US Army Corps of Engineers®

Charleston District

ATLANTIC INTRACOASTAL WATERWAY in SOUTH CAROLINA

APPENDIX C: BIOLOGICAL ASSESSMENT

August 2023

DEPARTMENT OF THE ARMY
CHARLESTON DISTRICT, CORPS OF ENGINEERS
69A HAGOOD AVENUE
CHARLESTON, SOUTH CAROLINA 29403-5107

March 27, 2023

Mr. Tom McCoy
Field Supervisor
U.S. Fish and Wildlife Service
South Carolina Ecological Service Field Office
176 Croghan Spur Road, Suite 200
Charleston, South Carolina 29407

Dear Mr. McCoy:

The U.S. Army Corps of Engineers, Charleston District (USACE) is proposing to conduct maintenance dredging of the Winyah Bay to Charleston Reach of the American Intracoastal Waterway (AIWW) located in Charleston County, South Carolina. Dredged material would be beneficially used at the beaches of Sullivan's Island and Isle of Palms.

The upcoming AIWW dredging project will dredge sandy material from Breach Inlet, and offload and beneficially re-use beach quality sands from AIWW upland dredged material management areas (DMMAs) near Breach Inlet. An estimated 200,000-400,000 yd^3 of beach-quality sand (i.e., sediment containing ≥80% sand for the purposes of this project) is available for beneficial re-use from DMMAs nearby Breach Inlet and would be transported via optional means outlined in the attached biological assessment to the beaches of Sullivan's Island and Isle of Palms. Additionally, up to 500,000 yd^3 of material is expected to be dredged from shoaling in Breach Inlet, with beach-quality sand placed in placement areas spanning the backshore, foreshore, and nearshore along Sullivan's Island and Isle of Palms. Sediment composed of approximately 60-79% sand will only be placed in the nearshore. Any dredged sediment consisting of <60% sand would be disposed of at nearby DMMAs. Maintenance dredging will be by means of a hydraulic cutterhead dredge that will transport the sand through a pipeline and discharged as a slurry and in a diked area and shaped with earth-moving equipment.

Enclosed please find a Biological Assessment for the proposed maintenance dredging and beneficial re-use of dredged material along the AIWW. By copy of this letter, we wish to initiate formal consultation under section 7(a)(2) of the Endangered Species Act. If you have any questions about the proposed project, please contact Niko Brown of my staff by telephone at (843) 329-8145 or by e-mail at *niko.r.brown@usace.army.mil*.

Respectfully,

Nancy Parrish

Nancy A. Parrish
Chief, Planning and Environmental Branch

Enclosure

BIOLOGICAL ASSESSMENT

OPERATION AND MAINTENANCE DREDGING OF THE AMERICAN INTRACOASTAL WATERWAY

CHARLESTON COUNTY, SOUTH CAROLINA

U.S. Army Corps of Engineers
Charleston District

March 2023

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BACKGROUND AND AUTHORIZATION

Within the State of South Carolina, the Atlantic Intracoastal Waterway (AIWW) extends 235 miles long. Charleston District maintains 210 miles of the AIWW beginning at the North Carolina – South Carolina state line above Little River Inlet and extending to Port Royal Sound near Hilton Head. Savannah District maintains the remaining 25 miles of the AIWW in South Carolina, from Port Royal Sound to the South Carolina/ Georgia state line. Throughout its length in South Carolina, the AIWW consists of a system of naturally deep estuaries, rivers, and sounds that have been connected by a series of man-made land cuts to provide a continuous inland navigation route that winds through tidal creeks, bays, sounds, and select land cuts.

The AIWW in South Carolina was authorized to a depth of 12 feet and width of 90 feet under the Rivers and Harbors Act of 1937. The earliest authorization for the South Carolina portion of the AIWW can be found in the Rivers and Harbors Act of 3 March 1881. This act authorized a 7’ x 200’ cut across the Ashley River bar and a 6’ x 60’ land cut between Wappoo Creek and the Stono River. Prior to 1937, the AIWW within South Carolina was treated as three separate projects with independent authorizations. Within Charleston District, the three segments of the AIWW are still referred to by their original names: Little River to Winyah Bay, Winyah Bay to Charleston Harbor, and Charleston to Port Royal. Table 1 lists the congressional authorizations for each segment of the waterway.

Table 1 Congressional authorizations for each reach of the AIWW

Rivers & Harbor Act	Work Authorized	Documents
	Reach 1. Little River to Winyah Bay	
3 Jul 1930	A waterway 8 feet deep and 75 feet wide from Cape Fear River to Winyah Bay	HD 41, 71st Cong., 1st sess
30 Aug 1935	Construction of bridges across the waterway in Horry County, SC	Rivers and Harbors Committee Doc 14, 72nd Cong, 1st sess
26 Aug 1937	All of AIWW in South Carolina authorized to 12 feet deep and 90 feet wide	Rivers and Harbors Committee Doc 6, 75th Cong, 1st sess
2 Mar 1945	To provide an anchorage basin near Myrtle Beach, SC 12 feet deep, 125 feet wide, and 335 feet long, with connecting channel	HD 327, 76th Cong,
Reach 2. Winyah Bay to Charleston Harbor		
19 Sep 1890	Channel from Minim Creek to Winyah Bay	Annual Report, 1889 p. 1184
13 Jun 1902	Channel from Charleston to a point opposite McClellanville	HD 84, 56th Cong, 1st sess and Annual Rpt, 1900, p.1908
2 Mar 1907	Branch channel to McClellanville	Annual Report, 1903 p. 1133
2 Mar 1919	Extending the channel to Minim Creek, thence through the Estherville-Minim Creek Canal to Winyah Bay	HD 178, 63rd Cong, 1st sess
3 Mar 1925	Cut across the Santee Delta at Four Mile Creek	HD 237, 68th Cong, 1st sess
30 Aug 1935	Enlarging the channel from Winyah Bay to Charleston, including the branch channel to McClellanville, to a depth of 10 feet and bottom width of 90 feet	Rivers and Harbors Committee Doc 11, 72nd Cong, 1st sess
26 Aug 1937	All of AIWW in South Carolina authorized to 12 feet deep and 90 feet wide	Rivers and Harbors Committee Doc 6, 75th Cong, 1st sess
Reach 3. Charleston to Port Royal		
3 Mar 1881	Wappoo Cut: 7 x 200 feet across Ashley River Bar and 6 x 60 feet from there to Stono River. Revision of 1888 includes revetting Elliott’s Cut.	H Ex Doc 19, 46th Cong, 3rd sess and Annual Report, 1881 p.1069. Revision: Annual Report, 1889 p. 1196
19 Sep 1890	Brickyard Creek, or Beaufort River, 7 feet x sufficient width channel in Brickyard Creek	Annual Report, 1890 p. 1235
13 Jul 1892	Revised widening and straightening of Brickyard Creek	
13 Jun 1902	Fenwick Cut: 7 x 90 feet cut connecting S. Edisto and Ashepoo Rivers	H Ex Doc 117, 50th Cong, 1st sess and Annual Report, 1888 p.999

3 Mar 1925	Entire waterway from Charleston to Beaufort authorized as 7 x 75 feet project, with cutoffs in Wappoo Creek and between Dawho and S. Edisto Rivers	SD 178, 68th Cong, 2nd sess
3 Jul 1930	Abbapoola and Russell Creeks, tributary channels, improved 3 x 40 feet, for 5 and 4.2 mi from mouths, respectively	Section 3 permitted improvement of tributaries to already authorized waterways
30 Aug 1935	7 x 75 feet cutoff between Ashepoo and Coosaw Rivers	HD 129, 72nd Cong, 1st sess
26 Aug 1937	All of AIWW in South Carolina authorized to 12 feet deep and 90 feet wide	HD 6, 75th Cong, 1st sess

For the purposes of this assessment, only the Winyah Bay to Charleston Harbor reach is discussed herein. The Winyah Bay to Charleston Harbor reach begins at Winyah Bay and flows through the Esterville Minim Creek canal, Four-mile Creek canal, and Alligator Creek through a land cut to McClellanville. From McClellanville, it passes through Matthews Cut, Harbor River, Graham Creek, and a landcut to Price Creek. From Price Creek, it passes north of Capers Island and through Bullyard Sound before moving north of Dewees Island and Sullivans Island and into Charleston Harbor (Figure 1).

Figure 1 Overview of the Winyah Bay to Charleston reach of AIWW in South Carolina

PROPOSED PROJECT

The U.S. Army Corps of Engineers (USACE) proposes to perform operations and management (O&M) dredging of the AIWW as described in this Biological Assessment (BA). In particular, USACE has proposed beneficial use (BU) of dredged sediment throughout beach profiles (nearshore[1], foreshore[2] and backshore[3]) at Sullivan's Island and Isle of Palms (Figure 2). Under the proposed action, beach quality-sand (i.e., sediment containing ≥80% sand for the purposes of this project) provided for backshore and some foreshore placement will either come from (1) the approximately 500,000 yd^3 of shoaling identified for dredging in the Breach Inlet reach of the AIWW; or (2) 200,000-400,000 yd^3 beach-quality sand derived from dredged sediment previously placed at Breach Inlet upland disposal sites (a.k.a. dredged material management area or DMMA). The needed frequency of dredging cycles is anticipated to be every 2 years for Breach Inlet and would be placed similarly in future cycles depending on dredged sediment composition, placement area (i.e., nearshore to backshore), DMMA capacity, equipment and contractor availability, and availability of funding. Sediment dredged from Breach Inlet that is not considered beach-quality sand but composed of 60-79% of sand may be used for nearshore placement. Any dredged sediment consisting of <60% sand would be disposed of at nearby DMMAs.

Figure 2 Landscape view of proposed project area for AIWW O&M and BU placement along Sullivan's Island and Isle of Palms, SC

Placement of dredged sediments from shoals in Breach Inlet would occur via use of cutterhead pipeline dredge. A cutterhead pipeline dredge is a type of hydraulic dredge that uses a rotating

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[1] Nearshore is defined in Engineer Manual (EM) -1110-2-1100 as (1) in beach terminology an indefinite zone extending seaward from the shoreline well beyond the breaker zone; or (2) the zone which extends from the swash zone to the position marking the start of the offshore zone, typically at water depths of the order of 20 m.
[2] Foreshore is defined in EM-1110-2-1100 as the part of the shore, lying between the crest of the seaward berm (or upper limit of wave wash at high tide) and the ordinary low-water mark, that is ordinarily traversed by the uprush of the waves as the tides rise and fall.
[3] Backshore is defined in EM-1110-2-1100 as that zone of the shore or beach lying between the foreshore and the coastline comprising the berm or berms and acted upon by waves only during severe storms, especially when combined with exceptionally high water. Also backbeach.

cutterhead to loosen and lift materials while skimming along the sediment surface in the bottom of waterways and uses pumps to move dredged sediment through a pipeline to a placement area. Pipelines placed on the sea floor must either be of sufficient weight to remain in place or be anchored or weighted. Floating pipelines are anchored to the sea floor and may require booster pumps if the length of the pipeline is too long for the dredge to push the material to the placement location. Pipelines are typically placed in the same pipeline corridor for each recurring event to minimize the potential damage to resources in the area. The cutterhead is also typically buried in sediment, limiting exposure in the water column to the suction field, historically resulting in significantly lower takes of threatened and endangered species than hopper dredges (NMFS 2020).

When dredging shoaling at Breach Inlet, careful observation of dredged sediments being excavated will determine whether sediments are placed nearshore, in the foreshore/backshore profile, or at upland DMMAs. Sediment composition analyses have been performed on samples obtained from shoaling and have shown higher proportions of sand in subsamples from the western half of the shoaling, and progressively more fines in eastern portions. As the cutterhead dredge moves eastward along the shoal, visual observation, in addition to sediment sampling information, will determine when sediment placement will shift from backshore/foreshore to nearshore and finally to upland DMMAs, with increasing proportions of fines. This is because only beach-quality sand is appropriate for backshore/foreshore placement, while nearshore placement has been demonstrated to transport sandy sediment landward and silty sediment seaward.

The above placement criteria would occur only in circumstances where funding, equipment/contractor availability, and appropriate beach conditions permit. Backshore placement is most costly, logistically intensive, and beneficial where erosional hotspots persist along beach profiles. Foreshore placement is slightly less dependent on these circumstances, and even less so for nearshore or upland DMMA placement. This is because less earthmoving equipment (i.e., bulldozers, front loaders, etc.), temporary diking, and logistics are necessary as placement occurs further into the intertidal and subtidal zones. When placement does occur in the nearshore, pipelines will be placed directly onto the sediment surface, typically from about 8' mean lower low water (MLLW), while sediment is transported, forming shallow longshore berms.

Sandy sediment to be transported from DMMAs (i.e., rehandled) would occur when adequate volumes are available and erosional hotspots exist in the project area. Rehandling may be accomplished by whatever method bidders deem appropriate. Potential options include but are not limited to: (1) excavation of material using traditional land-based equipment, loading material onto barges, and hydraulic pumping to the nearshore; and (2) excavation of material via small hydraulic cutterhead dredge inside of placement areas with pipeline transportation to the nearshore. Water from the AIWW would need to be pumped into the barge for option 1 to turn the material back into a slurry to be discharged into the nearshore. Likewise, for option 2, water would need to be pumped from the AIWW into the placement area in order for the sand to be hydraulically pumped by the dredge.

PRIOR CONSULTATIONS

There has been no prior formal consultation with USFWS in regard to this project.

LIST OF SPECIES

ADMINISTRATIVE JURISDICTION OF U.S. FISH AND WILDLIFE SERVICE

The following species have been listed by the U.S. Fish and Wildlife Service (USFWS) as occurring or possibly occurring as identified with the Information for Planning and Consultation (IPaC) tool on 10 February 2023 (https://ipac.ecosphere.fws.gov/).

Table 1 USFWS-listed ESA species and critical habitats known or expected to be on or near project area as determined by USWFS Information for Planning and Consultation tool

Common Name	Species	ESA Status[1]	Species Present	Critical Habitat Present
Mammals				
Northern Long-eared Bat	*Myotis septentrionali*	T	N	N/A
West Indian Manatee	*Trichechus manatu*	T	Y	N
Birds				
Bachman's Warbler	*Vermivora bachmanii*	E	N	N/A
Eastern Black Rail	*Laterallus jamaicensis ssp. jamaicensis*	T	N	N/A
Piping Plover	*Charadrius melodus*	T	Y	N
Rufa Red Knot	*Calidris canutus rufa*	T	Y	Y
Red-cockaded Woodpecker	*Picoides borealis*	E	N	N/A
Reptiles[2]				
Green Sea Turtle[3]	*Chelonia mydas*	T	Y	N
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	E	Y	N/A
Leatherback Sea Turtle	*Dermochelys coriacea*	E	Y	N
Loggerhead Sea Turtle[4]	*Caretta caretta*	T	Y	N
Insects				
Monarch Butterfly	*Danaus plexippus*	C	N	N/A
Plants				
American Chaffseed	*Schwalbea american*	E	N	N/A
Canby's Dropwort	*Oxypolis canbyi*	E	N	N/A
Pondberry	*Lindera melissifolia*	E	N	N/A
Seabeach Amaranth	*Amaranthus pumilis*	T	U[5]	N/A

[1]ESA classifications include: T = threatened, E = endangered and C = candidate
[2]Administrative jurisdiction shared between USFWS and NMFS
[3]Consisting of North and South Atlantic DPS
[4]Consisting of Northwest Atlantic Ocean DPS
[5]Species surveys are not known to have been conducted recently, and it is not known or documented that the species currently exists within the project area

Rufa Red Knot Proposed Critical Habitat

Rufa Red Knot critical habitat has been proposed for all beach profiles within the project area, consisting of units SC-12 (Isle of Palms Beach) and SC-13 (Sullivan's Island Beach) (Figure 3) (USFWS 2021). These unit boundaries functionally span from Isle of Palm's eastern shoreline along Dewee's Inlet southwest across Breach Inlet to the western shoreline of Sullivan's Island at Charleston Harbor. Units include all emergent land from MLLW to the toe of the dunes or where densely vegetated habitat begins. This includes ephemeral shoals within the flood-tidal and ebb-tidal deltas associated with inlets.

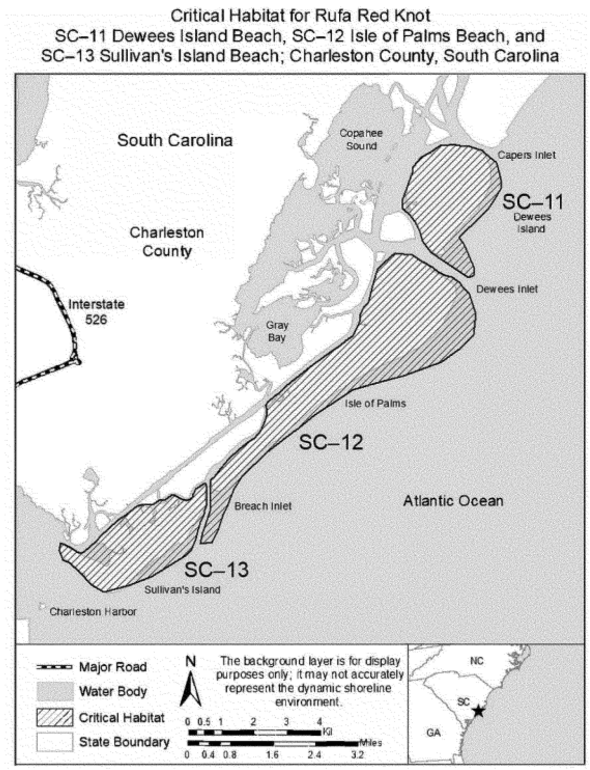

Figure 3 Rufa red knot proposed critical habitat units SC-12 and SC-13 (USFWS 2021)

GENERAL EFFECTS ON LISTED SPECIES/CRITICAL HABITAT

Since all aspects of the proposed actions will occur within DMMAs, beach habitats between dunes and the subtidal zone, and marine shoals, the project will not pose any measurable impacts to species occurring in unrelated habitat types, including Northern long-eared bat, Bachman's warbler, Eastern black rail, red-cockaded woodpecker, monarch butterfly, American chaffseed, Canby's dropwort, or pondberry.

Species that could be present in the project area during the proposed action include West Indian manatee, piping plover, rufa red knot, green sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, loggerhead sea turtle, and seabeach amaranth. In general, piping plover, rufa red knot, and loggerhead sea turtle are projected to be most affected by project construction, given their relative abundance and use of the project area.

SPECIES ASSESSMENTS

WEST INDIAN MANATEE

West Indian manatees are massive fusiform-shaped animals with skin that is uniformly dark grey, wrinkled, sparsely haired, and rubber-like; paddle-like forelimbs; no hind limbs; and a spatulate, horizontally flattened tail (USFWS 2016). Manatees occur in the southeastern U.S., east coast of Mexico and Central America, northeastern South America, the Greater Antilles, and parts of the Lesser Antilles. Their southeastern U.S. range is predominately in Florida year-round, and sometimes Georgia and Alabama during warmer months. However, some manatees have been documented as far north as Massachusetts and west to Texas (Beck 2015, Fertl et al. 2005, Domning and Hayek 1986, Lowery 1974, Gunter 1941). The southeastern population was estimated to be stable or increasing from 6,350 individual manatees in 2015 (Martin *et al.* 2015, Runge *et al.* 2015). Range for the species is limited by intolerance of cold. Temperate coastal and inshore waters, natural warm water springs, and even industrial outfalls provide conditions necessary for manatee occupation (Stith et al. 2006, Lefebvre et al. 2001, Hartman 1974). Manatees use coastal and riverine systems including freshwater, brackish, and marine waters. Submerged, emergent and floating vegetation is their preferred food. Important habitat components include forage, freshwater, corridors, shelter, and warm water for wintering.

In the southeastern United States, threats to manatee habitat include loss of seagrass due to marine construction activities, propeller scarring and anchoring, and oil spills; loss of freshwater due to damming and competing uses; and increasing coastal commercial and recreational activities (USFWS 2007). Seagrass losses may also result from dredging, fishing, anchoring, eutrophication, siltation, and coastal development (PRDNER 2012, PRDNER 2008, Orth *et al.* 2006, Duarte 2002). Most critical, however, is loss of warm-water natural spring areas in Florida, from loss of flow, diminished water quality, or human activities (Taylor 2006).

Direct losses of manatees in the southeastern U.S. primarily involve those in Florida and watercraft collisions, fishing gear entanglement, water control structures, exposure to contaminants, algal blooms, and cold weather among other factors (USFWS 2016). However, implementation of regulatory actions throughout the southeastern portions of the manatee range has significantly reduced manatee deaths from these factors and contributed to projected population growth and recovery. Habitat fragmentation and loss are believed to be the most significant threat to manatee outside the U.S. Nevertheless, based on range-wide recovery projections, in 2016, USFWS proposed the species be down listed to threatened (USFWS 2016).

Effect Determination

Whenever feasible, the proposed actions would be scheduled to occur during the cooler months of the year when manatees would not be present. However, to ensure the protection of manatees, all Federal and contract personnel associated with this project will be instructed on the potential presence of manatees and the need to avoid vessel or plant collisions with manatees. Standard Manatee Safety Guidelines (USFWS 2017) will also be implemented during all work. Since the proposed work is to be performed with a pipeline dredge, a dredge plant that is essentially stationary, no direct impacts to the manatee are anticipated. For the above reasons, USACE has made a *may affect, not likely to adversely affect* determination for West Indian manatee.

PIPING PLOVER & RUFA RED KNOT

Piping Plover

Piping plovers are small shorebirds approximately six inches long with sand-colored plumage on their backs and crown and white under parts. The piping plover breeds on the northern Great Plains, in the Great Lakes region, and along the Atlantic coast (Newfoundland to North Carolina); and winters on the Atlantic and Gulf of Mexico coasts from North Carolina to Mexico, and in the Bahamas West Indies. The species spends up to 10 months on their migration and winter grounds, generally from July 15 to May 15 (Noel et al. 2007, Elliot-Smith and Haig 2004). Piping plover are an occasional visitor along the South Carolina coast and individuals are occasionally sighted in the project area; however, there are no large wintering concentrations in the state.

The piping plover winters at coastal intertidal flats including sand and/or mud flats with no or very sparse emergent vegetation or occasionally those partially covered by a mat of bluegreen algae. An extension of these flats above high tide (backshore) coupled with debris, detritus, or microtopographic relief providing refuge from adverse weather are also important habitat components for roosting. Other important components include surf-cast algae for feeding of prey, and spits and washover areas for both feeding and roosting. Wintering plovers depend on a network of habitat patches and utilize patches differently based on local weather and tidal conditions (Drake 1999b). These unique conditions may explain their high site fidelity in wintering areas (Drake et al. 2001).

Behavioral studies have shown that piping plover spend most of their time on wintering grounds foraging (Nicholls and Baldassarre 1990b, Drake 1999a, 1999b). Primary prey for wintering plovers includes polychaete marine worms, various crustaceans, insects, and occasionally bivalve mollusks (Nicholls 1989; Zonick and Ryan 1996), which they peck from on top or just beneath the surface of moist or wet sand, mud, or fine shell.

The primary threats to the piping plover are habitat modification and destruction, and human disturbance to nesting adults and flightless chicks. Habitats may be adversely impacted by development and construction, dredging and sand mining, inlet stabilization and relocation, groins, seawalls and revetments, loss of foraging from shoreline stabilization, invasive vegetation, and wrack removal/beach cleaning (USFWS 2015). Other threats include those associated with energy development (e.g., oil spills, oil and gas exploration, wind turbines), as well as natural threats like storms, cold weather events, predation, and disease.

According to publicly available information on eBird, high counts[4] from within the project area have included up to 13 piping plover in late-March, but are generally fewer than 10 project-wide the remainder of the year with none counted from late-May to mid-July. These counts are considerably more than those by Elliot-Smith *et al.* (2009), which found only 2 individuals present in the project area during censuses done in 2006.

Rufa Red Knot

The rufa red knot is a medium-sized migratory shorebird that breeds in the Canadian Arctic, winters in parts of the Southeastern U.S., the Caribbean, and South America, and primarily uses well-known spring and fall stopover areas on the Atlantic coast of the U.S. Red knot are dependent on easily digested food at wintering and stopover locations to achieve adequate weight gain for successful migration (Niles *et al.* 2008, van Gils *et al.* 2005a, 2005b, Piersma *et al*. 1999). In addition to energetic needs for migration, food stores are utilized for body transformation to breeding conditions (Morrison 2006). These needs coupled with the species'

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[4] High counts is defined on eBird as "the highest count of a species submitted on a *single checklist* within a specified date range and region." This includes all data years maintained by eBird.

tendency to form congregations representing large proportions of a range-wide population at singular sites makes the species vulnerable (Harrington 2001).

Red knots, generally, overwinter and stopover at coastal marine and estuarine habitats with large areas of exposed intertidal sediments. Preferred microhabitats are muddy or sandy coastal areas, particularly at the mouths of bays and estuaries, tidal flats, and tidal inlets (Lott *et al.* 2009, Niles *et al.* 2008, Harrington 2001). In some localized areas, rufa red knots use artificial habitats that mimic natural conditions, such as nourished beaches, dredge spoil sites, elevated road causeways, rock structures (e.g., jetties, breakwaters), or impoundments. In other areas, living shorelines or other engineered structures can enhance rufa red knot habitat, for example by concentrating surf-cast prey items or by calming wave energies. However, rufa red knots generally require areas where erosion, accretion, overwashes, island migration, and inlet migration provide dynamic conditions for optimal habitat.

In coastal areas, rufa red knot foraging habitats include intertidal portions of beaches, islands, and shoals; tidal flats; wind-exposed bay bottoms or oyster reefs; peat banks; brackish ponds or impoundments; and ephemeral tidal pools (USFWS 2021). Foraging substrates can include sand, mud, peat, and sand embedded with shell, gravel, or cobble (Newstead 2014, Niles *et al.* 2008, Harrington 2001). Typical roosting areas are beyond the intertidal zone, beginning at backshores. In some locations, roosts include shoals, sand bars, overwashes, patches of mostly bare ground within salt marshes, dredge spoil sites, rock structures, or among wrack and mounds of seaweed (USFWS 2021). These areas often provide microtopographic relief and refuge from adverse weather. Selection among these habitats may also be influenced by predation pressures (Niles et al. 2008).

Across subspecies, red knot is a specialized molluscivore, eating hard-shelled mollusks, but supplements diet with accessible softer invertebrate prey, such as shrimp and crab-like organisms, marine worms, and horseshoe crab eggs (Piersma and van Gils 2011, Harrington 2001). These food items may be limited to shallow-buried prey (within the top 0.8 to 1.2 in of sediment) due to bill morphology (Gerasimov 2009, Zwarts and Blomert 1992).

Threats to the rufa red knot include habitat loss, reduced food availability, asynchronies in the annual cycle, competition with gulls, and human disturbance. Habitat destruction and modification are occurring throughout the entire range of the subspecies often affected by climate change, shoreline stabilization, and coastal development, in addition to smaller scale impacts like beach cleaning, invasive vegetation, agriculture, and aquaculture. Habitat changes may be compounded in effect by included disturbances from recreational and other human activities.

Red knots may be in the project area during fall, winter, and/or spring. Flocks in SC tend to be largest in spring, and smallest in winter (Maddock *et al.* 2013). According to publicly available information on eBird, high counts from within the project area have included up to 3,000 red knot at Breach Inlet in early April, along with some counts of several hundred birds elsewhere between late-March and early-May. From May through November, there are generally fewer than 20 birds observed project-wide, while from December to March groups of up to 150 have been counted.

Effect Determinations

BU placement within backshore and/or foreshore habitat may have direct and indirect impacts to piping plover and rufa red knot through disturbance, temporary decreases of food resources (i.e., invertebrate macrofauna, polychaetes, amphipods, horseshoe crab eggs), and/or modification of habitat. Depending on when construction occurs, this may affect local plover/red knot energetics and distribution. If placement occurs during periods of low local plover/red knot abundance (i.e., late May-July), enough time may pass for intertidal macrofauna to recover enough to minimalize effects on foraging wherever construction occurs, in addition to mitigating potential effects from disturbance. Conversely, if placement happens during localized peaks in presence (i.e., March-early May) the value of habitat in areas where construction occurs is likely to be diminished for the duration of invertebrate recovery and will limit availability of food resources. Nevertheless, species like red knot do show plasticity in foraging diet when the preferred prey species became reduced (Escudero *et al.* 2012, Musmeci *et al.* 2011), suggesting some adaptive capacity to cope with this threat. Further, only placement of sandy sediment in the foreshore is expected to directly impact piping plover and red knot foraging resources and would be confined to portions of Sullivan's Island and Isle of Palms depending on a suite of factors including quantity of beach-quality sand available, equipment/contractor availability, funding availability, etc. It is highly unlikely that large proportions of the approximately 7 miles of foreshore in the project area will be impacted any given dredge cycle, thus retaining foraging resources elsewhere.

Uncertainty remains about the effects of sand placement on invertebrate communities. Although some benthic species can burrow through a thin layer of additional sediment, thicker layers (over 35 in. (90 cm)) smother the benthic fauna (Greene 2002). By means of this vertical burrowing, recolonization from adjacent areas, or both, the benthic faunal communities typically recover. Recovery may be slow or incomplete if placed sediments are a poor grain size match to the native beach substrate (Bricker 2012, Peterson *et al.* 2006, Greene 2002, Peterson *et al.* 2000, Hurme and Pullen 1988), or if placement occurs during a seasonal low point in invertebrate abundance (Burlas 2001). Recovery is also affected by the beach position and thickness of the deposited material (Schlacher *et al.* 2012). If the profile of the nourished beach and the imported sediments do not match the original conditions, recovery of the benthos is unlikely (Defeo *et al.* 2009). Recovery can take as little as 2 weeks or as long as 2 years, but usually averages 2 to 7 months (Greene 2002, Peterson and Manning 2001). Although many studies have concluded that invertebrate communities recovered following sand placement, study methods have often been insufficient to detect even large changes (e.g., in abundance or species composition), due to high natural variability and small sample sizes (Peterson and Bishop 2005).

Sullivan's Island and Isle of Palms are not known for high densities of piping plover, thus it is expected that foraging and/or roosting opportunities maintained outside of active construction areas will minimize project impacts. As noted above, censuses of wintering plovers in South Carolina in 2006 showed only 2 wintering adults on Sullivan's Island and none on Isle of Palms (Elliot-Smith *et al.* 2009), and observations compiled through eBird indicate fewer than two dozen plovers ever occupy the project area. There is also no critical habitat identified in the project area. Red knot, however, flock in large foraging groups and may occur in the project area in very high-density flocks. A high count of 3,000 red knot was recorded in early April through citizen science counts on eBird within the project area (at Breach Inlet) – likely knots using the area as stopover while migrating to breeding grounds from wintering areas south of South

Carolina. The entire project area is also identified as proposed critical habitat and may be of greater significance to rufa red knot than to piping plover.

Effects of BU placement are also likely to depend on the topography of beach profiles, as creating escarpments or changing juxtaposition of foraging and roosting habitats may discourage use of an area. However, adding volume and utilizing leveling equipment (e.g., bulldozers, frontloaders) where prominent topographic variability already exists and habitat use may already be discouraged may have net benefits, particularly if construction occurs during months after plovers and red knot migrate from South Carolina. Ultimately, USACE would be improving areas of significant erosion or need by adding compatible sand to the backshore and foreshore of beach profiles, reducing escarpments, increasing area of backshore available as roosting habitats, and widening foreshore and nearshore (intertidal) habitat.

During each iteration of O&M, location and timing for placement of dredged material will be coordinated with SCDNR and USFWS. Placement of material may immediately provide additional foraging and roosting habitat for the piping plover and rufa red knot, as well as extend the intertidal area seaward and prolong longer-term impacts like sea level change and related erosion.

Despite the relatively low densities of piping plover and rufa red knot most of the year, it is anticipated that the proposed project area could potentially have adverse impacts to foraging behaviors in valuable localized habitat during periods of peak abundance. This outcome is likely only to occur where placement of sediments would occur during peak abundance and in specific localized parts of the project area, such as Breach Inlet. For this reason, USACE has made a *may affect, likely to adversely affect* determination for piping plover and rufa red knot. However, given the temporary duration and potential long-term benefits, USACE has made a *may affect, not likely to adversely affect* determination for rufa red knot proposed critical habitat.

Sea Turtles

Modified for living in the open ocean, sea turtles have paddle-like front limbs for swimming, cannot retract their heads and have special respiratory mechanisms and organs to excrete excess salt taken in with seawater when they feed. The loggerhead, Kemp's ridley, green and leatherback sea turtles can be found in South Carolina's near shore waters April through November or nesting on beaches from May through October (SCDNR 2014).

This BA only addresses topics related to nesting loggerhead sea turtles for the following reasons: (1) ESA Section 7 consultation with USFWS is limited in scope to activities that may impact nesting sea turtles, their nests and eggs, and hatchlings as they emerge from the nest and crawl to the sea; (2) within the action area, nesting occurs almost exclusively by loggerhead sea turtles, though at least one attempt has been made by green sea turtles and leatherback sea turtles (including one false crawl) between 2000 and 2022 on Isle of Palms (SCDNR 2023) (Table 2); (3) sea turtles have similar life histories and reproductive behavior; and (4) protection measures in place for loggerhead sea turtles will serve as an “umbrella” for other sea turtles that may attempt to nest in the project area.

Table 2 Nest counts by SCDNR Sea Turtle Conservation Program as reporting by Sea Turtle Nest Monitoring System from calendar year 2018-2022 for AIWW reaches analyzed herein (https://seaturtle.org/nestdb/). NOTE: Only loggerhead sea turtle nests are enumerated herein with exceptions mentioned in footnotes of table

Reach	2018[1]	2019	2020[2]	2021	2022	Average
Sullivan's	3	15	8	13	14	11
Isle of Palms	17	57	39	36	43	38
Total (% of Statewide)	20 (0.7%)	72 (0.8%)	47 (0.8%)	49 (0.9%)	57 (0.7%)	49 (0.8%)
South Carolina	2,761	8,772	5,551	5,628	7,965	6,135

[1]One leatherback nest was laid on Isle of Palms in 2018. This occurred relative to 3 nests that were laid in South Carolina in 2018.

[2]One green sea turtle nest was laid on Isle of Palms in 2020. This occurred relative to 3 nests that were laid in South Carolina in 2020.

Within the Northwest Atlantic, the majority of nesting activity occurs from April through September, with a peak in June and July (Weishampel *et al.* 2006, Dodd 1988, Williams-Walls *et al.* 1983). Nesting occurs within the Northwest Atlantic along the coasts of North America, Central America, northern South America, the Antilles, Bahamas, and Bermuda, but is concentrated in the southeastern U.S. and on the Yucatán Peninsula in Mexico on open beaches or along narrow bays having suitable sand (NMFS and USFWS 2008, Ehrhart *et al.* 2003, Ehrhart 1989, Sternberg 1981).

Loggerheads nest on ocean beaches and occasionally on estuarine shorelines with suitable sand. Nests are typically laid between the high tide line and the dune front (Hailman and Elowson 1992, Witherington 1986, Routa 1968,). Wood and Bjorndal (2000) evaluated four environmental factors (slope, temperature, moisture, and salinity) and found that slope had the greatest influence on loggerhead nest-site selection on a beach in Florida. Loggerheads appear to prefer relatively narrow, steeply sloped, coarse-grained beaches, although nearshore contours may also play a role in nesting beach site selection (Provancha and Ehrhart 1987).

The Northern Recovery Unit (NRU) of loggerheads consist of turtles originating from nesting beaches from the Florida-Georgia border through southern Virginia (the northern extent of the nesting range). The NRU is the second largest loggerhead recovery unit within the Northwest Atlantic Ocean distinct population segment (DPS). Since 2008, annual nests totals from NRU beaches have steadily increased (www.seaturtle.org). South Carolina had the two highest years of nesting on record in 2019 (8,772 nests) and 2022 (7,965 nests). The loggerhead nesting trend from daily beach surveys was declining significantly at 1.3 percent annually from 1983 to 2007 (NMFS and USFWS 2008). Nest totals from aerial surveys conducted by the SCDNR showed a 1.9 percent annual decline in nesting in South Carolina from 1980-2007. Overall, there is strong statistical data to suggest the NRU experienced a long-term decline in the past (NMFS and USFWS 2008). Currently, however, nesting for the NRU is showing possible signs of stabilizing (76 FR 58868).

Anthropogenic factors that impact hatchlings and adult female turtles on land, or the success of nesting and hatching include: beach erosion, armoring and nourishment; artificial lighting; beach cleaning; increased human presence; recreational beach equipment; beach driving; coastal construction and fishing piers; exotic dune and beach vegetation; and poaching. An increased human presence at some nesting beaches or close to nesting beaches has led to secondary threats such as the introduction of exotic fire ants, feral hogs, dogs, and an increased presence of native species (e.g., raccoons, armadillos, and opossums), which raid and feed on turtle eggs. Although sea turtle nesting beaches are protected along large expanses of the western North Atlantic coast, other areas along these coasts have limited or no protection.

Because of the limited remaining nesting habitat in a natural state with no immediate development landward of the sandy beach, frequent or successive severe weather events could threaten the ability of certain sea turtle populations to survive and recover. Sea turtles evolved under natural coastal environmental events such as hurricanes. The extensive amount of predevelopment coastal beach and dune habitat allowed sea turtles to survive even the most severe hurricane events. It is only within the last 20 to 30 years that the combination of habitat loss to beachfront development and destruction of remaining habitat by hurricanes has increased the threat to sea turtle survival and recovery. On developed beaches, typically little space remains for sandy beaches to become reestablished after periodic storms. While the beach itself moves landward during such storms, reconstruction or persistence of structures at their pre-storm locations can result in a loss of nesting habitat.

Sand placement projects may result in changes in sand density (compaction), beach shear resistance (hardness), beach moisture content, beach slope, sand color, sand grain size, sand grain shape, and sand grain mineral content if the placed sand is dissimilar from the original beach sand (Nelson and Dickerson 1988a). These changes could result in adverse impacts on nest site selection, digging behavior, clutch viability, and hatchling emergence (Nelson 1988, Nelson and Dickerson 1987). Beach nourishment projects create an elevated, wider, and unnatural flat slope berm. Sea turtles nest closer to the water the first few years after nourishment because of the altered profile (and perhaps unnatural sediment grain size distribution) (Trindell 2005, Ernest and Martin 1999). These impacts can be minimized by using suitable sand and by tilling (minimum depth of 36 inches) compacted sand after project completion followed by multi-year beach compaction monitoring and, if necessary, tilling would help to ensure that project impacts on sea turtles are minimized.

On Isle of Palms, nesting occurs throughout most of its 6.2 miles of beach (Figure 4). The island is well-developed and has homes on much of its primary dunes. From 2018-2022, an average of 38 loggerhead nests were laid here with high nesting success. Very few nests are affected by predators other than occasional ghost crabs, likely owing considerably to protection efforts by the Island Turtle Team. Nests here are influenced by other factors including shallow nesting and occasionally poaching. False crawls are also common here, making up about half of crawls. This island is also where there has been at least one account of nesting by loggerhead sea turtle in 2018 and green sea turtle in 2020.

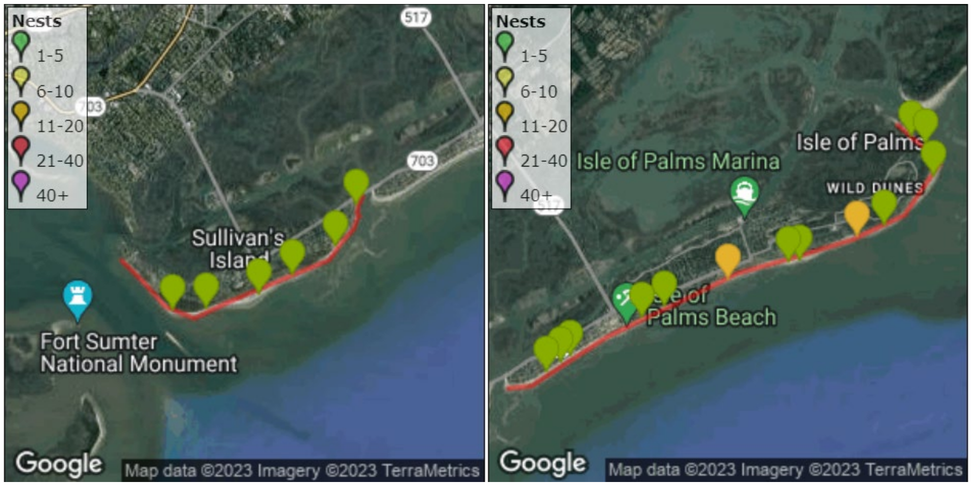

Figure 4 Locations of loggerhead nesting on Sullivan's Island and Isle of Palms in 2022

On Sullivan's Island, nesting occurs throughout most of its 4.8 miles of beach (Figure X). The island is well-developed and has a wide dune field with homes occurring well back from the beach. From 2018-2022, an average of 11 loggerhead nests were laid here with high nesting success. Like Isle of Palms, very few nests are affected by predators other than occasional ghost crabs, also likely owing considerably to protection efforts by the Island Turtle Team. Nests here are influenced by other factors including shallow nesting. False crawls are also relatively common here, making up about a third of crawls.

Effects Determinations

Potential adverse effects during the project construction phase include disturbance of existing nests (potentially missed during surveys), disturbance of females attempting to nest, and disorientation of emerging hatchlings. In addition, heavy equipment will be required to construct the beach profile. This equipment will have to traverse the beach portion, which could result in harm to nesting sea turtles, their nests, and emerging hatchlings. On severely eroded sections of beach (those targeted for placement) where little or no suitable nesting habitat exists, sand placement can result in increased nesting (Ernest and Martin 1999).

The placement of sand on a beach with reduced dry foredune (backshore) habitat may increase sea turtle nesting habitat if the placed sand is highly compatible (i.e., grain size, shape, color, etc.) with naturally occurring beach sediments in the area, and compaction and escarpment remediation measures are incorporated into the project. Usually, the Charleston District implements a standard beach monitoring protocol to measure beach hardness/compaction after placement of disposal material on the beach. After the material is disposed of on the beach, any areas that are determined to have an in-situ hardness greater than 500 Cone Penetrometer Units (CPU) is tilled in order to make it suitable for sea turtle nesting. This, however, will be the responsibility of municipalities governing use of the beaches. USACE does recommend conducting cone penetrometer testing before and after the dredging in an effort to collect data, which can be correlated with the turtle nesting during the summer, and which may provide useful information for similar projects. In addition, visual surveys for escarpments along the project area will be made during construction and immediately after completion of the O&M Project and prior to May 1. Escarpments exceeding 18 inches in height for a distance of 100 feet or more will be graded down.

In biological opinions for similar construction projects by USACE (USFWS 2018*a*, USFWS 2006), USFWS acknowledged that (1) nesting within the NRU appears to be increasing despite current threats; (2) nesting within the action area is following the same trend as the NRU despite current threats and environmental conditions; and (3) effects due to construction activities are expected to be short term and become beneficial once construction is completed. We believe these considerations are also applicable to this project. However, since some potential for incidental take exists for the reasons above, USACE has made a *may affect, likely to adversely affect* determination for loggerhead sea turtles. In following with previous biological opinions regarding determinations made by USACE for similar projects, USACE has also made effects determinations of *may affect, not likely to adversely affect* for green sea turtle, leatherback sea turtle and Kemp's ridley sea turtle. These determinations are reflective of the substantial rarity of current nesting patterns in the project area by these species and the likelihood of incidental take with protective measures in place in the foreseeable future.

SEABEACH AMARANTH

Seabeach amaranth is a vascular annual plant historically native to the barrier island beaches of the Atlantic coast from Massachusetts to South Carolina. The plant consists of fleshy and pink-red or reddish stems, with small, rounded leaves clustered toward the tip of the stem and normally being a somewhat shiny, spinach-green color, with a small notch at the rounded tip. Generally, from April through July, germination of individual plants occurs, while flowering may occur as early as June and persist until plants die in late fall or early winter. Annual reproduction is strongly impacted by natural forces including weather events and predation by webworms, as well as anthropogenic forces such as beach grooming and scraping (USFWS 1996).

Seabeach amaranth occurs on barrier island beaches, where its primary habitat consists of overwash flats at accreting ends of islands and upper backshore and foreshore of non-eroding beaches (USFWS 1996). Small temporary populations may occur on sound side beaches, blowouts in foredunes, and in dredged material placed for beach renourishment or disposal (USFWS 1996). Beach backshore, from 0.77 to 2.0 meters above mean high water, where limited vegetation exists, provides optimal seabeach amaranth habitat (Sellars and Jolls 2004, Jolls et al. 2004). This habitat is conducive to plant survival, though growth can be higher at lower elevations at greater risk of overwash. Upper parts of beach (i.e., backshore) are also areas of competition between species like seacoast marshelder (*Iva imbricata*), seaoats (*Uniola paniculata*), and American sea rocket (*Cakile edentula*) (Johnson 2004). Nourished beaches with shoreline protection structures have also been noted as productive habitats for seabeach amaranth (USWFS 2018*b*).

Suitable habitat for the species is diminished by construction of seawalls or other hard structures built along shorelines. The direct effects of habitat reduction from fortification with seawalls and other stabilization structures or heavy vehicular traffic may eliminate seabeach amaranth populations locally. Any given site may also become unsuitable at some time because of natural forces (i.e., erosion, adverse weather events), creating a need for dynamic habitat opportunities nearby. Loss of habitat from seawall construction and global sea level rise are thought to be major factors in the species' extirpation throughout parts of its historic range (USFWS 1996), as the range of suitable backshore and foreshore habitat becomes narrowed. Impacts from sediment placement projects may also eliminate existing plants if conducted during the summer, and bury viable seeds, particularly during the winter. However, sediment placement projects often emulate natural disturbances and extend the range of viable habitat between vegetated dunes or development and the intertidal zone.

Historically, seabeach amaranth occurred in 31 counties in 9 states from Massachusetts to South Carolina. It has been eliminated from six of the States in its historic range. The only remaining large populations are in North Carolina. Surveys in South Carolina found that the number of plants along our coast dropped by 90% (from 1,800 to 188) as a result of Hurricane Hugo, subsequent winter storms and beach rebuilding projects that occurred in its wake (USFWS 1996). According to USFWS (2018*b*), seabeach amaranth was not detected in censuses of South Carolina from 2010 to 2016 with the exception of 231 individuals in 2015. Census information was obtained from Cape Romain National Wildlife Refuge, Myrtle Beach State Park and Huntington Beach State Park. Since then, seabeach amaranth seeds have been planted at Cape Romain National Wildlife Refuge in May and June of 2017 and surveys have occurred from 2018 to 2020. However, no publicly available data for these surveys exists and no information for the project area is known.

Effect Determination

Due to the lack of population information for the project area, it cannot be determined what effects the proposed actions will have on the species. It may be inferred that viable seeds or individual plants that may be in the area may be buried with direct beach placement of dredged sediment in the backshore and foreshore. Although individuals would invariably die from burial, it is not clear whether seeds would be permanently destroyed as seeds may remain viable under sediment or even germinate after adequate time and weathering of sediment has occurred. However, given the absence of any known individual plants in the project area, USACE has made a *may affect, not likely to adversely affect* determination for seabeach amaranth.

SUMMARY OF PROTECTIVE MEASURES

If construction is delayed and extends into the summer months (June through September), contract personnel will be advised that there are civil and criminal penalties for harming, harassing, or killing manatees. The Contractor may be held responsible for any manatee harmed, harassed, or killed as a result of vessel collisions or construction activities. Failure of the Contractor to follow these specifications is a violation of the ESA and could result in prosecution of the Contractor under the ESA or the Marine Mammals Protection Act. The standard manatee conditions apply annually from 1 June to 30 September. It is the responsibility of the Contractor to take necessary precautions to avoid any contact with manatees. If manatees are sighted within 100 yards of the dredging area, all appropriate precautions shall be implemented to insure protection of the manatee. The Contractor will stop, alter course, or maneuver as necessary to avoid operating moving equipment (including watercraft) any closer than 50 feet of the manatee. Operation of equipment closer than 50 feet to a manatee shall necessitate immediate shutdown of that equipment.

A nest relocation program for sea turtles will be implemented to minimize impacts to nesting sea turtles only if the dredging activity extends into the nesting season. This program will include daily patrols of disposal areas at sunrise, relocation of any nests laid in areas to be impacted by disposal of dredged material, and monitoring of hatching success of the relocated nests. If nest relocation is required, sea turtle nests will be relocated to an area suitable to both the USFWS and the SCDNR. A beach monitoring program (for hardness/escarpment formation) will be implemented. USCAE will perform any necessary maintenance of beach profile (tilling and shaping or knocking down escarpments) during construction and prior to the nesting season.

If construction is delayed and extends into the nesting season, the staging areas for construction equipment will be located off the beach to the maximum extent practicable. Nighttime storage of construction equipment not in use shall be off the beach to minimize disturbance to sea turtle nesting and hatching activities. In addition, all dredge pipes that are placed on the beach will be located as far landward as possible without compromising the integrity of the existing dune system. Temporary storage of pipes will be off the beach to the maximum extent possible. Temporary storage of pipes on the beach will be in such a manner so as to impact the least amount of nesting habitat and will likewise not compromise the integrity of the dune systems (placement of pipes perpendicular to the shoreline will be recommended as the method of storage).

Further, if construction is delayed and extends into the nesting season, all on-beach lighting associated with the project will be limited to the immediate area of active construction during construction of this project. Such lighting will be shielded, low-pressure sodium vapor lights to minimize illumination of the nesting beach and nearshore waters. Red filters will be placed over vehicle headlights (i.e., bulldozers, front end loaders). No offshore equipment will be required to construct this project as proposed. However, if required, lighting on offshore equipment will be similarly minimized through reduction, shielding, lowering, and appropriate placement of lights to avoid excessive illumination of the water, while meeting all U.S. Coast Guard and OSHA requirements. Shielded, low pressure sodium vapor lights will be highly recommended for lights on any offshore equipment that cannot be eliminated.

SUMMARY OF EFFECTS DETERMINATIONS

This assessment has examined the potential impacts of the proposed project on designated habitat and listed species of plants and animals that are, or have been, present in the project area. Both primary and secondary impacts to habitat have been considered. Based on the analysis provided by this document, the following determinations have been made.

A determination of *may affect, not likely to adversely affect* has been made for West Indian manatee, green sea turtle, Kemp's ridley sea turtle, leatherback sea turtle and seabeach amaranth.

A determination of *may affect, likely to adversely affect* has been made for piping plover, rufa red knot, and loggerhead sea turtle

A determination of *may affect, not likely to adversely modify* for piping plover critical habitat.

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