

# 2024 Implementation Plan Update for the National Strategy for Ocean Mapping, Exploring, and Characterizing the United States Exclusive Economic Zone

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*Prepared by the*  
National Ocean Mapping, Exploration, and Characterization Council  
*of the*  
Ocean Science and Technology Subcommittee  
*of the*  
Ocean Policy Committee

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## About the Ocean Policy Committee

The Ocean Policy Committee (OPC) was codified by the National Defense Authorization Act (NDAA) for fiscal year 2021 to coordinate Federal actions on ocean-related matters.<sup>1</sup> The OPC traces its roots to the National Ocean Council created by Executive Order (EO) 13547<sup>2</sup> and the OPC established by EO 13840.<sup>3</sup> The OPC is co-chaired by the Director of the Office of Science and Technology Policy (OSTP) and the Chair of the Council on Environmental Quality (CEQ) and is directed to engage and collaborate with the ocean community on ocean-related matters, facilitate coordination and integration of federal activities in ocean and coastal waters to inform ocean policy, identify priority ocean science and technology needs, and leverage resources and expertise to maximize the effectiveness of federal investments in ocean research. For more information on the OPC, please see [www.noaa.gov/interagency-ocean-policy](http://www.noaa.gov/interagency-ocean-policy).

## About the Office of Science and Technology Policy

The OSTP was established by the National Science and Technology Policy, Organization, and Priorities Act of 1976 to provide the President and others within the Executive Office of the President with advice on the scientific, engineering, and technological aspects of the economy, national security, homeland security, health, foreign relations, the environment, and the technological recovery and use of resources, among other topics. As a Cabinet- level office in the Biden-Harris Administration, OSTP leads interagency science and technology policy coordination efforts, assists the Office of Management and Budget with an annual review and analysis of federal research and development in budgets, and serves as a source of scientific and technological analysis and judgment for the President with respect to major policies, plans, and programs of the federal government. More information about the OSTP is available at [www.whitehouse.gov/ostp](http://www.whitehouse.gov/ostp).

## About the National Ocean Mapping, Exploration, and Characterization Council

The OPC established the National Ocean Mapping, Exploration, and Characterization (NOMEc) Council<sup>4</sup> in June 2020 pursuant to the “National Strategy for Mapping, Exploring, and Characterizing the United States Exclusive Economic Zone” (NOMEc Strategy),<sup>5</sup> which was developed under Section 2 of the November 2019 Presidential Memorandum<sup>6</sup> on “Ocean Mapping of the United States Exclusive Economic Zone and the Shoreline and Nearshore of Alaska” (2019 Presidential Memorandum). The fiscal year 2023 NDAA<sup>7</sup> further codified the NOMEc Council and structure. The purpose of the NOMEc Council is to coordinate federal agency policy and actions needed to advance ocean mapping, exploration, and characterization and to support collaboration with non-federal and nongovernmental partners and stakeholders. The NOMEc Council develops and implements multi-disciplinary, collaborative, and coordinated approaches to mapping, exploring, and characterizing the ocean, coastal, and Great Lakes waters of the United States. The NOMEc Council reports to the OPC’s Ocean Science and Technology Subcommittee (OST), which provides support and guidance for the NOMEc Council’s work as appropriate. The OPC provides strategic direction and facilitates interagency resolution of policy issues as appropriate.

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<sup>1</sup> William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021, 10 U.S.C. § 8932 (2021)

<sup>2</sup> Exec. Order No. 13547, 75 Fed. Reg. 43023 (July 22, 2010), [www.federalregister.gov/d/2010-18169](http://www.federalregister.gov/d/2010-18169)

<sup>3</sup> Exec. Order No. 13840, 83 Fed. Reg. 29431 (June 22, 2018), [www.federalregister.gov/d/2018-13640](http://www.federalregister.gov/d/2018-13640)

<sup>4</sup> “The National Ocean Mapping, Exploration, and Characterization (NOMEc) Council.” National Ocean Mapping, Exploration, and Characterization Council, National Oceanic and Atmospheric Administration. Accessed October, 2024. [www.noaa.gov/ocean-science-and-technology-subcommittee/national-ocean-mapping-exploration-and-characterization-nomec-council](http://www.noaa.gov/ocean-science-and-technology-subcommittee/national-ocean-mapping-exploration-and-characterization-nomec-council)

<sup>5</sup> Ocean Policy Committee. *National Strategy for Mapping, Exploring, and Characterizing the United States Exclusive Economic Zone*, 2020, [www.noaa.gov/sites/default/files/2022-07/NOMECSStrategy.pdf](http://www.noaa.gov/sites/default/files/2022-07/NOMECSStrategy.pdf)

<sup>6</sup> Ocean Mapping of the United States Exclusive Economic Zone and the Shoreline and Nearshore of Alaska, 84 Fed. Reg. 64699 (2019). [www.federalregister.gov/d/2019-25618](http://www.federalregister.gov/d/2019-25618)

<sup>7</sup> James M. Inhofe National Defense Authorization Act for Fiscal Year 2023, 33 U.S.C. § 3408 (2022)

### **About the Interagency Working Group on Ocean and Coastal Mapping**

The Interagency Working Group on Ocean and Coastal Mapping<sup>8</sup> (IWG-OCM) was established in 2006 and authorized in the 2009 Ocean and Coastal Mapping Integration Act<sup>9</sup> to coordinate comprehensive federal ocean and coastal mapping efforts for United States waters; establish mapping priorities; enhance ecosystem approaches to decision-making for conservation, emergency response, and coastal resilience; support siting of research and ocean infrastructure; and advance coastal and ocean science. The IWG-OCM is a working group under the National Science and Technology Council's Subcommittee on Ocean Science and Technology (SOST), which serves as the lead interagency entity for federal coordination on ocean science and technology. Re-authorized by the fiscal year 2023 NDAA, the IWG-OCM now also reports to the NOMEc Council to support goals related to mapping the ocean, coastal, and Great Lakes waters of the United States, advancing research and development in mapping technologies, and building cross-sector partnerships to enhance collaborative mapping efforts. The IWG-OCM also represents the ocean and coastal mapping aspects of elevation on the Federal Geographic Data Committee's 3D Nation Elevation Subcommittee.

### **About the Interagency Working Group on Ocean Exploration and Characterization**

The Interagency Working Group on Ocean Exploration and Characterization<sup>10</sup> (IWG-OEC), created in September 2020 and authorized in the fiscal year 2023 NDAA, is charged with helping to implement Section 2 of the 2019 Presidential Memorandum. The NOMEc Council provides direction and support to the IWG-OEC and will consult and rely on the technical expertise and operational capacities of IWG-OEC member agencies to implement its objectives. The IWG-OEC will recommend and facilitate exploration and characterization efforts for deep water (>40 meters) environments, including the seafloor, sub-bottom, and water column. This includes exploratory assessments and comprehensive characterizations that directly support specific research, resource management and stewardship, policymaking, and applied mission objectives.

### **About this Document**

This document is an update to the first NOMEc Implementation Plan<sup>11</sup> released by the OPC in January 2021. The previous NOMEc Implementation Plan described the approach taken and the planned actions to accomplish the NOMEc Strategy goals pursuant to Section 2 of the 2019 Presidential Memorandum. The actions recommended in this Implementation Plan are subject to the Administration's annual budget process and the availability of appropriations.

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<sup>8</sup> "Interagency Working Group - Ocean and Coastal Mapping." Integrated Ocean and Coastal Mapping, National Oceanic and Atmospheric Administration. Accessed October, 2024. [iocm.noaa.gov/about/iwg-ocm.html](https://iocm.noaa.gov/about/iwg-ocm.html)

<sup>9</sup> Omnibus Public Land Management Act of 2009, 33 U.S.C. § 3501 (2009)

<sup>10</sup> "Interagency Working Group on Ocean Exploration and Characterization (IWG-OEC)." National Ocean Mapping, Exploration, and Characterization Council, National Oceanic and Atmospheric Administration. Accessed October, 2024. [www.noaa.gov/nomec/IWG-OEC](https://www.noaa.gov/nomec/IWG-OEC)

<sup>11</sup> Ocean Policy Committee. *Implementation Plan for the National Strategy for Ocean Mapping, Exploring, and Characterizing the United States Exclusive Economic Zone*, 2021, [www.noaa.gov/sites/default/files/2021-11/210107-FINALNOMEcImplementationPlan-Clean.pdf](https://www.noaa.gov/sites/default/files/2021-11/210107-FINALNOMEcImplementationPlan-Clean.pdf)

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## Acronyms

Acronym	Term
AGU	American Geophysical Union
BOEM	Bureau of Ocean Energy Management
CCOM/JHC	Center for Coastal and Ocean Mapping/Joint Hydrographic Center
CEQ	Council on Environmental Quality
CMECS	Coastal and Marine Ecological Classification Standard
COMIT	Center for Ocean Mapping and Innovative Technologies
CRADA	Cooperative Research and Development Agreement
DOD	Department of Defense
DOE	Department of Energy
DOOS	Deep Ocean Observing Strategy
DOS	Department of State
DOT	Department of Transportation
ECS	Extended Continental Shelf
EO	Executive Order
EPA	Environmental Protection Agency
FAC	Federal Advisory Committee
FDA	Food and Drug Administration
FGDC	Federal Geographic Data Committee
GDA	Geospatial Data Act
GEBCO	General Bathymetric Chart of the Oceans
ISO	International Organization for Standardization
JALBTCX	Joint Airborne Lidar Bathymetry Technical Center of Expertise
IWG	Interagency Working Group
IWG-BIO	Interagency Working Group on Biodiversity
IWG-FI	Interagency Working Group on Facilities and Infrastructure
IWG-NOPP	National Oceanographic Partnership Program
IWG-OCM	Interagency Working Group on Ocean and Coastal Mapping
IWG-OEC	Interagency Working Group on Ocean Exploration and Characterization
LIDAR	Light Detection and Ranging
MEC	Mapping, Exploration, and Characterization
MTS	Marine Technology Society
NASA	National Aeronautics and Space Administration
NDAA	National Defense Authorization Act
NCEI	NOAA National Centers for Environmental Information
NCSG	NOMEc Council Security Group
NGO	Nongovernmental Organization
NOAA	National Oceanic and Atmospheric Administration
NOMEc	National Ocean Mapping, Exploration, and Characterization
NPS	National Park Service
NSF	National Science Foundation
OCM	Ocean and Coastal Mapping
ODNI	Office of the Director of National Intelligence
OEC	Ocean Exploration and Characterization

<b>Acronym</b>	<b>Term</b>
OECI	Ocean Exploration Cooperative Institute
OMB	Office of Management and Budget
ONR	Office of Naval Research
OPC	Ocean Policy Committee
OST	Office of Science and Technology Subcommittee
OSTP	Office of Science and Technology Policy
RFI	Request for Information
SI	Smithsonian Institution
S&T	Science and Technology
SOMP	Standard Ocean Mapping Protocol
SOST	Subcommittee on Ocean Science and Technology
STEM	Science, Technology, Engineering, Math
UN	United Nations
UNOLS	University-National Oceanographic Laboratory System
USACE	United States Army Corps of Engineers
USARC	United States Arctic Research Commission
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

## Executive Summary

The 2020 “National Strategy for Ocean Mapping, Exploring, and Characterizing the United States Exclusive Economic Zone” (NOMEc Strategy) and its 2021 Implementation Plan responds to national concerns highlighted in the 2019 Presidential Memorandum on Ocean Mapping. U.S. waters contain underutilized, and likely undiscovered, natural resources and areas of significant ecological and conservation value. By expanding mapping, exploration, and characterization (MEC) activities, closing data gaps, and enhancing opportunities for collaboration among interagency and non-Federal entities, the NOMEc Strategy aims to safeguard our future prosperity, health, and national security. These activities support and advance maritime commerce, domestic seafood production, healthy and sustainable fisheries, coastal resilience, energy production, tourism and recreation, environmental protection, national and homeland security, and other interests. Such areas contribute more than \$300 billion per year of economic activity, three million jobs, and \$129 billion in wages. Highlighted in this Plan are achievements since the first Implementation Plan, remaining challenges to meeting long-term goals, and updated priorities and goals.

Over the past four years since the release of the initial Implementation Plan, the NOMEc Council and interagency working groups (IWGs) have made substantial progress toward meeting the goals of the NOMEc Strategy. The Council and IWGs have initiated pilot projects and regional campaigns, established data and protocol standards, identified strategic priorities, made data more usable and accessible, developed partnerships that enhance collaboration, and expanded public outreach. As of 2024, 52% of U.S. waters are mapped to modern standards, reflecting a 5% increase since 2021. However, substantial work is still required to increase the magnitude of MEC activities in U.S. waters.

Currently, major challenges exist that preclude the expansion of MEC activities and achievement of long-term goals. Some examples of these major challenges include the vast amount of unmapped waters that remain and limited resources in terms of funding, infrastructure, ships, submersibles and vehicles, and personnel. At the current pace, NOMEc Strategy mapping goals are unlikely to be met by 2030 for waters deeper than 40 meters and by 2040 for waters shallower than 40 meters, with even less exploration and characterization of priority areas completed. Accelerating the current pace and volume of MEC activity by better incentivizing industry partners to participate in MEC data collection would position the United States at a scientific, economic, and security advantage.

In this 2024 update to the Implementation Plan, many of the initial NOMEc goals and objectives are retained with highlighted accomplishments, progress, and updates, but the implementation focus has shifted to maintaining the organizational structures that were initially created. With this renewed focus, the updated plan includes actions to enhance communication with IWGs conducting MEC-related activities, increase cross-sector coordination, particularly with non-federal partners associated with MEC-related Federal Advisory Committees (FACs), expand collaborative funding mechanisms using new fiscal year 2023 NDAA authorizations, and conduct an economic analysis to portray the importance and value of acquiring MEC data. The goals of the NOMEc Strategy have also recently expanded geographically to the outer limits of the newly delineated Extended Continental Shelf (ECS), further highlighting the need to expand MEC activities and meet long-term goals. The rapid development and deployment of new technologies, expansion of public-private partnerships, and investment of additional funding are primary priorities of the NOMEc Council as all are critical to filling the gap between the current pace and what it will take to achieve the NOMEc Strategy goals.

## Introduction and Approach

Mapping, exploration, and characterization of U.S. waters plays a critical role in advancing diverse national interests across U.S. ocean, coastal, and Great Lakes waters. These activities support maritime commerce, national security, energy production, economic development, sustainable fisheries, environmental protection, conservation, coastal resilience, tourism, and recreation. Mapping, exploration, and characterization of U.S. waters underpins these national priorities with outputs ranging from foundational baseline maps to identification and detailed analyses of specific high-priority areas. The data, products, and services derived from MEC activities are essential to increasing our understanding of our oceans and informing sound decisions on their use.

On November 19, 2019, the Presidential Memorandum titled “Ocean Mapping of the United States Exclusive Economic Zone and the Shoreline and Nearshore of Alaska” (2019 Presidential Memorandum)<sup>12</sup> was signed, recognizing the value of ocean MEC data and products enhancing our future prosperity, health, and national security. The 2019 Presidential Memorandum includes three directives that provide an interagency framework for how this effort would be implemented and executed: Section 2 directs the preparation of a national strategy for mapping, exploring, and characterizing the waters of the United States;<sup>13</sup> Section 3 directs the preparation of a strategy for mapping the Arctic and Sub-Arctic Shoreline and Nearshore of Alaska; and Section 4 directs the preparation of recommendations for efficient permitting of ocean exploration, mapping, and research activities.

Pursuant to Section 2 of the 2019 Presidential Memorandum, the “National Strategy for Ocean Mapping, Exploring, and Characterizing the United States Exclusive Economic Zone” (NOMEc Strategy) proposes ambitious goals to completely map the seafloor within the outer boundary of the waters of the United States, explore and characterize priority areas, and leverage the expertise and resources of multi-sector partnerships. Deploying new and emerging science and technologies at scale in coordination with the private sector, academia, and nongovernmental organizations (NGOs) is essential to the NOMEc Strategy’s success. The NOMEc Strategy advances five goals, each supported by strategic objectives that incorporate high-level actions, to accomplish the task of mapping, exploring, and characterizing U.S. waters (Box 1).

### Box 1. NOMEc Strategy Goals

- Goal 1:** Coordinate Interagency Efforts and Resources to Map, Explore, and Characterize United States Waters
- Goal 2:** Map United States Waters
- Goal 3:** Explore and Characterize Priority Areas of United States Waters
- Goal 4:** Develop and Mature New and Emerging Science and Technologies to Map, Explore, and Characterize United States Waters
- Goal 5:** Build Partnerships to Map, Explore, and Characterize United States Waters

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<sup>12</sup> Ocean Mapping of the United States Exclusive Economic Zone and the Shoreline and Nearshore of Alaska, 84 Fed. Reg. 64699 (2019). [www.federalregister.gov/d/2019-25618](http://www.federalregister.gov/d/2019-25618)

<sup>13</sup> The initial Implementation Plan, NOMEc Strategy, and 2019 Presidential Memorandum refer to the U.S. Exclusive Economic Zone. This updated NOMEc Implementation Plan outlines the revised actions necessary to meet the urgent need of mapping, exploring, and characterizing the ocean, coastal, and Great Lakes waters of the U.S., which includes Extended Continental Shelf areas, hereafter referred to as U.S. waters or waters of the United States.

As directed by the NOMEc Strategy, the National Ocean Mapping, Exploration, and Characterization (NOMEc) Council was established in June 2020 to coordinate policy and actions needed to advance mapping, exploration, and characterization and support collaboration with nongovernmental partners and stakeholders. While the U.S. government has a long history of successful interagency MEC work, the NOMEc Council is uniquely poised to enhance coordination across sectors, reduce duplicative efforts, and maximize the use of collected data. The initial Implementation Plan was developed and published in 2021 outlining the approach taken and planned actions necessary to meet the ambitious goals of the NOMEc Strategy. The 2021 Implementation Plan underwent a public input process that included FACs, workshops and conferences, and two public listening sessions. The NOMEc Council and Interagency Working Groups on Ocean and Coastal Mapping (IWG-OCM) and Ocean Exploration and Characterization (IWG-OEC) reviewed and considered all comments received and incorporated the input into the Implementation Plan where feasible and appropriate.

To ensure effective coordination among all relevant stakeholders in MEC activities, a systematic and flexible approach to filling gaps is essential. The activities outlined in the 2021 Implementation Plan helped facilitate communication and coordination to plan, prioritize, and execute MEC activities. This updated Implementation Plan further builds out these actions to meet the goals of the NOMEc Strategy, including initial steps of obtaining a comprehensive inventory of MEC data needs, available assets, and planned activities of federal and state agencies, the private sector, academics, and NGOs. Federal agencies must continue aligning existing programs and developing shared standards and databases for tracking progress with stakeholder input.

Over the past four years, great strides have been made to meet the ambitious goals of mapping, exploring, and characterizing U.S. waters, but substantial work is still required to achieve strategic long-term goals. As of 2024, 52% of U.S. waters are mapped to modern standards, reflecting a 5% increase since 2021. At the current pace, NOMEc Strategy mapping goals are unlikely to be met by 2030 for waters deeper than 40 meters and by 2040 for waters shallower than 40 meters, with even less exploration and characterization of identified priority areas completed (Figure 1a, 1b). Collaboration across agencies and sectors with the necessary capabilities (e.g., vessels, autonomous systems, sensors, and technical and operational expertise) and relevant data needs (e.g., management, energy and aquaculture siting, marine minerals mining, and navigation) are critical to rapidly and efficiently meeting these goals. A successful national program for MEC requires leadership and robust coordination with scientists and managers implementing regional field efforts.

The scope of the NOMEc Council's work expanded following the announcement of newly delineated ECS coordinates. In December 2023, the United States released the geographic coordinates defining the outer limits of the U.S. continental shelf in areas beyond 200 nautical miles from the coast.<sup>14</sup> Subject to future revision, including maritime boundary delimitation with neighboring countries, the outer limits of the U.S. ECS delineate the full extent of the U.S. continental shelf where the nation holds sovereign rights and jurisdiction over the conservation, management, and utilization of living and non-living resources of the seabed and subsoil. The U.S. ECS encompasses approximately one million square kilometers across seven regions, which include areas within the Arctic Ocean, Atlantic Ocean (including two areas in the Gulf of Mexico), Bering Sea, and Pacific Ocean (including around the Mariana Islands). Very little is known about most of the U.S. ECS outside its boundary areas, which were mapped extensively for delineation. Continued mapping and exploration of the ECS is necessary to better understand its resources, habitats, ecosystems, and biodiversity. Although not yet included in official NOMEc progress

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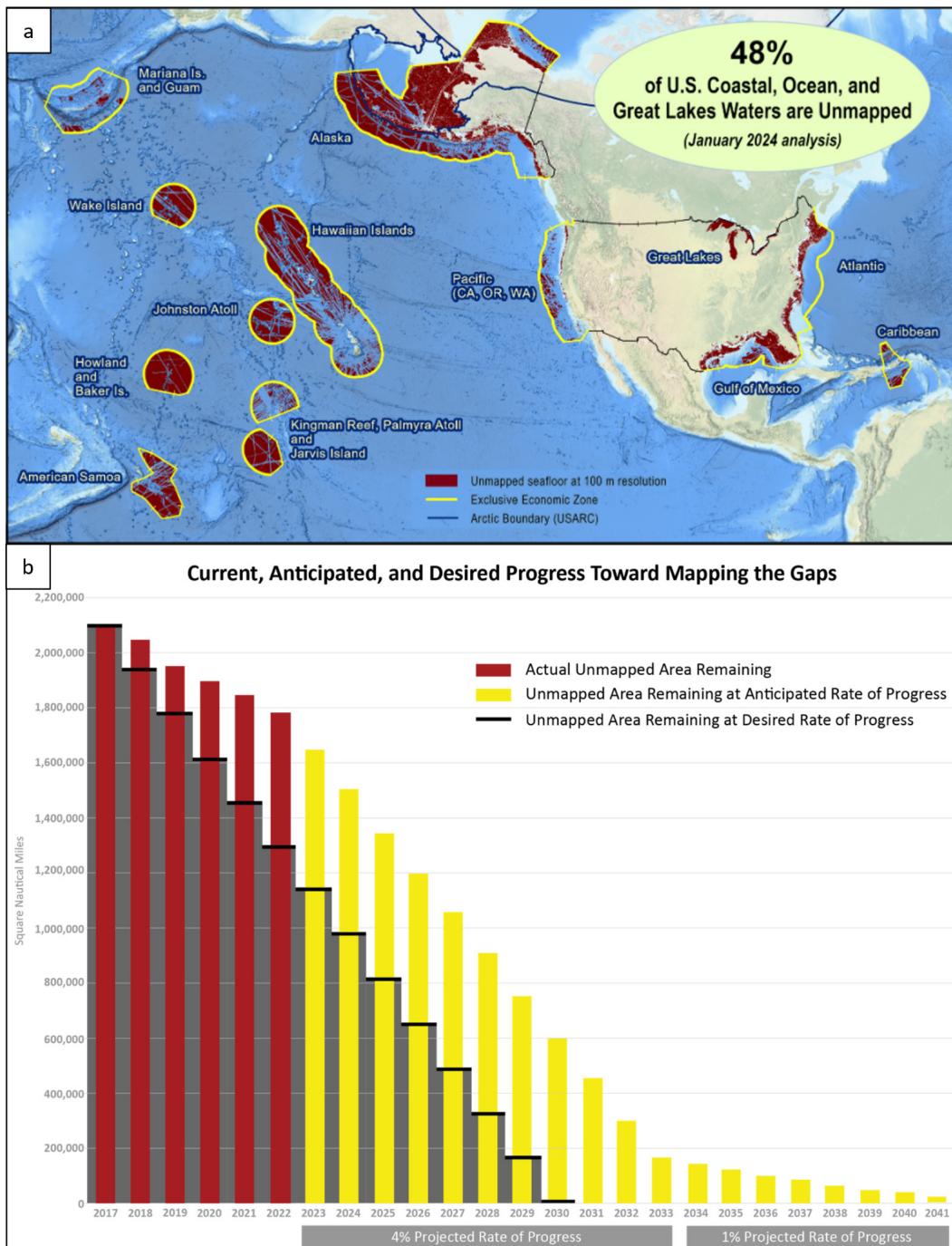
<sup>14</sup> "Public Notice 12244, 88 Fed. Reg. 88470 (December 21, 2023), [www.federalregister.gov/d/2023-28159](http://www.federalregister.gov/d/2023-28159)

metrics, an internal analysis conducted in January 2024 revealed that 44% of the ECS areas remained unmapped. These findings highlight important areas lacking MEC data that require a collaborative, cross-sectoral approach to obtain. Going forward, the NOMEc Implementation Plan and future updates will be flexible and responsive to federal agency needs for additional MEC data in these regions.

National security concerns intersect with scientific exploration and characterization activities. Data collected by MEC activities can unintentionally reveal vulnerabilities and impact national security. To address these concerns, the NOMEc Council Security Group (NCSG) was established in 2020 to coordinate NOMEc activities with the national security and intelligence communities and ensure these communities are consulted and included in all stages of implementation. Such coordination would enhance threat awareness, protect sensitive critical infrastructure, and assure aggregate data protection. The NOMEc Council encourages maximum transparency and accessibility and works with the NCSG to safeguard national security and raise awareness. They work with the national security and intelligence communities regarding MEC data collection and availability in the academic, commercial, and civilian sectors. The NCSG membership consists of members of the NOMEc Council, IWG-OCM, and IWG-OEC who hold appropriate security clearances, and others from the national security and intelligence community with interests relevant to NOMEc activities. The NCSG will launch an update of its classified addendum to the Implementation Plan in the fiscal year 2025.

This 2024 Implementation Plan updates the previous direction taken in reaching the goals of the NOMEc Strategy and tracks progress on meeting these goals. The NOMEc Council will continue to support regional campaigns, which serve as testbeds for effective coordination between MEC partners. Ongoing and future campaigns will build on the best practices from these pilot projects, scaling efforts to achieve long-term objectives. Throughout the execution of the Implementation Plan, agencies will work together to identify and support opportunities for technological innovation, educate the next generation of ocean mappers and explorers, and ensure common standards are met and data are preserved and made publicly available. This allows access for all interested parties, supports technology development, and engages and educates the public throughout all stages of the process. Given the rapid pace of technological advancement and variability in appropriations, the Implementation Plan will be periodically reviewed and updated as required in the NOMEc Strategy.

Ocean MEC activities are critical for advancing maritime commerce, national, homeland, and economic security, sustainable fisheries, environmental protection, conservation, coastal resilience, energy production, tourism, and recreation. The data and products from mapping the waters of the United States and exploring and characterizing priority areas greatly increase our understanding of our oceans and coasts. Various federal agencies, private sector entities, NGOs, and academic institutions conduct MEC activities; however, improved coordination across sectors is needed.



**Figure 1a.** Map highlighting the geographic distribution of unmapped U.S. waters as of January 2024<sup>15</sup> **1b.** Bar chart showing our current rate of progress to fill bathymetry gaps at ~1.5 to 2 percentage points annually (red); anticipated rate of progress assuming we double efforts through 2033 and then taper to 1% to fill gaps in waters less than 200 meters, which are the most time-consuming areas left to map (yellow); and the desired rate of progress (gray) based on the NOMEC Strategy 2030 goal for waters deeper than 40 meters.

<sup>15</sup> "Status of Seafloor Mapping Within U.S. Waters." Integrated Ocean and Coastal Mapping, National Oceanic and Atmospheric Administration. Accessed October 2024. [iocm.noaa.gov/seabed-2030-status.html](http://iocm.noaa.gov/seabed-2030-status.html)

## Definitions

As defined within the NOMEc Strategy and fiscal year 2023 National Defense Authorization Act (NDAA) and for the purposes of this Implementation Plan:

- **Ocean mapping**—The term “mapping” means activities that provide comprehensive data and information needed to understand seafloor characteristics, such as depth, topography, bottom type, sediment composition and distribution, underlying geologic structure, and benthic flora and fauna.
- **Ocean exploration**—The term “exploration” means activities that provide: (A) a multidisciplinary view of an unknown or poorly understood area of the seafloor, sub-bottom, or water column; and (B) an initial assessment of the physical, chemical, geological, biological, archeological, or other characteristics of such an area.
- **Ocean characterization**—The term “characterization” means activities that provide comprehensive data and interpretations for a specific area of interest of the sea floor, sub-bottom, water column, or hydrologic features, including water masses and currents, in direct support of specific research, environmental protection, resource management, policymaking, or applied mission objectives.

## Tracking NOMEc Progress

This Implementation Plan uses the following nomenclature to describe proposed activities: Milestone, Lead, Support, Performance Indicator, and Timeline. The Milestone column describes the activity undertaken. The Lead and Support roles assign the IWGs, agencies, or governing bodies that will be involved in completing the milestone. Milestone leads refer to the entity or entities acting as primary decision-makers and drivers, as well as responsible for tracking and reporting on progress. The support role designates entities that are positioned to provide guidance, promotion, subject matter expertise, or backing for a milestone. Under these roles, federal agencies, states, territories, NGOs, and/or members of the private sector and academia involved in advancing MEC goals according to the NOMEc Strategy are referred to as “MEC partners”. The Performance Indicators are metrics used to track the progress and completion of each milestone. The Timeline column indicates the status of each milestone and the target year for completion, if applicable.

This updated Implementation Plan highlights completed activities as accomplishments within each goal and indicates **ongoing** and **planned** activities milestone tables. Therefore, milestone numbers differ from the 2021 Implementation Plan, as completed milestones have been removed and new activities have been added based on developing priorities. Importantly, only new and ongoing projects initiated through the NOMEc Council are highlighted within this updated Implementation Plan. Within each milestone table, the Timeline column indicates the status of each milestone as either ongoing or planned and the target year for completion, if applicable. **Ongoing** milestones indicate activities that have been completed but elements of the performance indicator are repeated, regularly scheduled, or continue in perpetuity. **Planned** milestones have performance indicators with no activities (singular or repeated) started.

## GOAL 1. Coordinate Interagency Efforts and Resources to Map, Explore, and Characterize United States Waters

Goal 1 objectives are focused on federal coordination and aligning agency efforts to map, explore, and characterize U.S. waters. Federal agencies play direct roles in these activities and require MEC data to fulfill their missions and support non-government sectors that advance the economic, security, and environmental interests of the nation. Prior to the first Implementation Plan, there was no formal process for strategic coordination of these activities across the federal government. In 2020, the NOMEc Council was established to create governance structures and processes that ensure efficient and effective coordination. By strategically aligning agency efforts and fostering cross-sector collaboration, the NOMEc Council supports and relies on close collaboration with regional MEC campaigns and coordinates with other IWGs under the Subcommittee on Ocean Science and Technology (SOST) and other federal entities.

### Accomplishments

The following summarizes the progress that the NOMEc Council and IWGs have made toward meeting the NOMEc Strategy goals since the release of the initial Implementation Plan:

#### Objective 1.1. Establish a National Ocean Mapping, Exploration, and Characterization Council

- In 2020, the NOMEc Council, NCSG, and IWG-OEC were established, and members and Executive Secretaries for the different groups were identified. The reporting structure between the IWGs and the NOMEc Council was also established.
- The NOMEc Council updated its website in 2021 to include an inventory of educational and funding opportunities.<sup>16</sup>
- In 2022, the NOMEc Council—in collaboration with the Bureau of Ocean Energy Management (BOEM), U.S. Geological Survey (USGS), and National Oceanic and Atmospheric Administration (NOAA)—conducted a pilot project to investigate the effects of historic seabed mining on the Blake Plateau off the southeast coast. This pilot project tested the creation of a cost-effective sampling design for future data collection and collaboration between these agencies.
- The fiscal year 2023 NDAA reauthorized the Ocean and Coastal Mapping Integration Act and provided statutory authority for the NOMEc Council, formalized the IWG-OCM and IWG-OEC as part of its framework, and authorized federal agency members of the IWG-OCM to enter into agreements and transfer funds for the purpose of mapping.
- The NOMEc Council, IWG-OCM, and IWG-OEC Co-Chairs meet weekly, and the full memberships of the three groups meet quarterly. These quarterly meetings coordinate MEC-related activities and science and technology (S&T) developments across federal agencies.
- The NOMEc Council regularly engages with regional MEC campaigns to elevate partner agency interests and achievements at the federal level.
- The NOMEc Council releases yearly, public-facing progress reports detailing NOMEc engagement and achievements.<sup>17, 18, 19</sup>

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<sup>16</sup> “Educational and Funding Opportunities.” National Ocean Mapping, Exploration, and Characterization Council, National Oceanic and Atmospheric Administration. Accessed October, 2024. [www.noaa.gov/ocean-science-and-technology-subcommittee/national-ocean-mapping-exploration-and-characterization-nomec-council/educational-and-funding-opportunities](http://www.noaa.gov/ocean-science-and-technology-subcommittee/national-ocean-mapping-exploration-and-characterization-nomec-council/educational-and-funding-opportunities)

<sup>17</sup> National Ocean Mapping, Exploration, and Characterization Council. *NOMEc FY21 Progress*, 2022, [www.noaa.gov/sites/default/files/2022-06/NOMEc\\_FY21\\_Progress\\_Factsheet.pdf](http://www.noaa.gov/sites/default/files/2022-06/NOMEc_FY21_Progress_Factsheet.pdf)

<sup>18</sup> National Ocean Mapping, Exploration, and Characterization Council. *NOMEc FY22 Progress*, 2023, [www.noaa.gov/sites/default/files/2023-02/NOMEc2022ProgressFactsheet.pdf](http://www.noaa.gov/sites/default/files/2023-02/NOMEc2022ProgressFactsheet.pdf)

<sup>19</sup> National Ocean Mapping, Exploration, and Characterization Council. *NOMEc FY23 Progress*, 2024, [www.noaa.gov/sites/default/files/2024-06/NOMEc%202023%20Progress%20Factsheet\\_finaldraft.pdf](http://www.noaa.gov/sites/default/files/2024-06/NOMEc%202023%20Progress%20Factsheet_finaldraft.pdf)

### Objective 1.2. Develop an Implementation Plan for the NOMEc Strategy

- The 2021 NOMEc Implementation Plan was published following a multi-stage review process, including public engagement as well as submission to and feedback from the Ocean Policy Committee (OPC).
- Further efforts have been made to share information on NOMEc plans across federal agencies to advance the NOMEc Strategy by leveraging other IWGs beyond the IWG-OCM and IWG-OEC. This effort was best demonstrated through the collaboration with the National Oceanographic Partnership Program (IWG-NOPP) during recent public engagement forums. For example, IWG-NOPP and the NOMEc Council co-hosted a town hall at the Marine Technology Society (MTS) OCEANS 2023 Conference in Gulfport, Mississippi to improve private sector engagement.

### Looking Ahead

Building on the significant progress made in coordinating interagency efforts and resources for MEC activities in U.S. waters, priorities moving forward will focus on sustaining interagency engagement, fostering partnerships, and responding to the evolving needs and priorities of member agencies. The NOMEc Council will continue to facilitate coordination between federal partners, creating new opportunities to enhance MEC-related activities and drive innovation in S&T development. As federal agencies navigate new policy mandates, the NOMEc Council will emphasize maintaining strategic coordination and increasing awareness of new authorities that can help establish agreements and facilitate funding for MEC efforts.

The following objectives and milestones have been renumbered and updated to highlight the continued work needed to advance Goal 1:

### Objective 1.1. Maintain a National Ocean Mapping, Exploration, and Characterization Council

*This objective maintains the NOMEc Council as the interagency body overseeing the implementation of the NOMEc Strategy. The NOMEc Council facilitates coordination across federal agencies, relevant IWGs, and non-federal partners (described more fully in Goal 5). The NOMEc Council, IWG-OCM, and IWG-OEC work together to coordinate federal input and implement NOMEc activities.*

**Measure of Success:** The NOMEc Council and its IWGs improve ocean and coastal MEC coordination and collaboration across federal agencies and non-federal partners.

Milestone	Lead	Support	Performance Indicator	Timeline
1.1.1 Coordinate MEC-related activities and S&T development across federal entities	NOMEc Council, IWG-OCM, IWG-OEC	NOMEc Council agencies, relevant IWGs	NOMEc Council, IWG-OCM, and IWG-OEC members meet regularly to share information on plans to advance the NOMEc Strategy and meet with other IWGs, such as IWG-NOPP, the IWG on Biodiversity (IWG-BIO), as appropriate	Ongoing

Milestone	Lead	Support	Performance Indicator	Timeline
1.1.2 Identify and inventory the mechanisms available for leveraging MEC expertise, personnel, platforms, sensors, and funding of federal and non-federal MEC partners	NOMEc Council	IWG-OCM, IWG-OEC	NOMEc website is an online resource of the latest mechanisms available to support MEC coordination activities  Evolve site to show strengths/weaknesses for each funding and incentivizing mechanism	Ongoing
1.1.3 Convene an ocean MEC forum for relevant federal and non-federal entities	NOMEc Council	IWG-OCM, IWG-OEC	Complete forum and incorporate input to future implementation activities	Ongoing
1.1.4 Support more agreements among IWG-OCM agencies to transfer funds for additional mapping activities	NOMEc Council	IWG-OCM, IWG-OEC, MEC partners	Annually establish at least three interagency agreements between federal agencies of the IWG-OCM to advance mapping activities (fiscal year 2023 NDAA authorized activity)	Ongoing
1.1.5 Coordinate federal interdisciplinary MEC projects and accelerate field testing and adoption of cutting-edge technologies, enabling federal agencies to achieve MEC goals	NOMEc Council	IWG-OCM, IWG-OEC, NCSG, IWG-NOPP, IWG-BIO	Maintain a NOMEc Project Guidance Document for multi-agency, interdisciplinary activities and execute new projects and technology field tests as funds allow	Ongoing
1.1.6 Continue coordinating with Executive Office of the President to address established and evolving “Emerging Priorities” for MEC reflecting defined Administration priorities	NOMEc Council, IWG-OCM, IWG-OEC	Administration, relevant IWGs	Invite leadership from OSTP/Executive Office of the President to regularly brief the NOMEc Council on emerging priorities and needs related to ocean MEC activities  Respond to and participate in the development of emerging priority needs and strategic direction setting of the SOST	Ongoing

## Objective 1.2. Maintain an Implementation Plan for the NOMEc Strategy

*This objective maintains an Implementation Plan for the NOMEc Strategy that identifies specific actions needed to further the NOMEc Strategy goals.*

**Measure of Success:** The NOMEc Council maintains an Implementation Plan and provides regular updates that reflect input from federal agencies, private industry partners, and the public.

Milestone	Lead	Support	Performance Indicator	Timeline
1.2.1 Review and update Implementation Plan in 2024 and periodically thereafter	NOMEc Council	IWG-OCM, IWG-OEC, NCSG	Periodically updated Implementation Plan reflects emerging policy direction and technological developments	Planned, 2024, every 5 years thereafter
1.2.2 Create opportunities for public engagement on Implementation Plan	NOMEc Council	IWG-OCM, IWG-OEC	Implementation Plan and updates are informed by public input (also see Goals 5.1 and 5.2)	Ongoing

## GOAL 2. Map United States Waters

The focus of Goal 2 is to completely map the seafloor and lakefloor of U.S. waters deeper than 40 meters by 2030 and waters shallower than 40 meters by 2040. These mapping efforts are critical to improving our understanding of natural and cultural resources, physical hazards, and processes related to climate, earthquakes, tsunamis, ocean habitats, and fisheries. Mapping data also directly support *in situ* exploration and characterization activities (Goal 3), and, when combined, MEC data provide a more comprehensive understanding of the seafloor, lakefloor, and water column.

Achieving NOMEc Strategy mapping goals will require traditional ship-based sensors and innovative technological advances in uncrewed, airborne, and satellite remote sensing (accelerated by Goal 4 activities). The appropriate technologies will depend on water depth and conditions, such as swath sonar for deeper waters and topobathymetric light detection and ranging (lidar) for clearer, shallower waters. To enhance the efficiency of mapping operations, continual collaboration among federal and non-federal partners is essential (see Goals 1 and 5). Additionally, mapping efforts pursuant to the NOMEc Strategy will seek to acquire concomitant data types, such as sub-bottom profiling and magnetometer data, wherever feasible during continuous underway operations.

The value of mapping efforts lies in collecting new data and ensuring these data are preserved and made publicly available for future use. All mapping data collected shall be preserved to maximize potential future use and return on investment. These data and products will be processed, preserved, and made publicly available through data centers such as the National Centers for Environmental Information (NCEI) of NOAA.

## Accomplishments

The following summarizes the progress that the NOMEc Council and IWG-OCM have made toward meeting the NOMEc Strategy goals since the release of the initial Implementation Plan:

### Objective 2.1. Establish a Standard Ocean Mapping Protocol (SOMP)

- Following a public comment period, listening session, and convocation of federal and non-federal technical experts, the IWG-OCM published the first version of the SOMP<sup>20</sup> in May 2024.

### Objective 2.2. Coordinate and Execute Campaigns to Map the United States Exclusive Economic Zone

- The IWG-OCM Progress Report on Unmapped U.S. Waters<sup>21</sup> has been released annually since 2021. These reports reflect progress made toward adding bathymetric data to NCEI.
- In 2021, the United States Bathymetry Gap Analysis<sup>22</sup> web service was added to the University-National Oceanographic Laboratory System (UNOLS) Marine Facilities Planning tool<sup>23</sup> to help inform the academic research fleet of the remaining gaps.

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<sup>20</sup> "Standard Ocean Mapping Protocol." Interagency Working Group on Ocean and Coastal Mapping for the National Ocean Mapping, Exploration, and Characterization Council, 2024, [iocm.noaa.gov/standards/standard-ocean-mapping-protocol.html](https://iocm.noaa.gov/standards/standard-ocean-mapping-protocol.html)

<sup>21</sup> "Progress Reports of Unmapped U.S. Waters." Interagency Working Group on Ocean and Coastal Mapping for the National Ocean Mapping, Exploration, and Characterization Council. Accessed October, 2024. [iocm.noaa.gov/seabed-2030-status.html](https://iocm.noaa.gov/seabed-2030-status.html)

<sup>22</sup> "United States Bathymetry Gap Analysis." NOAA Office of Coast Survey, University of New Hampshire CCOM/JHC, NOAA NCEI, and NOAA Office for Coastal Management. Accessed October, 2024. [noaa.maps.arcgis.com/home/item.html?id=4d7d925fc96d47d9ace970dd5040df0a](https://noaa.maps.arcgis.com/home/item.html?id=4d7d925fc96d47d9ace970dd5040df0a)

<sup>23</sup> "Marine Facilities Planning." University-National Oceanographic Laboratory System. Accessed October, 2024. [mfp.us/](https://mfp.us/)

- A new NOMEc regional campaign, called Seascape Alaska,<sup>24</sup> was established in April 2021. This campaign includes federal, Tribal, state, and NGO partners and meets monthly to exchange information in support of NOMEc goals, including data contributions to national repositories, opportunities to align MEC capabilities, effective ways of coordinating projects, outreach activities, and national and international mapping activities.
- The IWG-OCM released an online tool called Bathymetric Coverage Report - U.S. Waters<sup>25</sup> in 2023 to allow stakeholders to develop survey plans and transits informed by the latest bathymetry coverage and gaps.
- In 2021, 2022, and 2024, the IWG-OCM facilitated spatial prioritization exercises that identified MEC data needs nationally for federal agencies as well as regionally for the Great Lakes, Alaska, and Florida. Summary reports were prepared for each of the regional results and shared on NOAA's Institutional Repository.
- IWG-OCM members continually engage with pre-existing regional campaigns—including Expanding Pacific Research and Exploration of Submerged Systems (EXPRESS), Lakebed 2030, Florida Coastal Mapping Program, Atlantic Seafloor Partnership for Integrated Research and Exploration (ASPIRE), and Beyond the Blue: Illuminating the Pacific—to advance NOMEc goals. IWG-OCM has presented and engaged with the ocean mapping community at regional mapping summits, including the Alaska Coastal and Ocean Mapping Summit (2021–2022), Lakebed 2030 (2021–2024), and the Florida Coastal Mapping Summit (2021–2024).

### Objective 2.3. Make Mapping Data Usable and Available

- The IWG-OCM updated its website in 2021 to include an inventory of data portals and repositories<sup>26</sup> as well as information about the Coastal and Marine Ecological Classification Standard (CMECS).<sup>27</sup>
- The IWG-OCM has established academic partnerships, such as those with the Center for Coastal and Ocean Mapping/Joint Hydrographic Center (CCOM/JHC) and the Center for Ocean Mapping and Innovative Technologies (COMIT), to advance ocean mapping science.
- Since 2021, 777 multibeam surveys have been added to the NOAA NCEI bathymetry archive, equating to 10.7 TB of data. Approximately 400 of these new surveys have data in U.S. waters.

## Looking Ahead

Building on previous work toward achieving mapping goals, priorities will focus on ensuring the SOMP remains a dynamic, living document with major revisions published every five years to reflect evolving standards. Efforts will prioritize facilitating the use of the SOMP through pilot programs, improving data accessibility via NCEI, and ensuring data on critical infrastructure and sensitive areas are carefully handled before public release. The NOMEc Council and IWG-OCM will emphasize the widespread adoption of the standards and best practices outlined by the ocean and coastal mapping (OCM) community for acquiring, processing, and archiving OCM data. This includes promoting efficient data collection, processing, publishing, interoperability, and stewardship, making data more easily available and usable. Efforts to align the mapping

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<sup>24</sup> "Introducing Seascape Alaska." National Oceanic and Atmospheric Administration, 2021, [storymaps.arcgis.com/stories/094abb14281e4b2489146a3f3e030961](https://storymaps.arcgis.com/stories/094abb14281e4b2489146a3f3e030961)

<sup>25</sup> "Bathymetric Coverage Report - U.S. Waters." Interagency Working Group on Ocean and Coastal Mapping for the National Ocean Mapping, Exploration, and Characterization Council, 2023, [gis.charttools.noaa.gov/bathy-coverage-report/](https://gis.charttools.noaa.gov/bathy-coverage-report/)

<sup>26</sup> "Data Sharing." Interagency Working Group on Ocean and Coastal Mapping for the National Ocean Mapping, Exploration, and Characterization Council, 2021, [iocm.noaa.gov/data-sharing/data-sharing.html](https://iocm.noaa.gov/data-sharing/data-sharing.html)

<sup>27</sup> "Ecological Classification - CMECS." Interagency Working Group on Ocean and Coastal Mapping for the National Ocean Mapping, Exploration, and Characterization Council, 2021, [iocm.noaa.gov/standards/cmeecs-home.html](https://iocm.noaa.gov/standards/cmeecs-home.html)

community and track mapping progress toward these goals will continue to strengthen collaboration and drive the successful advancement of mapping objectives in U.S. waters.

The following objectives and milestones have been renumbered and updated to highlight the continued work needed to advance Goal 2:

### Objective 2.1. Maintain and Evolve a Standard Ocean Mapping Protocol

*Leveraging national standards and best practices, this objective aims to maintain and evolve a standardized protocol for OCM that will encourage consistency in data acquisition and management across a subset of remote sensing capabilities for seafloor mapping (as described in the NOME Strategy). This also applies to corollary data, including bathymetry (acoustic and airborne), seabed and lakebed backscatter, water column sonar, side scan sonar imagery, sub-bottom profiling, and magnetometer data readings. The goal is to ensure the most comprehensive access to, use of, and integration of data, as well as to minimize duplication of effort and efficiently collect, process, publish, and archive OCM data into publicly accessible repositories.*

**Measure of success:** Increased consistency among OCM data contributors in data acquisition, processing, and accessibility through the maintenance and evolution of a SOMP validated with stakeholder input.

Milestone	Lead	Support	Performance Indicator	Timeline
2.1.1 Update the SOMP on a maximum 5-year refresh cycle with public comment incorporated	IWG-OCM	All federal/non-federal mapping partners	Periodically updated SOMP reflects latest best practices and standards for OCM data acquisition, processing, and accessibility	Planned, 2029, every 5 years thereafter
2.1.2 Pilot SOMP on various vessels/platforms and projects	IWG-OCM, IWG on Facilities and Infrastructure (IWG-FI)	Federal research/mapping vessels	Field test SOMP on at least two mapping projects on different vessels/platforms  Lessons learned will inform updates to the SOMP	Planned, 2026

### Objective 2.2. Coordinate and Execute Campaigns to Map United States Waters

*This objective aims to establish and execute regional mapping campaigns to coordinate and maximize resources at a local level. To the greatest extent possible, the IWG-OCM will continue to work with the IWG-OEC and the broader NOME Council to ensure mapping efforts are coordinated with exploration and characterization activities (see Objective 3.4), optimizing the collection of complementary data. Stakeholder prioritization exercises (e.g., use of interactive geospatial platforms to solicit cross-sector spatial and topical priorities), economic studies, and IWG-OEC reports of strategic ocean exploration and characterization (OEC) priorities will inform campaign activities. Contributions to the IWG-OCM U.S. Mapping Coordination website, which provides spatial priorities, data needs, planned acquisition activities, and recent unarchived data, will further shape these efforts. Tools like the Bathymetric Coverage Report, which highlights mapped and unmapped areas, will support planning for surveys and transit routes to fill*

*bathymetry gaps. National and regional mapping progress will be tracked annually via the Progress Report of Unmapped U.S. Waters. Diverse funding mechanisms, including federal contracts, grants, and agreements, will support OCM campaigns. Additionally, technological advancements from federal, private sector, and academic sources—such as uncrewed systems (e.g., remotely operated and autonomous underwater vehicles)—and contributions from citizen scientists in crowdsourced bathymetry will accelerate the pace of mapping U.S. waters (see Goal 4).*

**Measure of Success:** Demonstrable progress toward filling data gaps through mapping coordination tools and priorities, new data collection and funding partnerships, and technology innovations that maximize efforts while being sensitive to national security concerns.

Milestone	Lead	Support	Performance Indicator	Timeline
2.2.1  Use and improve geospatial analysis tools and geographic information system services and layers for campaign project planning, gap identification, and metrics (e.g., U.S. Mapping Coordination website, U.S. Bathymetric Gap Analysis and Bathymetric Coverage Report tool, U.S. Interagency Elevation Inventory, Global Multi-Resolution Topography Data Synthesis, and BlueTopo)	IWG-OCM	MEC partners	Produce annual reports and user-friendly mapping coordination tools that allow stakeholders to visualize the spatial coverage of planned surveys, data needs, and recently acquired data  Calculate percentage of mapping data coverage, identify mapping data gaps, and track progress toward NOMEc Strategy mapping goals	Ongoing
2.2.2  Solicit federal and non-federal vessel operators to acquire and share transit route data to inform mapping plans	IWG-OCM, IWG-OEC, IWG-FI	Federal fleet, U.S. Academic Research Fleet, MEC partners	Develop guidance and conduct outreach to increase the number of vessels submitting transit route and crowdsourced bathymetry data to NCEI	Ongoing

Milestone	Lead	Support	Performance Indicator	Timeline
2.2.3  Track multiyear national and regional mapping activities and progress to fill mapping gaps using gap analysis tools and MEC priorities  Highlight funding and technology advances	IWG-OCM	MEC partners	Annual reports of national progress to fill bathymetry gaps and acquire a minimum of 150,000 square nautical miles of new bathymetric data coverage for all U.S. waters, including the newly delineated ECS areas  Annual reports of regional campaign progress that demonstrate a consistent increase in mapping data coverage and availability and also highlight partner-funded activities and where technology innovations were applied	Ongoing
2.2.4  Build stakeholder engagement with regional summits and other opportunities to identify OCM data needs and drivers, build acquisition partnerships, and leverage external resources	IWG-OCM	MEC partners	Participate in at least one regional engagement opportunity annually, including convening regional summits  Federal agency prioritization exercise is maintained and regional prioritization exercises are expanded and maintained, as needed	Ongoing regional engagement; Federal agency prioritization exercise is planned for 2026 and every 5 years thereafter
2.2.5  Review campaign plans to ensure protection of critical and sensitive infrastructure	NCSG	NOAA, other federal agencies	Critical infrastructure and sensitive locales are not inadvertently mapped by NOAA or other trusted federal entities and released to the public	Ongoing

### Objective 2.3. Make Mapping Data Usable and Available

Mapping data acquired by federal agencies and external partners provide the most value when available for easy public access, download, and use. Consistent with, and subject to, national security considerations and applicable laws, federal agencies and their partners will collect and archive OCM data in standardized formats wherever possible. Making these data available at appropriate national repositories, such as NCEI for geophysical data, and supporting portals (e.g., Digital Coast, BlueTopo, and the National Bathymetric Source) is critical to facilitate public use, integration, and accessibility. Good metadata are also essential for all types of OCM data. Best efforts will be made to coordinate data discovery for MEC data, which can inform benthic habitat interpretation. Use of national standards such as the Federal Geographic Data Committee (FGDC)-approved and IWG-OCM-supported CMECS increase data discovery and

*interoperability. Federally funded projects working with environmental data in marine settings should include CMECS attributes for their data where possible and appropriate.*

**Measure of success:** OCM data support increased data integration and use by being in discoverable and accessible formats with Geospatial Data Act (GDA)-compliant metadata. OCM data are retained in national data archives.

Milestone	Lead	Support	Performance Indicator	Timeline
2.3.1  Inventory, promote, and utilize centralized national repositories, data portals, and clearinghouses for OCM data management, access, synthesis, and archival	IWG-OCM, IWG-OEC	MEC partners	IWG-OCM website maintains an inventory of OCM data access points, including repositories, inventories/registries, and data synthesis products and maps	Ongoing
2.3.2  Identify and inventory existing OCM data not currently in a national repository (such as NCEI) to include in coverage maps  For existing and new mapping data, ensure data formats and products are archived and meet FGDC/International Organization for Standardization (ISO) metadata and GDA requirements, using tools such as NCEI's CruisePack software	IWG-OCM	NOAA mapping partners	<p>Increase data provided to NCEI and other repositories with the ultimate goal to discover and publicly archive all existing OCM data</p> <p>OCM data acquired with public funds archived at national repositories (e.g., NCEI, USGS National Archive of Marine Seismic Surveys, and other federally funded repositories) in multiple forms, including: raw, unprocessed data; and processed, with calibrations, corrections, and filters applied</p> <p>Data are made publicly accessible and are readily usable by others due to the inclusion of FGDC/ISO compliant metadata</p>	Ongoing
2.3.3  Maintain, promote, and disseminate FGDC standards for MEC data, including CMECS	IWG-OCM	IWG-OEC	<p>Standards are periodically reviewed and updated</p> <p>IWG-OCM website promotes and disseminates pointers to MEC-relevant FGDC standards (e.g., CMECS)</p>	Ongoing

Milestone	Lead	Support	Performance Indicator	Timeline
2.3.4  Build federal agency areas of expertise into shared centers of expertise for data processing	IWG-OCM		Centers of Expertise identified and promoted (e.g., USGS Earth Resources Observation and Science Center for satellite data and topobathy integration, Joint Airborne Lidar Bathymetry Technical Center of Expertise (JALBTCX) for topobathymetric lidar data, and CCOM/JHC for acoustic data)	Ongoing
2.3.5  Ensure the integrity and security of aggregate data stores and centers	NCSG	NOAA	Conduct data aggregation security review process to identify sensitive data risk, controls, and protections associated with publicly available data in the NCEI archive	Ongoing

## GOAL 3. Explore and Characterize Priority Areas of United States Waters

Goal 3 aims to identify, explore, and characterize priority areas in U.S. waters deeper than 40 meters, including the seafloor, sub-bottom, and water column, by coordinating interagency and cross-sector efforts and establishing best practices and standard operating procedures.

Ocean exploration and ocean characterization serve distinct yet complementary purposes. Ocean exploration entails an initial assessment of an area's physical, chemical, and biological characteristics to provide a baseline understanding of the area applicable to many uses, including geology and marine cultural heritage. Ocean characterization provides data and interpretations for a specific area or volume of the ocean to support assessments and applications. Both are essential for thoroughly understanding the ocean's resources, hazards, environments, and processes and for providing vital data for managers, decision makers, and stakeholders to make informed, science-based decisions.

Exploration and characterization activities under the NOMEc Strategy are guided by mapping data (see Goal 2) and, therefore, work in parallel with mapping-focused efforts to streamline data collection and gain a more comprehensive understanding of priority areas. Seafloor maps inform site selection for exploration and habitat classification and provide essential information for validating exploration and characterization efforts. Where possible, these NOMEc-supported activities will take a collaborative and coordinated approach to MEC to minimize duplication and maximize data collection.

### Accomplishments

The following summarizes the progress that the NOMEc Council and IWG-OEC have made toward meeting the NOMEc Strategy goals since the release of the initial Implementation Plan:

#### Objective 3.1. Identify Strategic Ocean Exploration and Characterization Priorities

- The IWG-OEC assembled Subject Matter Experts to identify thematic priorities to inform OEC activities and efficiently collect critically important data that informs our understanding of ocean resilience and ocean-based solutions to climate change, biodiversity loss, and ecosystem management. IWG-OEC subgroups in non-living marine resources, cultural heritage, benthic ecology, water column, and seafloor hazards were established.
- In 2022, the NOMEc Council and IWG-OEC published the “Strategic Priorities for Ocean Exploration and Characterization of the United States Exclusive Economic Zone”<sup>28</sup> (Strategic Priorities Report) to identify geographic priority areas for OEC activities and inform campaign planning. This report synthesized public and scientific input through Requests for Information (RFIs), white paper submissions, listening sessions, and relevant meetings and workshops.
- The Strategic Priorities Report has been used to guide NOAA budget formulations, BOEM environmental studies, and interagency MEC operations in areas identified as geographic priorities.

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<sup>28</sup> Interagency Working Group on Ocean Exploration and Characterization for the National Ocean Mapping, Exploration, and Characterization Council. *Strategic Priorities for Ocean Exploration and Characterization of the United States Exclusive Economic Zone*, 2022, [www.whitehouse.gov/wp-content/uploads/2022/10/NOMEc\\_OEC\\_Priorities\\_Report.pdf](http://www.whitehouse.gov/wp-content/uploads/2022/10/NOMEc_OEC_Priorities_Report.pdf)

### **Objective 3.2. Establish Exploration and Characterization Standards and Protocols**

- In 2023, IWG-OEC published an article in *Frontiers in Marine Science*<sup>29</sup> outlining a strategy for establishing best practices and standard operating procedures for OEC. Building on the groundwork of the SOMP and the national Strategic Priorities Report, the strategy outlined in the article will guide IWG-OEC's efforts in defining and sharing best practices, guidelines, and resources for OEC.

### **Objective 3.3. Explore and Characterize Priority Areas**

- NOMEc-supporting projects have involved improved interagency coordination, collection of new MEC data, advanced innovative technologies and methods, and developed or strengthened new partnerships including multiple private sector and academic partners. A non-exhaustive list of recent projects that explicitly cite their support of NOMEc goals has included extensive new mapping and select exploration in large sections of the Blake Plateau, new mapping and environmental DNA sampling offshore Hawai'i, and three separate expeditions in the Aleutian Arc with complementary focuses on MEC done in that order to maximize the effectiveness of limited federal resources in this remote region.
- Projects created through multi-agency, public-private partnerships have informed the exploration objectives of more extensive mapping campaigns. In 2022, for instance, the Saildrone Surveyor mission mapped over 6,000 square miles of unknown seafloor in the Aleutian Islands, including a specific geographic priority area identified by the priorities report as requiring seafloor mapping that would not otherwise have been surveyed. This targeted and collaborative project informed the 2023 NOAA Ship *Okeanos Explorer* missions that included 27 remotely operated vehicle dives in the deepwater areas offshore of the Aleutian Islands, the Gulf of Alaska, and the Aleutian Trench.

### **Objective 3.4. Make Exploration and Characterization Data Usable and Available**

- As part of supporting publicly usable and available data, OEC data are archived through NOAA NCEI and partnerships with Oregon State University and the Smithsonian Institution, which have established repositories for geological and biological samples, respectively.

## **Looking Ahead**

Building on the successful identification of strategic OEC priorities and ongoing efforts to explore and characterize these areas, the IWG-OEC will focus on compiling best practices, guidelines, and resources for various OEC data types and products. Leveraging mapping campaigns described in Objective 2.2, which already and directly incorporate exploration and characterization priorities, will remain an important component of coordinating MEC priorities across U.S. waters. Additionally, the group will address the challenge of making OEC data more usable and accessible. Updates to this section of the Implementation Plan emphasize strategies for establishing standards and protocols for ocean exploration, as well as mechanisms to support the exploration and characterization of priority areas within U.S. waters. This includes regional campaigns, partnerships, and the development of an Exploration Gap Analysis tool.

The following objectives and milestones have been renumbered and updated to highlight the continued work needed to advance Goal 3:

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<sup>29</sup> Cantwell, Kasey, Amanda Demopoulos, Mitchell Hebner, Rachel Medley, Mark Mueller, and Amanda Netburn. "One Byte at a Time: Gathering Best Practices, Guidelines, and Resources for Data Standards to Support Ocean Exploration and Characterization." *Frontiers in Marine Science* 10 (2023). [doi.org/10.3389/fmars.2023.1250245](https://doi.org/10.3389/fmars.2023.1250245)

## Objective 3.1. Identify Strategic Ocean Exploration and Characterization Priorities

*This objective identifies key strategic priorities for OEC to address the President's direction to identify, explore, and characterize "priority areas" within U.S. waters. Executing this goal requires the consideration of multiple factors, including statutory requirements, federal agency missions, strategic national issues, Administration policy priorities, and stakeholder perspectives. Specific geographic and thematic priorities are identified through workshops, requests for information, and other avenues to solicit input from a multitude of partners and stakeholders. Specific examples of strategic priorities include, but are not limited to: areas with potential for offshore energy development or aquaculture, notable archaeological resources and recognized Underwater Cultural Heritage sites, critical minerals, biopharmaceutical resources, areas in which natural hazards pose a risk to public safety, features and resources subject to federal agency resource management and stewardship responsibilities such as Essential Fish Habitat and National Marine Sanctuaries, and areas or ecosystems that may provide key insights into understanding ocean and Earth systems.*

**Measure of success:** Report with actionable goals and/or geospatial platform that guides ongoing and future exploration and characterization efforts and identifies national-level multidisciplinary strategic priorities.

Milestone	Lead	Support	Performance Indicator	Timeline
3.1.1  Develop reports of recommended strategic OEC priorities in deep U.S. waters	IWG-OEC	IWG-OCM	Report identifies strategic priorities and relevant timeframes (e.g., near-, medium-, long-term), clarifies key stakeholders, and outlines OEC campaign plans (see Objective 3.3)	Ongoing, every 2 years
3.1.2  Scope, develop, and launch an Exploration Gap Analysis tool (similar to the Bathymetry Gap Analysis) to assist with planning and tracking OEC activities	NOAA	IWG-OEC	Exploration Gap Analysis developed to geospatially track areas explored from previous and ongoing exploration and characterization activities  Track progress on exploring and characterizing existing priority areas (from ongoing and previous missions) and to identify new priority areas  Integrate on-going analyses, data inclusion, and assessments of end-uses of the tool through an iterative feedback process	Ongoing

## Objective 3.2. Develop Repository of Exploration and Characterization Best Practices, Resources, Standards, and Protocols<sup>30</sup>

*There is no single suite of measurements, standards, and/or protocols that can address the full breadth of OEC applications. This goal seeks to identify, compile, disseminate, and promote relevant standards, protocols, best practices, guidelines, and resources for collecting and storing exploration and characterization data, ensuring that this information maximizes the benefit of such data and meets needs across sectors. Actions within this objective will align with existing efforts to identify standards and protocols within the ocean science community, leverage existing repositories for housing data and samples, and promote consistency with existing standards and protocols of the FGDC, other similar bodies, and international efforts to standardize oceanographic data. Similar to the prioritization process outlined in Objective 3.1, established exploration and characterization standards and protocols may be periodically reevaluated to allow for improvements in understanding, advancements in S&T, and stakeholder input.*

**Measure of success:** Relevant common standards, protocols, best practices, guidelines, and resources are published in a dynamic online repository, and their use is encouraged for federal agencies that conduct or fund OEC missions.

Milestone	Lead	Support	Performance Indicator	Timeline
3.2.1  Conduct outreach with federal agencies, private sector, academia, NGOs, and other stakeholders on the standards and protocols that are essential for deep OEC	IWG-OEC	IWG-OCM, relevant IWGs, MEC partners	<p>Public input solicited through RFIs, listening sessions, relevant meetings, workshops, and reports</p> <p>Federal input is collected through review of existing federal documents and reports</p> <p>An assessment of federal agencies' current deep OEC activities, existing or emerging requirements, and shared interests is conducted</p>	Ongoing
3.2.2  Develop framework for accessible online repository of best practices, resources, standards/protocols, and guidelines for OEC data types and products	IWG-OEC	NOME Council, IWG-OCM, relevant IWGs, MEC partners	<p>Repository helps users better leverage prior efforts, current capabilities, emerging technologies, and existing federal agency standards/protocols</p> <p>Feedback from the NOME Council, IWG-OCM, federal agencies, and public incorporated into the final repository</p>	Planned, 2025

<sup>30</sup> This objective title was rewritten from the 2020 NOME Implementation Plan. It was previously "Objective 3.2. Establish Exploration and Characterization Standards and Protocols."

Milestone	Lead	Support	Performance Indicator	Timeline
3.2.3 Provide draft framework to OST for final review	IWG-OEC	NOMEc Council	Data collection standards, protocols, and file format sharing guidelines are published for use by all federal agencies and nongovernmental partners that conduct deep ocean exploration to use when executing and supporting exploration and characterization missions within U.S. waters	Planned, 2026
3.2.4 Support dissemination of new and existing OEC-related data management best practices	IWG-OEC, IWG-OCM, NOMEc Council	MEC partners, FGDC	Information about relevant data management best practices shared via relevant websites, webinars, and workshops  Data management best practices may include procedures for effective data/metadata storage, archiving techniques, quality assurance/acceptance/validation criteria, metadata standards, and accessibility  Acknowledge and honor Tribal Nation data sovereignty	Ongoing

### Objective 3.3. Explore and Characterize Priority Areas

Priority areas identified in Objective 3.1 will be explored and characterized, leveraging various mechanisms and partnerships using the standards and protocols developed in Objective 3.2. In some instances, priorities may be addressed through a single at-sea mission supported by an individual federal agency or partner. However, to optimize priority exploration and characterization missions, multi-mission campaigns will need to be developed and supported by various partners and mechanisms. Such campaigns often encompass years of effort, multiple platforms and technologies, and multi-sector partners. These multi-mission campaigns should be designed to evolve with expected new technologies and mission requirements. To facilitate coordination and execution, the NOMEc Council and IWG-OEC will collect information from federal agencies (and non-federal partners when appropriate) about their planned exploration and characterization missions to identify opportunities for collaboration, resource coordination, and efficiency. To the greatest extent possible, the IWG-OEC will work with the IWG-OCM and through the NOMEc Council to ensure exploration and characterization activities (see Goal 3) are coordinated with mapping efforts (see Goal 2) to optimize the collection of complementary data.

**Measure of success:** Collaborations and partnerships have been created or strengthened, while executing exploration and characterization activities that advance identified priority needs under the NOMEc Strategy. This has led to new or expanded exploration and characterization results, including new inventories, observations, and assessments of living and non-living marine resources, ecosystems, ocean processes, and marine litter.

Milestone	Lead	Support	Performance Indicator	Timeline
3.3.1  Identify and utilize existing national priorities and standards documents relating to ocean MEC (using the results of Objectives 3.1 and 3.2, where applicable) and innovative approaches/models to facilitate and execute new OEC projects and campaigns, in coordination with mapping-focused campaigns (see Goal 2)	NOMEc Council, IWG-OEC	MEC partners	New activities/projects are demonstrably responsive to Objectives 3.1 and 3.2 and leverage mapping campaigns described in Objective 2.2  Federal agencies report projects identified to meet NOMEc priorities and demonstrate the value of effective leveraging and coordination	Ongoing
3.3.2  Leverage IWG-OEC resources (such as priorities reports) to help execute, expand, and enhance OEC activities by federal entities in collaboration with non-federal partners	NOMEc Council, MEC partners	IWG-OEC, IWG-NOPP	Government and external (e.g., private sector and philanthropy) funding aligns with identified national priorities, utilizing mechanisms for innovation (e.g., methods and collaborative partnerships), where appropriate  Activities are tracked, quantified, and publicly shared	Ongoing

### Objective 3.4. Make Exploration and Characterization Data Usable and Available

*OEC missions collect large amounts of data. While these data are used in near real-time to guide at-sea operations, the greater value comes from transforming data into actionable information that can be accessed and used by a variety of stakeholders that includes scientists, government policymakers, educators, and business owners. Successfully transforming, standardizing, ensuring quality control, and disseminating data and information requires significant effort and planning. The milestones below identify some specific actions that the NOMEc Council, IWGs, and federal agencies will take to make collected OEC data (including imagery, lidar, synthetic aperture radar, biological and geological samples, datasets, and accompanying FGDC-compliant metadata) useful and publicly available. Some known constraints related to this objective include national security considerations and proprietary data or data specifically exempted from public release by regulation or law (e.g., shipwreck locations under the National Historic Preservation Act). The NOMEc Strategy and this Implementation Plan seek to promote and facilitate the timely submission of data to established repositories, adhere to recognized standards, and streamline the process for public access. These steps will better enable subsequent analysis and synthesis,*

*such as helping to identify geographic and topical gaps where further exploration and characterization data collection efforts should be prioritized.*

**Measure of success:** Improved accessibility and usability of exploration and characterization data for the public, scientific communities, resource managers, and other data users and compliance with legally mandated data access and standards.

Milestone	Lead	Support	Performance Indicator	Timeline
3.4.1  Identify, promote, and utilize relevant data portals and clearinghouses for OEC data management, access, synthesis, and visualization	NOMEc Council, IWG-OCM, IWG-OEC	MEC partners	Create a list of existing relevant OEC related data portals/clearinghouses  Facilitate and promote appropriate archiving of OEC data collected through NOMEc-guided projects	Ongoing
3.4.2  Support primary, centralized repositories (e.g., NCEI) for OEC data and publicly accessible repositories for physical samples, including biological specimens (e.g., Smithsonian Institution) geological samples (e.g., NCEI, multiple contractors, academia), and satellite products (e.g., National Aeronautics and Space Administration (NASA) Earth Observing System Data and Information System)	NOMEc Council, IWG-OCM, IWG-OEC	MEC partners	Federal agencies coordinate on standard data requirements (see Objective 3.2) and language to include in federal funding mechanisms (e.g., contracts, cooperative agreements, grants, and interagency agreements) for digital (e.g., imagery and geospatial files, and databases) and physical samples collected using federal funding	Ongoing

Milestone	Lead	Support	Performance Indicator	Timeline
3.4.3 Promote and disseminate FGDC/ISO data and metadata standards and GDA compliance requirements for all federal agencies and federally recognized Tribes	Federal agencies	FGDC, NOME Council, IWG-OEC, IWG-OCM	Federal agencies' Inspectors General ensure FGDC/GDA compliance  Crosswalk National Geospatial Data Asset (NGDA) to relevant MEC datasets using agency points of contact. Ensure that Tribal nations have timely access to data  Acknowledge and honor Tribal Nation data sovereignty	Ongoing

## **GOAL 4. Develop and Mature New and Emerging Science and Technologies to Map, Explore, and Characterize United States Waters**

Goal 4 objectives are focused on coordinating efforts to identify and advance relevant S&T to support MEC activities. It is critical for the federal government to keep pace with emerging S&T innovations, encourage their development, and move them into operations to make MEC activities more efficient and effective. New technologies include advancements in 'omics, data synthesis, artificial intelligence and machine learning, remote sensing, vessels, uncrewed systems, and other platforms capable of increasing our capability to efficiently measure, sample, analyze, and image shallow and deep waters. Leveraging multi-sectoral partner expertise in marine technology development is key to meeting NOMEc goals. Federal agencies will coordinate efforts to identify S&T requirements, as well as promote existing and new technologies to support mapping, exploring, and characterizing the waters of the United States.

### **Accomplishments**

The following summarizes the progress that the NOMEc Council and IWGs have made toward meeting the NOMEc Strategy goals since the release of the initial Implementation Plan:

#### **Objective 4.1. Identify Science and Technology Priorities**

- The NOMEc Council commissioned a report by the Science and Technology Policy Institute identifying S&T priorities for MEC activities.

#### **Objective 4.2. Support Development, Testing, Deployment, and Use of New Technologies**

- In a collaboration between NOAA Ocean Exploration, the Ocean Exploration Trust, and CCOM/JHC, a 2022 expedition to the Papahānaumokuākea Marine National Monument deployed the uncrewed surface vessel DriX to map highly remote areas of the Pacific and showcased the capabilities of this new platform.
- Seminars hosted by the IWG-OCM, tailored toward federal audiences, have generated support for the development of new S&T to support MEC initiatives.

#### **Objective 4.3. Support Partnerships with Organizations that are Promoting, Investing in, or Developing Ocean Methodologies, Technologies, and Applications**

- Federal coordination has been achieved, maintained, and expanded to promote this objective. The JALBTCX partnership between NOAA and the U.S. Army Corps of Engineers (USACE) and the Rolling Deck to Repository partnership between NOAA's NCEI and select academic and philanthropic research vessels are prominent examples.
- Academic collaborations with universities to develop joint institutes, including CCOM/JHC, COMIT, and Ocean Exploration Cooperative Institute (OEI) and promote the development of new MEC technologies.

### **Looking Ahead**

Developing partnerships is crucial to advancing the S&T capabilities needed to efficiently and effectively map, explore, and characterize all U.S. waters. Federal MEC efforts have been maximized regarding current funding and workforce levels, so the involvement of private industry and joint institutes in S&T development, testing, and use is critical to reaching long term goals. Along these lines, the NOMEc Council will identify and catalog S&T needs and data stewardship gaps from the MEC community to identify priorities for S&T development. The NOMEc Council will continue to support joint institutes and academic partnerships that are currently conducting S&T development testing. It will also engage non-federal partners in testing new technologies.

The following objectives and milestones have been renumbered and updated to highlight the continued work needed to advance Goal 4:

## Objective 4.1. Establish a Science and Technology Priorities Document to Advance MEC Activities Throughout the Data Lifecycle

*This objective aims to develop a S&T priorities document that highlights innovations of strategic importance to advance NOMEc Strategy goals. S&T advancements are considered for the entire data lifecycle and not just acquisition. IWG-OCM and IWG-OEC members will identify and prioritize emerging S&T to move from research to operations and archiving in order to demonstrate progress toward NOMEc Strategy goals.*

**Measure of success:** Clearly articulated S&T priorities to advance MEC activities in U.S. waters.

Milestone	Lead	Support	Performance Indicator	Timeline
4.1.1  Identify S&T needs from MEC communities and prioritize based on strategic importance to advance NOMEc goals  Identify gaps in data stewardship pipelines where innovations can improve data delivery, archival, discovery, access, and use	IWG-OCM, IWG-OEC	Relevant IWGs (e.g., IWG on Ocean Sound and Marine Life)	Draft list of S&T priorities of strategic importance to support NOMEc Strategy MEC goals, including requirements for new technologies to improve delivery, archival, discovery, access and use of MEC data including the submission of data to NCEI	Planned, 2025
4.1.2  Draft a “Science and Technology Priorities” document of NOMEc S&T priorities	NOMEc Council	IWG-OCM, IWG-OEC, relevant IWGs (e.g., IWG on Ocean Sound and Marine Life)	Merge IWG-OCM and IWG-OEC S&T priorities into a comprehensive NOMEc S&T priorities document  Prepare a report containing recommendations for “achievable” technological innovations with the potential to dramatically improve NOMEc-guided activities	Planned, 2026

## Objective 4.2. Support Development, Testing, Deployment, and Use of New Technologies

*This objective aims to support the development of emerging marine observation technologies and applications through traditional contract and grant mechanisms (including those focused on small business and innovation), continued support of Cooperative Institutes and joint centers (e.g., CCOM/JHC, COMIT, OECI) conducting S&T research, and partnerships with organizations involved in the promotion, investment, and development of new methodologies and technologies. Federal agencies use frameworks, proving grounds, and testbeds to support at-sea testing of technologies to assess operational readiness and provide mission-focused feedback. Incorporation and use of these new or emerging technologies during MEC activities can enhance the overall objectives of the campaign, accelerate and spur innovation and discovery, and create a market for commercially developed technology applications. This will further bolster a robust ocean S&T industry that is supported by numerous professional societies and coordinated through local, regional, and national organizations that promote awareness of domestic and international developments in marine S&T, support information sharing, and facilitate cross-sectoral dialogue among leaders and members of government and nongovernmental institutions.*

**Measure of success:** Federal agencies and non-federal partners support the development, testing, and adoption of new and innovative technologies, scaling up existing capacity to map, explore, and characterize the ocean.

Milestone	Lead	Support	Performance Indicator	Timeline
4.2.1  Support the testing of advanced operations, services, and S&T capabilities that address the needs of the MEC community	NOMEc Council	IWG-OCM, IWG-OEC	<p>Annually identify and catalog MEC-related cooperative research and development agreements (CRADAs)</p> <p>Facilitate and promote cross-agency CRADAs to accelerate the advancement and development of new technologies</p> <p>Missions on federal and federally-supported vessels to test and evaluate new technologies through contracts, grants, and/or agreements</p>	Ongoing
4.2.2  Continue to support Cooperative Institutes and joint centers (e.g., CCOM/JHC, COMIT, OECI) conducting critical S&T research	NOMEc Council	IWG-OCM, IWG-OEC	<p>Engage with Cooperative Institutes and joint centers at reviews annually</p> <p>Biannually invite regular updates and presentations from Cooperative Institutes and joint centers at NOMEc Council and IWG meetings</p>	Ongoing

## GOAL 5. Build Public and Private Partnerships to Map, Explore, and Characterize United States Waters

Goal 5 objectives are focused on building partnerships beyond the federal government to fully map, explore, and characterize U.S. waters. Given the current pace of MEC activities, long-term NOMEc Strategy goals cannot be achieved on time without collaboration across federal, state, and territorial agencies, the private sector, academia, NGOs, Tribal Nations, and Indigenous Peoples.

Federal agencies must leverage public and private partnerships to access resources that extend beyond their own capabilities. For instance, private and academic sectors can offer cutting-edge technologies, innovative research methods, and specialized expertise, while NGOs and Tribal Nations can contribute valuable local knowledge, community engagement, and conservation efforts. In return, non-federal partners benefit through access to new MEC data, which can inform their own research and commercial ventures. Opportunities for technology development, funding, and data sharing further incentivize partnerships. These collaborations improve data acquisition, processing, and stewardship, helping to meet NOMEc Strategy milestones more efficiently.

Equally critical to achieving NOMEc Strategy goals is inspiring and educating the public about the value of acquiring MEC data. Public awareness campaigns can highlight the importance of mapping, exploring, and understanding the nation's waters. Outreach efforts—through citizen science programs, educational initiatives, and media campaigns—can stimulate broader interest and participation in MEC activities, encouraging more people to support and advocate for exploring and conserving marine environments.

### Accomplishments

The following summarizes the progress that the NOMEc Council and IWGs have made toward meeting the NOMEc Strategy goals since the release of the initial Implementation Plan:

#### Objective 5.1. Maximize Opportunities for Non-Federal Participation

- Starting as a pilot concept in 2019, NOAA has advertised the Brennan Ocean Matching Fund opportunity to non-federal entities annually as a means to pool funds through agreements and execute more mapping contracts. NOAA and non-federal partners entered agreements through the Fund and executed mapping projects in the Long Island Sound between Connecticut and New York. For the fiscal year 2025 opportunity, three proposals were received and accepted, and one moved forward with the agreement process.
- In 2021, the NOMEc Council hosted a Tribal listening session and received valuable concerns and suggestions for developing a more holistic, coordinated process that fulfills federal Indian trust and treaty responsibilities and promotes meaningful long-term relationships.
- In 2023, through the Seascape Alaska regional campaign, the private sector worked with its non-federal client to facilitate data sharing associated with a submarine cable installation and support NOMEc goals to fill bathymetry data gaps.
- The fiscal year 2023 NDAA officially named, established, and authorized \$20 million dollars toward the Brennan Ocean Matching Fund to increase coordinated acquisition, processing, stewardship, and archival of new OCM data in U.S. waters.
- In 2024, the NOMEc Council initiated a one-year Tribal engagement position, which was filled by a Knauss Fellow. Currently, NOMEc Council member agencies are collaborating to develop an interagency Tribal engagement framework that leverages existing federal resources and Tribal and Indigenous partnerships to accomplish this milestone.

### **Objective 5.2. Foster Cross-Sector Engagement**

- Internationally, the NOMEc Council has hosted a United Nations (UN) Ocean Decade Webinar on the NOMEc Strategy and presented at the Deep Sea Biology Symposium, among other forums. It has also engaged with the UN Ocean Decade, Seabed 2030, General Bathymetric Chart of the Oceans (GEBCO), Deep Ocean Observing Strategy (DOOS), and Challenger 150 initiative. In 2023, Seascape Alaska was endorsed by the Intergovernmental Oceanographic Commission as a UN Ocean Decade project in support of the Seabed 2030 initiative.
- NOMEc Council leaders have engaged with FACs, such as the Hydrographic Services Review Panel and Ocean Exploration Advisory Board, to solicit input and receive feedback on NOMEc activities.

### **Objective 5.3. Inspire and Involve the Public**

- The NOMEc Council has partnered to create the CCOM/JHC with the University of New Hampshire and the COMIT with the University of South Florida. Both institutions support graduate student research and education to develop researchers of the future.
- The NOMEc Council has presented or held town halls at multiple conferences, including the Alaska GeoSummit, Lakebed 2030, MTS Oceans, and American Geophysical Union (AGU) Ocean Sciences.
- The NOMEc Council and IWG-NOPP co-hosted a town hall at the MTS OCEANS 2023 Conference in Gulfport, Mississippi to improve private sector engagement.

## **Looking Ahead**

There is still work to be done in fostering meaningful partnerships that enhance collaboration between agencies, the public, Tribal Nations, and Indigenous Peoples. The NOMEc Council will focus on supporting regional campaigns, deepening engagement with Tribal Nations and Indigenous Peoples, and expanding public outreach to elevate awareness of the importance of MEC activities. By conducting a natural capital assessment, the NOMEc Council aims to clearly communicate the economic, social, and cultural importance of acquiring modern MEC data, while emphasizing the costs and risks of not having this information for the nation's waters. Furthermore, the Council has demonstrated that the United States cannot achieve its NOMEc objectives solely using dedicated federal assets or under the current collaborative framework with non-federal partners to acquire additional MEC data. More incentives from the federal government should be implemented going forward, especially the development of larger dedicated competitive financial mechanisms for industry partners to contribute.

The following objectives and milestones have been renumbered and updated to highlight the continued work needed to advance Goal 5:

### **Objective 5.1. Maximize Opportunities for Non-Federal Participation**

*This objective provides a framework to maximize opportunities for federal, state, and territorial agencies, the private sector, academia, NGOs, Tribal Nations, and Indigenous Peoples to advance NOMEc goals of mutual interest and benefit. Various mechanisms will be used to enhance the planning, coordination, and successful implementation of MEC activities within U.S. waters. Participation from all sectors in the planning and implementation of these activities will be critical to success. The NOMEc Council will promote opportunities for partnerships with American Indians, Alaska Natives, Native Hawaiians, Pacific Islanders, and Indigenous peoples. For Alaska Native Organizations, special consideration will be given to minimize potential conflicts with*

*subsistence and cultural activities—for example, avoiding bowhead whale migration and other important subsistence time periods.*

**Measure of Success:** Increase non-federal participation, collaboration, and partnership in ocean MEC activities and efficiencies to meet MEC goals.

Milestone	Lead	Support	Performance Indicator	Timeline
5.1.1  Promote broader use of existing funding and incentivizing mechanisms, and in some cases develop new ones, to support MEC data acquisition or technology innovations between federal and non-federal partners, including demonstrations and testing, while also improving connections/outreach to non-traditional sectors (e.g., medicine and computer science)	NOME Council, IWG-OCM, IWG-OEC	IWG-NOPP, MEC partners	<p>Increased public engagement and collaboration to advance the development, testing, deployment, and/or use of new technologies</p> <p>At least two public-private MEC data acquisition or technology innovation partnerships are funded annually to advance NOME goals; at least one Brennan Ocean Matching Fund project is awarded to non-federal entities</p>	Ongoing
5.1.2  Encourage non-federal partners to share previously collected MEC data with the appropriate federal repository/archive (e.g., NCEI for bathymetry)	NOME Council, IWG-OCM, IWG-OEC	IWG-NOPP, MEC partners	At least two data sharing partnerships are executed to advance NOME goals annually	Ongoing
5.1.3  Establish new or reinforce existing processes for better engaging Tribal and Indigenous Peoples in MEC activities and plans and ensuring compliance with federal mandates when working with Tribal Nations	NOME Council	IWG-OCM, IWG-OEC, IWG-NOPP, MEC partners	<p>Provide opportunities for Native and Indigenous peoples and federally recognized Tribes to participate in listening sessions, MEC activities, and plans</p> <p>Consistently acknowledge Tribal sovereignty, Indigenous Knowledge, data sovereignty, and the federal trust responsibility</p>	Ongoing

## Objective 5.2. Foster Cross-Sector Engagement

*Engagement activities provide an opportunity for multiple sectors to learn about NOMEc and align their strengths to achieve results that cannot be accomplished individually. The NOMEc Council and IWGs will provide engagement platforms that include all sectors in the planning and implementation of these MEC activities. The NOMEc Council and IWGs will also participate in international efforts that inform MEC best practices and enable bi-national activities that accomplish NOMEc Strategy goals.*

**Measure of Success:** All stakeholders have ample opportunity to provide input in NOMEc implementation and fully participate in activities.

Milestone	Lead	Support	Performance Indicator	Timeline
5.2.1  Improve and enable coordination with international efforts related to NOMEc goals (e.g., UN Decade for Ocean Science, Seabed 2030/GEBCO, DOOS, Marine Biodiversity Observation Network, and Challenger 150)	NOMEc Council, IWG-OCM, IWG-OEC	NCSG, IWG-BIO	NOMEc Strategy implementation enhanced by participation in international forums as appropriate  Incorporation of new best practices, shared protocols, development of Memoranda of Understanding, execution of shared missions	Ongoing

Milestone	Lead	Support	Performance Indicator	Timeline
5.2.2  Increase engagement with regional campaigns and strengthen collaboration between federal and non-federal stakeholders	NOMEc Council	IWG-OCM, IWG-OEC, NCSG	<p>Convene at least one NOMEc forum annually that solicits input from non-Federal partners participating in regional campaigns</p> <p>NOAA on behalf of the NOMEc Council publishes RFIs in the Federal Register, conducts public listening sessions, provides opportunities for public input at relevant advisory committee meetings and workshops</p> <p>Compiled list of stakeholders and federal agency activities relevant to the NOMEc Strategy that might result in cross-sector participation</p> <p>Workshops conducted before, during, or after MEC campaigns are used to inform and guide ongoing and future efforts; Information is efficiently synthesized and released</p>	Ongoing
5.2.3  Continue engagement with FACs with interests in NOMEc goals and activities	NOMEc Council	Relevant FACs and associated Designated Federal Officials (DFOs)	Solicit input and receive feedback on NOMEc activities from relevant FACs, as mutual interest allows	Ongoing
5.2.4  Participate and engage stakeholders through existing organizations and meetings/conferences (e.g., UNOLS Fleet Improvement Committee, UNOLS Deep Submergence Science Committee, AGU Ocean Sciences meetings, and others)	NOMEc Council, IWG-OCM, IWG-OEC		NOMEc Council, IWG members, and federal agency staff promote MEC efforts through the website, presentations, town halls, and workshops at relevant meetings/conferences	Ongoing

Milestone	Lead	Support	Performance Indicator	Timeline
5.2.5 Create new MEC-focused engagement opportunities focused on sharing current and developing technologies	NOME Council, IWG-OCM, IWG-OEC		New MEC-focused meetings and workshops, are scoped, planned, and held  Input/feedback documented in reports and inform NOME-supported technology improvements and adaptations	Ongoing

### Objective 5.3. Inspire and Involve the Public

*To address current and future needs for MEC data, the nation needs an inclusive, ocean-literate workforce that is highly proficient across the science, technology, engineering, and mathematics (STEM) fields. Continued investment in STEM education and outreach is critical to ensuring the continued leadership of the United States in the growing international field of ocean S&T. Special degree programs geared toward ocean education, hands-on experience, and professional development offered through partner and educational institutions can prepare students for marine occupations, including marine forecasters, ocean instrument technicians, scholars, Tribal natural resource managers, and uncrewed systems developers. Federal agencies shall support educational outreach programs, and grants that encourage the advancement and participation of underrepresented groups in ocean S&T. Federal agencies will increase opportunities for undergraduate and graduate students and early career professionals, particularly individuals from underrepresented groups, to participate in federal and non-federal ocean MEC activities, including on-vessel observations and training for Tribal representatives.*

**Measure of Success:** Members of American society are literate about their U.S. waters and all the resources that lie within, knowing that this vast area is part of their sovereign territory and worth better understanding and managing.

Milestone	Lead	Support	Performance Indicator	Timeline
5.3.1 Support student education and research in MEC fields to build a diverse, equitable, inclusive, and ocean-literate workforce	NOME Council, IWG-OCM, IWG-OEC	MEC partners	Support federal and nongovernmental opportunities for student and early career involvement in MEC research and activities, particularly for currently underrepresented communities	Ongoing

Milestone	Lead	Support	Performance Indicator	Timeline
5.3.2  Inspire and educate the public about NOMEc activities and convey the importance and urgency of this effort	NOMEc Council, IWG-OCM, IWG-OEC	MEC partners	<p>Outreach opportunities supported by federal and nongovernmental entities including web content (e.g., progress tracking pf NOMEc goals), telepresence access to real-time exploration activities, museum and aquarium exhibits, citizen science projects on MEC S&amp;T</p> <p>Engage the public through conference presentations and interactions, workshops, and outreach materials to convey the importance of acquiring MEC data and expand public support and involvement in these activities</p>	Ongoing
5.3.3  Determine and convey the economic impact of MEC data acquisition	NOMEc Council	IWG-OCM, IWG-OEC	<p>Conduct a natural capital assessment that highlights the benefits of having MEC data and annual costs of not acquiring it</p> <p>Publish a public written report that conveys findings</p>	Planned, 2025

## Conclusion

MEC data for U.S. waters play a vital role in supporting the marine and coastal economy and facilitating informed decision-making for natural resource management and conservation. The marine and coastal economy, along with the value of ecosystem services, contributes trillions of dollars to the U.S. economy annually. However, emerging pressures on the oceans—from climate change, industrial activity, and other drivers—underscore the urgency of acquiring MEC data. Failure to do so poses substantial economic risks, including unknown navigational hazards, diminished forecasting abilities for ocean and weather conditions, and a lack of knowledge of marine biodiversity and ecosystem services. With so many economic, environmental, and national security policies dependent on critical baseline information about the ocean, mapping, exploring, and characterizing our own waters must be a top priority for the U.S. government going forward.

This 2024 Implementation Plan update reflects the achievements, changes, and input from the National Ocean Mapping, Exploration, and Characterization (NOMEc) Council member agencies over the past four years. The NOMEc Council, Interagency Working Group on Ocean and Coastal Mapping (IWG-OCM), and Interagency Working Group on Ocean Exploration and Characterization (IWG-OEC) will continue to review and update the Implementation Plan as needed, incorporating new technologies, partnerships, and operational advancements. This updated document outlines the next steps to meet the ambitious MEC goals outlined in the NOMEc Strategy, enhancing interagency communication, cross-sector coordination, technological developments, progress tracking, and data provision.

While great strides have been made in advancing NOMEc goals and objectives, the magnitude of MEC activities in U.S. waters must increase dramatically to achieve strategic long-term goals (Figure 1a), which will not be met at the current pace of data acquisition (Figure 1b). As of January 2024, 48% (1.7 million square nautical miles) of U.S. waters to the extent of the U.S. Exclusive Economic Zone were considered unmapped. While there has been an 11-percentage point increase in mapped waters from 2017 to 2024, the pace of data collection has fallen short of projections needed to fully map the waters of the United States by the 2040 target (Figure 1b). The vast amount of the waters that remain unmapped, along with limited funding, infrastructure, vessels, and personnel, is a major challenge to achieving long-term goals.

An even smaller fraction of U.S. waters has been adequately explored or characterized. A recent report by the IWG-OEC identified Alaska, Hawai‘i, and Pacific Remote Islands as geographic priorities for data acquisition related to benthic ecological studies, cultural heritage, identification of marine natural resources, seafloor hazards, and characterization of the water column. Exploring and characterizing these and other regions provides critically essential data needed to face challenges associated with climate change and promote coastal community and ecosystem resilience.

The scope of the NOMEc Council’s work may expand following the announcement of newly delineated Extended Continental Shelf (ECS) coordinates,<sup>31</sup> adding 288,000 square nautical miles of seafloor to U.S. interests. An internal analysis conducted in January 2024 revealed that 44% of the ECS areas remained unmapped, and these areas are not yet included in official NOMEc progress metrics. Going forward, the NOMEc implementation plan will be flexible and responsive to federal agency needs for additional MEC data in these regions.

Under the status quo, we have maximized the potential of what federally sponsored MEC data collection can achieve. We must better incentivize private sector participation in data collection

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<sup>31</sup> Public Notice 12244, 88 Fed. Reg. 88470 (December 21, 2023), [www.federalregister.gov/d/2023-28159](http://www.federalregister.gov/d/2023-28159)

efforts to avoid incurring ongoing economic costs from the lack of critical data. Sufficient funding for federal agencies to support NOME goals will be critical to advance the NOME Council's primary priorities. Moving forward, the primary priorities of the NOME Council will be to increase public-private partnerships through the creation of new federal incentives and significantly increase the pace of MEC data acquisition and map all U.S. waters by 2040.