# MID-CURRITUCK BRIDGE STUDY

# ALTERNATIVES SCREENING REPORT

STATE PROJECT NO. 6.049002T
STIP NO. R-2576
CURRITUCK COUNTY
DARE COUNTY

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**for the**

NORTH CAROLINA Turnpike Authority

**Raleigh, North Carolina**

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# Alternatives Screening Report

This Alternatives Screening Report discusses the process used by the North Carolina Turnpike Authority (NCTA) and the Federal Highway Administration (FHWA) to select alternatives for detailed study in the Mid-Currituck Bridge Draft Environmental Impact Statement (DEIS).

This report is divided into the following sections:

- A description and discussion of the No-Build Alternative, beginning on page 1;
- A description and screening of project concept alternatives, beginning on page 2, including:
  - Existing-Road Improvement (ER) Alternatives;
  - Mid-Currituck Bridge (MCB) Alternatives;
  - Several low capital investment and operational alternatives; and
  - Ferry (F) Alternatives.
- A description and screening of Mid-Currituck Bridge corridor location alternatives, beginning on page 49;
- Identification of the detailed study alternatives to be evaluated in detail the in the DEIS, beginning on page 63; and
- A description of refinements developed for the bridge corridor selected for detailed study in the DEIS; , beginning on page 65.

## 1.0 No-Build Alternative

The evaluation of alternatives uses a No-Build Alternative as a benchmark for comparing the travel benefits of the alternatives considered. The No-Build Alternative assumes that the proposed project would not be implemented, and that the improvements contained in North Carolina Department of Transportation's (NCDOT) 2007 to 2013 State Transportation Improvement Program (STIP) and the draft *2009 to 2015* STIP (excluding the proposed project) would be implemented within the existing roadway system. The planned improvements listed in the STIP for development within or nearby the project area are:

- **Project No. R-4457**—Convert the existing at-grade US 158/NC 12 intersection to an interchange (the only STIP project within the proposed project area);

- **Project No. R-2404**—Widen US 17 to multi-lanes south of Windsor to west of Chowan River;
- **Project No. R-2544** —Widen US 64 to multi-lanes east of the Alligator River to US 264;
- **Project No. R-2545**—Widen US 64 to multi-lanes east of Columbia to east of the Alligator River;
- **Project No. R-2574** —Widen US 158 from NC 168 to east NC 34 at Belcross in Camden County; and
- **Project No. R-4429** —Upgrade NC 168 to north of SR 1232 and SR 1213 to SR 1216.

Figure 1 shows the locations of these STIP projects.

# 2.0 Project Concept Screening

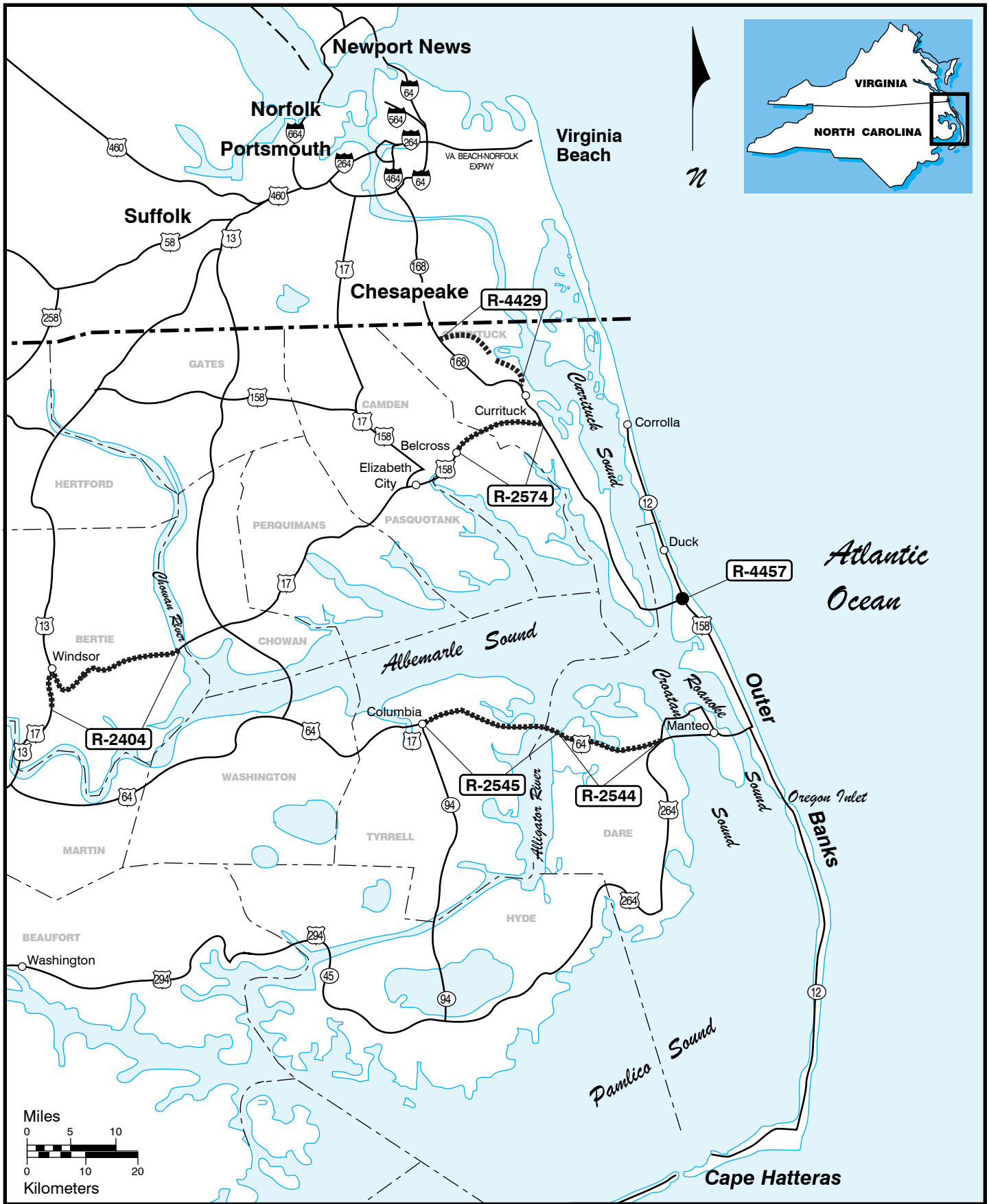
This section discusses the development and screening of project concepts. The screening focused primarily on two sets of alternatives: alternatives that improve existing roads without building a new bridge (ER1 and ER2) and alternatives that involve constructing a new Mid-Currituck Bridge in combination with improvements to existing roads (MCB1, MCB2, MCB3, and MCB4). The concept screening process also involved analysis of several other alternatives, including: shifting rental start times; transportation systems management (TSM); bus transit; and ferry service.

This section describes how each project concept alternative was developed, analyzes whether that alternative is reasonable, and indicates whether it will be carried forward in the DEIS as a Detailed Study Alternative. The project concept alternatives were analyzed based on a range of factors, including ability to meet purpose and need, economic feasibility, and potential for community and natural resource impacts.

## 2.1 Road and Bridge Alternatives

The current study, which was initiated by FHWA and NCTA in 2006, is a continuation of a previous study that was initiated by FHWA and NCDOT in 1995. That previous study produced a substantial body of data, analysis, and commentary, much of which focused on the choice between building a new bridge and improving existing roads.

Given the backdrop of the previous study, the alternatives screening process focused initially on developing and evaluating a range of two existing-road improvement alternatives and four Mid-Currituck Bridge alternatives. Two of those alternatives were selected as detailed study alternatives for the DEIS.




**LEGEND**

TIP Project Locations

# Transportation Improvement Plan Projects

**Figure**

1

### 2.1.1 Development of Road and Bridge Alternatives

#### *2.1.1.1 Existing-Road Improvement (ER) Alternatives*

Two alternatives were developed to examine the reasonableness of improving existing NC 12 and US 158, without building a new Mid-Currituck Bridge. These alternatives were ER1 and ER2, with the initials ER standing for "existing road." Figure 2 shows the locations of the improvements associated with each alternative. ER1 was developed in an attempt to achieve a desirable LOS D throughout the study area road network for the summer weekday. ER2 was developed to achieve maximum transportation benefits using the existing roadways while minimizing impacts to communities. The basic features of these two alternatives are:

- **ER1**
  - Adding a third northbound lane on US 158 from NC 168 to the Wright Memorial Bridge as a hurricane evacuation improvement or using the center turn lane as a third northbound evacuation lane;
  - Widening US 158 to eight lanes between the Wright Memorial Bridge and the NC 12 intersection; and
  - Widening NC 12 to four lanes between the US 158 and Corolla.
- **ER2**
  - Adding a third northbound lane on US 158 from NC 168 to the Wright Memorial Bridge as a hurricane evacuation improvement or using the center turn lane as a third northbound evacuation lane;
  - Widening US 158 to eight lanes between the Wright Memorial Bridge and the NC 12 intersection; and
  - Widening NC 12 to three lanes between US 158 and the Dare-Currituck County Line and to four lanes between the Dare-Currituck County Line and Corolla.

ER1 and ER2 differ only in that ER1 widens NC 12 to four lanes in Dare County and ER2 widens NC 12 to three lanes in Dare County. The sections that follow describe the assumptions made in determining the characteristics of these alternatives.

***Assumptions—Number of Lanes***

Other combinations of improvements to NC 12 and US 158 are possible other than those described for ER1 and ER2. Other combinations might include: widening US 158 to six lanes in Currituck County, not widening portions of NC 12 while widening others, and widening US 158 to only six lanes in Dare County. Widening of US 158 in Currituck


LEGEND

- Eight Lanes
- Six Lanes
- Four Lanes
- Three Lanes
- Third Northbound Lane or Contraflow Lane

# Highway Improvement Alternatives ER1 and ER2

**Figure**

2

County was not considered because congestion is not forecast to occur on US 158 in Currituck County on summer weekdays in 2035, but only the summer weekend. Improvements to NC 12 and US 158 were considered when summer weekday peak hour volumes in 2035 operated at a congested level of service (LOS) E or F.

The summer weekday peak period was the design hourly volume used to determine how many lanes to include in potential road and bridge improvement alternatives. The design hour is a peak traffic hour with a traffic volume that represents a reasonable value for guiding design decisions. It is selected such that hourly volumes over the course of a year are not congested with the exception of the highest peak periods. Serving high peak volumes that occur only periodically over the course of the year is considered an inefficient use of highway construction funds. The summer weekday peak hour was found to be appropriate for the Mid-Currituck Bridge alternatives development based on design hourly volume guidance found in the American Association of State Highway Officials' (AASHTO) policy manual, *A Policy on Geometric Design of Highways and Streets* (2004). The design hourly volume is given in units of vehicles per hour. Impact minimization and project area transportation plans also were considered in developing the preliminary alternatives.

Without a Mid-Currituck Sound Bridge, eight lanes on US 158 east of the Wright Memorial Bridge and four lanes on NC 12 are needed to achieve LOS D on the summer weekday. These two improvements are included in ER1.

ER2 assumes eight lanes on US 158 east of the Wright Memorial Bridge and four lanes on NC 12 in Currituck County. In Dare County on NC 12, ER2 assumes three lanes on NC 12 because the 60 foot right-of-way through most of Dare County on NC 12 is too narrow to accommodate a four lane road and the purchase of the additional 40 feet of right-of-way width needed to accommodate four lanes would result in substantial displacement of homes and businesses along NC 12.

Retaining two lanes on NC 12 with intersection improvements was not included in an ER alternative because opportunities to improve NC 12 operations without additional lanes are limited. Left-turn lanes or left-overs (left turns allowed from NC 12 to a local street but not the reverse movement) could be added at major intersections (those that service numerous homes), but particularly in Dare County, streets and driveways intersect NC 12 at frequent intervals. Thus, the interruption of traffic flow associated with turning, particularly left turns when turning vehicles wait in the travel lane for on-coming traffic to clear before turning, would continue even with improvements at major intersections. Frequent provisions for left turns would create essentially a three-lane road, particularly with the numerous intersections on NC 12 in Dare County.

***Assumptions—Road Width***

Conceptual designs were developed for ER1 and ER2 for use in assessing their potential for environmental impact and estimating their cost. Each design was based in part on a

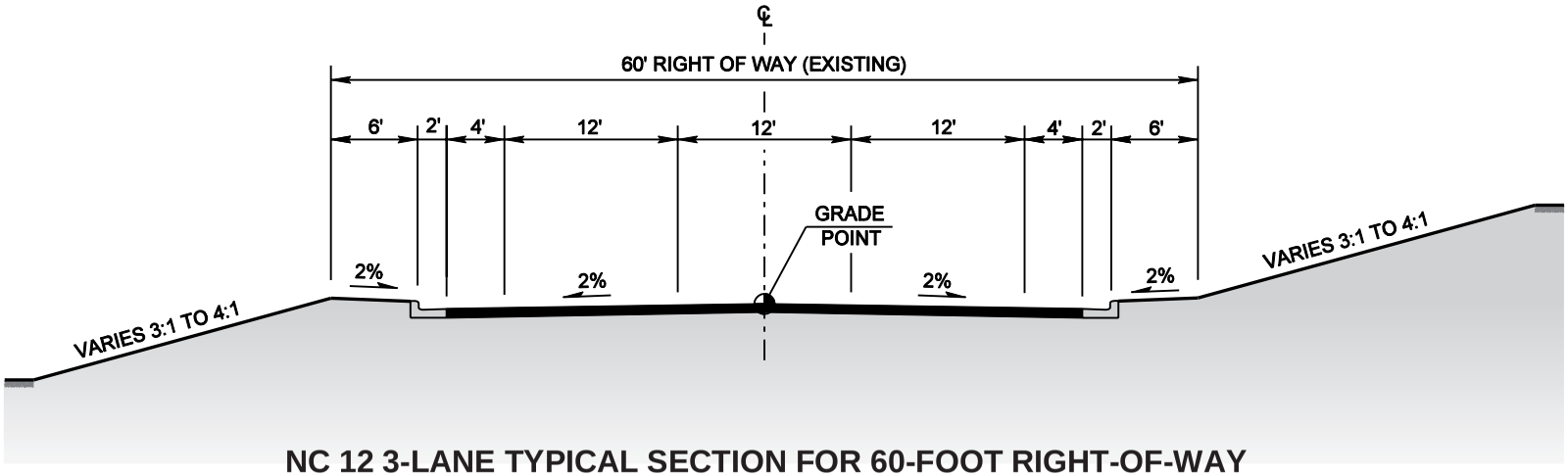
typical section defining lanes and median widths, curb and shoulder characteristics, and the width of a multi-use path for bicycles and pedestrians and its relationship to the roadway lanes. The three typical sections used with the ER1 and ER2 conceptual designs are shown in Figure 3, Figure 4, and Figure 5.

Typical sections were developed for three and four lanes on NC 12 and eight lanes on US 158 between the Wright Memorial Bridge and NC 12 with the intent of minimizing the potential impact to adjoining land uses by confining improvements to the existing right-of-way where possible. The typical sections were reviewed and approved for use in meetings with representatives of NCDOT on January 10, 2006, January 18, 2006 (which also included a representative of FHWA), and February 1, 2006. The typical sections do not contain substandard design features.

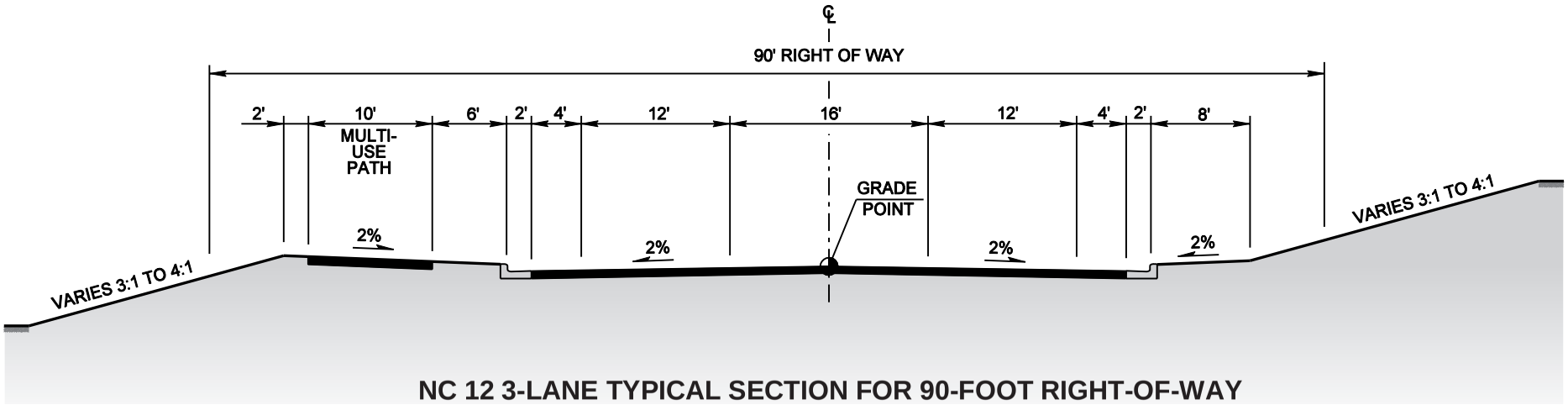
The four-lane typical section developed for NC 12 will fit within a 100-foot right-of-way (with only minor re-grading at some locations outside the right-of-way). It includes a 17.5-foot median. The available right-of-way is 100-feet wide in Currituck County. Two typical sections could be considered, one with bike lanes adjacent to travel lanes and one with a multi-use path. Since a multi-use path is common along NC 12, the latter typical section was assumed. A narrower four-lane cross section (with a reduced four foot concrete center island, a five foot sidewalk, and turning restrictions) was assumed at the Sanderling Inn, where resort facilities (parking lot and recreational facilities) are close to the edge of the existing right-of-way on both sides of NC 12. Displacing a portion of the Sanderling Inn operation would be difficult to replace and a narrower section could operate successfully for a short distance involved (0.25 miles).

Two three-lane typical sections with a continuous left turn lane were developed for NC 12. One would fit within the 60-foot right-of-way that predominates along NC 12 and would include 4-foot striped bike lanes like presently occur in downtown Duck. The third lane would serve as a continuous left turn lane available to both directions of travel. The other typical section would fit within the 90-foot right-of-way in the southern part of Southern Shores. It would include a multi-use path, as currently appears in the southern part of Southern Shores.

The typical section of the eight-lane improvement on US 158 in Dare County was developed such that it would fit within the existing US 158 right-of-way (150 feet) except for some grading. The eight-lane improvement includes a 30-foot median. A Super Street cross section was considered, but not recommended. A Super Street is a high capacity street whose primary feature is to channel all traffic on the side streets to a right turn onto the main road. Those who desire to turn left must then make a U-turn after turning right. Traffic on the main road can turn left directly from the main road to side roads. It was decided by NCTA and NCDOT that a short section of Super Street (Wright Memorial Bridge to NC 12) would be confusing to users, particularly tourists.

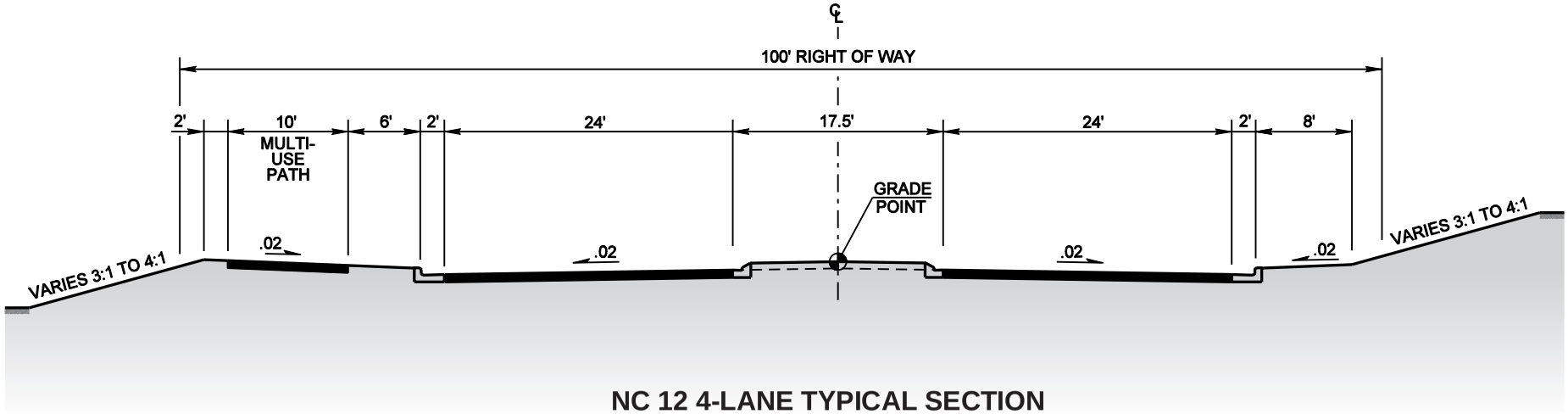



NC 12 3-LANE TYPICAL SECTION FOR 60-FOOT RIGHT-OF-WAY

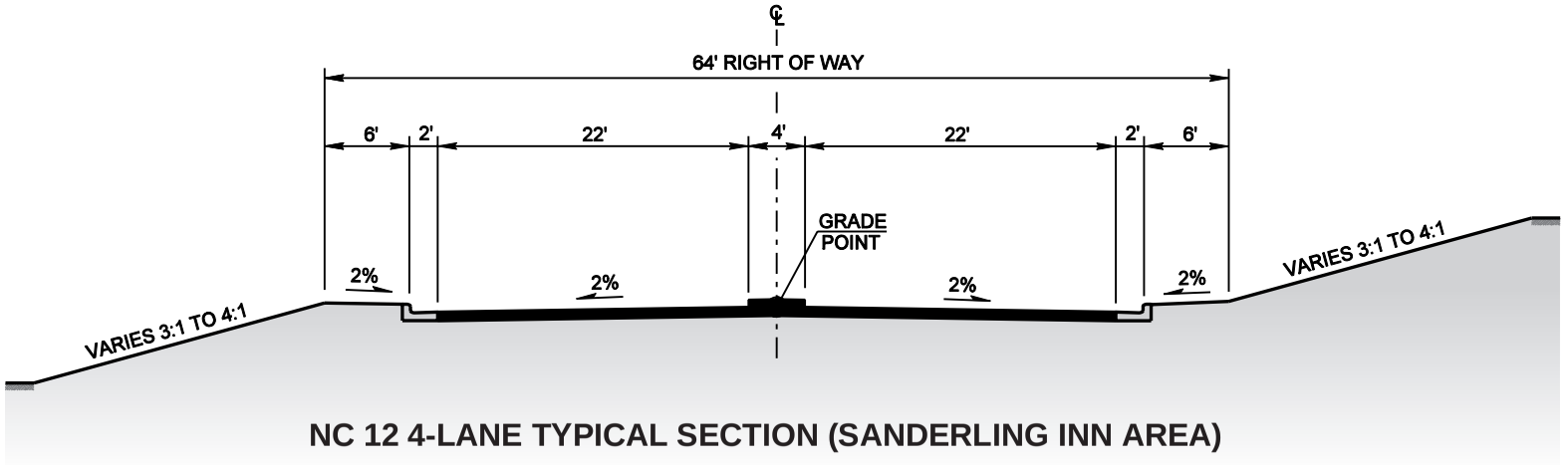



NC 12 3-LANE TYPICAL SECTION FOR 90-FOOT RIGHT-OF-WAY

| | | |
|---|---|---|
| | **NC 12 Three-Lane Typical Roadway Sections** | **Figure** 3 |




NC 12 4-LANE TYPICAL SECTION




NC 12 4-LANE TYPICAL SECTION (SANDERLING INN AREA)

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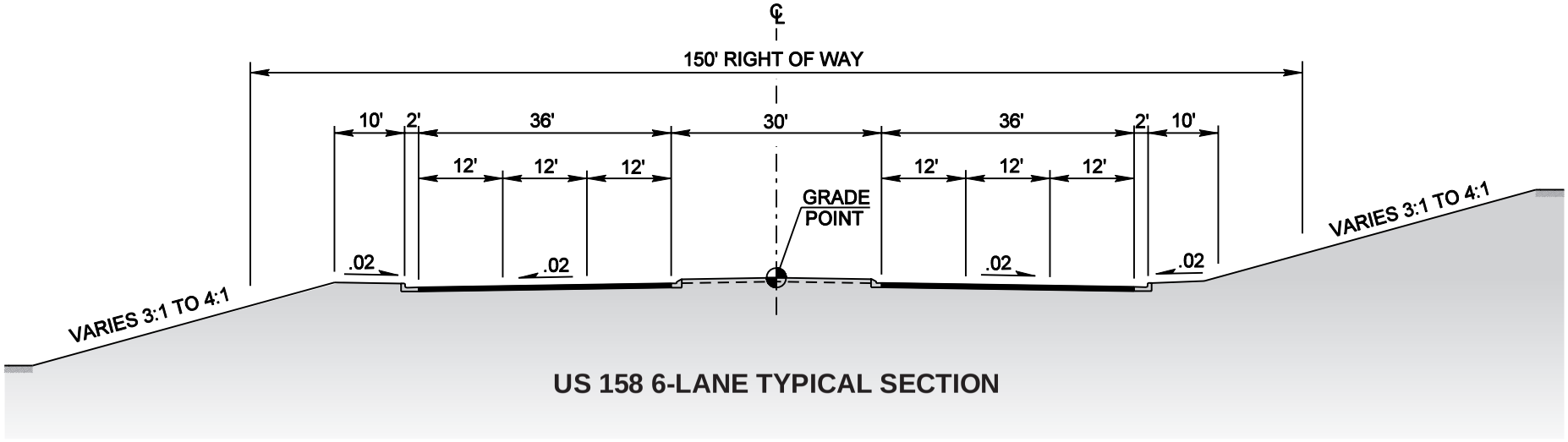
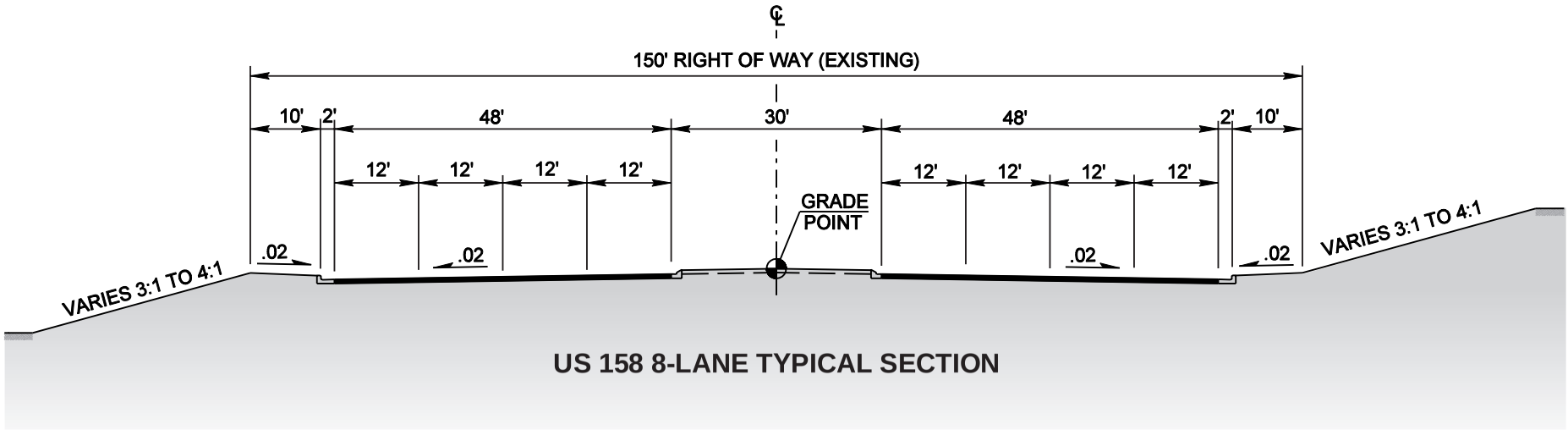
|---|---|---|
| | **NC 12 Four-Lane Typical Roadway Sections** | **Figure** 4 |

# Wright Memorial Bridge to NC 12




US 158 6-LANE TYPICAL SECTION




US 158 8-LANE TYPICAL SECTION

| | | |
|---|---|---|
| | **US 158 Six and Eight-Lane Typical Roadway Sections** | **Figure** 5 |

***Assumptions—Widening and Intersection Improvement Locations***

As noted above, the typical sections were developed so that the need for additional right-of-way along NC 12 and US 158 was minimized. However, in Dare County NC 12 generally has a 60-foot right-of-way (90-feet of right-of-way exists at the south end of NC 12 in Southern Shores). The typical section developed for four lanes requires a 100-foot right-of-way, the minimum needed to meet NCDOT design criteria for four-lane roads. Thus, additional right-of-way would be required in Dare County with four lanes, with associated impacts to the development lining NC 12. It was found that because of the small lot sizes along NC 12, displacement would be best minimized by generally widening to one side of the existing NC 12 right-of-way. Lot sizes are generally near the minimum allowed by current zoning. Symmetrical widening (some widening on both sides of NC 12) would leave substandard lot sizes on both sides of the road and necessitate the purchase of the full property and associated improvements on both sides of NC 12 rather than one side. Thus, the four-lane widening of NC 12 in Dare County generally assumes that the needed additional right-of-way would be purchased from one side of NC 12 or the other. The study team sought to use the side of the road where displacement losses would be least. In Duck's commercial area, use of land from the town's public park (west side of NC 12) was avoided.

The four-lane conceptual designs 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 to major intersections would greatly reduce the traffic interferences associated with drivers stopping in the travel lanes to make left turns. Limits on turning to and from NC 12 at some closely spaced intersections was assumed with the three-lane alternative, generally in the form of limiting turns on some local streets to right turns in and right turns out and, where alternate access is available, intersection closures to reduce the number of points where drivers would slow to make turns. These changes would add to the additional road capacity provided by the continuous left turn lane of the three-lane alternative.

Finally, for the four-lane NC 12, curves too tight to meet current NCDOT standards for a four-lane road were reconfigured in the conceptual designs to meet current minimum curve standards. Curves were not altered with the three-lane road.

***Assumptions—US 158 Hurricane Evacuation Improvements***

US 158 in Currituck and Dare counties, from NC 168 to NC 12 was found to be the road in the project area that would control future hurricane clearance times. Without improvements in the northbound capacity of this portion of US 158, future hurricane evacuation clearance times would not decrease, even if NC 12 were widened, or a Mid-Currituck Bridge were built. For hurricane clearance, US 158 would be a bottleneck. Hurricane clearance is the total number of hours from the time the first evacuee leaves their origin in the affected area until the last evacuee reaches shelter or a point of safety.

That point of safety is assumed to be I-95, which passes north and south through east-central North Carolina.

Thus, ER1 and ER2 also were assumed to include either a third northbound lane on US 158 from NC 168 to the Wright Memorial Bridge, where no other improvements were being considered, or that county and state emergency management personnel would operate the continuous left turn lane currently along US 158 as a third northbound lane, or so called contra-flow lane. At the Knapp Bridge across the Intracoastal Waterway there is no fifth center lane and in that case the center southbound lane would be used as a third northbound lane. These alternatives include widening US 158 between the Wright Memorial Bridge and NC 12, which also would facilitate hurricane evacuation.

***Assumptions – No Tolling on Existing Roads***

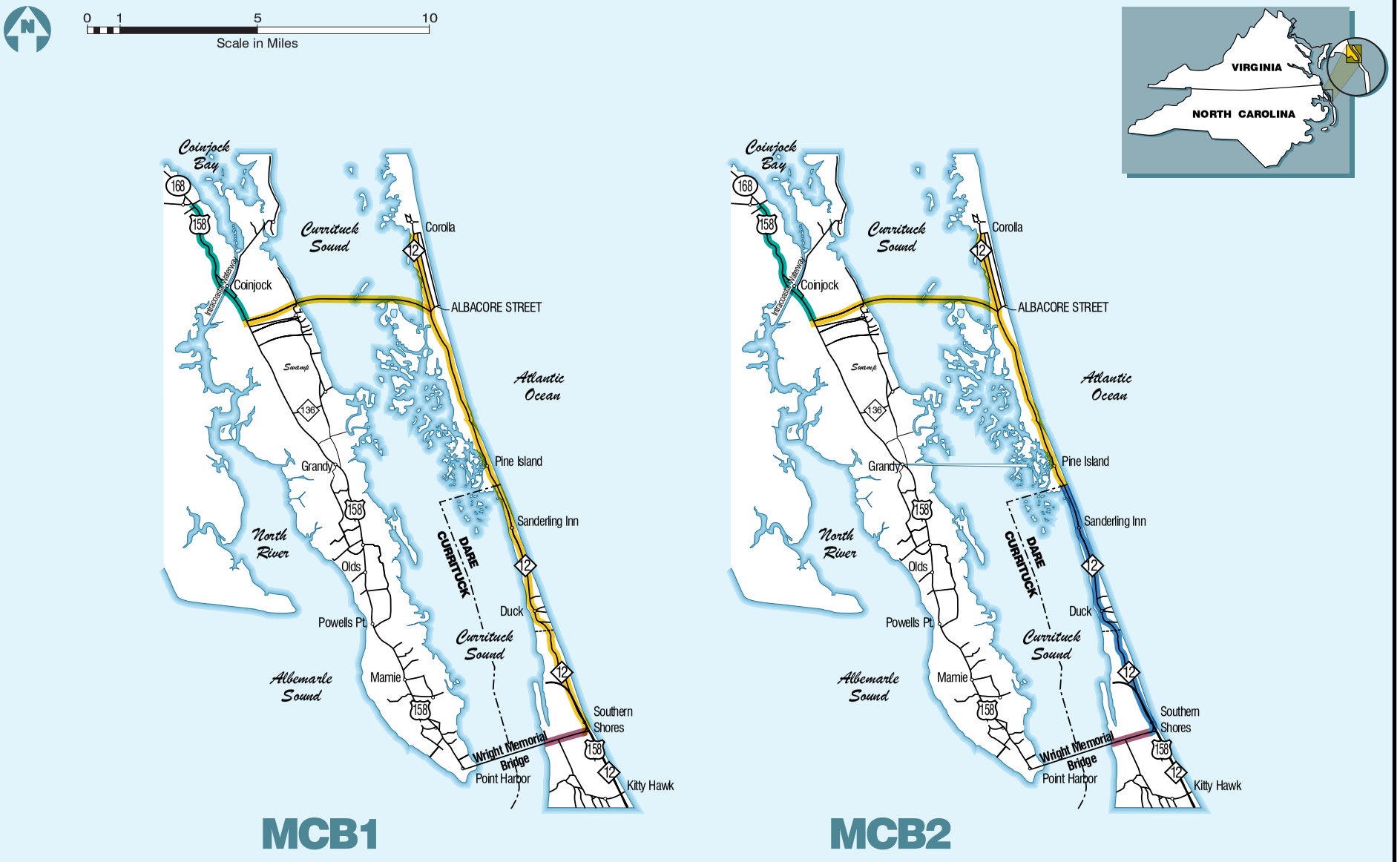
The existing-road improvement alternatives all assume that existing roads (US 158 and NC 12) would not be tolled. This assumption was made for two reasons. First, NCTA lacks authority under North Carolina law to toll existing roads, except in relation to a single proposed project in the Raleigh area (N.C. Gen. Stat. 136-89.187). Second, it is impractical to toll roads that have multiple uncontrolled access points, as is the case with NC 12 and US 158 in the project area. Given these two considerations, any improvement alternative that includes only widening existing roads would need to be funded entirely with traditional (non-toll) revenue sources.

#### *2.1.1.2 Mid-Currituck Bridge (MCB) Alternatives*

Four alternatives involving the construction of a bridge over Currituck Sound were considered. These alternatives are MCB1, MCB2, MCB3, and MCB4, with the initials MCB standing for "Mid-Currituck Bridge." Figure 6 and Figure 7 show the alternatives and their related highway improvements.

MCB1 and MCB2 consider the potential additional travel benefits of combining a Mid-Currituck Bridge with NC 12 and US 158 improvements. Thus, MCB1 and MCB2 include the road improvements similar to ER1 and ER2, respectively, plus a Mid-Currituck Bridge.

MCB3 and MCB4 were 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. This is the project as defined in the NCDOT's 2007 to 2013 STIP and county and state transportation improvement plans. To the bridge project, limited existing road improvements were added, which are needed to ensure that southbound traffic stopped at traffic signals on NC 12 would not queue back onto the bridge on the summer weekend. These improvements also would ensure that the purpose of substantially reducing hurricane clearance time was met. The two alternatives differ in terms of the extent of their hurricane evacuation improvements.

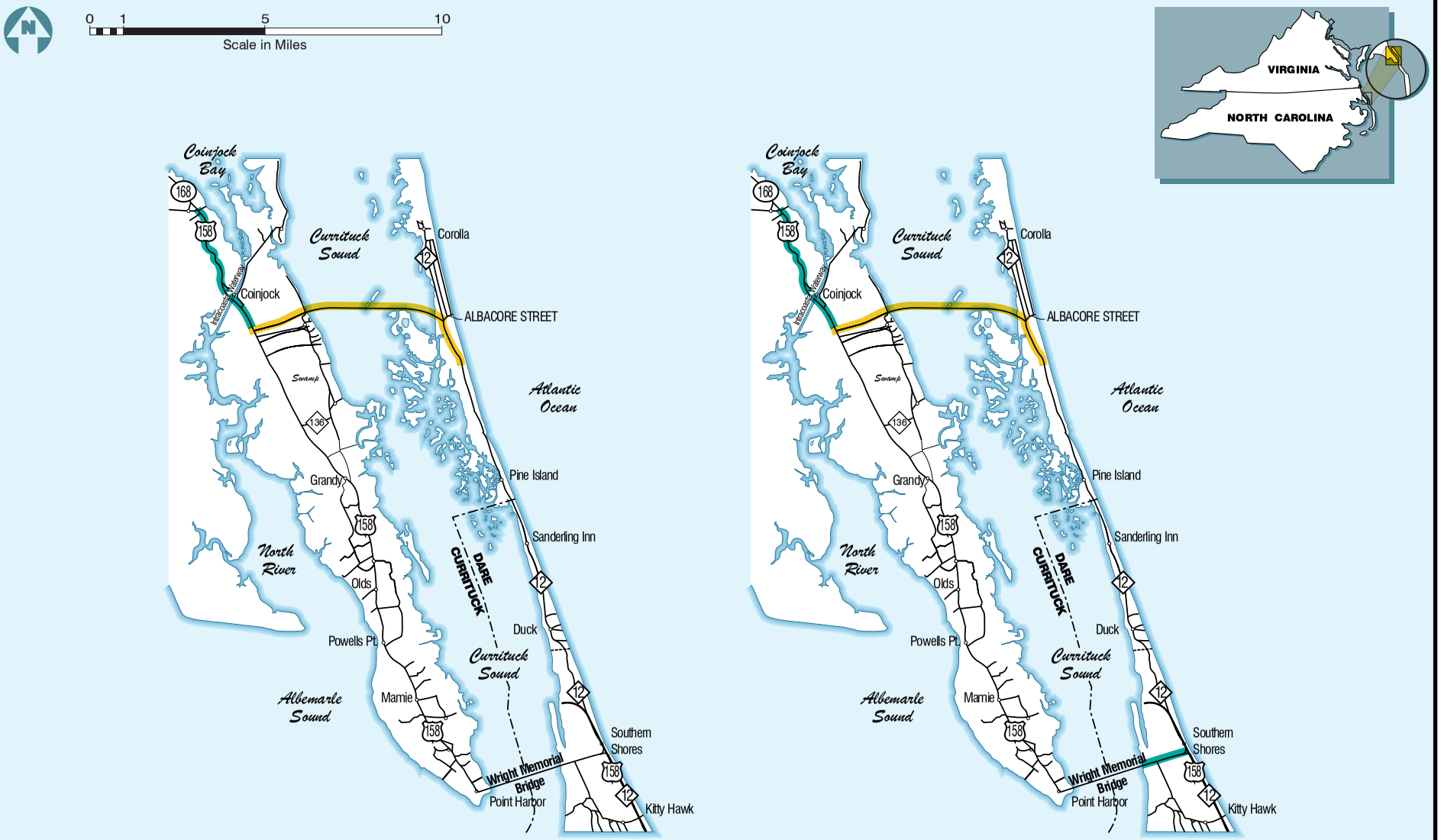



LEGEND

- Eight Lanes
- Six Lanes
- Four Lanes
- Three Lanes
- Third Northbound Lane or Contraflow Lane

# Bridge Alternatives MCB1 and MCB2

Figure 6




LEGEND

- Eight Lanes
- Six Lanes
- Four Lanes
- Three Lanes
- Third Northbound Lane or Contraflow Lane

# Bridge Alternatives MCB3 and MCB4

Figure 7

The basic features of the four Mid-Currituck Bridge alternatives are:

- **MCB1**
  - Constructing a two-lane toll bridge across the Currituck Sound in Currituck County;
  - Adding a third northbound lane on US 158 from NC 168 to Aydlett Road (SR 1140) as a hurricane evacuation improvement or using the center turn lane as a third northbound evacuation lane;
  - Widening US 158 to six lanes between the Wright Memorial Bridge andJupiter Trail/Wal-Mart entrance and eight lanes from Jupiter Trail/Wal-Mart entrance to the NC 12 area; and
  - Widening NC 12 to four lanes between US 158 and Corolla.
- **MCB2**
  - Constructing a two-lane toll bridge across the Currituck Sound in Currituck County;
  - Adding a third northbound lane on US 158 from NC 168 to Aydlett Road (SR 1140) as a hurricane evacuation improvement or using the center turn lane as a third northbound evacuation lane;
  - Widening US 158 to six lanes between the Wright Memorial Bridge andJupiter Trail/Wal-Mart entrance and eight lanes from Jupiter Trail/Wal-Mart entrance to the NC 12 area; and
  - Widening NC 12 to three lanes between US 158 and the Dare-Currituck County Line and to four lanes between the Dare-Currituck County Line and Corolla.
- **MCB3**
  - Constructing a two-lane toll bridge across the Currituck Sound in Currituck County;
  - Adding a third northbound lane on US 158 from NC 168 to Aydlett Road (SR 1140) as a hurricane evacuation improvement or using the center turn lane as a third northbound evacuation lane; and
  - Widening NC 12 to four lanes for two to four miles south of the intersection with a Mid-Currituck Bridge.

- **MCB4**

  – All components of MCB3 plus a third northbound (westbound) lane on US 158 between the Wright Memorial Bridge and NC 12 (or using the center turn lane as a third northbound evacuation lane) as an additional hurricane evacuation improvement.

Alternative bridge locations were not evaluated in the screening of project concepts because the travel benefits would be the same for different bridge locations. Alternative bridge locations are considered in Section 3.0 of this report.

Conceptual designs for MCB1 to MCB4 were developed for use in assessing their potential for environmental impact and estimating their cost. The sections that follow describe the assumptions made in determining the characteristics of these alternatives.

***Assumptions—Capacity at Interface Between the Bridge and US 158 and NC 12***

Although the design hourly volume for this project is for the summer weekday, it was determined that the bridge's interchange with US 158, toll plazas, and intersection with NC 12 should operate at LOS D on the summer weekend as well. This assumption was made because lengthy delay and associated queuing of vehicles (travelers completely stopped waiting for their turn to move) at these three key points could substantially increase travel time and lower speed on the bridge, as well as adversely affect travel on US 158 during this heaviest of travel periods in the project area. Although based on AASHTO design hourly volume guidance found in *A Policy on Geometric Design of Highways and Streets* (2004), it was considered acceptable to allow on the average summer weekend the slower traffic speeds associated with congested travel, it was not considered acceptable to build a bridge project that would result in substantial delay (LOS E and F) and queuing at the bridge's interface with the existing thoroughfare network, even in the case of average summer weekend travel.

AASHTO indicates that LOS D or better is achieved at a signalized intersection when delay is 40 seconds or less. LOS E occurs when delay is between 40.1 and 60 seconds and LOS F occurs when the delay time exceeds 60 seconds. Queuing occurs when vehicles arrive at an intersection at a rate faster than they can pass through an intersection.

Use of a signalized intersection between a Mid-Currituck and US 158 was considered; however, delay on the summer weekend would be 168 to 222 seconds or 2.8 to 3.7 times the 60 seconds where LOS F begins. Average summer weekend travel demand for the Mid-Currituck Bridge would be 1,050 vehicles in the peak hour for vehicles turning from southbound US 158 to the bridge. An intersection with dual left turn lanes can process approximately 300 vehicles per hour. These conditions would result in traffic queues from a US 158 intersection north for two miles or more in this single hour. Over the course of the summer weekend peak travel period on US 158 (11 hours) even longer

queues can be expected as demand continues to exceed capacity. Similar queues also occur for northbound traffic on US 158. Thus, an interchange with US 158 is assumed with the Mid-Currituck Bridge.

To achieve LOS D in terms of delay at the toll plazas, four plazas were assumed in each direction of travel, one with solely electronic toll collection where drivers would not need to stop to pay their toll and three with both manual toll collection (by an attendant) and electronic toll collection. In the eastbound direction, this number presumes an interchange with US 158. With an intersection, a fifth eastbound toll plaza would have been needed since traffic would arrive at the plaza in platoons created by traffic stopping and waiting at a traffic signal just before they arrive at the plaza rather than at consistent intervals.

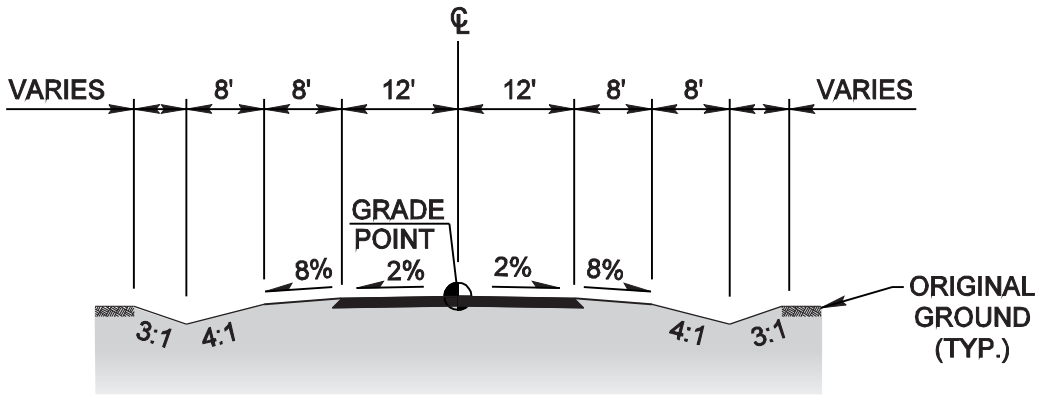
With MCB3 and MCB4, which do not include extensive four-laning on NC 12 in Currituck County, it is assumed that NC 12 would be widened to four lanes between the bridge terminus and Currituck Clubhouse Drive (an expected signalized intersection) to ensure that southbound traffic on NC 12 would not queue back onto the Mid-Currituck Bridge. The length of this widening would be approximately 2 to 4 miles depending on the location of the intersection between the bridge and NC 12. Without widening NC 12, eastbound queues from the bridge's intersection with NC 12 onto the bridge could be as much as 1.5 miles long.

The traffic numbers considered in making these decisions were 2035 forecasts that assumed a toll was charged.

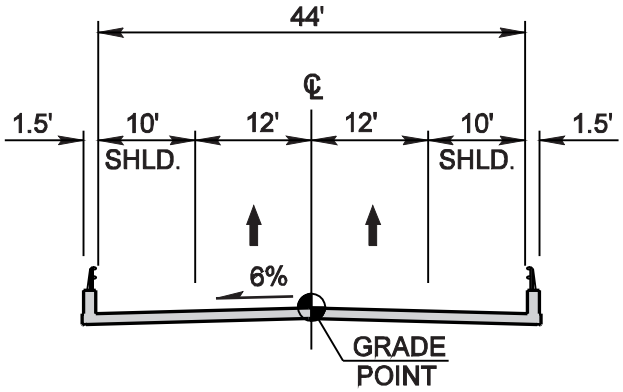
***Assumptions—Number of Lanes on Bridge***

All of the MCB alternatives assume a two-lane bridge. The typical section for such a bridge is shown Figure 8. Early in the alternatives screening study, a four-lane bridge was assumed as a potential worst-case scenario when considering potential environmental impacts of the bridge. Early traffic forecasts, which did not incorporate the potential traffic diversion that would occur as a result of a toll being charged, indicated that four lanes would be needed to achieve LOS D on the bridge on the summer weekday (the design hourly volume)

The decision to evaluate a two-lane bridge, rather than a four-lane or a three-lane bridge, was based on LOS, travel time, safety, and cost. Although the design hourly volume for the project is the average peak summer weekday, the benefits to summer weekend travel also were considered, as they are for other alternatives evaluations discussed in this report. Key factors in the decision to evaluate a two-lane bridge instead of a three- or four-lane bridge are shown in Table 1. The traffic numbers used in considering LOS, speed, and travel time across the bridge were 2035 forecasts that assumed a toll was charged.




BRIDGE APPROACH ROAD TYPICAL SECTION




MID-CURRITUCK BRIDGE AND APPROACH BRIDGE TYPICAL SECTION

| | | |
|---|---|---|
| | **Mid Currituck Bridge as a Two-Lane Bridge** | **Figure** 8 |

**Table 1. Bridge Lane Comparison**

| Number of Lanes | Summer Weekday (Peak Travel Direction) | | | Summer Weekend (Peak Travel Direction) | | | Conceptual Cost (millions of dollars) |
|---|---|---|---|---|---|---|---|
| | LOS | Speed (mph) | Travel Time (minutes) | LOS | Speed (mph) | Travel Time (minutes) | |
| 2-lane | D | 48 | 10.1 | E | 43 | 11.1 | $491 |
| 3-lane with lane control signals (LCS) | NA | NA | NA | B | 49 | 9.6 | $545 |
| 3-lane with movable barrier | NA | NA | NA | B | 52 | 9.2 | $574 |
| 4- lane (1 bridge) | A | 55 | 8.7 | B | 54 | 8.9 | $613 |
| 4-lane (2 bridges) | A | 55 | 8.7 | B | 54 | 8.9 | $709 |

The findings when comparing a two- and a four-lane bridge were:

- A two-lane bridge would provide a desirable LOS D on the average summer weekday in 2035. On the average summer weekend, LOS E would occur, but travel time across the bridge would be reduced by only 1.0 minute between the summer weekday and the summer weekend.
- A four-lane bridge would result in LOS B on the summer weekend in 2035 with a travel time 2.2 minutes less than with a two-lane bridge.
- A four-lane bridge would cost approximately $100 to $200 million more than a two-lane bridge.

It was decided that the reductions in travel time (1.4 minutes on the summer weekday and 2.2 minutes on the summer weekend) across a four-lane bridge was not worth the substantial additional cost.

A three-lane bridge also was considered as a possible means of improving average summer weekend travel times at a lower cost. In the case of a three-lane bridge, the third center lane would be reversible so that on the summer weekend, two lanes of travel always could be provided in the peak direction. On the average summer weekday, reversing the center lane would not be needed because an adequate LOS D is achieved with two lanes and because there is no prevailing peak direction in the traffic flow, i.e. one direction of travel carrying more traffic than another.

Two approaches to reversing the third lane on the summer weekend were considered:

1. Use of overhead lane control signals to designate direction of travel. This approach proved to be unacceptable because of:

    a. The lack of familiarity of tourists with the meaning of lane control signals and a safe response to what they indicate, which would create a risk for head-on collisions

    b. Their safe operation could necessitate lowering the bridge speed limit to 35 mph, less than the 43 mph (see Table 1)that could be achieved with a two-lane bridge.

2. Use of a moveable barrier to designate the direction of travel for the third lane, eliminating the opportunity for travelers moving in opposite directions to enter the same lane. This eliminates the safety concern associated with the first option. This approach also proved to be unacceptable because:

    a. Practicality of purchasing equipment ($12 million), training staff, and operating equipment for only 26 days summer weekends per year;

    b. Rubbernecking related to presence of the equipment moving the barrier could reduce speeds during the mid-day transition;

    c. The mid-day transition period where travel demand would be generally equal in each direction of travel would be one hour and both directions of travel would be operating at LOS E;

    d. Travel time saving in the peak direction would be only 1.9 minutes; and

    e. There would be an approximate additional capital cost of $80 million, as well as the cost to operate, maintain, and store the associated barrier moving equipment.

It was decided that the reductions in travel time across a three-lane bridge on the average summer weekend were not substantial enough to warrant the risk, challenges, and cost associated with a three-lane bridge.

***Assumptions—Existing Road Improvements***

The MCB alternatives vary in terms of their assumptions about improvements to existing roads. MCB1 and MCB2 include more extensive existing-road improvements than MCB3 and MCB4.

MCB1 assumes ER1's lane improvements to NC 12 and US 158, except that US 158 is assumed to be widened to six lanes instead of eight lanes between the Wright Memorial Bridge and Jupiter Trail/Wal-Mart Center driveway (1,700 feet west of NC 12). The Mid-Currituck Bridge would divert enough US 158 traffic from this area that a six lane

road generally would be sufficient to serve the remaining US 158 traffic at LOS D on the summer weekday.

MCB2 assumes ER2's lane improvements, except that like MCB1, MCB2 assumes six lanes on US 158 between the Wright Memorial Bridge between the Wright Memorial Bridge and Jupiter Trail/Wal-Mart Center driveway.

Like the eight-lane US 158 typical section considered with ER1 and ER2, the six-lane typical section (see Figure 5) for US 158 would fit within the existing 150-foot right-of-way and include a 30-foot median. The other road width and intersection location assumptions used for ER1 and ER2 also were used for MCB1 and MCB2, respectively.

MCB3 and MCB4 would involve building the bridge while making only those improvements to existing NC 12 and US 158 that are needed to meet the hurricane clearance need and to minimize the potential for congestion on a two-lane NC 12 from queuing back onto the bridge. Therefore, MCB3 and MCB4 assume NC 12 is widened to four lanes between Currituck Clubhouse Drive and the Mid-Currituck Bridge, as described above under "Assumptions—Capacity at Interface Between the Bridge and US 158 and NC 12," as well as the hurricane evacuation improvements described in the next section.

***Assumptions—US 158 Hurricane Evacuation Improvements***

As indicated in Section 2.1.1.1, under "Assumptions—US 158 Hurricane Evacuation Improvements," US 158 was found to be the road in the project area that would control future hurricane clearance times. Without improvements to northbound US 158, clearance times would not change even with a Mid-Currituck Bridge. The bridge, however, would divert some evacuating traffic from US 158. With some traffic leaving the Outer Banks via a Mid-Currituck Bridge, fewer improvements on US 158 would be needed to improve hurricane clearance times.

Thus, MCB3 assumes a third northbound lane for emergency use or using the center turn lane as a third northbound emergency lane only between the Mid-Currituck Bridge and NC 168. MCB4 seeks to further reduce clearance times by adding a third westbound lane between the Wright Memorial Bridge and NC 12 or using the center turn lane as a third emergency lane.

***Assumptions – Tolling***

All of the MCB alternatives assume that the Mid-Currituck Bridge itself, if constructed, would be a toll bridge. This assumption was based on several considerations. First, there is no other funding source for construction of the bridge; thus without tolls, the project could not go forward. Second, a *Preliminary Traffic and Revenue Study* prepared for the project (Wilbur Smith Associates, January 2007) concluded that tolls can cover a substantial portion of the project cost. Finally, the North Carolina General Assembly has specifically designated the Mid-Currituck Bridge as a toll bridge on the North Carolina

Intrastate System, and has specifically authorized NCTA to develop this bridge as a toll facility. Based on all of these considerations, this report assumes that any bridge across Currituck Sound would be operated as a toll bridge.

### 2.1.2 Evaluation of Road and Bridge Alternatives

The six Preliminary Alternatives (ER1, ER2, MCB1, MCB2, MCB3, and MCB4) were evaluated based on their ability to meet purpose and need, as well as economic feasibility, social impacts, and natural resource impacts. The assessment of economic feasibility included both total cost and the availability of financing to cover that cost. The factors used to compare the remaining alternatives described in Section 2.1.2.1 below.

As noted above, a four-lane bridge was initially assumed in the alternatives screening and provided the basis for the earliest discussions of the merits of the alternatives with environmental resource and regulatory agencies. When NCTA determined in late 2007 that a two-lane bridge would provide an adequate level of traffic service, the comparisons were revised to reflect that decision. All data in this report on benefits, costs, and impacts reflect a two-lane bridge.

#### *2.1.2.1 Evaluation Criteria*

The following factors were used to screen the Preliminary Alternatives:

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

***Ability to Meet Purpose and Need and Level of Benefit***

NCTA has identified four purposes in the purpose and need statement with corresponding measures of success, as follows:

1. To substantially improve traffic flow on the project area's thoroughfares. Thoroughfares in the project area are NC 12 and US 158.

   As described in the Statement of Purpose and Need, the ability of alternatives to achieve this purpose is measured in terms of:

   – The percent reduction in annual millions of vehicle-miles traveled under congested condition (at LOS E and F, at LOS F, and at a poor LOS F) on the project area's thoroughfares in 2035 (LOS E and F are considered congested);

- The percent reduction in miles of NC 12 and US 158 operating at LOS F on the summer weekday and summer weekend in 2035; and

- The percent reduction in miles of NC 12 and US 158 operating at a poor LOS F on the summer weekday and summer weekend in 2035.

LOS A to F are defined in Section 1.8.3 of the Statement of Purpose and Need. The traffic engineering literature does not define a poor LOS F but only LOS A to F. However, the LOS analysis for this project identified a 2035 peak period travel demand on some roads that would be much higher than the capacity of those roads (see Figure 1-8 of the Statement of Purpose and Need). For example, on US 158 east of the Wright Memorial Bridge and on NC 12 in Southern Shores summer weekend travel demand in 2035 would be 62 to 117 percent more than the capacity of the road (ratio of traffic volume to road capacity of 1.62 to 2.17 with LOS F beginnning at 1.0). Thus, for assessing the relative benefits of the alternatives it was important to create the distinction of poor LOS F. It is assumed that a poor LOS F occurs when the ratio of traffic volume to capacity is 1.3 or greater (peak period travel demand is 30 percent higher than the capacity of the road). This number was selected keeping in mind that traffic does not tend to have perfectly even flow. Thus, below a volume-capacity ratio of 1.3 there exists opportunities for breaks in the traffic flow for use by drivers turning from driveways and unsignalized intersections. In addition, some drivers can experience moments of better than LOS F flow in the course of a peak hour even though on the whole the peak hour LOS is F. Once the ratio of volume to capacity reaches 1.3, flow variation would likely disappear and a continuous unbroken stream of traffic would be experienced by people on NC 12 and US 158. Thus, it would be extremely difficult for people to turn out of driveways and unsignalized intersections.

2. To substantially reduce travel time for persons traveling between the Currituck County mainland and the Currituck County Outer Banks.

   The ability of alternatives to achieve this purpose is measured in terms of the percent reduction in summer travel time (weekday and weekend) in 2035 between Aydlett Road on the Currituck County mainland and Albacore Street on the Currituck Outer Banks via the Wright Memorial Bridge. The travel time in 2035 associated with the direct link a Mid-Currituck Bridge would create between the mainland and the Outer Banks also is considered.

3. To substantially reduce hurricane clearance time for residents and visitors who use NC 168 and US 158 during a coastal evacuation.

   The ability of alternatives to achieve this purpose is measured in terms the potential reduction in hurricane clearance time in 2035, as compared to North Carolina's

legislated (NC Gen. Stat. § 136-102.7, "Hurricane Evacuation Standard") standard of an 18-hour clearance time.

4. To improve system efficiency and fulfill State transportation planning goals by providing a new transportation link between the Currituck County mainland and the Currituck County Outer Banks.

   The ability of the alternatives to achieve this purpose is thus measured in terms of the potential reduction in annual million vehicle-miles traveled on the thoroughfare network and compatibility with the goal of the North Carolina State General Assembly and NCDOT to ensure an efficient transportation system in North Carolina. This goal is reflected in the North Carolina Strategic Highway Corridor (SHC) System and the North Carolina Intrastate System, both of which include a Mid-Currituck Bridge.

***Economic Feasibility (Cost and Funding Capacity)***

This screening factor considers the capital cost of and the available capital funding for the road and bridge alternatives. Available capital funding considers potential total revenue for bond financing, potential Transportation Infrastructure Finance and Innovation Act (TIFIA) financing, potential capital funding shortfall and potential ability of a public private partnership to cover the shortfall.

The President's Council on Environmental Quality (CEQ), in its March 1981 guidance document "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations," indicates that in determining the scope of alternatives to be considered in a National Environmental Policy Act document, the emphasis is on what is "reasonable." The guidance indicates that "reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense."

***Potential Impacts on Natural Resources and Communities***

Impact potential considers displacement, rural/beach community fragmentation, habitat fragmentation, wetlands filled/bridged and high quality resources filled/bridged. Most, but not all of the wetlands in the project area also are high quality resources. High quality resources in the project area are generally lands listed as Significant Natural Heritage Areas by the North Carolina Natural Heritage Program.

Initial analyses looked at a broad range of potential impact types using conceptual designs for the alternatives and available Geographic Information Systems (GIS) data, including:

- Major utility conflicts;
- Railroad crossings;
- Displacements;

  - Residences
  - Businesses
  - Cemeteries
  - Recorded historic sites
- Rural community fragmentation on mainland;
- Beach community fragmentation on OuterBbanks;
- Greenway crossings;
- Low income or minority populations;
- PotentialSsection 4(f) impacts;
- Hazardous materials sites affected;
- Known federally-listed species habitat
- 100-year floodplain impacts;
- Habitat fragmentation;
- Wetland impacts;
- Coastal (CAMA) wetland impacts;
- Stream impacts;
- Potential riparian buffer impacts;
- Water supply critical areas; and
- High quality resources.

The focus of the analysis turned to the measures listed in the first paragraph either because the road and bridge alternatives would not effect the resource/issue in the longer list or the potential for impact was identical for all alternatives.

#### *2.1.2.2 Evaluation*

The results of the screening analysis for the ER and MCB alternatives are presented in Table 2. The cost and impact numbers presented in Table 2 assume an average of the cost or impact of the six bridge corridor alternatives examined in Section 3.1. Key conclusions from this analysis are summarized below for each alternative.

***ER1***

Ability to Meet Purpose and Need. ER1 was developed to achieve LOS D operations on the summer weekday. In addition, ER1 would eliminate poor LOS F operations in the project area. Total annual congested vehicle-miles would drop 55 percent. In addition, travel times to and from the Currituck County Outer Banks would be reduced by 48 percent (compared to the No-Build Alternative). Hurricane evacuation times would be substantially reduced—by 50 to 81 percent of the amount needed to achieve the 18-hour evacuation standard. Thus, three of the four elements of the purpose and need would be met. However, this alternative would not serve the system-linkage purpose. It would not reduce the annual million vehicle-miles traveled in the project area. Also, it would not provide a new connection across Currituck Sound as specified in the North Carolina Strategic Highway Corridor and Intrastate System plans.

## Table 2. Evaluation of Existing Road (ER) and Mid-Currituck Bridge (MCB) Alternatives

| | Highway Improvement Alternatives | | | | | |
|---|---|---|---|---|---|---|
| | **ER1** | **ER2** | **MCB1** | **MCB2** | **MCB3** | **MCB4** |
| **Components** | | | | | | |
| • Bridge | NA | NA | 2-lane bridge | 2-lane bridge | 2-lane bridge | 2-lane bridge |
| • US 158 (Wright Memorial Bridge to NC 12) | 8 lanes | 8 lanes | 6 lanes (8 lanes in NC 12 area) | 6 lanes (8 lanes in NC 12 area) | 5 lanes | 5 lanes |
| • NC 12 (Dare County north of US 158) | 4 lanes | 3 lanes | 4 lanes | 3 lanes | 2 lanes | 2 lanes |
| • NC 12 (Currituck County) | 4 lanes | 4 lanes | 4 lanes | 4 lanes | 2 lanes (4 near bridge) | 2 lanes (4 near bridge) |
| • Location of US 158 Contraflow or Third Northbound Lane for Hurricane Evacuation | Wright Memorial Bridge to NC 168 (24.5 miles) | Wright Memorial Bridge to NC 168 (24.5 miles) | Mid-Currituck Bridge to NC 168 (5 miles) | | | Same as MCB3 plus Wright Memorial Bridge NC 12 (1.5 miles) |
| **Economic Feasibility** | | | | | | |
| **Capital Cost (in millions)** | | | | | | |
| • Two-Lane Mid-Currituck Bridge (average of six potential corridors) | NA | NA | $385 | $385 | $385 | $385 |
| • NC 12 | $550 | $207 | $550 | $207 | $72 | $72 |
| • US 158 in Dare County | $41 | $41 | $27 | $27 | $0 | $7 |
| • US 158 in Currituck County (third northbound lane) | $67 | $67 | $16 | $16 | $16 | $16 |
| TOTAL CAPITAL COST WITH A TWO-LANE BRIDGE | $658 | $315 | $978 | $635 | $473 | $480 |
| **Available Capital Funding (in millions)** | | | | | | |
| • Potential Total Revenue Bond Financing | $0 | $0 | $284 | $284 | $284 | $284 |
| • Potential Transportation Infrastructure Finance and Innovation Act (TIFIA) Financing | $0 | $0 | $128 | $128 | $128 | $128 |
| • Potential Capital Funding Shortfall (Surplus) (total cost minus available funding) | $658 | $315 | $566 | $223 | $61 | $68 |

**Table 2 (continued). Evaluation of Existing Road (ER) and Mid-Currituck Bridge (MCB) Alternatives**

| | Highway Improvement Alternatives | | | | | |
|---|---|---|---|---|---|---|
| | ER1 | ER2 | MCB1 | MCB2 | MCB3 | MCB4 |
| Potential for Public-Private Partnership to cover shortfall | No | No | No | No | Yes | Yes |
| **Travel Benefits[1]** | | | | | | |
| **2035 Traffic Flow Benefits** | | | | | | |
| Percent Reduction in Congested Annual Millions of VMT | | | | | | |
| • At LOS E or F | 55% | 22% | 64% | 50% | 37% | 37% |
| • At LOS F | 51% | 27% | 91% | 91% | 71% | 71% |
| • At a poor LOS F | 100% | 44% | 100% | 100% | 69% | 69% |
| Percent Reduction in Miles of Road Operating at LOS F | | | | | | |
| • Summer Weekday (SWD) | 100% | 60% | 100% | 100% | 61% | 61% |
| • Summer Weekend (SWE) | 37% | 10% | 89% | 89% | 73% | 73% |
| • Weighted Average of SWD & SWE | 66% | 33% | 94% | 94% | 68% | 68% |
| Percent Reduction in Miles of Road Operating at a Poor LOS F | | | | | | |
| • Summer Weekday (SWD) | 100% | 35% | 100% | 100% | 86% | 86% |
| • Summer Weekend (SWE) | 100% | 25% | 100% | 100% | 75% | 75% |
| • Weighted Average of SWD & SWE | 100% | 32% | 100% | 100% | 83% | 83% |
| **2035 Travel Time Benefits (Aydlett Rd to Albacore St)** | | | | | | |
| • Percent Reduction in Summer Travel Time via Wright Memorial Bridge (weighted average of SWD & SWE) | 48% | 19% | 53% | 44% | 31% | 31% |
| • Percent Reduction in Summer Travel Time via Currituck Sound Crossing (weighted average of SWD & SWE) | NA | NA | 93% | 93% | 93% | 93% |

**Table 2 (continued). Evaluation of Existing Road (ER) and Mid-Currituck Bridge (MCB) Alternatives**

| | Highway Improvement Alternatives | | | | | |
|---|---|---|---|---|---|---|
| | ER1 | ER2 | MCB1 | MCB2 | MCB3 | MCB4 |
| **2035 Hurricane Evacuation Benefit** | | | | | | |
| Clearance Time With US 158 Northbound Contraflow Lane in Currituck County | 27.4 hrs | 27.4 hrs | 27.4 hrs | 27.4 hrs | 27.4 hrs | 27.4 hrs |
| • Percent of a Reduction from 36.3 hours to 18 hours | 49% | 49% | 49% | 49% | 49% | 49% |
| • Amount Above 18-hour Goal | 8.9 hrs | 8.9 hrs | 8.9 hrs | 8.9 hrs | 8.9 hrs | 8.9 hrs |
| Clearance Time With US 158 Third Northbound Lane in Currituck County | 21.8 hrs | 21.8 hrs | 21.8 hrs | 21.8 hrs | 26.6 hrs | 21.8 hrs |
| • Percent of a Reduction from 36.3 hours to 18 hours | 79% | 79% | 79% | 79% | 53% | 79% |
| • Amount Above 18-hour Goal | 3.8 hrs | 3.8 hrs | 3.8 hrs | 3.8 hrs | 8.6 hrs | 3.8 hrs |
| **System Linkage and Efficiency Benefit** | | | | | | |
| Percent Reduction in Total Annual Millions of Vehicle Miles Traveled (VMT) | 0% | 0% | 13% | 13% | 13% | 13% |
| Consistent with Strategic Highway Corridor Vision Plan | No | No | Yes[2] | Yes[2] | Yes | Yes |
| Consistent with Intrastate System Designations | No | No | Yes[2] | Yes[2] | Yes | Yes |
| **Impact Potential** | | | | | | |
| **Displacement** | | | | | | |
| • Mid-Currituck Bridge (average of C1 to C6) | 0 | 0 | 5 | 5 | 5 | 5 |
| • NC 12 | 195 | 15 | 195 | 15 | 5 | 5 |
| • US 158 in Dare County | 0 | 0 | 0 | 0 | 0 | 0 |
| • US 158 in Currituck County (third northbound lane) | 32 | 32 | 1 | 1 | 1 | 1 |
| TOTAL DISPLACEMENT | 227 | 47 | 201 | 21 | 11 | 11 |

## Table 2 (concluded). Evaluation of Existing Road (ER) and Mid-Currituck Bridge (MCB) Alternatives

| | Highway Improvement Alternatives | | | | | |
|---|---|---|---|---|---|---|
| | **ER1** | **ER2** | **MCB1** | **MCB2** | **MCB3** | **MCB4** |
| **Rural/Beach Community Fragmentation** | Four through lanes crossed by beach users, shoppers, or hotel guests in Dare County. | New turn lane crossed by beach users or hotel guests in Dare County. | Same as ER1 plus Mid-Currituck Bridge passes through Aydlett (C3 and C4 through center) and C1, C3, and C5 pass through middle of new subdivision. | New turn lane crossed by beach users or hotel guests in Dare County, plus Mid-Currituck Bridge passes through Aydlett (C3 and C4 through center) and C1, C3, and C5 pass through middle of new subdivision. | Mid-Currituck Bridge passes through Aydlett (C3 and C4 through center) and C1, C3, and C5 pass through middle of new subdivision. | Mid-Currituck Bridge passes through Aydlett (C3 and C4 through center) and C1, C3, and C5 pass through middle of new subdivision. |
| **Habitat Fragmentation** | None | None | Associated with Mid-Currituck Bridge crossing of Maple Swamp and loss of swamp forest and hardwood forest; C1 to C4 in vicinity of an existing forest edge; C5 and C6 create a new edge and also use bay forest. | | | |
| **Wetland Filled/Bridged (Acres)** | | | | | | |
| • Mid-Currituck Bridge (average of C1 to C6) | 0.0/0.0 | 0.0/0.0 | 13.7/7.2 | 13.7/7.2 | 13.7/7.2 | 13.7/7.2 |
| • NC 12 | 10.9/0.0 | 10.4/0.0 | 10.9/0.0 | 10.4/0.0 | 6.3/0.0 | 6.3/0.0 |
| • US 158 in Dare County | 4.2/0.0 | 4.2/0.0 | 3.4/0.0 | 3.4/0.0 | 0.0/0.0 | 0.0/0.0 |
| • US 158 in Currituck County (third northbound lane) | 12.4/0.0 | 12.4/0.0 | 10.8/0.0 | 10.8/0.0 | 10.8/0.0 | 10.8/0.0 |
| TOTAL WETLANDS FILLED/BRIDGED | 27.5/0.0 | 27.0/0.0 | 38.8/7.2 | 38.3/7.2 | 30.8/7.2 | 30.8/7.2 |
| **High Quality Resources Filled/Bridged (Acres)** | | | | | | |
| • Mid-Currituck Bridge (average of C1 to C6) | 0.0/0.0 | 0.0/0.0 | 4.8/6.1 | 4.8/6.1 | 4.8/6.1 | 4.8/6.1 |
| • NC 12 | 17.8/0.0 | 16.8/0.0 | 17.8/0.0 | 16.8/0.0 | 0.0/0.0 | 0.0/0.0 |
| • US 158 in Dare County | 0.2/0.0 | 0.2/0.0 | 0.0/0.0 | 0.0/0.0 | 0.0/0.0 | 0.0/0.0 |
| • US 158 in Currituck County (third northbound lane) | 1.4/0.0 | 1.4/0.0 | 1.4/0.0 | 1.4/0.0 | 1.4/0.0 | 1.4/0.0 |
| TOTAL HIGH QUALITY RESOURCES FILLED/BRIDGED | 19.4/0.0 | 18.4/0.0 | 24.0/6.1 | 23.0/6.1 | 6.2/6.1 | 6.2/6.1 |

[1] The absolute numbers associated with the percents shown are included in Table 7 in the Appendix. Several charts showing these findings in a graphical form also are included in the Appendix.

[2] Consistent because it includes a Mid-Currituck Bridge, however, these plans do not call for the improvement of NC 12, which is a component of these alternatives.

Economic Feasibility. The capital cost of this alternative is $658 million. The current NCDOT STIP defines the proposed project as a toll project. No STIP funds are allocated for this project. ER1 could not be financed by tolls because NCTA lacks authority to toll existing roads in association with this project and it is impractical to toll roads that have multiple uncontrolled access points. The high cost of this alternative plus the inability to pay for it with tolls makes this alternative impractical from an economic standpoint.

Potential Impacts on Natural Resources. ER1 would not involve a new bridge and therefore would not cross Maple Swamp, which is both a wetland and a high quality natural resource. ER1 also would avoid the other environmental impacts associated with crossing Currituck Sound. ER1 would have impacts on the natural environment from widening existing NC 12 and US 158. This alternative would involve the filling of 27.5 acres of wetlands and 19.4 acres of high-quality natural resources.

Potential Impacts on Communities. ER1would involve widening NC 12 to four lanes in Dare County on the Outer Banks. There is extensive residential development along this section on NC 12, and many of the properties are close to the roadway. As a result, ER1 would result in 227 displacements (including 56 businesses), more than 10 times the potential for displacement under any other alternative (except MCB1, which involves the same widening of NC12). The bulk of this displacement would be associated with widening NC 12 to four lanes in Dare County where an additional 40 feet of right-of-way would need to be purchased for much of this area. Also in Dare County, NC 12 is frequently crossed by beach users, shoppers, and hotel guests, which would be more challenging with a four lane road.

Conclusion. While ER1 would offer a high level of congestion relief, it is not considered a reasonable alternative and therefore was not chosen for detailed study in the DEIS. The main reasons for eliminating this alternative are: (1) it does not meet the system-linkage need; (2) it is not economically feasible; and (3) it has a high number of displacements and would cause community fragmentation.

***ER2***

Ability to Meet Purpose and Need. ER2 was developed to balance transportation needs with community impacts. Consequently, ER2 would provide some of the transportation benefits of ER1, but to a much lesser extent. Where ER1 would completely eliminate poor LOS F conditions (i.e., severe congestion), ER2 would reduce it by 44 percent but would leave extensive periods of severe congestion. Where ER1 would reduce travel times to and from the Currituck County Outer Banks by 48 percent, ER2 would reduce those travel times by only 19 percent. ER2 would provide equivalent benefits as ER1 in hurricane clearance time reduction since the hurricane-related improvement on US 158 are identical between the two alternatives. Finally, like ER1, this alternative would not serve the system-linkage purpse. It would not reduce the annual million vehicle-miles traveled in the project area. Also, it would not provide a new connection across

Currituck Sound as specified in the North Carolina Strategic Highway Corridor and Intrastate System plans.

Economic Feasibility. The capital cost of this alternative is $406.1 million. Like ER1, ER2 could not be financed by tolls because NCTA lacks authority to toll existing roads in association with this project and it is impractical to toll roads that have multiple uncontrolled access points. The high cost of this alternative plus the inability to pay for it with tolls makes this alternative impractical from an economic standpoint.

Potential Impacts on Natural Resources. ER2 also would not involve a new bridge and therefore would not cross Maple Swamp, which is both a wetland and a high quality natural resource. ER2 like ER1 also would avoid the other environmental impacts associated with crossing Currituck Sound. ER2 would have impacts on the natural environment from widening existing NC12 and US 158. This alternative would involve the filling of 27.0 acres of wetlands and 18.4 acres of high-quality natural resources.

Potential Impacts on Communities. ER2 would involve widening NC 12 to three lanes, primarily within existing right-of-way, in Dare County on the Outer Banks. As a result, ER2 would avoid much of the displacement associated with ER1. ER2 would, however, result in 47 displacements.

Conclusion. ER2 would avoid the high number of displacements associated with ER1, but it still is not considered a reasonable alternative and therefore was not chosen for detailed study in the DEIS. The main reasons for eliminating this alternative are (1) it does not meet the system-linkage need; and (2) it is not economically feasible.

In other contexts, it may be reasonable to consider an alternative that is unfunded or cannot be built by designated funding source, yet is costly. Such an alternative is not reasonable in this context when there are other reasonable alternatives (MCB3 and MCB4) available that could be substantially or even fully funded by tolls, the funding source designated for this project.

***MCB1***

Ability to Meet Purpose and Need. MCB1 would provide the greatest transportation benefits of any alternative. It would eliminate poor LOS F operations in the project area and LOS F operations on the summer weekday. It would reduce travel times to and from the Currituck County Outer Banks by 53 percent (for the "U-shaped" trip across the Wright Memorial Bridge). Travel times for bridge users would be reduced by up to 93 percent. It would reduce hurricane evacuation times, by the same amount as ER1 and ER2, but would accomplish this objective with only 5 miles of hurricane evacuation-related improvement on US 158 (Mid-Currituck Bridge to NC 168) rather than the 25 miles (Wright Memorial Bridge to NC 168) associated with ER1 and ER2. Unlike ER1 and ER2, this alternativewould provide a new link in the transportation system, which would provide a more direct route to and from the Currituck County Outer Banks, as

per state plans. The increased efficiency of the network is reflected in a 13 percent reduction in millions of vehicle-miles traveled in 2035. Thus, all four elements of the purpose and need would be met with MCB1.

Economic Feasibility. The capital cost of this alternative is $978 million, which is the highest of any of the ER and MCB alternatives. The bridge component of the project likely could be funded by tolls. Some limited improvements perhaps could be made to existing roads using toll revenue where they connect with the bridge in order to ensure the functionality of the bridge. Toll revenues, however, would not be sufficient to cover the cost of all of the existing-road improvements. The high cost of this alternative, combined with the lack of any reasonably foreseeable funding source, makes this alternative impractical from an economic standpoint.

Potential Impacts on Natural Resources. MCB1 would involve a new bridge across Currituck Sound, as well as a crossing of Maple Swamp, which is both a wetland and a high quality natural resource. MCB1 also would have impacts on the natural environment, as a result of widening existing NC12 and US 158. As a result, this alternative has the highest impacts on the natural environment of any ER or MCB alternative. It would involve the filling of 38.8 acres and bridging 7.2 acres of wetlands, and would involving filling 24 acres and bridging 6.1 acres of high-quality natural resources.

Potential Impacts on Communities. MCB1, like ER1, would involve widening NC 12 to four lanes in Dare County on the Outer Banks. As a result, MCB1 would result in 201 displacements, which is nearly the same number of displacements as ER1. MCB1 would have fewer displacements than ER1 only because ER1 would involve more extensive hurricane clearance improvements (25 miles rather than 5 miles) on the Currituck County mainland. Also, similar to ER1 in Dare County, NC 12 is frequently crossed by beach users, shoppers, and hotel guests, which would be more challenging with a four lane road. In addition, the bridge component would pass through the community of Aydlett on the mainland.

Conclusion. While MCB1 would meet the purpose and need, including the need for system linkage, it is not considered a reasonable alternative and therefore was not chosen for detailed study in the DEIS. The main reasons for eliminating this alternative are: (1) it is not economically feasible, (2) it has a high number of displacements, and (3) it would cause community fragmentation.

***MCB2***

Ability to Meet Purpose and Need. MCB2 is the same as MCB1 except that NC 12 is widened only to three lanes in Dare County. With three lanes on NC 12 in Dare County, the travel benefits would be less, but still substantial. Like MCB1, MCB2 would meet all four elements of the purpose and need.

Economic Feasibility. The capital cost of this alternative is $635 million. Like MCB1, the bridge component of the project likely could be funded by tolls. Again, toll revenues, however, would not be sufficient to cover the cost of all of the existing-road improvements. The high cost of this alternative, combined with the lack of any reasonably foreseeable funding source, makes this alternative impractical from an economic standpoint.

Potential Impacts on Natural Resources. The natural resource impacts for MCB1 and MCB2 would be virtually identical.

Potential Impacts to Communities. MCB2 would involve widening NC 12 to three lanes in Dare County on the Outer Banks, rather than the four-lane widening as with MCB1. As a result, MCB2 would avoid much of the displacements associated with MCB1. MCB2 also avoids many of the displacements associated with ER2, because ER2 would involve more extensive hurricane clearance improvements (25 miles rather than 5 miles) on the Currituck County mainland. MCB2 would result in 21 displacements. Like MCB1, the bridge component would pass through the community of Aydlett on the mainland.

Conclusions. MCB2 would meet the purpose and need and would not involve severe displacement impacts, but is not considered a reasonable alternative and therefore was not carried forward for detailed study in the DEIS. The main reason for eliminating this alternative is that it is not economically feasible.

Note that the next two alternatives considered, MCB3 and MCB4 include part, but not all of MCB2. MCB3 and MCB4 do not include the full widening of NC 12 in Currituck County to four lanes, widening NC 12 to three lanes in Dare County, and the widening of US 158 (6 to 8 lanes) between the Wright Memorial Bridge and NC 12. Implementation of MCB3 or MCB4 would not preclude NCDOT from implementing the remaining improvements that make up MCB2 when resources are available, either in total or in parts. They could be implemented without additional cost (except that associated with inflation) or environmental impact compared with implementing MCB2 as a single project. Nothing built as a part of MCB3 or MCB4 would be lost with the addition of the remaining improvements that make up MCB2. However, neither NCDOT's thoroughfare plans for Dare and Currituck counties (NCDOT, July 1988 and March 1999, respectively) or the STIP include widening NC 12 to four lanes in Currituck County, NC 12 to three lanes in Dare County, or widening of US 158 from the Wright Memorial Bridge to NC 12, indicating NCDOT has no current short-term or long-term plans to implement these components of MCB2. If these improvements are eventually implemented, a separate environmental document and permits would be required.

***MCB3***

Ability to Meet Purpose and Need. MCB3 would involve a Mid-Currituck Bridge and limited improvements to US 158 and NC 12. Without the widening of much of NC 12

and US 158 between the Wright Memorial Bridge and NC 12, the travel benefits would be less than MCB1 and MCB2, but still notable. For example, there would be a 37 percent reduction in congested travel compared to the 64 percent and 50 percent reductions associated with MCB1 and MCB2, respectively. Travel time via the Wright Memorial Bridge would decrease 31 percent compared to the 53 percent and 44 percent reductions associated with MCB1 and MCB2, respectively. The travel time benefit of using the bridge would be identical (up to a 93 percent reduction over the current route) to MCB1 and MCB2. MCB3 would provide less of an improvement in hurricane clearance times assuming the provision of a third northbound lane at 26.6 hours. The clearance time with a contraflow lane would be 27.4 hours, identical to MCB1 and MCB2. The difference in the one number results because there are no improvements in MCB3 along US 158 east of the Wright Memorial Bridge. Such an improvement is included in MCB4. While less than MCB1 and MCB2, the benefits of MCB3 are substantial: it would reduce congestion, reduce travel times, improve hurricane evacuation, and provide a new link in the transportation system across Currituck Sound. Therefore, MCB3 would meet the four elements of the purpose and need.

Economic Feasibility. A combination of toll revenue bonds and TIFIA financing (which is also supported by toll revenues) would cover most of the cost of this alternative. It is expected within the context of a public-private partnership (which would finance the project for a longer term than traditional toll revenue bonds) that the entire project could be funded.

Potential Impacts on Natural Resources. The natural resource impacts for MCB3 would be less than those for MCB1 and MCB2, since less roadway improvements would be built.

Potential Impacts to Communities. MCB3 would result in 11 displacements—the lowest of any ER or MCB alternative. Similar to MCB1 and MCB2, the bridge component would pass through the community of Aydlett on the mainland.

Conclusions. MCB3 meets the purpose and need, is economically feasible, and does not involve high numbers of social or natural resource impacts, such as the displacement levels associated with ER1 and MCB1. While MCB3's benefits are lower than MCB1 or MCB2, it can serve as a substantial step in reducing congestion in the project area. The other improvements associated with MCB1 and/or MCB 2 could be made when funding is available as described in the conclusions for MCB2. Therefore, MCB3 is considered a reasonable alternative and will be carried forward for detailed study in the DEIS.

***MCB4***

Ability to Meet Purpose and Need. MCB4 would offer the same benefits of MCB3, plus the additional benefit of being able to achieve a hurricane clearance time of 21.8 hours through the inclusion of a third outbound lane on US 158 between the Wright Memorial Bridge and NC 12.

Economic Feasibility. Similar to MCB3, a combination of toll revenue bonds and TIFIA financing would cover most of the cost of this alternative. It is expected within the context of a public-private partnership, (which would finance the project for a longer term than traditional toll revenue bonds) that the entire project could be funded.

Potential Impacts on Natural Resources. The natural resource impacts for MCB4 would be identical to MCB3. The additional US 158 improvement included in MCB4 would not involve additional impacts on wetlands or high-quality natural resources.

Potential Impacts to Communities. Like MCB3, MCB4 would result in 11 displacements—the lowest of any ER or MCB alternative. As with all the MCB alternatives, the bridge component would pass through the community of Aydlett on the mainland.

Conclusions. For the same reasons as MCB3, MCB4 is considered a reasonable alternative. MCB4 meets the purpose and need, is economically feasible, and does not involve high numbers of social or natural resource impacts, such as the displacement levels associated with ER1 and MCB1. MCB4 will be carried forward for detailed study in the DEIS.

After identifying MCB3 and MCB4 as reasonable alternatives for evaluation in detail in the DEIS, NCTA focused its attention on further avoiding and minimizing natural resource impacts during the development of preliminary design drawings for these alternatives. These engineering refinements to MCB3 and MCB4 are discussed in Section 5.0.

## 2.2 Additional Alternatives Considered and Eliminated

In addition to considering the ER (existing-road) and MCB (Mid-Currituck Bridge) alternatives, NCTA also considered a range of other potential project concepts to determine whether they should be carried forward for detailed study. These alternatives include: (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.

This section discusses each of these alternatives. For each alternative, the report describes the concept, presents evaluation findings, and explains why the concept was not carried forward for detailed study. The travel benefits associated with each of these alternatives are presented in Table 3.

## Table 3. Travel Benefits of Other Alternatives Considered

| | Shift Rental Times | TSM | Bus Transit | Ferry Alternatives | | | |
|---|---|---|---|---|---|---|---|
| | | | | F1 | F2 | F3 | F4 |
| **2035 Traffic Flow Benefits** | | | | | | | |
| Reduction in Congested Annual Millions of VMT | | | | | | | |
| • At LOS E or F | 1% | 5% | 0% | 56% | 30% | 15% | 15% |
| • At LOS F | 5% | 9% | 0% | 52% | 31% | 20% | 20% |
| • At a poor LOS F | 14% | 1% | 0% | 100% | 100% | 22% | 22% |
| Reduction in Miles of Road Operating at LOS F | | | | | | | |
| • Summer Weekday (SWD) | 0% | 8% | 0% | 100% | 60% | 38% | 38% |
| • Summer Weekend (SWE) | 5% | 0% | 0% | 34% | 8% | 5% | 5% |
| • Weighted Average of SWD & SWE | 3% | 3% | 0% | 64% | 31% | 20% | 20% |
| Reduction in Miles of Road Operating at a poor LOS F | | | | | | | |
| • Summer Weekday (SWD) | 0% | 0% | 0% | 100% | 100% | 0% | 0% |
| • Summer Weekend (SWE) | 28% | 0% | 0% | 100% | 100% | 28% | 28% |
| • Weighted Average of SWD & SWE | 10% | 0% | 0% | 100% | 100% | 10% | 10% |
| **2035 Travel Time Benefit Aydlett Road to Albacore Street** | | | | | | | |
| Percent Reduction in Summer Travel Time via Wright Memorial Bridge (weighted average of SWD & SWE) | 1% | 11% | 0% | 50% | 26% | 11% | 11% |
| Percent Reduction in Summer Travel Time via Currituck Sound Crossing (weighted average of SWD & SWE) | NA | NA | NA | 59% | 59% | 59% | 59% |
| **2035 Hurricane Evacuation Benefit** | | | | | | | |
| Clearance Time with US 158 Northbound Contraflow Lane | No contraflow lane | 27.4 hrs | No contraflow lane | 27.4 hrs | 27.4 hrs | 27.4 hrs | 27.4 hrs |
| • Percent of a Reduction from 36.3 hours to 18 hours | 0% | 50% | 0% | 49% | 49% | 49% | 49% |
| • Amount Above 18-hour Goal | 18.3 hrs | 8.9 hrs | 18.3 hrs | 8.9 hrs | 8.9 hrs | 8.9 hrs | 8.9 hrs |
| Clearance Time with US 158 Third Northbound Lane | No third northbound lane | No third northbound lane | No third northbound lane | 21.8 hrs | 21.8 hrs | 26.6 hrs | 21.8 hrs |
| • Percent of a Reduction from 36.3 hours to 18 hours | 0% | 0% | 0% | 79% | 79% | 53% | 79% |
| • Amount Above 18-hour Goal | 18.3 hrs | 18.3 hrs | 18.3 hrs | 3.8 hrs | 3.8 hrs | 8.6 hrs | 3.8 hrs |
| **System Linkage and Efficiency Benefit** | | | | | | | |
| Percent Reduction in Total Annual Millions of VMT | 0% | 0% | 0% | 3% | 3% | 3% | 3% |
| Consistent with Strategic Highway Corridor Vision Plan | No | No | No | No | No | No | No |
| Consistent with Intrastate System Designations | No | No | No | No | No | No | No |

[1] The absolute numbers associated with the percents shown are included in Table 7 in the Appendix.

### 2.2.1 Shifting Rental Times

#### *2.2.1.1 Description of Alternative*

The project area includes a substantial number of vacation rental properties that commonly rent by the week with their peak use being in the summer (June to August). The distribution of rental unit check-ins and check-outs in the project area is 70 percent on Saturday, 25 percent on Sunday, and 5 percent on Friday. It is on the summer weekend during rental unit check-out and check-in that the highest traffic volumes in the project area occur. The Shift Rental Times Alternative assumes that shifting arrival times and check-ins to an even distribution amongst Friday, Saturday, and Sunday would improve the project area traffic flow. NCTA has no authority to compel implementation of the Shift Rental Times Alternatives, nor does any other state agency.

#### *2.2.1.2 Analysis and Conclusions*

The Shift Rental Times Alternative would—if implemented—result in some reduction in congestion on NC 12 and US 158 during summer weekends, but it would provide no benefits during other times and would not provide any reduction in hurricane clearance times. See Table 3. Also, this alternative would not address the system-linkage element of the purpose and need. In light of the difficulty of implementing this alternative, as well as its limited benefits, the Shift Rental Times Alternative would not meet the Purpose and Need and is not a reasonable alternative. Therefore, it will not be carried forward for detailed study in the DEIS.

### 2.2.2 Transportation Systems Management (TSM)

#### *2.2.2.1 Description of Alternative*

TSM alternatives are defined as alternatives that seek to maximize the efficiency of the existing transportation system without a major capital investment. For purposes of this report, the TSM Alternative includes:

- Optimizing signal timing on US 158 and NC 12 in the project area to improve traffic flow through signalized intersections;
- Improving major intersections on NC 12 (those that service numerous homes) with left turn lanes and/or traffic signals; and
- Restricting side-road access on some other intersections, generally in the form of right in-right out only limits from local streets and, where alternate access is available, intersection closures to reduce the number of points where drivers would slow to make turns.

In addition, this alternative includes provisions for reversing lanes on US 158 from NC 168 in Currituck County to NC 12 in Dare County during a hurricane evacuation.

This is an approach to facilitating hurricane evacuation that focuses on maximizing the efficiency of the current road system.

#### *2.2.2.2 Analysis and Conclusions*

The TSM Alternative could not be implemented by NCTA, because it would not involve a toll facility, but could be implemented by NCDOT or local governments. If implemented, the TSM Alternative would provide very modest congestion relief and reduction in travel times to the Currituck County Outer Banks (see Table 3). Its contraflow lane would reduce hurricane clearance times. This alternative would not meet the system-linkage goal of the project. Taking all of these factors into consideration, the TSM Alternative would not meet the purpose and need and is not a reasonable alternative. Therefore, it will not be carried forward for detailed study in the DEIS.

### 2.2.3 Bus Transit

#### *2.2.3.1 Description of Alternative*

This alternative would introduce bus transit into the project area with the objective of reducing the number of private vehicles traveling throughout the project area. Specific design and operational characteristics of the Bus Transit Alternative were not developed pending a finding on whether or not the potential benefits of transit made it an option worth pursuing in further detail.

In considering the Bus Transit Alternative, the following was taken into account:

- Existing bus transit service is minimal and no plans for public transit exist within the project area.
- FHWA guidance (Technical Advisory T 6640.8A) indicates that customarily transit is "considered as a potential alternative on proposed major highway projects in urbanized areas over 200,000 population." This project is not in such an urbanized area.
- There is no single concentrated destination where most trips go, such as a central business district in an urban area. Rather, people go to and from many scattered destinations.
- Transit service in resort areas usually involves transit circulating in an area of concentrated activity such as an area of high-rise hotels and night clubs, which the project area does not have and neither does the Outer Banks as a whole.
- In urban areas with a single concentrated destination only about 10 percent of trips use transit.

There are two types of trips that a transit service could attempt to serve in order to make a contribution to reducing congestion:

1. Summer Weekend Trips. On the summer weekend, it is the tourist trips arriving in the area and departing the area to return home. It is highly unlikely that these trips could be captured by transit, for the following reasons:

   - Visitors to the project area currently come by automobile carrying personal items needed for an up to week-long stay. They often bring children.

   - In order to capture these travelers, they would have to be willing to spend the time to load their luggage and other personal items into a bus, ride a bus with multiple stops along the way, walk with their luggage from the bus to the real estate office to check-in, board another bus with luggage to get into the general vicinity of their final destination (buses could not stop at every beach home), and finally walk with their luggage to their beach home or other destination. This clearly would be very time consuming and inconvenient.

   - No benefits of transit exist that would offset the time and inconvenience defined in the previous bullet to make transit attractive.

2. Summer Weekday Trips. On the summer weekday, the predominant type of trip is people moving between low density and dispersed origins and destinations. As noted above, even in urban areas with land use patterns that facilitate transit, one cannot expect to capture more than 10 percent of the trips. In the Raleigh-Durham Metropolitan area 2 to 3 percent of the work trips are on transit. Thus, it is expected that the number of summer weekday trips that could be captured would be less than 10 percent. In addition, most people use transit because it will save them time, parking at their destination is unavailable or expensive, incentives are offered by employers, or they do not own or have access to an automobile. Only travel time would apply in the Outer Banks, and bus transit service on the Outer Banks would operate on the same congested roads as other traffic.

In order to develop an estimate of the percent of trips that could be attracted to transit, the study team compared the travel time on NC 12 from the US 158/NC 12 intersection to Albacore Street in Currituck County (16.8 miles) on a bus under uncongested conditions to the time to drive from US 158 to Albacore Street with the No-Build Alternative. The analysis included estimates for the amount of time required for passengers to walk to the bus (7.5 minutes), wait for the bus (15 minutes, assuming 30-minute headways), ride the bus with the bus stopping every one-half mile for one minute to take on passengers, and walk to their destination (7.5 minutes). It was assumed that if the bus under uncongested conditions takes longer to make this trip than an automobile under worst-case congested conditions (No-Build Alternative), then it could be concluded that transit would offer no benefit. On the other hand, if the

uncongested bus travel time is less than the congested automobile travel time, then it could be assumed that the Bus Transit Alternative could potentially take some automobiles off of the roadway network until the two travel times for this trip are equal.

Based on the methodology above, it was found that bus travel times under uncongested conditions were greater (94 minutes) than automobile travel times on summer weekdays under congested conditions (55 to 65 minutes depending on the direction of travel). Thus, it is likely that bus transit would be little used if provided. However, some use might occur, so it was assumed that 1 percent of trips on NC 12 would use bus transit if provided. This assumption of 1 percent transit usage provided the basis for estimating the benefits of the Bus Transit Alternative in Table 3.

#### *2.2.3.2 Analysis and Conclusions*

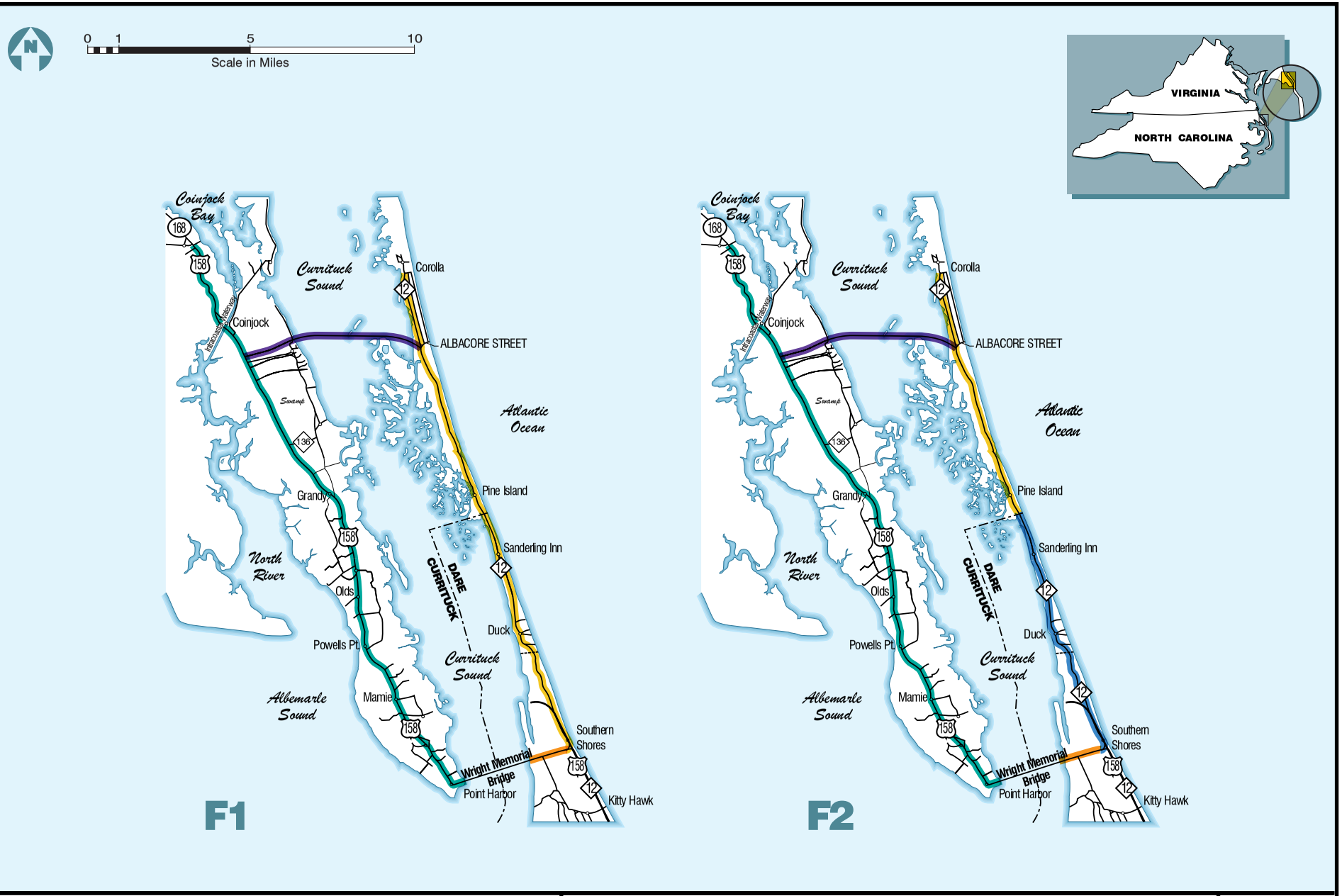
The Bus Transit Alternative could not be implemented by NCTA, because it would not involve a toll facility, but could be implemented by local government. If implemented, the Bus Transit Alternative would provide almost no congestion relief and no reduction in travel times to the Currituck County Outer Banks (see Table 3). It makes provision only for trips on the Outer Banks. Thus, it would offer no hurricane clearance time benefit for those leaving the area during an evacuation. This alternative would not meet the system-linkage goal of the project. Taking all of these factors into consideration, the Bus Transit Alternative would not meet the purpose and need and is not a reasonable alternative. Therefore, it will not be carried forward for detailed study in the DEIS.

### 2.2.4 Ferry Alternatives

#### *2.2.4.1 Description of Alternatives*

Four ferry alternatives are assessed, F1, F2, F3, and F4, with the F standing for "ferry." A ferry was considered as a possible alternative to a Mid-Currituck Bridge. Thus, each alternative assumes that a ferry is used in place of a bridge. The non-ferry components of F1 and F2 are the same as ER1 and ER2, creating a ferry equivalent of MCB1 and MCB2, respectively. F3 and F4 are the ferry plus improvements to US 158 needed to reduce hurricane clearance times, creating a ferry equivalent to MCB3 and MCB4, respectively. Figure 9 and Figure 10 show the ferry routes and each of the related highway improvements. The basic features of the ferry alternatives are:

- **F1**
  - Providing a ferry service across Currituck Sound;
  - Adding a third northbound lane on US 158 from NC 168 to the Wright Memorial Bridge as a hurricane evacuation improvement or using the center turn lane as a third northbound evacuation lane;

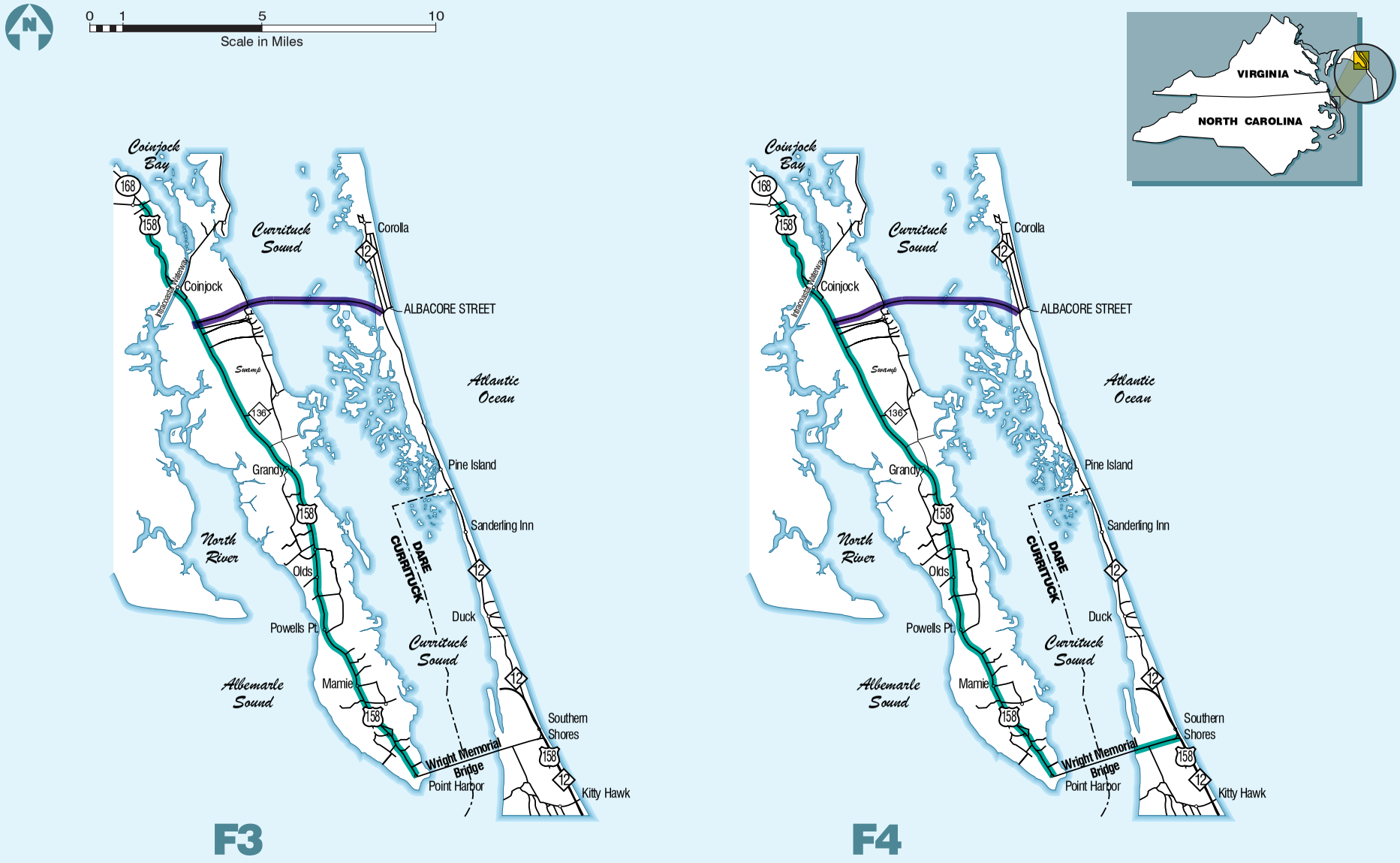



LEGEND

- Eight Lanes
- Six Lanes
- Four Lanes
- Three Lanes
- Third Northbound Lane or Contraflow Lane
- Ferry Service

# Ferry Alternatives F1 and F2

Figure 9




LEGEND

- Eight Lanes
- Six Lanes
- Four Lanes
- Three Lanes
- Third Northbound Lane or Contraflow Lane
- Ferry Service

# Ferry Alternatives
# F3 and F4

**Figure**
10

  - Widening US 158 to eight lanes between the Wright Memorial Bridge and the NC 12 intersection; and
  - Widening NC 12 to four lanes between the US 158 and Corolla.

- **F2**
  - Providing a ferry service across Currituck Sound;
  - Adding a third northbound lane on US 158 from NC 168 to the Wright Memorial Bridge as a hurricane evacuation improvement or using the center turn lane as a third northbound evacuation lane;
  - Widening US 158 to eight lanes between the Wright Memorial Bridge and the NC 12 intersection; and
  - Widening NC 12 to three lanes between US 158 and the Dare-Currituck County Line and to four lanes between the Dare-Currituck County Line and Corolla.

- F3
  - Providing a ferry service across Currituck Sound; and
  - Adding a third northbound lane on US 158 from NC 168 to the Wright Memorial Bridge as a hurricane evacuation improvement or using the center turn lane as a third northbound evacuation lane.

- F4
  - Implementing the components of F3; and
  - Adding a third northbound lane on US 158 between the Wright Memorial Bridge and NC 12 as an additional hurricane evacuation improvement.

For the Ferry Alternative, whether or not it meets the purpose and need depends on how the ferry component is defined. It would be possible to create a ferry service that provides the same level of service improvement as a Mid-Currituck Bridge. In examining the characteristics of a ferry service that would have the same travel benefits as a bridge, it was found that eight typical NCDOT ferry services would be needed to provide summer weekday travel benefits equivalent to a bridge, and 10 typical NCDOT ferry services would be needed to provide summer weekend travel benefits equivalent to a bridge. A typical NCDOT ferry service includes four operating ferries with a combined capacity of 80 vehicles per hour operating out of two ferry terminals, one at

the origin and one at the destination. Creating such a service would raise the following issues:

- Much of the cost and impact associated with the approach road to a bridge over Currituck Sound (including the US 158 interchange and the bridge across Maple Swamp) would remain because the approach road would be required to provide the large number of ferry users access to the ferry terminals.

- Substantial land with associated impacts to communities and habitat would be required for the construction of the ferry terminals. The land needed for terminals would be 30 to 40 acres with 10 typical ferry services.

- Substantial impacts to the sound bottom and its habitat would result. Dredging the channels for 10 typical ferry services would affect 2,190 acres of Currituck Sound bottom and require the disposal of 45 million cubic yards of material every five years.

- Initial capital costs would be more than the cost of a Mid-Currituck Bridge.

- Operating costs would be high and typically NCDOT only recovers 25 percent of its costs on existing ferries that charge a fare.

Given the above findings, which indicate that providing a ferry operation that would serve travel demand similar to a bridge could not be accomplished without substantial cost and potential for environmental impact, it was decided that providing such a ferry service level was not practical. Therefore, the following assumptions were used in defining the ferry component of the ferry alternatives:

- The Ferry Alternatives uses equipment and has operating characteristics similar to the current ferry service operated by NCDOT which, because of NCDOT's many years of experience in operating ferry service in North Carolina, is assumed to have the equipment and operating characteristics best suited for North Carolina waters. The Ferry Alternative would build on and complement the existing North Carolina ferry service.

- For the Ferry Alternative to be a viable alternative to a bridge, it should not cost substantially more than the total cost (capital, operation, and maintenance) of a bridge over 50 years.

The study team considered the cost of typical ferry operations over 50 years compared to the cost of building, operating, and maintaining a Mid-Currituck Bridge over the same period. The total cost of a single ferry service over 50 years would be approximately $300 million. The same cost for a two-lane Mid-Currituck Bridge would be approximately $500 million. Thus, the cost of two ferry services would higher but roughly equivalent to a two-lane Mid-Currituck Bridge. Given the limited capacity of

ferry service, three typical ferry operations were assumed for the ferry component of F1 to F4 for comparison with a Mid-Currituck Bridge. Thus, the benefits presented in this analysis of a ferry in contrast with a bridge would come at an estimated cost of that is almost twice as much as the bridge project. Two or one ferry service would cost less but have less travel benefit than three ferry services.

Based on estimates provided by the NCDOT Ferry Division for construction and operation of a single typical ferry operation times three, the ferry component of F1 to F4 would involve a capital cost of $200 million (2007 dollars) for ferries and facilities and approximately $700 million dollars (2007 dollars) in operating costs over 50 years, including replacement of the ferry boats after 30 years of use.

#### *2.2.4.2 Analysis and Conclusions*

The Ferry Alternatives would provide minimal additional benefits, at a much higher cost, than the comparable existing road (ER) or Mid-Currituck Bridge (MCB) alternatives.

Alternative F1. F1 would combine a ferry service with the road improvements contained in ER1. As explained above, the ER1 alternative itself is unreasonable because of its high cost and high number of displacements. Combining a ferry service with ER1 would compound the shortcomings of that alternative. The alternative would become more expensive, yet the benefits would barely increase. Comparing the findings in Table 2 and Table 3 for ER1 and F1, respectively, the addition of a ferry service would offer minimal or no additional reductions in miles of road operating at LOS F overall or a poor LOS F. Other measures of travel benefit also change either by small amounts or not at all with the addition of a ferry service to ER1. Alternative F1 is not a reasonable alternative because of its high cost and small incremental benefits compared to ER1 combined with the limitations of ER1. Additionally, Alternative F1 does not meet the system-linkage need; is not economically feasible; has high displacements, and would cause community fragmentation.

Alternative F2. Alternative F2 combines a ferry service with the road improvements contained in Alternative ER2. As explained above, the ER2 alternative is unreasonable because it does not meet the system-linkage need and it is not economically feasible. Adding the cost of the ferry service to ER2 would raise the cost, which makes it more economically infeasible. In addition, the incremental benefits offered by the ferry service, although greater than the incremental benefits between ER1 and F1, are still small in relation to the additional cost. (The one notable benefit of adding ferry service to ER2 is eliminating road operations at a poor LOS F.) Therefore, Alternative F2 is not a reasonable alternative.

Alternatives F3 and F4. Alternatives F3 and F4 combine a ferry service with the hurricane evacuation-related improvements on US 158 associated with MCB3 and MCB4. Improvements to NC 12 south of the ferry terminals (like those south of the

MCB3 and MCB Outer banks terminus) are not needed since the number of vehicles using the ferry service would be lower than a bridge given the ferry service's lower capacity.

Comparing F3 and F4 (Table 3) to their counterparts (MCB3 and MCB4 in Table 2) highlights the vast difference in performance between a ferry service and a bridge. For the same investment, the bridge would provide far greater transportation benefits. Because of their equivalent total cost (capital and operating) and minimal benefits, Alternatives F3 and F4 are not reasonable alternatives.

Ferries and Hurricane Evacuation. In terms of hurricane evacuation, a ferry would not achieve the hurricane evacuation benefit associated with a Mid-Currituck Bridge. As noted in Section 2.1.1.2 under "Assumptions—US 158 Hurricane Evacuation Improvements," the Mid-Currituck Bridge would eliminate the need for a third northbound lane or using the center turn lane as a third northbound emergency lane on US 158 between a Mid-Currituck Bridge and the Wright Memorial Bridge. Instead, the additional northbound lane would be needed for the full distance between the NC 168 and the Wright Memorial Bridge with the Ferry Alternative for the following reasons:

- The Ferry Division shuts down its operations 12 hours before the arrival of tropical or gale force winds in order to get its equipment and personnel to safety. Thus, the ferry would not operate for 12 of the 21.4 to 27 hours of clearance time associated with the MCB alternatives.
- Travel during an evacuation peaks during the middle 50 percent of the clearance time. Thus, the ferry service would not operate during the entire period of peak evacuation traffic.

Environmental Impacts of Ferry Alternatives. As explained above, the ferry alternatives were eliminated from further consideration primarily because they provide minimal additional benefits, at great additional cost. Given these shortcomings, ferry alternatives were not developed to the extent that would be needed to calculate impacts on natural resources and communities. However, based on standard assumptions for operation of a ferry service, general estimates were developed. A single ferry service would require:

- 3 to 4 acres of land for ferry terminals;
- 261,000 cubic yards of dredging annually for the access channel;
- 2,400,000 cubic yards of dredging every 5 years for the navigation channel;
- 400,000 cubic yards of dredging annually for turning basins;
- 57,050,000 cubic yards of dredging total over 50 years;
- 20 acres of Currituck Sound bottom affected by dredging for the access channel;

- 186 acres of Currituck Sound bottom affected by dredging for the navigation channel;
- 31 acres of Currituck Sound bottom affected by dredging for turning basins; and
- 237 acres of Currituck Sound bottom affected in total by dredging.

These preliminary estimates apply to a single typical ferry service. If three ferry services were provided, as assumed in the analysis of Alternatives F1 to F4, these impacts would be tripled. The acres of sound bottom dredged would rise from 237 acres to 711 acres. The total land required for ferry terminals and associated community impacts in Aydlett on the mainland and community and natural resource impacts on the Outer Banks would be nine to 12 acres. Thus, environmental impacts would provide an additional basis for eliminating the ferry alternatives.

## 2.3 Agency Comments

The alternatives screening analyses for this project have been discussed with federal and state environmental resource and regulatory agencies in a series of Turnpike Environmental Agency Coordination (TEAC) meetings in 2006 and 2007. The TEAC meetings were conducted under a Coordination Plan that satisfies the requirements for interagency coordination on transportation projects under Section 6002 of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) (23 USC § 139). SAFETEA-LU authorizes the federal surface transportation programs for highways, highway safety, and transit for the 5-year period 2005 to 2009.

Alternatives analyses for the Mid-Currituck Bridge Project were discussed with the agencies at meetings held on: January 17, April 18, May 23, June 20, July 18, August 15, September 19, and November 14, 2007. The TEAC also met in the study area on July 10, 2007. At the June 20 and July 18, 2007 TEAC meetings, FHWA and NCTA presented their recommendations for the Mid-Currituck Bridge detailed study alternatives for discussion and requested written comments within 30 days. FHWA and NCTA initially recommended carrying forward only MCB3; in response to comments from agencies, MCB4 was developed and carried forward.

Many of the issues raised and discussed at the TEAC meetings and in correspondence from the agencies have been resolved. For example, the definition of the Ferry Alternatives was developed and MCB4 was included in the analysis based on comments raised at the TEAC meetings. There also was general agreement that ER1 and MCB1 should not be evaluated in detail in the DEIS because of the substantial displacement of existing land uses that would occur in Dare County if NC 12 were widened to four lanes. These agency comments presented in this draft alternatives screening report were submitted based on a draft comparison of alternatives that evaluated the MCB

alternatives as a four-lane bridge. Also, the agency comments were based on a version of the draft Statement of Purpose and Need that did not include system-linkage objectives as part of the purpose and need.

However, in comments submitted in August and October 2007, several of the agencies expressed a desire for additional alternatives to be carried forward for detailed study. The principal agency comments, together with responses, are summarized below.

- Alternative MCB2. The US Army Corps of Engineers (USACE) representative requested that MCB2 be retained for detailed study because of its potential for additional traffic benefits. FHWA and NCTA have considered this comment. As discussed above in Section 2.1.2.2 under "MCB2," MCB2 is not practical or feasible from an economic standpoint because of its high cost in relation to the funding capacity of the toll bridge.

  Also, implementation of MCB3 or MCB4 (the selected detailed study alternatives) would not preclude NCDOT from implementing the NC 12 and US 158 widening improvements that make up MCB2 that are not included in MCB3 and MCB4 when resources are available, either in total or in parts. They could be implemented without additional cost (except that associated with inflation) or environmental impact compared with implementing MCB2 as a single project. Nothing built as a part of MCB3 or MCB4 would be lost with the addition of the remaining improvements that make up MCB2. NCDOT has no current short-term or long-term plans to implement the road widening components of MCB2.

- Alternative ER2. The North Carolina Wildlife Resources Commission (NCWRC), the North Carolina Department of Natural Resources (NCDENR) Division of Marine Fisheries (DMF), the US Environmental Protection Agency (USEPA), NCDENR Division of Water Quality (DWQ), and NCDENR Division of Coastal Management (DCM) each asked in written letters that the ER2 alternative be retained for detailed study. The reasons why included: its potential for less wetland, habitat and natural resource impacts; a desire to have a non-bridge alternative for detailed study; and a disagreement that its slightly higher displacements, poor affordability and lesser travel benefits are not suitable reasons for its elimination. FHWA and NCTA have considered this comment. As indicated in Section 2.1.2.2 under "ER2," ER2 is not a reasonable alternative because it does not meet the system-linkage need and it is not economically feasible.

- Use of Economic Feasibility to Screen Alternatives. The USEPA indicated a concern over the consideration of affordability as a criterion for selecting detailed study alternatives. Its representatives felt that feasibility from an economic standpoint should not be a part of the decision because none of the alternatives considered that offered substantial travel benefits had committed to cover the full cost of the project. NCTA, however, is confident that MCB3 and MCB4 can be fully funded within the

context of current law and policy where that would not be possible with the other alternatives.

- Comment Opportunities. The TEAC representatives indicated a desire to provide additional comment after alternatives study findings were presented to the public. FHWA and NCTA agreed to provide this opportunity for the agencies, following a public workshop and public comment period and an opportunity to review this April 2008 draft of the *Alternatives Screening Report*.

## 2.4 Public Comments

Citizens Informational Workshops were held in three locations around the Currituck Sound: Corolla (Currituck Outer Banks), Currituck (Mainland), and Southern Shores (Dare County Outer Banks) on February 26, 27, and 28 respectively. These meetings were informal, open house informational sessions that provided the public an opportunity to learn about the project and discuss issues with project staff. Of the 292 comments received during a comment period that ended March 28, 2008, 186 indicated they preferred the construction of a bridge and 28 indicated they favored widening existing roads. Primary reasons for favoring a bridge were reduced future congestion, improved hurrican evacuation times, and potential positive economic impacts. Primary concerns related to a Mid-Currituck Bridge project were: natural resource impact, changes in views of Currituck Sound, increased day visitors, increased crime, community impacts (particularly in Aydlett), and that a bridge would not completely solve area traffic problems. Those who favored widening existing roads also felt that such an alternative would reduce congestion and facilitate huricane evacuation. Primary concerns with widening existing roads included: changes in community character, the safety of pedestrians that cross NC 12, negative economic impacts from loss of business parking, and health risks associated with traffic and their emissions being closer to residences. Eleven respondents indicated that they favored the No-Build Alternative, primarily because the traffic problem in the project area is currently confined to summer weekends. A majority of comments regarding tolling, spoke favorably about this financing tool. Some comments noted that improved pedestrian and bicycle access should be provided regardless of the alternative pursued. Local officials, both at local officials meetings held on February 27 and 28 and in resolutions, indicated that they favored the bridge project over widening existing roads.

No comments were received related to the other alternatives considered and rejected except the ferry alternative. The ten comments regarding ferry service were equally split between proponents and opponents. Several expressed concern that ferry service had been tried and was unsuccessful. Others noted that the sound is too shallow and could not sustain ferry service. Some respondents noted that tourists might enjoy the novelty of a ferry and be inclined to use it.

# 3.0 Bridge Corridor Screening

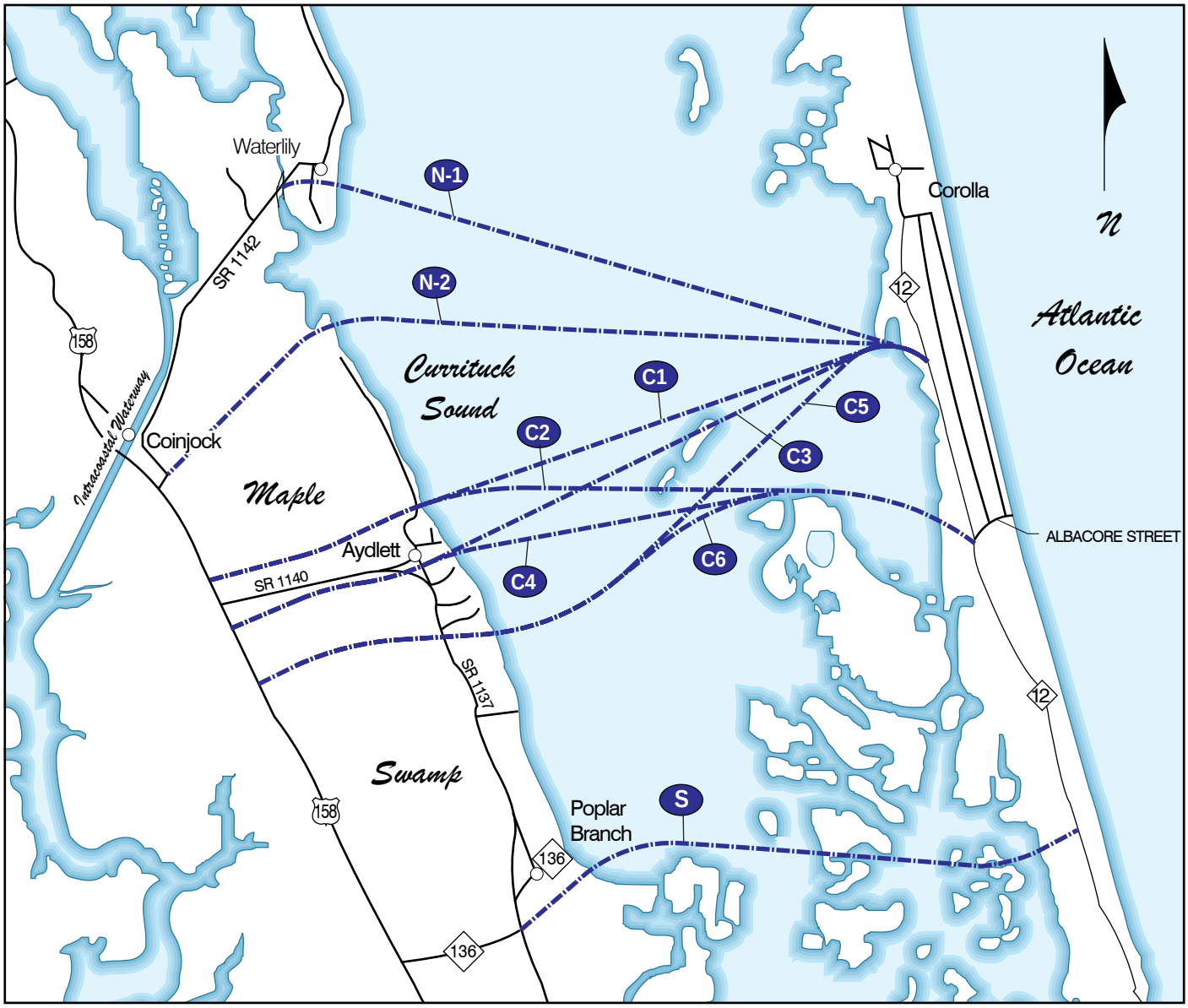
The bridge corridor screening identified and evaluated potential locations for a two-lane toll bridge across Currituck Sound. The starting point for this screening was a review of the bridge corridors discussed in an *Alternatives Study Report* prepared in 1995 by NCDOT, which subsequently was presented in a DEIS prepared for the Mid-Currituck Bridge Project and released for public review in 1998. This DEIS will be rescinded by FHWA. This earlier work is referred to as the 1995 studies in the rest of this report.

The 1995 studies focused on the evaluation of nine corridor alternatives called:

- **N1**—Parallel to SR 1142 and across the Sound to the north end of Monteray Shores.
- **N2**—Between Waterlily and Aydlett and across the Sound to the north end of Monteray Shores.
- **C1**—Parallel to the power line right-of-way and across the Sound to the north end of Monteray Shores.
- **C2**—Parallel to the power line right-of-way and across the Sound to the Official Map site.
- **C3**—Parallel to SR 1140 and across the Sound to the north end of Monteray Shores.
- **C4**—Parallel to SR 1140 and across the Sound to the Official Map site.
- **C5**—Between Aydlett and Poplar Branch and across the Sound to the north end of Monteray Shores.
- **C6**—Between Aydlett and Poplar Branch and across the Sound to the Official Map site.
- **S**—Parallel to NC 3, while avoiding the center of Poplar Branch, and across the Sound to the Currituck Shooting Club.

These corridors are illustrated in Figure 11. The 1995 studies identified alternatives C1 to C6 as the reasonable bridge corridor alternatives to be evaluated in detail in a DEIS.

The 1995 study findings were considered to be a reasonable starting point for the identification of bridge corridors for detailed evaluation in the 2008 DEIS. A review of the merits of these nine corridors was completed in the context of the current 2008 alternatives studies. The review focused on whether changes had occurred in the




**Legend**

Corridor Alternatives

**North**

- **N-1** SR 1142/Corolla Bay
- **N-2** Between Waterlily and Aydlett/Corolla Bay

**Central**

- **C-1** Parallel to Power Line/Corolla Bay
- **C-2** Parallel to Power Line/Albacore Street
- **C-3** Parallel to SR 1140/Corolla Bay
- **C-4** Parallel to SR 1140/Albacore Street
- **C-5** Between Aydlett and Poplar Branch/Corolla Bay
- **C-6** Between Aydlett and Poplar Branch/Albacore Street

**South**

- **S** NC 136/The Currituck Club

**1995 Preliminary Corridor Alternatives**

**Figure** 11

settings of the nine corridors between 1998 and 2007 that could result in corridor selection decisions different from those associated with the 1995 studies. The review was based primarily on an examination of aerial photography and the same GIS information listed in Section 2.1.2.1 under "Potential Impacts on Natural Resources and Communities" that was used in the comparison of project concepts. It was determined as a result of this review that the reasons for eliminating the N and S corridors remained valid, and therefore this corridor screening focuses on the six C corridors. The primary changes in the setting of the six C corridors were some additional development in Aydlett along the C3/C4 corridor on the mainland and the presence of a subdivision (platted with infrastructure improvements but only one completed home in 2007) at the C1/C3/C5 corridor on the Outer Banks. The representative alignment used in the assessment of these corridors was adjusted to account for these changes in the development of the conceptual designs used in the assessment of these alternatives.

Section 3.1 evaluates the six C corridors, which are numbered C1 through C6 with the purpose of determining which are reasonable alternatives for evaluation in the DEIS. All six C corridors meet the purpose and need of the project. Therefore, the screening process for the six corridors focuses on their potential for environmental impact. This screening resulted in a decision to evaluate two bridge corridor alternatives in detail in the DEIS.

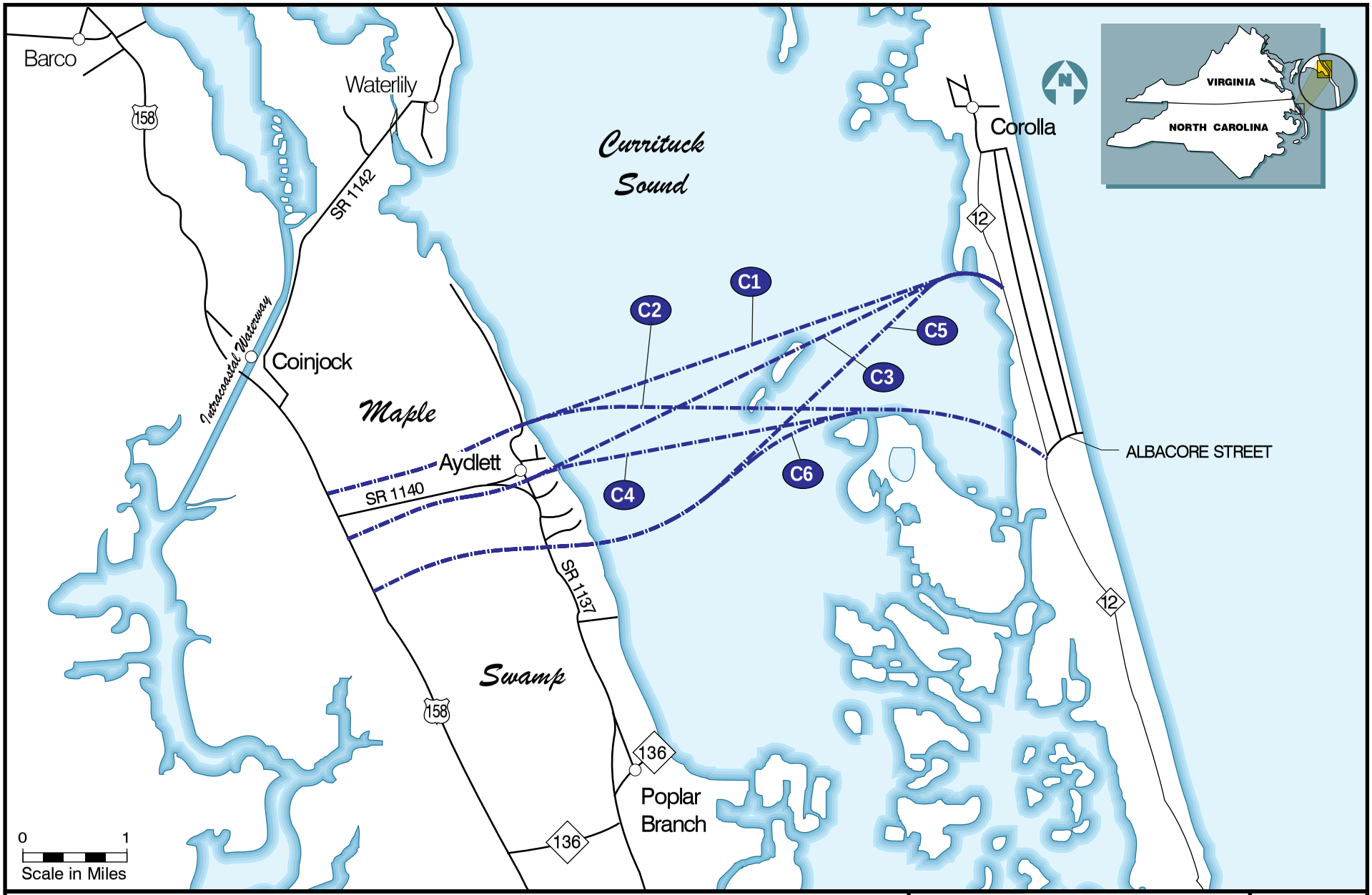
C1 and C2 were selected for detailed study in the DEIS. On the mainland, C1 and C2 share a single approach corridor, which parallels an existing powerline easement; on the Outer Banks, C1 and C2 have different bridge termini, one in the Albacore Street area and one approximately 2 miles north.

Section 3.2 reviews the other alternatives considered in the 1994 to1998 studies and why they were found not to be potential detailed study alternatives. In response to public comments received at the Citizens Informational Workshops conducted February 26 to 28, 2008, the merits of a bridge corridor that terminate on the mainland at the intersection of US 158 and NC 168 also are discussed. The results of the review of the 1994 to1998 study results also are presented in this section.

## 3.1 Bridge Corridor Alternatives

### 3.1.1 Development of Bridge Corridor Alternatives

Figure 12 shows the locations of corridors C1 through C6. The factors used in comparing C1 to C6 are presented in Table 4 . These are the same factors defined in NCDOT's Merger 01 process for comparing alternatives on new location. Added are right-of-way costs. Natural resource impacts are based on available GIS data bases available for the project area (see listed in Section 2.1.2.1 under "Potential Impacts on Natural Resources and Communities"), as well as a field review made to the project area




LEGEND

Bridge Corridors

**Corridors C1 and C3**

**Figure 12**

## Table 4. Comparison of Bridge Corridors C1 Through C6

| | | C1 | C2 | C3 | C4 | C5 | C6 |
|---|---|---|---|---|---|---|---|
| SOCIAL, ECONOMIC, AND CULTURAL IMPACTS | Major Utility Conflicts (yes or no) | No | No | No | No | No | No |
| | Railroad Crossings (number) | 0 | 0 | 0 | 0 | 0 | 0 |
| | Displacements (number) | | | | | | |
| | • Residences | 6 | 6 | 7 | 7 | 0 | 0 |
| | • Businesses | 0 | 1 | 0 | 1 | 1 | 0 |
| | • Cemeteries (all or part) | 1 | 1 | 1 | 1 | 0 | 0 |
| | • Recorded Historic Sites | 0 | 0 | 0 | 0 | 0 | 0 |
| | Rural Community Fragmentation on Mainland | Passes through Aydlett north of its center | | Passes through center of Aydlett | | At southern end of Aydlett | |
| | Beach Community Fragmentation on Outer Banks | Passes between 2 subdivisions taking southern end of one | None, in commercial area | Passes between 2 subdivisions taking southern end of one | None, in commercial area | Passes between 2 subdivisions taking southern end of one | None, in commercial area |
| | Greenway Crossings (number) | 0 | 0 | 0 | 0 | 0 | 0 |
| | Low Income or Minority Populations (yes or no) | No | No | No | No | No | No |
| | Potential Section 4(f) Impacts (yes or no) | No | No | No | No | No | No |
| | Hazardous Materials Sites (number completely or partially used) | 0 | 0 | 0 | 0 | 0 | 0 |

## Table 4. Comparison of Bridge Corridors C1 Through C6

| | | C1 | C2 | C3 | C4 | C5 | C6 |
|---|---|---|---|---|---|---|---|
| NATURAL RESOURCES IMPACTS | Known Federally-Listed Species Habitat (Natural Heritage Program) (number of areas affected) | 0 | 0 | 0 | 0 | 0 | 0 |
| | 100-Year Floodplain Impacts (yes or no) | Yes | Yes | Yes | Yes | Yes | Yes |
| | Habitat Fragmentation (Maple Swamp Bridged on Mainland) | Bridge corridor parallel to power line corridor; swamp forest lost; in vicinity of existing edge | | Bridge corridor parallel to Aydlett Road ; swamp forest lost; in vicinity of existing edge | | Bridge corridor is a new crossing ; swamp and bay forest lost; new edge created | |
| | Wetland Impacts | | | | | | |
| | • Crossings (number) | 3 | 3 | 4 | 4 | 4 | 4 |
| | • Total Area (acres; bridged is width of bridge times length) | 7.6 (fill) 13.7 (bridged) | 7.6 (fill) 14.6 (bridged) | 15.9 (fill) 12.2 (bridged) | 15.9 (fill) 13.1 (bridged) | 19.0 (fill) 10.5 (bridged) | 19.0 (fill) 11.4 (bridged) |
| | • Coastal (CAMA) wetland area (acres; bridged is width of bridge times length) | 1.1 (bridged) | 0.9 (bridged) | 1.1 (bridged) | 0.9 (bridged) | 1.1 (bridged) | 0.9 (bridged) |
| | Stream Impacts | | | | | | |
| | • Crossings (number) | 0 | 0 | 0 | 0 | 0 | 0 |
| | • Length in feet (within design construction limits) | 0 | 0 | 0 | 0 | 0 | 0 |
| | Potential Riparian Buffer Impacts (yes or no) | No | No | No | No | No | No |
| | Water Supply Critical Areas (yes or no) | No | No | No | No | No | No |
| | High Quality Resources | Maple Swamp; Gordonia Forest | Maple Swamp; Gordonia Forest | Maple Swamp; Gordonia Forest; North River/ Great Swamp | Maple Swamp; Gordonia Forest; North River/ Great Swamp | Maple Swamp; Gordonia Forest | Maple Swamp; Gordonia Forest |
| | | Forest is different character and quality than C3 to C6. and while of value is not as unique | | Bay forest exists but is thinner and smaller than C5 and C6. | | Passes though a bay forest unique primarily because of the large size of the trees. | |
| | • Crossings (number) | 2 | 2 | 2 | 2 | 2 | 2 |
| | • Area (acres) | 0.85 (fill) 12.9 (bridged) | 0.85 (fill) 12.9 (bridged) | 6.44 (fill) 10.8 (bridged) | 6.44 (fill) 10.8 (bridged) | 7.23 (fill) 9.2 (bridged) | 7.23 (fill) 9.2 (bridged) |

by the study team and representatives from state and federal environmental resource and regulatory agencies on July 10, 2007.

### 3.1.2 Evaluation of Bridge Corridor Alternatives

A comparison of the full range of factors yields the conclusion that the corridors show differences in their potential for impact only in relation to natural resource impact (in particular the location where impact occurs) and community fragmentation or division. Consideration of this information, as well as field trip results and written and oral comments made by environmental resources and regulatory agencies made at TEAC meetings in 2007, the following findings and conclusions were reached about the corridor alternatives.

#### *3.1.2.1 C5 and C6*

C5 and C6 on the mainland would minimize the fragmentation or division of the community of Aydlett associated with the bridge by passing through the community near its southern perimeter. Displacement would be confined to a single business. These corridors would have the highest potential for filling wetlands and would pass through a unique bay forest found within Maple Swamp. This forest is made up of loblolly bay (*Gordonia lasianthus*) and red bay (*Persea palustris*), with a few sweet bays (*Magnolia virginiana*). The NC Natural Heritage Program recognizes it as a Significant Natural Heritage Area called the "Maple Swamp Gordonia Forest." These corridors would add an additional break in the tree cover of Maple Swamp, further fragmenting the resource and creating a new forest edge. Finally, Great Swamp adjoins the western right-of-way edge of US 158, increasing the potential for impacts resulting from the interchange with US 158 included with the bridge project. The environmental resource and regulatory agency representatives agreed strongly that this corridor should be eliminated from consideration. The possibility exists that NCTA would not be able to obtain the Section 404 permit and associated Section 401 certification (both under the Clean Water Act) to build a bridge in this corridor because other practicable corridors with less natural resource impact exist. Because these corridors would potentially have the greatest natural impact and in particular a substantial effect on a unique natural area, the C5 and C6 corridors were not selected for detailed analysis in the DEIS, despite their lower potential community impact.

#### *3.1.2.2 C3 and C4*

C3 and C4 on the mainland would fragment or divide Aydlett by passing through the center of the community. Most of the seven displacements associated with these corridors would occur in the community of Aydlett. The natural resource impacts associated with this corridor would be similar to C5 and C6 with two exceptions where the impacts would be less:

- The corridor would be in the area of the bay forest where the bay trees are less frequent and smaller in diameter; and

- The corridor would be near an existing forest edge and habitat fragmentation point, Aydlett Road.

The environmental resource and regulatory agencies representatives indicated that it would be desirable to not consider a corridor south of Aydlett Road. Because of the remaining natural resource impacts, Aydlett community fragmentation, and the fact that the remaining corridors C1 and C2 showed a lower potential for impact in both these areas of concern, the C3 and C4 corridors were not selected for detailed evaluation in the DEIS.

#### *3.1.2.3 C1 and C2*

On the mainland, the corridors would pass through Aydlett, north of the center of the community. There would be six displacements, primarily along US 158. One cemetery would be displaced. This alternative would pass adjacent to the site of a structure (formerly a home) whose architectural features warrant it eligibility for inclusion in the National Register of Historic Places (NRHP). These corridors would have the least potential for wetland impacts in the US 158 interchange area because unlike the other corridors, upland adjoins the western edge of the US 158 right-of-way. The unique bay trees for the most part, do not occur in this corridor and the bridge could parallel or be close to an existing forest edge (a power line right-of-way) as it passes through Maple Swamp.

At the Outer Banks termini for these corridors, the C1 terminus would pass through a proposed development that is expected to be completed prior to right-of-way acquisition (should NCTA decide to build a bridge). C1 would create community fragmentation and have noise and visual impacts. The C2 Outer Banks terminus would reach NC 12 in a commercial area. This terminus was established in the early 1990s as a potential terminus for a Mid-Currituck Bridge on an Official Map. Land owners are required to notify NCDOT before they build at this location to provide NCDOT with an opportunity to buy the right-of-way before it is developed. From a natural resources perspective, C1 has the least potential for wetland and habitat impact. From a traffic operations perspective, C1 could be easier to implement because the C2 terminus area has numerous nearby driveways and local streets that would need to be relocated or altered to eliminate left turns in order for the intersection of the bridge and NC 12 to operate at an adequate level of service. This issue is addressed in Section 5.3. Since both corridors appear to be feasible and notable trade-offs exist between them in terms of potential impacts, C1 and C2 will be carried forward as detailed study alternatives in the DEIS.

Natural resource and regulatory agencies representatives indicated a preference for C1 and C2 over C3, C4, C5, and C6 based on environmental impacts. These agencies

requested that the NCTA consider the following during preliminary design of a project in these corridors:

- On the mainland, widen the C1/C2 corridor to Aydlett Road to provide additional preliminary design flexibility as more detailed natural resource information is gathered in the corridor. NCTA agreed to the wider mainland corridor and to gather detailed environmental resource data, including wetland delineations, for this wider mainland corridor. These data were considered in developing the preliminary design assessed in the DEIS.

- On the Outer Banks, make adjustments to conceptual alignments considered during the alternatives study to reduce wetland and particularly coastal wetland impacts associated with C1. NCTA considered adjustments at both terminus locations.

- At US 158, examine interchange design alternatives that would minimize wetland impacts west of US 158. The decision to focus on the C1 and C2 corridors already aids in this effort because a larger area of uplands occurs west of US 158 than with the other corridors. NCTA investigated alternative designs.

The results of these studies are presented in Section 5.0.

## 3.2 Additional Alternatives Considered and Eliminated

As indicated above, in 1995 NCDOT prepared an *Alternatives Study Report* that examined nine preliminary bridge corridors to select the reasonable and feasible bridge and approach road corridor alternatives. The nine preliminary alternatives are shown in Figure 11. Six of those corridors were discussed in Section 3.1. This section considers the remaining three corridors, N1, N2, and S, as well as the merits of considering a corridor further north or south of these three alternatives.

### 3.2.1 Assessment of N1, N2, and S Corridors

The 1995 assessment of the N1, N2, and S corridors (as well as C1 to C6) considered:

- Engineering considerations
  - Total cost
  - Percent curved bridge over Currituck Sound
  - Total length

- Traffic considerations
  - US 158 level of service
  - NC 12 level of service

- Social, economic and cultural resource considerations

  - Displacement
  - Proximity of homes to the edge of the approach roads' near lanes
  - Mainland community cohesion
  - Outer Banks subdivision compatibility
  - Public recreation lands impacted
  - Historic resources impacted

- Natural resource considerations

  - Wetlands impacted
  - Open water/potential submersed aquatic vegetation (SAVs) affected by bridge
  - Length of bridge near marsh islands
  - Undisturbed upland affected
  - Fragmentation of Maple Swamp
  - Listed or managed natural resource areas affected
  - Potential for affecting protected species

The review of N1, N2, and S to determine if the 1995 findings remained valid discovered only one substantial change within the corridors. It was along the S corridor and involved the development of a NRHP-listed historic landscape.

The S corridor would pass through the Currituck Shooting Club, which was listed on the NRHP in 1995. The Club's boundaries are extensive and encompass the marsh islands along the eastern shore of Currituck Sound. Although the hunt club is still listed on the NRHP, the associated hunt club building was destroyed by fire in 2003 and much of the Outer Banks portion of the site has been developed as a golf course community.

The following paragraphs discuss the merits of N1, N2, and S and why they are not reasonable alternatives for evaluation in the DEIS. The findings all assume a two-lane Mid-Currituck Bridge.

#### *3.2.1.1 Corridor N1*

Corridor N1 would be substantially more costly and would have high social and wetland impacts. N1 would be a longer project (10 miles long versus approximately 7 miles for the other corridor alternatives). This additional length would result in the higher cost, approximately 40 to 46 percent higher ($71 to $88 million versus $50 to $60 million in 1995 dollars). N1 would bisect the community of Waterlily by placing bridge traffic on SR 1142, which passes through the community. Approximately 51 acres of wetlands would be impacted, including 18.5 acres of coastal wetland under the jurisdiction of Coastal Area Management Act (CAMA).

#### *3.2.1.2 Corridor N2*

Corridor N2 would have higher natural resource impacts. This corridor would impact 40.7 acres of wetlands (again assuming a two-lane bridge), would cross Maple Swamp at its widest point, and would not follow an existing forest edge, further fragmenting the habitat.

#### *3.2.1.3 Corridor S*

Corridor S would have high social and natural resource impacts and would use land from a property listed on the NRHP. Also, S would not improve the level of service on NC 12 as well as the other corridors because bridge traffic would mix with a larger number of travelers on NC 12 going to and from destinations south of the bridge.

Corridor S would pass through the community of Poplar Branch on the mainland side of the project with associated noise, visual, and community coehsion impacts. Corridor S also would pass through a group of marsh islands currently considered a Significant Natural Heritage Area. Some of these islands would be crossed.

Corridor S would pass through the Currituck Shooting Club, which is listed on the NRHP. The Club's boundaries are extensive and encompass the marsh islands along the eastern shore of Currituck Sound. Although the hunt club is still listed on the NRHP, the associated hunt club building was destroyed by fire in 2003 and much of the Outer Banks portion of the site has been developed as a golf course community . This introduces additional social impacts that were not present in 1995, the division of a second community and increased right-of-way costs. The following summarizes the impacts to The Currituck Club community:

- The primary impact would be to the golf course. One hole would be displaced (including a water hazard) and three fairways would have to be shortened by either moving the tee box or the green. The easy movement of players from one hole to the next would be affected in two ways, through the loss of the hole and the bridge corridor would separate two remaining holes from the balance of the course. A passageway under the approach road to the bridge from NC 12 would need to be provided for access to the two holes.

- The corridor's presence would cause noise and visual impacts to nearby homes (10 homes are presently within 250 feet of the corridor). A local north-south road would need to be bridged to maintain the continuity of the subdivision's existing circulation system. Because the land used is primarily associated with the golf course, no displacement of homes or businesses would occur.

- The right-of-way costs and mitigation costs for modifying the golf course would add to the cost of building the project.

- Corridor S could be moved to the south or north to take a different pathway through the community. If this were done, in either direction, two golf course holes would be displaced or shortened by several hundred feet. Four to six homes would be displaced.

#### *3.2.1.4 Conclusion*

For reasons listed above, N1, N2, and S were not found to be reasonable alternatives for detailed evaluation in the DEIS, just as they were in 1995.

### 3.2.2 Far North and South Corridors

In 1995, alternatives north of Corridor N1 were not assessed for the following reasons:

- They would have necessitated a new high level bridge across the Intracoastal Waterway and would have resulted in a bridge that would have to have been even longer than that of Corridor N1. For example, such a project between the mainland at the intersection of US 158 and NC 168 and the Outer Banks in the same general area as N1, N2, and three of the C corridors would be approximately 15 miles long, almost all of the distance over open water, wetlands, or coastal marsh as compared with the approximately 7 mile length of the alternatives considered in the C corridors. Both of these factors would have resulted in substantially higher costs.

- The Outer Banks terminus would have to be placed at or south of the northern end of NC 12 as noted in the example in the previous bullet. Locations north of the N1, N2, C1, C3, and C5 Outer Banks terminus and south of the end of NC 12 would affect additional wetlands, developed areas, the viewshed of the Whalehead Hunt Club (listed on the NRHP), and/or use land from the Whalehead Hunt Club, Currituck Beach Light Station, or Corolla Historic District (all either listed or eligible for inclusion in the NRHP).

These reasons remain valid in 2008 and as such, alternatives further north than N1 were not to be reasonable for detailed evaluation in the DEIS.

In 1995, alternatives south of Corridor S were not assessed for the following reasons:

- The project is defined as a bridge in Currituck County.

- In order to avoid impacts to the Pine Island Audubon Sanctuary (which is also a Coastal Barrier Resources Act designated area), which parallels NC 12 for approximately 3.8 miles in Currituck County beginning at the Dare /Currituck County line.

- A bridge in Dare County would have brought bridge traffic into the most congested portion of NC 12 where widening the existing road to accommodate traffic coming

on an off the bridge would have caused displacement and community disruption since the NC 12 right-of-way is only 60 feet wide.

- The further south the bridge was considered for placement, less travel demand would shift from on NC 12 and US 158 in Dare County where the highest levels of congestion occur in 2025. Therefore, the travel benefits of the bridge would diminish.

These reasons remain valid in 2008 and as such, alternatives further south than the S corridor were not to be reasonable for detailed evaluation in the DEIS.

## 3.3 Agency Comments

The findings of the corridor analyses also were discussed with federal environmental resource and regulatory agencies within the context of the series of TEAC meetings describe in the introduction to Section 2.3. Many of the issues raised and discussed at the TEAC meetings were resolved. For example, as indicated above TEAC representatives indicated a strong preference for not assessing the C3, C4, C5, and C6 corridors in detail in the DEIS. They also indicated a strong preference for assessing C1 in detail in the DEIS because its use of natural habitat and wetlands would be less than C2. These preferences are reflected in NCTA's decision to assess the C1 and C2 corridors as a part of both MCB3 and MCB4.

The remaining concerns of TEAC representatives related to the alignment of the project within the two corridors are presented below.

- NCWRC, DMF, and DWQ requested that the C1 alignment be adjusted to avoid coastal wetlands defined under the Coastal Area Management Act (CAMA) wetlands. NCTA responded by examining four additional C1 alignments and selecting one that avoided coastal wetlands, as described in Section 5.3.

- USEPA cautioned NCTA that dropping corridors prior to performing a migratory bird analysis could be problematic. The other corridors could be better options with specific regard to migratory bird impacts once detailed information on migratory birds is obtained. However, USFWS and NCWRC representatives felt that C4 to C6 could be dropped at this time. To address the agencies' concern, NCTA expanded the width of the C1 and C2 on the mainland southward to Aydlett Road and gathered detailed wetland information and conducted a survey for large trees. These data will be used to refine the C1 and C2 alignments during preliminary design. (See Section 5.2).

- DWQ indicated that it was very interested in the preservation of SAV. DWQ said that C1 appeared to have the least amount of SAV impact potential. DWQ asked to review the results of NCTA SAV surveys before finalizing their opinion. The

surveys were provided to DWQ upon their completion and SAV and the potential for SAV in Currituck Sound was a factor considered in the alignment refinements addressed in Section 5.3.

- The agencies requested that NCTA look at alternative US 158 interchange configurations that might avoid and minimize wetland impact. The findings of this work are presented in Section 5.1.

## 3.4 Public Comments

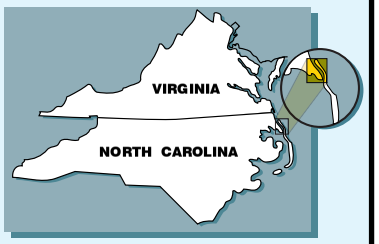
Public comments on the alignments generally focused onconcerns related to direct impacts associated with the bridge termini, including noise impacts at nearby homes in Aydlett, changes in views (including those of historic structures), the family cemetary displacement in the US 158 interchange area with C1 and C2, and impacts to the Corolla Bay subdivision by C1 (proximity to bridge, change in sound views, and right-turn only access to residential and commerical components). Many of the comments on these alternatives came from persons that would be personally affected by a particular corridor, as well as people concerned about potential impacts on their community in general.

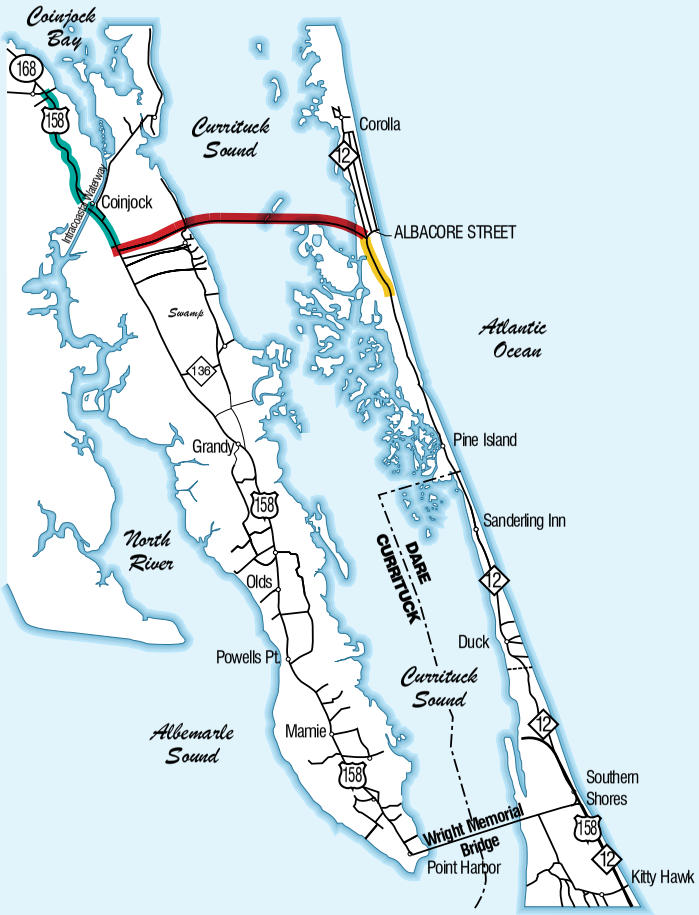
Several persons suggested that the bridge end on the mainland at the intersection of US 158 and NC 168. It was felt that such an corridor would reduce community impact and help hurricane evacuation by providing a second bridge across the Intracoastal Waterway and a direct route to NC 168. This concept was considered but eliminated for reasons described in Section 3.2.2 of this report.

# 4.0 Detailed Study Alternatives

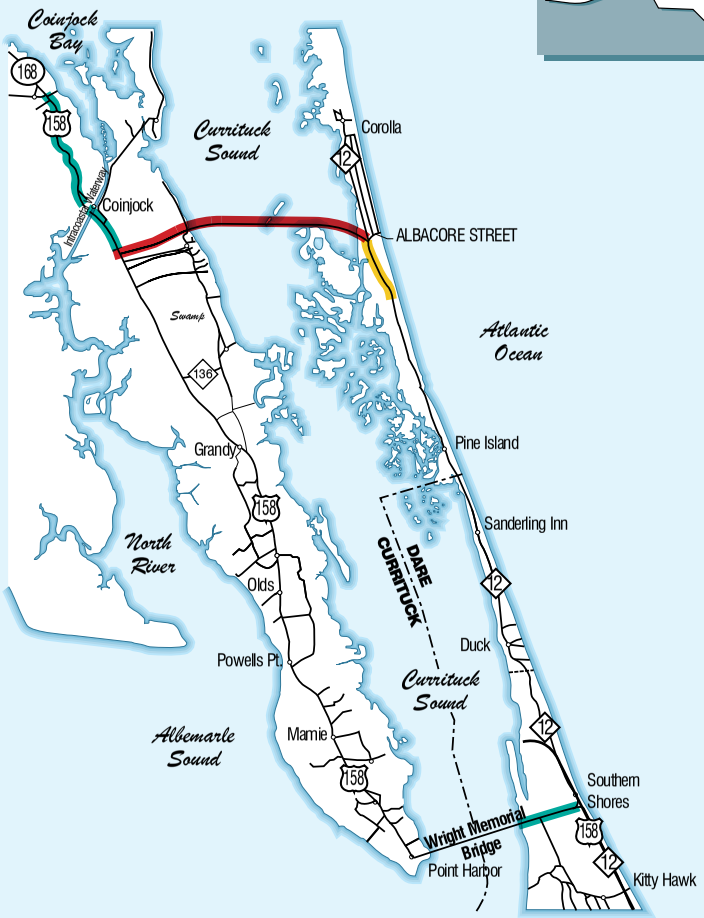
Based on discussions at the July 10, 2007 field trip, comments made at the June and July TEAC meetings, and written comments received since those meetings, NCTA selected MCB3 and MCB4 as detailed study alternatives. These alternatives are shown in Figure 13, and consist of:

- **MCB3**
  - Constructing a bridge across the Currituck Sound in Currituck County;
  - Adding a third northbound lane on US 158 from NC 168 to Aydlett Road (SR 1140) as a hurricane evacuation improvement or using the center turn lane as a third northbound evacuation lane; and
  - Widening NC 12 to four lanes for 2 to 4 miles south of the intersection with a Mid-Currituck Sound Bridge.


MCB3




MCB4

LEGEND

- Four Lanes
- Third Northbound Lane or Contraflow Lane
- Mid-Currituck Brige and Approaches

# Detailed Study Alternatives

Figure 13

- **MCB4**—The components of MCB3 plus a third northbound (westbound) lane on US 158 between the Wright Memorial Bridge.

The bridge component of both MCB3 and MCB4 will be evaluated in two bridge corridor alternatives (see Figure 13):

- **C1**—On the mainland, Corridor C1 will be between Aydlett Road and a line approximately 500 feet north of the powerline that parallels Aydlett Road. On the Outer Banks, Corridor C1 will end at the southern end of the Corolla Bay subdivision.

- **C2**—On the mainland, Corridor C2 will include the same area as Corridor C1 and on the Outer Banks will end in the vicinity of Albacore Road.

# 5.0 Corridor C1 and C2 Alignment Refinements

As per the request of TEAC representatives during development of the preliminary designs for the two bridge corridors that are evaluated in the DEIS, NCTA considered the following:

- At US 158, examined interchange and intersection design alternatives that would minimize wetland impacts west of US 158.

- On the mainland, considered field surveyed wetland boundaries and the results of a survey for large trees to determine whether natural resource impacts would be better minimized if the preliminary design alignment was north or south of the powerline right-of-way within the C1/C2 corridor.

- In Currituck Sound and on the Outer Banks, make adjustments to conceptual alignments considered during the alternatives study to reduce wetland, particularly coastal wetland impact, and SAV associated with both the C1 and C2 termini.

The study team also decided to assess an alternative alignment for C2 that would reduce the number of changes to driveways and local streets on NC 12. The results of these assessments were discussed with TEAC representatives and Currituck County. The results also were presented at the February 2008 Citizens Informational Workshops.

## 5.1 Refinements to Western Terminus (US 158 / Mid-Currituck Bridge Interchange)

Three interchange concepts were developed in order to avoid or minimize wetland impacts in the US 158/Mid-Currituck Bridge interchange area. They are:

- Trumpet interchange with a single toll plaza;

- Compressed Y interchange with ramp toll plazas; and
- Partial interchange/intersection with a single toll plaza.

These interchange designs are illustrated in Figure 14. Table 5 compares these alternatives from the perspectives of:

- Wetlands bridged and filled;
- Displacements;
- Operational characteristics; and
- Cost.

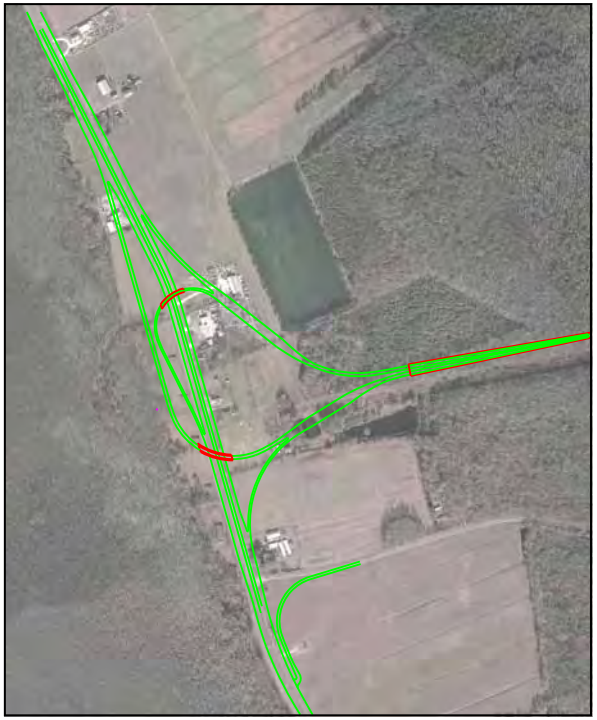
NCTA selected the compressed Y interchange for detailed study because it would affect the least area of wetlands, provide a high capacity to move traffic, and would be the least expensive of the three interchange concepts. The partial interchange/intersection configuration would have had operational limits that would have risked backups on to US 158 in certain situations and would not have minimize wetland impacts. The trumpet interchange would have had the greatest wetland impacts, both in terms of wetlands filled and wetlands bridged. The cost of the latter two interchange configurations would have been higher and bridged more wetlands because of the wide approaches to the toll booths, which would be over wetlands and in Maple Swamp.

## 5.2 Maple Swamp Alignment

Wetland field surveys found that the potential for wetland use in Maple Swamp would be similar wherever an alignment were placed in the swamp because Maple Swamp and associated wetlands cross the entire C1/C2 corridor at a generally consistent width. A survey for large caliper trees in the corridor in Maple Swamp showed that few trees greater than 22 inches diameter breast high (DBH) are in the corridor. None are in the area immediately north of the powerline corridor where conceptual designs prepared for the alternatives studies placed a C1/C2 bridge within Maple Swamp.

The conceptual design for the alternatives studies closely paralleled a powerline corridor for much of its length and crossed Maple Swamp at a right angle. This design would reduce potential habitat fragmentation and the length of the project's crossing of Maple Swamp, both important advantages. Since the new studies affirmed that location from the perspective of wetlands and large tree avoidance, NCTA decided to continue to use the conceptual alignment during preliminary design.

Trumpet Interchange Design



Compressed Y Interchange Design

Partial Interchange/Intersection Design

**NCTA Selected Concept**

LEGEND

Roadway (Edge of Pavement)

Grade Separated Roadway Section

Not to Scale

# Interchange Concepts

Figure 14

**Table 5. Comparison of US 158 Interchange Alternatives**

| | | Trumpet Interchange With Single Plaza | Compressed Y Interchange With Ramp Plazas | Partial Interchange/ intersection With Single Plaza |
|---|---|---|---|---|
| Wetlands Bridged / Filled (all non-coastal in acres) | | 14.7 / 5.4 | 7.8 / 2.1 | 14.7 / 1.8 |
| Displacements | East of US 158 | 3 residences and 1 business | 3 residences and 2 businesses | 3 residences and 1 business |
| | West of US 158 | 1 business | 1 business | 1 business |
| Operational Characteristics | Interchange Capacity | High | High | Medium |
| | Toll Plaza | Single toll plaza for eastbound and westbound flow | Split toll plazas for eastbound and westbound flow | Single toll plaza for eastbound and westbound flow<br>Requires one additional east bound toll lane to account for gaps in traffic caused by traffic signal |
| | Ramp Design | Directional interchange (no signals); high speed ramp serving US 158 southbound to bridge (90% of incoming traffic) | Directional interchange (no signals); high speed ramp serving US 158 southbound to bridge (90% of incoming traffic) | Includes a traffic signal; US 158 southbound to bridge (90% of incoming traffic) must pass through or stop at the signal |
| | US 158 Through Traffic | US 158 traffic maintained at high speed through interchange | US 158 traffic maintained at high speed through interchange | Potential for signal queuing to backup into US 158 traffic under special conditions[1] |
| Costs (in millions) | | $124 | $92 | $127 |

[1] For example, higher than average summer volumes because of peak summer weekends (such as July 4th), special events (such as a beach festival), variations in willingness to pay a toll and use the bridge, and toll plaza maintenance.

## 5.3 Refinements to the Outer Banks Termini

Figure 15 shows several alternative Outer Banks termini for the C1 and C2 corridors that were considered primarily at the request of environmental resource and regulatory agencies. These alternatives and the reasons they were considered are:

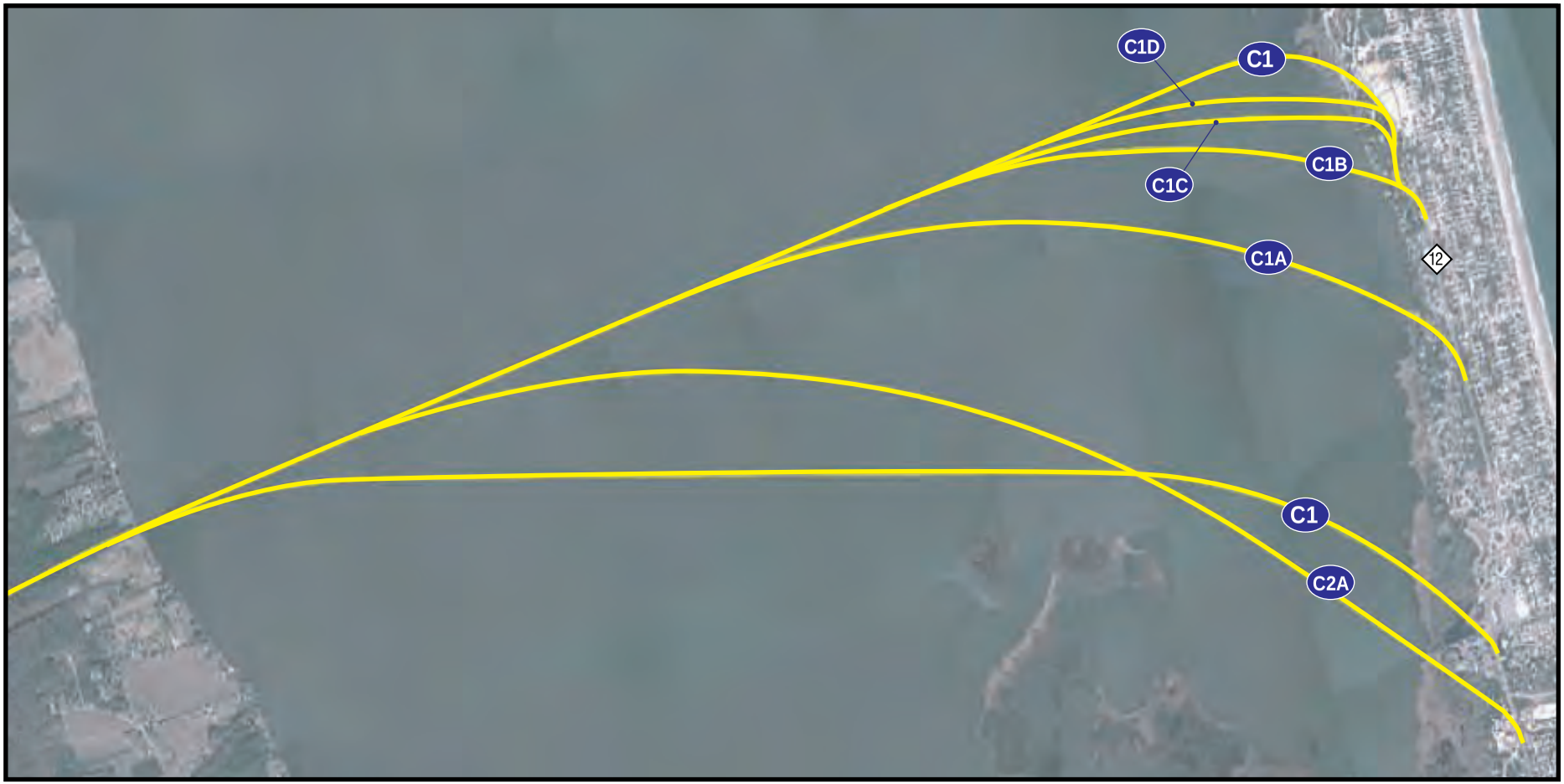
- Original C1;
- C1A—to minimize bridging of existing SAVs;
- C1B—to use of the narrowest land area between Currituck Sound and NC 12;
- C1C—to avoid coastal wetlands;
- C1D –to avoid coastal wetlands;
- Original C2; and
- C2A—to reduce changes in driveway and local road access to NC 12.

Table 6 compares these alternatives from the perspectives of:

- SAV bridged;
- Potential SAV habitat bridged (bridge over areas of sound less than 4 feet deep);
- Coastal wetlands bridged;
- Non-coastal wetlands bridged and filled;
- Displacements;
- Community impacts;
- Changes required in local road and driveway access; and
- Proximity to marsh islands (closest point in feet).

Cost was not considered to be a factor in the comparison of these alternatives and was not assessed. The results were reviewed with the environmental resource and regulatory agencies at the TEAC meeting on November 14, 2007. They also were discussed with representative of Currituck County on November 26, 2007. The two termini revisions selected for preliminary design were presented at the February 2008 Citizens Informational Workshops.

Not to Scale




LEGEND

Bridge Corridors

**C1 and C2 Alignment Options**

**Figure** 15

## Table 6. Comparison of NC 12 Intersection Alternatives

| | | Original C1 | C1A | C1B | C1C | C1D | Original C2 | C2A |
|---|---|---|---|---|---|---|---|---|
| SAV Bridged (in acres) | | 3.0 | 0.0 | 3.8 | 3.2 | 3.2 | 5.6 | 6.1 |
| Potential SAV Habitat Bridged (over areas of sound less than 4 feet deep in acres) | | 2.6 | 3.9 | 3.9 | 3.4 | 3.2 | 10.6 | 9.4 |
| Coastal Wetlands Bridged / Filled (in acres) | | 0.7 / 0 | 0.0 / 0.0 | 0.0 / 0.0 | 0.0 / 0.0 | 0.0 / 0.0 | 0.8 / 0.0 | 0.4 / 0.0 |
| Non-Coastal Wetlands Bridged/Filled (in acres) | | 0.8 / 0.7 | 0.3 / 0.4 | 0.2 / 0.9 | 0.1 / 1.4 | 0.4 / 1.5 | 1.7 / 0.2 | 1.6 / 0.0 |
| Displacements | | • 1 home<br>• 13 vacant residential parcels | • 9 homes<br>• 11 vacant residential parcels | • 2 homes<br>• 1 vacant residential parcels | • 6 homes<br>• 4 vacant residential parcels | 13 vacant residential parcels | 1 business | None |
| Community Impacts | | Bisects a developing subdivision | Bisects existing subdivision; separates approximately ¾ of homes from community center; substantial change in internal traffic movement. | Passes between two sections of a subdivision but both have independent access to NC 12; pond filled | At edge of a developing subdivision; pond partially filled | Bisects a developing subdivision but more towards its southern boundary than original C1 | None, except those related to NC 12 access | None |
| Changes Required in Local Road and Driveway Access (Currituck Clubhouse Road to Virgin Gordo Crescent) | NC 12 Widening to 4 Lanes (in miles) | 4.2 | 3.2 | 3.7 | 3.8 | 4.1 | 2.5 | 2.1 |
| | Total NC 12 Access Points | 27 | 19 | 24 | 26 | 26 | 17 | 10 |
| | Access Points with Revised Access | 13 | 10 | 12 | 12 | 13 | 10 | 3 |
| | • Right In – Right Out (RIRO) Only | 10 | 8 | 10 | 8 | 10 | 8 | 3 |
| | • Proposed Leftovers (no left turns from access point) | 3 | 2 | 2 | 3 | 3 | 2 | 0 |
| | • Road Closure | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Proximity to Marsh Islands (closest point in feet) | | Beyond 1,000 feet | | | | | 900 feet | 575 feet |

NCTA decided to use the C1D alignment in the project's preliminary design to represent the C1 corridor for the following reasons:

- It would not bridge or fill coastal wetlands;
- It would not displace existing land uses; and
- It would move the alignment south, closer to the southern end of a planned subdivision, leaving a larger area of the subdivision intact.

NCTA decided to use the C2A alignment in the project's preliminary design to represent the C2 corridor because it would substantially reduce NC 12 access impacts to subdivision and commercial development north and south of the bridge terminus while not increasing natural resource impacts substantially

## 5.4 Agency Comments

In discussing these findings with TEAC representatives, they indicated:

- When considering SAV impacts, both actual and potential areas for SAV should be considered, as reflected in Table 6;
- Agreement with the decision to use the compressed Y interchange design in the assessment of impacts in the DEIS;
- Agreement that an alignment, which closely paralleled the powerline in the C1 and C2 corridors on the mainland should be assumed with assessing impacts in the DEIS;
- That C1B, C1C, or C1D would be acceptable alignments in the C1 corridor; that C1A would not be appropriate because of its substantial community fragmentation impact; and original C1 would not be appropriate because it bridged coastal wetlands; and
- A preference for C2A because of its local traffic operation benefits.

## 5.5 Public Comments

Those who expressed an opinion on the Outer Banks termini, overwelmingly inidcated a preferrence for ending the C2 corridor south of TimBuckII because it would affect the community and traffic circulation the least. Comments were not directed to the interchange configuration on the mainland.

# *Appendix*

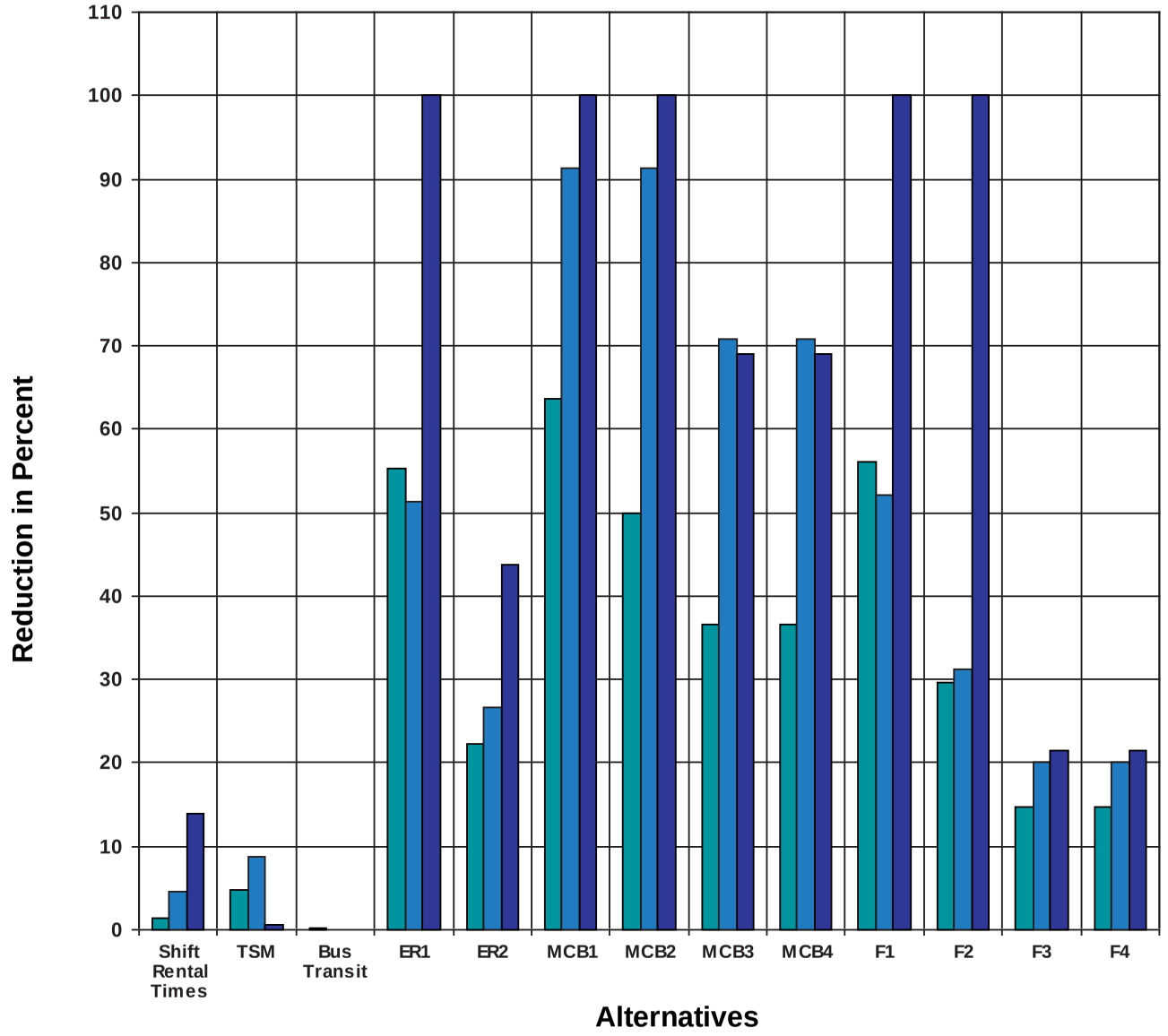
## Supporting Data

## Table 7. Travel Benefit Data for All Alternatives Considered in Concept Screening (in Absolute Numbers)

| | No-Build | Low Capital Investment & Operational Strategies | | | Highway Improvement Alternatives | | Bridge Alternatives | | | | Ferry Alternatives | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Shift Rental Times | TSM | Bus Transit | ER1 | ER2 | MCB1 | MCB2 | MCB3 | MCB4 | F1 | F2 | F3 | F4 |
| **2035 Traffic Flow Benefits (2035)** | | | | | | | | | | | | | | |
| Congested Annual Millions of VMT | | | | | | | | | | | | | | |
| • At LOS E or F | 66.1 | 65.2 | 62.9 | 66.0 | 29.6 | 51.4 | 24 | 33.1 | 41.9 | 41.9 | 29.0 | 46.5 | 56.4 | 56.4 |
| • At LOS F | 60.6 | 57.8 | 55.3 | 60.6 | 29.6 | 44.4 | 5.3 | 5.3 | 17.7 | 17.7 | 29.0 | 41.7 | 48.5 | 48.5 |
| • At a poor LOS F | 15.8 | 13.6 | 15.7 | 15.8 | 0.0 | 8.9 | 0.0 | 0.0 | 4.9 | 4.9 | 0.0 | 0.0 | 12.4 | 12.4 |
| Miles of Road Operating at LOS F | | | | | | | | | | | | | | |
| • Summer Weekday (SWD) | 14.7 | 14.7 | 13.5 | 14.7 | 0.0 | 5.9 | 0.0 | 0.0 | 5.7 | 5.7 | 0.0 | 5.9 | 9.1 | 9.1 |
| • Summer Weekend (SWE) | 43.5 | 41.4 | 43.5 | 43.5 | 27.5 | 39.0 | 4.8 | 4.8 | 11.7 | 11.7 | 28.7 | 40.2 | 41.4 | 41.4 |
| • Weighted Average of SWD & SWE | 22.9 | 22.3 | 22.1 | 22.9 | 7.9 | 15.4 | 1.4 | 1.4 | 7.4 | 7.4 | 8.2 | 15.7 | 18.3 | 18.3 |
| Miles of Road Operating at a poor LOS F | | | | | | | | | | | | | | |
| • Summer Weekday (SWD) | 5.7 | 5.7 | 5.7 | 5.7 | 0.0 | 3.7 | 0.0 | 0.0 | 0.8 | 0.8 | 0.0 | 0.0 | 5.7 | 5.7 |
| • Summer Weekend (SWE) | 7.9 | 5.7 | 7.9 | 7.9 | 0.0 | 5.9 | 0.0 | 0.0 | 2.0 | 2.0 | 0.0 | 0.0 | 5.7 | 5.7 |
| • Weighted Average of SWD & SWE | 6.3 | 5.7 | 6.3 | 6.3 | 0.0 | 4.3 | 0.0 | 0.0 | 1.1 | 1.1 | 0.0 | 0.0 | 5.7 | 5.7 |

## Table 7 (concluded). Travel Benefit Data for All Alternatives Considered in Concept Screening (in Absolute Numbers)

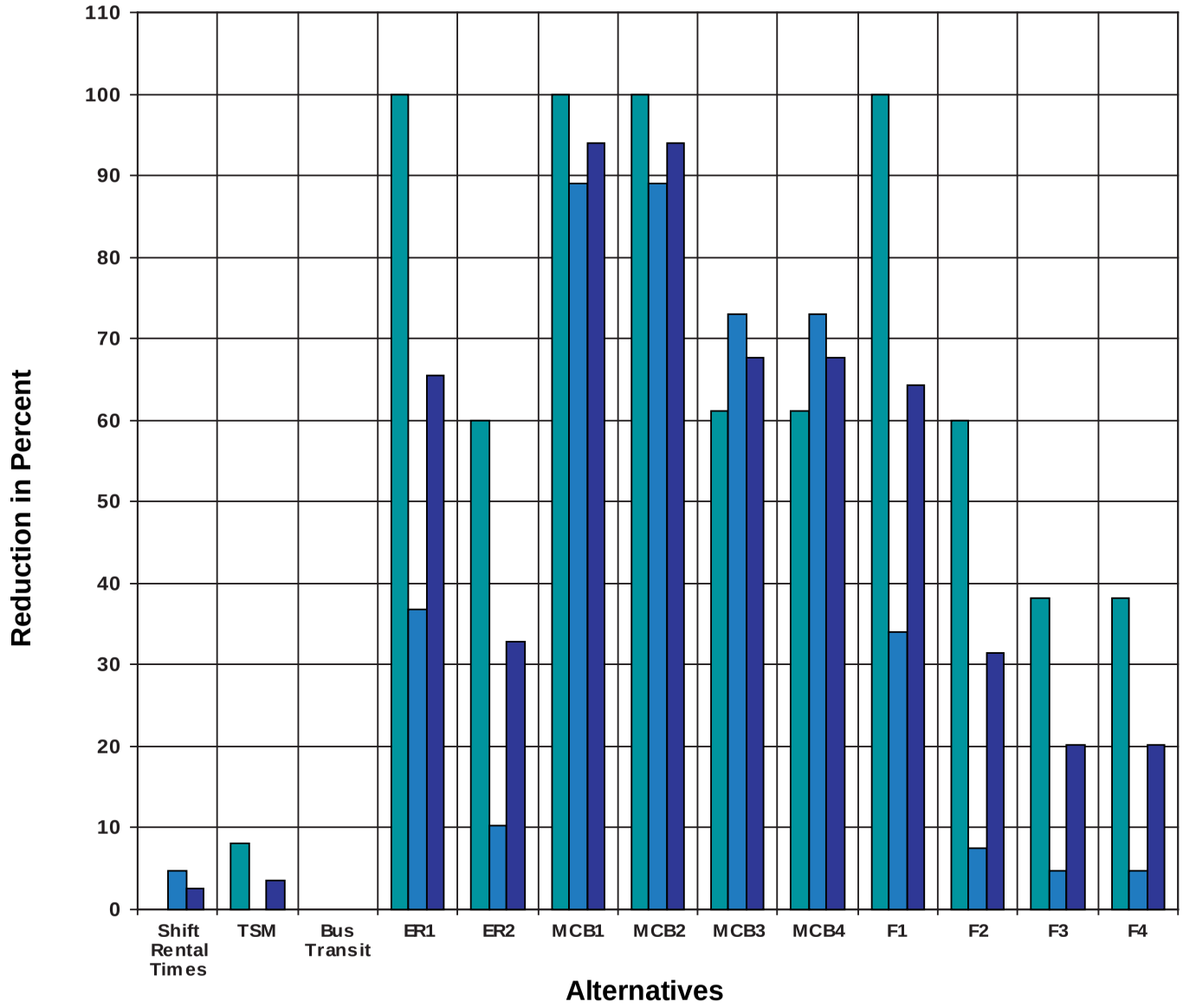
| | No-Build | Low Capital Investment & Operational Strategies | | | Highway Improvement Alternatives | | Bridge Alternatives | | | | Ferry Alternatives | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Shift Rental Times | TSM | Bus Transit | ER1 | ER2 | MCB1 | MCB2 | MCB3 | MCB4 | F1 | F2 | F3 | F4 |
| **2035 Travel Time Benefit Aydlett Road to Albacore Street** | | | | | | | | | | | | | | |
| Summer Travel Time via Wright Memorial Bridge (weighted average of SWD & SWE) | 153.7 | 152.3 | 137.3 | 153.7 | 79.7 | 125.0 | 73.0 | 86.3 | 106.7 | 106.7 | 76.8 | 113.5 | 136.3 | 136.3 |
| Summer Travel Time via Currituck Sound Crossing (weighted average of SWD & SWE) | NA | NA | NA | NA | NA | NA | 11 | 11 | 11 | 11 | 63 | 63 | 63 | 63 |
| **2035 Hurricane Evacuation Benefit** | | | | | | | | | | | | | | |
| Clearance Time with US 158 Northbound Contraflow Lane | 36.3 hrs | Improvement not part of alternative so remains 36.3 hrs | 27.4 hrs | Improvement not part of alternative so remains 36.3 hrs | 27.4 hrs | 27.4 hrs | 27.4 hrs | 27.4 hrs | 27.4 hrs | 27.4 hrs | 27.4 hrs | 27.4 hrs | 27.4 hrs | 27.4 hrs |
| Clearance Time with US 158 Third Northbound Lane | | | Improvement not part of alternative so remains 36.3 hrs | | 21.8 hrs | 21.8 hrs | 21.8 hrs | 21.8 hrs | 21.8 hrs | 21.8 hrs | 21.8 hrs | 21.8 hrs | 26.6 hrs | 21.8 hrs |
| **System Linkage and Efficiency Benefit** | | | | | | | | | | | | | | |
| Total Annual Millions of VMT | 663.9 | 664.6 | 663.9 | 662.7 | 663.9 | 663.9 | 577.7 | 578.3 | 578.3 | 578.3 | 643.6 | 643.6 | 643.6 | 643.6 |
| Consistent with Strategic Highway Corridor Vision Plan | No | No | No | No | No | No | Yes | Yes | Yes | Yes | No | No | No | No |
| Consistent with Intrastate System Designations | No | No | No | No | No | No | Yes | Yes | Yes | Yes | No | No | No | No |




LOS E and F
LOS F
Poor LOS F

**Percent of Reduction in Congested Annual Millions of Vehicle Miles Traveled Operating at LOS E and F, LOS F, and Poor LOS F in 2035**

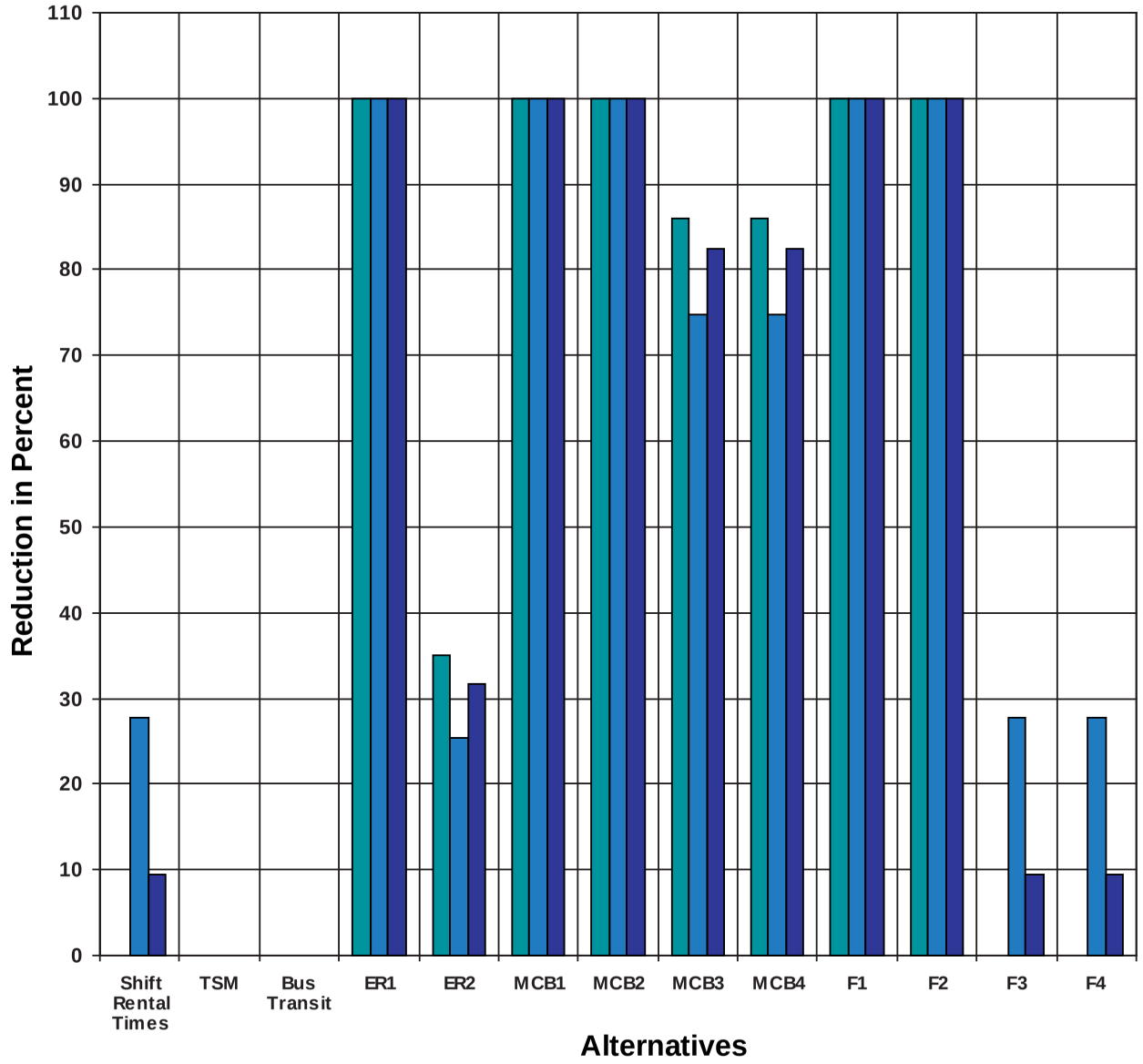
**Chart**
1




Summer Weekday (SWD)
Summer Weekend (SWE)
Weighted Average of SWD & SWE

**Percent of Reduction in Miles of Road Operatig at LOS F (V/C Ratio >1.0) in 2035**

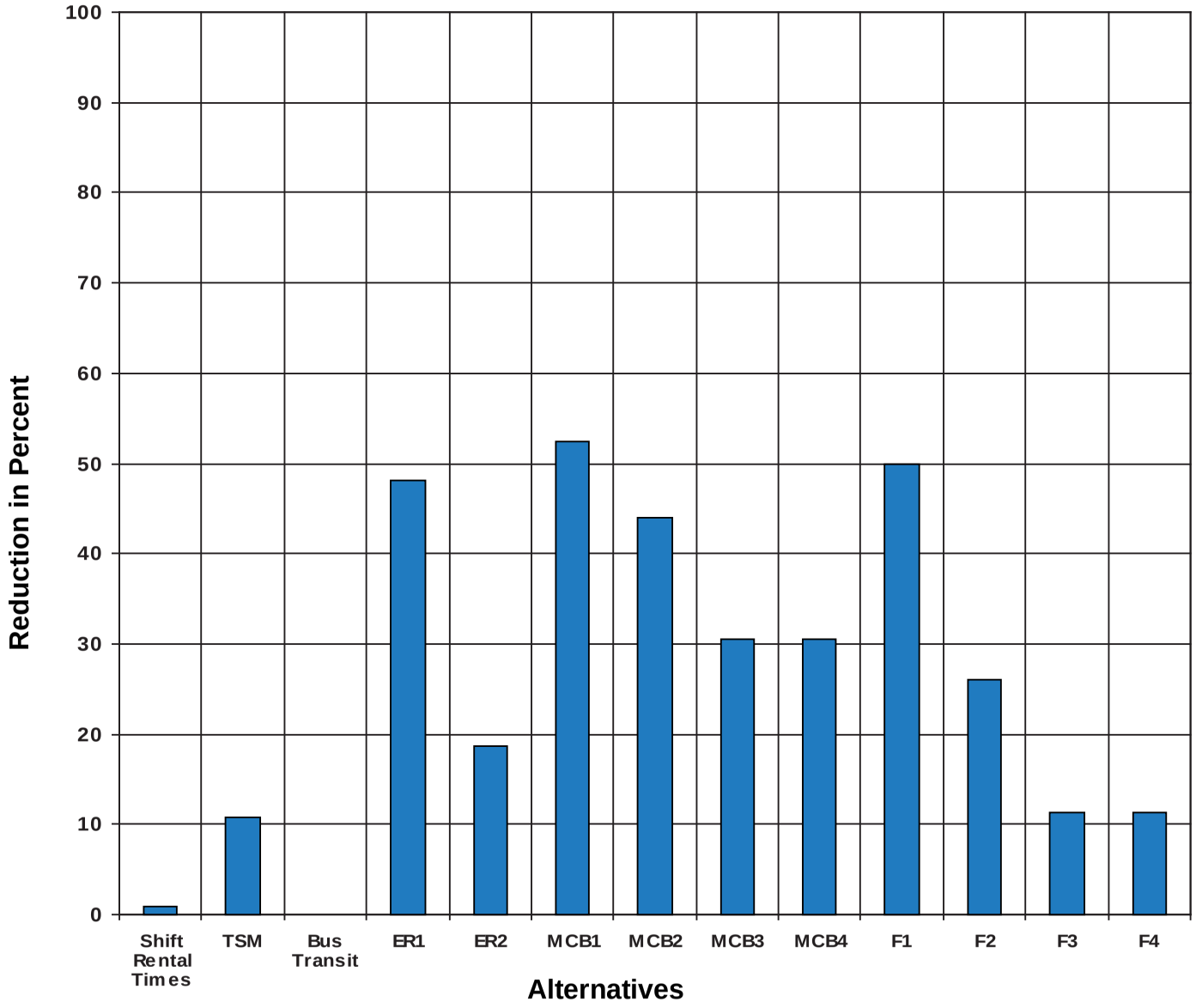
**Chart**
2




Summer Weekday (SWD)
Summer Weekend (SWE)
Weighted Average of SWD & SWE

**Percent of Reduction in Miles of Road Operatig at Poor LOS F (V/C Ratio >1.3) in 2035**

**Chart**
3




Percent Reduction in Summer Time Travel via Wright Memorial Bridge (Weighted Average of SWD & SWE)

**Percent of Reduction in Summer Time Travel via Wright Memorial Bridge (Weighted Average of SWD & SWE) in 2035**

**Chart**

4