DRAFT FINDING OF NO SIGNIFICANT IMPACT

Atlantic Coast of Maryland Shoreline Protection Project
Offshore Shoals in Federal Waters as Sand Sources for Ocean City, Maryland

The U.S. Army Corps of Engineers, Baltimore District (USACE), in cooperation with the U.S. Department of Interior (DOI), Bureau of Ocean Energy Management (BOEM), has conducted an environmental analysis in accordance with the National Environmental Policy Act of 1969, as amended, with USACE serving as the lead agency. The Environmental Assessment (EA), dated July 2019, for the Atlantic Coast of Maryland Shoreline Protection Project (Atlantic Coast Project) entitled *Offshore Shoals in Federal Waters as Sand Sources for Ocean City, Maryland,* supplements a 2008 Supplemental Environmental Impact Statement (2008 EIS). The Atlantic Coast Project, authorized through 2044, places sand on the beach of Ocean City, Maryland (MD), to reduce risk of coastal storm damage.

The 2019 EA, incorporated herein by reference, evaluates various alternatives that would meet the immediate sand needs of the Atlantic Coast Project. Because more than 10 years have elapsed since the 2008 EIS, USACE and BOEM prepared the EA to update findings of the 2008 EIS and to determine whether modifications are warranted to the previous recommended plan, which identified four offshore shoals - Weaver Shoal, Isle of Wight Shoal, Shoal A, and Shoal B - as sand sources. The updated recommended plan for the Atlantic Coast Project consists of:

- Placing sand on the beach of Ocean City every four years, with the next sand nourishment anticipated by or before the year 2022
- Dredging approximately 1,070,000 cubic yards of sand from offshore shoals each future beach nourishment cycle
- Conducting dredging under environmental constraints to minimize long-term impacts to offshore shoal habitats
- Dredging Weaver Shoal for the next nourishment cycle and up to two additional nourishment cycles to obtain sand
- After the next two or three nourishment cycles, dredging sand from the four offshore shoals would be based on reassessment of shoal conditions in accordance with considerations of this EA and the 2008 EIS

In addition to a “no-action” plan, the 2019 EA evaluates alternatives to provide sand for the Atlantic Coast Project formulated on several considerations, as presented in Section 3. The “no-action” alternative of the EA was the recommended plan in the 2008 EIS: to dredge either Weaver Shoal, Isle of Wight Shoal, or Shoal A to obtain sand, but postpone dredging of Shoal B. The EA presents dredging alternatives for the four offshore shoals that re-evaluate which shoals to dredge in the near future, whether to modify previously established dredging habitat constraints, and whether to add a time-of-year restriction. Additionally, as was done in the 2008 EIS, the EA re-evaluates whether some of Ocean City’s sand needs could be met by dredging the Ocean City Inlet ebb shoal under the separate USACE Assateague Island Long-Term Sand Management (LTSM) Project.

For all alternatives, the potential effects were evaluated, as appropriate. A summary assessment of the potential changes in effects from the current recommended plan as compared to the recommended plan in the 2008 EIS are listed in Table 1. Table 2 presents a summary of effects documented in the 2008 EIS.

Table 1: Summary – Potential changes in effects from the 2008 EIS recommended plan compared to the 2019 EA recommended plan.

2019 EA Topic	2019 EA Impact Change Summary	Change in Impacts from 2008 EIS	Corollary Topic in Table 2
Physiography and Bathymetry	Reduced in Outer Continental Shelf (OCS) (federal waters) as dredging through 2017 occurred in state waters	Negligible	Not considered
Geology	Forecast total sand need per nourishment cycle increased to account for sand placed on beach but not measured	Minor	Not considered
Hydrology and Water Quality	Minor turbidity	Negligible	Hydrology, Water quality
Climate	Negligible via contribution to anthropogenic fossil fuel cumulative emissions	Not previously addressed	Climate change
Air Quality	Delaware (DE) beach construction emissions quantified but minor	Negligible	Air quality
Noise	Negligible to minor to fish and wildlife.	Not previously addressed	Noise levels
Aquatic Habitats	Reduced in OCS as dredging through 2017 occurred in state waters instead	Negligible	Fish and wildlife habitat
Plant Life	Minor to benthic microalgae.	Not previously addressed	Aquatic living resources
Fish	Minor to fish	Negligible	Aquatic living resources
Wildlife	Negligible to seabirds	Reduced from minor	Aquatic living resources
Endangered Species	Unobserved turtle takes not identified in 2008 EIS would likely occur, but within limit set by National Marine Fisheries Service (NMFS) 2006 Biological Opinion (BO)	Negligible to population	Threatened/ Endangered species
Cultural Resources	USACE will survey prior to dredging and avoid, minimize, or mitigate	Negligible	Cultural resources
Munitions and Explosives of Concern (MEC)	USACE will utilize mitigation measures to minimize risk	Negligible	Munitions and explosives
Navigation	Minor	Negligible	Navigation
Infrastructure	Negligible	Not previously addressed	Public Infrastructure
Recreation, Visitor Use, and Public Safety	Negligible	Negligible	Not considered
Fishing	Minor	Negligible	Fisheries

Table 2: Summary of Potential Effects of Recommended Plan Documented in 2008 EIS.

Topic (as per USACE guidance [differs from 2008 EIS table of contents])	Significant adverse effect	Insignificant effects due to mitigation	Insignificant effects	Resource unaffected by action
Aesthetics	☐	☐	☒	☐
Air quality	☐	☐	☒	☐
Aquatic living resources	☒	☐	☐	☐
Fish and wildlife habitat	☒	☐	☐	☐
Threatened/Endangered species	☐	☒	☐	☐
Cultural resources	☐	☐	☐	☒
Hazardous, toxic & radioactive waste	☐	☐	☒	☐
Hydrology	☐	☐	☒	☐
Land use	☐	☐	☐	☒
Navigation	☐	☒	☐	☐
Noise levels	☐	☐	☒	☐
Public infrastructure	☐	☐	☒	☐
Socio-economics	☐	☐	☒	☐
Environmental justice	☐	☐	☐	☒
Water quality	☐	☐	☒	☐
Climate change	☐	☐	☒	☐
Munitions and explosives	☐	☒	☐	☐
Fisheries	☒	☐	☐	☐

The recommended plan of the 2008 EIS (and the 2019 EA) would cause significant temporary adverse impacts to benthic organisms (aquatic living resources in Table 2) and associated fisheries each dredging cycle. Environmental dredging constraints would serve to maintain geomorphic integrity of offshore shoals, and thus maintain offshore shoal habitats, over the long-term as described below.

All practicable and appropriate means to avoid or minimize adverse environmental effects were analyzed and incorporated into the recommended plan. USACE has committed to mitigation measures that would protect offshore shoal habitats, endangered species, historic resources, and human safety as described below.

Dredging would be conducted following environmental constraints to minimize long-term impacts to offshore shoal habitats, as discussed in Section 3 of the 2019 EA. Dredging would avoid the shoal crests and take no more than five percent of the total sand volume from any one offshore shoal. Bathymetric surveys of the offshore shoals would be conducted before and after each dredging cycle and the results would be used to re-assess the environmental constraints and to plan for future dredging events. One of the environmental dredging constraints from the 2008 EIS was not carried forward in this EA. The constraint to "preferentially dredge at the updrift or downdrift sides" did not produce the geomorphic mitigative result expected when dredging the southeast side of Great Gull Bank in 2002 (described in Section 3.3 of the EA). The constraint could be re-applied if the results of future monitoring support it.

No compensatory mitigation is required as part of the recommended plan.

Public review of the draft EA and FONSI are scheduled to occur in August-September 2019. All comments submitted during the public review period will be responded to in the final EA and FONSI.

Pursuant to Section 7 of the Endangered Species Act (ESA), the National Marine Fisheries Service (NMFS) issued a Biological Opinion (BO) in 2006 that determined that the Recommended Plan evaluated in the 2008 EIS may adversely affect, but is not likely to jeopardize the continued existence of, loggerhead and Kemp's ridley sea turtles. The 2006 BO allowed for an incidental take of one sea turtle per 500,000 cubic yards dredged annually. The 2006 BO stated that the Atlantic Coast Project is not likely to adversely affect leatherback or green sea turtles or right, humpback, or fin whales. NMFS stated by letter in 2013 that dredging of the borrow areas was not likely to adversely affect Atlantic sturgeon. Since the 2008 EIS, NMFS has determined that underwater takes of sea turtles typically occur during hopper dredging that are not identified by surface observers. Additionally, consequences to endangered species from screening munitions and explosives of concern (MEC) was not considered in previous ESA coordination with NMFS. NMFS stated by letter on October 24, 2018, that no re-initiation of formal consultation under the ESA regarding potential impacts on federally-listed species under their jurisdiction was necessary. Previous analysis and finding of effects of the Atlantic Coast Project by NMFS have not changed. The NFMS Reasonable and Prudent Measures requiring USACE to utilize to minimize impacts on sea turtles and whales as presented in the 2006 BO remains valid.

Pursuant to Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended, and its implementing regulations at 36 CFR 800, USACE has coordinated with BOEM, MD Historic Trust (MHT), and Federally-recognized tribes to ensure compliance with the NHPA. USACE conducted a Phase I archaeological investigation of Weaver and Isle of Wight Shoals in June 2019. The investigation did not document any potential submerged cultural resources; therefore, dredging Weaver or Isle of Wight Shoals will have no effect on cultural resources. Prior to each placement cycle, USACE surveys temporary pipeline placement routes in MD state waters. If any potential cultural resources are identified in the proposed pipelines' corridors, USACE would adjust the location of the corridors to avoid potential resources in coordination with MHT. In the event Shoal A or B are proposed for dredging in the future, USACE would conduct a Phase I archaeological investigation prior to dredging these shoals. If potential cultural resources are identified, USACE would avoid the resource and establish buffer areas in coordination with BOEM and MHT.

Pursuant to the Clean Water Act of 1972, as amended, analysis of the discharge of dredged or fill material associated with the Recommended Plan was evaluated in the 2008 EIS. A Clean Water Act Section 404(b)(1) Guidelines evaluation is found in Appendix A of the 2008 EIS. Because impacts of the proposed action lie within the parameters of the 2008 EIS analysis, no new 404(b)(1) Analysis was prepared for this EA.

Water Quality Certificates (WQC) pursuant to Section 401 of the Clean Water Act have been obtained from the States of MD and Delaware (DE) for the project. The MD WQC and Tidal Wetlands Authorization expires in 2026. The current DE Department of Natural Resources and Environmental Conservation (DNREC) WQC and Subaqueous Lands Permit expires in 2029. The

MD Department of Natural Resources is the holder of these permits and is responsible to obtain new ones when these expire. All conditions of the water quality certifications shall be implemented in order to minimize adverse impacts to water quality.

A determination of consistency with the DE Coastal Zone Management Program pursuant to the Coastal Zone Management Act of 1972 was obtained from DE DNREC in January 2019. A re-determination of consistency with the MD Coastal Zone Management Program was obtained from the MD Board of Public Works in March 2016. All conditions of the consistency determinations shall be implemented in order to minimize adverse impacts to the coastal zone.

USACE is committed to conducting dredging in accordance with MEC mitigation measures that would screen out MEC from being dredged from the seafloor or placed on the Ocean City beach.

BOEM published regulations on October 3, 2017, that define the process used by the Marine Minerals Program for issuing Negotiated, Noncompetitive Agreements (NNA) for sand, gravel, and shell resources on the OCS. USACE would obtain an executed NNA from BOEM prior to dredging offshore sands in accordance with BOEM procedures/requirements. USACE would be in compliance with the OCS Lands Act upon receiving an executed NNA from BOEM. This is anticipated after the FONSI is signed.

USACE and BOEM coordinated with NMFS during preparation of the 2019 EA to ensure compliance with the Fish and Wildlife Coordination Act and Magnuson-Stevens Act. Coordination is still ongoing. Environmental dredging constraints to provide long-term protection for offshore shoal habitats described above were developed to ensure compliance with the Magnuson-Stevens Act. USACE anticipates being at a full level of compliance with these acts at the time this FONSI is finalized.

All applicable environmental laws have been considered and coordination with appropriate officials has been undertaken.

Technical, environmental, economic, and cost effectiveness criteria used in the formulation of alternative plans were those specified in the Water Resources Council's 1983 *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies*. All applicable laws, executive orders, regulations, and local government plans were considered in evaluation of alternatives. Based on these reports, the reviews by other Federal, State and local agencies, Tribes, input of the public, and the review by my staff, it is my determination that changes in the Recommended Plan from the 2008 EIS would not significantly affect the human environment; therefore, preparation of a new EIS is not required.

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Date

____
John T. Litz
Colonel, U.S. Army
Commander and District Engineer

Atlantic Coast of Maryland, Shoreline Protection Project

Offshore Shoals in Federal Waters as Sand Sources for Ocean City

DRAFT SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT

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Atlantic Coast of Maryland, Shoreline Protection Project

Offshore Shoals in Federal Waters as Sand Sources for Ocean City

DRAFT SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT

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TABLE: SELECT ACRONYMS AND TERMS USED IN THIS REPORT

Acronym or Term	Explanation
AIS	Automatic Identification System
BOEM	Bureau of Ocean Energy Management
cfs	cubic feet per second
CSDR	coastal storm damage reduction
DNREC	Delaware Department of Natural Resources and Environmental Control
DOI	Department of Interior
EA	environmental assessment
EEZ	Exclusive Economic Zone
EIS	environmental impact statement
ft	feet
FONSI	Finding of No Significant Impact
m	meter
MAFMC	Mid-Atlantic Fishery Management Council
MD SHPO	MD State Historic Preservation Officer
MEC	munitions and explosives of concern
MGS	Maryland Geological Survey
MHT	Maryland Historic Trust
MMS	Minerals Management Service

Acronym or Term	Explanation
NAVD88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act
NGVD	National Geodetic Vertical Datum
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOx	nitrogen oxides
NPS	National Park Service
OCS	Outer Continental Shelf
psu	practical salinity unit
SEIS	supplemental environmental impact statement
SMAST	Massachusetts-Dartmouth School for Marine Science and Technology
THC	total hydrocarbons
USACE	U.S. Army Corps of Engineers
USEPA	US Environmental Protection Agency
UXO	unexploded ordnance
VOC	volatile organic compound
yd3	cubic yards

EXECUTIVE SUMMARY

The U.S. Army Corps of Engineers, Baltimore District (USACE), in partnership with the Maryland Department of Natural Resources (MD DNR), is proposing to dredge offshore shoals in federal waters to obtain sand for the Atlantic Coast of Maryland Shoreline Protection Project (Atlantic Coast Project) through the year 2044. The U.S. Department of Interior (DOI), Bureau of Ocean Energy Management (BOEM), is a cooperating agency with USACE in preparation of this Environmental Assessment (EA) for the proposed action in accordance with National Environmental Policy Act (NEPA) requirements, with USACE serving as the lead agency.

The Atlantic Coast Project places sand on the beach of Ocean City, generally every four years, to reduce risk of coastal storm damage. The next sand placement is anticipated by or before the year 2022. USACE and MD DNR have sometimes placed sand on Ocean City beach more frequently than every four years following severe storms.

USACE prepared an Environmental Impact Statement (EIS) in 2008 evaluating four offshore shoals as sources of sand for the Atlantic Coast Project: Weaver Shoal, Isle of Wight Shoal, Shoal A, and Shoal B (also known as Bass Grounds and First Lump). Offshore shoals contain large quantities of suitable sand that can be cost-effectively obtained. The offshore shoals lie in federal waters (beyond three nautical miles from shore) on the Outer Continental Shelf. Dredging from these shoals would be conducted using environmental constraints to maintain seafloor habitat conditions over the long-term. The Atlantic Coast Project has not yet utilized any of these offshore shoals in federal waters as borrow sources because sufficient sand was previously available from sources in nearby state waters. The 2008 EIS also evaluated increased sand back-passing to Ocean City from the inlet ebb shoal under the separate USACE Long-Term Sand Management (LTSM) Project.

Because sand sources in state waters are now exhausted and 11 years have elapsed since the 2008 EIS, USACE and BOEM are preparing a supplemental EA to update findings of the 2008 EIS. The EA compiled new pertinent environmental information, reassessed Atlantic Coast Project sand dredging volume needs, and re-evaluated environmental effects. Although new information since the 2008 EIS is substantial, the EA determined that substantial modifications to the 2008 EIS recommended plan were not warranted.

Forecast total sand need per nourishment cycle increased by 10 percent over the 2008 EIS to account for sand placed on the beach but previously not measured. Based on Atlantic Coast Project performance since 2000, USACE anticipates dredging an average of approximately 1,070,000 cubic yards of sand each future sand placement cycle with the total volume to be dredged through 2044 from these offshore shoals between 6,105,000 and 8,652,000 cubic yards of sand.

USACE and BOEM re-assessed the four offshore shoals in federal waters as sand sources. Additionally, increased back-passing of sand from the Ocean City Inlet ebb shoal under the USACE Long-Term Sand Management (LTSM) Project was re-considered. Weaver and Isle of Wight Shoals have been investigated in greater detail since the 2008 EIS. Isle of Wight Shoal contains enough sand to meet anticipated Atlantic Coast Project needs through 2044. Weaver Shoal alone could not meet Atlantic Coast Project needs within environmental dredging constraints established as mitigation measures in the 2008 EIS. Shoal B was determined to be unsuitable for

the next beach nourishment cycle because of its high value as a fishing ground. Isle of Wight Shoal was identified to be a productive fishing ground at this time, and fishermen coordinate with during EA preparation preferred USACE use Weaver Shoal or Shoal A. Sand in the ebb shoal is not suitable for the engineered Ocean City beach and would be more costly per cubic yard under the LTSM Project to obtain (because smaller dredges would be used than the large dredges typically used for the Atlantic Coast Project). Increased use of the ebb shoal under the LTSM Project is not recommended at this time.

Because Weaver Shoal contains sufficient sand for near-future borrow cycles and would be less expensive to obtain sand from than Shoal A, Weaver Shoal is recommended as the sand source for the next nourishment cycle and up to two additional cycles. In the future, sand needs and shoal values and conditions would be reassessed and sand would be dredged from Weaver Shoal, Isle of Wight, Shoal A, and or Shoal B in accordance with the 2008 EIS.

Dredging would be conducted following constraints to minimize long-term impacts to offshore shoal habitats. Bathymetric surveys of the offshore shoals would be conducted before and after each dredging cycle and results used to re-assess the dredging constraints and plan future dredging.

The proposed action would cause a variety of environmental consequences as previously evaluated in the 2008 EIS. Destruction of benthos in the borrow area each dredging cycle, and reduced fishery value over the recovery period, is the principal short-term concern. Within several years following dredging, benthos in the borrow areas and fishing opportunities would be expected to largely recover to pre-dredge conditions. Dredging would permanently remove sand from the offshore shoals, but offshore shoal habitats would be maintained. Changes in impacts from those forecast in the 2008 EIS would be negligible to minor. However, several changes are notable. There would be minor noise impacts to fish and wildlife not previously identified, but there would be negligible impacts to seabirds rather than minor detrimental impacts. The EA determined that unobserved dredging kill or serious injury (takes) of federally listed sea turtles probably have occurred that were not identified in the 2008 EIS. Future takes will likely occur. However, these takes would likely be within the limit established by the National Marine Fisheries Service (NMFS) under the Endangered Species Act (ESA) of 1973, as amended, for the Atlantic Coast Project. Adverse effects to sea turtle populations would not be expected.

In compliance with NEPA, USACE and BOEM have prepared this EA and evaluated potential effects on the natural and human environment. Resource agency and public input was incorporated into the recommended alternative. Changes in impacts from what was described in the 2008 EIS would be minor and not result in significant effects warranting preparation of a supplemental EIS. The Atlantic Coast Project would continue to manage coastal storm damage risk cost effectively and with appropriate environmental mitigation measures.

1.0 INTRODUCTION

1.1 PURPOSE AND NEED

The United States Army Corps of Engineers (USACE) Atlantic Coast of Maryland Shoreline Protection Project (Atlantic Coast Project) includes the placement of sand on the beach of Ocean City, MD, generally every four years, to reduce risk of coastal storm damage. USACE and U.S. Department of Interior, Bureau of Ocean Energy Management (BOEM), prepared a supplemental Environmental Impact Statement[1] (EIS) in 2008 recommending four offshore shoals on the Outer Continental Shelf[2] (OCS) as future sources of sand for the Atlantic Coast Project: Weaver Shoal, Isle of Wight Shoal, Shoal "A," and Bass Grounds (also known as First Lump or Shoal “B”). To date, the Atlantic Coast Project has not utilized any of the offshore shoals in the OCS identified in the 2008 EIS because sufficient sand has been available from sources in state waters nearby to Ocean City. The most recent beach replenishment effort, completed in December 2017, exhausted readily available sand from nearby shoals in state ocean waters. Accordingly, USACE is proposing to obtain future sand for the project from offshore shoals in the OCS as recommended in the 2008 EIS. The next beach nourishment is scheduled by 2022, and is anticipated every four years thereafter for duration of the project authorized life (through 2044[3]). USACE has sometimes placed sand on Ocean City beach more frequently than every four years following severe storms, most recently in 2017 when only three years had passed since the previous beach nourishment in 2014.

This 2019 Supplemental Environmental Assessment (EA) has been prepared to update and evaluate the potential effects of dredging sand resource areas located in the OCS to meet immediate sand needs of the Atlantic Coast Project. BOEM is a cooperating agency with USACE in preparation of this EA, with USACE serving as the lead agency. Because 11 years have elapsed since the 2008 EIS, USACE and BOEM are preparing a supplemental EA to update findings in accordance with National Environmental Policy Act (NEPA) requirements. This EA incorporates the 2008 EIS by reference. The Council on Environmental Quality considers NEPA documents to be out-of-date after about 5 years[4]. Shoal “B” was determined to be unsuitable as a borrow area at the time of the 2008 EIS because of its high value as a fishing ground. However, it was determined that its relative fishery value, and that of the other candidate shoals, would be periodically re-assessed in the future because fishing value of offshore shoals in the area has changed historically[5]. Estimations of future sand needed from the offshore shoals, including consideration of dredging since the 2008 EIS, have been revised. Additionally, in the 11 years that have passed since the 2008 EIS, information on the seafloor environment and fisheries has increased substantially, driven by investigations conducted to identify sand resources and plan

[1] USACE previously prepared an EIS for the project in 1980, and supplementary Environmental Assessments in 1989 and 1993.

[2] The Outer Continental Shelf Lands Act of 1953 defines all submerged lands seaward of state coastal waters (3 nautical mile limit) which are under US jurisdiction as “Outer Continental Shelf” (OCS).

[3] After 2044, it is anticipated that the project would be authorized for an additional 15 years in accordance with Implementation Guidance for Section 1037(a) of the Water Resources Reform and Development Act (WRRDA) of 2014, Hurricane and Storm Damage Reduction.

[4] 97 Federal Register 76986.

[5] One concern is that surf clam, an important commercial fishery species, could become re-established at commercial densities on any of the offshore shoals. This last occurred in 2009.

wind energy development offshore of MD. Public awareness of seafloor habitats and concern over potential impacts have also increased substantially. The purpose of this EA is to address whether or not new information will or may result in significantly different environmental effects not previously analyzed (43 CFR 46.120). Additionally, this EA evaluates whether modifications to the previous recommended plan are warranted, particularly which of the shoals to dredge in the near future, as well as whether to modify any previously established mitigation measures. The 2008 EIS also recommended considering making increased use of sand from the Ocean City Inlet ebb shoal as authorized under the USACE Assateague Long-Term Sand Management (LTSM) Project in the future. Thus, this EA also re-evaluates use of the ebb shoal under the LTSM Project as a sand source for Ocean City.

A substantial volume of beach-suitable sand occurs on the OCS off the Delmarva Peninsula, concentrated in offshore shoal fields that are the densest and most naturally well-developed of the entire US Atlantic Coast (Pendleton et al., 2017). This sand abundance facilitates obtaining sand needed to maintain Ocean City cost effectively, and in an environmentally sensitive manner. Because the regional habitat functions of the offshore shoals are considered to be important, a prudent approach for dredging of OCS offshore shoals is to attempt to maintain all existing shoals.

The principal area of interest for this analysis is the offshore shoal borrow actions located 5 to 10 nautical miles offshore of Ocean City in the Atlantic Ocean (Figures 1-1 and 1-2). Placement of sand on Ocean City beach is not considered in this EA as no changes are proposed from routine continuing construction practices[6]. However, because of changes in air quality designations since the 2008 EIS, this EA does include consideration of air quality at the northern end of the Atlantic Coast Project on the beach in Delaware. Additionally, this EA also considers potential effects on cultural/historic resources from placement of a temporary pipeline on the seafloor in MD state waters. This topic was identified as a concern by the MD Historic Trust (MHT) in the 2008 EIS and in preparation of this EA by BOEM.

[6] Beach environmental effects in MD were evaluated in the 1980 EIS. The 1989 EA expanded the area of consideration to include the portion of the project beach extending into DE.

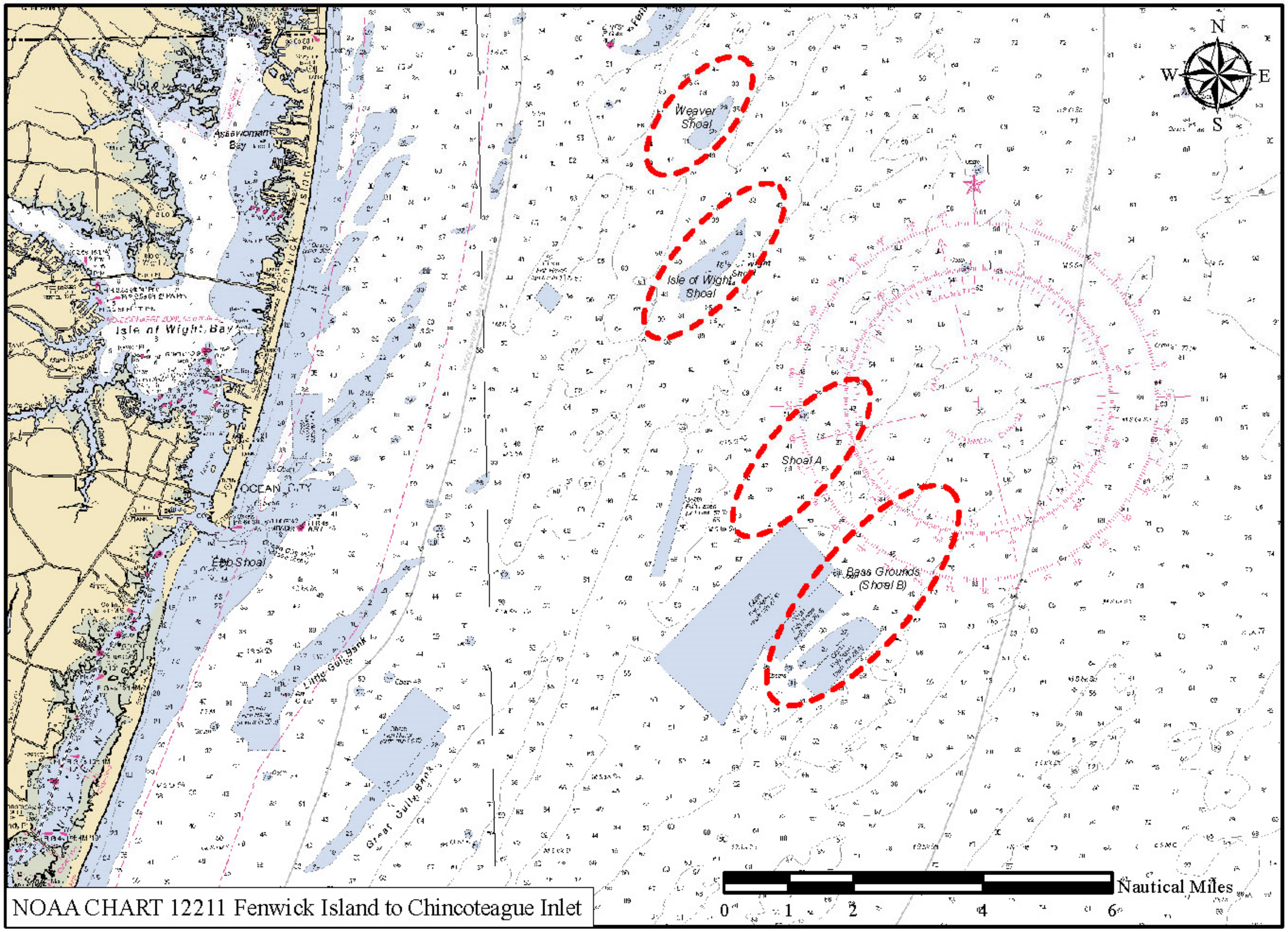

Figure 1-1: Study area off Ocean City, MD.

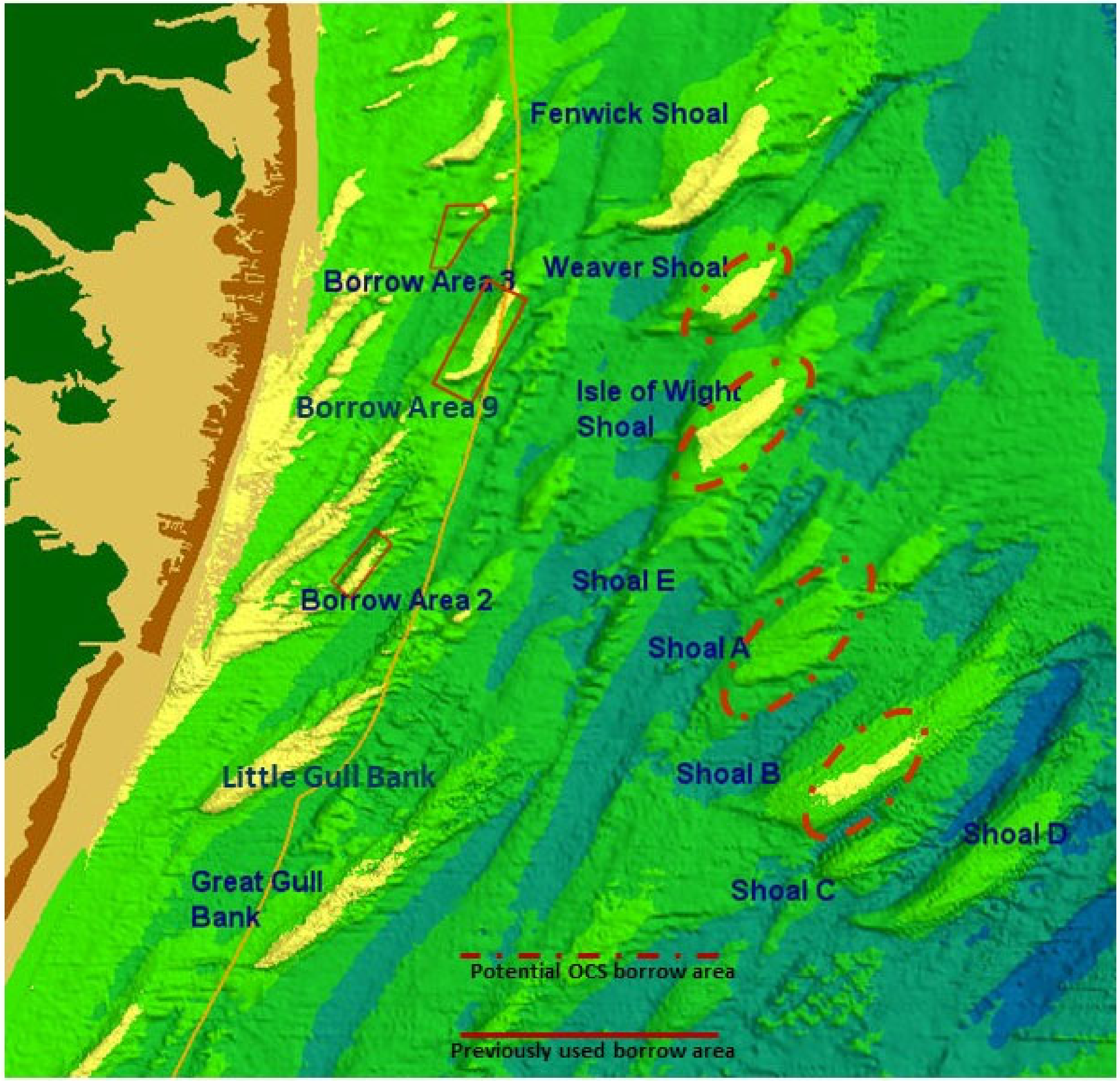

Figure 1-2: Previously used borrow areas, potential OCS borrow areas, and vicinity.

1.2 Background Information

1.2.1 Existing Project Description

The Atlantic Coast Project is designed to provide coastal flood and erosion risk management to Ocean City, MD against a 1 percent annual chance ("100-year") storm. The project includes maintaining the beach from 4th street to the Maryland/Delaware line (about 8.2 miles), with an additional 0.3 mile transition into Delaware that connects to the separate USACE Delaware Coast from Cape Henlopen to Fenwick Island, Fenwick Island DE Coastal Storm Damage Reduction (CSDR) Project (see Section 1.4). The MD portion of the nourished beach lies in Worcester County. The transition area into Delaware lies in Sussex County. By design, periodic nourishment and maintenance of the beach are required to maintain the design level of storm damage reduction. Each re-nourishment actually provides an estimated four years of advanced nourishment so that the design level of storm damage reduction will be maintained for the next four years. After initial beach re-establishment by the State of MD in 1988, USACE has placed approximately 12,343,000 cubic yards of sand on Ocean City beach within the construction template from the years 1990-2017 ("contract volume" in Table 1-1). USACE obtained this sand from Borrow Areas 2, 3, and 9 within state waters (Figure 1-2).

Year	Contract Volume* (cubic yards)	Estimated Actual Volume Dredged (cubic yards)
1990	2,199,000	2,418,900
1991	1,623,000	1,785,300
1992	1,592,000	1,751,200
1994	1,245,000	1,369,500
1998	1,290,000	1,419,000
2002	745,000	819,500
2006	932,000	1,025,200
2010	909,000	999,900
2014	902,000	992,200
2017	906,000	996,600
Total	12,343,000	13,577,300

*Placed on beach within measured construction template (see Section 2.3).

Table 1-1: History of USACE sand placement at Ocean City.

Beach contract volume measurements within the construction template do not capture the full volume of sand dredged from the seafloor. Volume dredged off the seafloor is not measured accurately because of the technical difficulty of doing so and a historic focus on payment, which is based on the construction template. It is estimated for this EA that sand placed on the beach but not captured in the contract volume measurement is an additional 10 percent greater than what was measured (Table 1-1; also Section 2.3).

1.2.2 Other USACE Projects

There are several other existing USACE projects located on the Atlantic coastline in the Ocean City area that have utilized or generated sand since 2008. Ocean and inlet currents move sand between the projects. These USACE projects include Delaware Coast Fenwick Island CSDR, LTSM, and Ocean City Harbor and Inlet Navigation Improvement (Figure 1-2).

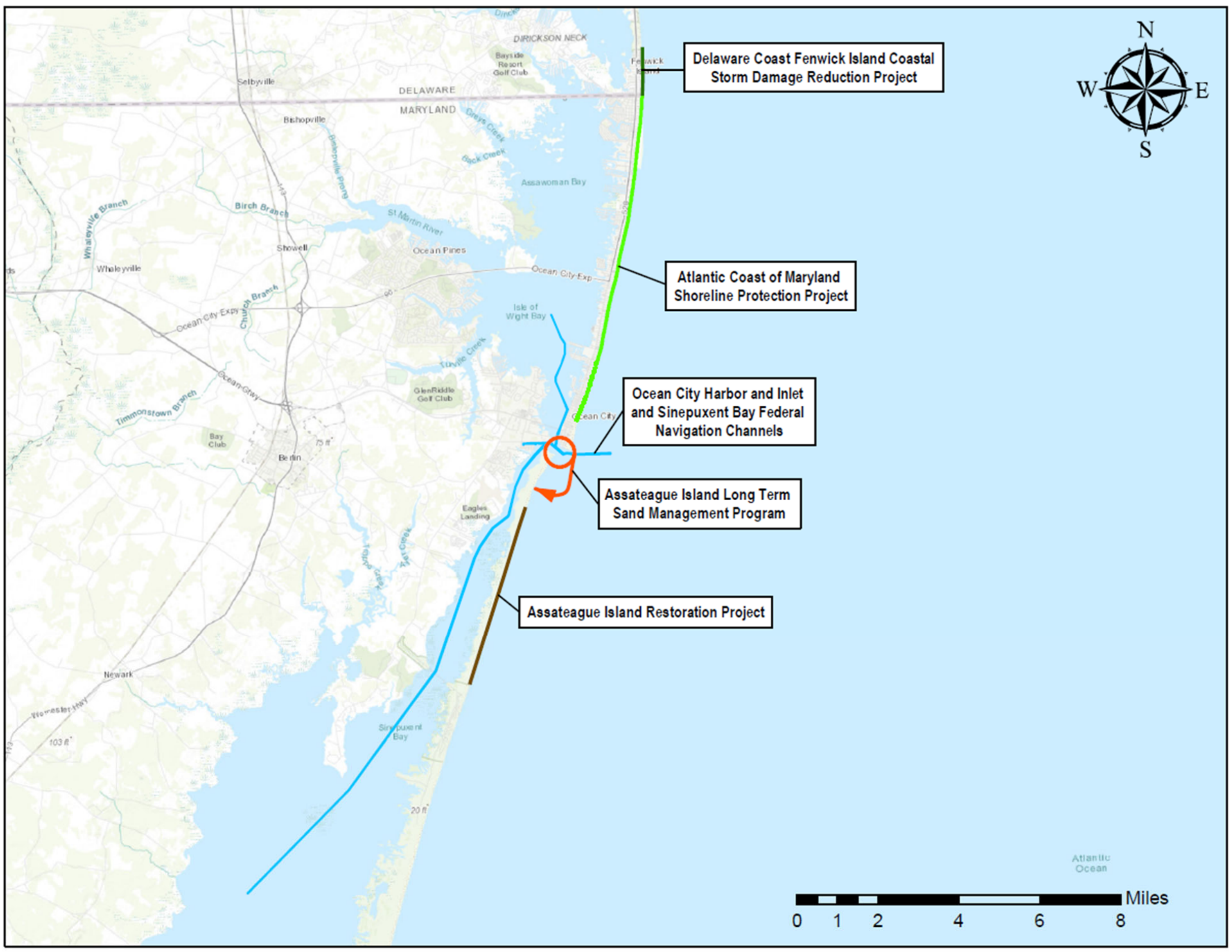

Figure 1-3: USACE projects in vicinity.

Assateague Island LTSM Project: Project implemented in 2004 is authorized for a 25 year period. USACE twice-yearly dredges sand from four natural accretion sites in the Ocean City Inlet vicinity (Figure 1-4) for by-pass placement off northern Assateague Island, MD. Bypassing compensates for disruption to longshore sand transport caused by the USACE Ocean City Inlet jetties, maintains Assateague Island's geologic integrity, and contributes to maintaining navigable conditions in the inlet vicinity. An annual volume of 189,000 cubic yards placed is the target for this purpose, but lesser amounts are often placed, depending on funding availability. USACE conducts dredging utilizing adaptive management principles based upon regular monitoring of bathymetry and grain size parameters in the four borrow areas. USACE places sand subtidally within the surf zone utilizing specialized small hopper dredges[7]. Also under the LTSM Project, amounts of up to 20,000 cubic yards per year are authorized for back-pass placement[8] on Ocean City to contribute to beach sand needs. USACE purposefully placed sand subtidally at Ocean City under the LTSM project from 2004 through 2009, but has not since that time. Based on recent coordination with Ocean City, it is anticipated that Ocean City would only request sand from the ebb shoal under the LTSM project in the future in extreme erosion situations following severe storms.

[7] Dredge vessels operated by USACE Wilmington District: the Murden or the Currituck. Typical loads for the Murden are 512 cubic yards; a typical load for the Currituck is 315 cubic yards.

[8] Sand naturally moves generally to the south along Ocean City. Back-pass placement from the inlet vicinity puts sand back "upstream" at Ocean City again.

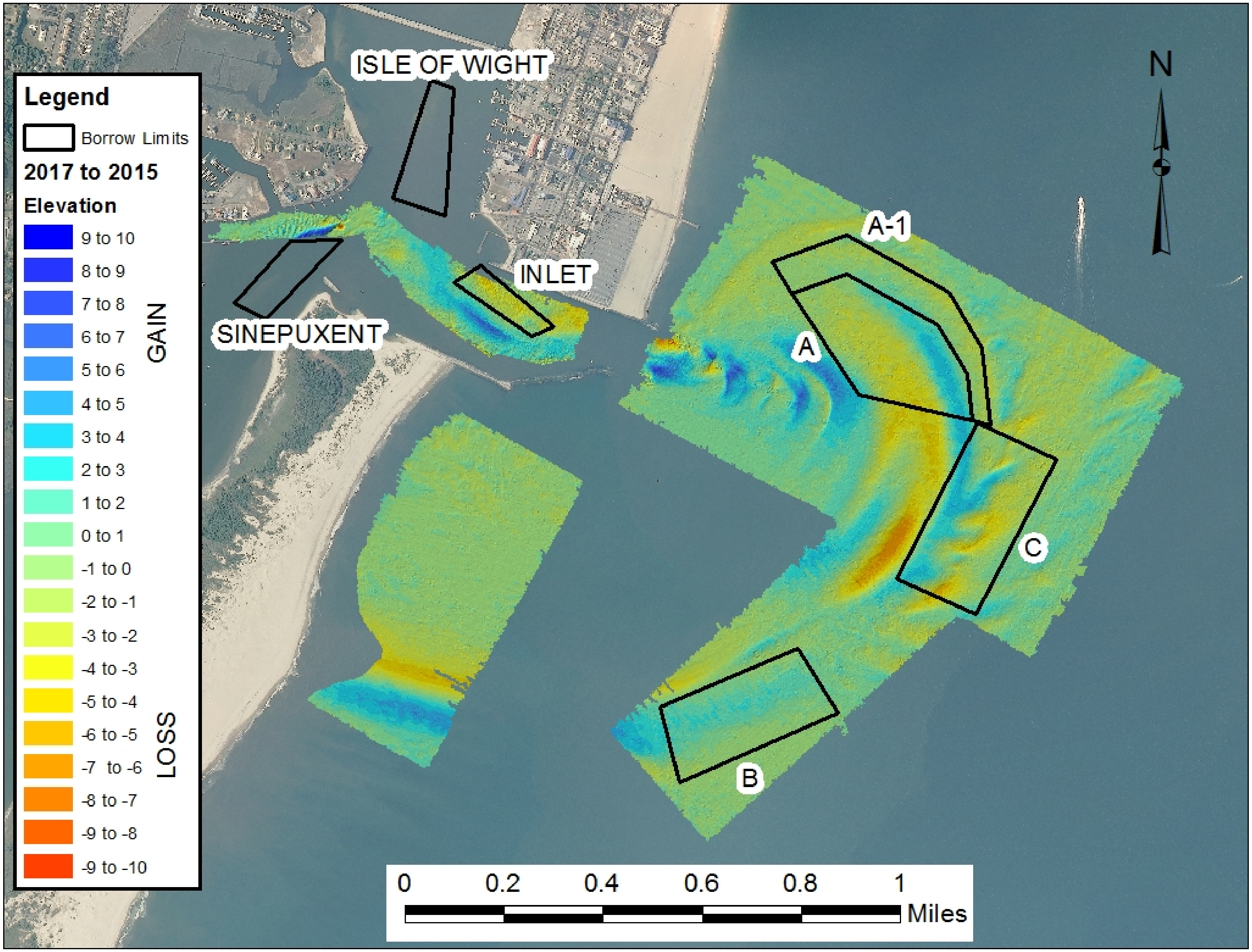

Figure 1-4: LTSM Project borrow areas and bathymetry changes in vicinity from 2015 to 2017.

Delaware Coast from Cape Henlopen to Fenwick Island, Fenwick Island DE CSDR Project[9]: Total project length 6,500 feet, including beachfill and dunes, extending north from about the Maryland/Delaware state line. Initial construction was completed in 2005 with placement of 864,000 cubic yards of sand dredged from seafloor borrow areas off DE. Subsequent work was undertaken in 2011 and 2013 with placement of 332,000 and 368,000 cubic yards, respectively. In 2018, an additional 270,000 cubic yards was placed.

Ocean City Harbor and Inlet and Sinepuxent Bay, Worcester County, MD Navigation Project: USACE constructed jetties in 1934-1935 to stabilize a natural inlet that had recently formed (today's Ocean City Inlet), constructed a harbor on the mainland, and dredged navigation channels into Isle of Wight and Sinepuxent Bays. Maintenance dredging is conducted periodically on an as-needed basis. Ocean City Inlet channel was most recently dredged in 2018 with a total of approximately 17,000 cubic yards removed. This material was placed on northern Assateague Island in the same location as material is placed on the island under the LTSM Project. The availability of USACE Operations and Maintenance funding is insufficient to keep the Ocean City Inlet channel at the authorized depth. (Following implementation of the LTSM project in 2004, inlet dredging has been undertaken under both the LTSM project and the Ocean City Harbor and Inlet Project.) The Sinepuxent Bay channel was most recently dredged in 2015. Approximately 360,000 cubic yards of material was dredged and used beneficially to create three islands to provide nesting habitat for waterbirds. Isle of Wight channel was last dredged in 2015 and approximately 45,000 cubic yards of material was removed. This material was also placed beneficially to create islands to provide nesting habitat for waterbirds. USACE has previously beneficially placed sand from the Isle of Wight channel on Ocean City beach, with this last having been done in 2009. Ocean City Harbor was last dredged in 2011. Approximately 26,000 cubic yards of material was removed and trucked to an upland placement site.

1.2.3 Other Studies and Future Projects

BOEM's Studies: BOEM's Environmental Studies Program develops, funds, and manages rigorous scientific research specifically to inform policy decisions on the development of energy and mineral resources on the OCS. Research covers physical oceanography, atmospheric sciences, biology, protected species, social sciences and economics, submerged cultural resources and environmental fates and effects. A suite of research has been conducted by BOEM off the Delmarva Coast because of interest in wind energy, including within the immediate vicinity of the Atlantic Coast Project area (Figure 1-5). BOEM published environmental studies relevant to the Atlantic Coast Project can be found at: https://www.boem.gov/ATLStudies/; https://www.boem.gov/MD-Environmental-Studies/; and https://marinecadastre.gov/espis/#/.

[9] The Delaware Coast project was constructed by USACE, Philadelphia District. Other USACE projects described above are undertaken by USACE, Baltimore District.

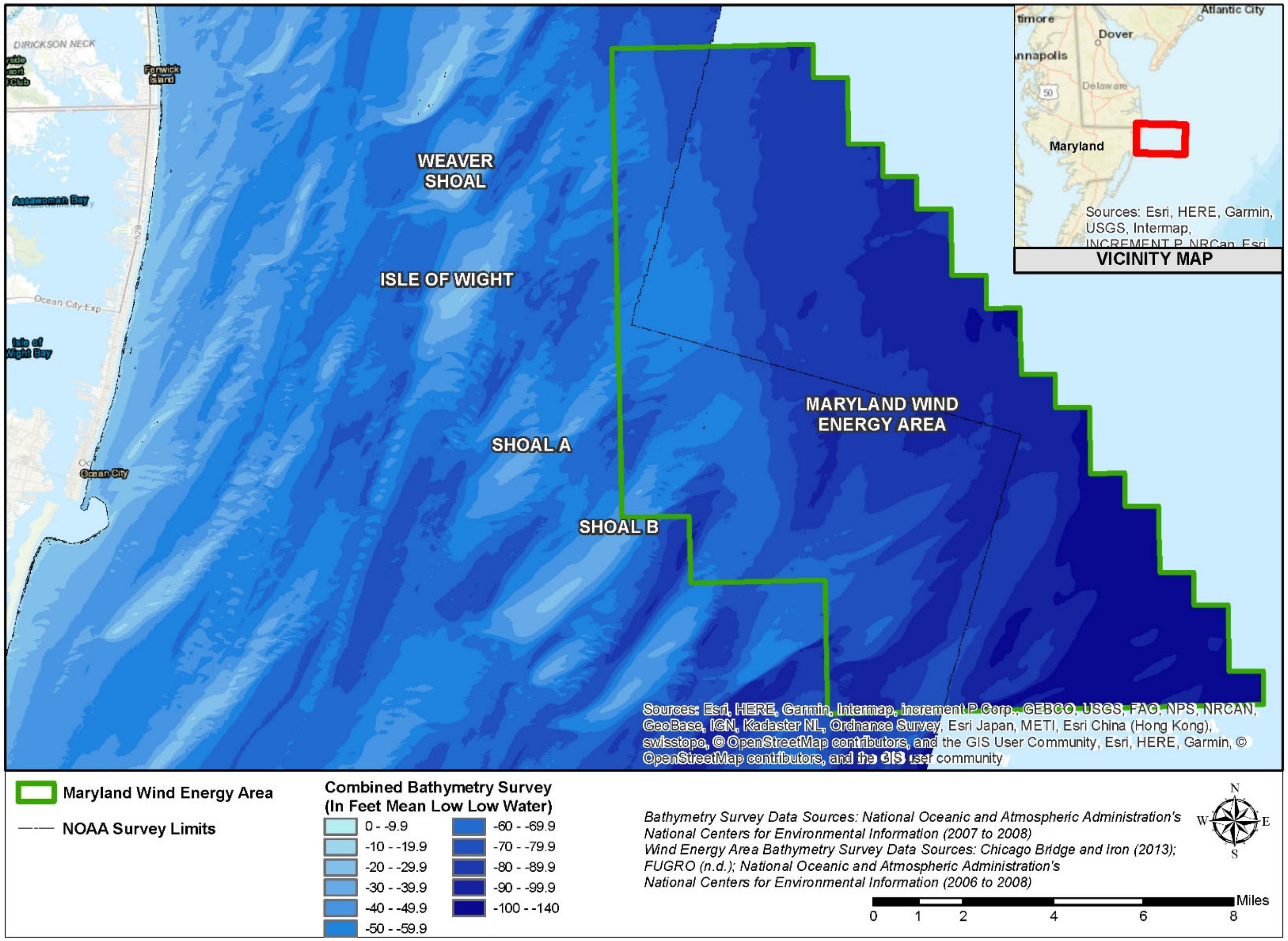

Figure 1-5: Map of MD WEA in relation to potential offshore shoal borrow areas.

Wind Energy Areas. BOEM has issued leases in eight Wind Energy Areas (WEA) along the Northwest Atlantic OCS from Massachusetts to North Carolina for offshore renewable energy development. BOEM presents updated information about the status of activities in these WEAs at: https://www.boem.gov/Renewable-Energy/.

MD WEA: This covers about 80,000 acres (Figure 1-6) (BOEM 2017-088), with its western boundary about 11 miles east of Ocean City (immediately east of the offshore shoals identified as sand sources in this EA). BOEM coordinates OCS renewable energy activities offshore MD with its federal, state, local, and tribal government partners through its Intergovernmental Renewable Energy Task Force. The MD WEA boundaries were established through this Task Force, which considered multiple factors in meetings held with stakeholders in 2016. Generally, the MD WEA boundary reflects efforts to avoid placing wind energy infrastructure where conflicts would be expected with notable habitats, fish, wildlife, fishermen, and already proposed sand borrow areas (primarily for Ocean City). BOEM has issued one lease covering the entire MD WEA.

US Wind holds the lease for the MD WEA. US Wind plans call for installing multiple turbines in water 60 to 90 feet deep. A substation will collect energy from the turbines and transmit electricity to the shore using underwater cables. US Wind anticipates that the project would come online in 2021, with an operational life expectancy of more than 25 years.

DE WEA: This covers about 96,000 acres, off the coast of Delaware, southeast of the mouth of Delaware Bay. In 2018, BOEM leased the southern portion of the DE WEA to Skipjack Offshore Energy whose plans call for construction to start as early as 2021, with the wind farm coming online in 2022.

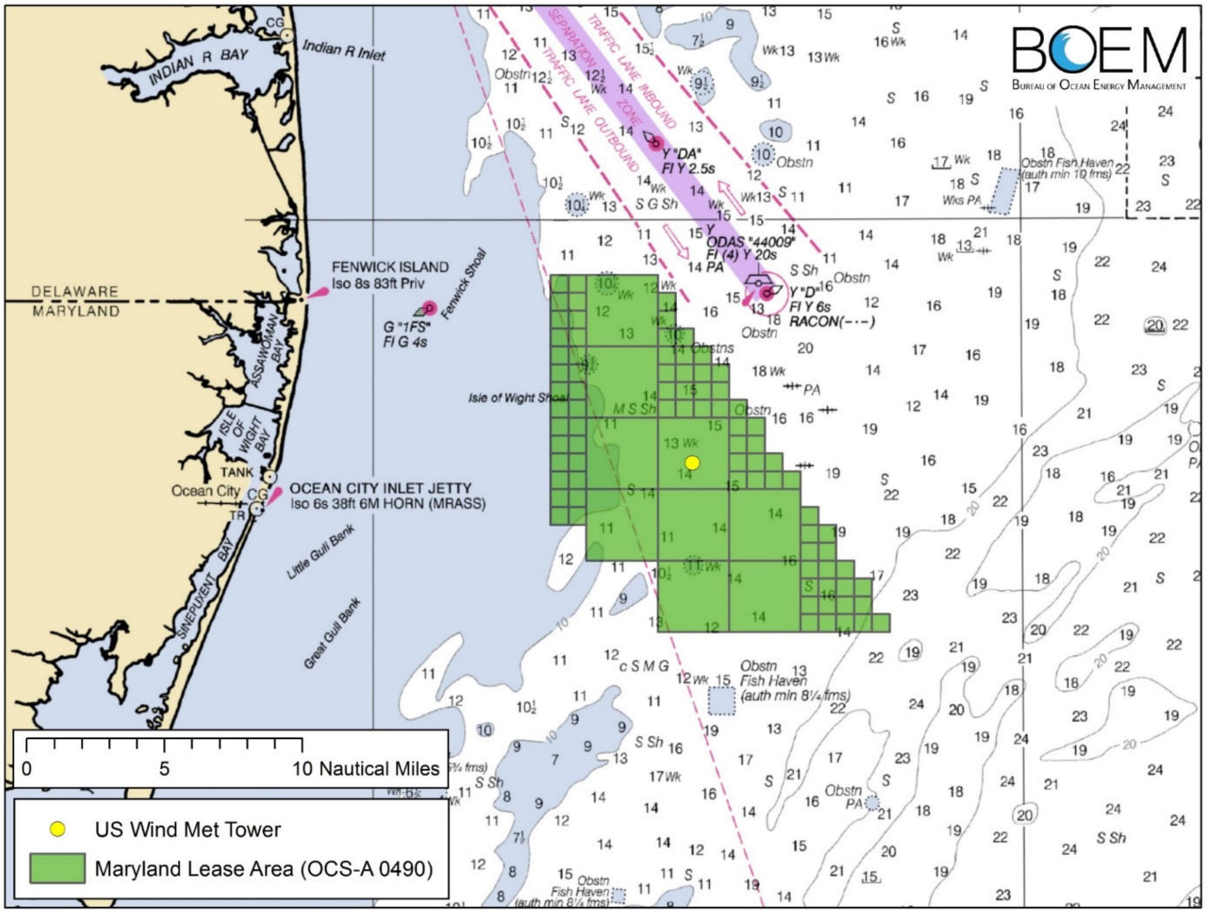

Figure 1-6: Map of MD WEA.

<u>USACE Ocean City Harbor and Inlets Navigation Improvements (Continuing Authorities Program, Section 107)</u>. The USACE Ocean City Water Resources Study completed in 1998 recommended navigation improvements to the harbor and inlet. The recommended project would have consisted of dredging Ocean City Harbor to a depth of 14 feet and dredging the inlet to a depth of 16 feet. The recommended project was not implemented due to nation-wide funding shortfalls in the Continuing Authorities Program and lack of non-Federal sponsor funds. The original sponsors expressed interest to USACE to re-start this project. USACE prepared a determination of federal interest in 2018 recommending re-investigating the project and developing a more comprehensive long-term solution as shoaling patterns have changed substantially since 1998. A Project Partnership Agreement between USACE, MD Department of Natural Resources (MD DNR), and Worcester County was signed in February 2019 to begin the design and implementation of a solution to prevent shoaling in the Ocean City Inlet and Harbor.

2.0 DESCRIPTION OF PROPOSED ACTION

The USACE proposed action is to dredge sand from offshore shoals located in the OCS for the remaining life of the Atlantic Coast Project. It is anticipated that the project would utilize Weaver Shoal for the next nourishment cycle by 2022 and up to two additional cycles. Subsequently, sand needs and shoal values and conditions would be reassessed for future beach nourishment cycles and sand would be dredged from Weaver Shoal, Isle of Wight, Shoal A, and or Shoal B in accordance with the 2008 EIS. Dredging is anticipated in future years 2026, 2030, 2034, 2038, and 2042. However, future borrow actions could occur more frequently than every four years in the event of severe storms.

BOEM is authorized under Public Law 103-426 [43 United States Code (U.S.C.) 1337(k)(2)] to negotiate on a non-competitive basis the rights to OCS sand resources for shore protection projects. BOEM's proposed connected action is to issue a negotiated agreement authorizing use of the sand source areas at the request of USACE and the project sponsor (MD).

2.1 Dredging Vessel Operations at Sea

Currently proposed Atlantic Coast Project dredging practices differ somewhat from what was presented in the 2008 EIS, and are described below.

It is expected that a trailing suction hopper dredge[10] (hopper dredge) will be used to dredge sand from the offshore shoals. One or more dredges may be used at a time. Sand will be dredged from the shoal and pumped into the vessel hopper until the hopper is full while the dredge is transecting the borrow area. Hopper dredges that could potentially be used have capacities ranging from about 4,000 to 15,000 cubic yards. Hopper dredges utilized in 2017 dredging had an effective capacity of approximately 5,000 cubic yards – more than double the volume of hopper dredges anticipated to conduct dredging reported in the 2008 EIS. For the purposes of this EA, it is assumed that dredges comparable to those used in 2017 would be utilized in the future. Based on the average from 2002 through 2017, it is anticipated that approximately 1,000,000 cubic yards would be dredged per renourishment cycle from the seafloor (see Section 2.4). This volume is 200,000 cubic yards per cycle greater than was estimated in the 2008 EIS. This volume would require approximately 200 total round-trip transits to/from the borrow area at 5,000 cubic yard vessel capacity. This is less than half the total number of round trips anticipated per cycle in the 2008 EIS.

Sand is taken up from the seafloor through dragheads, which typically have a width of about 15 feet, on either side of the vessel. Total width of seafloor impacted in a single pass of the vessel would thus be somewhat in excess of about 30 feet. Based on previous project experience, maximum thickness of material removed in a single pass by a hopper dredge could be as much as 1.5 feet (50 cm) or more if the ship speed is slow and sand conditions suitable. However, in sand of medium density, removal of about 1 foot (30 cm) in a single pass would probably be more

[10] A hydraulic cutter head dredge would be less suitable because of pumping distance, and multiple pumps would be required. If a cutter-head dredge is used, sand will be pumped from the borrow area through a pipeline on the sea floor to the beach. Floating booster pumps would be added to the pipeline.

typical. In conditions where more compact sand occurs, as little as 2 to 4 inches (5 to 10 cm) of sand could potentially be dredged on a single pass by a trailer suction hopper dredge. The dredge(s) may make one or multiple passes over any given location in the borrow area.

The hopper dredge will travel about 5 to 10 miles one-way from the offshore shoals to pump-out points (landings) located up to several thousand feet offshore of Ocean City where sand will be pumped to the beach through a temporary pipeline placed on the seafloor[11]. It is anticipated that three or four different landings would be established along the 8.5 mile project length. Dredging contactors determine the number of landings required based on the spatial distribution of fill required along the project and the pump-out capabilities of their equipment. Only one landing is used at a time, and the pipelines for the individual landings are never deployed concurrently[12]. The dredge, landing pipeline, and ancillary equipment would remain offshore of MD and would not cross the MD/DE state line. Following pump-out, the hopper dredge returns to the offshore shoal borrow area and resumes dredging. The 2008 EIS identified that booster pumps would be used to aid pumping sand from offshore. However, it is no longer expected that booster pumps will be utilized.

Dredging for the Atlantic Coast Project has historically occurred predominantly in spring before Memorial Day and in fall after Labor Day. This avoids impacts to summer beach use and avoids winter sea conditions that are typically the roughest of the year. Dredging conducted since 1998 typically took up to about 12 weeks to complete. Inclement weather or equipment problems may increase the amount of time required.

To ensure protection of endangered species (with sea turtles being of particular concern), dredging would be undertaken in compliance with all Reasonable and Prudent Measures and associated Terms and Conditions outlined in the 2006 National Marine Fisheries Service (NMFS) Biological Opinion (BO)[13], as amended and clarified by subsequent correspondence.

Dredging would be undertaken utilizing screening to mitigate against risk of explosions from historic military munitions and explosives of concern (MEC) being taken onto the dredge or placed on the beach. Current practices (2018) apply uniform mitigation measures that include: screening the intakes at the dragheads on the seafloor to prevent intake of any material with a diameter greater than 1.25", screening outflow onto the beach to prevent discharge of any material with a diameter greater than 0.75", and using a robust QC/QA program, which includes having a UXO technician on site 24/7 during operations.

2.2 DETAILS OF DREDGING ON THE SEAFLOOR OF OFFSHORE SHOALS

Sand would be dredged in accordance with environmental/fisheries constraints intended to maintain habitats of the offshore shoals over the long-term (Table 2-1). The mitigational

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[11] Work within state waters (at the pumpout points, pipeline to the beach, and on the beach) is not evaluated in this EA other than for effects to air quality of work on the beach in DE (Sections 4.2.5 and 5.2.5) and potential effects of the pipeline on cultural/historic resources (Sections 4.5.1 and 5.4.1).
[12] Annex B contains additional details on pipe placement procedure.
[13] Contained in 2008 EIS, Annex C.

constraints were previously developed through extensive coordination with resource agencies and academic experts in the 2000s, and were followed when dredging Great Gull Bank in 2002 to obtain sand for Assateague Island (see Annex B). The 2008 EIS provides background information on the rationale for these guidelines. The constraints presented below have been slightly modified from those of the 2008 EIS in that additional constraint information is presented (in parentheses). Additionally, one constraint from the 2008 EIS is not proposed for re-application at this time (discussed in Section 3.3). Section 4.4 presents information on habitat value of offshore shoals.

Mitigational Constraints	**Environmental/Fisheries Rationale**
Dredge no more than about 5% of the total volume of any shoal	Maintain long-term overall shoal relief and size, and thus habitat value.
Avoid the crest (within 500 feet of peak line)	Shoal habitat value contingent upon greater relief off seafloor and waves/currents at crest. Shoal crest may also play role in long-term shoal geomorphic maintenance.
Dredge evenly and thinly (generally no more than several feet) over a wide area. (Maximum removal thickness in one nourishment cycle would be 10 feet.)	Maintain overall shoal geomorphic character, avoid creation of pits (which could induce fine-grained sediment deposition or low oxygen conditions)
Dredge no deeper than ambient depths of the adjacent seafloor	Avoid exposing underlying clay, silt, or gravel (which would change substrate conditions), avoid creation of pits (which could induce mud deposition or be prone to low oxygen conditions)/

Table 2-1: Dredging guidelines and constraints.

2.3 Total Sand Volume Need Re-estimation

Estimates of proposed volumes to be dredged need to be accurate enough to plan dredging to maintain offshore shoal habitats over the long term, as well as ensure compliance with environmental laws. Sand placement that has occurred since the 2008 EIS and re-examination of volume calculations provides a means to check previous need estimates and revise future sand needs forecasts. Annex B provides additional detailed information on sand needs estimate.

Sand Dredged But Not Accounted for in 2008 EIS

USACE contracts for and records the volume of sand placed on the beach in accordance with the project design ("construction template"). The contractor typically places more sand within the construction template than required in order to account for sand movement from natural processes between the time of sand placement and volume verification. This extra volume of sand placed on the beach is not measured accurately by USACE, but is roughly estimated to be approximately 10 percent of the measured placed volume. The 2008 EIS does not consider this unaccounted for sand volume dredged from the borrow areas.

As was noted in the 2008 EIS, during dredging from the seafloor and placing sand in the dredge, less than about 1 percent of the dredged material washes over the weir in the dredge during the dredging process and is lost. This lost material consists of fine grained sand, plus a minor quantity of silt and clay.

Based on combining the estimates of unaccounted volume plus loss, this EA assumes an additional 10 percent increase in the dredged volume from offshore shoals that was previously underestimated in the 2008 EIS. Thus, about 10 percent more sand is dredged from the seafloor than is measured on the beach within the construction template.

Re-estimating Sand Needs Considering Longer Period of Record and Unaccounted for Sand

Volumes placed in the years 2002-2017 were less per renourishment cycle than those of the years 1990-1998 (Table 1-1). This occurred because initial establishment of the engineered beach in 1988 and the early 1990s required a substantial sand volume, as well as because of severe storms in the early 1990s. For the purposes of re-estimating future sand needs for this EA, it is assumed that beach conditions characteristic of the present started in January 1999, and that each renourishment volume placed from 2002 onward thus effectively replaces the volume of sand eroded in the period of several years prior to that placement. (For example, sand placed in 2002 provided sand to compensate for sand lost from the beach in the years 1999, 2000, 2001, and 2002).

The volume measured on the beach per nourishment cycle in 2002, 2006, 2010, 2014, and 2017 averaged 879,000 cubic yards. However, because the 2017 renourishment occurred after only 3 years rather than 4 years, the actual yearly average sand volume placed over the period was greater than dividing 879,000 cubic yards by four. Average annual sand placement as measured on the beach was approximately 232,000 cubic yards over the 19 years from 1999 through 2017 (inclusive). If this had been placed every four years, the average would have been 925,000 cubic yards measured on the beach per nourishment cycle. To account for an extra 10 percent placed on the beach, but not measured, would have required dredging 1,017,500 cubic yards from the offshore shoals every four years. Assuming that future renourishment would occur every four years at the volume of 925,000 cubic yards in the years 2022, 2026, 2030, 2034, 2038, and 2042, then total sand future need as measured on the beach within the construction template would be 5,550,000 cubic yards. The volume that would need to be dredged from the offshore shoals (to account for additional volume placed on the beach) would be 6,105,000 cubic yards.

The long-term record of the USACE project beginning in 1992 (after initial engineered beach establishment in 1990 and 1991) shows contract volume averaging 1,311,000 placed on the beach each nourishment cycle. The yearly average volume measured on the beach over the years 1992 through 2017 was 328,000 cubic yards (yd3). If the future contract volume need is forecast based on the 1992 through 2017 record, then annual average sand need measured on the beach would be 328,000 cubic yards, or 1,311,000 cubic yards every four years. Total future sand need as measured on the beach for six additional renourishment cycles in the years 2022, 2026, 2030, 2034, 2038, and 2042 would be 7,866,000 cubic yards.

The 2008 EIS forecast future sand needs based on the two time periods: total project placement record, and limited project placement record in 2002 and 2006. Updating forecast future sand needs based upon the total project placement record (which includes through 2017) and compensating for volume placed on the beach but not measured, it is forecast that sand needs dredged from the seafloor in federal waters out through 2044 would be 8,652,000 cubic yards (Table 2-2). Based on project sand needs considering only 1999 through 2017 (excluding consideration of volumes placed from 1990 through 1998) yields a sand needs from the offshore shoal forecast of 6,105,000 cubic yards.

Table 2-2: Estimated future sand needs through 2044.

Sand Needs Estimate Based on Years of Record	Contract Volume Measured on Beach (yd3)	Estimated Volume Dredged from Offshore (yd3)	Estimate Type
1999-2017	5,550,000	6,105,000	"Minimum"
1992-2017	7,866,000	8,652,000	"Maximum"

2.4 Dredging Individual Shoals

Utilizing the guideline to dredge no more than 5 percent of the total volume of any offshore shoal (Table 2-1) and shoal total volume as determined in Maryland Geological Survey (MGS) reports, the 2008 EIS provided a total volume that could be dredged from each of the four candidate shoals (Table 2-3). Total shoal volumes have not been updated since the 2008 EIS was prepared, so the 2008 EIS 5 percent volume determinations remain applicable at this time.

Table 2-3: Total volumes and maximum agreed-to environmental/fisheries dredge volumes.

Volume (yd3)	Offshore Shoal			
	Weaver	Isle of Wight	A	B
Total	93,000,000	136,000,000	103,000,000	50,0000,000
Maximum 5% acceptable to dredge	4,650,000	6,800,000	5,150,000	2,500,000

The boundaries and thickness of suitable sand in proposed borrow areas of Isle of Wight Shoal and Weaver Shoal have been refined to a greater level of detail than was presented in the 2008 EIS. USACE collected a substantial number of new cores from selected areas of Isle of Wight and Weaver Shoals in 2016[14]. (The last previous coring of Isle of Wight and Weaver Shoals was completed in 2002.) Shoal A and Shoal B have not been further investigated by USACE any

[14] Detailed information is contained in separate USACE engineering document entitled "Renourishment Borrow Study Isle of Wight and Weaver Shoals," completed in June 2019.

further than what was presented in the 2008 EIS, and were last cored in 2002 and 1995, respectively.

A substantial portion of the sand from Isle of Wight and Weaver Shoals is very similar to the sand on the engineered beach at Ocean City. While these offshore shoals do contain a small percentage of gravel, dredging would be conducted to match as well as possible the mean grain size of the Ocean City engineered beach. Multiple sub-areas have been delineated on each shoal based on sand characteristics and their suitability for use on Ocean City beach (Figures 2-1 and 2-2). Tables 2-4 and 2-5 present volumes of sand down to -40 ft and -60 ft elevation within sub-areas identified to be preferred for beach nourishment.

Sub Area	From Shoal Surface Down to Elevation ft (NAVD88)	Volume Cubic Yards
W-1	-60	14,500,000
W-1	-40	1,300,000
W-2	-60	Less suitable (finer)
W-2	-40	Less suitable (finer)
W-3	NA	Not determined

Table 2-4: Weaver Shoal sub-area sand volumes suitable for engineered beach.

Sub Area	From Shoal Surface Down to Elevation ft (NAVD88)	Volume Cubic Yards
IW-1	-60	22,500,000
IW-1	-40	6,200,000
IW-2	-60	Less suitable (finer)
IW-2	-40	Less suitable (finer)
IW-3	NA	Not determined
IW-4	NA	Not determined

Table 2-5: Isle of Wight Shoal sub-area sand volumes suitable for engineered beach.

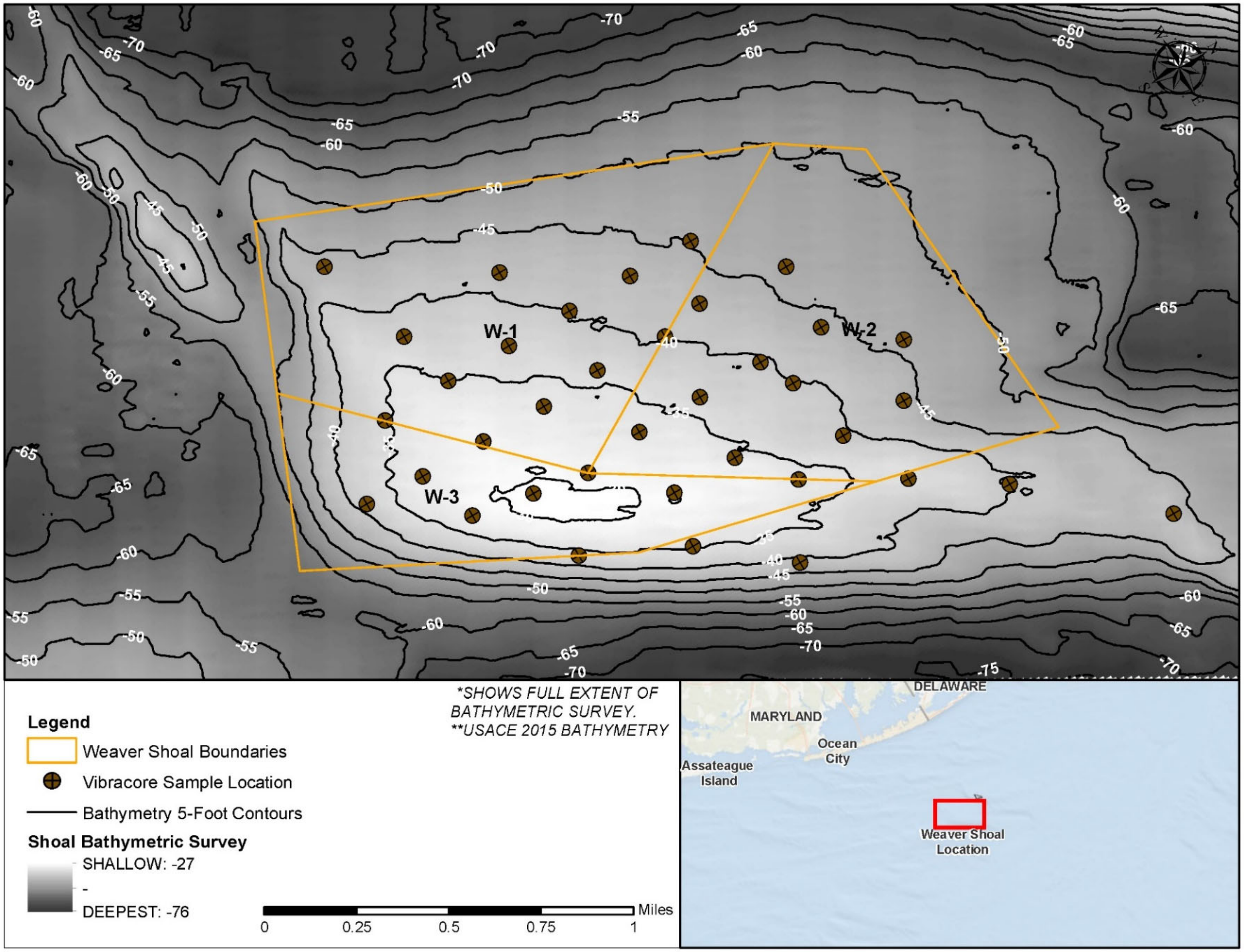

Figure 2-1: Weaver Shoal sub-areas.

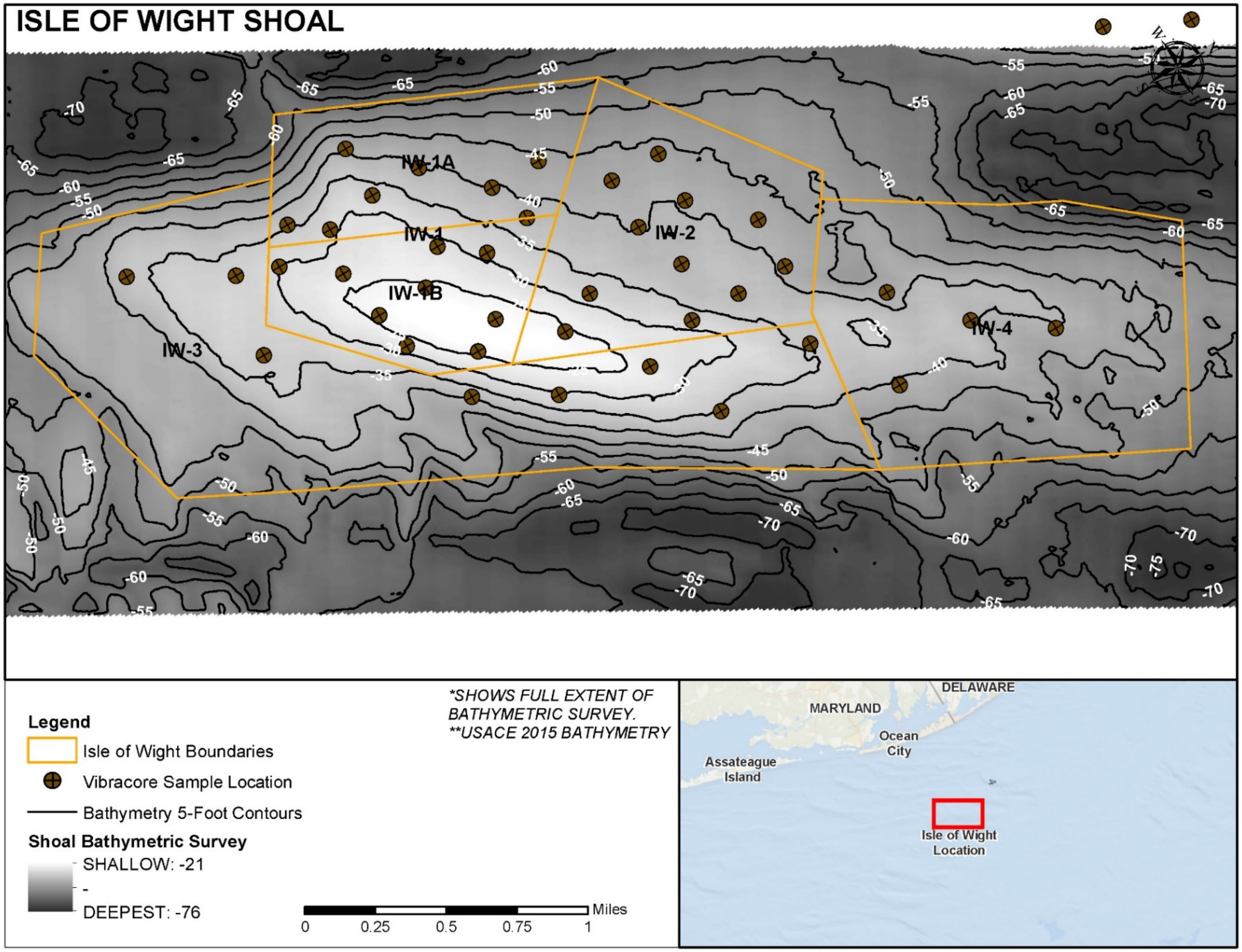

Figure 2-2: Isle of Wight Shoal sub-areas

Weaver Shoal
USACE would dredge Weaver Shoal in the next nourishment cycles within the subareas identified that have sand suitable for Ocean City beach (Figure 2-1; Table 2-4). The selection of which subareas to utilize would be identified just prior to the time of dredging. All dredging activities within each subarea would comply with the dredging constraints outlined in Section 2.2.

The 2008 EIS reported that the maximum volume that can be acceptably dredged from Weaver Shoal while maintaining its geomorphic integrity would be about 4,650,000 cubic yards (Table 2-3). This maximum acceptable volume is less than the estimated sand need out to 2044 (Table 2-2). Thus, it is unlikely that Weaver Shoal would be able to provide the full volume of sand needed to maintain the Atlantic Coast Project through 2044 unless sand needs prove to be much less than estimated.

Based on a revised engineering estimate of total volume of beach-suitable sand available down to elevation -60 feet (the seafloor plain elevation) prepared in 2018, a maximum of about 14,500,000 cubic yards of sand could potentially be obtained from Weaver Shoal from borrow sub-area I on the west/northwest side of the offshore shoal if there were no constraint on maximum volume that could be removed (Table 2-3). However, the dredging constraints (Table 2-1) would not allow this full volume to be dredged.

Isle of Wight Shoal
The 2008 EIS reported that total volume of Isle of Wight Shoal is 136,000,000 cubic yards. Thus, the maximum that could be dredged from Isle of Wight Shoal while meeting the 5 percent dredging constraint would be 6,800,000 cubic yards. This maximum acceptable volume is greater than the minimum volume of sand estimated to be needed (Table 2-2). Thus, potentially all the project sand needs out to 2044 could be obtained from Isle of Wight Shoal while still meeting the dredging constraints (Table 2-5).

Based on 2018 estimates, the volume of beach suitable sand identified within defined sub-area I on the west/northwest side of Isle of Wight Shoal is estimated to be 6,200,000 cubic yards to -40 feet, and 22,500,000 cubic yards to -60 feet. Both these volumes though would require sand to be blended from throughout that sub-area to meet engineering beach sand grain-size requirements. However, these full volumes could not be dredged while meeting the dredging constraints (Table 2-1). Borrow area I was further divided into sub-areas IA and IB, with IA containing sand of greater suitability than IB. Sand from sub-area IA could be dredged and placed on Ocean City beach without blending.

Shoal A, Shoal B
Pending future detailed investigation of sand resources, and re-assessment of fishery value and shoal condition, shoals A and or B could potentially be dredged in accordance with the dredging constraints in the future. On Shoal A, engineering investigations conducted prior to the 2008 EIS identified sand in one sub-area (I) as being fully acceptable for beach nourishment. On Shoal B, engineering investigations had also identified one sub-area (also I) as containing sand suitable for beach nourishment. Shoal B has an artificial reef that would need to be avoided. It is likely that the high fishery value of Shoal B will persist into the future as the high value is likely associated

with the artificial reef. However, the presence of the artificial reef itself does not mean that the shoal could never be used as a sand source. In the future, if Shoal B's relative fishery value declines, dredging could be conducted in such a manner as to avoid physical impacts to the artificial reef[15], as well as maintain offshore shoal habitats over the long-term.

2.5 BATHYMETRIC MONITORING

Bathymetric surveys of the offshore shoals will be conducted before and after each dredging event. These surveys will provide a means to verify that dredging is done in accordance with dredging constraints. Comparison of bathymetric records from multiple years will be conducted to determine whether dredging under the mitigational constraints (Table 2-1) are effectively maintaining longer- term geomorphologic integrity of the offshore shoals, and thus their habitat values. Bathymetric records comparison will focus on overall coarse scale bathymetric character of the shoals. The dredging process is anticipated to leave small scale temporary furrows that would not be monitored, as those furrows would not pose a long-term threat to shoal geomorphic character (Section 5.1.2).

[15] Great Gull Bank, which lies on the border of state and federal waters south of the Ocean City Inlet (Figures 1-1 and 1-2), has an artificial reef. Great Gull Bank was dredged to provide sand for Assateague in 2002 in a manner that avoided physical impacts to the artificial reef.

3.0 ALTERNATIVES CONSIDERED

The formulation of alternatives in this EA focuses on re-assessment of the four candidate shoals identified in the 2008 EIS (Table 3-1). It was recognized that the relative value of the offshore shoals as fishing grounds changes over time, and thus re-determining that relative value was necessary in planning future borrow actions. Additionally, in light of the substantial amount of new information available for the study area by virtue of passage of 11 years (without having dredged offshore shoals in the OCS), it was necessary to verify whether changes over the time period 2008 to 2018 had management implications.

Alternatives for Dredging Offshore Shoals
Offshore shoal sequence of dredging
Whether to modify dredging physical constraints of 2008 borrow plan
Whether to add time-of-year restrictions

Table 3-1: Considerations in formulating offshore shoal alternatives in this EA.

This EA also re-evaluates increased use of the ebb shoal under the LTSM Project as a sand source for Ocean City to update consideration of that potential resource from what was presented in the 2008 EIS.

3.1 No Federal Action

The project provides CSDR for Ocean City utilizing sand dredged from the ocean seafloor. Under the no action alternative, the project would be conducted following findings of the 2008 EIS and sand would be dredged for the Atlantic Coast Project from any combination of Isle of Wight Shoal, Weaver Shoal, and Shoal A for the next beach nourishment cycle. Shoal B would not be dredged as its fishery value relative to the other shoals would be assumed not to have declined. Updated information regarding environmental conditions and fisheries would not be sought or utilized to further select among these three offshore shoals or further plan the sequence of dredging from the candidate shoals. Dredging would be undertaken in accordance with the dredging constraints presented in the 2008 EIS without further review to determine whether modifications to the dredging constraints would be appropriate.

3.2 Offshore Shoal Sequence of Dredging

The 2008 EIS provided a flexible borrow plan in which sand could be dredged from any one of the candidate offshore shoals in any order depending on consideration of cost, engineering factors, and environmental concerns. Cost of transporting sand varies largely as a function of shoal distance offshore, with fuel consumption a principal cost variable. Engineering considerations focus on compatibility with Ocean City engineered beach sands and practicability of dredging. Environmental concerns principally focused on whether any of the candidate shoals is of notable habitat or fishery value at any particular time such that dredging of that shoal should not be conducted.

Since the 2008 EIS, detailed engineering investigations have been conducted of Weaver and Isle of Wight Shoals sands, as these shoals would be the most cost-effective because of their closer distance to shore than Shoals A and B. USACE cored and analyzed sands from Isle of Wight Shoal and Weaver Shoal in 2016 to generate detailed borrow plans for using sand from those shoals (Section 2.4). Both shoals contain sand suitable for borrow in large quantities for the next and future beach nourishment cycles, and either would cost about the same amount to dredge from. Either shoal would be acceptable from an engineering and cost perspective to dredge from.

To determine whether or not relative fishery value or environmental conditions on the candidate offshore shoals had changed such that it would influence which shoals were selected for dredging by 2022, coordination was undertaken with resource agencies and fishermen. This coordination verified the determination of the 2008 EIS that dredging Shoal B would be opposed by fishermen (Annex A). However, fishermen also expressed that Isle of Wight Shoal is highly productive at this time, and they would prefer that it not be dredged in the near term. This higher fishery value is speculated to result from it being the tallest of the offshore shoals being considered.

The 2008 EIS flexible borrow plan allowed for the offshore shoals to be dredged in any order and any number of times, provided that the dredging constraints were met. The 2008 EIS did not provide an explicit constraint regarding repeated dredging of the same area, but suggested it might be appropriate to allow substantial periods of time between making re-use of the same borrow area to allow for monitoring of change. Whether or not the same borrow area should be dredged in back to back cycles was re-considered for this EA. Of greatest importance from a fisheries and environmental perspective would be whether repeat dredging impacts long-term shoal geomorphic integrity and thus habitat value more than dredging with substantial periods of time between dredging events. Verifying this geomorphically would require multiple bathymetric data sets to track shoal evolution over time in the future. Over the short-term, repeated dredging would maintain that one area in a disturbed condition in which benthos may not have fully recovered, but it would also avoid spreading out impacts to benthos in multiple areas. Whether or not dredging should or should not make re-use of the same borrow area in back-to-back cycles was not resolved.

3.3 Modify Dredging Physical Constraints of 2008 Borrow Plan

Based on increased attention to the offshore shoals as habitat for shellfish and fish, utilizing constraints (Table 2-1) to ensure dredging would not compromise long-term habitat value of these features is even more important than at the time of the 2008 EIS. However, in the 2008 EIS the rationale for maintaining the offshore shoals was partly founded on identification of the offshore shoals as important foraging habitat for seabirds. Research since that time (Section 4.4.4) has not verified that offshore shoals are highly valued foraging habitat. Thus, the justification that dredging needs to be conducted in such a manner as to maintain the offshore shoals as foraging habitat for seabirds is of less importance than previously thought.

Because the offshore shoals have gentle side slopes and the highest elevations occur on a broad flat area along the shoal long axis, the "crest" is difficult to define. Accordingly, it was determined that the intent of the guideline to avoid the crest would be met in the future if dredging is not performed within 500 feet on either side of the highest elevations along the shoal "crest." While the constraints seek to maintain large-scale geomorphic character, it was recognized that minor lengthy furrows would be created, as well as localized low spots, during dredging.

The dredging constraints (Table 2-1) were developed in the early 2000s based on the best information available at that time. Since then, computer modeling has been conducted to investigate offshore shoal geomorphic changes that would occur under a variety of dredging scenarios. Minerals Management Service (MMS) (2010) modeled dredging scenarios at Isle of Wight Shoal, Weaver Shoal, and Shoal A. MMS (2011) modeled long-term evolution of Isle of Wight Shoal, and considered the possibility of universal dredging guidelines and constraints to protect shoals. BOEM (2013) summarizes guidelines proposed by investigators to that time, and BOEM (2015) provides additional consideration of constraints. Additionally, previous dredging of Great Gull Bank by USACE in 2002 (Annex B) provides a means to verify over the short-term (years) whether the dredging constraints served to maintain shoal geomorphic integrity.

Investigations conducted by MMS and BOEM since the 2008 EIS provide pertinent guidelines/constraints somewhat different or more detailed than those presented in the 2008 EIS. MMS (2010) recommended dredging higher elevations at the downdrift, leading edge of the offshore shoal. That way, sand would move from updrift into these downdrift areas by wave and current transport. MMS (2010) recommended against dredging from erosional areas that source downdrift depositional areas. This guideline in particular was different from the guidelines developed in the 2008 EIS which promoted dredging at either the downdrift or updrift shoal ends/sides (but was silent about intermediate areas). BOEM (2015) recommended dredging on the downdrift side, but not dredging longitudinally along the shoal.

MMS (2011) and BOEM (2013) recommended that the ratio of maximum height to base water depth be utilized as a criterion in determining whether or not an offshore shoal should be dredged. Shoals with relative shoal height ratio less than 0.5 would not likely recover to pre-dredge height.

BOEM (2015) stated that for ridge/trough shoals in the Mid-Atlantic region, shoal height (relief) was the most important factor representing shoal integrity. This supports the constraint to avoid the crest, and because crest relief off the seafloor is at least partly related to shoal volume, it probably supports having a constraint regarding total volume that can be dredged.

A desktop analysis of bathymetric change at Great Gull Bank over the period 1999 to 2008 that captures impacts of dredging on the southeast side of the shoal conducted in 2002 under the constraints presented in Table 2-2 provides an initial means to assess whether the guidelines of the 2008 EIS are adequate. Great Gull Bank crest height over the period 2002-2008 west of the area dredged showed minor change overall, with a maximum loss of elevation of about 5 feet in the area of the crest immediately west of the dredged area. Overall shoal geomorphic integrity was maintained (Annex B). The shoal had undersea spit growth at its southwestward end. However, scour on the southeast side of the shoal occurred after dredging, which would not have been expected given that the shoal itself is believed to be rolling to the south over time (Pendleton et al, 2017). This may reflect absence of severe storms during the time period 2002 – 2008 that could have caused southward shoal movement. Further monitoring of bathymetry at the shoals is needed to determine what longer term trends will be.

Coordination with the MGS indicated that the dredging guidelines of the 2008 EIS are still likely suitable (Annex A). However, because preferential dredging at the updrift or downdrift sides is not practicable given the wide area over which dredging would need to be conducted to thinly dredge, and uncertainty over how this constraint would apply to the apparent difference between how migration would be interpreted over the short-term versus the long-term (Great Gull Bank; Annex B), this guideline from the 2008 EIS is not proposed to be continued at this time, but may be reinstated again in the future. No further modification to the dredging constraints is proposed.

3.4 Add Time of Year Restriction mitigation measure

The 2008 EIS stipulated no environmental or fishery time-of-year restriction, allowing work to occur at any time of year subject to engineering and cost considerations. NMFS staff suggested that USACE consider including a time of year restriction on dredging as an additional mitigation measure. The Mid-Atlantic Fishery Management Council (MAFMC) recommends winter/early spring as an optimal time for dredging from an environmental and fisheries perspective as productivity of benthic infauna is at a minimum, and spring migrants have not yet arrived from southerly and offshore waters. (Winter diversity is somewhat lower, limited to year-round resident species plus some northerly species that have migrated south into the area; see Sections 4.3 and 4.4).

Although the area to be impacted cumulatively by dredging for borrow sand off Delmarva by USACE and others is large, it represents a small portion of available bottom or even shoal habitat. Benthos are widely distributed over this region and expected to recover to pre-project conditions within several years based on BOEM reports. Dredging during winter/early spring would pose greatest impact to bottom-oriented (demersal) fish at the time of year when they are sluggish and least capable of avoiding dredge collision or entrainment. Thus, winter dredging could pose greater risk of harming substantial numbers of demersal fish. Additionally, while project dredging and placement has been conducted to a limited extent in Winter, this season poses safety risks to vessels and crew because seas are generally the roughest of the year, making the work more difficult and increasing costs. Dredging is already routinely conducted otherwise in spring.

Review of NMFS "Other Trust Resources" concerns (Annex C) identified the possibility that horseshoe crab may occur in relatively high densities on the offshore shoals at times. If this is occurring in association with a concentrated migration route of this species into or out of Delaware Bay (highly important habitat for horseshoe crab), then this could potentially be an important consideration regarding time of year for dredging. Potential presence of this species in commercial numbers on Great Gull Bank was previously identified as a concern by MD DNR when dredging for Assateague in 2002 was being planned (Annex B). Coordination with NMFS (Annex A) was undertaken to further investigate this topic during preparation of this EA. It was determined that information on horseshoe crab concentration areas and migration corridors on the OCS is limited. However, because the candidate shoals are more than 25 miles from the mouth of Delaware Bay and the entrance into Delaware Bay from the Atlantic Ocean is more than 10 miles wide, horseshoe crabs could spread out over a wide area of the Continental Shelf when entering/exiting the bay. It was determined to be unlikely that potential impacts to horseshoe crab population would be an important concern for dredging Isle of Wight, Weaver, A, or B Shoals. However, because information regarding distribution of horseshoe crab in the OCS appears to be limited, further scientific study to investigate horseshoe crab migration and congregation appears warranted.

Based on the above considerations, adding a time-of-year restriction on dredging was determined to be of unclear environmental and fisheries benefit as this time. Accordingly, this alternative was rejected, and no additional time-of-year restriction beyond that in place to protect beach recreation is recommended.

3.5 UTILIZE EBB SHOAL UNDER LTSM PROJECT

The 2008 EIS also recommended considering making increased use of sand from the Ocean City Inlet ebb shoal for placement at Ocean City up to the full 20,000 cubic yards per year authorized under the LTSM Project (see Section 1.4). Members of the public and resource agency staff have previously suggested making increased use of the ebb shoal as a sand source for Ocean City, and this idea was identified again at a public meeting held with fishermen in July 2018 conducted during preparation of this EA (Annex A). The ebb shoal in its current form is an unintended consequence of manmade stabilization of the Ocean City Inlet by USACE in the 1930s, jetty modifications over time, as well as addition of sand to Ocean City to maintain the beach. USACE has monitored the ebb shoal since the 1990s and it has been continuously growing over this time period. Subsequent to the 2008 EIS, the ebb-shoal system gained 772,900 cubic yards from 2008 - 2014, even after accounting for sand being dredged and removed for the Assateague LTSM Project (USACE 2016).

The ebb shoal is considered to have low habitat and fishery value compared to the offshore shoals. Additionally, it is a navigation problem for vessels entering/exiting the inlet. Increased dredging of the ebb shoal could have important navigational benefits, and produce minor environmental benefits by reducing need of dredging the offshore shoals by a minor volume.

However, sand from the ebb shoal is not engineeringly suitable for the Atlantic Coast Project. Sand occurs in various layered gradations within the ebb shoal, and contains sand finer than what is necessary to maintain the engineered beach at Ocean City. Fine grained sand is mobilized by waves and wind, and does not remain on the beach adequately to fulfill the CSDR needs of the project. Getting large dredges that can cost-effectively obtain sand would be difficult because water depths do not meet draft requirements of these vessels. While the smaller dredges utilized for Assateague LTSM can dredge sand from the ebb shoal, the small capacity of these vessels would greatly increase cost of providing sand in comparison to large offshore-capable dredges. These small dredges place sand into the nearshore littoral system, and only minor quantities of sand would be moved by natural processes onto the beach to provide project coastal storm damage reduction benefits. While the ebb shoal is adjacent to southern Ocean City, it is 9 miles from the northern end of the Atlantic Coast Project, which would reduce potential cost advantages of reduced transport distance for that portion of the project. Ocean City expressed that it is not interested in increased use of sand from the ebb shoal under the LTSM Project, other than for possibly to repair erosion following severe storm events.

Thus, other than for possibly immediately after severe storm events, the alternative of making increased use of the ebb shoal to provide sand for Ocean City under the LTSM project is not recommended.

3.6 RECOMMENDED ALTERNATIVE

Dredging Weaver Shoal for the next one or more beach nourishment cycle(s) is the recommended alternative. Under this sequence of offshore shoal dredging, neither Isle of Wight nor Shoal A nor Shoal B would be dredged for the next one or more cycles. The recommended alternative includes one modification of the 2008 borrow plan dredging constraints, in that dredging need not be preferentially done at the up or downdrift end/side of Weaver Shoal. The recommended alternative would not impose any additional time of year restriction on dredging. This is a combination of alternatives "Offshore shoal sequence of dredging" and "Whether to modify dredging physical constraints of 2008 borrow plan" as described in Sections 3.2 and 3.3, respectively.

Although USACE conducted detailed engineering investigations of Isle of Wight and Weaver Shoals (because these would be lower cost sources of sand than Shoal A or Shoal B), because Isle of Wight Shoal currently has higher fishery value than Weaver Shoal, only Weaver Shoal is included in the recommended alternative for the next one or more beach nourishment cycles. The maximum volume that could be dredged from Weaver Shoal would be 4,650,000 cubic yards under the dredging constraints (Table 2-1). At an average expected renourishment volume dredged from the offshore shoals of 1,017,500 cubic yards per cycle, Weaver Shoal could support four future renourishment events.

In the future, dredging of Isle of Wight Shoal, Shoal A, or Shoal B could be conducted for sand needs, pending re-assessment of engineering, environmental, and cost considerations. The latter could include fluctuating fuel costs, which could make it more cost-effective over the long run to dredge further offshore (such as Shoal A) when fuel prices are low, but closer to shore when fuel prices are high (such as Isle of Wight Shoal).

Upon the reassessment contained in this EA, it was determined that the substantial increase in OCS knowledge, changes in policy, listing of new endangered species, changed EFH designations, better understanding of hopper dredging risk to sea turtles, and increased use of the OCS for other purposes do not have management implications inconsistent with the rationale behind the borrow plan formulated in the 2008 EIS. Detailed engineering investigations conducted since 2008 further support that Isle of Wight and Weaver Shoals are appropriate sources of sand for the Ocean City engineered beach. However, this EA determined that at this time Isle of Wight Shoal is perceived to be of higher value by fishermen than Weaver Shoal, which was not the case when the 2008 EIS was prepared. This EA determined that the apparent relatively high value of the offshore shoals as foraging grounds for seabirds is less than was previously believed (Section 4.4.4). However, the EA identified that it would be appropriate to further investigate horseshoe crab concentration areas and migration routes on the OCS, which was not a recommendation of the 2008 EIS.

Although there would be navigational, environmental, and fishery benefits of making greater use of the ebb shoal as a sand source for Ocean City under the LTSM project, that sand is less suitable for the engineered Ocean City beach. Additionally, the cost per cubic yard to transport sand with the small dredges used for the LTSM Project would not be competitive with the costs of transporting sand with large hopper dredges used for the Atlantic Coast Project. Accordingly, no increased use of sand from the ebb shoal for Ocean City under the LTSM project, other than following severe storm events, is recommended at this time.

USACE will conduct future bathymetric monitoring of the offshore shoals to verify how dredging impacts shoal evolution and whether the dredging constraints are maintaining shoal geomorphic integrity. USACE will conduct volumetric and depth change analyses, prepare seafloor change maps, and coordinate the findings with BOEM, NMFS, and MGS. In particular, future monitoring should reassess whether or not dredging should be focused on the leading edge of the shoal but avoid the trailing edge as recommended by various investigators. Long and short-term shoal evolution patterns may differ, as indicated by the apparent short-term migration direction of Great Gull Bank (Annex B) being somewhat different from reported long-term patterns (Pendleton et al., 2017). Whether or not additional dredging constraints proposed by recent modelers should be utilized in planning shoal dredging (such as ratio of shoal height to water depth; Section 3.3) should also be considered in the future.

4.0 AFFECTED ENVIRONMENT

This section provides a general information for each topic of interest summarized from the 2008 EIS, then provides a summary of new information and or changes since the 2008 EIS. USACE, Maryland Geological Survey (MGS), BOEM and its predecessor Minerals Management Service (MMS), US Geological Survey, and academic scientists have studied the seafloor and shoals of the study area since the 2008 EIS. Of particular interest, findings from BOEM studies in the MD WEA provide updated information regarding conditions immediately east of the candidate offshore shoals (Figure 4-1). The BOEM 2017 document "Habitat Mapping and Assessment of Northeast Wind Energy Areas" is incorporated by reference into this EA. Citations of reports of particular relevance to this study can be found in Section 8 (References).

4.1 EA Content and Topics Eliminated from Consideration

In preparation of this supplemental EA, topics given consideration in previous NEPA documents were reviewed for relevance. Table 4-1 provides a summary of topics eliminated from consideration in this document because of the offshore geographic focus of the study area or lack of notable new information.

Topic	Reason for Elimination
Aesthetic/Visual Characteristics	Negligible impact. Temporary presence of transiting dredges would occur. However, the proposed vessel presence is characteristic of the project area and is consistent with vessel activity during prior beach nourishment events for the Atlantic Coast project.
Land use	Not applicable. In the future, the use of the project area for energy production might require consideration under this topic.
Soils	Not applicable. Seafloor sediments are considered under the topic of geology.
Plankton	Negligible impact and no notable updated information which could have management implications identified.
Vegetation (including SAV and Wetlands)	Not applicable. Macroalgae and SAV are absent from the coastal ocean waters because the substrate is too dynamic and water clarity is limiting to growth. Wetlands are absent because water depth is too great.
Human Population	Not applicable. The area is open ocean with no permanent human inhabitants.
Wild and Scenic Rivers	Not applicable. The project area is open ocean and there are no designated wild or scenic rivers on the adjacent land

Table 4-1: Topics eliminated from detailed consideration.

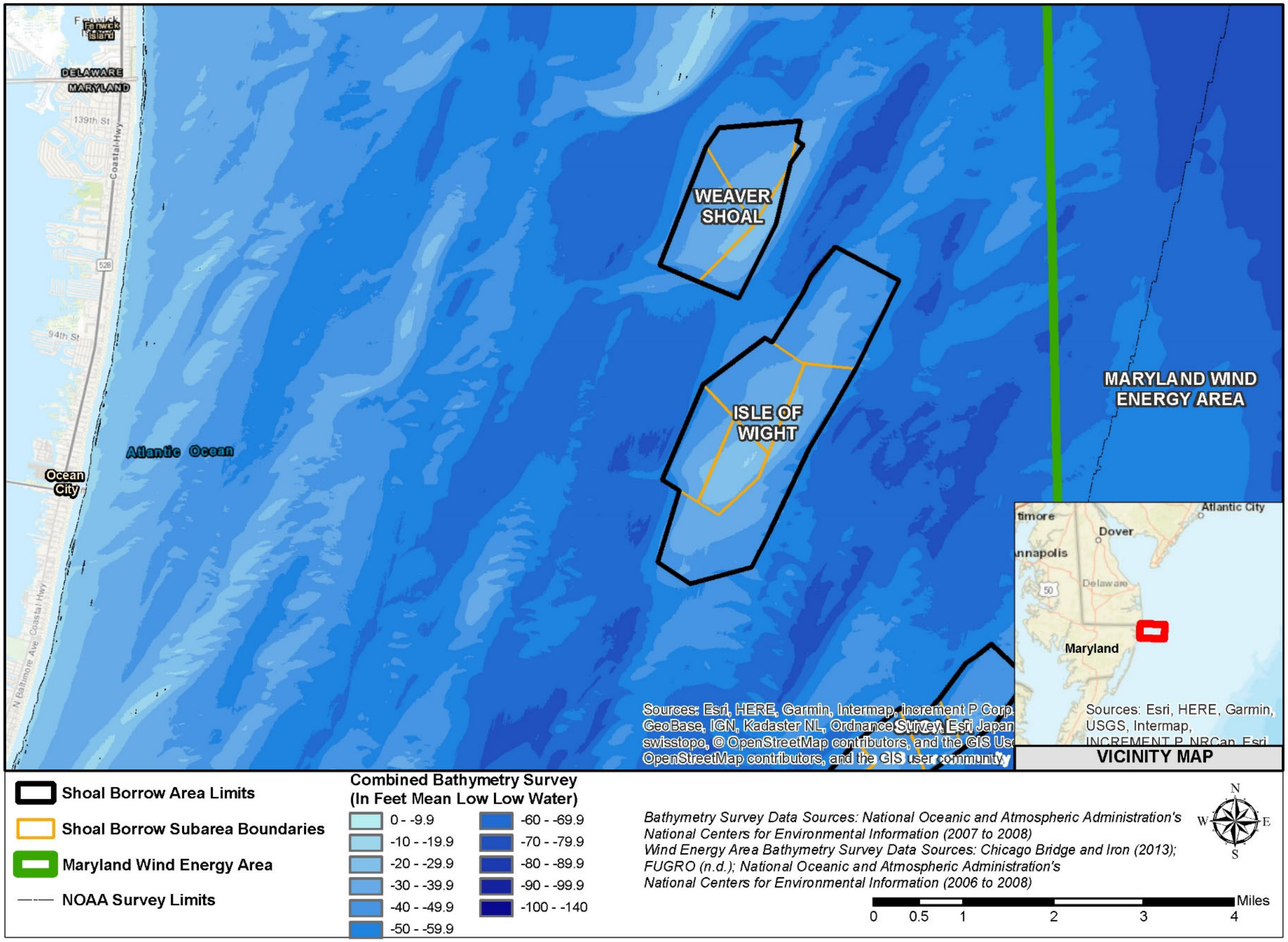

Figure 4-1: Potential borrow areas on Weaver and Isle of Wight Shoals in relation to MD WEA.

4.2 PHYSICAL ENVIRONMENT

4.2.1 Bathymetry and Physiography

The 2008 EIS provided a regional overview of the offshore shoals and ocean seafloor in the vicinity. The bathymetry of the study area is essentially a smooth underwater plain with a number of large shoals that rise gently up from the seafloor. Table 4-2 presents a summary of the characteristics of the four shoals of interest.

Shoal (N to S)	Distance Offshore – Shoal Centroid (mi)	Area (mi2)	Base Length (mi)	Maximum Width (mi)	Relief Off Seafloor (ft)
Weaver	7.2	3.8	4.1	1.4	36
Isle of Wight	7.2	5.5	4.9	1.6	42
A	9.6	5.2	3.7	1.5	28
B	11.0	4.4	4.7	1.2	33

Table 4-2: Offshore shoal characteristics (USACE, 2008).

Updated bathymetric data for the seafloor off MD was collected by NOAA in 2007-2008. USACE conducted bathymetric surveys of Isle of Wight and Weaver Shoals most recently in May 2015 in association with engineering investigations[16]. The highest elevation (where shallowest waters occur) recorded on Weaver Shoal by USACE in 2015 was -29 feet. The lowest elevations (where water depths are the greatest) in the proposed borrow areas are about --65 feet. The seafloor off Weaver Shoal in the surrounding vicinity has elevations of about -55 to -70 feet. Shallowest waters recorded on Isle of Wight Shoal by USACE in 2015 occurred at an elevation of -22 feet in 2015. Elevations in the proposed borrow area ranged from about -25 to about -70 feet elevation. The seafloor in the vicinity around the shoal had elevations of about -50 to -70 feet.

BOEM (2017) subdivided topographic areas of MD WEA into crest, depression, flat and slope. Depressions are identified in the swales between distinct offshore shoals in the west and southern portions of the MD WEA. Distinct slopes are also mapped in the western and southern portion of the MD WEA in the area also possessing offshore shoals. The majority of the MD WEA on its eastern side is mapped as flat and lacks distinct mapped crests, depressions, or slopes. MGS (2015) characterized bathymetric features in the vicinity of Weaver and Isle of Wight Shoals as shoal crest, shoal flank, intershoal, and patch mud (Figure 4-2).

[16] NAVD88.

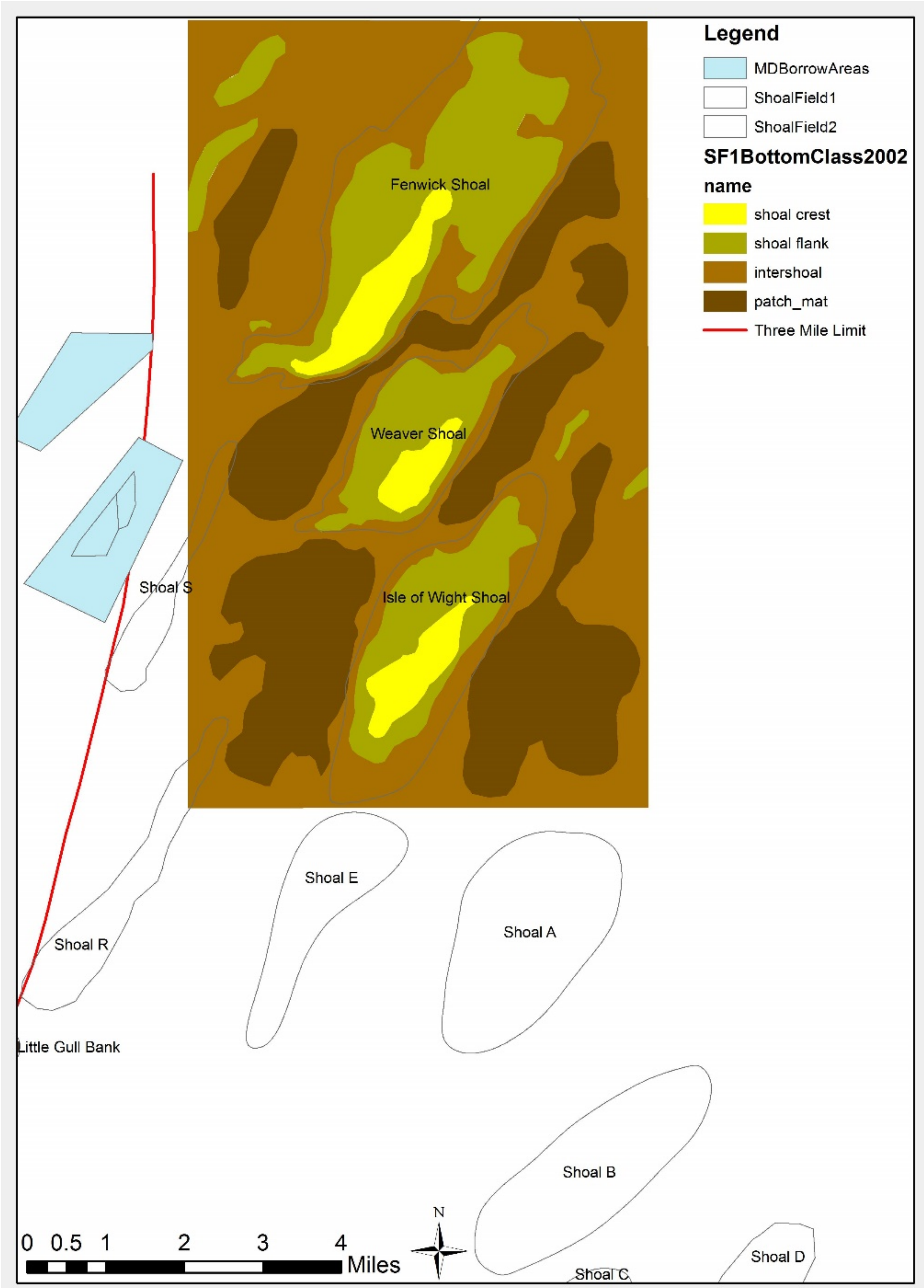

Figure 4-2: MGS bathymetric classification of seabed in vicinity of Weaver and Isle of Wight Shoals.

4.2.2 Geology

The 2008 EIS provided a regional characterization of the ocean seafloor. The seafloor consists of variable layers of surficial sands overlying interlayered gravels, sand, and mud. Offshore shoals contain sands up to tens of feet thick, thinning towards the outer margins of the shoals (Appendix B). Detached offshore shoals are believed to have formed originally as ebb-tidal shoals. Predominant storm waves originating from the northeast cause shoals to align in a northeast/southwest direction. Large shoals migrate in a generally southerly direction at rates of up to many feet per year. Table 2-3 presents shoal volume information from the 2008 EIS.

Since the 2008 EIS was prepared, USGS and MGS have conducted a variety of geological investigations of the area of interest. BOEM conducted investigations of the seafloor in the MD WEA immediately to the east of the offshore shoals of interest. USACE conducted additional cores to investigate shoal sands, and BOEM (MMS) conducted modeling investigations. Relevant findings of some of these investigations are described below.

The USGS has recently completed a regional characterization of sand ridges and their migration on the ocean seafloor off MD (Pendleton et al., 2017). Offshore shoal migration patterns differ regionally off the MD coast with those being north of the Ocean City Inlet generally showing a net southerly migration, whereas offshore shoals south of the inlet generally show a net southeasterly migration.

MGS (2015) found that the study area seafloor is highly dynamic, displaying a variety of surface features and sediment types. The study area is dominated by sands with 15 percent gravelly sand, 78 percent fine to coarse sand, and 7 percent silty sand to clayey mud[17].

MGS (2015) found that the most mobile sediment classes appear to be the fine and medium sand and non-cohesive mud. Fine- to medium- sand bodies form sheet and ribbon deposits on the seafloor surface. These deposits can migrate over relatively short periods, from days to weeks, depending on available water column energy. Non-cohesive mud is highly mobile, suspended by relatively little water column energy and deposited in low energy environments. This mobile, very fine sediment is probably derived from cohesive mud outcrops that are reworked by infaunal and epifaunal activity, which exposes the mud to wave and current motion. It forms ephemeral surface deposits in the troughs of bedforms and other low areas, tends to be aerially limited to less than a few square meters, and is readily resuspended. The least mobile classes are coarse sand, slightly gravelly sand and cohesive clayey mud. Coarse sediments tend to form lag deposits because they require more energy to mobilize than is ordinarily present in the regional water column. Only during extreme conditions is there enough wave or current energy to move coarse material. These coarser sediments were found predominantly on the crests of shoals. The cohesive clayey mud, mostly found in bottom outcrops in deeper water, resists mobilization due its cohesiveness.

[17] Mud includes silt, clay, and colloids. Mud is not a formal engineering sediment class.

USACE collected a substantial number of new cores from Isle of Wight and Weaver Shoals in 2016 to better characterize sands for potential borrow use (the last USACE coring of these shoals had been conducted in 2002). Neither Shoal A nor Shoal B were re-cored (last cored in 2002 and 1995, respectively). A substantial portion of the sand from these two shoals is very similar to the sand on the engineered beach at Ocean City[18]. Some of the sands of the offshore shoals contain a greater proportion of sand and gravel coarser than the existing beach.

MMS (2010) conducted modeling investigations of sediment movement on and in the vicinity of the shoals. Strong waves and currents during storms are capable of moving bottom sediment on the offshore shoals. Such conditions typically occur during Nor-easters when sand transport from northeast to southwest occurs on the offshore shoals. Otherwise, during typical non-storm conditions, wave energies are capable of producing bottom sediment movement only in the shallowest areas of the shoals. USGS (2017) in regional modeling of sediment mobility, estimated that 10-25 percent of the substrate of the area would be expected to be mobile annually.

BOEM (2017) provided sediment mapping of the MD WEA near to the offshore shoal candidates of interest and concluded that the area is predominantly sandy substrates. The western and southern part of the MD WEA have ridge and swale topography equivalent to that of the area of the candidate USACE shoals based on equivalent appearance in bathymetric charts. The MD WEA does have small areas of finer grained sediments, including mud, in areas mapped as "flat" habitat, but also in "sand ridge & swale" habitat, presumably within swales in the "sand ridge & swale" habitat.

4.2.3 Hydrology and Water Quality

The 2008 EIS provided a summary of general circulation and water quality. The coastal ocean waters between Cape Cod and Cape Hatteras are known of as the Mid-Atlantic Bight. The coastal ocean off the Delmarva Peninsula has one of the most extreme seasonal ranges of sea temperature in the world. Water circulation is characterized by a general southward movement of the surface and bottom water along the coast known of as the Virginia Current bringing cooler waters to the study area from the north. During warm weather months, winds from the south may cause northerly flow, contributing to warmer temperatures in surface waters. The Gulf Stream lies about 200 miles offshore, and only limited water exchange between the Gulf Stream and along shore waters occurs. The water column of the study area is typically well mixed vertically by waves other than in warm weather months. Then, differential greater warming of surface waters induces seasonal stratification with warm less dense water near the surface and cooler denser water at greater depths. During warm weather months, because oxygen continues to be consumed in deeper waters but not replenished from above because of reduced mixing, deep water has less available oxygen than surface waters. However, deeper ocean waters remain oxygenated adequately to fully support marine life.

[18] Section 2.1.2 of the 2008 EIS provides historic Ocean City beach sand characteristic information.

Since the 2008 EIS, there has been a substantial increase in research and availability of data related to water temperature and currents, storm wave conditions, and hydrologic conditions of the study area. Some of this new information is summarized below.

BOEM (2017) provided an overview of hydrologic conditions in the MD WEA based on review of data over the period from 2003 – 2012. Median temperatures and salinities over this period are presented in Table 4-5. Bottom water temperatures ranged between 37° F to 73° F over the period 2003 and 2013 in investigations of the MD WEA.

Period	Layer	Median Temperature (°F)	Median Salinity (practical salinity units [psu])
June-August	Surface	72	31.2
	Bottom	52	32.7
Sept-Oct	Surface	72	31.2
	Bottom	68	31.6
Jan-Mar	Surface	42	31.8
	Bottom	41	31.9

Table 4-5: Temperature and salinity conditions within MD WEA (BOEM 2017-088).

Additional detailed information on water temperature and salinity was also provided. Highly-stratified conditions are typical over the period of June to August, with surface temperatures near 70° F and bottom temperature 20° F colder. A thermocline develops seasonally above which warm lighter water occurs and below which cooler denser water occurs. As a consequence of reduced mixing of oxygen from the atmosphere through the thermocline into deeper waters but continued consumption of oxygen in the deeper water, oxygen levels below the thermocline become less than those of surface waters, declining to about 80 percent saturation versus surface waters which are fully saturated with oxygen. However, the lower oxygen levels below the thermocline are still at levels that are healthy and support marine life. Stratification largely dissipates by September, resulting in nearly isothermal (fully mixed water column) condition with temperatures about 70° F surface to bottom. Salinities, on the other hand, varied little throughout the year, particularly on the bottom (less than 0.3 psu variation). Surface to bottom gradients were also consistently small (less than 2 psu variation) throughout all seasons (BOEM 2017).

The shoals of interest are about 30 miles from the mouth of the Delaware River/Bay, and the Virginia Current brings Delaware River/Bay water southward to study area waters much of the time. This likely contributes to reducing water clarity in the offshore shoals of interest from that of oceanic water not affected by Delaware River/Bay (TNC, 2010). Offshore sampling cruises in the nearshore Atlantic Ocean in 2012 found levels of elevated nutrients and algae, including some harmful algae species. Elevated nutrients may be from Delaware Bay outflow, upwelling, and/ or emanate from the offshore discharge of the Ocean City sewage treatment plant in the summertime (tourist population maximum) (Dennison and others, 2016).

MMS (2010) further investigated wave height and energy in the vicinity of Isle of Wight Shoal, Weaver Shoal, and Shoal A. MMS (2010) confirmed that the largest waves originate from the north, but the majority of waves originate from the southeast. Storm waves from the northeast encountering the shoals increase in height and may break. Greatest storm wave heights and wave energies occur on the shoal crests, with lower waves in adjacent deeper waters off the shoals. Such storm waves from the northeast focus energy on the north side of the shoals.

Tidal currents in study area waters are gentle, with maximum speed of about 2 inches per second. Decadal mean current from 2007-2016 was 2 to 2.6 ft/minute in a southerly direction in the offshore shoal vicinity. Currents off MD are not affected by river outflows to the degree that coastal ocean waters at the mouth of Delaware or Chesapeake Bay are (NOAA, 2018). Conversely, wave-driven currents can be substantial during storms, as described above.

Since the 2008 EIS, concerns over change in ocean acidity anticipated from increasing atmospheric carbon dioxide concentration have increased. Generally, high salinity ocean waters are of lower vulnerability than Chesapeake and Delaware Bays waters because the chemistry of sea water buffers more strongly against acidity increase from atmospheric carbon dioxide. Although the study area waters are oceanic, because the study area receives substantial outflow from Delaware Bay and other estuaries further north whose waters contribute to the Virginia Current, it is likely somewhat more vulnerable to the effects of ocean acidification than are ocean waters off the southeast US coast less effected by estuarine outflow. To date though, ocean acidity of the area of interest appears to show greatest variation as a function of varying content of bay waters rather than changes driven by atmospheric carbon dioxide increase (Wanningkof and others, 2015).

Since the 2008 EIS, understanding of sea-level rise has increased substantially. Globally, acceleration in the rate of sea-level rise previously speculated upon has since been conclusively documented utilizing multiple measurement techniques. The global rate of sea-level rise increased from about 2 mm/yr to about 3 mm/yr over the period 1993 to 2014. If this rate of acceleration continues, then sea level would likely rise 2 feet globally by 2100 (Chen et al., 2017; Nerem et al., 2017). Since the 2008 EIS, there has been growing recognition that in addition to regional geological factors, sea-level rise rate along the Mid-Atlantic and northeast US Coast is strongly impacted by the speed of the Gulf Stream[19]. The ocean water surface off the US Atlantic Coast proceeding offshore is actually gently sloped and not perfectly level. The water surface is higher in the ocean center than along the US Atlantic Coast. The Gulf Stream has been slowing down over recent decades and the sea surface becoming flatter, decreasing the higher ocean water surface elevation in the ocean center but raising water levels along the US Atlantic Coast (Caesar et al., 2018; Smeed et al., 2018). This rise is occurring in addition to global sea-level rise, and is anticipated to increase the magnitude of sea-level rise along the US Atlantic Coast by an additional 0.5 to 0.7 feet over the 21st century (Yin et al., 2009. Slow down of the Gulf Stream is anticipated to cause the Gulf Stream to shift closer to the coast in coming decades (Caesar et al., 2018).

[19] The Gulf Stream is part of a larger current system known of as the Atlantic Meridional Overturning Circulation. This larger system itself is slowing down.

4.2.4 Climate

The 2008 EIS provided a summary of the climate of coastal ocean waters off Worcester County. The prevailing winds are from the west to northwest, except during the summer months, when they are southerly. Onshore winds from the northeast, east, and southeast occur one-fifth of the time. Most coastal storms causing erosion and other damage in the study area are northeasters. These storms can produce damaging storm waves for a duration of up to several days; they occur most frequently between December and April. Hurricanes and tropical storms also impact the study area, although less frequently.

No temperature or rainfall records over the coastal ocean itself were presented in the 2008 EIS. No such records were located for preparation of this EA. Temperatures of surface ocean waters have a strong influence on air temperatures at the sea surface.

Since the 2008 EIS, increased attention is being paid to changing climate. NOAA NCDC modeling indicate that surface temperatures over the coastal ocean waters of the offshore shoals over the period of 1880 – 2018 with respect to the 1981 to 2010 average have shown a trend of temperature increase of 0.1ºF per decade. Since 2010, temperatures are modeled to be up to about 2ºF warmer than over the period 1981 – 2010.

4.2.5 Air Quality

Six criteria[20] pollutants are evaluated by the US Environmental Protection Agency (USEPA) under the auspices of the Clean Air Act to determine outdoor air quality in an area. These pollutants can injure health, harm the environment and cause property damage. There are National Ambient Air Quality Standards (NAAQS) for each of the criteria pollutants that apply to the concentration of a pollutant in outdoor air. If the air quality in a geographic area meets or has lower concentration of the pollutant than the national standard, it is called an attainment area; areas that don't meet the national standard are called nonattainment areas and the air is more polluted than acceptable.

Because the area of interest is open coastal ocean, to determine whether air quality analyses needed to be undertaken, it was necessary to consider air quality of adjacent counties to the west in MD and DE. The engineered beach lies primarily in Worcester County, MD, but does extend into Sussex County, DE.

The 2008 EIS noted that Worcester County, MD, lacks large stationary sources of air pollutants. Instead, on and off-road mobile sources and small stationary sources of air pollutants are major sources of air pollutants originating in Worcester County. Mobile sources in the county include motor vehicles and boats; small stationary sources include dry cleaners and gasoline stations. The USEPA "Green Book" lists Worcester County, MD, as being in attainment with criteria air pollutants over the period 1992 - 2018.

[20] The USEPA calls these pollutants criteria air pollutants because the agency has developed science-based guidelines as the basis for setting permissible levels.

Sussex County, DE, was previously listed as being in attainment with criteria air pollutants at the time of the 2008 EIS. Since that time, however, the USEPA "Green Book" lists Sussex County as being in marginal non-attainment with respect to the 2008 NAAQS for ground-level ozone over the period from 2012-2018. Ground-level ozone is created by sunlight-driven chemical reactions between oxides of nitrogen and volatile organic compounds that themselves derive from emissions from industrial facilities and electric utilities, motor vehicle exhaust, gasoline vapors, and chemical solvents.

The waters of the study area lie offshore of the Eastern Shore Air Quality Control Region (AQCR 114) as designated by the USEPA. Delaware is also part of the Ozone Transport Region, which includes states in the northeast United States that must adhere to stricter conformity thresholds for nitrogen oxides (NOx) and volatile organic compounds (VOCs), which are precursors for ozone.

4.2.6 Noise

The 2008 EIS provided only limited consideration of noise in the offshore shoal area above the sea surface. Since the 2008 EIS was prepared, information is now available on natural and manmade underwater noises of the ocean, noises produced by various in-water construction activities, and impacts of these noises on fish and wildlife.

The University of Maryland, Center for Environmental Science is conducting investigations of underwater noise in the MD WEA. Extended physical environment increases in bottom noise are caused by large wind events acting on the sea surface (Secor and Bailey, 2017).

4.3 HABITATS

The 2008 EIS provided an overview of natural habitats, manmade habitats, and designated habitats. Habitats are the places where plants and animals live, where they feed, find shelter, and reproduce. The character of these places is determined by the physical environment as well as the structure of any non-mobile living creatures that occur at that place. For the purposes of this EA, habitats consist of the air, water surface, water column, seafloor, and in the seabed. Physical character of these habitats was largely described in Section 4.2. The seafloor habitat in the vicinity of the offshore shoals of interest includes the shoals, adjacent flat areas of the seafloor, and two artificial reefs.

4.3.1 Natural Seafloor Habitats

Since the 2008 EIS was completed, there has been extensive regional mapping of seafloor habitats on the OCS conducted by TNC (2010) and detailed local mapping off the Delmarva Peninsula by MGS (2015) and BOEM (2017).

BOEM (2017) provided habitat mapping of the MD WEA near to the offshore shoal candidates of interest. Habitat types of the MD WEA were characterized based on topography, and subdivided into three benthic habitat zones: "sand ridge & swale," "irregular," and "flat." All three topographic-based habitat types have sandy substrates. The western and southern part of the MD WEA have ridge and swale topography comparable to that of the area of the candidate USACE shoals. The MD WEA does have small areas of finer grained sediments, including mud, in areas mapped as "flat" habitat, but also in "sand ridge & swale" habitat. Presumably the mud within the "sand ridge & swale" habitat occurred within a swale.

MGS (2015) seafloor mapping was done for geological classification purposes. However, because habitat character of the area of interest is largely a function of two physical environmental factors as BOEM (2017) identifies: topography and grain size, the geologic mapping by MGS (2015) is effectively equivalent to habitat mapping. MGS (2015) maps all the shoals as consisting of slightly gravelly sand and sand. Of the four shoals of interest, Weaver Shoal is distinct in consisting of the greatest portion of its surface area covered by gravelly sand.

BOEM (2015) discusses habitat values generally of offshore shoals. Shoals and shoal complexes represent unique habitats in OCS waters that may enhance biological productivity. Shoals and shoal complexes can serve as fish habitat and provide ecological services including foraging areas, refuges from predation, spawning sites, and nursery areas. The lack of shoal-specific biological characterization at broad spatial scales makes it difficult to determine which shoals and shoal complexes within a region are the most valuable, contributing the greatest fish habitat value or ecological function. Studies in the Mid-Atlantic suggest that shoals and shoal complexes may act as migration corridors between estuarine and ocean habitats, linking early life stage and adult habitats for many fish species as well as providing macroscale guides for spawning and seasonal migrations.

4.3.2 Artificial Reefs

Artificial reefs have been established on the seafloor off MD to benefit and attract structure-oriented marine life. Artificial reef establishment on the seafloor off MD is undertaken in accordance with the Artificial Reef Management Plan for Maryland. There are two artificial reefs in the potential borrow areas.

Bass Grounds Reef lies 8.4 nautical miles southeast of the Ocean City inlet. The artificial reef occupies two separate sites on Bass Grounds Shoal (Shoal B) that total 804 acres in area. Water depth at this site slopes gently from 70 feet on the west side of the reef to 50 feet on the eastern side. Materials on this reef include concrete pipe, cable mounds, subway cars and several sunken vessels (Coastal Fishermen, Sept 12, 2012).

Isle of Wight Reef is a recent artificial reef located between Fenwick and Isle of Wight Shoals, 6.2 nautical miles northeast of the Ocean City inlet. This 90 acre reef is situated on a gentle slope from 65 to 48 feet in depth. The reef has 22 stainless steel subway cars and concrete rubble and modules (Coastal Fishermen, Sept 12, 2012).

No reefs are planned within Weaver Shoal, Isle of Wight Shoal, or Shoal A in the Artificial Reef Management Plan for Maryland of 2007.

4.3.3 Designated Essential Fish Habitat

The Atlantic Ocean coastal waters in the study area are designated by the National Marine Fisheries Service (NMFS) as "Essential Fish Habitat" (EFH) for numerous shellfish and fish species. Although utilizing the term "essential," the EFH designations for many species are broad in nature and cover wide geographic areas. EFH designations have evolved since the time of the 2008 EIS. Potential impacts to EFH for 26 species were evaluated in the 2008 EIS. In coordination with NMFS, it was determined that this EA should evaluate impacts to potential EFH for 33 species. The increased number of species evaluated for EFH impacts reflects improved natural history information available for fish and shellfish, changes in abundance of some species in study area waters, and differences in perspective of NMFS staff (Table 4-6).

Species Category	2008	2018
Bony Fish	17	19
Cartilaginous Fish	7	12
Shellfish	2	2
Total	26	33

Table 4-6: Numbers of fish species with potential EFH in study area waters.

Atlantic cod and winter flounder were formerly considered to have EFH in the area of interest in 2008. Since that time, waters considered to constitute EFH for these species have been shifted northward. Scalloped hammerhead was identified to have EFH in study area waters in 2008, but the area is no longer identified as potential EFH for that species. NMFS recommended that the 2018 EFH impacts document (Annex C) assesses the following: four new bony finfish species (albacore, bluefin, skipjack and yellowfin tunas); new life history stages for two bony finfish species previously assessed (yellowtail flounder eggs, Atlantic mackerel eggs and juveniles); six new cartilaginous species (common thresher shark; smooth and spiny dogfish; clearnose, winter and little skates); one new life history stage of a cartilaginous fish previously assessed (Dusky shark juvenile/adult); and one new life history stage of a cephalopod mollusk previously assessed (Longfin inshore squid eggs).

BOEM (2015) noted that although shoal areas have been designated as EFH for several Atlantic highly migratory species (e.g., tunas, sharks, swordfish, and billfishes), direct links to shoal habitats for these species are not well defined. The 2018 EFH impacts assessment, consistent with BOEM (2015), determined that it is unlikely that waters in the vicinity of the offshore shoals constitute EFH for albacore tuna. The 2018 EFH impacts assessment, consistent with the 2008 assessment, identified that the offshore shoals do provide bottom habitat for various life history stages of a variety of benthic (bottom-dwelling) and demersal (bottom-oriented) shellfish and finfish.

4.4 Marine Life

The 2008 EIS noted that study area ocean waters lie within the Virginian biogeographical province, which extends from Cape Hatteras, North Carolina, to Cape Cod, Massachusetts. Marine life typical of this province are widely distributed, but are distinct in diversity and distribution from biogeographical provinces to the north (Acadia) and south (Carolinian). Since the 2008 EIS, ranges of some species appear to be shifting (Section 4.3), however these general regional provinces remain applicable to characterize the study area.

4.4.1 Benthic Algae

Because of relatively deep water depths limiting sunlight penetration and shifting substrates, plants are limited to individually small algae that live on the bottom. However, plant life does occur on the seafloor in the study area - benthic microalgae. These organisms were not considered in the 2008 EIS.

Benthic microalgae in suitable conditions create a film that holds bottom sediment together where they occur. Benthic microalgae are foundational to the foodweb of the seafloor, supporting a variety of grazing organisms. No specific information documenting their occurrence in the study area was located. However, benthic microalgae would generally be expected to occur to at least depths of about 65 feet based on documentation from temperate seas globally (Cahoon, 1999). The naturally dynamic substrates of the offshore shoals may limit benthic algae.

4.4.2 Invertebrates

The 2008 EIS provided an overview of invertebrates. Invertebrates range from sessile (fixed position) organisms such as barnacles, to weakly mobile organisms such as mollusks, to highly mobile crustaceans. Benthic invertebrates are an important food source for many fish species and include animals that live in the substrate (infauna), such as worms and clams, as well as animals that live on the surface of the seafloor (epifauna), such as crabs. Invertebrates also include organisms that swim freely in the water column and that don't typically occur on the bottom known of as pelagic invertebrates. The 2008 EIS included information from multiple regional and shoal specific studies of animal life of the offshore shoal areas that had been conducted up to that time. Generally, these studies found that offshore shoals tend to possess lower numbers of benthic organisms, species, and biomass than adjacent deeper intershoal areas. The most common species of the offshore shoals in terms of frequency of occurrence are haustorid amphipods, isopods, bivalves, and polychaete worms. Benthic megafaunal species occurring on the offshore shoals and adjacent seafloor include lobed moon snails (*Polinices duplicatus*), whelks (*Busycon* spp.), starfish, and various crabs and shrimp. Sandy portions of the shoals appeared to be preferred by moon shell (*Polinices* spp.) and sand dollar. Highly abundant benthic invertebrates of the study area seafloor and shoals included right-handed hermit crab (Paguridae family), starfish (subclass Asteroidea), lady crab (*Ovalipes spp*), and portly spider crab (*Libinia emarginata*). Many taxa of mobile invertebrates occurred commonly between the shoals and seafloor sites. Squid (Class Cephalopoda) occurred throughout the study area waters in high abundance in all seasons but winter. Two species were most commonly identified in studies: shortfin squid (*Illex illecebrosus*) and longfin inshore squid (*Loligo pealei*).

BOEM (2017) contains findings of several investigations of the MD WEA conducted over the period of 2003-2012 that captured and photographed benthic invertebrates (and demersal fish, see Section 4.4.3). The MD WEA report does not provide a ready means to discriminate between what was captured on ridges versus in swales. The western and southern portions of the MD WEA have ridge and swale topography and water depths similar to that of the offshore shoal area of interest. (Conversely, the eastern side of the MD WEA contains seafloor plains at greater depths). BOEM (2017) reports 72 taxa of benthic infauna taken in trawl samples in the MD WEA. Benthic infauna were dominated by polychaete worms. BOEM (2017) reports that 38 taxa of benthic epifauna were taken in trawl samples. Sand shrimp dominated samples, with New England dog whelk snails and sand dollars also being sampled in high abundance. Sand dollars were more abundant in ridge and swale areas than irregular or flat topographic areas. Hermit crabs and burrowing anemones were abundant in the southern ridge and swale areas of the MD WEA near Shoal A and Bass Grounds (Shoal B). Photographic sampling conducted in Summer 2013 also identified numerous solitary sea anemones (Ceriathids) and rock crab (*Cancer irroratus*) throughout the MDE WEA.

4.4.3 Finfish

The 2008 EIS reported that a wide variety of finfish species are present in the ocean waters of the study area, but most of the fishes in the coastal area are seasonal migrants. Low abundance occurs in winter, as most species leave the area for warmer waters offshore and southward. Spring brings a progressive influx of species that reach a peak in the fall. Warm waters of the Gulf Stream provide a pathway for more southerly species to reach the vicinity of the study area during summer and fall months. The study area contains fish that live predominantly in the water column (pelagic species) and fish with a strong orientation towards the bottom (demersal). Spawning often takes place over relatively wide geographical areas, with most species producing pelagic eggs and larvae. As a consequence, the larvae of many species may occur in the vicinity of the borrow sites at different times of the year, but no species appears to concentrate a significant part of its spawning effort here. Finfish abundance and species diversity were generally higher at the seafloor flats than on the shoals. Finfish appear to concentrate at night on waters on shoals with greatest relief. Finfish support commercial and recreational fisheries, and many of these species are important top to mid-level carnivores. Information on fisheries is provided in Section 4.5.7.

BOEM (2015) conducted a regional review of research conducted on shoals and shoal complexes, determining that a variety of common fish species of the shallow continental shelf fish communities utilize these habitats. Some of these species have been documented on multiple shoals within a region (e.g., sand lance, spotted hake), and sixteen species (including, e.g., striped anchovy, smallmouth flounder, lined seahorse, striped cusk-eel, and inshore lizardfish) were found to occur on shoals and shoal complexes over a large geographic range that included multiple regions. Several species documented as using OCS shoals and shoal complexes have been identified as keystone species due to their important ecosystem roles in linking habitats and trophic biomass (i.e. forage fishes or apex predators) or as habitat engineers; these include river herring, sand lances, and highly migratory Atlantic herring and Atlantic menhaden. The studies completed in the Mid-Atlantic indicate that a few species such as sand lances, northern stargazers, and snakefish have a preference for the tops of shoals or ridges that consist of coarse sand and large bedforms, habitats conducive to burrowing.

Since the 2008 EIS was completed, BOEM has supported substantial efforts to compile previously collected data and undertake new investigations in the MD WEA. Scientific finfish sampling of the OCS, including the mid Atlantic Bight, is conducted annually by NOAA in the spring and fall. BOEM (2017) reviewed NOAA NEFSC trawl data over the period from the 2003-2012. A trawl survey of the MD WEA was conducted in June/July 2008, and visual sampling of bottom fish was conducted in July 2013 (BOEM, 2017). NOAA trawl sampling found 43 taxa (23 with managed fisheries) of megafauna, including both on- and off-shoal habitats. Consistent with previous studies, no year-round dominants were identified from that data, instead megafauna display seasonality of dominance and occurrence. Atlantic croaker (*Micropogonias undulates*), weakfish (*Cynoscion regalis*), and spot (*Leiostomus xanthurus*) were dominant in the warm season, and little skate (*Leucoraja erinacea*), spotted hake (*Cynoscion regalis*), and spiny dogfish were dominant in the cold season. Trawl and visual sampling conducted in June and July 2013 found sea robin

(*Prionotus evolans*) to be abundant in much of the MD WEA, including along the western boundary near Isle of Wight and Weaver Shoals.

Since the 2008 EIS was completed, attention to fish hearing and use of underwater sounds to communicate has grown. BOEM (2013) provides summary information on this topic. Fish use underwater sounds to detect information about their physical environment. Many species of bony fish use sound for communication as well as mating and territorial interactions. While there is very limited information available about fish hearing, generally bony fishes cannot hear sounds above about 3-4 kHz and the majority of species are only able to detect sounds to 1 kHz or below. Cartilaginous fishes detect sounds to no more than 600 or 800 Hz (BOEM, 2013).

4.4.4 Wildlife

The 2008 EIS provided an overview. Wildlife of coastal ocean waters regularly include a variety of sea turtles, marine birds, and marine mammals. Several species of marine mammals may occur in the vicinity of the offshore shoals, although the bottlenose dolphin (*Tursiops truncatus*) is the only common one. Several other species of dolphin, porpoise, seal, and whale are infrequent visitors to the area. Terrestrial birds and bats also occur as migrants. No amphibians occur in Maryland coastal ocean waters. Endangered and threatened wildlife of the area, including all the sea turtle species and several whale species, are covered in Section 4.4.5. The majority of the birds[21] and all of the marine mammals occurring in the study area migrate with the seasons. Wildlife species associated with warm water conditions are present in warm weather months whereas those associated with cold water conditions occur in the area in winter. Since completion of the 2008 EIS, substantial information has been compiled and analyzed regarding occurrence of wildlife on the Outer Continental Shelf.

Substantial investigations have been conducted since preparation of the 2008 EIS that have greatly improved understanding of the distribution of marine birds on the OCS. These include BOEM (2009), TNC (2010), Goyert and others (2015), BOEM (2017), and NOAA (2018). In these investigations, previous records over decades have been compiled into an electronic database, and new field observation, satellite telemetry, and modeling efforts have been done. Goyert and others (2015) investigated marine birds off the Delmarva by shipboard survey and modeling from 2012 through 2014. Goyert and others (2015) found that the mouths of Chesapeake and Delaware Bays are regional hotspots. Otherwise, generally distance from shore was the most common predictor of marine bird abundance with abundance decreasing further offshore. Diversity and abundance was highest in the winter. Overwintering species of marine birds (not breeding in area) include Northern Gannets, grebes, cormorants, gulls, loons, sea ducks (notably scoters), and alcids (e.g., murres). Species density and diversity was greater in spring and fall than summer as a result of both migrants and overwintering species being present. Of the species present, sea ducks are bottom-feeding, and dive to obtain benthic prey. Other species of marine birds feed on fish and plankton at the surface and in the water. The spatial and temporal patterns of marine birds at-sea are largely determined by their food. BOEM (2017) studied three species of marine diving birds,

[21] Birds names for individual species are standardized by the American Ornithological Union and capitalized accordingly.

Red-throated Loon, Surf Scoter, and Northern Gannet, from New Jersey to North Carolina. These three bird species are found in relatively large numbers. All three species were found to be generally associated with shallow inshore waters, but make limited use of OCS waters during migratory periods (spring and fall).

4.4.5 Rare, Threatened, and Endangered Species

Since the 2008 EIS, changes to designations of species listed as endangered have occurred. In 2011, distinct populations of loggerhead sea turtles were listed under the ESA. The Northwest Atlantic Distinct Population Segment (DPS) of the loggerhead sea turtle which utilizes project waters was listed. In 2012, five DPS of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) were listed under the ESA, including the Chesapeake Bay DPS. In 2016, nine of the fourteen populations of humpback whales were delisted as protected species under the Endangered Species Act, including the population utilizing the candidate offshore shoals. However, all populations of the humpback whales will still be protected under the Marine Mammal Protection Act of 1972, as amended, from hunting and other activities.

Since the 2008 EIS, knowledge of rare species range and occurrence on the OCS has increased. TNC (2010) provides maps of various sea turtle and whale sightings per unit effort. BOEM (2014) also includes regional information on rare species on the OCS. Whale presence in ocean waters is now mapped and readily available for viewing on Marinecadastre.gov. This website provides information on biologically important areas for Cetaceans for reproduction, feeding, and migration. NMFS "Section 7 Mapper" contains information on the spatial and temporal range of listed species life stages, behaviors, and critical habitat in our region. This new information supports the determinations presented in the 2008 EIS that sea turtles are expected to be present during warm water months, but whales are expected to be infrequent at any time of year.

Atlantic sturgeon distribution on the OCS has been modeled. Atlantic Sturgeon primarily occupy inshore areas of the continental shelf. Inlets and mouths of bays hold seasonally higher concentrations (Breece et al, 2017). Adults occur in heightened concentrations at the mouth of Delaware Bay in late Spring through Fall (Breece et al, 2018). Presence of Atlantic sturgeon in the OCS off MD is currently being studied using telemetric techniques for BOEM (Secor, personal communication). Atlantic sturgeon, although occasionally present, are not expected to occur in high concentrations in study area waters.

USFWS identified that two federally listed threatened bird species, Red Knot and Piping Plover, could occur as transients during migration, but would not nest or forage in OCS open waters (Annex A). These species were not mentioned in the 2008 EIS.

In addition to federally listed species, some Maryland-listed rare species that are not federally listed have been recently documented to occur on the OCS. Goyert and others (2015) found that some MD and DE-listed and federally listed bird species were present in OCS waters during summer. These included Roseate Terns, Least Terns, Common Terns, Forster's Terns, and Royal Terns.

4.5 HUMAN SETTING

4.5.1 Cultural Resources and Historic Structures

Cultural resources include artifacts, features, landscapes, districts, monuments, sacred places, etc., that are associated with Native American prehistory and the subsequent Colonial period until now. According to "Inventory and Analysis of Archaeological Site Occurrence on the Atlantic Outer Continental Shelf" (MMS 2014), the sea floor below and around the shoals has a high likelihood of containing prehistoric resources. Although settlement and habitation of the area of the offshore shoals may have occurred, any Native American groups in the study area would have retreated from the receding coastline. Since the offshore shoals were deposited upon the seafloor in conjunction with long-term sea-level rise that drove prehistoric groups off former dry land, the shoals are not likely to contain intact prehistoric resources. Furthermore, the formation and development of the shoals, as well as, the long-term action of waves limit both the probability of intact prehistoric resources and preservation potential.

A Phase I archaeological investigation of the Weaver and Isle of Wight Shoals was conducted between May 30th and June 1st, 2019. The survey utilized a cesium marine magnetometer, a side-scan sonar, and a sub-bottom profiler to investigate the possible occurrence of shipwrecks, aircraft, and other submerged cultural resources. No potential submerged cultural resources were documented during the investigation. USACE will conduct comparable detailed surveys of Shoals A and B prior to any future dredging of those shoals.

Within several thousand feet east of the Ocean City shoreline, the preservation of prehistoric resources is limited due to the high energy environment of the nearshore area. Any prehistoric artifacts or features that are present have likely lost the context and integrity that would have made them significant (Watts 1997). Historically speaking, only two shipwrecks have been recorded in the National Oceanic and Atmospheric Administration's (NOAA) Automated Wreck and Obstruction Information System (AWOIS). However, a survey conducted in 2007 by the MHT concluded that it is probable that additional historic cultural resources are in proximity to the shoreline (Langley and Jordan 2007). The possibility that significant historic cultural resources exist is also substantiated by the level of maritime activity along the Maryland Coast related to exploration, colonization, and the expansion of coastal commerce (Watts 1997).

Other more modern debris could exist within the project area including piping, cable, chain, tires, etc. These would not be considered significant cultural resources recommended for further evaluation.

4.5.2 Navigation

Since the 2008 EIS was prepared, vessel traffic information has been recorded spatially in the area of interest. Marine Cadastre depicts several maps of vessel traffic. The Automatic Identification System (AIS) in 2009 measured between 750 and 1500 vessels per year transiting into and out of Delaware Bay along a route proceeding from the bay mouth to the southeast. AIS 2013 data depicted this vessel route into and out of Delaware Bay with a medium density of vessels when compared with waters nationally. This vessel route is generally greater than 7 nautical miles from the offshore shoals of interest. AIS depicts a high density of vessels annually transiting in/out of the Ocean City Inlet, with the majority of these traveling to/from the south within state waters parallel to the coast. AIS depicts a medium density of vessels traveling in/out of Indian River Inlet with the majority of these staying within Delaware state waters and traveling to/from points north. AIS depicts vessel traffic in the area of the offshore shoals of interest as low density.

4.5.3 Infrastructure

Power and communication cables are increasingly being installed on the seafloor. These cables connect communications hubs on different continents, as well as increasingly within the US utilizing seafloor routes. The online tool "Marine Cadastre" depicts submarine cables of the North American Submarine Cable Association (NASCA) and NOAA-charted submarine cables. Marine Cadastre depicts numerous undersea cables on the US Atlantic Coast extending to/from New Jersey, New York, Connecticut, Rhode Island, and Massachusetts in the northeast and to/from Florida in the southeast. Marine Cadastre depicts no submarine cables going to/from the Delmarva Peninsula as of May 2018.

BOEM coordinates with USACE and state agencies in permitting new undersea cables and wind energy infrastructure, including determining boundaries of the MD WEA. Boundaries of the MD WEA were drawn to avoid the offshore shoals of particular interest to this EA to avoid use conflicts between energy production and proposed offshore sand sources.

Wind energy infrastructure has been proposed and permitted on the seafloor off MD. At this time, it is expected that energy cables associated with future wind turbines would go ashore in DE. Wind energy infrastructure is also proposed in the DE WEA. It is anticipated that energy cables from this project may go onshore in Ocean City, MD. BOEM would coordinate with USACE and MD and DE state agencies to position these cables such as to avoid/minimize risk to cables from other OCS activities.

4.5.4 Munitions and Explosives of Concern

The 2008 EIS provided information on historic military activities along the shoreline, and potential presence of MEC, including UXO, on the seafloor. Since that time, there have been no further comprehensive studies of UXO. USACE conservatively assumes the potential for MEC/UXO in offshore borrow areas and uses appropriate mitigation measures rather than seeking to conduct specific investigations regarding its presence. Mitigation measures utilized by Baltimore District rely upon utilization of screens at both the dredge intake on the seafloor and sand discharge point onto the beach and trained observers to minimize risk to the dredge vessel and people.

4.5.5 Recreation, Visitor Use, and Public Safety

Because the candidate shoals are in federal waters, the agency responsible for public safety is the US Coast Guard. As one of its missions, the Coast Guard works to eliminate deaths, injuries, and property damage associated with maritime transportation, fishing, and recreational boating. Because the offshore shoals are outside of state waters, MD DNR and Delaware Department of Natural Resources and Environmental Control (DNREC) police who perform boating law enforcement duties in state waters do not routinely work in federal waters.

MD Coastal Atlas identifies ocean waters out to 10 miles offshore as being used by recreational motorized boats. The majority of recreational boating is associated with fishing and is covered in Section 4.3.5.

4.5.6 Marine Protected Areas (MPA)

At the time of the 2008 EIS, there were no MPAs designated in the OCS off the Delmarva Peninsula. Since that time, two MPAs have been designated. The Frank R. Lautenberg Deep-Sea Coral Protection Area -Broad Zones MPA lies about 65 miles east of the offshore shoals of interest. This MPA was established in 2016. Commercial and recreational fishing is restricted within the Lautenberg MPA. The Norfolk Canyon MPA, which lies about 90 miles southeast of the Ocean City Inlet (about 60 miles perpendicular to Virginia within the southern Delmarva Peninsula), was established in 2011. Norfolk Canyon is closed to bottom-tending mobile fishing gear.

4.5.7 Fishing

The 2008 EIS stated that the offshore shoals of interest are fished by commercial fishermen, charter boats carrying recreational fishermen, and recreational fishermen who utilize their own vessels. Recreational vessels are generally disfavored the further the distance offshore increases, as private non-commercial vessels are generally smaller in size than commercial and charter vessels and have shorter cruising range and less capability to handle rough seas. Shoal B (Bass Grounds) was identified to be an important fishing area. However, the value of the various offshore shoals as fishing grounds was determined to vary over time. Fenwick Shoal seaward of the MD/DE state line was identified to have formerly been considered an important fishing ground. Also, the 2008 EIS considered the potential of offshore shoals to support commercially harvestable populations of surf clam, as this had been the case in previous decades. The offshore shoals did not support commercial fishing for surf clam at the time the 2008 EIS was prepared. At the time of the 2008 EIS, many of the managed fish species were overfished such that fishing itself was probably the principal factor controlling fishery species population health.

Substantial new geographic information on fishing intensity is now available that was not available at the time the 2008 EIS was prepared. Accordingly, it is now possible to better understand at a regional and even local scale where fishing activities are concentrated. Since the 2008 EIS, management of fishing pressure has allowed fishery species populations to recover, and stock status of managed fishery species has improved considerably. The recent Mid-Atlantic Regional Ocean Assessment states that the Mid-Atlantic is the only region in the country that has no stocks that are overfished or undergoing overfishing.

Marine Cadastre depicts fishing vessel densities from AIS safety devices. The most recent year for which data is mapped is 2013. The dataset uses a high to low vessel density scale and does not represent actual vessel counts. The data provides a means to identify travel routes, but only limited ability to determine destination of fishing vessels. Fishing vessel travel into/out of the Atlantic Ocean is depicted as high density going to/from Lewes, DE. Marine Cadastre depicts a low density of fishing vessels from the Atlantic Ocean going to/from Ocean City, MD, Indian River, DE, and Chincoteague, VA. Low densities of fishing vessels appear to transit the shoals originating from/going to Ocean City, Indian River, and Lewes.

Marine Cadastre depicts Atlantic Fishing Revenue Intensity from 2007-2012 derived from a larger study titled "Socio-Economic Impact of Outer Continental Shelf Wind Energy Development on Fishing in the U.S. Atlantic." The area of the offshore shoals of interest are depicted as lying in the lowest economic value category of $0 to $250 per quarter square kilometer per year. Waters of the Atlantic increase in value category proceeding further offshore from Ocean City with maximum value of $7501-$21,152/ quarter square km/year being reached about 34 nautical miles offshore of Ocean City. For the Mid-Atlantic Bight, the most high value fishing grounds over the period 2007-2012 were open ocean waters about 50 miles offshore southeast of the mouth of Delaware Bay and open ocean waters southeast of the mouth of Raritan Bay.

Commercial vessels fishing waters of the area of interest hail largely from Ocean City, MD. There is a core group of about 12 fishermen that regularly fish there. Additionally, commercial vessels from the Mid-Atlantic coast between NY and NC probably fish waters off MD (Blazer, personal communication, May 2018). Secor and Bailey (2017) note commercial dogfish fishing activity in area.

The 2008 EIS identified surf clam (*Spisula solidissima*) as a commercial fishery species of potential concern. Coordination with NMFS during preparation of this EA determined that surf clam populations last supported commercial fishing activity in the area in 2009; commercial surf clamming is not a notable activity in the area of interest. NEFSC (2017) states that the surf clam fishery offshore off the Delmarva coast has been in decline in recent years, as increasing ocean temperatures further limit their distribution to deeper waters offshore.

Coordination with commercial and recreational fishermen during preparation of this EA in 2018 (Annex A), determined that Shoal B (Bass Grounds) is still considered to be an important fishing ground. Additionally, Isle of Wight Shoal, particularly along the 3 mile limit, was identified to be an important fishing area. Conversely, Weaver Shoal and Shoal A were not identified to be important fishing grounds.

5.0 ENVIRONMENTAL CONSEQUENCES

This section of the EA provides an analysis of potential impacts comparing the recommended alternative (Section 3.6) to no action (Section 3.1) for each of the topics considered in Section 4 "Existing Conditions." Changes in impacts from those reported in the 2008 EIS are the focus of this EA (Table 8-1 presents a concise summary).

Potential impacts of alternatives are described to the degree applicable in terms of type (direct, indirect, cumulative [Table 5-1]); context; duration (short- or long-term); and intensity (negligible, minor, moderate, major [Table 5-2]). Impacts of the proposed action to non-living components of the physical environment are reported in the "5.1 Physical Environment" subsection below. Impacts of the proposed action to habitat and marine life are evaluated in subsections 5.2 (Habitat) and 5.3 (Marine Life), respectively. Impacts on people are largely evaluated in Section 5.3 (Community Setting).

Table 5-1: Types of impacts.

Type[22]	Description
Direct	Occur at the borrow site at the time of dredging and during vessel transit in federal waters.
Indirect	Occur after dredging and/or are removed in distance from the direct impact locations.
Cumulative	Result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions.

Table 5-2: Levels of negative biological and socioeconomic impacts (BOEM, 2016).

Level	Description
Negligible	Little or no measurable/detectable impact
Minor	Impacts are detectable, short-term, extensive or localized, but less than severe
Moderate	Impacts are detectable, short-term, extensive, and severe; or impacts are detectable, short-term or long-lasting, localized, and severe; or impacts are detectable, long-lasting, extensive or localized, but less than severe
Major	Impacts are detectable, long-lasting, extensive, and severe

There has been a tremendous growth of information covering environmental impacts of offshore dredging for sand since the 2008 EIS was prepared, largely led by BOEM and its predecessor MMS. These studies are referenced as appropriate in the individual subsections below.

The 2008 EIS recommended that one or more of three candidate shoals (Isle of Wight, Weaver, and Shoal A) be utilized as sand sources, but did not explicitly identify which shoal would be

[22] Direct and indirect impacts are considered by individual topic. Cumulative impacts are discussed separately in Section 5.5.

utilized in the next dredging cycle. As was presented in Sections 2 and 3, USACE now has recommended that Weaver Shoal be dredged for sand in the next one or more borrow cycles. Following future reassessment of engineering, environmental, and cost considerations, Isle of Wight Shoal, Shoal A, and or Shoal B would be utilized. All impacts below thus differ from the 2008 EIS in that impacts of the next nourishment cycle dredging would occur on Weaver Shoal, but future dredging impacts could occur on any of the four shoals as per the 2008 EIS.

5.1 Physical Environment

Project impacts to non-living components of the physical environment are reported in this section. Value judgments over whether these impacts are positive or negative to physical environment topics are included for water quality and air quality based on how these impacts relate to established standards to protect human beings and aquatic life.

Seafloor impacts would remain the same as those described in 2008 EIS, except that for the next dredging cycle (by 2022) only Weaver Shoal would be impacted, and the future number of cycles through 2044 impacting OCS offshore shoals would be less as sand was obtained from state waters through 2017. Dredging activities would impact up to about 500 acres of the seafloor each dredging cycle (about every 4 years), and up to about 3,000 acres could be impacted through the remaining federal life of the project (i.e., 2044). However, some areas may be dredged more than once, so the total area impact may include repeated dredging of some places but reduced total area of impacts. The total area of seafloor to be impacted in federal waters of the OCS is forecast to be less than those of the 2008 EIS because borrow actions in the years 2010, 2014, and 2017 used sand from shoal sources in state waters.

5.1.1 Bathymetry and Physiography

MMS (2010) modeled physical impacts of dredging to Isle of Wight Shoal, Weaver Shoal, and Shoal A. Additionally, previous dredging by USACE of Great Gull Bank in 2002 and subsequent bathymetric comparison desktop analysis prepared for this EA (Annex B) informed the assessment of physical environmental impacts.

Direct Impacts

Direct impacts would remain consistent with the 2008 EIS, with the constraints of Table 2-1 mitigating effects on offshore shoal bathymetry. Thus, changes in direct bathymetric impacts from the 2008 EIS would be negligible to minor. USACE will include stipulations in the dredging contract that incorporate the constraints, and thus which define the boundaries of the area to be dredged and limiting the thickness of material that can be removed from any one place during a single dredging cycle, effectively spreading impacts over a wide area during each cycle. Dredging would produce long furrows up to several feet deep within the dredged area, and potentially locally increase depth by a maximum of 10 feet. Hydrographic surveys of the borrow areas will be conducted upon completion of dredging to verify that borrow was conducted in accordance with dredging guidelines and constraints. Based on findings of dredging Great Gull Bank for

Assateague in 2002, there is high confidence that dredging can be conducted in a manner consistent with the dredging constraints.

Indirect Impacts

The 2008 EIS stated that furrows would gradually fill in. The EIS stated that overall, shoal height over the long-term would gradually be reduced by up to about 1 foot caused by loss of up to 5 percent of each shoal's volume, based upon the relationship of volume to height.

Additional information is available regarding potential indirect bathymetric impacts from the time of the 2008 EIS. Desktop analysis of Great Gull Bank bathymetric change through 2008, which includes impacts of 2002 dredging that avoided the crest, shows that the shoal crest was maintained following dredging, although some gains and losses occurred. The greatest loss in elevation was about 5 feet locally. Scour along the southeast side of the shoal in the borrow area occurred following dredging which was not anticipated as shoal migration in the area is to the south (Pendleton et al., 2017). This is hypothesized to be the result of minimal severe storm activity during that time period. Following more severe northeasters, it is anticipated that the shoal will roll south into that former borrow area. BOEM (2015) forecasts that overall shoal height may not change under certain conditions if the crest is avoided during dredging. Thus, changes in indirect bathymetric impacts from those of the 2008 EIS would be negligible to minor.

5.1.2 Geology

Direct Impacts

Minor change in direct impacts from what was forecast in the 2008 EIS would occur to geological characteristics of the offshore shoals. Because the volume to be removed described in the 2008 EIS did not account for 10 percent difference between beach measurement and removal from the shoal, it is anticipated that the total borrow available from each candidate shoal as per the dredging constraints (up to 5 percent; Table 2-1) will be reached more quickly as the volume borrowed for each action will be approximately 10 percent greater. This will have the effect of spreading out dredging over a greater area of the offshore shoals, versus if this 10 percent difference were not accounted for. This would thus increase both the minimum and maximum anticipated total sand volume need out to 2044 versus what was forecast in the 2008 EIS (see Section 2 and Annex B).

Indirect Impacts

The 2008 EIS addressed borrow action impact on wave energy at the shoreline, and thus impact on shoreline stability or shoreline erosion. As Ocean City and northern Assateague Island shoreline positions are controlled/maintained by coastal engineering, and USACE monitors the Ocean City shoreline while Assateague Island National Seashore monitors that shoreline, any potential impacts to the shorelines of Fenwick or northern Assateague Island would hopefully be identified under USACE and NPS efforts, and strategies to correct for that could be formulated within the auspices of the Atlantic Coast of MD and or Long-Term Sand Management (Assateague long-term restoration) projects. Negligible change from the 2008 EIS impact forecast to shorelines is anticipated.

5.1.3 Hydrology and Water Quality

Direct Impacts
Negligible change in impacts to water circulation or water quality from the 2008 EIS is anticipated. The 2008 EIS contained a Clean Water Act 404(b)(1) Analysis that concluded that because the offshore shoal sand contain very minor content of silts and clays (less than 1 percent), turbidity created by fine sand being stirred up from the seafloor and or washing out of the dredge would be minor (local and temporary).

Geotechnical investigations conducted since the 2008 EIS have confirmed that sands of the offshore shoals contain only a very amount of silts or clays that could cause longer-lasting turbidity during and following dredging.

Indirect Impacts
Negligible change in indirect impacts are expected from those presented previously in the 2008 EIS. Dredging of the offshore shoals in accordance with the dredging constraints would prevent creation of large deep pits that could have reduced circulation. Overall water circulation and biotic activity that affects water quality of the area is expected to be unimpacted. Thus, the project would not induce lower oxygen conditions in the water, even at depth where the water is naturally at somewhat lower oxygen levels. Because the dredging would maintain the crest, no change in wave energy reaching the shore would occur. Wave energy on the shoal crest would remain about the same. However, patterns of currents and waves on the sides of the shoals would change locally during storm conditions because lowering of the shoal surface to greater depth would reduce interaction of strong waves and currents with the seafloor.

5.1.4 Climate

The 2008 EIS did not address impacts to climate. Greenhouse gases produced by dredging activities would indirectly impact climate but constitute a negligible human greenhouse gas contribution overall. In accordance with President Trump's *Executive Order on Energy Independence (EO 13783)*, USACE did not quantify emissions of various greenhouse gases nor give detailed consideration to their impacts on climate in preparation of this EA.

5.1.5 Air Quality

Direct Impacts
The 2008 EIS stated that operation of dredges, tugboats, and other marine equipment will release air pollutants into the project area where equipment is operated. During construction occurring during any period of time when winds are light, relatively high air pollutant concentrations may temporarily occur in localized areas. Because dredging would occur offshore, winds would dissipate the pollutants such that they have minimal impact to MD or DE.

The 2008 EIS anticipated that impacts to air quality would likely need to be revisited in the future. Because Sussex County, DE, was designated as marginal nonattainment for the 2008 ozone NAAQS, and previous NEPA documents have not estimated emissions of beach nourishment work, it was necessary for this EA to estimate emissions produced by construction work on the beach in DE by the project terminus that extends 0.3 miles into DE. DE is part of the ozone transport region (OTR), therefore, the applicable thresholds would be 50 tons/year for VOC and 100 tons/year for NOx The onshore sand placement in Sussex County was evaluated to see if the emissions resulting from this activity exceed the general conformity thresholds in 40 CFR 93.153.

Emissions for beach nourishment work (Annex B) of NOx were estimated to be 570 pounds, and VOC (Total Hydrocarbons [THC]) were estimated to be 65 pounds. These quantities are vastly smaller than the emission quantities of concern that would require General Conformity Analysis. In summary, while the project temporarily degraded Sussex County air quality in 2008, 2012, and 2017, and will temporarily degrade air quality in the future during each beach nourishment cycle, effects will not undermine regional efforts to improve air quality as captured in the State Implementation Plan. Accordingly, no mitigation measures that could reduce or minimize impacts of air pollution are required.

Indirect Impacts

The 2008 EIS did not address indirect impacts to air quality. The project would produce negligible indirect air pollution.

5.1.6 Noise

The 2008 EIS addressed noise impacts to people, but did not address noise impacts to fish or wildlife.

Direct Impacts

Since 2008, new information from multiple BOEM documents is now available that addresses impacts of noises on fish and wildlife. BOEM (2013) recorded sound produced by hopper dredges working off the southern end of Assateague Island that were providing sand for Wallops Island, VA. The loudest sounds were produced by the hopper dredges during transiting, whether full or empty, and were substantially greater than the sounds produced by dredging activities. Larger dredges produced louder sounds when the vessels were in transit than smaller vessels in transit. Sound of the ships in transit attenuated to background levels within 1.6 miles of the vessel.

Based on BOEM (2017), it is anticipated that noise produced during dredging would not cause any mortality to marine life. However, manmade project underwater noises from the dredge vessel and draghead may alter the behavior of fish in the borrow area during dredging. Fish may alter swim speed and or direction, and fish communication could be affected. Overall noise impacts to marine life are expected to be negligible to minor.

Indirect Impacts
Following dredging, no manmade noises would be produced. Altered seafloor bathymetry could create sound shadows in dredge furrows until such time as natural processes rework the offshore shoal surface. It is not anticipated that this would have any substantial impact on marine life.

5.2 HABITATS

Direct Impacts
Negligible change in bottom habitat impacts is anticipated from those described in the 2008 EIS, except that the future number of cycles through 2044 that would obtain sand from offshore shoals in the OCS is less as sand continued to be obtained from state waters through 2017. Up to about 500 acres of bottom habitat would be impacted each dredging cycle (about every 4 years). Over the authorized project life to 2044, this impact would thus be about 3,000 acres if renourishment of Ocean City beach occurs at the anticipated rate. However, some areas may be dredged more than once, so total area impacted may include repeated dredging of some places.

Indirect Impacts
Negligible change from the 2008 EIS is expected. Under the dredging constraints, it is anticipated that habitat functions of the offshore shoals would be maintained over the long term. Bathymetric monitoring would verify whether offshore shoal geomorphic integrity is maintained. USACE, BOEM, and other agencies will periodically coordinate in the future to review findings of monitoring and plan future dredging.

5.3 MARINE LIFE

5.3.1 Benthic Algae

Impacts to benthic algae were not addressed in the 2008 EIS.

Direct Impacts
Dredging would directly impact benthic microalgae over much of the dredged area, whether by direct entrainment or by burial following microalgae slumping into furrows. However, benthic microalgae are very adaptable to disturbance. Recruitment of benthic microalgae onto the dredged surfaces would be expected to occur within years of dredging based on general recovery patterns of benthos in dynamic sandy substrates (BOEM, 2013). Overall impacts to benthic algae are expected to be minor.

Indirect Impacts
No permanent change in water quality which would impact benthic microalgae is expected. While water depth would be increased within the dredged area and light reaching the bottom slightly reduced, water depths would still be within the global average photic zone for benthic microalgae in coastal ocean waters. With reworking of bottom sediments from natural physical and biological

processes, bottom impacts are expected to be gradually reduced with no long-term impact to benthic microalgae expected.

5.3.2 Invertebrates

Direct Impacts

Overall, only negligible change in impacts to invertebrates are anticipated from what was forecast in the 2008 EIS which stated that dredging would destroy non-motile benthos by direct entrainment during dredging, or by burial concomitant with bottom slumping into furrows created by the dredge. Invertebrates that would be most impacted are ones that are immobile or nearly so during at least one life stage and are thus unable to escape from habitats subject to possible anthropogenic disturbance. Sand dollars, moon snails, and other abundant benthic invertebrates would be destroyed in large numbers. A variety of juvenile and adult shellfish of importance commercially would be impacted, including sea scallops, calico scallops, surfclams, and ocean quahogs.

The 2008 EIS did not address impacts to egg masses of longfin squid that may be present on the offshore shoals in warm weather months. Because dredging would not occur during summer, it is anticipated that only negligible or minor impacts to longfin egg masses would occur.

Indirect Impacts

Change in indirect impacts to invertebrates are anticipated to be negligible from those forecast in the 2008 EIS. However, new information is available which is appropriate to include here. BOEM (2013), in a review of dredging impacts, found that benthos generally recover within several years to pre-project conditions on sandy substrates. Because the post-borrow substrate would remain sandy with good water quality and change in depth of only several feet, it is anticipated that benthos would largely recover to pre-project condition within a several year period.

5.3.3 Finfish

Impacts to finfish from noise are addressed separately in Section 5.1.6.

Direct Impacts

The 2008 EIS stated that principal concerns over direct impacts to finfish focus on demersal fish, particularly during months of coldest bottom water when fish could be lethargic. Conversely, demersal fish could avoid direct entrainment during conditions of warmer bottom waters. Fish of the water column would be minimally impacted other than for minor and temporary impacts associated with increased turbidity. The 2008 EIS identified that species that would be directly impacted would depend on time of dredging, as many of the species present are seasonally migratory (north/south, as well as onshore/offshore).

Since the 2008 EIS, substantial additional investigations of impacts of dredging offshore shoals upon finfish have been conducted. BOEM (2013) reviewed physical and biophysical impacts from dredging offshore sand. While these studies have added substantial new information, change in impact concerns from those reported in the 2008 EIS are negligible.

Since the 2008 EIS, additional EFH designations have been made that have focused attention on additional benthic and demersal species. Those impacts are covered separately in Annex C.

Indirect Impacts
Negligible change from indirect impacts to finfish from those forecast in the 2008 EIS are anticipated. The 2008 EIS identified that the loss of benthic organisms during the several year period subsequent to dredging would reduce the value of the shoal as foraging habitat.

5.3.4 Wildlife

Direct Impacts
In the 2008 EIS, potential impacts to foraging seabirds were identified as a minor concern because seabirds were believed to preferentially forage on offshore shoals. Review of BOEM research since that time indicates seabird occurrence is largely tied to water depth, such that they prefer waters near the coast generally rather than offshore shoals specifically. Thus, direct impacts to seabirds that will occur by interrupting foraging activity would be less than previously anticipated, and instead be of negligible rather than minor concern for seabirds.

Indirect Impacts
As with direct impacts, indirect impacts to seabirds from loss of benthos that they could forage upon would be reduced from those considered in the 2008 EIS as seabirds have abundant foraging areas elsewhere in coastal ocean waters, and don't appear to preferentially select offshore shoals. Thus, indirect impacts to seabirds would be negligible. Long-term impacts would be minimized by dredging guidelines/constraints that would maintain shoal relief off seafloor.

5.3.5 Rare, Threatened, and Endangered Species

Direct Impacts
The 2006 NMFS Biological Opinion concluded that dredging of the new OCS borrow areas may adversely affect but is not likely to jeopardize the continued existence of the loggerhead and Kemp's ridley sea turtles. The 2006 Biological Opinion stated that the Atlantic Coast Project is not likely to adversely affect leatherback or green sea turtles or right, humpback, or fin whales.

Since the 2008 EIS but prior to preparation of this EA, USACE and NMFS coordinated regarding potential impacts to Atlantic sturgeon and loggerhead sea turtle (Northwest Atlantic Distinct Population Segment). NMFS stated by letter in 2013 that dredging of the borrow areas was not likely to adversely affect Atlantic sturgeon. The coast of MD is not a known overwintering area. The sand bottom is not preferred by Atlantic sturgeon for foraging. Atlantic sturgeon should be able to freely move away from the hopper draghead. NMFS stated by letter in 2013 that previous analyses presented in the 2006 Biological Opinion regarding effects of the Atlantic Coast Project on loggerhead sea turtle remained unchanged.

No observed injured or killed "takes" of rare marine species that could be associated with dredging sand for Ocean City from the seafloor have been documented since the 1990s. However, since the 2008 EIS, NMFS has determined that underwater takes of sea turtles typically occur during hopper dredging that are not identified by surface observers. Additionally, screening to exclude MEC was not considered in previous coordination with NMFS. Screening does not protect turtles from being struck or crushed, but does exclude their remains from being entrained into the dredge where it could be observed. Accordingly, it is now assumed that some sea turtles were likely taken during dredging for the Atlantic Coast Project. The 2006 Biological Opinion prepared by NMFS allowed for an incidental take of one sea turtle per 500,000 cubic yards dredged annually. The project would thus be expected to take individual sea turtles at up to this rate through the remainder of the authorized life (2044), but not jeopardize the continued existence of these species.

NMFS stated by letter on October 24, 2018 that no re-initiation of formal consultation under the Endangered Species Act regarding potential impacts on federally listed species under their jurisdiction was necessary. Previous analysis and finding of effects of the Atlantic Coast Project by NMFS on shortnose sturgeon, sea turtles, and whales have not changed. The Reasonable and Prudent Measures NFMS requires USACE to utilize to minimize impacts on sea turtles and whales as presented in the 2006 Biological Opinion remain valid. Based upon NMFS statements, negligible to minor change in impacts to sea turtles from what was forecast in the 2008 EIS is anticipated.

The 2008 EIS did not address potential impacts to rare shorebirds on the OCS. USFWS in its planning aid report prepared for this EA (Annex A) determined that the Atlantic Coast Project would not likely affect Red Knot or Piping Plover because they occur only as transients and do not forage in OCS waters. The Atlantic Coast Project would have negligible impacts on transient Maryland - listed bird species because they could relocate foraging activities elsewhere and not thought to concentrate on shoals.

Indirect Impacts

Indirect impacts to rare species would remain negligible as forecast in the 2008 EIS. The project would have temporary localized minor indirect impacts on rare species as potential forage species would be eliminated for several years following each dredging cycle. Over longer time frames, no indirect impacts would occur as habitat conditions would be maintained by conducting the dredging in accordance with the constraints.

5.4 Human Setting

5.4.1 Cultural Resources and Historic Structures

Direct Impacts

The 2008 EIS stated that USACE would conduct surveys of OCS offshore shoals prior to dredging to ensure compliance with cultural and historic preservation laws. A Phase I archaeological investigation of the Weaver and Isle of Wight Shoals was conducted between May 30th and June 1st, 2019. No potential submerged cultural resources were documented during the investigation.

Because the candidate shoals consist of modern reworked sediment, they do not contain intact archaeological resources associated with any Native American groups that lived in the study area at times of lower sea level. Prehistoric landforms that could contain such artifacts are being avoided. Thus, the project has no potential to effect prehistoric archaeological resources.

Another project component that could cause direct impacts to cultural resources is the placement of the pipes that pump sand onto Ocean City beach (Section 2.1 and Annex B). Composed of welded steel, the pipes are typically between 30 and 36 inches in diameter, and can be between 2,000 and 3,000 feet long. These are positioned in four to five different locations perpendicular to the beach. The placements could cause a direct impact to cultural resources if they were placed on top of any shipwrecks or sunken craft. However, the pipe corridors will be surveyed via multi-beam sonar prior to pipe placement. Additionally, pipes are only placed on smooth bottom where they have no likelihood of contacting any objects on the seafloor to ensure that the pipe is not damaged. Direct impacts to cultural resources from placement of pipes are not anticipated.

Indirect Impacts

While the proposed dredging would affect the bathymetric and geologic evolution of the offshore shoals from which dredging is conducted (Sections 5.1.1 and 5.1.2), no intact cultural or historic resources are known to be located in close proximity to the borrow areas. The seafloor in the vicinity of pipes through which sand would be pumped is naturally dynamic, and the pipes would not cause any indirect impacts beyond changes that would naturally occur. Thus, it is anticipated that there would be negligible indirect impacts to cultural resources.

5.4.2 Navigation

Direct Impacts

The 2008 EIS stated that navigation would be limited at the new borrow areas during dredging and in vessel transit areas, and that USACE would utilize a variety of measures to minimize risk to navigation. Utilizing these measures, impacts to navigation are anticipated to be negligible to minor. Updated to 2018, the contract specifications for the project will require multiple measures as presented in Table 5-3.

Table 5-3: Vessel interaction mitigation measures.

1	Maintain bridge-to-bridge radio communication with passing vessels.
2	Monitor VHF-FM radio channels 13 and 16.
3	Notify the US Coast Guard of intended dredging operations so that they can post a Notice to Mariners at least one week prior to the commencement of dredging operations.
4	Display lights and conduct operations in accordance with general regulations of the Department of the Army and US Coast Guard governing lights and day signals.
5	Mark floating dredge pipelines in accordance with US Coast Guard navigation rules.

The 2008 EIS did not specifically consider shipping into and out of Delaware Bay. Updated information compiled for this EA determined that the project would not directly cross major shipping routes into/out of Delaware Bay, assuming data from 2009 and 2013 as documented by Marine Cadastre is representative of current navigational activity. Accordingly, the proposed borrow action would have negligible impact on navigational traffic into/out of Delaware Bay.

<u>Indirect Impacts</u>
Negligible change in indirect impacts from those presented in the 2008 EIS were identified. Dredging would have minor impact to shoal bathymetry, but this would have no effect on navigation as the shoals are not a navigation concern.

5.4.3 Infrastructure

<u>Direct Impacts</u>
In the 2008 EIS, no infrastructure impact concerns were identified. Since that time, potential impacts to undersea cable and wind energy infrastructure are general concerns of seafloor construction projects. No undersea cables or wind energy infrastructure is present on offshore shoals of interest. Accordingly, no physical impacts to undersea communications or energy cables would occur.

<u>Indirect Impacts</u>
The proposed borrow actions lie miles from any existing undersea cables or other infrastructure thus impacts to the offshore shoals of borrow actions even if altering shoal character would not impact infrastructure. Future wind energy infrastructure turbines would lie seaward of the proposed borrow areas. The guidelines/constraints formulated to ensure that habitat functions of the offshore shoals are maintained (crest maintenance and geomorphic integrity) would also serve to minimize impacts of borrow actions on wave energy and currents, and thus minimize any possible indirect impacts on existing or future infrastructure.

5.4.4 Munitions and Explosives of Concern

Direct Impacts

The 2008 EIS stated that with screening mitigation measures, risk of UXO and MEC being entrained into the dredge or placed on the beach would be minimal. Current practices (2018) apply uniform mitigation measures that include: screening the intakes at the dragheads on the seafloor to prevent intake of any material with a diameter greater than 1.25", screening outflow onto the beach to prevent discharge of any material with a diameter greater than 0.75", and using a robust QC/QA program which includes having a UXO technician on site 24/7 during operations. These are proven mitigation measures to prevent MEC being placed with dredged material. Negligible change in impacts would occur from the forecast of the 2008 EIS.

Indirect Impacts

The 2008 EIS did not address indirect risk from UXO and MEC. Dredging could expose MEC buried below the surface which could subsequently present a risk to commercial or recreational fishing. However, the risk would presumably be equivalent to risks under pre-dredging conditions in that UXO and MEC may already be exposed, thus increased risk would be negligible.

5.4.5 Recreation, Visitor Use, and Public Safety

Direct Impacts

Recreational boat navigation in the study area is better documented than it was at the time of the 2008 EIS. However, negligible change in impacts to recreational use of the area and public safety would be expected from the forecasts of the 2008 EIS. Recreational boats would not be able to use waters of the borrow sites during dredging. Routine measures undertaken by USACE to protect mariners when dredging would be utilized to maintain public safety and would be expected to be equally successful in future. Other than for the loss of public use of the borrow areas during dredging and vessel transit, negligible impacts are anticipated.

Indirect Impacts

Negligible change from impacts forecast in the 2008 EIS would occur. Following dredging, conditions with regard to these activities would return to pre-project conditions. No long-term effects would occur. Fishing impacts discussed in Section 5.4.6.

5.4.6 Fishing

Direct Impacts

Substantially more detailed information has become available since the 2008 EIS to forecast potential impacts to fishermen. Because Isle of Wight Shoal and Shoal B, both identified to be important fishing areas for fishermen from Ocean City, would be avoided for the foreseeable future, detrimental impacts to that fishing area of concern to recreational and charter boat fishermen would be avoided. Fishermen would avoid the dredging and transit area during project construction. Fishing activities would be shifted elsewhere. In light of the vast area of ocean and seafloor available in the vicinity of Weaver Shoal of equivalent value as fishing grounds, dredging would be expected to cause a negligible or minor detrimental impact on fishermen.

Impacts to fishing would remain the same as anticipated in the 2008 EIS. Dredging would destroy relatively immobile and slow-moving benthic fishery species such as whelk and clam. Impacts to the populations of these species regionally would be negligible, and these benthic fishery species would recover to pre-dredging numbers several years after dredging. During that recovery period, fishermen could avoid the dredged area and fish elsewhere. During dredging, fishermen would need to avoid the dredged area and fish elsewhere to avoid vessel collisions. Dredging would generate turbidity, but turbid conditions would dissipate within hours, with no anticipated impact to commercial or recreational fishing.

Indirect Impacts

Negligible change in indirect impacts from those anticipated in the 2008 EIS would occur. Destruction of benthos would cause loss of forage for bottom-associated finfish. The offshore shoal dredged value as a fishing ground would be reduced for up to several years until benthos recover.

5.5 Cumulative Impacts

The 2008 EIS considered multiple offshore borrow activities and fishing off the Delmarva Peninsula[23]. While additional offshore borrow actions off the Delmarva Peninsula have been undertaken since that time (by USACE off MD and DE [Section 1.2], as well as by the National Aeronautics and Space Administration (NASA) off Wallops Island, VA), overall cumulative impacts of these activities remain consistent with the findings of the 2008 EIS and its EFH impacts assessment. The comparatively vast area of the OCS off Delmarva and vast volume of sand available compared to beach sand needs serves to limit cumulative habitat impacts of borrow activities in this region.

The 2008 EIS did not consider cumulative impacts from development of offshore wind farms, telecommunications/energy infrastructure, ship traffic, fishery management, artificial reefs, or atmospheric changes. No interactive cumulative impacts between wind energy projects and sand borrow actions would be anticipated. (However, interactive cumulative impacts between wind energy and artificial reef projects would occur. Both would create underwater structure that would benefit fouling organisms and structure-oriented fish.) Wind energy could potentially harm a variety of bird species, whereas borrow actions would have no impact on birds other than minor short-term impacts to foraging habitat for seabirds. This reduction in concern over impact to seabirds from the 2008 EIS thus serves to substantially reduce potential cumulative impacts to birds on the OCS.

Undersea cables, although causing bottom disturbance during installation, would not have long-term impacts on habitat or marine life (other than a potential repeat disturbance if the cables are

[23] The 2008 EIS EFH impacts assessment provides additional detailed cumulative impacts assessment.

serviced or removed in the future). Therefore, these would not interact cumulatively with impacts of sand borrow actions. Future coordination with BOEM and USACE would be expected to direct any proposed energy or communication cables away from the offshore shoals of interest.

Assuming that fishery species management continues to maintain stocks in healthy conditions into the future, then the relative importance of habitat quality as a factor controlling fish populations is more important than it was at the time of the 2008 EIS. The importance of bathymetric monitoring of dredging to ensure long-term maintenance of offshore shoal habitats is increased.

The 2008 EIS did not consider how accelerated sea-level rise or changes in the Gulf Stream could interact cumulatively with human activities. Acceleration in the rate of sea-level rise would be expected to gradually increase shoreline erosion rate and increase sand needs. However, the effect is not expected to exceed the volume of sand acceptably available in the recommended borrow areas. It is also unlikely over the authorized project life to cause realized sand need to exceed the maximum estimated sand needs. Continued slowdown of the Gulf Stream and its possible movement closer to shore might bring warm water fish into the proposed borrow areas for more extended periods of the year. Cold water species would be anticipated to make less frequent use of the project area waters. The dredging constraints were developed to maintain offshore shoal habitats over the long-term for marine life generally without regard to exactly which species make use of these habitats.

Continuing improvements to artificial reefs would be anticipated to increase their attractiveness for structure-oriented fish, and induce increased fishing activity in the vicinity of the artificial reefs. Any future expansion of the artificial reef at Bass Grounds would likely serve to further increase its value to structure-oriented species.

Potential uses of the OCS that could cause cumulative impacts have increased. However, potential conflicting and harmful uses of these activities are evaluated by multiple federal and state agencies, fishing interest groups, and environmental groups. Information available to all parties to better minimize conflicts and manage impacts is continuously increasing. Greater awareness of society and government of need to manage for multiple uses of OCS and use conflicts should reduce these from what they would be otherwise.

Fossil fuel emissions from beach nourishment would contribute cumulatively to emissions from other human sources that are changing atmospheric concentrations of greenhouse gases. These emissions would also contribute cumulatively to atmospheric changes that are causing increasing ocean acidity.

Ocean City and the beaches of DE would remain important tourist destinations generating substantial vehicle traffic. However, no change in vehicle traffic or other sources of air pollutants is anticipated with continued maintenance of the authorized project.

In summary, while human activities and natural processes impacting the OCS have changed since the 2008 EIS, the change in cumulative impacts to the OCS would be negligible.

6.0 COMPLIANCE WITH ENVIRONMENTAL STATUTES

Federal and State Permits

Because dredging would occur within federal waters, state standards of MD and DE do not apply at the offshore shoals themselves. However, it is anticipated that all dredging within federal waters would conform to requirements of MD and DE water quality certificates. Because impacts of the proposed action lie within the parameters of the Clean Water Act 404(b)(1) Analysis contained in the 2008 EIS, no new 404(b)(1) Analysis was prepared for this EA. Water Quality Certificates pursuant to Section 401 of the Clean Water Act have been obtained from the States of MD and DE for the project and are routinely renewed. The MD WQC and Tidal Wetlands Authorization expires in 2026. The current DNREC WQC and Subaqueous Lands Permit expire in 2029. The MD DNR is the holder of these permits and responsible to obtain new ones when these expire.

BOEM published regulations on October 3, 2017 that define the process used by the Marine Minerals Program for issuing negotiated, noncompetitive agreements for sand, gravel, and shell resources on the OCS (https://www.boem.gov/82-FR-45962/). USACE would obtain a lease from BOEM prior to dredging offshore sands in accordance with BOEM procedures/requirements.

Summary of Compliance

In addition to the environmental impacts discussed in this EA, a review of the proposed action has been made with regard to potentially relevant Federal statutes and regulations. Tables 6-1 and 6-2 present a summary of pertinent Federal regulations and the proposed action's current compliance status. USACE coordinated with DNREC during preparation of this EA to ensure compliance with the Clean Air Act and Coastal Zone Management Act. USACE is now in full compliance with these acts. USACE coordination with NMFS to ensure compliance with the Fish and Wildlife Coordination Act and Magnuson-Stevens Act is ongoing. USACE anticipates being at a full level of compliance with these acts also at the time an anticipated FONSI is signed. USACE would need to be in full compliance with cultural and historic regulations prior to any dredging being conducted, and will coordinate with BOEM, MHT, and Federally-recognized tribes to ensure this. Achieving full-compliance status is thus expected after the anticipated FONSI is signed. USACE would be in compliance with the Outer Continental Shelf Lands Act upon receiving an anticipated permit from BOEM. This is anticipated after the FONSI is signed, but prior to dredging on the OCS.

Table 6-1: Compliance of the Proposed Action with Statutes.

Federal Statutes	**Level of Compliance1**
Anadromous Fish Conservation Act	Full
Archeological and Historic Preservation Act	Partial
Clean Air Act	Full
Clean Water Act	Full
Coastal Zone Management Act	Full
Comprehensive Environmental Response, Compensation and Liability Act	Full
Endangered Species Act	Full
Estuary Protection Act	Full
Federal Water Project Recreation Act	Full
Fish and Wildlife Coordination Act	Partial
Land and Water Conservation Fund Act	Full
Magnuson-Stevens Fishery Conservation and Management Act	Partial
Marine Protection, Research and Sanctuaries Act	Full
Marine Mammal Protection Act	Full
Migratory Bird Treaty Act	Full
National Environmental Policy Act	Full
National Historic Preservation Act	Partial
Outer Continental Shelf Lands Act	Partial
Rivers and Harbors Act	Full
Submerged Land Act	Full
Water Resources Planning Act	Full
Watershed Protection and Flood Prevention Act	Full

Table 6-2: Compliance of the Proposed Action with Executive Orders.

Executive Order (EO)	**Level of Compliance1**
Protection and Enhancement of Environmental Quality (E.O. 11514, 1977)	Full
Protection and Enhancement of Cultural Environment (E.O. 11593)	Partial
Floodplain Management (E.O. 11988)	Full
Recreational Fisheries (E.O. 12962)	Full
Environmental Justice (E.O. 12898)	Full
Recreational Fisheries (E.O. 12962)	Full
Indian Sacred Sites (E.O. 13007)	Partial
Protection of Children from Environmental Health Risks and Safety Risks (E.O.13045)	Full
Migratory Bird (E.O. 13186)	Full
Stewardship of the Oceans, Our Coasts and the Great Lakes (E.O. 13547)	Full

1 Levels of Compliance

a. Full Compliance: having met all requirements of the statute, E.O., or other environmental requirements for the current stage of planning.

b. Partial Compliance: not having met some of the requirements that normally are met in the current stage of planning. This results from several causes, including changes in conditions and regulations from 2008 EIS, certain tasks having been purposefully postponed into the future, and coordination with agencies not having been fully completed.

7.0 COORDINATION/PUBLIC INVOLVEMENT

In compliance with the National Environmental Policy Act (NEPA), the proposed action has been and is being coordinated with concerned resource agencies and the public. The purpose of coordination is to ensure that environmental and social factors are considered while planning and executing a prudent and responsible action. Annex A contains a summary of coordination efforts, a copy of the study initiation notice, and copies of responses from resource agencies.

USACE and BOEM communicated throughout the action planning process. USACE requested that BOEM become a cooperating agency in preparation of the EA by letter in March 2018. USACE prepared draft EA text iteratively and provided it to BOEM for review during 2018. USACE incorporated revisions into the draft EA in accordance with BOEM comments. USACE and BOEM held occasional conference calls and meetings, and often coordinated jointly with other agencies.

USACE mailed out a public notice announcing preparation of the EA by first class mail in April 2018. The public notice was submitted to federal, state, and local agency representatives, elected officials, and leaders of local civic organizations anticipated to have an interest in the project. Information on the project was provided to Tribes and Nations representing Native Americans. The public notice was also displayed on the Baltimore District website. The notice requested comments within the concerned agencies' areas of responsibility and citizens' interests. Responses were received from multiple federal and state agencies, fishermen's' groups, and one tribal group.

MD DNR and USACE undertook additional coordination with recreational and commercial fishermen stakeholders. MD DNR has twice annual meetings entitled "Coastal Commercial Fisheries Forum" in Ocean City, MD. MD DNR introduced the project to fishermen at its April 27, 2018 meeting. Subsequently, on June 1, 2018 MD DNR emailed additional information on the project to participants of the fisheries forum. MD DNR requested that fishermen provide information on the relative value of the candidate shoals as fishing grounds (Isle of Wight, Weaver, A, and B), noting that Shoal B was previously considered too valuable as a fishing ground to dredge. MD DNR also requested information on how to contact commercial/recreational vessels that fish these waters.

Subsequent to the MD DNR fisheries forum, several charter boat and recreational fishermen from the Ocean City area requested that a public meeting be held to discuss the proposed borrow action. USACE contacted fishermen in early June and scheduled a meeting in July that would best accommodate the fishermen by not posing a conflict with fishing. Because this was during prime fishing season, no previously scheduled meetings were identified that could be utilized for the purpose. USACE held an evening meeting on July 10, 2018 in west Ocean City at the Marlins Club. Input from fishermen was utilized in selecting which shoal to dredge in the next borrow cycle.

The Ocean City Dispatch published an article on July 12, 2018 summarizing the July 10th meeting presentations and discussion. The article provided information on how to contact USACE for further information and input.

USACE and BOEM coordinated with NMFS during preparation of the EA to ensure compliance with the Magnuson-Stevens Fishery Management Act. Particular effort was focused on identification of species for which the proposed action waters may constitute EFH (Annex C contains an EFH impacts assessment). Discussion with NMFS also considered whether or not a time of year restriction would be appropriate (Section 3.5). Coordination with NMFS regarding potential impacts to EFH is ongoing.

USACE coordinated with NMFS and the USFWS during preparation of this EA to ensure compliance with the Endangered Species and Fish and Wildlife Coordination Acts. USACE coordination with NMFS regarding endangered species is ongoing.

USACE coordinated with USEPA, DNREC, and MDE to ensure compliance with the Clean Air Act. USACE coordinated with DNREC to ensure compliance with the Coastal Zone Management Act. USACE coordinated with BOEM and the MHT to ensure compliance with cultural and historic resource regulations.

Additional agency and public coordination will occur during agency and public review of this EA. Surfing groups were identified as potential stakeholders during EA preparation, and will be added to the mailing list for public and agency release of the draft EA.

8.0 CONCLUSION

The environmental and social consequences associated with the proposed action have been evaluated and assessed by USACE and BOEM. The alternative of taking no action was compared to the proposed action and the impacts were described and evaluated. Coordination with MGS, NMFS, and BOEM verified that the dredging constraints as proposed in 2008 EIS are still implementable and contain reasonable and prudent mitigation measures to maintain EFH while also providing sand to maintain the authorized Atlantic Coast Project at Ocean City. Undertaking dredging from Weaver Shoal first (by 2022) for one or more dredging cycles to provide sand for the Atlantic Coast Project was selected as the recommended alternative in coordination with fishermen, MD DNR, and NMFS.

Construction of the proposed project would cause a variety of environmental and social consequences as evaluated in the 2008 EIS. Destruction of benthos in the borrow area each dredging cycle, and reduced fishery value over the recovery period, is the principal short-term concern. Within several years following dredging, benthos in the borrow areas and fishing opportunities would be expected to largely recover to pre-dredge conditions. Dredging would permanently remove sand from the offshore shoals, but offshore shoal habitats would be maintained.

USACE would conduct dredging in accordance with mitigative constraints such that only a minor loss of offshore shoal height and volume would occur over the long term. USACE is committed to monitoring the offshore shoals and evaluating impacts of dredging to ensure that long-term geomorphic integrity, and thus their habitat values, is maintained. USACE will coordinate monitoring with BOEM, NMFS, and MGS. In the future, the value of Weaver Shoal, Isle of Wight Shoal, Shoal A, and Shoal B as fishing grounds will be re-assessed in making decisions over which offshore shoal to dredge. One potential concern could be if surf clam populations adequate to support substantial commercial fishing activity establish on one or more of the candidate shoals. USACE is committed to conducting dredging in accordance with reasonable and prudent measures required by NMFS to mitigate impacts to sea turtles and whales. USACE is committed to surveying temporary pipeline routes in MD waters as well as conducting Phase I archaeological investigations of the offshore shoals on the OCS prior to deploying pipeline and dredging. Conducted between May 30th and June 1st, 2019, a Phase I archaeological investigation of the Weaver and Isle of Wight Shoals did not document any potential submerged cultural resources. Dredging the Weaver and Island of Wight Shoals will have no effect on historic properties. USACE is committed to conducting dredging in accordance with MEC mitigation measures that would screen out MEC from being dredged from the seafloor or placed on the Ocean City beach.

This EA addresses changes in impacts from those reported in the 2008 EIS. Changes in impacts from those forecast in the 2008 EIS would be negligible to minor (Table 8-1). Accordingly, it has been determined that the preparation of an updated EIS is not warranted. A FONSI was prepared, a copy of which is provided at the beginning of this EA. BOEM has served as a cooperating agency in the development of this EA, has conducted its own independent review, and will prepare its own FONSI prior to authorizing use of OCS sand resources for the Atlantic Coast Project.

Table 8-1: Summary – change in environmental consequences.

Topic	2019 EA Impact Summary	Change in Impacts from 2008 EIS
Physiography and Topography	Reduced in OCS as dredging through 2017 instead occurred in state waters	Negligible
Geology	Forecast total sand need per nourishment cycle increased to account for sand placed on beach but not measured	Minor
Hydrology and Water Quality	Minor turbidity	Negligible
Climate	Negligible via contribution to anthropogenic fossil fuel cumulative emissions	Not previously addressed
Air Quality	DE beach construction emissions quantified but minor.	Negligible
Noise	Negligible to minor to fish and wildlife.	Not previously addressed
Aquatic Habitats	Reduced in OCS as dredging through 2017 occurred in state waters instead.	Negligible
Plant Life	Minor to benthic microalgae.	Not previously addressed
Fish	Minor to fish.	Negligible
Wildlife	Negligible to seabirds	Reduced from minor
Endangered Species	Unobserved turtle strikes not identified in 2008 EIS. Unobserved takes likely to have occurred in past and occur in future within limit set by 2006 Biological Opinion.	Negligible to population
Cultural Resources	No effect to historic properties on Weaver or Isle of Wight Shoals as none present. USACE will survey Shoals A and B prior to dredging and avoid, minimize, or mitigate.	Reduced from uncertain for Weaver and Isle of Wight Shoals.
Munitions and Explosives of Concern	USACE will utilize mitigation measures to minimize risk.	Negligible
Navigation	Minor	Negligible
Infrastructure	Negligible	Not previously addressed
Recreation, Visitor Use, and Public Safety	Negligible	Negligible
Fishing	Minor	Negligible

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