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Appendix I - EFH Assessment

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Essential Fish Habitat Assessment

US 21 over Harbor River Bridge Replacement
Beaufort County, South Carolina

Project ID: P026862

May 2016

Prepared by:

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1. Introduction

In conformance with the Magnuson-Stevens Fishery Conservation and Management Act of 1976 (as amended 1996) this assessment was conducted to describe potential adverse effects on essential fish habitat (EFH). EFH is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (16 USC 1802, 50 CFR 600.10). The National Oceanic and Atmospheric Administration (NOAA) – National Marine Fisheries Service (NMFS) works closely with the South Atlantic Fishery Management Council (SAFMC) to minimize adverse impacts to EFH in the southeast. Adverse effects are those that reduce the quality and/or quantity of EFH, including direct, indirect, site specific, or habitat wide impacts, including individual, cumulative, or synergistic consequences of actions.

This assessment describes the proposed project including potential effects to EFH, measures to minimize harm to EFH, and conclusions regarding impacts. This assessment is being submitted by the South Carolina Department of Transportation (SCDOT).

SCDOT is preparing an Environmental Assessment (EA) for the proposed project in accordance with the National Environmental Policy Act of 1969, as amended. The Federal Highway Administration (FHWA) and United States Coast Guard (USCG) are cooperating agencies for the EA. The EFH Assessment will be an appendix to the EA.

2. Proposed Action

SCDOT proposes to replace the existing US 21 Bridge over Harbor River in Beaufort County, South Carolina (**See Figure 2-1 – Project Location and Photo 1, Appendix B**). The 2,851-foot long bridge over the Harbor River was constructed in 1939. The existing bridge includes a 170-foot long, 76-year-old metal truss swing span. The existing bridge deck consists of two 10-foot travel lanes, one in each direction, with a 1-foot curb and railing.

The purpose of the project is to correct structural and functional deficiencies of the US 21 Bridge over the Harbor River and to upgrade the bridge and its approaches to current design standards.

The proposed project is located immediately south of the confluence of the Harbor River with the St. Helena Sound. The approximate latitude and longitude coordinates of the beginning point of this project are 32.413305° and -80.478579° and the ending point coordinates are 32.398816° and -80.443361°. The proposed project corridor is located within the Salkehatchie Coastal Frontage watershed [Hydrologic Unit Code (HUC) 03050210-01].

The proposed bridge replacement is being developed for Design-Build procurement, where a single entity is contracted to deliver the design and construction. A conceptual design has been developed and analyzed for five alternative locations, including a no-build alternative. While the final design will be completed by the Design-Build contractor, this EFH assessment has been prepared using conceptual designs of the current preferred alternative and typical construction methods.

SCDOT conducted a thorough alternatives analysis as part of the EA. A summary of the alternatives considered can be found in Section 6 of the EFH Assessment. The proposed bridge of the preferred alternative would be constructed approximately 65 feet to the north of the

existing alignment (**See Figure 2-2 – Preferred Alternative**). The length of the proposed bridge and roadway is 7,198 feet and the width would be approximately 47 feet. The vertical clearance of the new fixed span bridge over the Harbor River's channel would be 65 feet above Mean High Water and is currently being determined through coordination with the US Coast Guard (USCG). The proposed two-lane bridge would have 12-foot-wide travel lanes with 10-foot-wide shoulders in each direction (**See Figure 2-3 – Typical Section of Proposed Bridge**). The proposed bridge will include 28 bents and each bent would be supported by two 8-foot diameter columns. Once construction of the proposed bridge is complete, the existing bridge would be demolished and removed.

As currently proposed, the existing causeway would remain; portions of the causeway may be used by the contractor for stormwater management. Additional details about proposed construction methods can be found in Section 5 of the EFH Assessment.

SCDOT proposes to acquire new 100-foot right-of-way on each side of the proposed bridge. The proposed right-of-way on the western side of the Harbor River would match the current right-of-way of 100 feet. On the eastern side of the Harbor River, the proposed right-of-way would taper from 100 feet, to encompass the new causeway, to the existing 50-foot-wide right-of-way near Harbor Drive.

Figure 2-1
Project Location
US 21 Over Harbor River Bridge Replacement
Project ID: P026862
Beaufort County, SC

5 2.5 0 5 Miles

Source: OpenStreetMap (http://www.OpenStreetMap.org)

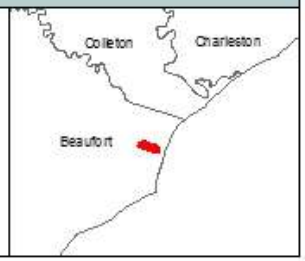

Figure 2-2
Preferred Alternative
US 21 Over Harbor River Bridge Replacement
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1,000 500 0 1,000 Feet

Source: ESRI World Imagery & Transportation

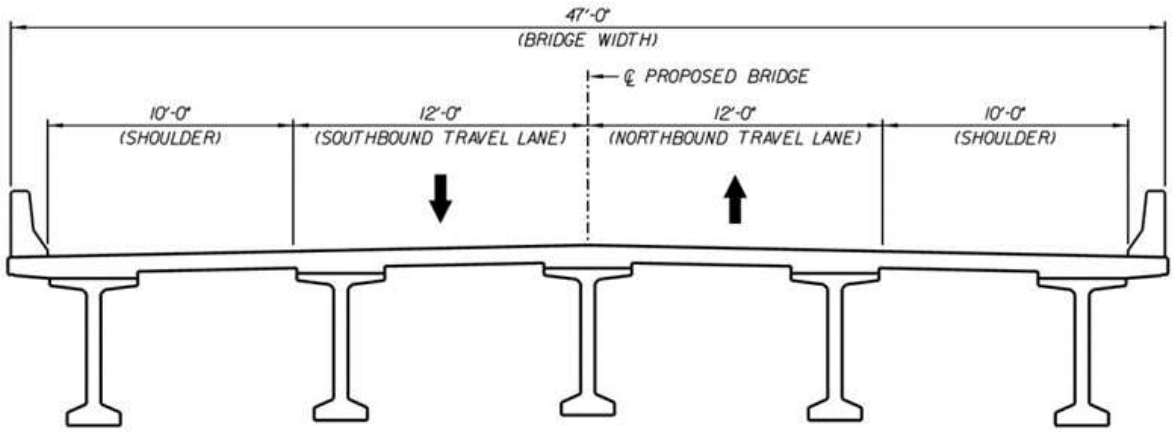

Figure 2-3. Typical Section of Proposed Bridge

3. Essential Fish Habitat Setting

The SAFMC is tasked with conserving and managing fish stocks for a portion of the Atlantic coast. Habitat types that are designated as EFH by the SAFMC are present within the project survey area.

During an onsite meeting with representatives from SCDOT on July 13, 2015 (**Meeting notes included in Appendix A**), NOAA-NMFS biologists determined that five high quality salt marsh habitat types were located within the project area and included estuarine emergent wetlands, intertidal non-vegetated flats, tidal creeks, oyster reef/shell, and unconsolidated bottom (**See Figure 3-1 – Habitat Types and habitat photos in Appendix B**).

The project survey area extends 600 feet from both sides of the existing US 21 centerline between Gay Fish County Road and Harbor Drive. Using ESRI ArcGIS software, recently flown aerial imagery (2015), and SCDNR's 2003 color-infrared digital orthophotography (https://www.dnr.sc.gov/GIS/descdoqqq.html), ESRI shapefiles were drawn of all predicted habitat type boundaries within the survey area. These files and images were then uploaded to a Trimble GPS (sub-meter accuracy) and were ground truthed in the field (July 13-18, 2015). During the ground truthing process, GPS data was collected at sample tidal creek and unconsolidated bottom boundary locations throughout the survey area at absolute low tides. As the tide rose across the intertidal flats and tidal creek banks to allow kayak access to other areas, GPS data was collected at sample boundary locations of the remaining habitat types. The predicted boundary shapefiles were then refined using the GPS sample data. These shapefiles were provided to NOAA-NMFS on November 17, 2015, and then refined/finalized based on NOAA-NMFS comments that were received on November 19, 2015.

Estuarine emergent wetlands

Estuarine emergent wetlands are interspersed between the intertidal flats and upland areas. Estuarine emergent wetlands are important areas for many invertebrates as well as nursery grounds for other species. The estuarine emergent wetlands within the project site are an

exposed area, flooded by tides and mostly dominated with smooth cordgrass (*Spartina alterniflora*).

Intertidal non-vegetated flat

An intertidal area is a subsystem of an estuarine system (Cowardin et al., 1979) where sediments from the estuarine and freshwater environment are deposited. These areas are important in coastal systems as nursery, foraging, and refuge areas for a variety of species, their predators, and their prey (Peterson and Peterson, 1979). The intertidal non-vegetated flat habitat adjacent to the existing causeway on the north side of US 21 and the west side of the Harbor River appears to be of lower quality and a result of spoils and debris from the construction of the existing causeway in 1939.

Tidal creek

Tidal creeks commonly drain the saltmarshes on the South Carolina coast. The water level and salinity of these creeks are affected by the tidal flow of the ocean. Tidal creeks and their associated wetlands serve as nurseries for fish, crustaceans, and mollusks, as well as habitat for adult species (SAFMC, 1998). The two largest tidal creeks within the survey area are located south of the existing alignment. The first is located west of the Harbor River and is an unnamed tidal creek off of Ward Creek. As this creek approaches the survey area limits, it is approximately 30 feet in width and then loses definition within a mixture of intertidal non-vegetated flat and estuarine emergent wetland habitat. This creek is currently being utilized by the Butches Road boat ramp for access to Ward Creek. The second significant creek is located east of the Harbor River. This creek is an unnamed channel off of the Harbor River, and it meanders to approximately 50 feet from the existing roadway. The portions located within the survey area are approximately 35 to 40 feet in width.

In addition, a very small, first order, tidal creek channel is located north of US 21 and just east of Butcher's Island. This channel ranges from approximately 3 to 7 feet in width and runs along the toe of the fill slope of a portion of the existing causeway. This small channel appears to be a result of the construction of the existing causeway.

Oyster reefs and shell banks

Oysters primarily settle and develop in intertidal habitats creating reefs or banks. In South Carolina 95% of oysters are intertidal. These reefs contain live oysters as well as remaining shells from previous generations. The structure of an oyster reef provides sediment stabilization, protection for mobile species, and habitat for other sessile species. Invertebrates such as clams, mussels, anemones, polychaetes, amphipods, sponges, and crabs inhabit oyster reefs and are prey for fish such as striped bass (*Morone saxatilis*), red drum (*Sciaenops ocellatus*), and black drum (*Pogonias cromis*) (SAFMC, 1998). Within the project area, oysters also occur on the 276 existing bridge piles of the existing bridge, typically between the high and low-tide water marks. Approximately 0.253 acre of oyster reef surface area is associated with existing bridge piles.

SCDNR has constructed two shellfish restoration areas within the survey area to the north of the US 21 bridge. One area was constructed of bagged oyster shells in 2013, is approximately 320 feet north of the existing bridge, and is 387 square feet in size. The second area was constructed of loose oyster shells between 2013 and 2014, is approximately 100 feet from the existing bridge, and is 6,404 square feet in size.

For the analysis of effects in this EFH assessment, the oyster reef/shell habitat type has been broken down into two separate habitat types; oyster reef and shell bank. The areas identified as shell banks are mostly comprised of washed oyster shell deposits and do not contain any living

oyster reef. Any shell bank habitat that is also currently comprised of living oyster reef has been included in the oyster reef habitat type. The two areas of shell bank located within the survey area that do not contain living oyster reef are located along the east banks of the Harbor River. All areas containing live oysters are included within the oyster reef habitat. These areas also include the above mentioned oysters inhabiting the existing bridge piles.

Unconsolidated Bottom

Unconsolidated Bottom includes all wetland and deepwater habitats with at least 25% cover of particles smaller than stones, a vegetative cover less than 30%, and subtidal, permanently flooded, intermittently exposed, or semipermanently flooded water regimes (Cowardin et al., 1979). This habitat type consists of soft sediments that are inhabited by macroinvertebrates that serve as prey to demersal fish species.

There are two types of unconsolidated bottom located with the survey area; the unconsolidated bottom associated with the Harbor River and those associated with man-made ponds. The man-made ponds are located east of the Harbor River and north of the existing US 21 alignment. These ponds appear to have been excavated as part of the Harbor Key residential area and are subject to tidal influence. The Harbor River is a saltwater river that experiences a 6.1-foot tidal range. The waterway at the existing swing span is approximately 33.8 feet deep and 1,835 feet wide at mean high water (NAVD88). The waterway narrows to approximately 27.1 feet deep and 1,415 feet wide at mean low water.

Figure 3-1
Habitat Types
US 21 Over Harbor River Bridge Replacement
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4. Managed Fishery Species

White shrimp (*Litopenaeus setiferus*)
Recruitment of white shrimp into estuarine waters generally begins in April and May (SAFMC, 1998). The mud-silt substrate and salinity distribution of the estuary provide a suitable feeding environment for juvenile shrimp, providing benthic worms, plant matter, and decaying animals (Wenner, E., 2004). Juveniles forage and mature in tidally influenced nursery areas. Beginning in August and running through December, white shrimp egress to more saline waters. Some smaller adult individuals may remain in the estuary over the winter (SAFMC, 1998). The onsite habitats include an abundance of smooth cordgrass dominated emergent wetlands, mud-silt substrate, and intermediate salinities that are important to the inshore life cycle of shrimp.

Brown shrimp (*Farfantepenaeus aztecus*)
Year-round spawning of brown shrimp occurs offshore in deeper water habitat with the eggs hatching soon after release (Lassuy, 1983). Postlarvae begin moving into estuarine areas around February, with the peak movement periods occurring through March and April (Wenner, E., 2004). Postlarvae remain in the estuary, foraging and developing into juveniles. The shelter of the estuarine emergent wetlands provides an optimal area for shrimp to forage (SAFMC, 1998). Egress of adult brown shrimp to offshore areas generally takes place during May through August (Lassuy, 1983). The onsite habitats include an abundance of smooth cordgrass dominated emergent wetlands, mud-silt substrate, and intermediate salinities that are important to the inshore life cycle of shrimp.

Snapper-Grouper Complex
The snapper-grouper plan manages 73 species of fish in the snapper-grouper complex, including sea bass (*Centropristis* spp.), grouper (*Serranidae* spp.), snapper (*Lutjanidae* spp.), porgy (*Sparidae* spp.), grunt (*Haemulidae* spp.), jack (*Carangidae* spp.), tilefish (*Malacanthidae* spp.), triggerfish (*Balistidae* spp.), wrasses (*Labridae* spp.) and spadefish (*Eppiphidae* spp.) families (SAFMC, 2009b). Although species from eight of these families use estuaries opportunistically, there are only five species that are estuarine-dependent. These species include gag (*Mycteroperca microlepis*), goliath grouper (*Epinephelus itajara*), cubera snapper (*Lutjanus cyanopterus*), gray snapper (*L. griseus*), and dog snapper (*L. jocu*). In the fishery management plan for the snapper-grouper complex, near-shore essential fish habitat that would be applicable to the project area includes estuarine emergent wetlands (saltmarsh and brackish marsh); tidal creeks; oyster reefs and shell banks; and unconsolidated bottom (soft sediment). It is also important to note that the fishery management plan for the snapper-grouper complex also includes oyster/shell habitat as a Habitat Area of Particular Concern (HAPC).

Other Fishes
The waters of the Harbor River and the surrounding area also serve as nursery and forage habitat for other species including black drum, red drum, Atlantic menhaden (*Brevoortia tyrannus*), and blue crab (*Callinectes sapidus*) that serve as prey for other species (e.g., mackerels, snappers, and groupers) that are managed by the SAFMC, and for highly migratory species (e.g., billfishes and sharks) that are managed by the National Marine Fisheries Service. Blue crab and many finfish prey upon penaied shrimp. Commercially important larval fishes move through the estuarine waters in mid-winter to feed on plankton (SAFMC, 1998). Red drum is an important state-managed fishery, and estuary wetlands within the project area provide habitat necessary for the development and survival of several life stages of red drum, as well as for several other fish species that serve as prey for species managed by the SAFMC.

Oysters and Shellfish

The eastern oyster (*Crassostrea virginica*) and the hard clam (*Mercenaria mercenaria*) are harvested along the coast of South Carolina. The eastern oyster is very commonly found in the intertidal estuaries and the oyster beds provide stability to the shoreline. The hard clam is found in intertidal and subtidal areas. This species requires high salinity waters, but can live in a variety of substrates including sand, mud and shell (Walker, 2005).

The waters of the Harbor River within and surrounding the survey area are classified as Shellfish Management Areas (SMA) by the South Carolina Department of Health and Environmental Control (SCDHEC) and State Shellfish Grounds by the South Carolina Department of Natural Resources (SCDNR, 2010). SCDNR data from 2010 of intertidal oyster reefs and shell deposits (oyster wash) shows that both are located within the project area (See Figure 4-1 – SCDNR 2010 Oyster Bed Data).

The survey area is located in SCDHEC Shellfish Management Area 16A and 16B. US 21 forms the boundary between these management areas. SCDNR manages state and recreational shellfish grounds within the SCDHEC Management Areas. State Shellfish Grounds S105, S127, and S108 are located within the survey area. Shellfish harvesting is prohibited near Gay Fish Company on Ward Creek; all other shellfish areas within the survey area are approved by SCDHEC for harvesting. No commercial culture, grant or mariculture permits, or recreational shellfish grounds are within the survey area.

HAPCs

HAPCs are discreet subsets of EFH that are considered high priority areas for conservation, management, or research because they are rare, sensitive, stressed by development, or important to ecosystem function. In a letter dated August 7, 2015 (**Appendix A**), NOAA-NMFS stated that the SAFMC fishery management plans most applicable to the project area are the plans for penaeid shrimp and the snapper-grouper complex and that oyster/shell habitat is a HAPC for the snapper-grouper complex.

A review of the NOAA EFH mapper identifies the project area as a HAPC for the snapper-grouper complex. According to the Fishery Ecosystem Plan of the South Atlantic Region (SAFMC, 2009c), oyster/shell habitat has a high ecological function, medium sensitivity to environmental degradation, and is moderately susceptible to threats from development activities. Additionally, the rarity of this habitat type is ranked as medium. Within the project area, two restoration beds have been established and the existing bridge piles provide a substrate that has promoted the establishment of oyster beds. Additionally, several other small oyster beds and shell banks were identified within the project area.

No HAPCs were identified within the project area for penaeid shrimp; however, the estuarine emergent wetland and tidal creeks within the project area are considered valuable components for HAPCs for penaeid shrimp.

Figure 4-1
SCDNR 2010 Oyster Bed Data
US 21 Over Harbor River Bridge Replacement
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Source: ESRI World Imagery
& SCNDR 2010 Oyster Bed Data (https://www.dnr.sc.gov/GIS/descoysterbed.html)

5. Analysis of Effects on Essential Fish Habitat

The potential for actions to impact managed species will vary based on life history stage, habitat use, distribution, and abundance. Fish managed in the snapper grouper complex, brown shrimp, and white shrimp all utilize the estuarine emergent wetlands, intertidal flats, unconsolidated bottom, oyster reef, and shell banks at various stages in their life histories. **Table 5-1. Potential Impacts to EFH** summarizes possible temporary and permanent impacts. This analysis is based on the conceptual design of the preferred alternative (Alternative 1B).

Table 5-1. Potential Impacts to EFH

Habitat Type	Temporary Impacts		Permanent Impacts	
	Indirect	**Direct**	**Indirect**	**Direct**
Estuarine emergent wetlands	Siltation	Clearing/Temporary Trestle Pilings/Barges	Shading	Fill/Columns
Intertidal flats	Siltation	Temporary Trestle Pilings	None	Fill/Columns
Oyster reef	Siltation	Temporary Trestle Pilings*	None	None
Shell bank	Siltation	None	None	None
Tidal creek	Siltation	None	None	Fill
Unconsolidated bottom	Siltation	Temporary Trestle Pilings	None	Columns

*The location of temporary trestle piles is unknown at this time. The location of temporary trestle pilings will be determined during final design and permitting. The contractor would make efforts to avoid oyster beds when constructing the temporary trestle.

5.1) Construction and Demolition Methods

Construction and demolition is expected to occur between mid-2018 and mid-2020. Construction methods cannot be finalized because the project will be constructed through Design-Build procurement. However, the proposed bridge would involve construction of a new bridge and its associated approaches in EFH. SCDOT has assumed the following construction scenario (**See Table 5-2 – Summary of the Worst-Case Construction Scenario**). This scenario is based on conceptual plans and a worst-case scenario involving pile driving techniques to install bridge support structures and a temporary trestle. During final design and permitting, the Design-Build contractor would be responsible for coordinating with NOAA-NMFS regarding design changes that would alter the effects on EFH.

Table 5-2. Summary of the Worst-Case Construction Scenario

	Installation Method	Diameter	Total Number Installed (Approximate Numbers)			Estimated Time per Unit	Total Estimated Pile Driving Timeframe
			Total	Unconsolidated Bottom	Intertidal Flats & Estuarine Emergent Wetland		
Concrete Columns	Vibratory Hammer	8 Feet	56	20	36	2 Hours per Steel Casing	112 Hours
Temporary Trestle	Vibratory Hammer	24 Inches	370	24	346	1 Hour per Steel Pile	740 Hours*

*Note: Installation and removal of trestle piles would each take 370 hours, for a total of 740 hours.

The distance between the existing roadway and new bridge would be sufficient enough that staged construction of the bridge would not be required. Construction of the proposed bridge would likely include a combination of drilling shafts and pile driving for the bridge support structures. Bridge construction access would be located in upland areas to the maximum extent practicable. Work in deep water habitats is likely to occur from barges. Temporary work trestles may be installed over the tidal marsh using pile driving. Timber mats and/or barges may be used over salt marsh areas. Temporary lighting would be used during construction.

The existing bridge would be demolished upon completion of construction. The bridge would be demolished using standard practices to remove the existing piers and swing span. Concrete bridge decks and the existing swing span would likely be placed on barges and transported offsite for disposal and/or recycling. Standard deconstruction practices may include using vibratory methods to remove existing pilings. If explosives are used for demolition, the contractor would submit a demolition plan to NOAA-NMFS for additional EFH coordination and evaluation.

5.2) Temporary Impacts

Bridge construction access would be located in upland areas to the maximum extent practicable. However, the existing causeway must remain open during construction to provide access between St. Helena Island and Harbor Island. Work in unconsolidated bottom habitats is likely to occur from barges. Temporary work trestles may be installed over the estuarine emergent wetlands, intertidal flats, and oyster reefs to support cranes during the drilled shaft construction and load/unload barges in the Harbor River.

For the proposed bridge, temporary trestles, including spurs for bent construction, would be approximately 3,800 feet long and would require approximately 370 steel piles. The steel piles would be approximately 24-inches in diameter and would be installed using a vibratory hammer. Approximately 24 of the 370 piles would be installed in unconsolidated bottom habitat, but most of the temporary trestles would be constructed over the estuarine emergent wetland and intertidal flat habitats. Since the design for the temporary work trestle will not be completed until the project is awarded to a Design-Build contractor, there is also potential that the temporary trestle piles could impact oyster reef, including the SCDNR shellfish restoration areas to the north of the existing US 21 bridge. Total construction time for the temporary work trestles is

expected to take four months. Two piles would be constructed at the beginning of each span; each span typically would take three days to construct. The vibratory hammer typically would take one hour to install one pile; therefore, two hours of pile installation would occur approximately every three days during construction of the temporary trestle. Removal of the piles typically would take one hour per pile.

Temporary clearing within the estuarine emergent wetland would occur to install erosion and sediment control measures. The temporary clearing for erosion control would impact 0.470 acre of estuarine emergent wetlands (**See Table 5-3 – Quantities of Temporary Impacts**). After construction, these habitats will be able to return to their typical functions. Timber mats and/or barges may cause temporary impacts to grasses during construction.

During construction activities and demolition of the existing bridge, temporary indirect impacts such siltation may occur along the margins of the intertidal flats, estuarine emergent wetland, oyster reef, shell bank, and unconsolidated bottom. Temporary siltation may cause indirect impacts by affecting thermal loading in the environment as well as temporarily increasing turbidity. Alterations in light attenuation in the water column can cause decreased visibility for organisms, affecting feeding, movement, and predator avoidance. Redistribution of sediments can alter nutrient distribution, dissolved oxygen levels, and primary productivity locally and throughout the estuarine waters. When suspended sediments begin to settle on the floor of the estuary, this can cause indirect impacts to benthic communities by smothering and burying organisms (Berry et al., 2003). Since turbidity is a natural condition along South Carolina's coast, impacts from the proposed project are expected to be relatively minor. Impacts should be minimal and would be limited to the immediate area of the construction.

Table 5-3. Quantities of Temporary Impacts

Habitat Type	**Temporary Clearing** (Acres)	**Temporary Fill** (Acres)
Estuarine emergent wetlands	0.470	0.025*
Intertidal flats	0	
Oyster reef	0	
Shell bank	0	0
Tidal creek	0	0
Unconsolidated bottom	0	0.002
Total	**0.470**	**0.027**

* Design for the temporary work trestle will not be completed until the project is awarded to a Design-Build contractor; therefore, impacts to estuarine emergent wetland, intertidal non-vegetated flats, and oyster reefs could not be separated.

5.3) Permanent Impacts

Direct impacts to unconsolidated bottom habitat in the Harbor River channel would be limited to the construction of bridge support structures, such as drilled shafts for concrete columns. The

proposed bridge would have approximately 56 8-foot-diameter concrete columns. The columns would be installed using drilled shaft construction, which typically includes the following process:

1. Install Steel Casing using vibratory hammer
2. Drill inside casing
3. Install rebar cage
4. Pour concrete inside casing

Typically, the steel casing would be installed in two hours using a vibratory hammer. Two casings typically would be installed within one day, with the remainder of the drilling and concrete process occurring over the following week. Approximately 22 columns would be installed in unconsolidated bottom habitat within the Harbor River channel, 8 columns in non-vegetated intertidal flats, while approximately 26 columns would be installed in estuarine emergent wetland habitat. The proposed columns would impact 0.040 acre of estuarine emergent wetland, 0.013 acre of intertidal flats, and 0.036 acre of unconsolidated bottom for a total of 0.089 acre.

Areas of estuarine emergent wetlands, intertidal flats, and tidal creeks may be filled as the new bridge connects to the existing causeway. The proposed project would also result in permanent direct impacts due to fill materials at both approaches. The approaches of the proposed bridge would result in 2.991 acres of fill materials in estuarine emergent wetland, 0.046 acre of intertidal flats, and 0.036 acre of tidal creek for a total of 3.073 acres. Only the upper most reach of a small, first order, tidal creek channel that runs along the toe slope of the existing causeway would be impacted by fill. Since it is a first order channel and only the most upper reach is proposed to be filled, there would be no impact on the hydrological surface connection. Therefore, no culvert/pipe would be necessary to maintain tidal flows and no additional channel function would be lost except to the area being filled.

The proposed project would indirectly impact estuarine emergent wetland by shading salt marsh grasses underneath the proposed bridge. The shading effects could potentially result in areas of sparse vegetation or the existing vegetation dying off. The extent of adverse indirect impact is dependent on several factors, including the proposed bridge orientation and height to width ratio. Impacts to salt marsh vegetation generally occur when the bridge height to bridge width ratio is less than 0.70 (Broome et al, 2005). The proposed bridge width is 46.5 feet; based on the 0.70 bridge height to bridge width ratio, indirect impacts to vegetated salt marsh may occur in areas where the bridge height is 33 feet or lower. Salt marsh vegetation may become sparse in these areas, with the greatest percentage of die-off as the bridge lowers to connect to the existing causeway. The proposed bridge would shade approximately 1.41 acres of estuarine emergent wetland (**Table 5-4 – Quantities of Permanent Impacts**). The existing bridge is approximately 21 feet wide and 12 to 15 feet above the salt marsh. With an existing bridge height to width ratio of 0.6, the existing bridge shades approximately 0.45 acre of estuarine emergent wetland. Sparse areas of salt marsh vegetation underneath the existing bridge would likely revegetate once the bridge is removed.

The demolition of the existing bridge will directly disturb the oysters on the 276 existing bridge piles. Oysters are located on each pile, typically between the high and low tide marks. Approximately 0.253 acre of surface area comprised of oysters would be impacted by the demolition of the existing bridge. However, the proposed bridge would be constructed with 56 piles (8-foot diameter), which would provide approximately 0.161 acre of surface area suitable for oyster habitat. Therefore, the proposed project would result in a net loss of approximately

0.092 acre of suitable surface area for oyster habitat. In addition, no SCDNR restoration areas would be permanently impacted by the preferred alternative.

Table 5-4. Quantities of Permanent Impacts

Habitat Type	**Existing Indirect** (to be removed) (Acres)	**Proposed Permanent Indirect** (Acres)	**Net Permanent Indirect** (Acres)	**Proposed Permanent Direct** (Acres)
Estuarine emergent wetlands	0.45	1.41	0.96	3.032
Intertidal flats	None	None	None	0.059
Oyster reef	None	None	None	0.092
Shell bank	None	None	None	None
Tidal creek	None	None	None	0.036
Unconsolidated bottom	None	None	None	0.036
Total	**0.45**	**1.41**	**0.96**	**3.254**

6. Avoidance and Minimization Measures

SCDOT analyzed several alternatives in the planning process to avoid and minimize impacts to the environment. SCDOT is considering a No-Build alternative as well as five reasonable build alternatives to constructing a fixed span bridge. **Table 6-1. Alternative Details**, highlights the details of each of the reasonable build alternatives.

Table 6-1. Alternative Details

	No-build	**Alternative 1A**	**Alternative 1B** (Preferred)	**Alternative 2A**	**Alternative 2B**	**Alternative 3**
Offset from the existing bridge (feet)	0	122 (North)	65 (North)	168 (South)	311 (South)	65 (South)
New bridge and roadway length (feet)	N/A	7,206	7,198	8,556	8,928	7,398
Bridge length (feet)	2,851	3,625	3,602	3,546	3,622	3,654
Bridge cross-section width (feet)	21	46.5	46.5	46.5	46.5	46.5

The five alternatives differ based on construction locations (**See Figure 6-1 – Proposed Alternatives**). At this time, the preferred alternative is Alternative 1B, which involves construction of a new bridge approximately 65 feet to the north of the existing alignment. Among other factors, Alternative 1B has the least amount of direct impacts on EFH as compared to the other Build alternatives (**See Table 6-2 – Direct Impacts Comparison**).

Table 6-2 – Direct Impacts Comparison

	Impacts (Acres)					
Habitat	**No-build**	**Alternative 1A**	**Alternative 1B** (Preferred)	**Alternative 2A**	**Alternative 2B**	**Alternative 3**
Estuarine emergent wetlands	0	3.864	3.502	8.248	8.913	4.688
Intertidal flats	0	0.081	0.080	0.220	0.778	0.204
Oyster reef	0	0	0	0.003	0	0.003
Shell bank	0	0	0	0.0004	0	0
Tidal creek	0	0.045	0.045	0	0.0004	0.0001
Unconsolidated bottom	0	0.036	0.036	0.032	0.032	0.032
Total	0	4.025	3.662	8.503	9.723	4.928

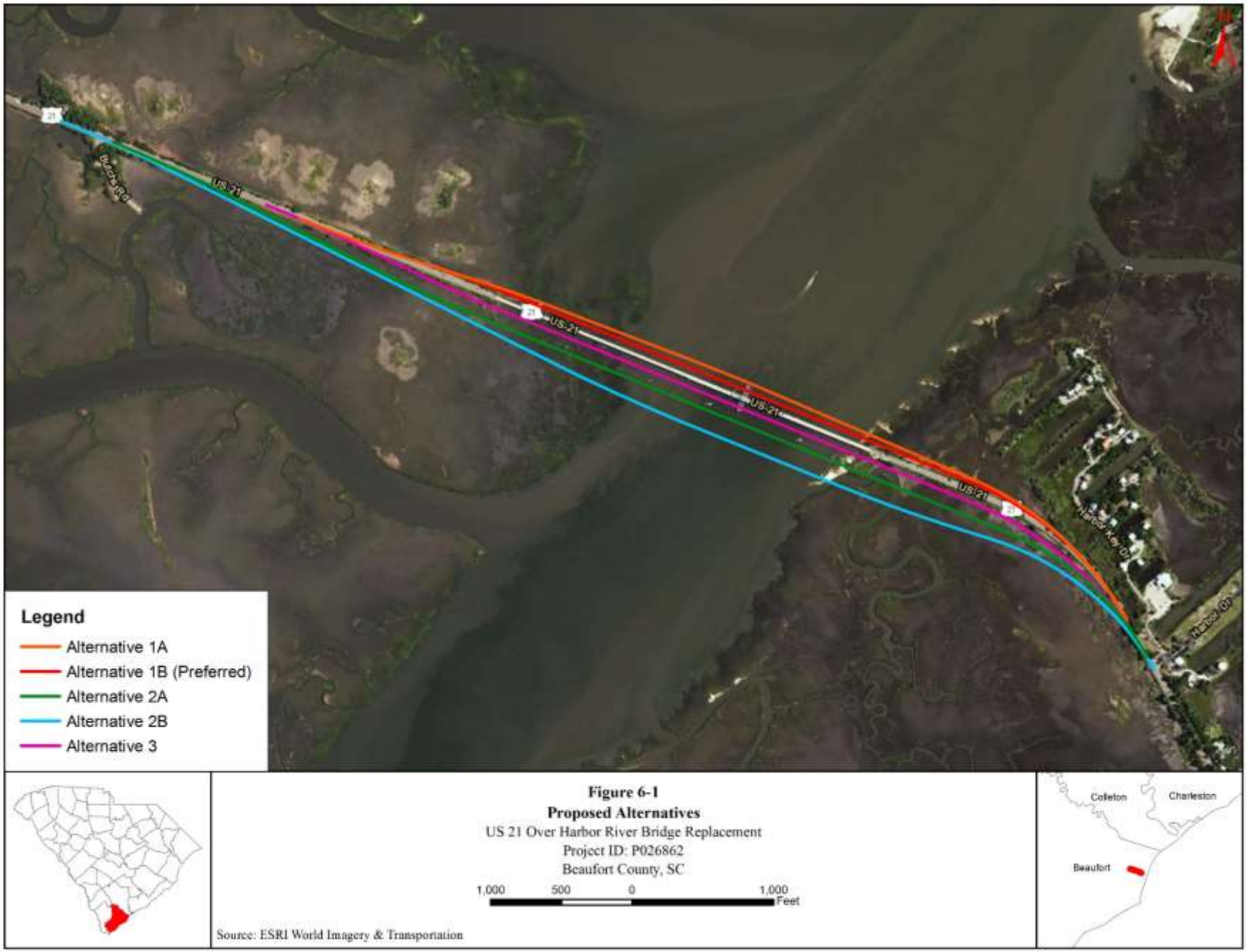

Figure 6-1
Proposed Alternatives
US 21 Over Harbor River Bridge Replacement
Project ID: P026862
Beaufort County, SC

Source: ESRI World Imagery & Transportation

SCDOT also considered but eliminated other alternatives, including replacing the existing bridge with a new moveable-span bridge and a tunnel under Harbor River. These alternatives were eliminated from further review because of the higher construction, operation, and maintenance costs, as well as potential constructability issues.

The US 21 bridge over Harbor River provides the only vehicle access between St. Helena Island and Harbor Island, Hunting Island, and Fripp Island. Closing and abandoning the existing bridge and replacing the bridge on existing alignment was found to be unfeasible and was eliminated from further review. SCDOT also considered rehabilitating the existing bridge; however, this alternative would not address the substandard geometry of the bridge deck, including the width of travel lanes and shoulders.

SCDOT also considered constructing a new causeway and bridge south of Ward Creek and connecting to either Hunting Island or Fripp Island. The existing causeway and bridge would be removed. This alternative was also eliminated because it has the potential for extensive impacts to the EFH, as well as higher cost.

In a letter dated August 7, 2015 (**Appendix A**), NOAA-NMFS recommended that SCDOT construct the new bridge in the same footprint of the existing since this would create the least amount of new EFH impacts. However, this would require that SCDOT close US 21 to traffic during bridge construction and prevent evacuation of surrounding communities in the event of a hurricane. NOAA-NMFS also stated that if this alternative is not feasible, they recommend that SCDOT construct the proposed bridge north of the existing bridge since the emergent wetland vegetation appears less dense and the intertidal flats appear to already contain spoils and debris from the construction of the existing roadway. In addition, a northern alignment would avoid impacts to numerous small tidal creeks on the south side as well as a large tidal creek in the southeastern quadrant of the project area.

The contractor may further minimize impacts to EFH by steeping side slopes on the new bridge approaches, or replacing the proposed fill with flat slab bridge approaches. Given the potential for temporary siltation and erosion, the contractor would be required to minimize these actions through implementation of construction Best Management Practices (BMP), reflecting policies contained in 23 CFR 650B and SCDOT's Supplemental Specifications on Seeding and Erosion Control Measures of August 15, 2001. In addition, no contaminants will be released into the water. SCDOT has emergency spill recommendations to the contractor in the event of an accident. If a leak is evident or a spill occurs, the contractor would be notified and would verify that it is mitigated as soon as practical by authorized personnel. Any unused or contaminated materials would be disposed of in accordance with Federal, State, and local laws.

7. Conclusions

In addition to the above considerations, the proposed project would not encourage future development that would cause the incremental loss of the cited fishery resources in this report. The proposed bridge would not add travel lanes to US 21 and there is a low potential for growth near the survey area because of zoning restrictions and prevalence of wetlands. It is the determination of SCDOT that the proposed project would adversely impact the EFH in the project area. Since there would be impacts to the EFH and possibly aquatic species managed by the SAFMC, an EFH Mitigation Plan would be established. The contractor would develop the EFH Mitigation Plan during the Section 404 permitting phase of the project. The EFH Mitigation Plan may include mitigation measures such as causeway removal, living shorelines, oyster bed

restoration, and/or other methods of mitigating for EFH impacts. The contractor would develop the plan in coordination with SCDOT and NOAA-NMFS.

7.1) Commitment Summary

The proposed project is a design-build project that will require further evaluation and analysis as the project design develops. As such, SCDOT commits to the following:

- During project development, if the demolition of the existing bridge is deemed to require blasting, the contractor will provide a Demolition Plan to NOAA-NMFS for further EFH coordination and evaluation of potential impacts.

- As a component of the USACE Section 404 permitting phase of the project, the contractor wil develop an EFH Mitigation Plan in coordination with SCDOT and NOAA-NMFS.

- Bridge construction access would be located in upland areas to the maximum extent practicable.

- The contractor would be required to minimize these actions through implementation of construction Best Management Practices (BMP), reflecting policies contained in 23 CFR 650B and SCDOT's Supplemental Specifications on Seeding and Erosion Control Measures of August 15, 2001. In addition, no contaminants will be released into the water. SCDOT has emergency spill recommendations to the contractor in the event of an accident. If a leak is evident or a spill occurs, the contractor would be notified and would verify that it is mitigated as soon as practical by authorized personnel. Any unused or contaminated materials would be disposed of in accordance with Federal, State, and local laws.

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9. Appendices

9.1 Appendix A – Agency Coordination

US 21 over Harbor River
EFH Field Coordination Meeting

SCDOT/HDR/Edwards-Pitman Environmental

July 13, 2015

Attendance: Nicole Riddle (SCDOT), Jaclyn Daly (NOAA NMFS), Keith Hanson (NOAA NMFS), Blair Wade (HDR), Collin Lane (EPEI), and Lee Williams (EPEI)

Meeting Notes

Field delineations & habitat

- EFH Assessment should use the habitat types based off of NOAA EFH guidelines
  - Can take habitats from the SCDOT EFH screening form
- NOAA-NMFS prioritizes Habitat Areas of Particular Concern (HAPCs) – includes oyster beds. We need clarification from NOAA-NMFS on additional HAPCs relevant to Harbor River.
  - "Shell hash" was mentioned as a potential shrimp habitat.
- Be sure to delineate out the non-vegetated mud flats from the vegetated areas, as impacts to mud flats are preferred over vegetated areas.
- Locate shellfish beds of 1-m^2 or greater.
  - The smaller scattered oysters can just be included in the habitat discussions
- A shellfish bed restoration project was noted on northwest side of existing bridge. Contact Nancy Hadley with SCDNR to find out more information about the shellfish bed.
- The open water tidal areas near Harbor Island community can be categorized as man-made canals

Avoidance/minimization/alternatives

- Avoid the tidal creek on the southeast side of the existing bridge. It flows very close to existing causeway which would be a concern to any shifts in this direction.
- NOAA-NMFS places higher value on *Spartina* vegetated marsh than unvegetated flats – when considering alternatives, avoid and minimize impacts to *Spartina* vegetated marsh
  - NOAA-NMFS expressed a preference for a northern alignment due to more unvegetated mud flats to the north and to avoid *Spartina* vegetated marshes in southwest quadrant of project and the tidal creek in southeast quadrant of project.
- Avoid placing bridge pilings next to shellfish beds to minimize scour/sedimentation in beds
- SCDOT prepared a study of how different bridge pile/bent types affect shading underneath bridges – Nicole Riddle to provide a copy of study.
- NOAA-NMFS asked about whether the causeway would be removed. Unknown at this time. SCDOT may want to keep causeway for future use. SCDOT does not want to use causeway removal as mitigation for EFH because of monitoring requirements; however, would like to see if the causeway could be removed anyway.
- Mitigation still be calculated using the USACE SOP
- NOAA-NMFS has different calculations and success criteria for shellfish bed mitigation – need to obtain from NOAA-NMFS

- Discussion of construction practices:
  - Project is design-build, so specific construction practices will not be known during the Environmental Assessment. The EFH Assessment should present range of impacts associated with varying construction practices. NOAA-NMFS will consult based on worst-case scenario. NOAA-NMFS suggested that if worst case scenario is presented in the EFH Assessment, re-opening the EFH process would not be necessary once the project is transferred to the design-build team, unless something is discovered during the design process that would require a shift to an alternative not discussed that would result in worse impacts or substantially different impacts.
  - We need to consider long-term effects of construction barges on marsh vegetation – NOAA-NMFS has documented long-term impacts on recovery of salt marsh grasses on similar bridge projects.

<u>EFH Assessment documentation</u>

- EFH Assessment should indicate future permitting mechanisms for project – i.e. Individual Permit – so they know of future review opportunities
- EFH Assessment should not include detailed discussion of project purpose and need or general fisheries information. The Assessment should be specific to the Harbor River project and impacts to EFH.
- If EFH cannot be avoided during alternatives analysis, SCDOT needs a detailed explanation of why - i.e. geotechnical issues.
- EFH Assessment should include detailed descriptions of habitat types at Harbor River, with photographs and mapping.
  - However, do not add much discussion on biological function of the habitats.
  - Discuss only what is there (species considered for EFH and habitats being utilized) and how they would be impacted. The discussion on each species (i.e. white shrimp) at the beginning of the document could potentially be a table summary.

<u>Section 7 and Marine Mammal Act</u>

- The BA should address how the project will comply with MMA.
  - The BA should incorporate data about bottlenose dolphin populations.
  - The BA should discuss how construction methods will impact marine mammals – i.e. pile driving techniques.
  - Obtain acoustics policy from NOAA-NMFS.
- Sturgeon moratorium – information from Nicole Riddle: NOAA-NMFS will allow work in areas as long as there is no standing water (during low tide). Pile driven "spudding" of barges is usually not permitted during moratorium, but gravity spudding has recently been allowed.
  allowed.

<u>Future coordination</u>

- NOAA NMFS will be sending a follow-up letter with more information on the habitat types that they identified during the field visit.
- NOAA NMFS does not require any more coordination from us until the EFH Assessment, but are more than happy to help and provide guidance as the design progresses and if the project limits change.
- Nicole offered to help review pieces of the EFH Assessment since it will likely progress before project design.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
http://sero.nmfs.noaa.gov

August 7, 2015 F/SER47:KH/pw

(Sent via Electronic Mail)

Mr. Chad Long
Archaeologist/NEPA Coordinator
South Carolina Department of Transportation
P.O. Box 191
Columbia, South Carolina 29201

Attention: Nicole Riddle

Dear Mr. Long:

NOAA's National Marine Fisheries Service (NMFS) submits the following response to the request by the South Carolina Department of Transportation (SCDOT) and Federal Highway Administration (FHWA), dated June 23, 2015, for scoping comments on the draft Environmental Assessment (EA) for the proposed U.S. 21 (Sea Island Parkway) bridge replacement over Harbor River in Beaufort County (SCDOT PIN: P026862). Sea Island Parkway is a two-lane highway providing the only vehicle access from St. Helena Island to Harbor Island, Hunting Island State Park, and Fripp Island. The SCDOT views the bridge as structurally deficient and functionally obsolete. While the SCDOT and FHWA have not yet selected an alignment for the new bridge, it likely will parallel and be in close proximity to the existing bridge. As the nation's federal trustee for the conservation and management of marine, estuarine, and anadromous fishery resources, the following comments and recommendations are provided pursuant to authorities of the Fish and Wildlife Coordination Act (FWCA) and the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).

Essential Fish Habitat in the Project Area
On July 13, 2015, NMFS biologists and representatives from SCDOT visited the area of the proposed bridge. The area includes high quality tidal salt marsh habitat, specifically estuarine emergent wetlands, intertidal non-vegetated flats, tidal creeks, oyster reef/shell, and unconsolidated bottom. The fishery management plans from the South Atlantic Fishery Management Council (SAFMC) with EFH designations most applicable to this project are the plans for penaeid shrimp and the snapper-grouper complex. Also, please note the fishery management plan for the snapper-grouper complex includes oyster/shell habitat as a Habitat Area of Particular Concern (HAPC). HAPCs are a subset of EFH that are either rare, particularly susceptible to human-induced degradation, especially important ecologically, or located in an environmentally stressed area. The SAFMC provides additional information on EFH for federally managed species in Volume IV of the *Fishery Ecosystem Plan of the South Atlantic Region*[1].

[1] Available at *http://safmc.net/EcosystemLibrary/FEPVolumeIV*

The waters of the Harbor River, the tidal creeks connected to it, and the surrounding coastal marsh also serve as nursery and forage habitat for other species, such as red drum (*Sciaenops ocellatus*), black drum (*Pogonias cromis*), Atlantic menhaden (*Brevoortia tyrannus*), and blue crab (*Callinectes sapidus*). Many of these species are prey for other fish managed under the Magnuson-Stevens Act, such as mackerels, snappers, groupers, billfish, and sharks. Red drum is an important state-managed fishery, and estuarine wetlands within the project area provide habitat necessary for development and survival of several life stages of red drum. The NMFS recommends the EA address these species as well as those managed under the Magnuson-Stevens Act.

Comments on Potential Effects to EFH and Federally Managed Fisheries
The NMFS recommends SCDOT construct the new bridge in the same footprint as the existing bridge because this approach would require the least amount of new impacts to EFH. If this approach is proves impracticable, the NMFS recommends SCDOT construct the new bridge northward of the existing bridge. Marsh vegetation on the northern side of U.S. 21 is less dense than vegetation on the southern side, and intertidal flats on the northern side of the creek appear to contain debris and spoils from the construction of the original roadway. A northern alignment would also avoid impacts to the numerous small tidal creeks located south of the existing bridge and a large tidal creek on the eastern end of the project boundary. The project should avoid the oyster reef the South Carolina Department of Natural Resources (SCDNR) South Carolina Oyster Restoration and Enhancement (SCORE) program built north of the existing bridge. All oyster reefs should be spanned to the maximum extent practicable or relocated. Lastly, the NMFS requests the EA include a detailed alternatives analysis for the new bridge and for the analysis to include detailed information on the type, amount, and site-specific function of wetlands directly and/or indirectly impacted by each alternative.

The NMFS recommends SCDOT avoid construction practices that smother marsh vegetation. The NMFS has documented the impacts to salt marsh vegetation from barges and barge mats lasting longer than three years at Shem Creek Park and the Folly River Bridge. These and similar projects should be reviewed for adjusting best management practices to improve impact forecasts.

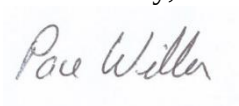
The NMFS prefers onsite mitigation and restoring existing bridge approach sections to salt marsh habitat could contribute to satisfying onsite mitigation. During the site visit, the NMFS and SCDOT discussed mitigating through the SCDNR SCORE program as one component of a larger mitigation plan, should there be unavoidable impacts to oyster reef/shell habitat. The NMFS would be happy to assist SCDOT and FHWA by providing preliminary reviews of the mitigation plan during its development.

The Magnuson-Stevens Act requires federal agencies to consult with NMFS regarding actions that may adversely affect EFH. Based on the information provided, NMFS believes adverse impacts to EFH are likely and the project requires a detailed EFH assessment. The level of detail should be commensurate with the complexity and magnitude of the potential adverse effects of the action. The SCDOT and FHWA may provide the EFH assessment as a stand-alone document or within an EA. In either case, the NMFS recommends communications occur during

development of the EFH assessment to ensure all issues are adequately covered and to avoid unnecessary delays in final evaluations.

The NMFS appreciates the opportunity to provide these comments. Please direct related questions or comments to the attention of Keith M. Hanson at our Charleston Area Office, 219 Fort Johnson Road, Charleston, South Carolina 29412-9110, Keith.Hanson@noaa.gov or by phone at (843)762-8622.

Sincerely,



/ for

Virginia M. Fay
Assistant Regional Administrator
Habitat Conservation Division

cc: SCDOT, LongCC@scdot.org, RiddleNL@scdot.org
DHEC, trumbumt@dhec.sc.gov
SCDNR, DavisS@dnr.sc.gov
EPA, Laycock.Kelly@epa.gov
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9.2 Appendix B – Photographic Log

PHOTOGRAPHIC LOG

Photograph 1. Existing US 21 Bridge over Harbor River.

Photograph 2. Expanse of estuarine emergent salt marsh on the south side of US 21 with intertidal non-vegetated flat and a small tidal creek visible.

PHOTOGRAPHIC LOG

Photograph 3. Estuarine salt marsh south of the existing US 21 Bridge over Harbor River at high tide.

Photograph 4. Expanse of estuarine emergent salt marsh on the north side of US 21 at high tide.

PHOTOGRAPHIC LOG

Photograph 5. Intertidal non-vegetated mud flat at the edge of Harbor River and estuarine emergent wetland located south of US 21 at low tide (looking south away from the existing bridge).

Photograph 6. Intertidal non-vegetated mud flat and estuarine salt marsh at the edge of Harbor River south of US 21 looking north toward the bridge in between tides.

PHOTOGRAPHIC LOG

Photograph 7. Intertidal non-vegetated mud flat adjacent to the Butches Road boat ramp during slack tide.

Photograph 8. Tidal creek and estuarine salt marsh at Butches Creek boat ramp.

PHOTOGRAPHIC LOG

Photograph 9. Unnamed tidal creek connecting to Ward Creek, near Butches Road boat ramp.

Photograph 10. Unnamed tidal creek and oyster reef/shell bank habitat located south of US 21 on the east side of Harbor River.

PHOTOGRAPHIC LOG

Photograph 11. Shell bank located on the south side of US 21 on the east side of Harbor River.

Photograph 12. Oyster beds formed around and between the existing piles for the US 21 Harbor River Bridge.

PHOTOGRAPHIC LOG

Photograph 13. Shellfish restoration area north of US 21 and west of Harbor River.

Photograph 14. Small oyster bed inclusion within an intertidal non-vegetated flat north of US 21 and west of Harbor River.

PHOTOGRAPHIC LOG

Photograph 15. View of Harbor River from the southwest side of the roadway and river.

Photograph 16. Sign detailing the boundary line for the State Shellfish Ground.

PHOTOGRAPHIC LOG

Photograph 17. Porpoise observed in Harbor River.

Photograph 18. Oyster shells encrusted on the existing US 21 Harbor River Bridge pilings on the eastern side of the bridge.