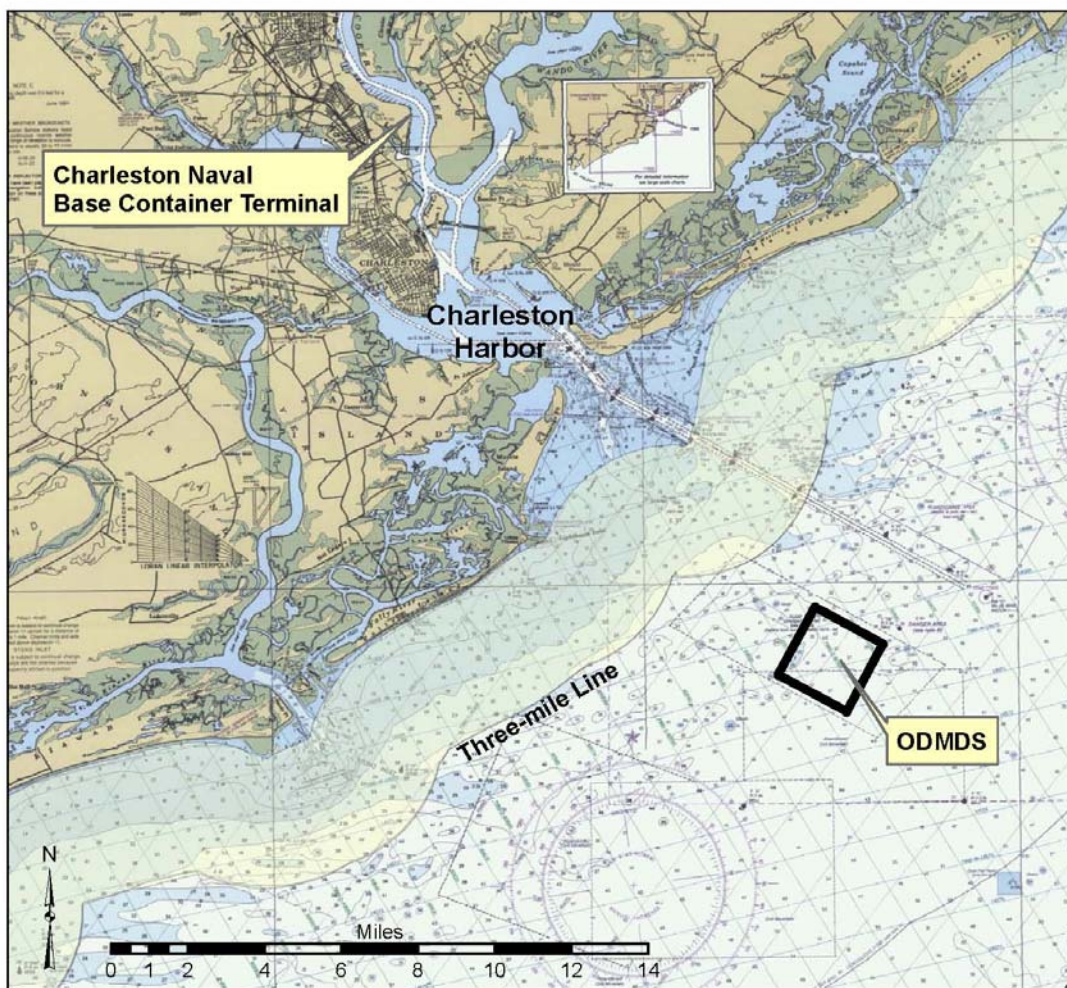


# Charleston Offshore Dredged Material Disposal Site Sand Borrow Project

## Final Environmental Assessment



U.S. Department of the Interior  
Minerals Management Service  
Environmental Division

# **Charleston ODMDS Sand Borrow Project**

## **Final Environmental Assessment**

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For

Minerals Management Service  
Branch of Environmental Assessment

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## **FINDING OF NO SIGNIFICANT IMPACT**

### **Charleston Offshore Dredged Material Disposal Site Sand Borrow Project**

As required by the National Environmental Policy Act (NEPA), the U.S. Department of Interior (USDOI), Minerals Management Service (MMS) has prepared an environmental assessment (EA) to determine whether the proposed Charleston Offshore Dredged Material Disposal Site (ODMDS) Sand Borrow Project would have a significant effect on the human environment and whether an environmental impact statement (EIS) must be prepared.

The purpose of the Charleston ODMDS Sand Borrow Project and alternatives is to provide structurally suitable material that will enable the South Carolina State Ports Authority (SCSPA) to build the Marine Container Terminal (MCT) in a timely fashion without using trucked-in fill material, thus meeting the Army Corps of Engineers' permit restrictions on the number of permissible truck trips; as well as to provide state-owned port facilities that meet the reasonably projected throughput capacity for containerized cargo in the state of South Carolina for the next twenty years.

Under the Proposed Action, up to 6 million cubic yards of OCS material would be removed from the ODMDS by dredging, and transported to the MCT site for placement as fill. Given the distance from the ODMDS to the MCT (approximately 15 miles (25 km)) and the impracticality of a direct pipeline dredging operation, the material is expected to be delivered to the MCT via a hydraulic cutter-suction dredge loading scows, by a hydraulic hopper dredge, or, more probably, by a combination of the two methods, as described below. The material would be removed from portions of the ODMDS that contain suitable material, as defined through further geotechnical testing; the dredge footprint and bottom-disturbing activities such as anchoring would be confined to the interior of the ODMDS.

### **Environmental Consequences of the Proposed Action**

The proposed action of the MMS is the issuance of a Negotiated Agreement to authorize use of the OCS sand resources located in the ODMDS. Consequences of pursuing the Proposed Action include physical modifications to the environment and mortality of organisms primarily from various aspects of the actual dredging activities. The dredging operation would create a depression of up to 1,125 acres (450 ha) in extent, an average of 3.5 feet (1.1 m) deep within the ODMDS. However, comparisons with previous evaluations of potential borrow pits closer to shore, as well as characterizations of other borrow pits up and down the Atlantic coast, indicate that the impacts to coastal processes would be insignificant. This conclusion is based on the substantially greater distance offshore of the ODMDS relative to other borrow sites investigated and the existence of the retaining berm, with its large vertical relief relative to expected depth changes in the ODMDS. In addition, these prior analyses and the one contained within the ODMDS EA also show no significant impact to affected marine life, habitat and cultural resources.

### **Alternatives to the Proposed Action**

The NEPA requires the analysis of a No Action Alternative. Pursuing this No Action Alternative (Section 2.3 of the Charleston ODMDS Sand Borrow Project Final EA), may result in the use of upland borrow material. The SCPA would acquire excavated fill material from one or more upland sites near Charleston and transport to the MCT site either by truck along local roads or by barge along local rivers. Import of 6 million cubic yards would require approximately 600,000 truck round trips on local roads or between 1,500 and 3,700 barge round trips. In this alternative, the MMS would not enter into a negotiated agreement for use of OCS material.

The other considered alternative, Borrow From An Open-Ocean Site (Section 2.2 of the Charleston ODMDS Sand Borrow Project Final EA), would be identical to the Proposed Action except that the OCS material would be removed from an area of open ocean outside the ODMDS that has not yet been

identified. Identification of another suitable open-ocean site would require substantial additional study, including geotechnical exploration, biological surveys to define sensitive habitat (e.g., live/hard bottom), cultural resource surveys to identify potential marine archeological artifacts, and hydrodynamic studies to define wave and current regimes. The MMS may not have to enter into a negotiated agreement for this alternative if a suitable location was found within state submerged lands.

### Supporting Document

-Charleston Offshore Dredged Material Disposal Site Sand Borrow Project Environmental Assessment

-Proposed mitigation for the Charleston Offshore Dredged Material Disposal Site Sand Borrow Project Environmental Assessment

- Outcome of the Essential Fish Habitat (EFH) consultation with NOAA Fisheries where the attached Negotiated Agreement Stipulations to mitigate any potential impacts to hard bottom areas outside the ODMDS were considered sufficient.

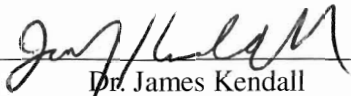
- Concurrence from both NOAA Fisheries and the U.S. Fish and Wildlife Service under Section 7 of the Endangered Species Act (ESA) that the Proposed Action may affect, but is not likely to adversely affect, ESA-listed species.

### Public Involvement

The Draft EA was posted to the MMS Marine Minerals Projects webpage for a 30-day public comment period that closed on September 19, 2009. The Branch of Environmental Assessment placed a notice in the Charleston Post and Courier that ran from August 20<sup>th</sup> through August 24<sup>th</sup> 2009 to alert the public of the posting. Through this notice, all public comments were directed through the Regulations.gov website. The only comments received were from the USACE Charleston District. Those comments have been incorporated and addressed in this Charleston ODMDS Sand Borrow Project EA.

### Conclusion

Based on the analyses in the EA, no significant effects on the human environment have been identified that would result from the Proposed Action. Therefore, MMS has concluded that an EIS is not required and is issuing this Finding of No Significant Impact.

  
\_\_\_\_\_  
Dr. James Kendall  
Chief, Environmental Division

10/16/09  
\_\_\_\_\_  
Date

## Proposed Mitigation and Negotiated Agreement Stipulations

A number of mitigation, monitoring and reporting measures would be employed during dredging and transportation of dredged materials under the Proposed Action.

Prior to commencement of operations, the South Carolina State Ports Authority (SCSPA) will provide the MMS with a copy of the Project's "Construction Solicitation and Specifications Plan" (herein referred to as the "Dredging Plan").

The Dredging Plan shall clearly delineate and support the SCSPA's strategy to obtain the sand resources from the two areas (entire area west of the interior berm and the area to the far east of the interior berm) of the Offshore Dredged Material Disposal Site (ODMDS). If additional sand resources are required after having dredged these areas of the ODMDS, the area formerly known as "the seaward (easternmost) interior berm" may be dredged.

No activity or operation, authorized by the Negotiated Agreement, shall be carried out until the MMS has determined in writing that each activity or operation described in the Dredging Plan will be conducted in a manner that is in compliance with the provisions and requirements of the Negotiated Agreement. Any modifications to the Plan that may affect the project area, including the use of submerged or floated pipelines to convey sediment, must be approved by the MMS prior to implementation of the modification.

The SCSPA will ensure that all operations at the Charleston ODMDS shall be conducted in accordance with the final approved Plan and all terms and conditions in the negotiated agreement, as well as all applicable regulations, orders, guidelines, and directives specified or referenced herein:

1. The contractor shall maintain a 500-foot no-dredging buffer around the exterior berms of the ODMDS.
2. The contractor shall maintain a 500-foot no-dredging buffer on both sides of the landward (western most) interior berm of the ODMDS.
3. The required buffers on the exterior and interior berms of the ODMDS will be implemented from the contour depth determined to best represent the toe of each berm. The best available and most recent bathymetry data shall be used to determine the contour location.

The MMS recommends the easternmost cell of the ODMDS as the primary target for dredging since existing dump and survey data suggest it to be the most abundant in compatible sand resources and it is the furthest distance from sensitive hard bottom areas.

The MMS will require that hopper dredges and scows follow designated routes to avoid hard bottom areas. This would be in consultation with the U.S. Army Corps of Engineers (USACE), National Marine Fisheries Service (NMFS) and the South Carolina Department of Natural Resources (SCDNR). The dredging contractor will be required to document every trip with global positioning system (GPS) logs and tracks.

The dredging contractor is prohibited, through the SCSPA contract and the USACE and MMS permit conditions, from anchoring, spudding, dredging within 500-foot (about 150 m) buffer zones starting at the toe of the internal edge of the exterior berm on all sides of the ODMDS, or otherwise disturbing the bottom outside of the boundaries of the ODMDS. This interior buffer protects the berm and expands the buffer between dredging and hard bottom habitat. The 500-foot internal buffer and the exterior berm together provide a buffer of between about 1600 and 2100 feet (450 - 600 m) between any dredge activity

and any possible hard bottom habitat. The berms to the south and west are wider and designed to provide protection to known hard bottom habitats west of the disposal site.

The MMS will also require that the contractor maintain a 500-foot, no-dredging buffer on both sides of the landward (western most) interior berm of the ODMDS. The required buffers on the exterior and interior berms will be based on the contour depth determined to represent the toe of each berm. The best available and most recent bathymetry data shall be used to determine the contour location. The MMS will also recommend that the easternmost cell the ODMDS be the primary target for dredging since dump and survey data suggest it to be the most abundant in compatible sand resources and it is the furthest distance from sensitive hard bottom areas.

The MMS will require continuous monitoring of the locations of dredges and scows. During all phases of the project, the SCSPA will ensure that the dredge is equipped with an onboard GPS capable of maintaining and continuously recording the location of the dredge within an accuracy range of no more than plus or minus 3m. The SCSPA will immediately notify the MMS if dredging occurs outside of the approved borrow area.

At a minimum, the SCSPA, in cooperation with the dredge operator, shall submit to the MMS on a weekly (no more than biweekly) basis a summary of the dredge head track lines, outlining any deviations from the original Plan. A color-coded plot of the cutterhead or drag arms will be submitted, showing any horizontal or vertical dredge violations. This map will be provided in PDF format. The SCSPA will provide a biweekly update of the construction progress including estimated volumetric production rates to MMS. The biweekly deliverables will be provided electronically to MMS.

Although the locations with higher sand content would be targeted for removal it is possible that some pockets of higher silt and sand content could be dredged. It should be noted, however, that based on this preliminary information the best sand resources are located towards the interior of the ODMDS site, which could effectively result in a broader buffer between dredging and live bottom locations.

The current disposal site was identified as part of an interagency effort as a location that would minimally impact live bottom habitats. This interagency group, consisting of the USEPA, the SCDNR, USACE and the SCSPA, approved the location. Its exterior berms should limit sediment transport. Five years of monitoring studies supported by this group on nearby hard bottom sites have not been able to discern an effect of the disposal of millions of cubic yards in the ODMDS on hard bottom habitats and on the abundance of finfish (See Crowe et al. 2006, An Environmental Monitoring Study of Hard Bottom Reef Areas near the Charleston Ocean Dredge Disposal Site, Final Report prepared for the U.S. Army Corps of Engineers, Charleston).

The monitoring of the movements of the dredges and scows should prevent any potential in-transit issues. The buffer provided by the berm and the internal buffer on all sides of the disposal site should decrease the likelihood of sediment transport and sedimentation outside of the disposal site. In summary, we have concluded that since the project location is itself a disturbed location, the berms should limit sediment transport and sedimentation off-site, previous disposal activities when monitored have not been able to distinguish issues above background, and the sediments with greater sand content will be targeted. Additional benthic monitoring is not warranted at this time.

Additional measures (aside from those listed below) are in place for ESA-listed species for the construction and operation of the MCT (see USACE 2006, Appendix R). All of these measures are meant to reduce or eliminate the potential for impacts to ESA-listed species.

### Sea Turtle Measures

1. NMFS-approved sea turtle observers would visually monitor the dredge area repeatedly prior to the commencement of dredging and during the dredging for the presence of sea turtles.
2. Observers would monitor the hopper spoil, overflow, screening, and draghead for sea turtles and their remains. Inflow screening baskets (4-inch mesh) would be installed to monitor the intake and overflow of the dredge for sea turtle remains.
3. The applicant would conduct assessment/relocation trawling as a method to further reduce the potential for takes of sea turtles during the proposed dredging. Trawling would be conducted repeatedly in the action areas prior to the dredging to assess the presence of sea turtles in the areas so that any individuals that may be in the path of the trawler could be relocated.
4. When a hopper dredge is used, the dredge would be equipped with a rigid sea turtle deflector attached to the draghead. The dredge would be operated in such a manner as to reduce interactions with sea turtles (e.g., reduce RPMs when the draghead is not on the surface of the sediment). In-flow screening baskets (4-inch mesh) would be installed to monitor the intake and overflow of the dredge for sea turtles.
5. Sufficient time would be allocated between each dredging cycle for approved observers to inspect and thoroughly clean the baskets and screens for sea turtles and/or turtle parts and document findings. Between each dredging cycle, the approved observer would also examine and clean the dragheads and document findings.
6. A final report summarizing the results of the dredging and any takes of listed species would be submitted to NMFS and MMS within 30 working days of completion of the project.

### North Atlantic Right and Humpback Whale Measures

1. All project-related vessels larger than 65 feet in length and operating within 20 nautical miles of the coast will not exceed 10 knots, unless inconsistent with safety of navigation, during the North Atlantic right whale (NARW) season (November 1 through April 30) to reduce the potential for vessel strikes to right whales and humpback whales. The dredges and support vessels conducting the proposed borrow operation would comply with the speed restriction, thereby reducing the likelihood of collisions with whales.
2. The SCSPA has committed to fund aerial surveys for whales for a period of 5 years, which is much longer than the period of this action, to collect data to design shipping lanes into and out of the POC that minimize the risk of vessel-right whale interactions. The surveys will be conducted daily throughout the NARW season by trained whale observers linked by radio directly to the U.S. Coast Guard and to vessels in the area. Vessel operators implementing the MMS-SCSPA negotiated agreement during the NARW season shall--especially if contacted by an aerial survey crew (by radio, text, or e-mail messaging systems) about actual or potential right whale presence near the vessel or the vessel's intended track--exert due diligence, abide by all agreed upon whale conservation instructions for transiting vessels, maintain a high level of alertness, and make every attempt to route around right whales.
3. As described in Section 3.1.3 of the biological assessment, the proposed project will employ hopper dredges between November 1 and April 14 and will have sea turtle observers aboard who will also serve as right whale and humpback whale observers and will have authority to shut down operations if a whale comes within close enough proximity to the dredge vessel to warrant the observer's concern over a

potential vessel strike. The observer will also watch for the presence of right whales and humpback whales during transit to and from the terminal site.

4. Project-related vessel operators shall be made aware that it is illegal to approach or remain within 500 yards of a right whale, unless the safety of a vessel will be compromised by avoiding such approaches.

5. Tugboats associated with barging of materials will maintain a maximum speed of 10 knots during the remaining few weeks of North Atlantic right whale (and humpback whale) presence in the area (i.e., until April 30), thus greatly limiting the potential for deadly vessel strikes with large whales.

#### Manatee Measures

1. The SCSPA will instruct all personnel associated with the project construction and operation of the potential presence of the manatees and the need to avoid collisions with manatees.

2. All SCSPA personnel and contractors will be advised that there are civil and criminal penalties for harming, harassing, or killing manatees, which are protected under the Marine Mammal Protection Act of 1972 (MMPA) and the Endangered Species Act of 1973 (ESA). The contractor may be held responsible for any manatee harmed, harassed, or killed as a result of port activity.

3. Siltation barriers that may be utilized during the port's construction activities must be made of materials and placed in a manner such that manatees cannot become entangled. The barriers may not block manatee movements and are to be regularly monitored to avoid manatee entrapment.

4. All vessels associated with the project will operate at idle speed at all times while in shallow waters.

5. If manatees are sighted within 100 yards of the project, all appropriate precautions shall be implemented to ensure protection of the manatees. These precautions shall include operating all equipment in such a manner that moving equipment does not come any closer than 50 feet of any manatee.

6. Any collision with any manatee must be reported immediately to the SC Wildlife and Marine Resources Department, Heritage Trust Section, (803) 844-2473.

7. The SCSPA will maintain a log detailing manatee sightings, collisions, or injuries should they occur during operations. Following project completion a report summarizing incidents and sightings must be submitted to Ms. Melissa Bimbi, US Fish and Wildlife Service, 176 Croghan Spur Road, Ste 200, Charleston, SC 29407.

The proposed action would have no effect on the following Federally-listed species identified to potentially inhabit or transit the study area: bald eagle, shortnose sturgeon, American alligator, and the blue, fin, sei and sperm whales.

Other Federally-listed species potentially occurring in the study area which may be affected by the proposed action include sea turtles, manatees, humpback whales, and right whales. Given the direct and indirect effects to manatees, right whales and humpback whales discussed within this BA (i.e., vessel strikes, acoustics harassment) and the conservation measures built contained within Section 6.0 (of the attached Biological Assessment found in Appendix C) to minimize or eliminate the potential for take, the proposed action may affect but is not likely to adversely effect manatees, right whales and humpback whales.



Dredging activities at the ODMDS would take place in an area in which several species of sea turtles (loggerhead, Kemp’s Ridley, green, leatherback) are likely to occur, and would probably involve equipment that is known to take sea turtles (i.e., hopper dredges). Although, this Section outlines standard measures meant to minimize or eliminate effects, the potential for the taking of sea turtles still exists. Therefore, the proposed action may adversely affect sea turtles. No impacts to designated Critical Habitat would occur.

Consultation must be reinitiated if a take occurs or new information reveals effects of the action not previously considered, or the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat in a manner or to an extent not previously considered, or if a new species is listed or critical habitat designated that may be affected by the identified action.

**Project Completion Report**

A project completion report will be submitted by the SCSPA to MMS within 90 days following completion of the activities authorized under this Negotiated Agreement. This report and supporting materials should be sent to Ms. Renee Orr, Chief, MMS Leasing Division, 381 Elden Street, MS 4010, Herndon, Virginia 20170 and dredgeinfo@mms.gov. The report shall contain, at a minimum, the following information:

- the names and titles of the project managers overseeing the effort (for USACE, the engineering firm (if applicable), and the contractor), including contact information (phone numbers, mailing addresses, and email addresses);
- the location and description of the project, including the final total volume of material extracted from the borrow area and the volume of material actually placed at the MCT (including a description of the volume calculation method used to determine these volumes);
- ASCII files containing the x,y,z and time stamp of the cutterhead or drag arm locations;
- a narrative describing the final, as-built features, boundaries, and acreage, including the restored beach width and length;
- a table, an example of which is illustrated below, showing the various key project cost elements;

	Project Cost Estimate (\$)	Cost Incurred as of Construction Completion (\$)
Construction		
Engineering and Design		
Inspections/Contract Administration		
Total		

- a table, an example of which is illustrated below, showing the various items of work construction, final quantities, and monetary amounts;

Item No.	Item	Estimated Quantity	Unit	Unit Price	Estimated Amount	Final Quantity	Bid Unit Price	Final Amount	% Over/Under
1	Mobilization and Demobilization								
2	Beach Fill								
3	Any beach or offshore hard structure placed or removed								

- a listing of construction and construction oversight information, including the prime and subcontractors, contract costs, etc.;
- a list of all major equipment used to construct the project;
- a narrative discussing the construction sequences and activities, and, if applicable, any problems encountered and solutions;
- a list and description of any construction change orders issued, if applicable;
- a list and description of any safety-related issues or accidents reported during the life of the project;
- a narrative and any appropriate tables describing any environmental surveys or efforts associated with the project and costs associated with these surveys or efforts;
- a table listing significant construction dates beginning with bid opening and ending with final acceptance of the project by the USACE; digital appendices containing the as-built drawings, beach-fill cross-sections, and survey data; and any additional pertinent comments.

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## **EXECUTIVE SUMMARY**

The Minerals Management Service (MMS) is considering a request from the South Carolina State Ports Authority (SCSPA) to authorize the removal of up to 6 million cubic yards of Outer Continental Shelf (OCS) resources (sand) from the Charleston Ocean Dredged Material Disposal Site (ODMDS) for use in the construction of a marine container terminal (MCT) and access road. The federal action under consideration is the issuance of a negotiated agreement. The purpose of this assessment is to identify and evaluate the potential effects of using OCS mineral resources from the Charleston ODMDS (the Proposed Action), using sand borrowed from elsewhere along the coast near Charleston, using maintenance dredging material from Charleston Harbor, or building the terminal with upland fill sources (no federal action). The evaluation includes threatened and endangered species in the general project area. Use of the ODMDS material would represent a beneficial re-use of a resource.

The Action Area for the Proposed Action and alternatives consists of the ODMDS and nearby coastal waters, as well as a potential upland borrow site and waters in and adjacent to Charleston Harbor. The ODMDS is a square encompassing approximately four square miles (10 square kilometers [km<sup>2</sup>]) located approximately nine miles (14 km) southeast of the entrance to Charleston Harbor, South Carolina; the site is managed by a consortium of state and federal agencies, including the U.S. Army Corps of Engineers (USACE) – Charleston District and U.S. Environmental Protection Agency (EPA) Region IV. The EPA has agreed to serve as a cooperating agency, as defined under Council on Environmental Quality (CEQ) regulations, for the preparation of this Environmental Assessment (EA).

The MCT site where the OCS material would be used is located inside Charleston Harbor, on the site of the former Charleston Naval Base. The impacts of fill placement were evaluated in the EIS prepared for the MCT (USACE 2006); the Corps issued a ROD and a Department of the Army permit for construction. The impacts that may occur at the MCT site that are related to placement activities are incorporated by reference and synopsized herein. The marine terminal can be built without the ODMDS material, but at greater cost and with different environmental impacts. Accordingly, this document does not consider the alternative of not building the terminal (the no-build alternative was evaluated in the MCT EIS), but rather different alternatives for supplying the fill needed to build the terminal.

Three alternatives are evaluated in this EA: Proposed Action (use of the ODMDS material); Open-Ocean Borrow Alternative (removal of sand from elsewhere on the OCS); and No Action (construction of the terminal using fill from upland sites in the Charleston area, which would not require an action by the MMS). The first two alternatives, referred to as the “ocean-based alternatives,” would be similar in that subaqueous material would be removed by dredging and transported to the MCT site by hopper dredge or barge. In the No Action Alternative, the material would be removed from upland sand and soil mined and transported to the MCT site by a combination of barges and trucks.

A fourth alternative, the Charleston Harbor Beneficial Use Alternative was also considered. In this alternative the required fill would be supplied from normal maintenance dredging activities by the Charleston District, U.S. Army Corps of Engineers. This alternative was not carried forward, however, because it would delay terminal completion well into the future, and thus not meet one of the objectives of the project.

This EA finds that no significant long-term environmental impacts are anticipated from implementing the Proposed Action, i.e., using OCS resources from the Charleston ODMDS. With implementation of the required mitigation plan, the potential impacts of dredging and construction would be localized and temporary in nature. The Proposed Alternative would have less impact on some biological resources compared to the Open-Ocean Borrow Alternative, and it would allow the marine container terminal to be built at a lower cost and with less air quality and traffic impacts than the No Action Alternative. The Proposed Action would have little chance of adverse impacts on cultural resources, whereas the Open-Ocean Borrow Alternative could conflict with the preservation of historical artifacts (shipwrecks). The Proposed Action would allow the terminal to be built on schedule, thus meeting the project's purpose.

# 1 INTRODUCTION

The Minerals Management Service (MMS) is considering a request from the South Carolina State Ports Authority (SCSPA) to authorize the use of Outer Continental Shelf (OCS) mineral resources (sand) from the Charleston Ocean Dredged Material Disposal Site (ODMDS). The proposed federal action is the issuance of a negotiated agreement between MMS and the SCSPA to allow the latter agency to obtain sandy dredged material from the Charleston ODMDS located on the OCS and transport this dredged material to and for use in the construction of the marine container terminal (MCT) and access road in the Port of Charleston.

To date, the environmental impacts of the proposed construction of the MCT, including placement of dredged material at the MCT, have been evaluated in an Environmental Impact Statement (EIS) prepared by the U.S. Army Corps of Engineers (MCT EIS, USACE 2006), which issued a ROD on April 26, 2007. The USACE further evaluated potential impacts to threatened and endangered species during the Section 7 consultation under the Endangered Species Act (ESA) with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS). These previous analyses, however, did not contemplate the potential consequences of collecting and transporting OCS sand resources from the Charleston ODMDS.

The purpose of this Environmental Assessment (EA) is to identify and evaluate the potential environmental effects of the proposed Charleston ODMDS Sand Borrow Project (the Proposed Action) and a range of reasonable alternatives. The scope of the proposed action and alternatives includes extraction, transport, and placement of the required fill material. The EPA has agreed to serve as a cooperating agency, as defined under Council on Environmental Quality (CEQ) regulations, for the preparation of this EA.

## 1.1 Project Location and Setting

The Action Area for the Proposed Action and alternatives consists of the Charleston ODMDS and nearby coastal waters, as well as a potential upland borrow site and waters in and near Charleston Harbor (Figure 1). The ODMDS is a square encompassing approximately four square miles (10 square km) located approximately nine miles (14 km) southeast of the entrance to Charleston Harbor, South Carolina, in approximately 40 feet (13 m) of water. The coordinates of the Charleston ODMDS's corners are:

32.65663° N, 79.75716° W  
32.64257° N, 79.72733° W  
32.61733° N, 79.74381° W  
32.63142° N, 79.77367° W.

The Charleston ODMDS is managed by the U.S. Army Corps of Engineers, Charleston District, the U.S. Environmental Protection Agency, Region 4, the South Carolina Department of Natural Resources, the U.S. Fish and Wildlife Service, and the South Carolina State Ports Authority in accordance with a Site Management and Monitoring Plan (SMMP) developed by those agencies (USACE et al. 2005). The management plan specifies the quality of the material that can be disposed of at the site and the controls that must be imposed on disposal operations to ensure proper disposal and to minimize potential environmental impacts.

According to USACE et al. (2005), the Charleston ODMDS is one of the most active, frequently used dredge material disposal sites in the South Atlantic Bight, and the general site has been in

use since 1896 for disposal activities. It has changed size and configuration at least twice in the past, most recently in response to the discovery of live hard-bottom areas in the western half of a larger site (dashed black line in Figure 1 outside the ODMDS designated by solid lines; “live bottom” is low-relief hard substratum, typically colonized by soft corals, sponges, and other attached organisms to form a flat reef). The current site delineated by the boundaries described above represents about half the site’s former extent and was designated in 1993. The current disposal site is divided into four mile-square cells. Those cells are surrounded by two boundary zones, inner and outer, each having two one-square-mile cells on each of its four sides, which have been established to facilitate long-term monitoring.

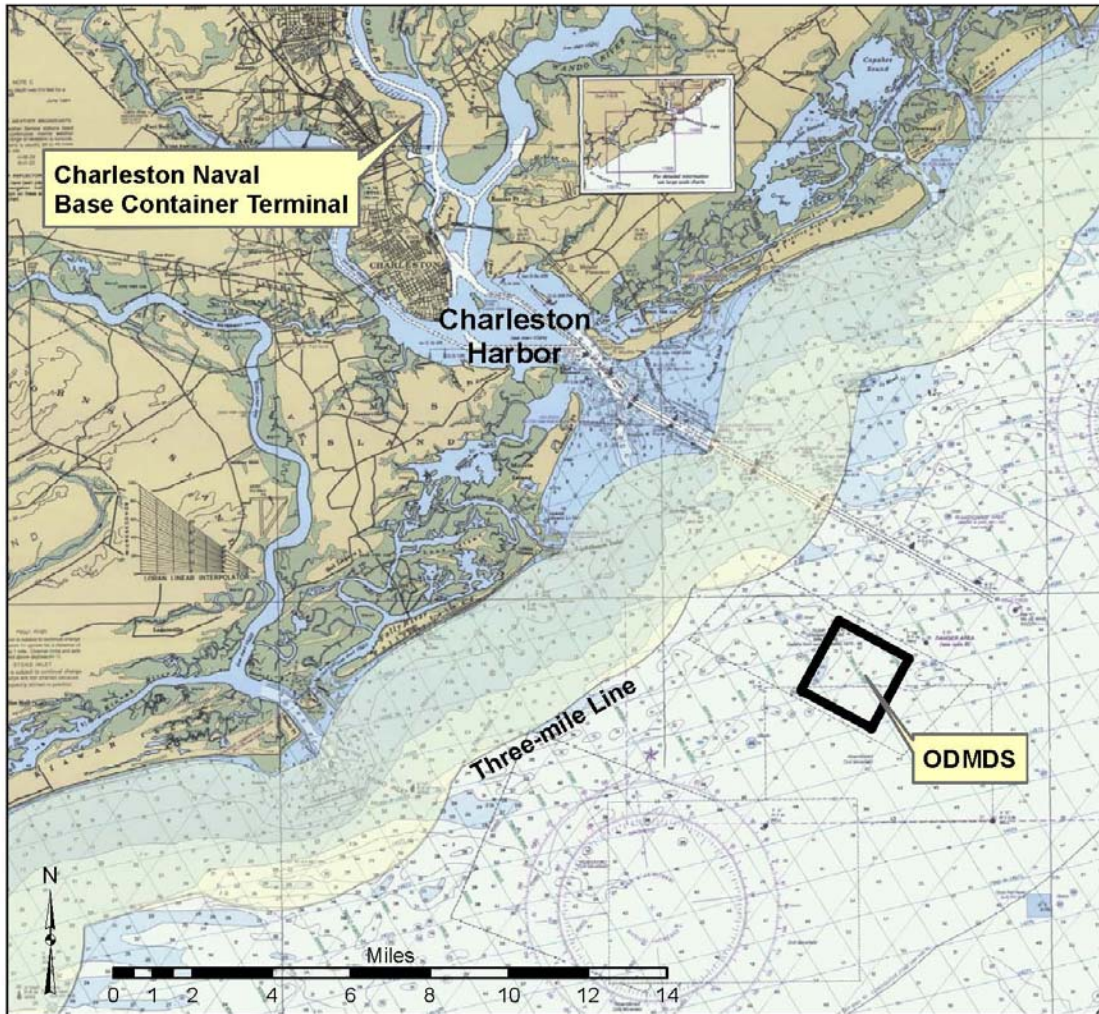


Figure 1. Action Area for the Charleston ODMDS Sand Borrow Project

Since 1987, approximately 40 million cubic yards of dredged material from USACE maintenance activities and SCSPA harbor deepening projects have been disposed of at the Charleston ODMDS; most recently 22 million cubic yards were deposited in the course of the Charleston harbor channel deepening project that ended in 2002. Upcoming projects through 2010 are expected to add as much as 1,100,000 additional cubic yards to the ODMDS (USACE pers. comm. 2008). The SMMP states that there are currently no restrictions on the timing of



disposal (i.e., there are no seasonal “windows” due to biological issues) or on the amounts of material that can be disposed. Although the site is principally delineated by geographical coordinates, there are two physical boundaries consisting of dikes on the northwestern and southwestern boundaries formed by coarse marl laid down in the early 1990s expressly to confine the deposited dredge material (Zimmerman, Jutte, and VanDolah 2002). Recent surveys have identified two berms in the interior of the disposal site; an eastern and western interior berms, running parallel to one another from northeast to southwest.

Although the SMMP has not established the capacity of the Charleston ODMDS to receive dredged material, the USACE has stated that removal of material in order to reuse it for construction purposes would extend the life of the site, besides representing a beneficial reuse of the material.

The site where the OCS material would be used is located approximately 8 miles (5 km) inside Charleston Harbor (Figure 2), on a portion of the former Charleston Naval Base. The SCSPA has already received federal and state approvals to develop a 267-acre (108 hectares [ha]) marine container terminal (MCT) with a 3,500-ft (1070 meter [m]) wharf fronting the tidal Cooper River in North Charleston. The project includes the filling of approximately 65 acres (26 ha) of tidelands to create land for wharf and container handling facilities, and dredging out structurally unsuitable material to deepen the berth and provide a firm footing for the new wharf and backland.



Figure 2. Charleston Marine Container Terminal at completion (artist’s rendering).

The impacts of that project, including fill placement for terminal development, have already been evaluated in the EIS prepared for the MCT (USACE 2006). The EIS also included measures required to mitigate any impacts from fill placement found to be significant. The USACE issued

a Record of Decision (ROD), on April 26, 2007, and a Department of the Army permit for construction. The impacts that may occur at the MCT site that are related to and depend on placement activities are incorporated by reference to the MCT EIS and are synopsised herein. This EA evaluates the potential consequences of using OCS sand resources from the offshore borrow area or other fill sources and transporting those materials to the project site.

## **1.2 Purpose and Need for the Action**

The USACE (2006) identified the purpose of the MCT project as, “To provide state-owned port facilities that meet the reasonably projected throughput capacity for containerized cargo in the state of South Carolina for the next twenty years.” The project includes the filling of approximately 65 acres (26 ha) of tidelands to create land for wharf and container handling facilities, and dredging out structurally unsuitable material to deepen the berth and provide a firm footing for the new wharf and backland. The purpose of the Charleston ODMDS Sand Borrow Project and alternatives is to provide structurally suitable material that will enable the SCSPA to build the MCT in a timely fashion without using trucked-in fill material, thus meeting the Army Corps of Engineers’ permit restrictions on the number of permissible truck trips.

Most of the dredged material from container terminal construction is unsuitable for reuse as fill material and will be disposed of at an existing disposal site located on Daniel Island in Charleston Harbor. Accordingly, fill to create the new land must be imported from outside the project area. Some fill sources have been identified, but according to the applicant a deficit of up to 6 million cubic yards remains. The SCSPA anticipates that the required additional fill material will come from both upland and marine sources. However, because the USACE section 404 permit limits the number of trucks that can access the site during construction, the majority of material will need to be delivered via the Cooper River, whether from an upland source or elsewhere. SCSPA has investigated possible marine sources of material and concluded that the Charleston ODMDS is the most promising candidate. Available data indicate that approximately 3 to 6 or more million cubic yards of material deposited in the past at the ODMDS (of the total of approximately 40 million cubic yards that have been deposited in the past 20 years) meet the fill material requirements (fines content less than 35%) and are available for this use. Furthermore, use of the ODMDS material would represent a beneficial re-use of a resource.

## **1.3 Authority**

Public Law 103-426, enacted October 31, 1994, gives the MMS the authority to convey, on a noncompetitive basis, the rights to Outer Continental Shelf (OCS) sand, gravel, or shell resources for shore protection, beach or wetlands restoration projects, or for use in construction projects funded in whole or part or authorized by the Federal government. In implementing this authority, the MMS may issue a non-competitive negotiated agreement for the use of OCS sand to a qualifying entity.

The National Environmental Policy Act and Title 40 of the Code of Federal Regulations, Parts 1500-1508 (40 CFR 1500-1508) require Federal agencies to consider the potential environmental consequences of proposed actions and alternatives. Executive Order (EO) 11514, Protection and Enhancement of Environmental Quality (amended by EO 11991), provides a policy directing the Federal government to take leadership in protecting and enhancing the environment.

## **1.4 Federal Consultation History**

Federal consultation on the Proposed Action has addressed both the sand borrow activity and the use of the sand for the construction of a marine terminal in Charleston Harbor.

Consultation and compliance efforts related to other environmental requirements are ongoing in support of issuing a negotiated agreement. Consistency requirements pursuant to the Coastal Zone Management Act were waived by the National Oceanic and Atmospheric Administration in a letter dated June 13, 2008, stating that the South Carolina Office of Ocean and Coastal Resource Management did not meet notification requirements under 15 CFR § 930.54. An emissions inventory and air quality analysis (South Carolina Department of Health and Environmental Control Regulation 61-62.5 (Standard Number 2) was completed on November 01, 2008 by the MMS. An Endangered Species Act Section 7 Biological Assessment was submitted to the U.S. Fish and Wildlife Service and National Marine Fisheries Service in December 2008. The U.S. Fish and Wildlife Service concurred in a letter dated, March 24, 2009 with MMS's effects determination. The MMS is awaiting a response from the National Marine Fisheries Service. An Essential Fish Habitat Assessment was submitted by the MMS to the National Marine Fisheries Service on December 15, 2008. The National Marine Fisheries Service provided Conservation Recommendations in a letter dated March 24, 2009. On June 10, 2009, the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers who co-manage the ODMDS concurred with a revised dredge operations plan (to be incorporated into the leasing document) to accommodate new information concerning the ODMDS berms. The MMS reinitiated an abbreviated Essential Fish Habitat consultation on June 10, 2009, providing the National Marine Fisheries Service the revised dredge operations plan. The MMS is awaiting a response from the National Marine Fisheries Service.

On June 10, 2009, the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers who manage ODMDS activity concurred with dredge plan stipulations (to be incorporated into the leasing document) written by the MMS.

Construction of the marine container terminal, including placement of dredged material in the MCT, was considered in an EIS prepared by the US Army Corps of Engineers (USACE). In the course of that process, the USACE consulted with both the US Fish and Wildlife Service (FWS) and the NMFS pursuant to Section 7 of the Endangered Species Act, and with the South Carolina Department of Health and Environmental Control (DHEC) pursuant to the federal Coastal Zone Management Act (CZMA). On April 5, 2006, the USACE requested a Section 7 consultation with NMFS. On April 27, 2006, NMFS requested additional information, which was received on May 17, 2006; on that same day, citing concerns over potential effects of project-related shipping on right whales, NMFS initiated formal consultation. The USACE and NMFS engaged in a series of meetings and discussions, and on September 14, 2006, the USACE submitted an addendum to the project description that included mitigation measures to avoid or reduce take of listed species. On October 3, 2006, NMFS issued a letter concluding that the effects of construction of the marine container terminal on all of the listed species in the project area were "discountable or insignificant". The USACE's coordination with the USFWS relative to listed species is documented in Appendix EE of the Final EIS (FEIS; USACE 2006, pp 1-35 to 36). Via comments on the Draft EIS, USFWS requested special precautions to protect the endangered manatee. USACE agreed to include those precautions on the Record of Decision and to incorporate them into special conditions on the Department of the Army permits. The USACE's

coordination under the CZMA is documented in the Coastal Zone Consistency Certification issued by the South Carolina DHEC on October 30, 2006. The certificate found the project to be consistent with the State of South Carolina's Coastal Zone Management Program and imposed mitigation for coastal impacts in the form of the purchase of 33.1 mitigation credits from an approved mitigation bank.

The relevant NEPA documents for the proposed action include the Final EIS for the marine container terminal project (USACE 2006), the Clean Water Act Section 404 permit (2003-1T-016) issued by the U.S. Army Corps of Engineers on April 27, 2007, the Regional Biological Opinion issued by the NMFS (NMFS 1997) covering the effects of hopper dredging on sea turtles along the South Atlantic coast of the United States, and the CZMA certificate. All of those documents are incorporated into this EA by reference.

## **2 ALTERNATIVES, INCLUDING THE PROPOSED ACTION**

The Minerals Management Service has identified three action alternatives, including the Proposed Action and No Action alternatives. Each of these is described below, and the rationale for selecting the proposed alternative is presented in Section 2.5. It is important to note that the marine terminal can be built without the ODMDS material, but at a greater cost and with potentially different environmental impacts. Accordingly, this document does not consider the alternative of not building the terminal, but rather different alternatives for supplying the fill needed to build the terminal. The marine terminal no-build alternative was evaluated in the MCT EIS (USACE 2006).

### ***2.1 Borrow from the Charleston ODMDS (Proposed Action)***

In this alternative, up to 6 million cubic yards of OCS material would be removed from the ODMDS (Figure 3) by dredging, and transported to the MCT site for placement as fill. Given the distance from the ODMDS to the MCT (approximately 15 miles (25 km)) and the impracticality of a direct pipeline dredging operation, the material is expected to be delivered to the MCT via a hydraulic cutter-suction dredge loading scows, by a hydraulic hopper dredge, or, more probably, by a combination of the two methods, as described below. The material would be removed from portions of the ODMDS that contain suitable material, as defined through further geotechnical testing; the dredge footprint and bottom-disturbing activities such as anchoring would be confined to the interior of the ODMDS.

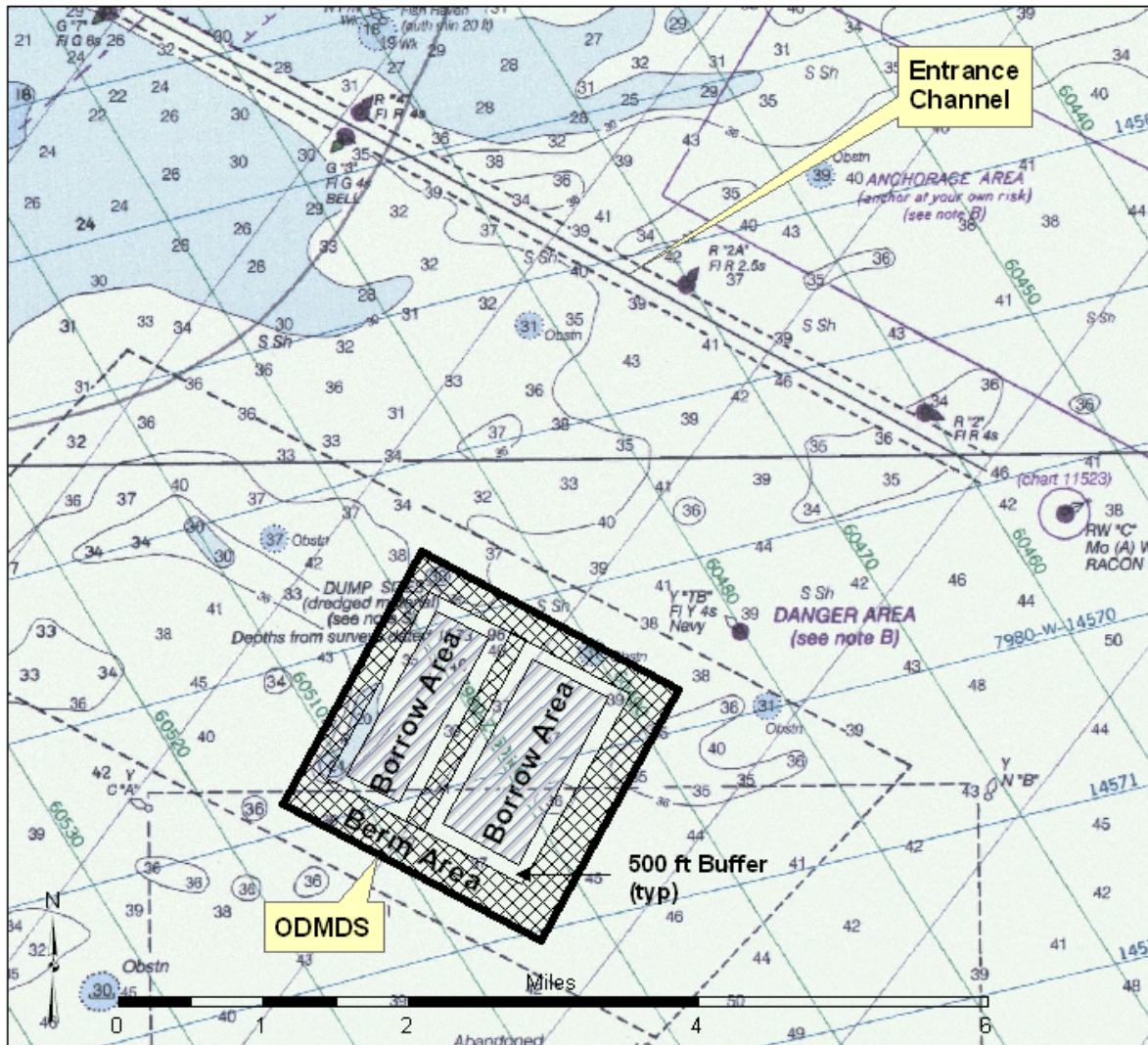


Figure 3. Proposed dredging area within the Charleston ODMDS

The potential borrow areas would include the two cells shown in Figure 3. The berms surrounding these borrow area vary in width from 1000 to 1500 feet (300 to 450m) and provide a buffer of 500 feet (150m) from each of the interior faces of the exterior berms and each face of the westernmost interior berm. The berms were established to protect the nearby live bottom areas from sediment migration. In order of priority, the dredging would occur as follows: first in the easternmost cell (since existing dump and survey data suggest it to be the most abundant in compatible sand resources and it is the furthest distance from sensitive hard bottom areas), next in the westernmost cell (which is closest to nearby live bottom areas; see Section 3.2.2), and only finally, if more material is needed, would the easternmost interior berm area (not shown) be dredged. This berm may have additional compatible sand in the event that the above mentioned easternmost and westernmost cells do not have the resources to complete the requirement.

The project may need less than 6 million cubic yards of material from the ODMDS because some material may be supplied by maintenance dredging activities in and around Charleston Harbor. The SCSPA has committed to accepting any material generated by U.S. Army Corps of Engineers maintenance dredging so long as the material is structurally suitable and can be

delivered to the MCT site within the project's schedule constraints (maintenance dredging in the Charleston Harbor area generates an average of 1.9 million cubic yards of material per year, which is typically fine-grained; USACE 2006, Section 4.16). This beneficial re-use of dredged material would reduce both disposal-related impacts on the ODMDS and the impacts of removing OCS sand resources.

### **2.1.1 Project Schedule**

The project schedule anticipates dredging and transport of up to 6 million cubic yards of sediment from the ODMDS. Operations would proceed 24 hours a day except for interruptions caused by routine service, equipment failure, and weather stoppages. The first phase of dredging would start in early November 2009, using a hopper dredge, and would proceed until mid-April 2010, in accordance with the biological window (a mitigation measure to reduce risk to biological resources from stressors generated during dredging and disposal activities) currently specified in USACE dredging permits (the same window would be specified in the MMS Negotiated Agreement). The 1997 Regional Biological Opinion between NMFS and the USACE stipulates that no hopper dredging operations can occur in the South Atlantic during the biological window between April and November due to the presence of protected sea turtles. If, at the close of the biological window, the required amount of material (up to 6 million cubic yards) has not been removed, dredging would continue using a cutter-suction dredge, which would not be subject to the biological window. Once dredging is started, the removal of 6 million cubic yards of sediment would require up to 575 dredging days. It is expected that the dredging would occur over two or three consecutive hopper dredge biological windows with dredging continuing between each of these windows by cutter suction dredge only to the extent necessary to obtain the required material.

### **2.1.2 Cutter-Suction Dredge Operation**

A cutter-suction dredge uses a rotating cutting apparatus around the intake of a suction pipe, called a cutterhead, to break up or loosen bottom material (Figures 4 and 5). A large centrifugal pump removes the loosened material from the ocean bottom and pumps it as a sediment-water slurry through a discharge pipeline. Cutter-suction dredges are generally characterized according to the size of the discharge pipe (which ranges from 6" to over 30"). A cutter-suction dredge with a 30" discharge pipe would be approximately 280 feet (90 m) long, draw approximately 9 feet (2.9 m) of water, and have a total of approximately 10,500 horsepower installed (engine, auxiliaries, and pump motors).

For the proposed project, the cutter-suction dredge would be anchored in a fixed position within the boundaries of the ODMDS by a three-wire anchoring arrangement; the position of the anchors would be changed from time to time as the dredge finished removing all the material it could reach from each position. The dredge would dig material from the bottom by swinging the cutterhead back and forth across an arc of 150 to 300 feet (45 to 90 m). Winches on the forward end of the dredge would pull the cutterhead back and forth and advance it ahead in the cut in 4- to 6-foot (1.3 to 1.8 m) steps.

Dredged material would be pumped a short distance to a barge with loading arms that would deliver the slurry into scows (a scow is a hopper-shaped, as opposed to a flat-decked, barge) of 3,000 to 7,000-cubic-yard (2,300 to 5,400 cubic meters [m<sup>3</sup>]) capacity (Figures 5 and 6). The scows would be loaded at a staging point close to the dredge and inside the boundaries of the

ODMDS; specifying that no loading, anchoring, or mooring would be allowed outside the ODMDS would ensure that vessel activities do not adversely affect hard bottoms. The scows would have standpipes that would allow supernatant water to be released during the loading operation, and the scows would not depart from the loading point inside the ODMDS until dewatering was completed. This precaution would minimize the chance that turbid supernatant water would overflow into surrounding ocean waters during the transit to the MCT site.

The project schedule would require that 4 to 6 scows, hauled by three or four ocean-going tugs, deliver 4 to 8 loads to the MCT site per day, for a total of between 1,000 and 2,500 scow loads, depending on final volumes and scow sizes. The tugs would follow routes designated by MMS and the USACE in order to avoid transiting near known hard-bottom areas outside the ODMDS.

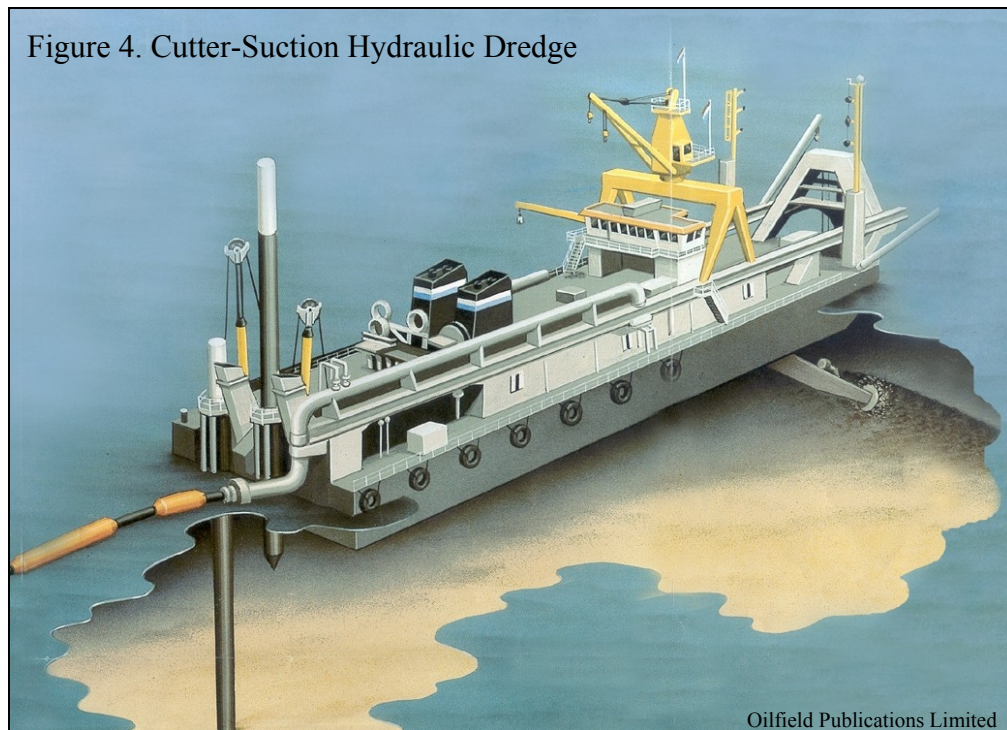


Figure 5. Close-up of a Cutterhead



Figure 6. Cutter-Suction Dredge Loading Barges



Figure 7. Close-up of Barge Loading Process (the vessels at the top of Figure 6)

### 2.1.3 Hopper Dredge Operation

Hopper dredges look much like conventional ships and are equipped with either single or twin trailing suction pipes, or “drag arms” (Figure 8). At the end of each drag arm are dragheads, which house the inlet to the pumping system and typically have teeth and high-pressure jets to loosen the material being dredged. The dragheads would be fitted with turtle deflectors (Figure 9). Hopper dredges currently in use in the U.S. vary in capacity from approximately 2,000 cubic yards (1,600 m<sup>3</sup>) to 12,000 cubic yards (9,600 m<sup>3</sup>), with typical dredges being in the range of 4,000 to 6,500 cubic yards (3,200 to 5,000 m<sup>3</sup>). The actual amount of material that a loaded hopper carries could be less than its rated capacity if the material is particularly dense, which would cause the vessel’s weight limit to be reached before the volume capacity (with sand, for example, a hopper might carry only 50 – 70% of its volume capacity). A smaller hopper dredge would be approximately 280 feet (90 m) long, draw up to 16 feet (5 m) of water fully loaded, and have approximately 9,000 horsepower installed, while the largest hopper dredges are approximately 390 feet (125 m) long, draw up to 28 feet (9 m) of water, and have approximately 23,500 horsepower installed.

A hopper dredge operates while underway (typically 1 to 3 knots), and material is lifted through the trailing suction pipes by one or more pumps. The slurry is discharged into a large hold (the hopper) in the center of the ship. The hopper is equipped with one or more adjustable overflow standpipes that allow the transport water to be skimmed off and discharged beneath the vessel as the solids from the slurry settle in the hopper. Once the hopper is full, the drag arms are raised and stored on deck and the vessel sails to the discharge location, where the material is either re-slurried and pumped ashore through a pump-off station, mechanically transferred ashore, or dumped through the bottom of the vessel via doors or split-hull openings.



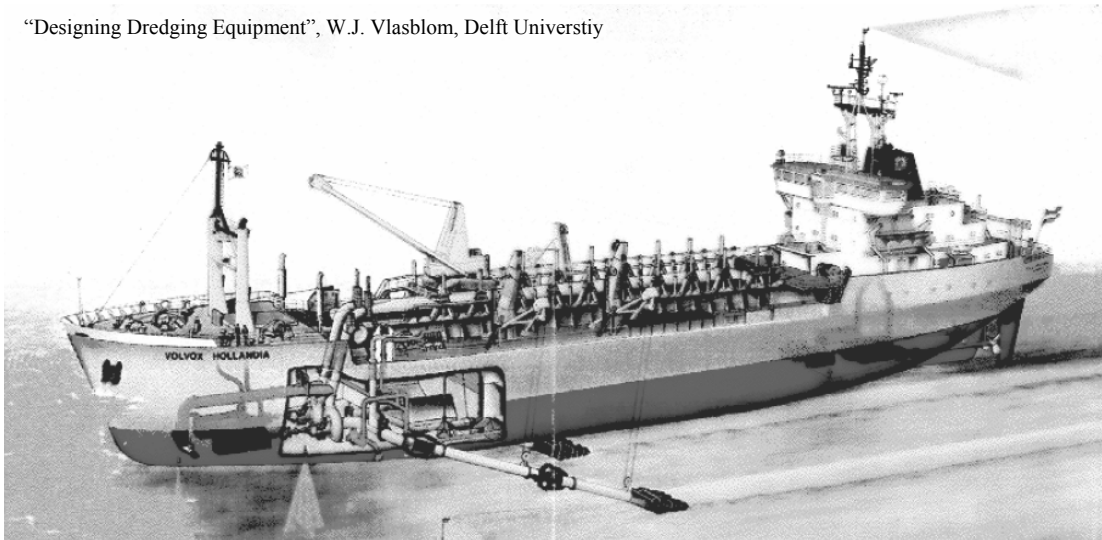


Figure 8. Twin-Arm Hopper Dredge in Cut-Away View



Figure 9. Close-up of a Draghead with a Turtle Deflector Mounted

This type of dredge is often used for rougher, open waters where other dredge types, which are fixed to the seabed, cannot operate as safely and effectively. This type of dredge is not easily maneuvered, unsuitable for use in shallow water, and not effective on hard materials such as stiff clays. A hopper dredge can move quickly to a placement area under its own power, but the operation loses efficiency as the transport distance increases, since dredging does not take place while the hopper is in transit.

For the proposed project, a hopper dredge would dig material from the bottom by making passes over the site, typically moving at 1 to 2 knots. In the case of a twin-arm dredge, the material is dug in two swaths that are each the width of the draghead (typically 6 to 8 ft (1.8 to 2.4 m) wide). To get a full load, a typical hopper dredge would make two passes across the ODMDS. Each pass would be 3,000 to 4,000 ft (900 to 1,200 m) long and the average cut depth would be approximately one foot (0.3 m). Dewatering of the dredged material would occur during the

later stages of each loading cycle, as the water level in the hopper reached the standpipes, and the hopper would not leave the ODMDS to make the transit to the MCT until dewatering was completed.

The project schedule would require either two medium-size hopper dredges 4,000-5,000 cubic yards [3,200 to 3,800 m<sup>3</sup>] capacity) delivering a total of six loads per day (three each), or one large hopper dredge (9,000 to 12,000 cubic yard [7,000 to 9,600 m<sup>3</sup>] capacity) delivering two or three loads per day. The total number of loads taken from the site is expected to be between 500 and 1,500, depending on the amount of fill actually required and the size of the dredge(s). The dredges would follow routes designated by MMS and the USACE in order to avoid transiting near known hard-bottom areas.

#### **2.1.4 Borrow Area**

The area proposed to be dredged within the ODMDS is 7,000 ft by 7,000 ft (2,100 m by 2,100 m), an area of approximately 1,125 acres (450 ha.). The borrow site is bordered by low, discontinuous berms constructed approximately ten years ago, composed largely of Cooper marl, a slightly cemented, stiff sandy clay. Conversations with USACE personnel indicate that a planned bisector berm may not have been completed because not enough Cooper marl was available. However, recent surveys indicate that two interior berms, running more or less northeast-southwest, are present, dividing the site into three cells. A survey performed by USACE in 2007 found that the tops of the perimeter berms generally range between elevation -28 ft to -36 ft (8.5 to 11 m), with the lower elevations at the southern perimeter. A diver survey of the interior berms performed by the South Carolina Department of Natural Resources (SCDNR) in 2009 (Appendix A) verified the presence of marl and high-relief substratum on both interior berms.

The material within the borrow area is approximately two-thirds fine sand and one-third silts and clays (see Section 3.1.1). The sands and clays are typically interbedded, but not mixed, and the material to be removed will be that which has the highest sand content and is readily accessible. Removal of 6 million cubic yards would require an average cut depth of approximately 3.5 ft. (1.2 m). In localized areas cut depths could be shallower or deeper (up to 15 ft. [4.6 m] below the existing surface) to maximize the collection of the best fill materials. The borrow pit would not be larger than 1,125 acres (450 ha) if less than 6 million cubic yards were removed or if the cut were deeper. Pre-dredge and post-dredging high-resolution bathymetric surveys would be required by MMS and USACE authorizations in order to document final volumes and bottom topography.

#### **2.1.5 MCT Site Material Placement**

Once loaded, the hopper dredges and scows would transport the material from the ocean site to the MCT site via the navigation channel, Charleston Harbor, and the Cooper River (Figure 1). At the MCT site, the material dredged from the ODMDS would be placed in engineered layers (termed “lifts”). The material would be retained in place by steel sheet-pile walls and rock berms that would form the new shoreline of the Cooper River at the terminal site. Whether the material is delivered by scows from a cutter-suction dredge operation or directly by hopper dredge, a barge- or shore-mounted unloading system would transfer the material from the scows or hopper to the fill site (Figure 11); supernatant water would be managed on-site through a system of settling ponds and weirs before being discharged to the river. Additional detail on

placement of the materials at the MCT can be found in the Final EIS for the MCT project (USACE 2006).

## **2.2 Borrow From An Open-Ocean Site**

This alternative would be identical to the Proposed Action except that the OCS material would be removed from an area of open ocean outside the ODMDS that has not yet been identified. Identification of a suitable open-ocean site would require substantial additional study, including geotechnical exploration, biological surveys to define sensitive habitat (e.g., live/hard bottom), cultural resource surveys to identify potential marine archeological artifacts, and hydrodynamic studies to define wave and current regimes. The MMS may not have to enter into a negotiated agreement for this alternative if a suitable location was found within state submerged lands.



Figure 11. Dredge Material Scow Being Unloaded at a Fill Site

In this alternative, up to 6 million cubic yards of native sands would be dredged from an area of up to 1,125 acres (450 ha) located along the inner shelf of South Carolina. Dredging equipment, procedures, quantities, and schedules would be as described in Section 2.1. Dredging would not take place in navigation channels or in hard bottom or live bottom areas. The project costs associated with this alternative would be very similar to those of the Proposed Action, depending upon the location of the borrow site (assumed to be in the general area of the ODMDS). This alternative would likely have greater impacts on marine biological resources than any of the other alternatives because it would involve the disturbance of natural communities rather than communities that have already been disturbed by disposal activities (see Section 3.2.2).

### **2.3 No Action**

In this alternative, the MMS would not enter into a negotiated agreement for use of OCS material and the SCSPA would build the terminal by another means, likely the use of upland borrow material. Fill material would be excavated from one or more upland sites near Charleston and transport to the MCT site either by truck along local roads or by barge along local rivers. Import of 6 million cubic yards would require approximately 600,000 truck round trips on local roads or between 1,500 and 3,700 barge round trips.

Consistent with the Department of the Army permit, SCSPA has committed to delivering at least 75 percent of the fill material by water. This commitment reflects existing traffic conditions: the MCT EIS (USACE 2006) demonstrated that local roads, including a segment of I-26 near the project, are already operating at poor levels of service and could reach failing levels of service as early as 2013 even without project construction.

Import by barge would require triple-handling of the material: once to excavate and load the material onto trucks, once to transfer the material from trucks to barges, and once to unload the barges at the MCT site. This alternative would achieve the project's stated purpose (Section 1.2), but would add cost (because of the additional labor and equipment needed for the extra handling steps) and result in increased construction-related emissions.

### **2.4 Alternative Considered But Eliminated**

MMS considered an alternative in which the MCT would be constructed using material dredged from Charleston Harbor and the approach channel in the course of maintenance dredging. Material would be delivered from the various dredge sites to the MCT site by barges or pipeline, depending upon the size and location of the dredging project. This alternative would not require a Negotiated Agreement from the MMS, but is an example of another approach to constructing the MCT.

This alternative would have the advantages of re-using a resource, i.e., dredged material; avoiding double-handling the material (to dredge it, dispose of it, and then dredge it up for re-use); and avoiding expending existing disposal site capacity. However, it would require that construction of the MCT accommodate the Charleston Harbor maintenance dredging needs and schedule. As noted above, the USACE has indicated that it expects approximately 1.1 million cubic yards of dredged material to be generated through 2010, well short of the 6 million cubic yards needed to build the MCT. To build the MCT from maintenance dredging material would necessitate extending the construction schedule for many years. The delay would prevent the SCSPA from accommodating the future increases in cargo volumes, which was identified by the MCT EIS (USACE 2006) as a key need for the project, and would result in substantial additional costs and lost revenues. Accordingly, this alternative would not achieve the project purpose and was eliminated from further consideration. It is important to note, too, that use of structurally suitable maintenance dredging material that becomes available in the course of terminal construction is a feature of the Proposed Action (Section 2.1).

### **2.5 Rationale for Selection of the Proposed Alternative**

The MMS's rationale for selecting the Proposed Alternative is that it will achieve project objectives and minimize environmental impacts. The Proposed Alternative would allow the beneficial re-use of dredged material; result in less costly completion of the MCT, thereby saving

public funds; and have fewer environmental impacts than all but one of the alternatives. Use of the OCS material at the Charleston ODMDS would be cost-effective compared to importing upland material (the No Action Alternative). Use of ODMDS material would have fewer impacts on marine resources than use of material from an open-ocean site in the Open-Ocean Borrow Alternative.

## 3 ENVIRONMENTAL SETTING

### 3.1 Physical Resources

#### 3.1.1 Geology and Topography

**Ocean Borrow Area:** The Charleston ODMDS is located approximately 7.5 miles southeast of the adjacent barrier islands Folly Island and Morris Island in water depths ranging from -35 ft to -45 ft mean low water (MLW). As described in Section 2.1, the ODMDS is bounded by berms constructed of Cooper marl rising above the seafloor on the southern and western borders to a water depth of approximately -30 ft MLW. The berms were constructed in order to minimize movement of dredged material from the ODMDS during and following disposal. In the interior of the bermed area, two elongated mounds, referred to in this document as interior berms, extend from the southwest side of the site to the northeast side of the site. These were thought to be the result of the disposal operations from various maintenance dredging cycles, but the 2009 SCDNR survey (Appendix A) found that they consist largely of marl, like the exterior berms.

The surface sediments throughout the ODMDS consist of fine sands (71%) and silts, with a median grain size of 0.25 mm (S&ME 2007). Those results are supported by a 2000 study by Zimmerman, Jutte, and VanDolah (2002), which reported that the majority of sediments were medium to fine-grained sands (mean = 78.0% sand content) mixed with moderate amounts of shell hash. The siltiest sediments were concentrated within the disposal zone itself and in the northwestern outer boundary area (i.e., the boundary area closest to the track of barges bringing material from Charleston Harbor to the disposal site). Several hard-bottom areas that support reef communities are located in and just outside the ODMDS boundary zones, generally to the west of the ODMDS (see Section 3.2.2). Sediment migration has been detected outside the ODMDS to the west and northwest during disposal and by natural processes (Zimmerman et al. 2003, Crowe et al. 2006).

Zimmerman, Jutte, and VanDolah (2002) found that sediment contaminant levels were low within the disposal zone and surrounding areas, as would be expected of material approved for ocean disposal. Trace metal, PAH, PCB, and pesticide concentrations above the detection limit were found in several of the monitoring and disposal cells, with highest levels consistently in disposal zone sediments. Contaminant concentrations were all below published bioeffects guidelines. These findings indicate that sediments containing detectable contaminants were largely limited to the disposal zone and comprised a small proportion of the deposited material.

**Marine Terminal Site:** The geology of and dominant physical processes occurring at the fill site are described in the MCT EIS (USACE, 2006, Sections 4.2 and 4.15). The land is flat and low-lying, with elevations ranging from sea level to +21 ft (6.5 m) MLW. The land consists of alluvium from the Cooper River, which borders the peninsula on which the site is located (Figure 1). The site itself contains a variety of habitats, including upland areas (approximately 75 acres),

freshwater wetlands (approximately 2.4 acres), and tidal wetlands (cordgrass, shrubby areas, and salt flats, approximately 10 acres). The adjacent Cooper River is an open-water, mud-bottom area with rip-rap reinforced banks.

The dominant physical process consists essentially of tidal action in the Cooper River, which empties into Charleston Harbor, and in Charleston Harbor itself (USACE 2006, Section 4.15.3). The tide range at the harbor entrance has an average range of 5 feet. Tidal action added to natural river flow produces average ebb flows of approximately 3.6 ft/sec.

### **3.1.2 Oceanography and Water Quality**

**Ocean Borrow Area:** The current regime of the ODMDS and vicinity was characterized by Voulgaris (2002), who found that wind-driven circulation dominates over tidal circulation and that the primary wind-driven current directions are northeast, in response to winter onshore winds, and southwest, in response to summer offshore winds. The wind-generated waves and wind-driven currents dominate sediment transport; strong winds generate waves that suspend fine sediment and currents that steer sediment along the direction of the mean current. Residual flows offshore of Folly Beach have been observed to be predominantly shore-parallel, responding to seasonal winds and tides (Work et al. 2004). Earlier studies, summarized by Zimmerman, Jutte, and VanDolah (2002), found generally similar patterns, although little, if any, southerly water movement was measured. Between 1980 and 1999, the mean significant wave height, period, and direction in the vicinity of the ODMDS were 3.3 ft, 5.4 sec, and 139° True (southeast waves), respectively. The maximum wave height for the period was 32.7 ft with a peak wave period of 15.4 sec and a wave direction of 139° True. Significant wave heights were less than 5 ft at the site approximately 90% of the time, and wave heights in excess of 15 ft occurred approximately 0.1% of the time. The predominant wave period was 4 sec, and 95% of the wave periods were less than 10 sec. The most frequently occurring wave direction was from 130° True with 90% of the waves from 30° True to 250° True. A more complete description of the physical processes characterizing the proposed action area are provided in Appendix B.

Water temperatures in the nearshore shelf area (Caro-COOPS buoy CAP2) range from approximately 52° F (11° C) in winter-spring to approximately 85° F (29° C) at the surface and from approximately 50° F (10° C) to 81° F (27° C) at the bottom (Caro-COOPS n.d.). Salinity at the CAP2 buoy varies only slightly, ranging between 34 and 36 parts per thousand, although short-term reductions in surface salinity occur as a result of storm events. Long-term monitoring of dissolved oxygen concentrations at an ocean inlet southwest of Charleston showed ocean water concentrations typically between approximately 10 mg/liter in the cold months to as low as 4.5 mg/liter in the summer (NERRS 2009). A monitoring study of deep-water candidate disposal sites off the north coast of Florida found generally clear water (transmissivity values of 65 to 70 percent), dissolved oxygen concentrations ranging from 4.5 to 6.5 mg/liter in April and May, and concentrations of dissolved metals ranging from undetectable to a few parts per billion (US EPA 1999).

Dissolved oxygen concentrations below approximately 5 mg/liter (hypoxia) are thought to be detrimental to higher marine organisms (e.g., SC DHEC 2005) if they persist. A low-oxygen event in 2004 caused a massive shoreward migration of flounders at Myrtle Beach, SC, in 2004; subsequent investigation determined that the event was caused by an unfortunate combination of natural processes (upwelling of low-oxygen bottom water and an intrusion of warm Gulf Stream

water) and anthropogenic factors (nutrient inputs from land exacerbated by heavy runoff) that caused oxygen concentrations to drop below 1 mg/liter (SC DHEC 2005).

**Marine Terminal Site:** Water quality at the MCT site is described in USACE (2006), Section 4.15. Temperatures range from approximately 64° F (18° C) to 86° F (30° C) and salinity from approximately 20 parts per thousand to 28 parts per thousand. Dissolved oxygen concentrations in the Cooper River typically range from approximately 4 m/liter to approximately 8 mg/liter, depending on depth, water temperature, and biological activity. Sampling for heavy metals found that copper concentrations exceeded the state water quality standard, but concentrations of lead, mercury, cadmium, nickel, zinc, and chromium did not.

Neither the Cooper River nor Charleston Harbor are included in any 303(d) listing of impaired water bodies. Fish consumption advisories are issued annually for mercury in portions of the Cooper River upstream of the MCT site, but not for the lower tidal reaches or Charleston Harbor (USACE 2006, Section 4.15).

### **3.1.3 Climate**

The alternative sites are very similar with respect to climate; the following description is adapted from the MCT EIS (USACE 2006). Climate within the Action Area is subtropical, with long, hot summers, relatively mild winters of short duration, and plentiful precipitation (as rain; snow is unusual). According to the National Weather Service, average annual rainfall at the Charleston monitoring station is 50.33 inches. Local thunderstorms and tropical storm systems result in the greatest monthly rainfall averages occurring during the summer months. January is the coldest month (average high of 59.1°F, average low of 39.2°F) and July is the warmest month (average high of 89.7°F, average low of 73.1°F). Temperatures at the ODMDS and an open-ocean borrow site would be similar, but generally cooler in the summer and warmer in the winter due to the moderating influence of the ocean.

The Action Area is prone to hurricanes, which bring strong, damaging winds, torrential rains, and tidal storm surges that flood low-lying areas. During the period 1900-2000, 16 hurricanes, four of them major, directly hit the state of South Carolina, for a recurrence interval of approximately 6.25 years. Three of the major hurricanes occurred in September, one during October. Tornadoes do occur, but are rare in coastal areas. However, waterspouts generated by thunderstorms are common over coastal waters.

### **3.1.4 Air Quality**

The Action Area is currently in attainment with all air quality standards as prescribed by the Clean Air Act and amendments. Overall, air quality within the Tri-County region that includes Charleston and the Cape Romain NWR is good: air quality monitoring data for the period 2002 through 2004 show that concentrations of SO<sub>2</sub>, PM<sub>10</sub>, CO, NO<sub>2</sub>, lead, and TSP were far below federal or state standards; PM<sub>2.5</sub> and ozone concentrations approached but never exceeded the standards (USACE 2006, Table 4.11-2).

## **3.2 Biological Environment**

This section describes the general biological setting of the ODMDS and the Marine Terminal Site, in order to provide context for the direct and indirect impacts of the proposed action. Listed

species are described in the appropriate resource areas (upland communities, plankton, benthos, fish, turtles, and marine mammals). More detailed information on biological resources at the MCT site is presented in the MCT EIS (USACE 2006, Section 4.17). Potential impacts of the alternatives on federally protected and managed biological resources are evaluated in Section 3.2.5 of this document.

### **3.2.1 Vegetative Resources**

The proposed borrow area under the Proposed Action and the alternate borrow areas under the Open-Ocean Borrow alternative have no aquatic vegetation resources other than the phytoplankton that is a normal component of the water column. Under the No Action Alternative, borrow would come from existing sand mines, which can be assumed to have no vegetation.

According to the MCT EIS (USACE 2006; Section 4.17), the site of the proposed marine terminal is characterized by a mixture of upland vegetation, including coastal scrub forest, revegetated dredged material, and landscaping, pockets of freshwater marsh, and tidal wetlands. The upland forests are secondary growth, having colonized previously disturbed military lands in the past few decades. The freshwater wetland habitats are pockets of forested and unforest wetlands less than an acre in extent, mostly on the fringes of the tidal wetland areas. The tidal wetlands range from emergent, cordgrass low marsh to shrub-dominated high marsh. The open-water subtidal area adjacent to the terminal site does not support aquatic vegetation other than phytoplankton and sparse macroalgae.

### **3.2.2 Avian Resources**

Avian resources at the ODMDS and the Open Ocean Borrow Site would consist of seabirds, the most common of which, according to Jodice et al. (2007), would be laughing gulls (*Larus auritus*), brown pelicans (*Pelecanus occidentalis*), royal terns (*Sterna maxima*), and Sandwich terns (*Sterna sandvicensis*). Pelicans and terns maintain several nesting colonies along the coast of South Carolina, including Crab Bank and Castle Pinckney in Charleston Harbor, and Bird Key approximately 15 miles southwest of Charleston Harbor (Jodice et al. 2007). These species and gulls typically feed in coastal waters, foraging on bait fish such as menhaden, sardines, anchovies, and mullet. Far-ranging pelagic seabirds such as tropicbirds, petrels, jaegers, gannets, and shearwaters would also be expected in coastal waters at various times of the year, feeding on schools of bait fish and squid (Lee and McDonough 2001).

According to the MCT EIS (USACE 2006; Section 4.17), avian resources at the MCT site consist of a variety of upland and wetland bird species common to the southeastern United States. Raptors (ospreys, red-tailed hawks, vultures, kestrels), pelicans, several gull species, four species of herons and egrets, cormorants, coots and mergansers, killdeers, and about 20 species of passerines (e.g., robins, jays, grackles, warblers) were sighted during field surveys.

### **3.2.3 Aquatic Resources and Communities**

Habitats at the Proposed Action borrow area (ODMDS) consist of both open-ocean water and bottom sediments; the latter include both hard-bottom and soft-bottom areas outside the ODMDS, as well as coarse marls, sand, and silty sands deposited inside the ODMDS by dredging projects (see section 3.1.1). Habitats at the Open-Ocean alternative borrow area would be similar except that the soft-bottom habitat would be native sands and silty sands rather than



dredged material. Habitats along the transport pathway from the ocean sites to the MCT site consist of the estuarine and nearshore water column and benthic habitat that ranges from soft muds to firm sands.

The aquatic communities of the marine terminal site are summarized in the MCT EIS (USACE, 2006, Section 4.17); potentially affected habitats include estuarine water column in the Cooper River; intertidal oyster reefs, shell banks, and mudflats; and subtidal soft bottom.

**Water Column Habitats:** The nearshore water column supports zooplankton and phytoplankton assemblages that serve as food for juvenile fish and commercially important invertebrates. Demersal and pelagic fish inhabit the water column (see section 3.2.3), including a number of managed species, and several species of marine mammals and sea turtles pass through the site in the water column (see section 3.2.4).

The estuarine water column of Charleston Harbor supports similar zooplankton and phytoplankton assemblages as the nearshore regions, but with differences caused by the shallow depths, higher turbidity, and wider range of salinity characteristic of estuaries. Estuarine zooplankton is typically characterized by fewer species, but more individuals, than open ocean assemblages, and is dominated by species adapted to salinity fluctuations and high rates of tidal flushing (e.g., Cronin, Daiber, and Hulbert 1962).

**Hard-Bottom Benthic Habitats (“Live Bottom”):** Hard-bottom areas near the ODMDS (Figure 12) and elsewhere along the coast of South Carolina support low-profile reefs characterized primarily by soft corals (e.g., *Leptogorgia virgulata*. and *Titanideum* sp.), the massive sponge *Ircinia* sp., and various encrusting sponges. These areas are typically rocky outcroppings that support the growth of attached and encrusting invertebrates (as opposed to the burrowing and epibenthic organisms characteristic of soft bottoms), and are considered valuable fish habitat. As Figure 12 shows, known live-bottom habitat occurs mostly outside the three-mile limit in water deeper than approximately 30 feet (9 m), but potential hard-bottom habitat is widely distributed along the coast, even in waters less than approximately 20 ft (6 m) deep. Live bottoms in the South Atlantic area represent Essential Fish Habitat for the snapper-grouper complex and spiny lobsters (MMS 2008b).

Low-relief (generally less than 3 ft) and low-growth hard bottom reef habitats are patchily distributed within 2.5 miles of the ODMDS (Crowe et al. 2006). The percent occurrence of sessile, erect growth forms at most neighboring reefs during a five-year monitoring period did not change significantly during disposal operations, and at sites where significant changes did occur, the changes did not appear to be related to movement of disposal material, but rather natural processes (Crowe et al. 2006). A five-year video survey by Crowe et al. (2006) of reefs near the ODMDS found a variety of finfish, notably black sea bass, scup, porgies, wrasses, and grunts (all members of the snapper-grouper complex). They found no difference in abundance or diversity between control reefs (C1 and C2 in Figure 13) and reefs near the ODMDS, and stated that, “The abundance of finfish individuals or species observed at study sites and reference areas does not appear to be affected by disposal activities during the five year survey period.” They also examined the encrusting fauna that characterizes these reefs and found that while there were some differences among sites, those differences “do not appear to be related to movement of disposal material.”

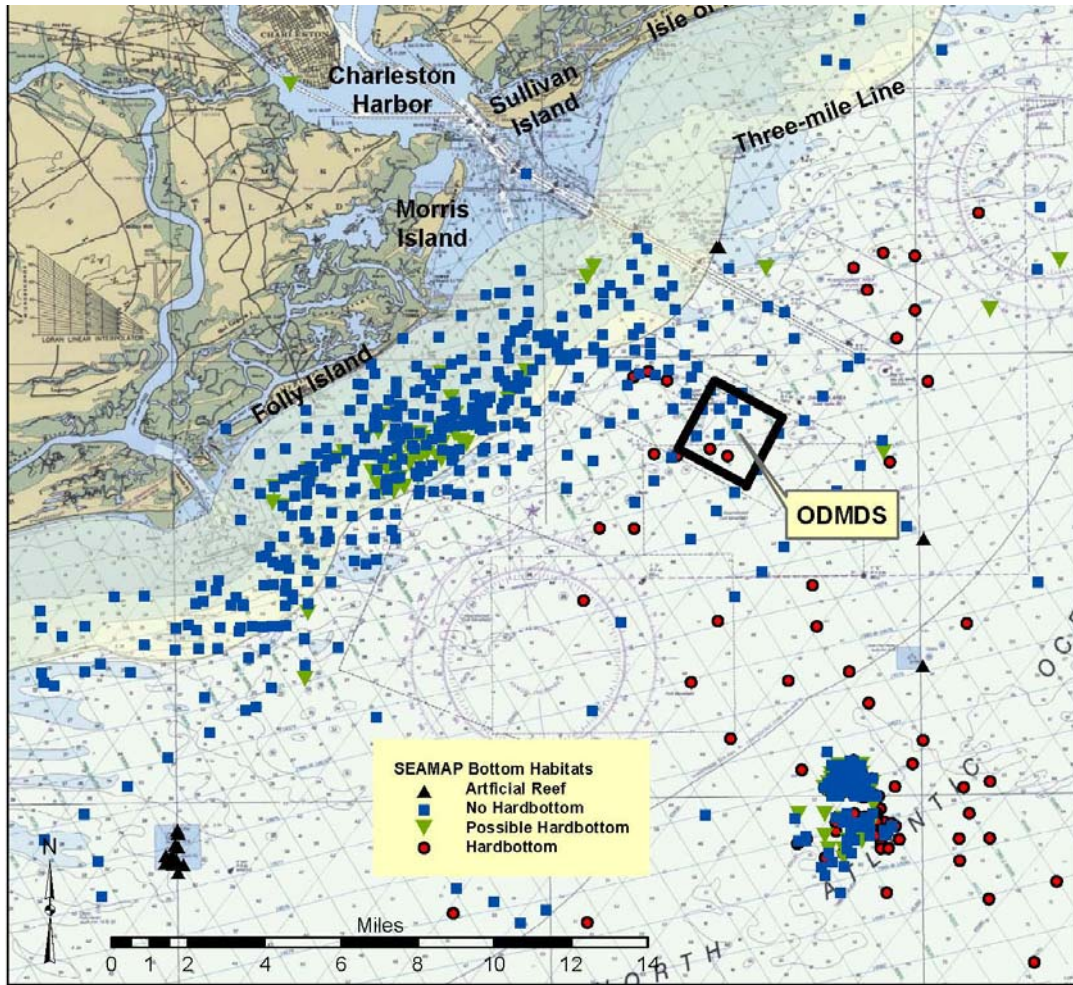


Figure 12. Location of known and potential hard-bottom areas in the Action Area (Source: SEAMAP 2008)

**Soft-Bottom Benthic Habitats:** The soft-bottom benthic assemblages of the coastal ocean off South Carolina, which would include both the Proposed Action borrow area and the Open Ocean Borrow area, are typical of the subtropical continental shelf (Table 3-1). A 2000 monitoring study of the ODMDS and nearby areas (Zimmerman, Jutte, and VanDolah 2002) collected 402 taxa with a site-wide mean density of 3,939 individuals per m<sup>2</sup>. Polychaetes were the most abundant taxonomic group, comprising 56% of all organisms identified in samples collected during 2000. The category 'other taxa' (e.g. *Nemertina*, *Branchiostoma* sp., *Polygordiidae*) made up 21% of the total abundance, and amphipods and molluscs comprised 13% and 10% of the total abundance, respectively. The first fourteen taxa listed in Table 3-1 made up 50% of the total number of individuals.

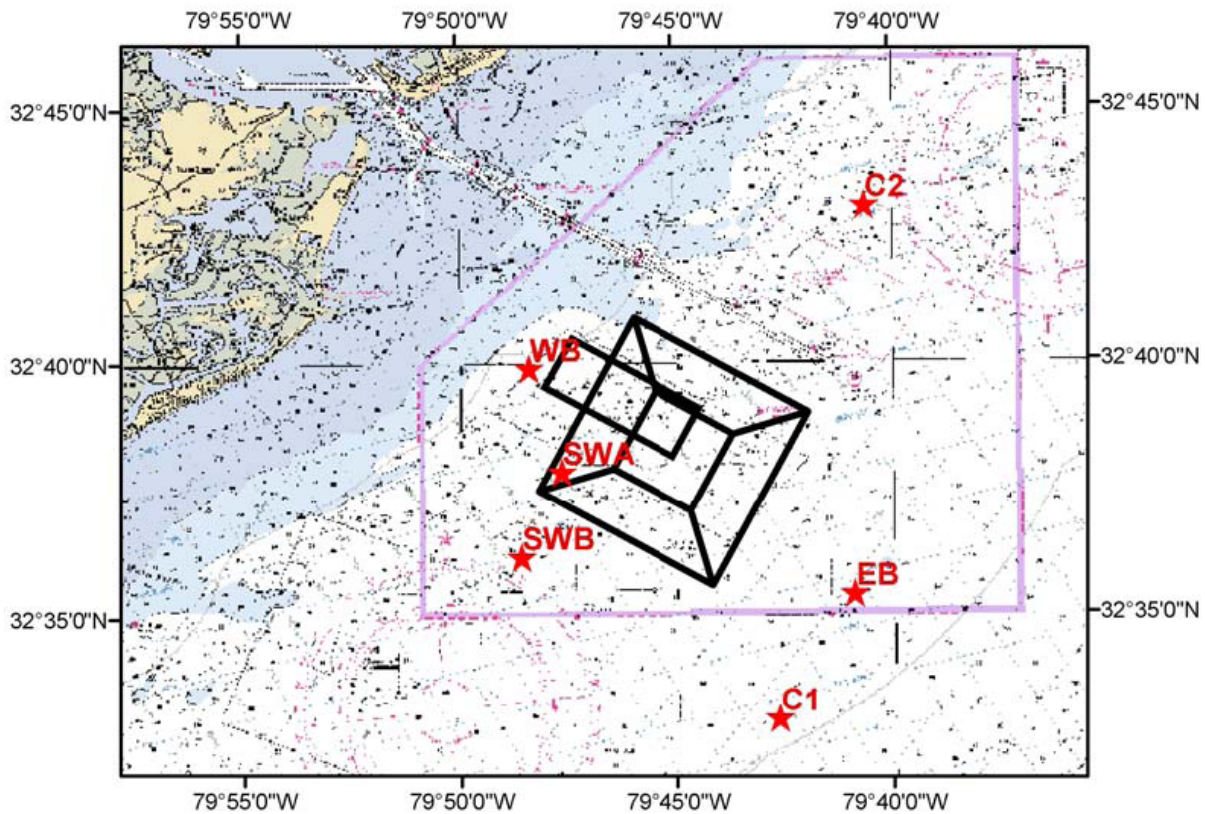


Figure 13. Location of reef sites in and near the ODMDS (delineated in black) surveyed by Crowe et al. (2006); other areas of hard bottom south and west of the ODMDS are not shown.

At the ODMDS, the monitoring cells affected by disposal activities had benthic assemblages somewhat different than those of the non-impacted cells. A statistical comparison showed that while seven of the eleven numerically dominant taxa were common to both non-impacted and impacted cells, the impacted cells had fewer *Prionospio cristata* and Polygordiidae and more *P. dayi* and Nemertina than the non-impacted cells. Furthermore, *Branchiostoma* sp. and *Eudevenopus honduranus* were among the top eleven taxa for the non-impacted cells but not for the impacted cells. Both of these taxa, accordingly to Zimmerman et al. (2002), are not characteristic of muddy sediments. *Magelona* sp. and *Protohaustorius deichmannae*, both associated with muddy sediments, were among the dominants in the impacted cells but not in the non-impacted cells. These changes indicate that the disposal of fine-grained material, which has occurred almost every year since 1988 (USACE et al. 2005), has somewhat changed the composition of the benthic infaunal community at the ODMDS, although Zimmerman et al. (2002) characterize the changes as subtle.

According to USACE (2006, Sections 4.17.4 and 4.17.5), the intertidal habitat at the marine terminal site supports scattered oyster beds, none of them commercially valuable, and benthic invertebrates typical of shell banks and mudflats (polychaete worms, mussels and burrowing bivalves, and small crabs, amphipods, and other crustaceans). The subtidal benthic habitat of the Cooper River supports abundant white and brown shrimp, which are commercially and recreationally important (see section 3.2.4), blue crabs, and a variety of infauna such as polychaete worms, clams, and various small crustaceans.

Five non-indigenous marine species are known to be present in Charleston Harbor, including two barnacles (*Balanus trigonus* and *B. amphitrite*), an isopod nicknamed the ‘wharf roach’ (*Ligia exotica*), an amphipod (*Apocorophium lacustre*), and the green porcelain crab (*Petrolisthes armatus*) (USACE 2006, Section 4.17.8). The Asian green mussel (*Perna viridis*) has also been found in Charleston Harbor.

Table 3-1. The twenty-five numerically dominant taxa collected in and around the ODMDS in 2000

Species Name	Type	Total Abundance	Species Name	Type	Total Abundance
<i>Prionospio dayi</i>	P	3078	<i>Myriochele oculata</i>	P	633
<i>Prionospio cristata</i>	P	2413	<i>Bhawania heteroseta</i>	P	578
<i>Branchiostoma</i> sp.	O	1840	<i>Mediomastus californiensis</i>	P	555
<i>Rhepoxynius epistomus</i>	A	1818	<i>Mellita</i> sp.	O	555
<i>Sabellaria vulgaris</i>	P	1728	<i>Goniada littorea</i>	P	495
Nemertinea	O	1633	Ophiuroidea	O	493
<i>Prionospio</i> sp.	P	1163	<i>Acanthohaustorius intermedius</i>	A	455
Sabellariidae	P	1103	Oligochaeta	O	453
<i>Magelona</i> sp.	P	1018	<i>Synelmis ewingi</i>	P	435
Polygordiidae	O	1008	<i>Armandia maculata</i>	P	380
<i>Mediomastus</i> sp	P	870	<i>Natica pusilla</i>	M	370
<i>Eudevenopus honduranus</i>	A	835	<i>Crassinella martinicensis</i>	M	343
<i>Protohaustorius deichmannae</i>	A	800			

Values are mean number of organisms per m<sup>2</sup> P = Polychaete, A = Amphipod, M = Mollusc, O = Other  
 Source: Zimmerman, Jutte, and VanDolah 2002.

### 3.2.4 Fish Resources

South Carolina’s open coastal waters in the vicinity of the ODMDS support two major fish habitats, as defined by Oakley and Pugliese (2001): the live/hard-bottom areas described above and the flat, soft-bottom area that comprises most of the nearshore shelf. The live/hard-bottom fish assemblage, as noted above, is dominated by snapper-grouper species, notably black sea bass (*Centropristis striata*), which are very abundant over South Carolina nearshore hard bottoms (Van Dolah 2009, SCDNR website). These species have a variety of feeding habitats, although they all depend heavily on reef resources. Black sea bass and most of the groupers, top predators in hard-bottom habitats as adults, are opportunistic feeders on fish and benthic invertebrates, including shrimp and crabs (SAFMC 2009, SMS 2005). Lower-order predators such as scup (*Stenotomus chrysops*), hogfish (*Lachnolaimus maximus*), and porgy (*Pagrus* spp.) tend to pick encrusting invertebrates off of hard substrates (SAFMC 2009). Grunts (*Haemulon* spp.) are bottom-feeders on small invertebrates associated with the reefs and adjacent soft bottoms (SAFMC 2009). Small forage fish such as gobies (Gobiidae), blennies (Labrisomidae), damselfish (Pomacentridae), and the young of larger species feed on reef algae, small

invertebrates, and zooplankton, and serve as food for larger fish, including open-water species that forage over the reefs.

The soft-bottom assemblage includes nearshore demersals, coastal pelagics, and open-ocean pelagics that migrate through the study area. Abundant demersal species include drums and croakers (e.g., *Cynoscion regalis*, *Leiostomus xanthurus*, *Micropogonias undulatus*, *Pogonias cromis*, *Sciaenops ocellatus*, *Stellifer lanceolatus*), seabasses (*Centropristis* spp.), grunts (Haemulidae), several species of flounders (*Paralichthys* spp.), small forage fish such as searobin (*Prionotus carolinus*), lizardfish (*Synodus foetens*), and toadfish (*Opsanus tau*), and skates and rays (e.g., *Raja eglanteri*, *Dasyatis americana*). The demersal fish tend to be bottom-feeders that depend heavily upon the benthic habitat for their food base. Drums, croakers, skates, and rays prey on the infauna (e.g., worms, clams, amphipods, and small burrowing fish such as lizardfish and gobies) and epifauna (e.g., shrimp, crabs, snails, toadfish, and searobins) of the soft bottom (SAFMC 2009, SMS 2005). Flounders, top predators in the demersal habitat (SMS 2005), are largely piscivorous as adults but tend to feed on epibenthic invertebrates as juveniles (SCDNR website, 2005).

Pelagic fish include small, schooling forage fish such as Atlantic menhaden (*Brevoortia tyrannus*), shad (*Alosa* spp.), anchovies and sardines, and mullet (*Mugil cephalus*) that feed largely on plankton, algae, and organic detritus (SMS 2005), as well as larger, predatory species such as silver perch (*Bairdiella chrysoura*), barracuda (*Sphyraena barracuda*), mackerel species (*Scomberomorus maculatus*, *S. cavalla*, *Acanthocybium solanderi*), bluefish (*Pomatomus saltatrix*), and various sharks (e.g., *Carcharhinus limbatus*, *Isurus oxyrinchus*, *Squalus acanthias*). The forage fish feed largely on plankton, and are themselves fed upon by most of the predatory organisms of the open coastal habitat (SMS 2005); anchovies, sardines, and menhaden are important food for many predatory fish and seabirds. Bluefish, barracuda, and mackerel, important coastal predators, feed on the forage fish, on squid, and on one another, and are in turn fed upon by larger predators such as sharks and billfish (SMS 2005). Oceanodromous species that are encountered in shelf waters include several members of the tuna family (e.g., *Thunnus* spp., *Euthunnus* spp.), occasional billfish such as marlins and swordfish, and dolphins (*Coryphaena hippurus*); all of these species are piscivorous top predators.

A study of Charleston Harbor by Van Dolah et al. (1990) found large numbers of the forage fish Atlantic menhaden (*Brevoortia tyrannus*) and bay anchovy (*Anchoa mitchilli*); the pelagic predator silver perch (*Bairdiella chrysoura*), and the demersal predators weakfish (*Cynoscion regalis*), spot (*Leiostomus xanthurus*), Atlantic croaker (*Micropogonias undulates*), and star drum (*Stellifer lanceolatus*) were also found in large numbers. Summer flounder (*Paralichthys dentatus*) and southern flounder (*P. lethostigma*), which are important recreational species and key predators of fish and large invertebrates (SMS 2005), were caught in low numbers throughout the year. Sharks, skates, and rays can all potentially be found in Charleston Harbor. Schwartz (2003) reported that six species of sharks (smooth dogfish, spiny dogfish, blacknose shark, Atlantic sharpnose shark, tiger shark, and dusky shark) can pup their young in Carolinian waters during warm summer months.

Dominant finfish species in the Cooper River, adjacent to the MCT site (USACE 2006, Section 4.17.5), include bay anchovy (*Anchoa mitchilli*), Atlantic menhaden (*Brevoortia tyrannus*), spot (*Leiostomus xanthurus*), Atlantic croaker (*Micropogonias undulates*), and southern flounder (*Paralichthys lethostigma*). Some recreationally important fish such as red drum, spotted sea trout, and catfish are present in low abundance, and the river is also used by several anadromous

and catadromous species including American shad (*Alosa sapidissima*), hickory shad (*Alosa mediocris*), blueback herring (*Alosa aestivalis*), Atlantic sturgeon (*Acipenser oxyrhynchus*), and American eel (*Anguilla rostrata*).

### 3.2.5 Marine Mammals

According to the MCT EIS (USACE 2006), marine mammals may be present in the coastal waters of the Action Area. This EA discusses all marine mammals and sea turtles that are known to have occurred or might reasonably be expected to occur in the Proposed Action Area. The ESA-listed species are discussed in the Biological Assessment (BA), submitted to NOAA (included as Appendix C of this EA) and summarized in Section 3.2.6. This section considers marine mammals not listed under the ESA. There are 25 marine mammal species that could possibly occur in the proposed action area; key aspects of their biology are summarized below.

#### Minke Whale (*Balaenoptera acutorostrata*)

Minke whales off the eastern U.S. are considered to be part of the Canadian East Coast stock which inhabits the area from the eastern half of the Davis Strait to 45°W and south to the Gulf of Mexico (Waring et al. 2007). The best estimate of abundance for the Canadian East Coast stock is 3,312 individuals; the minimum population estimate is 1,899 individuals (Waring et al. 2008).

Off eastern North America, minke whales generally remain in waters over the continental shelf, including inshore bays and estuaries (Mitchell and Kozicki 1975; Murphy 1995; Mignucci-Giannoni 1998). However, based on whaling catches and global surveys, there is an offshore component to minke whale distribution (Slijper et al. 1964; Horwood 1990; Mitchell 1991).

Minke whales are distributed in polar, temperate, and tropical waters (Jefferson et al. 1993); they are less common in the tropics than in cooler waters. This species is more abundant in New England waters rather than the mid-Atlantic (Hamazaki 2002). The southernmost sighting in recent NMFS shipboard surveys was of one individual offshore of the mouth of Chesapeake Bay, in waters with a bottom depth of 11,400 ft. (3,475 m) (Mullin and Fulling 2003).

Minke whales seem to have a strong seasonal influence in their distribution (Horwood 1990). Spring and summer are periods of relatively widespread and minke whale occurrence off the northeastern U.S. During fall in New England waters, there are fewer minke whales but during early winter (January and February), the species appears to be largely absent from this area (Waring et al. 2007). Minke whales off the U.S. Atlantic Coast seem to migrate offshore and southward in winter (Mitchell 1991; Mellinger et al. 2000). Minke whales are known to occur during the winter months (November through March) in the western North Atlantic from Bermuda to the West Indies (Winn and Perkins 1976; Mitchell 1991; Mellinger et al. 2000). Based on their distribution and the depth of the proposed action area, minke whales are unlikely to occur in the Proposed Action Area.

#### Bryde's Whale (*Balaenoptera edeni/brydei*)

Bryde's whales can be easily confused with sei whales. It is not clear how many species of Bryde's whales exist but genetic analyses suggest at least two species (Rice 1998; Kato 2002). No abundance information is currently available for Bryde's whales in the western North Atlantic (Waring et al. 2008).

Bryde's whales are found both offshore and near the coasts in many regions. They are found in subtropical and tropical waters and generally do not range north of 40° in the northern hemisphere or south of 40° in the southern hemisphere (Jefferson et al. 1993). In the Atlantic,

Bryde's whales are distributed in the Gulf of Mexico and Caribbean Sea south to Cabo Frio, Brazil (Cummings 1985; Mullin et al. 1994c). Long migrations are not typical of Bryde's whales although limited shifts in distribution toward and away from the equator in winter and summer, respectively, have been observed (Cummings 1985). Based on their distribution and the depth of the proposed action area, Bryde's whales are unlikely to occur in the Proposed Action Area.

#### Pygmy and Dwarf Sperm Whales (*Kogia breviceps* and *K. sima*)

There are two species of *Kogia*: the pygmy sperm whale and the dwarf sperm whale, which are difficult to tell apart. There is currently no information to differentiate Atlantic stock(s) (Waring et al. 2007). The best estimate of abundance for both species combined in the western North Atlantic is 395 individuals; the minimum population estimate is 285 individuals (Waring et al. 2007).

*Kogia* spp. occur in waters along the continental shelf break and over the continental slope (e.g., Baumgartner et al. 2001; McAlpine 2002). Baumgartner et al. 2001 state that data from the Gulf of Mexico suggest that *Kogia* spp. may associate with frontal regions along the continental shelf break and upper continental slope, where higher epipelagic zooplankton biomass may enhance the densities of squids, their primary prey. *Kogia* species have a worldwide distribution in tropical and temperate waters (Jefferson et al. 1993). Based on their distribution and the depth of the proposed action area, *Kogia* spp. are unlikely to occur in the Proposed Action Area.

#### Beaked Whales (Family Ziphiidae)

Cuvier's beaked whales and four members of the genus *Mesoplodon* (True's, Gervais', Blainville's, and Sowerby's beaked whales) which are nearly indistinguishable at sea (Coles 2001). The best estimate of *Mesoplodon* spp. and Cuvier's beaked whale abundance combined in the western North Atlantic is 3,513 individuals, with a minimum population estimate of 2,154 (Waring et al. 2007). Little is known about beaked whale habitat associations. Distribution of *Mesoplodon* spp. in the North Atlantic may relate to water temperature (MacLeod 2000b). The Blainville's and Gervais' beaked whales occur in warmer southern waters, in contrast to Sowerby's and True's beaked whales that are more northern (MacLeod 2000a). World-wide, beaked whales normally inhabit continental slope and deep oceanic waters (> 200 m) (Waring et al. 2001; Cañadas et al. 2002; Pitman 2002; MacLeod et al. 2004; Ferguson et al. 2006; MacLeod and Mitchell 2006). Beaked whales are only occasionally reported in waters over the continental shelf (Pitman 2002). In the southeast U.S., beaked whales are seen in waters with a mean bottom depth ranging from 2,100 to 15,700 ft (642 to 4,480 m) (Ward et al. 2005). Beaked whale abundance off the eastern U.S. may be correlated to the Gulf Stream and warm-core rings (Waring et al. 1992). The continental shelf break off the northeastern U.S. is primary habitat in the summer (Waring et al. 2001). In 2002, Waring et al. (2003) conducted a deepwater survey south of Georges Bank and examined fine-scale beaked whale habitat use. They found that beaked whales were located in waters with a mean sea-surface temperature of 20.7° to 24.9°C and a bottom depth of 1,600 to 6,600 ft (500 to 2,000 m). Sightings of beaked whales have been made in southern Georges Bank, near Oceanographer Canyon, between the 660 and 6,600 ft (200 and 2,000 m) isobaths, and did not coincide with a thermal gradient (Waring et al. 1992).

Cuvier's and Blainville's beaked whales are generally sighted in waters with a bottom depth greater than 660 ft. (200 m) and are frequently recorded at bottom depths greater than 3,300 ft. (1,000 m) (e.g., Ritter and Brederlau 1999; Gannier 2000; MacLeod et al. 2004; Claridge 2005; Ferguson 2005). At oceanic islands, both Baird et al. (2004) and MacLeod et al. (2004) reported

that Cuvier's beaked whales are found in deeper waters than Blainville's beaked whales. Most ecological information on Blainville's beaked whales comes from the northern Bahamas (MacLeod et al. 2004; Claridge 2005; MacLeod and Zuur 2005). According to Claridge (2005), Blainville's beaked whales in the northern Bahamas are found along shelf waters of canyon walls and in deeper offshore waters. Most time is spent along these walls where bottom depths are less than 2,600 ft (800 m) (Claridge 2003; MacLeod et al. 2004; MacLeod and Zuur 2005). Tove (1995) reported sighting a True's beaked whale off North Carolina well within the Gulf Stream in roughly 3,600 ft. (1,100 m) of water along a steep portion of the continental shelf. Weir et al. (2004) sighted True's beaked whales in the eastern North Atlantic in waters with a bottom depth of 7,200 to 13,400 ft (2,200 to 4,100 m).

Cuvier's beaked whales are the most widely-distributed of the beaked whales and are present in most regions of all major oceans (Heyning 1989; MacLeod et al. 2006). This species occupies almost all temperate, subtropical, and tropical waters, as well as subpolar and polar waters in some areas (MacLeod et al. 2006). The ranges of most mesoplodonts are poorly known. In the western North Atlantic and Gulf of Mexico, these animals are known mostly from strandings (Mead 1989; MacLeod 2000a; MacLeod et al. 2006). Blainville's beaked whales are thought to have a continuous distribution throughout tropical, subtropical, and warm-temperate waters of the world's oceans; they occasionally occur in cold-temperate areas (MacLeod et al. 2006). The Gervais' beaked whale is restricted to warm-temperate and tropical Atlantic waters with records throughout the Caribbean Sea (MacLeod et al. 2006). The Gervais' beaked whale is the most frequently-stranded beaked whale in the Gulf of Mexico (Würsig et al. 2000). The Sowerby's beaked whale is endemic to the North Atlantic (MacLeod et al. 2006). There has been a sighting made southeast of Hatteras Inlet, North Carolina (note that the latitude provided by Tove is incorrect) (Tove 1995). Based on their distribution and the depth of the proposed action area, beaked whales are unlikely to occur in the Proposed Action Area.

#### Rough-Toothed Dolphin (*Steno bredanensis*)

Abundance estimates are not available for rough-toothed dolphins in the western North Atlantic (Waring et al. 2007). The rough-toothed dolphin is regarded as an offshore species that prefers deep waters; however, it can occur in shallow waters as well (e.g., Gannier and West 2005). Stranded and rehabilitated individuals have been released with tags off the Atlantic Coast of Florida in March 2005. After being released, they moved in waters as deep as 16,000 ft. (5,000 m) (Manire and Wells 2005). The rough-toothed dolphin may regularly frequent coastal waters and areas with shallow bottom depths. Off the Florida Panhandle, this species can be found over the continental shelf (Fulling et al. 2003; Mullin et al. 2004).

Tagged and released rough-toothed dolphins off the Atlantic coast of Florida in 2005 swam to cooler and deeper waters (Manire and Wells 2005). These waters averaged 19°C. Rough-toothed dolphins are found in tropical to warm-temperate waters globally, rarely ranging north of 40°N or south of 35°S (Miyazaki and Perrin 1994). Based on their distribution and the depth of the proposed action area, rough-toothed dolphins are unlikely to occur in the Proposed Action Area.

#### Bottlenose Dolphin (*Tursiops truncatus*)

Of all species in the western North Atlantic, the species most commonly found in the proposed action area is the bottlenose dolphin. Scientists currently recognize several nearshore (coastal) and an offshore morphotype or form of bottlenose dolphins, which are distinguished by external and cranial morphology, parasite load, hematology, and diet (Duffield et al. 1983; Hersh and



Duffield 1990; Mead and Potter 1995; Curry and Smith 1997). There is a genetic distinction between nearshore and offshore bottlenose dolphins worldwide (Curry and Smith 1997; Hoelzel et al. 1998). Two forms of bottlenose dolphins are recognized in the western North Atlantic Ocean: nearshore (coastal) and offshore morphotypes. Each morphotype is referred to as a stock by NMFS. This is further broken down into seven discrete management units (MU) (or stocks) that have distinct spatial and temporal components. NMFS provides abundance estimates for each MU by season. The South Carolina management unit is believed to be comprised of 2,325 bottlenose dolphins, with a minimum of 1,963 individuals (Waring et al. 2007). Currently, a single western North Atlantic offshore stock is recognized seaward of 21 miles (34 km) from the U.S. coastline (Waring et al. 2007). The best population estimate is 81,588 individuals and the minimum population estimate for this stock is 70,775 individuals (Waring et al. 2007).

The MUs of the coastal morphotype show a temperature-limited distribution, occurring in significantly warmer waters than the offshore stock, and having a distinct northern boundary (Kenney 1990). Surface water temperature may influence seasonal movements of migrating coastal dolphins along the western North Atlantic coast (Barco et al. 1999); these seasonal movements are likely also influenced by movements of prey resources. In the western North Atlantic, the greatest concentrations of the offshore stock are along the continental shelf break (Kenney 1990). Evidence suggests that the offshore stock does not inhabit waters closer than 7 miles (12 km) from shore during summer and 17 miles (27 km) from shore during winter (Garrison and Yeung 2001). During CETAP surveys, offshore bottlenose dolphins generally were distributed between the 660 and 6,600 ft. (200 and 2,000 m) isobaths in waters with a mean bottom depth of 2,780 ft (846 m) from Cape Hatteras to the eastern end of Georges Bank. Geography and temperature also influence the distribution of offshore bottlenose dolphins (Kenney 1990). Bottlenose dolphins are expected to be the most common species in the Proposed Action Area.

#### Pantropical Spotted Dolphin (*Stenella attenuata*)

The best estimate of abundance of the western North Atlantic stock of pantropical spotted dolphins is 4,439 individuals while the minimum estimate is 3,010 (Waring et al. 2007). There is no information on stock differentiation for pantropical spotted dolphins in the U.S. Atlantic (Waring et al. 2007). Pantropical spotted dolphins tend to associate with bathymetric relief and oceanographic interfaces. Most sightings of this species in the Gulf of Mexico, Caribbean, and off Brazil occur over the lower continental slope (Davis et al. 1998; Mignucci-Giannoni et al. 2003; Mullin et al. 2004; Moreno et al. 2005). Mignucci-Giannoni et al. (2003) reported a sighting over the Puerto Rican Trench, one of the deepest areas in the world. Pantropical spotted dolphins may rarely be sighted in shallower waters (e.g., Peddemors 1999; Gannier 2002; Mignucci-Giannoni et al. 2003). Based on their distribution and the depth of the proposed action area, pantropical spotted dolphins are unlikely to occur in the Proposed Action Area.

#### Atlantic Spotted Dolphin (*Stenella frontalis*)

The best estimate of Atlantic spotted dolphin abundance in the western North Atlantic is 50,978 individuals, with a minimum estimate of 36,235 individuals (Waring et al. 2007). Recent genetic evidence suggests that there are at least two populations in the western North Atlantic roughly divided along a latitudinal boundary corresponding to Cape Hatteras (Adams and Rosel 2006), as well as possible continental shelf and offshore segregations. Atlantic spotted dolphins occupy both continental shelf and offshore habitats. Griffin et al. (2005) proposed that Atlantic spotted dolphins spend more time feeding over the continental shelf in winter than during summer.

Atlantic spotted dolphins are found commonly in inshore waters south of Chesapeake Bay as well as over continental shelf break and slope waters north of this region (Payne et al. 1984; Mullin and Fulling 2003). Sightings have also been made along the northern wall of the Gulf Stream and its associated warm-core ring features (Waring et al. 1992).

Atlantic spotted dolphins are distributed in warm-temperate and tropical Atlantic waters from approximately 45°N to 35°S; in the western North Atlantic (Perrin et al. 1987). Based on their distribution and the depth of the proposed action area, Atlantic spotted dolphins are unlikely to occur in the Proposed Action Area.

#### Spinner Dolphin (*Stenella longirostris*)

There is no estimate of abundances currently available for the western North Atlantic stock of spinner dolphins (Waring et al. 2007). Stock structure in the western North Atlantic is unknown (Waring et al. 2008).

Spinner dolphins occur in both oceanic and coastal environments. Most sightings of this species have been associated with inshore waters, islands, or banks (Perrin and Gilpatrick 1994).

Oceanic populations, such as those in the eastern tropical Pacific, are often found in waters with a shallow thermocline (Au and Perryman 1985; Reilly 1990). The thermocline concentrates pelagic organisms in and above it; spinner dolphins feed on this aggregation of prey. Coastal populations are usually found in island archipelagos where they are tied to trophic and habitat resources associated with the coast (Norris and Dohl 1980; Poole 1995). Spinner dolphin distribution in the Gulf of Mexico and off the northeastern U.S. coast is primarily in offshore waters. Along the northeastern U.S. and Gulf of Mexico, they are distributed in waters with a bottom depth greater than 6,600 ft. (2,000 m) (CETAP 1982; Davis et al. 1998). Off the eastern U.S. coast, spinner dolphins were sighted within the Gulf Stream, which is consistent with the oceanic distribution and warm-water associations of this genus (Waring et al. 1992).

Spinner dolphins are found in subtropical and tropical waters worldwide, with different geographical forms in various ocean basins. The range of this species extends to near 40° latitude (Jefferson et al. 1993). Based on their distribution and the depth of the proposed action area, spinner dolphins are unlikely to occur in the Proposed Action Area.

#### Striped Dolphin (*Stenella coeruleoalba*)

The best estimate of striped dolphin abundance in the western North Atlantic is 94,462 individuals, and the minimum estimate is 68,558 individuals (NOAA 2007). Striped dolphins are usually found beyond the continental shelf, typically over the continental slope out to oceanic waters and, often associated with convergence zones and waters influenced by upwelling (Au and Perryman 1985). They appear to avoid waters with sea temperatures of less than 20°C (Van Waerebeek et al. 1998). Off the northeastern U.S., striped dolphins are distributed from the southern margin of Georges Bank, along the continental shelf break to Cape Hatteras, and offshore over the continental slope and continental rise (CETAP 1982). Continental shelf break sightings were generally centered along the 3,300 ft. (1,000 m) isobath year-round (CETAP 1982). Striped dolphins likely have a northern limit associated with the meanderings of the Gulf Stream (Perrin and Gilpatrick, 1994; Archer II and Perrin 1999). Striped dolphins are known to associate with the Gulf Stream's northern wall and warm core ring features (Waring et al. 1992).

Striped dolphins are distributed worldwide in cool-temperate to tropical zones. In the western North Atlantic, this species occurs from Nova Scotia southward to the Caribbean Sea, Gulf of

Mexico, and Brazil (Würsig et al. 2000). Based on their distribution and the depth of the proposed action area, striped dolphins are unlikely to occur in the Proposed Action Area.

#### Clymene Dolphin (*Stenella clymene*)

For management purposes, the population in the western North Atlantic is currently considered a separate stock from the Gulf of Mexico stock, although, there is not enough information to distinguish this stock from the Gulf of Mexico stock(s) (Waring et al. 2007). The best estimate of abundance for the western North Atlantic stock of Clymene dolphins is 6,086 individuals (Mullin and Fulling 2003; Waring et al. 2007). Clymene dolphins are a tropical to subtropical species, primarily sighted in deep waters well beyond the edge of the continental shelf (Fertl et al. 2003). Clymene dolphins are found in waters with a mean bottom depth of 6,100 ft. (1,870 m) and a range out to the 15,000 ft. (4,500 m) isobath (Fertl et al. 2003; Moreno et al. 2005). Biogeographically, the Clymene dolphin is found in the warmer waters of the North Atlantic and is often associated with the North Equatorial Current, the Gulf Stream, and the Canary Current (Fertl et al. 2003). In the Gulf of Mexico, they were found in offshore areas in regions of cyclonic or confluent circulation (Davis et al. 2002). In the western North Atlantic, they were identified primarily in offshore waters east of Cape Hatteras over the continental slope and are likely to be strongly influenced by oceanographic features of the Gulf Stream (Mullin and Fulling 2003).

Clymene dolphins are known only from the subtropical and tropical Atlantic Ocean (Perrin and Mead 1994; Fertl et al. 2003). In the western Atlantic Ocean, they are known to occur from New Jersey to Brazil, including the Gulf of Mexico and Caribbean Sea (Fertl et al. 2003; Moreno et al. 2005). Based on their distribution and the depth of the proposed action area, Clymene dolphins are unlikely to occur in the Proposed Action Area.

#### Short-beaked Common Dolphin (*Delphinus delphis*)

The best estimate of abundance for the western North Atlantic common dolphin stock is 120,743 individuals, with a minimum population estimate of 99,975 individuals (Waring et al. 2007). There is no information available for western North Atlantic common dolphin stock structure (Waring et al. 2007). Common dolphins occur in a variety of habitats, including shallow continental shelf waters, waters along the continental shelf break, and continental slope and oceanic areas, often occurring over prominent underwater topography (Hui 1979; Evans 1994; Bearzi 2003). Along the U.S. Atlantic coast, common dolphins typically occur in temperate waters on the continental shelf between the 330 and 660 ft (100 and 200 m) isobaths but can occur in association with the Gulf Stream (CETAP 1982; Selzer and Payne 1988; Waring and Palka 2002). Waring et al. (1992) reported short-beaked common dolphin sightings along the northern wall of the Gulf Stream and warm-core rings that coincided with the continental shelf break. Some common dolphin populations appear to preferentially travel along topographic features such as escarpments and seamounts (Evans 1994). In tropical regions, common dolphins are routinely sighted in upwelling-modified (or otherwise high productivity) waters (Au and Perryman 1985; Ballance and Pitman 1998).

Common dolphins are widely distributed globally, found in subtropical, and tropical seas. They occur from southern Norway to West Africa in the eastern Atlantic and from Newfoundland to Florida in the western Atlantic (Perrin 2002a). However, they are more commonly found in temperate, cooler waters in the northwestern Atlantic (Waring and Palka 2002). Selzer and Payne (1988) described short-beaked common dolphin distribution along the northeastern U.S. They found that this species is abundant within a broad band paralleling the continental slope from

35°N to the northeast peak of Georges Bank. Short-beaked common dolphin sightings occurred primarily along the continental shelf break south of 40°N in spring and north of this latitude in fall. According to CETAP (1982), during the fall this species is particularly abundant along the northern edge of Georges Bank but less common south of Cape Hatteras (Gaskin 1992b). Based on their distribution and the depth of the proposed action area, common dolphins are unlikely to occur in the Proposed Action Area.

#### Fraser's Dolphin (*Lagenodelphis hosei*)

Abundance estimates of Fraser's dolphins in the western North Atlantic are not available (Waring et al. 2007). They are typically oceanic, except in places where deepwater approaches a coastline (Dolar 2002). Fraser's dolphins are found in subtropical and tropical waters around the world, typically between 30°N and 30°S (Jefferson et al. 1993). Strandings in temperate areas are considered extralimital and usually are associated with anomalously warm water temperatures (Perrin et al. 1994b). Few records are available from the Atlantic Ocean (Leatherwood et al. 1993; Watkins et al. 1994; Bolaños and Villarroel-Marin 2003). Based on their distribution and the depth of the proposed action area, Fraser's dolphins are unlikely to occur in the Proposed Action Area.

#### Risso's Dolphin (*Grampus griseus*)

The best estimate of Risso's dolphin abundance in the western North Atlantic is 20,479 individuals and the minimum population estimate is 12,920 individuals (Waring et al. 2007). Several studies have noted that Risso's dolphins are found offshore, along the continental slope, and over the continental shelf (CETAP 1982; Green et al. 1992; Baumgartner 1997; Davis et al. 1998; Mignucci-Giannoni 1998; Kruse et al. 1999). Risso's dolphins are distributed worldwide in warm-temperate to tropical waters from approximately 60°N to 60°S, where sea surface temperatures are generally greater than 10°C (Kruse et al. 1999). In the western North Atlantic, this species is found from Newfoundland southward to the Gulf of Mexico, throughout the Caribbean, and around the equator (Würsig et al. 2000). Risso's dolphins are distributed along the continental shelf break from Cape Hatteras north to Georges Bank from March through December (CETAP 1982; Payne et al. 1984). This range extends seaward in the mid-Atlantic Bight from December through February (Payne et al. 1984). Based on their distribution and the depth of the proposed action area, Risso's dolphins are unlikely to occur in the Proposed Action Area.

#### Melon-Headed Whale (*Peponocephala electra*)

There are no abundance estimates for melon-headed whales in the western North Atlantic (Waring et al. 2007). Melon-headed whales are most often found in offshore waters. Nearshore sightings are generally from areas where deep, oceanic waters approach the coast (Perryman 2002). Melon-headed whales occur worldwide in subtropical and tropical waters. There are very few records for melon-headed whales in the North Atlantic (Ross and Leatherwood 1994; Jefferson and Barros 1997). Maryland is thought to represent the northern limit of their distribution in the northwest Atlantic (Perryman et al. 1994; Jefferson and Barros 1997). Based on their distribution and the depth of the proposed action area, melon-headed whales are unlikely to occur in the Proposed Action Area.

#### Pygmy Killer Whale (*Feresa attenuata*)

There are no abundance estimates for pygmy killer whales in the western North Atlantic (Waring et al. 2007). Pygmy killer whales generally occupy offshore habitats. For example, pygmy killer whales were sighted in waters deeper than 5,000 ft. (1,500 m) off Cape Hatteras (Hansen et al.

1994). Pygmy killer whales have a worldwide distribution in tropical and subtropical waters, generally not ranging north of 40°N or south of 35°S (Jefferson et al. 1993). There are few records of this species in the western North Atlantic (e.g., Caldwell and Caldwell 1971b; Ross and Leatherwood 1994). Most records from outside the tropics are associated with unseasonably warm water in higher latitudes (Ross and Leatherwood 1994). Based on their distribution and the depth of the proposed action area, pygmy killer whales are unlikely to occur in the Proposed Action Area.

#### False Killer Whale (*Pseudorca crassidens*)

There are no abundance estimates available for false killer whales in the western North Atlantic (Waring et al. 2000). They are primarily an offshore species, although they do come close to shore, particularly around oceanic islands (Baird 2002). Inshore movements are occasionally associated with movements of prey and shoreward flooding of warm ocean currents (Stacey et al. 1994). False killer whales are found in tropical and temperate waters, generally between 50°S and 50°N with a few records north of 50°N in the Pacific and the Atlantic (Baird et al. 1989; Odell and McClune 1999). Based on their distribution and the depth of the proposed action area, false killer whales are unlikely to occur in the Proposed Action Area.

#### Killer Whale (*Orcinus orca*)

There are no abundance estimates for killer whales in the western North Atlantic (Waring et al. 2008). Most cetacean taxonomists agree that multiple killer whale species or subspecies occur worldwide (Krahn et al. 2004; Waples and Clapham 2004). However, further information is not available. Killer whales have the widest distribution of any species of marine mammal. They have been observed in virtually every marine habitat from the tropics to the poles and from shallow, inshore waters to deep, oceanic regions (Dahlheim and Heyning 1999). In coastal areas, killer whales often enter shallow bays, estuaries, and river mouths (Leatherwood et al. 1976). Based on a review of historical sighting and whaling records, killer whales in the northwestern Atlantic are found most often along the shelf break and farther offshore (Katona et al. 1988; Mitchell and Reeves 1988). Killer whales in the Hatteras-Fundy region probably respond to the migration and seasonal distribution patterns of prey species, such as bluefin tuna (*Thunnus thunnus*), herring (*Clupea harengus*), and squids (Katona et al. 1988; Gormley 1990).

Although found in tropical waters and the open ocean, killer whales are most numerous in coastal waters and at higher latitudes (Dahlheim and Heyning 1999). Ford (2002b) stated this species has a sporadic occurrence in most regions. In the western North Atlantic, killer whales are known from the polar pack ice southward to Florida, the Lesser Antilles, and the Gulf of Mexico (Würsig et al. 2000), where they have been sighted year-round (Jefferson and Schiro 1997; O'Sullivan and Mullin 1997; Würsig et al. 2000). A year-round killer whale population in the western North Atlantic may exist south of around 35° N (Katona et al. 1988). Based on their distribution and the depth of the proposed action area, killer whales are unlikely to occur in the Proposed Action Area.

#### Short-Finned and Long-Finned Pilot Whales (*Globicephala macrorhynchus* and *G. melas*)

The best abundance for pilot whale (combined short-finned and long-finned) in the western North Atlantic is 31,139 individuals and a minimum estimate is 24,866 individuals (Waring et al. 2007). Pilot whales occur along the continental shelf break, in continental slope waters, and in areas of high-topographic relief (Olson and Reilly 2002), but are also commonly sighted on the continental shelf and inshore of the 330 ft. (100 m) isobath, as well as seaward of the 6,600 ft. (2,000 m) isobath north of Cape Hatteras (CETAP 1982; Payne and Heinemann 1993). They are

also found close to shore at oceanic islands where the shelf is narrow and deeper waters are nearby (Mignucci-Giannoni 1998; Gannier 2000; Anderson 2005). Long-finned pilot whale sightings extend south along the continental slope to near Cape Hatteras (Abend and Smith 1999). Waring et al. (1992) sighted pilot whales principally along the northern wall of the Gulf Stream and along the shelf break at thermal fronts. A few of these sightings were also made in the mid-portion of the Gulf Stream near Cape Hatteras (Abend and Smith 1999). Several studies in different regions suggest that pilot whale distributions and seasonal inshore and offshore movements coincide closely with the abundance of their preferred squid prey.

### 3.2.6 Federally Managed Wildlife Resources

Federally-managed wildlife resources in the Proposed Action Area include threatened and endangered species and the fish and invertebrate species in managed fisheries.

**Threatened and Endangered Species:** The Biological Assessment under section 7 of the ESA was submitted separately to NOAA and USFWS by MMS (2008a) and included as Appendix C of this EA considers threatened and endangered species in the Proposed Action Area in more detail. Both the FWS and the NOAA list threatened and endangered species and designate critical habitats in the Southeast region. According to the FWS Threatened and Endangered Species System (TESS) website ([www.ecos.fws.gov](http://www.ecos.fws.gov)), which maintains a listing for both agencies of all species listed or proposed for listing as well as designated critical habitat, there are 47 species of threatened and endangered animals (28 species) and plants (19 species) in South Carolina and its waters. The NOAA-NMFS website ([sero.nmfs.noaa.gov/pr/esa/specieslist.html](http://sero.nmfs.noaa.gov/pr/esa/specieslist.html)) lists six marine mammal species, five species of sea turtles, and one fish species as threatened or endangered, and seven fish species and one invertebrate species as Species of Special Concern. Fifteen of the listed species could potentially be found in the Action Area (Table 3-2).

Table 3-2. Threatened and Endangered Species Potentially Occurring at the ODMDS and MCT Sites.

Common Name	Scientific Name	Occurrence in Action Area	Status
Green Sea Turtle	<i>Chelonia mydas</i>	Occasional at ODMDS, never at MCT	T
Hawksbill Sea Turtle	<i>Eretmochelys imbricata</i>	Rare at ODMDS, never at MCT	E
Kemp's Ridley Sea Turtle	<i>Lepidochelys kempii</i>	Occasional at ODMDS, never at MCT	E
Leatherback Sea Turtle	<i>Dermochelys coriacea</i>	Rare at ODMDS, never at MCT	E
Loggerhead Sea Turtle	<i>Caretta caretta</i>	Common at ODMDS, occasional at MCT	T
Blue Whale	<i>Balaenoptera musculus</i>	Unlikely at ODMDS, never at MCT	E
Fin Whale	<i>Balaenoptera physalus</i>	Unlikely at ODMDS, never at MCT	E
Sei Whale	<i>Balaenoptera borealis</i>	Unlikely at ODMDS, never at MCT	E
Humpback Whale	<i>Megaptera novaeangliae</i>	Occasional at ODMDS, never at MCT	E
Right Whale	<i>Eubalaena glacialis</i>	Occasional at ODMDS, never at MCT	E
Sperm Whale	<i>Physeter macrocephalus</i>	Unlikely at ODMDS, never at MCT	E
West Indian manatee	<i>Trichechus manatus</i>	Rare at ODMDS, common at MCT in summer	E
Shortnose sturgeon	<i>Acipenser brevirostrum</i>	Never at ODMDS, occasional at MCT	E
Alligator	<i>Alligator mississippiensis</i>	Never at ODMDS, potentially at MCT	T

As described in Section 1.4, separate assessments of the potential effects of the proposed action were prepared and submitted to the NOAA and USFWS as part of the ESA section 7 consultation process. The findings of those assessments and the results of the consultations are summarized in this document.

#### Ocean Borrow Sites

**Marine Mammals:** Six species of cetaceans (whales) and one sirenian (manatee) listed as threatened or endangered under the ESA could potentially occur in the Potential Action Area (Table 3-2).

#### Blue Whale (*Balaenoptera musculus*)

The status of this stock in the U.S. Atlantic EEZ is unknown, but the species is listed as endangered under the ESA. There are insufficient data to determine population trends for blue whales. The total level of human-caused mortality and serious injury is unknown, but it is believed to be insignificant and approaching a zero mortality and serious injury rate.

The distribution of the blue whale in the western North Atlantic generally extends from the Arctic to at least mid-latitude waters. Blue whales are most frequently sighted in the waters off eastern Canada, with the majority of recent records from the Gulf of St. Lawrence. According to Waring et al. (2007) the blue whale is best considered as an occasional visitor in the U.S. Atlantic Exclusive Economic Zone (EEZ: within 200 miles of coastline) waters, which may represent the current southern limit of its feeding range. Waring et al. (2007) presents data suggesting that the population in the western North Atlantic may be as low as a few hundred individuals. There are no confirmed records of mortality or serious injury to blue whales in the U.S. Atlantic EEZ since 1998, when a dead individual arrived at a New England port on the bow of a tanker. As a deep-water species (MMS 2003), blue whales are unlikely to be in water as shallow as the Proposed Action Area.

#### Fin Whale (*Balaenoptera physalus*)

Fin whales are common in waters of the North Atlantic, from the Gulf of Mexico (rarely – they are most abundant north of Cape Hatteras) northward to the edge of the Arctic ice pack (NMFS 2006b). Fin whales accounted for 46 percent of the large whales and 24 percent of all cetaceans sighted over the continental shelf during aerial surveys between Cape Hatteras and Nova Scotia during 1978-82.

The latest stock assessment report (Waring et al. 2007) gives a figure of 2,269 as the best abundance estimate available for the western North Atlantic fin whale stock. This is an estimate from a time when the largest portion of the population was within the study area, but NMFS cautions that it “must be considered extremely conservative in view of the incomplete coverage of the known habitat of the stock and the uncertainties regarding population structure and whale movements between surveyed and unsurveyed areas.”

The major threats to fin whales in U.S. waters are entanglement in fishing gear and collision with ocean-going vessels. The MCT EIS describes a large-ship strike on a fin whale in 1995 that was probably hit at sea, carried on the bow of a large ship into Charleston Harbor, and rolled off when the ship stopped or turned around, although it is not known where the ship was when it struck the whale. According to MMS (2003), fin whales are typically a deep-water species

unlikely to occur close to shore. In addition fin whales, like blue whales, are essentially a northern species: the survey data presented in Waring et al. (2007) shows relatively few individuals sighted south of Cape Cod. Accordingly, fin whales would not be expected to occur in the Proposed Action Area except as very rare stray individuals.

#### Sei Whale (*Balaenoptera borealis*)

The sei whale population in the North Atlantic constitutes a strategic stock because the species is listed as endangered under the ESA. The southern portion of the sei whale's range during spring and summer includes the northern portions of the U.S. Atlantic EEZ in the Gulf of Maine and Georges Bank. According to Waring et al. (2007), the size of the population is unknown, as there have been no reliable surveys since the 1970s.

There are few data on fishery interactions or human impacts: NMFS reported no observed fishery-related mortality or serious injury to sei whales during 1991-1999, and there are no reports of mortality, entanglement, or injury in the NEFSC or NE Regional Office databases; however, there is a report of a ship strike by a container ship that docked in Boston in 1994.

Though sei whales occasionally feed in shallower waters, they are a northern species that rarely, if ever, occurs south of the Gulf of Maine (Waring et al. 2007). For these reasons, sei whales are very unlikely to be encountered in coastal waters of South Carolina, including the Proposed Action Area.

#### Humpback Whale (*Megaptera novaeangliae*)

The humpback whale is found in all oceans and has a seasonal north-south migration pattern. The species prefers coastal areas more than most other whales, especially when feeding and calving/breeding. In North America, humpbacks winter in the Caribbean and spend spring, summer, and fall in the Gulf of Maine and nearby waters in the spring. Although they typically migrate via Bermuda, they can occur anywhere along the east coast of the U.S., including South Carolina, during their spring and fall migrations, and the MCT EIS cites unpublished data on wintertime sightings in coastal waters off the southeastern U.S. The latest stock assessment report (Waring et al. 2007) speculates that the continental shelf of the southeastern U.S. may be an important habitat for juvenile humpbacks. The expected life span for the humpback whale is at least 40-50 years, and 11,570 is regarded as the best available estimate of the North Atlantic population (Waring et al. 2003; Waring et al. 2007).

Given their coastal habits and their pattern of distribution and migration, humpback whales can be expected to pass through the Proposed Action Area in spring and fall during their migration to and from the Caribbean, and a few may winter in or near the Proposed Action Area.

#### North Atlantic Right Whale (*Eubalaena glacialis*)

The North Atlantic right whale is considered one of the most critically endangered marine mammals in the world. The eastern American population is estimated at approximately 300 (according to Waring et al. 2007, 313 recognizable individuals were known to be alive in 2001), and appears to be increasing very slowly, if at all.

Right whales are found in the North Atlantic Ocean from west of Greenland to Florida and Texas in the west brim and to Madeira in the east, and migrate from north to south in the fall and from south to north in the spring. Research results (Waring et al. 2007) suggest the existence of six major habitats or congregation areas for western Atlantic North Atlantic right whales: the coastal



waters of the southeastern United States; the Great South Channel; Georges Bank/Gulf of Maine; Cape Cod and Massachusetts Bays; the Bay of Fundy; and the Scotian Shelf. Mating and calving occur from February to April in the warmer southern waters. Critical habitat for right whales in U.S. waters, as designated by NMFS, includes coastal Florida and Georgia (for mating and calving), about 120 miles (190 km) southwest of Charleston Harbor, and two areas of Cape Cod Bay and Massachusetts Bay, which serve as nursery areas for calves (Waring et al. 2007). Since they move slowly, swimming and feeding at or near the surface of the water, right whales are very susceptible to collisions with ships and fishing gear. The Mid-Atlantic United States recorded five ship strike mortalities of right whales from 1991-2002, all of them north of North Carolina, and the Southeast Region (south of Savannah) recorded four ship strikes in the critical habitat off Florida and Georgia. Waring et al. (2007) estimates that at least three right whales are killed in the western North Atlantic each year by human factors.

South Carolina is not a critical habitat, but right whales would be expected to occur off the coast of South Carolina during their seasonal migrations. Charleston is within the Mid-Atlantic region, for the purposes of right whale management, an area that extends approximately from Block Island Sound, Rhode Island to Port of Savannah, Georgia, between known high-use areas in the northeast and winter calving areas in the southeast. The Mid-Atlantic Region is a migratory corridor for pregnant females moving from northeast to southeast in fall (September to November) and for mother/calf pairs departing winter calving area in the southeast headed for the northeastern United States (March through May), and is likely used by calving females December to March. The mother-calf pairs stay close to shore, with 94 percent of sightings within 30 nautical miles (56 km) of shore and 80 percent of sightings in depths less than 90 feet (27 m).

#### Sperm Whale (*Physeter macrocephalus*)

Sperm whales constitute a strategic stock because the species is listed as endangered under the ESA. According to Waring et al. (2007), total numbers of sperm whales off the U.S. Atlantic coast are unknown, although an abundance estimate for the western North Atlantic from 2004 puts that population at approximately 4,800 individuals.

Sperm whales are predatory carnivores, consuming fish and large mollusks, particularly squid. Although sperm whales are deep-water animals rarely venturing close to shore (MMS 2003) and not often caught by fishery gear, they are regularly stranded on beaches along the Atlantic Coast for reasons that are still unclear. Total fishery-related mortality and serious injury for this stock can be considered to be insignificant and approaching a zero mortality and serious injury rate. Because sperm whales are open-ocean, deep-water animals, it is unlikely that any would be found in the shallow waters of the Proposed Action Area.

#### West Indian Manatee (*Trichechus manatus*)

Manatees, marine mammals of the order Sirenia, are listed as endangered under the ESA. The West Indian manatee is divided into two subspecies, of which the Florida (*T. manatus latirostris*) is of concern for this project.

According to the account in USACE (2006), manatees inhabit both salt and fresh water of sufficient depth (5 feet (1.5 m) to usually less than 20 feet (6 m)) throughout their range. Manatees may be encountered in shallow, slow-moving water bodies such as canals, rivers, estuarine habitats, and saltwater bays, although on occasion they have been observed as much as 3.7 miles (6 km) off the Florida Gulf coast. Manatees require warm water, migrating to warmer

waters whenever the temperature falls below 20° C. They are herbivorous, subsisting on seagrasses, large algae, and freshwater plants. Manatees reproduce slowly, reaching sexual maturity at five to nine years of age and bearing a single young (rarely twins) every two to five years. The population, estimated at no less than 1,800 (Waring et al. 2007), is concentrated in Florida, but manatees are known to visit the Charleston Harbor area in the summer months (April through November) as they migrate up and down the coast.

Threats to the manatee include natural mortality due to cold and red tide poisoning and human-induced mortality from loss of habitat, watercraft collisions, pollution, litter, and water control structures. According to Waring et al. (2007), roughly a third of documented manatee mortality is due to human-related causes, the vast majority from collisions with watercraft.

Manatees are known to visit the Charleston Harbor area in the summer months (April through November) as they migrate up and down the coast (USACE 2006): for example, 18 manatee sightings were reported in the Cooper River between May and September 2004. Given their migratory habits, manatees can be assumed to occur in nearshore ocean waters between Charleston Harbor and the ODMDS, although it is unlikely that they would be found at the ODMDS itself, given the site's distance from land.

**Sea Turtles:** All sea turtles are listed as endangered or threatened under the ESA. South Carolina coastal waters support populations of loggerhead sea turtles (*Caretta caretta*) and are visited by several other species of sea turtles, as described in MMS (2008a). A total of five species of sea turtles could potentially be present in the Proposed Action Area (Table 3-2), as either residents (*C. caretta*) or transients.

#### Loggerhead Sea Turtle (*Caretta caretta*)

Loggerhead turtles are circumglobal, inhabiting continental shelves, bays, estuaries, and lagoons in temperate, subtropical, and tropical waters. Loggerhead turtles are considered to be characteristic of shallow water (less than 50 meters deep). According to Arendt et al. (2007) the bulk of sea turtle sightings in the Southeast are juvenile loggerheads. Juvenile loggerheads are thought to utilize bays and estuaries for feeding, while adults prefer open waters. The food of loggerheads consists of mollusks, crabs (especially blue crabs), shrimp, sea urchins, sponges, squid, basket stars, jellyfish, and even mangrove leaves in the shallows. They are well-adapted by their heavy jaws to eat hard-shelled food but are known to take a wide variety of prey items.

South Carolina's coastal waters are a migration path for loggerheads at all times of the year, and South Carolina's beaches are within the species' nesting range in the U.S. (North Carolina to Mexico), although most nesting occurs along the east coast of Florida (Murphy and Griffin, n.d.). Loggerhead turtles consistently occur off Charleston Harbor during spring, summer, and fall, and sporadically occur in the Charleston Harbor estuarine system (USACE 2006).

Sea turtles regularly strand along the coast of South Carolina, the majority of which are loggerhead sea turtles (two-thirds to three quarters of all strandings from 2002 to 2007; Sea Turtle Organization website, [www.seaturtle.org/strand](http://www.seaturtle.org/strand); USACE 2006).

#### Leatherback Sea Turtle (*Dermochelys coriacea*)

The leatherback is the most pelagic (open ocean) of the sea turtles and is often seen near the edge of the continental shelf; however, they have also been observed just offshore of the surf line. Critical habitat for the leatherback includes the waters adjacent to Sandy Point, St. Croix, U.S. Virgin Islands. The major nesting beaches are located in Malaysia, Surinam, French Guiana,

Mexico, Costa Rica, and St. Croix, U.S. Virgin Islands. Regular nesting in the United States is restricted to Florida, Puerto Rico, and the U.S. Virgin Islands (no nesting beaches are known within South Carolina), and critical habitat for the species has been designated as the waters adjacent to Sandy Point, St. Croix, U.S. Virgin Islands.

Leatherback turtles are not expected to be common within the Proposed Action Area, but they could occur. Leatherbacks are present off the coast of South Carolina during migration: one individual was reported stranded in 2007 (Sea Turtle Organization), and an average of six per year in the period 2002 – 2005 (USACE 2006).

#### Kemp's (Atlantic) Ridley Sea Turtle (*Lepidochelys kempii*)

Kemp's ridley sea turtle is the smallest and rarest species of the marine turtles. Adults are restricted to the Gulf of Mexico, but immatures have been observed along the Atlantic coast as far north as Massachusetts; adults and juveniles are often found in salt marsh and other estuarine habitats. Outside of nesting, which occurs almost entirely on a single beach in northern Mexico, the major habitat for Kemp's ridleys is the nearshore waters of the northern Gulf of Mexico, especially Louisiana. No critical habitat has been designated for the Kemp's ridley sea turtle. The population appears to be increasing as a result of protection of the nesting beaches, but is still far short of the numbers needed to determine that the species is no longer endangered. The species is carnivorous, feeding primarily on small benthic and epibenthic invertebrates such as crabs, snails, and clams, and also on jellyfish and other animal matter.

Kemp's ridleys are not common off the coast of South Carolina; however, immature individuals are occasionally encountered in the near-shore and coastal waters of South Carolina. Nineteen strandings of Kemp's ridleys were reported in 2007, nearly a quarter of all sea turtle strandings in South Carolina that year (Sea Turtle Organization), but in the period 2002 – 2005 the average was 10 reported strandings per year, roughly 11% of all turtle strandings in the lower half of the South Carolina coast (USACE 2006). Accordingly, Kemp's ridley sea turtles could be present in the ODMDS area during the proposed sand borrow project.

#### Hawksbill Sea Turtle (*Eretmochelys imbricata*)

Hawksbill sea turtles occur in all ocean basins, although they are relatively rare in the Eastern Atlantic. Hawksbills are the most tropical of the marine turtles, ranging from approximately 30° N to 30° S. Adults are closely associated with coral reefs and other hard-bottom habitats, but they are also found in other habitats including inlets, bays and coastal lagoons.

Major nesting populations (those with more than 1,000 females nesting annually) are in the Seychelles, Mexico (Yucatan), Indonesia, and two in Australia. Important but much smaller nesting aggregations in the Caribbean exist in Puerto Rico, the U.S. Virgin Islands, Antigua, Barbados, Costa Rica, Cuba, and Jamaica, and nesting very rarely takes place in Florida. Critical habitat for the hawksbill turtle includes waters around two islands off Puerto Rico. Reproductive females undertake periodic (usually non-annual) migrations to their natal beach to nest and exhibit a high degree of fidelity to their nest sites. Hawksbill turtles show fidelity to their foraging areas for up to several years. Their highly specialized diet consists primarily of sponges.

Outside of an occasional occurrence, hawksbill turtles are not expected within the Proposed Action Area. While there is some potential for hawksbills to be present off the coast of South Carolina during migration, no nesting beaches are known within South Carolina and no individuals were reported stranded between 2002 and 2007 (Sea Turtle Organization; USACE 2006).

### Green Sea Turtle (*Chelonia mydas*)

The green sea turtle is found worldwide in tropical and temperate seas and oceans. The North American distribution is from Massachusetts to Mexico and the Caribbean and from British Columbia to Baja California. On the east coast the major nesting areas are along the east coast of Florida and in the Caribbean. Green sea turtles migrate long distances between feeding and nesting grounds.

Green turtles are generally found in fairly shallow, warm waters (except when migrating) inside reefs, bays, and inlets. The turtles are attracted to lagoons and shoals with an abundance of marine grass and algae, as the adult diet is seagrasses (e.g., turtle grass, *Thalassia testudinum*). The low quality of the diet is thought to be a factor in the species' low reproductive rate and slow growth. Critical habitat for the green turtle has been designated as the water surrounding Culebra, Puerto Rico, and they also nest along the Atlantic coast of Florida and in the U.S. Virgin Islands. Major feeding grounds are located along the west coast of Florida.

Charleston Harbor is located within the green turtle's migrating and foraging range. According to USACE (2006) green turtles have not been sighted there (based on existing data: no survey for sea turtles was performed for the MCT EIS) nor, with its lack of marine vegetation, does Charleston Harbor represent suitable habitat. However, green turtles are not uncommon in South Carolina waters: the MCT EIS (USACE 2006) cites data from 2002 – 2005 indicating that an average of five green sea turtles are stranded along the southern half of the South Carolina coast each year. Accordingly, green sea turtles could be present in the ODMDS area during the proposed sand borrow project.

### Marine Terminal Site

According to the MCT EIS (USACE 2006, Section 4.), none of the plant species occurs in or near the Marine Terminal Site, and as all of the listed plant species are terrestrial, none occurs in the coastal ocean. Accordingly, this description concentrates on listed animal species. Three of the species in Table 3-2 are known to occur at the MCT site for at least part of the year (West Indian manatee, loggerhead sea turtle, and shortnose sturgeon) and one could occur (alligator). The bald eagle, *Haliaeetus leucocephalus*, was considered in the EIS, but as it was delisted in 2007, after the EIS was prepared, it is not considered in this EA. None of the other animal species listed by the FWS could occur at the MCT site because of the lack of suitable habitat.

**Managed Fisheries:** In addition to its responsibilities under the Endangered Species Act, the NMFS also manages fisheries under the Magnuson-Stevens Act; this includes identifying and protecting Essential Fish Habitat (EFH) for the managed fisheries. EFH is defined by the Magnuson-Stevens Act as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” The designation of EFH may include habitat for individual species or for an assemblage of species, whichever is appropriate within each Fisheries Management Plan (FMP).

Essential Fish Habitat (EFH) for the Action Area is described from South Atlantic Fisheries Management Council (SAFMC 2008) and referenced supporting documents in the Essential Fish Habitat Assessment provided separately to NOAA Fisheries (MMS 2008b) and included as Appendix D. The managed species under the various FMPs include those designated by the South Atlantic Fishery Management Council, several species designated by the Mid-Atlantic council, and a number of wide-ranging or broadly distributed species designated at the federal level. Because of the open coastal nature of the site environment and its mixture of soft-bottom,

hard-bottom (“live”), and oceanic habitat, most of the coastal species managed by the South Atlantic FMC could be present, either as casual visitors or residents, in the vicinity of the Charleston ODMDS and the open coastal ocean. Detailed accounts of the managed fish resources are presented in the Essential Fish Habitat Assessment (Appendix D, MMS 2008b).

As described in MMS (2008b), the ODMDS and Open Ocean Borrow sites include marine habitat types (marine water column, soft bottom, live/hard bottom, surf zone, and coastal inlet) that serve as EFH for the shrimp, red drum, snapper-grouper, coastal migratory pelagics, Middle-Atlantic FMP, and federally-implemented highly migratory species fisheries. As described in the EIS (USACE 2006 Section 4.17.2) and in MMS (2008b), the MCT site and Charleston Harbor include estuarine and marine habitats (tidal marsh, oyster reefs and shell banks, intertidal flats, forested wetlands, and marine water column) that serve as EFH for the shrimp, red drum, snapper-grouper, coastal migratory pelagics, and federally-implemented highly migratory species fisheries. One Habitat Area of Particular Concern, hard/live bottom, is known to be present in the Action Area, as hard-bottom areas were identified to the west of the ODMDS, and the site’s boundaries were altered to avoid those areas (see sections 1.1 and 3.2.2). None of the geographically defined Habitat Areas of Particular Concern listed in Appendix 5 of NMFS (2004) are within the Action Area.

### **3.3 Cultural and Socioeconomic Resources**

#### **3.3.1 Historic, Prehistoric, and Native American Resources**

Because of the nature of the potential borrow sites under the Proposed Action and Open-Ocean Borrow alternatives, there is low potential that prehistoric or Native American artifacts could be encountered. Any artifacts deposited at the sites would have likely been destroyed by marine transgression when they were exposed. Artifacts carried to the sites by ocean currents or in dredged material deposited at the ODMDS would have limited historical context. Prehistoric and Native American cultural resources are unlikely to be present at an upland borrow site (under the No Action Alternative) because, according to the MCT EIS (USACE 2006), the borrow material would come from existing sand and soil mines.

Historic resources may include shipwrecks, as numerous wrecks are known from the Charleston Harbor area (USACE 2006; US Navy 2008). Since the ODMDS site has been used for ocean disposal for several decades, however, the likelihood that intact wrecks are present is low, and the NOAA AWOIS database (NOAA 2009) does not list any wrecks in the immediate vicinity of the ODMDS. Any wrecks would, in any case, likely be buried by dredged material. Shipwrecks could be present at an Open-Ocean Borrow site, but because a specific site has not been designated, this possibility cannot be assessed in detail. As mentioned in Section 2.2, identification of a specific open-ocean borrow site would require a marine archeological survey to confirm the presence or absence of shipwrecks. Historic resources would not be expected to occur at upland borrow sites because those would be existing sand and soil mines.

The potential presence of cultural resources at the MCT site was evaluated in the MCT EIS (USACE 2006, Section 4.12). The area that would be affected by the fill activities has been heavily modified through fill, construction, and redevelopment activities over the past century. The EIS concluded that there are no historic, prehistoric, or Native American resources in the area.

### **3.3.2 Coastal Land Use and Offshore Multiple Use and Recreation**

The vicinity of the ODMDS is open ocean within United States Territorial Waters used for navigation, commerce, fisheries, and recreation. The area lies within the US Navy's Charleston Operating Area (US Navy 2008), which is used for naval operations associated with the Marine Corps Naval Air Station Beaufort (SC), Marine Corps Base Camp Lejeune (NC), King Bay Naval Submarine Support Base (GA), and Naval Air Station Jacksonville (FL). No details of operational activity are available, but it is likely that naval vessels conducting exercises involving amphibious and anti-submarine warfare periodically operate in the Action Area.

The Action Area lies offshore of the Port of Charleston, which in 2004 was the fifth busiest port in the country, in terms of cargo value, for international trade (US Navy 2008). Cargo vessels engaged in maritime commerce, both domestic and international, navigate through the proposed Action Area, although the larger vessels are restricted to the navigational channel north of the ODMDS.

There is an active commercial shrimp fishery in the area which uses the waters near the ODMDS (although typically farther offshore), as well as a small amount of commercial fishing for certain finfish species (e.g., kingfish, mullet, spot, and flounders; SCDNR 2001). Commercial landings in 2000 from South Carolina marine waters were valued at approximately \$28.5 million and consisted mostly of shrimp and blue crabs (SCDNR 2001); no data are available for specific areas, including the proposed Action Area. The major landings are in Charleston County. Recreational use of the area consists of recreational boating and recreational fishing, primarily for red drum and some of the coastal pelagic and Mid-Atlantic species (mackerel species, bluefish, spotted seatrout; SCDNR 2001). Recreational dive sites are located northeast and southwest of the ODMDS, but not in the immediate vicinity of the proposed Action Area (US Navy 2008). A use particular to the ODMDS is for the disposal of sediments dredged in support of maintaining and enhancing maritime commerce. The site is managed under a multi-agency Site Management and Monitoring Plan (USACE et al. 2005).

Land use that would be affected under the No Action Alternative would be the commercial extraction of mineral resources (sand, soil, and gravel) at upland borrow sites. According to the MCT EIS (USACE 2006), the fill site is currently largely vacant and consists of open space and coastal habitats. It is zoned for industrial use, and the planned land use is heavy industrial (a container terminal).

### **3.3.3 Infrastructure and Socioeconomics**

There is no established infrastructure at the ODMDS, in the coastal ocean waters, or in Charleston Harbor waters. The ODMDS site is used economically by the maritime industry as a disposal site for dredged sediments, but otherwise has no established commercial value. Open coastal waters support commercial and recreational fishing.

Infrastructure at the MCT site is described in the MCT EIS (USACE 2006) and consists largely of existing road access from nearby Interstate 26 and regional and local roads. The site is also accessible by water for small and medium-sized vessels. Infrastructure includes existing utilities, all of which would be reconstructed and enhanced for the proposed Marine Container Terminal. The site was used to support military operations and, as a major source of employment, played a role in the socioeconomic structure of the Charleston area (USACE 2006, Section 4.3.1).

## **4 ENVIRONMENTAL CONSEQUENCES**

### **4.1 Impact-Producing Factors**

The two ocean-based alternatives (Proposed Action and Open-Ocean Borrow) could have both direct and indirect effects on the environment. Direct effects would include physical modifications to the environment and mortality of organisms from various aspects of the actual dredging activities. Indirect impacts would include induced effects on the environment and organisms resulting from environmental changes caused by the project, including the effects of the construction and operation of the MCT.

The direct and indirect effects of the No Action (upland borrow) Alternative and of placing fill material at the MCT site were considered under the MCT EIS (USACE 2006), and included air emissions, erosion and runoff into local water bodies, loss of intertidal and subtidal habitat, increased vessel traffic in the Cooper River, and increased truck traffic on local roads and highways.

The qualitative impact assessment of the alternatives presented in this document uses the categories “no impact”, “less than significant impact,” and “significant impact” to categorize impacts. This assessment is based on a review of the available information as summarized above and on best professional judgment.

#### **4.1.1 Dredge Operations**

Impact-producing factors in dredge operations in the Proposed Action and the Open-Ocean Borrow Alternative include the operation of the draghead and cutterhead on the ocean floor, any coupled bottom-disturbing activities such as anchoring, the operation of engines on the dredges and supporting vessels, the movement of vessels in coastal and harbor waters, and the loss of dredged material into the water column during transport. These activities are described in detail in Section 2.1. The No Action Alternative would not involve dredging, and would thus have no effects associated with dredge operations.

#### **4.1.2 Borrow Site Effects**

The Proposed Action and the Open-Ocean Borrow alternatives would alter the bottom topography compared to existing conditions. The dredging operation would create a depression of up to 1125 acres (450 ha) in extent, an average of 3.5 feet (1.1 m) deep. Changes to the borrow area could conceivably alter coastal currents, waves, and bottom sediment type in ways that could cause changes in the environment, including food resources available to species. The No Action Alternative would not create a borrow pit because upland fill would come from existing sand and soil mines in the vicinity of Charleston.

#### **4.1.3 Placement of Fill**

The placement of fill for construction of the MCT would represent a potential source of impacts of the proposed federal action. Impact-producing factors would include air emissions from construction equipment, increased vessel traffic at the fill site, turbidity from runoff from barges and the fill site, and the conversion of the fill site from water and intertidal habitats to solid land.

Construction and operation of the terminal on top of the fill would have direct impacts on transportation, as a result of added trucks from the terminal, and air quality, as a result of

emissions from additional ships, terminal equipment, and trucks. The EIS evaluated the magnitude of the impacts, imposed mitigation where appropriate, and concluded that residual impacts would be less than significant.

## **4.2 Impacts on Physical Resources**

### **4.2.1 Impacts on Geology and Topography**

The potential physical effects of the proposed action at the ODMDS on wave energy, currents, and shoreline erosion are evaluated in Appendix B (Moffatt & Nichol 2008). In that study, comparisons with previous evaluations of potential borrow pits closer to shore, as well as characterizations of other borrow pits up and down the Atlantic coast, indicate that the impacts to coastal processes would be insignificant. That conclusion is based on the substantially greater distance offshore of the ODMDS relative to other borrow sites investigated and the existence of the retaining berm, with its large vertical relief relative to expected depth changes in the ODMDS. Given the physical similarity of the Open-Ocean Borrow Alternative to the Proposed Action, the effects of a depression in the ocean floor (i.e. subtle alterations in the wave climate) produced by that alternative would also be expected to be minimal. Accordingly, the alternatives would have less than significant impacts on coastal geology.

The Proposed Action and the Open-Ocean Borrow Alternative would cause minor changes in the topography of the ocean floor, but the impact would be less than significant given the shallow nature and limited extent of dredging. The No Action Alternative would have no impacts on the topography of areas under the jurisdiction of the MMS, but would cause minor changes to the topography of one or more upland borrow sites. The MCT EIS (USACE 2006, Section 5.2.2.3) concluded that, given the large number of active sand and soil mines in the area, the upland borrow operation would have no geological or topographic impacts.

### **4.2.2 Impacts on Oceanography and Water Quality**

**Oceanography:** As discussed above, the study (Moffatt & Nichol 2008) concluded that the Proposed Action would have minor effects on the local wave climate, primarily associated with long-period waves. Given its similarity to the Proposed Action, it is probable that the Open-Ocean Borrow Alternative would also have only minor effects on the wave climate. Accordingly, the alternatives would have less than significant impacts on the oceanographic regime of the proposed Action Area.

The MCT EIS (USACE 2006, Section 5.2.15.3) examined the effects of construction and operation of the MCT (the No Action Alternative) and concluded that the project would have less than significant impacts on tidal currents and elevations at the MCT site.

**Turbidity:** The Proposed Action and Open-Ocean Borrow alternatives would cause localized and short-lived increases in turbidity as a result of dredging and transport of dredged material. Turbidity would result from the draghead/cutterhead re-suspension and overflow discharge of fine sediments (silt and clay). To the extent that the dredged material would consist largely of sand (see section 3.1.1), turbidity would be minimized. Nevertheless, because the material to be dredged may contain as much as 30% fine-grained sediments, some turbidity is likely to occur, and a plume of turbidity may be carried away from the dredge site. Depending upon local oceanographic conditions, the turbidity plume could extend several hundred yards from the dredge (e.g., Newell, Seiderer, and Hitchcock 1998). The turbidity would decrease rapidly with



distance due to settling out and mixing with ambient water, and in the case of the ODMDS would occur largely within the boundaries of the ODMDS. Given the limited extent of the turbidity plume, both alternatives would have less than significant impacts on water quality as a result of turbidity.

The potential impacts related to turbidity of the No Action Alternative (upland borrow site) and of the placement of fill at the MCT site, were considered in the MCT EIS (USACE 2006, Section 5.2.15.3), which concluded that because substantial increases in suspended sediment concentrations would be limited to an area within 160 feet (50 m) of dredging operations, no significant impacts would result.

**Dissolved Oxygen:** The Proposed Action and Open-Ocean Borrow alternatives could cause localized decreases in dissolved oxygen concentrations in ocean waters as a result of the re-suspension of sediments with elevated biological oxygen demand (BOD). High BOD is not typical of sandy open-ocean sediments; accordingly, the impacts of those alternatives would not be significant. The Charleston Harbor Beneficial Use Alternative would not produce dissolved oxygen impacts beyond those already associated with maintenance and project dredging. The potential impacts of the No Action Alternative (upland borrow site) and of the placement of fill at the MCT site related to dissolved oxygen were considered in the MCT EIS (USACE 2006, Section 5.2.15.3), which concluded that there would be less than significant water quality impacts from temporarily lowered dissolved oxygen concentrations and increased turbidity in the Cooper River.

**Chemical Pollutants:** Dredging can cause elevated concentrations of water pollutants such as heavy metals, pesticides, and other organic substances by resuspending polluted sediments. In addition, accidental leaks and spills of fuel, lubricating fluids, and other contaminants from dredges, scows, and work vessels could occur. The Proposed Action Alternative would dredge sediments that have been approved for ocean disposal by reason of very low pollutant concentrations and lack of toxicity, and the Open-Ocean Borrow Alternative would dredge sediments that reflect natural background concentrations of contaminants. Accordingly, neither alternative would have significant impacts on water resources related to chemical pollutants associated with the dredged material.

The construction equipment would be governed by Coast Guard regulations, including the recently-promulgated Vessel General Permit, that address the use and control of potential pollutants on vessels and specify the response to accidental releases. Ships can discharge oily wastes in U.S. territorial water only when the vessel is underway more than 12 nautical miles from land and only after processing the oily waste through an oil-water separator, resulting in an effluent that does not exceed 15 parts per million and does not cause a visible sheen. Ships can retain bilge water onboard when in port or deposit untreated bilge water into a pipe line, sloop barge, or tank truck which carries the wastewater to a licensed wastewater treatment plant capable of treating oily wastewater (USACE 2006, Section 5.2.15.3). Nevertheless, accidental releases of chemical pollutants from construction equipment may occur under either of the ocean borrow alternatives. Accidental discharges have typically been small volumes (USACE 2006, Section 5.2.15.3), and it is reasonable to assume that the increased potential for accidental discharges would have a minimal impact to surface water quality.

The potential impacts of the No Action Alternative, and of the placement of fill at the MCT site, related to chemical pollutants were considered in the MCT EIS (USACE 2006, Section 5.2.15.3), which concluded that less than significant impacts would result.

#### **4.2.3 Impacts on Climate**

All of the alternatives would produce greenhouse gases (GHG), which have been linked to climate change, as a result of the combustion of fossil fuels during construction. The Proposed Action and the Open-Ocean Borrow Alternative can be assumed to have approximately equal GHG emissions. The Charleston Harbor Beneficial Use Alternative can be assumed to produce no GHG emissions beyond those associated with maintenance or project dredging, and thus would have no significant impact on climate. The No Action Alternative would likely produce more GHG emissions, because of the additional handling of material, than either of the ocean-based alternatives. In every case, the emissions would be temporary, lasting only during construction. The MCT EIS (USACE 2006, Section 5.2.2.1) concluded that construction and operation of the terminal would have a “negligible” impact on climate change as a result of GHG emissions. It is reasonable to suppose that the Proposed Action and the Open-Ocean Borrow Alternative, which would have lower emissions, would likewise have an even smaller impact than the construction of the MCT.

#### **4.2.4 Impacts on Air Quality**

All four of the alternatives considered in this document would affect local air quality during construction because of the exhaust emissions from construction equipment: dredges, tugboats, and workboats for the ocean-based alternatives, tugboats, workboats, and earthmoving equipment for the No Action Alternative. In the case of the Charleston Harbor Beneficial Reuse Alternative, however, those emissions would not be attributable to terminal construction, but rather to dredging activities that would take place even if the terminal were not built; accordingly, construction emissions for that alternative would be negligible.

A quantitative evaluation of construction-related emissions for the Proposed Action and the Open-Ocean Borrow Alternative was conducted by MMS (Appendix E, summarized in Table 4-1). The emission calculations were based on maximizing the use of a hopper dredge during the hopper window which can run from November 1 through April 15 of each year. Once this window closes, a cutter suction dredge would be used until the required quantity of material is obtained. Using this combination of hopper and cutter suction dredges, the required amount of material could be removed and placed within a three-year time period (stretching over four calendar years) after removal work began.

The emission calculations for the hopper dredge were based on a 6500-cubic-yard capacity dredge with a total horsepower of 23,500 (including the dredge pump, the main propulsion engine, and auxiliary generators and motors). The emission calculations for the cutter suction dredge were based on a 30” dredge with a total horsepower of 10,500 loading three 6000-cubic-yard capacity scows (hopper barges) towed by three 4,000-horsepower towboats. The fuel for all equipment was assumed to have a sulfur content of 0.05% (the average of currently available marine diesel fuel in the U.S.).

As Table 4-1 shows, the maximum emissions would occur during the two years when both the hopper dredge and the cutter-suction dredge would be in operation. Even during the period of maximum operation, however, the dispersion of air emissions between the dredge site and

sensitive receptors in the Charleston area, as well as the small quantity of emissions relative to the regional inventory (always less than one percent, usually less than 0.1%), means that the impact of project-related emissions of local air quality and public health would be less than significant.

<b>Table 4-1. Estimated emissions from construction of the Proposed Action and Open Ocean Borrow Alternative (figures in tons per year).</b>					
<b>Pollutant</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Regional Inventory*</b>
PM2.5	1.5	5.5	5.5	1.5	14,493
PM10	1.5	5.4	5.4	1.4	32,336
SOx	1.5	5.7	5.7	1.5	77,389
NOx	91.4	325.2	325.2	86.9	71,894
VOC	2.4	8.2	8.2	2.3	140,383
CO	21.0	67.4	67.4	19.9	207,585**
* Mobile, stationary, and point-source annual emissions for 2002 in Charleston, Berkeley, and Dorchester counties (Emission Inventories for Vista, 2002 Base Year).					
** Mobile, stationary, and point-source annual emissions for 2001 in Charleston, Berkeley, and Dorchester counties (USACE 2006, Appendix J).					

The EIS (USACE 2006, Section 5.2.12) found that construction of the MCT would cause temporary emissions associated with fugitive dust and fuel combustion and that operation of the terminal would cause combustion-related emissions associated with ships, vehicles, and cargo-handling equipment. The operational emissions would be less than one percent of the total regional emissions inventory. The EIS concluded that construction and operational-phase emissions from the marine terminal would cause less than significant impacts on local and regional air quality. The EIS also concluded that the air quality impacts of building and operating the marine terminal, including the emissions from construction, would not affect the attainment status of the Charleston and Cape Romain wildlife refuges.

### **4.3 Impacts on the Biological Environment**

#### **4.3.1 Impacts on Vegetative Resources**

**Direct Effects:** There are no vegetative resources at the ODMDS, any open-ocean borrow site that might be chosen, or in the areas of Charleston Harbor that might be dredged. Accordingly, the Proposed Action, Open-Ocean Borrow, and Charleston Harbor Beneficial Use alternatives would have no direct impacts on vegetative resources.

**Indirect Effects:** According to the MCT EIS (USACE 2006), the No Action Alternative would not result in a loss of upland vegetation at any borrow site because the material would come from existing sand and soil mines. The impacts of the placement of fill at the MCT site on vegetation

at the site were evaluated in the MCT EIS, which concluded that impacts would be less than significant.

### **4.3.2 Impacts on Avian Resources**

Marine birds visiting the ODMDS and the Open Ocean Borrow Site could be affected by dredging operations to the extent that foraging habitat was altered and the lights and noise of the dredging operations caused behavioral disturbances. Coastal seabirds (gulls, brown pelicans, and terns) and far-ranging pelagic seabirds (e.g., tropicbirds, petrels, jaegers, gannets, and shearwaters) could be attracted to the dredging operations by the concentration of dead and disoriented marine organisms brought to the surface, which would constitute a new foraging resource. They might also avoid the area because of the noise and light, which would deprive them of a normal foraging resource. It is not possible to predict which reaction would be more likely, although gulls and pelicans are habituated to human activities and are known to frequent vessels, which they associate with food. Pelican and tern nesting colonies at Crab Bank and Castle Pinckney in Charleston Harbor would not be expected to be affected by the minor increment in vessel traffic in the harbor associated with the Proposed Action. Accordingly, the Proposed Action and the Open-Ocean Borrow Alternative would be expected to have less than significant impacts on avian resources at the borrow sites and along the dredge and barge routes to the MCT site.

The potential impacts of the No Action Alternative, and of the placement of fill at the MCT site, related to avian resources at the MCT site were considered in the MCT EIS (USACE 2006, Section 5.2.17.1), which concluded that although there would be minor losses of habitat, less than significant impacts would result.

### **4.3.3 Impacts on Aquatic Resources and Communities**

**Direct Effects** -- Dredge operations in the ocean-based alternatives could have direct effects on planktonic and benthic organisms at the borrow areas and in the ocean between the borrow area and the fill site as a result of mortality due to removal of sediments; mortality from entrainment in the dredge gear; and disruptions to feeding activities and migratory movements caused by turbidity, and burial by sedimentation.

Impacts to planktonic organisms from turbidity would be short-lived and less than significant because sedimentation and the diluting effects of mixing would rapidly reduce turbidity to background levels. Planktonic organisms, including fish eggs and larvae, entrained in the dredge stream would experience heavy mortality, but the small volume of water and correspondingly small number of organisms affected relative to the coastal ocean would mean that the impact would be less than significant.

Impacts to benthic organisms would vary depending upon the mobility and feeding habits of the individual species. Larger, mobile organisms such as crabs and shrimp could move away from the area to some extent, although they could still experience heavy mortality. Infauna and sessile epibenthic organisms, such as polychaetes, snails, bivalves, and echinoderms, in the dredge footprint would be removed and would experience essentially 100 percent mortality, thereby destroying the benthic community. Organisms immediately adjacent to the dredge area would experience elevated turbidity and some degree of burial from fallback of dredged material. The turbidity would be temporary, lasting only as long as individual dredging episodes, although because dredging would occur for up to six months per year for up to four years, the benthos

could experience a substantial amount of increased turbidity. It is important to note that the benthic community at the ODMDS already experiences episodes of prolonged elevated turbidity and burial associated with dredged material disposal, which has only somewhat altered its composition (see Section 3.2.3). The provision of the dredging plan prohibiting dredging within 500 feet of the exterior berms and the western interior berm of the ODMDS would ensure that the Proposed Action would have minimal effects on live-bottom communities from physical damage, turbidity, or burial from fallback.

In the case of the Proposed Action and the Open-Ocean Borrow alternatives, neither the total volume of OCS resources to be removed nor the total amount of bottom that would be disturbed is significant. In the case of the Open-Ocean Borrow Alternative, however, the benthic community that would be affected would be an undisturbed community that might be more productive than the community at the ODMDS, which has already been disturbed by disposal activities.

Benthic communities at the ocean borrow sites would begin to recolonize the dredged areas as soon as the dredging was completed. Organisms would move in from adjacent, undredged areas and would settle out of the plankton during normal recruitment. The length of time recovery takes varies widely and depends on factors such as the nature of the sediment, the history of site disturbance, and the specific community involved. In general, finer-grained sediments and sediments that have a history of disturbance recolonize faster than coarser sediments or hard bottoms, as the organisms typical of those sediments are mobile and well adapted to rapid recolonization (e.g., Newell et al. 1998). Full recovery to a natural community would likely take several years at the Open-Ocean Borrow Alternative site but would not occur at the ODMDS because of continued disturbance in the form of disposal and periodic dredging.

Because the dredged material would not be contaminated under any alternative, no chemical or toxic impacts to organisms would be caused by the turbidity and subsequent sedimentation.

The MCT EIS (USACE 2006, Section 5.2.17) found that wetlands and open-water communities at the fill site would be affected by dredging and fill placement as a result of temporary lowered dissolved oxygen concentrations, increased turbidity, and sedimentation, and, in the long-term, mortality of eggs and larvae due to entrainment by the water jet sedimentation control feature of the terminal as well as habitat loss to the fill. The EIS imposed mitigation for the habitat losses (purchase of 33.1 acres (13 ha) of wetlands) and found the remaining impacts less than significant.

**Indirect Effects** – Indirect effects could be experienced by planktonic and benthic organisms at the ocean-based sites as a result of the destruction of potential food resources (benthic infauna and epifauna removed with the dredged material). These impacts are judged to be insignificant based upon the small size of the borrow sites in relation to the coastal area, and the temporary nature of the disturbance. Recolonization could take up to 2.5 years after the cessation of dredging (Newell et al. 1998; Brooks et al. 2006). The dredging operation would have no indirect effects at the MCT site.

#### **4.3.4 Impacts on Fish**

Dredge operations at the ocean-based sites could have direct and indirect effects on fish species. Direct effects would include adverse effects from dredging and indirect effects would include changes to the environment caused by the project.

Under the ocean-based alternatives, resident fish and fish attracted to the dredge site by the disturbance and exposure of benthic prey items could be exposed to adverse levels of turbidity, noise, and the possibility of entrainment or entrapment in the dredge apparatus; eggs and larvae, especially of demersal fish, could also be entrained and destroyed. The No Action Alternative is unlikely to have impacts on fish resources as there would be no dredging.

It is unlikely that dredging would result in injury or death of substantial numbers of adult fish. The immediate vicinity of the dragheads or cutterheads (i.e., within a few meters) would be a relatively noisy, high-turbidity environment that fish would tend to avoid. Some individuals are likely, however, to become disoriented and entrained in the dredge intake, and some relatively slow-moving species and early life stages would be unable to avoid the dredge. Given the limited geographic scope of the dredging, however this impact is expected to be less than significant in terms of the total number of fish in the coastal area.

Under the ocean-based alternatives, high levels of turbidity would be limited to the immediate vicinity of the dredge or scows. Fish subjected to those high turbidity levels, which would include slow-moving and/or sessile species that could not move out of the area, could experience adverse effects from having their gills clogged by sediment. Turbidity could also affect feeding by fish dependent on vision to locate prey. As in the case of entrainment, the number of fish that might be affected by high levels of turbidity is expected to be relatively small, and the effect is expected to be short-lived as the dredge relocates. Accordingly, the impact on fish resources would be less than significant.

Noise from the dredging operation could adversely affect fish through disruption of their swim bladders and hearing loss. Intense underwater noise (greater than 120 dB) is thought to produce a number of behavioral changes among fish, and very intense noise (greater than 150 dB) has been implicated in the injury and death of fish (e.g., Green, n.d.). Studies cited in Talisman Energy (2005) suggest that fish generally respond only to very low or very high frequency sounds and that vessel noise can cause either avoidance or attraction. Avoidance occurs at 118dB re 1  $\mu$ Pa within the frequency range of 60-3,000Hz, whereas sounds in the range of 20-60Hz have no effect. Changes in schooling behavior have also been noted, such as forming tighter formations, swimming faster, and turning away from the noise source. NMFS (2003) stated that intense sound could affect hearing in fish, but cited studies suggesting that this would be unlikely at received sound levels less than 200 dB re 1  $\mu$ Pa, and that the hearing loss would likely be temporary.

Most studies have addressed noise from military sonar and oil exploration activities, which are very intense sounds. Few, if any, studies have investigated the effects of routine commercial navigation and in-water construction on fish. Although there is some data on the noise levels associated with bucket dredging (e.g., USACE 2001), there appear to have been no comprehensive studies of the noise associated with hydraulic dredging. That noise would be generated by the diesel generator(s) powering the pump and cutterhead, the mechanical action of the cutterhead in the sediment, the sediment slurry moving in the pipes, and, in the case of the hopper dredge, the propulsion system (engine noise and cavitation from the propellers). Tyler-Walters and Jackson (1999) state that a working cutter-suction dredge approximates to a received

sound pressure level of 130 dB re 1  $\mu$ Pa over a frequency spectrum of 45 to 7,000 Hz at a distance of 330 ft. (100 m), and that the passing of a small trawler (which would be similar in noise profile to a typical slow-moving hopper dredge) generates a similar noise level. A hopper dredge would generate both types of noise, so that the combined noise sources would produce a total noise level of between 130 and 140 dB re 1  $\mu$ Pa at 330 ft. (100 m) distance (e.g., Talisman Energy 2005). Note that values for generated sound pressure levels are typically expressed as the pressure at a distance of 3.3 ft. (1 m); since that is not relevant to marine life, Tyler-Waters and Jackson (1999) recommend using the pressure at a distance of 330 ft. (100 m), where levels are typically about 40 dB less due to the attenuation with distance.

The data summarized above suggests that dredging operations are unlikely to generate noise levels high enough to cause harm to fish. Given that fact and the absence of published evidence of widespread harm from dredging operations, MMS concludes that the project impacts on fish from underwater noise would be less than significant.

Indirect effects on fish could result from the destruction of potential food resources (benthic infauna and epifauna removed with the dredged material). However, these effects are not expected to be significant (see discussion under Section 4.3.2). In addition, nearby hard-bottom habitat could be affected by settling of suspended solids from the increased turbidity. However, the fact that the deposition of up to 20 million cubic yards of material at the ODMDS in recent years has had no discernable effects on hard bottom areas (Crowe et al. 2006) suggests that the removal of material proposed in this project would likewise have little, if any, adverse impact. MMS will also include certain Negotiated Agreement stipulations to minimize effects on hard bottom habitats including: establishing routes that avoid hard bottoms; requiring a spatial buffer to protect hard bottom from dredging; and prohibiting spudding, anchoring or otherwise disturbing the ocean bottom outside the ODMDS boundaries (see the EFH assessment included as Appendix D). For these reasons, the indirect impacts on fish from disturbance of benthic habitats are not expected to be significant.

#### **4.3.5 Impacts on Marine Mammals**

Some marine mammals in the project area are managed under the Endangered Species Act (ESA; 50 CFR §402; 16 USC §1536(c)); potential project impacts on those species are considered in section 4.3.6. This section considers potential impacts on species not managed under the ESA (which are described in section 3.2.4).

Under the ocean-based alternatives, some of the smaller marine mammals, primarily bottlenose dolphins, could be attracted to the dredge site by the disturbance and potential availability of prey, then exposed to adverse levels of turbidity, noise, and the possibility of entrainment or entrapment in the dredge apparatus. Turbidity caused by re-suspension of sediments during the dredging could adversely affect feeding to the extent that the organisms rely on vision to locate their prey. Noise from the dredging operation could, if it is too loud, adversely affect marine mammals. The No Action Alternative is unlikely to have impacts on marine mammals as there would be no dredging.

The NMFS (2003) has established that a received sound level of 180 dB may result in injury or mortality to cetaceans from pile-driving activities. The level for pinnipeds (which are not expected in the Proposed Action Area) is set at 190dB. For both pinnipeds and cetaceans, NMFS has set the level of potential behavioral harassment at 160 dB. Given that project-generated sounds from dredging activities would be substantially less than those levels (section 4.3.3), none

of the ocean-based alternatives would be expected to have significant adverse effects on marine mammals.

The transport of dredged material by barge or hopper dredge from the ODMDS to the fill site at the MCT could have adverse impacts on animals in the path of the vessels due to vessel strikes. Leakage of dredged material could cause minor, localized turbidity that could cause avoidance reactions by dolphins and small whales. More seriously, animals could be struck by the vessels – hopper dredges, barges, and tugboats – as those vessels transport the dredged material to the MCT site and return to the ODMDS. The likelihood of dolphins being struck by project-related vessels is very small. Dolphins are accustomed to vessels, even frequenting the bow waves of large vessels, and can easily avoid the relatively slow-moving project vessels. Larger marine mammals, such as small whales, occur so infrequently in the Action Area that the likelihood of a strike is very remote. On December 9, 2008, NMFS established regulations to implement speed restrictions of no more than 10 knots applying to all vessels 65 ft (19.8 m) or greater in overall length in certain locations and at certain times of the year along the east coast of the U.S. Atlantic seaboard. The purpose of the regulations is to reduce the likelihood of deaths and serious injuries to endangered North Atlantic right whales that result from collisions with ships (73 FR 30173), but would also reduce the likelihood of deaths and serious injuries to all marine mammals and sea turtles. Accordingly, the Proposed Action and the alternatives with the speed restrictions on vessels would not be expected to have significant adverse impacts on marine mammals attributable to vessel activities.

#### **4.3.6 Impacts on Managed Species**

**Threatened and Endangered Species:** Impacts to managed species could result from the operation of the dredge and the transport of dredged material from the borrow site to the fill site at the MCT (see Section 4.1 for more detail).

##### Whales

As described in Section 3.2.5 and the Biological Assessment for this project (Appendix C), among the endangered species, right whales and humpback whales are most likely to occur in the Action Area. Blue, fin, sperm, and sei whales would not be adversely affected by dredging operations as these are deepwater species, unlikely to be found near dredging sites. Based on the unlikelihood of their presence and of interactions with the dredging operation, in addition to the NOAA-required speed restrictions on vessels, the Proposed Action and the alternatives, would have no impacts to blue, fin, sperm, and sei whales. There would be no adverse effects on any whale species from the No Action Alternative as whales would not occur in the waterways that would be used by vessels delivering fill material to the MCT site.

Although there has never been a report of a whale taken by a hopper dredge (MMS 2003) and there has never been a documented right whale ship strike in South Carolina waters (USACE 2006), the possible presence of right and humpback whales in the Action Area means that there would be a possibility of adverse effects on those species from the ocean-based alternatives. However, the NMFS concluded in its Section 7 consultation letter (USACE 2006, Appendix R) that the effects of operation of the MCT (i.e., cargo vessel traffic) on all of the listed whale species are discountable or insignificant; since vessel traffic associated with construction activities would be much less than that associated with operation of the terminal, and since conservation measures directed at protecting whales would be undertaken (MMS 2008a).



Dredging activities at the ocean-based alternatives may affect, but are not likely to adversely affect, humpback whales and right whales.

Any whales in the vicinity of the open-ocean borrow sites could be adversely affected by the noise of the dredge and the project vessels. The noise sources would be confined to rotating cutter heads and medium-size marine diesel engines. These sources have not been shown to cause injury or death among marine mammals, but they could be loud enough to interfere with whale feeding and social interaction and to cause whales to avoid the project area. Since the affected area is very small, however, the potential effects of such an impact are discountable, and project noise would not adversely affect whales.

### Sea Turtles

All of the ocean-based alternatives have the potential to affect sea turtles both directly and indirectly. This analysis of impacts is summarized from the Biological Assessment for the Proposed Action (Appendix D). Entrainment and entanglement of sea turtles in hopper-dredge dragheads has been observed in sand mining and channel dredging projects in other locations (MMS 2003). Entrainment would be caused by suction from the draghead or cutterhead. Entrapment would consist of simple mechanical entanglement in the wires, cables, and struts of the cutterhead apparatus. Either event can be assumed to cause 100% mortality of the affected individuals. The No Action Alternative would have no impacts on sea turtles because vessels transporting fill material from inland borrow sites to the MCT site would not traverse waters in which sea turtles would occur.

MMS (2003) cites several documented instances of sea turtle mortality in dredging operations in the South Atlantic Region, including 11 loggerhead turtles taken in sand mining operations near Myrtle Beach, South Carolina, from 1997 – 1999, and four Kemp’s Ridley and three loggerheads in North Carolina and Florida in 2001 and 2002. The MCT EIS (USACE 2006) states that eight turtles were taken during channel dredging for Charleston Harbor between 1991 and 1997. In Florida, 149 sea turtles were entrained by hopper dredges during channel maintenance activities between 1980 and 1990, although MMS (2003) points out that sand mining has historically taken far fewer turtles than channel dredging.

Most of the turtles taken by dredging activities have been loggerheads, presumably because of their relative abundance and their tendency to frequent shallow, coastal areas, but, as indicated above, Kemp’s Ridley sea turtles have also been taken by dredging operations in the South Atlantic region. Furthermore, USACE (2006) states that hopper dredges are more likely to take sea turtles both because the dredges move faster than other types and because they are more likely to be used at sea. Accordingly, entrainment and entrapment must be considered potential impacts on coastal sea turtles at the dredge site under the ocean-based alternatives. In addition, the presence of the dredging equipment could interfere with benthic foraging activities at the dredge site.

Collisions with vessels are a particular concern for marine turtles because they bask, forage, and mate on or near the surface. MMS (2003) cites a study estimating that approximately 400 sea turtles per year are killed by boat collisions off coastal beaches. Accordingly, it is possible that sea turtles could be struck by project vessels traveling between the borrow sites and the MCT site under the ocean-based alternatives.

Potential indirect impacts of the ocean-based alternatives include interference with underwater resting habitats, disturbance to benthic foraging habitats, and disruption of the prey base. Sea

turtles feed on benthic invertebrates, fish, crabs, jellyfish, sponges, and sea grasses. Dredging could destroy foraging habitat for sea turtles. Depending on the recovery rate of the benthic communities in the dredged area and extent of the area dredged this could have short-term or long-term effects. Over time, re-colonization of the dredged area by benthic organisms would occur (see Section 4.3.4), restoring the quality of the feeding habitat. In the case of the Proposed Action, the quality of the existing habitat as a turtle foraging area may be lower than for the Open-Ocean Borrow Alternative, given the repeated disturbances of the area by disposal activities.

Multiple mitigation measures to prevent entrainment and entrapment have been investigated, including biological windows, relocation, and deflectors (a turtle excluder device). Biological windows reduce the risk to biological resources (such as sea turtles) from stressors generated from dredging and disposal activities (National Academy of Sciences 2001). This window is based on water temperatures, and is generally from December 1 through March 31 (Clausner et al. 2004). Shrimp trawling equipment and techniques have been modified to capture and relocate sea turtles from hopper dredge sites and may reduce the number of animals affected (Dickerson et al. 2007). Deflectors have become a commonly-used mitigation measure for the use of drag heads to prevent sea turtle injury and deaths and have led to successful reductions in incidental takes to sea turtles. Dredge dragheads have commonly entrained sea turtles resting in or on the bottom of channels. The rigid draghead has been developed the stay in contact with the bottom which allows a sand wave to be created in front of the draghead so that turtles may be deflected without causing injury. Cutterheads used for dredging activities, which are also proposed in this EA, have not had the same problems with entrainment and thus, they have not had the high mortality or injury rate as those from drag heads. Therefore, dredging with cutterheads will not require the deflection mitigation measure (Clausner et al 2004).

To protect sea turtles, the Proposed Action would be subject to three mitigation measures (see the Biological Assessment, attached as Appendix D, for more detail): 1) NMFS-approved sea turtle observers would visually monitor the dredge area, hopper spoil, overflow, screening, and draghead; 2) assessment/relocation trawling would be conducted; and 3) hopper dredges would be equipped with turtle deflectors. With these three proposed mitigation measures, in addition to the restriction of vessel speeds to prevent collisions, sea turtle disturbance is expected to be negligible. Further, in both ocean-based alternatives, the relatively small size of the affected area, the short duration of the action, and the conservation measures that would be employed mean that indirect impacts on sea turtles would be negligible.

NMFS concluded in a previous 2006 Section 7 consultation letter for the MCT project (NMFS 2006a and Appendix F) that the effects of construction (i.e., fill placement) and operation of the MCT on sea turtles would be discountable.

#### Manatees

All three alternatives could affect manatees, which could be struck by vessels transporting the dredged material to the MCT site and returning to the borrow site. As described in the Biological Assessment for the Proposed Action (Appendix D), however, the small number of vessels involved in the dredging, the small number of manatees likely to be in the area, and the conservation measures that would be employed during dredging and material transport (see the Biological Assessment, Appendix D, for details) would minimize the impact.

The EIS evaluated the magnitude of the impacts of construction and operation of the MCT on the manatee and, in response to consultation with USFWS, proposed mitigation in the form of incorporating manatee avoidance measures into permits (USACE 2006, Section 6 and Appendix EE).

#### Other Listed Species

None of the alternatives would affect the listed species found only in the vicinity of the MCT (sturgeon, alligator, bald eagle) beyond the effects of constructing and operating the MCT, which were considered in the MCT EIS. The EIS concluded that construction and operation of the MCT would not adversely affect those three listed species. The FWS agreed, in its Section 7 consultation letter, with the EIS's determination that the effects of construction (i.e., fill placement) and operation of the MCT on the bald eagle, shortnose sturgeon, and alligator would be discountable.

**Essential Fish Habitat:** Fisheries whose EFH could be affected by dredging at the ODMDS include shrimp, red drum, spiny lobster, some of the Middle Atlantic FMP species (e.g., bluefish, summer flounder, and spiny dogfish), certain sharks of the HMS FMP, the snapper-grouper group, and the coastal migratory pelagics (see the EFH Assessment in Appendix E submitted to NMFS by MMS). As described in Section 4.3.3, water column and benthic habitat could be degraded by turbidity, dissolved oxygen, and noise impacts, causing shrimp and managed fish species to avoid the area, and possibly interfering with their respiration and feeding. This could also occur in the interconnecting waterways between the ODMDS and the MCT. Entrainment of organisms could occur. Affected fisheries would experience a loss of food resources in up to 1125 acres (450 ha) of unconsolidated habitat in the borrow area; the area would be of poor quality as a food resource until recolonization by the normal invertebrate fauna occurred. In the absence of further disturbance, that process is reported to take 3 months to 2.5 years (Brooks et al. 2006) but one to two years is likely given the fine-grained sediments characteristic of the site (Newell, Seiderman, and Hitchcock 1998; Tetra Tech 2003). As noted above, however, the ODMDS is in a continual state of disturbance as a result of periodic disposal activities (for example, Charleston Harbor and Entrance Channel maintenance projects were completed in 2008 resulting in over 2 million cubic yards of sediments delivered to the ODMDS). As a result, full recovery to the biological community characteristic of surrounding areas would not occur.

The EFH Assessment (Appendix E) concluded that EFH impacts at the Open-Ocean Borrow Sites would include a temporary (during construction) reduction in the quality of the water column habitat in the immediate vicinity of the dredge, which would affect shrimp habitat, and loss of the feeding resource in up to 1125 acres (450 ha) of unconsolidated habitat for an indeterminate, but finite, period of time, which would affect the shrimp, red drum, spiny lobster, and snapper-grouper fisheries. In both cases, MMS concludes that the short duration and limited extent of the impact would prevent the impacts from having a significant effect on managed species.

Longer-term impacts could occur on adjacent live-bottom habitats as a result of the settling of sediment resuspended during the dredging but, as described in Section 4.3.3, any such impact would not be expected to be significant. Conservation measures consistent with the ODMDS site management plan (USACE et al. 2005) and MMS Negotiated Agreement stipulations as described in the EFH Assessment would prevent effects on hard-bottom habitats from the transportation of dredged material under the two ocean-based alternatives.

Fisheries that would not be affected include the golden crab, dolphin-wahoo, mid-Atlantic species (other than bluefish, summer flounder, and spiny dogfish), and highly migratory species fisheries (with the exception of certain sharks) because none of their EFH is in the Action Area. EFH impacts under the No Action Alternative have been addressed in the MCT EIS (USACE 2006, Section 5.17), and would include loss of habitat for the shrimp fishery and localized, temporary increased turbidity and decreased dissolved oxygen. The EIS concluded that the impacts would be less than significant.

#### **4.4 Impacts on Cultural and Socioeconomic Resources**

As explained in Section 3.3.1, there is a low potential for prehistoric or Native American artifacts to be encountered under any of the alternatives. The MMS Negotiated Agreement shall include a mitigation measure for chance finds. Accordingly, the Proposed Action and the other alternatives are not expected to impact prehistoric resources.

There is a low potential for historic resources to be encountered under the Proposed Alternative because, as the ODMDS site has been used for ocean disposal for many decades, the chance that intact wrecks are present near the seafloor surface is remote. Any wrecks would, in any case, be covered by dredged material. The MMS Negotiated Agreement shall include a mitigation measure for chance finds. Accordingly, the Proposed Alternative is not expected to affect historic resources.

Shipwrecks could be present at the Open-Ocean Borrow Alternative site, but because a specific site has not been designated this possibility cannot be assessed in any detail. Under this alternative it is anticipated that a pre-dredging survey of the area would be required in order to ascertain whether historic resources were present, which would reduce the possibility of impacts on historic resources to less than significant.

The potential presence of cultural resources at the MCT site was evaluated in the EIS (USACE 2006, Section 4.12). The area that would be affected by the fill activities has been heavily modified through fill, construction, and redevelopment activities over the past century. The EIS concluded that there are no historic, prehistoric, or Native American resources in the area. The MCT EIS (USACE 2006, Section 5.2.12) concluded that placement of fill and operation of the marine terminal would have no impacts on cultural resources.

Construction and operation of the terminal could have socioeconomic and transportation effects by inducing economic and population growth, which could also add vehicles to local roads and highways. The EIS (USACE 2006, Sections 5.2.3 through 5.2.5) evaluated the magnitude of the socioeconomic impacts, identified positive economic impacts and potential adverse impacts to property values, and concluded that residual impacts would be less than significant. The EIS (USACE 2006, Section 5.2.6) evaluated the magnitude of the transportation impacts, identified potential adverse operational impacts on I-26, imposed construction-phase mitigation in the form of restricting the number of trucks hauling fill material and requiring roadway changes, and concluded that residual impacts would be less than significant.

#### **4.5 Environmental Justice**

As mandated by Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," states that "each Federal agency make achieving environmental justice part of its mission by identifying and addressing, as appropriate,

disproportionately high adverse human health and environmental effects of its programs, policies, and activities on minority populations and low income populations.” It is required by the Council on Environmental Quality that Environmental Justice be incorporated into bureau NEPA documents.

All of the alternatives considered in this document would facilitate construction of a marine container terminal. The MCT EIS (USACE 2006, Section 5.2.4) concluded that construction and operation of the proposed project would have less than significant impacts related to environmental justice. The proposed MCT project would create jobs that would replace some of the jobs lost to the closure of the military base.

Neither of the construction alternatives, in themselves, would have environmental impacts related to environmental justice because they would all be of short duration, involve relatively few workers, would not have significant impacts, and would not affect onshore communities. Accordingly, none of the alternatives would have impacts that would disproportionately affect minority or economically disadvantaged populations.

#### **4.6 Cumulative Impacts**

Cumulative impacts are those impacts on the environment that result from the incremental impacts of the proposed action when added to other past, present, and reasonably foreseeable future actions. This section analyzes the Proposed Action (i.e., the removal of OCS sand resources at the ODMDS) in the context of similar and unrelated actions occurring in the vicinity of the Action Area, which include navigation channel maintenance, commercial and recreational fishing, military exercises, and shipping traffic. Both beneficial and adverse cumulative impacts could occur when the impacts of the Proposed Action are considered in context, but the incremental contribution of the Proposed Action on impacts to physical resources, air quality, avian communities, marine mammals and sea turtles, finfish, and essential fish habitat are minor. The Proposed Action itself would have temporary direct impacts that would last only as long as the construction period, or approximately three years. Those impacts, which would include air emissions, vessel traffic, turbidity, and habitat disruption, would be added to the impacts of the other activities in the area.

##### Air Emissions

The air emissions have been shown to be a minute proportion of the total emissions in the Charleston area (Section 4.2.4). That fact, plus the fact that the Charleston area is in attainment of air quality standards as well as the temporary nature of the project emissions mean that the cumulative impact of the project on regional air quality would be less than significant.

##### Vessel Traffic

Vessel activity of the Proposed Action (hopper dredges, tugboats, dump scows, and workboats) would be added to the general background of vessel traffic in the area. The Port of Charleston received over 2000 vessel calls in 2003 (BTS 2004); the area is also used by thousands of recreational and commercial vessels, and by naval vessels conducting exercises. During maintenance and capital project dredging projects, the ODMDS itself is visited by hopper dredges and tug/scow combinations delivering dredged material. Compared to that level of activity, the vessel traffic from the Proposed Action, which would amount to no more than 16 transits per day, would not constitute a significant cumulative impact.

##### Water Quality

Water quality in the nearshore region, including the ODMDS, is affected by a variety of activities, including seasonal fluctuations in natural river and tidal inlet exchange that bring land-based pollutants (e.g., pathogens, contaminants, and agricultural nutrients) into the ocean, and releases of pollutants from vessels. These inputs can lead to reproductive failure, deformations, and mortality, and can contribute to locally anoxic zones, which have been observed off the coast of South Carolina (Section 3.1.2). Impacts from these sources of pollution are expected to continue with or without the Proposed Action. The impacts on water quality from the proposed borrow operation, primarily elevated turbidity, would be short in duration and limited to the immediate vicinity of the dredging activity. Accordingly, the Proposed Action would not contribute significantly to the cumulative impacts of regional activities on coastal ocean water quality.

#### Habitat Disruption

Cumulative impacts to EFH and finfish in the Action Area occur from many sources. The major impacts on marine biological resources and EFH in the Action Area are recreational and commercial fishing activities that conduct unsustainable fishing practices and policies (US Navy, 2008). Trawling, seining, and longlining are all practiced by commercial fishing boats; trawling is particularly destructive of bottom habitat, and all methods can affect biological resources through by-catch and losses of population reproductive capacity. Recreational anglers also catch managed fish species within the Action Area (i.e. bluefish, cobia, king mackerel) via rod and reel. Additionally, disruption of bottom habitat can occur from the anchoring of recreational boats. Benthos and fish caught by anchors may be destroyed, and repeated anchoring in the same location can lead to patches void of benthic organisms. It can reasonably be assumed that South Carolina will continue to license and permit recreational vessels and operations, which do not fall under the purview of a Federal agency. If recreational activity increases, the pressure on biological resources in the Action Area may continue to increase as well. In addition, commercial fishing will continue. The Proposed Action, however, would not contribute to those impacts in the long term because it would be a short-term (maximum of three years) action and would affect an area that does not support important biological resources (the ODMDS).

One sensitive habitat in the Action Area is hard/live bottom, a habitat type that is threatened by the commercial and recreational activities discussed above. Hard bottom habitat is sensitive both mechanical disturbance (i.e., trawls and anchors) and physical processes such as sedimentation. The Proposed Action would generate turbidity and resuspended sediments that are a potential threat to hard bottoms, but the project controls, including prohibiting any activities outside the ODMDS, prohibiting dredging within 500 ft. (150 m) of the exterior and westernmost interior berms, completing dredge/scow de-watering before departing the dredging area, and sequencing dredging to minimize activities on the western side of the ODMDS, would minimize the Proposed Action's contribution to the cumulative impacts of regional activities on nearby hard bottoms.

At the ODMDS, the areal extent of seafloor disturbance would be a function of dredging cut depth and thickness of available sand deposits. The Proposed Action would affect up to 1125 acres (450 ha) of seafloor, but the habitat at the ODMDS is naturally dynamic as a result of periodic dredge material disposal, and the loss of resources would be minimal. It is likely that recolonization of benthic fauna would occur rapidly (see the EFH Assessment, Appendix D). Other activities in and near the ODMDS, including dredged material disposal and vessel traffic, will have long-term impacts, but those impacts are a part of the environment of the ODMDS, in

the sense that the site is designated for dredged material disposal. Accordingly, the Proposed Action and foreseeable activities would not result in significant effects on sensitive habitats.

### Marine Animals

Dredges and support vessels, like military, shipping, and fishing activities, may contribute to disrupted feeding, loss of prey, noise disruption, and possible collision with and entrainment of marine mammals, sea turtles, and finfish (Section 4.1). Military activities, including ordnance testing, sonar testing, and operational exercises, may affect listed turtle and marine mammal species. Since marine mammals, sea turtles, and pelagic fish are highly migratory, they can generally avoid such disturbances, but impacts still occur, as discussed in Section 3.2. In particular, whales and sea turtles are injured or killed every year along the coast of the southeastern United States by cargo vessels, fishing vessels, military vessels, and dredge operations. The Proposed Action has the potential to contribute somewhat to those impacts, but in view of the small scale of the project relative to other activities, the cumulative impact is expected to be insignificant. Furthermore, the mitigation measures incorporated into the Proposed Action are adopted for the express purpose of reducing those impacts.

In summary, the small scale of the Proposed Action relative to other activities in the general vicinity of the ODMDS, combined with the mitigation measures incorporated into the project, are expected to reduce the Proposed Action's cumulative impact to less than significant.

## **5 OTHER CONSIDERATIONS REQUIRED BY NEPA**

### ***5.1 Agencies and Persons Consulted***

Dr. Paul Gayes, Coastal Carolina University

Dr. Bob Van Dolah, South Carolina Department of Natural Resources

Gary Collins, Environmental Protection Agency

Kay Davy, National Oceanic and Atmospheric Administration

Philip Wolf, United States Army Corps of Engineers

Alan Shirey, United States Army Corps of Engineers

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### ***5.2 Public Involvement***

The MMS is the lead agency for the Charleston ODMDS Sand Borrow Project. The U.S. Environmental Protection Agency has been a Cooperating Agency with the MMS for the duration of this project and has sought the expertise of a number of Federal Agencies for the development of the Draft and Final Environmental Assessment Charleston ODMDS Sand Borrow Project.

The MMS posted the draft version of this document for a 30-day public comment period on the Sand and Gravel Program webpage of the Minerals Management Service website, which closed

on September 19, 2009. A notice was placed in the Charleston Post and Courier newspaper from August 20, 2009 through August 24, 2009 to alert the public of this comment period.

The MMS received one letter from the U.S. Army Corps of Engineers, Charleston District. These comments (found below) have been incorporated into this Environmental Assessment.

<b>Table 5-1 Charleston Offshore Dredged Material Disposal Site Sand Borrow Project</b>	
<b>Draft Environmental Assessment-public comments received 8/09-9/09</b>	
<b>U.S. Army Corps of Engineers-Charleston District</b>	<b>MMS Response</b>
[DA] permits are issued pursuant to Section 404 (not 404b) of the Clean Water Act and Section 10 of the Rivers and Harbors Act, the DA permit also requires additional coordination regarding potential sources of fill material	The text has been changed to reflect all of Section 404. The Rivers and Harbors Act is applicable to the placement portion of the project, not the MMS Negotiated Agreement.
Page 11, Para 1- Has the Corps agreed to allow the SCSPA to dredge a portion of the easternmost berm?	Yes. The MMS has email verification of concurrence from both the USACE and EPA dated, 6/2009.
Page 16, Para 3- What authorization will be required by USACE? Are you referring to review and approval of the potential source of fill material in accordance with the SCSPA permit? Or does the removal of material [from] the ODMDS require some type of authorization from the Corps and/or EPA? Does USACE plan to include a special condition requiring a bathymetric survey?	The MMS is responsible for issuing a Negotiated Agreement between MMS and the applicant; after the completion of the Environmental Assessment. The Corps informed the applicant by letter that a permit was not required. However, since the Corps is one of the managers of the site, the statement was made because Corps approval may have been necessary for the conditions necessary for material removal. A 'before and after' sand removal bathymetric survey is required and will be completed by the applicant.
Page 16, Para 4-Has the SCSPA developed a specific management plan for supernatant water on the project site?	A specific plan has not been developed for the ODMDS project site. However, the contractor is required to develop a plan that meets all water quality requirements of the Corps 401 permit at the placement site.
Page 47, Dissolved Oxygen- I believe you are referring to language from the EIS that related to dredging adjacent to the Navy Base Terminal, not placement of fill material	That is correct.
Page 47, Chemical Pollutants- Same as above, additional coordination is required to consider secondary impacts associated with obtaining and transporting fill material to the project site.	The first paragraph of this section is new EA analysis. Additional coordination will be under the jurisdiction of the USACE and U.S. Coast Guard.
Page 48, Impacts on Climate- I assume there will be minor differences in GHG emissions, we assume that sandy material will come from the entrance channel and will be carried all the way to the project site rather than being placed in the ODMDS	The MMS analyzed criterion pollutants in this EA, the suite of GHG was not the focus of this analysis. Air quality analysis for the Proposed Action is attached in Appendix E of this document.
Page 49, Para 1- attainment status of the City of Charleston, Cape Romain wildlife refuge was also	This analysis can be found in Section 4.11.2.2. Cape Romain National Wildlife Refuge of the U.S.



evaluated to ensure that the proposed project would not have an adverse impact on air quality within this Class I Wilderness Area	Army Corps of Engineers Final Environmental Impact Statement Proposed Marine Container Terminal at the Charleston Naval Complex
Page 51, Para 3- mitigation included the purchase of freshwater mitigation credits, restoration of tidal marsh, and acquisition of lands within the Charleston Harbor estuary	This is a mitigation measure that should be noted for the placement phase of this project, covered in the USACE EIS.
Page 53, Para 3- impacts to ESA are considered in Section 4.3.6	Corrected
Page 54, Para 4- Does MMS 2008a include additional conservation measures? Do you mean to reference the conservation measures that were proposed by the SCSPA during NMFS coordination for the DA permit?	The MMS will include in the Negotiated Agreement stipulations, mitigation measures applicable to MMS consultations.
Page 55, Para 4- Does the EIS discuss the likelihood of hopper dredges taking turtles? Or are you trying to reference a different USACE document?	Concerning the reference to hopper dredges and turtles, it can be found on pg. 5-148 in the USACE EIS.
Page 57, Para 1- Is MMS planning to include manatee avoidance measures in their lease agreement? Do we need to delineate the limits of the Corps' ESA consultation and MMS' ESA consultation? Who will coordinate with NMFS if a hopper dredge or scow hits a right whale or turtle?	Manatee measures are listed on page 34 of the Biological Assessment document and will be included in the Negotiated Agreement stipulations.
Page 59, Para 3- Upland sources are expected to have an adverse impact on the adjacent low income minority community? Rosemont recently contacted to DOJ and has expressed an interest in filing an environmental justice claim regarding the port facility and port access road?	Socioeconomic and Environmental Justice for the placement portion of this project was analyzed in Section 3.5 of the U.S. Army Corps of Engineers Final Environmental Impact Statement Proposed Marine Container Terminal at the Charleston Naval Complex
Page 59 Cumulative Impacts- Paragraph 1 refers to turbidity as a potential impact, the text describes turbidity as a subset of water quality, for clarity you may want to use the same name (turbidity or water quality) in both places	These terms are not used synonymously.
Page 61, Agencies and Persons Consulted- Nathaniel, not Nathaniel	Corrected
Page 61, Public Involvement- you may want to clarify that MMS is the lead agency and EPA is a cooperating agency	Corrected
Page 62, Compliance- same as above, DA permit pursuant to Section 404 (not 404b) of the Clean Water Act and Section 10 of the Rivers and Harbors Act (text and bullets)	The MMS is incorporating the CWA and RHA by reference as the USACE must be directly compliant with these regulations.
Page 62, Compliance- Section 106 consultation is conducted by the State Historic Preservation Office, not USACE	Corrected to note that Section 106 is conducted by the State Historic Preservation Office in consultation with the USACE.

### **5.3 Compliance**

The Proposed Action is required to comply with a number of federal laws and regulations. Required permits, approvals, and consultations include Clean Water Act Section 401 Water Quality Certification (SC DHEC); Clean Water Act Section 404 permit (US Army Corps of Engineers); Coastal Zone Management Act subpart (d) coastal consistency certification (SC DHEC); Endangered Species Act Section 7 consultation (US Fish and Wildlife Service, NOAA Fisheries); Magnuson-Stevens Act Essential Fish Habitat Consultation (NOAA Fisheries); National Environmental Policy Act; Outer Continental Shelf Lands Act 43 U.S.C. § 1337 (k)(A)(i)(ii).

The MCT construction project's compliance to date includes:

- Clean Water Act Section 404 permit (2003-1T-016) issued by the U.S. Army Corps of Engineers on April 27, 2007
- Coastal Zone Management Act Coastal Zone Consistency Certification issued by the South Carolina DHEC on October 30, 2006
- Endangered Species Act Section 7 consultation with NOAA National Marine Fishery Service completed October 3, 2006.

## **6 CONCLUSIONS**

This Environmental Assessment finds that no significant long-term environmental impacts are anticipated from implementing the Proposed Action, i.e., the Charleston Ocean Dredge Material Disposal Site Sand Borrow Project. Temporary impacts of construction would be less than significant. This conclusion is based on a review of the Proposed Action and three alternatives, available information on environmental resources in the Action Area, and project-specific engineering reports.

As described in Section 2.5, the Proposed Alternative would have fewer impacts on biological resources than the Open-Ocean Borrow Alternative and would allow the marine container terminal to be built at a lower cost and with less air quality and traffic impacts than the No Action Alternative. The Proposed Action is not expected to have any impact on cultural resources, whereas the Open-Ocean Borrow Alternative could conflict with the preservation of historical artifacts (shipwrecks).

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## **APPENDICES**

- Appendix A: Charleston ODMDS Reconnaissance Dive Summary: April 23 and 26, 2009
- Appendix B: Physical Impacts Assessment Charleston ODMDS Sand Borrow Project. Prepared by Moffatt & Nichol Engineers, April 2008.
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## Charleston ODMDS Reconnaissance Dive Summary: April 23 and 26, 2009

### Dive Team:

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### Summary

Staff from South Carolina Department of Natural Resources performed six dives over two days on the interior berms of the Charleston offshore dredge material deposit site (ODMDS) (Figure 1). One dive was performed on the more landward interior berm (site 3), and four dives were performed on the more seaward interior berm (sites 1, 4, 6, and 7). One dive was accidentally performed in a non-berm area landward of the interior berms (site 5). To maximize visibility, dives were performed either on the early falling tide (Thursday 4/23/09) or late rising tide (Sunday 4/26/09). An underwater camera was used to document the bottom conditions along 200-300-foot transects at each dive site visited on 4/26/09 (1, 4, 6 and 7). Sediment depth was probed by hand with a 4-foot piece of rebar. Using the boat and fathometer, berm-perpendicular transects were performed to estimate berm width and elevation change.

Based on boat/fathometer transects, the water depth on the berms were 32-35 ft and depths between the berms was about 38-40ft. The seaward interior berm was approximately 600 feet wide and 6-8 feet above the non-berm areas.

At all dive sites on the two interior berms, bottom sediments consisted of a patchwork of sand, mud, and marl (Figures 2-5). Sediment depth varied from 0-3 feet, indicating underlying chunks of marl with often thin layers of overlying sand and loose mud. In some locations, chunks of marl projected above the bottom by up to 3 feet (Figure 4). A variety of animals were observed including black sea bass, bank sea bass, sheepshead, and spadefish (Figure 4). Invertebrates were limited to a few starfish (*Luidia clathrata* and *L. alternata*) and some attached epifaunal species. Figures 2-5 were from video collected at sites 1 and 4, but are similar to video collected at all 5 berm sites. By comparison, the non-berm area lacked vertical relief and any evidence of marl and seemed to consist of sand to a depth of at least 3 feet (full length of rebar).

### **Dive Site Descriptions:**

#### Off-berm

4/24/2009 Dive 1 (32.64474/79.75510)

Dove off of berm due to one digit being entered incorrectly into the GPS and did not notice until the divers were overboard. Visibility 10 feet. No video collected. Bottom was deep sand, rebar could be pushed in full depth (3 ft). Water depth 40 feet.

## Appendix A

### Site 3

4/24/2009 Dive 2 (32.63481/79.75530)

Visibility 10 feet. No video collected. 50-foot circle search search performed. Thin sand layer (2-3 inches) with marl underneath.

### Site 4

4/26/2009 Dive 1 (32.63251/79.74770) end transect (32.63224/79.74789)

Visibility 10 feet. Video collected. Bottom consisted of mud, oyster hash, exposed marl, and some sand. Sediment depth varied from 3 inches to 3 feet.

### Site 1

4/26/2009 Dive 2, (32.63602/79.74547) end transect (32.63627/79.74625)

Visibility 10 feet. Video collected. Bottom consisted of mud and mud/sand mix. Sediment depth varied from 1-3 feet. Areas with chunks of marl with 1-2 feet of relief present. From a beginning depth of 32-24 feet, divers swam approximately 300 ft to east into 39-40 feet of water.

### Site 6

4/26/2009 Dive 3, (32.63882/79.74363) end transect (32.63756/79.74369)

Visibility 10 feet. Video collected. Sediment depth varied from 2-4 ft. Areas with 1-3 feet of relief were present. Divers swam approximately 300 feet along berm; at end of transect, sediment depth was 2" over marl.

### Site 7

4/26/2009 Dive 4, (32.64158/79.74220) end transect (32.64260/79.74072)

Visibility 10-15 feet. Video collected. Sediments consisted of mud, sand and large exposed marl boulders. In places vertical relief of 3 feet was present. Sediment depth varied from 2 inches to 2feet. Area hosted abundant fish.

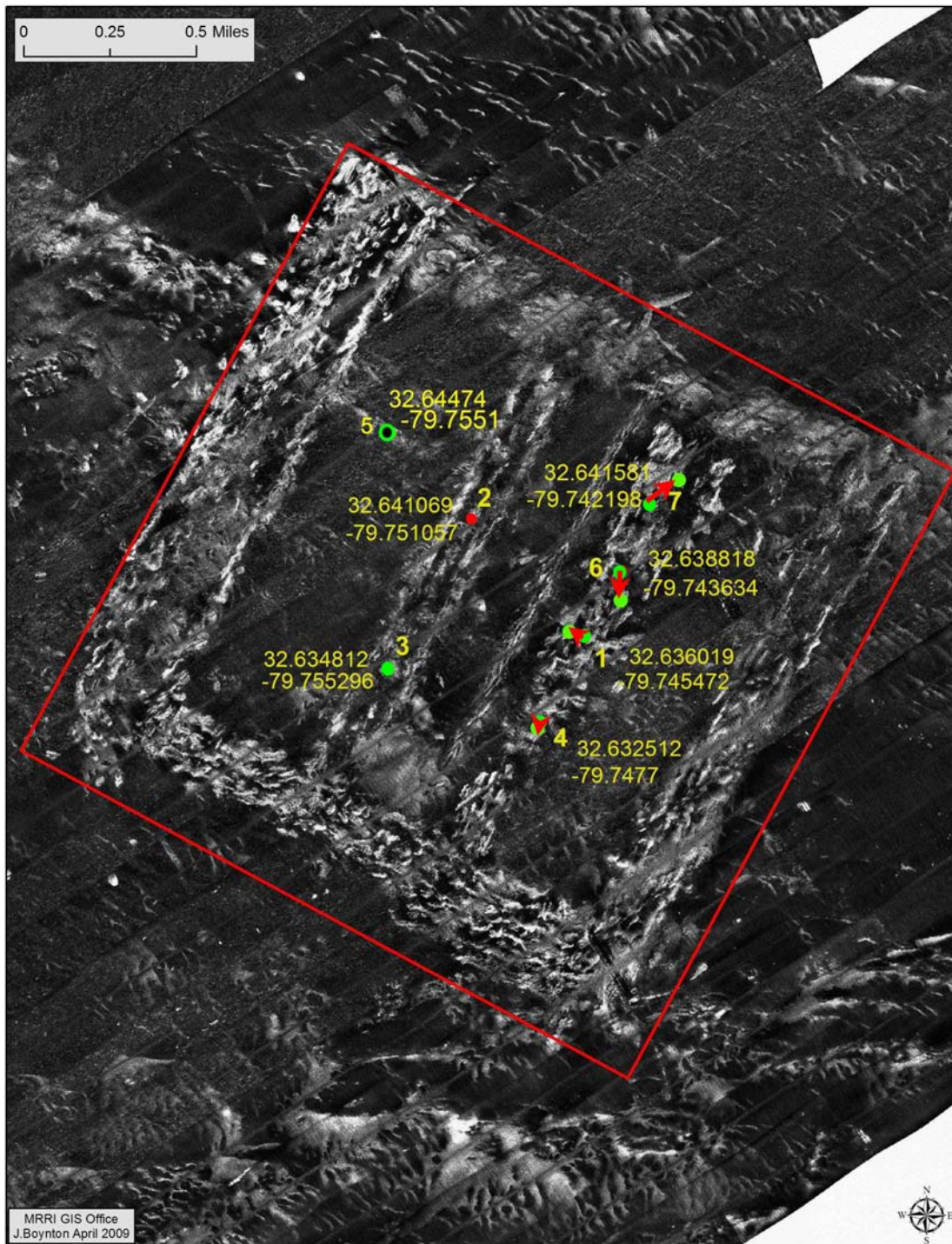


Figure 1: Map of the April 2009 SCDNR dive sites on the Charleston ODMDS. Red arrows show direction of berm transects. Station 2 was not visited; station 5 was an accidental dive off the berm.



Figure 2: Site 1--sand and low relief marl



Figure 3: Site 1--sand and marl chunks

Appendix A



Figure 4: Site 1--high relief marl, sand, trash (rope or cable). Fish are black sea bass.

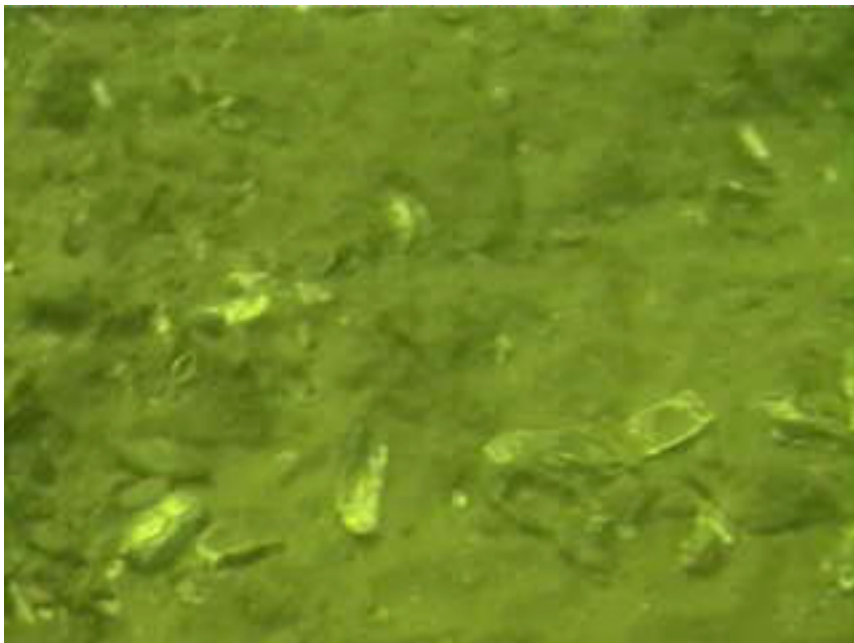


Figure 5: Site 4--marl, mud, oyster hash

## **Physical Impacts Assessment Charleston ODMDS Sand Borrow Project**

### **Purpose**

The South Carolina State Ports Authority has proposed to use Outer Continental Shelf (OCS) sediment located in the Charleston Offshore Dredged Material Disposal Site (ODMDS) offshore Charleston Harbor as fill material for a terminal expansion project at the Charleston Naval Base Terminal. The proposed action is considered by the applicant, the U.S. Environmental Protection Agency, and the U.S. Army Corps of Engineers- Charleston District to be a beneficial use of the dredged material historically placed in the ODMDS following maintenance dredging within Charleston Harbor and the approach channel. This assessment characterizes the affected environment and evaluates the potential physical impacts of dredging, with a particular focus on whether modifying offshore bathymetry will impact incident wave characteristics, sediment transport processes, and shoreline change of adjacent barrier islands.

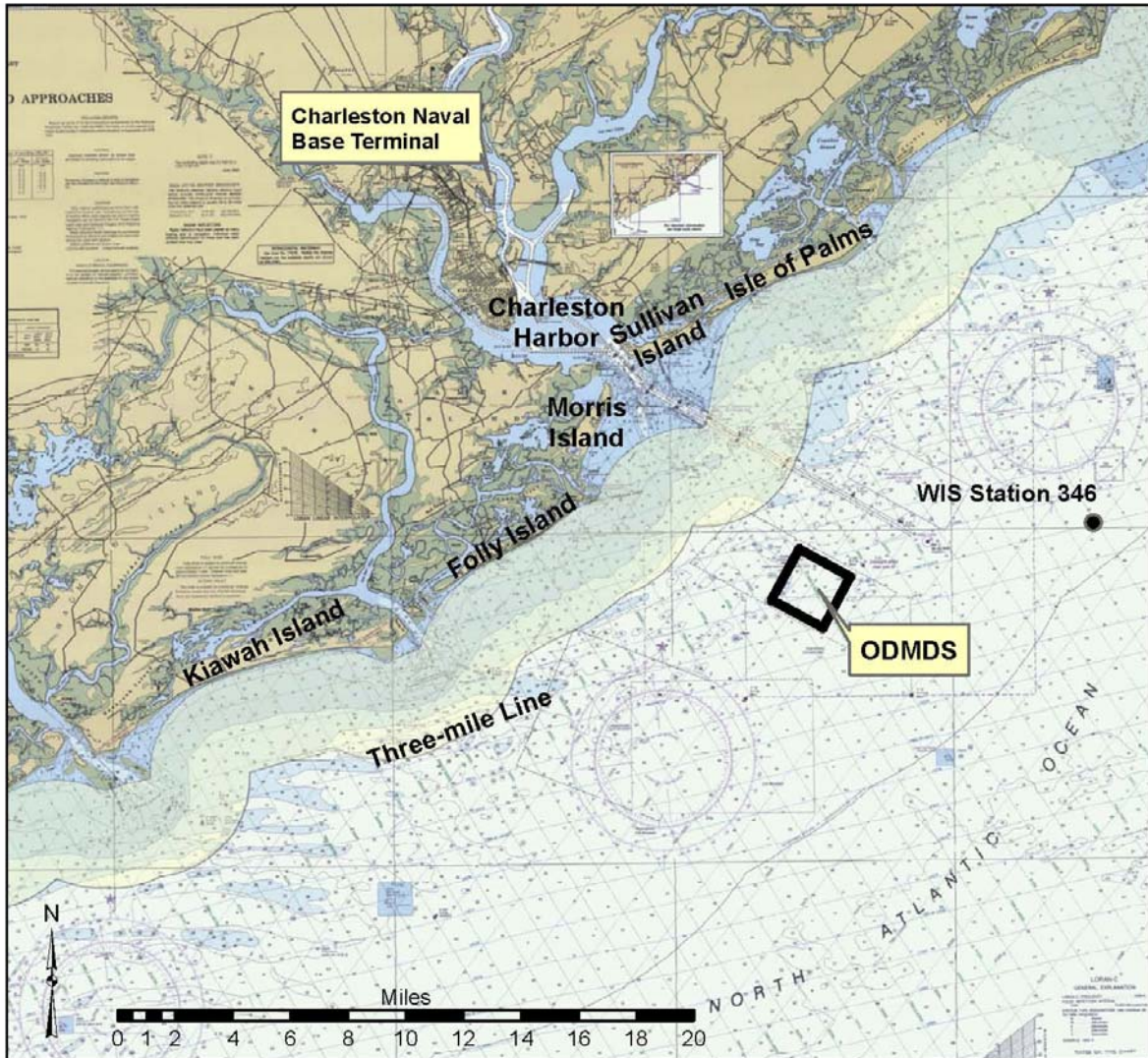
### **Affected Environment**

#### *Charleston ODMDS*

The Charleston ODMDS is located approximately 7.5 miles southeast of the adjacent barrier island shoreline in water depths ranging from -35 ft to -45 ft MLLW (Figure 1). The ODMDS is bounded by a constructed berm rising above the seafloor to a water depth of approximately -30 ft MLLW. The Charleston ODMDS is one of the most active, frequently used sites in the South Atlantic Bight. It has been in use since 1896 for disposal activities (Site Management and Monitoring Plan 2005). The active disposal site is a square 2 miles by 2 miles oriented parallel to the entrance channel to Charleston Harbor, which is located approximately 2 miles to the northeast. Dredging of material from the ODMDS will be limited to the sediment within the surrounding berms; the berms will not be altered.

Figure 2 shows the bathymetry in the ODMDS based on a survey conducted in 2007 to monitor dredge disposal volumes. The survey domain does not completely cover the berms around the periphery of the disposal site. The minimum water depth in the surveyed area is -24 ft MLLW which is located along the berm to the northeast and northwest. The maximum water depth is -45 ft MLLW near the southwest corner of the disposal site. The maximum water depth shown is near -48 ft MLLW near the southeast corner. In the interior of the bermed area, the bathymetry shows two elongated mounds extending from the southwest side of the site to the northeast side of the site. These are presumably the result of the disposal operations from various maintenance dredging cycles.

The sediments within the Charleston ODMDS have been sampled at 18 sites at several representative depths (S&ME 2007). The surface median grain size ( $d_{50}$ ) averaged 0.25 mm (fine sand) over the 18 sites and ranged from 0.17 mm (very fine sand) to 0.54 mm (coarse sand). The surface sediments consist primarily of fine sand with the average percent of sand



**Figure 1 Location of Charleston Harbor ODMDS (NOAA Chart 11521).**

contained in the near surface samples being 71%. The remainder is primarily silt and clay with small fractions of coarse sand. This most recent sediment sample analysis compares reasonably well with a previous investigation of the dredged material related to the harbor deepening project (Jutte et al. 2005). A summary of their sediment composition data is illustrated in Figure 3. A total of 200 sediment samples were collected from three zones at the disposal site including the disposal area, inner boundary, and outer boundary. Results presented in Figure 3 show predominantly fine sand within the disposal area with increased sand content going away from the disposal site, indicating the material dredged from the approach channel and harbor is finer-grained. The fine sand content ranged from 55% to 65% within the disposal area and 68% to 85% in the boundary areas. The boundary areas should be representative of the overall seafloor sediment characteristics in the area between the ODMDS to the shoreline, with increasing sand content approaching the surf zone.

## Appendix B

A compilation of seafloor habitat characteristics from North Carolina to the Florida Keys was completed by the Southeast Area Monitoring Assessment Program in 2001 (SEAMAP –SA 2001) and includes data in the vicinity of proposed action area. Figure 7 shows hardbottom habitat, possible hardbottom habitat, and no hardbottom habitat offshore of South Carolina. Low-relief (generally less than 3 ft) and low-growth hard bottom reef habitats are patchily distributed within 2.5 miles of the ODMDS (Crowe et al. 2006). Due to the proximity of the ODMDS to hardbottom areas, there is the potential for sedimentation and burial from sediments dispersed during dredging operations (Figure 8). Sediment migration has been detected outside the ODMDS to the west and northwest during disposal and by natural processes (Zimmerman et al. 2003, Crowe et al. 2006). Berms were constructed of cooper marl on the southern and western borders in order to minimize movement of dredged material from the ODMDS during and following disposal.

### *Barrier Islands*

The mesotidal, mixed-energy coastline immediately west of the ODMDS consists of two low-lying, barrier islands: Folly Island and Morris Island. These drumstick barrier islands are separated by the unstabilized, natural Lighthouse Inlet. Immediately northeast of the ODMDS and north of the Charleston Harbor lie Sullivan Island and Isle of Palms. Historically, most of the barrier islands in this section of the coast are erosional with the exception of Kiawah Island located to the southwest of Folly Island (Morton and Miller 2005, Harris et al. 2005). Morton and Miller (2005) suggest that Kiawah Island is a sand rich, high profile barrier island while the other barrier islands are characterized as low profile barriers, vulnerable to inundation by extreme storm surge and overwash during storms. The overwash tends to move beach sediment landward thus causing landward migration of the barrier island.

Shoreline change data for South Carolina indicate long-term erosion over 51% of the shoreline at a rate of  $-1.6 \pm 9.8$  ft/yr based on data from the mid- to late- 1800's to the present (Morton and Miller, 2005). Long-term shoreline change is especially variable along Morris Island, with erosion rates ranging from 2 ft/yr at the northern end to over 30 ft/yr along the southern segment. Long-term data specifically for Folly Island indicate shoreline retreat at an average rate of 4.0 to 4.6 ft/yr (Fitzgerald 1979). It has been suggested that the erosion of Folly Island and Morris Island can be attributed to the reduction in longshore sediment supply as a result of the Charleston Harbor Jetties (Katuna et al. 1993). The erosion of Folly Island has resulted in the development and implementation of the Folly Beach Renourishment Project. The first nourishment of the beach was completed in May, 1993 with an initial beach fill volume of 2.48 million cubic yards of sand. The renourishment plan calls for four additional 1.7 million cubic yard placements at eight year intervals with a final 2.1 million cubic yards as the last placement. Several smaller renourishment efforts involving the south end of the island were completed in recent years (Katuna et al. 1995). The beach along the face of Folly Island also contains numerous groins constructed throughout the 20<sup>th</sup> century to counteract chronic erosion of the sandy beaches.



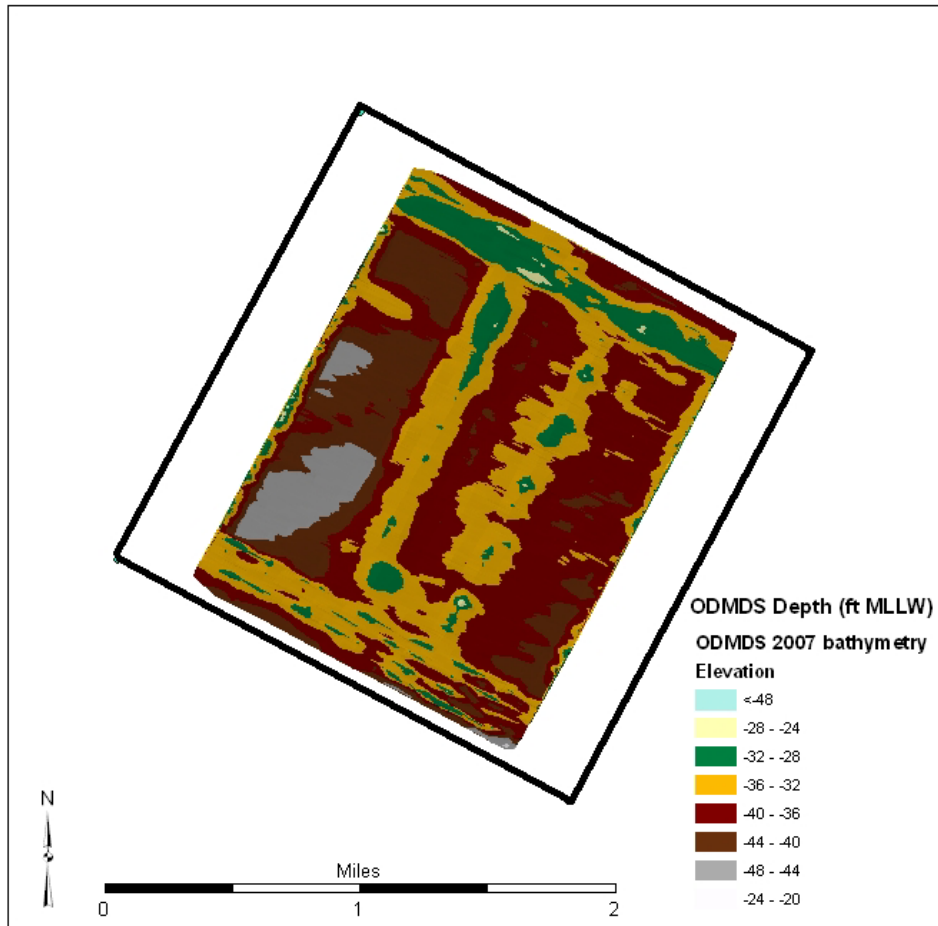


Figure 2 Bathymetry of the Charleston ODMDS surveyed during 2007.

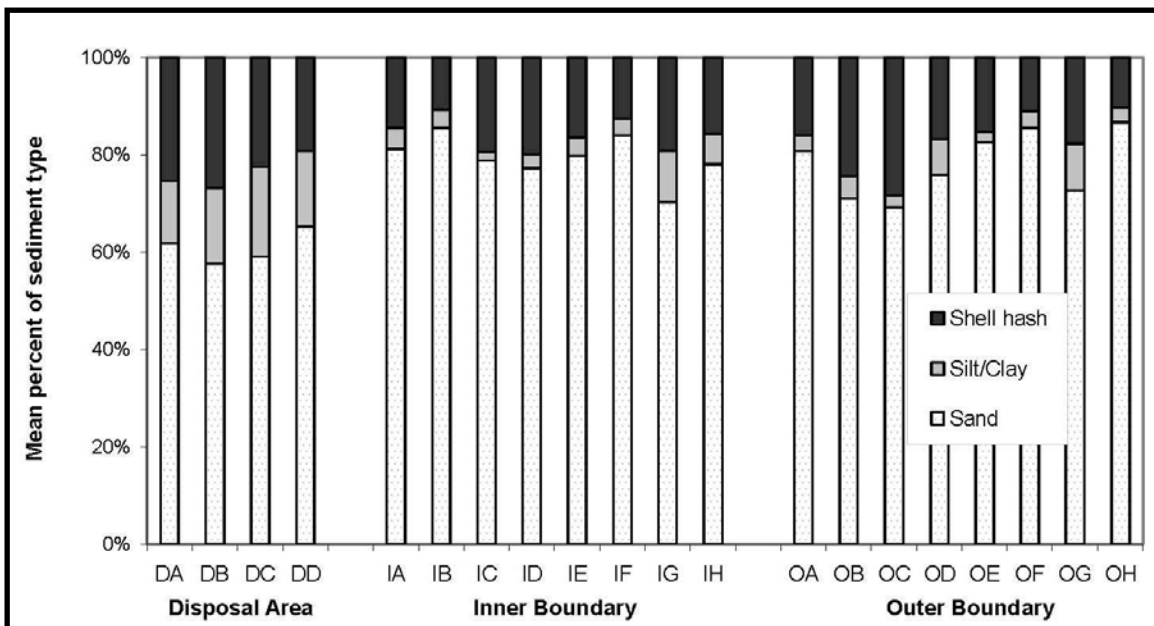


Figure 3 Sediment Composition Data, 2002 (After Jutte, et al. 2005)

## Appendix B

### *Oceanography*

In the vicinity of the ODMDS, wind-driven circulation dominates over tidal circulation. The primary wind-driven current directions are northeast in response to winter onshore winds and southwest in response to summer offshore winds (Voulgaris 2002). The wind waves and wind-driven currents dominate sediment transport; strong winds generate waves that suspend fine sediment and currents that steer sediment along the direction of the mean current. Residual flows offshore of Folly Beach have been observed to be predominantly shore-parallel responding to seasonal winds and tides (Work et al. 2004).

The deep-water wave climate near the proposed borrow area can be statistically characterized using Wave Information Study (WIS) hindcast wave data covering the period 1980 – 1999 available from the U.S. Army Corps of Engineers Field Research Facility (U.S. Army Corps of Engineers 2008). The primary WIS station of interest is Station 346, located at 32.6664 north latitude and 79.5833 west longitude in a water depth of approximately 53 ft, this location shown previously in Figure 1. The mean significant wave height, period, and direction over the 20-year period were 3.3 ft, 5.4 sec, and 139° True (southeast waves), respectively. The maximum wave height for the period was 32.7 ft with a peak wave period of 15.4 sec and a wave direction of 139° True. Although the date for this wave episode was not given, it is presumably the result of a hurricane passing through the area.

The wave height exceedance probability is plotted in Figure 4. The distribution shows significant wave heights are less than 5 ft at the site approximately 90% of the time and wave heights in excess of 15 ft occur approximately 0.1% of the time. The WIS wave periods and wave directions are summarized in Figure 5 and Figure 6, respectively. The predominant wave period is 4 sec and 95% of the wave periods are less than 10 sec. The most frequently occurring wave direction is from 130° True with 90% of the waves from 30° True to 250° True.

Nearshore coastal currents are driven by obliquely breaking waves and tide propagation. Tide ranges average 1.6 m neap to 1.9 m spring (Harris et al. 2005). The tidal currents become increasingly complex near the inlets at Folly Island, Morris Island, and entrance to Charleston Harbor given the interaction of tidal flow and wind waves. Since the tidal range represents at least 20% of the mean depth in the area inshore of the ODMDS, the potential sediment transport associated with tidally-driven currents may be significant, particularly when coupled with wind-generated waves that induce mobilization of the bottom sediment as bed and suspended load (Voulgaris 2002). Potential impacts to beach erosion resulting from waves must take into account the transformation of wave energy from deepwater to the shoreline. A complete modeling assessment incorporates the relevant, dominant physical processes including tide- and wind-driven currents, wind forcing, spectral wave characteristics, refraction, and shoaling (Work et al. 2004). Work et al. (2004) applied a coastal circulation model to compute the depth averaged currents resulting from tides and winds. These data were then incorporated as input parameters to a wave transformation model which again was configured with the detailed bathymetry and shoreline configuration. The wave transformation model utilized a spectral wave characterization to simulate wave refraction and shoaling as the wind generated waves propagated towards the shoreline over an irregular bathymetry. Breaking wave heights, periods, and directions were computed along the shoreline to be used as input to the shoreline change model. Tide state and wind speed were determined to have the greatest impact on wave heights.

Appendix B

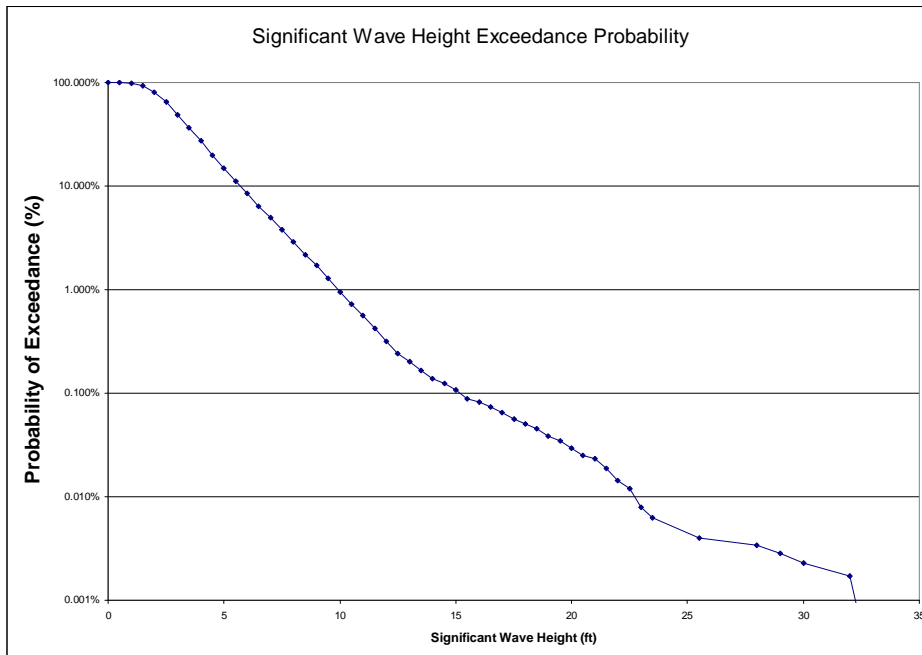


Figure 4 WIS Deep-Water Wave Height Exceedance Probability

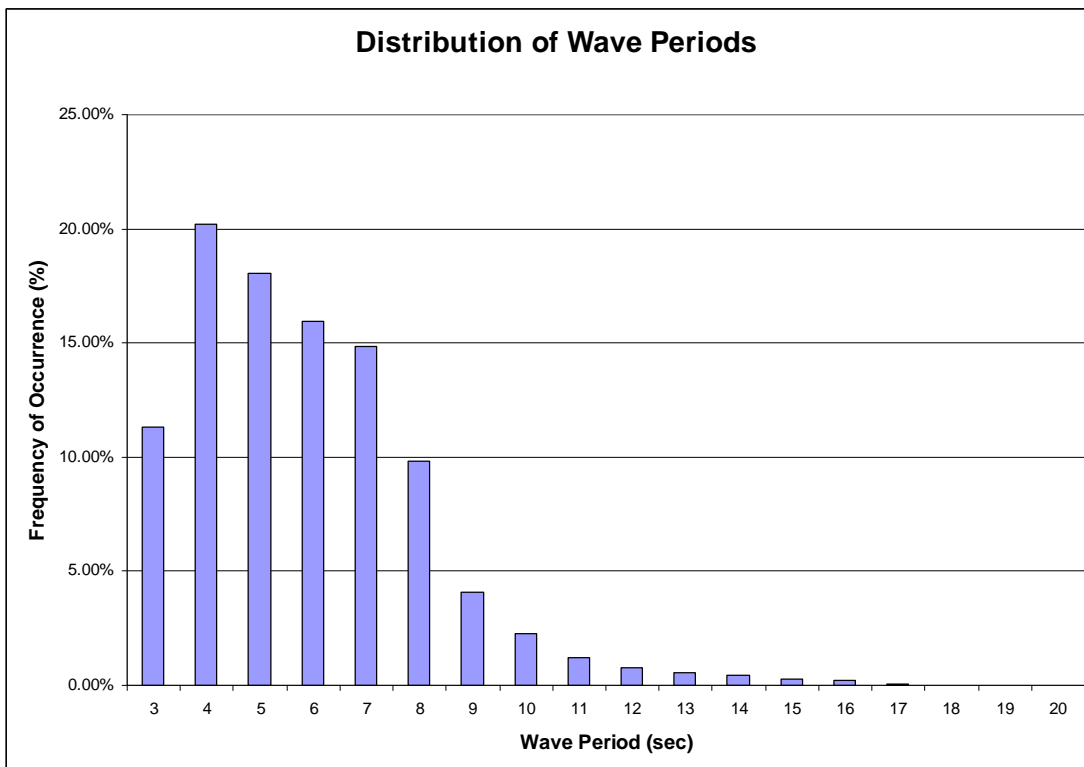
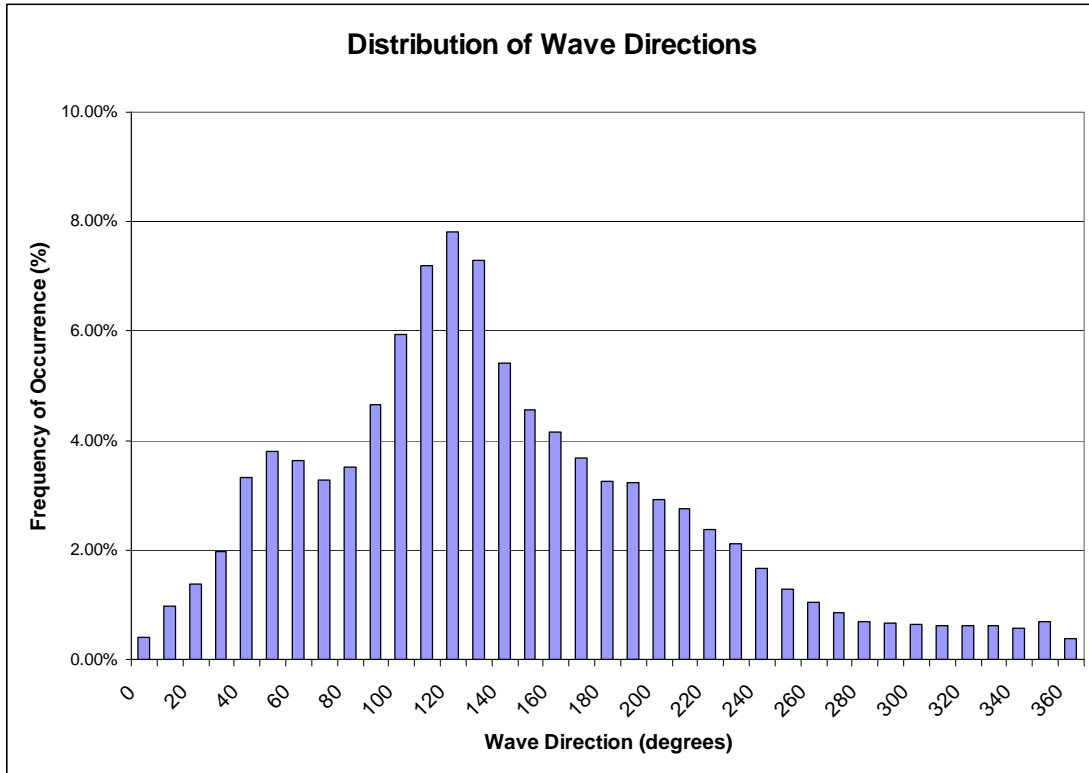
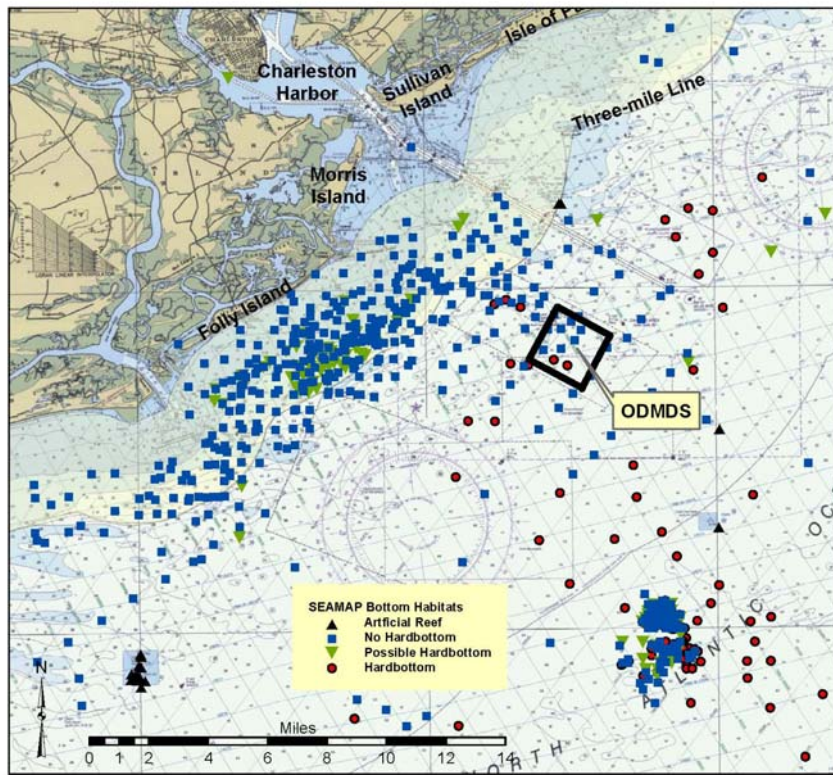


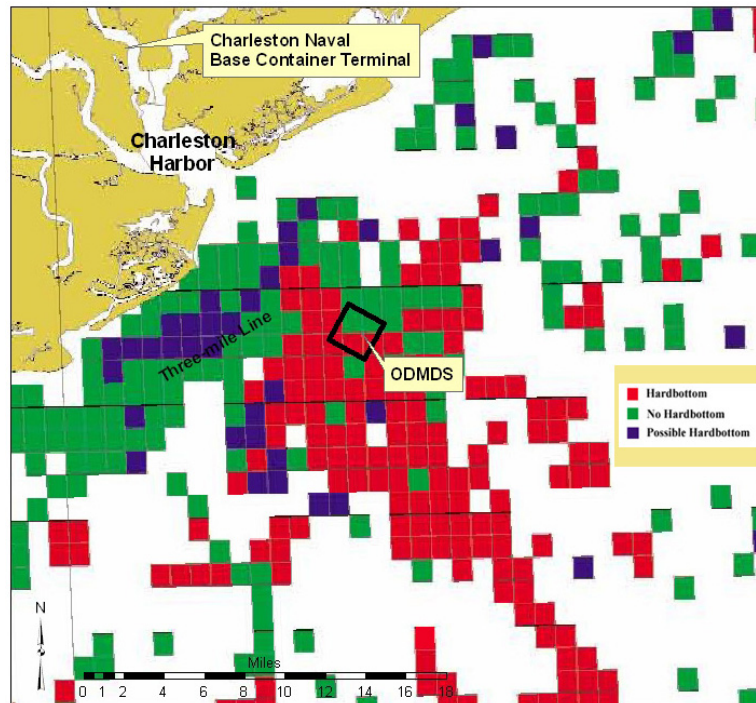
Figure 5 WIS Distribution of Deep-Water Wave Periods



**Figure 6 WIS Distribution of Deep-Water Wave Directions**



**Figure 7 Hardbottom observed in the vicinity of the ODMDS (SEAMAP-SA 2001)**



**Figure 8. Hardbottom designations in the vicinity of the ODMDS (SEAMAP-SA 2001)**

### **Potential Impacts / Environmental Consequences**

Several regional investigations have previously considered the potential impacts on wave climate by altering bathymetry during dredging operations (Work et al. 2004, Voulgaris 2002, Scheffner and Tallent 1994, U.S. Army Corps of Engineers 2007). In general, these studies, which considered the near and long-term physical impacts of dredging nearshore borrow areas to obtain sand for beach nourishment activities, determined that the potential effects on wave conditions, sediment transport potential, and shoreline change was below the magnitude of natural variability.

The U.S. Army Corps of Engineers – Charleston District reviewed the results of all MMS-sponsored wave-transformation analyses conducted on projects proposing the use of OCS borrow areas along the Atlantic coast (2007). Their comparative matrix is provided in Table 1. One of the key parameters for differentiating potential impacts is the distance of the proposed borrow area(s) from the shoreline. The significance of increased distance from the shoreline is that wave height irregularities along the wave crest caused by localized refraction or diffraction tend to dissipate through energy transfer along the wave crest as the wave travels. The longer the distance of travel to the shoreline, the less likely any localized impacts to the wave height will be realized. The Charleston Harbor ODMDS is located 7.5 miles from the shore which is near the maximum offshore distance shown in Table 1. Most of the borrow areas in Table 1 are typically 1 to 5 miles from shore.

Borrow areas with similar offshore distances include three proposed borrow areas in Alabama and six proposed areas along the Florida coast, although the environments are characterized by

## Appendix B

different nearshore and inner shelf gradients and wave climates. The authors of the original report have utilized the term acceptable or unacceptable to describe the borrow pits impacts. While this term is somewhat subjective, it does provide some indication of the significance of the impacts. Results of the wave modeling for the borrow areas offshore of Alabama suggest an insignificant impact. The water depths for the Alabama borrow areas are also similar to the ODMDS. For the case of the Florida borrow sites, three of the sites are rated as being “questionable”, taken to be a moderately significant impact. A significant difference between the questionable Florida sites and the ODMDS is the mean wave period. The mean wave period ranges from 9.1 sec to 9.3 sec at the Florida borrow areas compared to 5.4 sec at the ODMDS. Refraction will be substantially greater for the longer period waves which interact with the bottom with subsequent impacts to longshore sediment transport. The mean wave height at the ODMDS (3.3 ft) is also less than the Florida borrow areas (3.6 ft to 4.3 ft wave heights).

The U.S. Army Corps of Engineers review (2007) also analyzed the impacts associated with dredging three borrow areas offshore of Myrtle Beach, South Carolina, conducting wave transformation modeling using STWAVE to simulate impacts to the wave characteristics at the shoreline both with and without sediment removed from the borrow areas located 3 to 4 miles from shore, about half the offshore distance of the ODMDS. The hypothetical dredge depth for the model runs was 3 to 6 ft below the existing seafloor. This cut depth is similar to the proposed action; a cut depth of 3 to 5 ft below the existing seafloor is anticipated, but it may be up to 15 ft in some areas. The Corps concluded that only the most severe wave cases were affected and that the frequency of occurrence for those waves was insignificant when considered in context of wave frequency statistics and gross littoral transport potential. For instance, the highest wave evaluated in the hindcast record was 13.1 ft which occurred 2 times over 20-year hindcast used in the study. The 20-year hindcast record contained 94.6% of the waves between 0.0 and 6.3 ft. The authors concluded that the proposed activities at the borrow areas did not significantly impact the nearshore littoral transport. Since the wave climate and environmental setting at Myrtle Beach is not substantially different than near Charleston, the findings are generally applicable to the proposed action area.

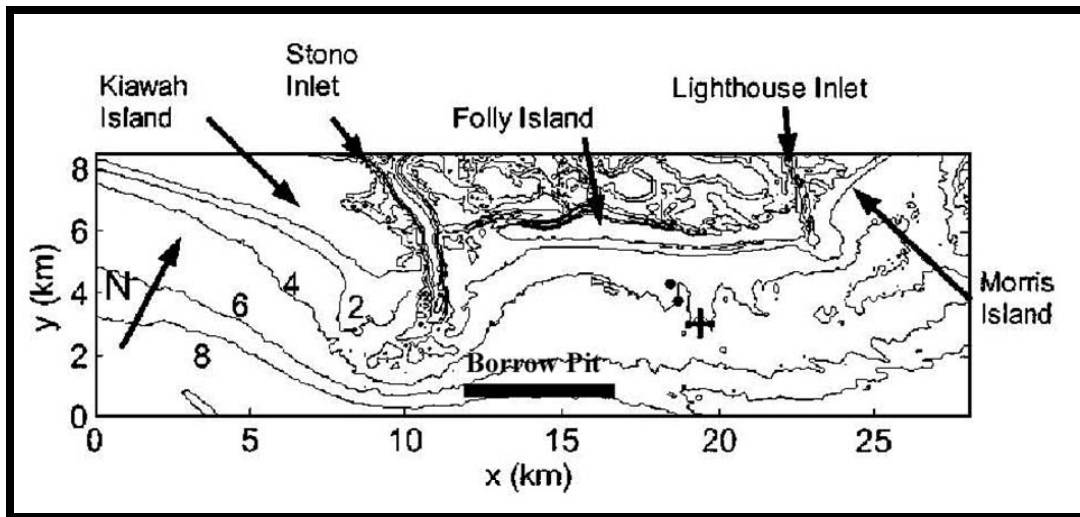
Work et al. (2004) conducted a detailed analysis of potential shoreline change resulting from the hypothetical use of a nearshore borrow area adjacent to Folly Island, located immediately to the southwest of the ODMDS. The location of the hypothetical borrow area is illustrated in Figure 9. The location of the ODMDS is located beyond the limits of Figure 9 southeast of Morris Island. The authors modeled wave- and tide- and wind-driven currents in context of existing and proposed bathymetry changes as input to a “one-line” shoreline change model to simulate long term shoreline movement associated with changes to the nearshore hydrodynamic climate. The borrow area was approximately 1640 ft in the cross-shore direction by 13,100 ft in the longshore direction with a cut depth of 3.3 ft along the 26 ft contour (8 m isobath in Figure 9) and a total volume of borrow material of 1.3 to 2.6 million cubic yards. The 26 ft contour is located approximately 3 miles from shore, substantially less than the 7.5 mile distance of the ODMDS. The cut depth of 3.3 ft is similar to the proposed cut depth over most of the proposed action area. The results indicated the area of potential shoreline change was limited to the area directly leeward of the borrow area and that the change in shoreline movement was within the uncertainty of the modeling approach.

Appendix B

**Table 1: Summary of previous borrow source impact analyses along the Atlantic coast.**

Study	Sand Resource Area	Distance Offshore (miles)	Water Depth (feet)	Surface Area (sq. mi.)	Sand Layer Thickness (feet)	Sand Volume Est (cu. yd)	Dredging Depth for Modeling (ft)	Dredging Needs (cu. yd)	Mean Wave Height (ft)	Mean Wave Period (sec)	Dominant Wave Direction	Modeling Conclusion	
Alabama	1	3.4 - 7.5	28 - 48	16.0	3 - 14	170,000,000	9.8	7,590,000	-	-	150 - 175	Acceptable	
	2	3.4 - 9.6	33 - 60	28.5	6.5	248,500,000	9.8	2,220,000	-	-	150 - 175	Acceptable	
	3	3.1 - 7.5	28 - 60	26.0	12 - 15	320,500,000	13.1	6,150,000	-	-	150 - 175	Acceptable	
	4	5.3 - 9.9	39 - 53	30	10	15,700,000	9.8	10,990,000	-	-	125 - 150	Acceptable	
North Carolina Dare County A	1	> 3	32 - 66	0.93	9.8	173,500,000	9.8	9,400,000	4.92	8.3	E-NE	Acceptable	
	2	> 3	32 - 66	0.75	9.8	44,900,000	9.8	7,590,000	4.92	8.3	E-NE	Acceptable	
	3 (west)	> 3	32 - 66	0.32	9.8	64,700,000	6.6	3,270,000	4.92	8.3	E-NE	Acceptable	
	3 (east)	> 3	32 - 66	0.27	6.6	64,700,000	9.8	1,800,000	4.92	8.3	E-NE	Acceptable	
	4	> 3	32 - 66	0.45	6.6	23,200,000	6.6	3,000,000	4.92	8.3	E-NE	Acceptable	
	Dare County B	N1	0.5 - 2.0	35 - 45		8 - 10	5,192,000	8 - 10	4,300,000	-	-	E-NE	Acceptable
		S1	1.0 - 3.0	35 - 45		8 - 10	104,454,000	8 - 10	70,280,000	-	-	E-NE	Questionable
New Jersey	A-1	-	-	0.85	6.5 - 19	-	13.1	11,500,000	3.94	7.7	E-NE	Acceptable	
	A-2	-	-	1.0	6.5 - 19	-	9.8	10,200,000	3.94	7.7	E-NE	Acceptable	
	M8	-	-	1.5	6.5 - 19	-	6.5	10,500,000	3.94	7.7	E-NE	Acceptable	
Virginia, SE	A	-	26 - 42	0.69	19.7	-	9.8	6,930,000	3.94	8.7	E-NE	Acceptable	
	B	-	26 - 42	0.89	19.7	-	9.8	9,020,000	3.94	8.7	E-NE	Acceptable	
Florida Cape Canaveral	2	9.3 - 12.4	23 - 46	1.9	10 - 16	-	17.1	34,000,000	4.27	9.3	E-NE	N/A	
Florida Central East Coast	A1	7.5 - 9.3	26 - 46	2.1	10 - 14	-	-	17,800,000	4.27	9.3	E-NE	Questionable	
	B1	7.5 - 9.3	26 - 46	1.8	6 - 8	-	-	14,400,000	4.27	9.3	60 - 90 deg	Acceptable	
	B2	7.5 - 9.3	26 - 46	1.3	6 - 8	-	-	9,940,000	4.27	9.3	60 - 90 deg	Acceptable	
	C1 (north)	7.5 - 9.3	26 - 46	2.0	10 - 22	-	-	7,590,000	3.94	9.1	30 - 60 deg	Questionable	
	C1 (south)	7.5 - 9.3	26 - 46	1.8	6.6	-	-	11,500,000	3.94	9.1	30 - 60 deg	Questionable	
	D2	7.5 - 9.3	26 - 46	0.87	-	-	-	5,360,000	3.61	8.8	30 - 60 deg	Acceptable	
New York/New Jersey	H1	-	46 - 66	1.3	6.5 - 16.4	6,300,000	4.9	-	3.1	4.2	S	Acceptable	
	H2	-	49 - 66	5.1	6.5 - 16.4	12,400,000	2.3	-	3.1	4.2	S	Acceptable	
	3	-	62	3.6	5.9 - 10.5	14,700,000	3.9	-	3.2	4.3	S	Acceptable	
	4W	-	52 - 66	4.7	5.9 - 10.5	25,900,000	5.2	-	3.2	4.3	S	Acceptable	
	4E	-	52 - 66	3.6	6.2 - 15.1	21,800,000	5.9	-	3.2	4.3	S	Acceptable	
South Carolina Myrtle Beach	Little River	1.5 - 3.9	32 - 39	10.4	2 - 4	11,800,000	≈3	2,170,000	3.08	5.25	SE	Acceptable	
	Cane South	1.7 - 4.2	30 - 39	3.0	1 - 10	11,300,000	≈6	3,310,000	3.44	5.75	ESE	Acceptable	
	Surfside	2.2 - 5.0	29 - 39	6.3	1 - 9	16,700,000	≈6	2,300,000	3.44	5.75	ESE	Acceptable	

After U.S. Army Corps of Engineers 2007



**Figure 9 Location of Potential Borrow Pit for Beach Nourishment along Folly Island (After Work, et al. 2004)**

Given the results of previous studies, the fact that the proposed borrow area is comparatively further offshore, and the incident wave climate and regional bathymetry is similar, a wave modeling study was not undertaken as part of this physical impacts assessment. Another key difference between the examples previously described and the proposed dredging at the ODMDS is that the dredged material is currently contained within the bermed disposal site. Since the proposed action does not include alteration of the berms, which are topographically higher than the surrounding seafloor, any wave refraction caused by the existing berms will not be substantially changed in any way after removal of material within the berms. Changes to the wave characteristics due to sediment removal will be localized within the ODMDS. As previously discussed, wave propagation between the ODMDS and shoreline will dissipate these local irregularities, particularly as the waves approach closer to the shoreline and the refractive effects of the natural bathymetry become more dominant. Not only will removing the dredged material within the ODMDS restore the seafloor back to its natural, deeper state, but it increases the capacity and extends the life of the Charleston ODMDS for future use.

A field study conducted by Voulgaris (2002) provides insight into dominant sediment transport processes in the vicinity of the Charleston ODMDS. Using tripod observations, the study examined bottom boundary layer dynamics due to the combined action of waves and currents in an attempt to quantify sediment mobilization and transport. The author concluded that wind-driven circulation was the most important control on sediment transport given a high correlation between measured winds, combined flows, and near bed shear-stress. The sediment transport was directed primarily in the alongshelf direction either to the northeast or southwest depending on the prevailing wind and wave direction. These results suggest sediment transport in the cross-shore direction resulting from wave propagation towards the shoreline is of secondary importance; therefore, it is presumed that any modification of the wave characteristics and wave-induced sediment transport due to the existence of the ODMDS may be of secondary



## Appendix B

importance. However, the authors also found that fine particles appear to remain in suspension for long periods of time (over 24 hours), in particular following resuspension events. This suggests that turbidity plumes likely to be generated during dredging may temporally affect water quality in the immediate vicinity of the ODMDS. Moreover, turbidity plumes may also contribute to enhanced, but ephemeral and localized sedimentation of hardground areas immediately adjacent to the ODMDS.

Assessment of the potential impacts from sediment deposition and transport associated with dredge material disposal at the ODMDS was conducted by Scheffner and Tallent (1994). The primary focus of the study was to determine if material deposited at the designated disposal site migrated to the live coral reefs and hard bottom areas discovered within the vicinity of the ODMDS. The authors modeled both the short-term and long-term fate during disposal. The short-term fate, on the order of hours, is dominated by entrainment and dispersal as the sediment descends to the seafloor. The long-term fate is dominated by the waves and currents, which erode, resuspend, and transport the dredged material. Their results indicated a significant fraction of the sand and silt/clay materials fall rapidly to the ocean floor and do not impact regions beyond one-quarter of a mile from the dump location. A small amount of silt/clay remains in the water column and is transported about 1 mile from the disposal point. The maximum thickness of the final deposition was approximately 0.5 ft over a near 700-ft diameter area. Results of the long-term fate modeling indicated a dispersive environment with the disposal mound migration rates as large as 60 ft/month.

The proposed action will not be discharging comparable quantities of sediment to the site as actual disposal operations. The fact that the deposition of up to 22 million cubic yards of material at the ODMDS in 1999-2002 had no discernable effects on hard bottom areas (Crowe et al. 2006) suggests that the removal of up to 6 million cubic yards would likewise have little adverse impact on areal extent or fauna abundance of neighboring hardbottom areas. However, the duration of dredging activities, unlike ODMDS disposal, may be continuous over a multi-year period providing less recovery time for potentially affected benthic habitat and communities. It is expected that the potential turbidity generated from cutterhead/drag suspension of sediment and hopper/scow overflow during dredging operations will be localized and its dispersal will depend on the oceanographic conditions. Since adjacent hardbottom areas are only ephemerally exposed and often covered with a thin veneer of sand, detection of any changes would be difficult (Crowe et al., 2006). It is expected that turbidity generated during dredging operations will be relatively lower and more readily dispersed compared to disposal operations because coarser sediment will be targeted, characterized by larger fall velocities, and notably less sediment will be introduced into the water column.

### **Conclusions**

Based on a review of available literature on the potential impacts of offshore sand removal, it is concluded that impacts to the nearshore zone from removal of sediment from the ODMDS are not significant. Most of the existing literature on dredging sediment from nearshore borrow areas is related to the use of the material for beach

## Appendix B

nourishment activities; borrow areas considered in those proposed actions are typically much closer to shore than the Charleston ODMDS. Modeling analyses of these borrow areas have shown negligible impacts in most cases, with the exceptions being areas close to the coast, with relatively steeper inner shelves affected by longer period waves. The longer period waves tend to refract more over the borrow areas with corresponding changes to the sediment transport potential.

The most significant difference between such beach nourishment borrow areas and the Charleston ODMDS is the existence of constructed berms around the ODMDS to contain the dredged material. Because of their relative relief, the berms are likely the primary contributor to wave refraction of long-period waves. These berms will remain in place during and following the removal of sediment. Any localized impacts to the incident wave field associated with removal of sediment within the ODMDS will dissipate rapidly with wave propagation towards the shoreline. This dissipation will result from energy transfer along the wave crest to eliminate any irregularities in wave height caused by refraction around the ODMDS.

A modeling study of a proposed Folly Beach borrow area immediately southwest of the Charleston ODMDS concluded there were no significant impacts to long-term shoreline movement related to the modification of bathymetry. The fact that the Folly Beach borrow area is located about half the distance offshore compared to the ODMDS also suggests impacts related to the ODMDS would be negligible. The shorter distance for wave travel to the shoreline reduces the time for energy transfer along the wave crest to reduce changes to wave direction from localized refraction.

The hardbottom habitat in the immediate vicinity of the ODMDS is ephemerally exposed and often covered by a thin veneer of sand. Potential impacts to the hardbottom habitat in the vicinity of the ODMDS are possible, but not expected in excess of natural variability. This conclusion is based on past field observations and the computations for dredge material disposal at the ODMDS where a large volume of sediment is actually settling through the water column during disposal operations.

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**BIOLOGICAL ASSESSMENT FOR  
ENDANGERED SPECIES ACT  
CONSULTATION ON THE CHARLESTON  
ODMDS SAND BORROW PROJECT**

Prepared for the

**Minerals Management Service**  
Environmental Assessment Branch  
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By  
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November, 2008

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Appendix A -- NMFS ESA Section 7 Consultation Correspondences on Port Construction

## 1 INTRODUCTION

The Minerals Management Service (MMS) is considering an application submitted by the South Carolina State Ports Authority (SCSPA or the Applicant) for the use of Outer Continental Shelf (OCS) resources (sand) from the Charleston Ocean Dredged Material Disposal Site (ODMDS). The proposed federal action is the issuance of a negotiated agreement between MMS and the SCSPA to allow the latter agency to obtain sandy dredged material from the Charleston ODMDS located on the OCS and transport this dredged material to the marine container terminal (MCT) at the Charleston Naval Base Complex in the Port of Charleston. To date, the environmental impacts of the construction of the MCT, including placement of the dredged materials at the MCT, have already been documented in the U.S. Army Corps of Engineers' Environmental Impact Statement and its Record of Decision issued on April 27, 2007 (MCT EIS, USACE 2006; and <http://www.porteis.com/project/documents.htm>) as well as the associated informal ESA Section 7 consultation with NMFS (see Appendix A of the BA). These previous analyses, however, did not contemplate the potential consequences of collecting and transporting OCS sand resources from the Charleston ODMDS.

More recently, the SCSPA has determined that dredged materials will need to be collected and used from the Charleston ODMDS and used in the construction of the MCT. Given that the previous consultation by NMFS only covered construction of the MCT and not collection of dredged materials from the Charleston ODMDS or transportation of these materials to the MCT, a separate consultation request is being initiated for this portion of the proposed action.

The purpose of this Biological Assessment (BA) is, therefore, to identify and evaluate the potential effects of the collection and transport of dredged materials from the Charleston ODMDS (the proposed action) on any of the ESA-listed species or designated critical habitats in the proposed action area. In addition, the information in this document is provided in order to comply with statutory requirements to use the best scientific and commercial information available when assessing the risks posed to listed and/or proposed species and designated and/or proposed critical habitats by proposed federal actions. This document is prepared in accordance with legal requirements set forth under regulations implementing Section 7 of the Endangered Species Act (ESA; 50 CFR §402; 16 USC §1536(c)).

## 2 FEDERAL CONSULTATION HISTORY

Construction of the marine container terminal, including placement of dredged materials at the MCT, was considered in an Environmental Impact Statement (EIS) prepared by the USACE. In the course of that process, the USACE consulted with both the FWS and the NMFS pursuant to Section 7 of the ESA. On April 5, 2006, the USACE requested a Section 7 consultation with NMFS. On April 27, 2006, NMFS requested additional information, which was received on May 17, 2006; on that same day, citing concerns over potential effects of project-related shipping on right whales, NMFS initiated formal consultation. The USACE and NMFS engaged in a series of meetings and discussions, and on September 14, 2006, the USACE submitted an addendum to the project description that included mitigation measures to avoid or reduce take of listed species. On October 3, 2006, NMFS issued a letter concluding that the effects of construction of the marine container terminal, in light of these mitigation measures, on all of the

listed species in the project area were discountable or insignificant and formal consultation would not be needed. Copies of all these relevant letters are included in Appendix A.

The USACE's coordination with the USFWS relative to listed species is documented in Appendix EE of the FEIS (USACE 2006, pp 1-35 to 36 and in Appendix A of this BA Via comments on the DEIS, USFWS requested special precautions to protect the endangered manatee. USACE agreed to include those precautions on the Record of Decision and incorporate them into special conditions on the Department of the Army permits. Therefore, formal consultation with the FWS was not required. Effects on all other species were considered by the FWS to be insignificant.

The other relevant documents for the proposed action include the Final EIS for the MCT (USACE 2006), and the Regional Biological Opinion issued by the NMFS (NMFS 1997) covering the effects of hopper dredging on sea turtles along the South Atlantic coast of the United States. Both of these documents are incorporated into this BA by reference.

### 3 DESCRIPTION OF THE PROPOSED ACTION

#### 3.1 Proposed Action

##### 3.1.1 Overview

The proposed federal action is the issuance of a negotiated agreement between MMS and the SCSA to allow the latter agency to obtain sandy dredged material from the Charleston ODMDS, located on the OCS approximately nine miles (14 km) offshore of the entrance to Charleston Harbor, and use it for the construction of a MCT in the Port of Charleston (Figure 1). The OCS sand resources would be removed by dredging and transported to the MCT site.

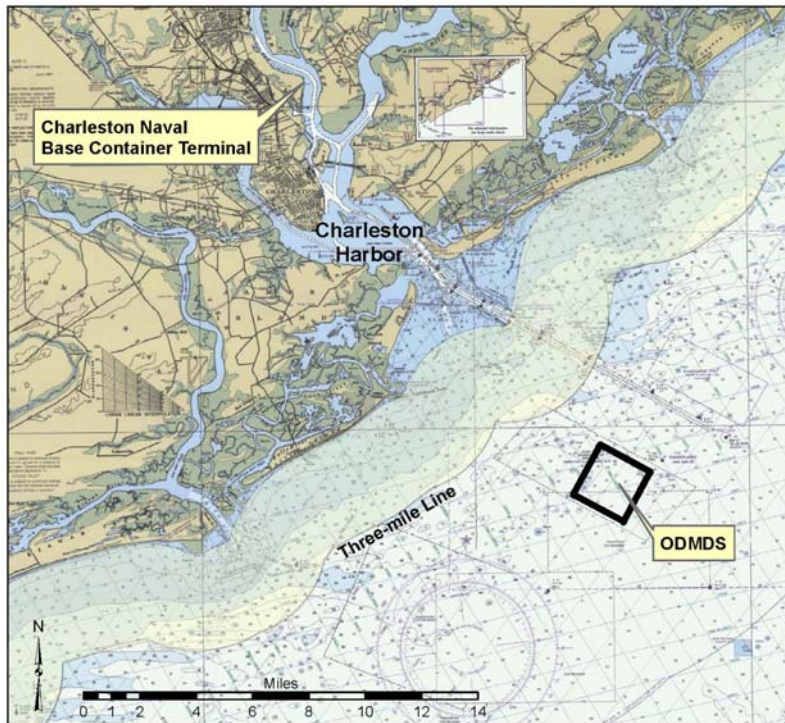


Figure 1. Action Area for the Charleston ODMDS Sand Borrow Project.



## Appendix C

The SCSPA has received federal and state approvals to develop an approximately 287-acre marine terminal on the Cooper River (Figure 2). That project includes the filling of approximately 65 acres of tidelands to create land for wharf and container handling facilities, and dredging out structurally unsuitable material to deepen the berth and provide a firm footing for the new wharf and backland. The environmental impacts of the marine terminal project have been examined in an EIS prepared by the USACE (MCT EIS, USACE 2006), which issued a ROD on April 26, 2007 (see Appendix B). The impacts examined included those resulting from the placement of fill in the tidelands area of the project. The EIS also included measures required to mitigate any impacts from fill placement found to be significant.

Most of the dredge material from the MCT site is unsuitable for reuse as fill material to build the MCT and will be disposed of at an existing disposal site located on Daniel Island in Charleston Harbor. Accordingly, fill to create the new land must be imported from outside the project area. Some fill sources have been identified, but a deficit of up to 6 million cubic yards remains.



Figure 2. The Charleston Marine Container Terminal at completion (artist's rendering).

The SCSPA anticipates the required additional fill material will come from both upland and marine sources. However, because the USACE permit limits the number of trucks that can access the site, the majority of material will need to be delivered via the Cooper River. SCSPA has investigated possible marine sources of material and concluded that the Charleston ODMDS (Figure 1) is a promising candidate. Available data indicate that approximately 3 to 6 million cubic yards of material deposited in the past at the ODMDS (of the total of approximately 40 million cubic yards that have been deposited in the past 20 years) meet the fill material

requirements (fines content less than 35%) and are available for this use. Furthermore, use of the ODMDS material would represent a beneficial re-use of a resource. It is important to note that the marine terminal can be built without the ODMDS material, but at a greater cost and with different environmental impacts.

### 3.1.2 Potential Dredging Methods

There are two basic methods of dredging: mechanical dredging and hydraulic dredging. The methods vary by the process used to loosen material from its *in-situ* state and transport it from the seafloor to the water surface/transport vessel. In hydraulic dredging, material is loosened from its *in-situ* state and lifted in suspension through a pipe system driven by a centrifugal pump. Offshore dredging of sand is performed almost exclusively by hydraulic dredging due to the limitations of operating mechanical dredges in an ocean wave environment, and mechanical dredging would not be used for the Proposed Action. Accordingly, this discussion is limited to the two main types of hydraulic dredges, the cutter-suction dredge and the hopper dredge.

**Cutter-Suction (Pipeline) Dredge** -- A cutter-suction dredge uses a rotating cutting apparatus around the intake of a suction pipe, called a cutterhead, to break up or loosen bottom material (Figures 3 and 4). A large centrifugal pump removes the loosened material from the ocean bottom and pumps it as a sediment-water slurry through a discharge pipeline. Cutter-suction dredges are generally characterized according to the size of the discharge pipe (which ranges from 6" to 30"), and resemble a large barge or a small ocean-going vessel (e.g., Figure 3). Smaller dredges are used for smaller, shallower, dredge projects. Larger projects, and particularly offshore projects, require larger cutter-suction dredges that are certified for offshore operation. A cutter-suction dredge with a 30" discharge pipe would be approximately 280 feet (90 m) long, draw approximately 9 feet (2.9 m) of water, and have a total of approximately 16,000 horsepower installed (engine, auxiliaries, and pump motors).

Typically, cutter-suction dredges pump material in a slurry directly to the placement site, but in cases where the distance from the dredge location to the placement site is beyond a few miles, the slurry is often pumped into barges for transport to the placement site (Figures 5 and 6). When the barge arrives at the placement site, the material can be mechanically or hydraulically unloaded. A hydraulic unloader re-slurries the material for pumping out of the barge to the placement site.

**Hopper Dredge** -- Hopper dredges look much like conventional ships and are equipped with either single or twin trailing suction pipes (or "drag arms"; Figure 7). At the end of each drag arm are dragheads, which house the inlet to the pumping system and typically have teeth and high-pressure jets to loosen the material being dredged. The dragheads are typically fitted with turtle deflectors (Figure 8). Hopper dredges currently in use in the U.S. vary in capacity from approximately 2,000 cubic yards to 12,000 cubic yards, with typical dredges being in the range of 4,000 to 6,500 cubic yards. The actual amount of material that a loaded hopper carries could be less than its rated capacity if the material is particularly dense, which would cause the vessel's weight limit to be reached before the volume capacity (with sand, for example, a hopper might carry only 50 – 70% of its volume capacity). A smaller hopper dredge would be approximately 280 feet (90 m) long, draw up to 16 feet (5 m) of water fully loaded, and have approximately 9,000 horsepower installed, while the largest hopper dredges are approximately 390 feet (125 m) long, draw up to 28 feet (9 m) of water, and have approximately 14,000 horsepower installed.

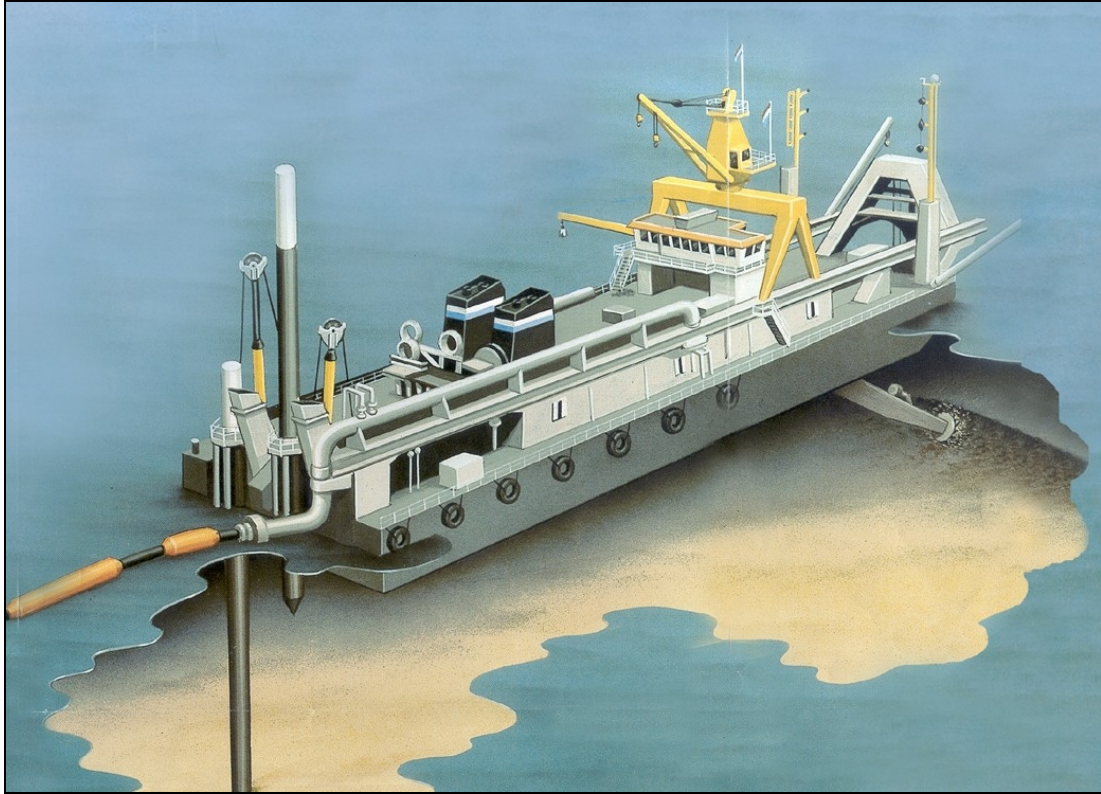


Figure 3. Cutter-Suction Hydraulic Dredge (source: Oilfield Publications Limited, n.d.)



Figure 4. Close-up of a Cutterhead



Figure 5. Cutter-Suction Dredge Loading Barges



Figure 6. Close-up of Barge Loading Process (the vessels at the top of Figure 5)

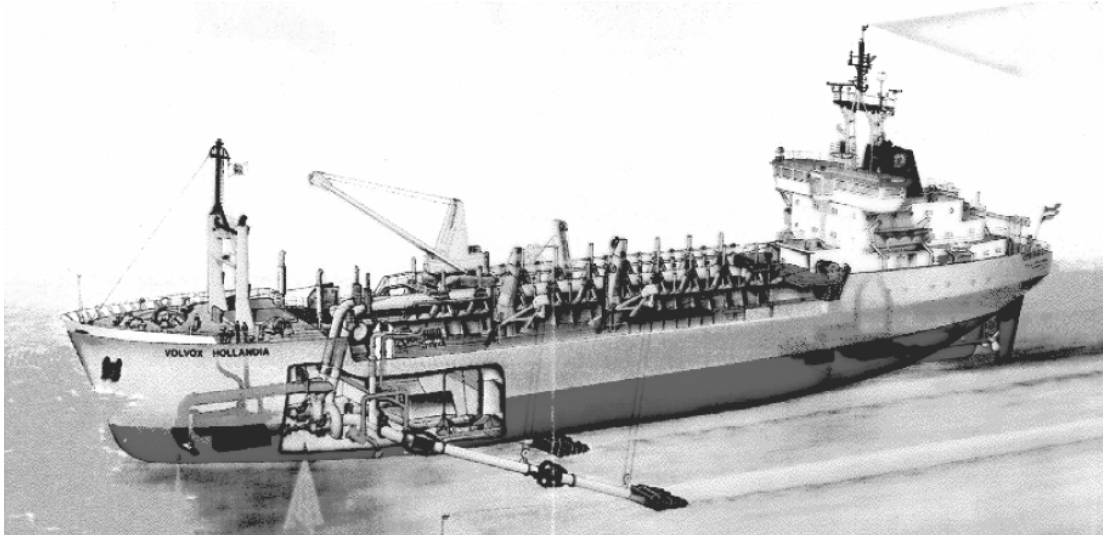


Figure 7. Twin-Arm Hopper Dredge in Cut-Away View

A hopper dredge operates much like a floating vacuum cleaner in that the dredge operates while underway (typically 1 to 3 knots) and material is lifted through the trailing suction pipes by one or more pumps. The slurry is discharged into a large hold (the hopper) in the center of the ship. The hopper is equipped with one or more adjustable overflow standpipes (Figure 9) that allow the transport water to be skimmed off and discharged beneath the vessel as the solids from the slurry settle in the hopper. Once the hopper is full, the drag arms are raised and stored on deck and the vessel sails to the discharge location where the material is either re-slurried and pumped ashore through a pump-off station, mechanically transferred ashore, or dumped through the bottom of vessel via doors or split-hull openings.

This type of dredge is often used for rougher, open waters where other dredge types, which are fixed to the seabed, cannot operate as safely and effectively. This type of dredge is not easily maneuvered, unsuitable for use in shallow water, and not effective on hard materials such as stiff

clays. A hopper dredge can move quickly to a placement area under its own power, but the operation loses efficiency as the transport distance increases, since dredging does not take place while the hopper is in transit to the dredging location.

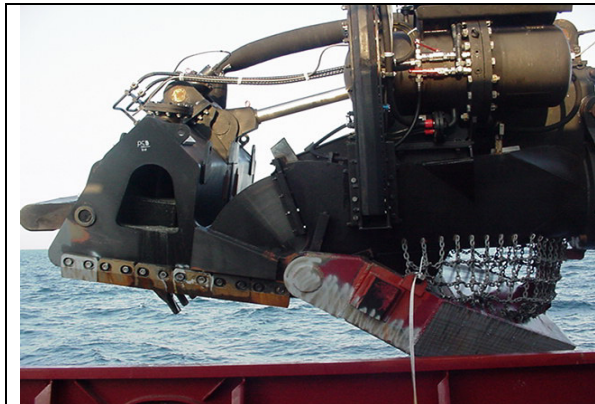


Figure 8. Close-up of a Draghead with a Turtle Deflector Mounted

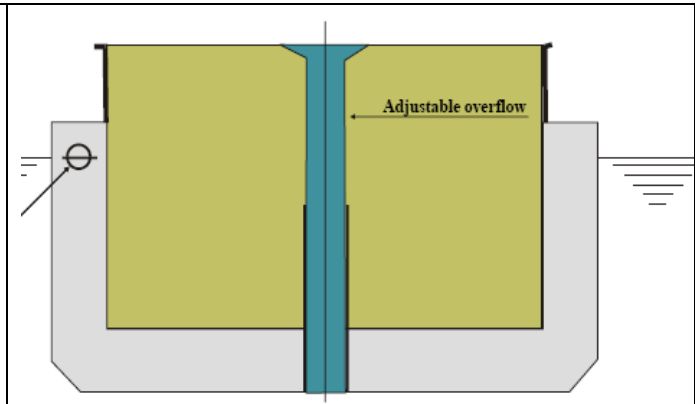


Figure 9. Schematic Cross-section of a Hopper Dredge Showing Overflow Standpipe

### 3.1.3 ODMDS Dredging

Given the distance from the ODMDS to the MCT and the impracticality of a direct-pipeline dredging operation, the material is expected to be delivered to the site via a cutter-suction dredge loading scows or, more probably, by a hopper dredge. The dredge footprint would be confined to the ODMDS and its edges would be no less than 100 feet (30 m) from the confining berms (Figure 10), in order to avoid impacts on nearby live-bottom areas (see Section 3.2.1).

**Project Schedule** -- The project schedule anticipates dredging and transportation of up to 6 million cubic yards of sediment. The dredging would start upon completion of the containment structure at the project site, and operations would proceed 24 hours a day except for interruptions caused by routine service and equipment failure. During the hopper dredge biological window defined by the USACE (early November to mid-April) all dredging would be performed by a hopper dredge. Outside the window the dredging would be performed by a cutter-suction dredge. Both dredging operations are more fully described below. It is estimated that the removal of 6 million cubic yards would require approximately 575 dredging days. It is expected the dredging would occur over two or three consecutive hopper dredge biological windows with dredging continuing between each of these windows by cutter suction dredge only to the extent necessary to obtain the required material.

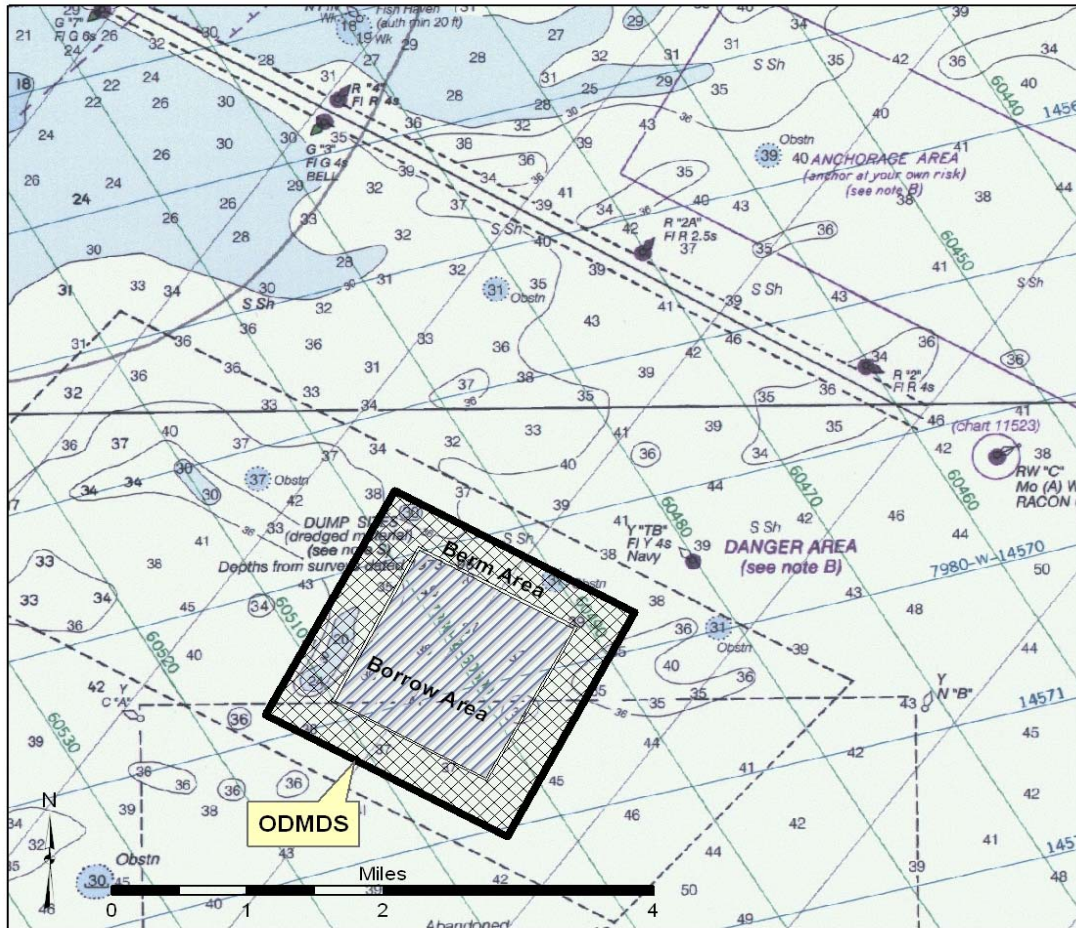


Figure 10. Anticipated dredging area within the Charleston ODMDS

**Cutter-Suction Dredge Operation** -- A cutter-suction dredge would be anchored in a fixed position at the ODMDS by a three-wire anchoring arrangement; the position would be changed from time to time as the dredge finished removing all the material it could reach from each position. The dredge would dig material from the bottom by swinging the cutterhead back and forth across an arc of 150 to 300 feet. Winches on the forward end of the dredge would pull the cutterhead back and forth and advance it ahead in the cut in 4- to 6-foot steps. Dredged material would be pumped a short distance to a barge with loading arms that would deliver the slurry into scows of 3,000 to 7,000-cubic-yard capacity (Figures 5 and 6). The scows would have standpipes that would allow supernatant water to be released during the loading operation.

The project schedule would require that 4 to 6 scows, hauled by three or four ocean-going tugs, deliver 4 to 8 loads to the MCT site per day, for a total of between 1,500 and 4,200 scow loads, depending on final volumes and scow size.

**Hopper Dredge Operation** -- A hopper dredge would dig material from the bottom by making passes over the site, typically moving at 1 to 2 knots. In the case of a twin-arm dredge, the material is dug in two swaths that are each the width of the draghead (typically 6-8 ft wide). To get a full load, a typical hopper dredge would make two passes across the ODMDS. Each pass would be 3,000 to 4,000 ft long and the average cut depth would be approximately one foot.

The project schedule would require either two medium-size hopper dredges (4,000-5,000 cubic yards capacity) delivering a total of six loads per day (three each), or one large hopper dredge (9,000 to 12,000 cys) delivering two or three loads per day. The total number of loads taken from the site is expected to be between 800 and 4,000, depending on the amount of fill actually required and the size of the dredge(s).

**Borrow Pit** -- The dredging operation would leave a depression in the bottom at the ODMDS. The area to be made available to be dredged within the ODMDS is expected to be up to 7,000 ft by 7,000 ft, an area of approximately 960 acres (380 ha.). Removal of 6 million cubic yards would require an average cut depth of approximately 3.5 ft. (1.2 m). In localized areas cut depths could be shallower or deeper (up to 15-feet) to maximize the collection of the best fill materials, but in no case would natural bottom material be removed. The borrow pit would not be as large as 960 acres if less than 6 million cubic yards were removed or if the cut were deeper.

### **3.1.4 MCT Site Material Placement**

At the MCT site, the material dredged from the ODMDS would be placed in engineered layers (termed “lifts”). The material would be retained in place by steel sheet pile walls and rock berms that would form the new shoreline of the Cooper River at the terminal site. Whether the material is delivered by scows from a cutter-suction dredge operation or directly by hopper dredge, a barge- or shore-mounted unloading system would transfer the material from the scows or hopper to the fill site (Figure 11); supernatant water would be managed on-site through a system of settling ponds and weirs before being discharged to the river. Additional detail on placement of the materials at the MCT can be found in the Final EIS for the MCT project (USACE 2006). Again, placement of the dredged materials was also considered in the Section 7 consultations for the MCT construction (see Appendix A).

## **3.2 Proposed Action Area**

The proposed action area for this project (Figure 1) would include the Charleston ODMDS, the ocean waters between the ODMDS and Charleston Harbor, and the Cooper River up to the MCT (the latter two areas are included because they would be traversed by barges or hoppers carrying dredged material). For the purposes of this analysis, the ocean waters between the ODMDS and Charleston Harbor are considered along with the ODMDS, and the Charleston Harbor-Cooper River area is considered part of the MCT because it was described in the MCT EIS (USACE 2006).



Figure 11. Dredge Material Scow Being Unloaded at a Fill Site

### 3.2.1 Charleston Ocean Dredged Material Disposal Site

The material to be removed is located entirely inside the Charleston ODMDS (Figure 1, Figure 10), which is a square encompassing approximately 4 square miles (10 square km) located approximately nine miles (14 km) southeast of the entrance to Charleston Harbor, South Carolina, in approximately 40 feet (13 m) of water. The coordinates of the Charleston ODMDS's corners are:

32.65663° N, 79.75716° W  
 32.64257° N, 79.72733° W  
 32.61733° N, 79.74381° W  
 32.63142° N, 79.77367° W.

The Charleston ODMDS is managed by the USACE, Charleston District, the U.S. Environmental Protection Agency, Region 4, the South Carolina Dept. of Natural Resources, the U.S. Fish & Wildlife Service, and the South Carolina State Ports Authority in accordance with a Site Management and Monitoring Plan (SMMP) developed by the those agencies (USACE et al. 2005). The management plan specifies the quality of the material that can be disposed of at the site and the controls that must be imposed on disposal operations to ensure proper disposal and to minimize potential environmental impacts.

According to USACE et al. (2005), the Charleston ODMDS is one of the most active, frequently used sites in the South Atlantic Bight, and the general site has been in use since 1896 for disposal activities. It has changed size and configuration at least twice in the past, most recently in response to the discovery of live bottom areas in the western half of a larger site (dashed black



line in Figure 1 outside the ODMDS designated by solid lines; “live bottom” is low-relief hard substratum, typically colonized by soft corals, sponges, and other attached organisms to form a flat reef). The current site delineated by the boundaries described above represents about half the site’s former extent and was designated in 1993. The current disposal site is divided into four mile-square cells. Those cells are surrounded by two boundary zones, inner and outer, each having two one-square-mile cells on each of its four sides, which have been established to facilitate long-term monitoring.

Since 1987, approximately 40 million cubic yards of dredged material from USACE maintenance activities and SCSPA harbor deepening projects have been disposed of at the Charleston ODMDS, most recently 22 million cy deposited in the course of the Charleston harbor channel deepening project that ended in 2002. The estimated projected use of the ODMDS to 2010 would add up to 1,100,000 cubic yards (USACE pers. comm. 2008). The SMMP states (pp 5-6) that there are currently no restrictions on the timing of disposal (i.e., there are no seasonal “windows” due to biological issues) or on the amounts of material that can be disposed of. Although the site is principally delineated by geographical coordinates, there are two physical boundaries consisting of dikes on the northwestern and southwestern boundaries formed by coarse marl laid down in the early 1990s expressly to confine the deposited dredge material (Zimmerman, Jutte, and VanDolah 2002). Although the SMMP has not established the capacity of the Charleston ODMDS to receive dredged material, the USACE has stated that removing material in order to reuse it for construction purposes could prolong the life of the site, besides representing a beneficial re-use of the material.

The ODMDS is in the general area of several sensitive resources, most notably the Cape Romain National Wildlife Refuge, approximately 30 miles north-northeast. Other sensitive resources include coastal shrimp and finfish fisheries, and live bottom.

### **3.2.2 Marine Container Terminal Site**

The material removed from the ODMDS would be re-used as fill to construct the approved Marine Container Terminal at the Charleston Naval Complex in Charleston County, South Carolina (Figure 2). The MCT, when finished, would consist of a 287-acre terminal with a 3500-ft wharf fronting the tidal Cooper River in North Charleston. The terminal site is a portion of the Charleston Naval Complex that was turned over to the SCSPA, and, according to the MCT EIS (USACE 2006) consists of tidal wetlands, submerged lands, and uplands formerly lightly used by the U.S. Navy. The site is approximately 8 miles up the Cooper River from the entrance to Charleston Harbor.

## **4 AFFECTED ENVIRONMENT**

### **4.1 Physical Environment**

#### **4.1.1 Geology and Oceanography**

**ODMDS Site** -- The most recent comprehensive study of the ODMDS and its environs was carried out in 2000 by Zimmerman, Jutte, and VanDolah (2002). That study characterized the sediments at the site and reported that the majority of sediments were medium to fine-grained sands (mean = 78.0% sand content) mixed with moderate amounts of shell hash. The siltiest sediments were concentrated within the disposal zone itself and in the northwestern outer

boundary area (i.e., the boundary area closest to the track of barges bringing material from Charleston Harbor to the disposal site). Zimmerman, Jutte, and VanDolah's (2002) observation that over time silts and clays are transported out of the site by currents suggests that the proportion of silt and clay at the disposal site may be lower now than in 2000. Several hard-bottom areas that support reef communities are located in and just outside the boundary zones, generally to the west and south of the ODMDS (Figure 12).

Sediment contaminant levels were low within the disposal zone and surrounding areas. Trace metal, PAH, PCB, and pesticide concentrations were all below published bioeffects guidelines. Contaminant concentrations above the detection limit were found in several of the monitoring and disposal cells, but highest levels were consistently found in disposal zone sediments. This suggests that contaminated sediments were largely limited to the disposal zone and comprised a small proportion of the deposited material.

The current regime of the ODMDS was characterized by Voulgaris (2002), who found that wind-driven circulation dominates over tidal circulation and that the primary wind-driven current directions are northeast, in response to onshore winds, and southwest, in response to offshore winds. The local winds dominate sediment transport: strong winds generate waves that suspend fine sediment and steer that sediment across the seabed, and also drive currents that transport the resuspended sediment along the direction of the mean current. Earlier studies, summarized by Zimmerman, Jutte, and VanDolah (2002), found generally similar patterns, although little, if any, southerly water movement was measured. Despite the generally northerly current regime, site monitoring suggests that fine sediments deposited at the ODMDS may be migrating generally westward (Zimmerman, Jutte, and VanDolah 2002).

In a five-year monitoring study of hard-bottom habitats near the ODMDS conducted during and after the Charleston Harbor channel deepening project, Crowe et al. (2006) found that silts and clays are a minor component of sediments. They stated that, "migration of disposal area sediments has not been a major problem to date" and, "it was clear that at the reef monitoring sites, most of the sediment settling from the water column was either resuspended or winnowed away and did not readily accumulate at the sites."

**Marine Terminal Site** – The geology and oceanography of the fill site are described in the MCT EIS (USACE, 2006). The land is flat and low-lying, with elevations ranging from sea level to +21 ft (6.5 m) MSL. The land consists of alluvium from the Cooper River, which borders the peninsula on which the site is located (Figure 1).

The site's oceanography consists essentially of tidal action in the Cooper River, which empties into Charleston Harbor, and in Charleston Harbor itself. Tidal currents are superimposed on a generally sluggish river flow. Neither the Cooper River nor Charleston Harbor are included in any 303(d) listing of impaired water bodies. Fish consumption advisories are issued annually for mercury in portions of the Cooper River upstream of the MCT site, but not for the lower tidal reaches or Charleston Harbor (USACE 2006).

### 4.1.2 Climate and Air Quality

The borrow and fill sites are very similar with respect to climate; the following description is adapted from the MCT EIS (USACE 2006). Climate within the affected region is subtropical, with long, hot summers, relatively mild winters of short duration, and plentiful precipitation (as rain; snow is unusual). According to the National Weather Service, average annual rainfall at the

Charleston monitoring station is 50.33 inches. Local thunderstorms and tropical storm systems cause the greatest average monthly rainfall to occur during summer. January is the coldest month (average high/low of 59.1°F/39.2°F) and July is the warmest month (average high/low of 89.7°F/ 73.1°F). Temperatures at the ODMDS would be similar, but generally cooler in the summer and warmer in the winter due to the moderating influence of the ocean.

The affected area is prone to hurricanes, which bring strong, damaging winds, torrential rains, and tidal storm surges that flood low-lying areas. During the period 1900-2000, 16 hurricanes, four of them major, directly hit the state of South Carolina, for a recurrence interval of approximately 6.25 years. Three of the major hurricanes occurred in September, one during October. Tornadoes do occur, but are rare in coastal areas. However, waterspouts generated by thunderstorms are common over coastal waters.

The affected area is currently in compliance with all air quality standards as prescribed by the Clean Air Act and amendments. Overall, air quality within the Tri-County region that includes Charleston and the Cape Romain NWR is good: air quality monitoring data for the period 2002 through 2004 show that concentrations of SO<sub>2</sub>, PM<sub>10</sub>, CO, NO<sub>2</sub>, lead, and TSP were far below federal or state standards; PM<sub>2.5</sub> and ozone concentrations approached but never exceeded the standards (USACE 2006, Table 4.11-2).

### **4.2 Biological Environment**

This section describes the general biological setting of the ODMDS and the Marine Terminal Site, in order to provide context for the direct and indirect impacts of the proposed action on ESA-listed species or designated critical habitat in the proposed action area. ESA-listed species are presented in Table 4-1, below, and further described in the appropriate resource areas (upland communities, plankton, benthos, fish, turtles, and marine mammals).

Both the USFWS and NMFS list threatened and endangered species and designate critical habitats in the Southeast region. According to the USFWS Threatened and Endangered Species System (TESS) website ([www.ecos.fws.gov](http://www.ecos.fws.gov)), which maintains a listing for both agencies of all species listed or proposed for listing as well as designated critical habitat, there are 47 species of threatened and endangered animals (28 species) and plants (19 species) in South Carolina and its waters. The NMFS website ([sero.nmfs.noaa.gov/pr/esa/specieslist.html](http://sero.nmfs.noaa.gov/pr/esa/specieslist.html)) lists six marine mammals, five sea turtles, and one fish species as threatened or endangered, and seven fish species and one invertebrate species as Species of Special Concern. Of those species, a total of 15 could potentially be found in the Proposed Action Area (Table 4-1); as will be described below, none of the other listed species would be expected to occur in or near the Proposed Action Area.

#### **4.2.1 ODMDS and Transport to the Marine Terminal**

The following provides an overview of the habitats and species found within the Charleston ODMDS and waters from the ODMDS to the MCT. More information on the general biological environment of the proposed action area can be found in Zimmerman, Jutte, and VanDolah (2002) and Crowe et al. (2006) and within the USACE EIS for the MCT project (USACE 2006) ESA-listed species or designated critical habitat are also described below.

**Habitats** -- Habitats at the proposed borrow site landward to Charleston Harbor consist of open-ocean water column and bottom sediments; the latter include both hard-bottom and soft-bottom

areas outside the ODMDS and coarse marls, sands, and silty sands deposited inside the ODMDS by dredging projects.

Table 4-1. Threatened and Endangered Species Potentially Occurring at the ODMDS and MCT Sites.

Common Name	Scientific Name	Occurrence in Action Area	Status
Green Sea Turtle	<i>Chelonia mydas</i>	Occasional at ODMDS, never at MCT	T
Hawksbill Sea Turtle	<i>Eretmochelys imbricata</i>	Rare at ODMDS, never at MCT	E
Kemp's Ridley Sea Turtle	<i>Lepidochelys kempii</i>	Occasional at ODMDS, never at MCT	E
Leatherback Sea Turtle	<i>Dermochelys coriacea</i>	Rare at ODMDS, never at MCT	E
Loggerhead Sea Turtle	<i>Caretta caretta</i>	Common at ODMDS, occasional at MCT	T
Blue Whale	<i>Balaenoptera musculus</i>	Unlikely at ODMDS, never at MCT	E
Fin Whale	<i>Balaenoptera physalus</i>	Unlikely at ODMDS, never at MCT	E
Sei Whale	<i>Balaenoptera borealis</i>	Unlikely at ODMDS, never at MCT	E
Humpback Whale	<i>Megaptera novaeangliae</i>	Occasional at ODMDS, never at MCT	E
Right Whale	<i>Eubalaena glacialis</i>	Occasional at ODMDS, never at MCT	E
Sperm Whale	<i>Physeter macrocephalus</i>	Unlikely at ODMDS, never at MCT	E
West Indian manatee	<i>Trichechus manatus</i>	Rare at ODMDS, common at MCT in summer	E
Shortnose sturgeon	<i>Acipenser brevirostrum</i>	Never at ODMDS, potentially at MCT	E
Alligator	<i>Alligator mississippiensis</i>	Never at ODMDS, potentially at MCT	T
Bald eagle	<i>Haliaeetus leucocephalus</i>	Never at ODMDS, observed at MCT in winter	T

T=Threatened, E=Endangered; Sources: [www.seo.nmfs.noaa.gov/pr/esa/specieslst.html](http://www.seo.nmfs.noaa.gov/pr/esa/specieslst.html); USACE (2006)

**Plankton and Benthos** -- The water column supports zooplankton and phytoplankton assemblages that serve as food for juvenile fish and commercially important invertebrates. The plankton community is not resident at the ODMDS area, since it is carried along the coast and across the continental shelf by ocean currents, and is thus not dependent upon the site.

The benthic assemblages of the coastal ocean off South Carolina are typical of the subtropical continental shelf. The 2000 monitoring study of the disposal and boundary sites (Zimmerman, Jutte, and VanDolah 2002) collected 402 taxa with a site-wide mean density of 3,939 individuals per m<sup>2</sup>. Polychaetes were the most abundant taxonomic group, comprising 56% of all organisms identified in samples collected during 2000. The category 'other taxa' (e.g. Nemertina, *Branchiostoma* sp., Polygordiidae) made up 21% of the total abundance, and amphipods and molluscs comprised 13% and 10% of the total abundance, respectively.

The monitoring cells affected by disposal activities had benthic assemblages somewhat different than those of the non-impacted cells. A statistical comparison showed that while seven of the eleven numerically dominant taxa were common to both non-impacted and impacted cells, the impacted cells had fewer *P. cristata* and Polygordiidae and more *P. dayi* and Nemertina than the non-impacted cells. Furthermore, *Branchiostoma* sp. and *Eudevenopus honduranus* were among the top eleven taxa for the non-impacted cells but not for the impacted cells. Both of these taxa, accordingly to Zimmerman, Jutte, and VanDolah (2002), are not characteristic of muddy sediments. *Magelona* sp. and *Protohaustorius deichmannae*, both associated with muddy

sediments, were among the dominants in the impacted cells but not in the non-impacted cells. These changes indicate that the disposal of fine-grained material has changed the composition of the benthic infaunal community.

No benthic invertebrates that might inhabit the ODMDS are listed as threatened, endangered, or species of special concern.

**Live Bottom** -- Survey data compiled by SEAMAP (2008) show live-bottom habitat offshore and south of the ODMDS and potential hard-bottom areas over wide areas inshore and west of the ODMDS site. The live bottom that prompted reconfiguration of the ODMDS site (see section 3.2.1 and Figure 1) is evident in Figure 12, just outside the western boundary of the site, and there appear to be two areas of hard bottom inside the ODMDS. Hard-bottom areas off South Carolina support low-profile reefs characterized primarily by soft corals (e.g., *Leptogorgia virgulata* and *Titanideum* sp.), the massive sponge *Ircinia* sp., and various encrusting sponges (Crowe et al., 2006). These areas are typically rocky outcroppings that support the growth of attached and encrusting invertebrates (as opposed to the burrowing and epibenthic organisms characteristic of soft bottoms), and are considered valuable fish habitat.

A five-year video survey by Crowe et al. (2006) of reefs near the ODMDS found a variety of finfish, notably black sea bass, scup, porgies, wrasses, and grunts (all members of the snapper-grouper complex). They found no difference in abundance or diversity between control reefs (C1 and C2 in Figure 13) and reefs near the ODMDS, and stated that, “The abundance of finfish individuals or species observed at study sites and reference areas does not appear to be affected by disposal activities during the five year survey period.” They also examined the encrusting fauna that characterizes these reefs and found that while there were some differences among sites, those differences “do not appear to be related to movement of disposal material.”

**Fish** – The fish assemblage of South Carolina’s open coastal waters, including the region of the ODMDS, includes a wide variety of fish types, including nearshore demersals, coastal pelagics, and open-ocean pelagics that migrate through the study area. Abundant demersal species include drums and croakers (e.g., *Cynoscion regalis*, *Leiostomus xanthurus*, *Micropogonias undulatus*, *Pogonias cromis*, *Sciaenops ocellatus*, *Stellifer lanceolatus*), seabasses (*Centropristis* spp.), grunts (Haemulidae), several species of flounders (*Paralichthys* spp.), groupers (e.g., *Epinephelus* spp.), small forage fish such as searobin (*Prionotus carolinus*), lizardfish (*Synodus foetens*), and toadfish (*Opsanus tau*), and skates and rays (e.g., *Raja eglanteri*, *Dasyatis americana*).

Pelagic fish include small forage fish such as Atlantic menhaden (*Brevoortia tyrannus*), shad (*Alosa* spp.), anchovies and sardines, and mullet (*Mugil cephalus*), as well as larger, predatory species such as silver perch (*Bairdiella chrysoura*), barracuda (*Sphyraena barracuda*), mackerel species (*Scomberomorus maculatus*, *S. cavalla*, *Acanthocybium solanderi*), bluefish (*Pomatomus saltatrix*), and various sharks (e.g., *Carcharhinus limbatus*, *Isurus oxyrinchus*, *Squalus acanthias*). Oceanodromous species that are encountered in shelf waters include several members of the tuna family (e.g., *Thunnus* spp., *Euthunnus* spp.), occasional billfish such as marlins and swordfish, and dolphins (e.g., *Coryphaena hippurus*). No fish that might inhabit the ODMDS are listed as threatened, endangered, or species of special concern.

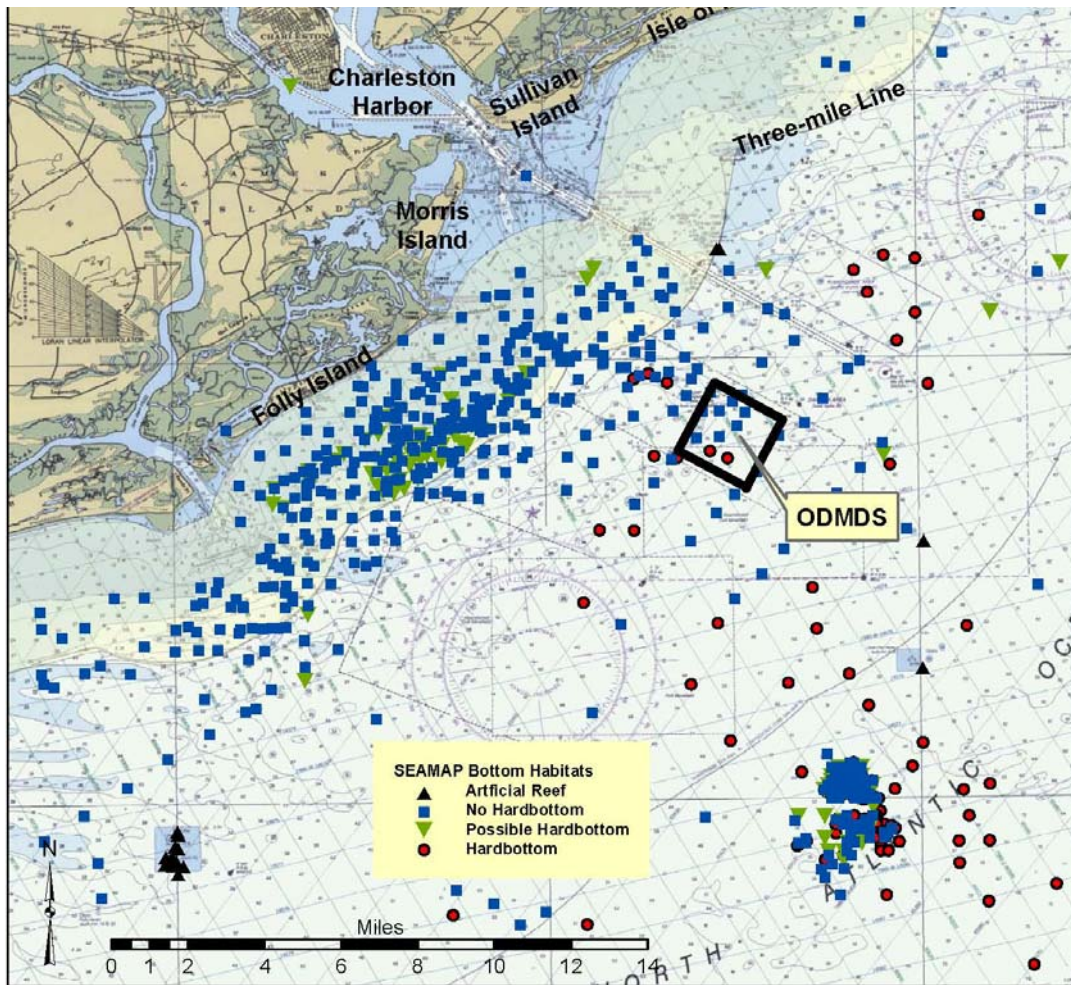


Figure 12. Location of hard-bottom and possible hard-bottom areas in the Action Area (Source: SEAMAP 2008)

**Reptiles** -- South Carolina coastal waters support populations of loggerhead sea turtles (*Caretta caretta*) and are visited by several other species of sea turtles (Table 4-1). All sea turtles are listed as threatened or endangered under the ESA. The following species accounts are summarized from more extensive accounts in MMS (2003) and USACE (2006), and incorporate information from the Sea Turtle Organization reports of strandings ([www.seaturtle.org/strand](http://www.seaturtle.org/strand)) and the NMFS website ([www.seo.nmfs.noaa.gov/pr/esa/specieslist.html](http://www.seo.nmfs.noaa.gov/pr/esa/specieslist.html)).

#### Green Sea Turtle (*Chelonia mydas*)

The green sea turtle is found worldwide in tropical and temperate seas and oceans. The North American distribution is from Massachusetts to Mexico and the Caribbean and from British Columbia to Baja California. On the east coast the major nesting areas are along the east coast of Florida and in the Caribbean. Green sea turtles migrate long distances between feeding and nesting grounds.

Green turtles are generally found in fairly shallow, warm waters (except when migrating) inside reefs, bays, and inlets. The turtles are attracted to lagoons and shoals with an abundance of marine grass and algae, as the adult diet is seagrasses (e.g., turtle grass, *Thalassia testudinum*). The low quality of the diet is thought to be a factor in the species' low reproductive rate and slow

growth. Critical habitat for the green turtle has been designated as the water surrounding Culebra, Puerto Rico, and they also nest along the Atlantic coast of Florida and in the U.S. Virgin Islands. Major feeding grounds are located along the west coast of Florida.

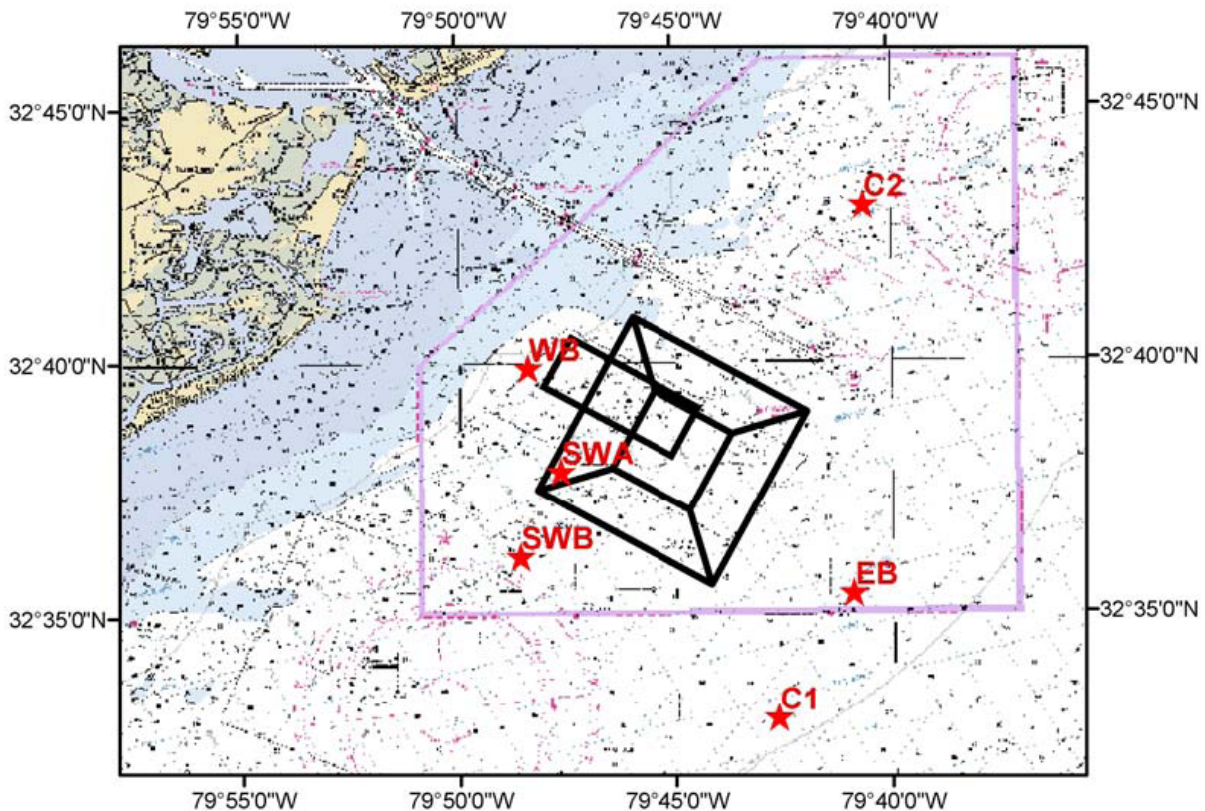


Figure 13. Location of reef sites inside (site SWA) and near the ODMDS (delineated in black) surveyed by Crowe et al. (2006).

Charleston Harbor is located within the green turtle's migrating and foraging range. According to USACE (2006) green turtles have not been sighted there (based on existing data: no survey for sea turtles was performed for the MCT EIS) nor, with its lack of marine vegetation, does Charleston Harbor represent suitable habitat. However, green turtles are not uncommon in South Carolina waters: the MCT EIS (USACE 2006) cites data from 2002 – 2005 indicating that an average of five green sea turtles are stranded along the southern half of the South Carolina coast each year. Accordingly, green sea turtles could be present in the ODMDS area during the proposed sand borrow project.

#### Hawksbill Sea Turtle (*Eretmochelys imbricata*)

Hawksbill sea turtles occur in all ocean basins, although they are relatively rare in the Eastern Atlantic and Eastern Pacific, and absent from the Mediterranean Sea. Hawksbills are the most tropical of the marine turtles, ranging from approximately 30° N to 30° S. Adults are closely associated with coral reefs and other hard-bottom habitats, but they are also found in other habitats including inlets, bays and coastal lagoons.

Major nesting populations (those with more than 1,000 females nesting annually) are in the Seychelles, Mexico (Yucatan), Indonesia, and two in Australia. Important but much smaller nesting aggregations in the Caribbean exist in Puerto Rico, the U.S. Virgin Islands, Antigua, Barbados, Costa Rica, Cuba, and Jamaica, and nesting very rarely takes place in Florida. Critical habitat for the hawksbill turtle includes waters around two islands off Puerto Rico. Reproductive females undertake periodic (usually non-annual) migrations to their natal beach to nest and exhibit a high degree of fidelity to their nest sites. Hawksbill turtles show fidelity to their foraging areas for up to several years. Their highly specialized diet consists primarily of sponges.

Outside of an occasional occurrence, hawksbill turtles are not expected within the Proposed Action Area. While there is some potential for hawksbills to be present off the coast of South Carolina during migration, no nesting beaches are known within South Carolina and no individuals were reported stranded between 2002 and 2007 (Sea Turtle Organization; USACE 2006).

### Kemp's (Atlantic) Ridley Sea Turtle (*Lepidochelys kempii*)

Kemp's Ridley sea turtle is the smallest and rarest species of marine turtle. Adults are restricted to the Gulf of Mexico, but immatures have been observed along the Atlantic coast as far north as Massachusetts; adults and juveniles are often found in salt marsh and other estuarine habitats. Outside of nesting, which occurs almost entirely on a single beach in northern Mexico, the major habitat for Kemp's Ridentles is the nearshore waters of the northern Gulf of Mexico, especially Louisiana. No critical habitat has been designated for the Kemp's Ridley sea turtle. The population appears to be increasing as a result of protection of the nesting beaches, but is still far short of the numbers needed to determine that the species is no longer endangered. The species is carnivorous, feeding primarily on small benthic and epibenthic invertebrates such as crabs, snails, and clams, and also on jellyfish and other animal matter.

Kemp's Ridentles are not common off the coast of South Carolina; however, immature individuals are occasionally encountered in the near-shore and coastal waters of South Carolina. Nineteen strandings of Kemp's Ridentles were reported in 2007, nearly a quarter of all sea turtle strandings in South Carolina that year (Sea Turtle Organization), but in the period 2002 – 2005 the average was 10 reported strandings per year, roughly 11% of all turtle strandings in the lower half of the South Carolina coast (USACE 2006). Accordingly, Kemp's Ridley sea turtles could be present in the ODMDS area during the proposed sand borrow project.

### Leatherback Turtle (*Dermochelys coriacea*)

The leatherback is the most pelagic (open ocean) of the sea turtles and is often seen near the edge of the continental shelf; however, they have also been observed just offshore of the surf line. Critical habitat for the leatherback includes the waters adjacent to Sandy Point, St. Croix, U.S. Virgin Islands. The major nesting beaches are located in Malaya, Surinam, French Guiana, Mexico, Costa Rica, and St. Croix, U.S. Virgin Islands. Regular nesting in the United States is restricted to Florida, Puerto Rico, and the U.S. Virgin Islands (no nesting beaches are known within South Carolina), and critical habitat for the species has been designated as the waters adjacent to Sandy Point, St. Croix, U.S. Virgin Islands.

Leatherback turtles are not expected to be common within the Proposed Action Area, but they could occur. Leatherbacks are present off the coast of South Carolina during migration: one individual was reported stranded in 2007 (Sea Turtle Organization), and an average of six per year in the period 2002 – 2005 (USACE 2006).



Loggerhead Turtle (*Caretta caretta*)

Loggerhead turtles are circumglobal, inhabiting continental shelves, bays, estuaries, and lagoons in temperate, subtropical, and tropical waters. Loggerhead turtles are considered to be characteristic of shallow water (less than 50 meters deep). According to Arendt et al. (2007) the bulk of sea turtle sightings in the Southeast are juvenile loggerheads. Juvenile loggerheads are thought to utilize bays and estuaries for feeding, while adults prefer open waters. The food of loggerheads consists of mollusks, crabs (especially blue crabs), shrimp, sea urchins, sponges, squid, basket stars, jellyfish, and even mangrove leaves in the shallows. They are well-adapted by their heavy jaws to eat hard-shelled food but are known to take a wide variety of prey items.

South Carolina's coastal waters are a migration path for loggerheads at all times of the year, and South Carolina's beaches are within the species' nesting range in the U.S. (North Carolina to Mexico), although most nesting occurs along the east coast of Florida. Loggerhead turtles consistently occur off Charleston Harbor during spring, summer, and fall, and sporadically occur in the Charleston Harbor estuarine system; their abundance in South Carolina waters is attested to by the fact that loggerheads comprised between two-thirds and three-quarters of all sea turtle strandings in 2002 – 2007 (roughly 65 per year; Sea Turtle Organization; USACE 2006). No critical habitat has been designated for loggerhead turtles.

**Marine Mammals** -- The following description is taken from the MCT EIS (USACE 2006) as it applies to the ODMDS and nearby open waters. Marine mammals, all of which are protected under the federal Marine Mammal Protection Act (MMPA) and in some cases the ESA, may be present in the proposed action area, although with the exception of bottlenose dolphin, they would be rare. The rare visitors would include the Federally endangered or threatened species discussed below. The following species accounts are summarized from more extensive accounts in MMS (2003) and USACE (2006), and incorporate information from the NMFS website ([www.serono.nmfs.noaa.gov/pr/esa/specieslist.html](http://www.serono.nmfs.noaa.gov/pr/esa/specieslist.html)) and NMFS (2007).

Blue Whale (*Balaenoptera musculus*)

The distribution of the blue whale in the western North Atlantic generally extends from the Arctic to at least mid-latitude waters. Blue whales are most frequently sighted in the waters off eastern Canada, with the majority of recent records from the Gulf of St. Lawrence. According to NMFS (2007) the blue whale is best considered as an occasional visitor in the U.S. Atlantic Exclusive Economic Zone (EEZ: within 200 miles of coastline) waters, which may represent the current southern limit of its feeding range. NMFS (2007) presents data suggesting that the population in the western North Atlantic may be as low as a few hundred individuals. There are no confirmed records of mortality or serious injury to blue whales in the U.S. Atlantic EEZ since 1998, when a dead individual arrived at a New England port on the bow of a tanker. As a deep-water species (MMS 2003), blue whales are extremely unlikely to be in water as shallow as the Proposed Action Area.

The status of this stock in the U.S. Atlantic EEZ is unknown, but the species is listed as endangered under the ESA. There are insufficient data to determine population trends for blue whales. The total level of human-caused mortality and serious injury is unknown, but it is believed to be insignificant and approaching a zero mortality and serious injury rate.

### Fin Whale (*Balaenoptera physalus*)

Fin whales are common in waters of the North Atlantic, from the Gulf of Mexico (rarely – they are most abundant north of Cape Hatteras) northward to the edge of the Arctic ice pack (NMFS 2006b). Fin whales accounted for 46 percent of the large whales and 24 percent of all cetaceans sighted over the continental shelf during aerial surveys between Cape Hatteras and Nova Scotia during 1978-82.

The latest stock assessment report (NMFS 2007) gives a figure of 2,269 as the best abundance estimate available for the western North Atlantic fin whale stock. This is an estimate from a time when the largest portion of the population was within the study area, but NMFS cautions that it “must be considered extremely conservative in view of the incomplete coverage of the known habitat of the stock and the uncertainties regarding population structure and whale movements between surveyed and unsurveyed areas.”

The major threats to fin whales in U.S. waters are entanglement in fishing gear and collision with ocean-going vessels. The MCT EIS describes a large-ship strike on a fin whale in 1995 that was probably hit at sea, carried on the bow of a large ship into Charleston Harbor, and rolled off when the ship stopped or turned around, although it is not known where the ship was when it struck the whale. According to MMS (2003), fin whales are typically a deep-water species unlikely to occur close to shore. In addition fin whales, like blue whales, are essentially a northern species: the survey data presented in NMFS (2007) shows relatively few individuals sighted south of Cape Cod. Accordingly, fin whales would not be expected to occur in the Proposed Action Area except as very rare stray individuals.

### Sei Whale (*Balaenoptera borealis*)

The sei whale population in the North Atlantic constitutes a strategic stock because the species is listed as endangered under the ESA. The southern portion of the sei whale’s range during spring and summer includes the northern portions of the U.S. Atlantic EEZ in the Gulf of Maine and Georges Bank. According to NMFS (2007), the size of the population is unknown, as there have been no reliable surveys since the 1970s.

There are few data on fishery interactions or human impacts: NMFS reported no observed fishery-related mortality or serious injury to sei whales during 1991-1999, and there are no reports of mortality, entanglement, or injury in the NEFSC or NE Regional Office databases; however, there is a report of a ship strike by a container ship that docked in Boston in 1994.

The sei whale is a deep-water species, and is also a northern species that rarely, if ever, occurs south of the Gulf of Maine (NMFS 2007). For these reasons, sei whales are very unlikely to be encountered in coastal waters of South Carolina, including the Proposed Action Area.

### Humpback Whale (*Megaptera novaeangliae*)

The humpback whale is found in all oceans and has a seasonal north-south migration pattern. The species prefers coastal areas more than most other whales, especially when feeding and calving/breeding. In North America, humpbacks winter in the Caribbean and spend spring, summer, and fall in the Gulf of Maine and nearby waters in the spring. Although they typically migrate via Bermuda, they can occur anywhere along the east coast of the U.S., including South Carolina, during their spring and fall migrations, and the MCT EIS cites unpublished data on wintertime sightings in coastal waters off the southeastern U.S. The latest stock assessment report (NMFS 2007) speculates that the continental shelf of the southeastern U.S. may be an important habitat for juvenile humpbacks. The expected life span for the humpback whale at

least 40-50 years, and 11,570 is regarded as the best available estimate of the North Atlantic population (NMFS 2003; NMFS 2007).

The major threats to the humpbacks are entanglement in fishing gear, collision with ocean-going vessels, and disturbance by whale watchers: two humpback whale killed by shipstrike washed ashore in South Carolina in 2006 (SEFSC website), and a humpback whale that was tangled in fishing gear and had prop scars washed ashore at Myrtle Beach in 2001. Given their coastal habits and their pattern of distribution and migration, humpback whales can be expected to pass through the Proposed Action Area in spring and fall during their migration to and from the Caribbean, and a few may winter in or near the Proposed Action Area.

### North Atlantic Right Whale (*Eubalaena glacialis*)

The North Atlantic right whale is considered one of the most critically endangered marine mammals in the world. By the 1800s the animal had been hunted almost to extinction and their numbers remain very low: the eastern American population is estimated at approximately 300 (according to NMFS 2007, 313 recognizable individuals were known to be alive in 2001), and appears to be increasing very slowly, if at all.

Right whales are found in the North Atlantic Ocean from west of Greenland to Florida and Texas in the west brim and to Madeira in the east, and migrate from north to south in the fall and from south to north in the spring. Research results (NMFS 2007) suggest the existence of six major habitats or congregation areas for western Atlantic northern right whales: the coastal waters of the southeastern United States; the Great South Channel; Georges Bank/Gulf of Maine; Cape Cod and Massachusetts Bays; the Bay of Fundy; and the Scotian Shelf. Mating and calving occur from February to April in the warmer southern waters. Critical habitat for right whales in U.S. waters, as designated by NMFS, includes coastal Florida and Georgia (for mating and calving), about 120 miles southwest of Charleston Harbor, and two areas of Cape Cod Bay and Massachusetts Bay, which serve as nursery areas for calves (NMFS 2007). Since they move slowly, swimming and feeding at or near the surface of the water, right whales are very susceptible to collisions with ships and fishing gear. The Mid-Atlantic United States recorded five ship strike mortalities of right whales from 1991-2002, all of them north of North Carolina, and the Southeast Region (south of Savannah) recorded four ship strikes in the critical habitat off Florida and Georgia. NMFS (2007) estimates that at least three right whales are killed in the western North Atlantic each year by human factors.

South Carolina is not a critical habitat, but right whales would be expected to occur off the coast of South Carolina during their seasonal migrations. Charleston is within the Mid-Atlantic region, for the purposes of right whale management, an area that extends approximately from Block Island Sound, Rhode Island to Port of Savannah, Georgia, between known high-use areas in the northeast and winter calving areas in the southeast. The Mid-Atlantic Region is a migratory corridor for pregnant females moving from northeast to southeast in fall (September to November) and for mother/calf pairs departing winter calving area in the southeast headed for the northeastern United States (March through May), and is likely used by calving females December to March. The mother-calf pairs stay close to shore, with 94 percent of sightings within 30 nautical miles of shore and 80 percent of sightings in depths less than 90 feet.

### Sperm Whale (*Physeter macrocephalus*)

Sperm whales constitute a strategic stock because the species is listed as endangered under the ESA. According to NMFS (2007), total numbers of sperm whales off the U.S. Atlantic coast are

unknown, although an abundance estimate for the western North Atlantic from 2004 puts that population at approximately 4,800 individuals.

Sperm whales, unlike the other whales considered in this document, are predatory carnivores, consuming fish and large mollusks, particularly squid. Although sperm whales are deep-water animals rarely venturing close to shore (MMS 2003) and not often caught by fishery gear, they are regularly stranded on beaches along the Atlantic Coast for reasons that are still unclear. Total fishery-related mortality and serious injury for this stock can be considered to be insignificant and approaching a zero mortality and serious injury rate. Because sperm whales are open-ocean, deep-water animals, it is extremely unlikely that any would be found in the shallow waters of the Proposed Action Area.

### West Indian Manatee (*Trichechus manatus*)

Manatees, marine mammals of the order Sirenia, are listed as endangered under the ESA. The West Indian manatee is divided into two subspecies, of which the Florida (*T. manatus latirostris*) is of concern for this project.

According to the account in USACE (2006), manatees inhabit both salt and fresh water of sufficient depth (5 feet to usually less than 20 feet) throughout their range. Manatees may be encountered in shallow, slow-moving water bodies such as canals, rivers, estuarine habitats, and saltwater bays, although on occasion they have been observed as much as 3.7 miles off the Florida Gulf coast. Manatees require warm water, migrating to warmer waters whenever the temperature falls below 20° C. They are herbivorous, subsisting on seagrasses, large algae, and freshwater plants. Manatees reproduce slowly, reaching sexual maturity at five to nine years of age and bearing a single young (rarely twins) every two to five years. The population, estimated at no less than 1,800 (NMFS 2007), is concentrated in Florida, but manatees are known to visit the Charleston Harbor area in the summer months (April through November) as they migrate up and down the coast.

Threats to the manatee include natural mortality due to cold and red tide poisoning and human-induced mortality from loss of habitat, watercraft collisions, pollution, litter, and water control structures. According to NMFS (2007), roughly a third of documented manatee mortality is due to human-related causes, the vast majority from collisions with watercraft.

Manatees are known to visit the Charleston Harbor area in the summer months (April through November) as they migrate up and down the coast (USACE 2006): for example, 18 manatee sightings were reported in the Cooper River between May and September 2004. Given their migratory habits, manatees can be assumed to occur in nearshore ocean waters between Charleston Harbor and the ODMDS, although it is unlikely that they would be found at the ODMDS itself, given the site's distance from land.

### **4.2.2 Marine Terminal Site**

**Habitats** -- According to the MCT EIS (USACE, 2006), the site of the proposed marine terminal is characterized by a mixture of upland vegetation, including coastal scrub forest, revegetated dredged material, landscaping, pockets of freshwater marsh, and tidal wetlands. Aquatic habitats include open-water estuary in the Cooper River; intertidal oyster beds, shell banks, and mudflats; and the subtidal benthic habitat.

**Upland Communities** -- The upland forests are secondary growth, having colonized previously disturbed military lands in the past few decades, and most of the other upland areas were disturbed by decades of military and industrial use. The freshwater wetland habitats are pockets of forested and unforested wetlands less than an acre in extent, mostly on the fringes of the tidal wetland areas. The tidal wetlands range from emergent, cordgrass low marsh to shrub-dominated high marsh. The open-water subtidal area adjacent to the terminal site does not support aquatic vegetation other than phytoplankton and sparse macroalgae.

According to the MCT EIS (USACE 2006), none of the 19 ESA-listed plant species occurs in or near the marine terminal site. Only one threatened bird species, the bald eagle (*Haliaeetus leucocephalus*), has been observed at the site (USACE 2006). Three others, the wood stork (*Mycteria americana*), the piping plover (*Charadrius melodus*), and the red-cockaded woodpecker (*Picoides borealis*), are known to occur in the general Charleston area, although not at the MCT site (USACE 2006). The FWS concurred with the USACE by letter dated April 23, 2007 (see Appendix A) that the potential effects of construction of the MCT, i.e., fill placement, on the bald eagle are discountable. None of the listed terrestrial amphibians, reptiles, or mammals occurs at the MCT site, but the flatwoods salamander (*Ambystoma cingulatum*) is known from an inland site in the general area (Francis Marion National Forest; USACE 2006). The three bird species and the amphibian known to occur on the general area are known on the basis of surveys not to be present at the MCT site itself, and they were not considered in the FWS Section 7 consultation (see Appendix A).

**Plankton and Benthos** -- The aquatic communities of the marine terminal site are described in detail by Moore et al. (2000), and summarized in the MCT EIS (USACE 2006). The open waters of the Cooper River support a number of important fish species and are used by a few species of marine mammals, notably river otter and bottle-nosed dolphins. The intertidal habitat supports scattered beds of oysters, none of them commercially valuable or characterized as an oyster reef for EFH purposes; and benthic invertebrates typical of mudflats (polychaete worms, mussels and burrowing bivalves, and small crabs, amphipods, and other crustaceans). The subtidal benthic habitat of the Cooper River supports abundant white and brown shrimp and blue crabs, which are commercially and recreationally important, and a variety of infauna such as polychaete worms, clams, and various small crustaceans.

**Fish** -- A study of Charleston Harbor by Van Dolah et al. (1990) found Atlantic menhaden (*Brevoortia tyrannus*), bay anchovy (*Anchoa mitchilli*), silver perch, weakfish (*C. regalis*), spot (*Leiostomus xanthurus*), Atlantic croaker (*Micropogon undulatus*), and star drum (*Stellifer lanceolatus*) in large numbers. Summer flounder (*Paralichthys dentatus*) and southern flounder (*P. lethostigma*), two important recreational species, were caught in low numbers throughout the year. Sharks, skates and rays can all potentially be found in Charleston Harbor, and Schwartz (2003) reported that six species of sharks, including several federally managed species, can produce young in South Carolina waters during the summer.

Dominant finfish species in the adjacent Cooper River include spot (*Leiostomus xanthurus*), Atlantic menhaden (*Brevoortia tyrannus*), Atlantic croaker (*Micropogonias undulatus*), southern flounder (*Paralichthys lethostigma*), and bay anchovy (*Anchoa mitchilli*). Some recreationally important fish such as red drum, spotted sea trout, and catfish are present in low abundance, and the river is also used by several anadromous and catadromous species including American shad (*Alosa sapidissima*), hickory shad (*Alosa mediocris*), blueback herring (*Alosa aestivalis*), Atlantic sturgeon (*Acipenser oxyrinchus*), and American eel (*Anguilla rostrata*). One listed

fish species, the shortnose sturgeon (*Acipenser brevirostrum*), is listed by the MCT EIS (USACE 2006) as present in the MCT project area.

### Shortnose sturgeon (*Acipenser brevirostrum*)

According to the MCT EIS (USACE 2006), this endangered species inhabits fresh and brackish-water areas of the Charleston area, although the species is not found in the project area, being restricted to areas of the Cooper and Santee River systems several miles upstream of the MCT site. The NMFS concluded in its Section 7 consultation letter (Appendix A) that the effects of construction of the MCT, i.e., fill placement, on this species are discountable.

**Reptiles** – According to the MCT EIS (USACE 2006) two ESA-listed marine reptiles could occur at the MCT site: the American alligator (*Alligator mississippiensis*) and the loggerhead sea turtle *Caretta caretta*). The biology and distribution of the loggerhead sea turtle are described above, in section 4.2.1.

### American alligator (*Alligator mississippiensis*)

Although population levels have risen substantially since its initial listing, the American alligator continues to be listed as threatened due to its similarity in appearance to the endangered American crocodile. Similarity of appearance to a listed species is a regulatory designation to facilitate the enforcement and further the policy of the ESA. It is used when a species is so closely similar to a listed species that enforcement personnel would have substantial difficulty in attempting to differentiate between the listed and unlisted species. The alligator can be found in the river swamps, lakes, bayous, marshes, and other water bodies of the Gulf States and lower Atlantic coastal plains.

Although no alligators were observed in the project area during field surveys of the project area (USACE 2006), the species could potentially be found passing through the MCT area in search of suitable freshwater habitat in an effort to expand their range. Alligators would be considered an occasional visitor, and the MCT EIS concluded that construction and operation of the marine terminal would have no effect on the species (see Appendix A).

**Marine Mammals** – The only ESA-listed marine mammal potentially found at the MCT is the endangered West Indian manatee (*Trichechus manatus*). As this species is frequently sighted in Charleston Harbor, it has been included in this analysis (see section 4.2.1, above, for a description of the species' biology). None of the whales listed in Table 4-1 would be expected to venture routinely so far upriver, although it is possible that on very rare occasions one individual might stray as far as the MCT site.

**Birds** – The bald eagle (*Haliaeetus leucocephalus*) is listed as threatened in the lower 48 states, but it is a candidate for delisting due to its recovery status. No bald eagles are known to nest near the project alternative sites, although one bald eagle was seen at the Proposed Project site over Shipyard Creek, being harassed by an osprey pair. No bald eagle nests were observed during field surveys.

## 5 EFFECTS OF THE PROPOSED ACTION

### 5.1 *Impact-Producing Factors*

The dredging operation could have both direct and indirect effects on ESA-listed species. Direct effects would include take of individuals from various aspects of the actual dredging and fill placement activities, whereas indirect impacts would include effects on factors such as growth and reproduction resulting from environmental changes caused by the project and the effects of the construction and operation of the marine terminal.

#### 5.1.1 Direct Effects

Dredge operations could have direct effects on ESA-listed species at the ODMDS and in the ocean between the dredge site and the fill site as a result of mortality due to entrainment and entrapment in the dredge gear, collisions with dredging vessels, and harassment from sound introduced from the proposed action into the marine environment as sound can potentially disrupt important natural behaviors (e.g., feeding, breeding, resting), migratory movements and other important life history behaviors. Turbidity from dredging operations could also disrupt important biological behaviors.

At the ODMDS, organisms could be attracted to the dredge site by the disturbance and exposure of benthic prey items and lights on the dredging equipment, then exposed to adverse levels of turbidity, noise, and the possibility of entrainment or entrapment in the dredge apparatus. Entrainment of sea turtles could be caused by suction from the cutterhead. Entrapment would consist of simple mechanical entanglement in the wires, cables, and struts of the cutterhead apparatus. Either event can be assumed to cause 100% mortality of the affected organisms.

Noise from the dredging operation could, if it is too loud, adversely affect ESA-listed species through hearing loss and behavioral modifications. Although there is some data on the noise levels associated with bucket dredging (e.g., USACE 2001), there appear to have been no comprehensive studies of the noise associated with hydraulic dredging. That noise would be generated by the diesel generator(s) powering the pump and cutterhead, the mechanical action of the cutterhead in the sediment, the sediment slurry moving in the pipes, and, in the case of the hopper dredge, the propulsion system (engine noise and cavitation from the propellers). Tyler-Walters and Jackson (1999) state that a working cutter-suction dredge approximates to a received sound pressure level of 130 dB re 1  $\mu$ Pa over a frequency spectrum of 45 to 7000 Hz at a distance of 100 meters, and that the passing of a small trawler (which would be similar in noise profile to a typical slow-moving hopper dredge) generates a similar noise level. A hopper dredge would generate both types of noise, so that the combined noise sources would produce a total noise level of between 130 and 140 dB re 1  $\mu$ Pa at 100 meters distance (e.g., Talisman Energy 2005). Note that values for generated sound pressure levels are typically expressed as the pressure at a distance of 1 meter; since that is not relevant to marine life, Tyler-Walters and Jackson (1999) recommend using the pressure at a distance of 100 meters, where levels are typically about 40 dB less due to the attenuation with distance.

The NMFS (2003) has established that a received sound level of 180 dB may result in injury or mortality to cetaceans. The level for pinnipeds (not found in the Proposed Action Area) is set at 190dB. For both pinnipeds and cetaceans, NMFS has set the level of potential behavioral harassment at 160 dB.

Turbidity caused by resuspension of sediments during the dredging could adversely affect the presence of or feeding by turtles and marine mammals that depend upon vision to locate their prey. In addition, turbidity could adversely affect fish respiration by clogging gills. Because the dredged material is not heavily contaminated, no chemical impact to organisms would be caused by the turbidity.

The transport of dredged material by barge or hopper dredge from the ODMDS to the fill site at the MCT could have adverse impacts on marine animals in the path of the vessels. Leakage of dredged material could cause minor, localized turbidity that could cause avoidance reactions by sea turtles, manatees, and whales. More seriously, sea turtles, manatees, and whales could be struck by the vessels – hopper dredges, barges, and tugboats – as those vessels transport the dredged material to the MCT site and return to the ODMDS.

The borrow pit resulting from the dredging operation would represent an alteration of the bottom topography compared to existing conditions. The dredging operation would create a depression of up to 960 acres in extent, approximately 3.5 feet deep. The borrow pit would be unlikely to have direct effects on any of the listed species at the ODMDS, given that a three-foot relief is well within the range normally encountered on the nearshore shelf (the relief at the ODMDS is currently approximately 15 feet), and would have no effect on organisms at the MCT site.

### **5.1.2 Indirect Effects**

Indirect effects could be experienced by ESA-listed species at the ODMDS as a result of the destruction of potential food resources (benthic infauna and epifauna removed with the dredged material) or otherwise suitable habitat. An example of such an indirect effect would be disruptions to the benthic environment that reduced the amount of prey available to a benthic-feeding sea turtle.

Indirect effects of the borrow pit at the ODMDS are conceivable: in theory, the borrow pit could alter coastal currents and waves in ways that could cause changes in the food resources available to the listed species as well as in the nature of their habitat. The potential physical effects of the borrow pit on wave energy and currents were evaluated in the course of this analysis and found to be negligible. The borrow pit would have no indirect effects at the MCT site.

The placement of fill for construction of the marine terminal and the subsequent operation of the marine terminal would be consequences of the proposed action. Accordingly, impacts of those activities constitute indirect effects of the proposed action. According to the MCT EIS (USACE 2006), construction of the marine terminal would result in a loss of aquatic habitat, temporary water quality impacts (lowered dissolved oxygen concentrations and turbidity) in the Cooper River, the potential for vessel strikes on whales, manatees, and sea turtles, and increased noise levels from pile driving and vessel activity. Operation of the marine terminal could have potential effects on listed species, including whales, manatees, and sea turtles, as a result of cargo vessel activity in the harbor and coastal waters that would generate vessel noise and increase the risk of collisions with project-related vessels.



## **5.2 Impacts on ESA-Listed Species**

### **5.2.1 Direct Effects**

**Reptiles** – Reptiles that could be directly affected by the proposed action include the American alligator and several species of sea turtles.

#### American Alligator

Although no alligators were observed during field surveys of the project area (USACE 2006), the species could potentially be found passing through the MCT area in search of suitable freshwater habitat in an effort to expand their range. Therefore, there is the potential for alligators to be present while dredging and support vessels are moving through the project area in the vicinity of the MCT. However, given that alligators would be considered an occasional visitor to areas directly in the vicinity of the MCT, and especially in the waters used for transporting dredged materials, any potential effects to alligators are not likely to adversely affect this species.

#### Sea Turtles

The proposed action may adversely affect ESA-listed sea turtles in the proposed action area. Entrainment and entanglement of sea turtles in hopper-dredge dragheads has been observed in sand mining and channel dredging projects elsewhere. MMS (2003) cites several documented instances of sea turtle mortality in dredging operations in the South Atlantic Region, including 11 loggerhead turtles taken in sand mining operations near Myrtle Beach, South Carolina, in 1997 – 1999, and four Kemp’s Ridley and three loggerheads in North Carolina and Florida in 2001 and 2002. The MCT EIS (USACE 2006) states that eight turtles were taken during channel dredging for Charleston Harbor between 1991 and 1997. In Florida, 149 sea turtles were entrained by hopper dredges during channel maintenance activities between 1980 and 1990, although MMS (2003) points out that sand mining has historically taken far fewer turtles than channel dredging. Most recently, a loggerhead was taken on September 21, 2008, in a hopper dredging operation off Myrtle Beach, SC (Shirey, pers. comm.). Most of the turtles taken have been loggerheads, presumably because of their relative abundance and their tendency to frequent shallow, coastal areas, but, as indicated above, Kemp’s Ridley sea turtles have also been taken by dredging operations in the South Atlantic region. Furthermore, USACE (2006) states that hopper dredges are more likely to take sea turtles both because the dredges move faster than other types and because they are more likely to be used at sea. Accordingly, entrainment and entrapment, resulting in injury or mortality, must be considered potential impacts on coastal sea turtles at the ODMDS.

Collisions with vessels are a particular concern for marine turtles because they mate, bask, and forage on or near the surface. According to MMS (2003), approximately 400 sea turtles per year are killed by boat collisions off coastal beaches. Accordingly, it is possible that sea turtles could be struck by project vessels traveling between the ODMDS and the MCT site. In addition, the presence of the dredging equipment could interfere with benthic foraging activities at the ODMDS.

Dredging would take place both night and day, meaning that any individuals of ESA-listed species in the vicinity of the ODMDS would be exposed to the lights of the dredge and support vessels at night. On-board lighting would be consistent with normal vessel illumination and would include the work area lighting and navigational lights required by OSHA and the U.S. Coast Guard. The ODMDS is adjacent to a busy navigational channel, and the work vessels

transporting dredge material would use the channel. The presence of one or two dredges and associated support vessels would not represent a significant increase in vessel traffic in rhw area nor would it be expected to significantly increase the level of nighttime illumination. Accordingly, nighttime lighting would not have significant impacts on sea turtles.

**Marine Mammals** – The ESA-listed marine mammals that could potentially be affected by the proposed action include several species of whales and the Florida manatee.

### Whales

The deeper water whale species (sei, fin, blue, and sperm) would not be expected to occur in waters as shallow as the project site and are generally not subject to vessel collisions although strikes have been document (see section 4.2). Noise from the dredging operation could propagate into deep waters, but given the intensity of shipping in the Proposed Action Area, whales would be expected to perceive dredging noise as part of the background noise associated with the Charleston area. Accordingly, the proposed project may affect but would not adversely affect sei, fin, blue, and sperm whales.

As the accounts in section 4.2 show, ship strikes have been documented on virtually all of the protected species of whales in U.S. waters, especially the relatively slow-moving baleen whales that could be found close to shore (humpback, right). The MCT EIS (USACE 2006) points out that no documented right whale ships strikes have occurred in South Carolina waters.

Nevertheless, the possibility of strikes by project vessels traveling between the ODMDS and the MCT site is a potential direct impact to right and humpback whales. However, the potential for vessel strikes and therefore direct impacts is low given the following: (1) the small number of vessels and their slow speed; (2) the infrequent occurrence of whales so close to shore (i.e., directly in the path or close vicinity of the vessel locations); (3) the speed of the whales relative to the dredging vessels when actively dredging; and (4) the conservation measures built into the proposed action as outlined in Section 6.0.

Any whales in the vicinity of the ODMDS may be adversely affected by the noise of the dredge and the project vessels. The project would not involve explosions or acoustic “pinging”; the noise sources would be confined to rotating cutter heads and medium-size marine diesel engines. These sources have not been shown to cause injury or death among marine mammals, but they could be loud enough to interfere with whale feeding and social interaction and to cause whales to avoid the project area (e.g., NMFS 2003, Talisman Energy 2005). However, given the portion of the proposed action area affected by the noise is small and the area is already the site of heavy vessel traffic, the potential effects of the noise emitted by these vessels is discountable.

The proposed action also has the potential for whales to be struck by dredging-related vessel traffic between the ODMDS and the MCT site. In addition, the speed restrictions outlined in Section 6.0 would be implemented, as per requirements from the Final Rule to Implement Speed Restrictions to Reduce the Threat of Ship Collisions with North Atlantic Right Whales (Federal Register Vol. 73 No. 198, 10 October 2008), in order to further reduce the potential for collisions with whales (see Section 6.0). The area is also already heavily used by a variety of vessels, including large ocean-going cargo ships entering and leaving the Port of Charleston, U.S. Navy vessels transiting the area offshore of the ODMDS, and commercial and recreational fishing vessels. The increment of project-related vessel traffic at the ODMDS and between the ODMDS and MCT would not constitute a major new threat to whales.

The potential for direct impacts to ESA-listed whale species and designated critical habitat, as noted above, is overall low especially given the mitigation and monitoring measures which are built into the proposed action. Therefore, the proposed action may affect but is not likely to adversely affect ESA-listed whale species nor adversely modify critical habitat.

### Manatees

According to the account in USACE (2006), manatees inhabit both salt and fresh water of sufficient depth (5 feet to usually less than 20 feet) throughout their range. Manatees may be encountered in shallow, slow-moving water bodies such as canals, rivers, estuarine habitats, and saltwater bays, although on occasion they have been observed as much as 3.7 miles off the Florida Gulf coast. Manatees require warm water, migrating to warmer waters whenever the temperature falls below 20° C. Manatees are known to visit the Charleston Harbor area in the summer months (April through November) as they migrate up and down the coast (USACE 2006). Given their migratory habits, manatees can be assumed to occur in nearshore ocean waters between Charleston Harbor and the ODMDS, although it is unlikely that they would be found at the ODMDS itself, given the site's distance from land. Via comments on the DEIS, FWS requested special precautions to protect the endangered manatee. USACE agreed to include those precautions on the Record of Decision and incorporate them into special conditions on the Department of the Army permits and formal consultation with the FWS was not required. These conditions will also be applied to the current proposed action (see section 6.0). Therefore, this proposed action may affect but is not likely to adversely affect the manatee.

**Fish --** According to the MCT EIS (USACE 2006), the Atlantic sturgeon inhabits fresh and brackish-water areas of the Charleston area, although the species is not found in the project area, being restricted to areas of the Cooper and Santee River systems several miles upstream of the MCT site. The NMFS concluded in its Section 7 consultation letter (Appendix A) that the effects of construction of the MCT, i.e., fill placement, on this species are discountable. Accordingly, as the collection and transportation of dredged materials under this proposed action will not occur in areas anticipated as higher sturgeon use, the proposed action will not affect the Atlantic sturgeon.

**Birds --** No bald eagles are known to nest near the MCT, although one bald eagle was seen at the Proposed Project site over Shipyard Creek, being harassed by an osprey pair. No bald eagle nests were observed during field surveys. Bald eagles are not present in or over the Charleston ODMDS. Given their uncommon or nonexistent occurrence at the ODMDS and from the ODMDS to the MCT, this proposed action will not affect the bald eagle.

### **5.2.2 Indirect Effects**

An indirect effect of this Proposed Action would include use of the dredged materials to allow for the construction of the MCT. Again, according to the MCT EIS (USACE 2006), construction and operation of the MCT would result in a loss of aquatic habitat, temporary water quality impacts (lowered dissolved oxygen concentrations and turbidity) in the Cooper River, the potential for vessel strikes on whales, manatees, and sea turtles (from increased vessel traffic once the MCT is complete and operating), and increased noise levels from pile driving and increased vessel activity.

The existence of the borrow pit once dredging is finished would not be expected to have an indirect effect on any of the sea turtles. However, indirect effects due to the disruption of potential prey base or resting areas could have a minor negative impact. Depending on the

recovery rate of the benthic food resource this impact could be short-term or long-term. However, sea turtles are highly mobile and would be able rapidly to exploit nearby undisturbed areas. It is apparent, moreover, that the frequent use of the ODMDS has altered the composition of the benthic biota (Section 3.2.1) to the extent that its long-term value as a turtle forage base is uncertain.

It also appears to be the case that disposal activities at the ODMDS have not significantly altered the nearby live bottoms (e.g., Crowe et al. 2006), which could represent a valuable foraging area for sea turtles. The dredging activity would resuspend some sediments at the ODMDS, although not on the scale of the disposal activities, but the evidence from recent monitoring studies indicates that any resuspended sediments would have no adverse effects on adjacent live bottoms, and therefore would have no impacts on sea turtle foraging resources.

According to the MCT EIS (USACE 2006), activities associated with the placement of the borrow material at the MCT site and construction of the other components of the marine terminal would not be likely to adversely affect any of the listed species at the MCT site (alligator, bald eagle) except the Florida manatee, which could be adversely affected by vessel activity, turbidity, and noise (see Appendix A). The EIS evaluated the magnitude of the impacts to the manatee and, in response to consultation with USFWS, proposed mitigation in the form of incorporating manatee avoidance measures into permits (USACE 2006, Section 6 and Appendix EE). The Record of Decision documented those mitigation measures.

During the Section 7 ESA consultation with NMFS for the construction and operation of the MCT, operation of the marine terminal was determined to potentially affect ESA-listed whale species, specifically the right and humpback, as a result of increased vessel traffic and the resultant increased risk of ship strikes. Consequently, the SCSPA and NMFS jointly developed a monitoring plan meant to reduce or eliminate the potential for impacts to whales or other ESA-listed species under NMFS jurisdiction (USACE 2006, Section 6 and Appendix R). Based on these mitigation and monitoring measures, NMFS ultimately determined, in its Section 7 consultation letter (Appendix A), that the MCT project's impacts on ESA-listed whales, sea turtles and shortnose sturgeon would be discountable or insignificant based on the mitigation and monitoring measures included in the proposed action for construction of the MCT. The Record of Decision documented those mitigation measures. Therefore, construction and operation of the MCT was found to potentially affect, but not likely to adversely affect, ESA-listed whale and sea turtle species and the short-nose sturgeon.

## **6 MITIGATION, MONITORING AND REPORTING MEASURES**

A number of mitigation, monitoring and reporting measures would be employed during dredging and transportation of dredged materials under this Proposed Action. Additional measures are in place for ESA-listed species for the construction and operation of the MCT (see USACE 2006, Appendix R). All of these measures are meant to reduce or eliminate the potential for impacts to ESA-listed species.

### Sea Turtle Measures

1. NMFS-approved sea turtle observers would visually monitor the dredge area repeatedly prior to the commencement of dredging and during the dredging for the presence of sea turtles.
2. Observers would monitor the hopper spoil, overflow, screening, and draghead for sea turtles and their remains. Inflow screening baskets (4-inch mesh) would be installed to monitor the intake and overflow of the dredge for sea turtle remains.
3. The applicant would conduct assessment/relocation trawling as a method to further reduce the potential for takes of sea turtles during the proposed dredging. Trawling would be conducted repeatedly in the action areas prior to the dredging to assess the presence of sea turtles in the areas so that any individuals that may be in the path of the trawler could be relocated.
4. When a hopper dredge is used, the dredge would be equipped with a rigid sea turtle deflector attached to the draghead. The dredge would be operated in such a manner as to reduce interactions with sea turtles (e.g., reduce RPMs when the draghead is not on the surface of the sediment). In-flow screening baskets (4-inch mesh) would be installed to monitor the intake and overflow of the dredge for sea turtles.
5. Sufficient time would be allocated between each dredging cycle for approved observers to inspect and thoroughly clean the baskets and screens for sea turtles and/or turtle parts and document findings. Between each dredging cycle, the approved observer would also examine and clean the dragheads and document findings.
6. A final report summarizing the results of the dredging and any takes of listed species would be submitted to NMFS and MMS within 30 working days of completion of the project.

### Right and Humpback Whale Measures

1. The first is NOAA's recently promulgated Final Rule to Implement Speed Restrictions to Reduce the Threat of Ship Collisions with North Atlantic Right Whales (Federal Register Vol. 73 No. 198, 10 October 2008). This rule amends the ESA to add §224.105, which establishes a 10-knot (over the ground) speed limit on all vessels over 65 feet in length operating within 20 nautical miles of the coastline in the Mid-Atlantic operational zone (between Brunswick, Georgia and Wilmington, North Carolina); the exact boundaries of the speed reduction zone are set forth in §224.105(a)(2). The dredges and support vessels conducting the proposed borrow operation would comply with the speed restriction, thereby reducing the likelihood of collisions with whales.
2. The Port of Charleston has committed to conduct whale surveys for a period of five years, which is much longer than the construction period. The surveys would be conducted daily throughout the right whale migration season (November – April) by trained whale observers linked by radio directly to the US Coast Guard and to vessels in the area. NMFS stated in its Section 7 consultation letter (see Appendix A) that this measure can reduce the risk to whales by 30 percent and pointed out that part of the benefit of this measure is that it would also reduce ship strikes by non-project vessel traffic.

### Manatee Measures

1. The SCSPA will instruct all personnel associated with the project construction and operation of the potential presence of the manatees and the need to avoid collisions with manatees.
2. All SCSPA personnel and contractors will be advised that there are civil and criminal penalties for harming, harassing, or killing manatees, which are protected under the Marine Mammal Protection Act of 1972 (MMPA) and the Endangered Species Act of 1973 (ESA). The contractor may be held responsible for any manatee harmed, harassed, or killed as a result of port activity.
3. Siltation barriers that may be utilized during the port's construction activities must be made of materials and placed in a manner such that manatees cannot become entangled. The barriers may not block manatee movements and are to be regularly monitored to avoid manatee entrapment.
4. All vessels associated with the project will operate at idle speed at all times while in shallow waters.
5. If manatees are sighted within 100 yards of the project, all appropriate precautions shall be implemented to ensure protection of the manatees. These precautions shall include operating all equipment in such a manner that moving equipment does not come any closer than 50 feet of any manatee.
6. Any collision with any manatee must be reported immediately to the SC Wildlife and Marine Resources Department, Heritage Trust Section, (803) 844-2473.
7. The SCSPA will maintain a log detailing manatee sightings, collisions, or injuries should they occur during operations. Following project completion a report summarizing incidents and sightings must be submitted to Ms. Melissa Bimbi, US Fish and Wildlife Service, 176 Croghan Spur Road, Ste 200, Charleston, SC 29407.
8. Failure to suspend explosive use may result in a violation of the MMPA and ESA.

## **7 CONCLUSIONS**

The proposed action would have no effect on the following Federally-listed species identified to potentially inhabit or transit the study area: bald eagle, shortnose sturgeon, American alligator, and the blue, fin, sei and sperm whales.

Other Federally-listed species potentially occurring in the study area which may be affected by the proposed action include sea turtles, manatees, humpback whales, and right whales. Given the direct and indirect effects to manatees, right whales and humpback whales discussed within this BA (i.e., vessel strikes, acoustics harassment) and the conservation measures built contained within Section 6.0 to minimize or eliminate the potential for take, the proposed action may affect but is not likely to adversely effect manatees, right whales and humpback whales.

Dredging activities at the ODMDS would take place in an area in which several species of sea turtles (loggerhead, Kemp's Ridley, green, leatherback) are likely to occur, and would probably involve equipment that is known to take sea turtles (i.e., hopper dredges). Although Section 6.0

outlines standard measures meant to minimize or eliminate effects, the potential for the taking of sea turtles still exists. Therefore, the proposed action may adversely affect sea turtles.

No impacts to designated Critical Habitat would occur.

## 8 PREPARERS

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**ESSENTIAL FISH HABITAT  
ASSESSMENT  
CHARLESTON ODMDS SAND BORROW  
PROJECT**

Prepared for the

Minerals Management Service  
Environmental Assessment Branch  
381 Elden Street, MS 4042  
Herndon, VA

By

Moffatt & Nichol Engineers

December, 2008

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# 1 INTRODUCTION

## 1.1 *Background*

The Minerals Management Service (MMS) is considering an application submitted by the South Carolina State Ports Authority (SCSPA) for the use of Outer Continental Shelf (OCS) resources (sand) from the Charleston Ocean Dredged Material Disposal Site (ODMDS). The purpose of this assessment is to identify and evaluate the potential effects of the Charleston ODMDS Sand Borrow Project on any of the managed species and on essential fish habitat in the general project area. In addition, the information in this document is provided in order to comply with statutory requirements to use the best scientific and commercial information available when assessing the risks posed to managed species and their habitats by proposed federal actions. This document is prepared in accordance with legal requirements set forth under regulations implementing the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act; 50 CFR Sections 600.805 - 600.930; 16 USC 1855).

## 1.2 *Federal Consultation History*

Federal consultation on the proposed action has addressed both the sand borrow activity and the ultimate use of the sand for the construction of a marine terminal in Charleston Harbor. For the sand borrow activity the preparers of this document contacted Dr. Kay Davis at the National Marine Fisheries Service (NMFS) office in Charleston, SC in February and March, 2008, to obtain guidance on Essential Fish Habitat analyses and to request review of an early draft of this document. No other federal agency consultation has occurred on the sand borrow activity.

Construction of the marine container terminal was considered in an Environmental Impact Statement (EIS) prepared by the US Army Corps of Engineers (USACE). In the course of that process, the USACE consulted with both the US Fish and Wildlife Service (FWS) and the NMFS pursuant to Section 7 of the Endangered Species Act. On April 5, 2006, the USACE requested a Section 7 consultation with NMFS. The USACE and NMFS engaged in a series of meetings and discussions, and on September 14, 2006, the USACE submitted an addendum to the project description that included mitigation measures to avoid or reduce take of listed species. On October 3, 2006, NMFS issued a letter concluding that the effects of construction of the marine container terminal on all of the listed species in the project area were discountable or insignificant.

The relevant NEPA documents for the proposed action include the Final EIS for the marine container terminal project (USACE 2006), and the Regional Biological Opinion issued by the NMFS (NMFS 1997) covering the effects of hopper dredging on sea turtles along the South Atlantic coast of the United States.

## 2 DESCRIPTION OF THE PROPOSED ACTION

### 2.1 Proposed Action

#### 2.1.1 Overview

The proposed federal action is the issuance of a negotiated agreement between MMS and the SCSPA to allow the latter agency to obtain sandy dredged material from the Charleston ODMDS, located on the OCS approximately nine miles (14 km) offshore of the entrance to Charleston Harbor, and use it for the construction of a marine container terminal (MCT) in the Port of Charleston (Figure 1). The OCS sand resources would be removed by dredging and transported to the MCT site.

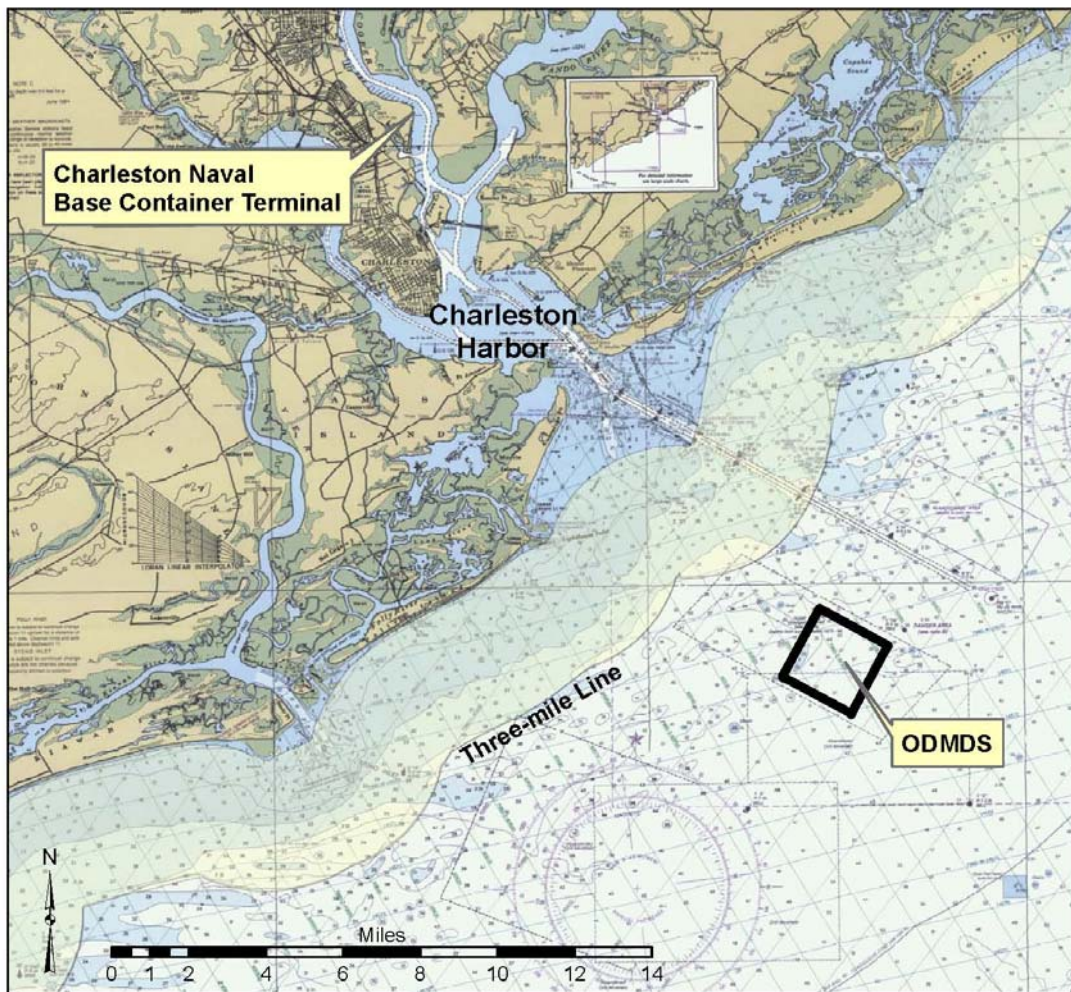


Figure 1. Action Area for the Charleston ODMDS Sand Borrow Project

The SCSPA has received federal and state approvals to develop a 287-acre marine container terminal on the Cooper River (Figure 2). That project includes the filling of approximately 65 acres of tidelands to create land for wharf and container handling facilities, and dredging out structurally unsuitable material to deepen the berth and provide a firm footing for the new wharf

## Appendix D

and backland. No federal funds will be used in this project. The environmental impacts of the marine terminal project have been examined in an EIS prepared by the U.S. Army Corps of Engineers (MCT EIS, USACE 2006), which issued a ROD on April 26, 2007. The impacts examined included those resulting from the placement of fill material in the tidelands area of the project. The EIS also includes measures required to mitigate any impacts from the placement of fill material found to be significant. This environmental assessment considers the potential consequences of using OCS sand resources from the offshore borrow area and transporting those materials to the project site.

Most of the dredge material at the MCT site is unsuitable for reuse as fill material and will be disposed of at an existing disposal site located on Daniel Island in Charleston Harbor. Accordingly, fill to create the new land must be imported from outside the project area. Some fill sources have been identified, but a deficit of up to 6 million cubic yards remains.



Figure 2. The Charleston Marine Container Terminal at completion (artist's rendering).

The SCSPA anticipates the required additional fill material will come from both upland and marine sources. However, because the USACE permit limits the number of trucks that can access the site, the majority of material will need to be delivered via the Cooper River. SCSPA has investigated possible marine sources of material and concluded that the Charleston ODMDS (Figure 1) is a promising candidate. Available data indicate that approximately 3 to 6 million cubic yards of material deposited in the past at the ODMDS (of the total of approximately 40 million cubic yards that have been deposited in the past 20 years) meet the fill material requirements (fines content less than 35%) and are available for this use. Furthermore, use of the ODMDS material would represent a beneficial re-use of a resource. It is important to note that

the marine terminal can be built without the ODMDS material, but at a greater cost and with different environmental impacts.

### 2.1.2 Potential Dredging Methods

There are two basic methods of dredging: mechanical dredging and hydraulic dredging. The methods vary by the process used to loosen material from its *in-situ* state and transport it from the seafloor to the water surface/transport vessel. Offshore dredging of sand is performed almost exclusively by hydraulic dredging due to the limitations of operating mechanical dredges in an ocean wave environment, and for this project no mechanical dredging is proposed. Accordingly, this discussion is limited to the two main types of hydraulic dredges, the cutter-suction dredge and the hopper dredge. In hydraulic dredging, material is loosened from its *in-situ* state and lifted in suspension through a pipe system driven by a centrifugal pump.

**Cutter-Suction (Pipeline) Dredge** -- A cutter-suction dredge uses a rotating cutting apparatus around the intake of a suction pipe, called a cutterhead, to break up or loosen bottom material (Figures 3 and 4). A large centrifugal pump removes the loosened material from the ocean bottom and pumps it as a sediment-water slurry through a discharge pipeline. Cutter-suction dredges are generally characterized according to the size of the discharge pipe, which ranges from 6" to 30", and resemble a large barge or a small ocean-going vessel (e.g., Figure 3). Smaller dredges are used for smaller, shallower, dredging projects. Larger projects, and particularly offshore projects, require larger cutter-suction dredges that are certified for offshore operation. A cutter-suction dredge with a 30" discharge pipe would be approximately 280 feet (90 m) long, draw approximately 9 feet (2.9 m) of water, and have a total of approximately 16,000 horsepower installed (engine, auxiliaries, and pump motors).

Typically, cutter-suction dredges pump material in a slurry directly to the placement site, but in cases where the distance from the dredge location to the placement site is beyond a few miles, the slurry is often pumped into barges for transport to the placement site (Figures 5 and 6). When the barge arrives at the placement site, the material can be mechanically or hydraulically unloaded. A hydraulic unloader re-slurries the material for pumping out of the barge to the placement site. The dredge is supported by one or more small work boats used for surveying, line handling, anchor placement, and transporting workers. In the case of a barge-based project, operation would include one or two tugboats and one or two barges.

**Hopper Dredge** -- Hopper dredges look much like conventional ships and are equipped with either single or twin trailing suction pipes (or "drag arms"; Figure 8). At the end of each drag arm are dragheads, which house the inlet to the pumping system and typically have teeth and high-pressure jets to loosen the material being dredged. The dragheads are typically fitted with turtle deflectors (Figure 8). Hopper dredges currently in use in the U.S. vary in capacity from approximately 2,000 cubic yards to 12,000 cubic yards, with typical dredges being in the range of 4,000 to 6,500 cubic yards. The actual amount of material that a loaded hopper carries could be less than its rated capacity if the material is particularly dense, which would cause the vessel's weight limit to be reached before the volume capacity (with sand, for example, a hopper might carry only 50 – 70% of its volume capacity). A smaller hopper dredge would be approximately 280 feet (90 m) long, draw up to 16 feet (5 m) of water fully loaded, and have approximately 9,000 horsepower installed, while the largest hopper dredges are approximately 390 feet (125 m) long, draw up to 28 feet (9 m) of water, and have approximately 14,000 horsepower installed.



Figure 3. Cutter-Suction Hydraulic Dredge (source: Oilfield Publications Limited, n.d.)



Figure 4. Close-up of a Cutterhead



Figure 5. Cutter-Suction Dredge Loading Barges



Figure 6. Close-up of Barge Loading Process (the vessels at the top of Figure 5)

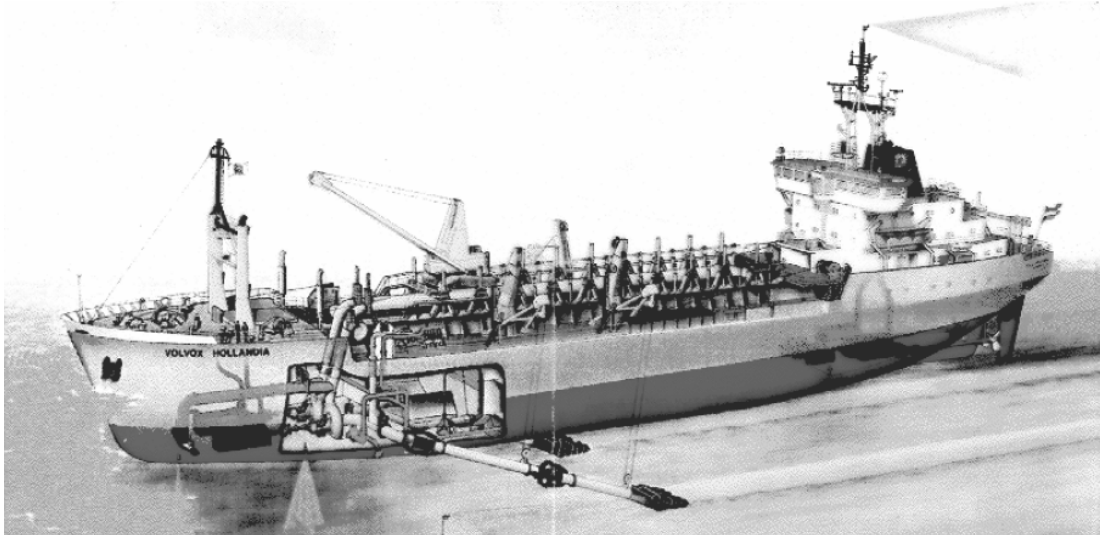


Figure 7. Twin-Arm Hopper Dredge in Cut-Away View

A hopper dredge operates much like a floating vacuum cleaner in that the dredge operates while underway (typically 1 to 3 knots) and material is lifted through the trailing suction pipes by one or more pumps. The slurry is discharged into a large hold (the hopper) in the center of the ship. The hopper is equipped with one or more adjustable overflow standpipes (Figure 9) that allow the transport water to be skimmed off and discharged beneath the vessel as the solids from the slurry settle in the hopper. Once the hopper is full, the drag arms are raised and stored on deck and the vessel sails to the discharge location where the material is either re-slurried and pumped ashore through a pump-off station, mechanically transferred ashore, or dumped through the bottom of vessel via doors or split-hull openings.



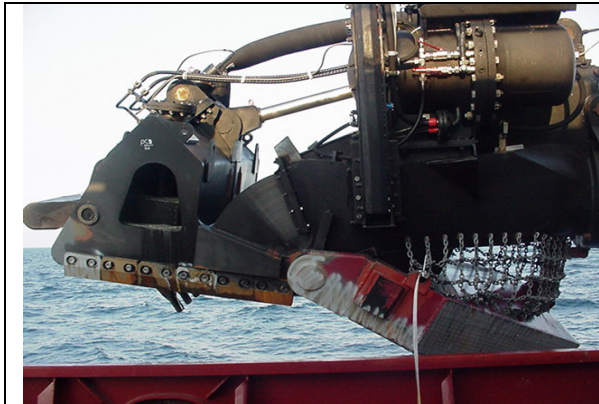


Figure 8. Close-up of a Draghead with a Turtle Deflector Mounted

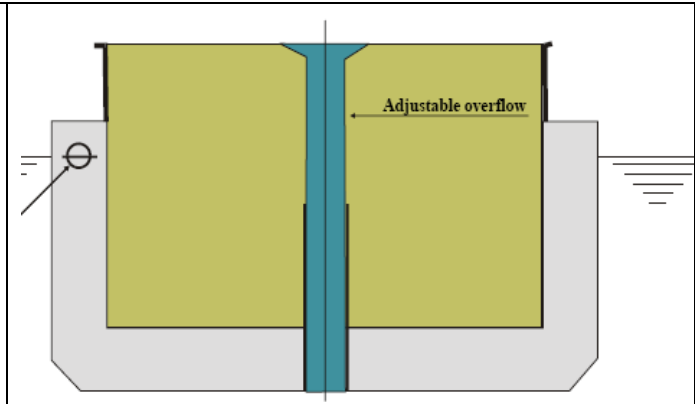


Figure 9. Schematic Cross-section of a Hopper Dredge Showing Overflow Standpipe

This type of dredge is often used for rougher, open waters where other dredge types, which are fixed to the seabed, cannot operate as safely and effectively. This type of dredge is not easily maneuvered, unsuitable for use in shallow water, and not effective on hard materials such as stiff clays. A hopper dredge can move quickly to a placement area under its own power, but the operation loses efficiency as the transport distance increases, since dredging does not take place while the hopper is in transit.

### 2.1.3 ODMDS Dredging

Given the distance from the ODMDS to the MCT and the impracticality of a direct pipeline dredging operation, the dredged material is expected to be delivered to the MCT site via either a cutter-suction dredge loading scows or, more probably, by one or two hopper dredges. The dredge footprint would be confined to the southern half of the ODMDS and its edges would be no less than 100 feet (30 m) from the confining berms (Figure 10), in order to avoid impacts on nearby live-bottom areas (see Section 3.2.1).

**Project Schedule** -- The project schedule anticipates dredging and transportation of up to 6 million cubic yards of sediment. Operations would proceed 24 hours a day except for interruptions caused by routine service and equipment failure. The dredging would start in early November, using a hopper dredge, and would proceed until mid-April, in accordance with the biological window currently specified in USACE dredging permits (the same window would be specified in the MMS lease). If, at the close of the biological window, the required amount of material had not been removed, dredging would continue using a cutter-suction dredge, which would not be subject to the biological window. This sequence of dredging would continue until the required amount of material (up to 6 million cubic yards) had been removed. Once dredging is started, the removal of 6 million cubic yards of sediment would require up to 575 dredging days. It is expected the dredging would occur over two or three consecutive hopper dredge biological windows with dredging continuing between each of these windows by cutter suction dredge only to the extent necessary to obtain the required material.

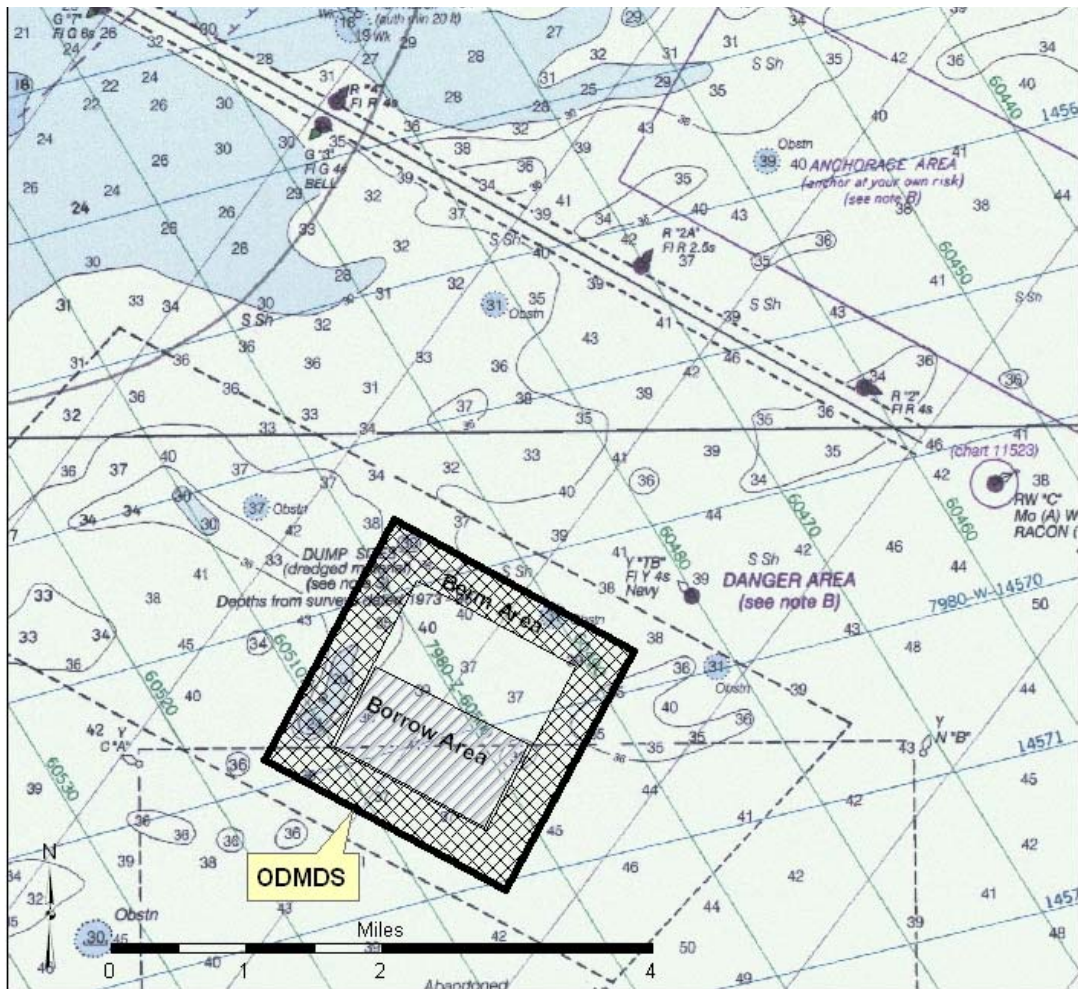


Figure 10. Anticipated dredging area within the Charleston ODMDS

**Cutter-Suction Dredge Operation** -- A cutter-suction dredge would be anchored in a fixed position at the ODMDS by a three-wire anchoring arrangement; the position would be changed from time to time as the dredge finished removing all the material it could reach from each position. The dredge would dig material from the bottom by swinging the cutterhead back and forth across an arc of 150 to 300 feet. Winches on the forward end of the dredge would pull the cutterhead back and forth and advance it ahead in the cut in 4- to 6-foot steps. Dredged material would be pumped a short distance to a barge with loading arms that would deliver the slurry into scows of 3,000 to 7,000-cubic-yard capacity (Figures 5 and 6). The scows would have standpipes that would allow supernatant water to be released during the loading operation.

The project schedule would require that 4 to 6 scows, hauled by three or four ocean-going tugs, deliver 4 to 8 loads to the MCT site per day, for a total of between 1,000 and 2,500 scow loads, depending on final volumes and scow size.

**Hopper Dredge Operation** -- A hopper dredge would dig material from the bottom by making passes over the site, typically moving at 1 to 2 knots. In the case of a twin-arm dredge, the material is dug in two swaths that are each the width of the draghead (typically 6-8 ft wide). To

get a full load, a typical hopper dredge would make two passes across the ODMDS. Each pass would be 3,000 to 4,000 ft long and the average cut depth would be approximately one foot. The project schedule would require either two medium-size hopper dredges (4,000-5,000 cubic yards capacity) delivering a total of six loads per day (three each), or one large hopper dredge (9,000 to 12,000 cys) delivering two or three loads per day. The total number of loads taken from the site is expected to be between 500 and 2,000, depending on the amount of fill actually required and the size of the dredge(s).

**Borrow Pit** -- The dredging operation would leave a borrow pit at the ODMDS. The area to be made available to be dredged within the ODMDS is expected to be up to 7,000 ft by 7,000 ft, an area of approximately 960 acres (380 ha.). Removal of 6 million cubic yards would require an average cut depth of approximately 3.5 ft. (1.2 m). In localized areas cut depths could be shallower or deeper (up to 15 feet) to maximize the collection of the best fill materials, but in no case would natural bottom material be removed. The borrow pit would not be as large as 960 acres if less than 6 million cubic yards were removed.

#### **2.1.4 MCT Site Material Placement**

At the MCT site, the material dredged from the ODMDS would be placed in engineered layers (termed “lifts”). The material would be retained in place by steel sheet pile walls and rock berms that would form the new shoreline of the Cooper River at the terminal site. Whether the material is delivered by scows from a cutter-suction dredge operation or directly by hopper dredge, a barge- or shore-mounted unloading system would transfer the material from the scows or hopper to the fill site (Figure 11); supernatant water would be managed on-site through a system of settling ponds and weirs before being discharged to the river.



Figure 11. Dredge Material Scow Being Unloaded at a Fill Site

## **2.2 Action Area**

The action area for this project would include the Charleston ODMDS, the ocean waters between the ODMDS and Charleston Harbor, and the Cooper River up to the Marine Terminal Site (the latter two areas are included because they would be traversed by barges or hoppers carrying dredged material; Figure 1). For the purposes of this analysis, the ocean waters between the ODMDS and Charleston Harbor are considered along with the ODMDS, and the Charleston Harbor-Cooper River area is considered part of the Marine Terminal Site because it was described in the MCT EIS (USACE, 2006).

### **2.2.1 Charleston Ocean Dredge Material Disposal Site**

The material to be removed is located entirely inside the Charleston ODMDS (Figure 1, Figure 10), which is a square encompassing approximately 4 square miles (10 square km) located approximately nine miles (14 km) southeast of the entrance to Charleston Harbor, South Carolina, in approximately 40 feet (13 m) of water. The coordinates of the Charleston ODMDS's corners are:

32.65663° N, 79.75716° W  
32.64257° N, 79.72733° W  
32.61733° N, 79.74381° W  
32.63142° N, 79.77367° W.

The Charleston ODMDS is managed by the U.S. Army Corps of Engineers, Charleston District, the U.S. Environmental Protection Agency, Region 4, the South Carolina Dept. of Natural Resources, the U.S. Fish & Wildlife Service, and the South Carolina State Ports Authority in accordance with a Site Management and Monitoring Plan (SMMP) developed by the those agencies (USACE et al. 2005). The management plan specifies the quality of the material that can be disposed of at the site and the controls that must be imposed on disposal operations to ensure proper disposal and to minimize potential environmental impacts.

According to USACE et al (2005), the Charleston ODMDS is one of the most active, frequently used sites in the South Atlantic Bight, and the general site has been in use since 1896 for disposal activities. It has changed size and configuration at least twice in the past, most recently in response to the discovery, in 1987, of live bottom areas in the western half of a larger site (dashed black line in Figure 1 outside the ODMDS designated by solid lines; “live bottom” is low-relief hard substratum, typically colonized by soft corals, sponges, and other attached organisms to form a flat reef, see section 3.2.1); the current site delineated by the boundaries described above represents about half the site's former extent and was designated in 1993. The current disposal site is divided into four mile-square cells. Those cells are surrounded by two boundary zones, designated inner and outer, each having two one-square-mile cells on each of its four sides, which have been established to facilitate long-term monitoring.

Since 1987, approximately 40 million cubic yards of dredged material from USACE maintenance activities and SCSPA harbor deepening projects have been disposed of at the Charleston ODMDS. The estimated projected use of the ODMDS to 2010 would add approximately 1,100,000 cubic yards (USACE pers. comm. 2008). The SMMP states (pp 5-6) that there are currently no restrictions on the timing of disposal (i.e., there are no seasonal

“windows” due to biological issues) or on the amounts of material that can be disposed of. Although the site is principally delineated by geographical coordinates, there are two physical boundaries consisting of dikes on the northwestern and southwestern boundaries formed by coarse marl laid down in the early 1990s expressly to confine the deposited dredge material (Zimmerman, Jutte, and VanDolah 2002).

Although the SMMP has not established the capacity of the Charleston ODMDS to receive dredged material, the USACE has stated that removal of material would extend the life of the site to accommodate upcoming maintenance and project dredging by the USACE and the SCSPA, representing a beneficial re-use of the material.

The ODMDS is in the general area of several sensitive resources, most notably the Cape Romain National Wildlife Refuge, approximately 30 miles north-northeast. Other sensitive resources include coastal shrimp and finfisheries, and live bottom, which are considered below.

### **2.2.2 Marine Container Terminal Site**

The material removed from the ODMDS would be re-used as fill to construct the approved Marine Container Terminal at the Charleston Naval Complex in Charleston County, South Carolina (Figure 2). The MCT, when finished, would consist of a 267-acre terminal with a 3500-ft wharf fronting the tidal Cooper River in North Charleston. The terminal site is a portion of the Charleston Naval Complex that was turned over to the SCSPA, and, according to the MCT EIS (USACE, 2006) consists of tidal wetlands, submerged lands, and uplands formerly lightly used by the U.S. Navy. The site is approximately 8 miles up the Cooper River from the entrance to Charleston Harbor.

## **3 AFFECTED ENVIRONMENT**

### **3.1 Physical Environment**

#### **3.1.1 Geology and Oceanography**

**ODMDS Site** -- The most recent study of the ODMDS and its environs was carried out in 2000 by Zimmerman, Jutte, and VanDolah (2002). That study characterized the sediments at the site and reported that the majority of sediments were medium to fine-grained sands (mean = 78.0% sand content) mixed with moderate amounts of shell hash. The siltiest sediments were concentrated within the disposal zone itself and in the northwestern outer boundary area (i.e., the boundary area closest to the track of barges bringing material from Charleston Harbor to the disposal site). Zimmerman, Jutte, and VanDolah's (2002) observation that over time silts and clays are transported out of the site by currents suggests that the proportion of silt and clay at the disposal site may be lower now than in 2000. Several hard-bottom areas that support reef communities are located in and just outside the boundary zones, generally to the west and south of the ODMDS (Crowe et al. 2006).

Sediment contaminant levels were low within the disposal zone and surrounding areas. Trace metal, PAH, PCB, and pesticide concentrations were all below published bioeffects guidelines. Contaminant concentrations above the detection limit were found in several of the monitoring and disposal cells, but highest levels were consistently found in disposal zone sediments. This suggests that contaminated sediments were largely limited to the disposal zone and comprised a small proportion of the deposited material.

The current regime of the ODMDS was characterized by Voulgaris (2002), who found that wind-driven circulation dominates over tidal circulation and that the primary wind-driven current directions are northeast, in response to onshore winds, and southwest, in response to offshore winds. The local winds dominate sediment transport: strong winds generate waves that suspend fine sediment and steer that sediment across the seabed, and also drive wind-driven currents that transport the resuspended sediment along the direction of the mean current. Earlier studies, summarized by Zimmerman, Jutte, and VanDolah (2002), found generally similar patterns, although little, if any, southerly water movement was measured. Despite the generally northerly current regime, site monitoring suggests that fine sediments deposited at the ODMDS may be migrating generally westward (Zimmerman, Jutte, and VanDolah 2002).

In a five-year monitoring study of hard-bottom habitats near the ODMDS conducted during and after the Charleston Harbor channel deepening project, Crowe et al. (2006) found that silts and clays are a minor component of sediments. They stated that, “migration of disposal area sediments has not been a major problem to date” and, “it was clear that at the reef monitoring sites, most of the sediment settling from the water column was either resuspended or winnowed away and did not readily accumulate at the sites.”

**Marine Terminal Site** – The geology and oceanography of the fill site are described in the MCT EIS (USACE, 2006). The land is flat and low-lying, with elevations ranging from sea level to +21 ft (6.5 m) MSL. The land consists of alluvium from the Cooper River, which borders the peninsula on which the site is located (Figure 1).

The site’s oceanography consists essentially of tidal action in the Cooper River, which empties into Charleston Harbor, and in Charleston Harbor itself. Tidal currents are superimposed on a generally sluggish river flow. Neither the Cooper River nor Charleston Harbor are included in any 303(d) listing of impaired water bodies, although both are included in a recently established TMDL for dissolved oxygen (SCDHEC 2002). Fish consumption advisories are issued annually for mercury in portions of the Cooper River upstream of the MCT site, but not for the lower tidal reaches or Charleston Harbor (USACE 2006).

### 3.1.2 Climate and Air Quality

The borrow and fill sites are very similar with respect to climate; the following description is adapted from the MCT EIS (USACE 2006). Climate within the affected region is subtropical, with long, hot summers, relatively mild winters of short duration, and plentiful precipitation (as rain; snow is unusual). According to the National Weather Service, average annual rainfall at the Charleston monitoring station is 50.33 inches. Local thunderstorms and tropical storm systems result in the greatest monthly rainfall averages occurring during the summer months. January is the coldest month (average high of 59.1°F, average low of 39.2°F) and July is the warmest month (average high of 89.7°F, average low of 73.1°F). Temperatures at the ODMDS would be similar, but generally cooler in the summer and warmer in the winter due to the moderating influence of the ocean.

The affected area is prone to hurricanes, which bring strong, damaging winds, torrential rains, and tidal storm surges that flood low-lying areas. During the period 1900-2000, 16 hurricanes, four of them major, directly hit the state of South Carolina, for a recurrence interval of approximately 6.25 years. Three of the major hurricanes occurred in September, one during October. Tornadoes do occur, but are rare in coastal areas. However, waterspouts generated by thunderstorms are common over coastal waters.

The affected area is currently in compliance with all air quality standards as prescribed by the Clean Air Act and amendments. Overall, air quality within the Tri-County region that includes Charleston and the Cape Romain NWR is good: air quality monitoring data for the period 2002 through 2004 show that concentrations of SO<sub>2</sub>, PM<sub>10</sub>, CO, NO<sub>2</sub>, lead, and TSP were far below federal or state standards; PM<sub>2.5</sub> and ozone concentrations approached but never exceeded the standards (USACE 2006, Table 4.11-2).

### **3.2 Biological Environment**

The following material in sections 3.2.1 and 3.2.2 describes the general biological setting of the Action Area; managed species and Essential Fish Habitat are described specifically in Section 3.3. More detailed information on biological resources at the MCT site is presented in the MCT EIS (USACE 2006).

#### **3.2.1 ODMDS**

Habitats at the proposed borrow site landward to Charleston Harbor consist of open-ocean water column and bottom sediments; the latter include both hard-bottom and soft-bottom areas outside the ODMDS and coarse marls, sand, and silty sands deposited inside the ODMDS by dredging projects.

**Plankton** -- The water column supports zooplankton and phytoplankton assemblages that serve as food for juvenile fish and commercially important invertebrates. The plankton community passes through the ODMDS area as it is carried along the coast and across the continental shelf by ocean currents, and is thus not dependent upon the site for habitat.

**Benthos** – The bottom sediments support benthic organisms. The benthic assemblages of the coastal ocean off South Carolina are typical of the subtropical continental shelf. The 2000 monitoring study of the disposal and boundary sites (Zimmerman, Jutte, and VanDolah 2002) collected 402 taxa with a site-wide mean density of 3,939 individuals per m<sup>2</sup>. Polychaetes were the most abundant taxonomic group, comprising 56% of all organisms identified in samples collected during 2000. The category 'other taxa' (e.g. Nemertina, *Branchiostoma* sp., Polygordiidae) made up 21% of the total abundance, and amphipods and molluscs comprised 13% and 10% of the total abundance, respectively.

The monitoring cells affected by disposal activities had benthic assemblages somewhat different than those of the non-impacted cells. A statistical comparison showed that while seven of the eleven numerically dominant taxa were common to both non-impacted and impacted cells, the impacted cells had fewer *P. cristata* and Polygordiidae and more *P. dayi* and Nemertina than the non-impacted cells. Furthermore, *Branchiostoma* sp. and *Eudevenopus honduranus* were among the top eleven taxa for the non-impacted cells but not for the impacted cells. Both of these taxa, accordingly to Zimmerman, Jutte, and VanDolah (2002), are not characteristic of muddy sediments. *Magelona* sp. and *Protohaustorius deichmannae*, both associated with muddy sediments, were among the dominants in the impacted cells but not in the non-impacted cells. These changes indicate that the disposal of fine-grained material has changed the composition of the benthic infaunal community.

**Live Bottom** -- Survey data compiled by SEAMAP (2001) show live-bottom habitat offshore and south of the ODMDS and potential hard-bottom areas over wide areas inshore and west of the ODMDS site. The live bottom that prompted reconfiguration of the ODMDS site (see

section 2.2.1 and Figure 1) is evident in Figure 12, just outside the western boundary of the site, and there appear to be two areas of hard bottom inside the ODMDS. Hard-bottom areas near the ODMDS support low-profile reefs characterized primarily by soft corals (e.g., *Leptogorgia virgulata*, and *Titanideum* sp.), the massive sponge *Ircinia* sp., and various encrusting sponges. These areas are typically rocky outcroppings that support the growth of attached and excrusting invertebrates (as opposed to the burrowing and epibenthic organisms characteristic of soft bottoms), and are considered valuable fish habitat. The NMFS (NMFS HAPC website) has designated extensive areas of the continental shelf off South Carolina as live-bottom EFH, including much of the area west and south of the ODMDS. The NMFS designation of EFH coincides exactly with the areas of known hard-bottom shown in the SEAMAP (2001) data (Figure 12).

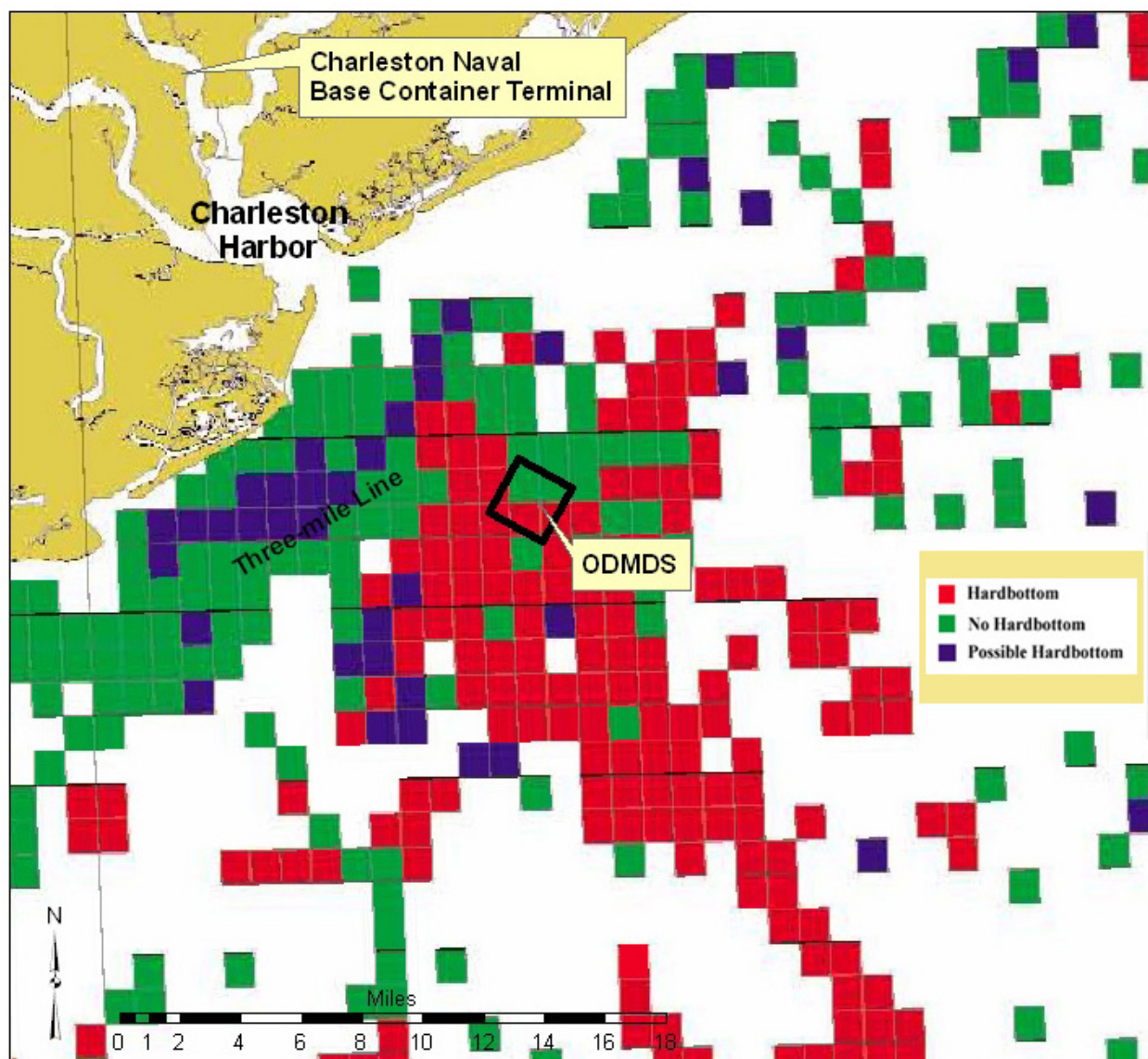


Figure 12. Live-Bottom Habitat in the Action Area (Source: SEAMAP-SA 2001).



Live bottoms in the South Atlantic area represent Essential Fish Habitat for the snapper-grouper complex and spiny lobsters (see section 3.3). Crowe et al.'s (2006) five-year video survey of reefs near the ODMDS found a variety of finfish, notably black sea bass, scup, porgies, wrasses, and grunts (all members of the snapper-grouper complex). They found no difference in abundance or diversity between control reefs (C1 and C2 in Figure 13) and reefs near the ODMDS, and stated that, "The abundance of finfish individuals or species observed at study sites and reference areas does not appear to be affected by disposal activities during the five year survey period." They also examined the encrusting fauna that characterizes these reefs and found that while there were some differences among sites, those differences "do not appear to be related to movement of disposal material."

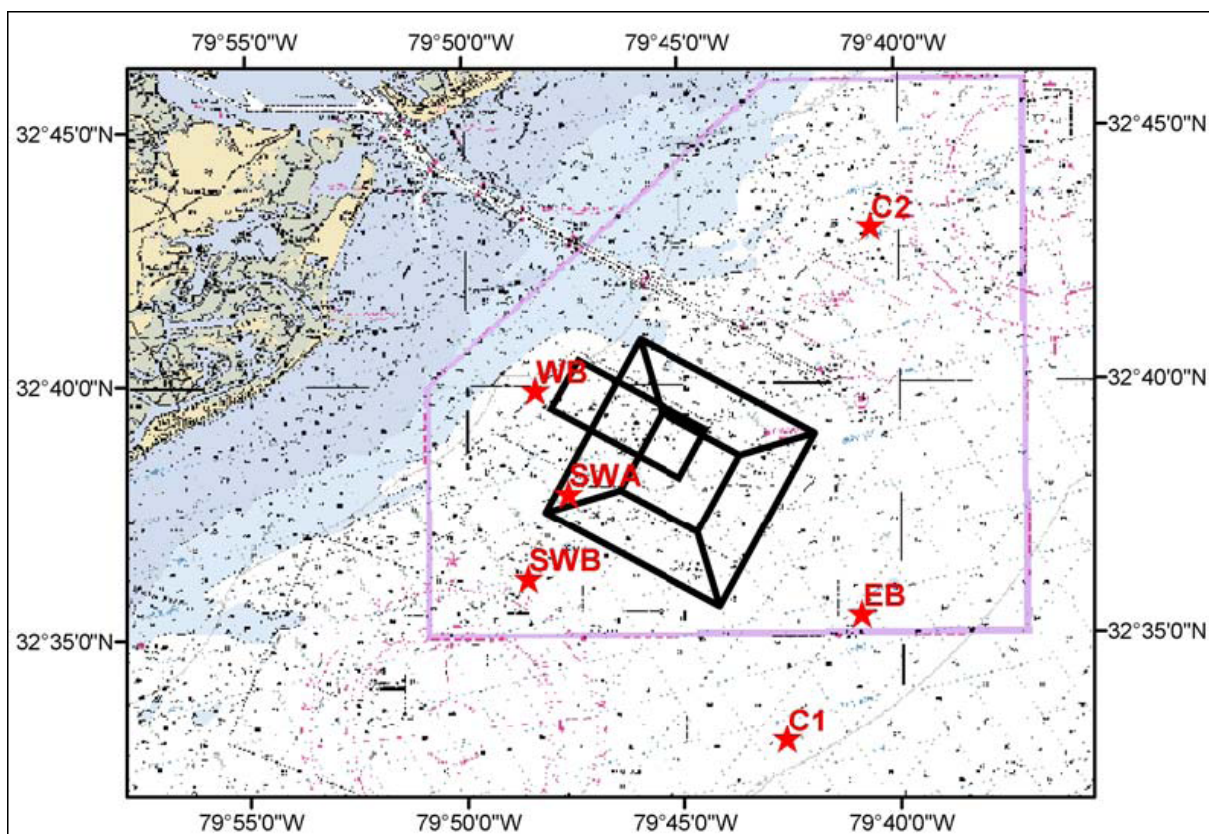


Figure 13. Location of reef sites (designated SWA, SWB, EB, and WB [the potentially affected reefs], and C1 and C2 [the control reef]s) in and near the ODMDS (the polygons delineated in black) surveyed by Crowe et al. (2006); other areas of hard bottom occur south and east of the ODMDS as shown in Figure 12.

**Fish** – The fish assemblage of South Carolina's open coastal waters, including the region of the ODMDS, includes a wide variety of fish types, including nearshore demersals, coastal pelagics, and open-ocean pelagics that migrate through the study area. Abundant demersal species include drums and croakers (e.g., *Cynoscion regalis*, *Leiostomus xanthurus*, *Micropogonias undulatus*, *Pogonias cromis*, *Sciaenops ocellatus*, *Stellifer lanceolatus*), seabasses (*Centropristis* spp.),

grunts (Haemulidae), several species of flounders (*Paralichtys* spp.), groupers (e.g., *Epinephelus* spp.), small forage fish such as searobin (*Prionotus carolinus*), lizardfish (*Synodus foetens*), and toadfish (*Opsanus tau*), and skates and rays (e.g., *Raja eglanteri*, *Dasyatis americana*).

Pelagic fish include small forage fish such as Atlantic menhaden (*Brevoortia tyrannus*), shad (*Alosa* spp.), anchovies and sardines, and mullet (*Mugil cephalus*), as well as larger, predatory species such as silver perch (*Bairdiella chrysoura*), barracuda (*Sphyraena barracuda*), mackerel species (*Scomberomorus maculatus*, *S. cavalla*, *Acanthocybium solanderi*), bluefish (*Pomatomus saltatrix*), and various sharks (e.g., *Carcharhinus limbatus*, *Isurus oxyrinchus*, *Squalus acanthias*). Open-ocean species that are encountered in shelf waters include several members of the tuna family (e.g., *Thunnus* spp., *Euthunnus* spp.), occasional billfish such as marlins and swordfish, and dolphins (e.g., *Coryphaena hippurus*).

A study of Charleston Harbor by Van Dolah et al. (1990) found Atlantic menhaden (*Brevoortia tyrannus*), bay anchovy (*Anchoa mitchilli*), silver perch, weakfish (*C. regalis*), spot (*Leiostomus xanthurus*), Atlantic croaker (*Micropogon undulatus*), and star drum (*Stellifer lanceolatus*) in large numbers. Summer flounder (*Paralichtys dentatus*) and southern flounder (*P. lethostigma*), two important recreational species, were caught in low numbers throughout the year. Sharks, skates and rays can all potentially be found in Charleston Harbor, and Schwartz (2003) reported that six species of sharks, including several federally managed species, can produce young in South Carolina waters during the summer.

### 3.2.2 Marine Terminal Site

According to the MCT EIS (USACE, 2006), the site of the proposed marine terminal is characterized by a mixture of upland vegetation, including coastal scrub forest, revegetated dredged material, and landscaping, pockets of freshwater marsh, and tidal wetlands. The upland forests are secondary growth, having colonized previously disturbed military lands in the past few decades, and most of the other upland areas were disturbed by decades of military and industrial use. The freshwater wetland habitats are pockets of forested and unforested wetlands less than an acre in extent, mostly on the fringes of the tidal wetland areas. The tidal wetlands range from emergent, cordgrass low marsh to shrub-dominated high marsh. The open-water subtidal area adjacent to the terminal site does not support aquatic vegetation other than phytoplankton and sparse macroalgae.

The aquatic communities of the marine terminal site are described in detail by SCDHEC (2000), and summarized in the MCT EIS (USACE 2006). Habitats include open-water estuary in the Cooper River; intertidal oyster beds, shell banks, and mudflats; and the subtidal benthic habitat. The open waters of the Cooper River support a number of important fish species and are used by a few species of aquatic mammals, notably river otter and bottle-nosed dolphins. The intertidal habitat supports scattered beds of oysters, none of them commercially valuable or characterized as an oyster reef for EFH purposes; and benthic invertebrates typical of mudflats (polychaete worms, mussels and burrowing bivalves, and small crabs, amphipods, and other crustaceans). The subtidal benthic habitat of the Cooper River supports abundant white and brown shrimp and blue crabs, which are commercially and recreationally important, and a variety of infauna such as polychaete worms, clams, and various small crustaceans.

Dominant finfish species in the adjacent Cooper River include spot (*Leiostomus xanthurus*), Atlantic menhaden (*Brevoortia tyrannus*), Atlantic croaker (*Micropogonias undulatus*), southern flounder (*Paralichthys lethostigma*), and bay anchovy (*Anchoa mitchilli*). Some recreationally

important fish such as red drum, spotted sea trout, and catfish are present in low abundance, and the river is also used by several anadromous and catadromous species including American shad (*Alosa sapidissima*), hickory shad (*Alosa mediocris*), blueback herring (*Alosa aestivalis*), Atlantic sturgeon (*Acipenser oxyrinchus*), and American eel (*Anguilla rostrata*).

### 3.3 Managed Species in the Action Area

Essential Fish Habitat (EFH) is defined by the Magnuson-Stevens Act as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” The designation of EFH may include habitat for individual species or for an assemblage of species, whichever is appropriate within each Fisheries Management Plan (FMP).

The managed species under the various FMPs include those designated by the South Atlantic Fishery Management Council, several species designated by the Mid-Atlantic council, and a number of wide-ranging or broadly distributed species designated at the federal level (Table 3-1). Because of the open coastal nature of the site environment and its mixture of soft-bottom, hard-bottom (“live”), and oceanic habitat, most of the coastal species managed by the South Atlantic FMC could be present, either as casual visitors or residents, in the vicinity of the Charleston ODMDS or at the Marine Container Terminal site. EFH at the MCT site is described in the MCT EIS (USACE 2006), and EFH for the ODMDS is described from South Atlantic Fisheries Management Council (SAFMC 2008) and referenced supporting documents.

Table 3-1. Fishery Management Plans (FMPs) and managed species for the South Atlantic Region that may occur in the Action Area (SAFMC 2008, NMFS 2004).

Common Name	Scientific Name	Occurrence in Action Area
<b>Shrimp FMP</b>		
brown shrimp	<i>Farfantepenaeus aztecus</i>	Eggs, Adults
pink shrimp	<i>F. duorarum</i>	Eggs, Adults
rock shrimp	<i>Sicyonia brevirostris</i>	Eggs, Adults
royal red shrimp	<i>Pleoticus robustus</i>	Eggs, Adults
white shrimp	<i>Litopenaeus setiferus</i>	Eggs, Adults
<b>Golden Crab FMP</b>		
golden crab	<i>Chaceon fenneri</i>	No life stages
<b>Spiny Lobster FMP</b>		
spiny lobster	<i>Panulirus argus</i>	Larvae, Adults
<b>Red Drum FMP</b>		
red drum	<i>Sciaenops ocellatus</i>	All life stages
<b>Dolphin-Wahoo FMP</b>		
dolphinfish	<i>Coryphaenus hippurus</i>	Adults
wahoo	<i>Acanthocybium solanderi</i>	Adults
<b>Snapper-Grouper Complex FMP</b>		
	<b>(representatives of the 73 managed species)</b>	
crevalle jack	<i>Caranx hippos</i>	All life stages of all species
greater amberjack	<i>Seriola dumerili</i>	
red hind	<i>Epinephelus guttatus</i>	
red grouper	<i>E. morio</i>	
Nassau grouper	<i>E. striatus</i>	
gag	<i>Mycteroperca microlepis</i>	
black grouper	<i>M. bonaci</i>	
scamp	<i>M. phenax</i>	

## Appendix D

black sea bass	<i>Centropristis striata</i>	
wreckfish	<i>Polyprion americanus</i>	
mutton snapper	<i>Lutjanus analis</i>	
red snapper	<i>L. campechanus</i>	
yellowtail snapper	<i>Ocyurus chrysurus</i>	
vermilion snapper	<i>Rhomboplites aurorubens</i>	
red porgy	<i>Pagrus pagrus</i>	
scup	<i>Stenotomus chrysops</i>	
Atlantic spadefish	<i>Chaetodipterus faber</i>	
white grunt	<i>Haemulon plumieri</i>	
Spanish grunt	<i>H. macrostomum</i>	
tomtate	<i>H. aurolineatum</i>	
tilefish	<i>Lopholatilus chamaeleonticeps</i>	
gray triggerfish	<i>Balistes capriscus</i>	
hogfish	<i>Lachnolaimus maximus</i>	
<b>Coastal Migratory Pelagics FMP</b>		
cero	<i>Scomberomorus regalis</i>	Adults of all species
Spanish mackerel	<i>S. maculatus</i>	
king mackerel	<i>S. cavalla</i>	
little tunny	<i>Euthynnus alleteratus</i>	
cobia	<i>Rachycentron canadum</i>	
<b>Mid-Atlantic species in South Atlantic Region</b>		
bluefish	<i>Pomatomus saltatrix</i>	Adults
summer flounder	<i>Paralichthys dentatus</i>	All life stages
Atlantic butterfish	<i>Peprilus triacanthus</i>	Adults, juveniles
Atlantic mackerel	<i>Scomber scombrus</i>	Adults
long-finned squid	<i>Loligo peales</i>	All life stages
short-finned squid	<i>Illex illecebrosus</i>	All life stages
spiny dogfish	<i>Squalus acanthias</i>	All life stages
<b>Federally Implemented FMP (for Wide-Ranging, Highly Migratory Species)</b>		
<u>Billfish</u> (4 species)		Occasional adults
<u>Swordfish</u> (1 species)		Occasional adults
<u>Tuna</u> (5 species)		Occasional adults
<u>Sharks</u> (35 species)		Juveniles, Adults

One Habitat Area of Particular Concern (HAPC), hard/live bottom, is known to be present in the action area, as hard-bottom areas were identified to the west of the ODMDS and the site's boundaries were altered to avoid those areas (see sections 2.2.1 and 3.2.1).

None of the geographically defined HAPCs listed in Appendix 5 of NMFS (2004) occurs within the Action Area.

### 3.3.1 Shrimp Fishery

According to the South Carolina Sea Grant Consortium ([www.scseagrant.org](http://www.scseagrant.org)) the commercial shrimp fishery is the largest and most economically valuable commercial fishery in South Carolina. Between 2000 and 2003, landings of the two most abundant species, brown shrimp (*Fantopenaeus azteca*) and white shrimp (*Litopenaeus setiferus*), averaged a combined 5 million pounds per year with a value of approximately \$12 million, and pink shrimp (*F. duorarum*) also contribute to commercial landings throughout the Southeast. Shrimp populations are supported by South Carolina's extensive salt marshes and coastal sounds, which serve as nurseries.

Although spawning appears to occur at sea, postlarval shrimp of the commercially valuable penaeid species enter coastal marshes and sounds, living in lower-salinity waters until they mature and return to the ocean (Smithsonian 2005). Adult *P. aztecus* live in coastal waters, reaching their greatest abundance in the depth range 27 – 55 m (90 – 170 ft) over soft bottoms. *L. setiferus* and *P. duorarum* occupy similar habitats and exploit similar resources as *P. aztecus*, although Smithsonian (2005) suggests that staggered recruitment decreases competition between the species. Rock shrimp (*Sicyonia brevirostris*) is most abundant over sandy rather than muddy bottoms, but otherwise its ecology is similar to that of the penaeid species (Smithsonian 2005).

Essential Fish Habitat for the shrimp fishery includes tidal freshwater, estuarine, and marine vegetated areas (swamps, marshes, seagrass beds), tidal and subtidal flats, tidal creeks and rivers connecting to the ocean, offshore open ocean, the Gulf Stream, and, for *S. brevirostris*, sandy bottom ocean between 60 and 600 feet deep (SAFMC 2008). Of these habitat types, offshore open ocean and sandy bottoms occur at the ODMDS and support adult shrimp, although the NMFS does not designate open ocean waters less than 60 feet deep as EFH (NMFS GIS website). No HAPC for shrimp is located in the vicinity of the ODMDS (NMFS HAPC website). EFH at the MCT site is described in the MCT EIS (USACE 2006), and includes HAPC consisting of tidal waters and marshes of the Cooper River (NMFS GIS website).

### 3.3.2 Golden Crab Fishery

Golden crabs (*Chaceon fenneri*) inhabit deep waters of the outer continental shelf and slope – according to the golden crab FMP (SAFMC 1995), maximum abundance occurs in waters 367 to 549 m deep. The species does not appear to inhabit shallow, soft-bottom areas such as the action area. Essential Fish Habitat for golden crab consists of the Gulf Stream, which is well offshore of the Action Area, and the entire continental shelf south of Chesapeake Bay (SAFMC 2008), but the NMFS HAPC website does not designate any golden crab EFH in the vicinity of the ODMDS.

### 3.3.3 Spiny Lobster Fishery

Spiny lobsters are characteristic of hard and sandy bottoms in tropical and subtropical regions. According to the FMP (Gulf of Mexico FMC [GMFMC] 1982), postlarval and juvenile spiny lobsters occupy shallow areas of seagrass, rocks, mangrove swamp, and algal mats. Older lobsters move into rubble and reef habitats in deeper water.

Spiny lobsters are common in Florida and Gulf coastal waters but less so off the Carolinas. Off South Carolina recreational takes are allowed, but the species does not support a commercial fishery. Most spiny lobsters are taken in the waters of south Florida, where the favorable reef habitat is most abundant.

The FMP indicates that the epipelagic zone is habitat of particular concern for the larval (phyllosome) stages and shallow-water rocky areas, mangrove flats, and seagrass beds for the juvenile stages. Reefs, including artificial structures, and other hard bottoms are important habitat for adults. Essential Fish Habitat for the spiny lobster includes mangrove swamps, sea grass and algal beds, shallow subtidal areas, soft bottom, coral reefs, sponges, live-bottom areas, nearshore shelf waters, and the Gulf Stream (SAFMC 2008). The whole inner continental shelf in the vicinity of the ODMDS is designated as spiny lobster EFH, but according to the NMFS HAPC Website, no spiny lobster HAPCs are located in the area. The vicinity of the ODMDS would support adult spiny lobsters but not younger life stages.

### 3.3.4 Red Drum Fishery

According to the South Carolina Department of Natural Resources (SCDNR 2004), the red drum (*Sciaenops ocellatus*) is one of the most highly-prized game fish along the coast of South Carolina. Red drum are widespread in nearshore waters of the southeastern U.S from Delaware Bay throughout the northern Gulf of Mexico.

The southern unit of the red drum fishery, which includes South Carolina, does not appear to migrate coastwise, but does migrate onshore-offshore with the seasons. Red drum spawn along the shoreline in inlets and sounds. Larval red drum spend about 20 days in the coastal oceanic water column before becoming demersal postlarvae and seeking out and inhabiting shallow, brackish rivers, bays, canals, tidal creeks, boat basins, and passes. Subadults are found in these habitats and in large aggregations in seagrass beds and over oyster bars, mud flats, or sand bottoms. Adult red drum are found mostly in nearshore shelf waters, where they migrate seasonally from offshore waters in the winter to inshore waters from, approximately, early April through November.

Commercial harvest of red drum is prohibited as a result of substantial overfishing in the 1980s, but the species is heavily exploited by the recreational fishery. SCDNR (2004) recommended against relaxing current fishing restrictions even if catches increase in the short term. Three years later it was not clear whether the population is beginning to recover: recent catch is up, but recruitment is too variable to reveal a clear trend (SCDNR 2007).

Red drum EFH in the ODMDS area includes unconsolidated bottom (soft sediments) and the ocean surf zones (SAFMC 2008), which would support the eggs, larvae, subadults, and adults of red drum, but not the postlarval and juvenile stages. The entire continental shelf in the vicinity of the ODMDS is designated as EFH for red drum (NMFS HAPC website; NOAA EFH website). Red drum EFH at the MCT site is described in the MCT EIS (USACE 2006) and consists of the waters of the Cooper River and adjacent tidal marshes.

### 3.3.5 Dolphin-Wahoo Fishery

According to the fishery management plan for the dolphin-wahoo fishery (SAFMC 2003), the common dolphin (*Coryphaena hippurus*) is an oceanic pelagic fish found worldwide in tropical and subtropical waters warmer than 20°C. They range in the western Atlantic from Nova Scotia to Brazil and throughout the Caribbean Sea and the Gulf of Mexico. *C. hippurus* is also managed under the Coastal Migratory Pelagics FMP. Pompano dolphin (*Coryphaena equiselis*), a more pelagic species, has been recorded off North Carolina, Florida, Bermuda, and in the central Atlantic, in waters warmer than 24°C. The two species, collectively referred to as “dolphinfish” in the management plan, support economically important fisheries from North Carolina to the northeast coast of Brazil.

The wahoo (*Acanthocybium solandri*) is an oceanic pelagic fish found worldwide in tropical and subtropical waters. Wahoo are caught off North and South Carolina primarily during the spring and summer; recreational landings in the latter years of the 1990s averaged approximately 1 million pounds per year in the South Atlantic region, where most of the catch occurs. Relatively little is known about the ecology of wahoo.

The dolphin stock in the waters off the eastern coast of the U.S. does not show signs of overfishing (SAFMC 2006). The status of the wahoo stock is unknown, but for both species the management plan recommends a precautionary approach to management in order to maintain the

status quo. EFH for the dolphin-wahoo fishery (SAFMC 2008) consists of pelagic *Sargassum*, which is not present in any abundance in the project area; the Gulf Stream and Florida Current, which are well offshore/south of the project area; and the coastal open waters known as the Charleston Gyre, between 32° and 34° N, which is also well offshore of the project area. The Action Area could support adult and subadult dolphins and wahoo, but not the younger life stages.

### **3.3.6 Snapper-Grouper Complex Fishery**

Ten families of fishes containing 73 species are managed by the SAFMC in the snapper-grouper fishery, an essentially tropical species complex. Major families include snappers (Lutjanidae), sea basses and groupers (Serranidae), porgies (Sparidae), grunts (Pomadasyidae), wrasses (Labridae), and jacks (Carangidae). There is considerable variation both in specific life history patterns and habitat use among the species in the complex, and in the status of the stocks (SAFMC 1983 et seq.). Several species have been severely over-fished to the point of being considered for threatened or endangered species status, and approximately one-third of the species are closed to commercial fishing.

Snapper-grouper EFH in and near the ODMDS (SAFMC 2008) consists of live/hard bottom and unconsolidated bottom, and the overlying water column, which would support all life stages of species that occur in the area. The entire continental shelf in the vicinity of the ODMDS is designated as EFH for the snapper-grouper complex, but HAPCs are restricted to three reef areas approximately 12 miles to the northeast, 15 miles to the southwest, and six miles to the southeast of the ODMDS (NMFS HAPC website). EFH at the MCT site is described in the MCT EIS (USACE 2006). The other listed EFH types (submerged aquatic vegetation, coral reefs, artificial reefs, and medium to high profile outcroppings on the shelf break zone) do not occur in the project area. In addition, the Gulf Stream is an essential habitat because it provides a mechanism to disperse snapper-grouper larvae, but it is well seaward of the ODMDS.

### **3.3.7 Coastal Migratory Pelagics Fishery**

Mackerel (king, Spanish, and cero) are large, predatory fish that move along the southeastern coast of the United States in large schools. According to the Amendment 15 of the FMP for this group (GMFMC et al. 2004), king and Spanish mackerel are major target species of recreational fisheries throughout the South Atlantic region, and small amounts of the two species are caught as an incidental catch or supplemental commercial target species off South Carolina. Neither species is considered to be over fished or undergoing overfishing at this time.

Cobia are large fish that feed primarily on crustaceans as juveniles and fish as adults. They migrate through coastal waters and bays along the southeastern United States in late spring and again in late fall and winter (SAFMC website [www.safmc.net] “Regulations by Species”). They are recreationally important in Florida and the Gulf, but much less so north of Florida. The FFWC (2006) cites an NMFS study conducted in 2001 that concluded that there was evidence that cobia are not being over fished.

The little tunny is a schooling fish found in tropical and subtropical waters of the Atlantic, but little appears to be known about it, as the SAFMC website’s profile contains no information on stock assessments and fishing restrictions, and very little information on its biology. The FMP for the coastal migratory pelagics has no mention of the species.

EFH for all species in this group in the ODMDS area includes the ocean surf zone, coastal inlets, and barrier island ocean-side waters, which would support adults of the species in this group during their migrations, and offshore areas deeper than approximately 60 feet (SAFMC 2008; NMFS HAPC website; NOAA EFH website). As described in the MCT EIS (USACE 2006), the MCT area contains coastal inlets (the mouth of Charleston Harbor) and, for the cobia, high-salinity bays and estuaries. The other EFH types for this group (*Sargassum*, sandy shoals, high-profile rocky bottoms, and the Gulf Stream) do not occur in the Action Area.

### 3.3.8 Middle-Atlantic FMP Species

Several species managed by the Middle-Atlantic Fishery Management Council (MAFMC 2008) occur commonly in the action area. The bluefish, *Pomatomus saltatrix*, is a migratory, pelagic species found throughout the world in most temperate coastal regions, except the eastern Pacific. Along the U.S. Atlantic coast, bluefish are found from Maine to Florida and undertake seasonal coastal migrations. Bluefish are predatory, feeding largely on pelagic fish and invertebrates. They support an important recreational fishery throughout their U.S. range. The stock experienced a sharp decline earlier in the century; it has been increasing, and a 2004 assessment concluded that it is not being over fished but is still below the target biomass (NEFSC 2007). EFH for all life stages of bluefish south of Cape Hatteras consists of pelagic waters over the continental shelf from the coast to the Gulf Stream; although there is no EFH for eggs and larvae in inshore waters such as bays and estuaries, major estuaries are EFH for juveniles and adults (NOAA EFH website).

Summer flounder are managed under the Summer Flounder, Scup and Black Sea Bass Fishery Management Plan. Summer flounder (*Paralichthys dentatus*) reach the southern limit of their distribution in South Carolina waters (NEFSC 2007), and appear not to support an important fishery south of Cape Hatteras. According to NEFSC (2007), *P. dentatus* spawn offshore and the larvae are carried into bays and estuaries of the mid-Atlantic. They develop there from late spring through early autumn, when they migrate offshore to the outer continental shelf. The stock is still over fished, but has recovered dramatically in the past 20 years (NEFSC 2007). EFH in the Action Area consists of waters over the continental shelf from the coastline to the limits of the EEZ, and major estuaries (NOAA EFH website).

Atlantic mackerel, *Scomber scombrus*, two squid species, and Atlantic butterfish (*Peprilus triacanthus*) are managed under the same FMP. *S. scombrus* is a fast swimming, pelagic, schooling species distributed in the Northwest Atlantic between Labrador and North Carolina (Studholme et al. 1999). No EFH has been established for *S. scombrus* south of Cape Hatteras (NOAA EFH website).

The two squid species are widely distributed along the Atlantic coast, *L. pealeii* being somewhat more southern and inshore, and are highly migratory. Both species are exploited primarily in the mid-Atlantic bight rather than in the South Atlantic area (MAFMC 2008). The EFH source document for *I. ilecebrosus* (Hendrickson and Holmes 2004) suggests that the species spawns well offshore of the coast from Florida to North Carolina and mature north of Cape Hatteras, and the source document for *L. pealii* (Jacobson 2005) indicates that the species is essentially inshore, and thus is likely common in the Action Area. There is no EFH designated for either species south of Cape Hatteras (NOAA EFH website).

Butterfish are also widely distributed along the Atlantic coast but are most abundant north of Cape Hatteras. They are schooling, predatory fish that live offshore in the winter and inshore in



summer, following warm water. The stocks are heavily fished in the mid-Atlantic and North Atlantic regions (MAFMC 2008). Adults and juveniles are common in the surf zone and in bays and estuaries (Cross et al. 1999), and thus would be expected to occur at the ODMDS and the MCT site. There is no EFH designated for butterfish south of Cape Hatteras (NOAA EFH website).

Spiny dogfish, *Squalus acanthias*, are managed under a FMP developed jointly by the Mid-Atlantic and New England FMCs, as the species is primarily a northern species. Spiny dogfish, characterized by McMillan and Morse (1999) as “voracious and opportunistic” predators, migrate extensively along the Atlantic coast from Labrador to Florida. Intense fishing pressure in the 1990s resulted in a sharp decline in stock size, leading to a designation of “over fished” in 1998, but according to MAFMC (2008) the stock is not currently over fished. South of Cape Hatteras, EFH includes the waters over the Continental Shelf to depths of 1280 ft. for juveniles and depths of 1476 ft. for adults.

### **3.3.9 Federally Implemented Highly Migratory Species FMP**

Several fisheries are managed at the federal level under the Highly Migratory Species (HMS) FMP because they involve species that are characteristic of the open ocean (oceanodromous) to an extent that precludes regional management. All of the species are primarily characteristic of open ocean, offshore areas, and designating EFH has been challenging (NMFS 2006b).

However, EFH does exist along the Atlantic coast of the United States for a number of species (NOAA EFH website). Generally speaking, EFH for neonates and juveniles of several of the managed shark species (Atlantic sharpnose, dusky, sand tiger, sandbar, scalloped hammerhead, and tiger) includes coastal bays and estuaries and coastal waters of the mid-Atlantic and South Atlantic states. EFH for the managed tuna species and swordfish is, roughly speaking, offshore of the Action Area (i.e., waters deeper than 25 m) for all life stages. Billfish EFH is offshore and, for most species, south of the Action Area. Generally speaking, the HMS managed species would be expected to occur at the ODMDS as occasional adult visitors migrating through the area. The exception would be the shark species mentioned above, for which the nearshore coastal waters, Charleston Harbor, and the Cooper River constitute neonate and juvenile EFH.

## **4 EFFECTS OF THE PROPOSED ACTION**

### **4.1 Impact-Producing Factors**

The dredging operation could have both direct and indirect effects on managed species. Direct effects would include mortality from various aspects of the actual dredging and fill placement activities, whereas indirect impacts would include effects on factors such as growth and reproduction resulting from environmental changes caused by the project. An example of an indirect effect would be disruptions to the benthic environment that reduced the amount of prey available to a managed species in the project area.

#### **4.1.1 Dredge Operations**

**Direct Effects** -- Dredge operations could have direct effects on managed species at the ODMDS and in the ocean between the dredge site and the fill site as a result of mortality due to entrainment and entrapment in the dredge gear, collisions with dredging vessels, and disruptions to hearing, feeding activities, and migratory movements caused by noise. Turbidity from dredging could also disrupt important behaviors of managed species. The dredge operations

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would have no direct effects on managed species at the MCT site because no dredging for borrow purposes would take place there.

At the ODMDS, organisms could be attracted to the dredge site by the disturbance and exposure of benthic prey items, then exposed to adverse levels of turbidity, noise, and the possibility of entrainment or entrapment in the dredge apparatus. Entrainment of organisms, most likely fish and epibenthic invertebrates such as shrimp, could be caused by suction from hopper dredge dragheads or from the cutterhead on a cutter suction dredge. Entrapment would consist of simple mechanical entanglement in the wires, cables, and struts of the cutterhead apparatus, and would not affect shrimp. Either event can be assumed to cause 100% mortality of the affected organisms.

Turbidity caused by resuspension of sediments during the dredging could adversely affect feeding by fish that depend upon vision to locate their prey. In addition, turbidity could adversely affect fish and shrimp respiration by clogging gills. Because the dredged material is not heavily contaminated, no chemical impact to organisms would be caused by the turbidity.

Noise from the dredging operation could, if it is too loud, adversely affect managed fish species through disruption of their swim bladders and hearing loss. Studies cited in Talisman Energy (2005) suggest that fish generally respond only to very low or very high frequency sounds and that vessel noise can either cause avoidance or attraction. Avoidance occurs at 118dB re 1  $\mu$ Pa within the frequency range of 60-3,000Hz, whereas sounds in the range of 20-60Hz have no effect. Changes in schooling behaviour have also been noted, such as forming tighter formations, swimming faster, and turning away from the noise source. NMFS (2003) stated that intense sound could affect hearing in fish, but cited studies suggesting that this would be unlikely at received sound levels less than 200 dB re 1  $\mu$ Pa, and that the hearing loss would likely be temporary.

Although there is some data on the noise levels associated with bucket dredging (e.g., USACE 2001), there appear to have been no comprehensive studies of the noise associated with hydraulic dredging. That noise would be generated by the diesel generator(s) powering the pump and cutterhead, the mechanical action of the cutterhead in the sediment, the sediment slurry moving in the pipes, and, in the case of the hopper dredge, the propulsion system (engine noise and cavitation from the propellers). Tyler-Walters and Jackson (1999) state that a working cutter-suction dredge approximates to a received sound pressure level of 130 dB re 1  $\mu$ Pa over a frequency spectrum of 45 to 7,000 Hz at a distance of 100 meters, and that the passing of a small trawler (which would be similar in noise profile to a typical slow-moving hopper dredge) generates a similar noise level. A hopper dredge would generate both types of noise, so that the combined noise sources would produce a total noise level of between 130 and 140 dB re 1  $\mu$ Pa at 100 meters distance (e.g., Talisman Energy 2005). Note that values for generated sound pressure levels are typically expressed as the pressure at a distance of 1 meter; since that is not relevant to marine life, Tyler-Walters and Jackson (1999) recommend using the pressure at a distance of 100 meters, where levels are typically about 40 dB less due to the attenuation with distance.

The transport of dredged material by barge or hopper dredge from the ODMDS to the fill site at the MCT could have adverse impacts on marine organisms and live bottom habitats in the path of the vessels. Leakage of dredged material could cause minor, localized turbidity that could cause avoidance reactions by the more motile marine organisms and that could affect feeding and respiration by planktonic organisms. Settling material could deposit sediment on live-bottom communities, adversely affecting their feeding and respiration. Crowe et al. (2006) state that it is

likely that disposal of sediment (including 22 million cubic yards of material in 2000 – 2002) is having no adverse effects on hard bottom habitat in the vicinity of the ODMDS, although they caution that subtle effects could occur that are masked by natural variability. In addition, the transport vessels would, like all marine vessels, produce underwater noise that could interfere with feeding and social contact among managed species.

**Indirect Effects** – Indirect effects could be experienced by managed species at the ODMDS as a result of the destruction of potential food resources (benthic infauna and epifauna removed with the dredged material). The dredging operation would have no indirect effects at the MCT site.

### 4.1.2 Borrow Site Effects

**Direct Effects** – The borrow operation would alter the bottom topography compared to existing conditions. The dredging operation would create a depression of up to 960 acres in extent, an average of 3.5 feet deep. The depression would be unlikely to have direct effects on any of the managed species at the ODMDS, given that a three-foot relief is well within the range normally encountered on the nearshore shelf (the relief in and around the ODMDS is currently approximately 15 feet [Crowe et al. 2006]), and would have no effect on organisms at the MCT site.

**Indirect Effects** - Indirect effects of the depression at the ODMDS are conceivable: in theory, the depression could alter coastal currents and waves in ways that could cause changes in the food resources available to the managed species as well as in the nature of their habitat. The potential physical effects of the depression on wave energy and currents were evaluated in the course of this analysis and found to be negligible. The borrow site depression would have no indirect effects at the MCT site.

### 4.1.3 Placement of Fill

**Direct Effects** – The placement of fill would have no direct effects at the ODMDS. The MCT EIS (USACE 2006) addressed the impacts of fill placement at the MCT site.

**Indirect Effects** – Fill placement would have no indirect effects at the ODMDS. The MCT EIS (USACE 2006) did not identify adverse indirect impacts to the quality of aquatic habitat at the MCT site.

## 4.2 Impacts on Managed Species

### 4.2.1 ODMDS

EFH impacts at the borrow site would include temporary increased turbidity and decreased dissolved oxygen (DO) in the water column during dredging, increased noise during dredging, and loss of up to 960 acres of food resources in the benthic habitat for an extended period.

Increased turbidity and reduced DO could affect offshore water column EFH and unconsolidated bottom EFH. In addition, nearby hard-bottom habitat could be affected by settling of suspended solids from the increased turbidity. However, the fact that the deposition of up to 20 million cubic yards of material at the ODMDS in recent years has had no discernable effects on hard bottom areas (Crowe et al. 2006) suggests that the removal of up to 6 million cubic yards would likewise have little, if any, adverse impact.

Transportation of dredge material to the fill site could have impacts on interconnecting water bodies (i.e., Charleston Harbor and its adjacent inlets and sounds). The borrow operation would not have impacts on the other marine EFH designated by the SAFMC (2008), consisting of offshore terrigenous and biogenic sand habitats from 18 to 182 meters; shelf current systems near Cape Canaveral; and the Gulf Stream.

Increased noise during dredging is not expected to affect managed species adversely. As noted above, noise levels from dredging would be below the thresholds cited by NMFS even near the source, and would be correspondingly lower farther from the dredge. Managed species would be expected to show avoidance reactions near the dredge, but the small area from which they would be excluded (a radius of a few hundred meters or less around the dredge) would represent an insignificant loss of habitat. Transport of borrow material by up to eight vessel transits per day would represent an insignificant addition to the general underwater noise environment in the approaches to Charleston Harbor and in the harbor itself.

Fisheries whose EFH could be affected by dredging at the ODMDS include shrimp, red drum, spiny lobster, some of the Middle Atlantic FMP species (e.g., bluefish, summer flounder, and spiny dogfish), the sharks of the HMS FMP listed in section 3.3.9, the snapper-grouper group, and the coastal migratory pelagics. Water column habitat could be degraded by the turbidity and DO impacts, causing shrimp and managed fish species to avoid the area and possibly interfering with their respiration and feeding. This could also occur in the interconnecting waterways between the ODMDS and the MCT. Shrimp, red drum, spiny lobster, Mid-Atlantic, the sharks listed in section 3.3.9, coastal migratory pelagics, and snapper-grouper species would experience a loss of food resources in the borrow area; the area would be of poor quality as a food resource until recolonization by the normal invertebrate fauna occurred. In the absence of further disturbance, that process would be expected to take one to two years (Tetra Tech 2003). It is important to note, however, that the ODMDS is in a continual state of disturbance as a result of periodic disposal activities (for example, a harbor maintenance project is currently out for bid that is expected to deliver approximately 1 million cubic yards of sediments to the ODMDS over the next two years). As a result, full recovery to the biological community characteristic of surrounding areas would not occur.

Fisheries that would not be affected include the golden crab, , dolphin-wahoo, the mid-Atlantic species other than bluefish, summer flounder, and spiny dogfish, and the highly migratory species with the exception of the sharks listed in 3.3.9 because no designated EFH for any of those species is in the Action Area.

### **4.2.2 MCT Site**

According to the MCT EIS (USACE 2006), EFH impacts at the proposed terminal site from construction and operation would affect marsh, shallow subtidal, and mudflat habitats; some would be permanently lost to the fill, the remainder would be affected by dredging and vessel activity. The EIS identified the magnitude of the impacts to the shrimp fishery and proposed mitigation, including restoration of tidal marsh on nearby Drum Island.

## **5 CONSERVATION MEASURES**

Three conservation measures would be employed during project construction that would mitigate potential impacts of the project on hard-bottom EFH in the action area:

1. SCSPA would, in consultation with the USACE, NOAA Fisheries, and SCDNR, establish vessel routes that would avoid known live bottoms. SCSPA's contract and the USACE and MMS permits would require the dredging contractor to follow those routes and to document every trip with GPS logs and tracks.
2. Dredging would be prohibited within 1000 feet of the edge of the northeast and southeast ODMDS boundaries (Figure 3) or within 1000 feet of the berms on the northwest and southwest sides of the ODMDS. The SCSPA contracts and the USACE and MMS permit conditions would require the dredger to maintain daily dredging tracking data, and would require that an inspector review those data daily and report to SCSPA and the USACE any violations of those conditions. This measure would ensure that the dredging operation does not directly jeopardize nearby live-bottom habitat and would provide a spatial buffer that would minimize the amount of suspended sediment that could settle onto hard bottoms.
3. The dredging contractor would be prohibited, through the SCSPA contract and the USACE and MMS permit conditions, from spudding, anchoring, or otherwise disturbing the ocean bottom outside the boundaries of the ODMDS.

## **6 CONCLUSIONS**

EFH impacts at the ODMDS would include a temporary (during the six to eight months of dredging each year) reduction in the quality of the water column habitat in the immediate vicinity of the dredge, which would affect the shrimp fishery, and loss of the feeding resource in up to 960 acres of unconsolidated habitat for the duration of the dredging, which would affect the shrimp, red drum, spiny lobster, some of the Middle Atlantic FMP species (e.g., bluefish, summer flounder, and spiny dogfish), the sharks of the HMS FMP listed in section 3.3.9, the coastal migratory pelagics, and snapper-grouper fisheries. In both cases, MMS concludes that the short duration and limited extent of the impact, combined with the disturbed nature of the borrow site, would prevent the impacts from having a significant effect on managed species.

Longer-term impacts could occur on the live-bottom habitats as a result of the settling of sediment resuspended during the dredging, but, as described in 4.1.1, any such impact would not be expected to be significant. Conservation measures would prevent any effect on hard-bottom habitats from the transportation of dredged material.

EFH impacts at the proposed terminal site have been addressed in the MCT EIS, and would include loss of habitat for the shrimp fishery and localized, temporary increased turbidity and decreased DO. MMS concludes that the short duration and limited extent of the impacts would prevent the impacts from having a significant effect on managed species.

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Appendix E

9/2/2008  
JGM

Spreading MMS emission calcs over years of construction  
MMS Sox emission factor adjusted for lower fuel sulfur content

	cys/day	hp-hrs/day	lbs/day					
			PM10	PM2.5	SOx	NOx	VOC	CO
Hopper	10,440	124,773	50	49	50	2,996	80	687
Cutter	16,278	181,824	70	69	73	3,827	81	516

Total Project	Period	Year 1					Period	Year 2					Period	Year 3					Period	Year 4							
		TW#1	CW#1	CW#2	TW#2	Total		TW#1	CW#1	CW#2	TW#2	Total		TW#1	CW#1	CW#2	TW#2	Total		TW#1	CW#1	CW#2	TW#2	Total			
	Start	1-Jan	15-Apr	1-Sep	1-Nov		1-Jan	15-Apr	1-Sep	1-Nov		1-Jan	15-Apr	1-Sep	1-Nov		1-Jan	15-Apr	1-Sep	1-Nov		1-Jan	15-Apr	1-Sep	1-Nov		
	End	15-Apr	31-Aug	31-Oct	1-Jan		15-Apr	31-Aug	31-Oct	1-Jan		15-Apr	31-Aug	31-Oct	1-Jan		15-Apr	31-Aug	31-Oct	1-Jan		15-Apr	31-Aug	31-Oct	1-Jan		
	Days	105	138	61	61		105	138	61	61		105	138	61	61		105	138	61	61		105	138	61	61		
451	Hopper Days	0	0	0	61	61	105	0	0	61	166	105	0	0	61	166	58	0	0	0	58	58	0	0	0	58	
80	Cutter Days	0	0	0	0	0	0	40	0	0	40	0	40	0	0	40	0	0	0	0	0	0	0	0	0	0	
4,708,499	Cys Hopper	0	0	0	636,848	636,848	1,096,214	0	0	636,848	1,733,062	1,096,214	0	0	636,848	1,733,062	605,528	0	0	0	0	605,528	605,528	0	0	0	605,528
1,302,240	Cys Cutter	0	0	0	0	0	0	651,120	0	0	651,120	0	651,120	0	0	651,120	0	0	0	0	0	0	0	0	0	0	0
6,010,739					636,848	636,848				2,384,182	2,384,182				2,384,182	2,384,182										605,528	
14.1	PM10	0.0	0.0	0.0	1.5	1.5	2.6	1.4	0.0	1.5	5.5	2.6	1.4	0.0	1.5	5.5	1.5	0.0	0.0	0.0	1.5	1.5	0.0	0.0	0.0	1.5	
13.8	PM2.5	0.0	0.0	0.0	1.5	1.5	2.6	1.4	0.0	1.5	5.4	2.6	1.4	0.0	1.5	5.4	1.4	0.0	0.0	0.0	1.4	1.4	0.0	0.0	0.0	1.4	
14.3	Sox	0.0	0.0	0.0	1.5	1.5	2.6	1.5	0.0	1.5	5.7	2.6	1.5	0.0	1.5	5.7	1.5	0.0	0.0	0.0	1.5	1.5	0.0	0.0	0.0	1.5	
828.6	Nox	0.0	0.0	0.0	91.4	91.4	157.3	76.5	0.0	91.4	325.2	157.3	76.5	0.0	91.4	325.2	86.9	0.0	0.0	0.0	86.9	86.9	0.0	0.0	0.0	86.9	
21.2	VOC	0.0	0.0	0.0	2.4	2.4	4.2	1.6	0.0	2.4	8.2	4.2	1.6	0.0	2.4	8.2	2.3	0.0	0.0	0.0	2.3	2.3	0.0	0.0	0.0	2.3	
175.6	CO	0.0	0.0	0.0	21.0	21.0	36.1	10.3	0.0	21.0	67.4	36.1	10.3	0.0	21.0	67.4	19.9	0.0	0.0	0.0	19.9	19.9	0.0	0.0	0.0	19.9	
		Cumulative Project Cys 636,848						Cumulative Project Cys 3,021,030						Cumulative Project Cys 5,405,211						Cumulative Project Cys 6,010,739							

**Equipment List -Beneficial Reuse - ODMSD Sands - CNBCT Fill  
Two Equipment Scenarios (Cutter Loading Scows & Hopper Dredge)**

**Option 1- Cutter Suction Dredge Loading Scows**

Hrs loading	Hrs idle	Time Eff %	No. of Scows	Load Size/ Scow(cut cys)	Trips/Day/ Scow	Cut/Fill	Cys/ Operating Day
15.6	8.4	65%	3	3600	1.6	1.15	16,278

	Installed Hp	Load Factors		Hp-Hrs each dredge			Dredge Emissions, lb/day					
		loading scows	idle	Loading Scows	Idle	Total	PM10	PM2.5	SOx	NOx	VOC	CO
<b>Dredge- Total of 1</b>												
1 cutter drive	1,500	0.4	0	9,360	0	9,360	3.8	3.7	3.8	224.7	6.0	51.5
ladder pump	1,500	0.8	0	18,720	0	18,720	7.5	7.3	7.6	449.4	12.0	103.1
main pump	5,000	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
generator (winches / house load)	1,200	0.4	0.2	7,488	2,016	9,504	3.8	3.7	3.8	228.2	6.1	52.3
tender boats	1,000	0.4	0.4	6,240	3,360	9,600	3.8	3.8	3.9	230.5	6.1	52.9
auxillary equipment	300	0.1	0.1	468	252	720	1.6	1.6	0.3	22.4	1.6	4.0
<b>Total each dredge</b>	<b>10,500</b>			<b>42,276</b>	<b>5,628</b>	<b>47,904</b>	<b>21</b>	<b>20</b>	<b>19</b>	<b>1,155</b>	<b>32</b>	<b>264</b>

	Installed Hp	Load Factors		Hp-Hrs each dredge			Towboat Emissions, lb/day					
		Towing	idle	Loading Scows	Idle	Total	PM10	PM2.5	SOx	NOx	VOC	CO
<b>Towboats- Total of 3</b>												
3 main engine	4,000	0.7	0	131,040	0	131,040	43.0	43.0	53.0	2582.9	43.0	236.8
auxillary generator	200	0.2	0.2	1,872	1,008	2,880	6.3	6.3	1.2	89.4	6.6	15.9
<b>Total each dredge</b>	<b>4,200</b>			<b>132,912</b>	<b>1,008</b>	<b>133,920</b>	<b>49.4</b>	<b>49.4</b>	<b>54.1</b>	<b>2672.3</b>	<b>49.6</b>	<b>252.6</b>

<b>Total Dredge - Towing Package Hp-hrs per Operating Day</b>						181,824	70	69	73	3,827	81	516
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Does not include unloading emissions

**Option 2- Hopper Dredge**

**Cycle**

Hrs loading	Hrs Sailing	Hrs Disch	Total Cycle	Load size (cut cys)	Cycles/day	Cut/Fill	Cys/ Operating Day
0.85	4.27	1.9	7.02	3,900	3.0785	1.15	10,440

Daily Hrs

Loading 2.617 sailing 13.145 unloading 5.849 idle 2.389

**Dredge- Total of 1**

	Installed Hp	Load Factors				Hp-Hrs each dredge				Total
		loading	sailing	unloading	idle	loading	sailing	unloading	idle	
1 Propulsion	10,000	0.5	0.7	0.0	0.0	13,084	92,016	0	0	105,100
Pumps/Jets	8,500	0.3	0.0	0.0	0.0	6,673	0	0	0	6,673
generator (winches / house load)	5,000	0.4	0.1	0.0	0.1	5,233	6,573	0	1,194	13,001
<b>Total each dredge</b>	<b>23,500</b>					<b>24,990</b>	<b>98,589</b>	<b>0</b>	<b>1,194</b>	<b>124,773</b>

**Dredge Emissions, lb/day**

	Installed Hp	Hp-hrs	Dredge Emissions, lb/day					
			PM10	PM2.5	SOx	NOx	VOC	CO
1 Propulsion	10,000	105,100	42	41	42	2,523	67	579
Pumps/Jets	8,500	6,673	3	3	3	160	4	37
generator (winches / house load)	5,000	13,001	5	5	5	312	8	72
<b>Total each dredge</b>	<b>23,500</b>	<b>124,773</b>	<b>50</b>	<b>49</b>	<b>50</b>	<b>2,996</b>	<b>80</b>	<b>687</b>

**Total Hp-hrs per Operating Day**

124,773

**Hopper dredge unloading emissions not included**

Emissions Estimates Prepared by Dirk Herkhof, Minerals Management Service, 07/24/08 - Dirk.Herkhof@mms.gov  
Emissions Estimates Revised by Jim McNally and Dick Wittkop, Moffatt & Nichol, 09/12/08

### EMISSIONS FACTORS

Equipment/Emission Factors	units	PM10	PM2.5	SOx	NOx	VOC	CO	REF.
Diesel Recip. > 600 hp.	gms/hp-hr	0.182	0.178	0.1835	10.9	0.29	2.5	ERG, 2007, Table 5.8
Diesel Recip. < 600 hp.	gms/hp-hr	1	1	0.1835	14.1	1.04	2.5	ERG, 2007, Table 5.9
Tow Boats	g/kW-hr	0.2	0.2	--	12	0.2	1.1	ERG, 2007, Table 6.1
Tow Boats	g/hp-hr	0.15	0.15	0.184	8.95	0.15	0.82	1 kW = 1.341 hp

Sulfur Content Source	Value	Units
Diesel Fuel	0.05	% weight

### **Proposed Mitigation and Negotiated Agreement Stipulations**

A number of mitigation, monitoring and reporting measures would be employed during dredging and transportation of dredged materials under the Proposed Action.

Prior to commencement of operations, the South Carolina State Ports Authority (SCSPA) will provide the MMS with a copy of the Project's "Construction Solicitation and Specifications Plan" (herein referred to as the "Dredging Plan").

The Dredging Plan shall clearly delineate and support the SCSPA's strategy to obtain the sand resources from the two areas (entire area west of the interior berm and the area to the far east of the interior berm) of the Offshore Dredged Material Disposal Site (ODMDS). If additional sand resources are required after having dredged these areas of the ODMDS, the area formerly known as "the seaward (easternmost) interior berm" may be dredged.

No activity or operation, authorized by the Negotiated Agreement, shall be carried out until the MMS has determined in writing that each activity or operation described in the Dredging Plan will be conducted in a manner that is in compliance with the provisions and requirements of the Negotiated Agreement. Any modifications to the Plan that may affect the project area, including the use of submerged or floated pipelines to convey sediment, must be approved by the MMS prior to implementation of the modification.

The SCSPA will ensure that all operations at the Charleston ODMDS shall be conducted in accordance with the final approved Plan and all terms and conditions in the negotiated agreement, as well as all applicable regulations, orders, guidelines, and directives specified or referenced herein:

1. The contractor shall maintain a 500-foot no-dredging buffer around the exterior berms of the ODMDS.
2. The contractor shall maintain a 500-foot no-dredging buffer on both sides of the landward (western most) interior berm of the ODMDS.
3. The required buffers on the exterior and interior berms of the ODMDS will be implemented from the contour depth determined to best represent the toe of each berm. The best available and most recent bathymetry data shall be used to determine the contour location.

The MMS recommends the easternmost cell of the ODMDS as the primary target for dredging since existing dump and survey data suggest it to be the most abundant in compatible sand resources and it is the furthest distance from sensitive hard bottom areas.

The MMS will require that hopper dredges and scows follow designated routes to avoid hard bottom areas. This would be in consultation with the U.S. Army Corps of Engineers (USACE), National Marine Fisheries Service (NMFS) and the South Carolina Department of Natural Resources (SCDNR). The dredging contractor will be required to document every trip with global positioning system (GPS) logs and tracks.

The dredging contractor is prohibited, through the SCSPA contract and the USACE and MMS permit conditions, from anchoring, spudding, dredging within 500-foot (about 150 m) buffer zones starting at the toe of the internal edge of the exterior berm on all sides of the ODMDS, or otherwise disturbing the bottom outside of the boundaries of the ODMDS. This interior buffer protects the berm and expands the buffer between dredging and hard bottom habitat. The 500-foot internal buffer and the exterior berm

## Appendix F

together provide a buffer of between about 1600 and 2100 feet (450 - 600 m) between any dredge activity and any possible hard bottom habitat. The berms to the south and west are wider and designed to provide protection to known hard bottom habitats west of the disposal site.

The MMS will also require that the contractor maintain a 500-foot, no-dredging buffer on both sides of the landward (western most) interior berm of the ODMDS. The required buffers on the exterior and interior berms will be based on the contour depth determined to represent the toe of each berm. The best available and most recent bathymetry data shall be used to determine the contour location. The MMS will also recommend that the easternmost cell the ODMDS be the primary target for dredging since dump and survey data suggest it to be the most abundant in compatible sand resources and it is the furthest distance from sensitive hard bottom areas.

The MMS will require continuous monitoring of the locations of dredges and scows. During all phases of the project, the SCSPA will ensure that the dredge is equipped with an onboard GPS capable of maintaining and continuously recording the location of the dredge within an accuracy range of no more than plus or minus 3m. The SCSPA will immediately notify the MMS if dredging occurs outside of the approved borrow area.

At a minimum, the SCSPA, in cooperation with the dredge operator, shall submit to the MMS on a weekly (no more than biweekly) basis a summary of the dredge head track lines, outlining any deviations from the original Plan. A color-coded plot of the cutterhead or drag arms will be submitted, showing any horizontal or vertical dredge violations. This map will be provided in PDF format. The SCSPA will provide a biweekly update of the construction progress including estimated volumetric production rates to MMS. The biweekly deliverables will be provided electronically to MMS.

Although the locations with higher sand content would be targeted for removal it is possible that some pockets of higher silt and sand content could be dredged. It should be noted, however, that based on this preliminary information the best sand resources are located towards the interior of the ODMDS site, which could effectively result in a broader buffer between dredging and live bottom locations.

The current disposal site was identified as part of an interagency effort as a location that would minimally impact live bottom habitats. This interagency group, consisting of the USEPA, the SCDNR, USACE and the SCSPA, approved the location. Its exterior berms should limit sediment transport. Five years of monitoring studies supported by this group on nearby hard bottom sites have not been able to discern an effect of the disposal of millions of cubic yards in the ODMDS on hard bottom habitats and on the abundance of finfish (See Crowe et al. 2006, An Environmental Monitoring Study of Hard Bottom Reef Areas near the Charleston Ocean Dredge Disposal Site, Final Report prepared for the U.S. Army Corps of Engineers, Charleston).

The monitoring of the movements of the dredges and scows should prevent any potential in-transit issues. The buffer provided by the berm and the internal buffer on all sides of the disposal site should decrease the likelihood of sediment transport and sedimentation outside of the disposal site. In summary, we have concluded that since the project location is itself a disturbed location, the berms should limit sediment transport and sedimentation off-site, previous disposal activities when monitored have not been able to distinguish issues above background, and the sediments with greater sand content will be targeted. Additional benthic monitoring is not warranted at this time.

Additional measures (aside from those listed below) are in place for ESA-listed species for the construction and operation of the MCT (see USACE 2006, Appendix R). All of these measures are meant to reduce or eliminate the potential for impacts to ESA-listed species.

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### Sea Turtle Measures

1. NMFS-approved sea turtle observers would visually monitor the dredge area repeatedly prior to the commencement of dredging and during the dredging for the presence of sea turtles.
2. Observers would monitor the hopper spoil, overflow, screening, and draghead for sea turtles and their remains. Inflow screening baskets (4-inch mesh) would be installed to monitor the intake and overflow of the dredge for sea turtle remains.
3. The applicant would conduct assessment/relocation trawling as a method to further reduce the potential for takes of sea turtles during the proposed dredging. Trawling would be conducted repeatedly in the action areas prior to the dredging to assess the presence of sea turtles in the areas so that any individuals that may be in the path of the trawler could be relocated.
4. When a hopper dredge is used, the dredge would be equipped with a rigid sea turtle deflector attached to the draghead. The dredge would be operated in such a manner as to reduce interactions with sea turtles (e.g., reduce RPMs when the draghead is not on the surface of the sediment). In-flow screening baskets (4-inch mesh) would be installed to monitor the intake and overflow of the dredge for sea turtles.
5. Sufficient time would be allocated between each dredging cycle for approved observers to inspect and thoroughly clean the baskets and screens for sea turtles and/or turtle parts and document findings. Between each dredging cycle, the approved observer would also examine and clean the dragheads and document findings.
6. A final report summarizing the results of the dredging and any takes of listed species would be submitted to NMFS and MMS within 30 working days of completion of the project.

### North Atlantic Right and Humpback Whale Measures

1. All project-related vessels larger than 65 feet in length and operating within 20 nautical miles of the coast will not exceed 10 knots, unless inconsistent with safety of navigation, during the North Atlantic right whale (NARW) season (November 1 through April 30) to reduce the potential for vessel strikes to right whales and humpback whales. The dredges and support vessels conducting the proposed borrow operation would comply with the speed restriction, thereby reducing the likelihood of collisions with whales.
2. The SCSPA has committed to fund aerial surveys for whales for a period of 5 years, which is much longer than the period of this action, to collect data to design shipping lanes into and out of the POC that minimize the risk of vessel-right whale interactions. The surveys will be conducted daily throughout the NARW season by trained whale observers linked by radio directly to the U.S. Coast Guard and to vessels in the area. Vessel operators implementing the MMS-SCSPA negotiated agreement during the NARW season shall--especially if contacted by an aerial survey crew (by radio, text, or e-mail messaging systems) about actual or potential right whale presence near the vessel or the vessel's intended track--exert due diligence, abide by all agreed upon whale conservation instructions for transiting vessels, maintain a high level of alertness, and make every attempt to route around right whales.
3. As described in Section 3.1.3 of the biological assessment, the proposed project will employ hopper dredges between November 1 and April 14 and will have sea turtle observers aboard who will also serve as right whale and humpback whale observers and will have authority to shut down operations if a whale comes within close enough proximity to the dredge vessel to warrant the observer's concern over a



## Appendix F

potential vessel strike. The observer will also watch for the presence of right whales and humpback whales during transit to and from the terminal site.

4. Project-related vessel operators shall be made aware that it is illegal to approach or remain within 500 yards of a right whale, unless the safety of a vessel will be compromised by avoiding such approaches.

5. Tugboats associated with barging of materials will maintain a maximum speed of 10 knots during the remaining few weeks of North Atlantic right whale (and humpback whale) presence in the area (i.e., until April 30), thus greatly limiting the potential for deadly vessel strikes with large whales.

### Manatee Measures

1. The SCSPA will instruct all personnel associated with the project construction and operation of the potential presence of the manatees and the need to avoid collisions with manatees.

2. All SCSPA personnel and contractors will be advised that there are civil and criminal penalties for harming, harassing, or killing manatees, which are protected under the Marine Mammal Protection Act of 1972 (MMPA) and the Endangered Species Act of 1973 (ESA). The contractor may be held responsible for any manatee harmed, harassed, or killed as a result of port activity.

3. Siltation barriers that may be utilized during the port's construction activities must be made of materials and placed in a manner such that manatees cannot become entangled. The barriers may not block manatee movements and are to be regularly monitored to avoid manatee entrapment.

4. All vessels associated with the project will operate at idle speed at all times while in shallow waters.

5. If manatees are sighted within 100 yards of the project, all appropriate precautions shall be implemented to ensure protection of the manatees. These precautions shall include operating all equipment in such a manner that moving equipment does not come any closer than 50 feet of any manatee.

6. Any collision with any manatee must be reported immediately to the SC Wildlife and Marine Resources Department, Heritage Trust Section, (803) 844-2473.

7. The SCSPA will maintain a log detailing manatee sightings, collisions, or injuries should they occur during operations. Following project completion a report summarizing incidents and sightings must be submitted to Ms. Melissa Bimbi, US Fish and Wildlife Service, 176 Croghan Spur Road, Ste 200, Charleston, SC 29407.

The proposed action would have no effect on the following Federally-listed species identified to potentially inhabit or transit the study area: bald eagle, shortnose sturgeon, American alligator, and the blue, fin, sei and sperm whales.

Other Federally-listed species potentially occurring in the study area which may be affected by the proposed action include sea turtles, manatees, humpback whales, and right whales. Given the direct and indirect effects to manatees, right whales and humpback whales discussed within this BA (i.e., vessel strikes, acoustics harassment) and the conservation measures built contained within Section 6.0 (of the attached Biological Assessment found in Appendix C) to minimize or eliminate the potential for take, the proposed action may affect but is not likely to adversely effect manatees, right whales and humpback whales.

## Appendix F

Dredging activities at the ODMDS would take place in an area in which several species of sea turtles (loggerhead, Kemp's Ridley, green, leatherback) are likely to occur, and would probably involve equipment that is known to take sea turtles (i.e., hopper dredges). Although, this Section outlines standard measures meant to minimize or eliminate effects, the potential for the taking of sea turtles still exists. Therefore, the proposed action may adversely affect sea turtles. No impacts to designated Critical Habitat would occur.

Consultation must be reinitiated if a take occurs or new information reveals effects of the action not previously considered, or the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat in a manner or to an extent not previously considered, or if a new species is listed or critical habitat designated that may be affected by the identified action.

### Project Completion Report

A project completion report will be submitted by the SCSPA to MMS within 90 days following completion of the activities authorized under this Negotiated Agreement. This report and supporting materials should be sent to Ms. Renee Orr, Chief, MMS Leasing Division, 381 Elden Street, MS 4010, Herndon, Virginia 20170 and dredgeinfo@mms.gov. The report shall contain, at a minimum, the following information:

- the names and titles of the project managers overseeing the effort (for USACE, the engineering firm (if applicable), and the contractor), including contact information (phone numbers, mailing addresses, and email addresses);
- the location and description of the project, including the final total volume of material extracted from the borrow area and the volume of material actually placed at the MCT (including a description of the volume calculation method used to determine these volumes);
- ASCII files containing the x,y,z and time stamp of the cutterhead or drag arm locations;
- a narrative describing the final, as-built features, boundaries, and acreage, including the restored beach width and length;
- a table, an example of which is illustrated below, showing the various key project cost elements;

	Project Cost Estimate (\$)	Cost Incurred as of Construction Completion (\$)
Construction		
Engineering and Design		
Inspections/Contract Administration		
Total		

- a table, an example of which is illustrated below, showing the various items of work construction, final quantities, and monetary amounts;

## Appendix F

Item No.	Item	Estimated Quantity	Unit	Unit Price	Estimated Amount	Final Quantity	Bid Unit Price	Final Amount	% Over/Under
1	Mobilization and Demobilization								
2	Beach Fill								
3	Any beach or offshore hard structure placed or removed								

- a listing of construction and construction oversight information, including the prime and subcontractors, contract costs, etc.;
- a list of all major equipment used to construct the project;
- a narrative discussing the construction sequences and activities, and, if applicable, any problems encountered and solutions;
- a list and description of any construction change orders issued, if applicable;
- a list and description of any safety-related issues or accidents reported during the life of the project;
- a narrative and any appropriate tables describing any environmental surveys or efforts associated with the project and costs associated with these surveys or efforts;
- a table listing significant construction dates beginning with bid opening and ending with final acceptance of the project by the USACE; digital appendices containing the as-built drawings, beach-fill cross-sections, and survey data; and any additional pertinent comments.