

Chapter 1

Project Purpose and Need

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1.0 Project Purpose and Need

1.1 Introduction

This State Draft Environmental Impact Statement (DEIS) has been prepared for the North Carolina Department of Transportation (NCDOT) in accordance with the requirements of the North Carolina State Environmental Policy Act (SEPA G.S. 113A, Article 1), for the purpose of evaluating the potential impacts of a proposed transportation improvement project.

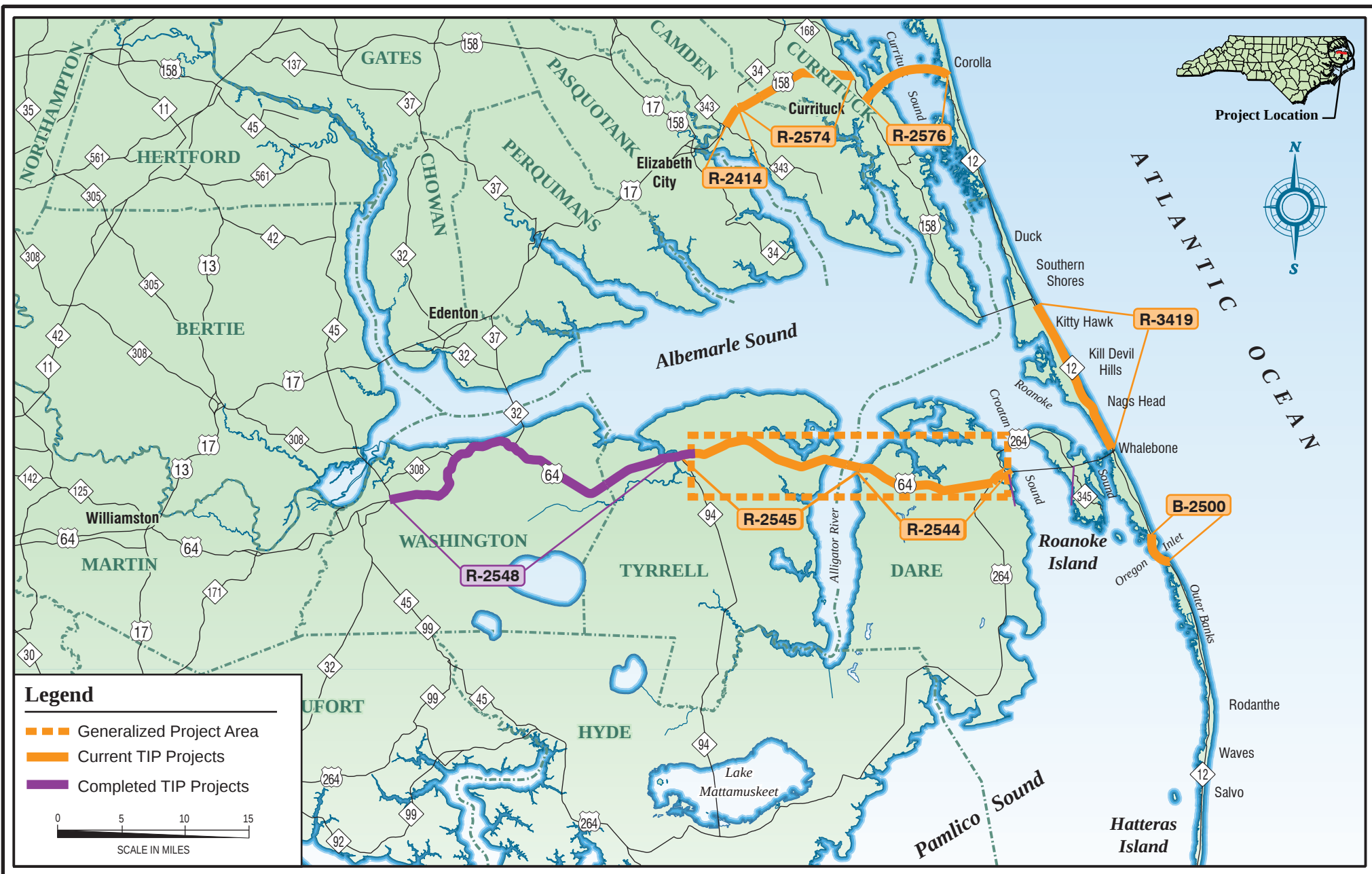
This is an informational document intended for use by both decision-makers and the public. As such, it represents a disclosure of relevant environmental information concerning the proposed action.

The action proposed in this state-funded DEIS is located along a rural 27.3-mile corridor of US 64 from east of Columbia in Tyrrell County to US 264 in Dare County. The NCDOT proposes to widen the existing road from two lanes to a four-lane divided highway and build a new four-lane bridge over the Alligator River. The posted speed limit along the improved roadway and new bridge would remain at the current 55 miles per hour (mph).

The NCDOT 2012-2018 *State Transportation Improvement Program (STIP)* allocates funds for the bridge replacement portion of the proposed project to begin design-build activities (which include design, right-of-way acquisition, and construction) in FY 2014. This section also includes constructing highway on new location that will connect a new bridge to back to existing US 64, on both sides of the Alligator River. The project section in Tyrrell County is funded to start right-of-way acquisition in FY 2014 and start construction in FY 2016. The remaining Dare County project component is scheduled in the current STIP to begin right-of-way in FY 2016 and construction in FY 2018; however the next-iteration STIP will likely accelerate the construction phase.

This document conforms to the Council on Environmental Quality (CEQ) guidelines that provide direction regarding implementation of the procedural provisions of SEPA/National Environmental Policy Act (NEPA). The United States Army Corps of Engineers is serving in the role of Lead Federal Agency on this project.

The NCDOT's 2012-2018 *State Transportation Improvement Program (STIP)* includes highway improvement projects that would improve the 27.3-mile segment of existing US 64 in Tyrrell (STIP No. R-2545) and Dare (STIP No. R-2544) counties, North Carolina, from a two-lane to a multi-lane roadway and replace the Lindsay C. Warren Bridge over the Alligator River. The regional location of the project is shown on Figure 1-1.



US 64 Improvements Project Environmental Impact Statement



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
PROJECT DEVELOPMENT AND ENVIRONMENTAL ANALYSIS BRANCH

County: TYRRELL / DARE COUNTIES
NCDOT Div: 1
TIP Nos.: R2544 & R2545
WBS: 35487

Regional Project Location and NCDOT 2012-2018 TIP Road Improvements

Figure 1-1

1.2 Summary of Need for Proposed Action

The primary deficiencies of the existing US 64 project corridor in Tyrrell and Dare counties are:

- **Non-compliance with the North Carolina Strategic Highway Corridor Plan and the Intrastate Highway System**

The North Carolina Strategic Highway Corridors plan designates the US 64 corridor as a multi-lane expressway. The designation of Strategic Highway Corridors (SHC) recognizes the need to improve, protect, and maximize the use of a set of (primarily existing) highways critical to statewide mobility and regional connectivity. US 64 from Raleigh to Nags Head, North Carolina, is designated as Corridor 44 in the Strategic Highway Corridors Plan. The improvement of this critical link of US 64 will increase mobility and connectivity through central and eastern North Carolina, extending to the Charlotte region and beyond shown on Figure 1-2.

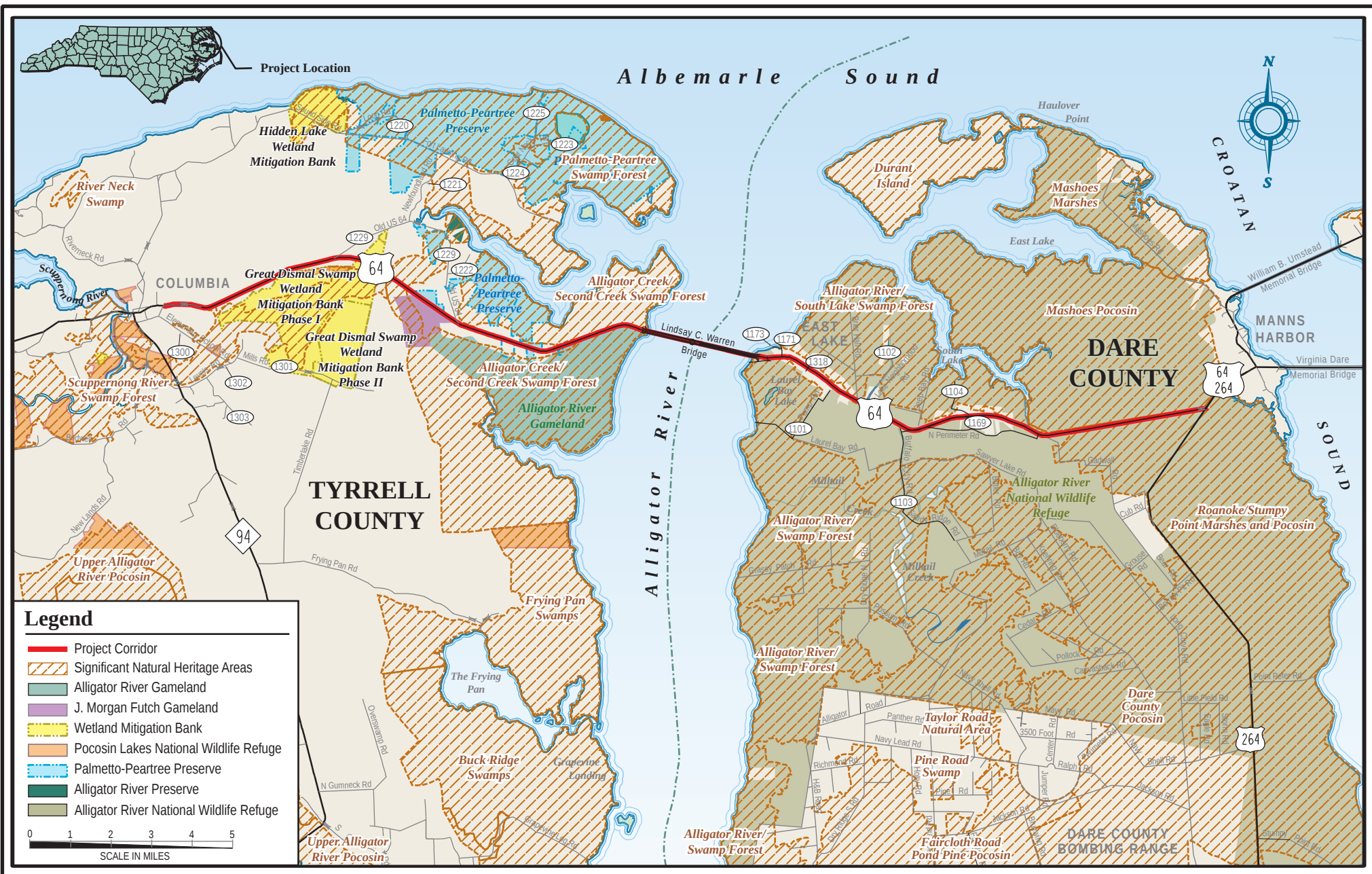
The current two-lane highway cross-section of US 64 within the project corridor does not comply with Intrastate Highway System standards. The 1989 Highway Trust Fund Act designated US 64 from US 52 in Davidson County to US 158 in Dare County as part of the North Carolina Intrastate Highway System. The intrastate system plan calls for the widening of the system's existing two-lane roads to four lanes. This two-lane corridor represents the last remaining section of US 64 between Raleigh and the Outer Banks that is not multi-lane.

Section 1.5 describes the Strategic Highway Corridors and Intrastate Highway System initiative in more detail.

Dare County, Tyrrell County, Albemarle RPO, Town of Columbia, The Albemarle Commission, and the Southern Albemarle Association support upgrading US 64 in this region to a four-lane highway.

- **The US 64 project corridor does not meet the state mandated clearance times for hurricane evacuation, and conditions are projected to degrade with time.**

US 64 is a primary North Carolina Hurricane Evacuation route for the Outer Banks and northeastern North Carolina. The State of North Carolina statewide hurricane evacuation goal is 18 hours (NC General Statute § 136-102.7, "Hurricane Evacuation Standard"). The standard of an 18-hour clearance time was developed and based upon specific design criteria established in 2005 by an interagency committee that studies North Carolina hurricane evacuations – such as a Category 3 hurricane and 75 percent tourist occupancy of the Outer Banks. Clearance time measurement begins when the first evacuating vehicle enters a roadway segment on a given corridor and ends when the last vehicle entering the roadway network reaches a point of safety (for the US 64 corridor, the point of safety is west of Interstate 95).



Project Location Map

Figure 1-2

County: TYRRELL / DARE COUNTIES
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A comprehensive US 64 project corridor hurricane evacuation analysis was developed to determine and document existing (2007) hurricane clearance conditions and to forecast 2030 conditions. The analysis was based on the official *North Carolina Department of Transportation State Hurricane Evacuation Study 2005* for the North Carolina coast.

Evacuation clearance time was determined and compared with the state-legislated maximum clearance time of 18 hours for vehicles to evacuate coastal areas to a "safe" location west of Interstate 95. Under 2007 existing roadway conditions, the 18-hour threshold is exceeded at approximately 51 percent tourist occupancy for a Category 3, 4, or 5 storm. By 2030, the 18-hour threshold will be exceeded at less than a 35 percent tourist occupancy rate for a Category 3, 4, or 5 storm.

- **The Lindsay C. Warren Bridge across the Alligator River is nearing the end of its service life.**

The current Lindsay C. Warren Bridge is structurally deficient and has geometric and safety-related concerns that do not meet current NCDOT design standards. NCDOT uses a scaled measure called a Sufficiency Rating, which ranges from 0 (critical) to 100 (good). The Lindsay C. Warren Bridge sufficiency rating is 36.0.

1.3 Purpose of Proposed Action

1.3.1 Primary Purposes of the Proposed Action

- Consistency with North Carolina's Strategic Highway Corridor Plan (which seeks long-term interconnectivity of consistent transportation corridors in North Carolina) and the Intrastate Highway System.
- Reduce US 64 hurricane evacuation time to better meet state clearance goals in the project study area.
- Maintain a bridge across the Alligator River that meets the needs of highway users.

1.3.2 Secondary Benefits of the Proposed Action

- Potential for reduction in total crash rates from the conversion of a two-lane rural roadway to a four-lane divided section.
- A new Alligator River bridge would provide the opportunity for safety improvements related to the swing-span and signalized approaches, as well as improving shoulders, lane width, and guardrail.
- Potential for improved regional bicycle trail connectivity and pathways - from the Town of Columbia to the Outer Banks.

1.4 Project Description

1.4.1 Project Setting

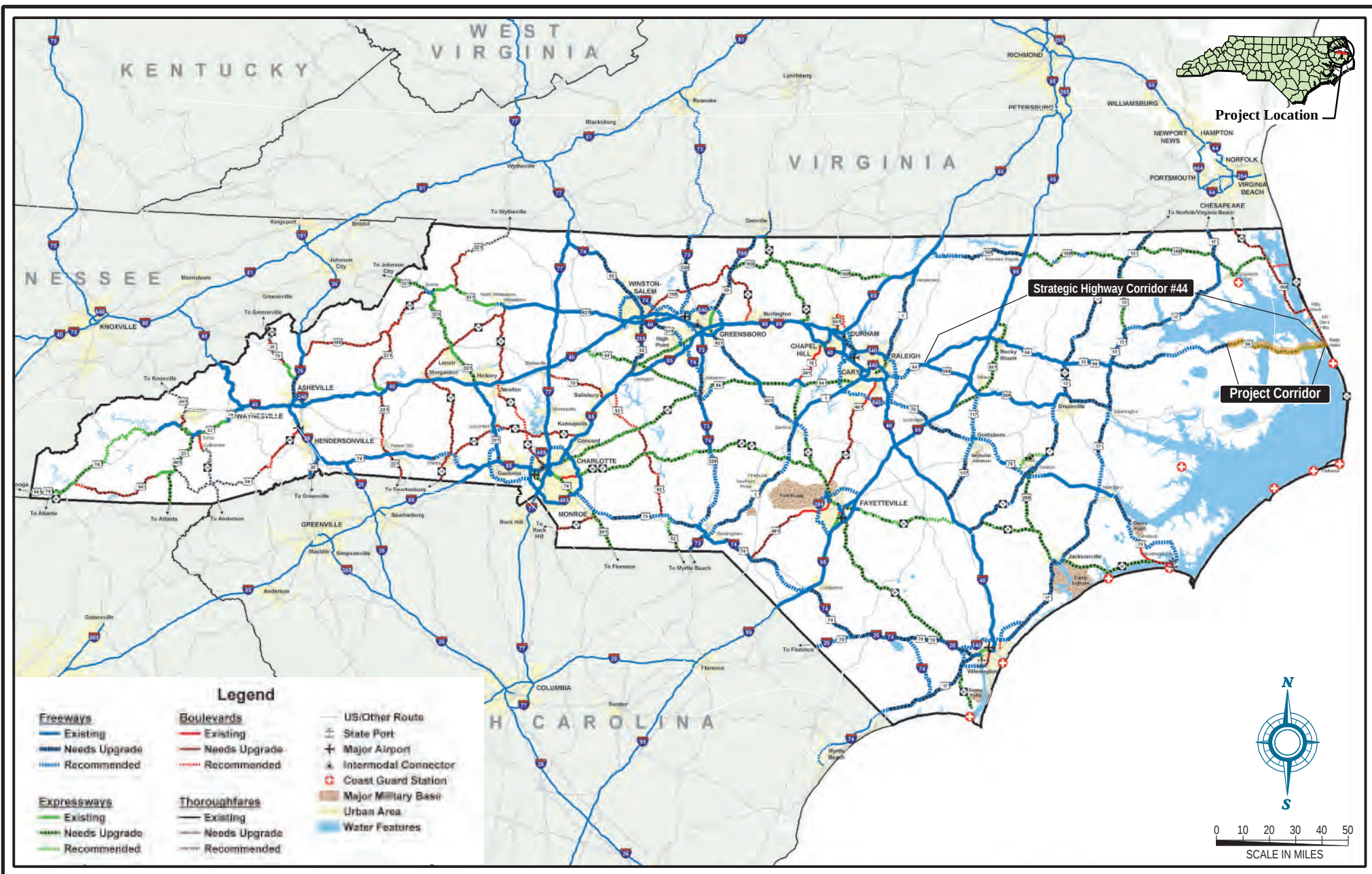
The project area is located in northeastern North Carolina (Figure 1-1). It begins east of the Town of Columbia, continuing across the northern part of Tyrrell County, the Alligator River and into the Dare County mainland. The Intracoastal Waterway (IWW) bisects the project corridor along the Alligator River. Development along the project corridor consists primarily of the town of Columbia west of the project, a small community at the intersection of US 64 and Old US 64, the marina on the Alligator River, and the community of East Lake in Dare County. Wetlands and canals are present on both sides of US 64 for most of the project length. The ground is generally wet and low-lying. Utilities consist mainly of underground fiber optic lines, cell towers, and aerial power. The project area is characterized by protected and managed natural resources. There are three known structures of historical or architectural importance along the corridor: the Lindsay C. Warren bridge, the East Lake Methodist Church and the East Lake Fire Tower.

1.4.1.1 *Tyrrell County*

Tyrrell County shown on Figure 1-3 is bordered by the Albemarle Sound to the north, the Alligator River to the east, Hyde County to the south, and Washington County to the west. Current and historic land use maps show that Tyrrell County's dominant land use is forest land, which accounts for 35 percent of the county's land. Agriculture is another major land use that encompasses a large portion of the county. The only incorporated municipality in the county is the Town of Columbia (population of 840 in 2005), just west of the project area. Other, scattered residential development and one church exist along US 64 in Tyrrell County. Approximately mid-way from Columbia to the Alligator River, a number of residences are concentrated in proximity to the eastern loop of the US 64/Old US 64 (SR 1229) intersection. One business is located along the corridor - a gas station/marina complex on the north side of US 64 at the Lindsay C. Warren Bridge. In the project vicinity, Tyrrell County is characterized by the presence of federal, state and private gamelands, nature preserves, and wetland mitigation banks, including the Palmetto Peartree Preserve (for the Red Cockaded Woodpecker), Alligator Creek Gamelands, J. Morgan Futch Gamelands, and Scuppernong River Swamp Forest. The Alligator River establishes the eastern boundary of Tyrrell County. The Alligator River, a tributary to the Albemarle Sound, is a large blackwater river, with a surface area of 64,000 acres. South of the Lindsay C. Warren Bridge, the river is designated as Outstanding Resource Waters (ORW).

1.4.1.2 *Dare County*

Dare County is bordered by the Albemarle Sound, Atlantic Ocean, Pamlico Sound and Hyde County as shown on Figure 1-3. The most developed portion of Dare County is located on Roanoke Island (Manteo) and the Outer Banks, which act as destinations outside of the project area.



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North Carolina Strategic Highway Corridor System Map

Figure 1-3

The project corridor is located on the Dare County Mainland, which is bound by the Alligator River to the west, Albemarle Sound to the north and Croatan Sound to the east. Scattered residential development, including single family homes and one mobile home park, are located along the corridor, primarily concentrated in the unincorporated, rural community of East Lake - which lies along US 64, just east of the Alligator River. Two churches and a community center are located in the East Lake community, all adjacent to US 64. A closed, public landfill is located on the north side of US 64 approximately 5 miles west of the US 64/US 264 intersection (Figure 1-3). The majority of the project corridor in Dare County lies within boundaries of the Alligator River National Wildlife Refuge (ARNWR). The ARNWR, established in 1984, is administered by the US Fish and Wildlife Service.

1.4.2 Project History

1.4.2.1 1999-2002

In January 1999, NCDOT initiated a feasibility study to address widening US 64 between Columbia and Manns Harbor and build a new bridge over the Alligator River in Tyrrell and Dare counties. In April 1999, NCDOT held a series of meetings with the Dare County Board of Commissioners, the Tyrrell County Administrator, the Tyrrell County Board of Commissioners, and the Columbia Town Council to solicit their comments on the proposed project. Also in April, informational meetings were held in East Lake and Manns Harbor to introduce the project to the public and solicit input.

In 2002, a Draft Feasibility Study was prepared, outlining the project Statement of Purpose and Need. Subsequently, in June 2002, a meeting was held with state and federal resource/regulatory agencies to discuss the Draft Feasibility Study and the Statement of Purpose and Need. Discussions focused on the need to update the NCDOT model for estimating hurricane evacuation clearance times over existing and future improved road networks. In August 2002, further work on the project was postponed pending completion of a revised hurricane evacuation model. This revised model was considered important to documenting the need for the project and the potential ability of improvement alternatives to reduce clearance times.

1.4.2.2 2003 to 2007

The revised hurricane evacuation model was completed in 2005. On February 6, 2007, NCDOT reinitiated the project and held an environmental resource and regulatory agency Scoping Meeting at NCDOT in Raleigh.

After the scoping meeting, the NEPA/404 "Merger Team"* was reconvened. The Merger Team consists of primary signatory agencies and partnering signatory agencies who, for this project are: US Army Corps of Engineers; US Coast Guard; US Environmental Protection Agency; US Fish and Wildlife Service; National Oceanic and Atmospheric Administration, National Marine Fisheries; North Carolina Department of Transportation; North Carolina Department of Cultural Resources; North Carolina

* A description of the NEPA/404 merger process and team is included in Chapter 7 of this DEIS.

Wildlife Resources Commission; North Carolina Department of Environment and Natural Resources – Division of Water Quality, Division of Marine Fisheries, Division of Coastal Management; and the ARNWR.

On March 14, 2007, NCDOT conducted a Public Officials Meeting at the Outer Banks Welcome Center. The meeting was attended by officials from Tyrrell and Dare counties and the towns of Columbia and Manteo. The following general comments resulted:

- A limited access rather than controlled access road is preferred.
- Consider the economic benefits of the project.
- The project would reduce travel times and benefit commuters to the Outer Banks.
- Traffic control during construction is important to minimize delays.
- Improvement of the roadway to a four-lane facility would reduce travel times for commuters.

Also on March 14, 2007, NCDOT held a Citizens Informational Workshop at the Dare County Justice Center. The meeting was attended by approximately 40 persons, primarily from the East Lake community, who commented on the following:

- The existing two-lane road is a safety concern for persons entering and exiting the highway.
- Animal collisions are a problem.
- Minimize potential impacts to homes in East Lake.
- A new bridge corridor south of the existing bridge is preferred.
- For reasons of safety, a four-lane road rather than three-lane road is preferred.

The project Statement of Purpose and Need was completed and distributed in May 2007.

1.4.2.3 2008 to Present

Project alternatives to be evaluated in detail in the Draft Environmental Impact Statement (DEIS) were reviewed at CP 2 Merger Meetings on June 19, 2008, and August 21, 2008 to continue discussions. The Merger Team concurred on:

- Cross-section of a replacement bridge
- Tyrrell County cross-sections (with 23- and 46-foot-wide medians)
- Tyrrell County corridor locations
- Dare County corridor locations.

The Merger Team did not reach concurrence on Dare County cross-sections to be studied in the document; therefore, the issue was elevated to a Merger Management Team (MMT) whose purpose is to arbitrate disagreement among the Merger Team. The MMT met on October 16, 2008, and determined that a typical section with a 23-foot-wide median would be studied in Dare County.

Following the MMT meeting, NCDOT developed preliminary designs for alternatives to be studied in detail in preparation for the next CP 2A concurrence meeting where bridge lengths (over water and wetlands) are determined. NCDOT conducted a CP 2A field meeting with Merger Team Members on March 24 and 25, 2009. At this meeting, the Merger Team also held preliminary discussions on the subject of "best fit" widening (that would avoid sensitive environmental resources) in those sections of the project where a simple widening may be appropriate. These are identified as Sections 1, 4 and 5 in Chapter 2 of this DEIS.

On April 27 and 28, 2009, NCDOT conducted one Public Officials Meeting and two Citizens Informational Workshops to present Merger Team recommendations on study corridors and cross-sections, and to obtain comments.

Following the field meeting and workshops, NCDOT revised preliminary designs in accordance with Merger Team comments and added an additional corridor in Dare County (Southern Bypass: a southern bypass of East Lake) at the request of the East Lake community.

After developing preliminary cost and impact tables for the alternatives, the Merger Team conducted a formal CP 2A meeting (Bridging and Alignment Review) in Raleigh on October 15, 2009. The Team agreed to add an East Lake southern bypass alternative, and to remove several alternatives that were no longer viable when compared with better alternatives. A second field meeting was scheduled for November 15, 2009, to allow Merger Team members on-site review and evaluation of wetland impacts. Following this meeting, the Merger Team reached concurrence on bridge lengths.

Following release of this DEIS, the project team will work toward Concurrence Point 3, selection of the LEDPA (Least Environmentally Damaging Practicable Alternative). Before this decision, NCDOT will publish the DEIS and seek stakeholder comments on the document, hold a public hearing, and hold a post-hearing meeting to discuss comments and their impact to project alternatives.

1.5 System Linkage

US 64 in eastern North Carolina is a significant transportation corridor critical for statewide mobility and regional connectivity. The improvement of this critical link of US 64 will increase mobility and connectivity from the northern Outer Banks through eastern and central North Carolina, extending west to the Charlotte region and beyond.

1.5.1 Existing Road Network

Figure 1-1 shows the regional roadway network in relation to the project area. US 64 is the only designated expressway in the area and is a primary east-west route to northeastern North Carolina between I-95 and US 17. US 64, including the Lindsay C. Warren Bridge over the Alligator River, is a two-lane road from Columbia to its intersection with US 264 in Manns Harbor. West of the project and through the town of Columbia, US 64 is a five-lane urban thoroughfare with a 12-foot-wide center turn-lane

and curb-and-gutter. From west of the Scuppernong River to the Town of Plymouth, US 64 is a median-divided four-lane freeway (controlled access with a 46-foot-wide depressed median). East of the proposed project terminus at US 264, US 64 is a four-lane, undivided facility for approximately 1 mile between US 264 and the western end of the Virginia Dare Bridge in Manns Harbor.

Other regional roadways include US 158 and NC 12. US 158 extends from north of the Albemarle Sound, across the Currituck County peninsula to Dare County. US 158 serves Kitty Hawk, Kill Devil Hills and Nags Head, ending at the intersection with US 64 at Nags Head. US 158 provides an important link between the Outer Banks and northeastern North Carolina and southeastern Virginia. NC 12 is a primary Outer Banks north-south thoroughfare, from US 70 in Carteret County to its northern terminus at Corolla. Movements on and off the Outer Banks to the mainland are restricted to US 64 and US 158 and to ferries between the mainland and Ocracoke Island.

Other roadways in the local network include NC 94 and US 264. NC 94 extends south 25 miles from Columbia to US 264 in Hyde County. US 264 is an east-west route that provides a link from Wake County to eastern North Carolina and the Pamlico Sound. US 264 generally follows the Pamlico River and Pamlico Sound shorelines, south around Lake Mattamuskeet then north to US 64 near Manns Harbor. The Pamlico Scenic Byway follows US 264 between Belhaven and Manns Harbor along the Pamlico River and Pamlico Sound.

1.5.1.1 Strategic Highway Corridors

US 64 is designated as a Strategic Highway Corridor (SHC) by the North Carolina Board of Transportation (BOT). In 2004, secretaries from the NCDOT, Department of Environment and Natural Resources (DENR) and Department of Commerce, adopted the SHC initiative, with accompanying signature from the Governor of North Carolina.

The SHC vision is part of an initiative to protect and maximize safety, mobility, and connectivity on a core set of highway corridors throughout North Carolina, while promoting environmental stewardship through maximizing the use of existing facilities to the extent practicable. In accordance with CEQ and Federal Highway Administration (FHWA) regulatory guidelines for long-range transportation planning, SHC is a first-tier planning component that establishes a broad, statewide vision. This vision is carried forward during the development of Comprehensive Transportation Plans (CTP) for individual towns, counties and/or Metropolitan Planning Organizations (MPOs). During the CTP process, the SHC vision may be refined to better align the ultimate corridor vision with the affected community's goals and values or the physical/environmental limitations specific to the planning area. NCDOT recognizes that the full SHC vision may not be implemented on every project; however relevant transportation needs generally necessitate full implementation of the SHC vision when practicable. As planning activities progress into a distinct NEPA and SEPA project study, SHC visions support development of the Statement of Purpose and Need and resulting alternatives. Through the NEPA/404 Merger process, NCDOT considers all applicable environmental laws, and then performs detailed, qualitative and quantitative environmental impact

analysis in order to best “locate” where a facility may be constructed - in terms of the LEDPA. It is within this progressive planning context that SHC recognizes environmental requirements to avoid, minimize, and mitigate impacts.

Detailed information about the SHC initiative is available at the following NCDOT web link:

<http://www.ncdot.org/doh/preconstruct/tpb/SHC/overview/>

The October 2005 “Concept Development Report” for SHC is available at:

http://www.ncdot.org/doh/preconstruct/tpb/SHC/pdf/shc_concept_development_report.pdf

Information on NCDOT’s long-range transportation planning process, including links to specific Comprehensive Transportation Plans, is available at:

<http://www.ncdot.org/doh/preconstruct/tpb/planning/default.html>

Purpose of SHC

The purpose of the SHC initiative is to provide a network of high-speed, safe and reliable highways throughout North Carolina for the consistent and efficient movement of people and goods. These corridors are critical to statewide mobility and connectivity and promote a vision of modern transportation, supportive of economic opportunities, and environmental excellence. The initiative offers NCDOT and its stakeholders a long-term vision to consider when making land use decisions, as well as design and operational decisions on the highway system. The creation of a long-term vision identifies the ultimate desired facility type (freeway, expressway, boulevard, or thoroughfare) for each corridor.

One or more of the following primary components characterize the designation of the corridors:

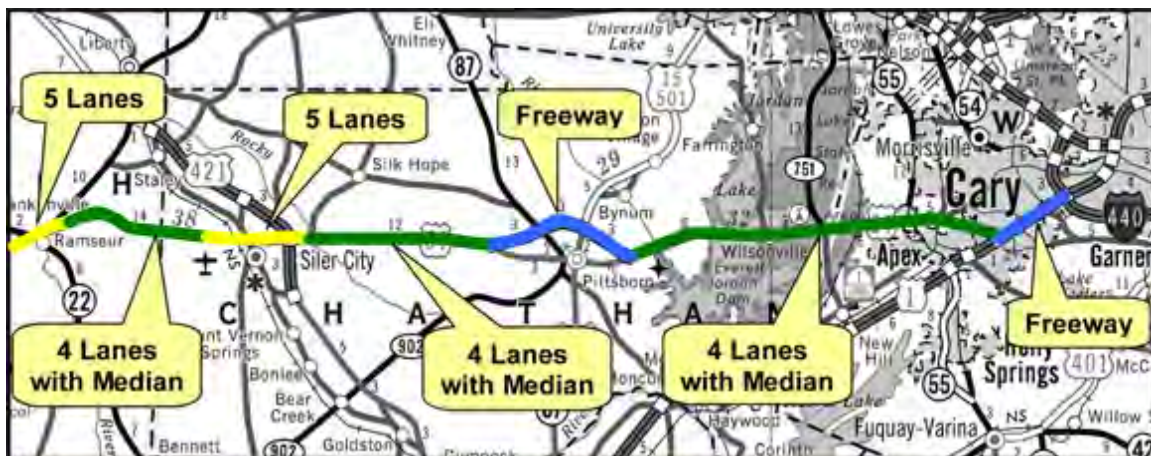
- Mobility. This criterion focuses on whether a corridor currently serves or has the potential to expeditiously move large volumes of traffic.
- Connectivity. This criterion focuses on whether a corridor provides a vital connection between Activity Centers (destinations of statewide or regional importance and places just outside of North Carolina's borders that serve the state’s citizens).
- Interstate Connectivity. This criterion focuses on whether a corridor provides an important connection between existing and/or planned interstates.
- Interstate Reliever. This criterion focuses on whether a corridor currently serves or has the potential to serve as a reliever route to an existing interstate facility.

Additional considerations include whether corridors are part of a national, statewide, economic, or military highway system.

Development of SHC

The SHC concept stems from the practice of long-range systems planning. Since the 1960s, systems planning studies have been conducted in local and regional areas throughout North Carolina. These studies have been valuable, and have helped communities understand growth and better plan for transportation improvements. However, study recommendations typically stop at planning area borders, which are usually just beyond city limits or county boundaries. In addition, decisions made in the project development and planning process typically focused on the limits of the project itself. NCDOT lacked a broader, statewide vision for how to ensure continuity and consistency for travel flow between these planning areas, communities, and in the development of projects. The lack of a corridor vision resulted in the construction of inconsistent corridor segments - as illustrated in Figure 1-4 below. The SHC concept represents the first step towards "connecting the dots" and promoting a more consistent transportation service for North Carolina's citizens, as illustrated in Figure 1-4 for US 64 in central North Carolina.

Figure 1-4. Variations in Roadway Cross-Sections along US 64 in Central North Carolina



The development of this concept began in 2002 and continued to evolve over time into a statewide initiative. From the beginning, the concept was shaped by sound technical criteria, planning and operational considerations, historical transportation studies, and the establishment of relevant goals and future applications. Work centered on the need for NCDOT and its stakeholders to consider planning from a broader perspective, with a specific focus on maximizing the mobility of "core" highway facilities within North Carolina's transportation system. NCDOT invited citizens and rural/municipal planners to participate in the effort, as well as a host of state and federal regulatory and resource agencies. The NCDENR and NC Department of Commerce agreed to partner and participate in the public involvement process.

Between November 2003 and January 2004, NCDOT staff held a series of nine public meetings throughout North Carolina in three geographic areas (west, central, and east), where the SHC concept was shared with stakeholders to gather their reactions in order

to share input with management and the BOT. The forums were held in both urban and rural areas. This outreach approach was structured to ensure that both broad statewide and unique regional perspectives would be heard. The forums were held at community colleges, town halls, civic centers, and other popular meeting places. A variety of techniques were used to publicize these forums, including email, brochures, and announcements - via newsletters and list serves.

The three major objectives for public forums were to:

- Educate stakeholders about the overall SHC concept.
- Gather stakeholders' reactions, ideas and critical issues about the SHC concept.
- Educate stakeholders about next steps and timeframes in the planning process.

Since the SHC concept represented a new planning direction, NCDOT initially chose to engage those stakeholders who have a vested interest in the conceptual planning aspects of Strategic Highway Corridors (versus those with an interest in project specific details). Targeted stakeholders included local, state and federal agencies, economic development and environmental organizations, freight industry representatives, regional and local planning agencies, political leadership organizations, and other advocacy groups. Approximately 250 people attended the forums, with an average of 25-28 people attending per forum.

Following adoption by the BOT in September 2004, the secretaries from the NCDOT, NCDENR, and NC Department of Commerce, along with the governor, signed the Strategic Highway Corridors Policy Statement. This statement provided a partnership between the three agencies, and established that North Carolina's top executive endorsed the SHC initiative as a statement of policy.

A SHC Strategy Summit Meeting was held with numerous state and federal agencies attending, including the FHWA, US Environmental Protection Agency, US Army Corps of Engineers, US Fish and Wildlife Service, and NOAA (National Marine Fisheries).

Integration of SHC into Long-Range Planning and TIP Programming

A critical step in the SHC implementation process is to incorporate recommendations from the SHC vision into local planning products such as Long-Range Transportation Plans (LRTPs), Comprehensive Transportation Plans (CTPs), or specific corridor studies. The NCDOT Transportation Planning Branch serves in this role, cooperatively working with Metropolitan Planning Organizations (MPOs), Rural Planning Organizations (RPOs), citizens, and other town, city, and county governments (including elected officials).

Long-Range Transportation Plans (LRTPs) are prepared by all of the 17 Metropolitan Planning Organizations (MPO) that are located in urban areas of North Carolina (such as Raleigh, Charlotte, etc). The MPOs work closely with NCDOT. General Statute § 136-66.2 mandates that each county and municipality not located within a Metropolitan Planning Organization (MPO) boundary, cooperate with NCDOT to develop a

multimodal Comprehensive Transportation Plan (CTP) that will serve present and anticipated travel demand in and around the municipality. In addition, specific corridor studies may be initiated as a stand-alone NCDOT study, or to augment or support local LRTP and CTP development.

LRTPs, CTPs, and corridor studies generally forecast travel demand 25-30 years in the future. They are based on the best information available, including but not limited to: local vision, statewide and departmental policies, population and traffic projections, present and future land development, travel patterns, and field data. Long-range plans seek to establish the vision for a transportation network that will meet future demands – such as functional classifications and facility types, while minimizing impacts to the natural and human environment.

Long-range planning studies often start by examining external network components that pass through planning boundaries. SHCs are an initial consideration. These include interstate and intrastate improvements that involve widening and new location projects, but not bridge replacement or intersection improvement projects. The scope and vision of LRTP and CTP system components are examined for consistency with the corridor vision. If the classification of a roadway segment differs from the SHC vision, the segment may be modified to fit or bring the current scope closer to the ultimate facility type, as warranted. Each segment is examined on a case-by-case basis, regarding the level of access control, interchange designs, median openings, driveway locations, and proposed traffic signals. Potential modifications to a segment include increasing the amount and level of control of access; modifying interchange designs to allow for high-speed, free-flow movements; closing, relocating, or modifying the design of median openings; consolidating or relocating driveway locations; and modifying traditional signalized four or three-legged intersections to an alternate intersection design that limits access, such as superstreet designs, signal-protected U-turns, and/or dedicated left-over lanes in the median.

The long-range planning process also seeks to avoid or minimize impacts to the natural and human environment. This is achieved by using ArcGIS mapping during planning phases, to identify important resources that may include but are not limited to: environmentally sensitive areas such as wetlands and streams, open waters, water supply areas, natural heritage inventories (rare plants and animals), cultural resources, local public lands (such as schools and public parks), state and federal lands/refuges, structures (such as homes, businesses, churches), etc. Once resources are identified, planners can adjust the location of network “connectors” or “connector nodes” in an effort to avoid and minimize the impact of future system components.

Working cooperatively with locals, a draft plan is developed which represents the recommendations for the multimodal transportation improvements required to meet the area’s mobility and connectivity needs for the next 25-30 years. Public and stakeholder involvement occurs throughout the planning process and may include surveys, citizen advisory groups, public workshops, and public hearings. LRTPs are approved locally, while CTPs are mutually adopted by local governments and NCDOT. Published plans

then become the guiding document for development of the area's transportation network. Long-range plans influence land planning and zoning decisions, and also serve as a basis for corridor preservation activities.

Ultimately, various system components from LRTPs and CTPs are selected and prioritized for individual project funding via the State Transportation Improvement Program (STIP) process. Local governments develop and submit prioritized lists, which are vetted through NCDOT professional staff and the BOT. Cost estimates are generated, and initial recommendations are presented at public workshops for feedback. The process is completed with publishing of the STIP, which reports the projects selected for funding and scheduling. Once a project is programmed in the STIP, it moves into the project development phase.

Integration of SHC into the Project Development (NEPA/SEPA) Process

Later in the comprehensive planning process as an individual NEPA or SEPA project study begins, engineers consider long-range plans such as LRTPs and CTPs (that incorporate the SHC vision) when developing project scopes and making design decisions. A Statement of Purpose and Need is prepared, which then guides the development and evaluation of alternatives. In the case of SHC corridors, Statements of Purpose and Need demonstrate how the project meets various criteria set forth in planning visions, and describe the need for improvements to a corridor as they relate to the corridor's function and vision. Alternatives are then developed in a manner which meets the subcomponent goals of SHC vision (if practicable), while attempting to maximize the use of existing infrastructure.

As a project progresses into detailed study, functional design criteria play an important role in determining a facility's typical cross-section and proposed access control. Considerations such as safety, operational issues, geometric needs and constraints, and constructability – all play a role in determining minimum design criteria. These criteria may include: access control type, design speed, intersection types, protected turn lanes, U-turns, median width, shoulder width, side slopes, ditch parameters, median and side barriers, etc.

The natural and human environment is studied in detail and input is solicited and considered, from such sources as: the public, elected officials, local/regional planning organizations, specific stakeholders, and appropriate state/federal resource agencies. Detailed qualitative and quantitative environmental analyses of alternatives provide an enhanced understanding of benefits and impacts so that a decision can be made which appropriately balances competing resources, laws, or issues. The ultimate result is individually-approved highway projects that satisfy system needs, maintain process transparency, meet applicable environmental laws, and provide fundamental environmental stewardship.

Strategic Highway Corridor #44

US 64 is an important link in the intrastate highway system, providing safe and reliable connections from central and northeastern North Carolina to the Charlotte region through its connection with NC 49 and I-85. US 64 between Raleigh and Nags Head is designated as part of SHC # 44. The corridor extends from I-440 in Raleigh (Wake County) to US 158 in Nags Head (Dare County). This corridor connects the Raleigh-Cary Area, Rocky Mount, and the Outer Banks (Kitty Hawk, Kill Devil Hills, and Nags Head) along a length of approximately 185 miles.

The North Carolina Division of Emergency Management has identified the section of US 64 between I-95 and US 158 as a major hurricane evacuation route. The entire corridor between Raleigh and Nags Head is a designated route on the North Carolina Intrastate System and on the National Highway System as an Other Principal Arterial. US 64 is also part of Congressional High Priority Route # 13, connecting Raleigh and Norfolk, Virginia, and is one of the two primary routes for motorists traveling to the Outer Banks.

The US 64 corridor is ultimately envisioned as a combination of a freeway (connections only by interchanges) and an expressway (connections provided only at interchanges for major cross streets and at-grade intersections for minor cross streets) according to the SHC Plan. The functional purposes of freeways and expressways are primarily to provide a high-level of mobility and low-level of access. The section of US 64 between I-440 in Raleigh and US 17 in Williamston is a freeway, as is US 64 between Plymouth and Columbia. The section of US 64 between US 17 in Williamston and US 158 in Nags Head is envisioned as an expressway. In the case of this project's study area, there are no major cross streets and thus no interchanges. Only at-grade intersections are considered at cross streets. Expressway design elements are shown on Table 1-1. The functional purpose of an expressway is high mobility and low to moderate access. A visual depiction of expressway access control techniques is shown on Figure 1-5.

As the R-2544/R-2545 project transitioned to environmental study stages, NCDOT first developed a Statement of Purpose and Need and then preliminary alternatives. From the beginning of the project, NCDOT recognized the environmental sensitivity of the ARNWR area, and indicated that a design exception to reduce the median from 46-feet to 23-feet would be acceptable in the Dare County location. During a project NEPA/404 Merger meeting, NCDOT also committed to review further median reductions on a site-specific basis, as practicable. In following chapters, the DEIS documents that NCDOT performed extensive natural and human environmental studies in the form of such products as: GIS modeling, detailed Natural Environment Technical Reports, Essential Fish Habitat assessments, Community Characteristics Reports, Community Impact Assessments, relocation reports, screenings for Archaeological and Historic Architecture sites, hazardous site reports, etc. Several preliminary alternatives were removed and some were also added. Continued environmental assessment occurred on the remaining detailed study alternatives. All the above information is presented in this DEIS as a natural progression of planning efforts that will lead toward a balanced decision of the LEDPA.

**Table 1-1
Key Design Criteria for Expressways**

Design Element		Criteria
AASHTO ¹ Design Classification		Arterial
Posted Speed Limit		45 mph to 60 mph
Control of Access		Limited or Partial
Traffic Signals		Not Allowed
Driveways	Limited Control of Access	Not Allowed
	Partial Control of Access	One driveway connection per parcel; consolidate and/or share driveways and limit access to connecting streets or service roads; restrict to right-in/right-out
Cross-Section		Minimum 4 lanes with a median
Connections		Provided only at interchanges for major cross streets and at-grade intersections for minor cross streets; use of acceleration and deceleration lanes for at-grade intersections
Median Crossovers		Allowed; alternatives to all-movement crossovers encouraged; minimum spacing between all-movement crossovers is 2,000 feet (posted speed limit of greater than 45 mph) or 1,200 feet (posted speed limit of 45 mph or less)

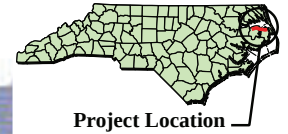
¹American Association of State Highway and Transportation Officials.

1.5.2 Modal Interrelationships – Rail, Transit and Airports

Rail service is not available in Dare and Tyrrell counties. No fixed route transit or bus service is available in the project area. Taxi service is available from Columbia and Manteo. Para-transit services are provided by both Tyrrell and Dare counties to service the elderly and handicapped. Some Outer Banks businesses provide vehicles to encourage workers to vanpool to jobs on the Outer Banks. Dare County Regional Airport is a publicly owned, general aviation airport in Manteo, North Carolina, east of the project area. The airport has two runways (4,400 feet and 3,300 feet) with radio-controlled lighting, a modern terminal building, hangars, and navigational equipment. The airport is capable of serving most regional jets; most uses of the airport are for charter flights, corporate transit services and air tours. Approximately three to four charter flights arrive daily at Dare County Regional Airport. Additionally, three

Expressway - Directional Crossovers and Median U-turns

(Illustrative Example in Rural Setting)



Disclaimer: This is for illustrative purposes only. Actual placement of design elements may vary according to NCDOT and federal guidelines.

US 64 Improvements Project Environmental Impact Statement



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
PROJECT DEVELOPMENT AND ENVIRONMENTAL ANALYSIS BRANCH

County: TYRRELL / DARE COUNTIES
NCDOT Div: 1
TIP Nos.: R2544 & R2545
WBS: 35487
Date: December 2009

**Generalized Example of
Managed Access and Partial Control**

Figure 1-5

companies fly charter services out of the airport. Corporate jets provide transit service for clients to the airport but maintain no set schedule or frequency. Air tours average at least 20 flights per day during summer months. Auto rental and taxi services are available at the airport.

1.5.3 Sidewalks, Bicycle Routes, and Pedestrian Movements

West of Columbia, US 64 is a controlled access freeway with no bicycle or pedestrian accommodations. Within Columbia, sidewalks line most of the 5-lane section on both sides of US 64. Bicycle traffic could be accommodated by re-striping the highway. No sidewalks or bicycle trails occur along the US 64 project corridor east of Columbia.

Off-highway, the Creef Cut and Sandy Ridge Wildlife Trails are located within the ARNWR in Dare County, and do accommodate bicycles and pedestrians.

East of the project corridor, provisions for bicycles have been provided on US 64/US 264 to the Outer Banks, through Manns Harbor and Manteo. These include wider outside shoulders and 54-inch guardrails on the Virginia Dare Bridge over the Croatan Sound.

The NCDOT Bicycle and Pedestrian Division requested the accommodation of bicyclists as a part of the US 64 project, from the Town of Columbia to the junction with US 264.

1.6 Land Use Planning

1.6.1 Economic Development

An efficient transportation system is essential to support the local and regional economy. US 64 between Raleigh and Nags Head is a designated Strategic Highway Corridor (SHC). The purpose of SHCs is to provide a network of high-speed, safe and reliable highways throughout North Carolina for the efficient movement of people and goods (Figure 1-2). These corridors are critical to statewide mobility and connectivity and promote a vision of modern transportation, supportive of economic opportunities and environmental excellence. Improving US 64 within the project corridor will provide motorists with more efficient travel through the region. Transportation infrastructure that provides safe and efficient travel contributes to meeting the vision of the Strategic Highway Corridor initiative.

1.6.2 Population Trends

Table 1-2 presents the permanent population for Tyrrell and Dare counties for each census year from 1970 to 2000, with a forecast for 2030. Tyrrell County is the least populated of all North Carolina's one hundred counties. The permanent population of Tyrrell County grew approximately eight percent between 1970 and 2000. Forecasts predict that population growth will continue at a modest rate of 10 percent between 2000 and 2030, the next 30-year period.

Dare County is experiencing substantial growth on the Outer Banks. The permanent population of Dare County grew by 328 percent between 1970 and 2000, and is projected to grow another 80 percent between 2000 and 2030.

**Table 1-2
Population Growth for Tyrrell and Dare Counties**

County	1970	1980	1990	2000	2030 Forecast¹
Tyrrell	3,806	3,975	3,856	4,149	4,595
Dare	6,995	13,377	22,746	29,967	53,843

¹North Carolina State Data Center, 2007.

The 2003 Dare County Land Use Plan indicates that the seasonal population peak (due to tourism) for Dare County is approximately 200,000. East Lake and Manns Harbor are primarily populated by full-time, permanent residents and are not subject to the same seasonal population fluctuations as many of the coastal communities in Dare County.

1.6.3 Tyrrell County Land Use Planning, Zoning and Economic Development

The Tyrrell County and Town of Columbia 1996 Land Use Plan Update (1998) indicates a need to stimulate growth. The Vision Statement in the Land Use Plan Update indicates the importance of developing the area's nature-based tourist industry, recognizing the need to develop infrastructure. Tyrrell County outside of the Town of Columbia is not subject to any zoning regulations.

Tyrrell County supports upgrading US 64 to a four-lane highway through the county and lists the project as one of four top priorities for transportation improvements.

1.6.4 Dare County Land Use Planning, Zoning and Economic Development

The Dare County Land Use Plan (2003) lists as a major goal maintaining the coastal village atmosphere that makes the area unique. County policy calls for applying land use planning techniques to guide private sector market forces in the direction of minimal commercialization, with single-family homes as the preferred type of development.

The Dare County Land Use Plan characterizes development patterns in East Lake as having little development except for the residential uses for the area's handful of permanent residents. Most homes in East Lake are located along US 64. The majority of the Dare County mainland in proximity to the corridor is under the jurisdiction of the US Fish and Wildlife Service (ARNWR), which minimizes potential of future development in managed areas. These large land holdings and protected natural areas have resulted in a scattering of small communities, such as East Lake, that are representative of Dare County's rural heritage.

The portion of the project study area (PSA) in Dare County traverses the ARNWR from the Alligator River to US 264. Therefore, the *Alligator River National Wildlife Refuge Comprehensive Conservation Plan* (plan) (USFWS, 2008) is relevant to development of the proposed project. The overall purpose of the plan is to provide long-term guidance for ARNWR management programs and activities specific to management and preservation

of wildlife and fish populations and habitat and to public education. The objective of the plan relative to utility lines and highway corridors is to limit impacts to ARNWR resources by continuous coordination on development and maintenance of corridors. The plan notes that US 64 will require some new right-of-way and proposes to avoid adverse impacts to ARNWR resources by developing terms and conditions to ensure that corridor construction and maintenance are compatible with ARNWR goals and objectives.

Widening US 64 through the mainland portion of Dare County is noted in the 2003 Land Use Plan as a key issue that should be addressed. The Dare County Emergency Management Office is committed to maintaining a full-time emergency management department and emergency operation centers and places a high priority on hurricane preparedness and response.

The dramatic growth rate (for the Dare County Outer Banks) over the past two decades has resulted in increased land values and new markets and, therefore, little need for redevelopment incentives. Industrial development is reviewed based on compatibility with existing development. Dare County promotes tourism during the peak season and the development of “shoulder” season tourism (in the spring and fall). The county supports the efforts of the Dare County Tourist Bureau to promote the Outer Banks as a resort area. Eco-tourism, a concept of combining ecological awareness with tourism, has become a new marketing tool for all of northeastern North Carolina.

1.7 Transportation Planning

1.7.1 NCDOT State Transportation Improvement Program

The proposed project is included as STIP Project Nos. R-2544 and R-2545 in the NCDOT *2012 to 2018 State Transportation Improvement Program*, which covers the period from Federal Fiscal Year (FFY) 2012 (October 2012) through FFY 2018 (September 2018). Regional transportation projects listed in the STIP that are near the proposed project are shown on Figure 1-1 and listed on Table 1-3.

1.7.2 Tyrrell and Dare County Thoroughfare Plans

Tyrrell County does not have a Thoroughfare Plan. The *Dare County Thoroughfare Plan*, last updated in 1988, covers a planning period through 2010. This document is considered out-of-date and is no longer used for transportation planning purposes (Creef, 2007).

1.8 Traffic Operations Analyses

1.8.1 Existing Roadway Characteristics

1.8.1.1 US 64 Corridor

US 64, from Columbia to Manns Harbor, is a two-lane highway of approximately 27.3 miles that facilitates moderate seasonal traffic. The travel lanes are 12 feet wide with a 10-foot unpaved shoulder on either side. Most of the right-of-way width is between 80

**Table 1-3
Status of Division 1 Highway Projects in Project Region**

STIP No.	County	TIP Project Area	Description of Work	Section	Start of Right-of-Way Phase	Start of Construction Phase
R-2545 PD	Tyrrell	US 64 E of Columbia to E of Alligator River (15.6 miles)	Widen US 64 to multi-lanes	AA – From E of Columbia to SR 1229 (Old US 64)	2014	2016
				AB – From SR 1229 (Old US 64) to W of Alligator River	2014	2016
				B – W of Alligator River to E of Alligator River	Design-Build Starts in 2014	
R-2544 PD	Dare	US 64 E of the Alligator River to US 264 (11.7 miles)	Widen US 64 to multi-lanes	A – E of Alligator River to SR 1169 (Old US 64)	2016	2018
				B – SR 1169 (Old US 64) to US 264	2016	2018
B-2500	Dare	NC 12 over Oregon Inlet (2.7 miles)	Replace Bridge No. 11	--	--	2011
R-2576 PD	Currituck	Currituck Sound between Coinjock and Corolla (7.3 miles)	Construct bridge over Currituck Sound and widen NC 12 and US 158	--	2011	2011
R-2574	Camden and Currituck	US 158 E of NC 34 at Belcross to NC 168 (10.6 miles)	Widen US 158 to multi-lanes	--	2020	Beyond 2020 (future years)
R-3620	Washington	US 64 to NC 32 (3.3 miles)	Construct new two lane road with shoulder on new location	--	2012	2014
B-4647	Tyrrell	NC 94 at Northwest Fork	Replace Bridge No. 8	--	2011	2012
R-4467 B-4923	Perquimans	US 17 Business /NC 37 E of Perquimans River Bridge to NC 37 (0.4 mile)	Construct new roadway on pilings and replace Bridge No. 19 (Includes B-4923)	--	2015	2016
R-3419	Dare	US 158 from US 64 to Putter Lane (14.6 miles)	Add lanes	--	2020	Beyond 2020 (future years)
R-2414	Camden	US 158 from E of Pasquotank River to NC 34 in Belcross (5.3 miles)	Widen to multi-lanes	A – Elizabeth City to SR 1257	Complete	Under Construction
				B – SR 1257 to Belcross	In Progress	2011

and 120 feet. Traffic includes moderate commercial truck use. The posted speed limit is 55 mph. US 64 has been realigned (straightened) at three locations in the Dare County portion of the PSA: east of the East Lake Community Center; west of the closed Dare County Landfill; and east of the closed landfill at Creef Cut Trail. At these locations, the existing right-of-way width is 275 feet.

The project begins approximately 0.9 mile east of Columbia at the easternmost reach of Columbia's five lane curb and gutter portion of US 64. The first mile of the project corridor is comprised of low-lying woods and wet cut-over on both sides of the highway. US 64 crosses an upland area, Dillon's Ridge, at 1.3 miles from the project start. A canal is along the south side of US 64 from approximately the 3-mile to 11-mile points. The abandoned, western "oxbow loop" of Old US 64 intersects the north side of the corridor approximately 3 miles east of Columbia. The eastern side of that loop ties back in to US 64 at 6.6 miles along the project. At milepoint 11.2, a gas station/marina complex is situated on the north side of US 64 just before the Lindsay C. Warren Bridge. At that location, commercial fishing docks are located to the south of US 64 at rivers' edge and along a south-side canal paralleling US 64.

US 64 crosses the Alligator River and Intracoastal Waterway, via the Lindsay C. Warren Bridge, approximately 12 miles east of the project start. The ARNWR begins at the east bank of the Alligator River and continues on both sides of US 64 to the eastern terminus of the project. ARNWR surrounds the East Lake community and any private or public parcels. Dare County has a greater number of roadside canals as compared to Tyrrell County. One begins on the south side of US 64 near the eastern terminus of the existing Lindsay C. Warren bridge and continues for approximately 0.75 mile. Another canal segment runs along the north of US 64 from the US 64 and Old Ferry Landing Road intersection to approximately 0.5 mile east. Residences on the north side of US 64 use corrugated metal pipes to allow canal waters to pass underneath driveways, small roads or periodic berms. Other canals are intermittently located on the north and south sides of US 64 from east of East Lake to US 264. The corridor ends at the four-lane, undivided section of highway that begins at the intersection of US 64 and US 264.

1.8.1.2 Lindsay C. Warren Bridge

The Lindsay C. Warren Bridge is a major structure crossing the Atlantic Intracoastal Waterway. The bridge has a swing-span to enable marine traffic to pass through. When a vessel signals the bridge operator, gates on either end of the bridge close to vehicular traffic on US 64, and the swing-span opens. The swing-span takes approximately two minutes from the time a vessel signals until the span is fully open. When the vessel has passed under the bridge, the swing-span is closed, and the gates re-opened for vehicular traffic. The length of time vehicular traffic is delayed is typically five minutes, although the bridge may open for a longer period for multiple boats or large boats. In May (generally the busiest month of the year) 2009, the swing-span typically opened from 13 to 35 times per day to enable an average of 35 boats per day to pass through the bridge.

The 2.8-mile bridge was constructed in 1960 and has two lanes with minimal outside shoulders to separate travel lanes from bridge rails. The bridge consists of 340 pre-stressed concrete girder spans and a steel through-girder swing-span located over the

navigational channel at Sandy Point. The existing bridge is nearing the end of its design service life, is structurally deficient as defined by the FHWA and NCDOT, and has geometric and safety-related deficiencies when compared to current design standards. Therefore, a need exists to replace the functionally-obsolete bridge before it becomes unsafe.

NCDOT evaluated the possibility of widening the existing structure; however, due to its swing-span configuration, existing condition, and original design parameters, widening is not practical.

Condition Rating

During bridge inspections, all bridge components are examined and assigned an evaluation code, or rating. Ratings range from 0 (critical condition) to 9 (good condition). Table 1-4 shows the rating scale used by the FHWA and the NCDOT.

**Table 1-4
National Bridge Inventory Rating**

Rating	Condition
0 to 2	Critical
3 & 4	Poor
5 & 6	Fair
7 to 9	Good

According to the latest National Bridge Inventory Structure Inventory and Appraisal form for the bridge, updated in September 2010, the deck, superstructure, substructure and paint each rated 4 (poor). In a 2008 machinery inspection it was noted that 75 percent of the swing span members, including girders exhibited a 100 percent loss of paint, with advanced section loss to some members. The condition ratings of 4 for the deck, superstructure and substructure result in the bridge being identified as “structurally deficient,” in accordance with the NCDOT rating method.

Sufficiency Rating

Aside from condition ratings, the FHWA and NCDOT use a measure called a sufficiency rating, ranging from 0 (critical) to 100 (good). This rating is used to identify structures needing repair or approaching end of lifespan, and to program funding for bridge replacements and rehabilitations. A bridge is eligible for funding for replacement when its sufficiency rating is less than 50. Based on the September 2010 National Bridge Inventory Structure Inventory and Appraisal form, the overall bridge rating listed for the Lindsay C. Warren Bridge is “fair,” with a sufficiency rating of 36.0.

In addition to the above, the existing bridge has other, non-structural, deficiencies. For example, the existing curb-to-curb bridge width of 26'-0" is substandard based on current NCDOT design practices. Also, the existing concrete bridge railings do not

conform to current crash-testing requirements adopted by the NCDOT for bridge railings. These geometric and safety related items play a role in the bridge having a low sufficiency rating.

1.8.2 Existing No-Build Traffic Conditions

A traffic forecast for this project was developed by NCDOT for the 2030 design year, based upon a 2006 base year. The traffic forecast included turning movements for five unsignalized intersections along the US 64 study corridor. For this project, understanding operations during summer peak periods is critical for understanding overall traffic operations.

To examine this issue in greater detail, traffic counts from the automatic count station on the Lindsay C. Warren Bridge (ATR 2702), summarizing 2006 volumes in both directions, were utilized. Using the period from Memorial Day to Labor Day to represent the summer months, a conversion factor was used to estimate the Average Annual Daily Traffic (AADT) in the NCDOT traffic forecast. It was determined that the summer weekday traffic is essentially the same as the AADT and that summer weekend traffic is higher. These factors were applied to the traffic forecast volumes for use in the capacity analysis. Using these forecasts and traffic data, Level of Service (LOS) estimates for both overall roadway operations and specific intersections are discussed below.

1.8.2.1 Level of Service Concept

Level of service, or LOS, is a qualitative measure that characterizes operational conditions within a traffic stream and the perception of traffic service by motorists and passengers. The Transportation Research Board's *Highway Capacity Manual* generally describes these conditions in terms of factors such as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. Six levels are used, ranging from A to F. For roadways, LOS A indicates no congestion, while LOS F represents traffic demand that exceeds roadway capacity and causes extreme delays. The engineering profession generally uses LOS D as a minimally acceptable operating condition, with LOS B desired in rural areas.

The LOS for signalized and unsignalized intersections is measured and evaluated differently. Although LOS for both is based on the average delay per vehicle, LOS at signalized intersections utilizes an average delay for all vehicles entering the intersection. In contrast, unsignalized LOS is estimated by examining only the delay for the most congested approach. This method is utilized because only those approaches with a stop sign or other form of intersection control are forced to stop at an unsignalized intersection. As all intersections on US 64 are unsignalized (discounting the signalized stop for the bridge swing-span), Table 1-5 provides a general description of the various LOS categories and delay ranges for unsignalized intersections.

Since LOS at an unsignalized intersection reflects operations on the critical approach only (instead of delays to all traffic), LOS E or even LOS F are often observed at

Table 1-5
Unsignalized Intersection Level of Service Criteria

Level of Service	Description	Control Delay for Critical Approach (seconds/vehicle)
A	Little or no delay	≤ 10
B	Short traffic delay	10-15
C	Average traffic delay	15-25
D	Long traffic delay	25-35
E	Very long traffic delay	35-50
F	Unacceptable delay	> 50

Source: Transportation Research Board, 2000.

unsignalized intersections on major corridors. The presence of LOS E or LOS F operations alone is not adequate reason for adding a signal. Instead, a more thorough traffic warrants study, including an analysis of traffic volumes and field conditions, would be required before signalization would be recommended.

1.8.2.2 Roadway Operations and Capacity Analysis – Existing and 2030 No-Build

Capacity analysis was conducted for the roadway corridor using Highway Capacity Software techniques. For this analysis, US 64 was divided into five critical segments – the five-lane section in Columbia just west of the project start, the two-lane section in Tyrrell County, the two-lane Alligator River bridge crossing, the two-lane section in Dare County, and the four-lane section just east of the project terminus.

The LOS performance measure used in this project is based on definitions outlined in the *Highway Capacity Manual 2000 (HCM 2000)* (Transportation Research Board, National Research Council, 2000) in the chapters titled Two-Lane Highways (Chapter 20) and Multilane Highways (Chapter 21).

The roadway LOS analysis methodology involved several steps:

- Developing representative input parameters for highway capacity analysis for the five sections of US 64 for existing 2006 conditions and the future (2030) No-Build scenario.
- Running a series of iterations with the *Highway Capacity Software 2000 (HCS 2000)* (University of Florida, 2003) for US 64 to obtain capacities for different roadway configurations.
- Calculating LOS related to the summer weekday and summer weekend time periods in 2006 and 2030 using the NCDOT-provided traffic forecasts noted above.

As shown on Table 1-6 the summer weekday, LOS C or better flow will occur for all segments, except the Alligator River Bridge crossing, through the 2030 study period. On the summer weekend, the existing four- and five-lane sections of US 64 (west and east of

**Table 1-6
2006 and 2030 Capacity Analysis**

Link No.	From	To	Cross-Section	AADT & Summer Weekday				Summer Weekend			
				AADT (vpd)		LOS		Daily Traffic Volume		LOS	
				2006	2030	2006	2030	2006	2030	2006	2030
1	SR 1209	Eastern limit of Columbia	Five-lane	7,100	13,800	C	C	9,600	17,600	C	C
2	Eastern limit of Columbia	Western shore of Alligator River	Two-lane	4,000	6,200	C	C	6,500	10,000	C	D
3	Western shore of Alligator River	Eastern shore of Alligator River	Two lane bridge	3,400	5,500	D	D	5,500	8,900	D	D
4	Eastern shore of Alligator River	US 264	Two-lane	3,400	5,500	C	C	5,500	8,900	C	D
5	US 264	US 64/264 and SR 1229 (Shipyard Road)	Four lane	4,200	6,800	B	B	6,800	11,000	B	B

the two-lane section under study) will maintain LOS C or better through 2030. The two-lane sections in Tyrrell and Dare counties, however, are forecast to operate at LOS D during the 2030 summer weekend. The Alligator River Bridge is currently operating at LOS D and is forecast to remain at LOS D through 2030, for both the summer weekday and summer weekend periods. The lack of shoulders and the passing restrictions on the bridge currently cause and will continue to cause vehicle "platooning," which results in some vehicles being forced to travel at lower speeds than desired.

1.8.2.3 Intersection Analysis – Existing and 2030 No-Build

Overall, intersection operations along the two-lane US 64 corridor are maintained at LOS C or better through 2030 with the current two-lane section in place. This analysis is based upon NCDOT forecasts, which assume low side-street volumes. If a medium-sized development were to be approved along this section, the side-street volumes could increase, with resulting changes to the forecasts.

All intersections along the study corridor are unsignalized. Intersections were examined for existing 2006 conditions and future 2030 No-Build conditions. Traffic analysis was conducted using the Highway Capacity Software for unsignalized intersection methodology. Intersection analysis was conducted for the AM and PM peak periods for

both existing 2006 and future 2030 traffic volumes. Both summer weekday and summer weekend volumes were analyzed.

All intersections along the existing two-lane project corridor operate at LOS B or better in 2006. By 2030, the majority of intersections continue to operate at LOS B or better, with some intersections operating at LOS C in the 2030 weekend period. Most side-streets are forecast to have minimal traffic volumes (less than 100 vpd), with the highest side-street volume forecast to reach 600 vpd.

At the Alligator River Bridge, vehicular traffic is delayed when the swing-span is opened to enable marine traffic to pass through the bridge. Traffic typically is delayed for approximately five minutes, although the bridge may be opened for longer periods (and traffic delayed for longer periods of time) for multiple boats or large boats. Bridge openings of 16 minutes have been recorded.

1.9 Crash Analysis

A crash analysis for the study corridor was conducted for all crashes occurring from 2003 through 2005. For this project, the NCDOT Traffic Safety Unit produced a Traffic Safety Analysis for the corridor. The analysis showed that traffic crash rates on the corridor are lower than the statewide average for similar two-lane rural US highways. As shown on Table 1-7, the total, fatal and non-fatal injury crash rates are all below the statewide averages. In addition, night and wet crash rates are lower than average. Note that crash rates are measured in crashes per 100 million vehicle miles (100 mvm).

**Table 1-7
US 64 Corridor Crash Rate Comparisons**

Types of Crashes	US 64 Corridor ⁽¹⁾		Statewide ⁽²⁾	
	Number of Crashes	Crash Rate per 100 MVM	Average Crash Rate	Critical Rate ⁽³⁾
Total	85	86.53	186.99	210.19
Fatal	1	1.02	2.45	5.56
Non-Fatal	20	20.36	73.07	87.77
Night	38	38.69	56.38	69.35
Wet	12	12.22	36.37	46.89

⁽¹⁾ Covers period from October 1, 2003, to September 30, 2006.

⁽²⁾ Covers period from 2003 through 2005.

⁽³⁾ Statistically derived number to identify or screen for high crash locations. Locations with a crash rate higher than the critical rate may have a highway safety deficiency and require additional analysis.

A primary reason for the lower than average crash rates is likely the limited amount of development, isolated access points, and low-volume crossroads. The low number of access points and crossroads result in reduced conflict points between vehicles.

A consistent goal of highway improvements is to improve safety conditions. In general, based upon North Carolina statewide averages for rural United States routes (2003-2005

Three-Year Crash Rates), a four-lane divided section has a lower average crash rate of 149.10 crashes per 100 mvm, compared to 186.99 crashes per 100 mvm on a two-lane undivided roadway. The difference in crash rates suggests that the existing two-lane highway generates a total crash rate that is 25 percent higher than the average four-lane divided section. Recognizing, however, that average crash rates are not always applicable to specific corridors, the FHWA conducted a study: *Safety Effects of the Conversion of Rural Two-Lane Roadways to Four-Lane Roadways* (FHWA, 1999). The study concluded that total crash rates could be expected to be reduced by 40 to 60 percent when a two-lane rural roadway is converted to a four-lane divided section. Although the benefits of converting to a four-lane undivided section were not conclusive, study results indicated a change in crash rates ranging from a 20 percent reduction to a slight increase.

To better understand crash rates along US 64, the analysis was divided into sub-corridors. As shown on Table 1-8, the crash rate is highest on the Lindsay C. Warren Bridge at the Alligator River.

Table 1-8
Sub-Corridor Crash Rate Analysis (crashes per 100 mvm)

Type of Crash	Crash Rates (per 100 mvm)		
	2-Lane Road in Tyrrell County	2-Lane Road at Lindsay C. Warren Bridge	2-Lane Road in Dare County
Total	93.72	103.58	79.02
Fatal	1.8	0	0
Non-Fatal	23.43	17.26	19.76

These rates are indicative of a bridge that may require additional safety features. Further review of crash locations on the bridge indicated five crashes occurred either at the existing swing-span (three crashes) or on the immediate approach to the swing-span (two crashes). A new Alligator River bridge would provide the opportunity for safety improvements related to the swing-span and the signalized approaches, as well as improved shoulders, lane width and guardrail.

Animals accounted for 36 percent of crashes along the 27.3-mile two-lane corridor. In terms of location, most of these crashes appeared to be random, although five occurred within a 1-mile stretch between milepost 10.26 and milepost 11.16 (approximately 1 mile west of the Alligator River bridge in Tyrrell County). Animals were involved in 77 percent of night crashes. Additionally, animal crashes along the corridor account for the majority of automobile crashes in Highway Patrol District A-4 (Coley, 2007), which includes all of Tyrrell County.

Fatal crashes on the corridor were limited to a single head-on crash with additional injuries, resulting in a fatal crash rate of 1.02 crashes per 100 mvm. Given the relatively low traffic volumes on US 64, the fatal crash rate could vary significantly with additional data. As an example, during the period from July 1996 to June 1999, the fatal crash rate for this same section of roadway was 4.13 crashes per 100 mvm. This change in fatal

crash rates appears to result from the recent addition of guardrail along the canals on either side of US 64.

1.10 Hurricane Evacuation Analysis

In 2005, NCDOT completed a State Hurricane Evacuation Study to establish standard evacuation clearance goals for NCDOT projects in the coastal region. Until that time, qualitative justifications were used to assert need for highway infrastructure to improve hurricane evacuation times. The 2005 study was established to project the magnitude of future clearance times on several primary evacuation routes in the state, and to develop quantitative target goals by which NCDOT will judge its current and proposed roadway infrastructure.

In the late 1990's, PBS&J completed a hurricane evacuation traffic model for the US Army Corps of Engineers (USACE), Wilmington District. Using that model as a basis, NCDOT contracted PBS&J to update the model with recent socioeconomic, behavioral, and roadway data and to develop modeling components. NCDOT also established a Hurricane Evacuation Study Oversight Committee consisting of representatives from NCDOT, FHWA, state and federal environmental resource and regulatory agencies, and North Carolina's coastal counties. The committee was charged with establishing critical policies and appropriate planning thresholds to use for modeling and goal-making. The oversight committee was comprised of:

- NCDOT
- FHWA
- USACE Regulatory and Operations
- US Fish and Wildlife Service Regulatory (USFWS)
- US Environmental Protection Agency (EPA)
- National Marine Fisheries
- NC Emergency Management
- NC Wildlife Resources Commission
- NCDENR/Division of Water Quality
- NCDENR/Division of Coastal Management
- NC Department of Cultural Resources
- Local City/County Emergency Management Officials

A Public Safety Sub-Committee was also established as a reference group to assist the main oversight committee. The sub-committee was comprised of:

- NCDOT
- NC Emergency Management
- NC State Highway Patrol
- National Weather Service
- Local City/County Emergency Management

The Hurricane Evacuation Study Oversight Committee discussed many detailed parameters appropriate for modeling, however several major policy-level thresholds

emerged as quantitative keys for modeling and to establish policy goals. These included:

- An appropriate “Tourist Occupancy Level” to use for modeling is that which matches an average summer day in August. This qualitative recommendation corresponds to a 75% tourist occupancy level.
- “Point of safety” was defined as a specific westerly location set by the relative location of Interstate 95.
- A Category 3 Hurricane was selected as the appropriate storm severity (which also induces specific behavioral responses) for planning/modeling.
- Minimum evacuation clearance time from evacuation zones to a point of safety. Clearance time is the total time (in hours), beginning with the start of an evacuation and ending when all evacuating vehicles have reached the point of safety.

The first three tenets were readily agreed-upon by the Oversight Committee; however a minimum evacuation clearance time elicited varying opinions – often depending upon the coastal region under consideration.

The Public Safety Sub-Committee met to discuss all aspects of evacuation policy and modeling thresholds, and recommended that the Oversight Committee establish a preferred maximum clearance time. The Public Safety Sub-Committee indicated a preference for an 18-hour maximum time that would allow for:

- Evacuations to be conducted mostly during daylight hours.
- Limiting the amount of personnel that North Carolina law enforcement would have to commit to one shift for an evacuation.
- Issuance of evacuation advisories within the National Hurricane Center’s warning period rather than issuance of evacuation notices during a hurricane watch period when the forecast track is much less certain.

NCDOT produced a draft State Hurricane Evacuation Study that recommended adopting an 18-hour minimum clearance time for all coastal regions. NCDOT distributed the draft study to the Oversight Committee. At that time, the North Carolina Legislature also procured a copy of the draft study. Upon deliberation, the legislature adopted the 18-hour evacuation clearance goal as NC General Statute § 136-102.7. The statute reads:

§ 136-102.7. Hurricane evacuation standard.

Evacuation Standard. – The hurricane evacuation standard to be used for any bridge or highway construction project pursuant to this Chapter shall be no more than 18 hours, as recommended by the State Emergency Management officials.

The State Hurricane Evacuation Study concluded that an 18-hour evacuation standard should be sought for the conditions of a Category 3 hurricane with a 75-percent tourist occupancy level. By applying these thresholds to an updated hurricane model, NCDOT is positioned to credibly and quantitatively analyze its current and proposed roadway

infrastructure - in order to make appropriate highway design and environmental impact decisions.

1.10.1 Methodology

To evaluate the proposed US 64 Improvements Project, NCDOT utilized and enhanced the original 2005 model to account for numerous evacuation scenarios, factoring in future land use growth and alternative roadway improvements on the US 64 corridor to project 2030 conditions. Clearance times were then modeled and compared with the state-legislated maximum 18-hour clearance time for vehicles to evacuate coastal areas to a location west of I-95.

The US 64 model uses a spreadsheet-based analysis, taking into account major land use, roadway and behavioral factors affecting evacuation at various hurricane intensities and levels of tourist occupancy. This model provides an estimate of the resulting clearance time, as measured from the time the first evacuating vehicle enters the roadway network to the time that the last vehicle has successfully evacuated to I-95 or points further west.

1.10.2 Findings

1.10.2.1 Storm Intensity and Percent Tourist Occupancy

The total volume of evacuating vehicles is a critical variable in determining the required clearance time for evacuation. For the US 64 study corridor, two variables impact this vehicular volume – the intensity of the hurricane and the number of tourists on the Outer Banks (measured in percent occupancy). In general, more intense storms and higher occupancy rates will result in longer clearance times. Table 1-9 illustrates the impact of these variables under both existing and 2030 No-Build roadway conditions. Under existing (2007) conditions, the 18-hour threshold is exceeded for a daylight evacuation at approximately 51 percent tourist occupancy for a Category 3, 4, or 5 storm. By 2030, the 18-hour threshold is exceeded at less than 35 percent occupancy for a Category 3, 4, or 5 storm. Given that these results fall short of the state goal to evacuate in an 18-hour evacuation timeframe for occupancy levels up to 75 percent, the "No-Build" model results indicate the need for an improved evacuation route.

**Table 1-9
Clearance Time (Hours) for Various Hurricane Strengths**

Hurricane Rating	35% occupancy	50% occupancy	75% occupancy	95% occupancy
Existing 2007				
Category 1-2	12.4	14.7	19.3	22.4
Category 3-5	15.6	17.9	22.5*	25.5
Future 2030 (No-Build)				
Category 1-2	15.8	18.8	24.5	28.4
Category 3-5	20.3	23.3	28.9*	32.9

Note: A category 3 hurricane with 75 percent occupancy is the standard storm defined as part of the 18-hour clearance threshold in North Carolina.

1.10.2.2 Base Scenario

Table 1-10 shows the estimated clearance time for the base scenario of a daylight evacuation with an assumed 8-hour loading of vehicles onto the roadway network. Loading time represents the amount of time necessary for all evacuees to start the evacuation process by exiting their places of residence (or in the case of tourists, their rental unit) and starting their trip on the roadway network. Under existing roadway conditions, the estimated clearance time would be 22.5 hours for 2007 traffic and 28.9 hours for the 2030 No-Build scenario. These clearance times exceed the state-mandated 18-hour threshold by 4.5 hours for 2007 traffic and 10.9 hours for the 2030 No-Build scenario.

Table 1-10
Clearance Time (Hours) Assuming 75% Occupancy and Category 3 Hurricane

Base Scenario with Daytime Evacuation (8 hour loading)	Clearance Time to I-95
Existing Conditions (2007)	22.5 hours
2030 No-Build	28.9 hours

1.10.2.3 Sensitivity Testing

In addition to the base scenario shown on Table 1-10, with daytime evacuations and an 8-hour loading time for the roadway network, a sensitivity analysis was conducted to examine the effect of variances in certain variables such as:

- Nighttime evacuation
- 12-Hour loading time

Nighttime Evacuation

A nighttime evacuation was tested to determine any impact on clearance times. In general, emergency management and law enforcement officials prefer to conduct an evacuation during daylight hours to facilitate safer conditions (particularly if rainfall is occurring). In some cases, however, a storm may increase speed and threaten earlier landfall and require an order for a nighttime evacuation. A comparison of daytime and nighttime evacuations is shown on Table 1-11. As shown, clearance times would be approximately 10 to 15 percent higher for a nighttime evacuation than a daytime evacuation. Primary contributions to this delay result from slower-starting evacuations under darkness, and slightly-reduced roadway capacities in darkness.

12-Hour Loading Time

The base scenario assumes that all evacuees start their trip within 12 hours of the official order to evacuate. An analysis of this assumption is summarized on Table 1-12. As shown, the loading time has a minimal impact on overall clearance goal. In some cases,

Table 1-11
Nighttime Clearance (Hours) Assuming 75 Percent Occupancy
and Category 3 Hurricane

Base Scenario (8 hour loading)	Clearance Time (hours) with Evacuation Starting in Daylight	Clearance Time (hours) with Evacuation Starting at Night	Clearance Time (percent increase) with Nighttime Evacuation
Existing Conditions	22.5 hours	25.6 hours	12%
2030 No Build	28.9 hours	33.3 hours	13%

Table 1-12
Clearance Time Assuming 75 Percent Occupancy and Category 3 Hurricane

Base Scenario with Daytime Evacuation	Clearance Time with 8-Hour Loading	Clearance Time with 12-Hour Loading
Existing Conditions	22.5 hours	22.3 hours
2030 No Build	28.9 hours	28.8 hours

clearance time is actually slightly improved, likely as a result of more efficient loading of the network. With a loading time of 12 hours, the minimum clearance time allowed is 12 hours, since it takes this long for vehicles to enter the roadway network.

Based on model results, additional roadway capacity is required to ensure safe and efficient evacuation of tourists from the Outer Banks. A two-lane US 64 is inadequate to achieve the state-mandated 18-hour hurricane evacuation clearance goal. In addition to the above, boat traffic may be evacuating the area at the same time as highway traffic, and this could result in a conflict at the Lindsay C. Warren Bridge. During an evacuation, westbound highway traffic needs to be unimpeded. However, in the event boats are evacuating at the same time, the swing-span may need to be opened to enable marine traffic to pass under the Lindsay C. Warren Bridge. This would delay motor vehicles for the time required to open the swing-span, allow boats to pass, and then close the swing-span.

1.11 Conclusion

The North Carolina Strategic Highway Corridors plan designates the US 64 corridor as a multi-lane expressway. The designation of Strategic Highway Corridors (SHC) recognizes the need to improve, protect, and maximize the use of a set of (primarily existing) highways critical to statewide mobility and regional connectivity. US 64 from Raleigh to Nags Head, North Carolina, is designated as Corridor 44 in the Strategic Highway Corridors Plan. The improvement of this critical link of US 64 will increase mobility and connectivity through central and eastern North Carolina, and to the

Charlotte region and beyond. Improving US 64 within the project corridor will provide motorists with more efficient travel through the region.

The 1989 Highway Trust Fund Act designated US 64 from US 52 in Davidson County to US 158 in Dare County as part of the North Carolina Intrastate Highway System. The current two-lane highway cross-section of US 64 within the project corridor is not in compliance with Intrastate Highway System standards. The NCDOT *State Transportation Improvement Program* and the North Carolina Intrastate Corridor System plan call for improvements to US 64 in Tyrrell and Dare counties. The intrastate system plan calls for widening the existing two-lane section of US 64 to four lanes. This two-lane corridor represents the last remaining section of US 64 between Raleigh and the Outer Banks that is not multi-lane.

The inadequate design and deteriorating condition of transportation infrastructure in the corridor create safety concerns for motorists and bicyclists. Some of the design deficiencies of US 64 in the project corridor are due to the age of the facility. The existing two-lane highway of US 64 within the project corridor has not been improved to meet current Intrastate Highway System design standards. Existing US 64 has two 12-foot-wide travel lanes and 10-foot-wide unpaved shoulders. Narrow shoulders on a highway present an increased safety risk and further deteriorate LOS when crashes or breakdowns create shoulder obstacles or cause lane closures. Separating traffic and improving shoulders by upgrading this section of US 64 from a two-lane rural roadway to a four-lane divided section has the potential to reduce total crash rates.

The Lindsay C. Warren Bridge was constructed in 1960 and is nearing the end of its design service life. The bridge is structurally deficient and has geometric and safety-related concerns that do not meet current NCDOT design standards. A new Alligator River bridge would provide the opportunity for operational and safety improvements by removing the swing-span and its approach signals, as well as improving shoulders, lane width, and guardrail. In addition, a high-span bridge is needed to provide continuous navigation passage and eliminate highway traffic delays, under both normal and evacuation conditions, that occur during operation of the swing-span.

US 64 is a primary North Carolina Hurricane Evacuation route for the Outer Banks and northeastern North Carolina. The state of North Carolina statewide hurricane evacuation clearance time goal is 18 hours. The existing US 64 project corridor does not meet the state mandated clearance times for hurricane evacuation, and conditions are projected to degrade with time. Under existing roadway conditions, the 18-hour threshold is exceeded at approximately 51 percent tourist occupancy for a Category 3, 4, or 5 hurricane. By 2030, the 18-hour threshold will be exceeded at less than a 35 percent tourist occupancy rate for a Category 3, 4, or 5 hurricane.