean to sound and back from sound to ocean) and with equalization of water levels in the floodplain. This could result in a higher flood elevation in some locations, increasing the risk of property damage.

Barrier Commitments

The NCTA is committed to the construction of feasible and reasonable noise abatement measures at the noise-affected sites identified, contingent upon the following conditions:

1. Detailed noise analysis updates during the final design process continue to support the opportunity to provide abatement barriers at the locations examined for this DEIS;

2. The outcome of hydraulic studies needed to determine the impact of barriers on drainage and flood flows, whether the impact can be mitigated, and what would be required to mitigate it and the associated cost;

3. Community input regarding desires and locations of barriers has been solicited by the NCTA;

4. Safety and engineering aspects related to the roadway user and the adjacent property owner have been reviewed; and

5. Coordination with local officials to identify any new development that has occurred between the date of the *Traffic Noise Technical Report* and the Date of Public Knowledge (i.e., the Record of Decision). Any new development would need to be assessed for noise impacts and given consideration for potential noise abatement measures during the final design process.

There is no intent to provide right-of-way fences or walls to mitigate impacts other than those required to mitigate noise or with Option B wildlife passage in Maple Swamp.

3.4.2 Would air quality be affected?

The proposed project is in Currituck and Dare counties, which have been determined to comply with the National Ambient Air Quality Standards (NAAQS) and, therefore, are in attainment. This project is not anticipated to create any adverse effects on the air quality of this attainment area. The detailed study alternatives would reduce regional emissions of mobile source air toxics, with the greatest reduction associated with the reduced vehicle-miles of travel with MCB2 and MCB4.

Air pollution is a general term that refers to one or more chemical substances that degrade the quality of the atmosphere. Individual air pollutants degrade the atmosphere by reducing visibility, damaging property, reducing the productivity or vigor of crops or natural vegetation, or harming human or animal health. When assessing the impact of a proposed transportation project on air quality, compliance with NAAQS for six criteria pollutants and the potential for the project to increase Mobile Source Air Toxics (MSAT) are considered. The six criteria pollutants are: carbon monoxide, nitrogen dioxide, ozone, particulate matter, sulfur dioxide, and lead. Additional information on air quality impacts is included in the *Air Quality Technical Report* (Parsons Brinckerhoff, 2010) on the CD included with this DEIS, at public review locations listed in Appendix C, and on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/.

3.4.2.1 Conformance with National Ambient Air Quality Standards

The US Environmental Protection Agency (USEPA) publishes a list of all geographic areas that are in compliance with the NAAQS (criteria pollutant levels below their respective standards), as well as those areas not in compliance with the NAAQS. The designation of an area is made on a pollutant-by-pollutant basis.

The project is in Currituck and Dare counties, which have been determined to comply with the NAAQS. The proposed project is in an attainment area; therefore, Title 40 *Code of Federal Regulations* Parts 51 (the NAAQS) and 93 (determination of conformity with a state implementation plan for air quality reduction) are not applicable. This project is not anticipated to create any adverse effects on the air quality of this geographic area.

3.4.2.2 Mobile Source Air Toxics

In addition to the criteria pollutants for which there are NAAQS, USEPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners), and stationary sources (e.g., factories or refineries).

For the detailed study alternatives and the No-Build Alternative, the amount of MSATs emitted would be proportional to the vehicle-miles traveled (VMT), assuming that other variables such as fleet mix are the same for each detailed study alternative. Table 3-16 shows the 2035 estimated total VMT and congested VMT for the detailed study alternatives. The VMT estimated for each of the detailed study alternatives is lower or the same as the No-Build Alternative. As shown in Table 3-16, the two bridge alternatives (MCB2 and MCB4) would reduce total estimated VMT by 12.9 percent in comparison to the 2035 No-Build Alternative, which would lead to a corresponding reduction in associated MSAT emissions. Estimated VMT would be unchanged with ER2. In the case of the two bridge alternatives, the Mid-Currituck Bridge would provide a shorter route to many destinations in the project area. All of the detailed study alternatives would reduce congestion, thereby increasing localized speeds and reducing travel times, with MCB2 reducing congested VMT by 52.5 percent. According to USEPA's Mobile6.2 emissions model, emissions of all of the priority MSATs except for diesel particulate matter decrease as speed increases. However, the extent to which these speed-related emissions decreases will affect overall MSAT levels cannot be reliably projected because of the inherent deficiencies of technical models.

Table 3-16. Estimated Total Vehicle-Miles Traveled and Congested Vehicle-Miles Traveled in 2035

	Total Vehicle-Miles Traveled (millions)[1]	Percent Reduction in Total Vehicle-Miles Traveled from No-Build	Congested Vehicle-Miles Traveled (millions)[1]	Percent Reduction in Congested Vehicle-Miles Traveled from No-Build
Annual Existing (2006)	355.1	—	5.4	—
Annual Future (2035)				
• No-Build	663.9	—	66.1	—
• ER2	663.9	0.0%	51.4	22.2%
• MCB2	578.3	12.9%	31.4	52.5%
• MCB4	578.3	12.9%	40.2	39.2%

Based on these results, the proposed project is predicted to reduce MSATs in the overall project area in contrast to the No-Build Alternative. MCB2, with both the greatest reduction in total VMT and the greatest reduction in congested VMT, would reduce MSAT emissions the most of the three detailed study alternatives.

The widening of NC 12 and US 158 on the Outer Banks contemplated as part of ER2 and MCB2 would have the effect of moving some traffic closer to nearby homes, businesses, and recreational paths. NC 12 and US 158 on the Outer Banks are lined with homes, businesses, and/or recreational paths for their full lengths. The distance of US 158 and NC 12 widening would be approximately 20.3 miles and 18.2 miles for MCB2 with bridge corridors C1 and C2, respectively. The distance of US 158 and NC 12 widening would be approximately 18.3 miles with ER2. The moving of traffic closer to nearby homes would be true for the Mid-Currituck Bridge associated with MCB2 and MCB4 at its termini on the mainland and on the Outer Banks, and as it passes through the community of Aydlett for approximately 1,800 feet. Currently, Aydlett is not adjacent to a thoroughfare. The moving of some traffic closer to nearby homes, businesses, and recreational paths also would be true along the limited widening of NC 12 associated with MCB4 (approximately 4.4 miles with bridge corridor C1 and 2.3 miles with bridge corridor C2). Therefore, under each detailed study alternative there may be localized areas along US 158, NC 12, and the Mid-Currituck Bridge where ambient concentrations of MSATs could be higher at some receptors than under the No-Build Alternative, but this could be offset as a result of increases in localized speeds and reductions in congestion (which are associated with lower MSAT emissions). In addition, MSAT emissions would be lower in other locations when traffic shifts away from them. For example, a Mid-Currituck Bridge would shift traffic away from US 158 and NC 12 in Dare County. On a regional basis, however, USEPA's vehicle and fuel regulations, coupled with fleet turnover, will, over time, cause substantial MSAT reductions that, in almost all cases, will cause region-wide MSAT levels to be lower than today.

3.4.3 How would the detailed study alternatives affect energy use?

The energy used in constructing, operating, and maintaining one of the detailed study alternatives likely would be greater than simply continuing to operate and maintain existing roads.

With each of the detailed study alternatives, however, there would be a substantial reduction in long-term future traffic operations energy use resulting from a 12.9 percent decrease in millions of vehicle-miles traveled (VMT) and reductions in congestion with MCB2 and MCB4 (52.5 percent and 39.2 percent, respectively). ER2 would see reductions in congested VMT only (22.2 percent). The benefit arising from the reduction in future VMT and congested VMT would in part offset the energy used to construct and maintain the detailed study alternatives. Differences in energy use related to the construction of the detailed study alternatives are reflected in differences in their cost (Caltrans Transportation Laboratory, July 1983). The higher the cost, the more energy that would be expended. The construction costs of the detailed study alternatives (in this case all costs except right-of-way costs), including differences associated with

mainland approach design Option A and Option B, are presented in Table 2-4. The lowest cost alternative is ER2. For MCB2 and MCB4, Option B would be less costly than Option A. Construction cost would be similar between bridge corridors C1 and C2, but C2 would be somewhat more expensive.

Decreases in potential operating energy use would result from both decreasing millions of VMT and reducing congestion.

Additional detail is presented in the *Other Physical Features Technical Report* (Parsons Brinckerhoff, 2009) on the CD included with this DEIS, at public review locations listed in Appendix C, and on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/.

3.4.4 How would potential accelerated sea level rise resulting from climate change affect long-term use of the detailed study alternatives?

Existing roads would be affected by sea level rise. A Mid-Currituck Bridge would be a useful asset in reducing the impact of sea level rise resulting from climate change on the project area's road system. Under all sea level rise scenarios considered, the entire barrier island would be inundated at the Dare/Currituck county line, creating a breach in the island and making a Mid-Currituck Bridge the only way off the Currituck County Outer Banks.

This assessment considers the potential effect of accelerated sea level rise on the No-Build and detailed study alternatives. Its findings are based on a comparison of the road network in the project area to sea level rise maps prepared for the report: *The Potential Impacts of Global Sea Level Rise on Transportation Infrastructure Phase 1—Final Report: the District of Columbia, Maryland, North Carolina and Virginia* (ICF International, 2008).

The sea level rise study developed a series of North Carolina maps for nine different eustatic (uniformly global) sea level rise scenarios ranging from 6 to 59 centimeters (2.4 to 23.2 inches) between now and year 2100. The sea level rise study used digital elevation models to evaluate the elevation in coastal areas. Tidal surfaces were created to describe the current and future predicted sea water levels. These models were used to identify land and in turn transportation infrastructure that, without protection, would be regularly inundated by the ocean or would be at-risk of periodic inundation as a result of storm surge under each sea level rise scenario. These terms are defined as:

- Regularly inundated: areas that would be permanently under water under a given sea level rise scenario; and

- At-risk: areas that could be temporarily flooded as a result of the storm surge under a given sea level rise scenario.

This assessment used seven of the nine sea level rise maps. The two not used were within a centimeter of other maps and thus were not considered relevant to this assessment.

When considering the various accelerated sea level rise scenarios, it was found that by year 2100 portions of the existing project area road network (including those sections of US 158 and NC 12 improved by the detailed study alternatives) would be inundated (permanently under water for 1.5 to 2.5 miles) or at risk during a storm surge (3.8 to 7.7 miles). Portions of the Mid-Currituck Bridge interchange area with US 158 would be at risk during a storm surge. Areas likely to be inundated along the bridge corridor would be bridged. Decisions on road and bridge elevations needed to accommodate potential sea level rise would be made during final design if either MCB2 or MCB4 were selected for implementation (see Project Commitment #6).

It was also found that a Mid-Currituck Bridge would be a useful asset in reducing the impact of sea level rise on the project area's road system. Under all sea level rise scenarios considered, NC 12 would be broken by inundation near the Currituck/Dare County line. The entire barrier island would be inundated at this location, creating a breach in the island. Thus, the bridge would become the only route on and off the Currituck County Outer Banks. ER2 and the road improvements associated with MCB2 and MCB4 would suffer the same levels of inundation and impact from the storm surge as the existing roads that they improve.

Finally, all components of the detailed study alternatives would likely be replaced before year 2100 and as such would never experience the highest sea level rise. The Mid-Currituck Bridge could stay in service up to 75 years and would experience most sea level rise between now and 2100. Year 2035 is the project's design year and also reflects the design life of the road components of the detailed study alternatives. The worst-case sea level rise scenario averages an increase of 1.6 centimeters (0.63 inch) per year from 2008 to 2100. If that rise occurred, one would see a 42 centimeters rise (16.5 inches) by 2035, which is between the 31 centimeters (12.2 inches) and 48.5 centimeters (19.1 inches) data generated by the FHWA study.

Additional detail is presented in the *Other Physical Features Technical Report* (Parsons Brinckerhoff, 2009) on the CD included with this DEIS, at public review locations listed in Appendix C, and on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/.

3.4.5 How would visual quality be changed?

Primary visual impacts would be the introduction of Mid-Currituck Bridge features into views along US 158 and in Aydlett (including views of Currituck Sound) with MCB2 and MCB4. On the Outer Banks, a C1 bridge terminus would adversely affect views of Currituck Sound from the Corolla Bay subdivision and, to a lesser extent, the northern part of Monteray Shores. A C2 bridge terminus would adversely affect views from the outdoor recreation area at TimBuck II. ER2 and MCB2 would introduce an interchange into views in Kitty Hawk. With all of the

detailed study alternatives, wider pavement and new drainage features would be introduced along NC 12. Roadside vegetation would be lost to provide for the drainage features. This change would be the least extensive with MCB4.

FHWA provides guidance in preparing visual resource discussions and impact assessments in its documents: *Visual Impact Assessment for Highway Projects* (FHWA 1988) and *Environmental Impact Statement—Visual Impact Discussion* (FHWA, 1990). This guidance was used in preparing this assessment.

3.4.5.1 Characteristics of the Existing Landscape

In the project area, the mainland and Outer Banks are distinctly different in their vegetation coverage, land coverage, and development patterns. The mainland is generally flat, with topographic variances ranging between mean sea level (MSL) and 7 feet above MSL. US 158 is the principal roadway on the mainland and is on top of a long ridge that runs between Barco and the Wright Memorial Bridge. US 158 represents the higher elevations on the mainland. The land uses of agriculture, residential, commercial, and light industrial are primarily along US 158, although some of these land uses also are in the small communities (e.g., Aydlett) located east of US 158. North-to-south oriented deciduous forest-covered swamplands exist within the mainland regional landscape and extend from the back end of the land uses along US 158 to the North River and Currituck Sound. Representative mainland views are shown on Figure 3-6.

The Outer Banks landscape is a peninsula that is bounded on the east by the Atlantic Ocean and on the west by Currituck Sound. The topography of the Outer Banks varies. The area between Kitty Hawk and the Town of Duck has rolling topography as a result of the presence of sand dunes. From the Town of Duck to the community of Corolla, the topography is generally flat, with a few intermittent hills. NC 12 is the principal roadway on the Outer Banks. Other roadways are residential streets to the west and east of NC 12. Land uses on the Outer Banks are largely residential and include single- and multi-family residences and resort type developments. Commercial uses are present in Kitty Hawk, Southern Shores, Duck, and Currituck County. However, Southern Shores, Duck, and Currituck County have far fewer commercial uses than Kitty Hawk, and the amount of commercial uses appears to dwindle as one travels from Kitty Hawk northward along NC 12. Vegetation on the Outer Banks includes: shrubs, ranging in size from 1-foot to 10-feet high; beach and dune type grasses; deciduous trees (mostly in the Town of Duck); and sparse stands of evergreen trees between Duck and Corolla. Representative Outer Banks views are shown on Figure 3-7.

3.4.5.2 Visual Impacts

The visual impact assessment examines how the addition of the features associated with the detailed study alternatives would change the visual character of the project area landscapes, the extent of the change, and whether the change could be considered adverse. No changes to the visual features of the project area would occur with the No-Build Alternative. The introduction of a third outbound emergency lane on US 158

2 miles south of the US 158/NC 168 intersection

US 158 at Aydlett Road

Aydlett at the Mid-Currituck Bridge Corridor

0.5 mile south of Walnut Island Boulevard

US 158 at Halls Harbor

Representative Views of Landscapes on the Mainland

Figure

3-6

US 158 east of Wright Memorial Bridge

NC 12 in Southern Shores at Chicahawk Trail

NC 12 in Duck at Thirteenth Street

NC 12 at Sandfiddler Trail

NC 12 in Currituck County 400 feet north of Orion's Way

Corolla Bay planned subdivision in Currituck County

Representative Views of Landscapes on the Outer Banks

Figure

3-7

would have minimal visual impact since no new substantial vertical attributes, such as poles or barriers, are proposed with the third lane, although some utility lines would be moved.

On the mainland with MCB2 and MCB4, the existing landscape would be substantially changed with the introduction of the US 158/Mid-Currituck Bridge interchange along US 158. Existing agricultural features would be lost, and new vertical elements would be introduced. Homes and businesses in this area would be relocated. One home close to Aydlett Road would remain with Option A only, and the interchange would be a notable presence and an adverse impact. The interchange is illustrated on Figure 2-8. Option B would displace this home.

With Option A, as the Mid-Currituck Bridge would enter Aydlett from Maple Swamp, it would transition to an earthen berm. The berm would be noticeable from homes south of the berm, and it would replace existing woods. Unless the trees are cut down by the property owners as timber, trees would obscure the berm from homes to the north, except those close to the shore of Currituck Sound.

With Option B, the proposed Mid-Currituck Bridge approach corridor would enter Aydlett near the existing ground elevation. It would include a toll plaza and an elevated realignment of Narrow Shore Road to take it over the toll plaza. These features would replace existing forest views within the community from both north and south of the toll plaza. Drivers on the relocated Narrow Shore Road would have views of the back yards of homes. The toll plaza would be lighted at night, and those lights would be seen by homes to the south. The nighttime lighting of the toll plaza was expressed as a concern by citizens from Aydlett, particularly as it relates to star gazing hobbyists who recognize Aydlett as an uncommon dark sky location. Light control would be a consideration in developing the final design of a toll plaza in Aydlett. Within 10 years of bridge opening it is expected that the toll plaza would be narrowed to a two-lane road and the lights removed. Tolls would be collected electronically.

With either Option A or Option B, the bridge crossing Currituck Sound would be a notable change in the high quality views of Currituck Sound from Aydlett. Essentially, the 180 degree panorama of Currituck Sound would be split, with the bridge becoming a new and substantial human-made element that bisects the view. This adverse impact would be greatest for homes near the bridge where it would be a more dominant presence. The bridge's passage through Aydlett is shown on Figure 2-10.

With ER2 and MCB2, the super-street and associated interchange east of the Wright Memorial Bridge would be introduced into the views of business patrons along US 158, pedestrians and bicyclists on multi-use paths, and motorists on US 158. Principal viewers of the interchange would be users of the Aycock Brown Welcome Center, which would overlook the interchange; businesses near the interchange; a multi-story hotel; and motorists on US 158. The super-street would be the only street of such a large scale on the Outer Banks. The interchange would be the only interchange on the Outer Banks. Although the road and interchange would serve a useful purpose in terms of serving travel demand in this area, neither is what one would expect to see in a beach vacation

area like the Outer Banks, with its mostly low density development. The configurations of the super-street and the interchange are shown on Figure 2-3.

With all of the detailed study alternatives, wider pavement and new drainage features would be introduced along NC 12. Roadside vegetation would be lost to provide for the drainage features. Although no high quality views would be lost, the overall character of the area along NC 12 would be changed by the loss of vegetation and the wider pavement. Some of the sense of intimacy and isolation associated with this section of NC 12 would be lost with this change. These changes are illustrated on Figure 2-4 and Figure 2-5. These changes would occur for most of the length of NC 12 from US 158 in Dare County to Albacore Street with ER2, for NC 12 from US 158 to the Mid-Currituck Bridge terminus with MCB2, and for approximately 2 to 4 miles south of the bridge terminus in Currituck County with MCB4.

With the C1 terminus associated with MCB2 and MCB4, the bridge would be introduced within the panoramic views of Currituck Sound at the planned subdivision of Corolla Bay and to a lesser extent the existing subdivision of Monteray Shores. The bridge would have the greatest adverse impact in Corolla Bay, as it would pass through the subdivision, in addition to obscuring views of Currituck Sound.

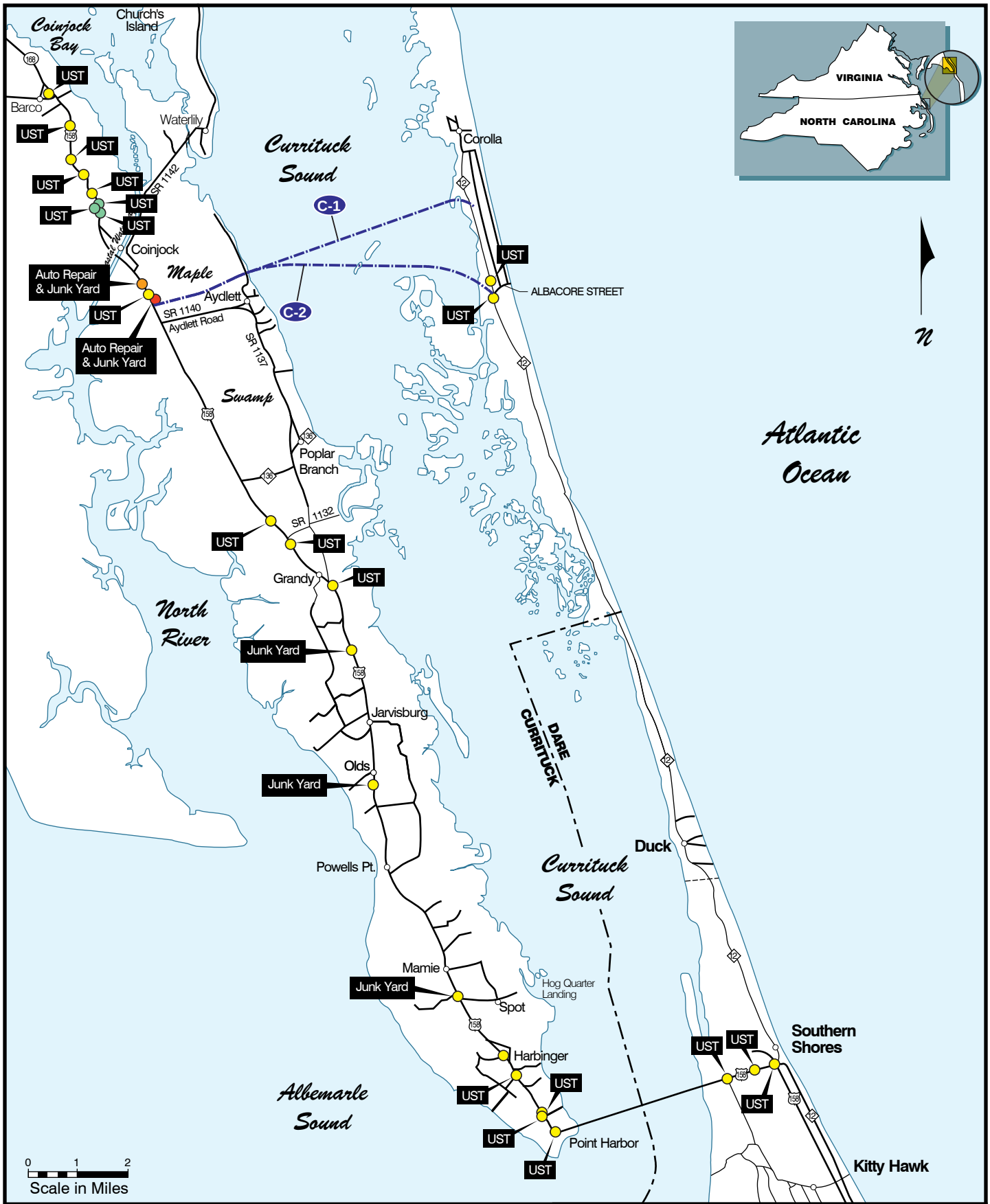
With the C2 terminus for MCB2 and MCB4, a viewing platform in Currituck Sound associated with the TimBuck II development would be displaced, and views of the natural vegetation and the sound from TimBuck II's outdoor recreation area would be replaced by the bridge approaching the shore at a 45-degree angle. This would create an adverse visual impact.

No changes to visual quality in the project area would occur with the No-Build Alternative. Additional detail on the visual impacts is presented in the *Other Physical Features Technical Report* (Parsons Brinckerhoff, 2009) on the CD included with this DEIS, at public review locations listed in Appendix C, and on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/.

3.4.6 Are there hazardous materials and underground storage tank sites that could affect the project?

There are 29 potential hazardous material or underground storage tank (UST) sites along the detailed study alternatives. The risk of increased project cost or schedule delays resulting from affecting any of these sites ranges from negligible to medium. This risk need not be a factor in choosing an alternative for implementation.

A hazardous material is any item or agent (biological, chemical, or physical) that has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors. Studies identified 25 underground storage tank sites and five junk yards (one junk yard is located on one of the 25 underground storage tank sites) along the corridors of the detailed study alternatives. The locations of these sites are shown on Figure 3-8. The risk of increased project cost or schedule resulting



LEGEND

County Boundaries

Alternative Bridge Corridors

Contamination Sites

- Negligible to Low Impact
- Low Impact
- Low to Medium Impact
- Medium Impact

GeoEnvironmental Sites

Figure

3-8

from affecting any of these sites ranges from negligible to medium. One junk yard is a low to medium risk, and one junk yard is a medium risk. The rest of the sites have a negligible to low or low risk. All of the detailed study alternatives could affect the two low to medium and medium risk sites. ER2 would affect 25 negligible to low or low risk sites; MCB2 would affect 14 such sites; and MCB4 would affect 11 such sites. Detailed soil and groundwater assessments on each of the properties identified (in the current surveys or in the future) would be made after selection of an alternative for implementation and before right-of-way acquisition. The results would be used to determine any need for remediation of contaminants in the soil or ground water and that need would be taken into consideration during right-of-way acquisition.

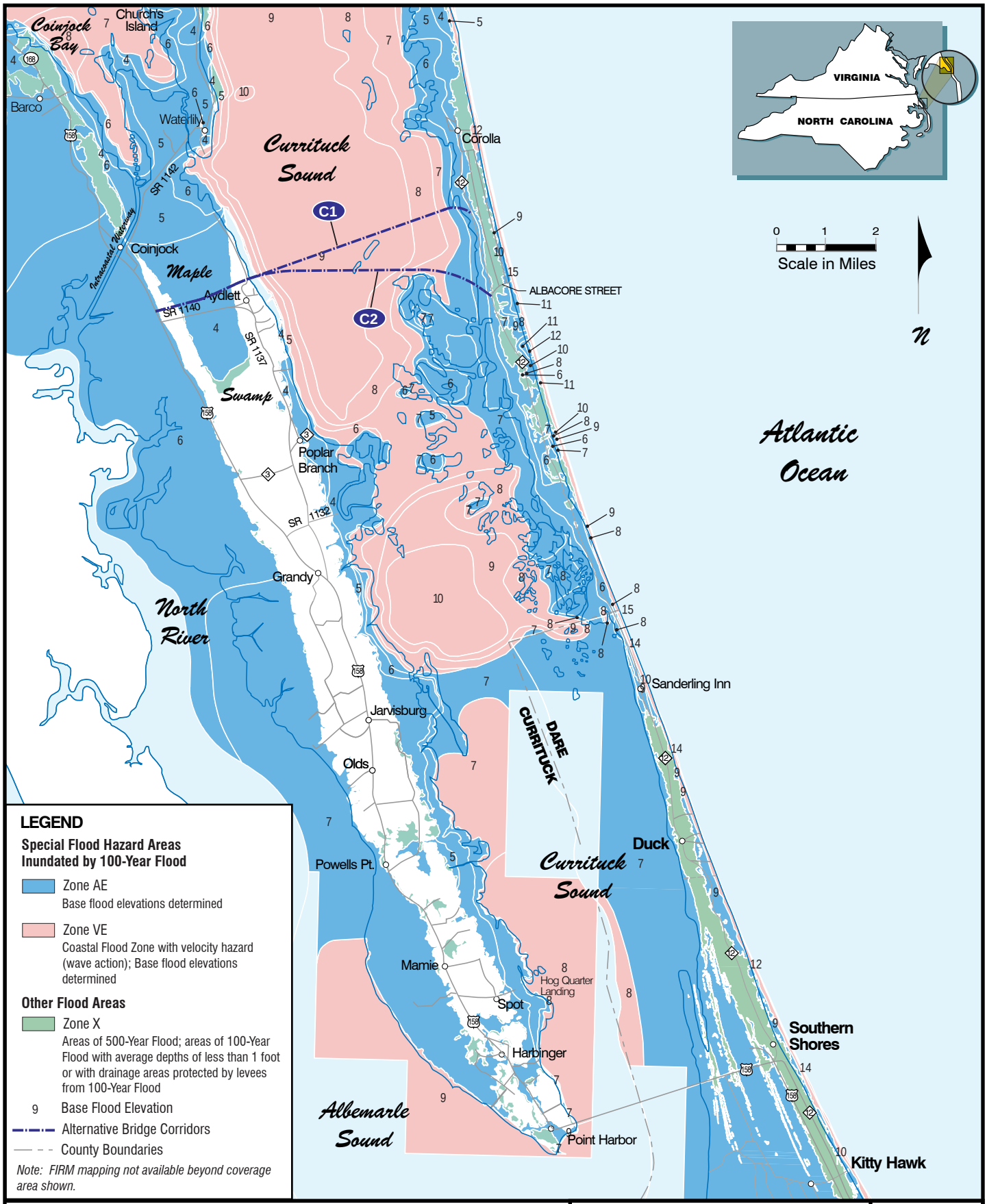
3.4.7 Would floodplains be affected?

There would be no hydraulic impacts to floodplains in the project area and no significant encroachment on those floodplains with ER2, MCB2/A, and MCB4/A. Such impacts would occur with MCB2/B and MCB4/B. Should MCB2/B or MCB4/B be selected for implementation, additional studies would be conducted during final design so adverse floodplain impacts on properties north of the Maple Swamp fill could be avoided or minimized, as well as affects on the groundwater hydrology, hydrologic characteristics of Maple Swamp, and supported ecological functions.

Floodplains and associated Base Flood Elevations in the project area are shown on Figure 3-9. The floodplains in the project area do not serve the same function as floodplains in non-coastal areas (fluvial or river/stream floodplains with associated stormwater runoff) because water levels in the project area are not dependent on floodplain storage capacity. Rather, the project area is subject to coastal flooding caused by both hurricanes in the summer and fall months and northeasters in the winter and spring, both of which can raise water levels substantially via storm surge. The tidal surge comes into shore with the storm, and then begins to retreat almost immediately once the storm moves on. The only storage that occurs in the project area floodplains is during the brief interval between the surge and the ebb of the storm-induced tide.

3.4.7.1 Hydraulic Impacts to Floodplain

The Mid-Currituck Bridge component of MCB2/A and MCB4/A would bridge the two major hydraulic features in the project area, Currituck Sound and Maple Swamp. MCB2/B and MCB4/B would bridge Currituck Sound only except for two 180-foot-long bridges for wildlife passage in Maple Swamp. ER2 would not cross these two features. The Mid-Currituck Bridge would be built above the mapped base flood elevations shown on Figure 3-9. MCB2/A and MCB4/A would encroach on fill for a portion of the total tidally-influenced 100-year floodplain, 9.8 acres on the mainland and 0.6 acre at the C1 Outer Banks terminus of the Mid-Currituck Bridge. With MCB2/B and MCB4/B, the mainland number would be 22.1 acres. The proposed widening of the roadways along both the US 158 and NC 12 corridors (with all detailed study alternatives) would occur at-grade and, therefore, would not result in obstruction or alteration of flood flows or flood elevations.



LEGEND

Special Flood Hazard Areas Inundated by 100-Year Flood

- Zone AE
  Base flood elevations determined
- Zone VE
  Coastal Flood Zone with velocity hazard (wave action); Base flood elevations determined

Other Flood Areas

- Zone X
  Areas of 500-Year Flood; areas of 100-Year Flood with average depths of less than 1 foot or with drainage areas protected by levees from 100-Year Flood
- 9 Base Flood Elevation
- Alternative Bridge Corridors
- County Boundaries

Note: FIRM mapping not available beyond coverage area shown.

Floodplains

Figure 3-9

Since base flood elevations in the project area are the result of tidal surges, neither the increases in runoff because of the expansion of paved surfaces (with all detailed study alternatives) nor the up to 10.4 acres of fill in the 100-year floodplain resulting from bridge construction with MCB2/A and MCB4/A would have an effect on base flood elevations in the project area. The fill area would be small in relation to the total area affected by the surge.

The fill in Maple Swamp associated with MCB2/B and MCB4/B, however, could obstruct or alter flood flows and elevations and would be considered by Currituck County to be a significant alteration to a water course. MCB2/B and MCB4/B would involve:

- 2.9 acres of fill associated with the west side of the US 158 interchange;
- 19.2 acres of fill associated with the proposed fill in Maple Swamp; and
- 0.6 acre of fill at the C1 Outer Banks terminus of the Mid-Currituck Bridge.

Again, since base flood elevations in the project area are the result of tidal surges, the up to 2.5 acres of fill (excluding that in Maple Swamp) in the 100-year floodplain resulting from bridge construction with MCB2/B and MCB4/B would not have an effect on base flood elevations in the project area. The fill area would be small in relation to the total area affected by the surge.

Hydraulic modeling results show that the MCB2/B and MCB4/B fill in Maple Swamp would result in an approximate 0.2-foot increase in the maximum water surface elevation for the 100-year storm at the downstream (north) face of the proposed fill. The 0.2-foot increase would taper to zero change in maximum water surface elevation for the 100-year storm at a point approximately 4,000 feet north of the proposed fill. Based on a visual inspection of available 2-foot contour mapping and satellite images, the area of effect for this rise in water surface elevation includes one residential property (and associated farm buildings) and portions of farm fields along the western edge of the swamp. These properties are east of US 158, between the proposed fill and Young Road. Modeling results also showed that the MCB2/B and MCB4/B fill would result in an approximate 0.75-foot decrease in the maximum water surface elevation for the 100-year storm at the upstream (south) face of the proposed fill. This decrease in water surface elevation would become negligible approximately 5,500 feet south of the proposed fill. If MCB2/B or MCB4/B is selected for implementation, detailed hydraulic studies would be conducted as part of the final design to determine mitigation measures necessary to avoid or minimize floodplain impacts on properties north of the Maple Swamp fill (see Project Commitment #7).

3.4.7.2 Significant Encroachment

With respect to floodplain highway encroachment, it is the policy of the FHWA "to avoid significant encroachments, where practicable." According to Title 23 *Code of Federal Regulations* Part 650, Subpart A:

"*Significant encroachment* shall mean a highway encroachment and any direct support of likely base floodplain development that would involve one or more of the following construction or flood-related impacts:

- A significant potential for interruption or termination of a transportation facility which is needed for emergency vehicles or provides a community's only evacuation route;

- A significant risk; or

- A significant adverse impact on natural and beneficial floodplain values."

ER2, MCB2/A, and MCB4/A would not involve a significant encroachment on the 100-year floodplain as defined in Title 23 *Code of Federal Regulations* Part 650, Subpart A (Location and Hydraulic Design of Encroachments on Floodplains). MCB2/B and MCB4/B would involve a significant encroachment since they would be considered a significant alteration to a water course by Currituck County.

Transportation Facility Interruption

There would not be a significant potential for interruption or termination of a transportation facility that is needed for emergency vehicles or provides a community's only evacuation route. The Mid-Currituck Bridge associated with MCB2 and MCB4 would lie above the storm surge elevation. The widening of US 158 and NC 12 associated with ER2, MCB2, and MCB4 roadways would be at-grade, the same as with the existing roads. There would be no increase in the risk of transportation facility interruption on those roads. Currituck and Dare counties recognize the risks associated with the storm surge, and each has developed an emergency management program that tracks storms and orders the voluntary evacuation of the entire Outer Banks prior to a storm surge. Dare and Currituck counties also have helicopters to transport patients to area hospitals in the event NC 12 is severed as a result of a storm.

Significant Risk

ER2, MCB2/A, and MCB4/A would not create a significant risk beyond those associated with development that already exists on the Outer Banks and the mainland. Risks on the Outer Banks and mainland are associated with storms and their consequences. Given the tidal nature of the flooding in the project area, the insignificant footprint of the bridges (Maple Swamp and Currituck Sound bridges) within this very wide floodplain, and the height of the bridges over the floodplain elevations, it is anticipated that the impact of the Mid-Currituck Bridge and, where applicable, associated road widening and interchanges on flood elevations, would be negligible. This conclusion would apply to MCB2/B and MCB4/B, too, except for the potential impact of the fill in Maple Swamp, which as indicated above would be considered by Currituck County to be a significant alteration to a water course. It also would result in an approximate 0.2-foot increase in the maximum water surface elevation for the 100-year storm from the downstream (north) face of the proposed fill. The area of effect for this rise in water surface elevation

includes one residential property (and associated farm buildings) and portions of farm fields along the western edge of the swamp.

Impact to Beneficial Floodplain Values

Natural and beneficial floodplain values associated with the project area are:

- The Outer Banks serving as a buffer (therefore flood control) to protect mainland shoreline areas by dampening tidal surges; and
- Wildlife habitat.

ER2, MCB2/A, and MCB4/A would not have a significant adverse impact on natural and beneficial floodplain values. As noted above, it is anticipated that the impact of these alternatives on flood elevations would be negligible. The bridge component of the MCB2/A and MCB4/A generally would bridge floodplains and their wildlife habitat. The road widening components would be confined to the existing right-of-way except for infiltration ponds and ditches along NC 12 and generally would pass through areas already disturbed by development.

MCB2/B or MCB4/B, as indicated above, could affect natural and beneficial floodplain values in two different ways: 1) changes in flood flows and elevations for the 100-year storm and 2) anticipated changes to existing groundwater and drainage patterns. Changes associated with the 100-year tidal storm surge include an approximate 0.2-foot increase and 0.75-foot decrease in maximum water surface elevations north and south of the proposed fill, respectively. Hydraulic modeling results for the 10-year tidal surge, however, show no significant impacts to water surface elevations as a result of the proposed fill. There also was negligible response in Maple Swamp (no variation in water surface elevations) during lower storm surge events for existing conditions. This indicates that the wetness of the swamp likely is controlled by the rise and fall of the groundwater table, which is close to the ground surface, rather than tides. The addition of fill proposed for MCB2/B and MCB4/B could result in changes to existing groundwater and drainage patterns in Maple Swamp for non-tidal storm surge situations, which also would affect natural and beneficial floodplain values. Further investigation of impacts to groundwater hydrology, hydrologic characteristics of the swamp, and ecological functions they support would be needed to support the final design of MCB2/B or MCB4/B, if selected. The removal of Aydlett Road with MCB2/B or MCB4/B could offer beneficial floodplain values. Impacts to wildlife movement would be mitigated through the provision of wildlife passages.

3.5 Construction Impacts

This section considers the impacts of the detailed study alternatives that could occur during construction, as follows:

- How would traffic be maintained to minimize the inconvenience to travelers?

- How would air quality be protected during construction?
- How would waste be disposed?
- Would fill have to be obtained to build the detailed study alternatives?
- How would erosion be controlled?
- What construction noise impact would occur?
- Would lighting be used to allow construction at night?
- How would natural resources be protected during construction?
- Would the relocation of utilities cause disruption of service?

The potential characteristics of the construction process for the detailed study alternatives are discussed in Section 2.4. There would be no construction impacts with the No-Build Alternative. Construction associated with the detailed study alternatives would be governed by:

- North Carolina Department of Transportation (NCDOT) *Standard Specifications for Roads and Structures* (NCDOT, 2006, or current at the time of construction); and
- American Association of State Highway and Transportation Officials (AASHTO) *Standard Specifications for Highway Bridges* (AASHTO, 2002, or current at the time of construction).

Appropriate Best Management Practices (BMPs) applicable to construction and maintenance for protection of surface waters, wetlands, and upland habitat would be used to control erosion, sedimentation, and stormwater runoff. Mechanisms would be put in place to maintain traffic flow; minimize air quality, noise, and construction lighting impacts; manage waste disposal; protect surrounding natural resources; control erosion; and handle any accidental waste spills. Any affected geodetic survey markers in the project area would be properly relocated.

Any major construction project may inconvenience and disturb adjacent residents and businesses. In the case where an existing road is widened or otherwise improved, inconvenience to motorists also can occur. Without proper planning and implementation of controls, traffic disruption, loss of access, dust, noise, burning debris, and utility relocation could adversely affect the comfort and daily life of residents and visitors. Disturbances to the bottom of Currituck Sound, disposal of wastes, lack of erosion control, and damage to trees outside the right-of-way would degrade the quality of the natural environment. In developing and implementing its construction projects, NCTA endeavors to minimize inconveniences and disturbances and would do so if a detailed study alternative were built.

3.5.1 How would traffic be maintained to minimize the inconvenience to travelers?

The construction contractor would be required to meet the traffic maintenance requirements of the NCDOT Standard Specifications for Roads and Structures (NCDOT, 2006, or current at the time of construction). A traffic control plan for each phase of construction would be developed during design, and special care would be taken to delineate clearly a safe travelway for traffic.

Traffic would be maintained on US 158, Aydlett Road (SR 1140), Narrow Shore Road (SR 1137), NC 12, and other local streets throughout construction of any of the detailed study alternatives. Emergency vehicles would be able to pass through the construction area. Continuous and safe access would be provided to all adjoining properties, and operations would be conducted so that inconvenience to property owners would be held to a minimum. Traffic generally would not be detoured to other roads. At least one lane in each direction of travel would operate throughout construction on US 158. Two travel lanes would operate on NC 12 throughout construction. Lane closures would not occur during peak travel periods, including the summer weekend when the bulk of the recreational housing on the Outer Banks changes occupants.

Brief periods of delay and disruption that result from construction vehicles operating on US 158 and NC 12 could be encountered by motorists. Most of the bridge components would be brought to the construction site by truck.

3.5.2 How would air quality be protected during construction?

Construction-related air quality effects of the project would be limited to short-term increased fugitive dust (dust in the air) and mobile-source emissions during construction. State and local regulations, as applicable, regarding open air burning, dust control, and other air quality emission reduction controls would be followed.

During construction of any of the detailed study alternatives, all materials resulting from clearing and grubbing, demolition, or other operations would be removed from the project site, burned, or otherwise disposed of by the contractor. Any open air burning would be accomplished in accordance with applicable laws, local ordinances, and regulations of the State of North Carolina.

Measures would be taken to reduce dust generated by construction when the control of dust is necessary for the protection and comfort of motorists and area residents. Dust suppression measures could include watering unpaved work areas; temporary and permanent seeding and mulching; covering stockpiled materials; and using covered haul trucks.

To minimize the amount of short-term emissions generated by construction equipment and vehicles, efforts would be made during construction to limit disruption to traffic, especially during peak travel periods, and to minimize construction equipment idling and unnecessary engine use.

3.5.3 How would waste be disposed?

Waste materials, including any toxic or hazardous materials, would be disposed of in accordance with current laws and guidelines. Timber from the woodland areas purchased for right-of-way could be merchandised and sold to lessen the need for disposal or burning of debris.

The disposal of excavated material outside the right-of-way would be the responsibility of the contractor, who would be contractually required to handle and dispose of the materials in accordance with NCDOT *Standard Specifications for Roads and Structures* (NCDOT, 2006, or current at the time of construction) and local, state, and federal laws. When using waste or disposal areas that are not active public waste and disposal sites, the contractor and the owner of the property where waste is to be disposed must jointly submit a Development, Use, and Reclamation Plan to NCTA for each waste or disposal area to be used. This plan must meet specific requirements related to drainage, covering debris with soil, shaping the covered waste into contours that are comparable to and blend in with the existing topography, and erosion control. The covered wastes must be seeded and mulched. Disposal in areas under US Army Corps of Engineers regulatory jurisdiction is not allowed unless the contractor obtains the required permit.

Any toxic and hazardous materials would be handled and used in accordance with package labels and manufacturers' directions. Wastes would be segregated, labeled, and stored in a manner that would prevent their release into the environment from an accident or spill. The contractor would dispose of these materials and their containers in accordance with applicable state and federal regulations.

In the event of hazardous waste or oil spills, the emergency response procedures established under the North Carolina Oil Pollution and Hazardous Substances Control Act of 1978 would be followed. The Act applies to spills of oil and those chemicals listed in the Federal Clean Water Act, whether on the ground or in water bodies, including off-shore spills.

3.5.4 Would fill have to be obtained to build the detailed study alternatives?

Fill would be required with any of the detailed study alternatives.

It is anticipated that excavation would be minor, primarily associated with accommodating drainage along NC 12 and US 158. The terrain along the alignment of the detailed study alternatives is mostly flat except for a few places in Duck that would be affected with ER2 and MCB2. There would be more fill than excavation, however, primarily associated with interchange ramps and the area between a Maple Swamp Bridge and a Mid-Currituck bridge. The contractor would select borrow sites and remove the material in accordance with NCDOT practices (see Section 230 of NCDOT standard specifications). No borrow would be taken from wetlands. In placing the fill, all standard construction procedures and measures, including NCDOT *Best Management Practices for Protection of Surface Waters* would be implemented, as applicable, to avoid or minimize environmental impacts.

3.5.5 How would erosion be controlled?

North Carolina Administrative Code Title 15A, Chapter 4, Subchapter B titled "Erosion and Sediment Control," requires approval of a soil erosion control plan before land-disturbing activities can begin. NCTA's contractor would prepare an erosion control plan prior to construction of a detailed study alternative and implement it during construction.

The erosion control plan must identify critical areas subject to severe erosion, limit the size of the area exposed at any one time, limit the time exposed, control water runoff, prevent off-site sedimentation damage, and manage stormwater runoff. Impacts resulting from erosion and sedimentation likely would be kept to a minimum by employing BMPs such as silt check-dams, silt fences, and silt basins. During construction of a detailed study alternative, appropriate improvement techniques would be employed, such as prompt establishment of appropriate grass species, sediment barriers, and proper grading of slopes in order to meet the standards set by the Sedimentation Pollution Control Act of 1973, as amended. These practices would include those in conformance with NCDOT *Sediment and Erosion Control Program* and *Best Management Practices for Protection of Surface Waters*.

Permanent erosion control measures would be incorporated into the project at the earliest practicable time and coordinated with temporary measures to ensure economical, effective, and continuous erosion control. Every reasonable precaution would be taken to prevent pollution of water bodies.

3.5.6 What construction noise impact would occur?

Overall, construction noise impacts are expected to be generally minimal because construction noise is relatively short in duration (as it moves along the project reach).

The major construction elements of this project are expected to be earth removal, hauling, grading, and paving. General construction noise impacts, such as temporary speech interference for passersby and individuals living or working near the project, can be expected, particularly from noise from paving operations and from the earth moving equipment during grading operations. High noise levels of impact pile driving and combustion-engine-powered equipment usually are the main contributors to bridge construction equipment noise levels. Construction noise impacts are expected to be generally minimal because construction noise is relatively short in duration (as it moves along the project reach). Furthermore on land, the transmission loss characteristics of the surrounding wooded areas and other natural and development features are considered sufficient to moderate the effects of intrusive construction noise. Noise impacts to fish are noted in Section 3.3.4.4.

3.5.7 Would lighting be used to allow construction at night?

It is not uncommon in North Carolina to restrict construction to daytime hours in residential areas.

The most critical areas with respect to lighting would be in Aydlett, a full-time quiet residential community, and on the Outer Banks, where sensitivity to construction disturbance would be greatest in the summer tourist season because of the presence of large rental cottages in the area.

3.5.8 How would natural resources be protected during construction?

Protection of the natural resources within the project area would involve implementing a variety of environmental safeguards during all stages of the project, from planning through construction, to protect sensitive natural resources adjoining the construction area.

Appropriate BMPs applicable to construction and maintenance for protection of surface waters, wetlands, and upland habitat would be used to control erosion, sedimentation, and stormwater runoff. Trees outside the construction limits would be protected from construction activities.

3.5.9 Would the relocation of utilities cause disruption of service?

The relocation of utilities would be included in final design plans. NCTA would coordinate construction activities with the appropriate officials to minimize damage or disruption of existing service.

3.6 Indirect and Cumulative Effects

The previous sections considered direct impacts, impacts that would be caused by the construction and operation of the project. This section considers impacts that are not directly related to the project, but that could be contributed to by the project.

Indirect effects are impacts caused by the project but, compared to direct impacts, are later in time or farther removed in distance, but are still reasonably foreseeable. In the case of this project, indirect effects include project induced changes in the pattern of land use and the impacts on the community and natural environment of that change.

Cumulative effects are effects on the environment that result from the incremental impact of the proposed project when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative effects are considered because they can result from individually minor but collectively significant actions taking place over a period of time. In the case of the proposed project, cumulative effects result from the project, land use changes induced by the project, and all other development activities expected through 2035.

This assessment of indirect and cumulative impacts was prepared in accordance with the *Guidance for Assessing Indirect and Cumulative Impacts of Transportation Projects in North Carolina* (NCDOT, 2001). The specific methodologies during each step of the

indirect and cumulative effects analysis were selected by the study team at East Carolina University, in association with an indirect and cumulative effects analysis specialist at the private engineering firm of Parsons Brinckerhoff and NCTA staff. They were reviewed and discussed with state and federal environmental resource and regulatory agencies at a meeting on October 7, 2008. Currituck and Dare county land use and economic development plans were an important input into the assessment. This section focuses on the key findings of the indirect and cumulative impacts assessment. Additional detail is presented in the *Indirect and Cumulative Effects Technical Report* (East Carolina University and Parsons Brinckerhoff, 2009) found on the CD that accompanies this DEIS, at public review locations listed in Appendix C, and on the NCTA web site at https://www.ncdot.gov/projects/mid-currituck-bridge/.

This discussion addresses the following questions:

- What procedures did you follow to determine the potential for indirect and cumulative effects?
- What indirect and cumulative effects could be expected?
- What are the substantial indirect and cumulative effects and could they be minimized?

3.6.1 What procedures did you follow to determine the potential for indirect and cumulative effects?

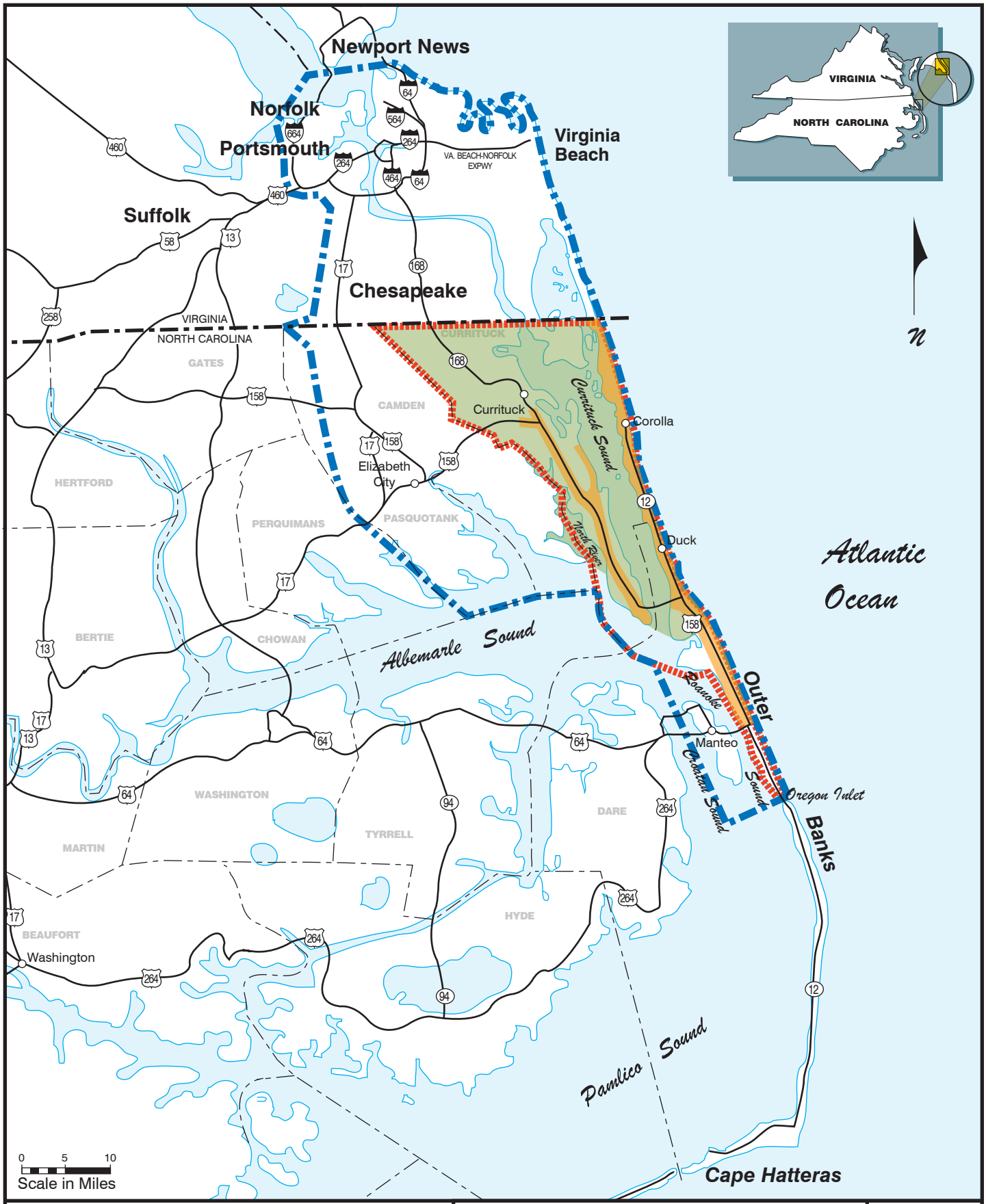
The following steps were followed:

- *An indirect and cumulative impacts study area was identified;*
- *The study area's directions and goals were identified;*
- *Notable features were inventoried;*
- *Impact-causing activities were identified; and*
- *Potential indirect and cumulative effects were identified for analysis.*

The sections that follow describe the outcome of these preparatory steps.

3.6.1.1 Study Area

Because communities and ecosystems are connected in a variety of ways, the study area for the indirect and cumulative impacts assessment is larger than that for the direct impact assessment. This study area is shown on Figure 3-10. It encompasses what is believed is the complete area of potential influence of the Mid-Currituck Bridge project, including political and planning boundaries, the commuteshed of area workers, the area where the Mid-Currituck Bridge project might affect future growth and development, and the area where there could be impacts on the natural environment. The inclusion of



LEGEND

- Commuteshed
- Political Boundaries
- Growth/Development Study Area
- Habitat/Water Quality Study Area

Indirect and Cumulative Effects Assessment Study Area Boundaries

Figure 3-10

these areas did not assume that impacts would occur, but rather that the construction of one of the detailed study alternatives would be sufficient to warrant consideration of this wider area.

Time also is a study boundary in an indirect and cumulative impact assessment, both for establishing past trends of development and forecasting future development. The assessment used the early 1970s as the primary starting point for assessing trends in land use change, and the project's 2035 traffic forecasting year as the ending point.

3.6.1.2 Directions and Goals

The study area's directions and goals were identified. Trends in population, housing, and employment were documented. The primary agencies establishing goals for the communities in the project area are the municipal governments of Currituck County, the towns of Duck, Southern Shores, and Kitty Hawk, and Dare County. The goals are articulated by the respective planning departments and approved by the electorates or their representatives. In addition, Currituck County commissioned a "Vision Plan" from the UNC Center for Competitive Economies (Lane and Jolley, 2008). This vision plan did not state goals per se, but did articulate 10 strategic options that could be adopted by the county commissioners.

Other agencies empowered at the state and federal levels establish goals for specific social and environmental conditions. Non-governmental organizations also express particular goals of organized community groups or national organizations with a stake in the region. The goals of these government and non-government organizations include: social health and well being; economic opportunity; and ecosystem protection.

3.6.1.3 Inventory of Notable Features

Four distinguishable landscapes and waterscapes are of interest in the study area: the Currituck County mainland, North River estuary, Currituck Sound, and the Outer Banks. The characteristics of each were considered, the characteristics of key environmental and community elements were described, and notable ecosystem and socioeconomic features were identified. Notable features in the study area are shown in Table 3-17 and Table 3-18.

3.6.1.4 Impact-Causing Activities

In the study area, impact-causing activities are primarily associated with:

1. The proposed project and its detailed study alternatives;

2. Private development and the provision of infrastructure to serve that development;

3. Other transportation projects presented in the *2009 to 2015 State Transportation Improvement Program* (STIP) and included in the No-Build Alternative (Figure 2-11); and

Table 3-17. Notable Ecosystem Features

Notable Feature	Landscape/Waterscape
Dune System	Outer Banks
Floodplains	Currituck County Mainland, Outer Banks
Estuaries/Water Quality	Currituck Sound, North River Estuary
Public Water Supplies	Currituck County Mainland, Outer Banks
Maritime Forests	Outer Banks
Submerged Aquatic Vegetation	Currituck Sound, North River Estuary
Coastal Marshes	Currituck Sound, North River Estuary
Non-coastal Wetlands	Currituck County Mainland (esp. Maple Swamp)
Atlantic Flyway	Currituck County Mainland, North River, Currituck Sound, Outer Banks
Anadromous Fish Spawning Areas	Currituck County Mainland (streams)
Protected Species	Currituck County Mainland
Wild Horses	Outer Banks (north end)
Coastal Barrier Resources Act Areas, Natural Heritage Areas, and Conservation Areas	Currituck County Mainland, Outer Banks

Table 3-18. Notable Socioeconomic Features

Notable Feature	Landscape/Waterscape
Workforce Housing	Currituck County Mainland
Tourist Housing	Outer Banks
Agriculture	Currituck County Mainland
Historic Structures and Places	Currituck County Mainland, Outer Banks
Circulation and Access	Currituck County Mainland, Outer Banks
Neighborhoods and Village Communities	Currituck County Mainland, Outer Banks
Scenic and Natural Area Character	Currituck County Mainland, North River, Currituck Sound, Outer Banks

4. Logging in forested areas, including wetlands.

The above activities can alter habitat and ground cover, introduce exotic flora, alter groundwater recharge and drainage, generate noise, require cuts and fills, fill wetlands or open water, change motor vehicle operating characteristics via new thoroughfares or increased capacity of thoroughfares, and change access, circulation patterns, and travel times to major traffic attractors.

Activities 2 to 4 generally would occur with or without the implementation of one of the detailed study alternatives. The proposed project and its detailed study alternatives are under consideration in this DEIS. Those alternatives, however, also could alter the

patterns of private development through the changes in access, road capacity, and circulation patterns that they involve. Thus, the study examined this possibility from five perspectives:

1. What is the potential for an increase in permanent residents on the Outer Banks?

2. What is the potential for an increase in the number of day trips to the Outer Banks? Where would an increased number of day trips potentially occur and how many could there be?

3. Would development in the paved NC 12-accessible Outer Banks change in terms of future development location, rate, or type?

4. Would development within the non-paved road-accessible area north of the terminus of NC 12 on the Currituck County Outer Banks change in terms of future development location, rate, or type?

5. Would development in mainland Currituck County change in terms of future development location, rate, or type?

The following sections describe how these questions were answered and why.

Potential to Increase Permanent Residents on the Outer Banks

The potential to increase the number of permanent residents on the Outer Banks relates specifically to:

- The commuteshed boundary of the study area;

- The commuting pattern of the region; and

- Other factors that individuals consider in choosing a permanent residence.

An increase in permanent residents on the Outer Banks, should it occur with the detailed study alternatives, could create upward pressure on real estate prices and housing demand, as well as create demands for additional public services such as schools. Findings for the detailed study alternatives are:

- ER2: No increase;

- MCB2: Negligible or slight increase; and

- MCB4: Negligible or slight increase.

Any increase in permanent residents would not be sufficient to affect the real estate market or municipal governance.

In large part, these findings result because the Outer Banks is a unique resort community with a high average price of housing. Because there is not likely to be

affordable or "workforce" housing on the Outer Banks, the number of workers that could live there irrespective of the changes in access to the Outer Banks is limited. Even with the reductions in travel time associated with a bridge, travel times from the main employment centers of the commuteshed that are in Hampton Roads, Virginia (an area with jobs that have incomes sufficient to live at the beach), would still be too great for a daily commute, especially given closer options like Virginia Beach and Sandbridge, Virginia. The Currituck County mainland is not a significant employment center. Additional factors in reaching the above conclusion were:

- Currently, there are few year-round residents on the Outer Banks. This is evidenced by the fact that 91.2 percent of the Outer Banks property in Currituck County (7,355 of 8,067 parcels) is non-resident owned (derived from 2008 Currituck County tax files).

- The dominant housing types (89 percent) on the Outer Banks are second homes and vacation rental properties and are designed to serve vacationers and not permanent residents.

- Permanent residents lack neighbors for social interaction. Because of the predominance of vacation homes on the Outer Banks, permanent residents usually do have not permanent neighbors and in the off season live in an empty neighborhood.

Potential for Increase in the Number of Day Trips to the Outer Banks

Currently, day visitors to the Currituck Outer Banks comprise a small minority of its visitors. Only 5.6 percent of respondents to a mail-in survey of visitors conducted by the Currituck County Department of Travel and Tourism (Randall Marketing Group, 2007) indicated their visit was a day trip. There are no data that indicate the preferred activity of day visitors to the Currituck Outer Banks. However, the preferred activities of all visitors to the Currituck Outer Banks are dining out, shopping, driving/sightseeing, beach swimming, visiting a historic site, sleeping late or napping, visiting a park, or looking for wild horses. A study performed in 2002 indicated that the top reasons for visiting the Cape Hatteras National Seashore (Reed, Le, & Littlejohn, 2002) were visiting the beach, swimming, and escaping crowds. Thus, day visitors to the Currituck Outer Banks are most likely interested in visiting the beach, swimming, or sightseeing.

In terms of the potential for an increase in the number of day trips to the Outer Banks, the findings for the detailed study alternatives are:

- ER2: No increase or negligible increase;

- MCB2: Some potential for an increase over the No-Build Alternative with the potential higher in the non-road-accessible area; and

- MCB4: Some potential for an increase over the No-Build Alternative with the potential higher in the non-road-accessible area.

The potential market area for substantial additional visitors to the Outer Banks would be in Virginia, particularly the Hampton Roads area. The Mid-Currituck Bridge (MCB2 and MCB4) would reduce the travel time from Hampton Roads to the Currituck County Outer Banks (156 minutes to 80 minutes under uncongested conditions according to Google Maps in combination with project area travel time studies for the project). This would not be the case with ER2. With the bridge, however, it is not reasonably foreseeable to expect a notable increase in the number of day trips to the Currituck Outer Banks because:

- Potential day visitors have closer and comparable options in Virginia.
- Combined tolls would be a deterrent to day trips traveling on the Mid-Currituck Bridge and the Chesapeake Expressway, the primary route in Virginia leading to the Outer Banks.
- Beach access, parking, public facilities, and services are important amenities in attracting day visitors. Beaches in Currituck and Dare counties, however, have limited to modest public facilities, especially when compared to Virginia Beach, which is closer to the largest potential source of day visitors, the Hampton Roads area.

The non-road-accessible northern Currituck County Outer Banks is a unique area that would appeal to a niche market of day trippers (e.g., beach drivers, sport fishermen, and surfers). Thus, the potential for increased day trips would be higher in this area than in the NC 12-accessible area. However, this is a specialized beach experience that would require a four-wheel drive vehicle and would provide no bathroom or other facilities or services. There is no evidence that a significant unrealized demand exists for this form of rustic beach trip. Thus, although the potential is higher than the road-accessible area, the number of increased trips is not expected to be notable.

Potential for Change in Development Location, Rate, or Type in the Paved Road-Accessible Outer Banks

For the NC 12-accessible Outer Banks, there would be no reasonably foreseeable change in the type and density of development with implementation of the detailed study alternatives compared to the No-Build Alternative. No increase in the rate of development on the Outer Banks as whole would be foreseeable over the No-Build Alternative, although the detailed study alternatives would reduce the potential for severe congestion to constrain the demand for new development in the study area. MCB2 would reduce this potential constraint the most, followed by MCB4 and ER2. The introduction of a Mid-Currituck Bridge with MCB2 or MCB4 would substantially reduce travel time from points north of the bridge on the mainland to the Currituck County Outer Banks. As such, the order in which available lots on the NC 12-accessible Outer Banks would develop in response to market demand would likely change, with more Currituck County lots developing before Dare County lots.

These findings are based on the following:

- The road-accessible portion of the Outer Banks is already largely developed.

- Currituck County, Kitty Hawk, Southern Shores, and Duck all have land use plans required by the Coastal Area Management Act of 1974. Current development regulations and past trends associated with implementation of these plans are indicative of the local jurisdictions' commitments to implement these plans as they stand.

- The types of development called for in the land use plans of Currituck County, Kitty Hawk, Southern Shores, and Duck are similar. Thus, changes in accessibility associated with the detailed study alternatives could not shift planned high density development into a low density area or vice versa.

- The Outer Banks represent a unique tourist destination. Area property owners recognize this and capitalize on it by providing beach rentals for those desiring short-term vacations. Transportation was once an important determinant of development in the area. Today, given the complex network of streets and roads that now exists, and that much of the NC 12-accessible Outer Banks has been subdivided, transportation improvements have little effect on the demand for and rate of development. Transportation improvements could, however, influence the location of development that occurs first.

- The lack of transportation improvements and associated growing congestion could constrain development under the No-Build Alternative.

Potential for Change in Development Location, Rate, or Type in the Non-Paved Road-Accessible Outer Banks

For the non-road-accessible Outer Banks (sometimes referred to as Carova), there would be no reasonably foreseeable change in the location, rate, or type of development with implementation of the detailed study alternatives compared to the No-Build Alternative. Several factors would overcome the influence of travel time savings that the detailed study alternatives would have on development decisions in this area, including the substantial travel time savings associated with the Mid-Currituck Bridge (MCB2 and MCB4).

This finding is based on the following:

- Demand for the unique experience offered by Carova has been a primary reason that development is occurring. Lack of accessibility both makes it attractive and helps limit development.

- Numerous government policy constraints related to development and the extension of NC 12 into Carova render unlikely both a change in the rate and characteristics of development from current trends, as well as unlikely an extension of NC 12 to support development there.

- All new subdivisions in the non-road-accessible area have minimum 3-acre lot sizes. Smaller grandfathered lots exist but may not have acceptable septic conditions.

- In November 2008, Currituck County Commissioners turned down a request to allow a commercial development in this area that was not in keeping with their land use plan's policy emphasis for this area. Other property owners in the area also opposed the project.

Potential for Change in Development Location, Rate, or Type in Mainland Currituck County

It is reasonably foreseeable that the introduction of a Mid-Currituck Bridge with MCB2 and MCB4 would alter the location of some future Outer Banks service-oriented businesses. Some business development that might otherwise have been scattered in planned commercial areas on the Outer Banks and mainland near the Wright Memorial Bridge would concentrate at locations on the mainland near the terminus of the Mid-Currituck Bridge at US 158. This change would represent a net gain in business development in a concentrated location on the Currituck County mainland, creating a potential for a notable indirect and cumulative impact focused on the mainland bridge terminus.

Given that decisions to build would be made by individual business owners with a variety of personal objectives, it is not foreseeable that new development shifted to the mainland bridge terminus would be shifted from a single location elsewhere in the study area. Thus, notable changes in the impact of development associated with this shift are expected only at the western end of the Mid-Currituck Bridge. A notable impact is not foreseeable at the numerous and scattered locations in the midst of other development where this development might otherwise have located had a Mid-Currituck Bridge not been built.

Although ER2 would increase road capacity and improve traffic flow, it would not change the accessibility of the road system to developable properties. Thus, it is not reasonably foreseeable that ER2 would shift expected new business development to a concentrated location on the mainland.

Thus, development patterns associated with Outer Banks service oriented businesses would be different with MCB2 and MCB4, which include a Mid-Currituck Bridge, compared to the No-Build Alternative and ER2, which do not include a Mid-Currituck Bridge.

Finally, there would be no reasonably foreseeable difference of note in future mainland residential development characteristics and concentrations between the detailed study alternatives and the No-Build Alternative. The introduction of a Mid-Currituck Bridge could result in people choosing different places to live than if the bridge were not built. However, travel time to work is one of many factors people consider when deciding where to live. While a Mid-Currituck Bridge would provide better access to retail and service jobs on part of the Outer Banks, if a short travel distance to the Outer Banks were an important determinant in deciding where to live, one would expect to see today a

greater concentration of residential and commercial development in Point Harbor near the Wright Memorial Bridge. Also, except for new Outer Banks businesses locating at the end of the bridge on the mainland, the location of employment centers would not be expected to change. Thus, while the pattern of residential development on the mainland could change with a Mid-Currituck Bridge, the change would not be concentrated in a single location, but rather scattered among lands considered suitable for development in the Currituck County land use plan.

These findings are based on the following:

- The commissioners of Currituck County are considering options that will increase the economic development and direction of the county into the future. While it is the expressed goal of the county to see a bridge constructed, the economic development goals exist regardless. The county commissioned an economic development strategy from The UNC Institute for Competitive Economies (Lane and Jolley, 2008). This plan calls for and forecasts development near the US 158/Mid-Currituck Bridge interchange on the mainland.

- Conclusions related to changes in development in the road-accessible Outer Banks do not indicate a net increase in overall business or residential development on the Outer Banks related to the detailed study alternatives. This also is the conclusion of Lane and Jolley (2008). As such, additional demand for homes and businesses on the mainland for Outer Banks workers and customers would not occur.

3.6.1.5 Identify Potential Indirect/Cumulative Effects for Analysis

Finally, this part of the analysis of indirect and cumulative effects considered how the activities listed in Section 3.6.1.4 would affect the study area's notable socioeconomic and ecosystem features.

3.6.2 What indirect and cumulative effects could be expected?

The assessment of indirect effects found that there is adequate land considered suitable for development to accommodate business development likely to occur near the US 158/Mid-Currituck Bridge interchange with MCB2 and MCB4. Potential visual and traffic impacts would be associated with that development. Also with MCB2 and MCB4, shifts in the timing of development on the Outer Banks are likely (i.e., more Currituck County lots developing before Dare County lots). These two effects would be compatible with area land use plans, social health and well-being goals, economic opportunity goals, and ecosystem protection goals.

The assessment of cumulative effects found that those effects would be primarily associated with future growth in Currituck County irrespective of a detailed study alternative being implemented. The growth trend assumed in area land use plans, with a horizon year of 2025, does not appear to be sustainable to 2035 on the Currituck County mainland. If plan densities and growth continue, then most land suitable for development, including land designated as Rural Areas in the current plan, would be developed. This appears to conflict with current plan goals.

This assessment of indirect and cumulative effects had four parts:

1. Assessment of the relationship of reasonably foreseeable changes in land development patterns with the detailed study alternatives on the Currituck County mainland.

   Land considered suitable for development is defined by the Currituck County Land Use Plan and is presented on Figure 3-11. The nature of the reasonably foreseeable changes in land development patterns with the detailed study alternatives is presented in Section 3.6.2.1.

2. Assessment of the effect of changed development patterns on the area's notable ecosystem and cultural/socioeconomic features, and their compatibility with local/regional goals, land use plans, and development regulations.

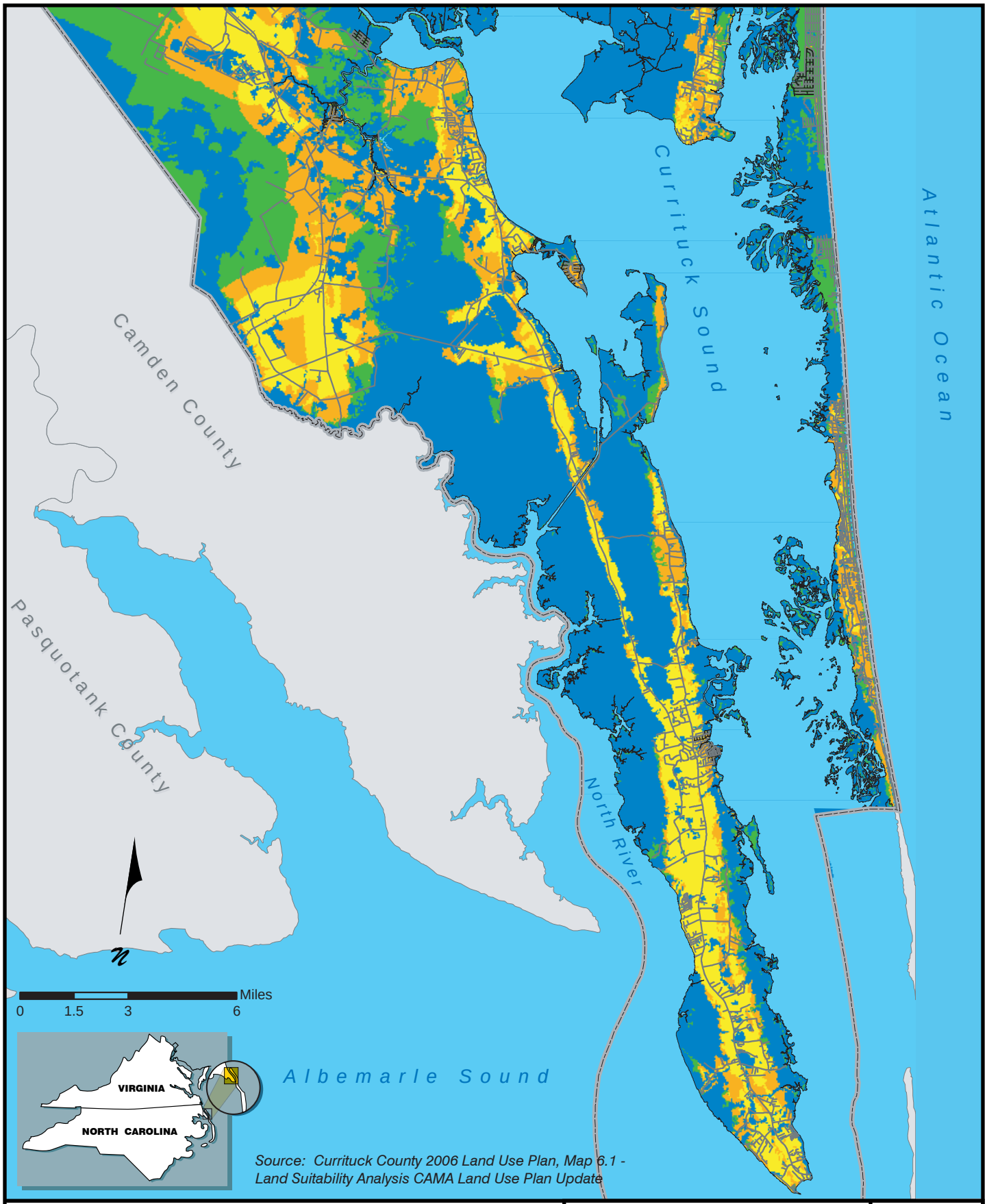
   These indirect impacts are those associated with changes in mainland development patterns as defined by item 1 above and are presented in Section 3.6.2.2.

3. Assessment of the cumulative effects of the detailed study alternatives, project-induced changes, and other activities. These are presented in Section 3.6.2.3 for the same items listed under item 2 above.

4. The extent of uncertainty in assessment results and risk that effects could be different.

3.6.2.1 Land Suitability Analysis for Changed Development Patterns

Section 3.6.1.4 indicates that some commercial development would shift from points elsewhere in the study area to the area around the Mid-Currituck Bridge. The UNC economic study indicated the potential for approximately 34 businesses to shift to this area. These businesses would be defined as occurring within an approximately 7.5-square-mile vicinity of the mainland terminus of a Mid-Currituck Bridge. In other words, the area roughly approximated by a radius of 1.5 miles around the end of the bridge could be influenced by this new business development. Based on past trends, these businesses could use an average of approximately 2 acres per business, or approximately 68 acres. Sixty-eight acres therefore is considered in this assessment to represent a reasonably foreseeable order of magnitude estimate of the area that would be affected by the shift of commercial development to the interchange area. An examination of land considered suitable for development in the Currituck County land use plan indicates there is more than adequate suitable land for such development, even within 1 mile of the bridge. Much of this land is currently in agricultural uses or undeveloped and is thus available, particularly south of the interchange. It is all land planned as having limited services, such as well and septic service.



Source: Currituck County 2006 Land Use Plan, Map 6.1 - Land Suitability Analysis CAMA Land Use Plan Update

LEGEND

- Least Suitable
- Low Suitability
- Medium Suitability
- High Suitability

Currituck County Land Suitability

Figure
3-11

3.6.2.2 Indirect Effects

The assessment of indirect effects focused on the impact of changed development patterns on the area's notable ecosystem and cultural/socioeconomic features, and their compatibility with local/regional goals, land use plans, and development regulations. As discussed in Section 3.6.1.4, ER2 would not result in notable induced changes. The No-Build Alternative reflects the status quo and, like ER2, there would be no indirect effects. Two notable induced changes are associated with MCB2 and MCB4 and are:

- A change in the order in which available lots on the NC 12-accessible Outer Banks would develop.

- Approximately 68 acres of business development would likely occur near the US 158/Mid-Currituck Bridge interchange on what is currently agricultural land.

The assessment concluded that, in general, the indirect effects of these two changes would be minimal or low. The change would be compatible with area land use plans, social health and well-being goals, economic opportunity goals, and ecosystem protection goals.

The primary indirect impact would be a visual change, as some existing features would be lost, and new vertical elements would be introduced. As a direct impact, the interchange associated with MCB2 and MCB4 would be a substantial change for an area defined in the visual impact assessment as having high visual quality. The introduction of businesses in the interchange area would have a similar impact. The extent of the visual impact of the businesses would depend upon the appearance requirements that might be imposed by Currituck County. If the development occurred based completely on decisions of individual developers, the result could be a setting with buildings of non-complementary design and a clutter of competing signs. Application by Currituck County of its appearance controls could permit the creation of development that could be an attractive prelude to the developed areas on the Outer Banks. An additional impact of approximately 68 acres of business development would be on US 158 traffic flow if each of the approximately 34 businesses were allowed individual access to US 158.

3.6.2.3 Cumulative Effects

Cumulative effects were considered for the detailed study alternatives, the two induced changes associated with MCB2 and MCB4, and other reasonably foreseeable activities in the study area. Potential effects were evaluated as related to the ecosystem and cultural/socioeconomic features, and their compatibility with local/regional goals, land use plans, and development regulations.

The cumulative impact assessment found that it was the continuation of current development trends beyond the 2025 horizon year to 2035 that would drive the extent of cumulative impacts, irrespective of the implementation of one of the detailed study alternatives or the No-Build Alternative.

According to the Currituck County land use plan, the high and medium land suitability categories are those that are generally considered for development. Jointly, these two categories currently comprise 34,435 acres of available land in the county. The 34,435 acres were derived by subtracting the total acres in development in 2005 (18,065) from the total acres of high and medium suitable land in 2005 (52,500).

The Currituck County land use plan provides population and land development estimates to the horizon year of 2025. Because the Mid-Currituck Bridge project has established a horizon year of 2035, it was necessary to extrapolate trend data from the land use plan's Table 2.8 (population) and Table 4.9 (land to be developed) and develop a calculation that provided a reasonable estimate of the acres to be developed between 2005 and the project horizon year of 2035. Table 3-19 provides the steps that were used to obtain the extended estimate.

Table 3-19. Population and Land Calculation Factors

Calculation Factor	Result	Source
Difference Between County's 2005 and 2025 Land in Development Estimates	19,118 acres	County land use plan Table 4.9
Difference Between County's 2005 and 2025 Population Estimates	14,300 persons	County land use plan Table 2.8
Land Needed per Person to Accommodate Population Growth between 2005 and 2025	1.34 acres/person	Product of dividing 19,118 by 14,300
Difference Between 2025 and 2035 Population Estimates	10,300 persons	Assuming 2.5 percent annual growth as shown in the medium growth scenario in county land use plan Table 2.8 from 2005 to 2025
Acres Needed to Accommodate Population Growth Between 2025 and 2035	13,800 acres	Result of multiplying 1.34 acres/person by 10,300 persons
Total Acres of Development Between 2005 and 2035	**32,988 acres**	Sum of 19,188 acres plus 13,800

Based on the trend extrapolation of land to be developed and population growth as shown in Table 3-19, a total of 32,988 acres of land would be developed in the county between 2005 and 2035. This indicates that the county has enough medium and high suitable land to continue its density assumptions from 2025 into 2035. However, that would include use of suitable land classified as rural areas in the 2025 plan. This is by no means certain. Currituck County, in developing future land use plans, could choose to increase densities and reserve more land for agricultural use.

The growth trend assumed in area land use plans with a 2025 horizon year does not appear to be sustainable to 2035 on the Currituck County mainland. If plan densities and growth continue, then most land suitable for development, including land designated as rural areas in the current plan, would be developed. This appears to

conflict with current plan goals related to agricultural preservation, neighborhood and village communities, scenic and natural character, preservation of heritage, promotion of land use patterns with a sense of community, and protection of landscape aesthetics. This result would occur with all alternatives, including the No-Build Alternative. The detailed study alternatives would not make a substantial contribution to this trend.

For most of the notable features identified in Table 3-17 and Table 3-18, the detailed study alternatives would not notably contribute to cumulative impacts on the resource. Of these, noteworthy natural environmental features impacts would be as follows:

- Estuaries/water quality would be largely affected by the anticipated growth independent of any detailed study alternative. With any of the bridge alternatives, the potential additional commercial growth on the mainland with forecasted approximately 44 acres of impervious surface, and the direct impacts of runoff from additional roadways (up to 126.8 acres of impervious surface) are minor components of the cumulative impacts.

- Public water supplies similarly would be mostly affected by planned development. With any of the bridge alternatives, the location of a forecast approximately 34 businesses on the mainland would exert minor additional water demand there.

- SAV would be affected by the general conversion of agricultural land to developed land and, in the case of bridge alternatives, from shading by the bridge. During land development, the increase in sediment loading and turbidity would increase, although once developed with a perennial ground cover, the conditions likely would be an improvement over tilled agricultural land. The bridge alternatives would shade up to 5.5 acres of existing SAVs and 17.8 acres of existing and potential SAVs.

- Non-coastal wetlands would be affected by the cumulative effect of logging and, in the case of bridge alternatives, the direct impacts of land alteration and construction through Maple Swamp. Logging is the major factor and is a historic land use in non-coastal wetlands in the study area.

Noteworthy socioeconomic features experiencing cumulative effects would be as follows:

- Agriculture currently is a major land use on the Currituck County mainland. The greatest factor affecting agriculture would be the projected 33,000 acres of new development between 2005 and 2035. With the bridge alternatives, possible induced commercial development of approximately 68 acres of current agricultural land would be a very minor contributing factor. The detailed study alternatives would affect 109 to 117 acres of prime or state and locally important farmland on the mainland.

- Neighborhoods and village communities and scenic and natural area character would be most affected by 2035 by the extensive development forecast for the study area regardless of any detailed study alternatives. Control of these attributes would

be most strongly determined by municipal planning measures. There also are potential project-related impacts. With ER2 or MCB2, the visual character and sense of place on the Outer Banks would be affected by a widening of NC 12. With MCB2 or MCB4, the scenic character of Currituck Sound would be affected by the presence of a bridge. The communities at either end of the bridge also would be affected by the visual presence of the bridge.

3.6.2.4 Evaluate Analysis Results

This portion of the analysis examined the assumptions made in the previous steps and considered uncertainty and how that uncertainty could influence the range of indirect and cumulative effects. Refer to the *Indirect and Cumulative Effects Technical Report* (East Carolina University and Parsons Brinckerhoff, 2009) for the findings of this analysis.

3.6.3 What are the substantial indirect and cumulative effects and could they be minimized?

Significant indirect effects would be visual and traffic effects at the US 158/Mid-Currituck Bridge interchange with MCB2 and MCB4. Significant cumulative effects are those associated with continued development in Currituck County. The NCTA would minimize impacts associated with the US 158/Mid-Currituck Bridge interchange itself. Minimization of other impacts would be the responsibility of Currituck County.

This final step of the indirect and cumulative impact assessment considered:

- Does the analysis of effects provide a reasonable basis for informed decision-making?
- Would there be significant effects that are seen as undesirable?
- Would there be practicable avoidance/minimization measures?
- Would avoidance/minimization measures be within the jurisdiction of NCTA?
- What is the role of NCTA when mitigation/enhancement measures would not be within its jurisdiction?

NCTA and FHWA believe that the indirect and cumulative effects assessment provides a reasonable basis for informed decision-making.

Substantial undesirable effects were considered to be the indirect visual impact associated with development at the US 158/Mid-Currituck Bridge interchange with MCB2 and MCB4 and the finding that the growth trend assumed in area land use plans with a 2025 horizon year does not appear to be sustainable to 2035 on the Currituck County mainland.

Practicable avoidance/minimization measures for these impacts include:

- Induced effects minimization

  The extent of the visual impact of new businesses would depend on the appearance requirements that might be imposed by Currituck County. Appearance controls regarding placement of parking, building exteriors, and signage could permit the creation of development that would be an attractive prelude to the developed areas on the Outer Banks.

  Much of the visual change associated with the interchange could not be substantially reduced. Its presence and visual impact could not be hidden. As a part of final design, a landscaping plan would be developed. Sensitivity to the context would be considered in bridge- and interchange-related structure design.

  Consolidated driveways in new concentrations of development are today common practice and would be expected to be required both by the county and NCDOT.

- Cumulative effects minimization

  The cumulative effects of development on the mainland could be addressed in Currituck County's next land use plan, including:

  – Re-examining potential growth trends;

  – Refining the focus on the type of economic development the county would like to attract in the larger context of land use planning;

  – Establishing high density village areas and/or clustered mixed-used developments;

  – Continued promotion of conservation subdivision design;

  – Continued promotion of a farmland conservancy and transfer of development rights (if authorized by the North Carolina General Assembly);

  – Consideration of viewsheds and visual elements in land use plans;

  – Advocacy of "low impact development" as a best management practice that would reduce the runoff impacts of development, as defined by the Coastal Studies Institute in Manteo;

  – Supporting the efforts of historical and heritage associations;

  – Taking into account the preservation of connectivity between valued natural resource features; and

- Use of a nuisance vegetation ordinance that would prohibit invasive exotic species from being sold or planted in the county.

NCTA and FHWA generally have no mitigation jurisdiction over indirect and cumulative effects. Within NCTA and/or FHWA jurisdiction are:

- Selecting a Preferred Alternative that meets the project purpose and need while considering: the degree of travel benefit offered, state transportation network efficiency, project affordability, and the manner in which each alternative would avoid, minimize, and have the potential for mitigating environmental impact.

- Mitigating direct construction, maintenance, and operation impacts of the Preferred Alternative where feasible, practicable, and reasonable. Examples of how this was done in the preliminary designs assessed in this DEIS include:

  - Providing no direct access from the bridge to Aydlett, to ensure that induced development would focus on US 158 (with either Option A or Option B).

  - Bridging Maple Swamp to minimize potential hydrologic impacts and impacts to wildlife movement (Option A) or placing fill in Maple Swamp, while removing Aydlett Road and restoring its right-of-way as a wetland and providing for wildlife passage through the fill (Option B).

  - Locating the US 158/Mid-Currituck Bridge interchange in an area considered suitable for development where land suitable for development surrounds the interchange to ensure induced development would occur on suitable lands.

  In addition, purchase of a portion of bay forest lands in Maple Swamp could be considered as a part of direct impact mitigation. Such a purchase also would mitigate the potential cumulative impact of logging in Maple Swamp and the loss of bay forest, although this impact would not be caused by any detailed study alternative. This mitigation strategy would be most appropriate to mitigate direct impacts associated with MCB2 or MCB4, which include bridging through Maple Swamp.

- Developing a project design that is sensitive to its context.

- Controlling access of induced and other development to public thoroughfares so that access is provided in a manner that would not reduce the efficiency of public thoroughfares.

The role of NCTA and FHWA when avoidance/minimization measures are not within their jurisdiction includes:

- Guiding future thoroughfare planning in Currituck and Dare counties; and

- Identifying indirect and cumulative impact concerns under the jurisdiction of others in this DEIS and the subsequent FEIS.

3.7 What is the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity?

The local short-term impacts and the use of resources for any of the detailed study alternatives would be consistent with the maintenance and enhancement of long-term productivity for Currituck and Dare counties and the State of North Carolina. This conclusion is first reflected in the travel benefits associated with the detailed study alternatives. These benefits vary by alternative, as presented in Table 2-3, and include:

- MCB2, which includes both the Mid-Currituck Bridge and substantial improvements to existing roads, would have the greatest traffic flow benefits, and ER2 would have the least;

- MCB2 also would have the greatest travel time benefits, and ER2 would have the least, with a Mid-Currituck Bridge, which is included in both MCB2 and MCB4, offering substantial travel time savings for many travelers between the Currituck County mainland and its Outer Banks; and

- The construction of a third outbound lane on US 158 would offer the greatest reductions in hurricane evacuation clearance times with any alternative.

Second, from the perspective of area land use and transportation plans, the short-term impacts and use of resources in the construction of MCB4 would be consistent with the maintenance and enhancement of the long-term productivity of the project area. Those plans consistently call for the construction of a Mid-Currituck Bridge. This finding also would be true for MCB2 but to a lesser extent because MCB2 includes the widening of NC 12 in Dare County, which is not considered desirable according to area plans. Although unfunded, the interchange at US 158 and NC 12 included in MCB2 is listed in the *2009 to 2015 State Transportation Improvement Program* (STIP), and improvements to US 158, such as those included in MCB2, are consistent with the goals of the North Carolina *Strategic Highway Corridors Concept Development Repor*t (NCDOT, 2005), which lists US 158 as a strategic highway corridor. ER2, because it lacks a Mid-Currituck Bridge, would not be consistent with the maintenance and enhancement of long-term productivity of the project area as defined by area land use and transportation plans.

3.8 What resources are committed irreversibly and irretrievably?

Implementation of any of the detailed study alternatives would involve commitment of a range of natural, physical, human, and fiscal resources. Land used in the construction of any of the detailed study alternatives would be considered an irreversible commitment during the time period that the land is used for a highway and/or bridge facility. However, if a greater need arises for use of the land or if the project is no longer

needed, the land could be converted to another use. At present, there is no reason to believe such a conversion ever would be necessary or desirable.

Considerable amounts of fossil fuels, labor, and highway/bridge construction materials (such as asphalt, concrete, and steel) would be expended. Additionally, large amounts of labor and natural resources would be used in the fabrication and preparation of construction materials. These materials generally are not retrievable although asphalt, concrete, and steel are recyclable. These materials are not, however, in short supply, and their use would not have an adverse effect on continued availability of these resources. Any construction also would require a substantial one-time expenditure of funds. In the case of MCB2 and MCB4, these funds would be retrieved (only in part with MCB2) through tolls charged to users of a Mid-Currituck Bridge.

The commitment of these resources is based on the concept that residents in the immediate area, state, and region, as well as visitors to the area, would benefit by increasing the capacity of the thoroughfare system in the project area, thereby reducing travel time to the Outer Banks and hurricane evacuation clearance times. Such benefits are anticipated to outweigh the commitment of resources.

Appendix A

Comments and Coordination

A. Comments and Coordination

A.1 1994 to 1998 Mid-Currituck Bridge Studies and Review

The Mid-Currituck Bridge Study began in mid-1994 with an alternatives study. A DEIS evaluating several alternatives for improving access and traffic service to the Currituck County Outer Banks was approved in 1998. The 1995 Notice of Intent (NOI) and the 1998 DEIS were rescinded by the Federal Highway Administration (FHWA) in 2008 (*Federal Register* Vol. 73, No. 107, page 31733). A new NOI was issued soon after (*Federal Register* Vol. 73, No. 116, page 34065).

In association with these earlier studies, two public hearings were held in Aydlett and Corolla in Spring 1998 to allow area citizens an opportunity to comment on the findings presented in the 1998 DEIS.

A.2 2001 to 2009 Scoping and Citizen and Agency Involvement

Scoping is designed to encourage early participation of the public, elected officials, and interested governmental agencies in the decision-making process. The scoping process is intended to be a collaborative and cooperative process considering views from parties who will be affected by or who have an interest in a proposed project. For the Mid-Currituck Bridge Study, the public was involved in scoping through Citizen Informational Workshops and small group meetings. Governmental agencies were involved in the scoping process through National Environmental Policy Act (NEPA)/Section 404 team meetings, Turnpike Environmental Agency Coordination (TEAC) meetings, and local officials meetings. These meetings and the items discussed are presented in Table A-1 and Table A-2.

The NCTA also implemented several other public outreach efforts to keep the public informed about the project and its status. These included newsletters, a toll-free project information line, a web site, and small group meetings.

Additional information on citizen and agency involvement and its outcome is presented in the *Stakeholder Involvement for Draft Environmental Impact Statement Technical Report* (Parsons Brinckerhoff, 2009). This report's table of contents is listed in Appendix D.

Table A-1. Agency Coordination Meetings

Date	Topics of Discussion
NEPA/Section 404 Merger Team Meetings	
July 12, 2001	Project work plan
August 16, 2001	Project need and environmental issues
May 8, 2002	Statement of Purpose and Need
July 24, 2002	Hurricane evacuation methods
August 20, 2003	Statement of Purpose and Need
Turnpike Environmental Agency Coordination (TEAC) Meetings	
December 15, 2006	Agency coordination plan
January 17, 2007	Project status
April 18, 2007	Statement of Purpose and Need, conceptual alternatives, and alternatives screening criteria
May 23, 2007 & May 31, 2008	Statement of Purpose and Need, conceptual alternatives, and analysis of conceptual alternatives
June 20, 2007	Statement of Purpose and Need, conceptual alternatives, and agency coordination plan
July 10, 2007	Field trip to view the project area's natural and cultural resources
July 18, 2007	Statement of Purpose and Need, conceptual alternatives and their merits, functional design plans for the alternatives, funding constraints, and the North Carolina hurricane evacuation clearance time statute
September 19, 2007	Responses to questions raised at the July 18 meeting and in agency letters; NCTA's recommendation for alternatives to be evaluated in DEIS
November 14, 2007	Results of environmental field studies; an assessment of three potential US 158/Mid-Currituck Bridge interchange configurations and seven potential NC 12 bridge termini locations based on suggestions made by agency representatives at the July 10, 2007 field trip
February 5, 2008	Overview of upcoming Citizens Informational Workshops, Statement of Purpose, and results of Mid-Currituck Bridge study on the number of bridge lanes
April 8, 2008	A draft Statement of Purpose and Need report, a draft Alternatives Screening Report, and public comments from the February 2008 Citizens Informational Workshops
May 6, 2008	Written agency comments on the draft Statement of Purpose and Need report and draft Alternatives Screening Report; and planned NCTA Public Private Partnership Predevelopment Agreement
July 8, 2008	Agreement on components of Statement of Purpose and Need and alternatives to be evaluated in the DEIS; DEIS impact assessment scope
October 7, 2008	Indirect and cumulative impact assessment and detailed study alternative design concepts
June 10, 2009	Discussion of mainland approach road Option B and agreement to assess it in detail in the DEIS.

Table A-2. Citizens and Local Officials Meetings and Request for Comments

Date	Topics of Discussion
Citizens Informational Workshops	
July 15, 21, and 22, 2004	Study requirements, activities, and schedule; and Statement of Purpose and Need.
February 26, 27, and 28, 2008	Mid-Currituck Bridge Study process and components and project concerns and issues.
Public Review of Statement of Purpose and Need and Alternatives Screening Report	
April 2008	On April 7, 2008 the NCTA released a draft Statement of Purpose and Need report and a draft Alternatives Screening Report for the Mid-Currituck Bridge Study. These documents were delivered to project area municipal offices in Currituck, Corolla, Kitty Hawk, Southern Shores, and Duck, and posted on the project web site. Stakeholders were notified of the release of these documents through a postcard mailing and via the project web site. Comments were requested.
Local Officials Meetings	
July 15, 2004 (2 meetings)	Study activities, the planned study area, the traffic flow analysis, and the planned Statement of Purpose and Need.
June 2, 2005	Joint local officials and environmental agencies meeting on project issues and working together
October 26 and 27, 2005	Field trip with discussion of project impact issues
February 26 and 28, 2008	Summary of the study activities, the findings in a draft Statement of Purpose and Need report, and the results of the preliminary alternatives analyses.

Appendix B

List of Preparers

B. List of Preparers

The persons listed below were responsible for preparing this Draft Environmental Impact Statement (DEIS).

B.1 Federal Highway Administration

Name and Degree	Responsibility	Experience	Professional Discipline
George Hoops, MS, BS	Major Projects Engineer	18 years in transportation engineering.	Civil Engineer, P.E.

B.2 North Carolina Turnpike Authority

Name and Degree	Responsibility	Experience	Professional Discipline
Steven D. DeWitt, BS	NCTA Chief Engineer	25 years in project development, environmental evaluations and processes, design-build program and project development, contract procurement and administration, and construction processes.	Civil Engineer, P.E.
Jennifer Harris, BS	Director of Planning and Environmental Studies	9 years in transportation, project development, impact analysis, public involvement, and NEPA analysis.	Civil Engineer, P.E.

B.3 North Carolina Department of Transportation

Name and Degree	Responsibility	Experience	Professional Discipline
Ted Devens, BSCE, MCE, CPM	DEIS review	24 years in civil, environmental, and transportation engineering	Civil Engineer, P.E.
Mary Alice (Missy) Dickens Pair, BSCE	DEIS review	16 years in transportation planning	Staff Engineer Project Development and Environmental Analysis Branch
Dewayne L. Sykes	Roadway Design	34 years in civil engineering and transportation engineering	Civil Engineer, P.E., CPM
Brian Yamamoto, BSCE	DEIS review	18 years in transportation planning	Consultant Group Leader (Eastern) for Project Development and Environmental Analysis Branch P.E.

B.4 PB Americas, Inc.

Name and Degree	Responsibility	Experience	Professional Discipline
John M. Page, BS, MUP	Project Manager, Environmental Lead	34 years in land use planning and environmental document preparation	Planner, AICP; Environmental Professional, CEP
Christopher G. Bailey, BS	Structural design and construction engineering	9 years in structural design and construction engineering	Senior Engineer P.E.
Daniel H. Bridges, BS, MS	Project Engineer	15 years in highway design for planning documents and final design plans.	Engineer, P.E.

Name and Degree	Responsibility	Experience	Professional Discipline
Don Brown, BS, MURP	Land-use plans and assessment support	11 years in transportation planning and environmental analysis	Planner, AICP
Matthew Coffin, BS	Noise analysis and noise barrier evaluations	7 years in noise, planning, and GIS	Noise Analyst, GIS
Jason Doughty, BSCE, MSCE	Design-build criteria	10 years in civil and structural engineering	Structural Engineer, P.E.
Michael J. Fendrick, BSCE, MCE	Traffic forecasts and analysis	20 years in civil engineering; traffic and transportation engineering	Civil Engineer, P.E., PTOE
Chin Y. Lien, MS	Water Resources/Water Quality Analysis	27 years in water resources engineering, water quality analysis and ecological restoration	Water Resources Engineer, P.E.
Alice Lovegrove, BE, MS	Air Quality, Energy	21 years in air quality and energy analysis	Environmental Engineer
Ray Magsanoc, BS	Noise analysis and noise barrier evaluations	13 years in noise and environmental planning and permitting	Noise Analyst
Eric Misak, BSCE	Design Engineering	23 years in civil engineering	Civil Engineer
Robert Norburn, BSCE, BA	Quality control for Noise and Natural Resources	17 years in transportation planning and environmental document preparation	Transportation Engineer/Planner, EIT
William T. Rice, BS, MA	Indirect and Cumulative Effects Visual Assessment	16 years in planning	Planner, REA, CEI

Name and Degree	Responsibility	Experience	Professional Discipline
Valerie Robbins, BUPD	Community Impact Assessment	8 years in transportation and environmental planning	Transportation Planner
Albert E. Schaufler, BSCE	Evacuation Plan, NC 12 Reversible Center Lane Alternative & Toll Facility Concepts	40 years in traffic engineering	Traffic and Operations Engineer, Toll Facility Design and Operation
Edward Tadross, BA	Air Quality / Energy	10 years in air quality and energy analysis	Environmental Planner
Carolyn Trindle, BA, MA	Community impacts	26 years in environmental planning	Planner
Han Zhang, BE, MS	Traffic forecasts and analysis	8 years in traffic engineering	Senior Traffic Engineer, P.E.

B.5 CZR Incorporated

Name and Degree	Responsibility	Experience	Professional Discipline
Samuel Cooper, BS, MS	Technical Director, management of natural resources investigations and documentation, including affected environment, environmental consequences, and supporting documents.	18 years in environmental assessment, permitting, and impact analysis	Coastal Ecologist and Technical Director
Julia Kirkland Berger, BA, MS	Document review, oversight of quality control, and assistance with document preparation	13 years in environmental assessment, permitting, and impact analysis	Senior Environmental Scientist

Name and Degree	Responsibility	Experience	Professional Discipline
Steve Beck, BS	Field task manager for wetland and stream delineations and assessments, aquatic and terrestrial community assessments threatened and endangered species assessment, preparation of the natural resource technical report and essential fish habitat assessment.	3 years in wetland and stream delineation and assessment	Biologist
Mark Grippo, BS, MS	Preparation of the essential fish habitat assessment	4 years in natural resources assessment and impact analysis	Biologist
T. Travis Brown, BS, MS	Field work and documentation with aquatic and terrestrial community assessments, threatened and endangered species assessment, and preparation of the natural resource technical report.	2 years	Biologist

B.6 East Carolina University

Name and Degree	Responsibility	Experience	Professional Discipline
Daniel J. Marcucci, Ph.D., MLA	Natural Resources Inventory, Regional Impacts Analysis, ICE Analysis	17 years in environmental and regional planning, landscape architecture	Assistant Professor, Planning Program AICP
Amy F. Blizzard, Ph.D.	Natural Resources Inventory	18 years in urban and regional planning in coastal communities	Assistant Professor, Planning Program AICP

Name and Degree	Responsibility	Experience	Professional Discipline
James W. Kleckley, Ph.D.	Socioeconomic Conditions, Economic Forecasting	30 years in sub-state economic analysis and modeling	Director, Bureau of Business Research,; Research Associate Professor, Department of Finance

B.7 Panamerican Consultants, Inc.

Name and Degree	Responsibility	Experience	Professional Discipline
Andy Lydecker, MA, MS	Cultural Resources Site File Search	12 years in cultural resources management	Archaeologist, RPA
Stephen James, MA	Cultural Resources Site File Search, Report Author	28 years in cultural resources management	Archaeologist, RPA
Ramie Gougeon, Ph.D.	Cultural Resources Report Background	15 years in cultural resources management	Archaeologist, RPA

B.8 Howard Stein – Hudson, Incorporated

Name and Degree	Responsibility	Experience	Professional Discipline
Veronica Bailey-Simmons, BS, MPH	Stakeholder Involvement	9 years in transportation planning and public involvement	Transportation Planner/Public Involvement Specialist
Arnold Bloch, BA, MCE, Ph.D.	Stakeholder Involvement	Over 28 years in transportation planning and public involvement	Principal Transportation Planner

Name and Degree	Responsibility	Experience	Professional Discipline
Ryan Walsh, BS, MUP	Stakeholder Involvement	3 years in transportation planning and public involvement	Transportation Planner/Public Involvement Specialist

B.9 PBS&J

Name and Degree	Responsibility	Experience	Professional Discipline
Donald C. Lewis, BA, MSP	Hurricane Evacuation Analysis	29 years in transportation planning/ hurricane evacuation analyses	Planner, AICP

Appendix C

List of Agencies, Organizations, and Persons to Whom Copies of this Statement are Sent

C. List of Agencies, Organizations, and Persons to Whom Copies of this Statement are Sent

The agencies and interest groups listed below were sent a copy of this Draft Environmental Impact Statement (DEIS). Associated technical reports were enclosed with this DEIS in the form of a CD. Paper copies of this DEIS also were placed at the public review locations. This DEIS and the associated technical reports, public hearing maps, and public hearing announcements are available electronically at: http://ncturnpike.org/projects/Mid_Currituck/ documents.asp.

C.1 Federal Agencies

Advisory Council on Historic Preservation

Federal Aviation Administration

Federal Emergency Management Agency

Federal Energy Regulatory Commission

General Services Administration

US Army Corps of Engineers

US Coast Guard, 5th District

US Department of Agriculture

- Farm Service Agency
- Natural Resources Conservation Service

US Department of Commerce

- Ecology and Conservation Office
- National Oceanic and Atmospheric Administration – National Marine Fisheries Service

US Department of Health and Human Services

US Department of Housing and Urban Development

US Department of the Interior

- Office of the Secretary
- Bureau of Outdoor Recreation
- Fish and Wildlife Service
- Keeper of the National Register
- Office of Environmental Policy and Administration
- US Geological Survey

US Environmental Protection Agency, Region IV (Environmental Review Branch)

C.2 State Agencies

North Carolina Department of Administration, State Clearinghouse

North Carolina Department of Crime Control and Public Safety, Division of Emergency Management

North Carolina Department of Cultural Resources, Division of Archives and History

North Carolina Department of Environment and Natural Resources

- Division of Air Quality
- Division of Coastal Management
- Division of Land Resources
- Division of Marine Fisheries
- Division of Parks and Recreation
- Division of Water Quality
- Natural Heritage Program
- Wildlife Resources Commission

C.3 Local Governments and Agencies

Albemarle Regional Planning and Development Commission (Albemarle Rural Planning Organization)

Area Development Coordination Agency (ADCA)

County of Dare

- Chair, County Commissioners
- County Manager
- Director, Emergency Management
- Superintendent, County Schools

Currituck County

- Chair, County Commissioners
- County Manager
- Coordinator, Emergency Management
- Superintendent, County Schools

Mayor of Duck

Mayor of Kitty Hawk

Mayor of Southern Shores

C.4 Local Interest Groups

Build the Bridge—Preserve Our Roads

Currituck County Chamber of Commerce

Greater Aydlett Civic Organization

Outer Banks Chamber of Commerce

C.5 Public Review Locations

Currituck County Courthouse
Currituck, North Carolina

Corolla Library
Corolla, North Carolina

Currituck County Public Library
Barco, North Carolina

Dare County Library
Kill Devil Hills, North Carolina

Town of Duck Administrative Building
Duck, North Carolina

Kitty Hawk Town Hall
Kitty Hawk, North Carolina

North Carolina Department of Transportation Maintenance Yard Office
Maple, North Carolina

Southern Shores Town Hall
Southern Shores, North Carolina

Appendix D

List of Technical Reports and Other Supplemental Materials

D. List of Technical Reports and Other Supplemental Materials

The technical reports and other supplemental materials listed below are included in the compact disc accompanying this Draft Environmental Impact Statement (DEIS). The tables of contents of this material are listed beginning on the page numbers indicated:

Printed copies are provided at public review locations. The technical reports include additional documentation of the studies and impact assessments that resulted in the findings presented in this DEIS. The public hearing maps show the preliminary designs for the detailed study alternatives used in the assessment of impacts.

D.1 Statement of Purpose and Need

D.2 Alternatives Screening Report

D.3 Air Quality Technical Report

D.4 Community Impact Assessment Technical Report

D.5 Essential Fish Habitat Technical Report

D.6 Historical Architecture Resources Reports and Supplemental Materials

Historic Architectural Resources Report (for MCB4 Area of Potential Effects)

Historic Architectural Resources Report Addendum (for Additional ER2 and MCB2 Area of Potential Effects)

Historic Architectural Resources Supplemental Materials

D.7 Indirect and Cumulative Effects Technical Report

D.8 Natural Resources Technical Report

D.9 Other Physical Features Technical Report

D.10 Phase I Terrestrial and Underwater Archaeological Background Study

D.11 Stakeholder Involvement for Draft Environmental Impact Statement Technical Report

D.12 Traffic Noise Technical Report

D.13 2035 Traffic Alternatives Report

D.14 Public Hearing Maps

KEY MAPS

ER2

MCB2/C1

MCB2/C2

MCB4/C1

MCB4/C2

US 158 HURRICANE EVACUATION THIRD OUTBOUND EMERGENCY LANE MAPS

Sheet 1—ER2

Sheet 2—ER2

Sheet 3—ER2

Sheet 4—ER2

Sheet 5—ER2

Sheet 5—ER2

Sheet 7—ER2, MCB2, and MCB4

MID-CURRITUCK BRIDGE MAPS

Sheet 8A—MCB2 and MCB4 (Option A)

Sheet 8B—MCB2 and MCB4 (Option A)

Sheet 9—MCB2/C1 and MCB4/C1

Sheet 10—MCB2/C2 and MCB4/C2

NC 12 CORRIDOR MAPS

Sheet 11—ER2, MCB2, and MCB4

Sheet 12—ER2, MCB2, and MCB4

Sheet 13—ER2 and MCB2

Sheet 14—ER2 and MCB2

Sheet 15—ER2 and MCB2

US 158 CORRIDOR MAPS

Sheet 16—ER2 and MCB2

Sheet 16A—MCB4

Appendix E

List of References and Abbreviations

E. Lists of References and Abbreviations

E.1 List of References – Publications and Technical Reports

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E.3 List of Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
ACHP	Advisory Council on Historic Preservation
ADCA	Area Development Coordination Agency
AEC	Area of Environmental Concern
AFSA	Anadromous Fish Spawning Areas
AICP	American Institute of Certified Planners
APE	Area of Potential Effects
BMP	Best Management Practice
CAMA	Coastal Area Management Act
CEP	Certified Environmental Professional
CFR	Code of Federal Regulations
CWA	Clean Water Act
dB	Decibels
dBA	A-weighted Sound Level in Decibels
DEIS	Draft Environmental Impact Statement
DOE	Determination of Eligibility
EFH	Essential Fish Habitat
ER	Existing Road
FEIS	Final Environmental Impact Statement

FFY	Federal Fiscal Year
FHWA	Federal Highway Administration
HAPC	Habitat Area of Particular Concern
HQW	High Quality Waters
MAFMC	Mid-Atlantic Fishery Management Council
MCB	Mid-Currituck Bridge
MOA	Memorandum of Agreement
MPO	Metropolitan Planning Organization
MSAT	Mobile Source Air Toxics
MSL	Mean Sea Level
NAAQS	National Ambient Air Quality Standards
NAC	Noise Abatement Criteria
NCDENR	North Carolina Department of Environment and Natural Resources
NCDENR-DWQ	North Carolina Department of Environment and Natural Resources-Division of Water Quality
NCDOT	North Carolina Department of Transportation
NCEEP	North Carolina Ecosystem Enhancement Program
NCNHP	North Carolina Natural Heritage Program
NCTA	North Carolina Turnpike Authority
NCWRC	North Carolina Wildlife Resources Commission
NCWRP	North Carolina Wetlands Restoration Program
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent

NR	National Register
NRHP	National Register of Historic Places
ORW	Outstanding Resource Waters
OSHA	Occupational Safety and Health Administration
P.E.	Professional Engineer
PNA	Primary Nursery Areas
ROD	Record of Decision
SAFMC	South Atlantic Fisheries Management Council
SAV	Submerged Aquatic Vegetation
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SNHA	Significant Natural Heritage Area
SR	State Route
STIP	State Transportation Improvement Program
SWD	Summer Weekday
SWE	Summer Weekend
TEAC	Turnpike Environmental Agency Coordination
TSM	Transportation Systems Management
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VMT	Vehicle-Miles Traveled
WBS	Work Breakdown Structure