Addendum I
NC 12 Ocracoke Island Hot Spot
Ocracoke Island

Hyde County, North Carolina

Division 1
R-3116A

Prepared for the
North Carolina Department of Transportation, Division 1

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1.0 Executive Summary

Ocracoke Island is a coastal barrier island in the southeast portion of Hyde County, North Carolina. Most the island is part of the Cape Hatteras National Seashore. Regional access to Ocracoke Island is provided by four NCDOT operated ferries: Hatteras Inlet Ferry in Dare County, Swan Quarter Ferry in Hyde County, Cedar Island in Carteret County, and the Hatteras/Ocracoke Ferry. The Hatteras Inlet Ferry is the most widely used ferry to access Ocracoke Island. The Hatteras/Ocracoke Ferry is a seasonal passenger ferry that operates during the summer months from Hatteras Island to Silver Lake.

NC 12 is North Carolina's eastern most primary route that runs throughout the entire Outer Banks Region. It is mostly a two-lane roadway that runs along the North Carolina Outer Banks from Corolla, Dare County in the northeastern section of the state, to the unincorporated community of Sea Level in southeastern Carteret County. In 1991, NCDOT identified six "hot spots" along NC 12 in need of extensive maintenance due to continued severe storm and erosion damage. One of the hot spots, which is the focus of the 2016 Study and this Addendum, was located at the north end of Ocracoke Island, and extends from the Hatteras Inlet Ferry Terminal south for approximately five miles.

NC 12 and the ferry operations are subject to heavy seasonal variations in traffic and use related to summer tourism. Summer time is the peak period for short-term population increase on the island. In general, the summer population makeup on Ocracoke Island is approximately 90 percent tourists, and 10 percent permanent residents.

The design alternative examined in this Study Addendum is relocation of the Hatteras Inlet Ferry Terminal, which is located at the north end of Ocracoke Island and is referred to as South Dock. Long Term Alternative 7 (Alternative 7), a new ferry terminal north of Ocracoke Village, is being considered in detail, and then compared to all other alternatives based on project location, impacts, and preliminary design. In the Feasibility Study completed in 2016, Alternative 7's location for the new ferry terminal north of Ocracoke Village had not been identified, and there were no preliminary designs considered. Detailed descriptions, and potential impacts of this alternative are provided in this document. The key findings and concerns of the service to the New Ferry Terminal North of Ocracoke Village follows in this summary.

This Addendum now defines Alternative 7 as a new ferry terminal six miles north of Ocracoke Village that is approximately one mile south of the Pony Pens. Should the existing terminal be decommissioned, all NC 12 pavement and structures north of the proposed terminal to the existing terminal would be decommissioned and removed. Alternative 7 is being added to the list of all alternatives considered with two design options. In Alternative 7, Option A, a ferry ramp would extend approximately 9,000 feet from the existing NC 12 easement and beyond a nearby sand reef into the Pamlico

Sound, and would require minimal to no dredging for ferry vehicles. In Alternative 7, Option B, the ferry ramp would extend into the Sound approximately 5,000 feet from the existing NC 12 easement to a point inshore of the outer sand reef, and would require channel dredging to accommodate ferry vessel operations.

The study area for this Addendum is in southeastern Hyde County, North Carolina, on the northern extent of Ocracoke Island. The Addendum study area is along NC 12 approximately one mile south of the National Park Service's (NPS) Pony Pens, and six miles' northeast of Ocracoke Village and 10 miles south of the existing Hatteras Inlet Ferry Terminal on Ocracoke Island. The overall project study area's southern extent is within the NCDOT 100-foot-wide easement for NC 12, and extends north to the NPS-owned lands in the Cape Hatteras National Seashore, and into the Pamlico Sound. It is important to note that the applicability of Section 4(f), with regard to the Cape Hatteras National Seashore, will be determined by Federal Highway Administration (FHWA) should the project proceed using federal funds to the project development phase and environmental review per the National Environmental Policy Act (NEPA). In other projects involving NC 12, FHWA has determined that NC 12 was jointly developed with the Cape Hatteras National Seashore and, as such, Section 4(f) did not apply to the Seashore. Early coordination between the NPS and FHWA is recommended, should the project proceed to the NEPA phase with federal funds. The additional alternative project study area is shown on Figure 1 in the appendix A.1.

Additionally, in this Addendum, Alternative 6 Long, Ferry Service to Ocracoke Village Ferry Terminal, is being removed from further consideration. Analysis subsequent to the original feasibility study showed that this alternative is not feasible because there is no place in Ocracoke Village's Ferry Terminal area to accommodate additional ferry service. The alternative would also likely have adverse impacts to historic resources. For these reasons, Alternative 6 Long will no longer be considered a viable alternative.

This Addendum evaluates and compares Options A and B of Alternative 7 and alternatives from the 2016 Feasibility Study. In total, 10 alternatives are presented for comparison: four Near Term Alternatives (previously 5-Year), and six Long Term Alternatives (previously 50-Year). These alternatives were evaluated based on design criteria and considerations, coastal impacts, human and natural environmental impacts from findings in this study, and then costs were updated and developed for all alternatives.

As a NCDOT feasibility study, R-3116A was a preliminary document that was the initial step in the planning and design process for a candidate project, and not the product of exhaustive environmental or design investigations. The purpose of the feasibility study was to describe the proposed project including construction, right-of-way and utility costs, and identify potential problems that may require consideration in the planning and design phases.

Alternative 7 Considerations

- Constructability considerations include: land acquisition, channel development, terminal facility development during concomitant operations, and permitting.

- Travel time to and from the island by vehicle would increase with implementation of the Ferry Alternative options; specifically, for the Hatteras Inlet Ferry. During peak season, passengers could still take the passenger ferry from Hatteras Inlet to Silver Lake, which would not impede travel times.

- This alternative has the potential to reduce vehicle access to some recreational opportunities on the north end of the island. However, with the removal of NC 12, there would be more undisturbed natural space that could be used for passive recreational uses and native species habitat. The NPS has expressed interest in expanding the roaming area of the wild ponies on the north end of the island if the ferry ramp and NC 12 are removed.

- There are potential Section 4(f) impacts with the conversion of NPS land to develop new ferry facilities. However, with the removal of portions of NC 12 and relocation of South Dock, there will be more undisturbed NPS land at the Northern part of the island, which would cause a net gain of section 4(f) lands.

- There could be moderate visual impacts from additional ferry infrastructure and new ferry terminal.

- There is limited potential for impact to protected species, Significant Natural Heritage Area (SNHA), or wetlands. With the relocation of South Dock and removal of parts of NC 12, there would be more natural space on the northern part of the island. Dredging for a new ferry route could disrupt subaquatic vegetation (SAV) and essential fish habitat (EFH).

- The total estimated cost for installing the ferry terminal was determined to be approximately $87,200,000 for Alternative 7, Option A, and $52,700,000 for Alternative 7, Option B. This cost does not include crew, supporting facilities, maintenance, and vessel replacement.

- According to North Carolina General Statute 136 Article 6 subsections (a) and (b), the ferry between Hatteras Island and Ocracoke Island is a ferry route exempt from tolls, while the ferries from Swan Quarter and Cedar Island are tolled. Aside from the tolled ferries outlined in this statute, all other ferries are exempt from tolls. If the ferry from Hatteras Island were to become tolled, there would need to be legislation changes.

An updated summary of costs for all alternatives that remain under study including findings from this Addendum are presented in Table 1. Table 2 presents a summary evaluation of alternatives and identifies Alternative 7A Long as the best performing alternative.

Table 1: Cost Summary Table

Near Term Alternatives			
Alternative 1 Near Large Scale Beach Nourishment	Alternative 2 Near Dune Nourishment	Alternative 3 Near Relocate Roadway & Dune Nourishment	Alternative 4 Near Bridge over Hot Spot
$32,200,000	$6,400,000	$22,500,000	$62,600,000
Long Term Alternatives			
Alternative 1 Long Pamlico Sound Bridge	Alternative 2 Long Bridge throughout Hot Spot	Alternative 3 Long Roadway Relocation & Bridging	Alternative 4 Long Bridging in Existing Easement
$219,800,000	$260,600,000	$96,800,000	$273,900,000
Long Term Alternatives - continued			
Alternative 5 Long Large Scale Beach Nourishment	Alternative 6 Long Ferry Service to Ocracoke Village Ferry Terminal	Alternative 7 Long, Option A Service to New Ferry Terminal North of Ocracoke Village	Alternative 7 Long, Option B Service to New Ferry Terminal North of Ocracoke Village with Dredging
$542,600,000	Removed from Study	$87,200,000	$52,700,000

Table 2: Evaluation Summary of Alternatives

Alternative	Description	Cost	Recreational Area	Habitat for Native Species	Protected Species	Wetlands	Maintenance (Years)	Constructability	Long-Term Viability
1N	Large Scale Beach Nourishment	$32,200,000	Minimal Potential	Minimal Potential	Potential	None	1-10	Availability of Sand Resources	Potential to wash away in next major weather event
2N	Dune Nourishment	$6,400,000	Minimal Potential	Minimal Potential	Potential	None	1-10	Availability of Sand Resources	Potential to wash away in next major weather event
3N	Relocate Roadway and Dune Nourishment	$22,500,000	Parking, ORV	Reduction	Potential (lighting)	Potential	1-10	Availability of Sand Resources	Potential to wash away in next major weather event
4N	Bridge over Hotspot	$62,600,000	Parking, ORV	Reduction	Potential (lighting)	Potential	25-50	Temporary Easement	Would not solve washout problem; bridge could be compromised
1L	Pamlico Sound Bridge	$219,800,000	Parking, ORV	Reduction	Potential (lighting)	Potential	25-50	New Permanent Easement Needed; timing constraints	
2L	Bridge Through Hotspot	$260,600,000	Parking, ORV	Reduction	Potential (lighting)	Potential	25-50	New Permanent Easement Needed	Would not solve washout problem; bridge could be compromised
3L	Roadway Relocation and Bridging	$96,800,000	Parking, ORV	Reduction	Temporary Potential	Potential	25-50	New Permanent Easement Needed	New Roadway could be at-risk in near future if washout persists
4L	Bridging in Existing Easement	$273,900,000	Parking, ORV	Reduction	Potential	Potential	25-50		Would not solve washout problem; bridge could be compromised
5L	Large Scale Beach Nourishment	$542,600,000	Minimal Potential	Minimal Potential	Potential	None	1-10	Availability of Sand Resources	Potential to wash away in next major weather event
7AL	Service to New Ferry Terminal North of Village	$87,200,000	Net Increase of Recreational Area	Net Increase for habitable areas	Minimal Potential	Potential	25-50	Construction of new Ferry Terminal	Would remove at-risk ferry terminal and roadway
7BL	Service to New Ferry Terminal North of Village with Dredging	$52,700,000	Net Increase of Recreational Area	Net Increase for habitable areas	Minimal Potential	Potential	25-50	Construction of new Ferry Terminal	Would remove at-risk ferry terminal and roadway

Next Steps

Factors to consider as the project advances to study under NEPA include the following:

Ferry Terminal Alternative

- Costs
    - Ferry acquisition and maintenance
    - New terminal facility development & maintenance
    - Channel development and maintenance

- Constructability
    - Construction methodology and phasing
    - Material transport requirements, construction staging within Seashore
    - Permit/ new easement requirements

- Natural Environment
    - Submerged Aquatic Vegetation (SAV)
    - Essential Fish Habitat (EFH)

- Recreation & Access
    - Section 4(f) - access to NPS recreation facilities
    - Bike and pedestrian access
    - Off road vehicles (ORV)
    - Economic impact / Travel convenience

Investigations, coordination, and studies that may be conducted include:

- Prepare a Community Characteristics Report (CCR) and Community Impact Assessment (CIA) to understand the characteristics and resources of the community and determine the effects of displacements, changes in access and other impacts associated with a roadway on new alignment.
- Prepare air quality analyses, if needed.
- Coordination with the U.S. Coast Guard
- Coordination with the North Carolina Wildlife Resources Commission
- Coordination with the North Carolina Department of Environmental Quality-Division of Marine Fisheries
- Coordination with the U.S. Fish and Wildlife Service and National Marine Fisheries Service
- Coordination with the United States Army Corps of Engineers (USACE)
- A future environmental study will be required to assess project impacts to floodplains and open water.

- Conduct environmental wetland delineations for wetlands in the project study area.
- Develop a Public Involvement Plan and engage the community, local officials and business owners as early as possible.
- Coordination between the NPS and FHWA will be required to determine the applicability of Section 4(f) about the Cape Hatteras National Seashore.
- Coordination with the NPS will be required because they currently own all the land in the project study area.
- Coordinate with the Division of Coastal Management to determine any necessary procedures to avoid impacts.
- An environmental justice analysis will be prepared during the NEPA process to determine if there are disproportionally high and adverse impacts to these communities.
- Surveys will need to be done and coordination held with USFWS during project development to determine the impact to these species and any other species of concern in the study area.
- The project is within a Coastal Area Management Act (CAMA) County. The proposed project is subject to the rules and policies of the Coastal Resource Commission, and will require a permit for work impacting any areas designated as Area of Environmental Concern (AEC).
- A noise study will be done during the NEPA phase of the study to detail these impacts.
- Detailed sand sediment analysis (needed only for beach nourishment or dredging alternatives)
- Storm surge analysis to determine structure height and design
- Offshore surveys to determine sand source availability
- Studies to determine extent of dredging and potential for shoaling if ferry terminal is moved
- Shoreline studies to determine likelihood of a breach in the study area

2.0 Introduction

2.1 Project Background

NC 12 (R-3116A) Ocracoke Island Hot Spot Feasibility Study

In August 1991, NCDOT sponsored a research project conducted by North Carolina State University to identify vulnerable sections of North Carolina's coastal highways, and presented options that were available to maintain them. The research project concluded that NC 12 had six critical sections, or "hot spots," between the Oregon Inlet and the southwestern tip of Ocracoke Island. One of the hot spots was located at the north end of Ocracoke Island, and extends from the Hatteras Inlet Ferry Terminal south for approximately five miles. NCDOT initiated planning studies for the project in 2001, but funding to complete construction was never allocated. The State Transportation Improvement Program (STIP) for FY 2016 – 2025 did not include funding to improve this section of NC 12; however, the research project aided decision-makers as they considered funding for future projects in this area.

This Addendum is to the Feasibility Study that was published in December 2016. The 2016 study evaluated short-term (previously 5-Year) alternatives and long-term (previously 50-Year) alternatives. Four short-term alternatives and seven long-term alternatives were initially considered. In the feasibility study, alternatives were broadly categorized as nourishment options, road and bridge options, ferry alternatives, and combination alternatives. This addendum expands on the 2016 long-term ferry alternatives: Alternative 7, a new Ferry Terminal North of Ocracoke Village.

Draft 2016-2025 State Transportation Improvement Program (STIP)
NCDOT initiated planning studies for the project in 2001, but funding to complete construction was never allocated. R-3116A is listed in NCDOT's Division 1 2015's STIP as, "NC 12, Ocracoke Island Hotspot. Interim Improvements – Programmed for Planning and Environmental Study Only". R-3116A is not listed in the current FY 2018-2027 STIP. This feasibility study will aid decision-makers as they consider funding for future projects in this area.

Hyde County, NC CAMA Core Land Use Plan
The Coastal Area Management Act (CAMA) Core Land Use Plan from 2008 lists the NC 12 ferry terminal on Ocracoke Island as a vital economic development driver, and supports NCDOT to maintain access through ferries. The plan also recommends scenic resource preservation and enhancement, recreation access and historic interpretation through Ocracoke Island by roadway improvements, and protection to NC 12.

Comprehensive Transportation Plan (CTP)
The CTP represents Hyde County's long-term vision for how the transportation network should evolve. It includes four transportation modes: highways and streets; public transportation and rail; bicycle and pedestrian. It assesses the condition of the entire

network and serves as a framework for transportation planning efforts at the local and regional scale. The CTP recommends a multi-use path on NC 12 from the Pony Pens to the Hatteras Ferry that would tie into the existing multi-use path. This would allow for safer travel routes between ferries for pedestrians and bicyclists. Additionally, the CTP recommends NC 12 on Ocracoke Island to have a 4-foot paved shoulder to accommodate bicycle travel. The CTP does not include any specific ferry terminal location changes on Ocracoke Island.

Hurricane Matthew Resilient Redevelopment Plan, Hyde County
Hyde County identified rebuilding the dune along NC 12 from Hatteras Inlet to the Pony Pens as a major investment to resilience. This investment would reduce the potential for major roadway flooding and erosion, protect island infrastructure, and allow the tourism industry to operate with fewer interruptions and provide shorter evacuation periods because there will no longer be a need to maintain the section of NC 12 or the dunes north of the Pony Pens if Alternative 7 is constructed.

2.2 Adjacent Projects

NCDOT STIP projects included in the 2018-2027 STIP on Ocracoke Island are included in Table 3.

Table 3: Adjacent Projects

County	STIP Project	Description	Schedule (ROW/Construction)
Hyde	F-5702B	Ocracoke Pedestrian Waiting and Access Accommodations	Complete
Hyde	F-5702C	Construct One Passenger Ferry	Under Construction
Hyde	F-5702E	Hatteras and Ocracoke Dock Improvements	Complete – Work Accomplished Under F-5702B

2.3 Funding

As part of implementing the new Strategic Transportation Investments (STI) Law, NCDOT released its draft 10-year STIP on December 4th, 2014, which scheduled the statewide projects proposed for full or partial funding between 2016 and 2025. The purpose of the STI Law is to allow NCDOT to maximize North Carolina's existing transportation funding to enhance the state's infrastructure and support economic growth, job creation, and high quality of life.

STI established the Strategic Mobility Formula, a new way of allocating available revenues based on data-driven scoring and local input. Proposed transportation projects

go through a prioritization process during which they are evaluated through an analysis of the existing and future conditions, the benefits the project is expected to provide, the project's multi-modal characteristics, and how the project fits in with local priorities. Generally, the projects that increase capacity, safety, connectivity, and economic development score higher under the prioritization formula. The current Prioritization 5.0 (P5.0) does not include NC 12 R-3116A Hot Spot project. The current draft State STIP for FY 2020-2029 does not include funding to improve the section of NC 12.

2.4 Problem Statement and Purpose of Study

The purpose of the proposed project is to improve the resilience of the transportation network by implementing measures that maintain the long-term integrity and viability of the transportation system.

The proposed project is needed because of natural erosion combined with severe weather creates overwash and flooding of NC 12 on Ocracoke Island, which limits access both on and off the island to other islands and the mainland. Currently, severe weather conditions require continual maintenance or road closure that reduces and occasionally eliminates the operational capacity of the roadway that spans the island. The South Dock ferry terminal, located on the northern most point on the island, and NC 12 on Ocracoke Island is vulnerable to erosion based on studied shoreline trends. This limited and unreliable access on and off the island for residents, visitors, and officials can cause potentially dangerous situations during an emergency.

Due to steady and rapid erosion of the north end of the island, which threatens the sustainable operation of South Dock, to protect it from imminent threat of erosion, NCDOT constructed a sheet pile barrier during the summer of 2019. The recent efforts are not expected to provide a long-term solution but rather a short-term fix to protect ferry operations. The unplanned efforts to quickly construct a barrier to prevent further erosion and the ultimate demise of South Dock are further evidence that larger steps need to be taken to protect the long-term viability of this terminal. The images below show the original conditions of South Dock before significant erosion (top) and after erosion and washout and the construction of the barrier (bottom).

Photos of South Dock Erosion

Alternative 7 is intended to maintain the operational integrity of NC 12 and the South Dock ferry terminal on Ocracoke Island after a major storm or event. This goal will be met by reducing the road pavement length of NC 12 on Ocracoke Island, and placing the ferry terminals closer to each other, therefore reducing potential areas where roadways are compromised by severe weather conditions. The alternatives described in the

Feasibility Study completed in 2016 studied road, bridge, and ferry options, as well as beach and dune nourishment options. The Alternative 7 (Options A and B) proposed in this Addendum were investigated in more detail due to the rapidly worsening conditions on the island, which threaten NC 12 and the current ferry terminal, South Dock. Projected shoreline erosions trends from the 2016 Feasibility Study underestimated the severity of erosion in this area. Since the study was completed, erosion rates around the South Dock area were significant and unprecedented. A study conducted by Moffat and Nichol (2019), which led to the recommendation of barrier placement, found that wave height could reach up to 3.5 feet during a surge event. It was imperative to evaluate additional long-term alternatives more in depth to offer the best solution and eliminate undesirable alternatives that would not provide lasting results. Alternative 7 is the only alternative that would reduce the amount of road pavement on the island by placing the ferry terminals closer to Ocracoke Village. In addition to a need to identify an alternative which provides better protection from erosion, the NPS requested that relocation of the ferry terminal be considered because the relocation would allow ponies to roam free on the northern side of the island.

With the proposal of the relocation of the ferry terminal in Alternative 7, additional passenger ferry service could run into Ocracoke Village decreasing wait times for people without cars on the Hatteras side. Construction and operating costs of passenger ferries are lower than the traditional vehicle ferry used along this route. Running additional passenger ferry service into Silverlake would equate to time savings for people without vehicles compared to taking the vehicle ferry to the new location and then going into town. With additional passenger ferry service directly to Ocracoke, there would be less traffic congestion in the village, safer roads for pedestrians, and less road maintenance due to percentage of vehicles being removed from the roads.

2.5 Project Limits

The project area is in southeastern Hyde County, North Carolina, on the northern extent of Ocracoke Island. The project study area for this Addendum is along NC 12 approximately one mile south of the National Park Service's (NPS) Pony Pens, and six miles' northeast of Ocracoke Village and 10 miles south of the existing Hatteras Inlet Ferry Terminal (known as South Dock) on Ocracoke Island. The addendum project study area's southern extent is within the NCDOT 100-foot-wide easement for NC 12, and extends north to the NPS-owned lands in the Cape Hatteras National Seashore, and into the Pamlico Sound. The Addendum study area can be seen in Figure 1.

Figure 1. Project Study Area

3.0 Coastal Conditions

3.1 Current Conditions

NCDOT Division 1 provided an update on the rehabilitation efforts of South Dock at the northeastern limits of the 2016 project study area. Under existing conditions, the rate of shoreline erosion at South Dock has made the northeastern tip of Ocracoke Island unusable, and that the northern tip of the island is in extreme jeopardy due to significant erosion. NCDOT is taking measures to protect the shoreline in the vicinity of the South Dock with shoreline nourishment and the placement of sheet piles; however, these actions are not sustainable long-term. The 2019 Study conducted by Moffat and Nichol recommended barrier placement to decrease erosion rates to help protect the shoreline at South Dock from these large surges shown in the modeling. However, the study notes that the piling system will eventually be scoured at the base due to the surges and will continuously need to be monitored and supplemented for the barrier to remain effective. Since the 2016 Feasibility Study, unprecedented erosion is taking place and is threatening the operability of the ferry terminal. It is imperative to find solutions that identify long-term resilient solutions for the terminal, which include possible relocation, to sustain operations regardless of erosion patterns and large-scale weather events.

3.2 Shoreline and Erosion Studies

For this Addendum, all analysis of shoreline and erosion studies used the 2016 Feasibility Study findings.

3.3 Dredging Operations – Potential Sand Resources

NCDOT Division 1 stated that all potential sand resources would come from offshore dredging- performed by the USACE or a contractor- because channel dredging does not produce enough sand. The dredging of the existing channel within Hatteras Inlet is no longer a viable potential source of sand that can be considered for this study because the channel lacks sufficient amounts of sand. The USACE is responsible for dredging operations between the channel into South Dock.

The remainder of the Hatteras Inlet/Ocracoke ferry terminal channel is maintained by the NCDOT Ferry Division. Typically, the ferry channel from Hatteras Inlet to South Dock is dredged annually; however, dredging quantities and frequencies have varied historically with the occurrence of storm events.

4.0 Design Considerations and Criteria

4.1 Design Criteria

Design criteria were developed for the road relocation, bridge, and beach nourishment alternatives in the Feasibility Study completed in 2016. Additional criteria were developed for Alternative 7 (Table 4).

Table 4: Design Criteria for Ferry Terminals

Element	New Ferry Terminal Values
Access Channel Width	At least 200 ft. in width
Turning Basin	No less than 400 ft. x 400 ft.
Docks	At least 3
Ramps	At least 3
Stacking Lanes	At least 3

4.2 Traffic Estimate

In the feasibility study completed in 2016, 2010 traffic data was used to forecast 2040 traffic counts for NC 12 on Ocracoke Island in the summer on weekdays and weekends. According to the data from 2010, Average Annual Daily Traffic (AADT) on Ocracoke Island is expected to grow between 2.2 to 2.8 percent annually between 2010 to 2040 (Table 5). The NCDOT Roadway Design Manual recommends a two-lane roadway with eight-foot shoulders to be incorporated into the alternative designs under study. The paved shoulder policy also indicates that a five- foot paved shoulder could be considered along bike routes.

Table 5: Ocracoke Island Traffic Forecast (2010)

Time Period	2010	2040	Growth Rate
Average Annual Daily Traffic (AADT)	1,500	4,200	2.8%
Summer Weekday	2,800	6,700	2.4%
Summer Weekend	4,400	9,800	2.2%

4.3 Ferry Traffic Data

Ferry traffic data was provided by the NCDOT Ferry Division. All counts shown in Table 4 were based on total number of vehicle traffic for annual periods between July to June. Hatteras Inlet ferry counts by direction were not reported until the 2012/2013 annual period. Table 6 shows historical average annual daily traffic data for roads and ferries in the area for each year.

Table 6: Historical Average Annual Daily Ferry Traffic

Section	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19
Cedar Island to Ocracoke	32,354	32,725	30,660	28,054	26,786	24,873	23,753	23,047	21,749	21,131
Ocracoke to Cedar Island	32,091	32,700	30,012	26,753	26,608	25,247	23,584	23,153	23,585	21,238
Swan Quarter to Ocracoke	11,936	12,722	18,355	17,245	14,429	15,772	16,572	16,448	16,752	18,220
Ocracoke to Swan Quarter	11,783	13,259	17,940	17,058	16,731	16,142	16,831	16,532	16,532	18,153
Hatteras Inlet North-South	339,013	324,340	264,508	129,153	137,567	129,693	124,686	124,404	117,583	120,155
Hatteras Inlet South-North				131,095	136,951	129,944	142,791	116,580	115,908	120,160

No field counts were taken specifically for this study.

Table 7 displays the total vehicle and passengers carried for four ferry routes that access Ocracoke Island in 2019 from January to June.

Table 7: Existing Ferry Routes Accessing Ocracoke Island (2019)

Ferry Roads	Description	Total Vehicles	Passengers Carried
Hatteras – Ocracoke	Connects NC 12 from Ocracoke north to Dare County	103,899	246,685
Cedar Island - Ocracoke	Connects NC 12 from Ocracoke south to Cedar Island (Carteret County)	20,672	45,279
Swan Quarter - Ocracoke	Connects Ocracoke to mainland	16,228	33,819
Ocracoke – Hatteras Passenger Ferry	Seasonal Passenger Ferry connecting Ocracoke and Hatteras Islands	N/A	10,961
Total		140,799	336,744

5.0 Environmental Setting

5.1 Human Environment

5.1.1 Socio-economics

Ocracoke Island is home to 948 permanent residents (2010 US Census). The island's economy is based almost entirely on tourism, which peaks during the summer months and declines during the winter off-season. The summer population is approximately 90 percent tourists and 10 percent permanent residents. Of the tourist population, 70 percent are day trippers who make their arrival to and departure from the island within one day.

Ocracoke Island is not connected to the mainland or other barrier islands via bridges; residents and visitors alike are dependent on using the ferry system to travel to and from the island. Three ferry routes serve Ocracoke: the Hatteras Inlet Ferry, the Cedar Island Ferry, and the Swan Quarter Ferry. While some amenities are present on the island, especially during peak tourist season, permanent residents depend on the ferry system for routine trips such as daily commutes, school-related travel, trips to medical care facilities, and shopping, either on the mainland or other islands.

On the island, residents and visitors primarily make use of recreational opportunities provided by the Cape Hatteras National Seashore.

5.1.2 Environmental Justice

The project study area for this Addendum intersects two block groups. One block group in the study area contains a notable presence of low-income populations meeting the criteria for Environmental Justice. In Census Tract 9201, Block Group 4, 28.8 percent of the population is near poor, which is defined as within 100-149 percent of the poverty level. Because over 25 percent of the population is considered near poor, and it is at least five percent higher than the county average of 10.1 percent, this block group meets the criteria for Environmental Justice with a notable presence of low-income population. This block group is generally associated with the population on Ocracoke Island. An Environmental Justice analysis will be prepared during the NEPA process to determine if there are disproportionally high and adverse impacts to these communities due to the project. Additionally, NCDOT should target outreach to this area.

ACS Census data for the second block group, Census Tract 9902, Block Group 0 is not available. This block group is generally associated with the Pamlico Sound.

5.1.3 Land Use

The existing land use within the study area for this Addendum is on the Cape Hatteras National Seashore, and the study area extends into the Pamlico Sound. The Cape Hatteras National Seashore is a combination of natural and cultural resources, and provides a wide variety of recreational opportunities. The five main types of recreational opportunities found along the Seashore on Ocracoke Island are water and sand-based

activities, camping, fishing, hiking, and hunting. The water-based activities include swimming and surfing in the Atlantic Ocean or Pamlico Sound. Sand-based activities include sunbathing and shell-hunting along the Atlantic Ocean. Approximately 2.3 miles south of the project area, one of four National Seashore campgrounds can be found on Ocracoke Island with tent, trailer, and motor home sites. Camping at this campground is allowed between April and October. The Seashore offers a variety of fishing opportunities. Several kinds of fish can be caught from the surf, piers, and freshwater ponds or from boats in the inlets, the sound, and offshore in the Gulf Stream. Hiking designated trails can be used to explore other aspects of a barrier island beyond the beach. The islands also provide a variety of habitats and are a valuable wintering area for migrating waterfowl. Waterfowl hunting is permitted during designated seasons and with strict guidelines.

5.1.4 Cultural Resources

No schools, places of worship, cemeteries, greenways, recreational facilities, or neighborhoods are within the Addendum project study area. There is one beach access approximately one mile north of the project study area at the Pony Pens. Additionally, the Mountains to Sea Trail traverses the beach just outside of the study area. There would be no community displacements for either alternative studied in this Addendum. The community facility features can be seen on Figure 2 of the appendix A.1.

5.1.5 Historic Resources

No sites or local historic districts were identified from the North Carolina State Historic Preservation Office GIS data within 1,000 feet of the Addendum project study area.

5.1.6 Archeological Resources

Online research was conducted through the North Carolina Department of Natural and Cultural Resources and the North Carolina Office of State Archaeology to determine if there are archaeological resources or sites in the Addendum project study area. While no archaeological sites were identified from this work, it is recommended that more in-depth study be conducted during project development.

The Office of State Archaeology is also currently undertaking the laborious process of creating a GIS database of North Carolina's archaeological sites and systematically surveyed areas. This digitization effort has enabled staff to record sites and conduct environmental review within GIS. Consultants and researchers who visit the Raleigh office have access to the GIS in its current state; however, at this time, they do not offer web-based access.

5.1.7 Cape Hatteras National Seashore

Approximately 78.7 acres of the Addendum project study area is within the Cape Hatteras National Seashore, a federally designated National Seashore since 1937. The seashore preserves portions of the Outer Banks of North Carolina from Bodie Island through Hatteras Island to Ocracoke Island, stretching over 70 miles. This publicly-

owned resource's primary purpose is as a public recreational area, or park. It is managed by the National Park Service.

The Addendum project study area between the Pamlico Sound and NC 12 is designated as a National Heritage Area. Approximately 51.2 acres of National Heritage Area is within the project study area. These areas are lived-in places that combine cultural, historic, and natural significance to form nationally important landscapes. These entities determine how the significant landscapes can be utilized to make heritage relevant to local interest and needs. National Heritage Areas are community-led conservation and development areas, and are managed by coordinating entities and the National Park Service provides technical assistance and matching federal funding. These areas can be seen in Figure 4 of the appendix A.1.

A determination regarding the applicability of Section 4(f) for the Seashore will be made by FHWA during the NEPA process if the project proceeds using federal funds. For other projects involving NC 12, FHWA determined that the Seashore was 'jointly developed' with NC 12 and as such the Seashore was determined to be exempt from Section 4(f). Coordination between the NPS and FHWA will be required to determine the applicability of Section 4(f) regarding the Seashore.

5.1.8 Emergency Medical Services

The Addendum project study area is served by the Hyde County Emergency Services. A detailed assessment of potential impacts to emergency service routes will be provided during the NEPA phase as part of the Community Impact Assessment.

5.2 Natural Environment

A detailed environmental study was not conducted for this Feasibility Study Addendum. GIS level research and preliminary site review were completed. Resources in the Addendum project study area are described in the following sections.

5.2.1 Water Quality Resources

The project is within a Coastal Area Management Act (CAMA) County. The proposed project is subject to the rules and policies of the Coastal Resource Commission, and will require a permit for work impacting any areas designated as Area of Environmental Concern (AEC).

A portion of the Addendum project study area is located within an Otherwise Protected Area (OPA) CBRA area, CBRS Unit NC-03P. Coordination with the U.S. Fish and Wildlife Service is recommended during project development.

Three North Carolina Department of Environmental Quality (NCDEQ) classified water bodies were identified in the Addendum study area. These are listed in Table 8 below.

Table 8: Surface Water Classifications

Surface Water Name	Classification
Try Yard Creek	SA; HQW
Pamlico Sound	SA; HQW
Atlantic Ocean	SB

There are two named, NCDEQ classified streams and one ocean within the Addendum project study area: Try Yard Creek, Pamlico Sound, and the Atlantic Ocean. Try Yard Creek flows from its source to the Pamlico Sound. The Pamlico Sound is where the Neuse and Tar-Pamlico river basins drain and is a part of the larger Albemarle-Pamlico estuarine system. Both streams are rated as Class SA and High Quality Waters (HQW). The Atlantic Ocean is south of NC 12, and its waters are rated as SB, tidal salt waters protected for secondary recreation in addition to primary recreation. The water bodies are shown in Figure 2 in the appendix A.1.

Class SA waters are tidal salt waters that are used for commercial shell fishing or marketing purposes and are also protected for all Class SC and Class SB uses. All Class SA waters are also HQW by supplemental classification. The HQW supplemental classification is intended to protect waters which are rated excellent based on biological and physical/chemical characteristics through NC Division of Water Resources (DWR) monitoring or special studies, primary nursery areas designated by the Marine Fisheries Commission, and other functional nursery areas designated by the Marine Fisheries Commission. Class SB uses include primary recreational activities (swimming, skin diving, water skiing) and similar uses involving human body contact with water where such activities take place in an organized manner or on a frequent basis. Class SC uses include secondary recreation such as fishing, boating, and other activities involving minimal skin contact; fish and noncommercial shellfish consumption; aquatic life propagation and survival; and wildlife.

All water bodies in the project Addendum study area are subject to the Tar-Pamlico River Basin Buffer Rules (15A NCAC 02B .0259). This rule limits certain activities within the 50-foot wide riparian buffers directly adjacent to surface waters in the Tar-Pamlico River Basin (intermittent streams, perennial streams, lakes, ponds, and estuaries).

Try Yard Creek and the Pamlico Sound are considered waters of the United States. Activities impacting waters of the United States are regulated by Section 404 of the Clean Water Act (CWA) and will require a permit from the USACE Wilmington Regulatory District for the project. A CWA Section 401 Water Quality Certification approval from DWR would also be required.

The USCG Stream Coordination Map identifies the surface waters within the project Addendum study area as tidally influenced waters. The project may require coordination and permitting with the USCG. Try Yard Creek and the section of the Pamlico Sound within the project Addendum study area are not on the 2018 303(d) list. The project is within a Coastal Area Management Act (CAMA) County; therefore, it is subject to the rules and policies of the Coastal Resource Commission and will require a permit. There are no designated trout streams, Wild and Scenic Rivers, or FERC licensed facilities within 1,000 feet of the project Addendum study area.

5.2.2 Wetlands

Based on review of the USFWS National Wetland Inventory (NWI) map, 84.8 acres of wetland areas are located within the addendum project study area. Wetland areas may be present in the project study area that are not identified on the NWI maps.

There are approximately 1.8 acres of wetland, which includes 0.4 acre of aquatic bottom and 0.7 acre of unconsolidated shore wetlands, and 5.0 acres of surface waters (Pamlico Sound) in the project right of way for Alternative 7, Option A. There are approximately 0.7 acre of wetlands and 2.7 acres of surface waters (Pamlico Sound) in the project right of way for Alternative 7, Option B.

A preliminary jurisdictional determination of wetlands and waters of the U.S. within the project area should be obtained to accurately calculate impacts. An Individual Section 404 Permit may be required for this project as USACE has the discretion to require an individual permit if it determines that the proposed impacts will have more than a minimal impact on the aquatic environment or on other environmental factors, or if the project would normally require an Environmental Impact Statement (EIS) under current FHWA guidelines.

Environmental wetland delineations will be conducted for wetlands in the Addendum project study area. Wetlands in the Addendum project study area are shown in Figure 2 in the appendix A.1.

5.2.3 Submerged Aquatic Vegetation

There are approximately 78.7 acres of dense submerged aquatic vegetation, and 26.4 acres of patchy submerged aquatic vegetation in the Addendum project study area. This can be seen in Figure 3 of the appendix A.1. Submerged Aquatic Vegetation in the Addendum project study area is shown in Figure 3 in the appendix A.1.

5.2.4 Protected Species

There are seven species currently listed by USFWS as Threatened, five species listed as Endangered, one species listed as Threatened due to Similarity of Appearance, one species listed as At Risk Species, and one species listed as Experimental for Hyde County as of June 27, 2018. Surveys will need to be done and coordination held with USFWS during project development to determine the impact to these species and any other species of concern in the Addendum study area.

Additionally, there are two species listed as Threatened and seven species as Endangered for North Carolina under National Marine Fisheries Service (NOAA) Fisheries jurisdiction. Some species listed by NOAA will not be affected by either Alternative because they do not occur in the Pamlico Sound. Consultation with National Marine Fisheries Service (NMFS) is not required if it is determined that the proposed project will have "no effect" to listed species or designated critical habitat. If listed species or critical habitat may be affected, then consultation is required. Further analysis of potential effects to the species will be needed. Sea turtles are listed by both USFWS and NMFS, therefore the agencies may share consultation responsibilities. The protected species list for Hyde County can be seen in Table 9 below.

Table 9: Federally Protected Species Listed for Hyde County

Scientific Name	Common Name	Federal Status*
Alligator mississippiensis[1]	American alligator	T(S/A)
Laterallus jamaicensis[1]	Black rail	ARS
Chelonia mydas[2]	Green sea turtle	T
Eretmochelys imbricate[2]	Hawksbill turtle	E
Lepidochelys kempii[2]	Kemp's ridley sea turtle	E
Dermochelys coriacea[2]	Leatherback sea turtle	E
Caretta caretta[2]	Loggerhead sea turtle	T
Mytosis septentrionalis[1]	Northern long-eared bat	T
Canis rufus[1]	Red wolf	EXP
Calidris canutus rufa[1]	Rufa red knot	T
Charadrius melodus[1]	Piping plover	T
Picoides borealis[1]	Red-cockaded woodpecker	E
Trichechus manatus[1]	West Indian manatee	E
Amaranthus pumilus[1]	Seabeach amaranth	T
Aeschynomene virginica[1]	Sensitive joint-vetch	T
Acipenser oxyrinchus oxyrinchus[3]	Atlantic sturgeon	E
Acipenser brevirostrum[3]	Shortnose sturgeon	E
Manta birostris[3]	Giant manta ray	T
Carcharhinus longimanus[3]	Oceanic whitetip shark	T
Balaenoptera musculus[3]	Blue whale	E
Balaenoptera physalus[3]	Fin whale	E
Eubalaena glacialis[3]	North Atlantic right whale	E
Physeter microcephalus[3]	Sperm whale	E
Balaenoptera borealis[3]	Sei whale	E
*T(S/A) = Threatened due to Similarity of Appearance; ARS = At Risk Species; T = Threatened; E = Endangered; EXP = Experimental		
[1]Species listed by USFWS only [2]Species listed by USFWS and under NOAA Fisheries jurisdiction [3]Species listed under NOAA Fisheries jurisdiction only		

5.2.5 Bald and Golden Eagle Protection Act

The bald eagle is protected under the Bald and Golden Eagle Protection Act, and enforced by the USFWS. Surveys will be done and coordination held with USFWS to determine the impact to these species.

5.2.6 Anadromous Fish

No anadromous fish spawning areas were identified within 1,000 feet the Addendum project study area, but the Pamlico Sound's waters are connected to inland water bodies that are considered anadromous fish spawning waters. The project should coordinate with the North Carolina Division of Marine Fisheries to determine potential effects to those areas.

5.2.7 FEMA Hazard Mitigation Grant Program Properties

Protection of floodways and floodplains is required under 23 CFR 650A; Executive Order 11988, Floodplain Management; and US Department of Transportation (USDOT) Order 550.2, Floodplain Management and Protection. The intent of these regulations is to avoid or minimize highway encroachments within the 100-year (base) floodplains or regulatory floodway, where practicable, and to avoid supporting land use development that is incompatible with floodplain values.

Based on a preliminary review of data available on the North Carolina Flood Risk Information System, there are approximately 75.2 acres of 100-year floodplain within the Addendum project study area. Additionally, there is open water associated with the Pamlico Sound in the project Addendum study area. There will be anticipated impacts to the floodplain and open water. However, a future environmental study will be required to assess project impacts to floodplains and open water. There are no FEMA Hazard Mitigation Grant Program buyout properties within the vicinity of the Addendum project study area.

6.0 Description of Long Term Alternative 7

Per a request from NPS to evaluate relocation of the South Dock ferry terminal, and due to the steady and rapid erosion of the north end of the island, which threatens the sustainable operation of South Dock, NCDOT Division 1 has added Alternative 7 to the alternatives presented in the Feasibility Study completed in 2016. Both options of Alternative 7 consider the building of a new ferry terminal approximately six miles north of Ocracoke Village to replace the existing South Dock Ferry Terminal at the eastern edge of Ocracoke at the Hatteras Inlet. Should the existing terminal be decommissioned, all NC 12 pavement and structures north of the proposed terminal to the existing terminal would be decommissioned and removed. The alternative would be built approximately 6,000 feet south of the Pony Pens. The NPS requested that relocation of the ferry terminal be considered because the relocation would allow ponies to roam free on the eastern side of the island.

Both design options include a toll booth for ticketing located at the entrance in the center of the road for approaching vehicles, stacking vehicle queuing lanes with a capacity of 264 vehicles, and a surface parking lot with 54 spaces with an associated building for restrooms and another for NCDOT use. These facilities would be located on land. The ferry ramps that extend into the Sound would be constructed in two phases; the first phase would include two Sound Class piers and ramps and the second phase would include two Sound Class piers with ramps.

6.1 Long Term Alternative 7 Option A

This alternative extends approximately 9,000 feet into the Pamlico Sound from NC 12, with the ferry ramp located beyond the nearby sand reef in a water depth of approximately seven feet. This location should require minimal to no dredging for ferry vessels.

6.2 Long Term Alternative 7 Option B

This alternative extends approximately 5,000 feet into the Pamlico Sound from NC 12, with the ferry ramp located before the nearby sand reef in a water depth of approximately one to two feet. This location will require dredging for ferry vessels.

6.3 Removal of Alternative 6

Based on operational requirements of future ferry service, Long Term Alternative 6, Ferry Service to Ocracoke Village Ferry Terminal, was not feasible. Additionally, the NPS had concerns with this alternative because of how it could potentially impact the Ocracoke Village Historic District. Long Term Alternative 6 proposed to expand ferry service to the Silver Lake ferry terminal, which is located immediately outside the Ocracoke Historic District boundary. If, as proposed, the ferry terminal was expanded, then approximately 4.5 acres of land needed for the proposed expansion might encroach upon the historic district. No other alternatives were expected to have any impact on historic or cultural resources.

7.0 Summary Description of All Alternatives Considered

This section considers all alternatives remaining under consideration. In this Feasibility Study Addendum, all quantities have been updated for a cost comparison to the new alternatives, and the comparisons matrix has been updated to include Alternative 7's Options A and B, and removes the 2016 Feasibility Study Alternative 6. The complete list of alternatives under study in this section can be seen below.

Near Term Alternatives help mitigate the vulnerability of the NC 12 roadway structure, but do not mitigate the vulnerability of South Dock and are as follows:

- Near Term Alternative 1– Large Scale Beach Nourishment. This alternative includes nourishment along 4.65 miles of the beach to a predetermined project baseline. The nourishment seeks to ensure a suitable distance between the roadway and the shoreline is maintained.

- Near Term Alternative 2 – Dune Nourishment. Sand would be used to nourish 3.63 miles of dune. This alternative would comply with current NPS requirements that generally preclude nourishment of the ocean beach.

- Near Term Alternative 3 – Roadway Relocation and Dune Nourishment. NC 12 would be relocated relative to the forecast 2018 (5-Year) shoreline and sand would be used to nourish a protective dune along the east side of the roadway.

- Near Term Alternative 4 – Bridge over Hot Spot. NC 12 would be bridged within the existing easement throughout most of the hot spot. Bridging the hot spot removes the need for major dune construction and berm nourishment.

Long Term Alternatives (Alternatives1-5 do not mitigate the vulnerability of South Dock):

- Long Term Alternative 1 – Pamlico Sound Bridge. A bridge would be constructed from the project's northern terminus on existing NC 12, through the Pamlico Sound along the west side of Ocracoke Island, terminating along existing NC 12 approximately four miles of south the starting point.

- Long Term Alternative 2 – Bridge Alternative throughout Hot Spot. A bridge would be constructed starting at the project's northern terminus on existing NC 12, through NPS land and west of the forecast 50-Year shoreline, terminating approximately two and a half miles south on existing NC 12.

- Long Term Alternative 3 – Relocate Roadway and Bridging. NC 12 would be relocated to the west of the 2063 (50-Year) projected shoreline, and bridges would be constructed over streams and small coves.

- Long Term Alternative 4 – Bridge in Existing Easement. NC 12 would be bridged within the existing roadway easement throughout nearly all of the project area.

- Long Term Alternative 5 – Large Scale Beach Nourishment. The dune and beach nourishment cycles would occur once every four years for up to 50 years. Under this alternative, sand would be used to nourish 4.82 miles of the beach and existing dune system. All potential sand resources for nourishment would come from offshore dredging. This work would have to be done by either the USACE or a contractor.

- Long Term Alternative 7 – Ferry Service to New Ferry Terminal North of Ocracoke Village. Ferry service would be extended from the Hatteras Inlet Ferry Terminal on Hatteras Island to a new ferry terminal located six miles north of Ocracoke Village.

    - Option A - Service to New Ferry Terminal North of Ocracoke Village

    - Option B – Service to New Ferry Terminal North of Ocracoke Village with Dredging

8.0 Comparison of Alternatives

A more detailed assessment of impacts for each alternative will be conducted during the NEPA documentation process. To simplify the comparison of alternatives, design options were broadly categorized as nourishment options, road and bridge options, ferry options, or a combination as shown below:

Nourishment Options

- Near Term Alternative 1 – Large Scale Beach Nourishment
- Near Term Alternative 2 – Dune Nourishment
- Long Term Alternative 5 – Large Scale Beach Nourishment

Road and Bridge Options

- Near Term Alternative 4 – Bridge Over Hot Spots
- Long Term Alternative 1 – Pamlico Sound Bridge
- Long Term Alternative 2 – Bridge throughout Hot Spot
- Long Term Alternative 3 –Relocate Roadway and Bridge
- Long Term Alternative 4 – Bridge in Existing Easement

Ferry Options

- Long Term Alternative 6 – Ferry Service to New Ferry Terminal in Ocracoke Village – eliminated from further consideration.
- Long Term Alternative 7 – Ferry Service to New Ferry Terminal North of Ocracoke Village

Combination Options

- Near Term Alternative 3 – Roadway Relocation and Dune Nourishment

8.1 Long Term Alternative 7 Option A and B

8.1.1 Human Environment Impacts

8.1.1.1 Travel Time and Recreation

The new location of the ferry terminal would mean the Hatteras Inlet Ferry trip time would be longer than the current ferry route between Ocracoke and Hatteras Islands. The current NCDOT ferry route is 8.5 miles long and takes approximately 1 hour to complete Alternative 7 would be approximately a 15-mile route from the Hatteras Ferry terminal to a new ferry terminal north of Ocracoke Village. These longer routes would translate to longer ferry rides. Depending upon the vessel used and the channel condition, Alternative 7 would take between 1.25 and 1.75 hours. The current route from Hatteras Inlet to South Dock is approximately 1 hour. It should be noted that in

both options for Alternative 7, the drive to Ocracoke Village will be cut shorter than with the current ferry terminal at the north end of Ocracoke Island.

Additionally, the ferry alternatives would reduce vehicle access to northern parts of the island and would allow for more open space for the wild ponies. This area would still be able to be used for recreational purposes, but would not be accessible via a state-maintained roadway facility.

8.1.1.2 Land Use

Conversion of NPS Land. The project corridor occurs within the Cape Hatteras National Seashore which is federally owned land managed by the NPS. A determination regarding the applicability of Section 4(f) for the National Seashore will be made by the FHWA during the NEPA process if the project proceeds using federal funds.

8.1.1.3 Section 4(f)

As discussed in Section 5.1.5, Section 4(f) will be applicable only if federal funds are used for the project. If federal funds are used, FHWA will make a determination as to the applicability of Section 4(f) regarding the Seashore.

Alternative 7 could have Section 4(f) impacts under the permanent use category because approximately 4.5 acres of potential Section 4(f) resources would be converted to a new transportation facility. However, as previously mentioned, more land on the northern portion of the island would be returned to a natural state.

8.1.1.4 Visual Impacts

Alternative 7 also could cause moderate visual impacts through the construction of a new ferry terminal along the west side of NC 12. Although typical terminal buildings and structures are one story, it is likely that this could be viewed from NC 12 and would be a visual disruption in the views of the sound. Alternative 7, Option A would have more visual disruption in the views of the sound because it extends longer into the Sound.

8.1.2 Natural Environment Impacts

8.1.2.1 Natural Heritage Areas

Alternative 7 may have potential impacts to North Carolina Natural Heritage Program (NCNHP) areas. It would likely not affect sea turtles that use the ocean beach, as all work would take place on the sound-side of Ocracoke Island. The presence of other threatened and endangered species and associated habitats may be affected. Dredging operations in Alternative 7, Option B would potentially disrupt SAV and EFH more than Alternative 7, Option A.

8.1.2.2 Wetlands

There are approximately 1.8 acres of wetlands, which includes 0.4 acre of aquatic bottom and 0.7 acre of unconsolidated shore wetlands, and 5.0 acres of surface waters (Pamlico Sound) in the project right of way for Alternative 7, Option A, and approximately 0.7

acre of wetlands and 2.7 acres of surface waters (Pamlico Sound) in the project right of way for Alternative 7, Option B.

Additionally, a portion of the Addendum project study area is located within an Otherwise Protected Area (OPA) CBRA area, CBRS Unit NC-03P.

8.1.2.3 Water Bodies

Pamlico River and Pamlico Sound, and Try Yard Creek waters are tidal salt waters use for commercial shell fishing or marketing purposes (Class SA) and High Quality Waters (HQW). All Class SA waters are also HQW by supplemental classification. The Atlantic Ocean is classified as Class SB, tidal salt waters protected for secondary recreation in addition to primary recreation. There are approximately 78.7 acres of dense submerged aquatic vegetation, and 26.4 acres of patchy submerged aquatic vegetation in the addendum project study area. All water in the in the Addendum project study area is tidally influenced.

8.1.3 Constructability

Long Term Alternative 7

For Alternative 7, given that the terminal would be constructed outside of the NC 12 right-of-way, complications from vehicle traffic are not a significant concern; however, all new land required for the terminal and the access roadway would have to be authorized by the NPS, likely in a new easement. Additional vessels may be required for this alternative. Alternative 7, Option B would require additional maintenance because the channel would need to be dredged for ferry clearance.

8.1.4 Cost

The estimated capital costs of both Options A and B of Alternative 7 are $87.2 million and $57.2 million, respectively. In July of 2019, the Hatteras Ferry Route made a total of 36 trips in a given day. There were six day boats that made five trips each for a total of 30 day trips and there were two night boats that made three trips each for a total of six night trips. With the Options A and B moving the ferry terminal further south on the island, there are longer trip times associated, which impacts the number of trips one ferry vessel can make in a given day. With the extra distance, the six day boats would only be able to make three trips a day for a total of 18 day trips. The two night boats would still be able to make 3 trips a day for a total of six night trips and a grand total of 24 trips. This 12-trip reduction would lead to an overcapacity of vehicles on the ferries and would therefore require additional resources to increase the number of trips. An additional four boats would be needed in order to make the 30 day trips needed. With each boat making three trips, ten boats would satisfy the 30 trips. This increase in boats would require additional staffing. With an additional four boats, eight crews would be needed. Each crew has six workers. The total cost for these extra employees for one year would be $4,331,501.20.

The other factor to consider with cost is fuel. Per the Ferry Division, fuel consumption would increase on average by 2,400 gallons a day. This accounts for the longer trip and

the additional boats needed to make the extra trips. Assuming that a gallon of fuel is $2.01 and an additional 876,000 gallons of fuel would be needed in one year, the total cost for additional fuel in a year would be $1,760,760. In total, an additional $6,092,261 in funding would be needed for extra fuel and crew for Options A and B. This number does not take into consideration maintenance/repair or vessel replacement.

When considering the cost of Alternative 7, the reduction in cost of maintaining both NC 12 and South Dock for the next 50 years should also be considered.

8.2 Summary

Table 10 summarize potential impacts for the Near Term and Long Term alternatives based on the considerations presented in this Addendum. The following summarizes the table and text presented in this section for each group of options.

8.2.1 Beach Nourishment Options

- The nourishment of the beach, berm and dune alternatives will likely have minor potential impact on recreational resources.
- These alternatives have the potential for Section 4(f) impacts. If federal funds are used, FHWA will determine the applicability of Section 4(f) regarding the Seashore.
- NPS permits and policy guidelines would need to be completed and followed for beach nourishment.
- Minor visual resource impacts may occur with these alternatives.
- Minor temporary impacts to protected species, SAVs and EFH. No impact anticipated to Significant Natural Heritage Areas or wetlands.
- The availability of sand for fill both in the short- and long-term, its transport method and permitting concerns are key constructability considerations for these alternatives. Sand from dredging operations is no longer available
- Costs for these alternatives are expected to range from approximately $6 million to $550 million.

8.2.2 Road and Bridge Options

- Constructability concerns include: the ability to obtain permits from appropriate agencies, the manner of transporting and staging of construction materials in existing ROW, the ability to transport prefabricated bridge parts, and construction methodology. In addition, limitation on construction activities during peak tourist season is also a factor. There are campgrounds near the study area. Construction activities could be limited to minimize impacts to such areas during peak tourist season.

- NCDOT Division 1 stated that there is concern with the shoreline erosion rate, and shoreline and sound erosion from storms. The road setback requirement in roadway re-alignment alternatives may be readjusted because of sound erosion after storms.

- These alternatives are expected to have moderate impacts to recreation access points.

- These alternatives will enhance bicycle and pedestrian travel.

- Permanent use and potential for constructive and temporary use under Section 4(f).

- Visual impacts range from minor with roadway relocation alternative to substantial for new bridge alternatives.

- These alternatives are most likely to affect sea turtles, piping plover and red knot. Only the Pamlico Sound Bridge (Long Term Alternative 1) is expected to impact SAV and EFH. Impacts to SNHA range from approximately 12 acres to approximately 68 acres.

- The near-term alternative has an estimated cost of $62.6 million and the long-term alternatives have a range of costs between $220 million and $273.9 million.

8.2.3 Ferry Options

- Constructability concerns include: land acquisition, channel development, terminal facility development, and permitting.

- Travel time to and from the island will be increased with implementation of a new terminal north of Ocracoke Village. This could affect visitors to the island and delivery of goods and services.

- The Alternative 7 options will reduce access to some recreational opportunities, including bicycle and pedestrian access, if NC 12 is not maintained north of the ferry terminal.

- If federal funds are used and the conversion of the NPS land to develop new transportation facilities alters access, there could be a Section 4(f) determination.

- There could be moderate visual impacts from additional ferry infrastructure and new ferry terminal.

- There is limited potential for impact to protected species, SNHA, or wetlands. Dredging for a new ferry route in Alternative 7, Option B could disrupt SAV and EFH habitats.

- The estimated capital costs for Option A equal $87.2 Million and $57.2 million for Option B.

Table 10. Comparison of Near Term Alternatives

			Near Term Alternatives			
			Near Term Alternative 1 Large Scale Beach Nourishment	Near Term Alternative 2 Dune Nourishment	Near Term Alternative 3 Relocate Roadway & Dune Nourishment	Near Term Alternative 4 Bridge Over Hot Spot
Potential Impacts		Cost	$32,200,000	$6,400,000	$22,500,000	$62,600,000
		Constructability	Availability of sand resource; transport method concerns; local competition for sand resources; and required permits from NPS. Adherence to NPS Policy guidelines with regard to Beach Nourishment.	Availability of sand resource; transport method concerns; local competition for sand resources; and required permits from NPS. Less sand needed than Option 1.	New easement would require permit from NPS; concern about construction materials transport and staging.	Concern about ability to detour traffic during construction. Concerns about completing all construction activities, including staging, within the existing easement. Temporary construction easement outside existing easement would require permit from NPS
		Travel Convenience	No change anticipated	No change anticipated	Possible delays during construction.	Possible delays during construction.
		Need for Dredging	1,916,000 cy of sand resources needed. Sand resources expected to come from offshore sites.	139,000 cy of sand resources needed. Sand resources expected to come from existing dredging operations.	256,000 cy of sand resources needed. Sand resources expected to come from existing dredging operations.	66,000 cy of sand resources needed. Sand resources expected to come from existing dredging operations
	Human Environment	Land Use	No change anticipated	No change anticipated	Conversion of 37.6 acres of NPS land for new NC 12 easement.	No permanent land use changes anticipated, but some NPS lands may be used for construction easement.
		Cultural Resources	No change anticipated	No change anticipated	No change anticipated	No change anticipated
		Bike & Pedestrian	No change anticipated	No change anticipated	Potential beneficial impact with use of proposed wider paved shoulder.	Potential beneficial impact with use of proposed wider paved shoulder
		Section 4(f)	Permanent incorporation impacts are likely to occur with berm and dune nourishment outside of the existing NC 12 easement.	Permanent incorporation impacts are likely to occur with berm and dune nourishment outside of the existing NC 12 easement.	Permanent incorporation of approximately 38 acres for new NC 12 easement.	Potential constructive use possible, depending upon visual impact of bridge. Potential for temporary use associated with temporary construction easement.
		Visual Considerations	Minor potential impact based on height increase of dunes over existing conditions.	Minor potential impact based on height increase of dunes over existing conditions.	Minor potential for impacts with vegetation removal.	Impact based on visual presence of new bridge.
		Recreation	Minor potential to affect recreation resources. Efforts for beach fill could be performed in tourism off-season.	Minor potential to affect recreation resources. Efforts for beach fill could be performed in tourism off-season.	Loss of access to one parking area, one ORV access, and two dirt roads to the sound.	Likely loss of one ORV access and cut off of loss of access to one parking area.
	Natural Environment	Significant Natural Heritage Areas (SNHA)	0 acres	0 acres	45.96 acres	20.83 acres
		Protected Species[1]	Minor potential temporary impact to sea turtles, but could be minimized if beach fill occurs outside of the nesting season. Minor potential temporary impact to piping plover and red knot during construction.	Minor potential temporary impact to sea turtles, but could be minimized if beach fill occurs outside of the nesting season. Minor potential temporary impact to piping plover and red knot.	Potential lighting impacts to sea turtles.	Potential lighting impacts to sea turtles.
		Wetlands	No change anticipated	No change anticipated	Potential impacts to wetlands west of NC 12.	Potential wetland impacts
		SAVs & EFHs	Potential temporary, localized impacts to EFH in offshore area associated with sand extraction from off-shore sites. Potential impacts to EFH present in the surf zone sand placement areas.	No change anticipated	No change anticipated	No change anticipated

[1]Protected species refers to species listed as threatened or endangered by the USFWS. NPS species refers to species that either are proposed for listing (Rufa red knot) or are species of high concern (American oyster catcher). Because of agency concern for these species, their impacts were considered in this evaluation.

Table 11. Comparison of Long Term Alternatives

Long Term Alternatives (Options 1-4)						
			Long Term Alternative 1 Pamlico Sound Bridge	Long Term Alternative 2 Bridge throughout Hot Spot	Long Term Alternative 3 Roadway Relocation and Bridging	Long Term Alternative 4 Bridging in Existing Easement
Potential Impacts		Cost	$219,800,000	$260,600,000	$96,800,000	$273,900,000
		Constructability	Channel Dredging to deliver pre-fabricated bridge components; top down construction; Potential timing constraints for certain construction activities during peak tourist season; New permanent easement outside existing easement would require permit from NPS	Channel Dredging to deliver pre-fabricated bridge components; top down construction; NCDEQ, Potential timing constraints for certain construction activities during peak tourist season. New permanent easement outside existing easement would require permit from NPS	Channel Dredging to deliver pre-fabricated bridge components; top down construction; Potential timing constraints of certain construction activities during peak tourist season; New permanent easement outside existing easement would require permit from NPS	Concern about ability to detour traffic during construction. Concerns about completing all construction activities, including staging, within the existing easement; Potential timing constraints of certain construction activities during peak tourist season
		Travel Convenience	Possible delays during construction.	Possible delays during construction.	Possible delays during construction.	Possible delays during construction.
		Need for Dredging	Channel dredging for construction activity. 1,916,981 cy of sand needed (over 50 years), expected to come from existing dredging operations.	Channel dredging for construction activity. 111,187 cy of sand needed (over 50 years), expected to come from existing dredging operations.	Channel dredging for construction activity. 4,775,825 cy of sand needed (over 50 years), expected to come from existing dredging operations.	111,187 cy of sand needed (over 50 years), expected to come from existing dredging operations.
	Human Environment	Land Use	62.21 acres of NPS land converted to road/bridge use.	59.66 acres of NPS land converted to road/bridge use.	59.56 acres of NPS land converted to road/bridge use.	Temporary land use changes due to new TCE needed outside the existing easement.
		Cultural Resources	No change anticipated	No change anticipated	No change anticipated	No change anticipated
		Bike & Pedestrian	Potential beneficial impact with use of 8-foot proposed shoulder	Potential beneficial impact with use of 8-foot proposed shoulder with 5-foot bicycle lanes within shoulder	Potential beneficial impact with use of 8-foot proposed shoulder with 5-foot bicycle lanes within shoulder	Potential beneficial impact with use of 8-foot proposed shoulder with 5-foot bicycle lanes within shoulder
		Section 4(f)	Permanent incorporation of approximately 62 acres into new NC 12 easement; potential impact based on change in visual character.	Permanent incorporation of approximately 60 acres for new NC 12 easement; potential impact based on change in visual character.	Permanent use of approximately 60 acres for new NC 12 easement.	Visual intrusion could be a constructive use of the Seashore. The final determination will be made by FHWA during the NEPA phase of the project. Potential for temporary use associated with temporary construction easement
		Visual Considerations	Impact to views from Sound and upland, less impact from beach.	Significant impact to views from beach and upland, less so for sound.	Minor impacts because of vegetation removal for new road construction.	Impact to views from beach and upland, less so for sound.
		Recreation	Loss of access to one parking area, one ORV access, and two dirt roads to the sound.	Loss of access to one parking area, one ORV access, and two dirt roads to the sound.	Loss of access to one parking area, one ORV access, and two dirt roads to the sound.	Loss of access to one parking area, one ORV access, and two dirt roads to the sound.
	Natural Environment	Significant Natural Heritage Areas (SNHA)	32.53 acres	12.7 acres	68.31 acres	12.06 acres
		Protected Species[2]	Potential impact to sea turtles from proximity of construction activities.	Potential impact to sea turtles from proximity of construction activities.	Potential impact to sea turtles from proximity of construction activities.	Potential impact to sea turtles from construction lighting and vehicle headlights. Due to proximity to beach, potential to impact plover and red knot during construction.
		Wetlands	Potential impacts to wetlands west of NC 12.	Potential wetland impacts.	Potential impacts to wetlands west of NC 12.	Potential wetland impacts.
		SAVs & EFHs	Potential shadow impacts to SAV habitat. Minor EFH impacts from shadowing.	No change anticipated	No change anticipated	No change anticipated

[1]Protected species refers to species listed as threatened or endangered by the USFWS. NPS species refers to species that either are proposed for listing (Rufa red knot) or are species of high concern (American oyster catcher). Because of agency concern for these species, their impacts were considered in this evaluation.

Table 11. Comparison of Long Term Alternatives (continued)

Long Term Alternatives (Options 5, 7A, 7B)					
			Long Term Alternative 5 Large Scale Beach Nourishment	Long Term Alternative 7, Option A Ferry Service to New Ferry Terminal North of Ocracoke Village	Long Term Alternative 7, Option B Ferry Service to New Ferry Terminal North of Ocracoke Village with Dredging
Potential Impacts		Cost	$542,600,000	$ 87,200,000	$ 52,700,000
		Constructability	Availability of continued sand resource; Easement from NPS may be needed to place sand within Seashore	Land acquisition; dredging and related permitting; and channel maintenance. Additional ferry vessels may be needed.	Land acquisition; dredging and related permitting; and channel maintenance. Additional ferry vessels may be needed.
		Travel Convenience	No change anticipated	Longer ferry trip, increased travel time (45 minutes).	Longer ferry trip, increased travel time (45 minutes).
		Need for Dredging	4,279,000 cy of sand needed (over 50 years), expected to come from offshore sites.	No Dredging Need Anticipated	Dredging will likely be necessary for the new ferry channel. This may disturb SAV and EFH.
	Human Environment	Land Use	No change anticipated	11.7 acres of land converted to transportation use.	11.7 acres of land converted to transportation use.
		Cultural Resources	No change anticipated	No change anticipated	No change anticipated
		Bike & Pedestrian	No change anticipated	Potential beneficial impact with use of 8-foot proposed shoulder with 5-foot bicycle lanes within shoulder	Potential beneficial impact with use of 8-foot proposed shoulder with 5-foot bicycle lanes within shoulder
		Section 4(f)	Permanent use likely because berm and dune nourishment would be outside of the existing NC 12 easement.	Access changes to Seashore expected with new terminal.	Access changes to Seashore expected with new terminal.
		Visual Considerations	Minor potential to impact based on height increase of dunes over existing conditions in some lower dune areas	Additional ferry infrastructure could cause a moderate change in visual character. Access changes to Seashore expected with new terminal.	Additional ferry infrastructure could cause a moderate change in visual character. Access changes to Seashore expected with new terminal.
		Socio Economic	No change anticipated	Longer ferry routes could potentially affect delivery times and costs for goods and services. Depending on how much of NC 12 is maintained north of Ocracoke Village, public access could be lost to parts of the Seashore.	Longer ferry routes could potentially affect delivery times and costs for goods and services. Depending on how much of NC 12 is maintained north of Ocracoke Village, public access could be lost to parts of the Seashore.
	Natural Environment	Significant Natural Heritage Areas (SNHA)	0 acres	11.65 Acres	11.65 Acres
		Protected Species[2]	Minor potential to impact sea turtles, but impact minimized if beach fill occurs outside of the nesting season. Minor potential temporary impact to piping plover and red knot during construction.	Unknown for NCNHP impact. No impacts to sea turtle. Little potential for other NPS species impacts.	Unknown for NCNHP impact. No impacts to sea turtle. Little potential for other NPS species impacts.
		Wetlands	No change anticipated	Potential impacts to wetlands west of NC 12.	Potential impacts to wetlands west of NC 12.
		SAVs & EFHs	Potential impacts to EFH present in the surf zone sand placement areas.	No Change Anticipated	Dredging for new ferry route would potentially disrupt SAV and EFH habitats.

[1]Protected species refers to species listed as threatened or endangered by the USFWS. NPS species refers to species that either are proposed for listing (Rufa red knot) or are species of high concern (American oyster catcher). Because of agency concern for these species, their impacts were considered in this evaluation.

9.0 Summary of Agency Coordination

9.1 Coordination Meetings

Two coordination meetings occurred during this Feasibility Study Addendum process.

9.1.1 July 19th, 2019 Coordination Meeting

A project coordination and kickoff meeting was held on July 19th, 2019 with the WSP project team and NCDOT Division 1. The purpose of the meeting was to discuss submittal deadlines, data collection, and general coordination for the project.

WSP proposed to move the ferry terminal south of the Pony Pens, which was a previously proposed terminal, and to make the docks a pier structure to limit dredging costs. NCDOT Division 1 asked WSP for input on where the updated proposed location should be after considering the offshore geography.

NCDOT Division 1 said that the NPS would prefer the proposed terminal to be south of the Pony Pens. NCDOT Division 1 also stated that the NPS is interested in the proposed site accommodating vessels that take the Sound Route in the Silver Lake Ferry Terminal because it would take traffic out of the village.

NCDOT Division 1 mentioned that the alternatives analysis should consider the level of service (LOS) that would be lost from the Hatteras Ferry because of increased travel time and include additional vessel costs, and general operating costs. WSP noted that they would like to obtain data on annual upkeep and maintenance for the NC 12 as well as for the existing Ferry Terminal. NCDOT Division 1 will provide Ferry Annual maintenance cost including dredging, ramp and gantry upkeep, and 5-year average storm response and sand removal costs for NC 12 to WSP.

9.1.2 November 25th, 2019 Alternatives Overview

An overview meeting was held on November 25th, 2019 between the NCDOT Division 1, NCDOT Feasibility Studies Unit, NCDOT Ferry Division and the WSP Project Team. The purpose of the meeting was to provide an overview of the project, a comprehensive overlook of all alternatives under study and their design criterion and project constraints, and next steps of the project. The following concerns were expressed at the meeting:

- NCDOT Division 1 stated that there is concern with the shoreline erosion rate, and shoreline and sound erosion from storms. The road setback requirement in roadway re-alignment alternatives may be reconsidered because of sound erosion after storms.
- NCDOT Division 1 stated that Long Term Alternative 6, the Ferry Service to Ocracoke Village Ferry Terminal would not be feasible, operationally, and that the NPS had concerns with this alternative.

- NCDOT Division 1 stated that offshore dredging of sand would be required as the source of sand for all alternatives because channel dredging cannot produce enough sand.

- NCDOT Division 1 stated that South Dock is in extreme jeopardy from significant erosion of the north end of the island, and should be considered in choosing a preferred alternative. NCDOT Division 1 stated that part of the eight-foot paved shoulders on all roadway, bridge and ferry improvements would include a five-foot paved path for bicycles.

10.0 Next Steps

If this project receives funding and is programmed in the STIP, the next step would be to initiate the NEPA process. Preliminary designs would be developed, a detailed impact assessment would be undertaken, and the information would be recorded in an environmental document. Factors to consider as the project advances to the NEPA study phase include:

Ferry Terminal Alternative

- Costs
    - Ferry acquisition and maintenance
    - New terminal facility development & maintenance
    - Channel development and maintenance
    - Long term nourishment costs

- Constructability
    - Construction methodology and phasing
    - Material transport requirements, construction staging within Seashore
    - Permit/ new easement requirements

- Natural Environment
    - Submerged Aquatic Vegetation (SAV)
    - Essential Fish Habitat (EFH)

- Recreation & Access
    - Section 4(f) - access to NPS recreation facilities
    - Bike and pedestrian access
    - Off road vehicles (ORV)
    - Economic impact
        - Travel convenience

Investigations, coordination, and studies that may be conducted include:

- Prepare a Community Characteristics Report (CCR) and Community Impact Assessment (CIA) to understand the characteristics and resources of the community and determine the effects of displacements, changes in access and other impacts associated with a roadway on new alignment.
- Prepare air quality analyses.
- Coordination with the U.S. Coast Guard is recommended during project development.

- Coordination with the U.S. Fish and Wildlife Service and National Marine Fisheries Service is recommended during project development.
- A future environmental study will be required to assess project impacts to floodplains and open water.
- Conduct environmental wetland delineations for wetlands in the project study area.
- Develop a Public Involvement Plan and engage the community, local officials and business owners as early as possible.
- Coordination between the NPS and FHWA will be required to determine the applicability of Section 4(f) about the Cape Hatteras National Seashore.
- Coordination with the National Park Service will be required because they currently own all the land in the project study area.
- Coordinate with the Division of Coastal Management to determine any necessary procedures to avoid impacts.
- An environmental justice analysis will be prepared during the NEPA process to determine if there are disproportionally high and adverse impacts to these communities.
- Surveys will need to be done and coordination held with USFWS during project development to determine the impact to these species and any other species of concern in the study area.
- The project is within a Coastal Area Management Act (CAMA) County. The proposed project is subject to the rules and policies of the Coastal Resource Commission, and will require a permit for work impacting any areas designated as Area of Environmental Concern (AEC).
- A noise study will be done during the NEPA phase of the study to detail these impacts.
- Economic impact studies
- Detailed sand sediment analysis
- Storm surge analysis to determine structure height and design
- Offshore surveys to determine sand source availability
- Studies to determine extent of dredging and potential for shoaling if ferry terminal is moved
- Shoreline studies to determine likelihood of a breach in the study area

11.0 Works Cited

NC Historic Preservation Office. GIS Data Download. http://gis.ncdcr.gov/hpoweb/

NCDEQ. NC Surface Water Classifications.
https://ncdenr.maps.arcgis.com/apps/webappviewer/index.html?id=6e125ad7628f494694e259c80dd64265

https://deq.nc.gov/about/divisions/water-resources/planning/classification-standards/classifications#DWRPrimaryClassification

NCDOT. Feasibility Study NC 12 Ocracoke Island Hot Spot 2016

NCDOT. State Improvement Transportation Program, 2018.
https://connect.ncdot.gov/projects/planning/STIPDocuments1/NCDOT%20Current%20STIP.pdf

NCDOT. NCDOT Mitigation Site Map.
http://www.arcgis.com/home/webmap/viewer.html?webmap=d560dfeb1ea443b299ca7fc68b2506b4

USFWS. National Wetlands Inventory.

https://www.fws.gov/wetlands/data/mapper.html

Hyde County Planning and Economic Development. Hyde County CAMA Land Use Plan. 2008

http://www.hydecountync.gov/departments/docs/Hyde_County_CAMA_Land_Use_Plan.pdf

Hazardous Materials

https://ncdenr.maps.arcgis.com/apps/webappviewer/index.html?id=7dd59be2750b40bebebfa49fc383f688

Hyde County CAMA Land Use Plan, 2008

http://www.hydecountync.gov/departments/docs/Hyde_County_CAMA_Land_Use_Plan.pdf

Hyde County Public Transportation

https://www.hydecountync.gov/public_transportation.php

Land and Water Conservation Act

https://www.wilderness.org/articles/article/mapping-land-and-water-conservation-fund-lwcf

FEMA Floodplain

https://fris.nc.gov/fris/Index.aspx?FIPS=055&ST=NC&user=General%20Public

FEMA Hazard Mitigation Grant Program Properties

https://www.fema.gov/media-library/assets/documents/85455

Flood Risk Information System

https://fris.nc.gov/fris/Download.aspx?ST=NC

Wild and Scenic River

https://www.rivers.gov/north-carolina.php

Anadromous Fish Spawning Waters

http://portal.ncdenr.org/web/mf/afsa-maps

Coastal Barrier Resources Act

https://www.fws.gov/CBRA/Maps/Mapper.html

https://www.fws.gov/cbra/

NCDOT Traffic Noise Policy

https://connect.ncdot.gov/resources/Environmental/PDEA%20Procedures%20Manual%20Documents/2016%20NCDOT%20Traffic%20Noise%20Policy.pdf

Water Quality Classifications

https://deq.nc.gov/about/divisions/water-resources/planning/modeling-assessment/water-quality-data-assessment/integrated-report-files

National Heritage Areas

https://www.nps.gov/subjects/heritageareas//index.htm

12.0 APPENDIX

Figures

Project Scoping Report Checklist

A.1 Figures

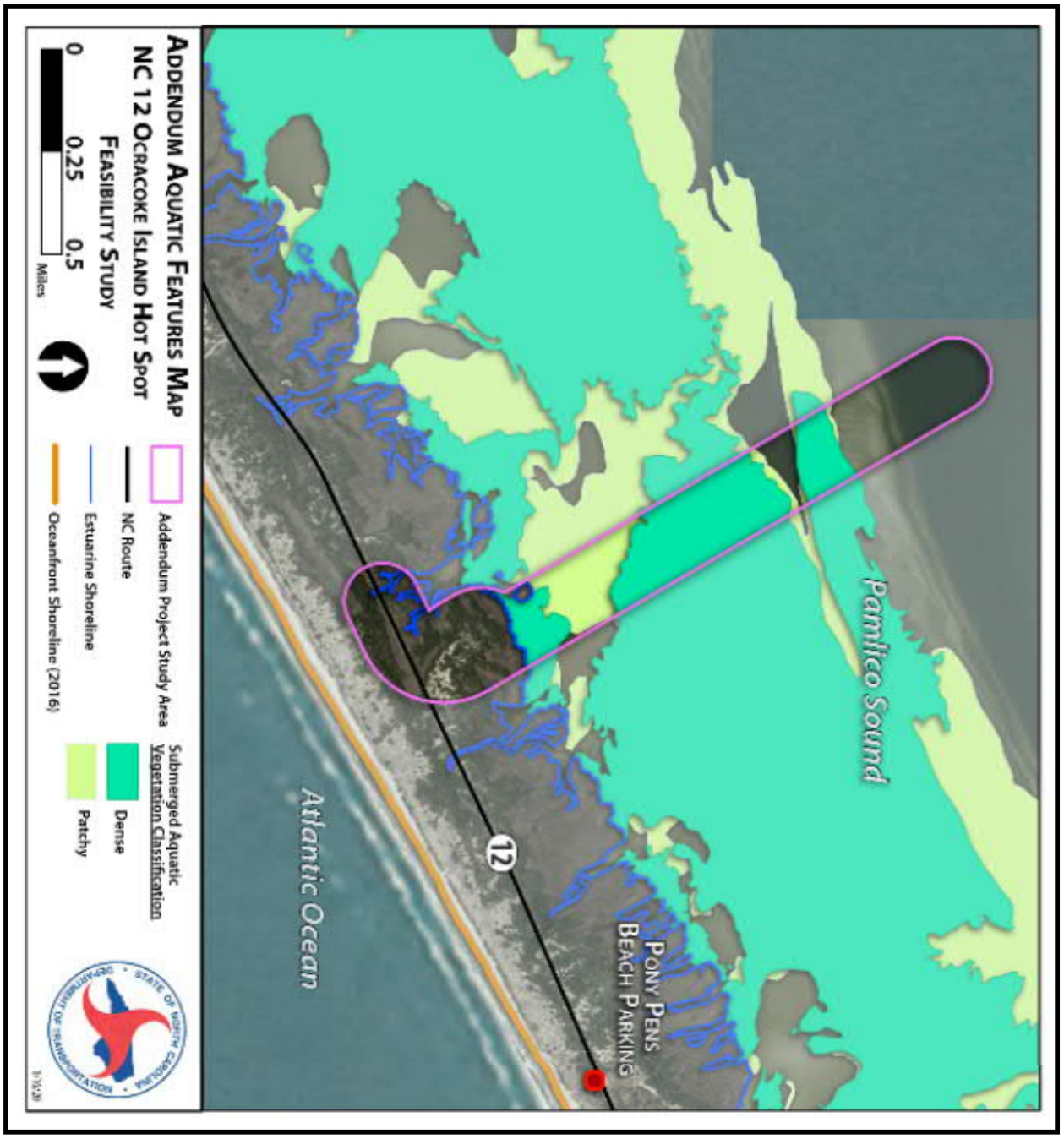
Figure 1.

Study Area	Figure 1

Figure 2.

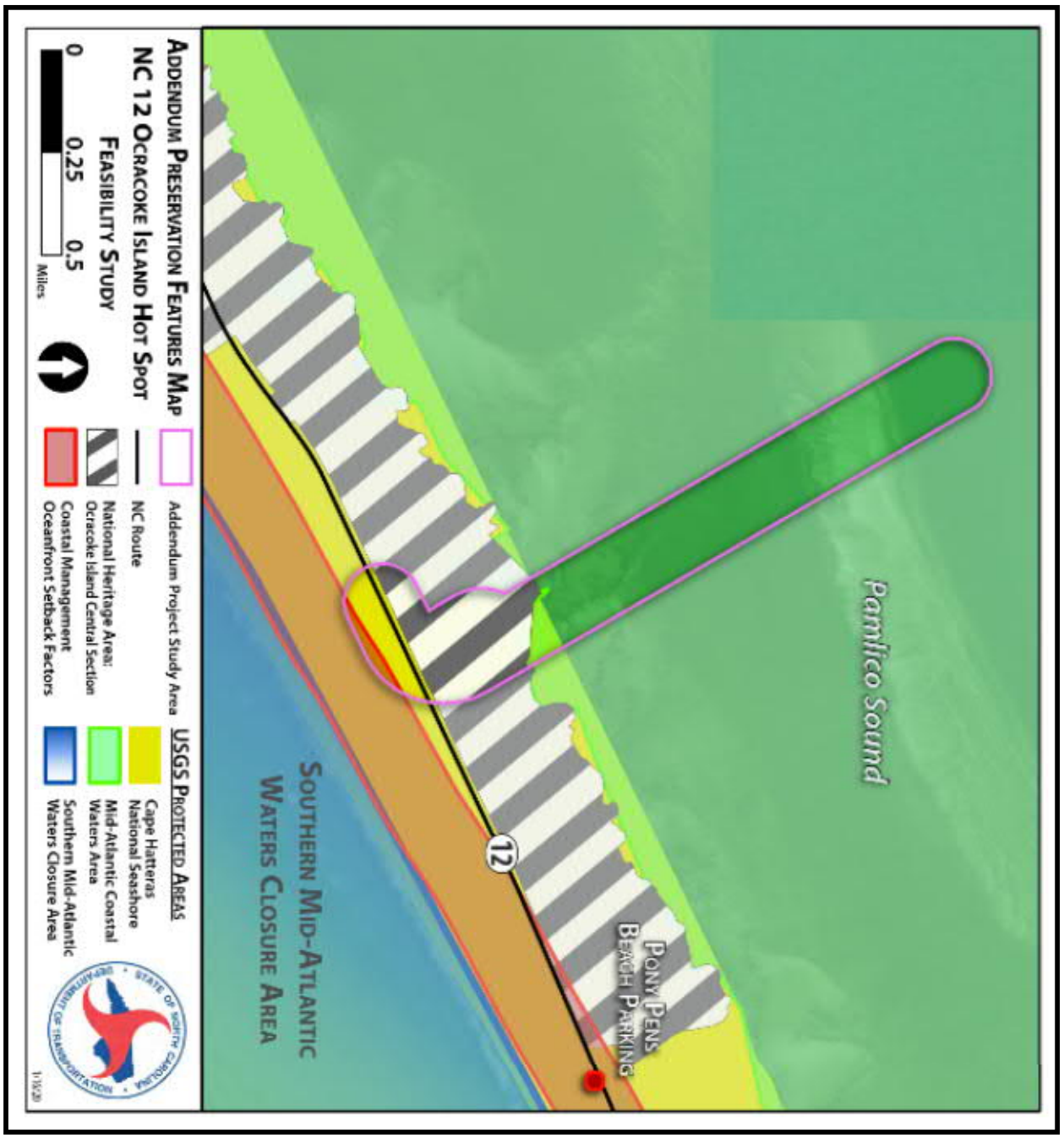
Environmental Features	Figure 2

Figure 3.



Aquatic Features	Figure 3

Figure 4.



Preservation Features	Figure 4

A.2 Project Scoping Report Screening Checklist

PROJECT SCOPING REPORT
SCREENING CHECKLIST

SPOT ID: N/A	FACILITY: NC 12	DIVISION: 1	FIRM: WSP

INSTRUCTIONS: The following questions are based on the CE Checklists for TYPE I and II projects. Answer each question in the space provided based on available data. Include qualitative discussion as appropriate.

1 Does the project require formal consultation with U.S. Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS)?

A Natural Resources Technical Report (NRTR) must be prepared during project development before this question can be fully answered. Review the current USFWS Endangered and Threatened Species and Species of Concern by County for North Carolina and note species or designated critical habitat listed in the county(s).

There are currently seven species listed by USFWS as Threatened, five species listed as Endangered, one species listed as Threatened due to Similarity of Appearance, one species listed as At Risk Species, and one species listed as Experimental for Hyde County as of June 27, 2018. Surveys will need to be done and coordination held with USFWS during project development to determine the impact to these species and any other species of concern in the study area.

Additionally, there are two species listed as Threatened and seven species as Endangered for North Carolina under National Marine Fisheries Service (NOAA) Fisheries jurisdiction. Some species listed by NOAA will not be affected by either Alternative because they do not occur in the Pamlico Sound. Consultation with NMFS is not required if it is determined that the proposed project will have “no effect” to listed species or designated critical habitat. If listed species or critical habitat may be affected, then consultation is required. Further analysis of potential affects to the species will be needed. Sea turtles are listed by both USFWS and NMFS, therefore the agencies may share Section 7 consultation responsibilities.

Scientific Name	Common Name	Federal Status
Alligator mississippiensis[1]	American alligator	T(S/A)
Laterallus jamaicensis[1]	Black rail	ARS
Chelonia mydas[2]	Green sea turtle	T
Eretmochelys imbricate[2]	Hawksbill turtle	E
Lepidochelys kempii[2]	Kemp's ridley sea turtle	E
Dermochelys coriacea[2]	Leatherback sea turtle	E
Caretta caretta[2]	Loggerhead sea turtle	T
Mytosis septentrionalis[1]	Northern long-eared bat	T
Canis rufus[1]	Red wolf	EXP
Calidris canutus rufa[1]	Rufa red knot	T
Charadrius melodus[1]	Piping plover	T
Picoides borealis[1]	Red-cockaded woodpecker	E
Trichechus manatus[1]	West Indian manatee	E
Amaranthus pumilus[1]	Seabeach amaranth	T
Scientific Name	Common Name	Federal Status

	Aeschynomene virginica[1]	Sensitive joint-vetch	T
	Acipenser oxyrinchus oxyrinchus[3]	Atlantic sturgeon	E
	Acipenser brevirostrum[3]	Shortnose sturgeon	E
	Manta birostris[3]	Giant manta ray	T
	Carcharhinus longimanus[3]	Oceanic whitetip shark	T
	Balaenoptera musculus[3]	Blue whale	E
	Balaenoptera physalus[3]	Fin whale	E
	Eubalaena glacialis[3]	North Atlantic right whale	E
	Physeter microcephalus[3]	Sperm whale	E
	Balaenoptera borealis[1]	Sei whale	E

*T(S/A) = Threatened due to Similarity of Appearance; ARS = At Risk Species; T = Threatened; E = Endangered; EXP = Experimental

[1]Species listed by USFWS only
[2]Species listed by USFWS and under NOAA Fisheries jurisdiction
[3]Species listed under NOAA Fisheries jurisdiction only

2	Does the project result in impacts subject to the conditions of the Bald and Golden Eagle Protection Act (BGPA)? *A NRTR must be prepared during project development before this question can be fully answered. Review the current USFWS Endangered and Threatened Species and Species of Concern by County for North Carolina and note if BGPA species are listed in the county(s).*
	The bald eagle is listed in Hyde County. Surveys will be done and coordination held with USFWS to determine the impact to these species.
3	Does the project generate substantial controversy or public opposition, for any reason, following appropriate public involvement? *Review the appropriate CTP for documentation of public involvement in the CTP development and any comments related to the project.*
	No specific public comments were identified in the CTP.
4	Does the project cause disproportionately high and adverse impacts relative to low-income and/or minority populations? *This question will require additional evaluation during project development. Using the NCDOT Demographic Tool, note the total population, as well as minority and low-income populations for the county and each Census Block Group in which the project is located. Also, note any observations based on review of aerial photography.*

Summary tables for minority and low-income populations are provided below.

Minority Population					
Geography	**Total Population**	**White, Non-Hispanic**		**Minority Population***	
		#	**%**	**#**	**%**
CT 9902, BG 0	-	-	-	-	-
CT 9201, BG 4	405	285	70.4%	120	29.6%
DSA	**405**	**285**	**70.4%**	**120**	**29.6%**

Hyde County	**5,629**	**3,433**	**61.0%**	**2,196**	**39.0%**
North Carolina	**9,940,828**	**6,361,438**	**64.0%**	**3,579,390**	**36.0%**

*Minority population includes all races that are non-white and Hispanic populations that are also White.

Source: US Census Bureau, American Community Survey 5-year Estimates (2012-2016), Table B03002, "Hispanic or Latino Origin by Race."

Poverty							
Geography	**Total Population for whom Poverty Status is Determined**	**Below Poverty Level**		**Very Poor: Under 50% of Poverty Level**		**Near Poor: Between 100% and 149% of Poverty Level**	
		#	**%**	**#**	**%**	**#**	**%**
CT 9902, BG 0	-	-	-	-	-	-	-
CT 901, BG 4	400	37	9.3%	-	0.0%	115	28.8%
DSA	**400**	**37**	**9.3%**	**-**	**0.0%**	**115**	**28.8%**
Hyde County	**4,946**	**1,108**	**22.4%**	**330**	**6.7%**	**498**	**10.1%**
North Carolina	**9,685,511**	**1,631,704**	**16.8%**	**709,029**	**7.3%**	**1,043,922**	**10.8%**

Source: US Census Bureau, American Community Survey 5-year Estimates (2012-2016), Table C17002, "Ratio of Income to Poverty Level in the Past 12 Months."

Any Block Group where 50 percent or more of the population is minority, or “majority minority,” is considered to have a notable environmental justice (EJ) presence. This does not include any block groups within the study area. Any Block Group with a minority population at least ten percentage points higher than the county average would also have a notable EJ presence. This does not include any Block Groups within the study area.

Any Block Group where the percentage of the population in any of the poverty categories – Below Poverty Level, Very Poor, or Near Poor equals or exceeds 25 percent of the total population of that Block Group is considered to have a notable EJ presence. This includes CT 9201, BG 4. Any Block Group where the percentage of the population in any of the poverty categories – Below Poverty Level, Very Poor, or Near Poor exceeds the county average by five percentage points or more would also have a notable EJ presence. This includes CT 9201, BG 4.

In total, one Block Group, CT 9201, BG 4 has a notable presence of low-income populations meeting the criteria for Environmental Justice (EJ). There are no ACS Census data for the second Block Group, CT 9902, BG 0, within the study area.

An EJ analysis will be done as part of the NEPA process to determine if there are disproportionately high and adverse impacts, but the proposed alternatives are located outside any development.

5	Does the project involve a residential or commercial displacement, or a substantial amount of right of way acquisition? *Provide a count of potential residential and commercial displacements.*
	The proposed project will not require residential or commercial displacement; however, it will require right-of-way acquisition of land owned by the National Park Service (NPS).
6	Does the project require an Individual Section 4(f) approval? *This question will require additional evaluation during project development. At this time, note the presence of properties that may be subject to Section 4(f), including historic resources, parks, and wildlife/waterfowl refuges. Note those within the proposed right of way, as well as within 1,000' of the project.*
	The project is located within the Cape Hatteras National Seashore, which is a publicly-owned resource that serves as a park and recreation area on NPS land. A determination regarding the applicability of Section 4(f) for the Seashore will be made by FHWA during the NEPA process if the project proceeds using federal funds. For other projects involving NC 12, FHWA determined that the Seashore was 'jointly developed' with NC 12 and as such the Seashore was determined to be exempt from Section 4(f). Coordination between the NPS and FHWA will be required to determine the applicability of Section 4(f) regarding the Seashore. No historic resources are located within or within 1,000 feet of the project study area. No wildlife/waterfowl refuges are located within or within 1,000 feet of the project study area.
7	Does the project include adverse effects that cannot be resolved with a Memorandum of Agreement (MOA) under Section 106 of the National Historic Preservation Act (NHPA) or have an adverse effect on a National Historic Landmark (NHL)? *This question will require additional evaluation during project development. Review NC State Historic Preservation Office GIS data and note the presence of historic properties within the proposed right of way, as well as within 1,000' of the project. Note: this site does not include archaeological resources.*
	There are no historic sites or districts identified from the NCHPO GIS data within 1,000 feet of the project corridors.
8	Does the project result in a finding of "may affect not likely to adversely affect" for listed species, or designated critical habitat under Section 7 of the Endangered Species Act (ESA)? *A NRTR must be prepared during project development before this question can be fully answered. Refer to Question #1 above.*
	SEE #1 ABOVE
9	Is the project located in anadromous fish spawning waters? *Review the anadromous fish spawning areas maps to determine if the project is within 1,000' of these areas.*
	No anadromous fish spawning areas were identified within 1,000 feet the project corridor, but the Pamlico Sound's waters are connected to inland water bodies that are considered anadromous fish spawning waters. The project should coordinate with the North Carolina Division of Marine Fisheries to determine potential effects to those areas.
10	Does the project impact waters classified as Outstanding Resource Water (ORW), High Quality Water (HQW), Water Supply Watershed Critical Areas, 303(d) listed impaired water bodies, buffer rules, or Submerged Aquatic Vegetation (SAV)? *Determine the NCDEQ Surface Water Classification of any waters within 1,000' of the project, and note if any have a "WS" (Water Supply) classification or supplemental classification of ORW or HQW. Check the current 303(d) list for 303(d) listed waters within 1,000 feet of the project. Review the Division Resource Map to determine if the project is within a watershed subject to buffer rules.*

	Three NCDEQ classified waters were identified within 1000 feet of the project corridor: • Pamlico River and Pamlico Sound – SA; HQW • Try Yard Creek – SA; HQW • Atlantic Ocean – SB Pamlico River and Pamlico Sound, and Try Yard Creek waters are tidal salt waters use for commercial shell fishing or marketing purposes (Class SA) and High Quality Waters (HQW). All Class SA waters are also HQW by supplemental classification. The Atlantic Ocean is classified as Class SB, tidal salt waters protected for secondary recreation in addition to primary recreation. No waters within 1,000 feet of the project study area are 303(d) listed waters. Try Yard Creek and the Pamlico Sound are subject to the Tar-Pamlico River Basin Buffer Rules (15A NCAC 02B .0259). There are approximately 78.7 acres of dense submerged aquatic vegetation, and 26.4 acres of patchy submerged aquatic vegetation in the project study area.
11	Does the project impact waters of the United States in any of the designated mountain trout streams? *Trout counties are identified on the PDEA Agency Merger Contact Map, and trout waters are identified by "Tr" classification in their NCDEQ Surface Water Classification (see Question #10 above). Determine if project is within 1000' of a trout stream.*
	The project corridor is not within 1000 feet of a designated trout stream.
12	Does the project require a U.S. Army Corps of Engineers (USACE) Individual Section 404 Permit? *This question will require additional evaluation during project development. Using express conceptual design right of way limits and National Wetland Inventory (NWI) mapping, calculate potential impacts to waters of the U.S. Note impacts to wetlands to the nearest 0.1 acre and to streams to the nearest 10 feet.*
	Alternative 12: According to NWI mapping, there are approximately 1.8 acres of wetlands, which includes 0.4 acre of aquatic bottom and 0.7 acre of unconsolidated shore wetlands, and 5.0 acres of surface waters (Pamlico Sound) in the project right of way for Alternative 12. Alternative 13: There are approximately 0.7 acre of wetlands and 2.7 acres of surface waters (Pamlico Sound) in the project right of way for Alternative 13. A preliminary jurisdictional determination of wetlands and waters of the U.S. within the project area should be obtained to accurately calculate impacts. An Individual Section 404 Permit may be required for this project as USACE has the discretion to require an individual permit if it determines that the proposed impacts will have more than a minimal impact on the aquatic environment or on other environmental factors, or if the project would normally require an Environmental Impact Statement (EIS) under current FHWA guidelines.
13	Will the project require an easement from a Federal Energy Regulatory Commission (FERC) licensed facility? *Review the Division Resource Map to determine if the project is within 1,000' of a FERC licensed facility.*
	There are no FERC licensed facilities within 1,000 feet of the project corridor.
14	Does the project include a Section 106 of the NHPA effects determination other than a no effect, including archaeological remains? *This question will require additional evaluation during project development. Refer to Question #7 above.*
	There are no historic sites or districts identified from the NCHPO GIS data within 1,000 feet of the project corridors.
15	Does the project involve hazardous materials and/or landfills?

	Note any potential hazardous properties based on review of aerial photography or from NC OneMap data.
	There are no hazardous materials sites and/or landfills identified within 1,000 feet of the project corridor.
16	Does the project require work encroaching and adversely affecting a regulatory floodway or work affecting the base floodplain (100-year flood) elevations of a water course or lake, pursuant to Executive Order 11988 and 23 CFR 650 subpart A? *Review NC Floodmaps data to determine whether the project may encroach on any base (100-year) floodplain and/or regulatory floodway.*
	There are approximately 75.2 acres of 100-year floodplains in the project study area. This will require work affecting the base floodplain (100-year flood) elevations of a water course, pursuant to Executive Order 11988 and 23 CFR 650 subpart A.
17	Is the project in a Coastal Area Management Act (CAMA) county and substantially affects the coastal zone and/or any Area of Environmental Concern (AEC)? *A NRTR must be prepared during project development before this question can be fully answered. Review the Division Resource Map to determine if the project is within a CAMA county.*
	The project is within a Coastal Area Management Act (CAMA) County, the proposed project is subject to the rules and policies of the Coastal Resource Commission, and will require a permit for work impacting any areas designated as Area of Environmental Concern (AEC).
18	Does the project require a U.S. Coast Guard (USCG) permit? *Review NCDOT's USCG Stream Coordination Map to determine if the project impacts a navigable waterway that may require coordination and permitting with the USCG.*
	The USCG Stream Coordination Map identifies the surface waters within the project study area as tidally influenced waters and may require coordination and permitting with the USCG. Coordination with the U.S. Coast Guard is recommended during project development.
19	Does the project involve construction activities in, across, or adjacent to a designated Wild and Scenic River present within the project area? *Review the Division Resource Map to determine if the project is within 1,000' of a Wild and Scenic River.*
	The project corridor is not within 1,000 feet of a Wild and Scenic River.
20	Does the project involve Coastal Barrier Resources Act (CBRA) resources? *Review the Division Resource Map to determine if the project is within a CBRA area.*
	A portion of the project corridor is located within an Otherwise Protected Area (OPA) CBRA area, CBRS Unit NC-03P. Coordination with the U.S. Fish and Wildlife Service is recommended during project development.
21	Does the project impact federal lands (e.g. U.S. Forest Service (USFS), USFWS, etc.) or Tribal Lands? *Review the Division Resource Map to determine if the project is within federal lands.*
	The project corridor occurs within the Cape Hatteras National Seashore which is federally owned land managed by the NPS. A determination regarding the applicability of Section 4(f) for the National Seashore will be made by the Federal Highway Administration (FHWA) during the NEPA process if the project proceeds using federal funds. See #6 above for additional details.
22	Does the project involve any changes in access control? *Note if the project is proposing a change in control of access.*

	No
23	Does the project have a permanent adverse effect on local traffic patterns or community cohesiveness? *This question will require additional evaluation during project development. At this time, note changes in traffic patterns and any reduction in access to community resources.*
	No
24	Will maintenance of traffic cause substantial disruption? *Note if an offsite detour is recommended.*
	Alternative 12 – No Alternative 13 – No
25	Is the project inconsistent with the STIP or the Metropolitan Planning Organization's (MPO's) Transportation Improvement Program (TIP) (where applicable)? *This question will be evaluated during project development.*
	N/A
26	Does the project require the acquisition of lands under the protection of Section 6(f) of the Land and Water Conservation Act, the Federal Aid in Fish Restoration Act, the Federal Aid in Wildlife Restoration Act, Tennessee Valley Authority (TVA), or other unique areas or special lands that were acquired in fee or easement with public-use money and have deed restrictions or covenants on the property? *A list of resources using funds provide through Section 6(f) of the Land and Water Conservation Fund (LWCF) is available at http://waso-lwcf.ncrc.nps.gov/public/index.cfm. Review the Division Resource Map to determine if the project crosses a TVA area. If parcel data is available, use best available information to determine if any of these situations exist.*
	No 6(f) resources were identified within the project corridor vicinity.
27	Does the project involve Federal Emergency Management Agency (FEMA) buyout properties under the Hazard Mitigation Grant Program (HMGP)? *This question will require additional evaluation during project development. Refer to Question #16 above, and if the project is within a flood zone, review property data for locally-owned property (county or municipality) within the flood zone and note. If parcel data is available, determine if any property in the flood zone is government owned.*
	The project is within flood zone areas and is government owned by the National Park Service.
28	Does the project include a de minimis or programmatic Section 4(f)? *This question will require additional evaluation during project development. Refer to Question #6 above.*
	SEE #6 ABOVE
29	Is the project considered a Type I under the NCDOT's Noise Policy? *Review NCDOT's Traffic Noise Policy (pages 2-3) to determine the level of noise analysis that may be required. Provide responses for each funding scenario noting the level of environmental documentation.*
	IF THE PROJECT IS FEDERALLY FUNDED *Is the project a Type I project?* Per the NCDOT Noise Policy, a project is considered a Type I if project includes: • The construction of a highway on a new location.

	IF THE PROJECT IS STATE FUNDED *Is the project on an interstate or full control of access US route and does it involve adding additional through lanes? Will the project require a state EA or EIS?* No
30	Is there prime or important farmland soil impacted by this project as defined by the Farmland Protection Policy Act (FPPA)? *This question will be evaluated during project development.*
	No
31	Are there other issues that may affect project decisions? *Note any other issues that should be considered during project development.*
	No

INSTRUCTIONS: The following questions are based on the CE Checklist for TYPE III projects. Answer each question in the space provided based on available data. Include qualitative discussion as appropriate.	
32	Is a project-level analysis for direct, indirect, or cumulative effects required based on the NCDOT community studies screening tool? *This question will be evaluated during project development.*
	N/A
33	Is a project level air quality Mobile Source Air Toxics (MSAT) analysis required? *Note if existing or projected traffic volumes on the project are greater than 140,000 vpd.*
	No

In preparing this estimate of future volumes, multiple sources were examined including land use data, roadway traffic data, and ferry data sources.

A.2.1. Population and Land Use Data

Traffic volume increases result from population growth. Population growth is directly tied to land use development and tourism, if an area is a tourism-based economy. Given this, a review of historical, existing, and forecast population and land use on Ocracoke Island was conducted, with emphasis on peak tourism season numbers.

Historical Population and Land Use

Historical population and land use data were gathered from the US Census, Hyde County CAMA Core Land Use Plan (2008) (LUP), and interviews with local planners. This data is presented in the traffic report. This feasibility study summarizes key findings of the analysis. These findings include:

- Population Growth – Annual population growth rates between 1970 and 2010 fluctuated slightly, but averaged approximately 1.4 percent growth. Annual growth rates between 2000 and 2010 demonstrated higher growth, averaging approximately 2.1 percent.

- Housing Unit Use and Growth – There are currently 983 housing units on Ocracoke Island. Approximately 269 housing units are owner occupied, with the remainder presumably being rental properties. An analysis of the data indicated a decline in owner occupancy and an approximate 3.8 increase in rentals between 2000 and 2010.

Projected Population and Land Use

A review of data in the Hyde County LUP indicates the following for Ocracoke Island:

- Population Growth – The forecast annual growth rates between 2000 and 2030 show population increase, with an anticipated acceleration in growth between 2010 and 2030.

- Housing Unit Growth – Although housing unit growth is anticipated through 2030, the rate is expected to be slower than the pre-2010 timeframe. Hyde County planners indicated that development restrictions associated with environmental conditions (primarily wetlands) and the Cape Hatteras National Seashore substantially limit continued growth in the undeveloped areas in and around Ocracoke Village. Given this constraint, most growth will likely occur as the result of replacing and expanding older structures. However, since more than 65 percent of structures in Ocracoke Village are 50 years old or older, their replacement or expansion may also be limited by the potential for them to be designated as historic structures. Based on the land development restrictions and potential restrictions on structural replacements or expansions, it is reasonable to assume that a maximum annual increase in housing units of 0.5 percent may occur. This assumption is consistent with the Hyde County LUP.

A.2.2. Summer Peak Population

The summer season is the time of greatest population on Ocracoke Island. Summer weekends are the peak times for short term population increase. In general, the summer population makeup is approximately 90 percent tourists and 10 percent permanent residents (Hyde County LUP). Of the 90 percent tourist population, approximately 20 percent are overnight visitors and 70 percent are day trippers. Detailed data are presented in the traffic report. Key findings regarding the summer population include:

- Seasonal Population Growth – Similar to the growth of Ocracoke permanent residents, seasonal populations are anticipated to grow. However, the anticipated 2010 to 2030 tourist population growth rate is less than the permanent population growth rate by 0.3 percent.

- Statistical Distribution of Tourist Population – Day trippers have historically made up the bulk of the seasonal population increase, and this trend is expected

to continue. The growth rate of 0.7 percent for this population is anticipated to continue through 2030.

- Day Trips – The number of day trippers spikes on the summer weekends with tourists utilizing the ferry system to access Ocracoke Island, park in limited public parking locations or along NC 12, and enjoy the beach for the day. These volumes indicate that close to 2,000 cars already require parking at certain times (compared with less than 200 public parking spots provided in the National Seashore). Most parking on a summer weekend occurs on the beach and along NC 12.

A.2.3. Traffic Data

Roadways

As stated earlier, no traffic counts were performed. Additionally, since the project area is relatively remote, some data that would normally be available for urban areas is not available. This information includes published hourly and/or daily traffic counts and summer traffic counts. Instead, historical traffic data were reviewed for this study. Using the historical AADT records, it is possible to get an understanding of historical traffic growth rates. The locations of the NCDOT AADT map count stations used in this analysis are listed in Table -1 and shown graphically in Figure A-1. The table indicates that:

- The highest AADT volume reported is on Ocracoke Island and occurs in Ocracoke Village near the Silver Lake Ferry terminal. No AADT count stations are located on the north end of Ocracoke Island. Because of this, historical data from the Hatteras Inlet Ferry were extrapolated to establish AADT on the northern part of Ocracoke Island on the segment of NC 12 near the Hatteras Inlet Ferry Terminal.

- NC 12 near the Hatteras Inlet Ferry Terminal on Ocracoke typically has less AADT than NC 12 near the Hatteras Inlet Ferry Terminal on Hatteras Island. This segment also shows a decreasing trend in the years following 2002.

- Traffic volumes on all links fluctuate each year. However, volumes on all sections of NC 12 have generally decreased over the past 10 years. The highest volumes were reported in 2002 (5,300 vpd). Since then, traffic volumes decreased at an annual rate of nearly 5 percent each year.

Figure A-1. NCDOT AADT Count Station Locations

Table A-1. Historical Average Annual Daily Traffic (Roadways)

Section	Vehicles Per Day (VPD)										
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
NC 12 Near Hatteras Inlet Ferry Terminal on Hatteras Island in Dare County (Count Station 26)	4,200	1,600	3,000	4,100	2,900	3,800	3,100	2,600	2,700	3,200	2,600
NC 12 just south and east of Ocracoke Village (Count Station 3402)	5,300[1]	--	--	2,100	1,600	2,000	1,500	1,100	1,500	1,400	1,200
NC 12 within Ocracoke Village (Count Station 3411)	--	--	--	--	1,800	2,300	1,900	1,600	1,500	2,100	2,100
NC 12 Near Silver Lake Ferry Terminal in Ocracoke Village (Count Station 3410)	--	--	--	--	3,000	3,400	3,000	2,500	2,500	--	2,800
NC 12 on Cedar Island (Count Station 3400)	1,000	880	730	900	740	750	520	700	830	570	600

Source: NCDOT AADT program. Notes: 1.) Largest AADT for years surveyed. General Notes: Grey shading indicates NC 12 segments on Ocracoke Island. Two dashes (--) indicate no data available

Ferry Data

All vehicles accessing Ocracoke Island must use a ferry. Because of this, ferry data are a good indicator of traffic patterns. Daily ferry data were obtained to compare weekend and weekday traffic volumes. Monthly ferry traffic data were obtained from the NCDOT Ferry Division dating back to 1998 for the three ferry routes serving Ocracoke Island. The Hatteras Inlet Ferry and Cedar Island Ferry provide north-south linkage for NC 12. The AADT equivalents for these ferry routes are shown below in Table A-2. Key findings from the ferry data include:

- The Hatteras Inlet Ferry carries the greatest volume of traffic to and from Ocracoke Island (75 percent and 80 percent during the summer). This usage peaked between the years 2001 and 2002.
- The Swan Quarter Ferry provides east-west access to mainland Hyde County and is the longest ferry route. It, therefore, has a lower percentage of tourism-related trips than the north-south ferries serving NC 12.
- Summer weekend traffic is not substantially higher than summer weekday traffic on Ocracoke Island. Wednesday and Thursday are high volume days for the ferries. Weeklong visitors tend to use the Hatteras Inlet Ferry for trips to Ocracoke Island returning the same day.
- During peak summer conditions, the Hatteras Inlet Ferry has high volume intervals during which not all vehicles can be served by the ferry.
- The Cedar Island Ferry and Swan Quarter Ferry have a familiar tourist pattern of weekly flows with the weekend volumes being greater due to the turnover of rental units.

Table A-2. Ferry Route AADT Equivalents

Ferry	Crossing	Connecting	Number of Summer Departures/ Crossing Time	2012-2013 AADT Equivalent (vpd)	2012-2013 Summer (vpd)
Hatteras Inlet Ferry	Hatteras Inlet	NC 12 on Hatteras Island to NC 12 on Ocracoke Island.	30 per day per direction/ 55 minutes	735	1,486
Cedar Island Ferry	Pamlico Sound	NC 12 on Ocracoke Island to NC 12 on Cedar Island.	6 per day per direction/ 2 hours 15 minutes	150	244
Swan Quarter Ferry	Pamlico Sound	NC 12 on Ocracoke Island to US 264 on the mainland.	6 per day per direction/ 2 hours 30 minutes	94	134

Notes:

1. The historical ferry data in Table 8 was developed by computing an AADT from the total annual trips.
2. NCDOT reports ferry data on a non-standard fiscal year. It is assumed that the first year identified in the range correlates with the AADT years reported by NCDOT for roadways (e.g., ferry data for 2012–2013 is assumed as comparable to the 2012 AADT data for roads.

A.3 Forecast Methodology

The historical land use, roadway, and ferry data were evaluated and compared with the Hyde County Land Use Plan to estimate both existing 2013 and future 2040 volumes. Due to unique issues, specific to developing future traffic estimates in an area subject to high levels of seasonal tourist traffic, the methodology examined multiple issues not typical for a traditional roadway facility.

A.3.1. Existing Conditions

Establishing existing traffic volumes is a typically standard procedure because existing traffic counts are relatively consistent, both day-to-day and throughout the year. In an area with a high number of seasonal tourists, such as Ocracoke Island, traffic volumes vary significantly based on the time of year, day of the week, the economy, and weather. In addition to variances throughout the year, the annual AADT for NC 12 on Ocracoke Island varies considerably from year to year.

As shown in Table , the AADT on the project segment has fluctuated between 1,200 vpd and 2,100 vpd over the past ten years based upon Count Station 3402 south of the project study area. In addition, 2002 had a reported AADT of 5,300 vpd. To the north of the study area at the Hatteras Ferry terminal, vehicles using the ferry have fluctuated between approximately 700 vpd and 1,200 vpd, with 1,400 vpd recorded in 2002.

Based on a review of the growth rates on both NC 12 and the ferries, it was determined that the best indicator of the baseline volume would be the historical data from 2002 through 2013. The 2002-2013 range was selected because it provides at least 10 years of trends and because 2002 was the earliest year that highway AADT volumes were available to directly compare with the ferry-based AADT equivalents. The traffic analysis further determined that the 85th percentile value of 2,100 vpd is an appropriate estimate for the baseline AADT (see the full traffic report for a detailed description of the analysis). The 85th percentile value was used because it incorporates both the overall reduction in traffic volumes since 2002 (5,300 vpd on Sta. 3402), while also accounting for the fact that the infrastructure is already in place to serve a higher volume than observed since the 2008 recession.

A.3.2. Future Growth Rate

Despite some downward trends in growth rates for traffic and ferry use over the past 10 years, the land use and tourism infrastructure in place is capable of, and has in the past, supported much higher average annual daily traffic. Therefore, the historical traffic decline is not a prudent single assumption for future growth. Review of housing data (discussed in Section A.2.1) showed a 2.3 percent annual increase in total housing units in Ocracoke Village between 2000 and 2010. However, it is recognized that this growth may be constrained.

Day trippers using the ferry system to access Ocracoke Island are the primary source of summer traffic volumes, both during the week and on weekends. Hyde County anticipates an increase to a maximum of 10,000 day trippers in 2030 (the future year indicated in the Hyde County Land Use Plan). On Saturday July 6, 2013, the ferry

system carried 3,600 vehicles and 9,800 passengers. Given that some of the passengers are full time residents, it is estimated that there were 4,400 day trippers who both accessed and left the island (8,800 ferry passengers). If it is assumed that there will be 10,000 day trippers by 2030, an annual increase of 3.1 percent is required. Similarly, it was computed that for 8,000 day trippers in 2030, an annual growth rate of 2.2 percent was required. Based on a combination of these two growth rates, it is estimated that AADT would increase by 2.5 percent per year.

A.4 Moffatt and Nichol Report