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SUMMARY

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Critical Minerals on the U.S. Outer Continental Shelf: The Bureau of Ocean Energy Management's Role and Issues for Congress

The Biden and Trump Administrations issued executive orders announcing U.S. policies to build and strengthen the resiliency of domestic critical mineral supply chains. *Critical minerals* include any minerals, elements, substances, or materials that are determined to be essential to the economic and national security of the United States, have a supply chain vulnerable to disruption, and play an essential role in manufacturing a product whose absence would significantly affect U.S. economic or national security. One potential source of critical minerals is the U.S. outer continental shelf (OCS), the federally managed ocean area extending from the outer boundaries of state-controlled waters (generally 3 nautical miles [nmi] from shore) to 200 nmi from shore, with some exceptions. Experts estimate that 37 of the U.S. Geological Survey's (USGS's) 2022 list of 50 critical minerals occur on the OCS. Seabed deposits with critical mineral resources may occur across the OCS, but not all deposits on the OCS may be economically viable.

The Bureau of Ocean Energy Management (BOEM), within the Department of the Interior, administers offshore energy and mineral leasing on the OCS, pursuant to the Outer Continental Shelf Lands Act (OCSLA, as amended; 43 U.S.C. §§1331-1356c). BOEM's two primary roles related to critical minerals consist of (1) evaluating the OCS for these resources and (2) leasing submerged lands for critical mineral development. Within BOEM, the Marine Minerals Program seeks to facilitate access to and manage marine minerals on the OCS. To date, the Marine Minerals Program has supported work to evaluate critical mineral resources on the OCS, but BOEM has not issued any leases for critical mineral exploration and development.

BOEM works with the National Oceanic and Atmospheric Administration (NOAA) and USGS to determine which areas of the OCS have potential for critical minerals. For example, these three agencies contribute to the *National Strategy for Ocean Mapping, Exploring, and Characterizing the United States Exclusive Economic Zone* (NOMEC Strategy). A goal of the NOMEC Strategy is to "explore and characterize priority areas," such as areas with potential for critical minerals. In addition to the NOMEC Strategy, BOEM led the development of the National Offshore Critical Minerals Inventory (NOCMI), a conceptional framework to organize its resource evaluation and environmental research related to critical minerals on the OCS. BOEM collaborates with NOAA and USGS to fund, plan, and conduct research relevant to the NOCMI. These agencies have studied or plan to study the western Aleutian Islands (offshore of Alaska), the Escanaba Trough (offshore of California), areas north of Puerto Rico, areas around Hawaii and the U.S. Pacific Island territories (e.g., American Samoa, Guam, Northern Mariana Islands), and the Gulf of Mexico for sites with potential for critical minerals.

As the federal government works to strengthen the United States' domestic critical mineral supply chain, Congress may consider BOEM's role related to the evaluation and assessment of the OCS for these resources as well as the agency's role in leasing for critical minerals. For example, Congress may evaluate the structure and funding of BOEM's Marine Minerals Program. Congress also could address whether BOEM should pursue critical mineral leasing in areas offshore of U.S. territories that are anticipated to have critical mineral resource potential, following an amendment to the OCSLA (in P.L. 117-169) that redefined the OCS to include these territorial areas. Other considerations may include whether BOEM's regulations for marine minerals pose economic burdens for the mining industry. Similarly, Congress may consider how the Jones Act (Section 27 of the Merchant Marine Act of 1920; P.L. 66-261), which requires that waterborne transportation between "U.S. points" be conducted only by vessels built in the United States and owned and crewed by U.S. citizens, might impact critical mineral activities on the OCS. Congress also may weigh potential environmental impacts of mining on the OCS and options for mitigating such impacts.

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Critical minerals are defined in federal statute to include any minerals, elements, substances, or materials that are determined to be essential to the economic and national security of the United States, have a supply chain vulnerable to disruption, and play an essential role in manufacturing a product whose absence would significantly affect U.S. economic or national security.[1] The Biden and Trump Administrations issued executive orders announcing U.S. policies to build and strengthen the resiliency of domestic critical mineral supply chains.[2] In particular, in December 2017, then-President Trump issued Executive Order (E.O.) 13817, "A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals," which made it the "policy of the Federal Government to reduce the Nation's vulnerability to disruptions in the supply of critical minerals" and stated that the U.S. government will further this policy by "identifying new sources of critical minerals," among other activities.[3] The Energy Act of 2020 (Division Z of P.L. 116-260) directed the President to coordinate the work of departments and agencies to "facilitate the availability, development, and environmentally responsible production of domestic resources to meet national material or critical mineral needs."[4]

One potential source of critical minerals is the U.S. outer continental shelf (OCS), the federally managed ocean area extending from the outer boundaries of state-controlled waters (generally 3 nautical miles [nmi] from shore) to at least 200 nmi from shore, with some exceptions (**Figure 1**).[5] Critical minerals may occur on the OCS at the surface of the seabed and marine geologic features (e.g., seamounts), as well as inside some geologic features such as hydrothermal vents (see "Potential OCS Critical Mineral Deposits," below). The Bureau of Ocean Energy Management (BOEM), within the Department of the Interior, administers offshore energy and mineral leasing on the OCS. According to BOEM, the United States is "lagging other nations in domestic [critical mineral] planning and investments, including scientific research" on critical minerals on the OCS (see textbox below, "Countries Pursuing Seabed Mineral Resources on Their Continental Shelves").[6]

[1] 30 U.S.C. §1606(a)(3); 30 U.S.C. §1606(c)(4)(A)-(C). 30 U.S.C. §1606(c)(4)(A) gives the Secretary of the Interior responsibility for identifying and maintaining a list of critical minerals. For more information, see CRS Report R47982, *Critical Mineral Resources: National Policy and Critical Minerals List*, by Linda R. Rowan.

[2] Executive Order (E.O) 13817, "A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals," 82 *Federal Register* 60835, December 20, 2017; E.O 13953, "Addressing the Threat to the Domestic Supply Chain from Reliance on Critical Minerals from Foreign Adversaries and Supporting the Domestic Mining and Processing Industries," 85 *Federal Register* 62539, September 30, 2020; and E.O 14017, "America's Supply Chains," 86 *Federal Register* 11849, February 24, 2021.

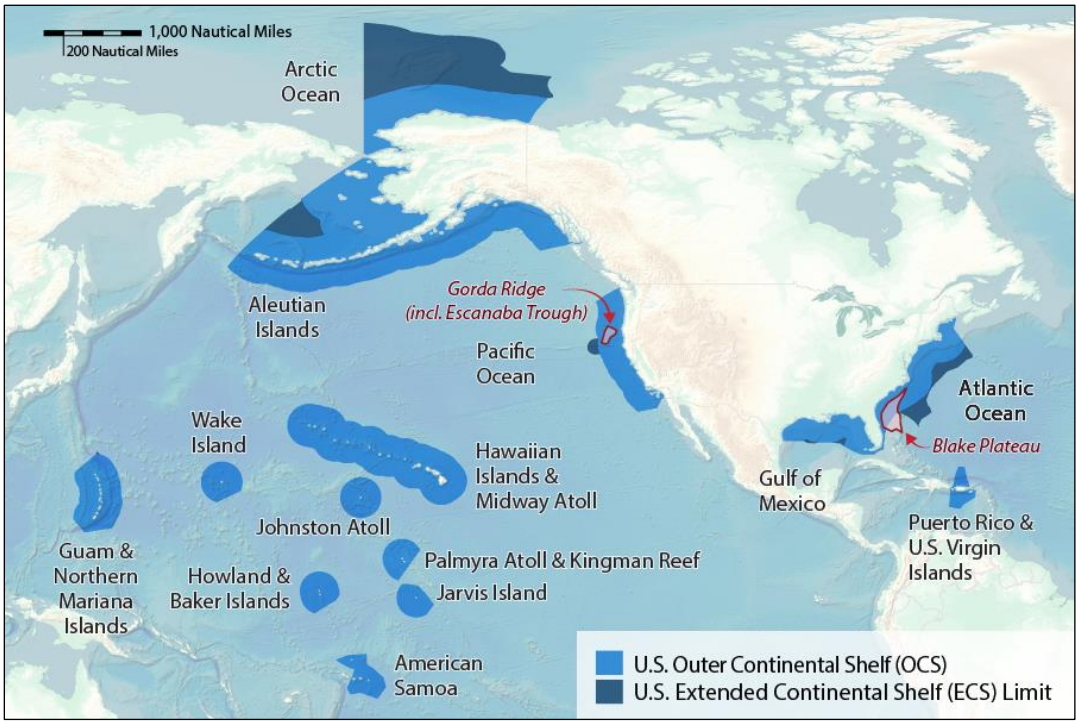
[3] E.O. 13817.

[4] Energy Act of 2020, P.L. 116-260, Division Z, see especially Section 7002(b)(1)(C); 30 U.S.C. §1602(7).

[5] Most U.S. states have jurisdiction over an area extending 3 nautical miles (nmi) from their officially recognized coasts, under the Submerged Lands Act (43 U.S.C. §§1301 et seq.). Two states (Florida, along its Gulf coast, and Texas) have been held by the Supreme Court to have boundaries extending 9 nmi from shore. The Commonwealth of Puerto Rico also has jurisdiction over an area of 9 nmi from its coast, whereas other U.S. territories have jurisdiction over areas 3 nmi from their coasts. Beyond state and territorially controlled waters, the federally managed outer continental shelf (OCS) generally extends 200 nmi from shore, but in some areas the United States has claimed *extended continental shelf* beyond this 200-nmi limit. In cases where the OCS abuts a neighboring country's continental shelf, the OCS may measure less than 200 nmi from the U.S. shoreline. For more information, see CRS Report RL33404, *Offshore Oil and Gas Development: Legal Framework*, by Adam Vann.

[6] Ibid., p. 2.

Figure 1. U.S. Outer Continental Shelf, Including Extended Continental Shelf



Source: CRS, modified from Bureau of Ocean Energy Management, "Outer Continental Shelf," https://www.boem.gov/oil-gas-energy/leasing/outer-continental-shelf, and using Stephen R. Hartwell et al., *Polygons of Global Undersea Features for Geographic Searches*, U.S. Geological Survey Open-File Report 2014–1040, ver. 1.1, June 2018, https://doi.org/10.3133/ofr20141040.

Notes: The OCS generally extends to 200 nautical miles (nmi) from shore. In some areas, the United States has claimed *extended continental shelf* (ECS) beyond this 200-nmi limit based on geological and geophysical data, thereby extending the outer limits of the OCS. In cases where the OCS abuts a neighboring country's continental shelf, the OCS may measure less than 200 nmi from the U.S. shoreline.

BOEM's two primary roles related to critical minerals consist of (1) evaluating the OCS for these resources and (2) leasing submerged lands for critical mineral development. Within BOEM, the Marine Minerals Program seeks to facilitate access to and manage non-energy marine minerals on the OCS.[7] The Marine Minerals Program has supported work to evaluate critical mineral resources on the OCS. To date, BOEM has not issued any leases for critical mineral exploration and development.[8] With regard to evaluation, BOEM has produced prospective maps, based on models and expert knowledge, of where critical minerals could be present on the OCS.[9] This report addresses BOEM's research on the occurrence of critical minerals on the OCS, BOEM's

[7] Bureau of Ocean Energy Management (BOEM), "Marine Minerals Program," https://www.boem.gov/sites/default/files/documents/about-boem/MMP-Mission-Vision_2.pdf.

[8] BOEM, "Marine Minerals," https://www.boem.gov/marine-minerals; and BOEM briefing to CRS, March 7, 2024. BOEM's Marine Minerals Program also manages sand and gravel leasing for coastal restoration, among other activities.

[9] See slide 6 of BOEM's presentation, "Not Just Nodules—Critical Minerals on the Federal Seabed," at the National Academies Sciences, Engineering, and Medicine (NASEM) Standing Committee on Environmental Science and Assessment for Ocean Energy Management: April Meeting (April 2-3, 2024). The presentation is available at https://www.nationalacademies.org/event/42335_04-2024_standing-committee-on-environmental-science-and-assessment-for-ocean-energy-management-april-meeting. Hereinafter referred to as BOEM, "Not Just Nodules."

work to collect data on baseline environmental conditions, its regulations for critical mineral leasing, and issues for congressional consideration.

BOEM's program for the OCS is separate from federal activities related to critical mineral exploration in international waters. For critical minerals occurring in areas beyond national jurisdiction, the National Oceanic and Atmospheric Administration (NOAA) has authority to issue exploration licenses and commercial recovery permits for hard mineral resources (i.e., seabed minerals).[10] For more information on critical mineral exploration in international waters, see CRS In Focus IF12608, *U.S. Interest in Seabed Mining in Areas Beyond National Jurisdiction: Brief Background and Recent Developments*; and CRS Report R47324, *Seabed Mining in Areas Beyond National Jurisdiction: Issues for Congress*.

Countries Pursuing Seabed Mineral Resources on Their Continental Shelves

Several countries have taken steps to mine for seabed minerals on their continental shelves. For example, the Cook Islands, Japan, and Norway have passed domestic laws related to seabed mining activities in their national waters, invested in the exploration of their continental shelves for marine minerals, and/or developed technology for the purpose of commercial recovery.

The Cook Islands Seabed Mineral Authority estimates that 6.7 billion tonnes of polymetallic nodules—potato-shaped rocks lying on the deep seafloor that may contain cobalt, copper, manganese, nickel, and rare earth elements (REEs)—occur on the country's continental shelf. The Cook Islands estimates its nodules contain 20 million tonnes of cobalt. In 2022, the Cook Islands issued three five-year licenses to explore for polymetallic nodules on its continental shelf. As of December 2024, the Cook Islands government has allowed only for exploration of its seabed for polymetallic nodules, not resource extraction.

In 2010, Japan experienced REE supply disruptions from China, which controls more than 70% of the global market share in REEs. Japan has since explored its continental shelf for seabed mineral deposits, in accordance with a domestic 2007 ocean policy law. In 2017, a Japanese government-owned mining company reportedly mined zinc and other minerals from an inactive hydrothermal vent on Japan's continental shelf. Japan also has invested in pumping machinery to extract deep-sea muds for REEs; researchers estimate these muds could meet annual global demands for some REEs, such as yttrium, europium, terbium, and dysprosium, for 30-60 years. Some experts speculate that seabed mining within Japan's national waters could shift it from being import dependent to being a mineral resources-producing country.

In 2008, Norwegian geologists discovered a hydrothermal vent system located on Norway's continental shelf that occurs along the Arctic Mid-Ocean Ridge. Some geologists have speculated that economic quantities of minerals (e.g., copper, zinc) occur in the deposits surrounding the vent system. On January 9, 2024, the Norwegian Parliament opened an area of its continental shelf for commercial-scale mining activities. Following the Norwegian Parliament's decision, the European Parliament passed a resolution expressing its concerns about Norway opening an area of its continental shelf for mining. On December 1, 2024, Norway's Socialist Left Party temporarily blocked the government's plans to offer the country's first deep-sea mining exploration permits in early 2025 due to environmental concerns.

Sources: Rosanna Carver et al., "A Critical Social Perspective on Deep Sea Mining: Lessons from the Emergent Industry in Japan," *Ocean & Coastal Management*, vol. 193 (2020), pp. 1-10; Maia Davies, "Norway Suspends Controversial Deep-Sea Mining Plan," *BBC*, December 2, 2024, https://www.bbc.com/news/articles/c9wlj8l8kr7o; Cook Islands Seabed Mineral Authority (SMA), "Frequently Asked Questions: Exploration Phase," updated September 6, 2022, https://www.sbma.gov.ck/faqs1; Cook Islands SMA, "Seven Hundred Trillion Reasons: The Unseen Scale of Cook Islands' Seabed Resources," August 24, 2024, https://www.sbma.gov.ck/news-3/article-148; Cook Islands SMA, "Register of Titles," https://www.sbma.gov.ck/rot; CRS In Focus IF12517, *U.S.-Japan Critical Minerals Agreement*, by Kyla H. Kitamura; European Parliament, "Motion for a Resolution on Norway's Recent Decision to Advance Seabed Mining in the Arctic," 2024/2520(RSP), January 31, 2024, https://www.europarl.europa.eu/doceo/document/B-9-2024-0095_EN.html; *Japan Times*, "Japan Successfully Undertakes Large-Scale Deep-Sea Mineral Extraction," September 26, 2017, https://www.japantimes.co.jp/news/2017/09/26/national/japan-successfully-undertakes-large-scale-deep-sea-mineral-extraction/; Government of Japan, *Basic Act on Ocean Policy*, Act No. 33 of April 27, 2007, https://www8.cao.go.jp/ocean/english/act/pdf/law_e.pdf; Government of Norway, "Norway Gives Green Light for Seabed Minerals," January 10, 2024, https://www.regjeringen.no/en/aktuelt/norway-gives-

[10] 30 U.S.C. §§1401-1473.

green-light-for-seabed-minerals/id3021433/; Rolf B. Pedersen et al., "Discovery of a Black Smoker Vent Field and Vent Fauna at the Arctic Mid-Ocean Ridge," *Nature Communications*, vol. 1, no. 126 (2010); and Ben Snook et al., "Characterisation of Mineralised Material from the Loki's Castle Hydrothermal Vent on Mohn's Ridge," *Minerals*, vol. 8, no. 12 (2018), pp. 1-22.

Potential OCS Critical Mineral Deposits

In 2022, the Secretary of the Interior, acting through the Director of the U.S. Geological Survey (USGS), published a list of 50 critical minerals, of which 37 occur on the OCS (**Figure 2**).[11] In 2023, the United States was 100% net import reliant for five of the critical minerals that occur on the OCS—gallium, manganese, niobium, scandium, and yttrium.[12]

Figure 2. Critical Minerals Occurring Offshore

(with subset of minerals occurring on the U.S. Outer Continental Shelf)

Source: Bureau of Ocean Energy Management, "Offshore Critical Mineral Resources: Critical Minerals Occurring Offshore," https://www.boem.gov/marine-minerals/offshore-critical-mineral-resources.

[11] U.S. Geological Survey (USGS), "U.S. Geological Survey Releases 2022 List of Critical Minerals," February 22, 2022, https://www.usgs.gov/news/national-news-release/us-geological-survey-releases-2022-list-critical-minerals (hereinafter referred to as USGS, "2022 List of Critical Minerals"). For more information about USGS research on critical minerals, see CRS Report R48005, *Critical Mineral Resources: The U.S. Geological Survey (USGS) Role in Research and Analysis*, by Linda R. Rowan.

[12] USGS, *Mineral Commodity Summaries 2024*, January 31, 2024, p. 7.

BOEM has identified five main categories of mineral deposits on the OCS that may contain critical minerals: nearshore minerals (known as placers), phosphorites, hydrothermal deposits, ferromanganese crusts, and polymetallic nodules (**Table 1**).[13] Each deposit type is described below, generally in order from deposits occurring nearshore to farthest offshore.

Table 1. Mineral Deposits on the U.S. Outer Continental Shelf

Deposit	Description	Depth (meters)	Potential Critical Minerals
Placers (heavy mineral sands)	Heavy minerals mixed with other mud- and sand-sized grains deposited by a river or glacier in a marine nearshore environment	< 200	Platinum, tin, titanium, and some REEs
Phosphorites	Sedimentary rocks containing a high concentration of calcium phosphate that generally occur along continental shelves, slopes, and seamounts	< 1,000	Some REEs
Hydrothermal deposits (seafloor massive sulfide deposits)	Mineral accumulations that form from hot waters emitted at seafloor spreading ridges and areas of undersea volcanic activity	100 to 7,000	Antimony, bismuth, gallium, germanium, tellurium, and zinc
Ferromanganese crusts	Mineral encrustations that form on hard surfaces from seawater rich in dissolved metals occurring in volcanically active regions such as seamounts	600 to 7,000	Cobalt, manganese, nickel, platinum, tellurium, and some REEs, such as scandium
Polymetallic nodules	Potato-shaped rocks composed of concentric layers that form over millions of years as minerals from the seawater and sediment pore water accrete around a hard nucleus (e.g., shark tooth, whale ear bone, rock fragment) lying on the deep seafloor	4,000 to 7,000	Cobalt, lithium, manganese, nickel, tellurium, titanium, and some REEs

Source: Bureau of Ocean Energy Management (BOEM), "Offshore Critical Mineral Resources: Types of Relevant Marine Mineral Deposits," https://www.boem.gov/marine-minerals/offshore-critical-mineral-resources; BOEM, *Budget Justification and Performance Information Fiscal Year 2025*, p. 94.

Notes: REEs = rare earth elements. The REEs that may be found within marine deposits include scandium, yttrium, lanthanum, cerium, praseodymium, neodymium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, and lutetium.

Of the five types of deposits, the nearest to shore are *placers*—sedimentary deposits concentrated with heavy minerals that formed by surface weathering and erosion of primary rocks (e.g., bedrock) that are transported and redeposited by gravity, water, glacial activity, or wind.[14] Marine

[13] BOEM, "Offshore Critical Mineral Resources: Types of Relevant Marine Mineral Deposits," https://www.boem.gov/marine-minerals/offshore-critical-mineral-resources. Hereinafter referred to as BOEM, "Offshore Critical Mineral Resources: Types of Deposits."

[14] "Placer Deposit," Encyclopedia of Geology (Second Edition), 2021, https://www.sciencedirect.com/topics/earth-and-planetary-sciences/placer-deposit.

placers occur in coastal nearshore environments and may contain critical minerals, such as platinum, tin, titanium, and some rare earth elements (REEs).[15]

Phosphorites are sedimentary rocks containing a high concentration of calcium phosphate. These rocks generally occur in water depths less than 1,000 meters (m) along continental shelves and slopes, as well as on seamounts. Depending on the location, these deposits may contain one or more REEs.

Hydrothermal deposits (also known as *seafloor massive sulfide deposits*) can precipitate from hot waters emitted at seafloor spreading ridges and areas of undersea volcanic activity, such as the Juan de Fuca Ridge located off the Pacific Northwest coast of North America. These deposits generally occur in water depths ranging from 100 to 7,000 m. Hydrothermal deposits may contain critical minerals, such as antimony, bismuth, gallium, germanium, tellurium, and zinc.

Ferromanganese crusts are layers (typically less than 25 centimeters thick) of mineral encrustations that form on hard surfaces (e.g., rocks) from seawater rich in dissolved metals occurring in volcanically active regions, such as seamounts and ridges, at water depths of 600 to 7,000 m. These crusts generally form on the tops and flanks of seamounts, precipitating at a growth rate of less than 1 to 4 millimeters per million years. Ferromanganese crusts may contain critical minerals such as cobalt, manganese, nickel, platinum, tellurium, and some REEs, such as scandium.

Polymetallic nodules are potato-shaped rocks lying on the deep seafloor, typically at water depths of 4,000 to 7,000 m. The nodules are formed over millions of years as minerals from the seawater and sediment pore water accrete around a hard nucleus (e.g., shark tooth, whale ear bone, rock fragment), forming concentric layers. Critical minerals contained in polymetallic nodules may include cobalt, lithium, manganese, nickel, tellurium, titanium, and REEs.

Three of these five types of marine deposits—hydrothermal deposits, ferromanganese crusts, and polymetallic nodules—also occur beyond the OCS in international waters.[16] Some countries are actively exploring areas of the international seabed with potential for high concentrations of certain critical minerals.[17] The United States is not currently pursuing exploration of the international seabed for the purpose of commercial recovery of critical minerals.[18]

Two types of deposits—placers and phosphorites—tend to occur in shallow water environments, potentially including U.S. state waters. However, the quantities and types of critical minerals and REEs found nearest to shore may not be of commercial interest. Seabed minerals of commercial interest tend to occur in deeper waters beyond state jurisdiction (see **Table 1**).

Oregon, Washington, California, Hawaii and America Samoa prohibit mining in the waters under their jurisdiction (i.e., the first 3 nmi seaward of the coastline).[19] These U.S. states and territories may allow for certain mining exceptions (e.g., beach replenishment, scientific research).

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[15] BOEM, "Offshore Critical Mineral Resources: Types of Deposits." Unless otherwise noted, information in the remainder of this section is drawn from BOEM, "Offshore Critical Mineral Resources: Types of Deposits."

[16] For example, see International Seabed Authority, "Exploration Contracts," https://www.isa.org.jm/exploration-contracts/.

[17] Ibid.

[18] For information about U.S. involvement in international seabed mining activities, see CRS Report R47324, *Seabed Mining in Areas Beyond National Jurisdiction: Issues for Congress*, by Caitlin Keating-Bitonti; and CRS In Focus IF12608, *U.S. Interest in Seabed Mining in Areas Beyond National Jurisdiction: Brief Background and Recent Developments*, by Caitlin Keating-Bitonti.

[19] Or. Rev. Stat. §196.405 (1991); S.B. 5145, 67th Leg., Reg. Sess. (Wash. 2021); A.B. 1832, 2021–2022 State Leg., (continued...)

National Offshore Critical Minerals Inventory

BOEM's Marine Minerals Program has developed a conceptual framework to organize its resource evaluation and environmental research related to critical minerals on the OCS, known as the National Offshore Critical Minerals Inventory (NOCMI). The NOCMI aims to understand the occurrence of critical minerals on the OCS and to identify areas with high economic potential.[20] BOEM collaborates with NOAA and USGS to fund, plan, and conduct research relevant to the NOCMI.[21] BOEM identifies five strategic priorities under the NOCMI.[22]

1. Advance resource evaluation and environmental assessment standards and information assets
2. Advance assessment of offshore critical minerals
3. Advance understanding of baseline environmental conditions
4. Advance technologies that efficiently and cost-effectively assess offshore critical minerals
5. Provide accessible information on OCS critical minerals

Additionally, several federal agencies, including BOEM, NOAA, and USGS, are coordinating research efforts and resources to achieve the goals outlined in the *National Strategy for Ocean Mapping, Exploring, and Characterizing the United States Exclusive Economic Zone* (NOMEC Strategy).[23] The Ocean Science and Technology Subcommittee of the Ocean Policy Committee developed the NOMEC Strategy pursuant to a 2019 presidential memorandum.[24] Among the NOMEC Strategy's goals are to completely map the U.S. seafloor and to "explore and characterize priority areas," such as areas with potential for critical minerals.[25]

Reg. Sess. (Cal. 2022); S.B. 2575, 32nd Leg., Reg. Sess. (Haw. 2024); and Office of Governor Lemanu P.S. Mauga, Exec. Order No. 006-2024: An Order Implementing a Moratorium on Deep Seabed Mining Exploration and Exploitation Activities (Am. Sam. July 24, 2024).

[20] BOEM, "Offshore Critical Mineral Resources: Critical Minerals Occurring Offshore," https://www.boem.gov/marine-minerals/offshore-critical-mineral-resources.

[21] BOEM, *Budget Justification and Performance Information Fiscal Year 2025*, p. 93; and BOEM and USGS, "America's Offshore Critical Mineral Resources," fact sheet, pp. 1-2, https://www.boem.gov/sites/default/files/documents/marine-minerals/Critical%20Mineral%20State.pdf (hereinafter referred to as BOEM and USGS, "America's Offshore Critical Mineral Resources").

[22] BOEM, "Not Just Nodules," slide 15.

[23] Ocean Policy Committee, Ocean Science and Technology Subcommittee, National Ocean Mapping, Exploration, and Characterization (NOMEC) Council, *Implementation Plan for the National Strategy for Ocean Mapping, Exploring, and Characterizing the United States Exclusive Economic Zone*, January 2021 (hereinafter referred to as NOMEC Council, *Implementation Plan*). The U.S. exclusive economic zone is the ocean area located generally between 3 and 200 nmi from the shoreline (White House, "Proclamation 5030: Exclusive Economic Zone of the United States of America," 48 *Federal Register* 10605, March 10, 1983). For more information about U.S. ocean and coastal mapping efforts, see CRS Report R47623, *Frequently Asked Questions: Mapping of U.S. Ocean and Coastal Waters*, coordinated by Caitlin Keating-Bitonti.

[24] Executive Office of the President, "Ocean Mapping of the United States Exclusive Economic Zone and the Shoreline and Nearshore of Alaska," 84 *Federal Register* 64699, November 22, 2019. The Ocean Policy Committee was established in 2018 through Executive Order 13840, "Ocean Policy to Advance the Economic, Security, and Environmental Interests of the United States," and codified by the William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021 (P.L. 116-283), Title X, Subtitle E.

[25] NOMEC Council, *Implementation Plan*, pp. 15-16.

Outer Continental Shelf Areas with Potential for Critical Minerals

Seabed deposits with critical mineral resources likely occur throughout the OCS, but not all deposits will be economically viable.[26] The types and quantities of critical minerals within seabed deposits vary geographically based on local seawater chemistry, porewater chemistry with seafloor sediments, or the resulting seawater chemistry from hot hydrothermal fluids interacting with seafloor crustal rocks.[27] Volcanic activity at ocean ridges or hydrothermal vents often increases the concentration of dissolved metals in the surrounding seawater.[28] In these areas, minerals can precipitate from the seawater onto the seabed, forming mineral deposits of potential economic value.[29]

BOEM, NOAA, and USGS work together to determine which areas of the OCS have potential for critical minerals.[30] BOEM has funded several offshore critical mineral assessment projects on the OCS.[31] In the Pacific, these projects included sites located off the western Aleutian Islands, offshore of Alaska, and in the Escanaba Trough, offshore of California (**Figure 1**).[32] BOEM, NOAA, and USGS first explored seafloor massive sulfide deposits in the Escanaba Trough in the early 1980s.[33] These three agencies also have an ongoing study through FY2027 to investigate the western Aleutian Islands for hydrothermal deposits with potential for critical minerals.[34]

BOEM and USGS are collaborating to assess the offshore areas around Hawaii and the U.S. Pacific Island territories for critical minerals. BOEM anticipates that U.S. Pacific Island territorial areas (e.g., American Samoa, Guam, Northern Mariana Islands) may have seamounts with ferromanganese crusts and polymetallic nodule deposits on the surrounding abyssal plains within U.S. national jurisdiction.[35] In FY2022, BOEM, NOAA, and USGS used seafloor mapping technologies to investigate polymetallic nodule potential offshore of Hawaii in areas adjacent to the Clarion-Clipperton Zone, a 1.7 million-square-mile area of the international seafloor with high commercial interest.[36] BOEM stated in its FY2025 budget justification that it planned to work with USGS and academic researchers to collect bottom samples from specific sites located off Hawaii.[37]

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[26] BOEM and USGS, "America's Offshore Critical Mineral Resources," p. 5.

[27] USGS, "Global Marine Mineral Resources," June 15, 2022, https://www.usgs.gov/centers/pcmsc/science/global-marine-mineral-resources.

[28] For example, see National Oceanic and Atmospheric Administration (NOAA), "Hydrothermal Systems in Escanaba Trough," https://oceanexplorer.noaa.gov/explorations/22escanaba/features/hydrothermal-systems/hydrothermal-systems.html.

[29] For example, see USGS, "Critical Minerals in the EEZ," June 5, 2020, https://www.usgs.gov/news/featured-story/critical-minerals-eez.

[30] BOEM, *Budget Justification and Performance Information Fiscal Year 2025*, p. 92.

[31] For example, see BOEM, "Marine Mineral Resource Evaluation Studies," https://www.boem.gov/marine-minerals/marine-mineral-research-studies/marine-mineral-resource-evaluation-studies.

[32] BOEM, "Not Just Nodules," slide 16.

[33] BOEM, *Budget Justification and Performance Information Fiscal Year 2025*, p. 93.

[34] Ibid.; and BOEM, "Seamount Benthic Mapping and Characterization for Deep-Sea Corals, Benthic Ecosystems, and Critical Minerals of the Aleutian Islands," MM-21-04, https://www.boem.gov/sites/default/files/documents/environment/environmental-studies/MM-21-04_3.pdf.

[35] BOEM, *Budget Justification and Performance Information Fiscal Year 2025*, p. 92.

[36] Ibid., p. 94. For more information about the Clarion-Clipperton Zone, see CRS Infographic IG10053, *Seabed Mining in the Clarion-Clipperton Zone*, by Caitlin Keating-Bitonti, Corrie E. Clark, and Emma Kaboli.

[37] BOEM, *Budget Justification and Performance Information Fiscal Year 2025*, pp. 93-94.

In the Atlantic, BOEM and USGS plan to investigate critical mineral resources north of Puerto Rico within U.S. jurisdiction.[38] Previous seafloor mapping and sediment core data indicate the presence of polymetallic nodules in the region north of the Puerto Rico Trench.[39] BOEM also has participated in federally funded studies to investigate a nodule field located on the Blake Plateau off the state of Georgia (**Figure 1**).[40] However, federal studies of the Blake Plateau nodule field have focused on ecosystem recovery post-seabed disturbance, not the potential for critical minerals within the nodule field.[41] In the 1970s, a private company conducted an experimental seabed mining pilot project on the Blake Plateau to test the nodule collecting capability of its mining machinery.[42] In 1982, USGS visited the pilot project's site to mark the area for future studies.[43] BOEM, NOAA, and USGS have returned to this site several times over the past five years to study the potential long-term environmental impacts of seabed mining.[44]

In the Gulf of Mexico, BOEM plans to study the potential for critical minerals in salt brine deposits.[45]

Critical Minerals Environmental Assessment Framework

BOEM identified that information about baseline conditions of offshore environments with potential for critical minerals is "sparse."[46] BOEM, in collaboration with the National Academies of Sciences, Engineering, and Medicine (NASEM), has been developing *environmental baseline* information acquisition and assessment standards for critical mineral-related activities on the OCS.[47] Such baseline data could facilitate BOEM's evaluation of future requests for lease sales (see further discussion below under "Mineral Leasing on the U.S. Outer Continental Shelf"). Specific research questions to be addressed by BOEM and NASEM include the following:

[38] Ibid., p. 93.

[39] Kathryn M. Scanlon and Douglas G. Masson, "Fe-Mn Nodule Field Indicated by GLORIA, North of the Puerto Rico Trench," *Geo-Marine Letters*, vol. 12 (1992), pp. 208-213.

[40] BOEM, "Scientists Explore Site of Historic Seabed Mining Equipment Testing Offshore Georgia," December 20, 2022, https://www.boem.gov/newsroom/ocean-science-news/scientists-explore-site-historic-seabed-mining-equipment-testing. Hereinafter referred to as BOEM, "Scientists Explore Site of Historic Seabed Mining."

[41] NOAA, "Investigation of a Historic Seabed Mining Equipment Test Site on the Blake Plateau," https://oceanexplorer.noaa.gov/explorations/22seabed-mining/welcome.html. Hereinafter referred to as, NOAA, "Investigation of a Historic Seabed Mining Equipment Test Site on the Blake Plateau."

[42] Ibid.

[43] NOAA, "Searching for Historic Deep-Sea Mining Impacts on the Blake Plateau," November 7, 2019, https://oceanexplorer.noaa.gov/okeanos/explorations/ex1907/logs/nov7/nov7.html. Hereinafter referred to as, NOAA, "Searching for Historic Deep-Sea Mining Impacts on the Blake Plateau."

[44] BOEM, "Scientists Explore Site of Historic Seabed Mining."

[45] BOEM, *Budget Justification and Performance Information Fiscal Year 2025*, p. 93.

[46] BOEM, Marine Minerals Program, *Developing a Critical Minerals Environmental Assessment Framework (CMEAF) for Critical Mineral Activities*, February 10, 2023, pp. 1-4, see p. 1. Hereinafter referred to as BOEM, *Developing a CMEAF for Critical Mineral Activities*.

[47] Knowledge of the environmental baseline condition of a proposed site for seabed mining can be used to forecast the effects of mining activities or evaluate impacts to the marine environment. BOEM, *Budget Justification and Performance Information Fiscal Year 2025*, p. 93. In 2015, BOEM and NASEM established a committee to assist BOEM in "its efforts to manage development of the nation's offshore energy resources in an environmental and economically responsible way" (NASEM, "Standing Committee on Environmental Science and Assessment for Ocean Energy Management," https://www.nationalacademies.org/our-work/standing-committee-on-environmental-science-and-assessment-for-ocean-energy-management).

1. What is the baseline environment associated with deep sea critical mineral resources?

2. What are the potential impacts associated with deep sea critical mineral prospecting and operations activities?

3. What are potential mitigations that can be applied to deep sea critical mineral prospecting and operations activities?[48]

BOEM and NASEM have stated they will engage with affiliated academic partners to develop environmental recommendations and solicit information from stakeholders related to environmental assessment of offshore critical mineral activities.[49]

Mineral Leasing on the U.S. Outer Continental Shelf

BOEM has authority under the Outer Continental Shelf Lands Act of 1953 (OCSLA; 43 U.S.C. §§1331-1356c) to lease areas of the OCS for critical mineral exploration and development.[50] Pursuant to this authority, BOEM has issued regulations addressing leasing for non-oil and gas minerals, including critical minerals.[51] To date, BOEM has not held any lease sales for critical minerals on the OCS or issued any critical mineral leases.[52] In 1991, BOEM's predecessor agency planned a lease sale in the Alaska region for gold (which is not considered a critical mineral) and associated minerals but received no bids. Earlier, in the 1960s, the federal government had issued several leases for marine phosphate mining off the California coast; these leases were later terminated. See the section entitled "Selected Previous Federal Lease Sales for Marine Minerals," below, for further discussion.

The leasing regulations that pertain to non-oil and gas minerals, including critical minerals, cover *prospecting* (pre-lease exploration for marine minerals, including geological and geophysical [G&G] explorations), *leasing* of rights for mineral development, and *operations* under a lease.[53] Commercial prospecting for marine minerals, such as through G&G surveys, requires a BOEM-issued permit unless conducted by an existing leaseholder in that entity's lease area.[54] Data acquired through prospecting must be shared with BOEM.[55] A prospecting permit is separate from a lease to develop minerals in an area, and the prospecting permit does not convey any

[48] BOEM, *Developing a CMEAF for Critical Mineral Activities*, p. 3.

[49] Ibid., p. 3. Stakeholder groups would include nongovernmental organizations, environmental groups, industry, tribes, and other Indigenous groups.

[50] Provisions of the Outer Continental Shelf Lands Act of 1953 (OCSLA) at 43 U.S.C. §1337(k)(1) authorize the Secretary of the Interior to grant leases "of any mineral other than oil, gas, and sulphur in any area of the outer Continental Shelf not then under lease for such mineral ... " In 2022, P.L. 117-169, commonly known as the Inflation Reduction Act of 2022 (IRA), expanded the definition of the OCS in the OCSLA to include submerged lands offshore of U.S. territories. As of December 2024, BOEM's regulations for critical mineral leasing continue to reflect the previous definition of the OCS, prior to the IRA amendment. For further discussion, see the section of this report on "Critical Mineral Leasing Offshore of U.S. Territories."

[51] BOEM regulations pertaining to leasing for minerals other than oil, gas, and sulfur are at 30 C.F.R. Parts 580-582. Regulations elsewhere in Title 30, Subchapter B, cover leasing for oil, gas, and sulfur.

[52] BOEM briefing to CRS, March 7, 2024.

[53] 30 C.F.R. Parts 580-582.

[54] Separate rules apply for activities undertaken for purposes of scientific research (30 C.F.R. §580.11).

[55] 30 C.F.R. §§580.24, 580.40-580.52. The data generally are protected from public disclosure for specified lengths of time under BOEM regulations at 30 C.F.R. §§580.70-580.73.

preferential right to a lease.[56] For further discussion of this point, see the section below on "Preferential Rights to Lease the Prospecting Area for Critical Minerals."

The leasing process may start with an unsolicited request for a lease sale or by BOEM's own initiative.[57] In either case, BOEM would publish in the *Federal Register* a request for interest, which could specify particular areas or minerals to be considered.[58] BOEM selects the areas to be offered at a lease sale based on industry interest, resource information, environmental data, and the recommendations of any joint state-federal task force.[59] Leases are awarded through a competitive cash auction.[60] Unless otherwise specified in the leasing notice, the lease would include rights to all minerals within the leased area except for oil, gas, sulfur, and certain other reserved commodities.[61] Agreements for the use of OCS sand, gravel, and shell resources may be negotiated noncompetitively, outside of the lease sale process.[62]

To conduct operations once a lease is secured, a lessee must obtain BOEM's approval of multiple plans (along with any permits or approvals that may be required from other agencies under various laws).[63] A *delineation plan* describes activities the lessee will take to locate and characterize the minerals; it also generates information needed for subsequent plans.[64] Among other information, this includes the mineral(s) of primary interest and how they will be located and evaluated, what types of equipment will be used, where test mining will occur, anticipated impacts to the marine environment and how they will be addressed, and potential conflicts with other ocean users. A *testing plan* governs the lessee's program for pilot mining and testing activities, including information on testing locations and methods, equipment to be used, anticipated environmental impacts and how they will be addressed, and other information.[65] For subsequent development and production, the lessee must obtain approval of a *mining plan* that includes "comprehensive detailed descriptions, illustrations, and explanations of the proposed OCS mineral development, production, and processing activities," as well as plans to address environmental impacts and plans to clear the lease area when mining activities end.[66]

BOEM's sister agency, the Bureau of Safety and Environmental Enforcement (BSEE), enforces a lessee's compliance with its BOEM-approved plans. BSEE has promulgated regulations that apply to mineral exploration and development,[67] but to date these activities have not occurred on the OCS. Among other things, the BSEE regulations include provisions for inspections of mining operations, environmental protection measures, penalties for violating requirements and plans, and circumstances under which BSEE would suspend operations and production.

[56] BOEM and USGS, "America's Offshore Critical Mineral Resources," p. 5.

[57] 30 C.F.R. §§581.11-581.12.

[58] 30 C.F.R. §581.12.

[59] 30 C.F.R. §581.14.

[60] 30 C.F.R. §§581.18-581.21.

[61] 30 C.F.R. §581.8.

[62] 30 C.F.R. Part 583.

[63] For example, some offshore mineral exploration and development activities could require authorizations from NOAA under Section 101(a) of the Marine Mammal Protection Act (16 U.S.C. §1371(a)(5)(A)-(E)) and Section 7 of the Endangered Species Act (16 U.S.C. §1536), or from the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act (33 U.S.C. §1344) and Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. §403).

[64] 30 C.F.R. §582.22.

[65] 30 C.F.R. §583.23.

[66] 30 C.F.R. §583.24.

[67] 30 C.F.R. §§280-282.

Selected Previous Federal Lease Sales for Marine Minerals

In 1961, the Department of the Interior issued six leases for marine phosphate mining on the California OCS.[68] These six leases were terminated, however, following the "discovery of unexploded naval missiles on the ocean floor."[69]

In 1991, the Minerals Management Service, BOEM's predecessor agency, offered a marine mineral lease sale for gold and associated minerals in placer deposits in Alaska's Norton Sound, offshore of Nome (between 3 and 14 miles offshore in water depths from 66 to 99 feet).[70] This offshore area, encompassing approximately 147,000 acres, was adjacent to a mined area in Alaska state waters and upland mining areas.[71] No bids were received by the bid deadline, and no sale occurred.[72] According to one analysis, industry indicated that "low gold prices, limited availability of mining vessels, lowest point of price curve swing, difficulty in obtaining capital financing, better opportunities in State waters, and legal uncertainty" contributed to the lack of bids.[73] Neither phosphate nor gold is consider a critical mineral, according to the USGS's 2022 list of 50 critical minerals.[74]

Issues for Congress

As the United States works to strengthen its domestic critical mineral supply chain, Congress may consider BOEM's role in evaluating areas of the OCS and leasing submerged lands for critical minerals, as well as the potential roles of other federal agencies. The sections below examine five potential issues for Congress: first, federal funding for BOEM's critical mineral activities; second, BOEM's leasing regulations for marine minerals; third, potential critical mineral leasing offshore of U.S. territories; fourth, potential interpretations by U.S. Customs and Border Protection (CBP) of certain U.S. statutes for vessels engaging in seabed mining activities on the OCS; and fifth, potential marine environmental impacts of seabed mining.

Funding for BOEM Critical Mineral Activities

Congress may consider whether BOEM's resources to evaluate and assess mineral resources on the OCS, conduct any leasing activities, and ensure effective environmental stewardship should be increased, decreased, or retained at current levels. Some stakeholders advocate for additional investment to facilitate exploration and development of critical minerals on the U.S. OCS. Others oppose additional investment, contending that seabed mining is an "unproven industrial endeavor" that may carry "potential financial and legal liabilities for both public and private

[68] USGS, *Mineral Resource Management of the Outer Continental Shelf*, Geological Survey Circular 720, 1975, p. 3; and U.S. Department of the Interior, Minerals Management Service (MMS), *Federal Offshore Statistics: 1995*, OCS Report MMS 97-0007, 1997, p. 6.

[69] U.S. Department of the Interior, MMS, *Federal Offshore Statistics: 1995*, OCS Report MMS 97-0007, 1997, p. 6.

[70] Anthony C. Giordano, "A Case Study of the Norton Sound Alaska Marine Mineral Lease Sale Process," in *Proceedings of the 1991 Exclusive Economic Zone Symposium on Mapping and Research: Working Together in the Pacific EEZ*, eds. Millington Lockwood and Bonnie A. McGregor (Portland, OR: United States Government Printing Office, 1992), pp. 72-76.

[71] Ibid.

[72] Ibid.

[73] Ibid. Two pending legal actions requesting a preliminary injunction were before the United States District Court for the District of Alaska related to the 1991 proposed sale (Nome Eskimo Community and others v. Lujan).

[74] USGS, "2022 List of Critical Minerals."

investors."[75] In addition, some stakeholders oppose seabed mining, arguing that the risks and impacts of seabed mining remain unknown due to insufficient scientific information on the deep sea (see "Potential Marine Environmental Impacts of Seabed Mining," below).[76]

In particular, Congress may consider the structure and funding of BOEM's Marine Minerals Program, which implements the agency's critical mineral activities among other non-oil and gas activities. Historically, the program's funding and full-time equivalent (FTE) employees have focused primarily on provision of offshore sand and gravel resources (e.g., for beach nourishment projects), with fewer resources going to critical mineral-related activities. In FY2024, the Marine Minerals Program budget was $13.8 million.[77] Of this amount, $6.2 million (45%) went toward sand and gravel activities and $2.1 million (15%) went toward critical minerals-related activities.[78] As of July 2024, 21 of the 25 authorized FTE positions for the Marine Minerals Program were filled;[79] of those filled positions, two are "focused on critical minerals," although other BOEM staff may support critical mineral functions on a part-time basis.[80] Congress may consider desired funding levels for the program and whether to direct any changes in the balance of critical mineral activities versus those related to sand and gravel resources.

BOEM also collaborates with other federal agencies to study critical minerals on the OCS. Seabed deposits with potential for critical minerals typically occur in deeper-water environments located beyond the continental shelf (see **Table 1**), and data collection in such environments may be resource and time intensive. As of January 2024, 52% of the U.S. seafloor had been mapped (not including the U.S. extended continental shelf declared in 88 *Federal Register* 88470; see **Figure 1**).[81] Congress may consider whether to support federal agencies to map, explore, or characterize certain areas of the OCS, which may elucidate the occurrence, quantity, and potential composition of certain marine deposits.[82] Considerations could include tradeoffs between such activities and other uses of limited federal funds.

Another option to address data gaps regarding the occurrence, quantity, and quality of critical minerals on the OCS could be to direct additional activities under the Marine Minerals Resources

[75] For example, see The Ocean Foundation, *Deep Sea Mining Isn't Worth the Risk: High Costs, Finance Developments Since 2021, and Externalities Stand to Diminish Theoretical Returns on Investment*, 2024, p. 4. Hereinafter referred to as The Ocean Foundation, *Deep Sea Mining Isn't Worth the Risk*.

[76] For example, see Letter from U.S. Representatives Grijalva, Case, Tlaib, Huffman, Norton, McCollum, Cohen, Lofgren, Jackson, Kamlager-Dove, Garcia, and Jayapal to President Biden, June 28, 2024, https://plus.cq.com/pdf/8043575. Hereinafter referred to as Letter from U.S. Representatives Grijalva et al., to President Biden, June 28, 2024.

[77] Explanatory statement for P.L. 118-42, Consolidated Appropriations Act, 2024, *Congressional Record*, vol. 170, no. 39 (March 5, 2024), p. S1810.

[78] See page 5 of BOEM's "Marine Minerals Story Map" at the NASEM Standing Committee on Environmental Science and Assessment for Ocean Energy Management: April Meeting (April 2-3, 2024). The story map is available at https://www.nationalacademies.org/event/42335_04-2024_standing-committee-on-environmental-science-and-assessment-for-ocean-energy-management-april-meeting. Hereinafter referred to as BOEM, "Marine Minerals Story Map." The remainder of the funding went to personnel (33%), executive direction (5%), and program support (2%). The Administration's FY2025 budget request included $14.8 million for BOEM's Marine Minerals Program (BOEM, *Budget Justification and Performance Information Fiscal Year 2025*, p. 81).

[79] Email correspondence from BOEM to CRS, August 15, 2024.

[80] Ibid.; and BOEM, "Marine Minerals Story Map," p. 6.

[81] Department of State, "Continental Shelf and Maritime Boundaries; Notice of Limits," 88 *Federal Register* 88470, December 21, 2023; and Interagency Working Group on Ocean and Coastal Mapping, *Progress Report: Unmapped U.S. Waters*, March 2024, https://iocm.noaa.gov/documents/mapping-progress-report2024.pdf.

[82] For example, see NOAA, "Chapter Four: Why Map the Seafloor? To Keep Us—and Natural Resources—Safe," https://oceanexplorer.noaa.gov/world-oceans-day-2015/why-map-the-seafloor-to-keep-us-and-natural-resources-safe.html; and USGS, "Deep Sea Exploration, Mapping and Characterization," https://www.usgs.gov/special-topics/deep-sea-exploration%2C-mapping-and-characterization.

Act of 1996 (MMRA; P.L. 104-325). The MMRA authorized the Secretary of the Interior to "establish and carry out a program of research on marine mineral resources."[83] The research program includes the following goals:

> (1) promote research, identification, assessment, and exploration of marine mineral resources in an environmentally responsible manner;
>
> (2) assist in developing domestic technologies required for efficient and environmentally sound development of marine mineral resources;
>
> (3) coordinate and promote the use of technologies developed with Federal assistance, and the use of available Federal assets, for research, identification, assessment, exploration, and development of marine mineral resources; and
>
> (4) encourage academia and industry to conduct basic and applied research, on a joint basis, through grants, cooperative agreements, or contracts with the Federal Government.

Congress mandated a research program under the MMRA, but has not appropriated funds to support the program's research objectives such as awarding grants or entering into cooperative agreements with eligible entities related to the identification, assessment, and exploration of marine mineral resources.[84] Additionally, three Marine Mineral Technology Centers, authorized under the MMRA,[85] have closed due to lack of funding.[86] Some stakeholders might object to additional funding for MMRA activities because funding for environmental studies is not explicitly included in the statute, although the MMRA does direct research centers to identify, assess, explore, and manage marine mineral resources in an "environmentally sound manner."[87] Others might contend that appropriations for the MMRA could encourage the development of lower-impact recovery technologies, mitigations, and practices for deep-sea critical mineral data and sample collection.[88]

Preferential Rights to Lease the Prospecting Area for Critical Minerals

BOEM's critical mineral leasing regulations require that a developer obtain a permit to explore (prospect) in any unleased areas, but this permit does not convey the preferential right to lease the prospecting area (see "Mineral Leasing on the U.S. Outer Continental Shelf," above).[89] In this respect, BOEM's regulatory framework differs from that of the International Seabed Authority (ISA) for seabed mining activities in waters beyond national jurisdiction, in that the ISA gives "preference and priority" to prospectors (holders of "exploration" contracts) when awarding seabed mining ("exploitation") contracts.[90] BOEM's approach for critical mineral prospecting on

[83] 30 U.S.C. §1902.

[84] BOEM, "Not Just Nodules," slide 21. 30 U.S.C. §1904.

[85] 30 U.S.C. §1903(a).

[86] BOEM, "Not Just Nodules," slide 21.

[87] 30 U.S.C. §1904(d)(4).

[88] BOEM, "Not Just Nodules," slide 23.

[89] BOEM and USGS, "America's Offshore Critical Mineral Resources," p. 5. An exception to the permit requirement would be for prospecting conducted by an existing leaseholder in an already leased area.

[90] The International Seabed Authority (ISA) is an autonomous organization that regulates parties to the United Nations Convention on the Law of the Sea (UNCLOS) conducting mineral-related activities in areas beyond national jurisdiction. Article 10 of the Annex to UNCLOS states that an operator that holds an ISA-issued exploration contract "shall have a preference and a priority among applicants for a plan of work covering exploitation of the same area and resources." See United Nations, *United Nations Convention on the Law of the Sea of 10 December 1982, Overview and* (continued...)

the OCS is similar to its framework for geological and geophysical (G&G) explorations for OCS oil and gas, in that a BOEM permit for pre-lease G&G activities in the oil and gas context also does not convey any preference in subsequent leasing of the area for oil and gas development.[91] With regard to the seabed mining industry, BOEM has suggested that some mining companies could be dissuaded from engaging in prospecting by the current regulatory structure, in which a company could conduct assessments and environmental studies as part of a prospecting permit but then lose its bid to lease the prospecting area.[92] Congress could consider whether to direct BOEM to give prospecting companies preferential rights to lease the prospecting area, similar to the ISA. Such a change in BOEM's regulations for critical mineral leasing could encourage U.S. mining companies to seek prospecting permits, thereby increasing the chances that the mining companies would subsequently obtain a lease and produce critical minerals. However, since prospecting permits may be awarded noncompetitively under current regulations,[93] granting a prospecting entity preferential rights to a lease could be seen by some to favor certain companies over others. Such a change also could reduce revenues that the federal government would receive from a competitive lease auction. Some may contend that even without a preferential right to a lease, the chance to gain proprietary geological data about a seabed area would be sufficient to incentivize companies to engage in prospecting in some cases.[94]

Critical Mineral Leasing Offshore of U.S. Territories

P.L. 117-169, commonly known as the Inflation Reduction Act of 2022 (IRA), amended the definition of the OCS in the OCSLA to include submerged lands offshore of U.S. territories as part of the OCS.[95] The IRA also amended the definition of *state* in the OCSLA to include Puerto Rico, Guam, American Samoa, the U.S. Virgin Islands, and the Northern Mariana Islands.[96] Although the IRA provisions primarily related to leasing for wind energy development offshore of the territories, the expanded definition of the OCS would appear to also make territorial submerged lands available for critical mineral leasing. This is because the OCSLA broadly authorizes the Secretary of the Interior to grant non-oil and gas mineral leases in "any area of the outer Continental Shelf not then under lease for such mineral."[97] To date, BOEM's regulations for critical mineral leasing continue to reflect the OCSLA's earlier definition of the OCS, without the IRA amendments to include submerged lands offshore of U.S. territories.[98]

Full Text, https://www.un.org/depts/los/convention_agreements/convention_overview_convention.htm; and Regulation 24 in ISA, *Decision of the Council of the International Seabed Authority relating to amendments to the Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area and related matters*, ISBA/19/C/17, July 22, 2013. The United States is not a party to UNCLOS and is not a member of the ISA.

[91] 30 C.F.R. Part 551. For both oil and gas geological and geophysical exploration and critical mineral prospecting, the regulations separately provide for existing leaseholders to conduct these exploratory activities in lease areas they already hold, in which case the lessee would have exclusive development rights on its own lease.

[92] BOEM and USGS, "America's Offshore Critical Mineral Resources," p. 5.

[93] 30 C.F.R. Part 580, Subpart B.

[94] BOEM regulations require that prospecting companies share the geological data they obtain with BOEM, but the agency keeps the data confidential for specified periods of time (30 C.F.R. §§580.70-580.73).

[95] 43 U.S.C. §1331(a). As amended, the act states: "The term 'outer Continental Shelf' means—(1) all submerged lands lying seaward and outside of the area of lands beneath navigable waters as defined in section 1301 of this title, and of which the subsoil and seabed appertain to the United States and are subject to its jurisdiction and control or within the exclusive economic zone of the United States and adjacent to any territory of the United States; and (2) does not include any area conveyed by Congress to a territorial government for administration."

[96] 43 U.S.C. §1331.

[97] 43 U.S.C. §1337(k)(1).

[98] 30 C.F.R. §581.3.

The IRA provisions directed the Secretary of the Interior to pursue wind leasing activities offshore of the territories, while specifying that oil and gas leasing shall not apply to U.S. territories.[99] The IRA did not address potential marine (critical) mineral leasing off U.S. territories. Congress may seek to clarify its intent for critical mineral leasing on the areas of the OCS adjacent to U.S. territories—whether BOEM should allow or restrict critical mineral leasing in these areas. Congress may consider making this clarification in light of areas off U.S. territories that have been identified as having (or are anticipated to have) potential for critical mineral resources, such as American Samoa, Guam, the Northern Mariana Islands, and Puerto Rico (see "Outer Continental Shelf Areas with Potential for Critical Minerals," above). Congress could choose to restrict critical mineral leasing in these areas (e.g., for environmental protection and conservation purposes) or direct BOEM to offer leases in these areas (e.g., to help build domestic critical mineral supply, pursuant to E.O. 13817). Alternatively, Congress could allow BOEM to determine whether to pursue any critical mineral leasing activities under current authorities.[100]

Jones Act and Dredge Act Applicability to Critical Mineral Leasing[101]

The Jones Act (Section 27 of the Merchant Marine Act of 1920; P.L. 66-261) requires that waterborne transportation between "U.S. points" be conducted only by vessels built in the United States and owned and crewed by U.S. citizens.[102] The same requirement applies to dredging vessels under the Dredge Act of 1906 (P.L. 59-185). The Jones Act is applicable to U.S. states and Puerto Rico, but not to U.S. territories and possessions in the Pacific Ocean. CBP has determined that the Dredge Act is applicable to U.S. territories.[103]

One or both of these laws could potentially apply to various aspects of critical mineral development on the OCS, including mining activities and transportation of mined seabed material from the OCS to the U.S. mainland for processing. With regard to the latter, the United States currently "lacks domestic processing and manufacturing capabilities for some critical minerals," but some stakeholders have proposed development of domestic processing facilities.[104]

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[99] 43 U.S.C. §§1344(i), 1356c.

[100] The Governor of American Samoa issued an order in July 2024 banning deep seabed mining in the territorially controlled waters directly off American Samoa. Office of the Governor of American Samoa, Executive Order 006-2024, "An Order Implementing a Moratorium on Deep Seabed Mining Exploration and Exploitation Activities," July 24, 2024, https://www.americansamoa.gov/_files/ugd/4bfff9_cea25f51dcb84d0bbe5bbac7db513477.pdf.

[101] This section was authored by John Frittelli, CRS Specialist in Transportation Policy.

[102] Some seabed mining operations require two vessels: a production support vessel and a transport vessel. For more information on the Jones Act, see CRS Report R45725, *Shipping Under the Jones Act: Legislative and Regulatory Background*, by John Frittelli.

[103] Department of Homeland Security (DHS), U.S. Customs and Border Protection (CBP), "Application of the Dredge Statute (46 U.S.C. App. 292) to Dredging in American Samoa," Customs Ruling HQ 111878, September 4, 1991; and DHS, CBP, "Dredging; 46 U.S.C. § 55109," Customs Ruling HQ H327270, November 14, 2022. Customs rulings can be accessed at https://rulings.cbp.gov/home.

[104] U.S. Department of Commerce, *A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals*, June 4, 2019, https://www.commerce.gov/sites/default/files/2020-01/Critical_Minerals_Strategy_Final.pdf. Some stakeholders have proposed Texas as a potential site for a smelting or refining facility for processing critical minerals from polymetallic nodules, a proposal that some Members of Congress have supported (Rifat Jabbar et al., *Polymetallic Nodules and the Critical Mineral Supply Chain: A North American Approach*, Wilson Center, pp. 11-12; and James Osborne, "Texas Congressmen Angling to Have Deep-Sea Mined Minerals Refined on the Gulf Coast," *Houston Chronicle*, December 13, 2023, https://www.houstonchronicle.com/business/energy/article/deep-sea-minerals-gulf-(continued...)

CBP interprets the Jones Act and the Dredge Act for vessels engaging in U.S. offshore activity. Based on its prior interpretations for vessels supporting offshore oil, gas, and wind development, the agency could find the Jones Act applicable to vessels transporting minerals from an offshore mining site to a U.S. onshore point, as well as to vessels transporting supplies to an offshore site. In a 1988 ruling, CBP found that a vessel engaging in offshore phosphorus mining off the coast of North Carolina would be considered a dredge and therefore would be required to be U.S. built, owned, and crewed.[105] Similarly, CBP determined that pipe-laying vessels that dig a trench in the seafloor to lay pipe also are dredging vessels and thus must comply with the Dredge Act.[106] However, CBP determined that cable-laying vessels are not dredge vessels because they construct only a temporary slot in the sea floor.[107]

CBP's working definition of dredging is "the use of a vessel equipped with excavating machinery in digging up or otherwise removing submarine material"; however, in one ruling, the agency noted an alternative definition from the International Maritime Dictionary that defines dredging as a "vessel or floating structure equipped with excavating machinery, employed in deepening channels and harbors, and removing submarine obstructions such as shoals and bars."[108] This alternative definition could exclude mining vessels, as their purpose is not to deepen channels or harbors.

Based on these prior determinations, it is not clear whether CBP would consider modern seabed mining vessels to be dredging vessels or if its interpretation would depend on the method or technology used for mining. For instance, in the oil and gas sector, drill ships are not required to comply with these acts, nor are offshore oil and gas platforms.

The domestic build requirement can substantially impact the cost and availability of vessels. U.S. offshore vessel operators typically request a letter ruling from CBP concerning whether their proposed activity would require a Jones Act- or Dredge Act-compliant vessel. However, these letter rulings do not establish legal precedent and the agency has, in the past, proposed changing its interpretation. Thus, in addition to the cost and availability of U.S.-built vessels, uncertainty as to the regulatory landscape for vessels engaging in U.S. offshore mining could be an issue for Congress. Congress could consider whether to amend the Jones Act or Dredge Act to clarify whether vessels engaging in U.S. offshore mining and related transportation are subject to or exempt from these acts.

coast-refinery-18540332.php). In the 118th Congress, H.R. 7636 would instruct the President to direct certain federal departments to "coordinate and expedite across Federal agencies the development of infrastructure to process and refine seafloor [polymetallic] nodules within the United States." In addition, S. 5251 in the 118th Congress would direct the Secretary of Energy to establish a Domestic Critical Material Processing Pilot Program to support the processing of not fewer than three different types of critical materials, which may include seabed deposits with critical minerals.

[105] DHS, CBP, "Applicability of 46 U.S.C. App. 292 and 833 to the Exploration for, or the Extraction of, Resources from the Outer Continental Shelf Outside the United States Territorial Waters," Customs Ruling HQ 109081, May 12, 1988. BOEM found no records of a phosphate lease or of a company mining phosphate in or around 1988. BOEM interprets the CBP ruling as "not referencing an active lease, but rather as presenting a hypothetical situation" (Email correspondence from BOEM to CRS, November 1, 2024).

[106] DHS, CBP, "46 U.S.C. §55109; 43 U.S.C. 1333(a); Dredging, Outer Continental Shelf Lands Act; 43 U.S.C. §1333(a)(1)," Customs Ruling HQ H253621, August 14, 2014.

[107] DHS, CBP, "Coastwise Transportation; Undersea Cable Laying; Dredging; 46 U.S.C. §55102; 46 U.S.C. §55109; 19 C.F.R. §4.80b," Customs Ruling HQ H332364, July 25, 2023.

[108] DHS, CBP, "Dredging; 46 U.S.C. §55109," Customs Ruling HQ H327270, November 14, 2022.

Potential Marine Environmental Impacts of Seabed Mining[109]

Congress may weigh potential environmental impacts of mining on the OCS and consider whether certain federal agencies may work to mitigate such impacts. For example, BOEM, in collaboration with NASEM, has been developing environmental baseline information acquisition and assessment standards for critical mineral-related activities on the OCS (see "Critical Minerals Environmental Assessment Framework"). In addition, since 2019, BOEM, NOAA, and USGS have collaborated to study the long-term environmental impacts and ecosystem recovery of an area of the Blake Plateau disturbed during a 1970s seabed mining pilot project.[110] Congress may consider whether to support additional work by federal agencies to continue research on the Blake Plataea or other areas of the OCS that may elucidate the potential environmental impacts of seabed mining or provide environmental baseline information. Some stakeholders may oppose federal funding to study the impacts of seabed mining, characterized by some as an "unproven industry,"[111] especially in light of the rate at which energy technologies using critical minerals are evolving. Some critical minerals, including those found in seabed deposits, may be of less interest in the future, should technologies (e.g., electric vehicle batteries) no longer require them.[112]

Some Members of Congress contend that "there is currently insufficient scientific information on the deep sea and related marine ecosystems to fully and accurately assess the risks and impacts of deep seabed mining activities" and have introduced legislation to prohibit BOEM from conducting any hardrock mineral leasing activities on the OCS.[113] The potential effects of seabed mining on the marine environment remain incompletely understood. This is in part because commercial-scale seabed mining in areas beyond national jurisdiction under the ISA framework has yet to occur and only a few countries have allowed or tested seabed mining within their waters (see textbox above, "Countries Pursuing Seabed Mineral Resources on Their Continental Shelves"). Some stakeholders are concerned that seabed mining activities may:

- Cause deep-sea habitat disturbance and marine biodiversity loss;
- Disturb and disperse seafloor sediments, reducing water quality and clarity for benthic (i.e., living on or within the seafloor) organisms;
- Create sediment plumes along the seabed where mining activities are taking place and in the water column where processed seabed material is discharged back into the ocean;
- Crush, smother, or disperse benthic organisms;
- Harm or affect the behaviors of marine mammals and some large fish; and

[109] For more information about the potential marine environmental impacts of seabed mining that may be applicable to mining activities on the OCS, see CRS Report R47324, *Seabed Mining in Areas Beyond National Jurisdiction: Issues for Congress*, by Caitlin Keating-Bitonti, especially the section "Potential Marine Environmental Impacts of Seabed Mining."

[110] BOEM, "Scientists Explore Site of Historic Seabed Mining;" NOAA, "Investigation of a Historic Seabed Mining Equipment Test Site on the Blake Plateau;" and NOAA, "Searching for Historic Deep-Sea Mining Impacts on the Blake Plateau."

[111] The Ocean Foundation, *Deep Sea Mining Isn't Worth the Risk*.

[112] For example, Casey Crownhart, "How Sodium Could Change the Game for Batteries," *MIT Technology Reviews*, May 11, 2023, https://www.technologyreview.com/2023/05/11/1072865/how-sodium-could-change-the-game-for-batteries/.

[113] See H.R. 4537 in the 118th Congress.

- Alter natural marine process such as deep-sea carbon storage.[114]

Efforts to prohibit seabed mining activities on the OCS align with other proposals for a precautionary pause or moratorium on deep-seabed mining in international waters until there is sufficient scientific information and knowledge of the deep sea.[115] Proponents of seabed mining that is "properly managed with appropriate governance safeguards" argue that sourcing minerals from seabed deposits has the potential to create less pollution (e.g., tailings, waste), fewer impacts on freshwater sources, and fewer social impacts (e.g., human fatalities, injuries, health effects) compared with traditional land-based open-pit and underground mining.[116] Instances of terrestrial mining have been associated with drinking water contamination, air pollution, and alteration of landscapes, among other impacts.[117]

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[114] For example, see Diva Amon et al., "Assessment of Scientific Gaps Related to the Effective Environmental Management of Deep-Sea Mining," *Marine Policy*, vol. 138 (2022), pp. 1-22; Lisa Levin et al., "Defining 'Serious Harm' to the Marine Environment in the Context of Deep-Seabed Mining," *Marine Policy*, vol. 74 (2016), pp. 245-259; Kathryn Miller et al., "Challenging the Need for Deep Seabed Mining From the Perspective of Metal Demand, Biodiversity, Ecosystem Services, and Benefit Sharing," *Frontiers in Marine Science*, vol. 8 (July 2021), pp. 1-7, see p. 4; Holly Niner et al., "Deep-Sea Mining with No Net Loss of Biodiversity—An Impossible Aim," *Frontiers in Marine Science*, vol. 5 (2018); Beth Orcutt et al., "Impacts of Deep-sea Mining on Microbial Ecosystem Services," *Limnology and Oceanography*, vol. 17, no. 7 (2020), pp. 1489-1510; and Rahul Sharma, "Environmental Issues of Deep-Sea Mining," *Procedia Earth and Planetary Science*, vol. 11 (2015), pp. 204-211.

[115] As of December 2024, more than 60 companies have signed a business statement calling for a moratorium on deep-seabed mining (https://www.stopdeepseabedmining.org/endorsers/) and more than 30 foreign governments have called for a moratorium on deep-seabed mining (https://deep-sea-conservation.org/solutions/no-deep-sea-mining/momentum-for-a-moratorium/governments-and-parliamentarians/). Also, see Letter from U.S. Representatives Grijalva et al., to President Biden, June 28, 2024; and H.R. 4536 in the 118th Congress.

[116] For example, Daina Paulikas et al., "Life Cycle Climate Change Impacts of Producing Battery Metals from Land Ores versus Deep-Sea Polymetallic Nodules," *Journal of Cleaner Production*, vol. 275 (2020), p. 17.

[117] For example, Aboka Yaw Emmanuel et al., "Review of Environmental and Health Impacts of Mining in Ghana," *Journal of Health and Pollution*, vol. 8 (2018), pp. 43-52.