Supplemental Essential Fish Habitat Assessment

Feeder Channel, Bay Area & South Jinks Creek, Sunset Beach,

Brunswick County, North Carolina

Prepared for:
Town of Sunset Beach, Brunswick County, NC

Submitted to:
The North Carolina Division of Coastal Management

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1.0 INTRODUCTION

This Supplemental Essential Fish Habitat Assessment (EFH) provides an update to the EFH dated November 2018 and includes information on the beneficial placement of beach compatible material to the nearshore environment, a change from the previous placement of material on the oceanfront shoreline. As advised by NOAA staff in a June 30, 2020 scoping meeting, the Town is reinitiating consultation to provide additional information on project changes.

The Town of Sunset Beach is proposing to maintenance dredge South Jinks Creek, the Feeder Channel, inclusive of finger canals A-D, and the Bay Area in Sunset Beach, Brunswick County, NC. Sunset Beach lies in Brunswick County, along the southern coastal border of North Carolina, adjacent to Ocean Isle Beach. The proposed project will occur along the eastern border of Sunset Beach, within the interior estuarine waters of Tubbs Inlet. Figure 1 shows the proposed project area in relation to Brunswick County.

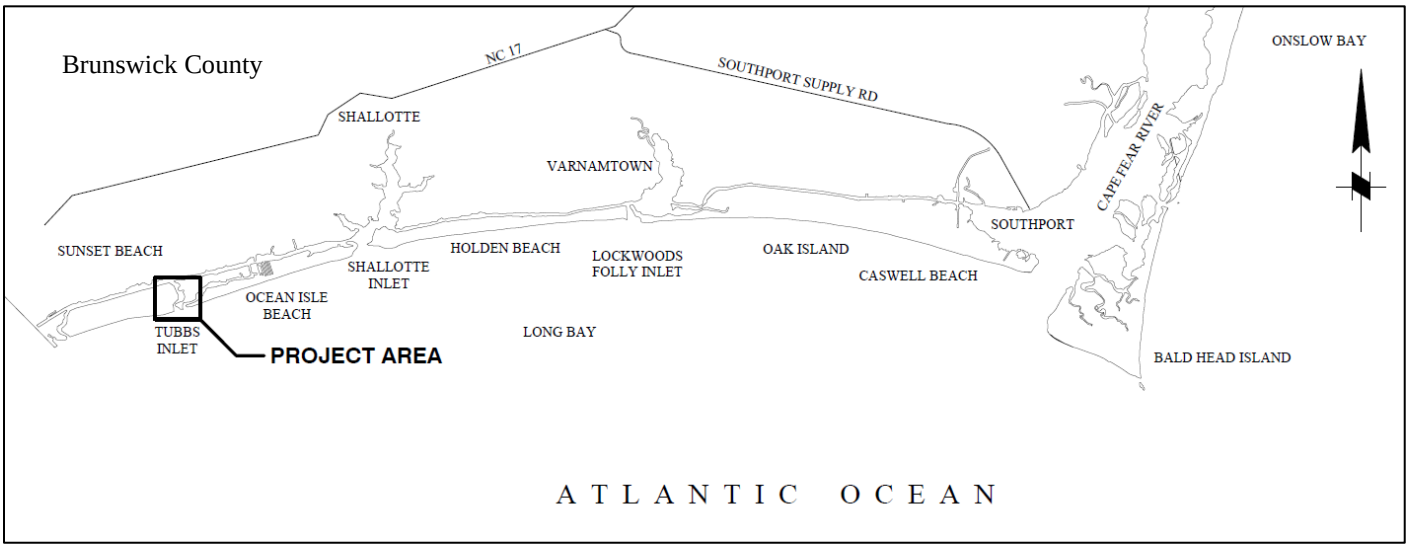

Figure 1. Project Vicinity Map

The following analysis evaluates the potential for impacts to essential fish habitat to occur as a result from the project. The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (16 USC 1801 et seq.) requires the U.S. Secretary of Commerce to develop guidelines assisting regional fisheries management councils on the identification and creation of management and conservation plans for EFH. Each council is required to amend existing fisheries management plans (FMP) to include EFH designations and conservation requirements. The Act also requires federal agencies to consult with the Secretary of Commerce on all actions, or proposed actions, authorized, funded, or undertaken by the agency that might adversely affect EFH.

The US Code (USC) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 USC 1802(10)). "Waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate. "Substrate" includes sediment, hard

bottom structures underlying the waters, and associated biological communities. “Necessary” refers to the habitat that is required to support a sustainable fishery and the managed species’ contribution to a healthy ecosystem. “Spawning, breeding, feeding, or growth to maturity” covers a species’ full life cycle.

1.1 Summary of Proposed Project

South Jinks Creek comprises a portion of the Jinks Creek connector channel that extends from the Atlantic Intracoastal Waterway (AIWW) to Tubbs Inlet and the Atlantic Ocean. The navigation project will connect the Bay Area and Feeder Channel systems along the southeast portion of Sunset Beach to south Jinks Creek. The Bay Area entails one (1) residential canal and the Feeder Channel system includes one (1) main channel connected to four (4) residential finger canals referenced as Canals A – D. The proposed project will help restore navigation access within these systems while also helping to restore access along Jinks Creek’s eastern most shoreline within the Town’s jurisdictional limits.

An estimated 40,500 cubic yards (CY) of beach compatible material will be dredged from S. Jinks Creek, and an additional 48,600 CY of non-compatible material will be removed from the Feeder Channel system and Bay Area. The beach compatible material will be hydraulically placed as beneficial reuse in the nearshore along approximately 2,000-ft of shoreline seaward of 3rd Street to 13th Street on Sunset Beach. The beneficial reuse material will be placed in an approximate 200-ft wide template in water depths ranging between approximately -9-ft to -13-ft MLW. The final grade for the placed material will not exceed -6.0-ft MLW in height. While no State standards exist for sediment compatibility for nearshore placement, the material has been determined to be compatible with the characteristics of the immediately adjacent native beach. It can therefore be assumed that the placement material is also compatible with the sediment characteristics of the recipient nearshore area.

As proposed in the original permit application, the non-compatible material from the Feeder Channel and Bay Area will be mechanically dredged and placed in a permitted upland landfill facility.

South Jinks Creek, the Bay Area, and the Feeder Channel systems have been dredged previously, with the original event occurring approximate to 1970 (Cleary & Marden, 1999). Figures 2 and 3 show aerial photographs from 1966 and 1974 depicting before and after conditions of the initial dredging event. The initial dredging presumably occurred as part of a relocation project for Tubbs Inlet and the development of Sunset Beach. The action occurred prior to 1974 and the establishment of the Coastal Area Management Act (CAMA), so the action did not receive a CAMA Major permit authorization.

The first maintenance event for the feeder channel system occurred in 1985 under CAMA permit 211-85 and a subsequent maintenance occurred in 2002 under CAMA permit 45-02. The proposed action will be the first known maintenance event for south Jinks Creek and the Bay Area since the initial dredging approximate to 1970.

The proposed maintenance dredging will help establish and maintain a navigational channel for access to the residential docks along the east end of Sunset Beach. Sediment runoff from storm events has most likely impaired access through the Bay Area and Feeder Channel while shoaling from sediment transport has impaired navigation in south Jinks Creek. As a result, the Town of Sunset Beach has proposed the maintenance operations as part of a long-term management strategy to maintain navigation access for small recreational vessels through the waterbodies. However, future maintenance operations will be requested through separate permit applications.

Figure 2. Tubbs Inlet 1966 (Originally printed in Cleary & Marden, 1999)

Figure 3. Tubbs Inlet 1974 (Originally printed in Cleary & Marden, 1999)

Figure 4 provides a plan view of the proposed maintenance dredging project as described above. The design template for the Feeder Channel follows the same alignment as proposed under permit 45-02 with small adjustments to avoid the existing marsh grass. In addition, the design depth for the proposed action has been raised from -5.27 MLW to -5 MLW. Raising of the design depth should help to simplify the construction process and reduce the potential for adverse impacts. The dredging proposal includes a 1-ft allowable overdredge template to provide a buffer for maneuvering the construction equipment within the work area. Therefore, the maximum dredge depth in the Feeder Channel extends to -6-ft MLW, inclusive of the proposed 1-ft allowable

overdredge template. Within the finger canals the maximum dredge depth raises to -5-ft MLW, inclusive of the 1-foot overdredge tolerance.

The proposed template for the finger canals maintains a constant 20-ft width. This represents a reduction from the 2002 permitted template, which provided a varying width between 20-ft & 30-ft. The reduction in width helps provide adequate clearance between the proposed channel and the existing residential docks. In many instances, the navigable waterway through finger canals A-D remains even less than 20-ft wide. Therefore, the dredge equipment most likely will not be able to access the full channel even with the reduced 20-foot width. Although the docks may be moved by the private homeowners to help facilitate construction, expectations suggest the docks would be returned to their original position after the maintenance event. Therefore, there would be little public benefit in providing more than a 20-foot channel through the residential waterway.

Figure 4. South Jinks Creek, the Bay Area, and Feeder Channel Work Areas

The dredge template for the Bay Area initiates with an 80-ft width at the connection with South Jinks Creek. The template reduces gradually to 20-ft progressing towards the Bay Area terminus. The larger width proposed for the Bay Area entrance should help control sediment shoaling during tidal influences by providing additional storage capacity within the dredge alignment. The template decreases in width to approximately 40-ft roughly 800-ft into the Bay Area. The minimized

template helps reduce the potential for unexpected impacts while also attempting to balance the navigational need of the Bay Area residents. The maximum dredge depth for the Bay Area matches the Feeder Channel at -6-ft MLW for the complete system. The maximum dredge depth includes the 1-ft overdredge allowance provided from the design depth (-5 MLW) for maneuvering the dredge equipment. A summary of the dredge templates are provided in Table 1.

The dredge material from the Feeder Channel and Bay Area will be mechanically dredged and trucked to a permitted landfill facility. Sediment tests show the material is not beach compatible in accordance with the North Carolina Administrative Code (NCAC). As a result, the upland landfill facility entails the most practical end use location identified for the dredge spoil. The template for south Jinks Creek also maintains the -6 MLW maximum dredge depth. The south Jinks Creek material meets the NCAC criterial for beneficial reuse and will be hydraulically dredged and placed in the nearshore region between 3rd Street and 13th Street, approximately 600-ft offshore of the MHW contour. The nearshore placement area is approximately 6,000-ft west of Tubbs Inlet.

Placement operations will not be allowed to move east or back over an area that has already received material without measuring the current material height. The material will not be placed higher than -6-ft MLW at any time. If material accumulates at a stage higher than -6-ft MLW, excess material shall be removed immediately and prior to advancing further with the placement operations.

Hydrographic surveys shall be conducted before and after nearshore placement occurs. The surveys shall be conducted in perpendicular and parallel directions to the beach. The surveys will be used to verify material placement did not encroach above the -6-ft MLW contour. Any deviation found where material placement occurs above the -6-ft MLW contour shall be remediated by leveling the material with an excavator positioned on the barge or through other mechanical means. Hydraulic dredging shall not be allowed as a measure to fix or remediate the material accumulation.

The nearshore placement shall strive to maintain a placement density no greater than 25 CY per foot of shoreline. This will provide a low-density placement option that allows the placed material to blend into the existing contours within a six (6) to 18-month period. The low-density placement will also help avoid visual impacts to the upland properties, as the material will disburse in the nearshore zone and not accumulate along the beachfront. The material is anticipated to provide additional storm protection, but the benefit should be minimal due to the low-density placement.

The maintenance dredging operations will be conducted during the months of November 16th thru April 30th to reduce the potential for environmental impacts. In addition, the dredge footprint will be minimized to provide a minimum 10-ft buffer from any coastal marsh identified at the time of construction. The 6,500-ft hydraulic pipeline carrying the beneficial reuse material dredged from S. Jinks Creek will also be positioned away from any established dune or beach vegetation. These items are a few of the precautions proposed to help minimize the potential for environmental impacts on this project.

Table 1. Dredge Template Description

Area	Existing Avg. Depth (MLW-ft)	Proposed Depth (MLW-ft)	Length (ft)	Width (ft)	Side Slope (H:V)	Est. Volume (CY)	Placement Location
Feeder Channel	-3 MLW	-6 (-5+1) MLW	3,500	30 – 40	3:1	22,000	Landfill
Finger Canals A-D	-2 MLW	-5 (-4+1) MLW	3,200	20	3:1	10,700	Landfill
Bay Area	-2 MLW	-6 (-5+1) MLW	2,200	20 – 80	3:1	15,900	Landfill
S. Jinks Creek	- 1.5 MLW	-6 (-5+1) MLW	1,750	100	5:1	40,500	Nearshore
TOTAL			**10,650**	**Varies**	**Varies**	**89,100**	**Varies**

2.0 ESSENTIAL FISH HABITAT

Pursuant to the MSFMCA (Public Law 94-265) and the 1996 amendments to the Act, known as the Sustainable Fisheries Act (Public Law 104-297), an EFH consultation was requested by NOAA Fisheries for the proposed project. As of the date of this supplemental EFH (August 2020), NOAA National Marine Fisheries Service (NMFS) provided comments on August 2, 2019 that were taken into consideration in the evaluation of the project's beach compatible sediment placement area.

For the North Carolina coast and Sunset Beach project location, this requires that EFH be identified for all fish species managed by the South Atlantic Fisheries Management Council (SAFMC), Mid-Atlantic Fishery Management Council and the NMFS. The NMFS is the nation's federal trustee for the conservation and management of marine, estuarine, and diadromous fishery resources.

This EFH assessment's objective is to determine whether the actions for the proposed project "may adversely affect" designated EFH for relevant managed fisheries species within the proposed project area. Table 2 provides a list of EFH habitat types and their presence or absence in the project area. Habitats are described in more detail in following sections.

Table 2. EFH Types Present in the Project Area

EFH Type
Marine Unvegetated Sandy Bottom
Oyster Reef and Shell Banks
Estuarine Emergent Wetlands
Aquatic Bed (Tidal Freshwater)
Estuarine Water Column/Creek

2.1 Marine Unvegetated Sandy Bottom

Regional sediment grain size influences the wind, wave, and tidal interactions that shape and manage the development and movement of sub- and intertidal flats (SAFMC 1998a). These sub- and intertidal EFH locations provide feeding grounds for predators and forage fish species as well as refuge, juvenile nurseries, and feeding grounds for many species (SAFMC 1998a). Animals

that move from a pelagic larval to a benthic juvenile existence make use of these EFH flats for life stage development. Species such as summer flounder, red drum, spotted seatrout (*Cynoscion nebulosus*), striped mullet (*Mugil cephalus*), gray snapper (*Lutjanus griseus*), blue crab (*Callinectes sapidus*), and shrimp use these marine/estuarine EFHs as nurseries. These flats also serve as refuge areas for avoiding predators, which use the tide cycles for access to feeding grounds.

Associated benthic species dominating NC's bays and sounds include bivalves, polychaetes, and amphipods. The dominant coastal research indicator species include mole crabs (*Emerita talpoida*), coquina clams (*Donax variabilis*, *D. parvula*), some amphipods (Haustoriids), and polychaetes (mostly *Capitella capitata* and *Scolelepis squamata*), all of which can be found in NC's intertidal beaches (Peterson et al. 2006, 2000a, and 2000b; Street et al. 2005; and USFWS 2002). Most oceanfront shoreline benthic species are found in the substrate's upper 3.3 ft. maximizing oxygen concentrations, pore space, and variable grain sizes (USFWS 2002).

2.2 Oyster Reef and Shell Banks

Shell bottom habitats include oyster reefs, aggregations of non-reef building shellfish species [e.g., clams and scallops (*Argopecten irradians*, *A. gibbus*)], and surface concentrations of broken shells (shell hash). Oysters (*Crassostrea virginica*) are the dominant reef-building species of estuarine shell bottom habitats in North Carolina. Non-reef building shellfish species that occur at densities sufficient to provide structural habitat for other organisms include scallops, pen shells (*Atrina seratta*, *A. rigida*), and rangia clams (*Rangia cuneata*) (SAFMC 2009). The distribution of shell bottom and other estuarine benthic habitats in the vicinity of the proposed project has been mapped and quantified by the NCDMF in collaboration with Moffatt and Nichol (Appendix A – Jinks Creek Shellfish Survey Report). Mapped areas are concentrated in the northern portion of Jinks Creek. Shell bottom habitats perform several important ecological functions such as water filtration, benthic-pelagic coupling, sediment stabilization, and erosion reduction (Deaton et al. 2010, SAFMC 2009, and Coen et al. 2007). Oysters and other suspension feeding bivalves reduce turbidity in the water column by filtering particulate matter, phytoplankton, and microbes. The consumption of particulates also results in the transfer of material and energy from the water column to the benthic community (i.e., benthic-pelagic coupling). Shell bottom structural relief alters currents and traps and stabilizes suspended solids, thus further reducing turbidity. By moderating waves and currents, oyster reefs and other shell bottom habitats reduce shoreline erosion.

The hard surfaces provided by existing oyster reefs and shell hash function as important larval settlement and accumulation sites for recruiting oysters, hard clams, and other shellfish (NCDMF 2008). Studies summarized by Deaton et al. (2010) have described the importance of shell bottom as foraging, spawning, and nursery habitat for numerous species of invertebrates and fish. Shell bottom structure concentrates macroinvertebrates [e.g., grass shrimp (*Palaemonetes* spp.) and mud crabs (*Scylla* spp.)] and small forage fishes (pinfish and gobies), which in turn attract larger predatory fish such as Atlantic croaker, black drum, pigfish, southern and summer flounder, and spotted seatrout. Shell bottom habitats are utilized as spawning areas by a number of finfish and decapod crustaceans; including anchovies, blennies (Blennidae), gobies, mummichog (*Fundulus heteroclitus*), oyster toadfish (*Opsanus tau*), sheepshead minnow (*Cyprinodon variegatus*), grass shrimp, and blue crab. Numerous finfish and decapod crustaceans also utilize shell bottom habitats as a nursery area; including anchovies, black sea bass, blennies, gobies, oyster toadfish, pinfish,

red drum, sheepshead, spot, weakfish, penaeid shrimp, blue crabs, and stone crabs (*Menippe mercenaria*).

2.3 Estuarine Emergent Wetlands

Estuarine Emergent Wetlands includes all tidal wetlands dominated by erect, rooted, herbaceous hydrophytes (excluding mosses and lichens). These wetlands occur in tidal areas where salinity due to ocean-derived salts is equal to or greater than 0.5 percent and that are present for most of the growing season during most years. Perennial plants usually dominate these wetlands and vegetation cover is typically above 80 percent. These wetlands are typically dominated by marsh grasses such as *Spartina* species, needlerush (*Juncus* spp.), and narrow leaved cattail (*Typha angustifolia*). Estuarine emergent wetlands are nutrient-rich with high primary productivity, allowing these habitats to support a diversity of fish, invertebrates, and coastal birds. Managed fish species use these marshes during multiple life stages because they provide nursery habitat for juveniles and foraging habitat for adults. Estuarine emergent wetland habitat is expected on the fringe of the channels, near the marsh.

2.4 Aquatic Bed (Tidal Freshwater)

Aquatic bed habitats in the project area include the soft bottom substrate occurring in Sunset Beach. This habitat type is comprised of sand as well as inorganic muds, organic muds, and peat. Nutrients are typically provided by riverine sources and transported via wind tides in addition to lunar tidal exchange. The abundance of benthic macroalgae in this habitat supports a high diversity of invertebrates that are an important fishery food source.

2.5 Estuarine Water Column/Tidal Creeks

The estuarine water column extends from the estuarine bottom to the surface waters and is especially important as it directly affects all other estuarine aquatic habitats (NCWRC, 2005). This habitat is characterized by the oligohaline (estuarine) waters present in Sunset Beach with seasonally variable salinity levels. Distinct zones within the water column can be defined by parameters such as salinity, temperature, and dissolved oxygen. Water column zonation continually fluctuates and is a function of tidal dynamics, season, nutrient levels, and ocean proximity. Fish and shellfish often exploit distinct resources within the water column based on species-specific diet, behavior, and morphology. For example, pelagic fishes live higher in the water column compared to demersal fishes, which are bottom dwelling. These distinct types of fishes have adapted to take advantage of these differing habitats, and favorable spawning and feeding conditions occur at varying locations at differing times of the year.

2.6 Primary Nursery Areas

While not a single specific EFH type, Primary Nursery Areas (PNA) are composed of several EFH types and are state-designated waters that are used by marine and estuarine fishes and invertebrates during early development. Nursery areas are designated and regulated by the North Carolina Division of Marine Fisheries (NCDMF) and North Carolina Wildlife Resources Commission (NCWRC) in some areas. The State of North Carolina has not designated the project area as a

PNA, although the project includes elements of PNA including shallow waters with soft bottom substrate that are surrounded by marshes and wetlands. The abundance of refuge, foraging habitat, and food resources present in these areas result in the successful development of many sub-adult organisms (Beck *et al.*, 2001). Nursery areas are also considered HAPC for several managed fish species. Marshes adjacent to the channels, not including the channels in consideration for this EFH assessment, have been designated as primary nursery areas.

3.0 MANAGED SPECIES

Multiple environmental agencies have interest in the potential impacts dredging projects may cause. The primary resource organizations include the following:

- South Atlantic Fisheries Management Council (SAFMC)
- National Marine Fisheries Service (NMFS)
- Atlantic States Marine Fisheries Commission (ASMFC)
- North Carolina Division of Marine Fisheries (DMF)

The following provides a discussion on the species managed by each agency with a potential presence of EFH within the project area.

3.1 SAFMC and NMFS-managed Species

SAFMC have developed FMPs for several species, or species units (SAFMC, 2008), although not all of these species are found in the project area. Highly migratory species' FMPs and Atlantic billfish FMPs were developed by the Highly Migratory Species Management Unit, Office of Sustainable Fisheries, NMFS (NMFS, 1999, 1999a, 1999b; NOAA, 2016). As part of each FMP, the council designates not only EFH, but also High Areas of Potential Concern (HAPC), a subset of EFH that refers to specific locations required by a life stage(s) of that managed species. Table 3 presents the species or species units potentially present in the project area for which EFH and/or HAPC exist.

3.1.1 Penaeid Shrimp (*Penaeus* spp.)

Penaeid shrimp (white, pink, and brown shrimp) are estuarine-dependent species of commercial and ecological significance. Penaeid shrimp spawn offshore where both larval and post-larval development occurs. Currents carry post-larval shrimp into estuaries, where they are distributed based on salinity and substrate preferences. As shrimp grow, they migrate to higher salinity areas before returning to offshore spawning areas. All tidal and estuarine waters within the project area, including estuarine emergent wetlands and aquatic beds, are designated as EFH for penaeid shrimp.

3.1.2 Snapper-Grouper Management Unit

The Snapper-Grouper Management Group includes more than 70 species that are managed by the SAFMC. Atlantic Spadefish, and Black Sea Bass are species within this group that have been documented near or within the project area. Atlantic Spadefish are opportunistic bottom feeders that utilize a variety of brackish water and nearshore habitats. Spawning occurs from May to September and juveniles are typically found in estuarine waters while adults are typically found in

nearshore areas. Atlantic Spadefish have been documented in local fishing reports in or near the project area.

The Black Sea Bass is a demersal species found from Maine to Florida that are opportunistic feeders and accept a variety of food sources. As juveniles and adults, this species is associated with submerged structures in estuarine and marine waters. Spawning occurs offshore from May to October along the continental shelf in an area extending from southern New England to North Carolina. Eggs are generally hatched on the continental shelf near large estuaries, but eggs have also been found in bays in North Carolina. Juvenile Black Sea Bass enter estuaries during late spring and early summer to forage on invertebrate prey and small fish. This species is typically not found in the project area, but fishing reports from NCDEQ-DMF have shown presence of this species in the last 10 years. All tidal and estuarine waters, including emergent wetlands, and estuarine water column habitat are designated EFH for this species.

3.1.1 Spiny Lobster

Spiny Lobster have EFH for all life stages within the project area. EFH includes estuarine water column/creeks, aquatic bed, and SAV (NOAA, 2016). The Spiny Lobster larvae are typically found in open ocean in the epipelagic zone of the Caribbean Sea, Gulf of Mexico, and the Straits of Florida. Post-larvae and juveniles occupy shallow waters of bays, lagoons, and reef flats, habitats supported by the production of seagrasses, benthic algae, phytoplankton, and detritus. As the lobsters increase in size, they move towards deeper waters in bays, reefs, and nearshore areas. As adults, they can be found in deeper waters both nearshore and offshore.

Table 3. Managed Species Potentially Present in the Project Area

Species Present	Life Stages Present in Project Area	Designated EFH in Project Area	HAPC in Project Area
South Atlantic Fisheries Management Council (SAFMC)			
Penaeid Shrimp (*Penaeus* spp.)	Larvae, Juveniles, Adults	Estuarine Water Column/Creeks, Aquatic Beds, Estuarine Emergent Wetlands	Estuarine Water Column/Creeks, Aquatic Beds, Estuarine Emergent Wetlands
Snapper-Grouper Management Unit	Larvae, Juveniles, Adults	Estuarine Water Column/Creeks, Estuarine Emergent Wetlands	Estuarine Water Column/Creeks, Estuarine Emergent Wetlands
Spiny Lobster (*Panulirus argus*)	Eggs, Larvae, Juveniles, Adults	Estuarine Water Column/Creeks, Aquatic Beds, Estuarine Emergent Wetlands	Estuarine Water Column/Creeks, Aquatic Beds, Estuarine Emergent Wetlands
Coastal Migratory Pelagic Species	Larvae, Juveniles, Adults	Estuarine Water Column/Creeks, Aquatic Beds	Estuarine Water Column/Creeks, Aquatic Beds
Atlantic Highly Migratory Species (HMS) National Marine Fisheries Service (NMFS)			
Blacktip Shark (*Carcharhinus limbatus*)	Juveniles, Adults	Estuarine Water Column/Creeks	None
Sandbar Shark (*Carcharhinus plumbeus*)	Juveniles, Adults	Estuarine Water Column/Creeks	None
Spinner Shark (*Carcharhinus brevipinna*)	Neonates, Juveniles, Adults	Estuarine Water Column/Creeks	None
Tiger Shark (*Galeocerdo cuvier*)	Neonates, Juveniles, Adults	Estuarine Water Column/Creeks	None
Blacknose Shark (*Carcharhinus acronotus*)	Neonates, Juveniles	Estuarine Water Column/Creeks	None
Bonnethead Shark (*Sphyrna tiburo*)	Juveniles, Adults	Estuarine Water Column/Creeks, Aquatic Beds	None
Atlantic Sharpnose Shark (*Rhizoprionodon terraenovae*)	Neonates, Juveniles, Adults	Estuarine Water Column/Creeks	None
Smooth Dogfish Shark (*Mustelus canis*)	Neonates, Juveniles, Adults	Estuarine Water Column/Creeks	None
Dusky Shark (*Carcharhinus obscurus*)	Neonates, Juveniles, Adults	Estuarine Water Column/Creeks	None
Sand Tiger Shark (*Carcharhinus taurus*)	Neonates, Juveniles, Adults	Estuarine Water Column/Creeks	None

Source: SAFMC, 2008; NMFS, 1999, 1999a, 1999b; NOAA, 2006, 2009, 2016

3.1.2 Coastal Migratory Pelagic Species

Coastal Migratory Pelagic species found near the project area are the Spanish Mackerel and King Mackerel. Spanish Mackerel and King Mackerel spawn from May to September (SAFMC, 1998), with eggs and larvae using pelagic habitats and juveniles moving into estuaries for use as nursery areas. While typically not found in oligohaline waters, these Mackerels do occur in the area based

on commercial fishing data. Estuarine water column/creek habitats are designated as EFH by SAFMC in the management of this unit because prey items for species in this unit are typically estuarine dependent. There are no HAPCs designated by SAFMC for these Mackerels in the project area.

3.1.3 Highly Migratory Species

The Blacktip Shark inhabits circumtropical waters that are shallow as well as offshore surface waters. The coastal islands of the Carolinas are prime nursery areas due to the variety of habitat conditions available at the shallow water depths. Sandbar Sharks are a slow growing species, utilizing shallow coastal waters for its nurseries, until migrating to deeper waters. The Spinner Shark is a migratory species common to coastal-pelagic waters. EFH presents nursery areas to reproduce and rear the young. Tiger Sharks are both shallow coastal water and deep oceanic inhabitants utilizing EFH for refuge during their year-long gestation periods. Blacknose Sharks are common to coastal waters creating nursery areas for the reproducing females and young in shallow waters. The Bonnethead Shark is a fast-growing species, reproducing each year; this species is abundant in the shallow, coastal waters of the Atlantic. The females and young are found in estuarine waters often for the variety of habitat and food resources available. Atlantic Sharpnose Sharks are smaller in size, common in the waters along the coasts of the Carolinas. Often these sharks tend to congregate in schools of uniform sex and size. EFH is utilized as nursery areas for neonates and pups. The Smooth Dogfish Shark is a migratory species, moving north to south in the Atlantic Ocean. It is small in size, inhabiting estuarine, shallow waters to feed on the variety of food resources available. Dusky Sharks are a larger, migratory species, moving north to south depending on the season. These sharks inhabit inshore waters as well as outer reach of the continental shelf. EFH is prime nursery areas for births occurring in the spring months. The Sand Tiger Shark prefers very shallow waters, common to the inshore estuarine waters of the Carolinas. These sharks reproduce in warmer, temperate waters, followed by neonates migrating northward to summer nurseries.

3.2 ASMFC-Managed Species

The Atlantic States Marine Fisheries Commission (ASMFC) coordinates additional conservation and management of states' shared nearshore fishery resources (ASMFC, 2017). Member states include North Carolina, South Carolina, Georgia, Florida, Virginia, Maryland, Delaware, Pennsylvania, New Jersey, Connecticut, Rhode Island, Massachusetts, New Hampshire, and Maine. Species managed by the ASMFC that are found in the waters off Sunset Beach include: American Eel (*Anguilla rostrata*), Atlantic Croaker (*Micropogonias undulates*), Atlantic Menhaden (*Brevoortia tyrannus*), Atlantic Striped Bass (*Morone saxatillis*), Atlantic Sturgeon (*Acipenser oxyrhynchus*), Black Drum (*Pogonias cromis*), Black Sea Bass (*Centropristis striata*), Bluefish (*Pomatomus saltatrix*), Red Drum (*Sciaenops ocellatus*), Blueback Herring (*Alosa aestivalis*), American Shad (*Alosa sapidissima*), Spanish Mackerel (*Scomberomorus maculatus*), Spot (*Leiostomus xanthums*), Spotted Seatrout (*Cynoscion nebulosus*), Summer Flounder (*Parlichthys dentalus*), and Weakfish (*Cynoscion regalis*).

3.3 NCDEQ-DMF Managed Species

The Fisheries Reform Act of 1997 (FRA) prompted NCDEQ-DMF to begin the process of developing FMPs for all commercially or recreationally important species and fisheries that are present in state marine or estuarine waters, with the goal of ensuring the long-term sustainability of these fisheries (NCDEQ-DMF, 2001). Species with existing or in-development management plans include: Bay Scallop (*Argopecten irradians*), Blue Crab (*Callinectes sapidus*), Estuarine Striped Bass (*Morone saxatilis*), Hard Clam (*Mercenaria mercenaria*), Kingfish (*Menticirrhus americanus*), Oyster (*Crassostrea virginica*), Red Drum (*Sciaenops occelatus*), River Herring (*Alosa pseudoharengus*), Shrimp (*Penaeus* spp.), Southern Flounder (*Achiropsettidae*), Spotted Seatrout (*Cynoscion nebulosus*), and Striped Mullet (*Mugil cephalus*).

4.0 POTENTIAL IMPACTS TO EFH

Potential impacts to EFH may occur as short-term / temporary measures or they may provide permanent or long-term measures. The discussion below illustrates the potential impacts considered likely as a result of the project. The discussion provides avoidance and minimization efforts planned for the project to help alleviate the potential damage.

4.1 Short-term and Temporary Impacts

Construction activities will produce noise, turbidity, and siltation, thereby creating short-term, localized impacts to EFH identified in the Feeder Channel system, Bay Area, South Jinks Creek, nearshore placement area and possibly to targeted management species. Dredging activities could create a short-term decrease in dissolved oxygen. Many, if not all, of the fish species with EFH within the project area would be expected to escape the area during construction activities, and construction disturbances would not be expected to be lethal to any fish species with EFH within the project area.

At the ecosystem level, increased turbidity could result in temporary, reduced ecosystem productivity (ability of the ecosystem to produce and export energy) and nursery value by elimination of organisms that cannot easily flee construction activities, and the displacement of mobile organisms. For individual organisms, turbidity can impair visual predation success, predator avoidance, and an organism's ability to take in oxygen through clogging of respiratory organs. Siltation could alter invertebrate animal communities within the project area. Again, these potential impacts are expected to be short-term and temporary in nature. Mobile animals would likely avoid the area during the construction phase, but likely return once construction is complete and pre-construction conditions return.

Nearshore placement of beach compatible material will physically cover benthic organisms; however, it is likely these communities will recover rapidly post-construction due to the transient nature of sediment movement in the nearshore environment. Most benthic communities are resilient and recolonize quickly after short-term impacts (Ellis, 2009; Dernie 2003). In addition, the dredging activities will occur within the environmental window of November 16th through April 30th, outside the general spawning and migration period for most EFH species.

4.2 Permanent and Long-Term Impacts

While dredging construction activities and placement of dredged material will create short-term and localized impacts on EFH within the project area, long-term and permanent impacts are expected to be minimal for the Preferred Alternative. The Feeder Channel system and Bay Area have previously been dredged multiple times dating back to approximately 1970 without noticeable long-term or permanent impacts.

4.3 Managed Species Effects Determination

The maintenance dredging of the Feeder Channel, Bay Area and South Jinks Creek should create minimal localized and short-term effects within the project. Most species are mobile and should be able to avoid the construction activities. This section evaluates impacts to SAFMC, NMFS, and NCDEQ-DMF managed species, but does not included an evaluation of impacts to ASMFC-managed species. ASMFC is primarily a deliberative body, coordinating the conservation and management of states' shared fishery resources.

In general, short-term impacts include potential mortality in earlier life stages for managed species, and some limited displacement and habitat disturbance in later life stages. Long-term impacts are minimal and generally involve the potential disruption of dispersion of early life stage populations (larval and juvenile individuals) within the Feeder Channel and Bay Area. Table 4 provides a summary of both short-term and long-term potential impacts for SAFMC, and NMFS-managed species within the project area.

4.3.1 NCDEQ-DMF Managed Species Impacts

In addition to the SAFMC and NMFS-managed EFH species, NCDEQ-DMF has developed, or is in the process of developing, FMPs for many species found in North Carolina waters, including Bay Scallop, Blue Crab, Estuarine Striped Bass, Hard Clam, Kingfish, Oyster, Red Drum, River Herring, Shrimp, Southern Flounder, Spotted Seatrout, and Striped Mullet. Potential impacts to Red Drum, Kingfish, River Herring, Estuarine Striped Bass, Hard Clams, Bay Scallops, Oysters, Blue Crabs, and Striped Mullet are addressed below.

The Red Drum is an estuarine-dependent species with foraging areas throughout Sunset Beach waters. Red Drum typically arrive in the area in the spring, with a second arrival often occurring in the fall as fish begin a southerly migration from the Mid-Atlantic States. Both juvenile and adult Red Drum may occur in the project area but are mobile enough to avoid construction activities. Kingfish have a similar life history to Red Drum. Juveniles and adult kingfish may occur in the project area, but are a highly mobile species, therefore impacts will be minimal.

River Herring and Estuarine Striped Bass are anadromous (move from the ocean to freshwater to spawn) fish whose adult life stages live in lower estuaries and marine waters. Juveniles and adults are mobile enough to avoid construction disturbance in the project area.

Potential impacts to Hard Clams include increased short-term turbidity and siltation that could clog the respiratory and feeding structures of these bivalve mollusks; limited mortality may occur. Based on the shellfish survey conducted by the Town (Appendix B), it is estimated to be approximately 50,000 oysters in Jinks Creek at a density of 1,131 oysters per acre. It was estimated that there would be direct impacts to approximately 13,000 oysters with the original

dredging footprint. The Town eliminated dredging within the northern part of Jinks Creek to avoid disturbance of 9.0 acres of undisturbed soft bottom/subtidal EFH.

Table 4. Potential Short-Term and Long-Term Impacts to Project Area EFH Species

Species	Impact Type	Eggs	Larvae	Juveniles	Adults
Penaeid Shrimp (*Penaeus* spp.)	Short-Term Impacts	N/A	Mortality from construction; Displacement and habitat disturbance		Displacement and habitat disturbance
	Long-Term Impacts	N/A	Limited potential disruption of dispersion in waters of Sunset Beach	N/A	
Snapper-Grouper Management Unit	Short-Term Impacts	N/A	Mortality from construction; Displacement and habitat disturbance		Displacement and habitat disturbance
	Long-Term Impacts	N/A	Limited potential disruption of dispersion in waters of Sunset Beach	N/A	
Spiny Lobster	Short-Term Impacts	Mortality from construction		Mortality, displacement and habitat disturbance	
	Long-Term Impacts	Limited potential disruption of dispersion in waters of Sunset Beach		N/A	
Coastal Migratory Pelagic Species	Short-Term Impacts	N/A	Mortality from construction	Displacement and habitat disturbance	
	Long-Term Impacts	N/A	Limited potential disruption of dispersion in waters of Sunset Beach	N/A	
Highly Migratory Species (Sharks, Tuna, Swordfish)	Short-Term Impacts	N/A		Displacement and habitat disturbance	
	Long-Term Impacts	N/A			

Impacts to Oysters and Bay Scallops are expected to be like those experienced by Hard Clam populations. However, no Bay Scallops were observed during a field visit in July of 2017 and the sites surveyed did not contain live oyster populations.

Blue Crabs occupy various marine and estuarine habitats throughout their life cycle. Mating occurs in estuaries, followed by spawning near coastal inlets from April to June and August to September in North Carolina. Weather, water quality conditions, proximity to inlets, hours of dark flood tide, and wind direction may impact breeding productivity in Blue Crabs. Short term impacts may occur to eggs and larvae from turbidity and siltation. Juveniles and adults are mobile and would be able to escape construction disturbance.

Striped Mullet is a catadromous (move from freshwater to the ocean to spawn) species that live in fresh and estuarine waters until moving to high salinity estuarine and nearshore marine waters to

spawn in winter and early spring. Larvae develop in marine offshore environments, and would not be present within Sunset Beach waters. Immature Striped Mullet move to estuaries during the winter and generally occupy estuarine waters until spawning. Juveniles and adults may be present near the project area, but are mobile and would be minimally impacted by turbidity, siltation, and noise resulting from construction activities.

5.0 SUMMARY

The maintenance dredging of the Feeder Channel and Bay Area, proposed dredging in south Jinks Creek and placement of beach compatible material in the nearshore of Sunset Beach could likely result in primarily short-term, localized, and temporary adverse effects to EFH and managed species. However, the avoidance of dredging within northern Jinks Creek and ensuring construction measures proposed should keep temporary and localized impacts to a minimum.

The proposed maintenance dredging project should not create any permanent, long-term impacts to federally- or state-managed species or EFH. Short-term impacts will include increased localized turbidity, siltation, and noise from construction activities, but most managed species found in this area are highly mobile and likely be able to escape construction disturbance temporarily, eventually returning to the area post-construction. Similarly, impacts to EFH areas such as the water column, benthic substrate, and emergent wetlands may experience short term impacts which will recover over time. Limiting the dredging activities from November 16th through April 30th should also limit the potential for impacts to occur.

The Town of Sunset Beach will implement construction and physical monitoring efforts to document the project performance. Since nearshore placement remains a rare or infrequent practice for non-federal entities, the monitoring results may assist in guiding future projects. Turbidity monitoring shall be conducted during the construction efforts and physical monitoring will help confirm the long-term project performance.

6.0 REFERENCES

Atlantic States Marine Fisheries Commission (ASMFC). 2017. Fisheries Management. Available at http://www.asmfc.org/fisheries-management/program-overview. Accessed July 2017.

Beck, M.W., K.L. Heck, Jr., K.W. Able, D.L. Childers, D.B. Eggleston, B.M. Gillanders, B. Halpern, C.G. Hayes, K. Hoshino, T.J. Minello, R.J. Orth, P.F. Sheridan, and M.P. Weinstein. 2001. "The Identification, Conservation, and Management of Estuarine and Marine Nurseries for Fish and Invertebrates." *Bioscience*. 51(8):633-641.

Cleary, W. J. and Marden, T. P. 1999. Shifting Shorelines: A Pictorial Atlas of North Carolina Inlets. North Carolina Sea Grant. Raleigh, North Carolina.

Dernie, K.M., M.J. Kaiser, and R.M. Warwick. 2003. "Recovery rates of benthic communities following physical disturbance." *Journal of Animal Ecology*. 72:1043-1053.

Ellis, B.O. 2009. "Year Five (Final) Submersed Aquatic Vegetation Survey, Currituck Sound, Whalehead Bay-Currituck Heritage Park." Memorandum to John Hennessy,

Environmental Supervisor, National Park Service, Assistance and Compliance Oversight Unit.

North Carolina Department of Environmental Quality Division of Marine Fisheries (NCDEQ-DMF). 2001. Fishery Management Plans: Under Review or Completed. Available at http://portal.ncdenr.org/web/mf/fmps-under-development. Accessed July 2017.

North Carolina Wildlife Resources Commission. 2005. North Carolina Wildlife Action Plan. Available at http://www.ncwildlife.org/Portals/0/Conserving/documents/ActionPlan/WAP_complete.pdf. Accessed July 2017.

National Marine Fisheries Service (NMFS). 1999. Essential fish habitat: A marine fish habitat conservation mandate for federal agencies. Revised 08/04. NMFS, Habitat Conservation Division, Southeast Regional Office, St. Petersburg, Florida.

NMFS. 1999a. Final fishery management plan for Atlantic tuna, swordfish, and sharks, including the revised final environmental impact statement, final regulatory impact review, the final regulatory flexibility analysis, and the final social impact assessment. Highly Migratory Species Management Division, Office of Sustainable Fisheries, National Marine Fisheries Service, Silver Springs, Maryland.

NMFS. 1999b. Amendment 1 to the Atlantic billfish fishery management plan, including the revised final environmental impact statement, the final regulatory impact review, the final regulatory flexibility analysis, and the final social impact assessment. Highly Migratory Species Management Division, Office of Sustainable Fisheries, National Marine Fisheries Service, Silver Springs, Maryland.

National Oceanic and Atmospheric Administration (NOAA). 2006. Consolidated Atlantic Highly Migratory Species Fishery Management Plan; Appendix B: Essential Fish Habitat. Available at: http://www.fisheries.noaa.gov/sfa/hms/documents/fmp/consolidated/feis_appendixb.pdf. Accessed July 2017.

NOAA. 2009. Final Amendment 1 to the 2006 Consolidated Atlantic Highly Migratory Species Fishery Management Plan, Essential Fish Habitat. National Oceanic and Atmospheric Administration, National Marine Fisheries, Office of Sustainable Fisheries, Highly Migratory Species Management Division, Silver Springs, Maryland. Public Document pp. 395.

NOAA. 2016. Amendment 10 to the 2006 Consolidated HMS Fishery Management Plan: Essential Fish Habitat. Available at http://www.nmfs.noaa.gov/sfa/hms/documents/fmp/am10/index.html. Accessed July 2017.

South Atlantic Fishery Management Council (SAFMC). 1998. Final Habitat Plan for the South Atlantic Region: Essential Fish Habitat Requirements for Fishery Management Plans of the South Atlantic Fishery Management Council. The Shrimp Fishery Management Plan, the Snapper-Grouper Fishery Management Plan, the Coastal Migratory Pelagics Fishery Management Plan, the Spiny Lobster Fishery Management Plan, Charleston, South

Carolina: South Atlantic Fishery Management Council, 457 p. plus Appendices and Amendments. Available at http://www.safmc.net/resource-library/fishery-management-plans-amendments. Accessed: July 2017.

SAFMC. 2008. Fishery Management Plans. Available at http://safmc.net/fishery-managment-plans-amendments/. Accessed: July 2017.