BOEM Cooperative Agreement Number M22AC00020

New Jersey Geological & Water Survey

Evaluation and prioritization of sand and gravel resources to support coastal resilience projects along portions of the New Jersey coast

Cooperative Agreement Summary Report

Performance Period: October 01, 2022 – September 30, 2025

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New Jersey Geological & Water Survey

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Overview

New Jersey's coastline is faced with increasing risks from coastal erosion, rising sea levels and storm surges which threaten coastal infrastructure, beach ecosystems and local economies. The state relies on beach nourishment as a key coastal management strategy, requiring a sustainable supply of compatible sand from offshore areas. NJGWS collaborated with BOEM through this cooperative agreement to develop a continuing study investigating mapped sand and gravel resource units in relation to sand replenishment needs and examining the geospatial characteristics of these mapped units. The goals of this cooperative agreement were to:

- Develop a sand resource site selection workflow to determine which project areas(s) have the greatest need for sediment resources and where additional project planning can be focused.
- Create a suitability model utilizing ArcGIS Pro to evaluate, identify, and rank offshore areas based on a defined set of criteria using available geospatial data and identify offshore locations that exhibit physical characteristics favorable for potential sand resource development.
- Identify data gap areas in federal waters offshore New Jersey related to geophysical and geologic data, geologic framework, mineral resources and sand resources.

This information will establish an effective and adaptable framework that prioritize resources to better assess the availability and quality of offshore sand deposits for coastal resilience projects while navigating conflicts with competing ocean uses such as offshore wind energy development, fishing and telecommunications infrastructure. This process can be tailored to address the unique needs and challenges of each coastal area.

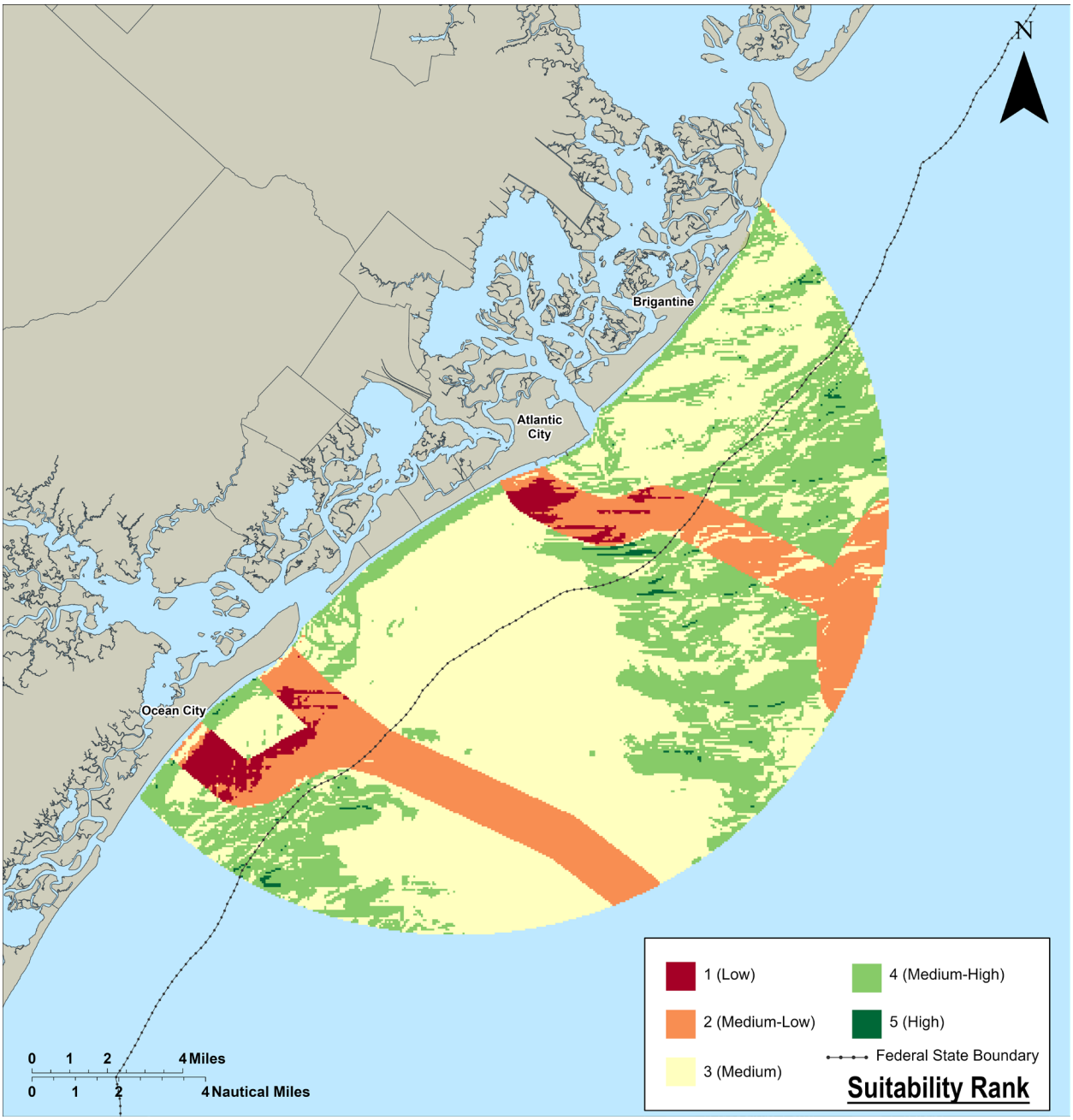
The primary deliverables are a technical report covering the methodology and interpretation of findings, a report delineating spatial data gaps offshore New Jersey, and an ESRI Geodatabase containing geospatial model data, modeled offshore sand resources, and other datasets utilized in our analysis. These deliverables will be accessible through the U.S. Department of the Interior, Bureau of Ocean Energy Management Marine Minerals webpage Marine Mineral Resource Evaluation Studies | Bureau of Ocean Energy Management.

Cooperative Agreement Outputs and Deliverables for M22AC00020

Technical Report:

Sulzmann WM, Spencer ME, Gagliano MP (New Jersey Geological & Water Survey, Ewing Township, NJ). 2025. Evaluation and prioritization of sand and gravel resources to support coastal resilience projects along portions of the New Jersey coast. Sterling VA: U.S. Department of the Interior, Bureau of Ocean Energy Management. Agreement No.: M22AC00020

Abstract:
Offshore sand resources along the New Jersey coast are increasingly constrained by rising demand and competing ocean uses. This report presents a multi-use planning tool to assist in identifying and evaluating offshore sand resources. First, a site selection workflow is discussed to determine which project area(s) have the greatest need for sediment resources. Absecon Island emerged as the focus area for this report. Next, an ArcGIS Pro suitability model was developed to identify, evaluate and rank offshore areas based on a defined set of criteria. Within that area, a GIS-based suitability model in ArcGIS Pro integrates bathymetry-derived terrain metrics (depth, slope, standard deviation, bathymetric position index) and distance-to-constraint rasters for prime fishing grounds and proposed export cables; inputs are reclassified and combined via weighted overlay (15% each terrain metric, 5% fishing grounds, 35% cables) to map suitability from 1–5. Results concentrate attention on positive-relief features that avoid high-use areas: Rank 3 accounts for 53.6% of cells, Rank 4 for 28.4%, and Rank 5 for 0.4%. Spatial agreement between high-rank cells, previously delineated NJGWS shoals, and reconnaissance core indicators of beach-compatible sediment supports the model's credibility, while heavier cable weighting quantifies access constraints and mitigation needs. The workflow is intended for reconnaissance-level planning to focus survey investments and inform trade-off discussions, and it is readily transferable and extensible to incorporate additional constraints and geotechnical data for site-specific decisions. Data available for this report is listed in Appendix C and can be obtained from BOEM.

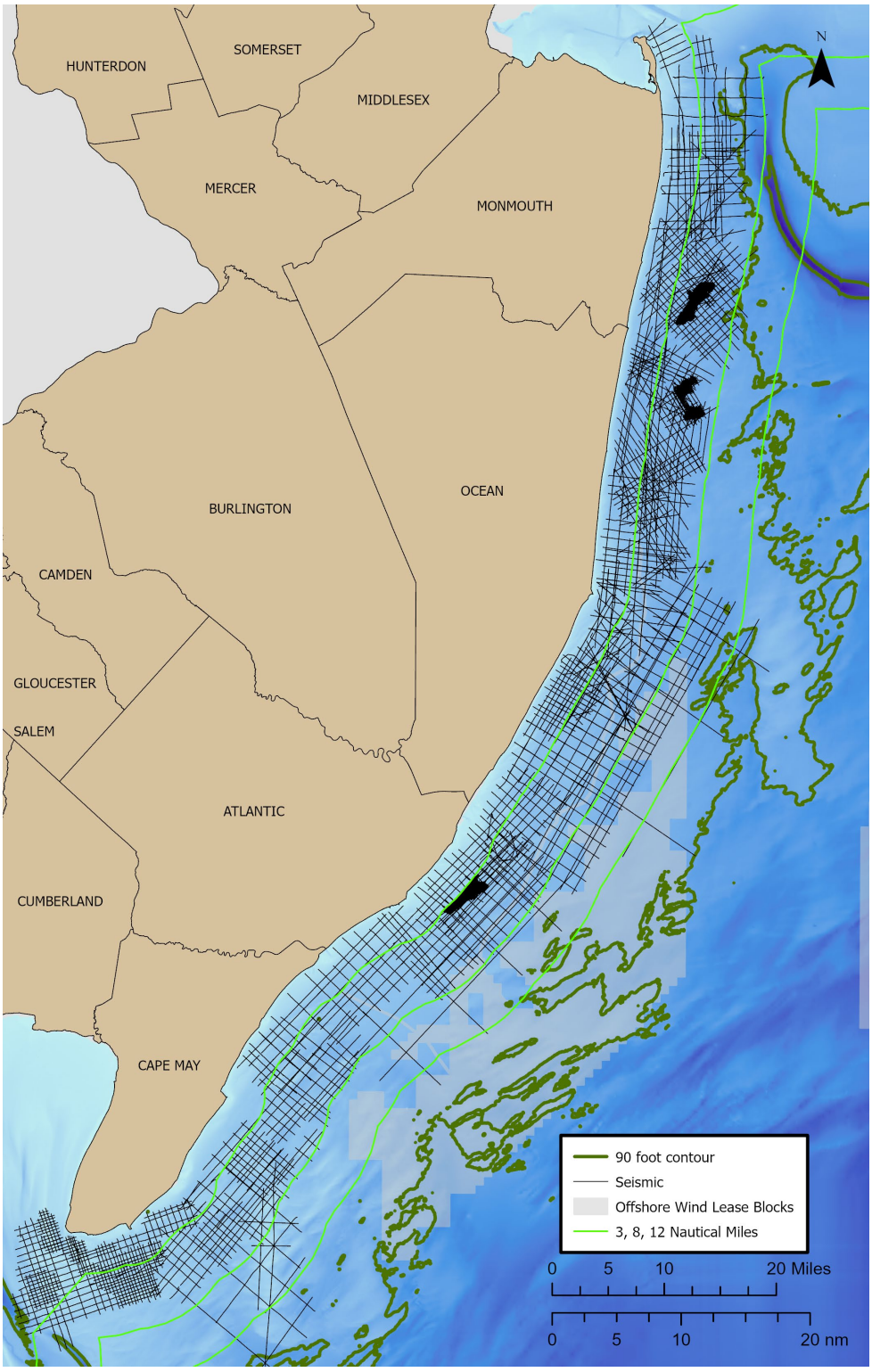


Raster layer representing the combined results of multiple reclassified input layers—including bathymetry, slope, standard deviation, bpi, proximity to offshore infrastructure, and fishing grounds—each weighted according to its relative importance. Higher values indicate areas of greater overall suitability based on the criteria defined in the analysis, while lower values represent areas with more constraints. This output supports spatial decision-making for offshore planning and was generated using the Weighted Overlay tool in ArcGIS Pro.

Data Gap Report:

Spencer ME, Gagliano MP, Sulzmann WM (New Jersey Geological & Water Survey, Ewing Township, NJ). 2025. GIS coverage delineating areas for future geophysical and geological surveys to fill existing data gaps. Sterling VA: U.S. Department of the Interior, Bureau of Ocean Energy Management. Agreement No.: M22AC00020.

Abstract:
This report identifies and evaluates spatial data gaps in several key areas that support sand resource identification and coastal resilience planning offshore New Jersey. We compile and assess existing geophysical and geological datasets, summarize historical survey coverage, and discuss areas where additional data are recommended within the 0–10 nautical mile corridor as these boundaries are targeted for borrow area development. In addition, areas in water depths up to 90 feet are considered, as they are increasingly relevant to future dredging capabilities and impacted by offshore wind development. We recommend targeted recollection of outdated lines and expansion of acquisition to include multibeam bathymetry, sidescan sonar, and magnetometer surveys, integrated with seismic to improve seabed and shallow-subsurface geologic characterization. Collecting geologic data, such as cores and seafloor surface grab samples, are important to ground-truth geophysical data, and advance CMECS substrate mapping and mineral analyses. Collectively, these efforts will strengthen offshore geologic understanding, optimize sand resource management and improve reconnaissance and design level surveys amid evolving environmental and infrastructure demands.



Ninety-foot water depth contour, which reaches a maximum of 18nm offshore at the farthest point. This water depth corresponds to the typical operational limit of U.S.-flagged sand dredges and has been largely unexplored for sand resource potential. Also shown are NJGWS and BOEM offshore seismic track lines and federal wind lease blocks.