Projected OCS Sand Resource Needs and Effort

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Table of Contents

List of Tables

List of Figures

1. Introduction

United States (U.S.) beaches are the first line of defense against storms, and they provide critical environmental habitat and valuable recreational benefits. U.S. wetlands are productive ecosystems that sustain an intricate food chain. Encroachment on these environments and natural destructive processes have led to decisions to intervene to maintain and restore these natural assets through dredging and placement of sediment (sand, gravel, shell, and silt/clay). As sediment resources in state waters have diminished over the years, there has been an increased demand for sediment from the Outer Continental Shelf (OCS) (Figure 1-1).

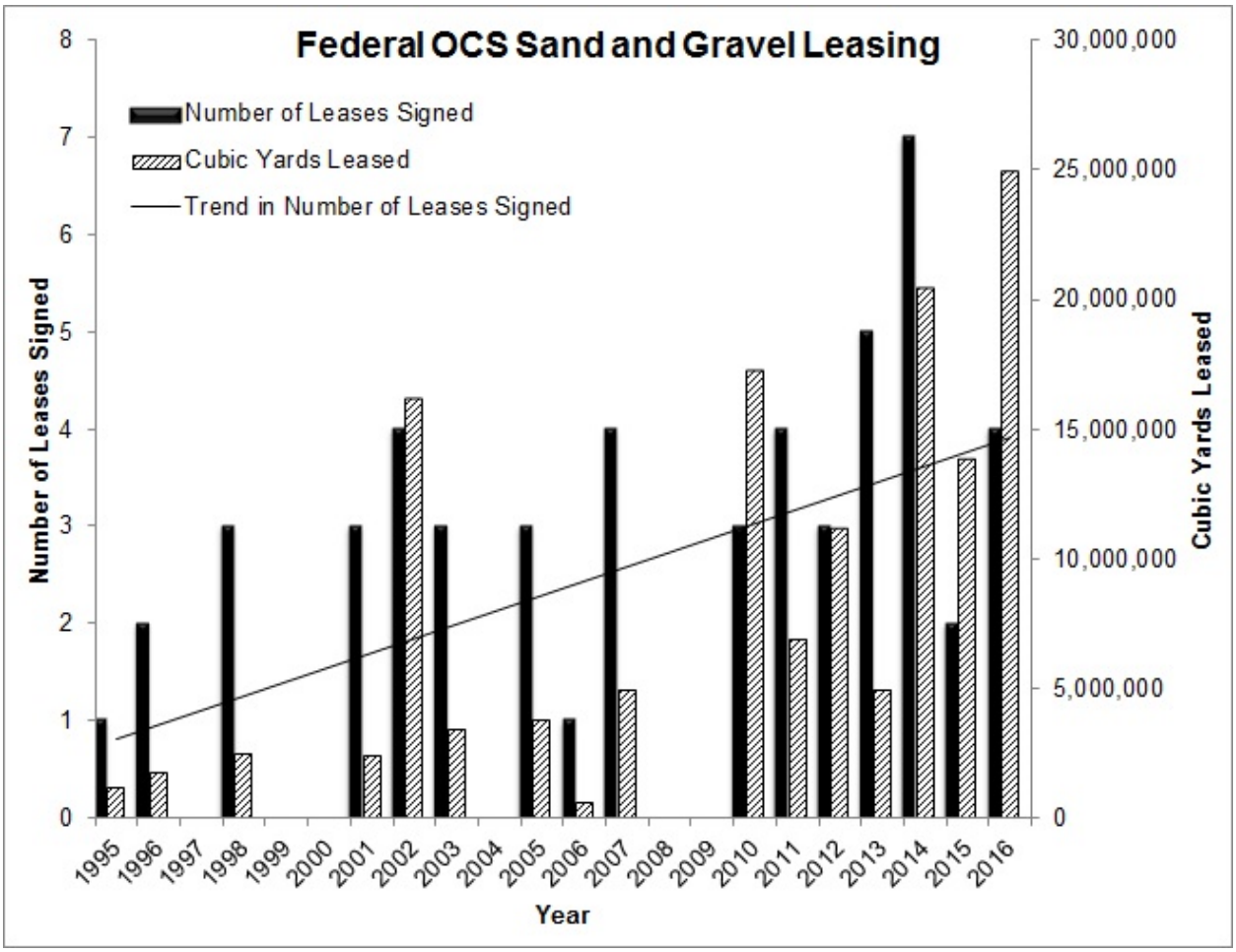

Figure 1-1: History of BOEM Leases Signed and Total Volume Leased.

The Bureau of Ocean Energy Management (BOEM) Marine Minerals Program (MMP) is the only federal agency with the authority to convey the rights to dredge OCS mineral resources. With this authority, BOEM is also charged with ensuring that dredging, handling, and placement of federal sediment resources are performed in a safe and environmentally sound manner. BOEM has already authorized the use of over 147 million cubic yards (MCY) of sand for such projects, but this is just the start. Unfortunately, sediment sources along the OCS are increasingly expensive to obtain due to increasing distance from the project area, are

typically not renewable, and have competing offshore interests. Thus, careful planning for the use of these resources is required to optimize longevity and minimize costs while protecting the environment.

Understanding the future demands of sediment for coastal restoration projects is one aspect of effective management. This report summarizes a forecast of activities that could require OCS sand resources through 2028, a 10-year horizon.

The report describes the methods in Sections 2 through 4, including database development, data collection, and data compilation. The section on data compilation defines the Base scenario and Elevated Need scenario, and the project complexity variable. The results are described in Section 5 in a state-by-state discussion of the history of beach nourishment and OCS sand resource use, as well as that state's OCS sand needs forecast. Section 6 steps up a geographic level from the state-level analysis and provides a discussion of the National Needs Forecast, including the expected number of leases and sand volume requirements over the next 10 years. The report closes out with conclusions, recommendations, acknowledgements, and references.

2. Database Development

The development of an accurate year-by-year forecast of OCS sand resource demand requires an inventory of previous and potential nourishment projects along the nation's Atlantic, Gulf of Mexico, and Pacific coastlines. These projects can then be assessed for the likelihood that they will need OCS resources, which feeds into the BOEM's future lease volume estimate. The timeline, construction volume, and likely borrow area location are useful in making this determination. However, all of these items are subject to variability, including the potential for catastrophic events, such as Hurricane Sandy. Thus, sufficient data must be collected to bracket the potential sand needs. It is also critical that data be compiled and presented in a uniform manner so that they can be efficiently and accurately analyzed. The Needs Forecast Database (NFD) accompanies this report and can be updated over time. The following information, where available, was gathered into the NFD.

- Project Location (name, latitude, longitude)
- State
- Principal Project Sponsor
- Federal Project (Y/N)
- Is Funding in Place (Y/N)
- Funding Source/Program
- Latest Project Engineer
- Number of Renourishment Events
- First Year Periodic Nourishment Began
- Year Last Constructed
- Initial Project Construction Volume (cy)
- Largest Project Construction Volume (cy)
- Total Volume Placed to Date (cy)
- Renourishment Plan (Y/N)
- Average Renourishment Interval (yr)
- Average Renourishment Volume (cy)
- Anticipated OCS Lease Application Date
- Next Anticipated Construction Date
- Anticipated Volume of Next Nourishment (cy)
- Basis for Volume estimate (see Section 4.1 and 4.2)
- Average Annual Loss Rate (cy/yr)
- Annual Average Nourishment Rate (cy/yr) – calculated field
- Is the Project Best Identified as a Beneficial Disposal Project (Y/N)
- Borrow Area identified for Next Project (Y/N)
- Borrow Area Name
- Borrow Area Location (latitude, longitude)
- Volume Available from Borrow Area (cy)
- Sufficient Volume in Borrow Area for stated needs (Y/N)
- Will Future Borrow Area be Located in OCS Waters (Yes/Likely/Unlikely/No)
- Reason for Expected Borrow Area to be Located in OCS Waters
- Are OCS Sand Borrow Areas located within 50 miles of the project (Y/N)
- Is project likely to be constructed using OCS sand resources if OCS sand resources are greater than 50 miles away (Y/N)
- Previous BOEM Lease (Y/N)
- Document Reference
- Document Link
- Project Complexity Value
  - Project Lead
  - Expected Lease Effort
  - Level of Borrow Area Development Completed
  - Anticipated NEPA Compliance Effort
  - Borrow Area Compatibility
  - Project Volume
  - Overall Project Complexity
  - Pipeline Discharge Location
  - Protected Resources (species and habitat)
  - Infrastructure and Cultural Resources
  - Multiple Use Conflicts
- General Comments

3. Data Collection

The Needs Forecast Database (NFD) was developed by scouring various data sources. This section outlines our approach for collection of data outlined in Section 2.

3.1 National Database Review and Data Extraction

The NFD was initially populated with nourishment projects using data from the publicly accessible U.S. beach nourishment databases including:

- BOEM Lease Areas on Marine Cadastre (BOEM and NOAA, 2018)
- American Shore and Beach Preservation Association (ASBPA) National Beach Restoration Database (ASBPA, 2017)
- Western Carolina Beach Nourishment Viewer (Western Carolina University, 2017)
- United States Army Corps of Engineers (USACE) Coastal Systems Portfolio Initiative (CSPI) (USACE, 2017)
- USACE Dredging Information System (DIS) (USACE, 2017b)

These databases include data on project name, location, year completed, history of multiple events, latitude, longitude, funding source, justification, length, volume, and cost.

These national databases do not always state whether a project is ongoing or pending, though they provide the nourishment history of some projects. Projects that appeared to be ongoing efforts and are relatively new (less than 15 years old) were used to populate the NFD. These data were then used during the subsequent phases of the forecasting effort.

3.2 On-Line Reports and Permits

With the preliminary list of projects, on-line sources for details of the various projects, such as permitting portals and USACE records of federal projects, were reviewed. The intent at this stage was to obtain as much data as possible prior to contacting project representatives. Thus, the goal of contacting representatives was to confirm details rather than request data. In instances where additional data are required, BOEM can be confident other avenues for obtaining data prior to the interview have been exhausted.

4. Data Compilation

The analysis was separated into two primary assessments. The first assessment was the most likely demand for OCS sand resources based on anticipated resource needs. This was termed the "Base Scenario." The "Elevated Need Scenario" was an upper estimate of sand resource needs based on more aggressive assumptions. The approach to develop these estimates is discussed further in the following sections.

4.1 Base Scenario

The Base Scenario provided a forecast that was based on anticipated sand resource needs and thus represents a likely but lower-end forecast of volumetric needs for OCS sand, gravel, shell, silt, and clay. It assumed that projects will be constructed on the project sponsor's expected timeline even though project sponsors tend to be optimistic with respect to a timeline.

The Base Scenario was developed based on the following approach and assumptions:

- Determined the likely volumetric requirements each year over the next 10 years assuming anticipated renourishment volume. The anticipated volume was determined using the following hierarchy:
  1. Volumes included in project permit applications.
  2. Volumes included in project design reports.
  3. Historic average annual renourishment volume.
- Determined whether OCS sand resources would be required using the following hierarchy:
  1. Pre-existing borrow areas will be fully utilized first, whether located in state or OCS waters.
  2. If the borrow area is located in OCS waters, then future borrow area will also be located in OCS waters.
  3. Defer to the project sponsor's opinion of the likely borrow area location if the existing borrow area runs out of sand.
  4. If the borrow area location is unknown, then assume the borrow area will be located in OCS waters.
- Determined the likely year of project construction using the following hierarchy:
  1. Any projects where construction spans two years will be allocated to the first year of construction, because BOEM must plan for lease issuance for the start of construction.
  2. Use construction dates listed in permit applications.
  3. Use construction dates listed in funding documents (this is positioned lower than permit application, because project sponsors may need permits in hand before obtaining funding, and the focus of this study is to forecast BOEM's workload).
  4. Use construction dates/intervals listed in project design reports.
  5. Use historic renourishment interval following the date of the last construction event.

The data were filtered and compiled by year to provide the annual forecast.

4.2 Elevated Need Scenario

The Elevated Need Scenario provided a forecast with higher volumetric needs based on more aggressive assumptions as to the future need of OCS resources. This forecast attempted to incorporate uncertainties such as:

- Large storm events impacting long sections of the coast creating increased demand (e.g. Hurricane Sandy).
- Increased funding to support beach nourishment.
- Revised rules and regulations eliminating borrow areas in state waters requiring use of OCS resources.
- Projects without identified sand resources requiring OCS resources.
- New projects being constructed.
- Existing projects or projects under design being expanded.

The Elevated Need Scenario was developed based on the following approach:

- Determined the likely volumetric requirements each year over the next 10 years assuming the maximum potential volume of the project using the largest of the following volumes:
    1. Initial construction volume (assumes extreme hurricane event impacts the area).
    2. Anticipated construction volume of the next event.
    3. Tentatively Selected Plan (from federal design document).
    4. Locally Preferred Plan (from federal design document).
    5. Include potential project expansion based on constructed fill density.
    6. Other potential fill volume based on Project Sponsor input.
- Determined whether OCS sand resources will be required using the following hierarchy:
    1. Assume OCS resources will be used unless OCS resources are located more than 50 miles from the project fill area
    2. If OCS sands are greater than 50 miles away, then defer to the opinion of whether the project will be constructed
- Determined the likely year of project construction using the same hierarchy as in the Base Scenario.

The forecast timeline was the same for the Base Scenario and Elevated Need Scenario, as the timing of a hurricane cannot be predicted. The forecast can be revised to reflect the potential for earlier work should a hurricane impact a section of coast.

As with the Base Scenario, the Elevated Need Scenario was filtered and compiled by year to provide an annual forecast through 2027.

4.3 Project Complexity

BOEM indicated that the forecast will be used to forecast BOEM workload as well as potential OCS resource needs. However, workload is not necessarily directly correlated with the volumetric need of a project or the number of projects. To better evaluate staffing levels, a “Project Complexity” analysis was developed. The complexity of each project was quantified by applying a point score for various aspects of project that will impact BOEM personnel review time. Thus, this provides a better forecast of the potential workload for BOEM personnel each year than simply considering the number of leases. Project complexity was applied to the Base Scenario only because the Elevated Need Scenario incorporates far greater uncertainty geared more towards a storm event.

A complexity grade was proposed for various aspects of the project. Points were allocated based on the level of complexity for various aspects of the project:

- Project Lead
    - State or local project where BOEM has significant lead design responsibilities – 7 pts

  - State or municipality led project with private consultant – 6 pts
  - Federal project with multiple federal agency leads and/or local sponsor – 5 pts
  - Federal project led by another federal agency – 4 pts
- Expected Lease Effort
  - New Non-competitive Negotiated Agreement – 5 pts
  - Amendment likely to trigger NEPA – 4 pts
  - Minor Amendment – 1 pt
  - Not Applicable – 0 pts
- Level of Borrow Area Development Completed
  - Borrow area likely to be located in OCS water but no preliminary location identified – 5 pts
  - Previously used borrow area but unusual case leading to added complexity – 4 pts
  - Borrow area to be located in OCS water with approximate location identified – 3 pts
  - Borrow area is located in OCS water and has been developed – 2 pts
  - Borrow area is located in OCS waters and a portion has been previously dredged – 1 pt
  - Federal agency led using a borrow area that is in state waters – 1 pt
  - Local sponsor led using a borrow area that is in state waters – 0 pts
- Anticipated NEPA Compliance Effort
  - Environmental Impact Statement (EIS) – 7 pts
  - Supplemental EIS – 5 pts
  - Programmatic Consultation – 3 pts
  - Environmental Assessment – 2 pts
  - Determination of NEPA Adequacy – 2 pts
  - NEPA Completed already – 0 pts
  - Not Applicable - BA in state waters – 0 pts
- Borrow Area Compatibility
  - The mean grain size, sorting value, silt content, color, and carbonate content must be close to the native material to be considered beach compatible material – 2 pts
  - The mean grain size, silt content, and to a lesser extent color, must be reasonably close to the native material to be considered beach compatible material – 1 pt
  - Mean grain size and silt content are not of significant concern once the material is broadly similar to the intended project need – 0 pts
- Project Volume
  - >15 MCY – 4 pts
  - 5-15 MCY – 3 pts
  - 2-5 MCY – 2 pts
  - <2 MCY – 1 pt
- Overall Project Complexity
  - Multiple OCS borrow areas, discharge sites, overburden, and types of dredges capable of constructing the project – 7 pts
  - Multiple OCS borrow areas but single project site – 4 pts

  - Single OCS borrow area, single project site, and likely only one type of dredge capable of dredging the borrow area – 1 pt
  - Borrow area located in state water – 0 pts
- Pipeline and Discharge Location
  - Submerged Pipeline AND Pumpout Station are in OCS Waters – 2 pts
  - Submerged Pipeline OR Pumpout Station are in OCS Waters – 1 pt
  - Neither Pipeline nor Pumpout Station is in OCS Waters – 0 pts
- Protected Resources (species and habitat)
  - Project area has numerous protected resources requiring above average coordination and careful review of lease conditions – 4 pts
  - Project area has one or two protected resources requiring above average coordination and careful review of lease conditions – 3 pts
  - Project area has numerous protected resources, but they can be covered by standard lease conditions – 2 pts
  - Project area has limited protected resources, but they can be covered by standard lease conditions – 1 pt
  - Project area is outside of a protected resource area – 0 pts
- Infrastructure and Cultural Resources
  - Project area has extensive infrastructure (pipelines, cables, etc.) and/or cultural resources requiring offsets and crossing agreements – 3 pts
  - Project has minimal infrastructure or cultural resources to avoid – 1 pt
  - Project area has been cleared, and there is no infrastructure in the vicinity of the project – 0 pts
- Multiple Use Conflicts
  - Close to artificial or natural reefs requiring additional offsets and monitoring – 3pts
  - Close to sensitive fishing grounds – 2 pts
  - Close to United States Coast Guard anchorages – 1 pt
  - Other potential conflicts that must be considered that are outside of normal expectations – 1 pt

The maximum complexity value using this system is 50. The average complexity value was 28.

Note, if it was determined that a project's future borrow area would not be located in OCS waters, then data was not compiled for that project. Neither would a full complexity value analysis be performed. Rather than erase this project, it was left in the database so that future reviewer could see that it had been considered. However, some of the complexity values auto populate (such as volume) based on information within the spreadsheet leading to a low complexity value that is not truly representative. Thus, any analyses involving the complexity value should filter out projects that will not use an OCS borrow area in the future.

The "Multiple Use Conflicts" is entered as a value to allow for additive values. For example, a project could be close to sensitive fishing grounds and artificial reefs and another potential conflict, leading to point score of 6.

5. Data Analysis

This section provides a state by state analysis of data compiled for the 24 coastal states that border OCS waters. Each state discussion starts with a summary discussing the results of this study including the state's nourishment history and past use of OCS resources, the state's OCS sand forecast (which projects will need OCS sand and the number of leases), a discussion of the complexity values for those projects requiring OCS leases, and a summary of the references used to determine the state forecast. The coast of each state has then been analyzed to determine if a project requiring offshore resources may be forthcoming and the potential source of this sand. Some states have been broken into sub-areas (county or geographic region) due to the volume of potential projects and thus more easily locate an individual project within the discussion.

BOEM has executed 54 leases authorizing the use over 147 MCY to restore the nation's coasts (BOEM, 2017). Forty-two projects have been completed using OCS resources.

A discussion of the national forecast of the number of leases and volume of sand required over the next 10 years, as well as the complexity values for these projects, is included in Section 6.

5.1 Alabama

There have been 15 nourishment events along Alabama's coast since 1986 at a total cost of $67M (ASBPA, 2017). To date, Alabama has not used OCS resources to construct a beach nourishment project (BOEM, 2017).

Two projects are projected as being likely to use OCS resources in the next 10 years, Dauphin Island West and Perdido Pass. The Base Scenario for expected volume need is more than 9.5 MCY with an Elevated Need scenario of 19.2 MCY. Both projects have a complexity value of 34. The complexity values are higher than the national average of complexity values of 28, primarily due to both projects being state led and each requiring a new lease.

Numerous beach nourishment projects have been constructed along the Alabama coastline including placement along Gulf Shores to Orange Beach and eastern Dauphin Island. Beneficial dredging of Perdido Pass has constructed projects along Perdido Key and Orange Beach. However, to date, these projects have all used sand resources located in state waters.

The Gulf Shores/Gulf State Park/Orange Beach stretch of shoreline was last nourished in 2013. A specific plan to renourish this section of shoreline could not be located, though this area has a history of repeated beach nourishments extending back to 2001. A review of the previous project documents shows that the projects dredged sediment from borrow areas located in state waters, including a potentially reusable source at Perdido Pass. However, the project has tended to be large, and the potential for needing OCS resources is likely. The renourishment intervals have also been relatively short and average three years between 2001 and 2013. The longest interval was seven years. This followed the largest nourishment in 2005/06. Given that renourishment periods tend to increase over time, a seven-year renourishment period was estimated for the next project, suggesting a 2020 construction. The largest project volume was used for the Elevated Need Scenario, while the average of the renourishment volumes was used for the Base Scenario.

The Alabama Barrier Island Restoration Assessment (National Fish & Wildlife Foundation, 2016) is "building on previous studies to conduct a scientific feasibility study to assess the current and future function of Dauphin Island, develop options for restoration, and evaluate the feasibility and cost associated with restoration actions." This restoration effort may include nourishing the western end of Dauphin Island. Previous nourishment efforts for Dauphin Island proposed using borrow sources in state waters (Coastal Planning &

Engineering, Inc., 2010). However, this project was listed as likely to use OCS resources if the project moves forward as there is an Offshore Material Disposal Site (OMDS) close to the project and the previous borrow area Is close to Sand Island, which may prompt concerns. This project was proposed for Deepwater Horizon (DWH) oil spill funding as Dauphin Island was heavily impacted due to the oil spill but there is no current timeline for this project. A 2024 lease application was assumed for planning purposes.

The East Dauphin Island Project was constructed using sand dredged from just south of Sand Island. Future projects will likely use beneficial disposal from Mobile Pass navigation channel given the close proximity. This was recently constructed and was the first nourishment effort. Thus, there is no expected use of OCS sands in the next 10 years.

Alabama is also applying Deepwater Horizon (DWH) oil spill funds for several coastal projects. These projects are currently progressing or have been constructed but do not require OCS resources (East Fowl River Restoration & Watershed Study, D'Olive Creek Watershed Restoration, Gulf State Park Enhancement Project, Oyster Reef Restoration in Baldwin County, Swift Tract Living Shorelines, Marsh Island).

5.2 Alaska

There have been dozens of nourishment projects along Alaska's coast dating back as far as 1922 (USACE, 2012) but almost all of them have been beneficial disposal projects. The total cost of these projects has exceeded $164M (USACE, 2012), the overwhelming majority of which was required to maintain navigation for Nome Harbor.

No OCS lease applications are expected for Alaskan projects within the 10-year planning horizon.

Very few dedicated beach nourishment projects have been undertaken in Alaska (Smith & Hendee, 2011) and the state has no formal erosion control program (USACE, 2009). The Alaska Department of Environmental Conservation (ADEC) developed their BEACH Program in 2002 in response to the authorization of The BEACH Act by Congress; however, this program focuses mainly on providing grants to local communities, tribal governments, and watershed councils to sample beach water for the presence of fecal contamination.

North Slope Borough's (NSB) Beach Nourishment Program was authorized in 1991. The NSB invested over $20M for a beach nourishment program using an offshore dredge to place gravel on the shoreline. This project provided protective sediment nourishment to about 3,000 feet of shoreline before it was abandoned after being severely damaged in a storm in 2000.

The 1995 *Barrow and Wainwright Beach Nourishment Program: Budget and Cash Flow Update* prepared by BTS/LCMF, Inc., stated the Wainwright Beach Nourishment Project began with material dredged from offshore borrow source sites and placed on the beach in 1995 to dissipate wave and storm energy, and to provide a buffer zone. Approximately 95,000 cy of material were placed on the beach. Subsequent storms reportedly have removed most of the gravel beach nourishment material. Again, no plans to reinstitute this project could be found.

On the east coast of Cook Inlet, beach fill was placed in front of a sheet-pile retaining wall constructed at the toe of an eroding bluff just north of the Nikiski ship terminals, in 2004. Again, this does not appear to be a concerted effort that would require future OCS resources.

The shoreline in many parts of southern Alaska is rising due to glacial rebound. Elsewhere, melting of permafrost is causing significant erosion. The typical response to date is to use structures to slow erosion or retreat.

5.3 California

California has a greater number of nourishment projects performed to date (435) than any other state in the US (ASBPA, 2017), though a lease to use OCS sand resources has never been issued in California (BOEM, 2017).

No application for an OCS lease is expected in California in the next 10 years due to a combination of water depth and permitting restrictions.

There are 48 beach nourishment projects listed in the NFD, and none of them have used OCS sand resources to date (BOEM, 2017). Most of the nourishment projects have relied on sand dredged from navigation channels (California Geological Survey, 2005). Because of the narrow shelf, OCS sand resources are generally in waters too deep for dredges in the US commercial fleet to access (Moffat Nichol, 2009). According to the Coastal Regional Sediment Management Plan for The San Diego Region: “dredging at depths greater than 90 feet would require specialized equipment and may not be cost-effective.” Along most of the coast from CA to WA, the OCS starts in water depths that exceed 90 feet.

The California Coastal Sediment Master Plan (California Coastal Sediment Management Workgroup, 2012), developed by the California Coastal Sediment Management Workgroup (CSMW), of which BOEM is a member, did not list any beach nourishment projects that may use OCS resources. This is a collaborative effort formed in 1999 by federal, state, and local agencies and non-governmental organizations committed to evaluating and addressing California's coastal sediment management needs on a regional, system-wide basis.

Historically, most of the replenishment/nourishment activities in California have been pursued as local, rather than regional, projects. They have been dominantly “opportunistic” projects, meaning that beach restoration was not the primary purpose of the placement of fill. Rather, the beach systems were the receiving (disposal) sites for dredged material from other primary activities such as harbor construction or channel maintenance. Studies by the California Geological Survey (2005) and AECOM (2011) were used to identify beneficial disposal projects in the NFD. Of the 48 projects, 30 were identified as beneficial use of navigation material and 18 were identified as for beach nourishment from offshore sand in state waters. Only in recent years has the number of “deterministic” projects become more common. In these projects, beach restoration through replenishment and nourishment is the primary purpose. The Regional Beach Sand Project of the San Diego Association of Governments (SANDAG) was the first regional deterministic beach-nourishment program on the Pacific Coast of the U.S. The San Diego Regional Beach Sand Project II (AECOM, 2011) includes multiple sites, but the borrow areas are all located in state waters.

The USGS recently completed a series of detailed offshore geology maps as part of the California Seafloor and Coastal Mapping Program (United States Geological Survey, 2015). The maps have identified several potential offshore sources of sand, including relatively thick (30 to 80 feet) deposits located within a couple of miles of Pillar Point, Pescadero Point, Pigeon Point and the mouth of Waddell Creek. While these deposits could prove to be rich sources of sand, removal for beach nourishment will face significant engineering, cost, and regulatory challenges. Also, offshore sediment sources tend to be finer grained than the sand on native beaches.

Monterey Bay National Marine Sanctuary (MBNMS) extends along 276 miles of shoreline from Marin County to Cambria. The MBNMS enforces 13 federal regulatory prohibitions designed to preserve and protect the natural and cultural resources and qualities of the ocean and estuarine areas within its boundaries, including:

- Drilling into, dredging, or otherwise altering the submerged lands of the sanctuary; or constructing, placing, or abandoning any structure, material, or other matter on or in the submerged lands of the sanctuary (with the exception of several activities, such as boat anchoring and harbor maintenance projects).

- Discharging or depositing, from within or into the sanctuary, any material or other matter (with the exception of several activities, such as dredged material disposal at designated sites).
- Discharging or depositing, from beyond the boundary of the sanctuary, any material or other matter that subsequently enters the sanctuary and injures a sanctuary resource or quality.

Given these regulations, dredging state or OCS sand resources in the MBNMS will face significant environmental and regulatory challenges. It was determined that it was highly unlikely that a project would come to fruition that would dredge OCS resources. However, current projects in the ASBPA database that were adjacent to the USGS/BOEM Marine Sand Resource Assessment Study areas were assigned as "Unlikely" in the NFD.

5.4 Connecticut

There have been nourishment events at 27 sites along the Connecticut coast since 1955. Overall, Connecticut has placed over 4.8 MCY of sand along its beaches at a cost of over $15M (ASBPA, 2017). Connecticut has not constructed any projects using OCS resources.

Given that there are no projects in Connecticut expected to require OCS resources, none of the projects have a complexity rating.

Given the paucity of beach nourishment projects in Connecticut and the longer distance to OCS waters, no OCS lease applications are anticipated for beach nourishment projects in Connecticut in the next 10 years.

Connecticut has employed beach nourishment in the past but predominantly in the western portions of Long Island Sound. Connecticut's shoreline is almost fully protected from waves developing in the Atlantic Ocean by Long Island and fronted by Long Island Sound. The submerged lands in Long Island Sound are considered state submerged lands over which BOEM would not exert regulatory authority for leasing.

Only one recent beach nourishment project (constructed in the last 20 years) could be identified, which was the Hammonasset Beach State Park, Madison project. This relied on sediment dredged from the Housatonic River.

5.5 Delaware

Delaware's history of beach nourishment stretches back to 1953. Delaware has constructed close to 220 projects totaling over 35 MCY at a cost of over $180M (ASBPA, 2017). Delaware has not used OCS resources for any of these projects to date (BOEM, 2017).

It is projected that four OCS leases may be required in the next 10 years, two for Bethany/South Bethany and two for Fenwick Island. Bethany/South Bethany has a four-year renourishment interval while the Fenwick Island project has a five-year renourishment interval meaning that at least two leases are likely for each project. These leases combine for over 2.6 MCY of sand.

These projects each have a complexity value of 27, which matches the average level of complexity value for potential projects using OCS sands.

Delaware has instituted several large-scale beach nourishment projects at Fenwick Island, Bethany Beach/ South Bethany Beach, and Dewey Beach/ Rehoboth Beach. A review of the Environmental Assessment for Sand Borrow Area B (United States Army Corps of Engineers, 2016) suggested that the current borrow areas have sufficient sand to sustain the proposed projects over the next decade. However, there are concerns about the quality of material within the Bethany/South Bethany borrow area. Contractors complained about the

difficulty of dredging sand due to the high gravel content (personal communication with Mike Powell at DNREC). This would likely create a need to use a different borrow source and one likely offshore in federal waters. Thus Bethany/South Bethany has been listed as being likely to require an OCS lease. The Bethany/South Bethany has a four-year renourishment interval suggesting that multiple leases may be required over the 10-year NFD study period. The project has a complexity value of 27, which is average. Having multiple discharge sites adds to the complexity but previous investigations have identified the approximate location of the borrow area which simplifies the effort.

The material within the Dewey/Rehoboth beach borrow area appears satisfactory and thus no OCS resources are expected to be required here.

The borrow areas for Fenwick Island have beach compatible material. However, OCS borrow sources are immediately offshore of the project site and thus offer an affordable option. Thus, it has been deemed likely that the Fenwick project may elect to apply for a lease to use OCS resources. The Fenwick Island project has a five-year renourishment interval and thus it is possible that two leases will be required over the 10-year forecast period. Fenwick Island also had a complexity value of 27, to mirror the average project complexity value.

Delaware has a sand bypassing system at Indian River Inlet that assists in regional sediment management (RSM). Thus, the shorelines in the vicinity of the inlet are managed based on RSM principles.

There are smaller nourishment projects along the Delaware Bay coastline. To date, these efforts have exclusively used sand resources located within state limits. A review of the plans for these projects suggests a continuation of the use f state resources. The latest discussions include the beneficial use of the Delaware River for renourishment efforts (USACE and DNREC, 2016).

5.6 Florida

Florida has a long history of using OCS resources for beach nourishment dating back to 1944 (ASBPA, 2017). Overall, Florida has spent more than $1.26B to place over 300 MCY of sand along its beaches (ASBPA, 2017), and beach nourishment efforts are expected to continue as beaches are a major driver of Florida's economy. BOEM has executed 22 lease agreements in Florida resulting in the placement of over 25.5 MCY of sand to restore 142.4 miles of shoreline (BOEM, 2017).

It is anticipated that 16 projects will likely seek OCS leases in the next 10 years with another two rated as possible though unlikely (Table 5.1 and Figure 5-1). The projects requiring OCS resources are the federal projects in St. Lucie, Broward, Indian River, Miami Dade, Flagler, Brevard, Martin, Duval and Pinellas Counties. The total lease volume under the Base Scenario could be 16.3 MCY while under an Elevated Need scenario the volume would be 41.6 MCY.

The complexity ratings for Florida projects requiring OCS resources range from 39 for the Broward County and St Lucie projects to 17 for the Pinellas County Sand Key and Duval County projects. For comparison purposes, the average complexity rating for likely projects is 28.

The Florida Department of Environmental Protection (FDEP) Bureau of Beaches and Coastal Systems online permit system was heavily utilized as a data source for this effort (FDEP, 2018), providing information about permitted and planned borrow areas and volume requirements. Numerous projects recently had Environmental Impact Statements (EIS) or Environmental Assessments (EA) prepared. These documents were also valuable reference sources (e.g., USACE and BOEM, 2016). The Federal Business Opportunities website (www.fbo.gov) also provided information on borrow areas used for awarded federal projects.

Table 5.1: Number of Expected Lease Applications over the 10-year Forecast Period in Florida

Year	Higher Certainty	Lower Certainty
2018	1	0
2019	3	1
2020	3	0
2021	2	0
2022	1	0
2023	3	1
2024	1	0
2025	1	0
2026	1	0
2027	0	0
Total	**16**	**2**

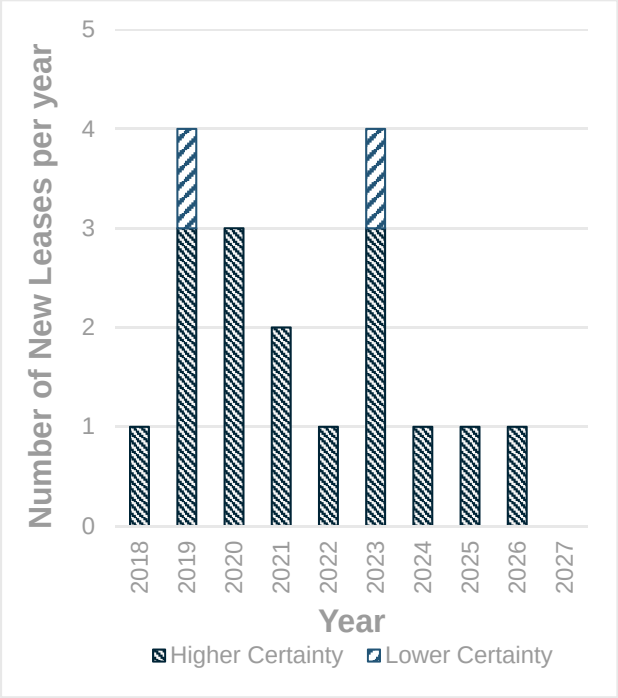

Figure 5-1: Number of Expected Lease Applications over the 10-year Forecast Period in Florida

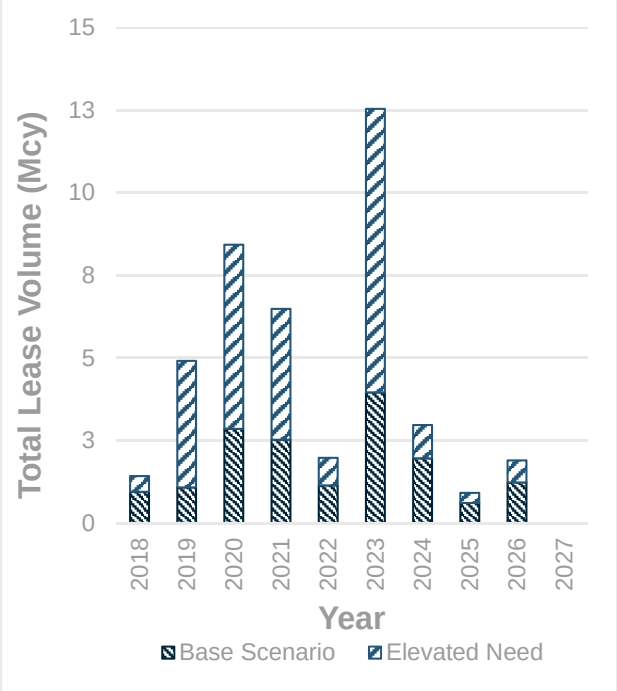

Figure 5-2: Total Lease Volume by Year in Florida for Base and Elevated Need Scenarios

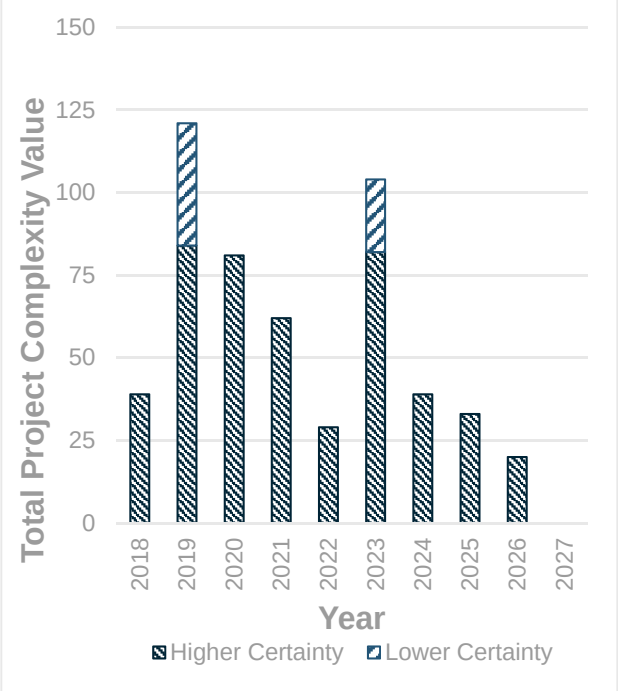

Figure 5-3: Project Complexity Values for Florida Projects

Given the large number and complexities of projects in Florida, a county by county discussion is provided.

5.6.1 Bay County

The Panama City Beach project dominates the length of shoreline along Bay County. This was last constructed in 2017 using numerous offshore borrow areas. Sand resources remain available within these borrow areas, and it is not anticipated that OCS resources will be required within the 10-year horizon.

Mexico Beach has been constructed using truck hauled sand of late.

5.6.2 Brevard County

BOEM has issued several leases to assist Brevard County with nourishment of their beaches. Three of the nine anticipated leases over the next 10 years are for projects within Brevard County: Mid Reach/Patrick Air Force Base, North Reach, and South Reach/Indialantic. The North and South Reaches were constructed in 2018 and have leases that expire in 2020. The renourishment interval is approximately six years, suggesting that another lease agreement will be required within the 10-year horizon. Also, if there are any large storm events, it is likely that OCS resources will be required for repairs.

The estimated volumes required for the next renourishment total approximately 3 MCY. The project complexity for these projects (23 to 26) is lower than the average project complexity (27.8), because leases have already been issued for these projects, and the main challenges are known.

5.6.3 Broward County

Given the large population and significant tourism derived from Broward County's beaches, they must continue to maintain their beaches. However, Broward County is running out of sand and has turned to upland sand sources for their latest (2017) renourishment efforts. Any additional exploration for offshore resources will likely occur in OCS waters. Broward is also looking at the potential for using offshore sand from OCS waters located offshore of counties to the north.

Nearshore hardbottom limits the volume of sand that can be placed in any given project for Segments II and III of the Broward County Shore Protection Project. Thus, the anticipated volume of over 4.6 MCY may be higher than the ultimately constructed volume. These nearshore resources also increase the complexity of the project, so they each have a complexity rating of 39. The limited resource availability in southeast Florida also makes finding sand for projects difficult, which increases project complexity. Thus, Broward has the highest project complexity value of any project.

Hillsboro Beach maintains its beaches using sand bypassed from Hillsboro Inlet. There is a borrow area located in state waters at the north end of the County that has been used and potentially has some additional sand remaining within it. It is not anticipated that an OCS lease will be required for this project area in the next 10 years.

5.6.4 Charlotte County

Charlotte County has several reaches with beach nourishment projects. However, it is not anticipated that any of these projects will require OCS sands in the next 10 years.

Manasota Key has identified numerous borrow areas, but while ranging from 2 to 4.5 miles offshore, these are all in state waters, because the state/federal boundary is approximately 10.5 miles offshore at this location.

Knight Island and Bocarilla Island are considering the Stump Pass ebb shoal and offshore borrow sources to renourish their beaches. Again, they are all located in state waters, so there is no expectation of needing an OCS lease.

5.6.5 Collier County

Collier County held a BOEM lease for Vanderbilt/Pelican Bay, Park Shore, and Naples Beach. This lease expired in April 2018. Collier County has returned to using upland trucking due to the expense of offshore sand, but it is likely that dredging from the OCS will return as an option. Due to the timing, this project has been included as a separate lease for future needs. It is assumed that the existing lease will be used and/or extended for the next renourishment period in 2019. A new lease has been included for a potential 2022 project, given that the renourishment period is typically three years. The project complexity for Collier County is 32, which is above average. The project complexity value is driven by nearshore hardbottom concerns and multiple discharge sites and potential borrow areas.

South Marco Island will be nourished using sand dredged from Caxambas Pass. Therefore, no future need for OCS resources is anticipated.

Marco Island/Hideaway Beach has a relatively low fill volume based on the permit application project description. Borrow areas have been identified in the immediate vicinity of the project area (Big Marco Pass/Capri Pass borrow area, Hideaway Beach nearshore borrow area, and Collier Bay borrow area).

5.6.6 Duval County

The 2016/17 renourishment placed about 1,060,000 cy of OCS sand to the beach and dunes following the passage of Hurricane Matthew on October 7, 2016. The sand was dredged from Duval Shoal South, which will likely continue to serve as the borrow area for the next decade. Another renourishment is planned in late 2018 to repair damage caused by Hurricane Irma. A new lease is anticipated for submittal in 2023 to support construction of the next regularly scheduled project in 2025. The anticipated lease volume is 1.4 MCY. This project has a relatively low project complexity value (17) as many studies have already been completed and only a minor amendment to the existing OCS lease is anticipated.

5.6.7 Escambia County

There are three main sections of shoreline in Escambia County: Perdido Key, Pensacola Beach, and Santa Rosa Island.

Perdido Key is requesting state funding to support a project using a borrow area located within state waters. An eight-year renourishment interval is anticipated with intended construction in the next year or two. Therefore, there is no need to locate an OCS borrow area within the 10-year NFD horizon.

Pensacola Beach was renourished in 2016 using sand located immediately offshore. There is sufficient volume remaining in the borrow area for future nourishments that OCS sand is not anticipated as being needed within the 10-year horizon of the NFD. Pensacola Beach has also been nourished using upland sand sources.

To date, there has been little support for beach nourishment along Santa Rosa Island east of Pensacola Beach with the last effort in 1961.

5.6.8 Flagler County

The USACE is leading the effort to construct the Flagler County Shore Protection Project. Borrow areas have been identified in OCS waters (USACE, 2014c) and the Chief signed the report is December 2014. The project is now waiting federal funding in WRDA 2018 so it's not clear as to the start date of the next project. For planning purposes, a start date of 2021 has been assumed. A state permit application could not be located. This lease has a below average complexity value of 24 due to a developed borrow area.

5.6.9 Franklin County

The County applied for a permit to nourish Alligator Point in 2006, but this project has been dormant. A borrow area has been developed, but it is located in state waters.

5.6.10 Gulf County

Cape San Blas and the St. Joseph Peninsula are located in Gulf County. St. Joseph Peninsula is currently scheduled to be constructed in the summer of 2018 using a borrow area located in state waters. However, an OCS borrow area was identified and included in the permit application. Thus, future projects may use an OCS source, and this has been listed as likely. The complexity value is just below average at 26.

Some nourishment from beneficial disposal of the navigation channel to St. Joe may be expected, but this would be at the northern end of the St. Joseph Peninsula and not likely to affect the need for OCS resources.

5.6.11 Hillsborough County

Hillsborough County is the eastern side of Tampa Bay. There are no large-scale nourishment projects within Tampa Bay, and none are expected. Therefore, no projects within Hillsborough County have been included in the NFD.

5.6.12 Indian River County

Indian River County has significant nearshore resources that limit the volume of sand that can be placed during any individual project. County projects have mostly focused on dune nourishment projects using upland sand. However, they are limited in resources within state waters and have identified a potential borrow area in OCS waters. Therefore, Indian River County has been listed as likely to use OCS resources in the NFD within the next 10 years. Nearshore hardbottom increases the project complexity value to 33, which is above average.

5.6.13 Lee County

Lee County has several sections of shoreline with a long history of beach nourishment projects. However, the state/federal boundary offshore of Lee County is close to 10 miles offshore. Thus, there is greater potential to locate sand resources in state waters.

Gasparilla Island has had three nourishment projects, the last in 2013, though another project is imminent. The borrow area is located in state waters.

Costa Caya is an uninhabited barrier island. No projects are anticipated for this island in the next 10 years.

North Captiva Island is sparsely inhabited and has no bridge to the mainland. Thus, it is difficult to access, and beach nourishment projects are difficult to justify economically. Therefore, a beach nourishment project using OCS resources is not anticipated in the immediate planning horizon.

Captiva Island has an Erosion Prevention District to help fund their nourishment program, which extends back to 1961. Sanibel and Captiva Islands have a history of joint projects, because the two islands are separated by Blind Pass, a relatively small inlet. Projects along these islands have multiple offshore borrow areas, with one located up to 9.6 miles offshore. However, all of these borrow areas are still within state waters, and it's unlikely that they will need a borrow area within 10 years that goes into OCS waters. Weight limits on bridges going out to the island limits upland sand as a cost-effective source.

Estero Island has used Matanzas Pass and a nearshore borrow area to provide their sand needs. Big Carlos Pass was dredged in 2017 with fill placed on Estero Island. There is limited need for OCS resources anticipated here.

Big Hickory Island/Pelican Landing was recently constructed using sand dredged from New Pass. Future projects will likely use the same source.

5.6.14 Manatee County

Manatee County has two principal islands that have beach nourishment, Anna Maria Island and Longboat Key. Longboat Key is halved with Sarasota County but addresses beach issues at a town level, so is included here for convenience.

Longboat Key has historically used borrow areas located within state waters. A sand source investigation was performed looking at OCS sand and a lease was issued. To date, this borrow area has not been dredged. Longboat Key recently constructed a project using upland sand and has been focusing on using sources at New Pass and Longboat Pass.

Anna Maria Island has historically been nourished using an offshore borrow source located in state waters and beneficial dredging of Longboat Pass. No OCS resources are anticipated for use in the next 10 years.

5.6.15 Martin County

Martin County has an active lease with BOEM that expires in July 2020. This project was completed in early 2018. With a five-year renourishment interval, it is expected that the next project would be slated for 2023 and another in 2028. An additional OCS lease has been granted offshore of Martin County for the Miami-Dade Federal Shore Protection Project: M4-R105. Thus, two potential leases will be likely required within the NFD 10-year horizon.

The Jupiter/Carlin project relies on upland and Intracoastal Waterway dredging.

Bathtub Beach has historically relied on upland sand sources.

Jupiter Island was constructed in 2016 and used a borrow site two miles directly offshore. It is unlikely but possible it will be required within the next 10 years. No preliminary work has been performed to determine this likelihood.

5.6.16 Miami-Dade County

Miami-Dade County has exhausted all known reserves of offshore sand and is looking at other counties and potentially countries to support their beach nourishment sand needs. Miami Beach, Surfside, and Sunny Isles have been grouped for this analysis given that they all have the same predicament. Given the need for sand to provide storm damage reduction and support the tourism industry, it is likely that Miami-Dade County will require OCS sand, especially given the cost and difficulty of transporting significant quantities of upland sand to the beaches (USACE and BOEM, 2016). Congressional authorization has been made available to

investigate possible solutions. Given that major nourishment projects are typically spaced six years apart, and the last major project was completed in 2017/18, then the next major project is scheduled for 2024.

Bal Harbor can benefit from localized bypassing at Baker's Haulover Inlet.

Smaller projects are relying on upland sand sources to nourish their beaches (Key Biscayne, Fisher Island, Virginia Key).

5.6.17 Monroe County

Monroe County tends to have small man-made pocket beaches. Given the shallow water and plethora of natural resources typically close to the shoreline, beach nourishment projects tend to be very limited in scale and constructed using upland sand. Furthermore, most of the offshore area is a National Wildlife Refuge.

5.6.18 Nassau County

Nassau County's open coast shoreline is Amelia Island, which lies between St. Mary's River to the north and Nassau River to the south. Fernandina Beach is located along the northern half of Amelia Island.

The Nassau County Shore Protection Project uses the St Mary's River ebb shoal as a sediment source. Thus, it is not anticipated that an OCS sand source will be required within the next 10 years.

Similarly, South Amelia Island uses material from Nassau Sound as well as material from the Atlantic Intracoastal Waterway. There is no indication of the need to use OCS resources in the near future.

5.6.19 Okaloosa County

Okaloosa County's western shoreline is the eastern half of Santa Rosa Island. It is uninhabited except for the community of Okaloosa Island (Fort Walton Beach). Destin is the eastern half of the inhabited barrier island portion of Okaloosa County.

The Destin beach nourishment project uses East Pass as a borrow source. Periodic maintenance dredging of East Pass also provides sediment to the beach. The use of OCS sands in the near future is not anticipated.

The Fort Walton Beach project obtained a permit to build a beach nourishment project using a borrow site located in state waters, 1.25 miles off of Santa Rosa Island. However, the County withdrew the permit in 2012, and it's not clear whether a project will be constructed. Maintenance dredge material is placed at the east end of Fort Walton Beach.

5.6.20 Palm Beach County

Palm Beach County has numerous projects spread along the almost 45-mile long coastline. However, all of the projects have identified the sand resources necessary to support the beach nourishment program, and these resources are all located within state waters.

Boca Raton has three separate reaches. The southern reach is managed exclusively through dredging of the Boca Raton Inlet and ebb shoal. This material is almost exclusively placed to the south. Central Boca Raton has been constructed using offshore sand and then a one-time back passing of material from the ebb shoal. North Boca Raton is constructed using a borrow area located directly offshore in state water. There are reserves within this borrow area to avoid the need for OCS sand for the foreseeable future.

Highland Beach is sandwiched between Boca Raton and Delray Beach. It has never been nourished, and nourishment does not appear to be likely. There are likely reserves immediately offshore.

Delray Beach is also a federal project. It has used a series of offshore borrow areas located in state waters directly offshore and will not need OCS sand in the next 10 years.

Gulf Stream and Briny Breezes have not previously constructed beach nourishment projects. They appear to have relied on longshore sediment transport of sand from the nourishment project at Ocean Ridge (discussed below) to maintain their beaches.

Ocean Ridge is periodically nourished by dredging the South Lake Worth Inlet ebb shoal and a borrow area directly offshore with many times the volumetric need of the project. Again, there does not appear to be an imminent need for OCS sand resources.

Lantana and Manalapan have not constructed a beach nourishment project before. Manalapan is located immediately updrift of South Lake Worth Inlet. Again, a project in these areas does not appear imminent. Judging by borrow areas of adjacent towns, an offshore borrow source located in state waters is likely.

Due to offshore environmental resources (hard bottom and coral), South Palm Beach uses smaller quantities of upland sand to maintain their beach to avoid causing the burial of nearshore environmental habitat by large scale cross-shore sediment transport of placed sediment. There is no readily apparent need for OCS resources.

Palm Beach has identified sufficient offshore borrow areas in state waters to supply their expected sand resource needs for the next two decades. They also nourish the beaches at the north end through sediment bypassing at the Lake Worth Inlet. A borrow area investigation in OCS waters is not required within the 10-year NFD horizon.

Singer Island is limited in the beach fill that they can place due to nearshore resources and instead benefit from updrift beach projects that transport sand to the south. Some dune repair work is performed using upland sand sources. No OCS resources are required.

Juno Beach is a federal project and uses an offshore borrow source located in state waters.

5.6.21 Pinellas County

There are numerous beach nourishment projects along Pinellas County's 35 miles of managed Gulf beaches but only one that has utilized OCS resources. Almost all beach nourishment has utilized state sand resources since 1969 when the first project was constructed on Treasure Island. Multiple tidal inlets provide readily available sand including Hurricane Pass, Clearwater Pass, Johns Pass, Blind Pass, Pass-a-Grille Pass, and the entrance to Tampa Bay and its Egmont Shoals.

The Sand Key project is Pinellas County's largest beach nourishment project. It is a 9.1-mile-long segment of the federal Pinellas County Shore Protection Project. An OCS borrow area was utilized in 2012, but the upcoming renourishment will return to the traditional Egmont Shoals borrow area. The disadvantage of Egmont Shoals is the distance from the beach to the borrow area and the numerous types of dredge plant required. However, the sand is plentiful and apparently similar in cost to the last project, which utilized OCS sand.

5.6.22 Santa Rosa County

The only populated section of coastline in Santa Rosa County is Navarre Beach. The last project was completed in 2016 and used 1.2 MCY out of a potential 5 MCY borrow area. Since this borrow area was located in state waters, it is not anticipated that an OCS borrow area will be required in the near future.

5.6.23 Sarasota County

Sarasota County extends from Longboat Key at the north end to Manasota Key at the south end.

Longboat Key has been discussed as part of Manatee County.

Lido Key has been using New Pass for many of its maintenance dredge projects. Two larger projects in 1998 and 2001 used offshore borrow areas, but these were located in state waters.

Siesta Key is located immediately south of Lido Key. The last project was completed in 2016, and approximately 1 MCY remains in the borrow areas following that project. This is sufficient to supply the next project scheduled for 2026; therefore, no OCS resources are required.

Casey Key does not currently have a beach nourishment planned. However, there is considerable property along the shoreline, and at some point, a beach nourishment project is likely to be constructed. However, with the state/federal boundary approximately 10.5 miles offshore, it is likely that a borrow area could be located in state waters, especially given the number of borrow areas located for surrounding projects. Thus, this project is included as unlikely to require an OCS lease.

Venice Beach has a federally-authorized Hurricane and Storm Damage Reduction project that extends through 2036. It's estimated that they need another 1.2 MCY of sediment, and the existing borrow areas, which are located in state waters, contain 1.8 MCY. Therefore, there is no need for OCS resources.

5.6.24 St. Johns County

St. Johns County has three principal inhabited shoreline areas: Ponte Vedra Beach, Vilano, and St. Augustine Beach.

A beach nourishment project is planned for South Ponte Vedra Beach, Vilano Point, and Summer Haven stretch, but this has not been constructed as yet. The permit application (dated Jan 2018) suggests that the project will be constructed using a combination of upland sand and maintenance dredging. Thus, this project has been listed as unlikely to need OCS resources.

The St. Augustine Beach area is managed under the St. Johns County Shore Protection Project. This principally uses sand from the St. Augustine ebb shoal to nourish the adjacent beaches. Thus, no OCS resources are required.

5.6.25 St. Lucie County

Fort Pierce is the only section of shoreline in St. Lucie County currently deemed to be critically eroded and in need of nourishment. It is currently using the Capron Shoals as its sand source. This straddles the state/federal boundary, and thus it is likely that this project will apply for an OCS lease. They may also consider the use of St. Lucie Shoal, which is also in OCS waters.

South St. Lucie County has also been nourished. This used a borrow area just inside the state/federal boundary, and it is possible the next project will use OCS resources.

Thus, St. Lucie County has three projects listed as likely to use OCS resources. The two projects within the County limits both have relatively high complexity rating at 34 and 37 and expected volumetric needs of 1.4 MCY. The high complexity values are primarily driven by nearshore environmental resources (Taylor Engineering and CSA International, Inc., 2011) .

5.6.26 Volusia County

The north end of Volusia County has Ormond Beach and then Daytona Beach. However, Volusia County has not pursued a beach nourishment project in this region.

Ponce de Leon Inlet is regularly dredged for navigational purposes, and beach compatible sediment is placed both north and south of the inlet. This contributes to 3.6 miles of beach to the south (New Smyrna Beach) and 1.5 miles of beach to the north (Town of Ponce Inlet). Bethune Beach is partially nourished and relies on littoral drift from the New Smyrna Beach project to maintain their beach. South of Bethune Beach is uninhabited.

Thus, no OCS leases are expected to be pursued in the coming years.

However, Coastal Tech (Parkinson & Budde, 2006) located approximately 5 MCY of sand in OCS waters offshore of Volusia County. These could be dredged if there was significant storm damage.

5.6.27 Walton County

The Walton County Hurricane and Storm Damage Reduction Project, authorized by Congress in 2014, encompasses five critically eroded sections of shoreline totaling 18.8 miles. Based on a previously submitted permit application that has since been withdrawn, the project proposed to dredge 5.7 MCY from a borrow area in state waters, and place it along 13.5 miles of beach. Should the project restart, then it is assumed that a similar project plan will ensue. It was estimated that this borrow area contains 13.7 MCY of material, so OCS material will not be required in the next ten years.

5.7 Georgia

Georgia has had 13 nourishment events at two projects locations, Sea Island and Tybee Island. These started in 1964 and 1976 respectively and required 13 MCY of sand at a cost of $48M (ASBPA, 2017). An OCS lease has not been previously issued for a project in Georgia.

There are only four inhabited islands in Georgia (Tybee, St. Simons, Jekyll, and Sea Islands), and it is likely any beach nourishment using OCS sand would be restricted to these islands. Of these four, it appears that only the Tybee Island project is likely to use OCS resources in the next 10 years with an estimated volumetric need of 1.9 MCY and a below average complexity score of 23 due to below average environmental concerns.

Tybee Island has historically used a borrow area located in state waters, but this borrow area may be close to being expended, increasing the likelihood that OCS resources may be required. Tybee has also been reluctant to use sand dredged from the Savannah Harbor Entrance Channel due to sediment-quality and color concerns. The next sand investigation may locate additional sand resources in state waters, but for planning purposes, BOEM should be prepared for Tybee Island to consider OCS waters for their sand resource needs. The last project was constructed in 2015, and the next project is anticipated for construction in 2024.

A developer on Sea Island has proposed to install a groin and beach nourishment along Sea Island. A borrow area has been identified that is located within state waters. The borrow area appears to have sufficient volume to satisfy the project needs. The Savannah District issued a request for public comment in March 2018.

The other two islands (Jekyll and St. Simons) have been discussing beach nourishment for years, but no action has occurred to initiate an actual project. Given that both Tybee Island and Sea Island have managed to locate sand resources within state waters, it is assumed that should Jekyll Island and/or St. Simons Island proceed with a project, that they too could locate sand within state waters.

The Coastal Resources Division within Georgia's Department of Natural Resources is responsible for state management of Georgia's coastal resources while the USACE Savannah District is charged with ensuring compliance with federal regulations. The Georgia Sea Grant has also been funded to assess the beaches and sediment resources in state waters. BOEM's Cooperative Agreement with Skidaway Institute of Oceanography yielded information on the available OCS sand resources that were integrated into this effort.

5.8 Hawaii

Hawaii has constructed 28 beach nourishment projects stretching back as far as 1951. This has resulted in nearly 400,000 cy of sand on their beaches. However, none of these projects have previously used OCS resources.

No OCS lease applications are anticipated to originate from Hawaii over the next 10 years.

Beach erosion is common throughout the Hawaiian Islands. A recent study by researchers at the USGS and University of Hawaii (Fletcher, et al., 2012) found that 70% of beaches in Hawaii are undergoing chronic (long-term) erosion and 10%, or over 13 miles, of beach has been completely lost to erosion over the past century.

The USACE developed the Hawaii RSM Needs Assessment (USACE, 2014b). This report documented some areas that are planned to be, or have been, nourished, but these projects use upland sediment or sediment dredged from rivers or navigation channels. The report commented that onshore sand sources are limited. No reference is made to needing or considering OCS resources.

A review of bathymetry around the Hawaiian Islands overlaid with the state submerged lands outline shows that the start of OCS resources is typically in water depths (>90 feet) that are too deep to dredge. Thus, it's unlikely that Hawaii could use OCS sand resources.

The Hawaii Shore and Beach Preservation Association (HSBPA) is a non-profit organization of private sector, academic, and government professionals, students, and local community members dedicated to the preservation and restoration of Hawaii's beaches and coastal environments. HSBPA (2014) discusses potential sand sources but does not mention the potential for OCS resources.

5.9 Louisiana

Louisiana has implemented 56 restoration projects since 1985, totaling almost 86 MCY and costing over $600M (ASBPA, 2017). Of these, BOEM has issued nine leases to use OCS resources (second most of any state), though the OCS volumes dredged for these projects (52.9 MCY) is larger than for any other state (BOEM, 2017). The trend of using OCS resources is expected to continue.

It is expected that nine Louisiana projects will require OCS leases over the next 10 years (Table 5.2 and Figure 5-4) requiring a volume of 32 MCY under the Base Scenario and 34 MCY under the Elevated Need Scenario. These projects include Chaland Headland, Chandeleur Island, East Grand Terre, East Timbalier, Holly Beach, Pass Chaland to Grand Bayou, Timbalier Island, West Grand Terre, and Whiskey Island. The Base scenario for Louisiana is 42.6 MCY while the Elevated Need Scenarios is 69.1 MCY.

Table 5.2: Number of Expected Lease Applications over the 10-year Forecast Period in Louisiana

Year	Higher Certainty	Lower Certainty
2018	1	0
2019	1	0
2020	0	0
2021	1	0
2022	1	0
2023	0	0
2024	0	0
2025	1	0
2026	1	0
2027	3	1
Total	**9**	**1**

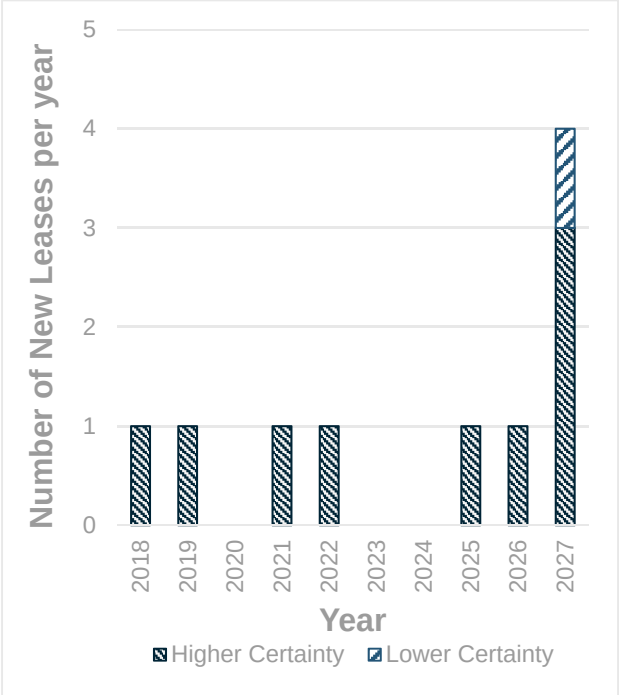

Figure 5-4: Number of Expected Lease Applications over the 10-year Forecast Period in Louisiana

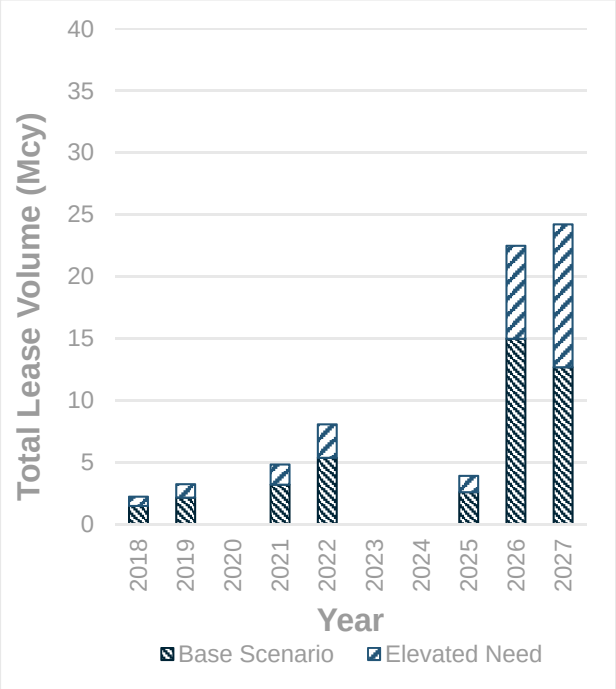

Figure 5-5: Total Lease Volume by Year in Louisiana for Base and Elevated Need Scenarios

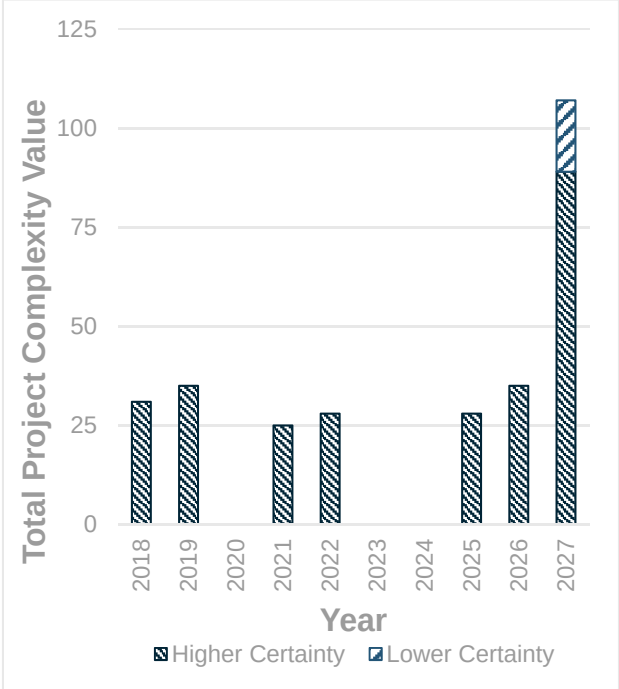

Figure 5-6: Project Complexity Values for Louisiana Projects

The project complexity values for these projects range between 23 and 35. The less complex projects have a previous lease and project and defined borrow areas. The most complex project (Chandeleur Island and complexity value of 35) has not been previously constructed, is part of a National Wildlife Refuge, and has a large volume and potentially numerous borrow sites.

Louisiana has employed several funding mechanisms to restore their barrier islands and headlands, though the one common denominator has been the Louisiana Coastal Protection and Restoration Authority (CPRA). Initially part of the Louisiana Department of Natural Resources, this separate entity was created in acknowledgement of the significant coastal challenges facing Louisiana. These challenges are exacerbated by sea level rise and subsidence such that Louisiana will continue to need to dredge offshore resources to nourish their coastline.

All restoration projects in Louisiana must be consistent with the state's Coastal Master Plan (Coastal Protection & Restoration Authority of Louisiana, 2017). The plan states, "the 2017 Coastal Master Plan recommends funding Louisiana's barrier island program, which CPRA is currently developing. Rather than recommending specific barrier island/headland projects and assigning them to a certain implementation period, given the uncertainty of events like hurricanes, CPRA intends to have plans for restoration of the Terrebonne and Barataria barrier shorelines ready so that when future hurricanes do impact these areas, we can react quickly to restore the impacted barrier shoreline. This decision was informed through the 2017 Master Plan modeling effort; model results indicated that, under the High Environmental Scenario, recently restored barrier islands and headlands were surviving in some manner".

The Coastal Wetlands Planning, Protection and Restoration ACT (CWPPRA) may also fund restoration projects. With NRDA and NFWF funds now becoming available following the *Deepwater Horizon* Oil Spill Settlement, this program is turning to smaller restoration projects. The latest Project Priority List was reviewed for approved projects that may use OCS resources, but none of the projects are barrier island restoration projects or marsh restoration projects that would require OCS resources.

St. Bernard Shoals has also been discussed for restoration of Breton and Chandeleur Islands. It's our understanding that the current Breton Island Restoration Project is proposing a borrow area inside state waters.

The USFWS is responsible for the Chandeleur Islands and is considering nourishing the Chandeleurs at this time. Two potential borrow areas have been identified. The St. Bernard Shoals are located in OCS waters while Hewes Point is located in state waters. The project could require between 7 MCY and 15 MCY. This project is estimated to be one of the most complex projects (complexity value of 38) because of the size and volume of the project, multiple borrow areas and it being a National Wildlife Refuge.

5.10 Maine

There have been twelve nourishment events at five separate sites along the Maine coast since 1955. Overall, Maine has placed about 1.7 MCY of sand along its beaches (ASBPA, 2017). Maine has not constructed any projects using OCS resources (BOEM, 2017).

No OCS lease applications are anticipated in the next 10 years to support a beach nourishment project. Maine has a mostly rocky coastline, which limits the total number of projects likely to be constructed.

Twelve nourishment events were identified at five separate sites. Seven of these events occurred at Camp Ellis Beach. The USACE is undertaking the Saco River Federal Navigation Project, which would deepen the

channel and beneficially dispose of material along Camp Ellis Beach. An offshore borrow area was considered to add additional nourishment to the beach but was rejected in favor of upland sand (USACE, 2013a).

Maine's Department of Environmental Protection (DEP) is responsible for enforcing state regulations. Their effort is mostly focused on beach water quality. The USACE New England District is responsible for federal regulatory compliance, though the U.S. Environmental Protection Agency (EPA) helps fund many of the state initiatives (primarily due to it being a water quality consideration).

5.11 Maryland

Maryland's beach nourishment projects have been historically limited to Assateague Island (Assateague Island National Seashore and Assateague State Park) and Ocean City. A total of 13.3 MCY was placed during these projects at a cost of almost $96M (ASBPA, 2017). BOEM has supplied 2 MCY of this material through three leases (BOEM, 2017).

Ocean City is expected to need 800,000 cy every four years for a total of two projects, while Assateague State Park could expect one project requiring a lease, if a storm causes the beaches to erode beyond which can be restored by dredging Ocean City Inlet. The Base Scenario for lease volume is 2.4 MCY while the Elevated Need scenario is 14.1 MCY. This disparity is due to the large initial construction volume of the Ocean City project.

The Ocean City projects have been listed with a complexity value of 25 and 21, which is below average because the borrow areas have been identified and the project is repetitious. The Assateague State Park project has a complexity value of 23.

In 1988, the Atlantic Coast of Maryland Shoreline Protection Project was undertaken to restore the width of the beach from about 120 feet to 220 feet. Approximately 2.2 MCY of sand were pumped onto 8.25 miles of beach. Since 1994, the Baltimore District has placed more than 8 MCY of sand on Ocean City beaches. Some of this sand has been dredged from federal waters, and future OCS resources will be required. The borrow areas for the latest project straddle the federal/state water bottom boundary (USACE, 2008). The project plan calls for an average of 800,000 cy of sand to renourish the Ocean City beach every four years. The last regularly occurring renourishment was completed in 2011 (Town of Ocean City, 2018). The beaches were renourished after Hurricane Sandy, with project completion in 2014. However, because of erosion from the January 2016 winter storm (Jonas), renourishment was pushed up to 2017, with placement of 900,000 cy of sand from an OCS borrow site (Town of Ocean City, 2018).

On 11 April 2018, the USACE Baltimore District issued a public notice proposing that sand would be obtained from federal sources for renourishment of Ocean City beaches by the year 2022 (USACE, 2018a). They have determined that most of the sand resources in state waters have been depleted (Stephen Van Ryswick, Maryland Geological Survey, pers. comm. 15 May 2018). The following shoals in federal waters were evaluated in the 2008 EIS: Weaver Shoal, Isle of Wight Shoal, Shoal "A," and Bass Grounds (also known as First Lump and Shoal "B") (Enclosure). The public notice stated that "Shoal "B" was determined to be unsuitable at that time [at the time of the 2008 EIS] because of its high value as a fishing ground. The project has not utilized any of these offshore shoals in federal waters as borrow sources yet, because sufficient sand has been available from sources in nearby state waters. USACE is re-evaluating the four offshore shoals in federal waters as sand sources."

The northern end of Assateague Island benefits from dredging of Ocean City Inlet but this is driven by navigation needs.

The Assateague Island National Seashore Restoration Program (National Park Service, 2006) consists of a short-term phase, with one-time placement in 2002 of 1,800,000 cy of sand from Great Gull Bank B in the OCS. Assateague Island State Park placed 95,000 cy from Great Gull Bank in the OCS at the same time, as a separate state project. However, the long-term plan for all of Assateague Island is to rely on "mobile bypassing" of sand that would have naturally reached the island had the Ocean City Inlet south jetty had not been constructed. Mobile bypassing involves the use of a shallow-draft hopper dredge to remove sand that has been redirected to a number of locations in the vicinity of the inlet and placing this sand within the surf zone along the northern end of Assateague Island. Thus, the plan is to re-establish the "natural" sediment supply for northern Assateague that reflects historic, pre-inlet rates.

The Maryland Geological Survey, in conjunction with the Delaware Geological Survey and BOEM, has created sand need prediction numbers and has performed studies to identify potential offshore sand deposits (Maryland Geological Survey, 2018). They have identified four shoal fields, with draft estimates of the volume in each shoal that are under review by BOEM (Stephen Van Ryswick, Maryland Geological Survey, pers. comm. 15 May 2018).

5.12 Massachusetts

ASBPA has documented a total of 43 projects with a total volume of over 4.6 MCY (ASBPA, 2017). None of these projects to date have used OCS sand (BOEM, 2017).

Two projects could potentially need OCS sand in the next decade: Sconset Beach, Nantucket and Plum Island. The Base Scenario volume is 1.1 MCY while the Elevated Need Scenario is 1.7 MCY.

The Sconset project has one of the highest complexity values of any project (39) because of numerous unknowns with respect to the location of the borrow area, location of the fill area, and the likely need for an EIS. Plum Island also has an above average complexity value of 32 because of an unknown borrow area location.

Baird is currently engaged with a private client on Nantucket that has expressed interest in using OCS sand for a nourishment project on Sconset Beach, though this is still in the early design phase. The client is proposing to install a geotextile tube revetment along an eroding bluff. They recognize the need to keep the revetment covered in sand and are exploring sand supply options. One option is to dredge a large volume from offshore and store it at an upland though on-beach location and then truck the sand to the revetment periodically. The client has not determined whether they will conduct an offshore borrow source investigation. The volume could range from 270,000 cy to 1 MCY.

The Winthrop Beach Project previously investigated the potential of using an OCS borrow source, but this was stalled due to environmental concerns raised by NOAA. Since then, Winthrop Beach has been nourished using an upland sand source. It has been listed as likely that the next project will use OCS resources but the likely time frame for construction is beyond the 10-year horizon of the NFD.

The 2015 Ocean Plan (Commonwealth of Massachusetts, 2015) calls for the formation of an Offshore Sand Task Force to provide guidance and advice on the potential use of ocean sand resources for beach nourishment. While there are considerable sand resources in certain offshore areas in both state and federal waters, the extraction of this material for beach nourishment must be balanced with the protection of marine ecosystems—especially impacts on habitat for commercial and another important fish species—and water-dependent uses. The map shown in Figure 5-7 was generated using the MASSGIS portal, and reflects "Potential offshore sand resources for further investigation" at two locations: 1) at the northern end of Salisbury/Plum Island; and 2) in Nantucket Sound between Cape Cod and Martha's Vineyard. Of all the

projects in the ASBPA database, Plum Island and Winthrop Beach were considered “Likely” for using OCS sand based on the history of the projects investigating OCS sands.

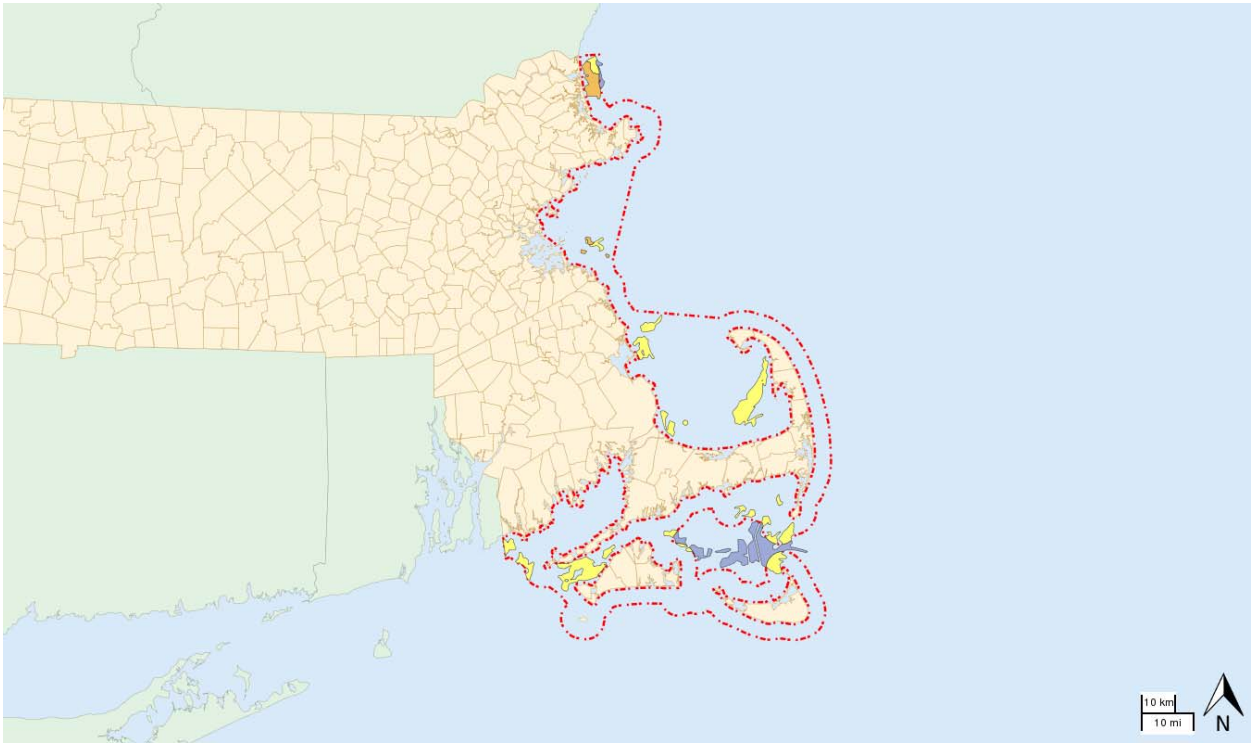

Figure 5-7: Potential offshore sand resource areas for further investigation, from the MASSGIS portal

5.13 Mississippi

Mississippi has been nourishing its beaches as long ago as 1952. Thy have conducted 17 nourishment events placing a total of 37.7 MCY of sand along their beaches at a cost of $328M (ASBPA, 2017).

Only one lease has been issued to Mississippi in 2016. This was for the MsCIP program (BOEM, 2017).

Within the NFD, it is estimated that Mississippi will apply for three new leases in the next 10 years. These are Cat Island, Petit Bois Island and Ship Island. An additional two leases are considered unlikely (Harrison County and Pass Christian). Thus, BOEM may expect up to five lease applications to be submitted in the 10-year NFD horizon (Table 5.3 and Figure 5-8).

The Base Scenario Volume is 15.3 MCY while the Elevated Need Scenario is 59.4 MCY.

Each likely project has the same complexity value of 32, which is slightly above the average complexity value (28) due to multiple locations and borrow areas. The unlikely projects have complexity values of 27 and 31.

The Mississippi Coastal Improvements Program Comprehensive Plan (MsCIP) being developed by the USACE Mobile District is considering Mississippi's coast over the next 30-40 years. This effort is considering a comprehensive suite of projects including barrier island and ecosystem restoration projects (USACE, 2016). In January 2017, BOEM signed a Memorandum of Agreement with the USACE to extract 19.6 MCY of sand from 10 OCS locations to restore Ship Island, Cat Island and Petit Bois Islands within the Gulf Islands National Seashore in Mississippi. This is the largest volume of OCS sand conveyed by BOEM to date. Going forward a single lease may be issued, or these projects may be permitted separately. Given the uncertainty, they have been listed as three separate applications. The large volumes and multiple discharge points have resulted in the complexity of these projects being slightly above average (Figure 5-10).

The beach nourishment project in Harrison County (Gulfport) has been listed as unlikely to need OCS resources. This project has typically used borrow areas located immediately offshore. The project was constructed in 2017 and thus is not in imminent need. It had a higher than average complexity value of 31 because it could consider multiple types of dredges and had multiple discharge points along the shore.

Nourishment at Pass Christian has also been deemed as unlikely to need OCS resources. This has historically used sediment dredged as part of the navigation maintenance program.

The Base Scenario volume for Mississippi is 15.3 MCY while the Elevated Need Scenario is 59.4 MCY (Figure 5-9). The Elevated Need Scenario is significantly higher than the Base Scenario, because it assumes 50% more volume than the largest project is needed and includes both the MSCIP program (initial construction volume of 22 MCY) and Harrison County (7 MCY).

The project complexity values range between 27 and 31.

Table 5.3: Number of Expected Lease Applications over the 10-year Forecast Period in Mississippi

Year	Higher Certainty	Lower Certainty
2018	0	0
2019	0	0
2020	0	0
2021	0	0
2022	0	0
2023	0	1
2024	0	0
2025	3	0
2026	0	0
2027	0	1
Total	**3**	**2**

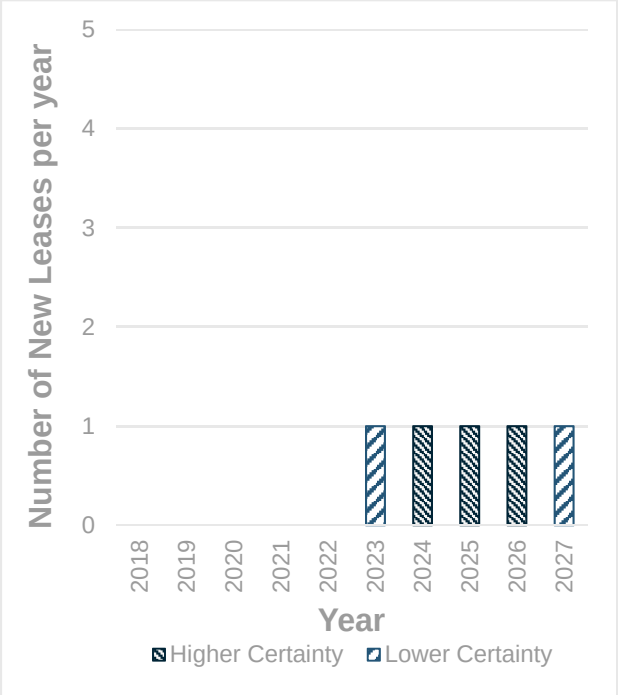

Figure 5-8: Number of Expected Lease Applications over the 10-year Forecast Period in Mississippi

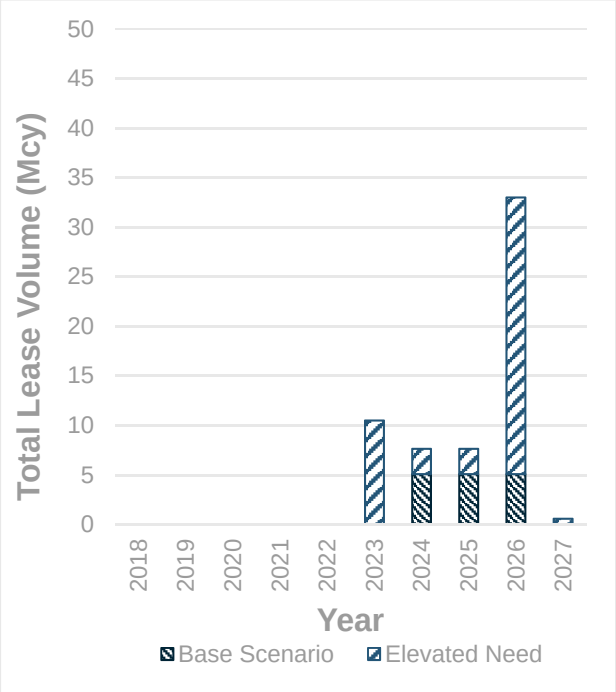

Figure 5-9: Total Lease Volume by Year in Mississippi for Base and Elevated Need Scenarios

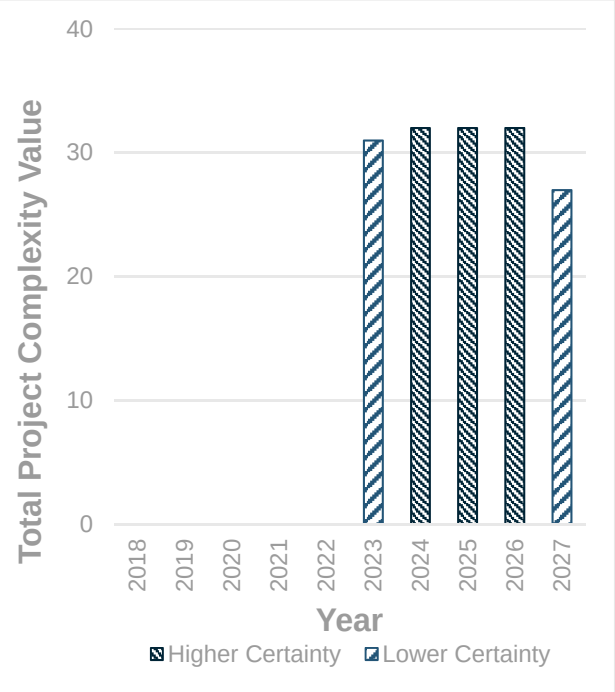

Figure 5-10: Project Complexity Values for Mississippi Projects

5.14 New Hampshire

New Hampshire has had nine beach nourishment projects extending back to 1935. These placed 2.1 MCY along their beaches at a cost of $6.2M (ASBPA, 2017). These have typically been beneficial disposal projects from dredging adjacent harbors.

New Hampshire has never applied for an OCS lease and no applications are expected in the next 10 years.

The New Hampshire coastline is less than 15 miles long. Furthermore, the -90-foot contour (effective limit of dredging for the US dredge fleet) is within state waters. Therefore, it's highly unlikely that OCS resources will be used.

The New Hampshire Department of Environmental Services (NHDES) is tasked with coastal issues and list their "focus areas" as being Salt Marsh Restoration, Coastal River Restoration, and Coastal Invasive Species (NHDES, 2017). The USACE New England District would be responsible for any federal review of permit applications.

5.15 New Jersey

New Jersey has constructed almost 270 beach nourishment projects dating back to 1936. As of 2015, over 171 MCY of sand had been placed along the New Jersey coastline at a cost exceeding $1B (ASBPA, 2017).

Despite this large number of projects, New Jersey has only been issued one OCS lease. However, this one lease allowed for the placement of 7 MCY along 11.5 miles of coastline (BOEM, 2017).

There are seven projects in New Jersey that are expected to need OCS leases in the next 10 years (Table 5.4 and Figure 5-11). There are five project areas that rely on inlets as their material source. Should a major event occur, then OCS resources may be needed to renourish these beaches if the inlet source does not have sufficient volume available. Rather than assume this will occur on the next renourishment cycle, each project along the coast was assumed to require a lease in a different year if they are relying on an inlet related borrow area. Thus, five "unlikely", "lower certainty" projects have been included in the NFD. This approach spreads the spike in storm induced lease applications across multiple years. This avoids showing this spike that may not actually occur. The volume required for the Base Scenario for New Jersey is 29.3 MCY while the Elevated Scenario is 82.1 MCY. This wider discrepancy is driven by the large initial construction volumes for some of the projects especially compared to "lower" more frequent renourishment volumes.

The project complexity for the potential projects ranges from 26 to 34. The average complexity value of the New Jersey projects is 28, which is the average of all anticipated BOEM leases in the US.

Table 5.4: Number of Expected Lease Applications over the 10-year Forecast Period in New Jersey

Year	Higher Certainty	Lower Certainty
2018	2	0
2019	1	0
2020	0	0
2021	2	0
2022	1	0
2023	0	1
2024	2	1
2025	1	1
2026	0	1
2027	1	1
Total	**10**	**5**

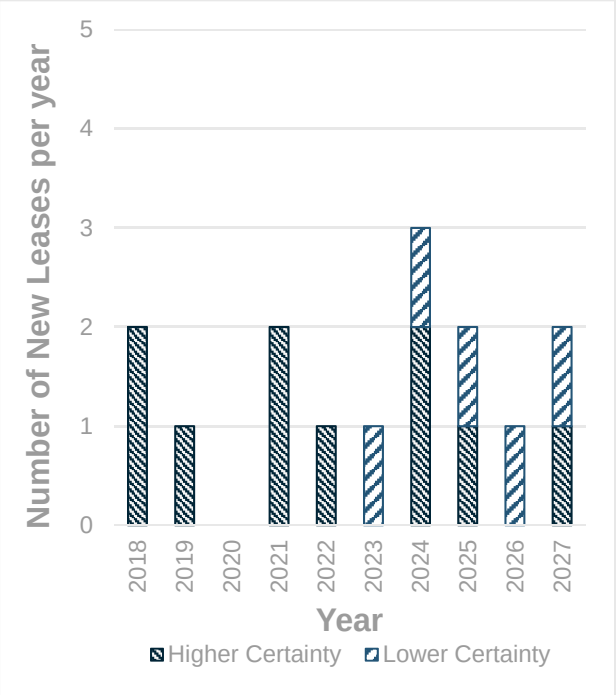

Figure 5-11: Number of Expected Lease Applications over the 10-year Forecast Period in New Jersey

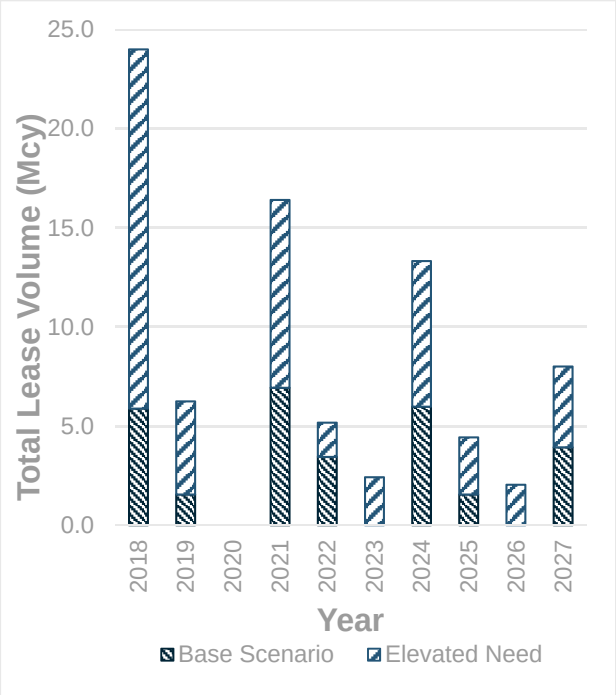

Figure 5-12: Total Lease Volume by Year in New Jersey for Base and Elevated Need Scenario

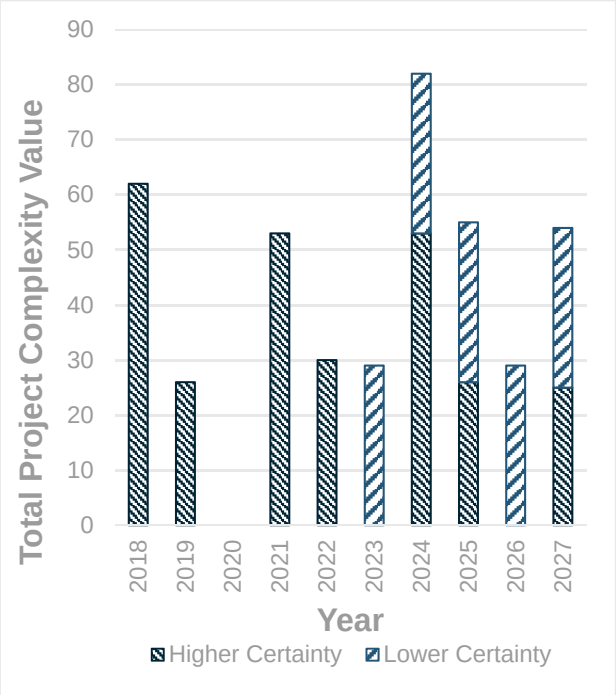

Figure 5-13: Project Complexity Values for New Jersey Projects

Several borrow areas located within state waters off the New Jersey coast have been used to supply sand to many beachfront communities. However, many of these sand sources have since been deemed environmentally sensitive and are no longer available for use. The sand in other borrow areas is not beach compatible or the borrow areas do not have sufficient volumetric capacity to support the life of the project.

The approach in New Jersey for sand sources for long-term renourishment includes three scenarios:

1. Sand from up-littoral-drift tidal inlets will be used, taking advantage of natural replenishment where possible. This approach is the preferred one for most of the USACE projects;
2. In some project areas, sand backpassing is used, moving sand from the south end of an island to the north end, such as at Wildwood and Avalon/Stone Harbor; and
3. For projects that do not follow the above approaches, federal OCS sand sources will be used as state sand resources are depleted or no longer available because of EFH concerns, such as the southern part of Sea Bright to Manasquan (where the Sea Bright borrow area in state waters is too far away to be economical); North Ocean County (Manasquan Inlet to Barnegat Inlet) where there are no inlets with sufficient sand; Barnegat Inlet to Little Egg Inlet, where OCS borrow site D2 will be used for the north end; and Great Egg Harbor to Townsends Inlet, where they will use OCS borrow sites M8 and L3.

The USACE is now responsible for all beach nourishment in New Jersey, with the exception of two federal properties: Sandy Hook National Seashore and Edwin B. Forsythe National Wildlife Refuge on the south end of Long Beach Island. The New York District AOR extends along the outer New Jersey shore from Sandy Hook to Manasquan Inlet; the Philadelphia District is responsible for the rest of New Jersey (Figure 5-14).

As shown in Figure 5-14, the USACE organized projects after Superstorm Sandy into stretches of shoreline bounded by inlets. Therefore, it is very difficult to re-group the historical nourishment projects by municipality in the Western Carolina Database, which doesn't match other sources, which themselves are incomplete. Dr. Stewart Farrell, Director of the Coastal Research Center, Stockton University, provided a spreadsheet for 30 years of beach nourishment projects in New Jersey that he has been compiling. Its organization is similar to the post-Sandy USACE projects. Therefore, the decision was made to create new entries into the NFD for the 13 USACE New Jersey projects, pulling data from both the Western Carolina Database and the Stockton spreadsheet, focusing on project history since the 1990s, when there was a lot of "initial" beach nourishment work by the USACE. Notes on data sources and issues for each of these 13 project areas are provide below.

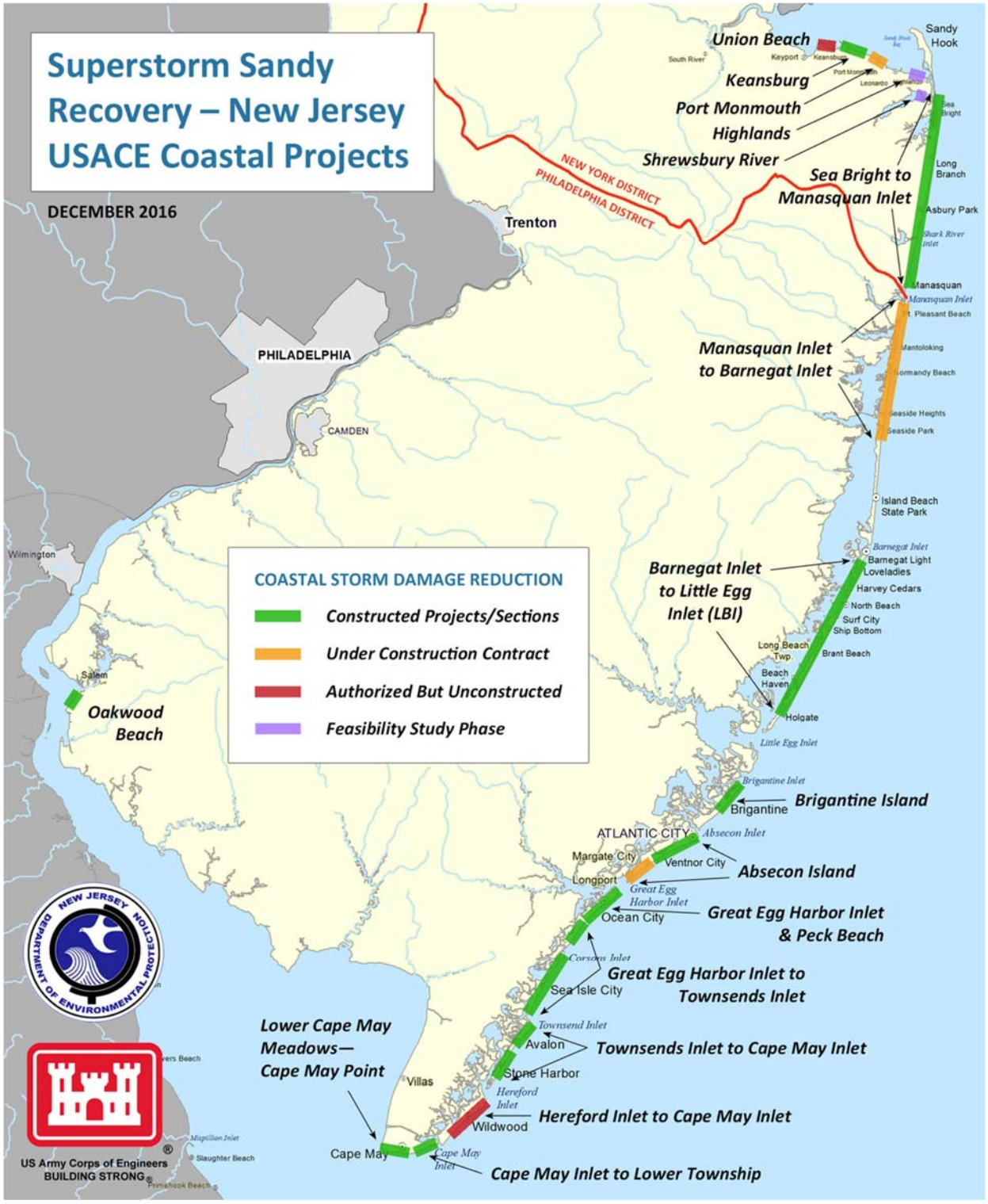

Figure 5-14: USACE Management of the New Jersey Coastal Projects

5.15.1 Sea Bright to Manasquan Inlet

The Sea Bright to Manasquan Inlet Project covers 21 miles of the New Jersey shoreline and is the largest beach nourishment project ever undertaken by the Corps of Engineers. Furthermore, it is the largest beach fill project, in terms of volume, in the world (USACE, 2015).

The project includes periodic nourishment of the restored beaches on a six-year cycle for a period of 50 years from the start of initial construction. The initial construction of this project began in 1994 and was completed (in 2001, with the exception of the beaches at Elberon, Deal, Allenhurst, and Loch Arbour). Construction at these remaining beaches was completed in December 2016 at 100% federal cost. In the intervening time between 2001 and Superstorm Sandy, federal funding was only available for four limited renourishment contracts in areas of Monmouth Beach, Sea Bright, Long Branch, and a very small portion of Spring Lake. Following Superstorm Sandy, over 8 MCY of sand were added during the repair. This included the initial construction of the beach project in Elberon, Deal, Allenhurst, and Loch Arbour, which was completed in December 2016 at 100% federal cost.

It is estimated that the Sea Bright Borrow Area contains over 54.5 MCY of sand (Castelli et al., 2015) though the volume of sand has not been re-evaluated considering current hardening issues dues to use of screens to remove munitions and explosives of concern, and the potential for loss of access to the remaining volume of materials. The borrow area is located in state waters, between one and three miles offshore of the southern end of Sandy Hook. Given the challenges with the Sea Bright Borrow Area, it was assumed that an OCS borrow area will need to be developed to support the Sea Bright to Manasquan Inlet reach. The Sea Bright to Manasquan section in Figure 5-14 was divided into two subsections: North (federal sand source) from Sea Bright to Loch Arbour and South (state and federal sand sourced) from Asbury Park to Manasquan Inlet.

The north section has a three-year renourishment interval. A new lease has been assumed for the construction of each of these projects. The first one is the most complex (complexity value of34) because a new borrow area will need to be defined. Subsequent projects will use the volume remaining in the borrow area and won't need as much effort to develop. This lead to a complexity value of 25 for the remaining projects.

This section could use state or federal borrow areas. There is also documentation on the Belmar Borrow Areas 3, 5, and 6. Belmar 6 is located in OCS waters while Belmar 3 and Belmar 5 are in state waters. The average renourishment interval going forward was based on six-year interval with a 900,000 cy need per cycle.

5.15.2 Manasquan Inlet to Barnegat Inlet

This section extends for 13.7 miles from Point Pleasant Beach to Island Beach State Park. For initial construction, material would be taken from the state sand borrow areas identified as areas A, B, D, and E. Borrow Areas A, B, D, and E contain approximately 13.3 MCY, 7.5 MCY, 4.5 MCY, and 8.8 MCY, respectively (USACE, 2018b). Sand for periodic nourishment would be obtained from these four offshore borrow areas and potentially one that is currently being studied known as F2. Borrow Area F2 is located entirely within federal waters and would be used upon approval from BOEM. A new Environmental Assessment (EA) will be completed to address potential impacts associated with Borrow Area F2.

The selected plan involves the placement of sand, obtained from offshore sources, to construct a berm and a dune for the purpose of storm damage reduction for the municipalities of Point Pleasant Beach, Bay Head, Mantoloking, Brick Township, Toms River Township, Lavallette, Seaside Heights, Seaside Park, and Berkeley Township.

The quantity of sand required for initial construction is estimated at 10,728,000 cy. Approximately 1,364,000 cy of sand will be needed for periodic nourishment every four years to maintain the berm and dune. Initial construction is currently being conducted and is expected to be completed in 2018.

For initial construction, sand is being taken from Borrow Areas A, B, D, and E. The use of these borrow areas was evaluated in an EA and EIS. Sand for the first few periodic nourishment cycles would be obtained from these four offshore borrow areas and the expansion of Borrow Area D. Additional sand sources may need to be investigated in the future to ensure an adequate sand supply for the 50-year project. The current EA covers only the expansion of Borrow Area D.

The nourishment interval and volumes were based on data from the Draft EA. State Borrow Areas A, B, D, and E will be the source for future sand needs in the short-term; OCS sand may be needed in the longer-term needs.

5.15.3 Barnegat Inlet to Little Egg Inlet (Long Beach Island)

Long Beach Island extends 20 miles between Barnegat Inlet and Little Egg Inlet. BOEM facilitated the dredging of up to 7 MCY of sand from federal waters under a July 2017 agreement between BOEM, the USACE Philadelphia District, and the New Jersey Department of Environmental Protection. The 2017 agreement was amended, increasing the total volume leased to 10 MCY. Construction is expected to extend from May to August 2018. This will be the largest amount of OCS sand conveyed by BOEM along the Atlantic coast for a single project to date.

Approximately 2 MCY of sand will be required every seven years for periodic nourishment, depending on how frequently significant storm events erode the Long Beach Island project. It is estimated that 2 MCY will be needed for emergency replacements based on the experience from Superstorm Sandy.

There is insufficient volume of sand remaining in Borrow Area D1 for continued project maintenance and/or full project construction. The 1,034-acre OCS borrow area D2 was identified and evaluated as a new sand resource.

Little Egg Inlet will be the source for the south end and OCS site D2 the source for the north end.

5.15.4 Brigantine Inlet to Absecon Inlet (Brigantine Island)

Brigantine Island extends 6.5 miles between Brigantine Inlet and Absecon Inlet. The northern half of Brigantine Island is uninhabited. The project has been constructed previously using sand dredged from Brigantine Inlet ebb shoal. Therefore, it is unlikely that Brigantine Island will be renourished using OCS sand.

5.15.5 Absecon Island (Absecon Inlet to Great Egg Harbor Inlet)

This section is 8.1 miles long. Atlantic City is located at the north end and Longport at the southern end. Three borrow areas have been delineated in state waters for Absecon Island: Absecon Inlet, Borrow Area “B,” and the northern half of the Great Egg Harbor Inlet ebb shoal (USACE, 1996). It is anticipated that Absecon Inlet will be the source for future sand needs.

Periodic nourishment is scheduled for a three-year cycle. The first full-scale renourishment of the project was completed in the summer of 2012 prior to Hurricane Sandy.

5.15.6 Great Egg Harbor to Townsends Inlet

This section extends approximately 16 miles from Great Egg Harbor Inlet to Townsends Inlet and includes the municipalities of Ocean City, Upper Township, and Sea Isle City.

The plan for Ocean City beaches required the initial placement of approximately 6.2 MCY of material and subsequent periodic nourishment of approximately 1.1 MCY every three years. The material for the initial construction and periodic nourishment is being taken from the ebb shoal area located approximately one mile offshore of the Great Egg Harbor Inlet.

Great Egg Harbor Inlet sand will be the likely source for Ocean City into the future. Since this is also a beneficial use project as the project maintains navigation through the inlet, it's unlikely that OCS sand will be required in the next 10 years for Ocean City.

For Ludlam Island, periodic nourishment sand would be obtained from three sand borrow areas: L3, C1 (Corson Inlet), and L1. In the future, there may be a need for sand from borrow areas M8 and L3. All of M8 and a portion of L3 lies in OCS waters, so it is anticipated that a lease will be required for future events. This section was last constructed in 2016; with a five-year nourishment schedule, it is anticipated that the next project will be constructed in 2021. The volume is typically in the 1.2 MCY range. The complexity value for this project area is 26, which is just below the average of 28.

5.15.7 Townsends Inlet to Cape May Inlet (Avalon)

This seven-mile stretch is typically nourished by dredging Townsends Inlet. Avalon also performs backpassing of sand, which extends the project life and limits the need for additional borrow area investigations. Thus, the use of an OCS borrow source in the next 10 years is not anticipated and has been rated as unlikely. Should a major beach erosion event occur, then OCS resources may be needed. Rather than assume this will occur on the next renourishment cycle, each project along the coast has been assumed to require a lease in a different year if it is relying on an inlet-related borrow area.

5.15.8 Townsends Inlet to Cape May Inlet (Stone Harbor)

This project also uses sediment from Townsends Inlet and doesn't have a specific offshore borrow area. The renourishment plan is a three-year cycle. Given repeated use of the inlet, dredging of OCS resources is not anticipated. As with Avalon, a date has been given for a potential lease need in an unlikely scenario.

5.15.9 Hereford Inlet to Cape May Inlet (Wildwood)

Previous beach nourishment events used Hereford Inlet as a borrow source. Backpassing has been used more frequently. Thus, between these two options, there is little need for OCS resources unless another large storm event like Superstorm Sandy occurs. To account for this potential in the NFD, Wildwood has been listed as unlikely to require OCS sand and offset by a year from Stone Harbor in terms of a potential lease timeline.

5.15.10 Cape May Inlet to Lower Township

This project uses a borrow area that is located in state waters. Two other borrow areas are located in state waters, while a third has been identified in OCS waters based on the cultural resource survey within the bid specifications. Thus, while unlikely to use the OCS borrow area in the near term, a future project may elect to dredge this borrow area. As with the other New Jersey projects, this section of shoreline has been listed as unlikely to be need OCS resources rather than a definitive no. The date of the expected lease has been offset by one year to represent a low risk likelihood.

5.15.11 Lower Cape May Meadows

This project area is approximately 2.5 miles long and includes Lower Cape May Meadows and the Borough of Cape May Point. Lower Cape May Meadows Project was constructed for the purposes of ecosystem restoration, hurricane and coastal storm damage reduction, and navigation mitigation. It is approximately 350 acres in area containing Cape May Point State Park and the Nature Conservancy's Cape May Migratory Bird Refuge. The same state borrow area will likely be used for Lower Cape May as for Cape May Inlet to Lower Township.

5.16 New York

The first beach nourishment project in the US was at Coney Island in 1922. Since then, ASBPA (ASBPA, 2017) reports that there have been 136 additional projects in the state. Overall, New York has placed over 190 MCY of sand along its beaches but none of these projects have required OCS resources (BOEM, 2017). All of the state's projects have used sand resources located within state waters and are situated to continue this trend. A cooperative study between New York State, BOEM, and Stony Brook University (2016), suggested that there are 50 MCY to 75 MCY of sand in New York State waters, which could provide between 8 and 150 years of sand supply.

While there is a great demand for sand in New York (Figure 5-15 and Figure 5-16), no projects have been listed that are likely to use OCS resources. The Outer Harbor Gateway Storm Barrier may require significant volume of COS resources but it will not be constructed in the next 10 years.

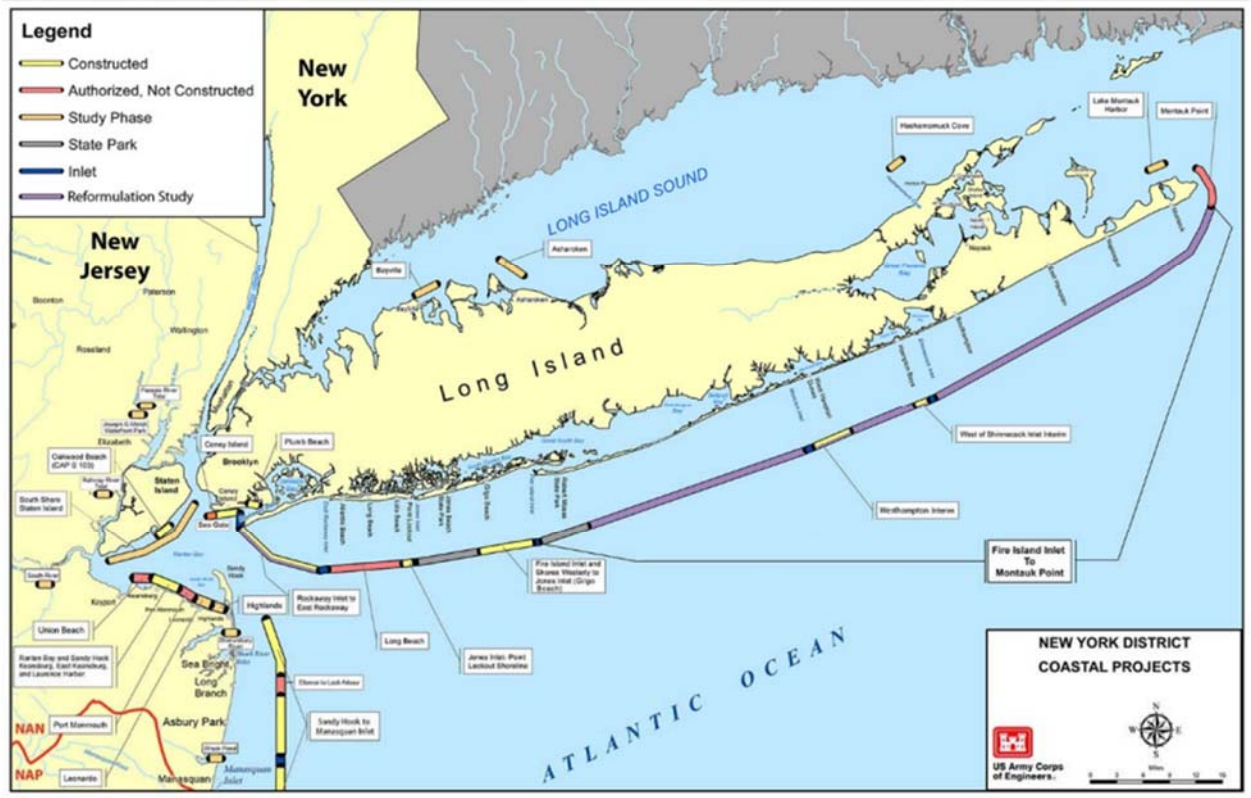

Figure 5-15. USACE Map of Projects within the New York District (USACE, 2018c)

Project Name	Renourishment Quantity Per Cycle (cy)	Renourishment Cycles Remaining	Estimated Year of Final Renourishment Cycle	Total Quantity Required(cy)	Borrow Area Capacity (cy)	Borrow Area Surplus/Deficit (cy)	Borrow Area Location
Atlantic Coast of New Jersey, Sandy Hook to Barnagate Inlet, Seabright to Loch Arbor	4,000,000	5	2048~	20,000,000	0	(20,000,000)	Offshore
Atlantic Coast of New Jersey, Sandy Hook to Barnagate Inlet, Asbury Park to Manasquan Inlet	3,000,000	5	2050~	15,000,000	0	(15,000,000)	Offshore
Norton Point to Rockaway Inlet (Coney Island public beach)	1,000,000	1	2044~	1,000,000	1,000,000	0	Shoal and Offshore
Norton Point to Rockaway Inlet (Coney Island-sea gate)	30,000	4	2053~	120,000	12,000	(108,000)	Backpassing and shoal
East Rockaway Inlet to Jones Inlet (Long Beach)	2,000,000	9	2057~	18,000,000	0	(18,000,000)	Offshore
Fire Island to Montauk Point-Moriches Inlet to Shinnecock Inlet (Westhampton)	1,000,000	4	2027~	4,000,000	5,000,000	1,000,000	Offshore
Raritan and Sandy Hook Bays-Port Monmouth	100,000	5	2057~	500,000	500,000	0	Initial = Offshore, Renourishment = Quarry
Orchard Beach	30,000	5	2050~	150,000	150,000	0	Initial = Quarry, Renourishment = Rehanding + Quarry

Figure 5-16: USACE New York District List of Projects with Renourishment Cycles and Borrow Area Capacities (USACE, 2017c).

5.17 North Carolina

North Carolina has a long history of beach nourishment using state sand resources, both offshore borrow areas in state waters and nearshore sand resources such as inlets and federal navigation channels. Approximately 74.8 miles of North Carolina's 326 miles of shoreline has been historically managed. The expectation is for the length of managed shoreline to increase to 85.3 miles in the near future (NCBIMP, 2016). Historically, the beach nourishment volume placed statewide has been between 1 and 2 MCY but has increased to 4 to 5 MCY over the last five years (NCBIMP, 2016). Despite these increases, North Carolina has only constructed one project using OCS sand resources – the 2018 Dare County project which included the towns of Kitty Hawk, Kill Devil Hills, Southern Shores, and Duck. The OCS volume dredged for this project was 4,136,000 cy. It is anticipated that this project will require OCS resources in the future.

Due to the increased need described above, some projects, such as the Bogue Banks project in Carteret County, have been identified as likely needing OCS resources resulting in eight possible leases over the next 10 years (Table 5.5 and Figure 5-17). The timing on some of these are arbitrary as it is estimated based on hurricane impacts, federal authorizations and appropriations.

The total expected lease volume for the Base Scenario in North Carolina is 19.4 MCY (Figure 5-18). This increases to 34.7 MCY under the Elevated Need Scenario. The complexity rating for North Carolina projects requiring and possibly requiring OCS sand resources ranges from 14 for the Dare County project to 33 for the Currituck County project (Figure 5-19). The Dare County project has utilized OCS resources in the past, and generally have below average requirements for compatibility and protected and cultural resources.

Table 5.5: Number of Expected Lease Applications over the 10-year Forecast Period in North Carolina

Year	Higher Certainty	Lower Certainty
2018	1	0
2019	1	0
2020	1	0
2021	0	1
2022	0	0
2023	0	1
2024	0	0
2025	1	0
2026	0	0
2027	1	0
Total	**5**	**2**

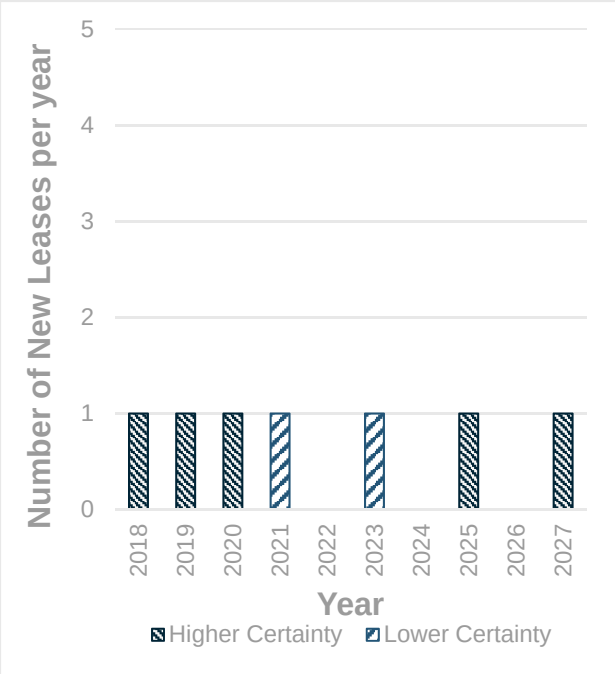

Figure 5-17: Number of Expected Lease Applications over the 10-year Forecast Period in North Carolina

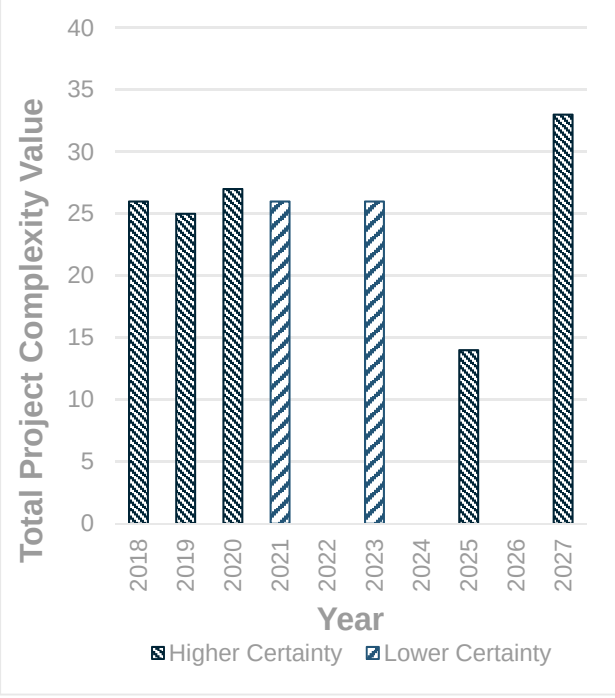

Figure 5-18: Total Lease Volume by Year in North Carolina for Base and Elevated Need Scenarios

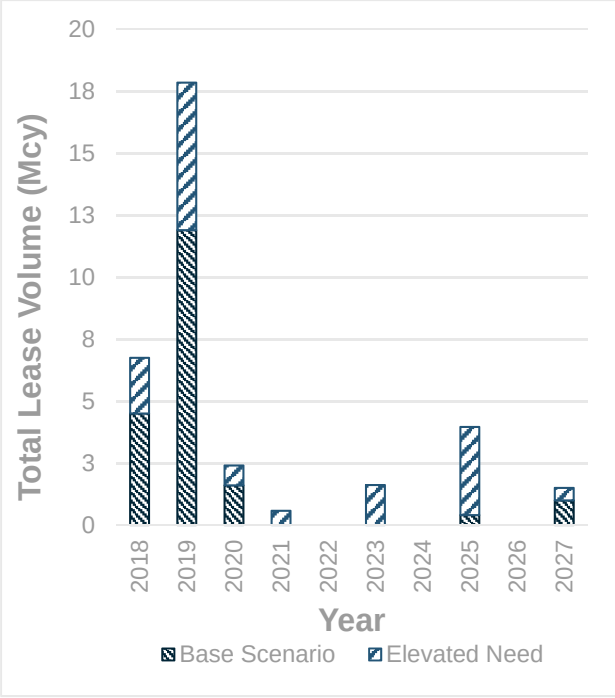

Figure 5-19: Project Complexity Values for North Carolina Projects

There are several federal Coastal Storm Damage Reduction Projects in North Carolina. Project documentation served as a basis for much of the information. Additionally, the North Carolina Department of Environmental Quality also developed a Beach and Inlet Management Plan (BIMP), originally published in 2009 and updated in 2016 (North Carolina Beach and Inlet Management Plan Update, 2016). To be consistent with the North Carolina Beach and Inlet Management Plan, the state has been broken into four regions for discussion purposes.

5.17.1 Region 1 – Brunswick County

Ocean Isle Beach plans to use Shallotte Inlet for its sand supply needs. In an emergency, an offshore borrow area is also available. Therefore, Ocean Isle will not need a borrow source in OCS waters within the 10-year NFD horizon.

Holden Beach has used a combination of Lockwood Folly Inlet maintenance dredging, upland sites, and offshore borrow sources to supply their sand needs. The offshore borrow source has 500,000 cy remaining, and an offshore borrow source could be required in the future to augment the upland and inlet sources. Therefore, the need for BOEM lease is possible though unlikely. Holden Beach has been included as possibly needing a BOEM lease under the Brunswick County Beaches Coastal Storm Damage Reduction project.

Caswell Beach is located immediately west of Cape Fear River Inlet. This inlet has historically been used as a sediment source along with periodic nourishment using an offshore borrow area. The inlet is expected to provide sufficient sediment resources in the near term that OCS resources will not be required.

Caswell Beach, Holden Beach, and Oak Island fall under the Brunswick County Beaches Coastal Storm Damage Reduction project. Two of the borrow areas for this project are located in OCS Waters. Wilmington Harbor and Lockwood Folly Inlet can also supply sediment through the beneficial placement of dredged sand from these federal navigation channels.

Bald Head Island is the easternmost portion of Region 1, extending west from Cape Fear. Wilmington Harbor navigation project has disposed of material along Bald Head Island. A portion of Frying Pan Shoals in state waters has been permitted as a borrow source. It is likely that Brunswick and New Hanover counties will investigate the state and federal resources associated with Frying Pan Shoals as a long term borrow sources (D. Piatkowski, pers. comm, April 10, 2018).

5.17.2 Region 2 – New Hanover County Plus Rich Inlet

Carolina Beach and Kure Beach Storm Damage Reduction Project has located multiple sand sources within state waters to support the project. Carolina Beach Inlet is the preferred borrow area, but two offshore borrow source have also been located. Kure Beach uses sediment from an offshore borrow area located within state waters.

Wrightsville Beach uses Masonboro Inlet to nourish its beach. Thus, no OCS borrow area is required.

Masonboro Island is uninhabited and therefore not in need of an OCS borrow area. Should a need arise, Masonboro Island could be nourished using sand from either Masonboro Inlet or Carolina Beach Inlet.

Wrightsville Beach has historically utilized sand from Masonboro Inlet to nourish its beach.

Wilmington District has evaluated an additional OCS source offshore of Wrightsville beach for future consideration as an alternative borrow source. There are limited sand resources available within the inlet for the Wrightsville Beach project and sand bypassing to Masonboro Island to mitigate impacts from the jetties.

The offshore source could be considered as an alternative for future projects (D. Piatkowski, pers. comm, April 10, 2018).

Adjacent to Wrightsville Beach is Figure Eight Island. This beach has been recently nourished, and there are no plans to conduct a new sand investigation as it uses Rich Inlet and Mason Inlet as sand sources. Therefore, it is not anticipated that an OCS borrow area investigation is imminent in the next 10 years. To acknowledge the chance that a large storm event could alter the renourishment cycle, and the inlets may not have sufficient sediment, a borrow area investigation has been listed as unlikely for Figure Eight Island (north) within the NFD.

Topsail Beach has a federal project. The federal West Onslow/Topsail Beach project includes the towns of North Topsail Beach, Topsail Beach and Surf City. This project has considered use of both state and federal sand resources. If appropriated funds, OCS sand would likely be utilized (D. Piatkowski, pers. comm, April 10, 2018). Topsail Beach has also executed a non-federal permitted project using state sand resources from the ebb shoal.

North Topsail Beach has used offshore sand and New River Inlet as its nourishment sources. However, the borrow areas in state waters resulted in the placement of some non-beach compatible sediment and may require more federal sand resources as a result. North Topsail Island had a major renourishment in 2015. A follow-on project is not planned for several years and will likely use sediment from New River Inlet; however, if the federal project is appropriated, OCS sand may be used.

The West Onslow Beach Coastal Storm Damage Reduction contains Topsail Beach, Surf City, and North Topsail Beach. Borrow areas have been identified in state and federal waters that can provide all of the sediment required for the 50-year life of this project.

The Bogue Banks, Carteret County Coastal Storm Damage Reduction (USACE, 2014a) project covers a 25-mile section of beach including Emerald Isle, Indian Beach, Pine Knoll Shores, and Atlantic Beach. The Final Integrated Feasibility report suggests a renourishment interval of four years using three offshore borrow areas, two of which are located in federal waters. A BOEM lease request is anticipated for this project. Additionally, a non-federal project locally managed by Carteret County has maintained the beaches in the recent past. The next non-federal project is slated for construction starting at the end of 2018.

5.17.3 Region 3 – Cape Lookout Lighthouse to Cape Hatteras

Core Banks and Portsmouth Island are uninhabited islands with no history of nourishment and are restricted from development. They are federally-owned lands and form the Cape Lookout National Seashore. Therefore, these were not included as potential for a future OCS borrow area need.

Ocracoke Island has not been nourished recently. Literature suggests that there are sand resources immediately offshore and sand from Ocracoke Inlet is also available. Since these sources are available, Ocracoke Island has not been included as an applicant for an OCS lease.

Hatteras and Frisco are the inhabited sections of the Hatteras Island, west of Cape Hatteras. A variety of sand sources have been used to nourish these beaches over the years. The need for an OCS sand resource in the next 10 years is not evident, and this has been listed as not needing OCS resources.

5.17.4 Region 4 – Cape Hatteras to Virginia Border

Cape Hatteras Island is using a borrow area in state waters to conduct beach nourishment. This project is slated for completion in March 2018. There should be sand remaining in the borrow area following construction so needing an OCS sand source is not anticipated.

Pea Island is a U.S. Fish and Wildlife Service National Wildlife Refuge and has historically been nourished by beneficial disposal from dredging of the Oregon Inlet. There is an offshore source that is approximately 4.7 miles offshore, which would place it in OCS waters. However, this has not been developed, and there do not appear to be imminent plans. Thus, Pea Island has been listed as unlikely to have an OCS lease application in the next 10 years.

Nags Head is slated for its next renourishment toward the end of 2018. While the borrow area has been previously used, there is over 13 MCY in the existing borrow area. Therefore, there is no need for OCS sand in the foreseeable future.

Kitty Hawk, Kill Devil Hills, Southern Shores, and Duck were all grouped in one project that used a borrow area located in OCS waters. This project was completed in 2017. Given this history, it is expected that any subsequent nourishment project will use a borrow area located in OCS waters. These were grouped as one lease.

North of Duck in Currituck County are several communities (Corolla, Currituck Banks, Ocean Hill) that may need a beach nourishment project in the future. The BIMP suggests that only OCS resources are available. While there do not appear to be any active plans, the NFD is intended to predict new projects and this qualifies in that category. A lease application date of 2027 was applied to recognize the potential for this project in the next 10 years but does not have a truly informed basis.

5.18 Oregon

No dedicated beach nourishment projects have been constructed in Oregon. All of the projects have been beneficial disposal of dredge material (ASBPA, 2017). Thus, no OCS leases have been issued to Oregon or are anticipated.

The Oregon Coastal Management Program (OCMP) is charged to “work in partnership with coastal local governments, state and federal agencies, and other stakeholders to ensure that Oregon's coastal and ocean resources are managed, conserved, and developed consistent with statewide planning goals.” The Oregon Department of Land Conservation and Development is the lead agency for OCMP though it is the Oregon Parks and Recreation Department that would review permits for “ocean shore alterations,” which include “shoreline protective structures, beach access ways, dune grading, and other sand alterations…”. The Oregon Department of Geology and Mineral Industries would be the lead regulator for geologic resources including sand and gravel.

The USACE Portland District leads the federal permitting effort for any beach nourishment projects.

5.19 Puerto Rico

Puerto Rico does not have a beach nourishment policy, and a history of beach nourishment projects in Puerto Rico could not be located. The Hurricane Irma Recovery Bill does not appear to include funding for beach nourishment. Therefore, it is not anticipated that OCS resources will be required in Puerto Rico in the foreseeable future.

5.20 Rhode Island

Rhode Island has constructed ten beach nourishment projects (ASBPA, 2017). The total volume of sediment placed just exceed 500,000 CY at a cost of $4.7M.

Rhode Island and BOEM have not previously entered into a lease agreement (BOEM, 2017) and this is not expected to change in the next 10 years. Given that no projects are anticipated, complexity values do not apply.

Of the 10 beach nourishment projects constructed in Rhode Island documented by ASBPA, the largest was the Misquamicut Beach project, which placed 200,590 cy of sand but used an upland sand source. At Misquamicut Beach, the -90-foot contour is only two miles offshore and inside state waters. Thus, future projects using OCS resources for this area are not anticipated.

The Rhode Island Coastal Resources Management Council (CRMC) is responsible for the preservation, protection, development, and restoration of the coastal areas of the state. The preferred method of protecting private property is building setbacks. In emergencies, CRMC allows non-structural shoreline protection that is designed to enhance beach recovery. It appears that the state currently does not have beach nourishment projects planned or underway.

5.21 South Carolina

There have been 66 nourishment events along the South Carolina coast since 1954. Overall, South Carolina has spent more than $356B to place over 54.5 MCY of sand along its beaches (ASBPA, 2017). South Carolina has constructed two projects using OCS resources.

The two major federal beach nourishment projects in the state rely on OCS sand. Recently, Folly Beach, the Grand Strand/Myrtle Beach (three reaches), and the SC State Ports Authority have utilized or leased OCS sand. It is anticipated that the Myrtle Beach project (all three reaches) will require OCS sand in the future and it is somewhat likely that the Folly Beach project may use OCS sand in the future. Four leases are anticipated over the next 10 years (Table 5.6 and Figure 5-21).

The Base Scenario volume for these four leases is 6.3 MCY. The Elevated Need Scenario would require 10.7 MCY (Figure 5-21).

The complexity rating for S.C. projects requiring and possibly requiring OCS sand resources ranges from 17 for Debideu to 23 for Garden City/Surfside (Reach 3 of the Myrtle Beach project) (Figure 5.22). The values are lower than the national average of complexity values of 28. These projects have utilized OCS resources in the past, and generally have average requirements for compatibility and protected and cultural resources.

BOEM's Cooperative Agreement with the SC Department of Natural Resources yielded detailed information and datasets on the available OCS sand resources. These were integrated into this effort, including, the SC Department of Health and Environmental Control, Office of Ocean and Coastal Resource Management online beach renourishment geodatabase (SCDHEC OCRM, 2016), and the SCDNR Comprehensive Spatial Database on SC's Coastal Resources and Uses (SCDNR, 2015).

Table 5.6: Number of Expected Lease Applications over the 10-year Forecast Period in South Carolina

Year	Higher Certainty	Lower Certainty
2018	0	0
2019	0	0
2020	0	0
2021	1	0
2022	1	0
2023	0	0
2024	0	0
2025	1	0
2026	1	0
2027	0	0
Total	**4**	**0**

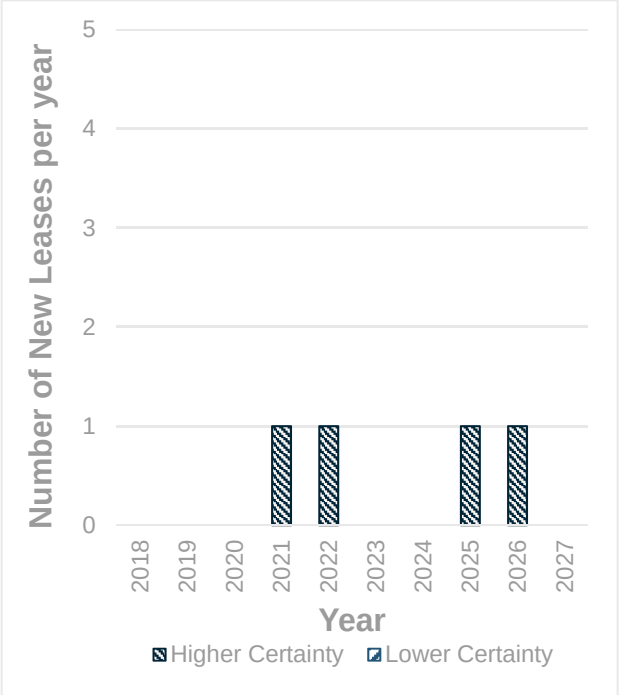

Figure 5-20: Number of Expected Lease Applications over the 10-year Forecast Period in South Carolina

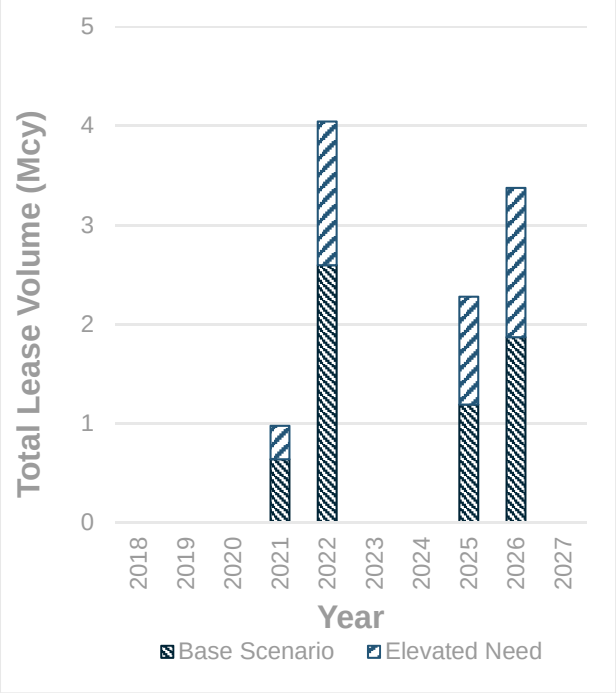

Figure 5-21: Total Lease Volume by Year in South Carolina for Base and Elevated Need Scenarios

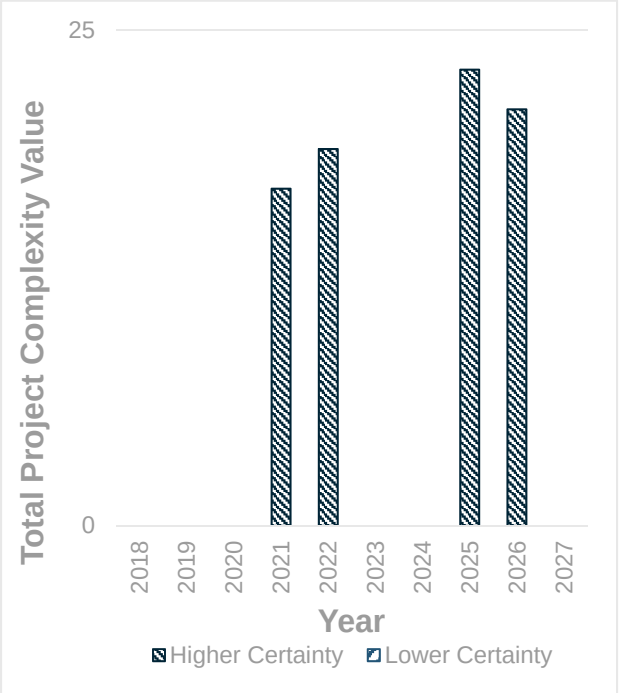

Figure 5.22: Project Complexity Values for South Carolina Projects

5.21.1 Jasper County

Jasper County has a short shoreline consisting of two uninhabited islands: Jones Island and Turtle Island. Both are small and consist of mixed sediment shorelines. Being located at the mouth of the Savannah River, they have no need for OCS resources.

5.21.2 Beaufort County

Daufuskie Island has been nourished, but not recently, and there is only a small population on the island. Any future needs will likely be met by dredging Calibogue Sound.

Hilton Head Island has a long history of beach nourishment projects. The borrow sites have been located in state waters, and no OCS resources appear to be required within the 10-year NFD horizon.

Fripp Island is privately owned and is completely lined with rock. It's not clear whether a beach nourishment project is planned. Thus, it was assumed that no project is scheduled for Fripp Island that would need OCS resources.

Updrift of Fripp Island is Hunting Island, which has been renourished repeatedly using borrow areas located directly offshore. Again, there was no data indicating that OCS resources were being considered for any future efforts.

5.21.3 Colleton County

Edisto Beach is located in Colleton County. It has used the South Edisto River ebb shoal as a sand source, and this is likely to be its future sand source, at least for the next 10 years.

5.21.4 Charleston County

Seabrook Island has been nourished several times. It is slated to use Captain Sam's inlet for its next nourishment event.

Kiawah Island was nourished using upland sand towards the end of 2017. The previous project was in 2007. It does not appear that another large project is being considered at this time that would require OCS sand resources.

Folly Beach has a long history of beach nourishment and previously used a borrow area located in OCS waters. The USACE is utilizing the Folly River for the ongoing 2018 renourishment. Sand source locations for future projects will depend on the outcome of this project. This report conservatively assumes that another OCS lease may be required for the next scheduled project in 2024.

Sullivan's Island was nourished in 1998. There is no foreseeable interest in offshore sand resources. It is anticipated that they will continue using upland sand for smaller projects.

Isle of Palms was recently (2018) nourished and thus likely should not require renourishment for numerous years. The borrow areas were located in state waters.

The remainder of the barrier islands in Charleston County are uninhabited.

5.21.5 Georgetown County

Debidue Island is the most southerly barrier island in Georgetown County that is inhabited. It has been nourished several times with a combination of upland and offshore sediment sources. The latest borrow area is located just inside state waters and has sufficient sand to supply the next nourishment. However, it is possible, though unlikely, that another borrow area may be developed that is located in OCS waters. Therefore, this has been included in the NFD as having lower certainty of occurrence.

Pawley's Island has not been nourished until recently. The initial project used the ebb shoal at Midway Inlet, while the last project in 2017 used upland sand to recover from Hurricane Matthew. No OCS sand resources are expected for future nourishment projects.

5.21.6 Horry County

Horry County is dominated by the federal Myrtle Beach Shore Protection Project, which includes three reaches: Reach 1: North Myrtle Beach; Reach 2: Myrtle Beach; and Reach 3: Surfside and Garden City (which extends into Georgetown County). This project will rely on the remainder of the OCS borrow source used for the 2017 project. Thus, while a new lease is required, much of the initial effort to develop the borrow area has been performed. This is reflected in a lower complexity value.

Myrtle Beach (Reach 2) and North Myrtle Beach (Reach 1) have previously used OCS resources to supply their sand needs. These have been included in the NFD for future needs as two separate projects.

Arcadian Shores is located between Myrtle Beach and North Myrtle Beach. Last constructed in 2009, it has been fed by the Reach 1 and Reach 2 projects but may seek to piggyback on the 2018 federal Myrtle Beach renourishment.

Waties Island has been previously nourished, though it is uninhabited. This was strictly a sediment bypassing project and use of future OCS sands is not anticipated.

5.22 Texas

Texas has constructed over 96 projects and placed over 30 MCY of sand along its beaches (ASBPA, 2017). None of these projects have used OCS resources previously (BOEM, 2017).

Three projects are expected to require OCS leases: Bolivar Peninsula/Galveston Island, Follets Island, and McFaddin National Wildlife Refuge. One project (South Padre Island) is listed as unlikely to need an OCS lease. These represent a need of 117 MCY of sand.

Each of these projects have a complexity value of 39, which is the highest of any project considered in any state.

The Texas General Land Office (TGLO) developed the Texas Coastal Resiliency Master Plan (TGLO, 2017). The plan suggests several beach and dune restoration projects though only the location and length of the projects were provided. The six projects discussed in the Master Plan are the R1-1 Bolivar Peninsula Beach and Dune Restoration Project, R1-2 Follets Island Nourishment and Erosion Control, R1-7 McFaddin National Wildlife Refuge (NWR), R-12 Galveston Island West of Seawall to Mile 8 Road Beach Nourishment, R2-7 Sargent Beach and Dune Restoration Project, and R4-1 City of South Padre Island Gulf Shoreline Restoration.

The USACE Galveston District combined the Bolivar Peninsula and Galveston Island Projects within the Coastal Texas Study (TGLO & USACE, 2018) and selected this plus Follets Island and McFaddin NWR as projects for further research. The Galveston District has also indicated that funding is available for these

projects so they have been included in the NFD. Details on these projects were unavailable from the study documents but the Draft Environmental Impact Statement, tentatively scheduled for release in May 2018, should have additional details. The USACE has indicated to BOEM (personal correspondence with Mike Miner, May 2018) that the Bolivar Peninsula/ Galveston Island and Follets Island projects will require 100 MCY of sand. This has been broken into two leases of 80 MCY and 20 MCY within the NFD based on project length. The USACE has suggested that 20 MCY will be needed for McFaddin NWR. A 4 MCY project was completed along here in 2017, so the total volume has been reduced to 16 MCY. Given the dearth of nearshore sand resources in Texas, it is likely that this sand will have to be supplied from OCS waters. Seeing as these projects have never been constructed it was assumed that the Base Need and Elevated Need Scenarios would have the same volume.

These three projects are expected to be complex, each with complexity values of 39. These are the highest of any projects in the NFD because the volumes are large, which will likely result in the need for a supplemental EIS. The USACE is currently developing an EIS though there has been limited interaction with BOEM (personal correspondence with Mike Miner, 2018). It is unclear as to the level of detail on the borrow areas that could have been incorporated into the EIS without BOEM coordination so a Supplemental EIS has been assumed. The initial borrow areas have not been delineated though it is likely to be in the general vicinity of Sabine Bank and Trinity shoals. BOEM expects that coordination on these projects will begin in 2019 (personal correspondence with Mike Miner, 2018)

For the Sargent Beach and Dune Restoration Project (R2-7), the Master Plan (TGLO, 2017) stated that the project will rely on “sand sources that have been developed nearshore along the Brazos and San Bernard River deltas”. Thus, OCS sand resources are not anticipated to be needed for this project.

South Padre Island has been historically restored using sediment dredged from the Brownsville Ship Channel and the Master Plan (TGLO, 2017) only lists the ship channel as a potential source. Ravella et al (2012) also discuss Highway 100 as a source of nourishment projects. (Texas A&M Corpus Christi CBI, 2018) mentions an offshore source but provides no details. It appears that the historic use of channel dredging will continue to be the predominant sand source.

5.23 Virginia

Virginia has completed 77 individual projects and placed over 34 MCY of sand along their beaches (ASBPA, 2017). The cost of this effort is over $174M.

There are four major beach nourishment projects within the State of Virginia, and each of them has used OCS sands to construct a project. BOEM has entered into nine offshore sand leases for projects constructed in Virginia, totaling 14.9 MCY to support these projects (BOEM, 2017). The use of OCS resources to support beach nourishment is expected to continue.

For the 10-year NFD, it is estimated that three of these projects will use or are likely to use OCS resources again: Dam Neck, Sandbridge, and Wallops Island. Due to short renourishment intervals, this will result in 5 leases requiring 7 MCY of sand (Table 5.7 and Figure 5-23). Under an Elevated Need Scenario, this increases to 31.4 MCY.

The complexity values for these projects ranges from 19 to 27, which are all below the national average of 28.

Dam Neck is scheduled for renourishment every 10 years based on the previous nourishment frequency. Thus, the next project is scheduled for 2025, and a lease application is expected in 2023. This project has been issued a previous lease, which leads to a lower complexity value because the next project could be constructed with a minor lease amendment because only a portion of the borrow area has been dredged.

Similarly, Sandbridge has a 13-year renourishment interval. The last project was constructed in 2013 and the historic renourishment schedule would suggest the next renourishment is in 2026. However, BOEM is currently negotiating a lease for 2 MCY to support this project. This has been included in the count for 2018. Given the 13-year renourishment interval, this project only has one lease within the 10-year forecast. The project complexity is 27, just below the national average. BOEM has significant responsibilities in the development of this borrow area, which increases the complexity value but all other factors tend to make this a less complex project.

Wallops Island is expected to have a five-year renourishment cycle. Given that the last project was constructed in 2014, it is expected that the next project would be constructed in 2019. BOEM is at the beginning stages of discussing this project and a formal request is imminent. A follow-on project would then be expected in 2024 and 2029. This could mean three lease applications over the next 10 years. Repetition through multiple projects results in a complexity value of 20, which is well below average.

The resort section of City of Virginia Beach continues to use sand from the Thimble Shoal Channel and Atlantic Ocean Channel and does not expect to use OCS resources to support ongoing efforts (pers. comm. between Phil Roehrs and Gordon Thomson). Thus, the City of Virginia Beach was excluded from the NFD.

The remaining sections of the exposed Atlantic coast are uninhabited. The only other major beach nourishment project in Virginia is along Willoughby. This was last constructed through beneficial disposal of Norfolk Channel dredging.

Table 5.7: Number of Expected Lease Applications over the 10-year Forecast Period in Virginia

Year	Higher Certainty	Lower Certainty
2018	1	0
2019	0	0
2020	0	0
2021	0	0
2022	1	0
2023	1	0
2024	1	0
2025	0	0
2026	0	0
2027	1	0
Total	**5**	**0**

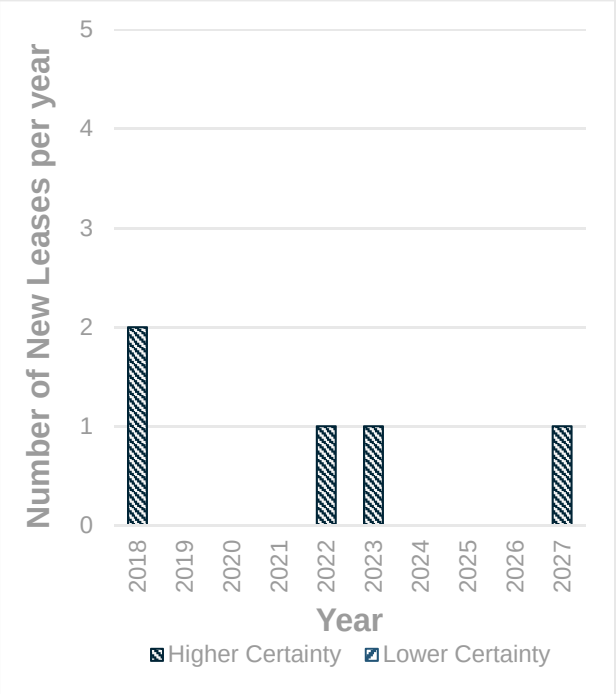

Figure 5-23: Number of Expected Lease Applications over the 10-year Forecast Period in Virginia

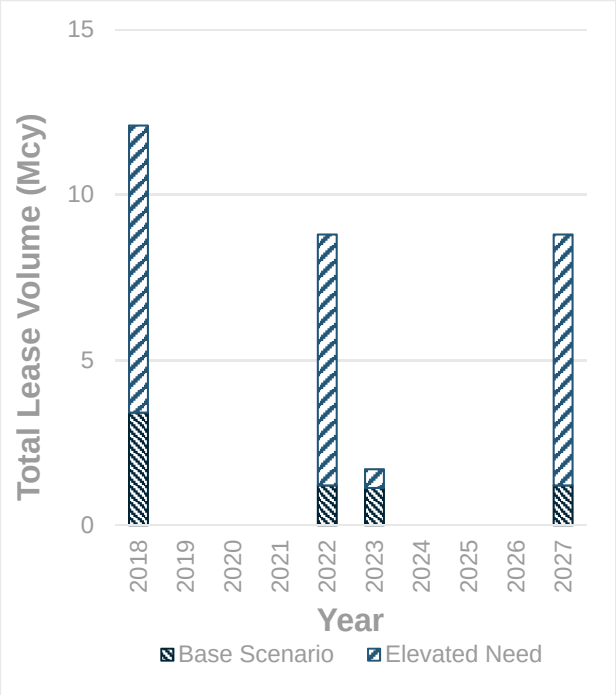

Figure 5-24: Total Lease Volume by Year in Virginia for Base and Elevated Need Scenarios

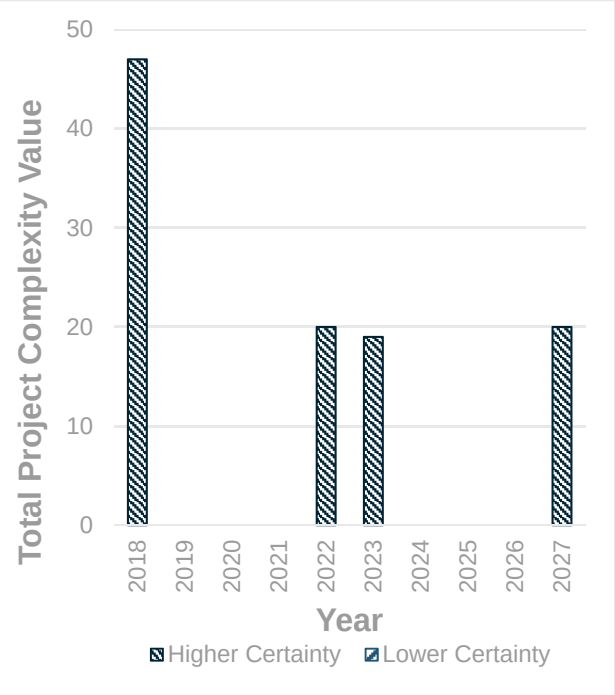

Figure 5-25: Project Complexity Values for Virginia Projects

5.24 Washington

Washington has a limited history of beach nourishment projects. ASBPA (2017) suggests that nine projects have been constructed since 1994. Research suggests that the bulk of these are beneficial disposal of dredge fill from navigation operations. No OCS leases have been granted to Washington.

No projects using OCS resources are anticipated in the 10-year horizon of the NFD or even beyond.

The USACE has been dredging the Grays Harbor channel and beneficially disposing of material along the Point Chehalis shoreline. The USACE also authorized the Shoalwater Bay Shoreline Erosion Project that included a dune restoration project. The borrow source was located within Willapa Bay (USACE, 2009b).

In summer 2010, 280,000 cubic meters of dredged sand from the mouth of the Columbia River were placed on Benson Beach. Most of the nourishment material was transported into the nearshore bars during moderate wave conditions 16 days later (Stevens, A A; Gelfenbaum, G; Ruggiero, P; Kaminksy, G M, 2012).

Over 30 beach nourishment projects have occurred in Puget Sound (WDOE, 2015), where there is limited opportunity to use OCS resources, because Puget Sound is comprised of only state waters.

6. National Need Forecast

The National Needs Forecast includes predictions of how many lease applications BOEM will receive over the next 10 years, as well as a prediction of the expected volumes of sand that will be requested in these applications under both a Base Scenario (Section 4.1) and Elevated Need Scenario (Section 4.2). The maximum number of leases expected over the next 10 years is 75 with a total maximum volume of sand required under an Elevated Need scenario of 496 MCY.

6.1 Expected Number of Leases

It is anticipated that BOEM will receive at least 62 lease applications between 2018 and 2027 and potentially as many as 76 lease applications. High certainty is defined as a new lease where the borrow area is defined as being in OCS waters or likely to be located in OCS waters, while lower certainty means there is a potential that the borrow area will require OCS resource, but it is unlikely. Projects for which the borrow area is not going to be located in OCS waters were excluded. The distribution is shown by year in Table 6.1 and graphically in Figure 6-1. Figure 6-2 graphically shows the number of leases by state.

Table 6.1: Total Number of Expected Lease Applications over the 10-year Forecast Period

Year	Higher Certainty	Lower Certainty
2018	7	0
2019	11	2
2020	7	0
2021	7	1
2022	6	0
2023	4	4
2024	7	1
2025	6	1
2026	5	1
2027	6	3
Total	**66**	**13**

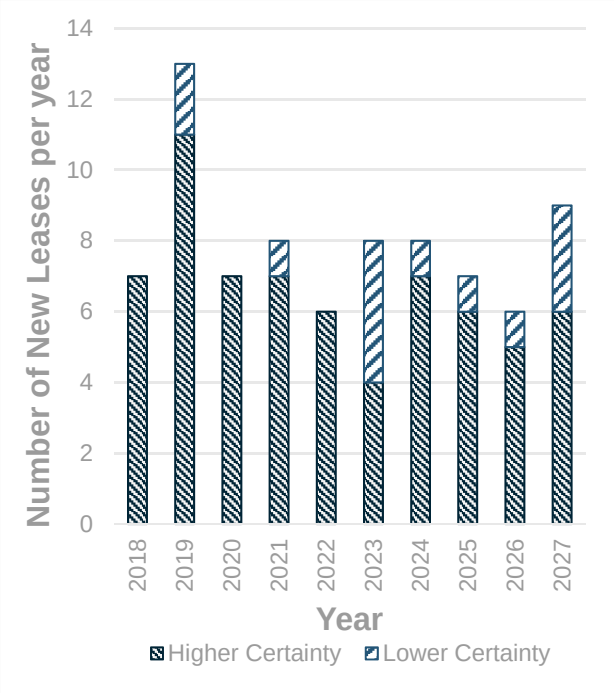

Figure 6-1: Total Number of Expected Lease Applications over the 10-year Forecast Period

There may be a natural bias within the analysis to anticipate that projects that have not been constructed for several years and are beyond their regular renourishment period to occur in 2018 and 2019. This could account for the spike (5 leases or 60% increase over the average of 8) in expected leases in 2019. Three of the leases are due to the Texas Master Plan. It was also considered whether this spike was related to a Superstorm Sandy. Many projects along the Atlantic Coast were renourished a year or two after Superstorm Sandy impacted the coast and a typical renourishment interval could have those beaches being renourished in

2021 to 2022. However, Atlantic coast projects did not contribute an inordinate number of leases to the forecast. Without a specific cause outside of the Texas projects, this increase in lease activity is interpreted as simply being natural variation.

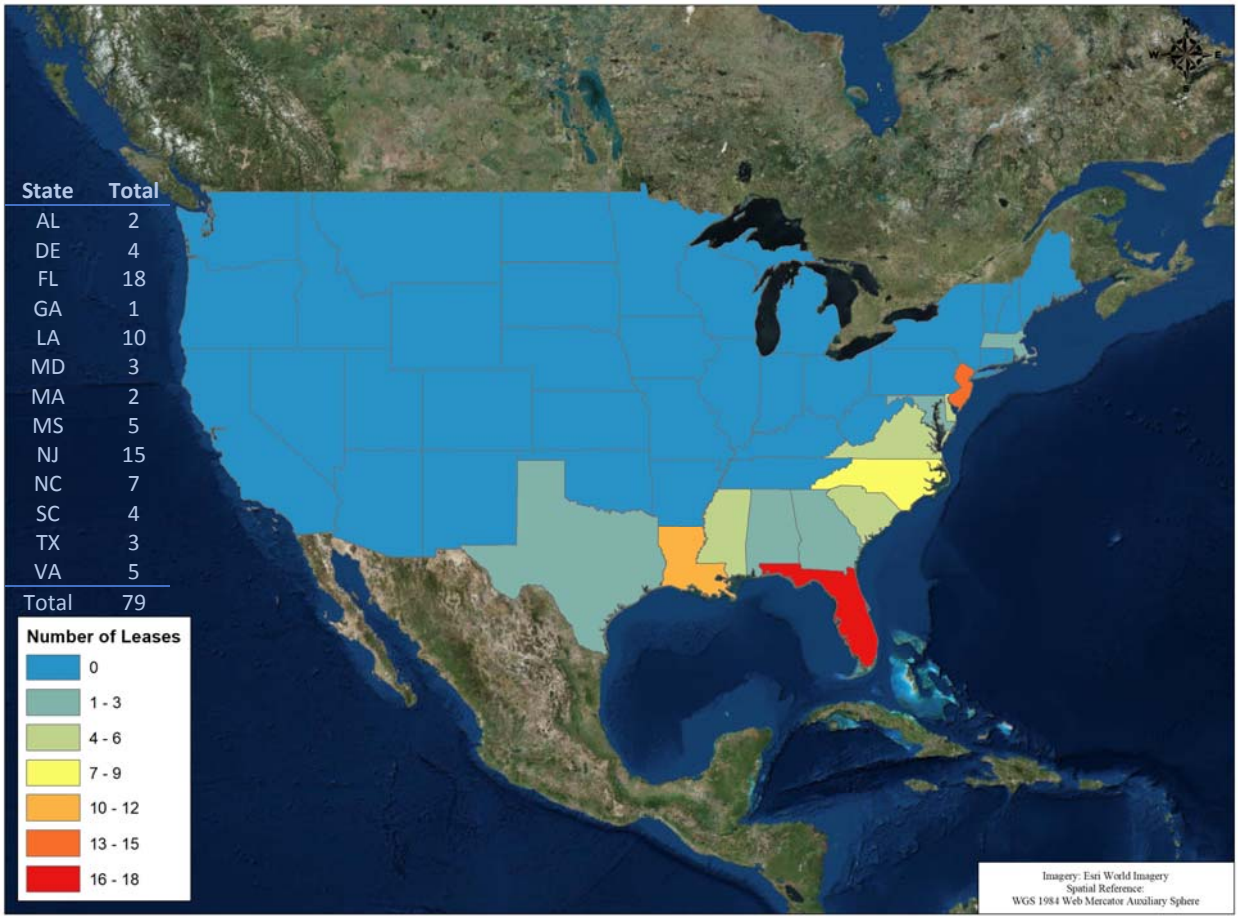

Figure 6-2: Color Coded Map showing the Number of Anticipated Lease Applications by State over the 10-year Forecast Period

6.2 Expected Lease Volume

The Base Scenario and Elevated Need Scenario volumes are based on the expected volume to be requested in the lease application, as discussed in Section 4.1. This volume was increased by 50% to account for the borrow area needing to have a greater volume than what will be constructed. The one key exception was for the three Texas projects. These have exceptionally large volumes and haven't been constructed. Thus, the Base Scenario and Elevated Need Scenario were assumed to require the same volume, which would be the initial construction volume.

Table 6.2 and Figure 6-3 show the volume of OCS mineral resource that is expected to be requested over the 10-year horizon. A total of 270 MCY are expected under the Base Scenario, but the need could be as large as 496 MCY based under the Elevated Need Scenario.

Table 6.2: Total Volume Included in Expected Lease Applications over the 10-year Forecast Period (millions of cy)

Year	Base Scenario	Elevated Need Scenario
2018	16.3	46.5
2019	137.0	162.3
2020	7.7	23.7
2021	13.6	29.9
2022	15.7	31.5
2023	5.1	28.8
2024	20.7	43.4
2025	11.5	23.2
2026	23.5	63.4
2027	18.8	43.1
Total	**269.8**	**495.9**

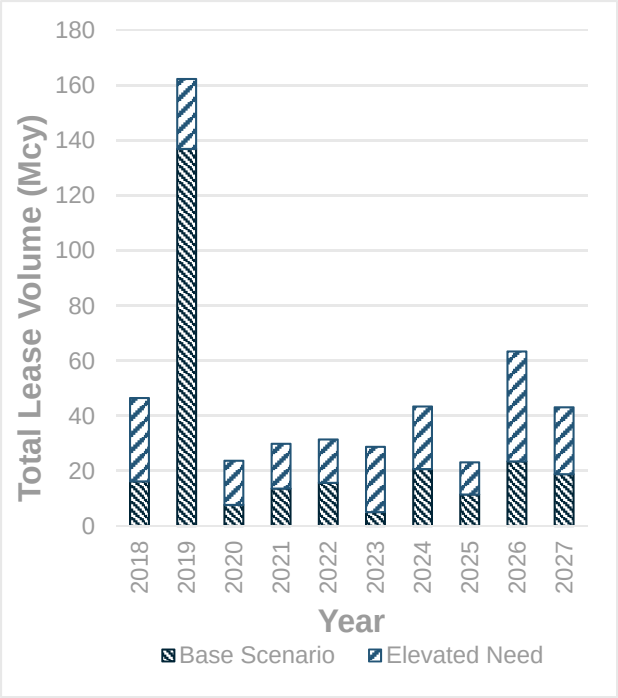

Figure 6-3: Total Volume Included in Expected Lease Applications over the 10-year Forecast Period (millions of cy)

The totals in Table 6.2 and range of Figure 6-3 are skewed significantly by the size and timing of the three Texas leases. Removing these three lease applications reduces the Base Scenario volume to 154 MCY and the Elevated Need Scenario to 380 MCY.

Figure 6-4 highlights that Texas is anticipated to have the highest volumetric need of any state over the next 10 years followed by Louisiana and New Jersey.

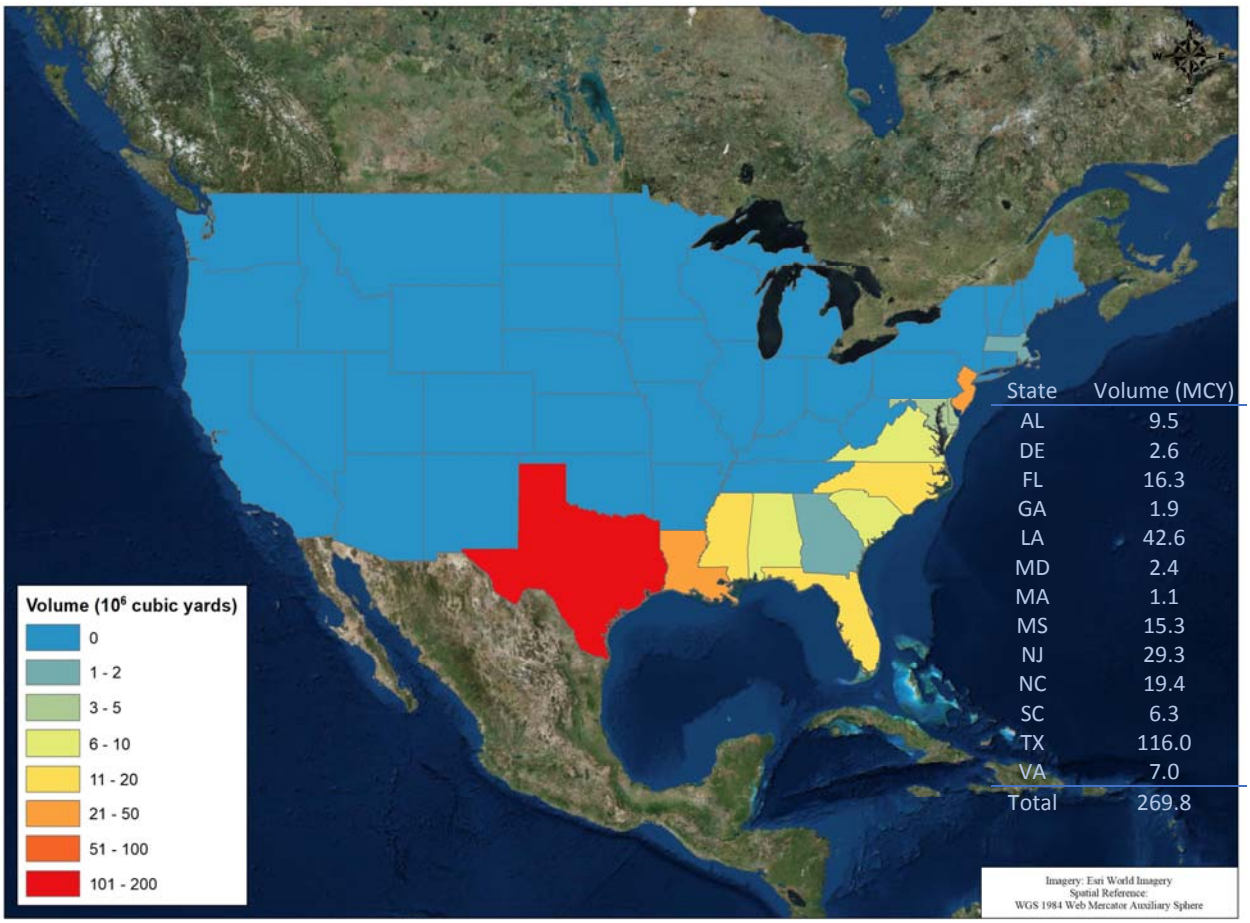

Figure 6-4: Anticipated Lease Volume by State over the 10-year Forecast Period for Base Scenario.

6.3 Project Complexity

The complexity value was summed for projects for which it was determined that the borrow area will be or is likely to be located in OCS waters. The lower-certainty complexity values were for projects that were unlikely to require OCS resources. Table 6.3 and Figure 6-5 summarize the expected complexity values over the next 10 years.

Dividing the total complexity value by the number of higher certainty leases leads to an average complexity value of 28.2 per lease application. This compares to a maximum possible value of 50 points. For projects unlikely to use OCS resources, the complexity level was lower at 26.9. No typical reason can be provided for why projects with a lower likelihood of using OCS resources have a lower complexity score than projects more likely to use OCS resources.

Table 6.3: Complexity Value of Lease Applications over the 10-year Forecast Period

Year	Higher Certainty	Lower Certainty
2018	205	0
2019	354	55
2020	199	0
2021	184	26
2022	149	0
2023	101	108
2024	206	29
2025	156	29
2026	135	29
2027	167	74
Total	**1856**	**350**

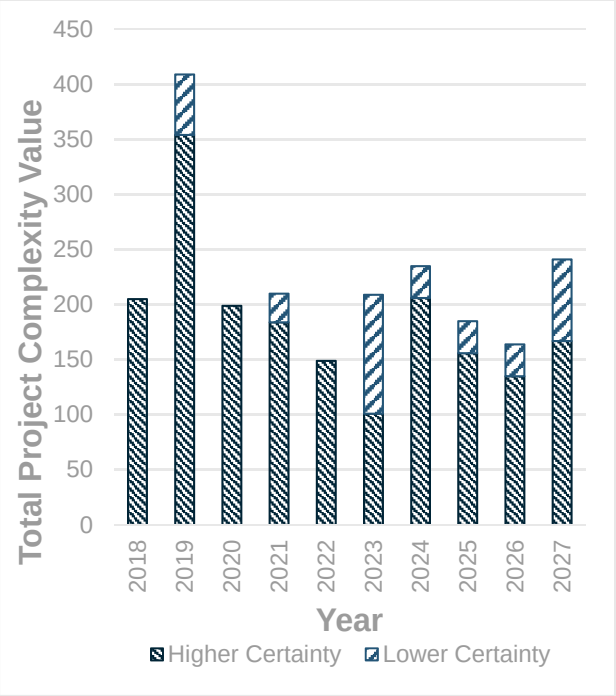

Figure 6-5: Total Complexity Value of Lease Applications over the 10-year Forecast Period

Figure 6-6 shows the average complexity value by state. Texas has only three projects expected to require OCS resources and each of these have very large volumes with no preliminary borrow area locations identified. This increases the complexity values. Alabama, Mississippi and Massachusetts are somewhat similar with respect to a low number of projects and thus one project can affect the average more strongly. Alabama and Mississippi complexity values are driven by needing to identify the borrow areas. Massachusetts' complexity values also require borrow areas but also have more strenuous permitting requirements and the likelihood for an EIS. Florida has a large range of projects, some with the highest complexity values due to limited sand supply and nearshore environmental resources. The Mid-Atlantic states are generally below average because of lower volumes, history or past projects and no nearshore resources to raise significant environmental concerns.

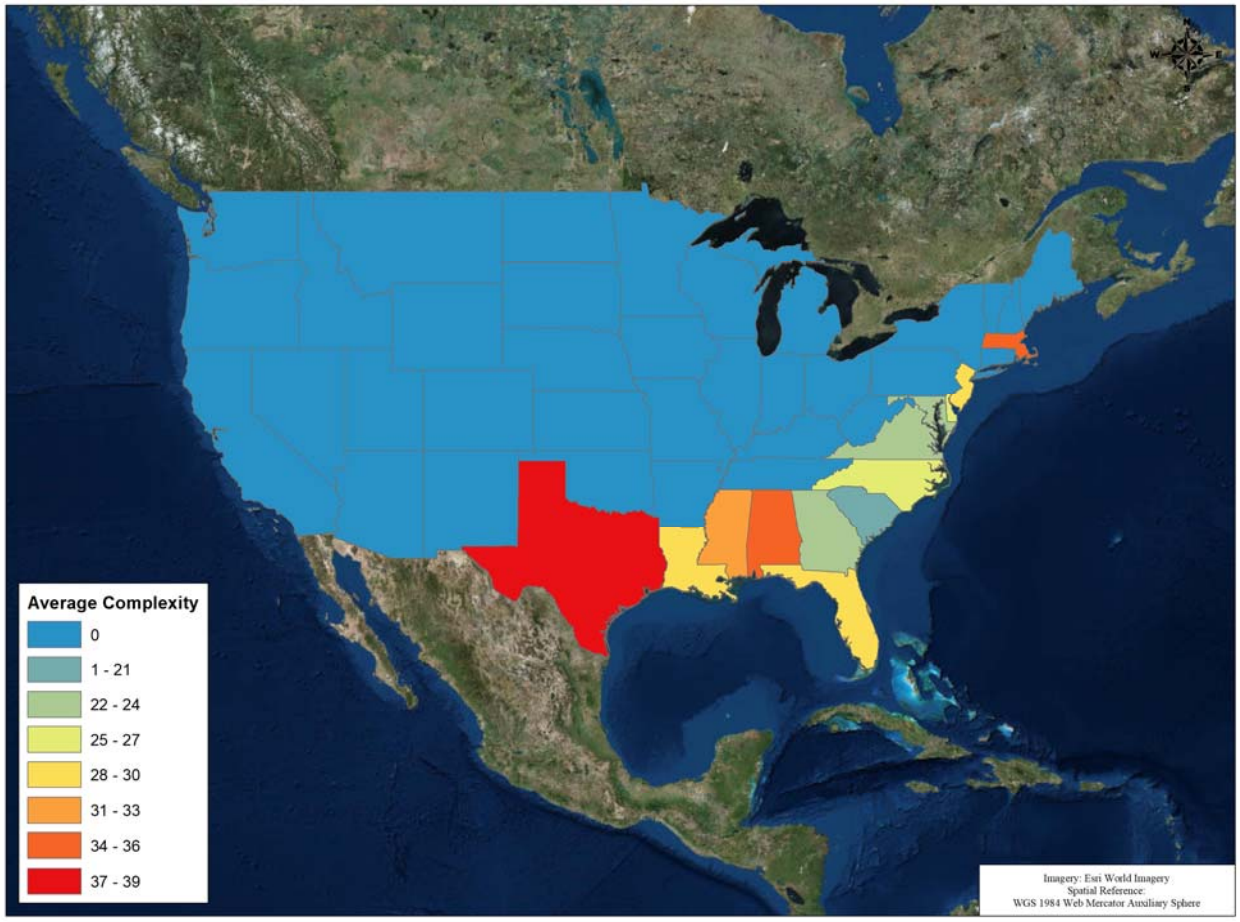

Figure 6-6: Average Complexity Value by State

6.4 Other Considerations

This effort examined the potential need for OCS resources based on projected beach nourishment projects. However, other industries, such as the construction industry, also use mineral resources and could apply for a BOEM lease to dredge these resources. The construction industry has a need for sand and gravel for general fill and concrete production. Dredging of offshore resources for mineral extraction (rare earth minerals, etc.) could also arise. The potential for this has not been included within the NFD.

Offshore wind farms, telecommunications, and oil and gas pipelines also require large swaths of ocean bottom. These have eliminated sand resources from use due to required offsets from the cables and pipelines. BOEM has implemented measures to minimize the loss of valuable sand resources going forward. Understanding where the demand for offshore resources is greatest can help focus investigative work where new pipelines and cables are being placed.

7. Conclusions

A National Forecast Database was developed that considered potential coastal projects that could require OCS sediment resources along the Atlantic Ocean, Gulf of Mexico, and Pacific Ocean over the next 10 years. It was determined that BOEM should anticipate at least 66 lease applications over this time and as many as 79. This continues a trend of increasing number of leases with time (Figure 7-1). This trend is both a function of an increase in the number of projects and existing projects exhausting local sand supplies and looking further away (into federal waters) to locate borrow areas.

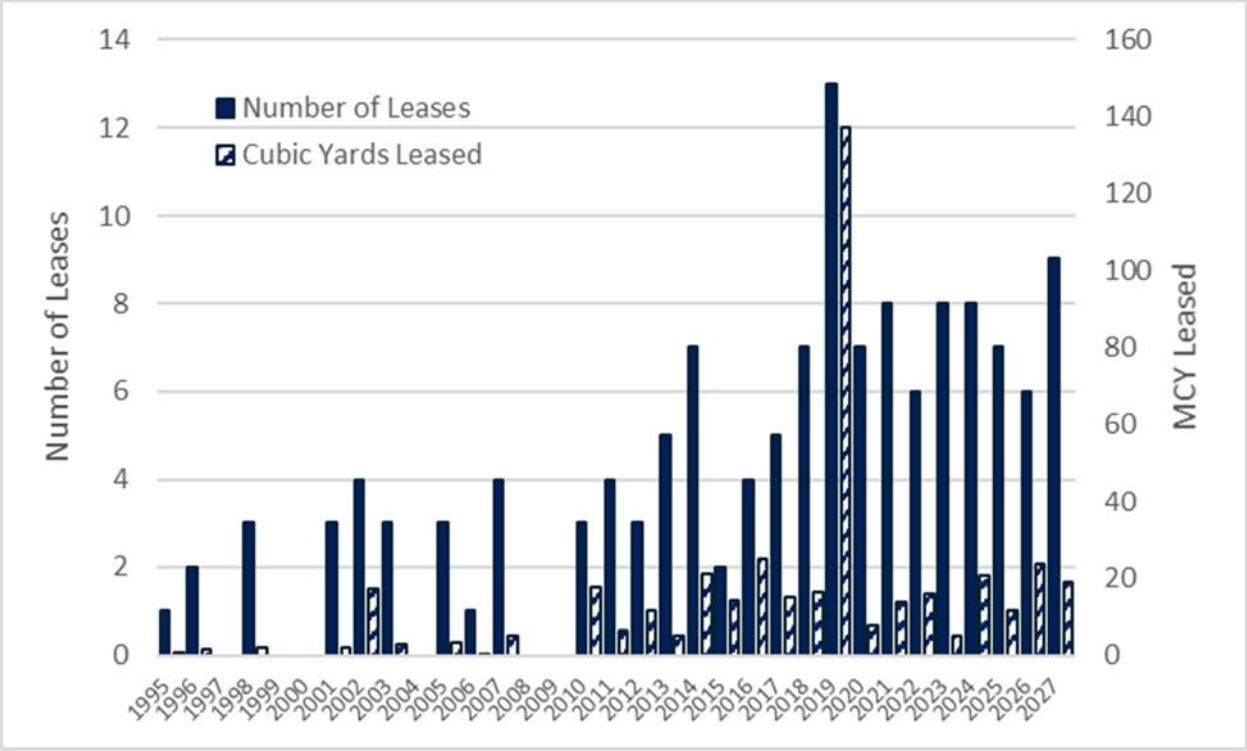

Figure 7-1: Historic and Predicted Lease Number and Lease Volume Over Time

The total volume of sediment to be requested could range from 270 MCY to 496 MCY. Care should be taken when considering these value as three potential leases in Texas add 116 MCY to both the Base Need Scenario and the Elevated Need Scenario. Thus, the timing and volume of future leases could change significantly based on the outcome of these projects. However, potential funding has been identified and these projects are in design.

This study undertook a major national assessment under a short time schedule and with limited resources. One of the limitations of the database is that the data are extracted from published information with limited conversations with state and federal personnel. Thus, the data could be dated. Furthermore, judgments used to support the finding of whether an OCS lease is needed, the timing of the lease application and the expected lease volume may not have the benefit of nuances behind the project. However, the National Forecast Database has been developed so that it can be updated as new data become available.

Another limitation of the database is that it often assumes that projects will follow a regularly scheduled nourishment interval. A major storm event and subsequent project need and emergency funding could revise the timing, need and volume for an OCS lease, as was observed in the aftermath of Superstorm Sandy.

The NFD considers only new lease applications. The database does not consider the work required for BOEM staff to amend existing leases. Lease amendments are often needed as projects move through the design phase.

8. Recommendations

The product delivered here (report and database) are an excellent start to an assessment of future sand resource needs. However, given the limited time, resources, and conversations allowed (see below), the product should be considered as the first phase of a multi-phase effort.

This study should be expanded to a refined geodatabase that maps beach nourishment projects Nationwide, with visual cues to easily identify which have utilized, may require, or will not require OCS resources in the future. Interviews with specific coastal management agencies and increased, early collaboration with BOEM would be valuable to this effort. A geodatabase like this could be linked to BOEM's internal GIS. National level maps and easily visible statistics and comparisons will help to inform BOEM administrators and if desired, BOEM's partners.

A limitation of this study is the lack of a national database that includes georeferenced borrow area locations. Databases utilized to develop the NFD contain many historic projects and many projects that have never and will never utilize OCS sand. During the database refinement process, these redundant beach nourishment projects should be filtered out and/or consolidated to reduce the overall number of projects in the database. Next, regional webinars with BOEM staff would be held to review all of the projects that will or may require OCS sand in the future. Finally, the team would reach out to other local, state, and federal agencies, as well as private industry, to further refine the database and quality check the forecasts. A future effort should not limit the ability to contact outside agencies or organizations.

Due to Paperwork Reduction Act, contact with state and federal agency personnel outside of BOEM was limited, which limited the accuracy and timeliness of the database. The accuracy of the forecast can be improved through frequent reviews and updates when new data become available. The NFD has been developed to allow updating by BOEM staff. Appendix A provides a summary of the database and mechanisms to input and analyze the data and then output a summary.

It is recommended that the database be available to particular BOEM staff to update periodically. The database has been created so that it can be updated and easily extended into the future. Appendix A describes the MS Excel database in greater detail and mechanisms to update and revise the data.

9. Acknowledgements

Contributors to this report include:

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Appendix A

National Forecast Database Description and Guidance

A.1 National Forecast Database Description and Guidance

This appendix provides guidance for users to update the MS Excel document that comprises the NFD. A list and function of the various worksheets is provided first. This is followed by suggestions on how best to input and revise data on each of the sheets.

A.1.1 List and Summary of Worksheets

The main worksheet is labelled “National Forecast Database”. This is where all project data are input and revised.

The “Summarized Data” worksheet extracts data from the NFD worksheet and provides the annual summaries of the data both as a total for all states and by individual state.

- No. of Expected Lease Applications (Borrow area in OCS water listed as Yes or Likely)
- No. of Potential Lease Applications (Borrow area in OCS water listed as Unlikely)
- Complexity Level (Projects with borrow areas located in OCS Waters or Likely to be located in OCS Waters)
- Complexity Level (Projects with borrow areas Unlikely to be located in OCS Waters)
- Anticipated Volume of Leases (Base Scenario) (MCY)
- Potential Volume of Leases (Elevated Need) (MCY)
- Difference between Base and Elevated Need Volume (MCY)
- How many have a scheduled renourishment plan?
- No. of Expected Lease Applications with Borrow Area Identified
- No. of Federally Supported Projects that will or are likely to have a borrow area in OCS Waters
- No. of Federally Supported Projects that are "Unlikely" to have a borrow area in OCS Waters but still possible.

The “Total” worksheet extracts the sum from all of the states of each element described on the “Summarized Data” worksheet. The purpose is mainly for creating figures of the data. Similarly, worksheets have been created for several states that have more data than the others and merit graphics – DE, FL, LA, MS, NC, NJ, SC, and VA.

The “Dropdown References” worksheet is where the list of options for the dropdown boxes on the National Forecast Database sheet are housed. The complexity values associated with the list item is also located here.

The “Western Carolina Master Database” worksheet contains data that was initially used to populate some projects and values in the NFD. A user should refer to the Western Carolina website rather than using this sheet. Baird is considering erasing this worksheet as it is not linked to the NFD. It was left to assist others understand some of the data background.

A.1.2 National Forecast Database Worksheet

This is the worksheet where data for individual projects is populated. This section will describe key elements of this worksheet.

Column A (Project Number) is a simple count. If projects (rows) are inserted then the equation for the count must be copied down to the cell below or an error message appears.

Column B is the Project Location

Columns C and D are the approximate latitude (lat) and longitude (long)for the center of the project area. Note that a negative value for longitude is required. This allows users to export the data and correctly locate it geographically.

Column E (State) is the state abbreviation. This column is limited to the two-letter abbreviation by cell validation.

Column F is for listing the Principal Project Sponsor. This will typically define whether this is a federally run or non-federally lead project. This column is limited to yes and no responses by cell validation with a dropdown box.

Column G (Federal Project) should be answered considering whether federal funding is being provided. Again, data validation restricts the cell use to “Y’, ‘N’, or “Both”.

Column H (Is Funding in Place) should be interpreted as whether Funding has been appropriated to build the project. This column is limited to yes and no responses by cell validation with a dropdown box.

Column I (Funding Source/Program) describes the source(s) of the funding stream.

Column J (Latest Project Engineer) provides the last known engineer on the project. The intent here was to allow a reviewer to know who best to contact for details of the last project.

Column K (Number of Renourishment Events) is the number of renourishment event. Thus, if two construction events have taken place, then this column would state “1” as it is renourishment.

Column L (First Year Periodic Nourishment Began) is the first year that a project was constructed.

Column M (Year Last Constructed) was the last known project construction. When multiple projects are expected in the 10-year NFD horizon, then this number may actually be in the future.

Columns N, O and P (Initial Project Construction volume, Largest Project Construction Volume, and Total Volume Placed to Date) provide details on previous construction event volumes in cubic yards (cy).

Column Q (Renourishment Plan) indicated whether a renourishment plan was published. This column is limited to yes and no responses by cell validation with a dropdown box.

Columns R is the Average Renourishment Interval in years. If there is a stated value then the stated value should be used to overwrite he equation. If the number of events, start date and last year constructed are available, the NFD will calculate an estimate of the next event based on the average renourishment interval added to the year the project was last constructed.

Column S is the Average Renourishment Volume (cy). Again, if a stated renourishment volume is available, then this value should be used. If not, the NFD will calculate one based on data within the NFD.

Column T is the Anticipated Date of the Next OCS Lease. This is one of the most important columns in the spreadsheet. The Summary spreadsheet uses this column to extract projects. If this value is not within the 10-year horizon of the forecast, then the project will not register on the summary page. If known, the anticipated

year of the lease application should be inserted here. If not stated, then the column assumes that the lease application will be submitted 2 years before intended construction.

Column U (Next Anticipated Construction Date) is important because of the relationship to the lease date. Typically, projects are discussed based on their next construction date. If this year is known, it should be inserted here. If not, then the cell will add the renourishment interval to the year of the last construction.

Column V is the Anticipated Volume of the Next Project (cy). Again, if this volume is known it should be inserted here. If not, the NFD will estimate the volume. It first checks if there have been any renourishment events. If there have it uses 150% of the average renourishment volume from Column S. If there have been no nourishment events, it uses 150% of the initial construction volume. If no data was available then the box will be blank.

Column W provides the basis for the volume estimate. This is limited to options through the dropdown box. Should more options be required, then the "Dropdown References" worksheet must be changed.

Column X is the Annual Average Loss Rate. These data were surprisingly difficult to obtain and this column is not really used. Instead, the project volumes and number of projects over a given time frame were used to develop volumetric estimates of future projects. This column was retained in case the data were available and provides another comparison point. Blank values mean that this data was unavailable or could not be calculated from the available data.

Column Y is the Average Annual Renourishment Rate (cy/yr). As with Column X, this is used sparingly. Blank values mean that this data was unavailable or could not be calculated from the available data.

Column Z (Is the project best identified as a Beneficial Disposal Project) identifies whether this is a beneficial disposal project. If yes, then it is highly unlikely that the project will ever apply for a BOEM lease. This column is limited to yes and no responses by cell validation with a dropdown box. When in doubt as to whether this was only a beneficial use project or may need a future dedicated beach nourishment project, then "No" was selected.

Column AA asks whether there is a borrow area identified for the next project. It is limited by cell validation to "Y" or "N" to allow easy extraction of data. This selection was based on an identified borrow area with sufficient sand to provide the required volume.

Columns AB (Borrow Area Name), AC (Borrow Area Lat), AD (Borrow Area Long) and AE (Borrow Area Volume) provide details on the borrow area. Unfortunately, this is not set up to handle multiple borrow areas. It is recommended to use the most likely borrow source except for column AE, which should use volume from all of the available borrow areas. The latitude and longitude values were estimated for the approximate center of the borrow area. If the borrow area is unknown, then these cells will be blank.

Column AF (Sufficient Volume in BA for Stated Needs) is user defined as "Y" or "N" for whether the borrow area has sufficient volume. It was considered to automate this but issues arose and it was determined to be better to simply let the user compare needed and available volumes. This column is limited to yes and no responses by cell validation with a dropdown box.

Column AG (Will Future Borrow Area be located in OCS Waters) is the critical column in the NFD. This column lists whether in the user's opinion a project will require a lease, is likely to require a lease, is unlikely to require a lease or will not require a lease. This is also limited to these four responses (Yes, Likely, Unlikely, and No) through a dropdown box and cell validation.

Column AH (Reason for Expected Borrow Area Located in OCS Waters) provides reasoning for the decision in Column AG. It is also limited to choices from a dropdown box in order to standardize the response.

Column AI (Are OCS Sand Borrow Areas Located within 50 miles of the Project?) is to determine whether OCS resources are within 50 miles of the project. This was an arbitrary threshold but provides some delineation for distance. This column is limited to yes and no and N/A (not applicable) responses by cell validation with a dropdown box. N/A is when state resources are available. A blank value was reported if a project was not going to use future OCS resources.

Column AJ (Is the Project Likely to be Constructed using OCS Sand Resources if OCS Sand Resources are Greater than 50 miles Away?) provides insight as to whether the project will be constructed if the sand resource is more than 50 miles away. It is also limited on inputs through cell validation and has a dropdown box for yes, no or not applicable.

Column AK (Previous BOEM Lease (Y/N)) states whether the project has a previous BOEM lease (Yes or No). This column is limited to yes and no responses by cell validation with a dropdown box.

Column AL (Document Reference) provides a list of references used upon which the determinations were made.

Column AM (Document Link) provides a link to references related to the project.

Column AN (Project Complexity) is the overall complexity score and sums the individual complexity values.

Columns AO through BH develop the complexity values and provides a score as discussed in Section 4.3. The score columns are auto filled based on the response provided in the dropdown boxes. To add or remove options, the “Dropdown Reference” worksheet must be revised as discussed in the next section.

Colum BI provides general comments on the individual projects and should provide insight into decisions made regarding that project.

A.1.3 Summarized Data Worksheet

This worksheet extracts summary data from the NFD worksheet as discussed in Section A.1.1. Data is extracted for each state and then sums the state value to provide a total value. Data is extracted for each year.

There are two cells highlighted in yellow (C5 and A6). Changing cell C5 changes the State in Column C so that the user doesn’t have to scroll right to get to the state of interest.

Changing cell A6 revises the start year for the forecast. Thus, BOEM can simply change this cell in 2019 and obtain an updated forecast. Care must be taken to ensure that multiple leases for the same project in the forecast period are correctly accounted for by adding in another row.

This worksheet uses “COUNTIFS” and “SUMIFS” functions in MS Excel.

COUNTIFS counts the number of times all criteria are met. The syntax is: COUNTIFS(criteria_range1, criteria1, [criteria_range2, criteria2]…)

The SUMIFS sums the values of the cells that meet the criteria. The syntax is SUMIFS(sum_range, criteria_range1, criteria1, [criteria_range2, criteria2], ...)

A.1.4 Dropdown References Worksheet

The Dropdown References worksheet summarizes the various dropdown boxes used in the NFD worksheet. This is applied using the “Data Validation” tool within MS Excel.

> https://support.office.com/en-us/article/apply-data-validation-to-cells-29fecbcc-d1b9-42c1-9d76-eff3ce5f7249

To add another element to the dropdown box, it may be easiest to highlight a cell within the existing dropdown boxes and then request to insert cells. The user can then add text in the new row. Similarly, existing options can be removed by deleting the row (not just the text) on this sheet. Be careful to only highlight the cells that you want to delete and then use the “Shift cells up” option to avoid impacting the other data sets.

The complexity values can be changed on this sheet. Updating them on this worksheet will automatically update the values within the NFD worksheet. This is because the data are linked through the VLookup command.

> https://support.office.com/en-us/article/vlookup-function-0bbc8083-26fe-4963-8ab8-93a18ad188a1