



Commercial Leasing for Minerals Offshore American Samoa: Biological Assessment and Essential Fish Habitat Assessment

Prepared for the National Marine Fisheries Service
in Accordance with Section 7(c) of the Endangered Species Act of 1973, and the
Magnuson-Stevens Fishery Conservation and Management Act, as Amended

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Table of Contents

List of Figures	iv
List of Tables	v
List of Abbreviations and Acronyms	vi
1 Background and Purpose	8
1.1 Background	8
1.2 Purpose of and Need for the Proposed Action	9
1.3 Consultation History with NOAA's NMFS	10
2 Proposed Federal Action	11
2.1 Leasing for Commercial Mining and Authorization of Preliminary Activities	11
2.2 Bathymetric, Geophysical, and Mapping Surveys	12
2.3 Other Environmental Surveys	14
2.3.1 Geological, Geotechnical, and Biological Sampling	14
2.3.2 Moorings and Equipment Placement	16
2.4 Vessel Trip and Number of Days for Surveys	18
2.5 Lost Survey Equipment	19
2.6 BMPs	19
3 Action Area	21
3.1 Fishing Industry	21
3.2 Vessel Traffic	24
3.3 Allisions and Collisions	27
3.4 Entrapment and Entanglement	28
3.5 Climate Change	29
3.6 Accidental Release of Pollutants and Marine Debris	30
4 Rangewide Status of Species and CH	32
4.1 Blue Whale (<i>Balaenoptera musculus</i>)	32
4.2 Fin Whale (<i>Balaenoptera physalus</i>)	35
4.3 Sei Whale (<i>Balaenoptera borealis</i>)	38
4.4 Humpback Whale (<i>Megaptera novaengliae</i>)	39
4.5 Gray Whale (<i>Eschrichtius robustus</i>)	43
4.6 Sperm Whale (<i>Physeter macrocephalus</i>)	49
4.7 Southern Resident Killer Whale (<i>Orcinus orca</i>)	50
4.8 False Killer Whale (<i>Pseudorca crassidens</i>)	52
4.9 North Pacific Right Whale (<i>Balaena japonica</i>)	55
4.10 Guadalupe Fur Seal (<i>Arctocephalus townsendii</i>)	55
4.11 Steller Sea Lion (<i>Eumetopias jubatus</i>)	56
4.12 Hawaiian Monk Seal (<i>Neomonachus schauinslandi</i>)	56
4.13 Leatherback Turtle (<i>Dermochelys coriacea</i>)	58
4.14 Pacific Loggerhead Turtle (<i>Caretta caretta</i>)	60
4.15 Green Turtle (<i>Chelonia mydas</i>)	60
4.16 Olive Ridley Turtle (<i>Lepidochelys olivacea</i>)	63
4.17 Hawksbill Turtle (<i>Eretmochelys imbricata</i>)	64
4.18 Oceanic Whitetip Shark (<i>Carcharhinus longimanus</i>)	65
4.19 Giant Manta Ray (<i>Mobula birostris</i>)	65
4.20 Eulachon (<i>Thaleichthys pacificus</i>)	66
4.21 Scalloped Hammerhead Shark (<i>Sphyrna lewini</i>)	66
4.22 Green Sturgeon (<i>Acipenser medirostris</i>)	67

4.23	Salmonid Fishes.....	68
4.24	Chambered Nautilus (<i>Nautilus pompilius</i>).....	76
4.25	Black Abalone (<i>Haliotis cracherodii</i>).....	76
4.26	White Abalone (<i>Haliotis sorenseni</i>).....	76
4.27	Sunflower Sea Star (<i>Pycnopodia helianthoides</i>).....	77
4.28	Coral Species.....	78
4.29	Giant Clam Species.....	81
5	BA: Effects of the Action	83
5.1	Active Acoustic Sound Sources	83
5.2	Allisions and Vessel Collisions	90
5.3	Entanglement and Entrapment.....	91
5.4	Disturbance to Feeding or Modified Prey Abundance.....	92
5.5	Habitat Disturbance.....	93
5.6	Accidental Release of Pollutants and Marine Debris	94
5.7	Impacts to Fishes and Invertebrates	96
5.7.1	Introduction	96
5.7.2	Regulatory and Biological Context.....	96
5.7.3	IPFs and Analysis	96
5.7.4	Cumulative and Indirect Effects.....	102
5.7.5	Conclusion.....	102
5.8	Impacts to CH	102
6	BA: Cumulative Effects and Conclusions for ESA-Listed Species.....	105
6.1	Cumulative Effects	105
6.2	Conclusion	105
7	EFH Assessment	111
7.1	Purpose	111
7.2	Project Description	111
7.3	EFH	111
7.3.1	American Samoa FEP	113
7.3.2	Pelagic FEP.....	114
7.3.3	The Hawai'i Archipelago FEP	114
7.3.4	Pacific Remote Islands Area (PRIA) FEP.....	115
7.3.5	Coastal Pelagic Species (CPS) FMP	116
7.3.6	Highly Migratory Species (HMS) FMP	117
7.3.7	Pacific Coast Groundfish (PCG) FMP.....	117
7.3.8	Pacific Coast Salmon FMP.....	118
7.4	Potential IPFs.....	119
7.5	Effects on EFH and Mitigations and BMPs.....	119
7.6	Cumulative Analysis.....	127
7.7	EFH Conclusion.....	128
8	BA References.....	129
9	EFH References	164
	Appendix A: Bureau of Ocean Energy Management Identification and Survey Assumption Memorandums	A-1
	Appendix B: BMPs for Protection of ESA-Listed Species	B-1

List of Figures

Figure 1. Map of the Proposed Action, which includes the American Samoa OCS, Hawaiian waters, and the U.S. West Coast	8
Figure 2. Buoy schematic.....	17
Figure 3. Vessel position density using AIS in and around American Samoa waters	25
Figure 4. Vessel activities in and around Hawaii waters	26
Figure 5. Vessel activities in and around the U.S. West Coast	27
Figure 6. Feeding BIAs for blue whales relative to the Action Area	34
Figure 7. Feeding BIAs for fin whales relative to the Action Area	37
Figure 8. Feeding BIAs for humpback whales relative to the Action Area within the West Coast	40
Figure 9. Reproductive BIAs for humpback whales relative to the Action Area in Hawaiian waters	41
Figure 10. Action Area and CH of Steller sealions, leatherback sea turtles, Southern Resident killer whales, and Central America and Mexico DPS of humpback whales	43
Figure 11. Feeding BIAs for gray whales relative to the Action Area	46
Figure 12. Migratory BIAs for gray whales relative to the Action Area	47
Figure 13. Reproductive BIA for gray whales relative to the Action Area	48
Figure 14. Small and resident BIAs of Southern Resident killer whales relative to the Action Area	51
Figure 15. Reproductive BIAs of Southern Resident killer whales relative to the Action Area	53
Figure 16. Action Area and location of the false killer whale and Hawaiian Monk seal critical habitats	54
Figure 17. Locations of black abalone and green sturgeon CH overlapping the Action Area.....	68
Figure 18. Action Area in American Samoa waters and location of the CH of the listed coral species.....	79

List of Tables

Table 1. Potential actions fitting the preliminary activity type and description evaluated in this BA	12
Table 2. HRG survey equipment considered during preliminary activities.....	13
Table 3. Estimated range of number of box core and/or free fall grab sample stations	15
Table 4. Estimated area of disturbance to the seafloor caused by box core and/or free fall grab surveys.....	16
Table 5. Estimated area of disturbance to the seafloor caused by placing UTP units to support AUV navigation and deploying moorings and landers for physical and biological data collections.....	18
Table 6. Vessel trips estimated for surveys and for equipment or mooring deployments (two lease areas)	19
Table 7. Marine mammal functional hearing groups and acoustic thresholds identifying the onset of auditory injury for marine mammals from impulsive and non-impulsive sound sources	84
Table 8. Hearing capabilities and acoustic thresholds identifying the onset of auditory injury of sea turtles from impulsive and non-impulsive sound sources.....	84
Table 9. Acoustic thresholds identifying the onset of physical and behavioral injury for fish.....	85
Table 10. Ranked classification of acoustic sources based on impacts to marine mammals.....	86
Table 11. Summary of BOEM's determinations for NMFS ESA-listed species and CH as <i>no effect</i> or <i>may affect</i> , but <i>not likely to be adversely affected</i> (NLAA) by the Proposed Action.....	106
Table 12. Management unit species for EFH within the U.S. Pacific Islands	112
Table 13. EFH within the U.S. West Coast EEZ	112

List of Abbreviations and Acronyms

ADCP	acoustic doppler current profiler
AIS	Automatic Identification System
AMP	Alternative Monitoring Plan
ASV	autonomous surface vessel
AUV	autonomous underwater vehicle
BA	Biological Assessment
BIA	biologically important area
BMP	best management practice
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
CH	critical habitat
CNMI	Commonwealth of the North Mariana Islands
CNP	Central North Pacific
CPS	Coastal Pelagic Species
CRE	Coral Reef Ecosystem
dB	decibel(s)
DP	dynamically positioned
DPS	distinct population segments
DVM	diel vertical migration
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EFHCA	Essential Fish Habitat Conservation Areas
EMF	electromagnetic field
ENP	Eastern North Pacific
ESA	Endangered Species Act
ESU	evolutionary significant units
FAD	Fish Aggregating Device
FEP	Fishery Ecosystem Plan
FFS	French Frigate Shoals
FMP	Fishery Management Plan
ft	foot/feet
FR	Federal Register
GPS	Global Positioning System
HAPC	Habitat Area of Particular Concern
HMS	Highly Migratory Species
HRG	high-resolution geophysical
IMO	International Maritime Organization
IPF	impact-producing factor
ISA	International Seabed Authority
km	kilometer(s)

kn	knot(s)
LBL	long baseline
m	meter(s)
MARPOL	International Convention for the Prevention of Pollution from Ships
MBARI	Monterey Bay Aquarium Research Institute
MHI	Main Hawaiian Islands
mi	mile(s)
MPA	marine protected areas
nmi	nautical mile(s)
NLAA	not likely to be adversely affected
NMFS	National Marine Fisheries Service
NOAA	National Oceanic & Atmospheric Administration
NTL	Notice to Lessees
NWHI	Northwestern Hawaiian Islands
OCS	Outer Continental Shelf
ONMP	Operational National Mitigation Protocol
PAH	polycyclic aromatic hydrocarbons
PAM	passive acoustic monitoring
PCB	polychlorinated biphenyl
PCFG	Pacific Coast Feeding Group
PCG	Pacific Coast Groundfish
PFMC	Pacific Fishery Management Council
PIRO	Pacific Islands Regional Office
PRIA	Pacific Remote Island Areas
PSO	protected species observer
ROV	remotely operated vehicle
SBP	sub-bottom profiler
UNCLOS	United Nations Convention on the Law of the Sea
USCG	U.S. Coast Guard
USACE	United States Army Corps of Engineers
USBL	ultra-short baseline
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USV	uncrewed surface vessel
WBG	World Bank Group
WNP	Western North Pacific
WPRFMC	Western Pacific Regional Fishery Management Council

1 Background and Purpose

1.1 Background

The mission of the United States (U.S.) Department of the Interior's Bureau of Ocean Energy Management (BOEM) is to manage development of U.S. Outer Continental Shelf (OCS) energy, mineral, and geological resources in an environmentally and economically responsible way. The OCS is the federally managed ocean area extending from the outer boundaries of U.S. controlled waters 3 nautical miles (nmi) to 200 nmi from shore, with some exceptions.

BOEM initiated a Request for Information and Interest on June 16, 2025, with intent to potentially lease for seabed minerals within the eastern OCS of American Samoa. American Samoa is a U.S. Territory located in the South Pacific Ocean. On October 15, 2025, BOEM's Acting Director signed the Area Identification Memorandum (**Appendix A**) describing an area covering approximately 134,097 km², with water depths ranging from 1,400–6,000 m. This OCS area is 150 mi from Tutuila and 104 mi from Manu'a Islands. This OCS area partially borders the Rose Atoll Marine National Monument, which is 57 mi from Rose Atoll (**Figure 1**).

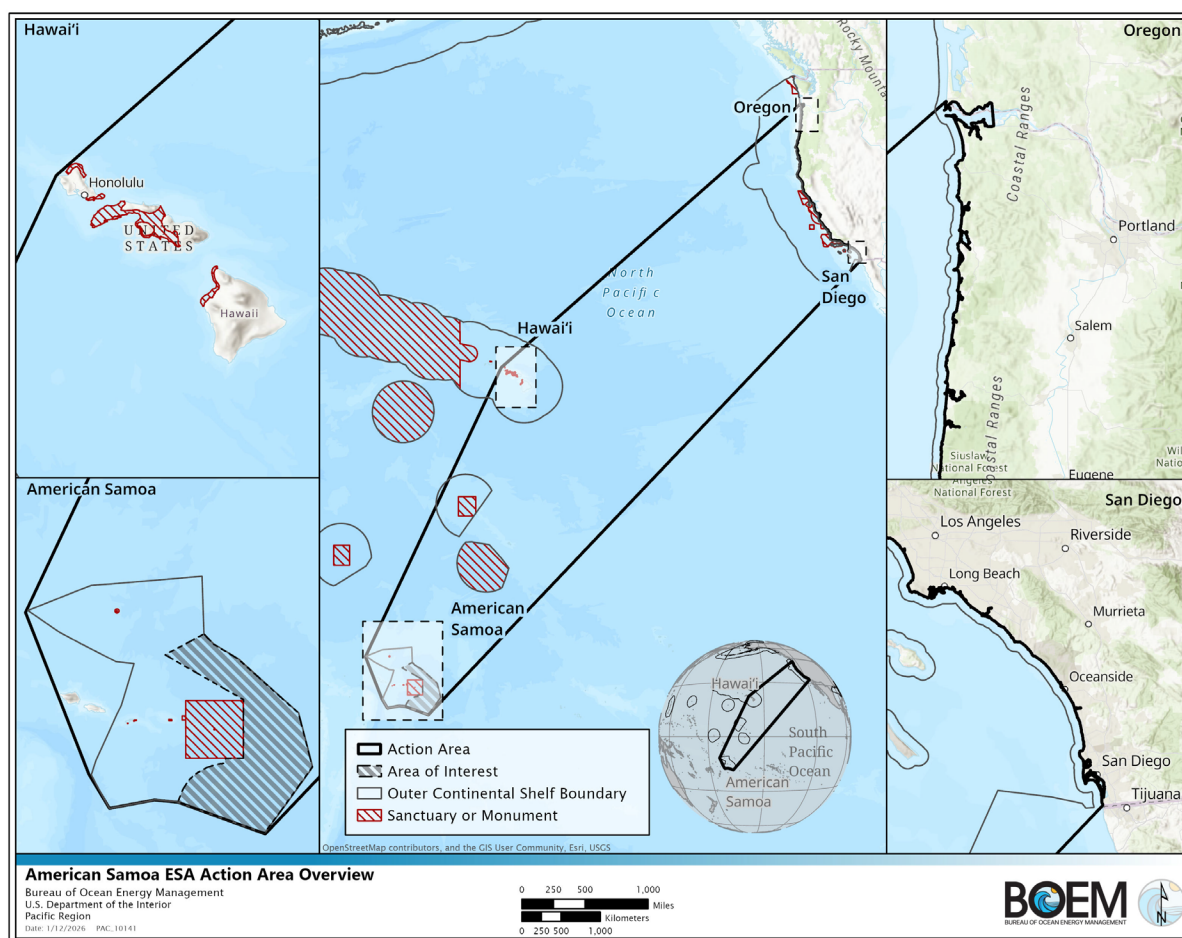


Figure 1. Map of the Proposed Action, which includes the American Samoa OCS, Hawaiian waters, and the U.S. West Coast

1.2 Purpose of and Need for the Proposed Action

The purpose of this document is to evaluate the potential effects of the Proposed Action—issuing up to two leases for marine minerals in the American Samoa OCS—on species listed under the Endangered Species Act (ESA) and their designated critical habitat (CH), as well as on Essential Fish Habitat (EFH). This document thus contains a 1) Biological Assessment (BA) for threatened and endangered marine mammals, sea turtles, fishes, and invertebrates and their designated CH likely to occur in the Action Area (**Figure 1**) and 2) an EFH Assessment for this area.

This BA and EFH Assessment are consistent with the revised *Guidance for Combining EFH Consultations with ESA Section 7 Consultations* (Guidance) within National Marine Fisheries Services (NMFS) Policy Directive 03-201-05.

Under Section 7(c) of the ESA, as amended, federal agencies are required to ensure actions they authorize do not jeopardize the existence of any species listed under the ESA. NMFS Pacific Islands Regional Office (PIRO) in Honolulu, HI, provided technical input on the list of species considered. PIRO provided previous EFH consultations with suggested Best Management Practices (BMPs).

The purpose of the Proposed Action is to issue up to two commercial leases for marine minerals in the American Samoa OCS. The Proposed Action aims to facilitate the potential development of the areas that may contain economically recoverable mineral resources in an environmentally and economically responsible way. The seabed leasing aligns with ensuring secure and sustainable domestic supply of strategic minerals essential for manufacturing, energy technologies, and defense applications.

The need is for BOEM's issuance of these OCS leases to provide access to marine minerals that could potentially be an important and underutilized domestic source that could help to meet the U.S. demand while reducing reliance on imports. This Proposed Action could support national security and economic resilience while managing development of the OCS mineral resources in an environmentally responsible manner. Section 3 (43 U.S.C. §1332) describes the OCS as a vital national resource reserve to be developed expeditiously and in an orderly manner, while ensuring environmental protection. Section 8 (43 U.S.C. §1337(k)) establishes a competitive leasing process for commercial mineral development. Section 11 (43 U.S.C. §1340) allows BOEM to authorize geophysical and geological exploration for marine minerals commercial use. Many of U.S. Geological Survey's (USGS's) 2025 list of 60 critical minerals (90 Federal Register [FR] 50494) occur on the OCS. Seabed deposits with mineral resources may occur across the OCS, but not all deposits may be economically viable.

Commercial-scale seabed mining is a new industry with only a few countries testing seabed mining equipment or recovery within their waters. For the ratifiers of the United Nations Convention on the Law of the Sea (UNCLOS), the International Seabed Authority (ISA) governs the mining of mineral resources in the seabed and subsurface beyond the limits of national jurisdiction, totaling approximately 60% of the ocean floor.

Equipment testing and baseline environmental research within these areas, and led by the ISA, gives exploration prospectors "preference and priority" when awarding seabed mining activities beyond national jurisdiction. Since the U.S. has not ratified UNCLOS, the National Oceanic Atmospheric Administration (NOAA) (under the [Deep Seabed Hard Mineral Resources Act](#)) regulates U.S. exploration and potential commercial recovery of critical minerals like manganese, cobalt, and nickel from the ocean floor beyond

national jurisdiction, balancing resource access with environmental stewardship. That process is not connected with BOEM's regulations and authorities.

In preparation for this BA and EFH, BOEM certifies that we used the best scientific and commercial data available.

1.3 Consultation History with NOAA's NMFS

This is the first time BOEM has consulted with NOAA's NMFS in accordance with section 7 of the ESA of 1973, as amended (16 U.S.C. 1531 et seq.) on preliminary activities associated with the seabed mining in American Samoa. On September 26, 2025, BOEM requested confirmation of an appropriate point of contact for NMFS, and, on the same date, we received confirmation regarding two NOAA employees to contact when BOEM is prepared to discuss further. On December 3 and 4, 2025, BOEM and NMFS staff exchanged emails to set up a meeting to discuss the upcoming consultation. On December 11, 2025, we had a pre-meeting for the consultation to discuss the Proposed Action, Action Area, and timeline. During the meeting, NMFS suggested BOEM reach out to United States Army Corps of Engineers (USACE) as a potential cooperative agency, since deploying buoys and moorings as part of the Proposed Action would require USACE permit. Several follow-up email exchanges with NMFS were made following the meeting on December 11 to clarify the list of species and suggested BMPs to include in this BA.

On December 19, 2025, BOEM met with USACE to share the Proposed Action for this BA and determined USACE's interest in becoming a cooperative agency. USACE responded on December 22, 2025, agreeing to become a cooperative agency. BOEM replied on December 29, 2025, asking for clarification on language USACE would like added in the BA, if any. Due to lack of response, BOEM resent a reminder email on January 8, 2026, and USACE responded the same day with specific language to incorporate into this BA regarding USACE's Nationwide Permit.

On January 16, 2026, BOEM requested for expedited informal ESA/EFH consultation for the Proposed Action included in this BA/EFH document. EFH will proceed from this date for a 30-day consultation period. On January 30, BOEM provided NMFS with a link to five videos of sampling footage taken from the cruise with USGS for additional information for the EFH Assessment. On February 11, 2026, BOEM received an EFH Conservation and Recommendation Letter from NMFS. For ESA, NMFS requested additional information regarding noise impacts, and BOEM met with the NMFS' BA team on January 28th to discuss the needed information. NMFS and BOEM met again briefly on January 29th to confirm the parameters NMFS requested. On February 3rd, BOEM submitted an updated BA with clarification on acoustic thresholds and limitation on equipment use. On February 6th, NMFS confirmed that they have sufficient information to proceed with the consultation and requested GIS layers for the Action Area. BOEM provided NMFS with the GIS layers on February 13, 2026. BOEM received the NMFS' Letter of Concurrence on February 17, 2026. On March 2, 2026, BOEM and NMFS' BA team discussed and shared an updated BMP language eliminating requirements to avoid and reduce speed for jellyfish aggregations. NMFS agreed, on the same day, that the edits in the BMP language will not change the effect analysis included in the BA and will not trigger reinitiation. On March 27, 2026, BOEM and NMFS discussed the operational error in the BA regarding the sound source level used in the acoustic analysis and agreed that the Ruppel et al (2022) paper is the best available science to use instead. Impact determinations remain unchanged. BOEM agreed to provide an updated BA with track changes to NMFS.

2 Proposed Federal Action

Under the ESA, “action” means all activities or programs of any kind—authorized, funded, or carried out, in whole or in part—by federal agencies (see 50 CFR 402.02). This section describes the proposed federal action for which we are requesting ESA consultation. This section also discusses avoidance and BMPs used for protection of ESA-listed species and designated CH; details of the BMPs can be found in **Appendix B**.

2.1 Leasing for Commercial Mining and Authorization of Preliminary Activities

The Proposed Action is to issue up to two leases for the purpose of commercial mining and authorize early-stage data collection, consistent with the limited and preliminary scope of activities evaluated in the environmental assessment. Up to two leases is reasonable due to the need for sufficiently large lease areas to allow for mineral exploration and the number of companies that responded with interest in the [Request for Information and Interest](#) comment period. Issuing up to two leases promotes competition, accounts for the unquantified commercial value, and provides opportunity for potential commercial exploration and mining.

Each lease would be approximately 67,000 km². The ISA typically issues exploration leases areas of similar size, of 75,000 km². Offering large lease areas also provides flexibility for exclusion areas that may be deemed necessary on an environmental or technical basis.

Issuing leases in the proposed area would authorize the lease holder to conduct only preliminary activities. Preliminary activities are defined as “bathymetric, geological, geophysical, mapping, and other surveys necessary to develop a comprehensive Delineation, Testing, or Mining Plan. Such activities are those which have no significant adverse impact on the natural resources of the OCS” (30 CFR 582.21d). These activities are further described in **Table 1**. Geological, geophysical, and other surveys classified as preliminary may indicate the presence of mineral resources and, in the case of geological sampling, may involve collection of limited samples of the seabed. The regulatory classification of these activities as preliminary is determined in part by objective, but more by the scope and intensity of potential environmental effects of the activity.

Table 1. Potential actions fitting the preliminary activity type and description evaluated in this BA

Activity Type	Description
Preliminary Activities Allowed with Lease Issuance	• Use of dynamic positioning (DP) vessels, autonomous underwater vehicles (AUVs), and remotely operated vehicles (ROVs)
Bathymetric, Geophysical, and Mapping Surveys	• High-resolution geophysical (HRG) surveys using sound sources that are documented as causing little to no impact to species, Tier 4 <i>de minimis</i>¹ sound sources² • High-resolution video or acoustic cameras
Other Surveys: Physical, Geological, Chemical and Biological Sampling	• Sampling seabed (sediments, minerals), water, and species from a ROV • Anchors on the seafloor for buoys and physical, chemical or biological data collection • Scientific physical and biological monitoring from a ship or moored anchor, including box core sampling and use of landers • Expendable equipment such as weight, acoustic doppler current profilers (ADCPs), and underwater transponder positioning units • Focused biological surveys from the air, ship, or in water can utilize aerial digital imaging; visual observation; radar; thermal or acoustic monitoring

2.2 Bathymetric, Geophysical, and Mapping Surveys

Bathymetric, geophysical, and mapping surveys are an important first step for planning subsequent activities. Bathymetric surveys measure depth and elevation of the seafloor, while geophysical surveys are focused on the composition of sediments on and below the seafloor. The scientific community, several U.S. agencies, and the ISA established standard methodologies for exploring and sampling the ocean seafloor that have become less destructive as technology improved. The initial survey of an area of interest of potential mining uses a hull-mounted multibeam echosounder (MBES) to provide a roughly 100-m resolution of the seafloor; finer resolution surveys are conducted within smaller areas.

The past decade marked the commercial use of automated and robotic technologies to sample and research the deep ocean seafloor. Modern seabed site and mineral exploration can rely on mobile technologies, including DP vessels, AUVs, ROVs, and other autonomous or robotic equipment that temporarily disturb and move across the seafloor. These technologies vastly increase the positional accuracy over the historic method of deploying equipment over the side of a vessel at the surface and allowing the equipment to drift with the current.

Most survey systems are collectively termed HRG surveys. There are many types of equipment used in these surveys. Most of the equipment used in HRG surveys generate sound, which is transmitted toward the seafloor, where it is reflected back and received by the AUV or vessel. Different equipment types have different frequencies and source levels, which could cause harm to species if they are too close and sensitive to those frequencies. The scientific and regulatory communities categorized the sound profiles of HRG equipment into tiers of impact. BOEM uses the standardized tiering system based on Ruppel et al. (2022). Tier 4 of this categorization lists activities considered *de minimis*, defined as sources considered unlikely to result in the incidental take of ESA-listed species. Equipment types are described in **Table 2**.

Table 2. HRG survey equipment considered during preliminary activities

Equipment Type	Data Collection and/or Sea Floor Survey Types	Description of the Equipment
Bathymetry (depth) sounder; multibeam echosounder (MBES)	Shallow hazards, archaeological resources, and seafloor habitats	A depth sounder is a microprocessor-controlled, high-resolution, survey-grade system that measures precise water depths in both digital and graphic formats. The system records with a sweep appropriate to the range of water depths expected in the survey area. This BA assumes the use of multibeam bathymetry systems to characterize complex bathymetric. Units can be hull-mounted, mounted in an AUV or towed.
Side-scan sonar	Shallow hazards, hard (rock) bottoms, and archaeological resources	Side-scan sonar evaluates surface sediments, seafloor morphology, and potential surface objects (MMS 2007). Systems typically consist of a top-side processor, tow cable, and towfish with transducers (or “pingers”) that generate and record the returning sound traveling through the water column at a known speed. This BA assumes the use of a digital dual-frequency side-scan sonar system with 300–500 kHz frequency ranges or greater to record continuous planimetric images of the seafloor. Synthetic aperture sonar may also be used, are similar to side-scan sonars, and operate in the 70–100kHz frequency ranges. Side-scan sonars and synthetic aperture sonars can be mounted in an AUV or towed.
Magnetometers/ Gradiometer	Archaeological resources and shallow hazards	These types of equipment detect and aid in the identification of ferrous or other objects having a distinct magnetic signature. The gradiometer sensor is typically towed approximately 6 m above the seafloor. This methodology is not anticipated as it is not commonly used in depths greater than 500 m. Magnetometers can be installed inside AUVs and may be present during surveys. They are passive and make no noise.

Key: kHz = kilohertz

Several survey methods can be used to collect HRG data. Typically, these methods are based on the water depth of the survey area. However, restrictions on available equipment may affect which survey methods are chosen. Additional information about autonomous underwater surveys, shallow multi-instrument tow, deep-tow, and uncrewed surface vessel surveys is provided in the *Commercial Leasing for Minerals Offshore American Samoa Environmental Assessment (EA)*. The instruments listed below are generally considered *de minimis* according to the standardized tiering system (Ruppel et al. 2022):

- Fathometers for navigation
- Sub-bottom profilers that are hull-mounted, towed, and parametric sub-bottom profilers
- MBES systems (hull-mounted: EM 120–124 [EM 120, EM 122, EM 124; 12kHz], EM 302–304 [30kHz])
- MBES systems (towed/AUV) EM 2040 (200–700 kHz)
- EK60 and EK80 split-beam echosounders
- Pingers (acoustic locators) for locating over the side wireline instrumentation in the water column
- Acoustic releases (brief duration pinging), e.g., for moorings and landers
- Ultra-short baseline (USBL) and long baseline (LBL) positioning equipment, e.g., for navigation of submersibles, ROVs

- ADCP equipment
- Instrumentation on HOVs, AUVs, and ROVs
- Pressure-equipped inverted echo sounders and Pressure Monitoring Transducers
- Electromagnetic sources

Sub-bottom profilers are HRG equipment types used to survey geological features, hazards, and archaeological resources present below the seafloor (in subsurface sediments). Sub-bottom profilers (sometimes referred to as pingers) can penetrate sediment depth ranges of 3 m to greater than 100 m, depending on frequency and bottom composition. High-resolution compressed high-intensity radar pulse system sub-bottom profilers generate a profile view under the seabed to develop a geologic cross-section of subsurface sediment conditions. Although the above instruments are generally considered *de minimis*, some types of MBES systems and sub-bottom profilers can potentially cause acoustic injury or disturbance to marine mammals when operated at certain source levels, transmission frequencies, directionalities, beamwidths, tow depths, and pulse repetition rates. Potential impacts are further outlined in **Section 5.1**.

The HRG surveys associated with the Proposed Action are not going to use medium-penetration sub-bottom profiler systems, which are also known as boomers, sparkers, bubble pulsers, or impulse-type systems. Low-frequency sources, such as the Wolfspar listed in Ruppel et al. (2022), are not evaluated here and will not be used.

2.3 Other Environmental Surveys

Part of preliminary activities are other surveys to characterize the seabed condition and the surrounding environment. Geological, oceanographic, and biological surveys that collect seabed, physical, and species information are necessary for describing this deep-sea, open-ocean environment. These data are commonly collected nationally and internationally in ways determined to not significantly alter the environment or natural resources by domestic and international agencies. As listed in **Table 1**, other surveys include sampling sediments and species by ROV, anchoring buoys and scientific equipment to the seafloor, deploying equipment (such as box core sampling) from a ship, and using landers. Some equipment can remain on the seafloor—such as weights, ADCPs, and underwater transponder positioning (UTP) units. Focused biological surveys from the air, ship, or in water can utilize aerial digital imaging; visual observation; radar; and thermal or acoustic monitoring. Species collection techniques and impacts are location- and species-specific. This document does not consider actions such as dredging or trawling. The *Commercial Leasing for Minerals Offshore American Samoa EA* describes the status of similar surveys in the Pacific Ocean and the standards of research to justify the undetectable or low impacts caused from these survey types.

2.3.1 Geological, Geotechnical, and Biological Sampling

Geological and geotechnical surveys include sampling of the seabed and can utilize a variety of equipment that cause a range of impacts to the seafloor. The purpose of geological sampling during preliminary activities is multifold: to validate (ground truth) HRG surveys, to conduct environmental characterization, and to perform initial reconnaissance to the seabed to better identify site-specific exploration targets and collect information useful to develop a Delineation, Testing, or Mining Plan.

The most precise method to collect seafloor sediments or species is by ROV, which can target samples to within a centimeter and provides real-time visual control. A grab or scoop of seafloor sediment can be collected from a box core lowered from the surface by a vessel. A box core is lowered to the seabed by winch and penetrates the seabed; when tension is applied, the box core jaws close, sealing the sample inside. Once on deck, various tests can be performed. A free fall grab is similar except that it is released unconnected to the vessel, descends to the seafloor, samples the seabed and releases ballast weights, and comes back to the surface via a float. A box core or free fall grab retrieves a greater volume of sediment than an ROV, but preclearance is typically not possible. CTDs, USBL pingers, cameras, and other equipment can also be mounted on a box core or free fall sampler or additional environmental sampling.

Box core sampling also can sample species information. Species, or a portion of a species, may be collected for the purpose of characterizing the biological environment. Collections also could verify the discovery of a new species or further document electronic DNA libraries, reducing the need for future voucher specimens. The intent would be to further scientific understanding, not for commercial benefit.

This Proposed Action maximizes the number of surveys and samples (and therefore a greater environmental impact) estimated from of research-based activities, U.S. agency research, and 2023 guidance from the ISA to make assumptions about the area and number of surveys (**Appendix A**). The ISA's deep data website shows that sampling grids sometimes are not constant throughout a lease; however, the below values assume a consistent survey density and values that are greater than the average number for samples in the ISA's exploration contracts. BOEM assumes three seafloor sampling efforts, either by box core or free fall grab at a course scale covering a larger area and then two subsequent sampling surveys that focus on the leased area and then a particular area of interest. Four box core or free fall grab surveys would be completed under the Proposed Action, collecting approximately 2,259 samples (**Table 3**). Each sample could disturb 0.5 to 1.5 m² area of the seafloor. Together, these three surveys could disturb 1952 m² of the seafloor for a two-lease scenario and represent less than 0.0000019 % of the total area (**Table 4**).

Geotechnical sampling (e.g., box cores) is expected to be performed with the support of a vessel equivalent in size and capability to that used for other parts of the project. All geotechnical sampling may require applications to be reviewed by USACE, potentially under the Nationwide Permit Activity 6.

Table 3. Estimated range of number of box core and/or free fall grab sample stations

Survey	Number of Stations for Two Leases	Number of Stations for Five Leases	Number of Stations in Total Area
Course survey using free fall grab (15-km grid) and/or	253 (125 to 504)	101 (50 to 201)	506 (250 to 1,008)
Box cores (50-km grid)	27 (16 to 56)	11 (6 to 24)	54 (31 to 113)
Box core lease area survey (10-km grid)	527 (203 to 1,572)	211 (81 to 629)	1,054 (407 to 3,143)
Box core area of interest survey (7-km grid)	261 (151 to 446)	104 (60 to 179)	521 (303 to 894)
Total	1,126 (694 to 2,170)	452 (278 to 870)	2,259 (1,389 to 4,349)

Note: Counts of samples or stations contacting the seafloor are 50% values with a range in parenthesis of 5% to 95% the value. Totals are derived from running simulations, and not additive, from the four surveys and explained further in **Appendix A**.

Table 4. Estimated area of disturbance to the seafloor caused by box core and/or free fall grab surveys

Survey	Two Leases (m ²)	Five Leases (m ²)	Total Area (m ²)
Course survey using free fall grab (15-km grid) and/or	124 (57 to 265)	50 (23 to 106)	248 (114 to 530)
Box core (50-km grid)	27 (14 to 59)	11 (6 to 24)	53 (28 to 117)
Box core lease area survey (10-km grid)	519 (188 to 1,610)	208 (76 to 643)	1,038 (378 to 3,216)
Box core area of interest survey (7-km grid)	257 (135 to 478)	103 (54 to 190)	514 (271 to 950)
Total	977 (543 to 2,089)	390 (217 to 838)	1,952 (1,083 to 4,167)

Note: Area of disturbance to the seafloor are 50% values with a range in parenthesis of 5% to 95% the value. Totals are derived from running simulations, and not additive, from the four surveys and explained further in **Appendix A**.

2.3.2 Moorings and Equipment Placement

Ocean environmental characterization surveys utilize anchors, clump weights or ballast weights, and the placement of scientific equipment on the seafloor. Weights and some equipment are considered expendable and released onto the seafloor, while the connected equipment is released and retrieved. Sediment plumes are a known concern from commercial-scale mining, and the only known way to understand ocean sedimentation and currents is to anchor sampling devices on or near the seafloor. AUVs also require the use of multiple navigation devices positioned on the seafloor. A lessee would likely include placement of sampling devices and anchors to position those devices on the seafloor.

Buoys float on the surface of the water and are anchored at fixed locations with equipment attached to monitor and evaluate the water column or air. Buoys are rare in deeper waters, where a lessee is more likely to set moorings for collecting oceanographic data without a surface buoy (AMC Consultants Pty Ltd et al. 2021). However, BOEM estimates two large surface ocean buoys would be placed per lease (the Proposed Action would have a maximum of four buoys). Types most likely for deep water include discus-shaped, boat-shaped, and spar buoys (**Figure 2**); a large discus-shaped hull buoy has a circular hull of 10–12 m in diameter. Meteorological buoy anchors deployed in approximately 1,000 m created a buoy watch circle (i.e., excursion radius) of approximately 1,250 m and almost 3000 m of line (Pacific Northwest National Laboratory 2019). Onboard power supply sources for buoys could include solar arrays, lithium or lead-acid batteries, and diesel generators, which require an onboard fuel storage container with appropriate spill protection and environmentally sound methods for refueling activities. Decommissioning is assumed to be essentially the reverse of the installation process, removing approved facilities. Installation and decommissioning of buoys is expected to be completed within one day per buoy and would be performed with the support of a vessel(s) equivalent in size and capability to that used for installation.

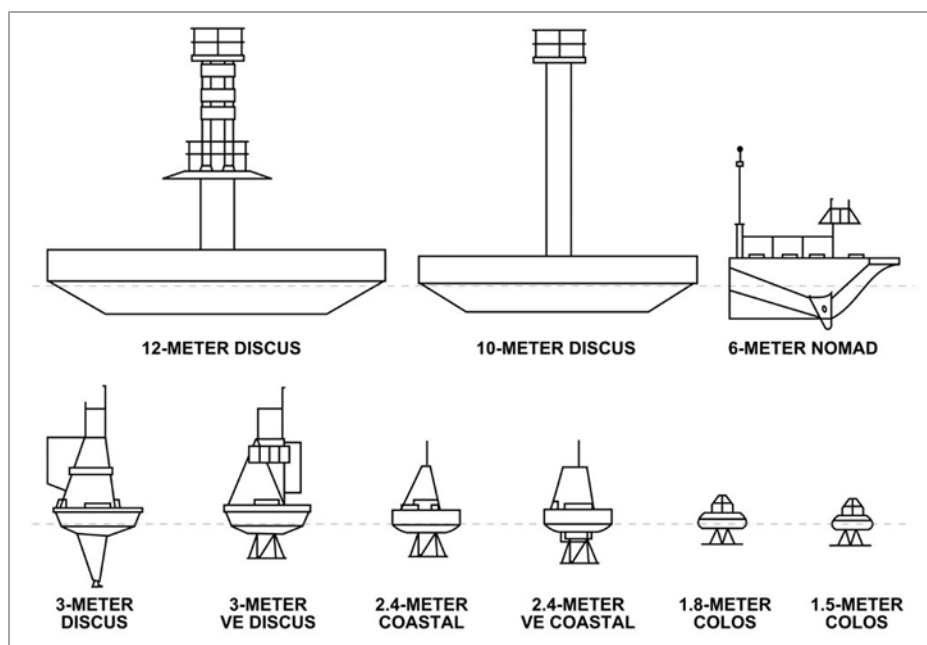


Figure 2. Buoy schematic

Source: National Data Buoy Center (2013)

A buoy would be anchored to the seafloor at two or three locations that would be made from materials such as solid cast iron, cement, or chain. The line connecting the buoy to the anchor consists of chain, jacketed wire, nylon rope, polypropylene rope, and subsurface floats, which keep the mooring line taut to semi-taut, reduce slack, and eliminate looping (National Data Buoy Center 2013). The chain at bottom of the mooring line could sweep and disturb the seafloor. Meteorological buoy anchors deployed at approximately 1,000 m use a solid cast iron anchor weighing approximately 11,000 lbs and have a footprint of approximately 2.3 m² (Pacific Northwest National Laboratory 2019). Moorings for collecting oceanographic data without a metocean surface buoy are more common internationally at depths of 4,500–5,200 m. Anchors range from 3,700–6,800 lbs, with similar types of mooring lines extending approximately 500 m below the surface to avoid interference with other marine activities (Sharma and Nath 2020; AMC Consultants Pty Ltd et al. 2021; China Minmetals Corporation 2024; National Data Buoy Center 2025). BOEM estimates that mooring installation could disturb approximately 28 m² of seafloor per mooring (**Appendix A**). After installation, the transport vessel likely would remain in the area for several hours while technicians configure systems.

The speed and direction of ocean currents would likely be assessed with ADCPs. ADCP is a remote sensing technology that transmits sound waves at a constant frequency and measures their reflection as the waves ricochet off fine particles or zooplankton suspended in the water column. ADCPs could be mounted independently on the seafloor, attached to a buoy, or have multiple instruments deployed as a subsea current mooring. A seafloor-mounted ADCP likely would be mounted in a tripod or a trawl resistant mount. One subsea current mooring might have 8–10 ADCPs vertically suspended from an anchor, combined with several floats made of syntactic foam. These moorings do not breach the surface. A typical ADCP has three to four acoustic transducers that emit and receive acoustical pulses from different directions, with frequencies ranging from 300–600 kHz and a sampling rate of every 1 to 60 minutes. A typical ADCP is about 1–2 ft tall and 1–2 ft wide. Its mooring, base, or cage (surrounding frame) would be

several feet wider. BOEM estimates that approximately 16 moorings could be installed across both lease areas, with seafloor disturbance likely around 28 m² per mooring, ranging from 13 to 78 m².

Another emerging scientific piece of equipment that rests on the seafloor is a lander. This stationary scientific monitoring device ‘lands’ on the seafloor and ranges in size. BOEM assumes approximately 26 landers could be deployed across the total area but not at the same time. Most landers would displace about 2 m² of seafloor, though the footprint of a newer device rated to ocean depths of 6,000 m is approximately 4 m² (Guo et al. 2023).

As a part of the Proposed Action, BOEM also assumes one HRG AUV-based survey would use multiple AUVs and require the use of UTP units placed on the seafloor. Each UTP could displace 1 m² of area, with up to 416 UTPs placed across the total area (**Table 5**).

Site assessment involves the deployment and decommissioning of buoys, which may require applications to be reviewed by the USACE, potentially under the Nationwide Permit Activity 5.

Table 5. Estimated area of disturbance to the seafloor caused by placing UTP units to support AUV navigation and deploying moorings and landers for physical and biological data collections

Survey	Two Leases (m ²)	Five Leases (m ²)	Total Area (m ²)
UTP deployment for one multiple AUV survey	196 (99 to 349)	78 (40 to 139)	393 (197 to 695)
Moorings for equipment (26 count, 28 m ² each)	261 (138 to 442)	104 (55 to 177)	522 (277 to 885)
Landers (11 count, 2 m ² each)	11 (7 to 14)	4 (3 to 6)	21 (15 to 28)
Total seafloor disturbance	479 (306 to 703)	192 (122 to 280)	960 (611 to 1401)

Note: Any value that has a range will be described as 50% value (5% to 95%) value.

2.4 Vessel Trip and Number of Days for Surveys

The number of survey vessels at any one time is estimated to be four with a maximal statistical potential of six (**Appendix A**). The type of survey and the duration of trips anticipated for the Proposed Action (Preliminary Activity) surveys and equipment deployments are estimated on **Table 6**. BOEM projected vessel trips information from the initial assessment of a geographically separate area of the Clarion-Clipperton Zone’s Nauru Ocean Resources property and from Tonga Offshore Mining Limited Clarion-Clipperton Zone Project Exploration Area. We assume vessels will go in and out of Pago Pago, but vessels could use ports from the Cook Islands to the east. Transit to American Samoa would likely be from U.S. mainland ports but could be from other energy hubs in the Pacific Ocean (e.g., Malaysia, Australia). Available ships that can access deep waters and stay in the open ocean are limited in this global market.

Vessels that install moorings and conduct surveys are typically 90 to 122 m in length (German Federal Institute for Geosciences and Natural Resources 2018; China Minmetals Corporation 2024). Crew boats used for buoy operations and maintenance are usually 16 to 17 m in length, with 100- to 400-hp engines and 1,800-gal fuel capacity. Vessels performing surveys or towing equipment are relatively slow moving at approximately 4–6 kn. The remote location is a large cost for data collection. BOEM anticipates larger vessels would attempt to collect as much data as possible while on the water. This means that, while a

cruise may have a particular category or priority, most survey vessels would be platforms for collecting HRG, geotechnical, biological, and oceanographic information. Specific surveys and data collection are further explained in **Appendix A**.

Previous critical mining related assessments collected varying densities of geophysical data depending on the stage of the project, so there is a range for the survey duration estimates listed (**Table 6**). Survey duration combined the following factors: (1) expected duration of the actual survey work using the calculated line miles and expected velocity, (2) number and duration of line turns, (3) expected daily time for deck work, such as AUV or device deployments, retrievals, or sampling operations, and (4) amount of time when no work is conducted because of either mechanical or weather delays. The sum of these factors approximates the survey duration. More explanations and assumptions are listed in **Appendix A**.

Table 6. Vessel trips estimated for surveys and for equipment or mooring deployments (two lease areas)

Surveys	Duration of Survey in Days and Number of Two-way Vessel Trips ¹
MBES survey: initial or course with low or medium frequency (one survey)	53 (43 to 65) days across 5 trips (low frequency) 101 (83 to 125) days across 9 trips (med frequency)
Geological, geotechnical, and biological sampling: ² initial or course, lease area, and fine (total of three) surveys	816 (483 to 1,716) days across 75 trips
Oceanographic/biological surveys: include deployment and retrievals of equipment, water, chemical, avian, fishes, marine mammal, and sea turtle (total of four) surveys ³	194 (172 to 217) days across 17 trips
Total estimated number of days at sea with two-way vessel trips—medium frequency MBES	1,114 (772 to 2,017) days across 98 trips

Notes:

1. Day and trip numbers and ranges were calculated using methodology explained in **Appendix A**. Values are intended to be conservative estimates of survey requirements, with actual numbers likely to be lower.

2. Geotechnical and biological sampling assumes 24-hr survey days.

3. Avian, fish, marine mammal, and sea turtle surveys are typically conducted during daylight hours (10 hours). Surveys could occur simultaneously from the same vessel but not concurrently with HRG surveys.

2.5 Lost Survey Equipment

In the event of equipment loss during surveys or a meteorological buoy disconnecting from its anchor, recovery operations may be conducted. Recovery operations could be performed in a variety of ways, including ROVs and grapnel lines, depending on water depth and equipment lost. For example, grapnel lines (e.g., hooks, trawls) may be used to retrieve lost equipment. For the recovery of lost survey equipment, BOEM would work with the lessee/operator to ensure the retrieval process minimizes the risk to ESA-listed species.

2.6 BMPs

If leases or grants are issued, BOEM will require the lessee to comply with BMPs through lease stipulations to minimize potential impacts to ESA-listed species. These BMPs have been developed through

years of conventional energy operations and consultations with the NMFS, including vessel strike avoidance BMPs, visual monitoring, and reporting. These BMPs, which minimize or eliminate potential effects from preliminary activities to ESA-listed species are described in **Appendix B**. Operators are expected to follow the measures when conducting actions on or near the Action Area. They are enforceable as conditions to lease sales, permits, and exploration plans.

3 Action Area

The “Action Area” means all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR 402.02). The Action Area encompasses a big area which includes waters nearby American Samoa where most of the Proposed Action will take place as well as waters near Hawaii and the West Coast, where vessels may start their transit(s) (**Figure 1**).

Around the American Samoa waters, the Action Area includes approximately 134,097 km² with water depths ranging from 1,400–6,000 m. This area is 150 mi from Tutuila and 104 mi from Manu'a Islands. This OCS area partially borders the Rose Atoll Marine National Monument, which is 57 mi from Rose Atoll.

Most of the Proposed Action will occur in the vicinity of the American Samoa waters. American Samoa has a population of approximately 46,029 people. It consists of five volcanic islands and two coral atolls. The capital and main urban center is Pago Pago, situated on Tutuila Island. Pago Pago is notable for its deep, naturally protected harbor, which serves as the Territory’s primary port and a hub for tuna processing, one of the region’s key industries. American Samoa has a rich Polynesian and maritime heritage. Rose Atoll, also known as Motu O Manu or Rose Island, is the easternmost island of the Samoan archipelago. Located approximately 130 nmi east-southeast of Pago Pago, it is a remote atoll with no permanent human population. In 2009, it was designated as the Rose Atoll Marine National Monument by presidential proclamation, and in 2014, it became part of the National Marine Sanctuary of American Samoa.

The Action Area includes two additional areas to account for possible vessels transiting from Hawaii and the U.S. West Coast. For waters around Hawaii, we made the boundary around O’ahu and excluded Kauai since the vessels will not be coming out of that island for this project. Lastly, the most eastern side of the Action Area is the U.S. West Coast. The northern side of the West Coast includes up to Astoria, Oregon, and the southern tip includes San Diego (**Figure 1**).

This rest of this section below describes the ongoing activities within the Action Area and stressors unassociated with the Proposed Action that may impact ESA-listed species and/or CH within the Action Area.

3.1 Fishing Industry

Fishing is central to the culture, economy, and daily life of American Samoa (Craig et al. 1993; Levine and Allen 2009; Grace-McCaskey 2015). For generations, Samoans have relied on the ocean as a primary source of food, employment, and cultural identity. The distinction between commercial, recreational, and subsistence fishing is often blurred, as the same individuals may participate in all three activities depending on season, opportunity, or community needs (Dombrow and Hospital 2023). Fish caught for sale in local markets may also be distributed through customary exchange networks or shared at family gatherings, weddings, funerals, and other events (Severance et al. 2013). This sharing system reflects the importance of fishing not only as an economic activity but as a way of reinforcing social cohesion and supporting extended family obligations under the fa’a Samoa (Samoan way of life). Even when fish are sold, the proceeds are frequently used to support church commitments, community events, or village obligations, underscoring the overlap between the subsistence and cash economies. As such, fishing in American Samoa cannot be described simply as a commercial enterprise because it is also a cultural

cornerstone and a mechanism of food security and social resilience. Summaries and studies related to the complexity and richness of American Samoa fisheries are available and are incorporated here by reference (Craig et al. 1993; Dalzell et al. 1996; Western Pacific Regional Fishery Management Council 2005; Levine and Allen 2009; Western Pacific Regional Fishery Management Council 2009; Grace-McCaskey 2015; Kleiber and Leong 2018; Chan 2023; Dombrow and Hospital 2023).

Fisheries in American Samoa are managed under both federal and territorial authority. The Western Pacific Regional Fishery Management Council (WPRFMC) regulates the U.S. Exclusive Economic Zone (EEZ) through fishery ecosystem plans for pelagic, bottomfish, crustacean, coral reef, and precious coral fisheries (Western Pacific Regional Fishery Management Council 2005; 2009). These plans establish harvest limits, bycatch controls, gear regulations, and habitat protections under the authority of the Magnuson-Stevens Fishery Conservation and Management Act. The American Samoa Government, via the Department of Marine and Wildlife Resources, manages nearshore and reef fisheries, emphasizing local priorities such as subsistence access and cultural practices. In American Samoa, illegal, unreported, and unregulated fishing is a concern that undermines sustainable fisheries management and threatens the livelihoods of those who rely on legal fishing practices (Western Pacific Regional Fishery Management Council 2005).

Commercial fisheries in American Samoa are dominated by the pelagic longline fleet, which primarily targets albacore tuna (*Thunnus alalunga*) (Western Pacific Regional Fishery Management Council 2009). Longlining is conducted by larger vessels, typically between 50 and 90 ft, that operate offshore and widely throughout the American Samoa EEZ, including the Action Area, and occasionally on the high seas. Albacore tuna landed by the fleet are an essential input for the StarKist tuna cannery in Pago Pago, which is one of the Territory's largest private employers and a cornerstone of its export economy). In addition to albacore, the longline fishery catches yellowfin (*Thunnus albacares*), bigeye (*Thunnus obesus*), billfish such as marlin (*Makaira* spp.) and swordfish (*Xiphias gladius*), and various shark species. The primary fishing grounds for purse seine tuna fisheries are located north of the Action Area (Gillett et al. 2002; emLab 2023).

Smaller-scale commercial fisheries also contribute to the Territory's economy and food supply. There are two broad categories of fisheries in nearshore habitats and managed by the WPRFMC (Western Pacific Regional Fishery Management Council 2005). The crustacean fishery, focused on spiny lobsters (*Panulirus penicillatus*), occurs in shallow nearshore reef habitats within territorial waters (0 to 3 mi), with harvests typically made by free divers at night. Coral reef fisheries operate in shallow reef habitats (0 to 50 fathoms) and lagoons, targeting a wide variety of reef-associated species using hook-and-line, spears, and nets for subsistence and small-scale commercial use. Currently, there is no precious coral fishery in American Samoa.

Farther offshore, the alia fleet, which consists of 28–32 ft catamarans traditionally powered by outboard motors and captained by indigenous American Samoans, has historically engaged in trolling and handline fishing for various pelagic species including yellowfin tuna, skipjack tuna (*Katsuwonus pelamis*), wahoo (*Acanthocybium solandri*), and mahi-mahi (*Coryphaena hippurus*) (Western Pacific Regional Fishery Management Council 2009). These fisheries operate in the epipelagic zone and occur primarily around Tutuila and the Manu'a Islands, usually within 50 nm of shore (Western Pacific Regional Fishery Management Council 2009; Kleiber and Leong 2018; Ayers et al. 2024). Limited fuel capacity and vessel

range restrict their ability to fish farther offshore, which reduces their exposure to potential interactions with deep-sea mining.

Bottomfish fisheries, targeting deepwater snappers such as *Etelis carbunculus* and *Pristipomoides filamentosus* and various groupers, operate at depths between 50 and 400 m along seamounts, slopes, and offshore banks (Western Pacific Regional Fishery Management Council 2005). Although this fishery contributes only modestly to commercial landings, it is important for local markets and cultural uses (Western Pacific Regional Fishery Management Council 2005). While bottomfish are unlikely to be directly affected by activities at abyssal depths, they could experience indirect effects.

Fish aggregating devices (FADs) play an important role in both commercial and non-commercial fishing in American Samoa (Buckley et al. 1989; Buckley and Miller 1994). Anchored FADs deployed around Tutuila and the Manu'a Islands create predictable fishing grounds by concentrating pelagic species such as skipjack, yellowfin, and mahi-mahi. For alia fishermen and subsistence fishers, FADs are especially critical because they reduce search time, lower fuel costs, and provide reliable access to pelagic species that would otherwise be difficult to target with small vessels (Dalzell et al. 1996). FADs thereby enhance food security, improve the efficiency of small-scale fisheries, and sustain cultural practices of sharing fish within communities. Because many households depend on FAD-associated fishing for both nutrition and income, the availability of FADs represents an important link between community well-being and pelagic ecosystem health (Bell et al. 2015). Any disruption to pelagic species distribution, whether from oceanographic variability, shifts in prey dynamics, or other ecosystem disturbances, can reduce the effectiveness of FADs and disproportionately affect small-scale fishers.

Non-commercial and subsistence fishing forms an essential part of household economies and cultural identity (Western Pacific Regional Fishery Management Council 2005; Kleiber and Leong 2018). Families engage in handline fishing, spearfishing, gleaning, and net fishing in lagoons and nearshore reefs, and they target many different fish and invertebrate species, with the palolo worm being a particular favorite (Dalzell et al. 1996). Catches are often consumed within the household or distributed widely among extended families, churches, and village networks. This distribution system reflects the Samoan cultural value of reciprocity and ensures that fishing supports not only immediate household needs but also broader community obligations (Kleiber and Leong 2018). Aquaculture is not a dominant activity in American Samoa, but small backyard operations produce tilapia for local consumption (Pacific Community 2025) and giant clam farming is a prospective activity (Rippe et al. 2024).

Recreational and sport fishing, while smaller in scale, contributes to local tourism and community events (NMFS 2025d). Annual tournaments target billfish, tuna, and wahoo, drawing both local and off-island participants. Some charter operations also exist, though the scale is modest compared to other Pacific Islands. Recreational fishing often intersects with cultural and subsistence practices, as tournament catches may be shared or consumed within the community rather than treated solely as trophies.

Several areas of the American Samoa EEZ are closed to fishing or otherwise designated for protection (ProtectedSeas 2025). All fishing is prohibited within 12 nm of Rose Atoll and commercial fishing is prohibited in all Monument waters (NOAA Fisheries 2013). The National Marine Sanctuary of American Samoa covers large portions of the American Samoa EEZ and has established various zones that restrict fishing activities. In addition, certain areas are designated as prohibited fishing zones for large-scale pelagic gear, providing protection for nearshore fisheries and traditional fishing grounds. These closures

help distribute fishing effort and protect sensitive habitats but also concentrate activity in remaining open zones, increasing competition for accessible fishing grounds. Importantly, none of these closures overlap with the proposed lease areas.

3.2 Vessel Traffic

Commercial shipping, passenger vessels, fishing vessels, and leisure or pleasure vessels are the bulk of the vessel traffic type in American Samoa. For analysis of vessel traffic in and around the American Samoa waters, vessel position data were downloaded from World Bank Group (WBG) data catalog for American Samoa. The analysis used International Monetary Fund's analysis of hourly AIS positions received between January 2015 and February 2021.

The general interpretation of the data as shown in **Figure 3** below is that brighter red colors indicate higher density and as the values decrease, they move closer to green. The WBG data available from January 2015 to February 2021 provides an aggregate of AIS-broadcasted points of vessel activity concentration in the areas north and southwest of the area ID. These images do not differentiate between commercial, recreational, and for-hire fisheries or the activities the vessels are engaged in (actively fishing, transiting, etc.). Passenger vessel transiting to and from the Port of Pago Pago are mostly concentrated between the islands, there are visible AIS-broadcasted points that mirror a track line that goes through the center of the area ID, but it is unclear if it belongs to one or more passenger vessels and if this occurred in 1 year or a concentration from the combined 6 years. Leisure vessels are active in the area, sparsely within the area ID, but scattered around closer to American Samoa. Lastly, commercial vessels have aggregated points that mimic tracklines from all directions to the Island. There are four distinct routes that go across the area ID with relatively higher densities of vessels in the west-northwest to east-southeast. It seems to be the main informal route, indicated in both bright red and green (**Figure 3**) for vessels heading from and/or going east of American Samoa.

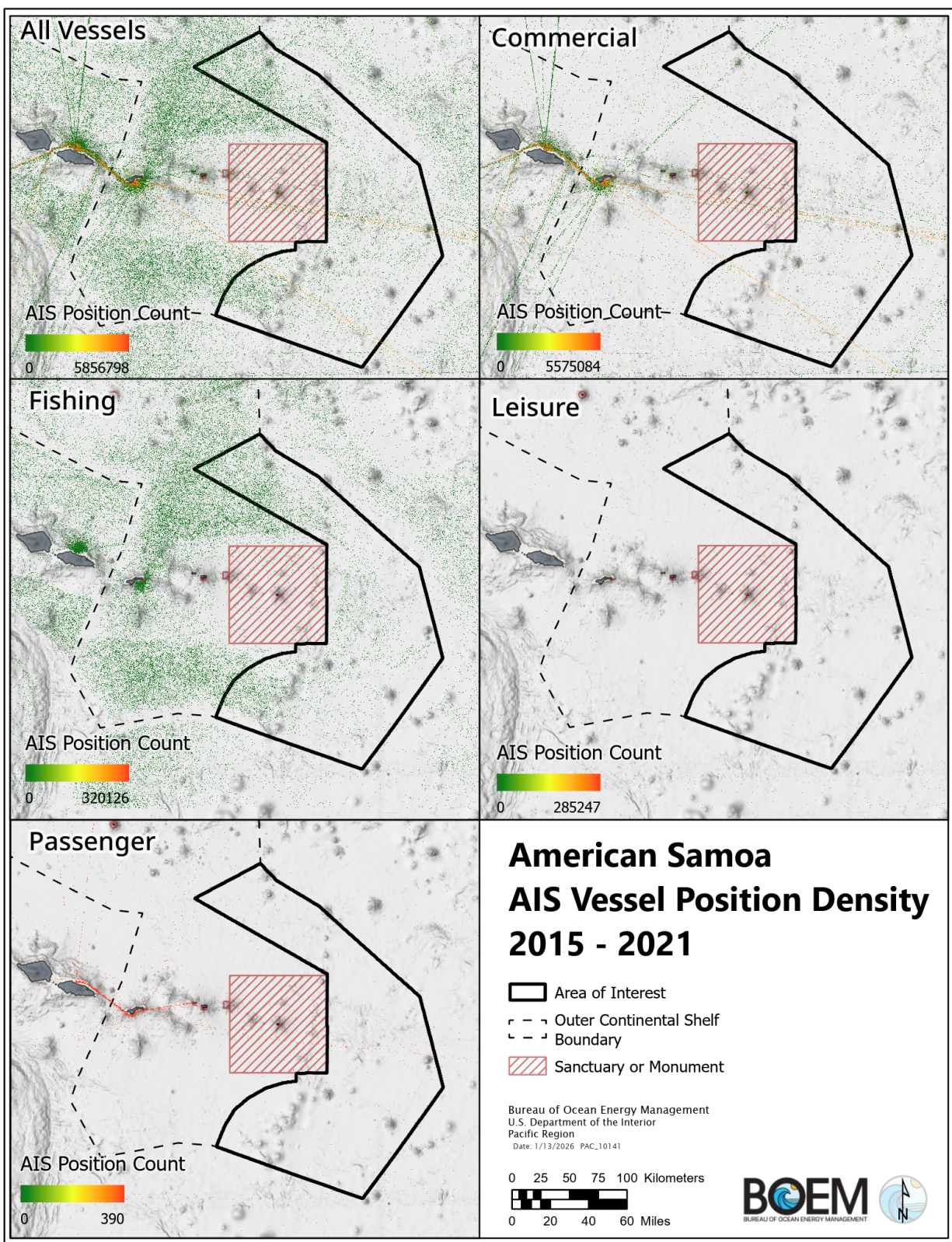


Figure 3. Vessel position density using AIS in and around American Samoa waters

Position density of all and each type of vessels are shown.

Port of Pago Pago is the port identified for possible use in the navigation and vessel traffic geographic analysis area. Port of Pago Pago has navigational aids (buoys, lighthouses), but no formal routing measures (traffic separation schemes, precautionary area, safety fairways) exist in the area. Proposed Action Area within the American Samoa waters does not have seasonal management areas with federally established vessel speed regulations. Marine protected areas (MPAs) consist of the Rose Atoll Marine National Monument, which shares the southwestern border of the area ID and does not have transit restrictions.

For analysis of vessel traffic in and around the Hawaiian waters, vessel data were downloaded from WBG data catalog. The analysis used International Monetary Fund's analysis of hourly AIS positions received between January 2015 and February 2021 (**Figure 4**). The brighter red and yellow colors indicate higher position density of vessels and as the values decrease, they move closer to green. The WBG data available from January 2015 to February 2021 (as seen in **Figure 4**) provides an aggregate of AIS-broadcasted points of vessel activity concentration in the areas around Hawaii. The image does not differentiate between commercial, recreational, and for-hire fisheries or the activities the vessels are engaged in (actively fishing, transiting, etc.).

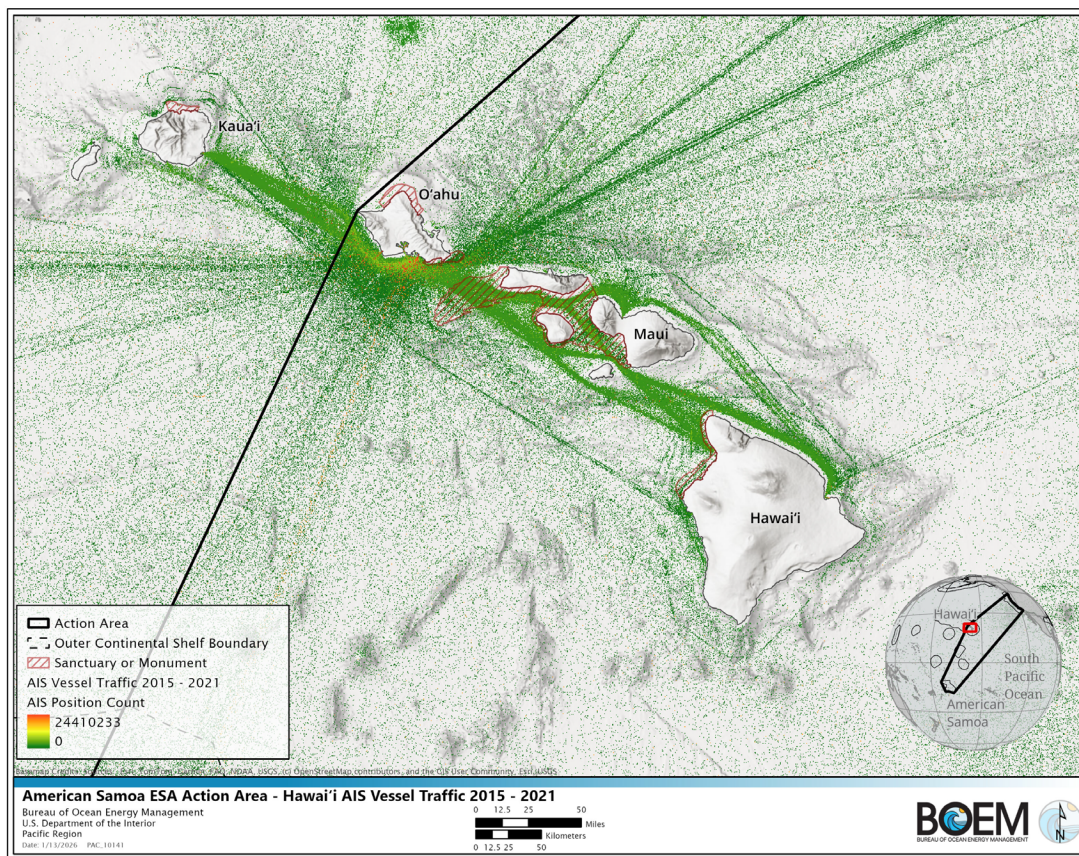


Figure 4. Vessel activities in and around Hawaii waters

For analysis of vessel traffic in and around the U.S. West Coast waters, vessel data were downloaded from WBG data catalog. The analysis used International Monetary Fund's analysis of hourly AIS positions received between January 2015 and February 2021 (**Figure 5**). The brighter red color indicates higher

position density of vessels and as the values decrease, they move closer to green. The WBG data available from January 2015 to February 2021 aggregate of AIS-broadcasted points of vessel activity concentration in the areas around the U.S. West Coast. The image does not differentiate between commercial, recreational, and for-hire fisheries or the activities the vessels are engaged in (actively fishing, transiting, etc.).

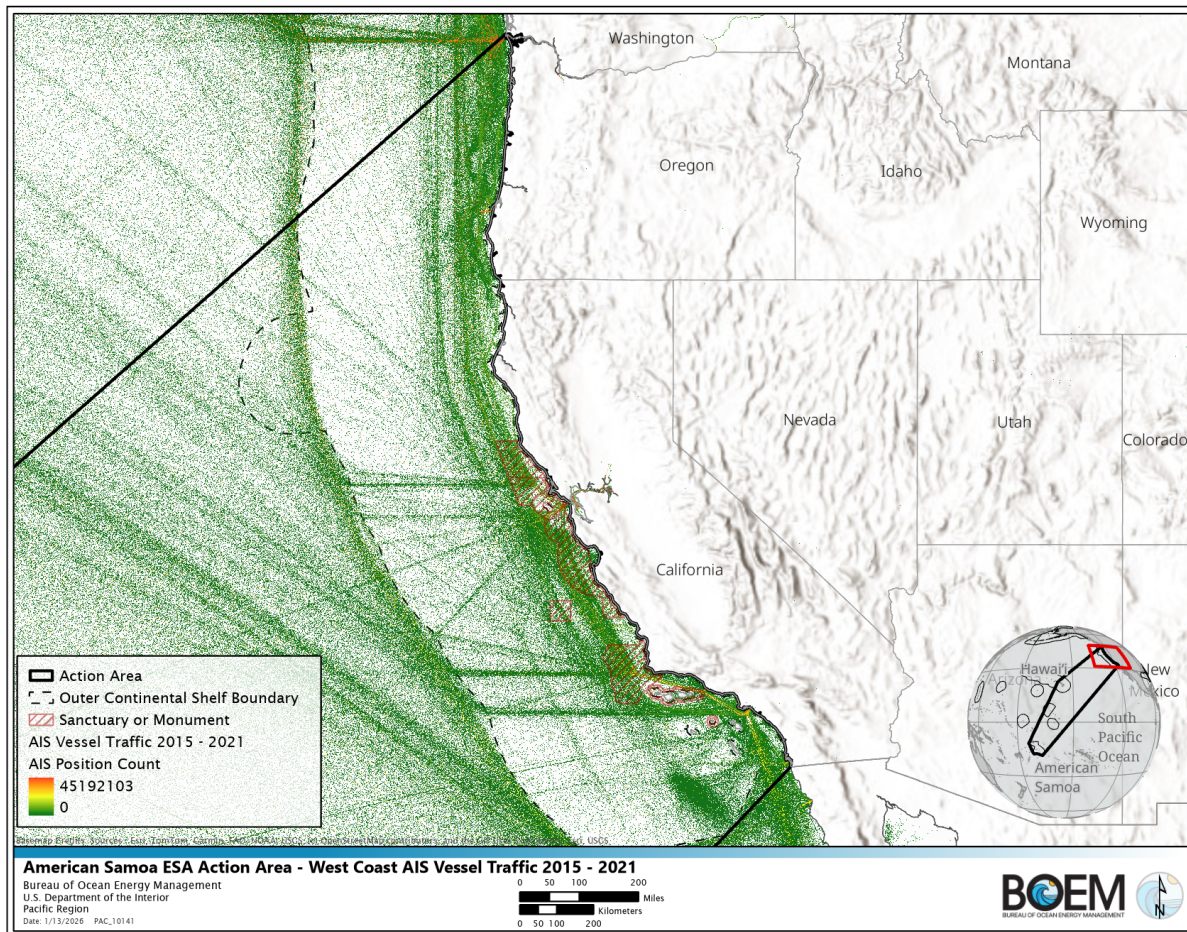


Figure 5. Vessel activities in and around the U.S. West Coast

3.3 Allisions and Collisions

An *allision* occurs when a moving object (i.e., a vessel) strikes a stationary or moored object (e.g., meteorological buoy); a *collision* occurs when two moving objects strike each other. A buoy in the area could pose a risk to vessel navigation. An allision between a ship and buoy could result in the damage or loss of the buoy and/or the vessel, as well as loss of life and spillage of petroleum product. Vessels associated activities could collide with other vessels, resulting in damages to the vessels, petroleum product spills, or capsizing.

Vessel strikes of marine mammals and sea turtles occur but precise information on the rate at which collisions occur each year for species is unknown. However, vessel collisions are identified as known or possible cause of death for several ESA-listed species. The potential for vessel collisions to injure listed species depends on vessel speed and the manner in which encounters occur. A marine mammal or sea turtle at the surface could be struck directly by a vessel, a surfacing animal could hit the bottom of a vessel, or an animal just below the surface could suffer injuries from a propeller. For large whales in particular, the severity of injuries typically depends on the size and speed of the vessel (Knowlton and Kraus 2001; Laist et al. 2001; Vanderlaan and Taggart 2007). Because some whale species can avoid slower-moving vessels, reducing vessel speed is a practical measure for reducing the risk of vessel strikes of large whales. For instance, Wiley et al. (2011) determined that a 10-kn speed restriction in North Atlantic right whale seasonal management areas reduced the risk of collisions by nearly 60% from the status quo. Less research is available for vessel interactions with sea turtles, but Hazel et al. (2007) found that green sea turtles fled less frequently and at shorter distances from vessels approaching at higher speeds than at lower speeds.

3.4 Entrapment and Entanglement

Cetaceans are known to be entangled in a variety of types of fishing gear especially with longlines (Perrin et al. 1994). A photographic-based scar study of humpback whales of American Samoa stock has been initiated, and there is some indication of healed entanglement and ship strike wounds (NMFS 2009). Two false killer whales and one rough-toothed dolphin were entangled near 40-Fathom Bank south of the islands by the American Samoa-based longline fishery in 2008 (NMFS 2011b; 2011c). American Samoa longline fishery also interacted with sea turtles with documentation of 59 interactions with leatherback sea turtles between 2010 and 2017 (NMFS and FWS 2020a).

There are reports of large whales (including humpback, right, and fin whales) interacting with anchor moorings of yachts and other vessels, towing small yachts from their moorings or becoming entangled in anchor chains, sometimes with lethal consequences (Blue Water Sailing 2012; Saez et al. 2020). A total of 511 whale entanglements, 429 confirmed, along the U.S. West Coast have been reported from 1982–2017. The annual average of total entanglement reports received by NMFS for the same period was 14, with an average of 12 confirmed entanglement reports per year (Saez et al. 2020). There are no recorded events in the literature of ESA-listed species becoming entangled in ROV cables. The following gear types have been identified as involved in the entanglement of large whales off the U.S. West Coast between 1982 and 2017: netting, commercial and recreational fishing pots/traps, salmon troll line, steel cables, and one weather buoy (in 2014). Since 2000 (289 confirmed reports), pot/trap gear has become the most commonly identified gear type associated with entanglement reports (32 %).

Sea turtles have been documented to be entangled in a large variety of man-made items (Duncan et al. 2017). Sea turtle entanglements are an underestimate as not all entanglements are reported. Since the Sea Turtle Disentanglement Network was formed in 2002 and through 2014, there have been 275 entanglements in vertical lines (NMFS 2015a). Turtles are usually entangled around the neck and/or front flippers. Leatherback sea turtles, most frequently sighted in central California, face significant threats from bycatch in fisheries (entanglement and/or hooking) (Benson et al. 2020).

It is possible that ESA-listed turtle may become entrapped in moon pools, a term used to describe opening in vessel hulls used for deploying and retrieving AUVs and other equipment. Although not within the Action Area, four instances of sea turtle entrapment (two loggerhead and two leatherback turtles) in moon pools have been documented aboard vessels operating in the Gulf of Mexico, with all animals released alive (NMFS 2020a). Moon pools have been used for decades off the West Coast and there is no known record of entrapment of ESA-listed species in the moon pools in the Pacific. The Monterey Bay Aquarium Research Institute (MBARI) regularly uses moon pools in launching ROVs and other instruments as it is safer for their staff and equipment. MBARI researchers and monitors have never had an animal trapped in their moon pool (MBARI staff, pers. comm.).

3.5 Climate Change

One of the factors affecting ESA-listed species and the marine environment is climate change. Global warming (increase in average annual surface air temperature by 1.0 °C over the last 115 years between 1901 and 2016) is occurring and the earth's temperature is the warmest in the history of modern civilization. Strong evidence suggests human activities, particularly greenhouse emissions, as probable cause of this trend (U.S. Global Change Research Program 2017). There is broad consensus that the further and faster earth warms, the great risk of potentially large and irreversible negative impacts to wildlife (U.S. Global Change Research Program 2017).

Greenhouse emissions and changes in air and sea surface temperatures can impact the marine environment (e.g., changes in ocean acidity, altered precipitation patterns, sea level rise, and changes in ocean currents). Global average sea levels are expected to rise by several inches in the next 15 years and 1–4 ft by 2100 (U.S. Global Change Research Program 2017).

Climate change can influence ocean circulation for major basin-wide currents including intensity and position of western boundary currents. Natural climatic oscillations (e.g., El Niño, La Nina, etc.) occur off the U.S. West Coast and are associated with anomalously warm water incursions. These oscillations can potentially impact the biological ecosystems with regards to nutrient availability and phytoplankton and zooplankton distribution (van Gennip et al. 2016). These impacts may also lead to changes to ecological functions such as migration, feeding, and breeding locations of listed species. Changes to any of these factors may make the currently used habitat unsuitable and lead to decreased productivity in different patterns of prey distribution and availability. These changes may affect individual animals dependent on those affected prey.

NMFS has conducted climate vulnerability assessments for many of its protected species (Lettrich et al. 2020). The potential impacts of climate and oceanographic change on whales and other marine mammals will likely affect habitat availability and food availability. Site selection for migration, feeding, and breeding may be influenced by factors such as ocean currents and water temperature. For example, there is some evidence from Pacific equatorial waters that sperm whale feeding success and, in turn, calf production rates, are negatively affected by increases in sea surface temperature (Smith and Whitehead 1993; Whitehead 1997). Any changes in these factors could render currently used habitat areas unsuitable. Changes to climate and oceanographic processes may also lead to decreased prey productivity and different patterns of prey distribution and availability. Different species of marine mammals will likely react to these changes differently. For example, range size, location, and whether or not specific range areas

are used for different life-history activities (e.g., feeding, breeding) are likely to affect how each species responds to climate change (Learmonth et al. 2006).

Based upon available information, it is likely that sea turtles are being affected by climate change. Sea turtle species are likely to be affected by rising temperatures that may affect nesting success and skew sex ratios, as some rookeries are already showing a strong female bias as warmer temperatures in the nest chamber leads to more female hatchlings (Chan and Liew 1995; Kaska et al. 2006). Rising sea surface temperatures and sea levels may affect available nesting beach areas as well as ocean productivity. Based on climate change modeling efforts in the eastern tropical Pacific Ocean, for example, Saba et al. (2012) predicted that the Playa Grande (Costa Rica) leatherback nesting population would decline 7% per decade over the next 100 years. Changes in beach conditions are expected to be the primary driver of the decline, with hatchling success and emergence rates declining by 50–60% over the next 100 years in that area (Tomillo et al. 2012). Sea turtles are known to travel within specific isotherms, and these could be affected by climate change and cause changes in their bioenergetics, thermoregulation, prey availability, and foraging success during the oceanic phase of their migration (Robinson et al. 2009; Saba et al. 2012). While the understanding of how climate change may impact sea turtles is building, there is still uncertainty and limitations surrounding the ability to make precise predictions about or quantify the threat of future effects of climate change on sea turtle populations (Hawkes et al. 2009).

Environmental changes associated with climate change are occurring within the Action Area (e.g., increased sea level rise, altered precipitation patterns, etc.) and are expected to continue into the future.

3.6 Accidental Release of Pollutants and Marine Debris

Oil and other chemical spills are a specific type of ocean contamination that can have damaging effects on some marine mammal species directly through exposure to oil or chemicals and indirectly due to pollutants' impacts on prey and habitat quality (Matkin et al. 2008; Helm et al. 2014). In the five-year period from 2013–2017 along the Pacific Coast, there were 127 pinnipeds found stranded with a serious injury or mortality caused by oil or tar coating their body (Carretta et al. 2019a).

On a broader scale ocean contamination resulting from chemical pollutants inadvertently introduced into the environment by industrial, urban, and agricultural use is also a concern for marine mammal conservation and has been the subject of numerous studies (Krahn et al. 2007; Fair et al. 2010; Moon et al. 2010; Desforges et al. 2016; Cossaboon et al. 2019). For example, the chemical components of pesticides used on land flow as runoff into the marine environment and can accumulate in the bodies of marine mammals and be transferred to their young through mother's milk (Fair et al. 2010). The presence of these chemicals in marine mammals has been assumed to put those animals at greater risk for adverse health effects and potential impact on their reproductive success given toxicology studies and results from laboratory animals (Krahn et al. 2007; Fair et al. 2010; Godard-Coding et al. 2011; Peterson et al. 2014; Peterson et al. 2015). Desforges et al. (2016) have suggested that exposure to chemical pollutants may act in an additive or synergistic manner with other stressors, resulting in significant population-level consequences. Although the general trend has been a decrease in chemical pollutants in the environment following their regulation, chemical pollutants remain important given their potential to impact marine mammals (Law et al. 2014; Bonito et al. 2016; Jepson and Law 2016). Marine species, including seals,

sea birds, sea turtles, whales, and dolphins can become entangled in debris, resulting in hindered movement, decreased feeding ability, injury, and death (NOAA Marine Debris Program 2014; Kühn et al. 2015). Fish, crustaceans, shellfish, and zooplankton ingest microplastics, and some of these organisms consume less food and have decreased energy for growth as a result (Boerger et al. 2010; Murray and Cowie 2011; Cole et al. 2013; Watts et al. 2015). Furthermore, microplastics adsorb organic contaminants and trace metals from their surrounding environments (Holmes et al. 2012; Rochman et al. 2013).

There is a clear increase in the number of species, particularly marine mammals, known to be affected with 40 per cent of the taxa known to ingest marine debris, mainly attributable to a review of the impacts of marine debris on cetaceans (Baulch and Perry 2014). The number of marine fish and seabirds affected by ingestion or entanglement has also risen. New records for plastic ingestion by fish have been reported in a range of habitats, including open ocean, deep water, and temperate pelagic and demersal (see Appendix 1a in Secretariat of the Convention on Biological Diversity 2016).

Within the Action Area near the American Samoa waters where majority of the Proposed Action will take place, several oil spills have occurred. In 1991, tropical cyclone Val caused nine fishing vessels to run aground in Pago Pago Harbor, discharging approximately 1,500 gallons of oil (Natural Resource Damage Assessment and Restoration Program 2026b). Several abandoned vessels continued to leak oil into the harbor for years, requiring ongoing cleanup efforts. In 1993, a Taiwanese fishing vessel, Jin Shian Fa, grounded on a reef at Rose Atoll breaking apart and spilling over 100,000 gallons of diesel and lube oil (Natural Resource Damage Assessment and Restoration Program 2026a). This caused long-term damage to the reef ecosystem resulting in killing of many organisms. In 2018, a 228-ft commercial fishing vessel caught fire, sank, and released fuel into the water. Same year, a fishing vessel Cap. Vincent Gann discharged oil into Pago Pago Harbor while undergoing repairs.

In addition to oil spills, other discharges have occurred in and around American Samoa. For instance, groundwater flows through highly permeable basaltic lava flows often results in discharging along the shore as springs and seep. Coastal and Marine Hazards and Resources Program (2025) found that groundwater discharge can carry excess nutrients that fuel the growth of algae, potentially threatening the health of coral reefs in coastal areas. Additionally, tuna processing facility has been known to discharge industrial wastewater without authorization into Pago Pago Harbor bypassing the treatment processes (USEPA 2019). Illegal oil dumping from shipping vessels have been documented for discharging oily bilge waste into the ocean (DOJ 2011). Untreated waste from pig farms is often flushed into streams or wetlands, which can contaminate local watersheds, drinking water, and coastal areas leading into streams and oceans (USEPA 2006). Moreover, runoff from unlined dumpsites can leach pollutants into the groundwater, which can then discharge into nearby lagoons and possibly harm the reefs (NPS 2018).

4 Rangewide Status of Species and CH

In this section, BOEM considers the status of the NOAA ESA-listed species within the Action Area that may affect but not likely to be adversely affected (NLAA) by the Proposed Action. This section also examines the condition of the CH throughout the designated area and discusses the function of the physical or biological features that are essential for the conservation of the species. Although humpback whales will likely occur in the Action Area, we did not include any analysis of this species because it is not listed under ESA.

4.1 Blue Whale (*Balaenoptera musculus*)

Blue whale populations were greatly reduced by commercial whaling in the early 1900s, and the species was federally listed as endangered in 1970 (35 FR 18319). Two blue whale stocks are recognized in the North Pacific Ocean: the Eastern North Pacific (ENP) stock and the Central North Pacific (CNP) stock (Carretta et al. 2024).

The seasonal migration of the ENP population has been confirmed by long-term acoustic monitoring (Burtenshaw et al. 2004) and by movements of photo-identified individuals between southern California and the Gulf of Alaska (Calambokidis 2009). Blue whales travel northward as summer progresses in response to northward progressing spring transition, and subsequent increases in primary productivity (Burtenshaw et al. 2004; Calambokidis 2009). Blue whale biologically important areas (BIAs) are described in Calambokidis et al. (2015) and updated in Calambokidis et al. (2024). Both the blue whale feeding core and parent BIAs overlap with the Action Area on the West Coast (**Figure 6**).

The most current information suggests that the ENP population may have recently recovered since commercial whaling ended in 1971, despite ship strikes, interactions with fishing gear, and increased levels of ambient sound in the Pacific Ocean (Barlow 1997; 2003; Calambokidis and Barlow 2013; Campbell et al. 2015; Monnahan et al. 2015; Širović et al. 2015b; Barlow 2016; International Whaling Commission 2016; Rockwood et al. 2017; Valdivia et al. 2019; Carretta et al. 2020). The population of ENP blue whales may be near carrying capacity and the rate of change of the population size has declined (Monnahan et al. 2015; International Whaling Commission 2016; Carretta et al. 2020). Based on NMFS systematic ship surveys from 1991 to 2014, the abundance of blue whales in the area (the combined Oregon/Washington stratum and the northern California stratum) is estimated at 1,496 whales (Barlow 2016). The annual entanglement rate of blue whales (observed) during 2013–2017 is the sum of observed annual entanglements (1.35/yr), plus species probability assignments from unidentified whales (0.09/yr), totaling 1.44 blue whales annually (Carretta et al. 2020). Most observed blue whale ship strikes have been in southern California or off San Francisco, CA, where the seasonal distribution of blue whales is in close proximity to shipping ports (Berman-Kowalewski et al. 2010). Using the moderate level of avoidance model from Rockwood et al. (2017), estimated ship strike deaths of blue whales are 18 annually. A comparison of average annual ship strikes observed over the period 2013–2017 (0.4/yr) versus estimated ship strikes (18/yr) indicates that the rate of detection for blue whale vessel strikes is approximately 2%. The observed and assigned annual incidental mortality and injury rate from ship strikes (0.4/yr) and commercial fisheries (≥ 1.44 /yr), totals 1.84 whales annually from 2013–2017. This exceeds the calculated potential biological removal of 1.23 for this stock of blue whales (Carretta et al. 2020).

Blue whales identified in the area off northern California are re-sighted most frequently off Point St. George (Calambokidis et al. 2004; Calambokidis 2007). They are most commonly sighted along the continental shelf break but also occur farther inshore, in transit or feeding on surface swarms of krill. Satellite-tagged blue whales provided information on “core areas of use,” indicating a high area of overlap for individuals at the western part of the Channel Islands, and near the Gulf of the Farallones, and the northern part of Cape Mendocino (Irvine et al. 2014). Irvine et al. (2014) found that although the satellite tracks were widely distributed, these whales tended to occupy the area off northern California during the latter part of the feeding season in late October–November. Based on a series of aerial and summer/fall shipboard surveys off California, Oregon, and Washington from 1991–2018 sightings of blue whales in inshore and offshore waters off California decreased (Becker et al. 2020).

The CNP stock are known to be found around the Hawaiian Islands during the winter. This stock appears to feed in summer southwest of Kamchatka, south of the Aleutians, and in the Gulf of Alaska, and in winter migrate to lower latitudes in the western and central Pacific, including Hawaii (NMFS 2018a). The status of this stock of blue whales in Hawaii is unknown and is insufficient to evaluate trends in abundance.

No CH is designated for blue whales in the Pacific.

Threats

Blue whales experienced intensive whaling throughout the 20th century, and the threat of directed hunting remains. Other threats that may be affecting blue whales with at least a potential for population-level consequences or are significant enough to contribute to the species’ extinction risk include ship strikes, entanglement in marine debris and fishing gear, anthropogenic noise, and loss of prey base due to climate and ecosystem change (NMFS 2020b). Recovery of the globally listed blue whale population is contingent upon all nine management units meeting the relevant criteria described in the blue whale recovery plan (NMFS 2020c).

It is difficult to estimate the numbers of blue whales possibly killed and injured by fishing gear, because large whales that become entangled in fishing gear may often die later and drift far enough to not strand on land after such incidents. Vessel strikes are also a threat to all large whales, including blue whales, although reported vessel strikes are considered a minimum accounting of the total. The threat to blue whales due to underwater noise, pollutants, marine debris, and habitat degradation, are difficult to quantify. However, there is a growing concern that the increasing levels of anthropogenic noise in the ocean may be a habitat concern for whales, particularly for whales that use low-frequency sound to communicate, such as baleen whales.

The blue whale recovery plan (NMFS 2020c) describes recommended actions to determine the level of threat fishery entanglements, vessel strikes, and other potential threats pose to the likelihood of survival and recovery of the species.

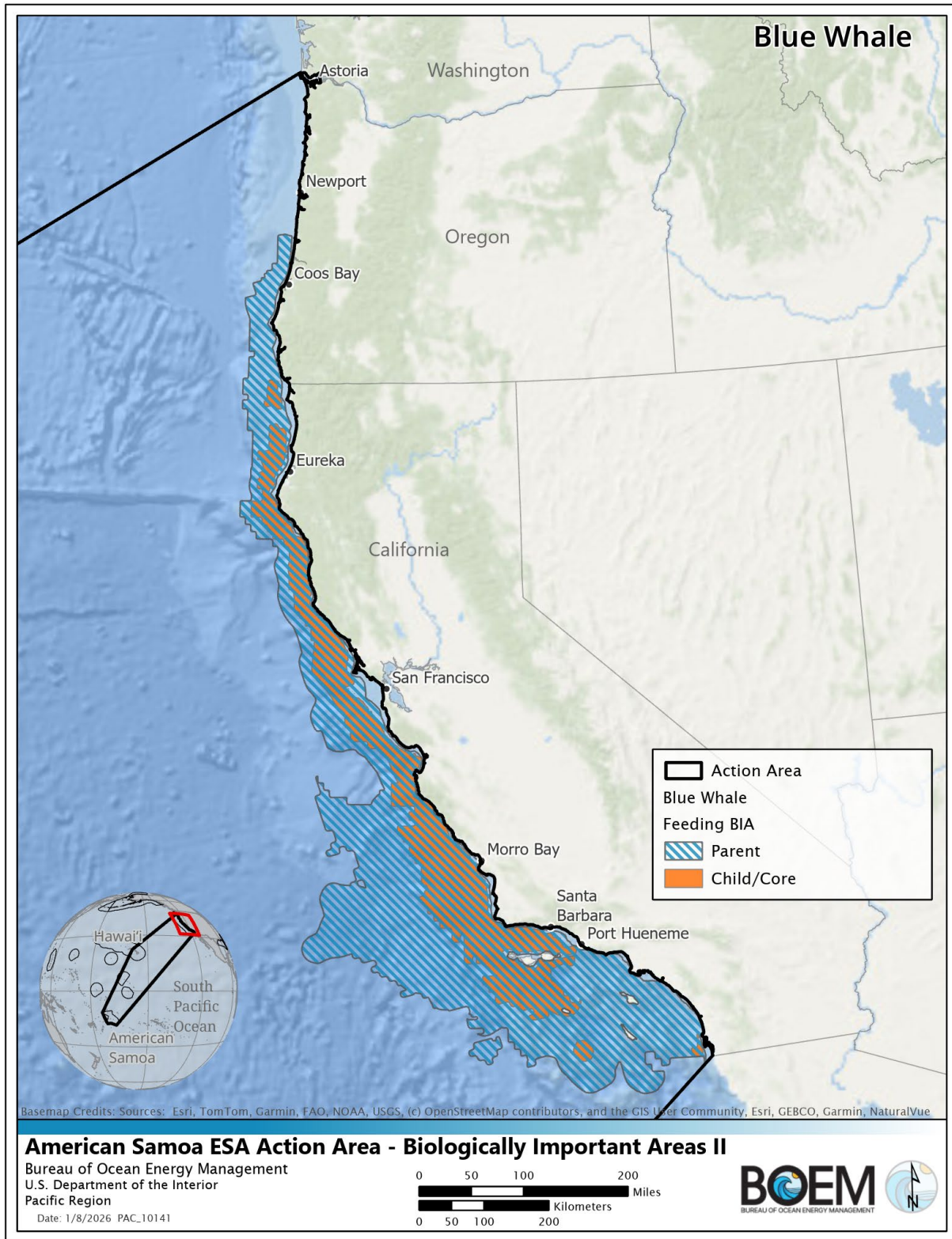


Figure 6. Feeding BIAs for blue whales relative to the Action Area

Data source: Calambokidis et al. (2024)

4.2 Fin Whale (*Balaenoptera physalus*)

Fin whales prefer temperate and polar waters (Reeves et al. 2002; Jefferson et al. 2015). This species has been documented from 60° N in Alaska waters to tropical waters off Hawaii, in Canadian waters both offshore and inland including some fjords, and they have frequently been recorded in waters within the Southern California Bight (Campbell et al. 2015; Jefferson et al. 2015; Mate et al. 2016; Širović et al. 2016; Mate et al. 2018). As demonstrated by satellite tags and discovery tags, fin whales make long-range movements along the entire U.S. West Coast (Falcone et al. 2011). Locations of breeding and calving grounds are largely unknown. The species is highly adaptable, following prey, typically off the continental shelf (Azzellino et al. 2008; Panigada et al. 2008). Survey and acoustic data indicate that fin whale distributions shift both seasonally as well as annually (Douglas et al. 2014; Jefferson et al. 2014; Calambokidis et al. 2015; Burnham et al. 2019).

During aerial surveys conducted within the 2,000 m isobath off southern Washington, Oregon, and northern California in the spring, summer, and fall of 2011 and 2012, there were six sightings of 13 fin whales during winter and summer 2012 only in offshore waters over the continental slope (Adams et al. 2014). Sightings from systematic ship surveys out to 300 nmi off the U.S. West Coast, satellite tag data and habitat-based density models built with these data indicate that fin whales are more likely to be present seaward of the continental shelf in the offshore portion of the Action Area in late June to early December (Becker et al. 2020). Because fin whale abundance appears lower in winter/spring in California (Dohl et al. 1983; Forney et al. 1995) and in Oregon (Green et al. 1992), it is likely that the distribution of this stock extends seasonally outside these coastal waters.

The fin whale is listed as endangered under the ESA, but there is no designated CH for this species. Fin whale population structure in the Pacific Ocean is not well known. During the 20th century more fin whales were taken by industrialized whaling than any other species (Rocha Jr. et al. 2014). NMFS recognizes three fin whale stocks: (1) the Northeast Pacific stock (Alaska); (2) the California, Oregon, and Washington stock, and (3) the Hawaii stock, all stocks are considered depleted under the Marine Mammal Protection Act and endangered under the ESA (Carretta et al. 2024). Analysis of genetic and acoustic data suggests that fin whales in the North Pacific interbreed and are a single population (Archer et al. 2019).

There has been a roughly five-fold abundance increase between 1991 and 2014. Since 2005, the abundance increase has been driven by increases off northern California, Oregon, and Washington, while numbers off central and southern California have been stable (Nadeem et al. 2016). The best estimate of fin whale abundance in California, Oregon, and Washington waters out to 300 nmi is 9,029 (CV = 0.12) whales, based on a trend analysis of 1991–2014 line-transect data (Nadeem et al. 2016).

Total mean annual fishery-related serious injury and mortality is 0.67 fin whales annually (2014–2018) (Carretta et al. 2020). The average observed annual mortality and serious injury due to ship strikes is 1.6 fin whales per year during 2014–2018. Documented ship strike deaths and serious injuries are derived from direct counts of whale carcasses and represent minimum impacts (Carretta et al. 2020). The most conservative estimate of ship strike deaths from Rockwood et al. (2017) is 43 whales annually. The ratio of documented ship strike deaths (1.8/yr) to estimated annual deaths (43) implies a carcass recovery/documentation rate of 4.1%. There is uncertainty regarding the estimated number of ship strike deaths, however, it is apparent that carcass recovery rates of fin whales are quite low.

Although no fin whale entanglements have been observed 1990–2016 (Carretta et al. 2018), some gillnet mortality may go unobserved because whales swim away with portion of the net (Carretta et al. 2020). The average observed annual mortality due to ship strikes is 0.2 sei whales per year for the period 2012–2016. Additional ship strike mortality probably goes unreported because the whales do not strand or, if they do, they may not have obvious signs of trauma.

BIAs for fin whales, including parent and core areas, were recently delineated due to the availability of additional data (see Calambokidis et al. 2024). Both the fin whale parent and core feeding BIAs overlap with the Action Area (**Figure 7**).

Threats

A comprehensive list of general threats to fin whales is detailed in the recovery plan (NMFS 2010) and updated in the most recent 5-year status review (NMFS 2019b). Obvious threats to fin whales besides vessel interactions and fishery entanglements include reduced prey abundance due to overfishing or other factors (including climate change and competition with other baleen whales), habitat degradation, and disturbance from low-frequency noise, including ship traffic and airguns. Because little evidence of entanglement in fishing gear exists, and large whales such as the fin whale may often die later and drift far enough not to strand on land after such incidents, it is difficult to estimate the numbers of fin whales killed and injured by gear entanglements.

Documented ship strike deaths and serious injuries are derived from actual counts of fin whale carcasses and should be considered minimum values, although Rockwood et al. (2017) recently published efforts to generate plausible estimates of ship strike mortality for several whale species. Continued research around vessel traffic pattern inconsistencies may inform our understanding of the mitigation of vessel strike risks with Redfern et al. (2019) who suggested consideration of both the reduction of vessel speeds along with expanded areas of avoidance.

The threats to fin whales due to underwater noise, pollutants, marine debris, and habitat degradation, are difficult to quantify, although recent studies are finding concerning levels of persistent organic pollutants (Pinzone et al. 2015) and microplastics, including plastic additives (Fossi et al. 2012), in the blubber of fin whales, and there is a growing concern that the increasing levels of anthropogenic noise in the ocean may be a habitat concern for fin whales that use low-frequency sound to communicate.

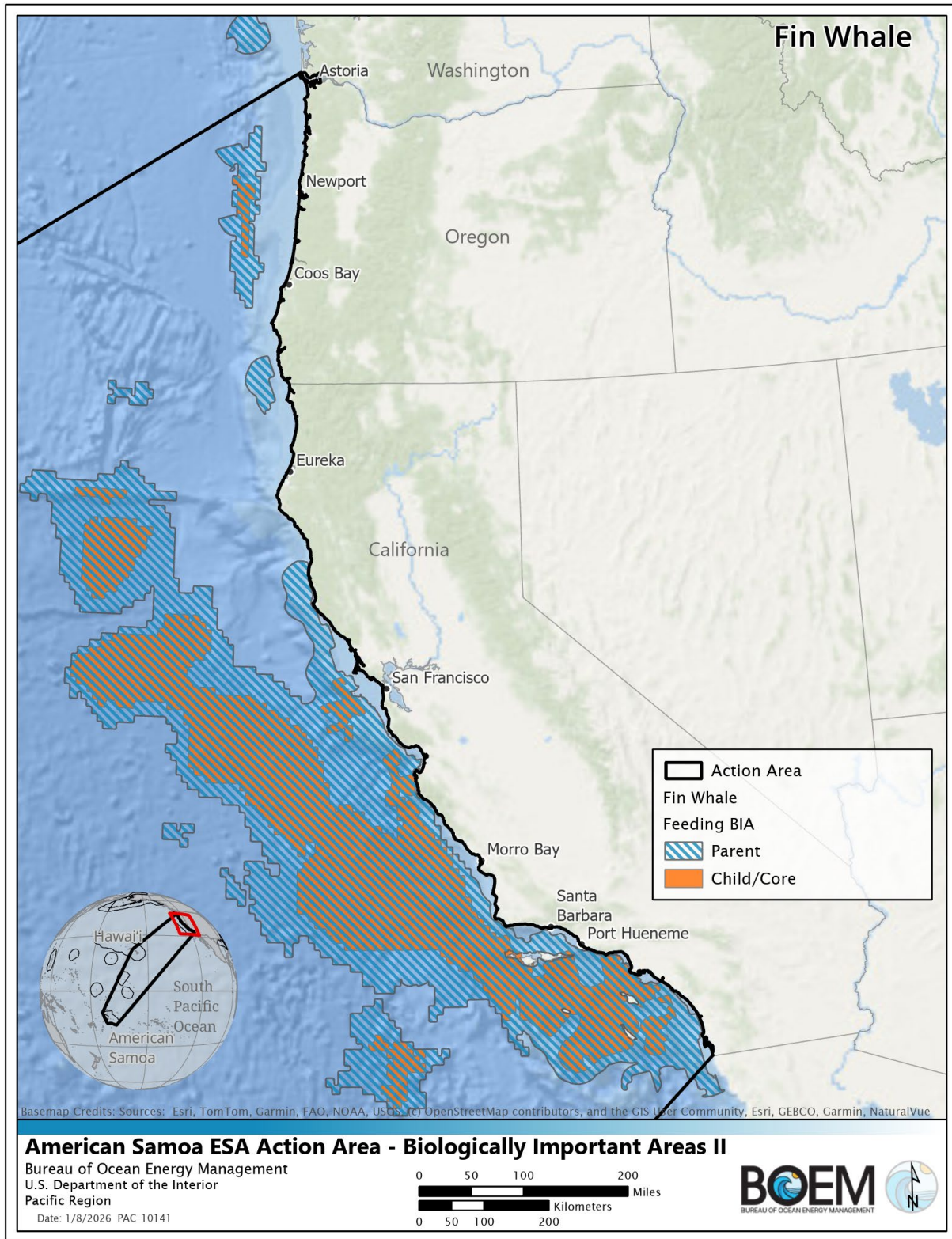


Figure 7. Feeding BIAs for fin whales relative to the Action Area

Data source: Calambokidis et al. (2024)

4.3 Sei Whale (*Balaenoptera borealis*)

Sei whales have a worldwide distribution and are found primarily in cold temperate to subpolar latitudes across the North Pacific where there is steep bathymetric relief, such as the continental shelf break, canyons, or basins between banks and ledges (Horwood 1987; Best and Lockyer 2002; Horwood 2009; Burnham et al. 2019). Sei whales are migratory, spending the summer months feeding in the subpolar higher latitudes and returning to the lower latitudes to calve in the winter (Fulling et al. 2011; Smultea and Jefferson 2014; Rone et al. 2017). In the winter in the Pacific, sei whales have been detected as far south as the Mariana Islands, Hawaii, and southern California (Fulling et al. 2011; Smultea and Jefferson 2014). Analysis of sei whale genetic samples from around the Pacific suggests a single stock present in the Pacific (Baker et al. 2006; Huijser et al. 2018). For the marine mammal stock assessment reports, sei whales within the Pacific U.S. EEZ are divided into three discrete non-contiguous areas: (1) California, Oregon, and Washington waters, (2) waters around Hawaii, and (3) Alaskan waters. The ENP stock includes animals found within the U.S. West Coast EEZ and in adjacent high seas waters, and the Hawaiian stock includes animals found both within the Hawaiian Islands EEZ and in adjacent high seas waters (NMFS 2023b).

The sei whale is listed as endangered under the ESA, but there is no designated CH for this species (Carretta et al. 2024). No data on trends in sei whale abundance exist for the eastern North Pacific. Although the population in the North Pacific is expected to have grown since being given protected status in 1976, the possible effects of continued unauthorized takes (Yablokov 1994), vessel strikes and gillnet mortality make this uncertain. Barlow (2016) noted that an increase in sei whale abundance observed in 2014 in the California Current is partly due to recovery of the population from commercial whaling but may also involve distributional shifts in the population. The best estimate of abundance for California, Oregon, and Washington waters is the unweighted geometric mean of the 2008 and 2014 estimates, or 519 (CV = 0.40) sei whales (Barlow 2016). For the Hawaiian stock, encounter data from a 2010 shipboard line-transect survey of the entire Hawaiian Islands EEZ was used to evaluate the current abundance estimate of 391 (CV=0.9) (Bradford et al. 2017).

Threats

Sei whales are rare in the California Current (Dohl et al. 1983; Green et al. 1992; Forney et al. 1995; Barlow 2016) but were the fourth most common whale taken by California coastal whalers in the 1950s–1960s (Rice 1974). Shipboard surveys off California, Oregon, and Washington from 1991–2014 sighted approximately 17 sei whales from 35° N to 45° N (Barlow 2016). The California swordfish drift gillnet fishery is the most likely U.S. fishery to interact with sei whales from this stock, but no entanglements have been observed from 8,845 monitored fishing sets from 1990–2016 (Carretta et al. 2018). The average observed annual mortality due to ship strikes is 0.2 sei whales per year for the period 2012–2016. The reported take of North Pacific sei whales by commercial whalers totaled 61,500 between 1947 and 1987 (C. Allison, IWC, pers. comm.). There has been an International Whaling Commission prohibition on taking sei whales since 1976, and commercial whaling in the U.S. has been prohibited since 1972. Increasing levels of anthropogenic sound in the world’s oceans is a habitat concern for whales, particularly for baleen whales that may communicate using low-frequency sound (Croll et al. 2002). Other threats include prey base changes due to climate change and impacts from oil and gas exploration.

4.4 Humpback Whale (*Megaptera novaengliae*)

Humpback whales occur throughout the North Pacific, with multiple populations recognized based on low latitude winter breeding areas (Calambokidis et al. 2001; Calambokidis et al. 2008; Barlow et al. 2011). Exchange of animals between breeding areas occurs rarely, based on photo-identification data of individual whales (Calambokidis et al. 2001; Calambokidis et al. 2008). Photo-identification evidence also suggests strong site fidelity to feeding areas, but animals from multiple feeding areas converge on common winter breeding areas (Calambokidis et al. 2008). For the marine mammal stock assessment reports, the California/Oregon/Washington Stock is defined to include humpback whales that feed off the U.S. West Coast, including whales from the endangered Central American and threatened Mexican distinct population segments (DPSs) defined under the ESA (NMFS 2022). Three other stocks are recognized in the Pacific region stock assessment reports: (1) CNP Stock (with feeding areas from Southeast Alaska to the Alaska Peninsula), (2) Western North Pacific Stock (with feeding areas from the Aleutian Islands, the Bering Sea, and Russia), and (3) American Samoa Stock in the South Pacific (with largely undocumented feeding areas as far south as the Antarctic Peninsula) (Carretta et al. 2024). Nearly all Central American whales migrate to California and Oregon to feed, but the California/Oregon feeding area represents a mix of whales from Mexico and Central America (Wade 2021).

Both core and parent BIAs for humpback whale feeding areas were identified off the U.S. West Coast by Calambokidis et al. (2015) and updated by Calambokidis et al. (2024). Both the core and parent humpback whale feeding BIAs overlap with the Action Area on the West Coast (**Figure 8**). There are also reproductive BIAs in Hawaii for humpback whales (**Figure 9**).

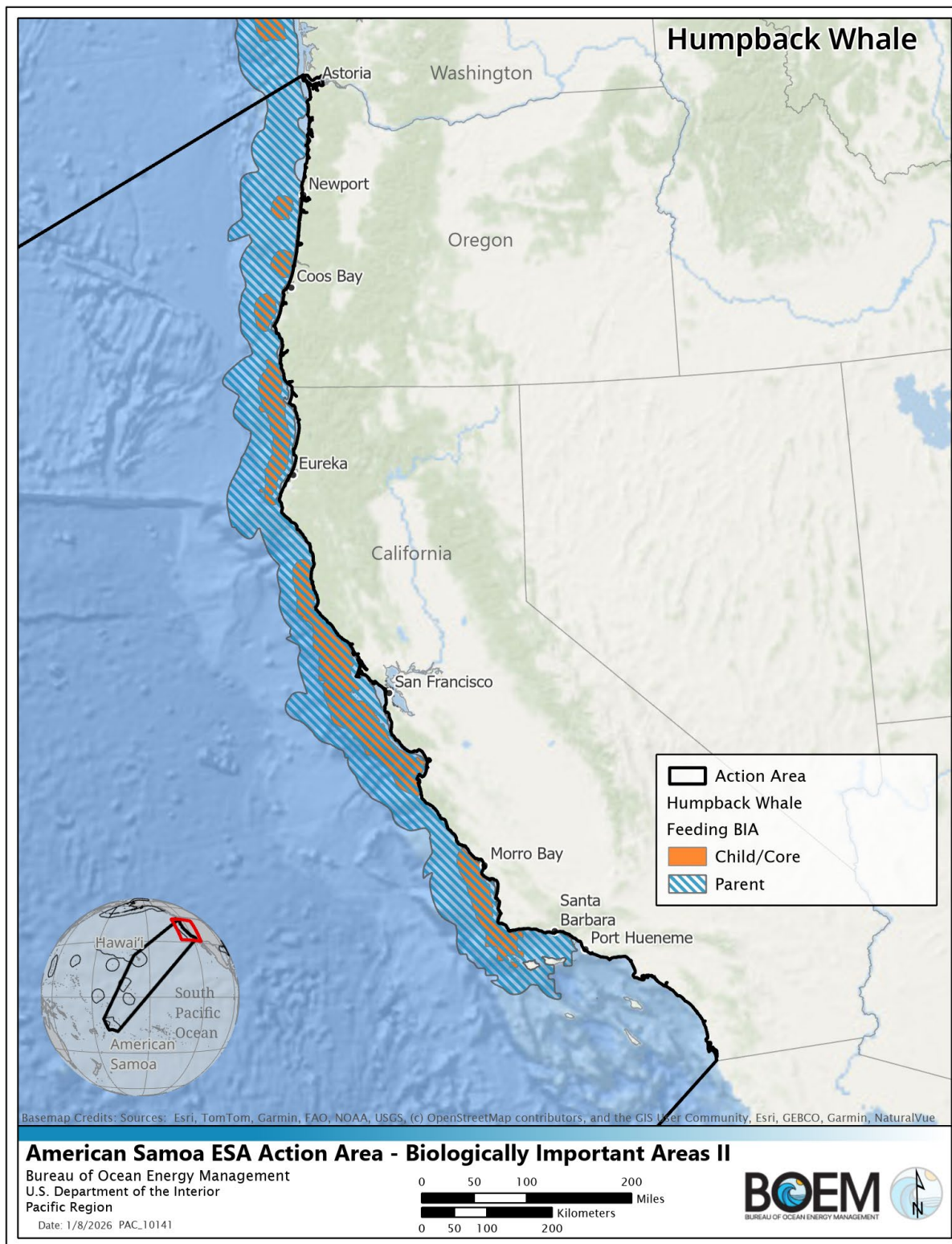


Figure 8. Feeding BIAs for humpback whales relative to the Action Area within the West Coast

Data source: Calambokidis et al. (2024)

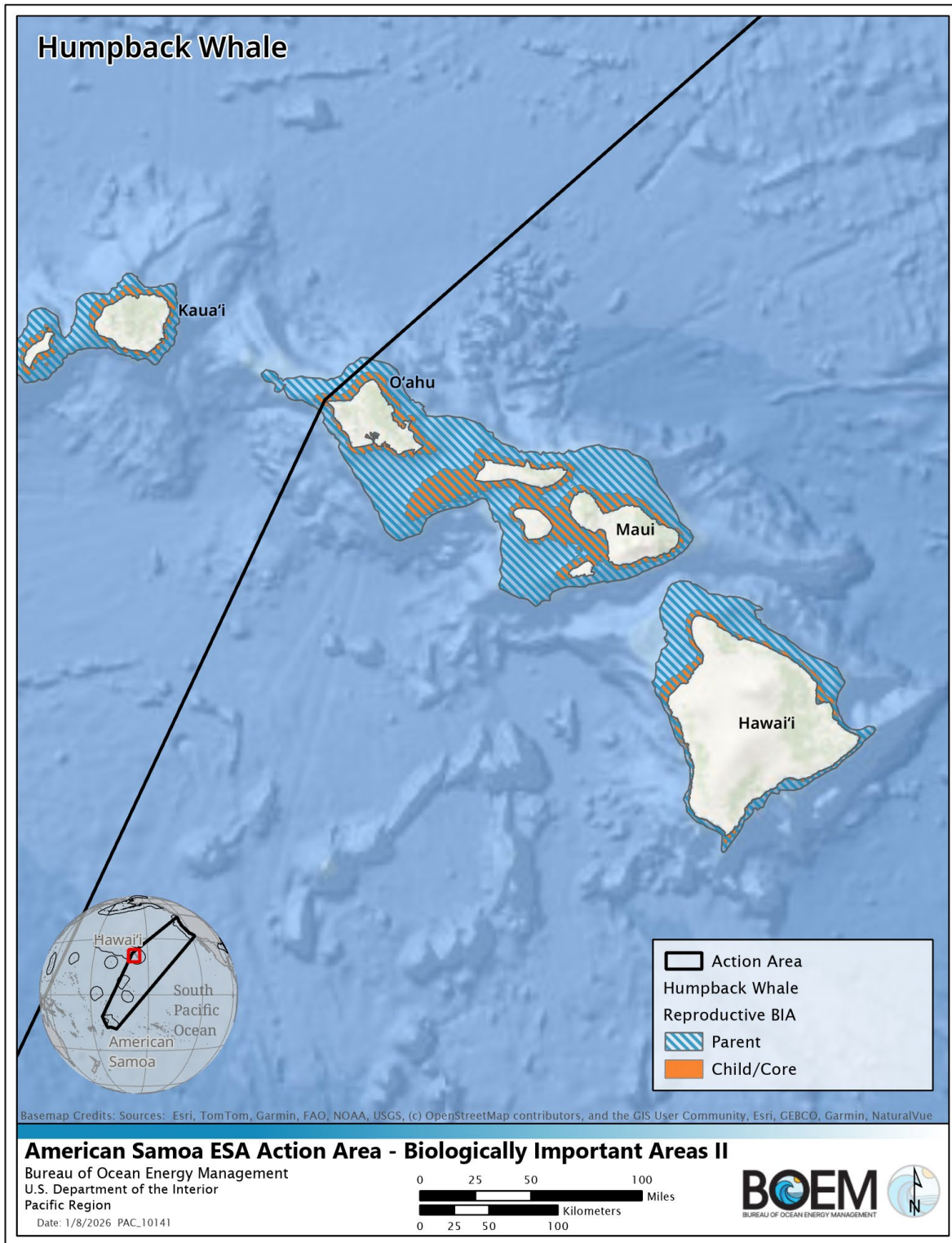


Figure 9. Reproductive BIAs for humpback whales relative to the Action Area in Hawaiian waters
Data source: Calambokidis et al. (2024)

CH for the endangered Central America DPS and the threatened Mexico DPS of humpback whales within waters off the U.S. West Coast (**Figure 10**) was designated on April 21, 2021 (86 FR 21082), identifying prey as the single essential feature for both DPSs. CH for these DPSs serve as feeding habitat and contain the essential biological feature of humpback whale prey. CH for the Central America DPS of humpback whales contains approximately 48,521 nmi² of marine habitat in the North Pacific Ocean within the portions of the California Current Ecosystem off the coasts of Washington, Oregon, and California. Specific areas designated as CH for the Mexico DPS of humpback whales contain approximately 116,098 nmi² of marine habitat in the North Pacific Ocean, including areas within portions of the eastern Bering Sea, Gulf of Alaska, and California Current Ecosystem. For the Central America DPS, the prey essential feature is described as primarily euphausiids (*Thysanoessa*, *Euphausia*, *Nyctiphanes*, and *Nematoscelis*) and small pelagic schooling fishes, such as Pacific sardine (*Sardinops sagax*), northern anchovy (*Engraulis mordax*), and Pacific herring (*Clupea pallasii*), of sufficient quality, abundance, and accessibility within humpback whale feeding areas to support feeding and population growth. For the Mexico DPS, the prey feature is described as primarily euphausiids (*Thysanoessa*, *Euphausia*, *Nyctiphanes*, and *Nematoscelis*) and small pelagic schooling fishes, such as Pacific sardine (*Sardinops sagax*), northern anchovy (*Engraulis mordax*), Pacific herring (*Clupea pallasii*), capelin (*Mallotus villosus*), juvenile walleye pollock (*Gadus chalcogrammus*), and Pacific sand lance (*Ammodytes personatus*) of sufficient quality, abundance, and accessibility within humpback whale feeding areas to support feeding and population growth.

Threats

Fishery interaction is one of the primary threats humpbacks face. From 2013–2017, mortality due to interactions with fisheries amounted to 17.3 whales per year (Carretta et al. 2020). Fourteen humpback whales (totaling 8 deaths, 2.8 serious injuries, and 2 non-serious injuries) were reported struck by vessels between 2013 and 2017 (Carretta et al. 2019a). An encounter theory model estimated the number of annual ship strike deaths to be 22 humpback whales, though this includes only the period July–November when whales are most likely to be present in the U.S. West Coast EEZ and the time of year that overlaps with cetacean habitat models generated from line-transect surveys (Becker et al. 2016; Rockwood et al. 2017). A humpback whale was entangled in a research marine mooring buoy in 2014. The whale is estimated to have been entangled for 3 weeks and had substantial necrotic tissue around the caudal peduncle. Although the whale was fully disentangled, this animal was categorized as a serious injury because of the necrotic condition of the caudal peduncle and the possibility that the whale would lose its flukes due to the severity of the entanglement (Carretta et al. 2019a). Increasing levels of anthropogenic sound in the world's oceans (Andrew et al. 2002) has also been identified as a threat to humpback whales. Other threats include climate change and vessel-based harassment (e.g., whale watching vessels, recreational boats and other boats causing stress and behavioral changes).

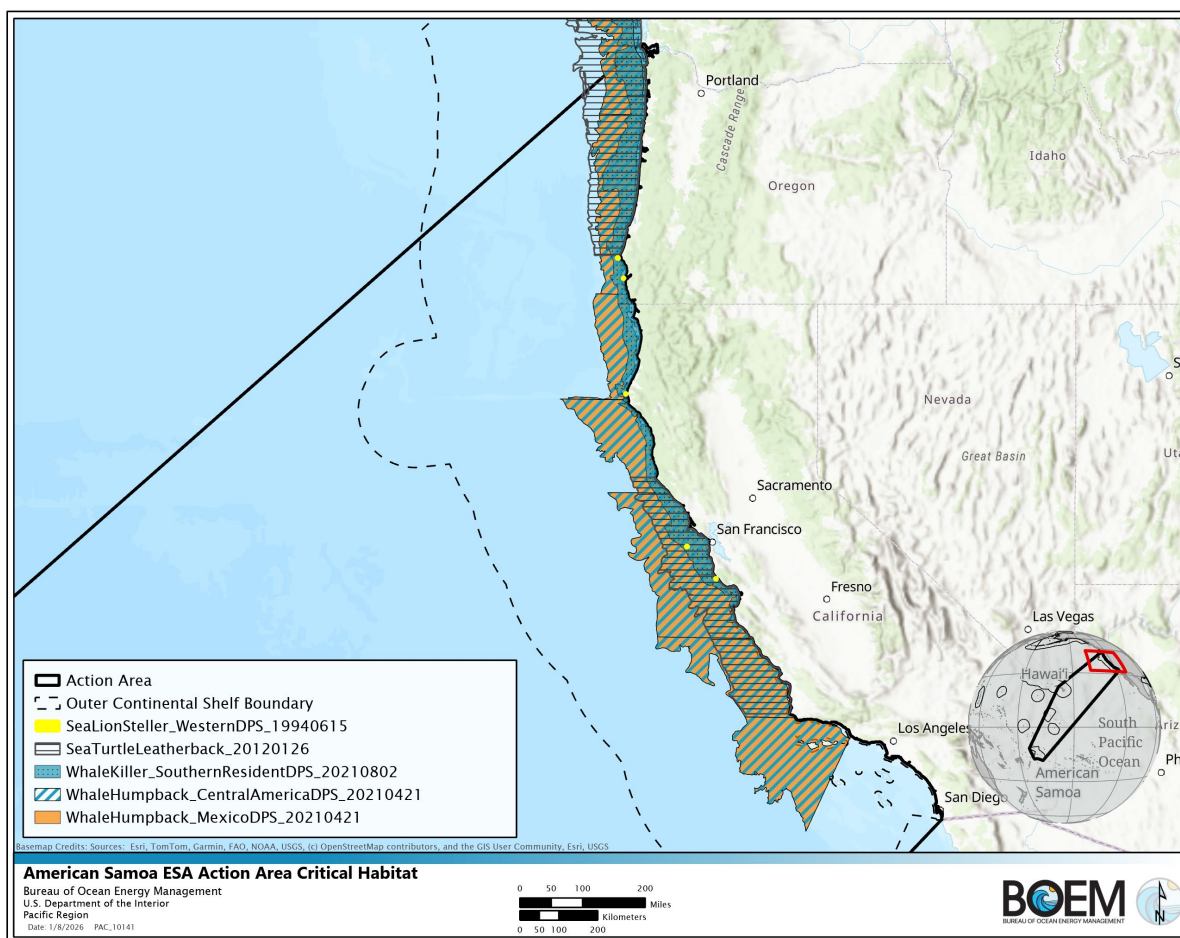


Figure 10. Action Area and CH of Steller sealions, leatherback sea turtles, Southern Resident killer whales, and Central America and Mexico DPS of humpback whales

4.5 Gray Whale (*Eschrichtius robustus*)

There are two North Pacific stocks of gray whales: the Western North Pacific (WNP) stock and the ENP included in the Pacific Stock Assessment Report (Carretta et al. 2024). Gray whales of the WNP stock primarily occur in shallow waters over the U.S. West Coast, Russian, and Asian continental shelves, while the ENP stock whales primarily occur in shallow waters over the continental shelf of the U.S. West Coast and Mexico. This species is considered to be one of the most coastal of the great whales (Jones and Swartz 2009; Jefferson et al. 2015; Carretta et al. 2024). The WNP stock primarily feed in the Okhotsk Sea off Sakhalin Island, Russia, and in the southeastern Kamchatka Peninsula in the southwestern Bering Sea in nearshore waters generally less than 225 ft deep (Jones and Swartz 2009; Weller and Brownell Jr. 2012). The breeding grounds consist of subtropical lagoons in Baja California, Mexico, and suspected wintering areas in southeast Asia (Urbán R. et al. 2003; Alter et al. 2009; Jones and Swartz 2009; Weller et al. 2013; Mate et al. 2015). The ENP stock also feeds in nearshore waters in the Chukchi Sea, Bering Sea, Gulf of Alaska, the Pacific Northwest, and northern California (Mate et al. 2010; Mate et al. 2013; Weller et al. 2013; Calambokidis et al. 2017; Lagerquist et al. 2019). The main breeding grounds consist of

subtropical lagoons in Baja California, Mexico (Urbán R. et al. 2003; Alter et al. 2009; Jones and Swartz 2009).

Some gray whales make the longest annual migration of any mammal (15,000–20,000 km roundtrip; Guazzo et al. 2019). Gray whales migrate along the Pacific Coast twice a year between October and July (Calambokidis et al. 2015). Although they generally remain mostly over the shelf during migration, some gray whales may be found in more offshore waters to the west of San Clemente Island and the Channel Islands (Mate and Urbán-Ramirez 2003; Smultea and Jefferson 2014; Calambokidis et al. 2015; Guazzo et al. 2019; Schorr et al. 2019). Recordings from a hydrophone array deployed offshore of central California (near Monterey) show that gray whales are acoustically active while migrating and that this acoustic behavior and their swimming behavior during migration changes on daily and seasonal time scales (Guazzo et al. 2017).

Information from tagging, photo-identification and genetic studies show that some whales identified in the Western North Pacific off Russia have been observed in the eastern North Pacific, including coastal waters of Canada, the U.S. and Mexico (Weller and Brownell Jr. 2012; Mate et al. 2015; Urbán R. et al. 2019). The number of whales documented moving between the Western and Eastern North Pacific represents 14% of gray whales identified off Sakhalin Island and Kamchatka according to (Urbán R. et al. 2019). Some whales that feed off Sakhalin Island in summer migrate east across the Pacific to the west coast of North America in winter, while others migrate south to waters off Japan and China (Weller et al. 2016). The current stock structure for gray whales in the Pacific has been in the process of being re-examined for a number of years and remains uncertain as of the most recent Pacific Stock Assessment Report (Carretta et al. 2020). Genetic data reveal mixed stock aggregations of gray whales in the North Pacific Ocean and indicate that current population structure is not reflected by the current eastern and western stock or DPS designations based on geography (Brüniche-Olsen et al. 2018; Carretta et al. 2020).

The WNP is endangered, with an estimated population size from photo-ID data for Sakhalin and Kamchatka in 2016 of 290 whales (90% percentile intervals = 271–311) (Cooke et al. 2017; Cooke 2018). Their main wintering areas are in waters off Russia and Asia (Weller et al. 2012; Moore and Weller 2013; Weller et al. 2013; Mate et al. 2015). Recent analysis of the data available for 2005 through 2016 estimates the combined Sakhalin Island and Kamchatka populations are increasing (Cooke 2019). The ENP has recovered from whaling exploitation, is not considered depleted, and was delisted under the ESA in 1994 (Swartz et al. 2006; Carretta et al. 2020). The most recent estimate of abundance for the ENP population is from the 2015/2016 southbound survey and is 26,960 (CV = 0.05) whales (Durban et al. 2017).

A few hundred gray whales that feed along the Pacific Coast between southeastern Alaska and northern California throughout the summer and fall are known as the Pacific Coast Feeding Group (PCFG) (Mate et al. 2013; Weller et al. 2013; Calambokidis et al. 2017; Carretta et al. 2018). The group has been identified as far north as Kodiak Island, Alaska (Gosho et al. 2011) and has generated uncertainty regarding the stock structure of the ENP (Weller et al. 2012; Weller et al. 2013; Carretta et al. 2018). Photo-identification, telemetry, and genetic studies suggest that the PCFG is demographically distinct from the ENP (Mate et al. 2010; Frasier et al. 2011; Calambokidis et al. 2017; Lagerquist et al. 2019). In 2012–2013, the Navy funded a satellite tracking study of PCFG gray whales (Mate et al. 2013). Tags were attached to 11 gray whales near Crescent City, California in fall 2012. Good track histories were received from nine of the 11 tags, which confirmed an exclusive nearshore (< 19 km) distribution and movement along the northern

California, Oregon, and Washington coasts (Mate et al. 2013). Although the duration of the tags was limited, none of the PCFG whales moved south beyond northern California.

Both stocks could be present in the west coast part of the Action Area during their northward and southward migration (Weller et al. 2012; Moore and Weller 2013; Weller et al. 2013; Calambokidis et al. 2015; Cooke et al. 2015). During whale surveys of the northern feeding grounds, the largest number of WNP gray whales was observed in late August and early September (Meier et al. 2007), suggesting those few gray whales that may migrate down the U.S. West Coast will not be in California waters in general during those months.

Gray whale BIAs, including migratory, reproductive, and feeding BIAs were identified along the U.S. West Coast (Calambokidis et al. 2015; Calambokidis et al. 2024). The migration corridors used by the majority of gray whales are within 10 km of the U.S. West Coast (Calambokidis et al. 2015). However, some gray whales may take a migration path farther offshore, so an additional buffer extending 47 km from the coastline was added to the BIAs. The gray whale feeding (core and parent), migratory (core and parent), and reproductive (single) BIAs overlap with the Action Area (**Figures 11, 12, and 13**).

There has been no CH designated for this species.

Threats for gray whales include entanglement in fishing gear, vessel strikes, disturbance from whale watching activities, ocean noise, habitat degradation, and climate change.

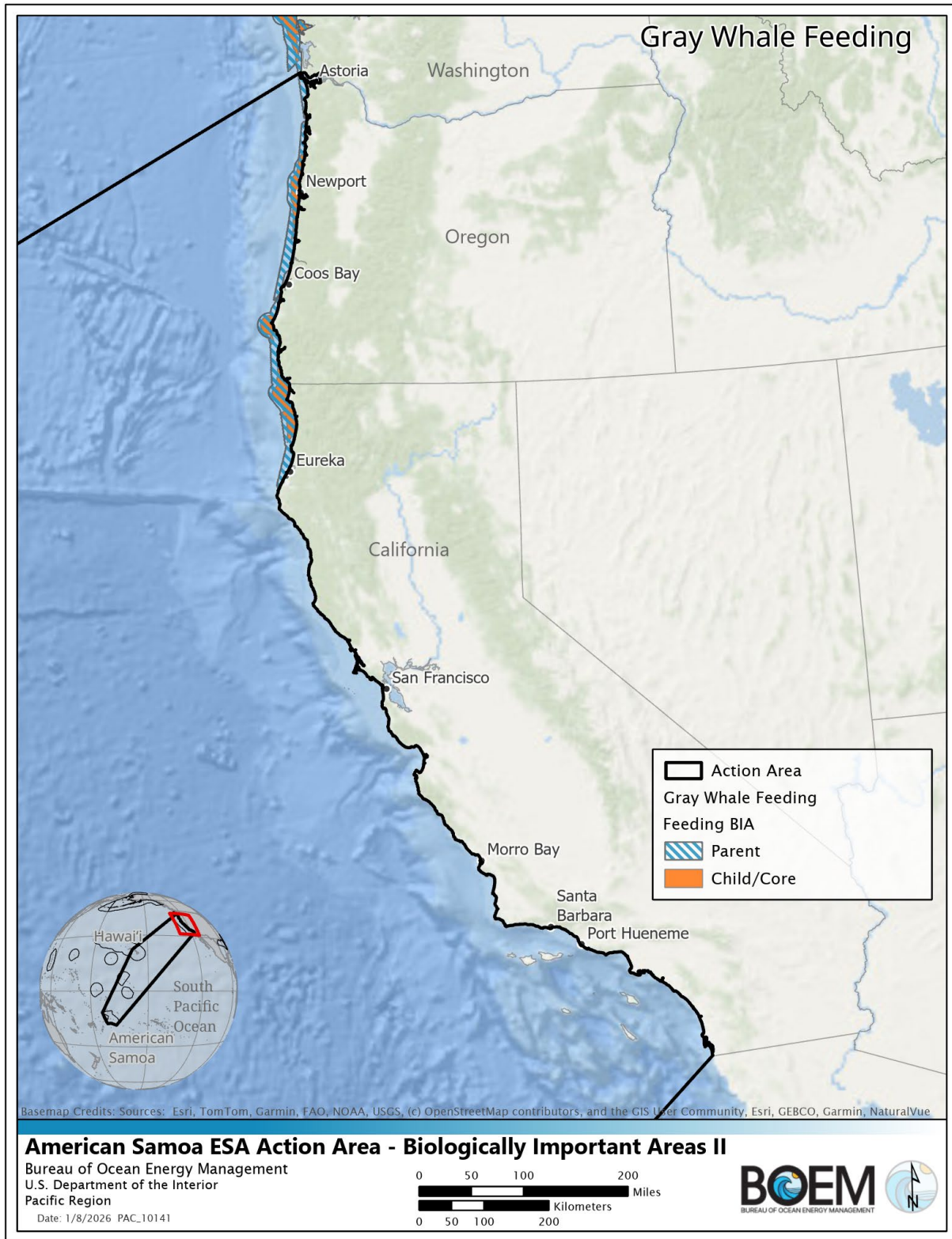


Figure 11. Feeding BIAs for gray whales relative to the Action Area

Data source: Calambokidis et al. (2024)

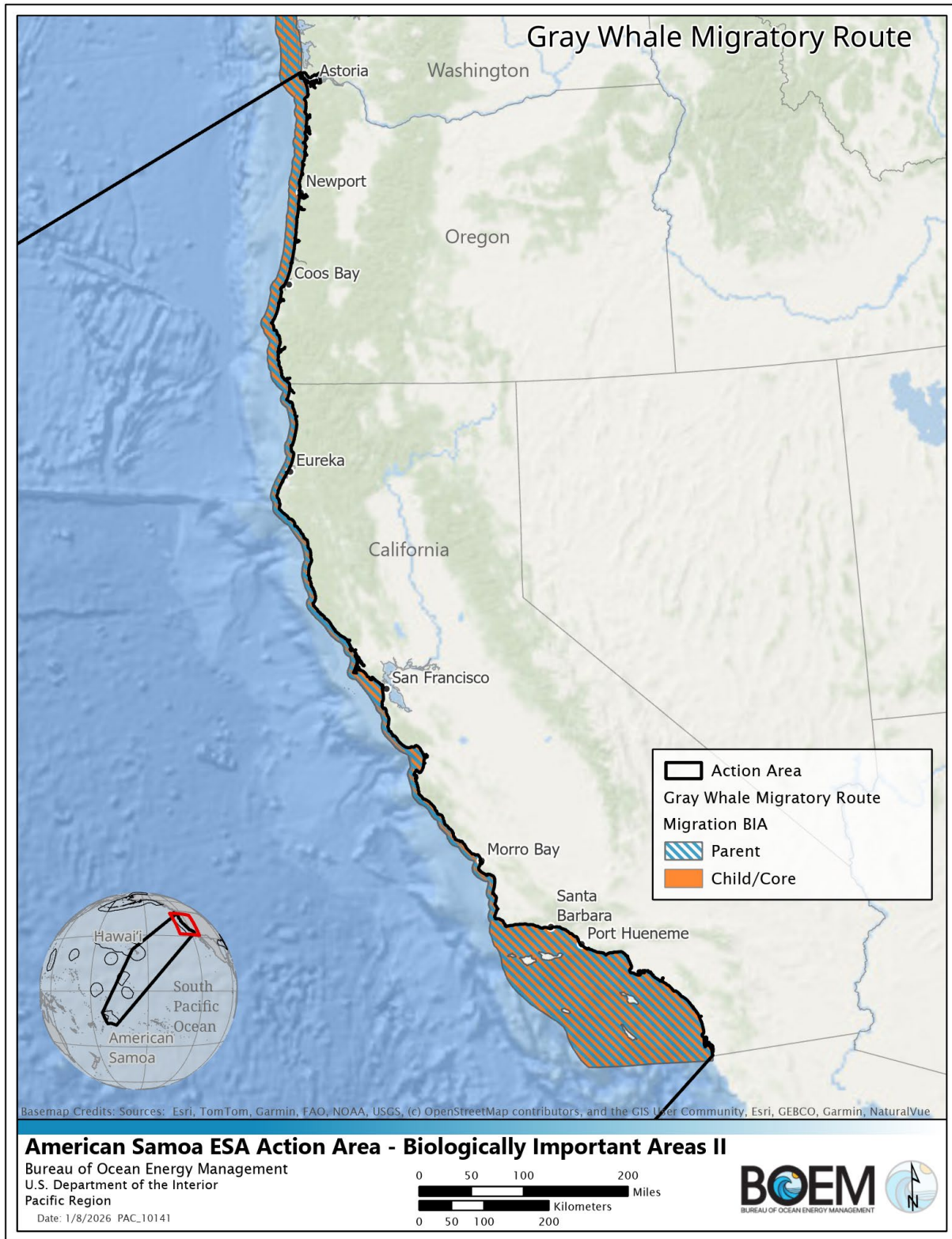


Figure 12. Migratory BIAs for gray whales relative to the Action Area

Data source: Calambokidis et al. (2024)

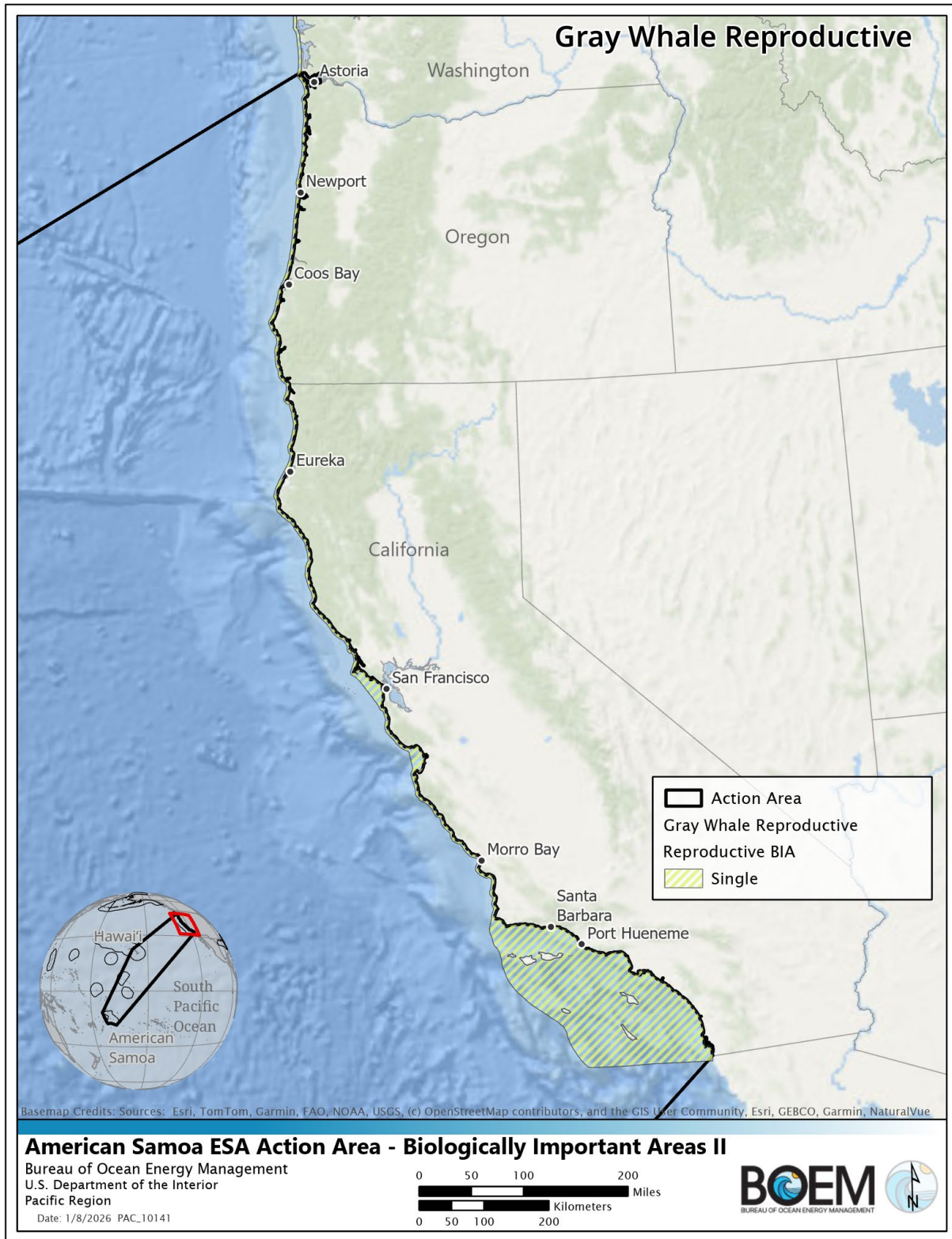


Figure 13. Reproductive BIA for gray whales relative to the Action Area

Data source: Calambokidis et al. (2024)

4.6 Sperm Whale (*Physeter macrocephalus*)

The sperm whale has been listed as endangered since 1970 under ESA (NMFS 2015b), but there is no designated CH for this species in the North Pacific. Sperm whales within the Pacific U.S. EEZ are divided into three discrete, non-contiguous areas: California, Oregon, and Washington waters, waters around Hawaii, and Alaska waters (Carretta et al. 2024).

Sperm whales in the California Current have been identified as demographically independent from animals in Hawaii and the Eastern Tropical Pacific (Mesnick et al. 2011). The best estimate of sperm whale abundance in the California Current is the trend-based estimate corresponding to the most recent 2014 survey, or 1,997 (CV = 0.57) whales (Moore and Barlow 2014).

Sperm whales of the Hawaiian stock have been sighted throughout the Hawaiian EEZ, including nearshore waters of the main and Northwestern Hawaiian Islands (NWHI) (NMFS 2021b). In addition, the sounds of sperm whales have been recorded throughout the year within the main and NWHI (Thompson and Friedl 1982; Merckens et al. 2019). Summer/fall shipboard surveys of waters within the U.S. EEZ of the Hawaiian Islands resulted in 43 sperm whale sightings in 2002, 46 in 2010, and 24 in 2017 throughout the study area (NMFS 2021b).

Sperm whales consume a variety of squid and fish; females feed mostly on deep-living species of squid, whereas males often forage for bottom-dwelling fish (Whitehead 2003; Whitehead et al. 2008). Based on habitat models derived from line-transect survey data collected between 1991 and 2008 off the U.S. West Coast, sperm whales show an apparent preference for deep waters (Barlow et al. 2009; Becker et al. 2010; Becker et al. 2012; Forney et al. 2012). Sperm whales are distributed across the entire North Pacific and into the southern Bering Sea in summer, but the majority are thought to be south of 40°N in winter (Rice 1974; 1989; Miyashita et al. 1995). Sperm whales are found year-round in California waters (Dohl et al. 1983; Forney et al. 1995; Barlow 1997), but they reach peak abundance from April through mid-June and from the end of August through mid-November (Rice 1974). Sperm whales are seen off Washington and Oregon in every season except winter (Green et al. 1992). Of 176 sperm whales that were marked with discovery tags off southern California in winter between 1962 and 1970, only three were recovered by whalers: one off northern California in June, one off Washington in June, and one far off British Columbia in April (Rice 1974).

Since 1978, there have been accounts of at least three other stranded sperm whales, including two in 2008, recorded by the Humboldt State University Vertebrate Museum. No sperm whales were reported from 30 surveys conducted off Eureka in fall 1991–2007 (Calambokidis 2009). Only two sperm whales were observed in low-elevation aerial surveys, both at depths of 200–2,000 m (Adams et al. 2014); satellite tracking has indicated their migration occurs along the continental shelf break, and passive acoustic monitoring has detected them in the Eel River Canyon.

The fishery most likely to injure or kill sperm whales from this stock is the California thresher shark/swordfish drift gillnet fishery (Julian and Beeson 1998; Carretta et al. 2019a; Carretta et al. 2019b), although sablefish hook-and-line fishery, entanglements in unknown fisheries, ingestion of marine debris and vessel strikes are also threats to this species (Carretta et al. 2020). For the 1991–2014 study period, conclusions about whether the population has increased or decreased are uncertain (Moore and Barlow 2017).

Threats to sperm whales include commercial whaling industry, sperm whale depredation in sablefish longline fishery, sounds from anthropogenic sources (e.g., shipping, military exercises), changes in prey distribution and quality with climate change, entanglement in fishing gear, ship strikes due to increased vessel traffic and oil and gas activities

4.7 Southern Resident Killer Whale (*Orcinus orca*)

The Eastern North Pacific Southern Resident stock of killer whales is composed of three matrilineal pods named J, K, and L (Bigg et al. 1990) and occur in the inland waterways of Puget Sound, Strait of Juan de Fuca, and southern Georgia Strait in spring, summer, and fall. Little is known about their fall, winter, and spring movements, but they have been reported in coastal waters off Oregon and Washington, especially in the area between Grays Harbor and the Columbia River (Ford et al. 2000; Hanson et al. 2017), and travel as far south as central California and as far north as the Southeast Alaska. Although less is known about the whales' movements in outer coastal waters, satellite tagging, opportunistic sighting, and acoustic recording data suggest that Southern Residents spend nearly all of their time on the continental shelf, within 34 km of shore in water less than 200 m deep (Hanson et al. 2017). Details of their winter range from satellite tagging reveal whales use the entire Salish Sea (northern end of the Strait of Georgia and Puget Sound) in addition to coastal waters from the central west coast of Vancouver Island, British Columbia to Pt. Reyes in northern California (Carretta et al. 2020). Of the three pods comprising this stock, one (J) is commonly sighted in inshore waters in winter, while the other two (K and L) apparently spend more time offshore (Ford et al. 2000). Krahn et al. (2009) described sample pollutant ratios from K and L pod whales that were consistent with a hypothesis of time spent foraging in California waters, which is consistent with sightings of K and L pods as far south as Monterey Bay.

Following the peak census count of 99 animals in 1995, the population size has declined approximately 1% annually and currently stands at 73 animals as of the 2019 census (Ford et al. 2000; Center for Whale Research 2020).

The Southern Resident killer whales were federally listed as endangered in 2005 (70 FR 69903). CH for this DPS was designated in the summer core area in Haro Strait and waters around the San Juan Islands, Puget Sound (**Figure 10**), and the Strait of Juan de Fuca (79 FR 69054). In August 2021, additional CH was designated along the U.S. West Coast from the Canadian border to Point Sur, California, between depths of 6.1–200 m (86 FR 41668). Vessels transiting from the West Coast (e.g., Coos Bay, Crescent City, San Francisco Bay, etc.) would intersect CH en route to American Samoa. Essential features for Southern Resident killer whales include (1) water quality to support growth and development; (2) prey species of sufficient quantity, quality and availability to support individual growth, reproduction, development, as well as overall population growth; and (3) passage conditions to allow for migration, resting, and foraging. In particular, Southern Resident killer whales show a strong preference for salmonids, particularly larger, older age class Chinook (79 FR 69054). Small and resident BIA parent and core areas were delineated for Southern Resident killer whales (Calambokidis et al. 2024), and the small and resident BIAs overlap with the Action Area (**Figure 14**).

Threats

A population viability analysis identified several risk factors to this population, including limitation of preferred Chinook salmon prey, entanglement in fishing gear, anthropogenic noise and disturbance

resulting in decreased foraging efficiency, vessel strikes and high levels of contaminants, including polychlorinated biphenyls (PCBs) and DDT (Erbe 2002; Krahn et al. 2007; Clark et al. 2009; Krahn et al. 2009; Lacy et al. 2017; Carretta et al. 2020).

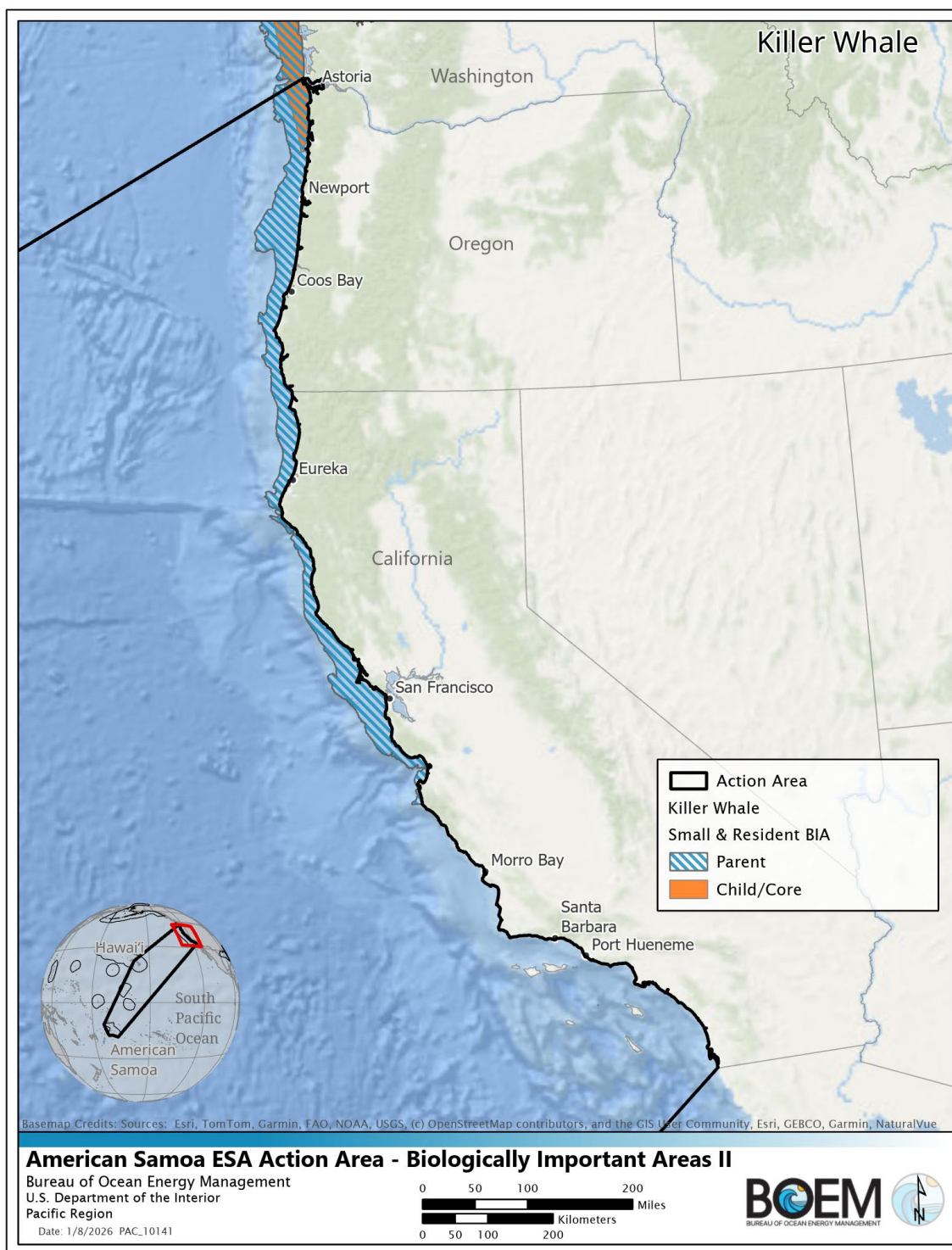


Figure 14. Small and resident BIAs of Southern Resident killer whales relative to the Action Area
Data source: Calambokidis et al. (2024)

4.8 False Killer Whale (*Pseudorca crassidens*)

Main Hawaiian Islands insular false killer whales were listed as “endangered” under the ESA (77 FR 70915, 28 November 2012) and they are found worldwide in tropical and warm temperate waters (Stacey et al. 1994). They have been encountered during periodic shipboard line-transect surveys of the U.S. EEZ around the Hawaiian Islands, and focused studies near the main and NWHI indicate that false killer whales occur in nearshore waters throughout the Hawaiian archipelago (Baird et al. 2008; Baird et al. 2013). This species also occurs in the U.S. EEZ around Palmyra and Johnston Atolls and American Samoa (NMFS 2024c). The abundance estimate for 2015 was 167 (CV = 0.14). Annual estimates over the 16-year survey period ranged from 144 to 187 animals and are similar to multi-year aggregated estimates published previously (Oleson et al. 2010).

The status review report produced by the Biological Review Team (Oleson et al. 2010; amended in Oleson et al. 2012) found of the 29 identified threats to the population, the effects of small population size, including inbreeding depression and Allee effects; exposure to environmental contaminants (Ylitalo et al. 2009); competition for food with commercial fisheries (NMFS 2024c); and hooking, entanglement, or intentional harm by fishermen to be the most substantial threats to the population. There is significant geographic overlap between various nearshore fisheries and evidence of interactions with hook-and-line gear (NMFS 2024c), such that these fisheries may pose a threat to the stock. Six main Hawaiian Islands (MHI) insular false killer whales stranded between 2010 and 2021, including four from cluster 3 (Baird et al. 2023), a high rate for a single social cluster. High concentrations of PCBs exceeding those proposed to cause adverse health effects (Kannan et al. 2000) were measured from 29 of 41 sampled individuals in the MHI insular stock (Kratofil et al. 2020). All PCB concentrations from four stranded individuals within this population revealed levels more than twice the highest suggested health threshold for PCBs, and this population had the highest levels of any sampled whales in the study. Differences in contaminant loads for various contaminant classes are also evident among social clusters, suggesting differences in exposure or consumption of contaminated prey based on preferred foraging regions (Kratofil et al. 2020).

Reproductive BIAs for false killer whale are also found in Hawaii within the Action Area (**Figure 15**).

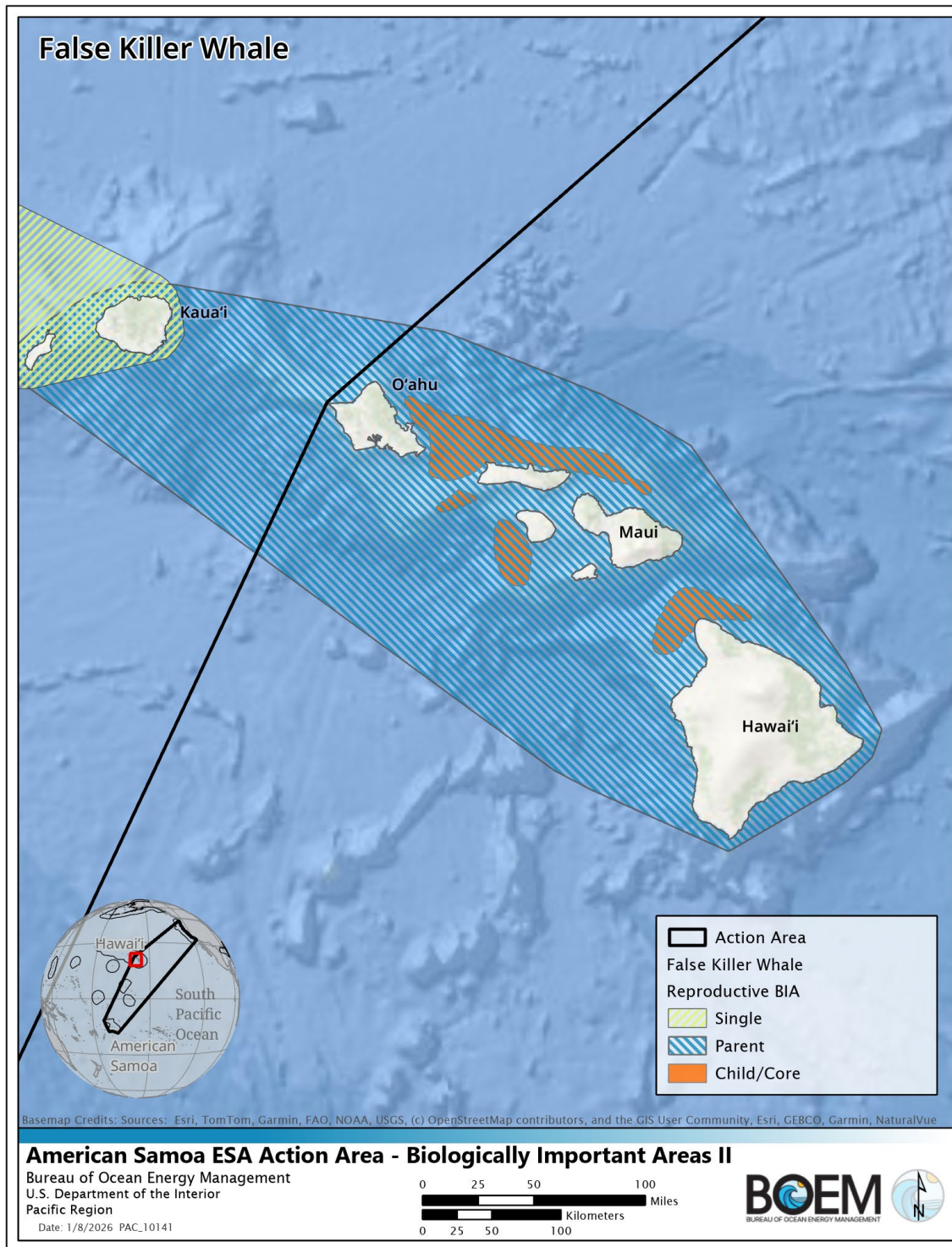


Figure 15. Reproductive BIAs of Southern Resident killer whales relative to the Action Area

Data source: Calambokidis et al. (2024)

CH of false killer whales was designated in the waters surrounding the main Hawaiian Islands from the 45-m depth contour out to the 3,200-m depth contour (**Figure 16**). MHI insular false killer whales are island-

associated whales that rely entirely on the productive submerged habitat of the main Hawaiian Islands to support all their life-history stages. The following characteristics of this habitat support insular false killer whales' ability to travel, forage, communicate, and move freely around and among the waters surrounding the main Hawaiian Islands:

- Adequate space for movement and use within shelf and slope habitat
- Prey species of sufficient quantity, quality, and availability to support individual growth, reproduction, and development, as well as overall population growth
- Waters free of pollutants of a type and amount harmful to MHI insular false killer whales
- Sound levels that would not significantly impair false killer whales' use or occupancy

Threats of the false killer whales include fishery interactions, competition of prey with fisheries, environmental contaminants, hunting, and small population size with reduced genetic diversity make them very vulnerable to diseases or environmental changes.

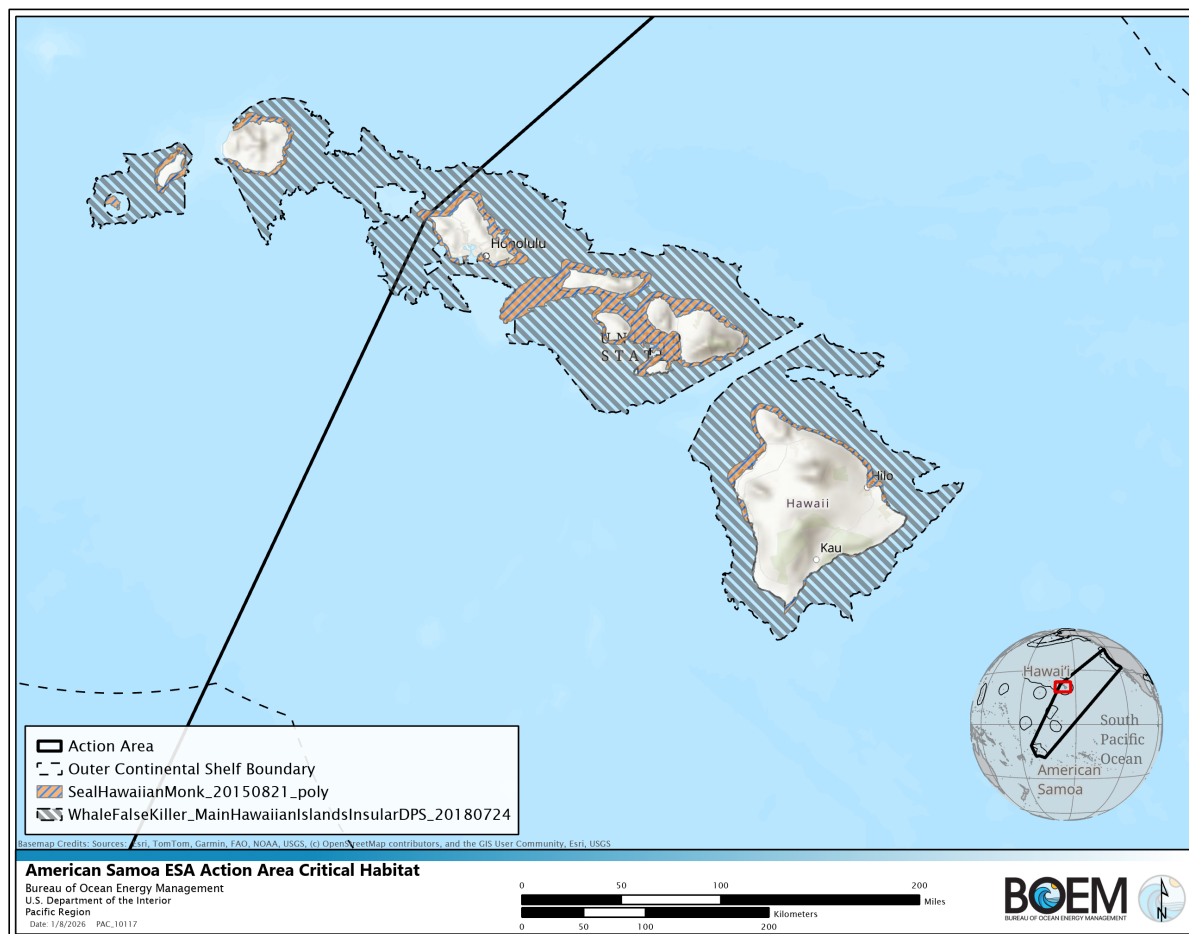


Figure 16. Action Area and location of the false killer whale and Hawaiian Monk seal critical habitats

4.9 North Pacific Right Whale (*Balaena japonica*)

The likelihood of a North Pacific right whale being present in the Action Area is extremely low, as in recent years this species has only been routinely observed or acoustically detected in the Bering Sea (Brownell Jr. et al. 2001; Shelden et al. 2005; Zerbini et al. 2010; Wade et al. 2011a; Wade et al. 2011b; Zerbini et al. 2015; NMFS 2017; Wright et al. 2018; Filatova et al. 2019; Wright et al. 2019), with occasional sightings of individuals in the Gulf of Alaska (Wade et al. 2011a; Matsuoka et al. 2014; Širović et al. 2015a), waters off British Columbia and the border with Washington State (Širović et al. 2015b; U.S. Navy 2015; Ford et al. 2016), and southern California (Muto et al. 2019). The most recent estimated population for the eastern North Pacific right whale is between 26 and 31 individuals (Muto et al. 2020). Although this estimate may be reflective of a Bering Sea subpopulation, the total eastern North Pacific population is unlikely to be much larger (Wade et al. 2011b). There have been only four sightings, each of a single right whale, in southern California waters over approximately the last 30 years (in 1988, 1990, 1992, and 2017) (Carretta et al. 1994; Brownell Jr. et al. 2001; NMFS 2017). Sightings off California are rare, and there is no evidence that the western coast of the United States was ever highly frequented by this species (Scammon 1874; Brownell Jr. et al. 2001; NMFS 2017). As for Hawaiian waters, only two whales have been documented. One right whale was sighted off Maui in April 1996 (Salden and Mickelsen 1999) was identified 119 days later and 4,111 km north in the Bering Sea (Kennedy et al. 2012). One other right whale was sighted twice in March and April in 1979 (Herman et al. 1980; Rowntree et al. 1980).

The North Pacific right whale was listed under ESA in 1970 and in 2008 (35 FR 8491; 73 FR 12024), and their CH was designated in 2008 (73 FR 19000). The CH is only located in Alaska (Bering Sea and Gulf of Alaska) and does not overlap with the Action Area. Thus, no further discussions are included in this BA.

Threats of the North Pacific right whale include vessel strikes, entanglement, ocean noise, biotoxins from harmful algal blooms, and climate change.

4.10 Guadalupe Fur Seal (*Arctocephalus townsendii*)

The Guadalupe fur seal is a pelagic species for most of the year, occurring in the subtropical waters of southern California and Mexico. Breeding occurs almost entirely on Isla de Guadalupe, Mexico, from May to July (California Resources Agency 2009; NMFS 2019c). In recent years, several Guadalupe fur seals have been consistently observed at San Miguel Island. In 1997, a pup was observed there but no other pups were observed until 2008. Breeding colonies may occur on San Miguel and San Nicolas Islands (Pacific Marine Mammal Center 2023). Guadalupe fur seals are solitary, non-social animals, but males may mate with up to 12 females during the breeding season (NMFS 2019c). They feed in deep waters on krill, squid, and small schooling fish (California Resources Agency 2009). Unusual mortality events, in the form of increased strandings of Guadalupe fur seals, have occurred along the entire coast of California, beginning in January 2015 at eight times higher than the historical average. Strandings have continued since 2015 at well above average rates in California. Additionally, Guadalupe fur seal strandings in Oregon and Washington became elevated in 2019. Along the U.S. West Coast, strandings occur almost annually in California waters and animals are increasingly observed in Oregon and Washington waters (Carretta et al. 2020). Most stranded animals were less than 2 years old, malnourished with secondary bacterial and parasitic infections (NMFS 2019a; Carretta et al. 2020). Guadalupe fur seals that stranded in central California and treated at rehabilitation centers were fitted with satellite tags and documented to travel as

far north as Graham Island and Vancouver Island, British Columbia, Canada (Norris et al. 2015). Some satellite-tagged animals traveled far offshore outside the U.S. EEZ to areas 700 nmi west of the California-Oregon border. The population is considered to be a single stock because all are recent descendants from one breeding colony at Isla Guadalupe, Mexico (Carretta et al. 2020).

The Guadalupe fur seal was federally listed as endangered in 1967 and then re-listed as threatened in 1985 (50 FR 51252). The main reason for listing was a severe population decline due to hunting. No CH has been designated for the Guadalupe fur seal. Since their listing, Guadalupe fur seals have significantly increased in numbers with an estimated annual rate of increase of 5.9% (range 4.1–7.7%) (García-Aguilar et al. 2018). The minimum population size of 31,019 animals is taken as the lower bound of the estimate provided by García-Aguilar et al. (2018) in Muto et al. (2020).

Current threats include incidental mortality and serious injury in commercial and unidentified fisheries, entanglement in marine debris and shootings (Carretta et al. 2020).

4.11 Steller Sea Lion (*Eumetopias jubatus*)

The Steller sea lion was federally listed as threatened in 1990 (55 FR 49204). In 1997, the eastern DPS (i.e., east of 144° W longitude) was listed as threatened, and the western DPS (i.e., west of 144° W longitude) was listed as endangered (62 FR 24345). The eastern DPS has since recovered and was delisted in 2013 (78 FR 66139).

CH for Steller sea lions was designated in 1993 (58 FR 45269; **Figure 10**). Physical and biological features identified as essential for conservation of Steller sea lions include terrestrial, air, and aquatic habitats (as described at 50 CFR § 226.202) that support reproduction, foraging, rest, and refuge. CH includes an air zone that extends 3,000 ft above areas historically occupied by sea lions at each major rookery in California and Oregon, measured vertically from sea level. CH includes an aquatic zone that extends 3,000 ft seaward in state and federally managed waters from the baseline or basepoint of each major rookery in California and Oregon. CH for the Steller sea lion remained in effect for the endangered western DPS, as the designated CH remains to support the DPS' important biological functions (e.g., feeding and resting).

Although the Action Area includes areas that remain associated with designated CH, we do not expect that any individuals from the currently listed western DPS of Steller sea lions would occur within these areas. Based on genetic and tagging data, individuals of the listed western DPS of Steller sea lions are not known to visit the areas designated as CH in Oregon or California (Bickham et al. 1996; Raum-Suryan et al. 2006). Additionally, there is no evidence that would suggest that the western DPS would need to expand into these areas for recovery. Thus, no further effect analyses of Steller sea lion from the Proposed Action will be discussed in this BA.

4.12 Hawaiian Monk Seal (*Neomonachus schauinslandi*)

Hawaiian monk seals are endemic to the Hawaiian archipelago and are distributed throughout the NWHI, with subpopulations at French Frigate Shoals (FFS), Laysan Island, Lisianski Island, Pearl and Hermes Reef, Midway Atoll, Kure Atoll, and Necker and Nihoa Islands. They also occur throughout the main Hawaiian Islands. Population is about 1,600 and only about 400 in the main Hawaiian Islands. The main

terrestrial habitat requirements for the monk seals include haul-out areas for pupping, nursing, molting, and resting. These are primarily sandy beaches, but virtually all substrates are used at various islands. Monk seals also spend nearly two-thirds of their time in marine habitat. Monk seals are primarily benthic foragers (Goodman-Lowe 1998) and will search for food in a broad depth range up to 500 m and over different substrates (Parrish et al. 2000; Parrish et al. 2023). Hawaiian monk seals are "generalist" feeders. They eat a wide variety of foods depending on what is available. They eat many types of common fishes, squids, octopuses, eels, and crustaceans (crabs, shrimps, and lobsters). Diet studies indicate that they forage at or near the seafloor, and they prefer prey that hides in the sand or under rocks. Hawaiian monk seals can hold their breath for up to 20 minutes and dive more than 1,800 ft. However, they usually dive an average of 6 minutes to depths of less than 200 ft to forage at the seafloor.

In 1976, Hawaiian monk seals were listed as endangered under ESA (41 FR 51611; 1976) and the species is well below its sustainable population and has not recovered from past declines. Monk seal CH has been designated in 2015 (80 FR 50925) (**Figure 16**). There are two terrestrial and one marine essential feature of the Hawaiian monk seal CH described below.

1) *Terrestrial areas and adjacent shallow, sheltered aquatic areas with characteristics preferred by monk seals for pupping and nursing.* Preferred areas that serve an essential service or function for Hawaiian monk seal conservation are defined as those areas where two or more females have given birth or where a single female chooses to return to the same site more than one year. Preferred pupping areas generally include sandy, protected beaches located adjacent to shallow sheltered aquatic areas, where the mother and pup may nurse, rest, swim, thermoregulate, and shelter from extreme weather. Additionally, this habitat area provides relatively protected space for the newly weaned pup to acclimate to life on its own. The newly weaned pup uses these areas for swimming, exploring, socializing, thermoregulatory cooling and the first attempts at foraging. Characteristics of terrestrial pupping habitat may include various substrates such as sand, shallow tide pools, coral rubble, or rocky substrates, as long as these substrates provide accessibility to seals for hauling out. Some preferred sites may also incorporate areas with low lying vegetation used by the pair for shade or cover, or relatively low levels of anthropogenic disturbance. Characteristics of the adjoined sheltered aquatic sites may include reefs, tide pools, gently sloping beaches, and shelves or coves that provide refuge from storm surges and predators.

(2) *Marine areas from 0 to 200 m in depth that support adequate prey quality and quantity for juvenile and adult monk seal foraging.* Inshore, benthic and offshore teleosts, cephalopods, and crustaceans are commonly described as monk seal prey items. Habitat types that are regularly used for foraging include the sand terraces, talus slopes, submerged reefs and banks, nearby seamounts, barrier reefs, and slopes of reefs and islands. Monk seals focus foraging in bottom habitats on bottom-associated prey species, with most foraging occurring in waters between 0 to 200 m in depth. Habitat conditions, such as water quality, substrate composition and available habitat, should support growth and recruitment of bottom-associated prey species to the extent that monk seal populations are able to successfully forage.

(3) *Significant areas used by monk seals for hauling out, resting or molting.* Significant haul-out areas are defined by the frequency with which local populations of seals use a stretch of coastline or particular beach. Significant haul-out areas are defined as natural coastlines that are accessible to Hawaiian monk seals and are frequented by Hawaiian monk seals at least 10% as often as the highest used haul-out site(s) on individual islands, or islets. Significant haul-out areas are essential to Hawaiian monk seal conservation because these areas provide space that supports natural behaviors important to health and

development, such as resting, molting, and social interactions. Hawaiian monk seals use terrestrial habitat to haul out for resting, and molting. Certain areas of coastline are more often favored by Hawaiian monk seals for hauling out. These favored areas may be located near preferred foraging areas, allow for relatively undisturbed periods of rest, or allow small numbers of Hawaiian monk seals to socially interact as young seals and reproductive adults. These haul-out sites are generally characterized by sandy beaches, sand spits, or low shelving reef rocks accessible to seals.

Threats

Several threats exist for this population. Interactions in nearshore recreational and subsistence fisheries occur frequently with Hawaiian monk seals in the main Hawaiian Islands. Between 1976 and 2024, NMFS documented 317 hookings, 13 net entanglements, and 14 mortalities associated with these fisheries. Intentional killing of seals is another threat to these species. Additionally, as of 2024, at least six seals died from apparent gunshots (including one pregnant female) and 12 from blunt force trauma. Other threats include limited prey, contaminants, habitat loss, and shark predation.

4.13 Leatherback Turtle (*Dermochelys coriacea*)

Leatherback sea turtles were listed in 1970 as endangered throughout their global range (35 FR 8491). The leatherback turtle has the most extensive global distribution of any reptile and is distributed throughout the oceans of the world from the equator to subpolar regions in both hemispheres. Leatherback turtles spend the majority of their lives at sea, where they develop, forage, migrate, and mate, nesting on beaches on every continent except Europe and Antarctica, and several islands of the Caribbean and the Indo-Pacific (Eckert et al. 2012; NMFS and FWS 2020a). Seven populations are currently recognized: (1) Northwest Atlantic; (2) Southeast Atlantic; (3) Southwest Atlantic; (4) Northeast Indian; (5) Southwest Indian; (6) West Pacific; and (7) East Pacific Ocean populations (NMFS and FWS 2020a). While NMFS and FWS (2020a) have identified and defined the seven DPSs, the population has not been established and listed as DPSs under the ESA, which requires official rulemaking and publication in the Federal Register (16 U.S.C. 1533(a)(1)), and no effort to this extent is anticipated. Recent information on population structure (through genetic studies) and distribution (through telemetry, tagging, and genetic studies) have led to an increased understanding and refinement of the global population structure and supported the separation of the population into DPSs (NMFS and FWS 2020a). For this BA, we focus only on the West Pacific leatherback sea turtle population.

The marine distribution for Pacific leatherback sea turtles extends north into the Sea of Japan, northeast and east across the North Pacific to the west coast of North America (predominantly off California), west to the South China Sea and Indonesian Seas, and south into the high latitude waters of the western South Pacific Ocean and Tasman Sea (Benson et al. 2011). About 150 to 170 leatherback sea turtles occur annually off the California coast between Point Conception and Point Arena during the summer and fall (June and stay until mid-October) whereafter they move to waters off Hawaii. A total index of nesting female abundance of the West Pacific population was estimated to be 1,277 females. Leatherback turtles of the West Pacific DPS nest in tropical and subtropical latitudes primarily in Indonesia, Papua New Guinea, and Solomon Islands, and to a lesser extent in Vanuatu (NMFS and FWS 2020a). Oceanic currents help to structure the spatial and temporal distribution of juveniles which lead them to foraging and

developmental habitats (e.g., the North Pacific Transition Zone); they undertake seasonal migrations seeking favorable oceanic habitats/temperatures and abundant foraging resources (Gaspar et al. 2012).

The West Pacific Ocean leatherback sea turtle was estimated to have declined by as much as 78.3% from 1984 to 2011 (Tapilatu et al. 2013). Causes for the decline in the Pacific include the intensive egg harvest at leatherback rookeries and high levels of mortality through the 1980s associated with bycatch in the gill net fisheries (NMFS and FWS 2020a). The trend in the foraging population off central California is similar to declines of about 6% annually in the nesting population on Indonesian beaches (Benson et al. 2020).

Migration and foraging strategies vary based on these life-history strategies, likely due to prevailing offshore currents and, for hatchlings, seasonal monsoon-related effects experienced as hatchlings (Benson et al. 2011; Gaspar et al. 2012). Summer nesting females forage in Northern Hemisphere foraging habitats in Asia and the North Pacific Ocean, while winter nesting females migrate to tropical waters of the Southern Hemisphere in the South Pacific Ocean (Benson et al. 2011; Harrison et al. 2018). The lack of crossover among seasonal nesting populations suggests that leatherback turtles develop fidelity for specific foraging regions likely based on juvenile dispersal patterns (Benson et al. 2011; Gaspar et al. 2012). Stable isotopes, linked to particular foraging regions, confirm nesting season fidelity to specific foraging regions (Seminoff et al. 2012).

Leatherback sea turtles feed from near the surface to depths exceeding 1,000 m, including nocturnal feeding on tunicate colonies within the deep scattering layer (Spotila 2004). Migrating leatherback sea turtles spend a majority of their time submerged and display a pattern of continual diving. They appear to spend almost the entire portion of each dive traveling to and from maximum depth, suggesting continual foraging along the entire depth profile (Eckert et al. 1989). Diet is primarily jellyfish, but they also consume other invertebrates, small fish, and plant material (NOAA Fisheries 2016; Nafis 2026).

CH for leatherback turtles designated in 2012 for waters off the U.S. West Coast (**Figure 10**) is defined at 50 CFR 226.207 (77 FR 4170). CH stretches along the California coast from Point Arena to Point Arguello east of the 3,000-m depth contour, and also includes around 25,000 mi² stretching from Cape Flattery, Washington to Cape Blanco, Oregon, east of the 2,000-m depth contour. In the final rule designating leatherback CH, NMFS identified one primary constituent element essential for the conservation of leatherbacks in marine waters off the U.S. West Coast: the occurrence of prey species, primarily scyphomedusae of the order Semaestomeae (e.g., *Chrysaora*, *Aurelia*, *Phacellophora* and *Cyanea*), of sufficient condition, distribution, diversity, abundance, and density necessary to support individual as well as population growth, reproduction, and development of leatherbacks.

The primary ongoing threats to leatherback sea turtles worldwide are fisheries bycatch, marine debris or other entanglement, and the legal and illegal directed harvest of nesting female turtles and their eggs (NMFS and FWS 2020a). Other threats to this species include changing environmental conditions due to climate change (e.g., sand temperatures that result in egg or hatchling mortality or changes in hatchling sex ratios, erosion of nesting beaches due to rising sea levels and increased storm frequency and magnitude), vessel strikes, pollution, and ingestion of marine debris (NMFS and FWS 2020a).

4.14 Pacific Loggerhead Turtle (*Caretta caretta*)

Loggerhead turtles were listed as threatened in 1978 (43 FR 32800). The North and South Pacific DPS's were listed as endangered in 2011 (76 FR 58868) with no designated CH.

Within the North Pacific, loggerhead nesting has been documented only in Japan, although low level nesting may occur outside of Japan in areas surrounding the South China Sea (Conant et al. 2009). In the South Pacific, nesting beaches are restricted to eastern Australia and New Caledonia and, to a much lesser extent, Vanuatu and Tokelau (Conant et al. 2009). There are no nesting records from Guam, the Commonwealth of the North Mariana Islands (CNMI), Palau, the Republic of the Marshall Islands, the Federated States of Micronesia, or American Samoa (NMFS and FWS 1998b).

With the exception of four records from Hawaii (see Insular and Pelagic Range), U.S. Pacific sightings are confined to the west coast of the continent. The loggerheads are occasionally sighted from the coasts of Washington and Oregon, but most records are of juveniles off the coast of California. Sightings in California tend to occur from July to September but can occur over most of the year during El Niño years when ocean temperatures rise. It is not known whether these individuals are resident or transient. No studies of distribution, abundance, or residency have been undertaken. Since there is no documented nesting anywhere in the U.S. Pacific, we can conclude that U.S. waters (principally those off California) are used as foraging grounds and as migratory corridors (NMFS and FWS 1998b). The loggerhead sea turtle is primarily pelagic, but occasionally enters coastal bays, lagoons, salt marshes, estuaries, creeks, and mouths of large rivers (NMFS and FWS 2020b). They consume whelks and conchs, but also sponges, crustaceans, jellyfish, worms, squid, barnacles, fish, and plants (NMFS and FWS 2020b).

For the North Pacific Ocean DPS, the greatest anthropogenic threats exist for the neritic juveniles and neritic adults, where the coastal fisheries in Baja California, Mexico, and Japan kill significant number of turtles (Conant et al. 2009). For the South Pacific Ocean DPS, the greatest threats come from bycatch in the oceanic environment for juveniles and adults (Conant et al. 2009). At nesting beaches, an average of 40 adult females are taken annually in aboriginal harvest (Conant et al. 2009). Threat levels for this DPS include anthropogenic and natural mortalities. Other threats for both the North and South Pacific DPS include loss and degradation of nesting habitat, vessel strikes, ocean pollution, and changing environmental conditions.

4.15 Green Turtle (*Chelonia mydas*)

The green turtles were listed as threatened in 1978 (43 FR 32800). They occur worldwide in surface water that remains above 22°C (Van Houtan et al. 2015) and nest in over 80 countries. We assess 6 DPS of green turtles: Central South Pacific, Central West Pacific, East Pacific, East Indian-West Pacific, and Southwest Pacific, since genetic evidence demonstrates these DPS may occur in the American Samoa waters (NMFS 2023a). The sixth DPS, Central North, will also be included in analysis because they are found in Hawaii and the vessels may be transiting or coming through that location.

The Central South Pacific DPS of green turtles were classified as endangered in 2016 (81 FR 20057). They are distributed north from northern New Zealand to Fiji, Tuvalu, and Kiribati and east to include French Polynesia. The range of this DPS includes a longitudinal expanse of 7,500 km—from Easter Island, Chile in the east to Fiji in the west, and encompasses American Samoa, French Polynesia, Cook Islands, Fiji,

Kiribati, Tokelau, Tonga, and Tuvalu. Central South Pacific green sea turtle nesting is geographically widespread at low levels. The most abundant nesting area is Scilly Atoll, French Polynesia, which in the early 1990s hosted 300–400 nesters annually (Balazs 1995). The current estimate is 1,050 breeding females (Seminoff et al. 2015). The most recent information is for American Samoa, with the majority of nesting at Rose Atoll and sporadic nesting on Tutuila (no recent reported nesting), Ofu and Swains Islands; subadult and adult turtles occur in low abundance in nearshore waters around Tutuila, Ofu, Olosega, Ta'u, and Swains islands (NMFS and FWS 1998a; Maison et al. 2010). Historically, 100–500 females nested annually at Canton Island, Kiribati (Balazs 1975). Although population trends are not known, NMFS' Status Review Team concluded that this DPS had a 62% probability of having a greater than 1% risk of extinction over the next 100 years (Seminoff et al. 2015). The Status Review Team estimated the Central South Pacific green sea turtle nester abundance as 2,677 females (Seminoff et al. 2015) based on known nesting. They indicate that the number is likely higher due to the level of unmonitored nesting, suggesting fewer than 3,600 total nesters. The Status Review Team concluded that chronic harvesting, the effect of coastal development, and the effect of phenomena related to climate change (e.g., sea level rise) would be expected to place this DPS of green turtle at a relatively high risk of extinction in the foreseeable future (Seminoff et al. 2015).

The East Pacific green sea turtle is listed as threatened in 2016 (81 FR 20057). The geographic range of this DPS extends from the California/Oregon border (USA; 42°N) southward along the Pacific Coast of the Americas to central Chile. These green sea turtles occur year-round off the southern California coast with highest concentrations occurring between July through September. The green sea turtle is usually seen in El Niño years when ocean temperatures are warmer than normal. Climate change and ocean warming trends may impact the habitat and range of this species over time (Fuentes et al. 2013). It inhabits shallow waters of lagoons, bays, estuaries, mangroves, eelgrass, and seaweed beds; it prefers areas with abundant vegetation in shallow, protected water. Green sea turtles are herbivorous, feeding primarily on algae and seagrasses (NMFS 2025a). Counts of adult females at nesting sites in Mexico, Costa Rica, and Ecuador used by the East Pacific DPS were used to estimate an abundance of over 20,000 nesters (Seminoff et al. 2015). Seminoff et al. (2015) ranked the DPS as having a low risk of extinction based on the abundance of nesting females.

The distribution of Southwest Pacific green sea turtles extends from the western boundary of Torres Strait (at 142°E longitude), southeast to the eastern tip of Papua New Guinea and out to the offshore coordinate of 13°S, 171°E; the eastern boundary runs from this point southeast to 40°S, 176°E; the southern boundary runs along 40°S from 142°E to 176°E; and the western boundary runs from 40°S, 142°E north to Australian coast then follows the coast northward to Torres Strait. Similarly to the East Pacific DPS, this Southwest Pacific DPS is included in the BA because the genetic evidence demonstrates that this DPS may occur in American Samoa waters. Southwest Pacific green sea turtles are listed as threatened in 2016 (81 FR 20057). The estimated abundance of nesting females in this population is high with 83,058 adult nesting females (Seminoff et al. 2015). The population dynamics of this DPS are similar to that of the other green turtles, but Southwest Pacific green sea turtles may produce higher proportions of females or females in this DPS may have survival rates that are disproportionately higher than their male counterparts. If this trend continues, it would have severe implications for the future of this DPS.

The Central West Pacific green sea turtle DPS has as their northern boundary 41°N latitude and is bounded by 41°N, 169°E in the northeast corner, going southeast to 9°N, 175°W, then southwest to 13°S, 171°E, west and slightly north to the eastern tip of Papua New Guinea, along the northern shore of the

Island of New Guinea to West Papua in Indonesia, northwest to 4.5°N, 129°E then to West Papua in Indonesia, then north to 41°N, 146°E. This DPS is also included because the genetic evidence demonstrates that this DPS may occur in American Samoa waters. Central West Pacific green sea turtles are listed as endangered in 2016 (81 FR 20057). The DPS exhibits low nesting abundance, with an estimated total nester abundance of 6,518 females at 51 documented nesting sites (Seminoff et al. 2015). The population dynamics of this DPS are similar to that of the other green turtles; however, clutch sizes appear to be more variable: clutch sizes range from 59 to 139 eggs per nest (compared with 80 to 120 eggs per nest in the general pattern; Palacios 2012 as cited in Seminoff et al. 2015). Moreover, hatching success for areas where this information is available is more variable: from 44.1–73.8% (Suganuma 1985 as cited in Seminoff et al. 2015).

The western boundary for the East Indian-West Pacific green sea turtle DPS is 84°E longitude from 40°S to where it coincides with India near Odisha, northeast and into the West Pacific Ocean to include Taiwan extending east at 41°N to 146°E longitude, southwest to 4.5°N, 129°E, then south and east to West Papua in Indonesia (at 135°E) and the Torres Straits in Australia (at 142°E longitude). This DPS is also included because the genetic evidence demonstrates that this DPS may occur in American Samoa waters. East Indian-West Pacific green sea turtles are listed as threatened in 2016 (81 FR 20057). The abundance of nesting females in this DPS is estimated at 77,009 females over 50 nesting sites (Seminoff et al. 2015).

CNP green turtle DPS, listed under ESA in 2016 (81 FR 20057) cover the Hawaiian archipelago and Johnston Atoll. FFS, located in the NWHI, represents the prominent focal point of green turtle nesting and hatchling production in the Hawaiian archipelago. Information from tagging at FFS, other areas in the NWHI, areas in the main Hawaiian Islands and Johnston Atoll show that the vast majority of reproductive females and males periodically migrate to FFS for seasonal breeding from these distant locations. At the end of the season, they return to their respective foraging areas. While the nesting population trajectory is positive and encouraging, more than 96% of nesting occurs at one site in the NWHI and it is highly vulnerable to threats. Survival of this DPS is currently highly dependent on successful nesting at FFS (Niethammer et al., 1992 as cited in Seminoff et al. 2015).

Based on the behavior of post-hatchlings and juvenile green turtles raised in captivity, it is presumed that those in pelagic habitats live and feed at or near the ocean surface, and that their dives do not normally exceed several meters in depth (NMFS and FWS 1998a). The maximum recorded dive depth for an adult green turtle was 138 m (Hochscheid 2014), while subadults routinely dive 20 m for 9–23 minutes, with a maximum recorded dive of 66 minutes (Brill et al. 1995 cited in Lutcavage and Lutz 1997).

NMFS and the U.S. Fish and Wildlife Service (USFWS) are proposing to designate CH for five DPS of green turtles including: Central South Pacific DPS (American Samoa area), East Pacific DPS (the West Coast area), Central Pacific DPS (Hawaii area) for green turtles (88 FR 46572; 2023). Although these CHs have been proposed, it has not been finalized. Thus, no analysis will be conducted for this proposed CH.¹

¹ The reason for a proposal of designating green turtle CH in the Pacific are the following: 1) Reproductively active females nest in the following areas: Palmyra atoll (Strawn, Copper and Aviation) and Rose Atoll (Swains, Ofu, Olosega, Ta'u, Aunu'u, and Motu o Manu); 2) Migratory green turtles (East Pacific DPS) need 10 km offshore with unobstructed water that allow for unrestricted transit of reproductive individuals between benthic foraging/resting and reproductive areas; and 3) From the mean high water line to 20-m depth, underwater refugia and food resources (i.e., seagrasses, macroalgae, and/or invertebrates) of sufficient condition,

Threats

A thorough discussion of threats to green turtles worldwide can be found in the most recent status review (Seminoff et al. 2015). Major threats include coastal development and loss of nesting and foraging habitat; incidental capture by fisheries; and the harvest of eggs, subadults, and adults. Climate change is also emerging as a critical issue. Destruction, alteration, and/or degradation of nesting and nearshore foraging habitat is occurring throughout the range of green turtles. These problems are particularly acute in areas with substantial or growing coastal development, beach armoring, beachfront lighting, and recreational use of beaches. In addition to damage to the nesting beaches, pollution and effects on foraging habitat is a concern. Pollution runoff can degrade seagrass beds that are the primary forage of green turtles. The majority of green turtles in coastal areas spend their time at depths less than 5 m below the surface (Schofield et al. 2007; Hazel et al. 2009) and hence are vulnerable to being struck by vessels. Collisions with vessels are known to cause significant numbers of deaths every year (NMFS and FWS 2007; Seminoff et al. 2015). Marine debris is also a source of concern for green sea turtles especially given their presence in nearshore coastal and estuarine habitats.

The bycatch of green sea turtles, especially in coastal fisheries, is a serious problem because in the Pacific, many of the small-scale artisanal gillnet, setnet, and longline coastal fisheries are not well regulated. These are the fisheries that are active in areas with the highest densities of green turtles (NMFS and FWS 2007). The meat and eggs of green turtles have long been favored throughout much of the world that has interacted with this species. As late as the mid-1970s, upwards of 80,000 eggs were harvested every night during the nesting season in Michoacán (Clifton et al. 1981). Although Mexico has implemented bans on the harvest of all turtle species in its waters and on the beaches, poaching of eggs, females on the beach, and animals in coastal waters continues. In some parts of Mexico and the eastern Pacific, consumption of green sea turtles remains a part of the cultural fabric and tradition (NMFS and FWS 2007). Like other sea turtle species, increasing temperatures have the potential to skew sex ratios of hatchlings. Many rookeries are already showing a strong female bias as warmer temperatures in the nest chamber leads to more female hatchlings (Chan and Liew 1995; Kaska et al. 2006). Increased temperatures also lead to higher levels of embryonic mortality (Matsuzawa et al. 2002). An increase in typhoon frequency and severity, a predicted consequence of climate change (Webster et al. 2005), can cause erosion which leads to high nest failure (Van Houtan and Bass 2007). Climate change may also affect green sea turtle feeding. Seagrasses are a major food source for green sea turtles and may be affected by changing water temperature and salinity (Short and Neckles 1999; Duarte 2002).

4.16 Olive Ridley Turtle (*Lepidochelys olivacea*)

Olive ridley turtles were listed as threatened in 1978 (43 FR 32800) with no designated CH. They have a global tropical distribution, occurring in the Atlantic, Pacific, and Indian oceans (NMFS and FWS 2014). In the eastern Pacific, olive ridley typically occur in tropical and subtropical waters, as far south as Peru and as far north as California but occasionally have been documented as far north as Alaska. The number of

distribution, diversity, abundance, and density are necessary to support survival, development, growth, and/or reproduction of benthic foraging/resting of the following green turtles: East Pacific, Central North Pacific, Central South Pacific, and Central West Pacific DPSs.

olive ridley sea turtles occurring in U.S. territorial waters is believed to be small (NMFS and FWS 1998c; 2014).

Studies from different populations of olive ridley sea turtles show a strong preference for neritic waters (shallow, nearshore waters overlying the continental shelf) (Polovina et al. 2004; Plot et al. 2015; Rees et al. 2018). However, deepwater foraging has been documented in the North Pacific, where prey items are scattered and less predictable and migrate widely from nesting locations (Polovina et al. 2004). Comparing olive ridley habitat use in different regions, Plot et al. (2015) suggest that the differing migration patterns observed (i.e., oceanic migrations versus neritic movements) may be attributed to specific environmental conditions of the areas in close proximity to nesting sites. There are no known nesting sites within U.S. territory.

Overall, at least 1,000,000 nesting females occur in the threatened population in the East Pacific, and this is considered a minimum population estimate. In the western Pacific, information on the size of olive ridley nesting aggregations and their trends are limited (NMFS and FWS 2014).

Olive ridley sea turtles exhibit temperature-dependent sex determination, and warmer incubation temperatures produce more females (NMFS and FWS 2014). The middle third of the incubation period is when the developing embryo's sex determination is sensitive to temperatures (Merchant-Larios et al. 1997). The temperature at which a nest will produce 50% males/females was estimated to be 29.95°C for nesting populations in Mexico (Sandoval Espinoza 2011 as cited in Hernández-Echeagaray et al. 2012), approximately 30–31°C for nesting populations in Costa Rica, and less than 29°C in Gahirmatha, India (NMFS and FWS 2014). Pivotal temperatures likely vary within and among populations and generalizations should be applied with caution. Studies on sex ratios of olive ridley hatchlings are few and non-existent for juvenile and adults. (Hernández-Echeagaray et al. 2012) found a slight female-bias sex ratio (55%) for the 2010–2011 nesting season at La Escobilla, Mexico. Sex ratios may also change over the nesting season.

Although olive ridley turtles are probably surface feeders, they have been caught in trawls at depths of 80–110 m (NMFS and FWS 1998c), and a post-nesting female reportedly dove to a maximum depth of 290 m. The average dive length for an adult female and adult male is reported to be 54.3 and 28.5 minutes, respectively (Plotkin et al. 1993).

They face threats throughout each of their respective life cycles, including bycatch in fishing gear, harvesting of eggs, loss and degradation of nesting habitat, vessel strikes, ocean pollution, and changing environmental condition.

4.17 Hawksbill Turtle (*Eretmochelys imbricata*)

Hawksbill turtles were listed as endangered in 1970 (35 FR 8491), and they inhabit the tropical and subtropical waters of all the world's major oceans. They nest at nine primary locations within Oceania (excluding Hawaii) including: Australia's Great Barrier Reef World Heritage Area, Papua New Guinea, Solomon Islands, Vanuatu, Fiji, the Federated States of Micronesia, Republic of Palau, and the Samoan Islands (Independent Samoa and American Samoa) spanning the Central Pacific population excluding Hawaii and the eastern portion of the West Pacific population. Hawksbill sea turtle nesting may occur elsewhere within this region, but any such nesting is thought to be in very low numbers. Thus, the total

number of annual nesting females in Oceania is estimated based on information from the nine locations mentioned at 5,400–6,160 females annually, with an overall downward trend (NMFS and FWS 2013).

Hawksbill diving behavior has been studied at several sites (NMFS and FWS 2013). Dive patterns are influenced by complex biological and environmental factors (Blumenthal et al. 2008; Gaos et al. 2012), thus factors such as benthic topography, oceanic characteristics, prey availability, diel period, and life stage would likely affect diving behavior. Unlike other marine turtles, hawksbills are not generally deep divers, which may be a reflection of the shallow depths of their primary food—sponges and macroalgae. Hawksbills actively forage during the day and tend to rest at night (NMFS and FWS 2013). However, (Gaos et al. 2012) documented foraging activity at night as well as during the day and thought it might be due to possible overlap of foraging and resting areas.

CH was designated in 1998 (63 FR 46693), but it is near Puerto Rico and does not overlap with the Action Area.

Their threats include bycatch in fishing gear, harvesting of eggs, loss and degradation of nesting and foraging habitat, predation of eggs and hatchlings, vessel strikes, and ocean pollution. Boat strikes have been documented. In Australia, five stranded hawksbill sea turtles in 2011 were determined to have injuries from boat strikes (Meager and Limpus 2012). Increasing boat traffic may increase the likelihood of boat strikes (NMFS and FWS 2013).

4.18 Oceanic Whitetip Shark (*Carcharhinus longimanus*)

The oceanic whitetip shark (*Carcharhinus longimanus*) was listed as endangered under the ESA on January 30, 2018 (83 FR 4153). NMFS determined on March 5, 2020, that a designation of CH was not prudent at this time (85 FR 12898).

The oceanic whitetip shark is a highly mobile, large, open-ocean shark found in tropical and subtropical waters around the globe. It generally remains offshore in the open ocean, on the OCS, or around oceanic islands in water depths greater than 184 m, and occurs from the surface to at least 152-m depth. This species has a strong preference for warm waters above 20°C and is therefore a surface-dwelling species (NMFS 2024b). These sharks are apex predators in pelagic ecosystems and feed primarily on teleost fishes and cephalopods, although sometimes they may consume sea birds, marine mammals, other sharks and rays, mollusks, crustaceans, and garbage (NMFS 2024b). Bycatch and harvest for international trade threatens this species (NMFS 2024b).

4.19 Giant Manta Ray (*Mobula birostris*)

The giant manta ray (*Mobula birostris*) was listed as threatened throughout its range on January 22, 2018 (83 FR 2916; taxonomy revised on November 22, 2023, 88 FR 81351). NMFS determined on December 5, 2019, that a designation of CH was not prudent at this time (84 FR 66652).

The giant manta ray is a migratory species and seasonal visitor along productive coastlines with regular upwelling, in oceanic island groups, and near offshore pinnacles and seamounts (Miller and Klimovich 2017). The timing of these visits varies by region and seems to correspond with the movement of zooplankton, current circulation and tidal patterns, seasonal upwelling, seawater temperature, and possibly

mating behavior. While seeking zooplankton, its primary food source (Miller and Klimovich 2017), this manta species demonstrates a great deal of plasticity in depth distribution, ranging from the surface to about 1,000 m (Weigmann 2016). Across its range the giant manta ray inhabits waters between 19–30°C (Miller and Klimovich 2017), although during deeper foraging ambits individuals will encounter water as cool as 12°C (Stewart et al. 2016).

Along the U.S. West Coast, the giant manta ray has not been formally recorded north of Santa Barbara, CA (Love et al. 2021). In the Morro Bay lease areas in 2024, shipborne marine mammal observers recorded one uncertain instance of one large and four small “manta rays” that were viewed using an infrared camera at the surface during nighttime (Marine Ventures International 2024). Until further documentation is secured, BOEM considers this observation unsubstantiated for the giant manta ray. These rays may be a closely related species, *Mobula mobular* (formerly *M. japonica*), which is very similar in appearance to the giant manta ray and which has a northern range limit that extends into central California and thus overlaps with the Morro Bay lease areas (Love et al. 2021).

Bycatch and overutilization from commercial fishing activities threatens this species (Miller and Klimovich 2017).

4.20 Eulachon (*Thaleichthys pacificus*)

The eulachon is a small, cold-water species of anadromous smelt, occupying the eastern Pacific Ocean in nearshore waters to depths of about 300 m from California to the Bering Sea. Eulachon will return to their natal river spawn. Juveniles disperse from freshwater to marine habitats on the continental shelf within the first year of their life, residing near the bottom at depths of 50–200 m. The Southern DPS was first listed as threatened by NMFS on March 18, 2010 (75 FR 13012). On October 20, 2011, NMFS designated CH for Southern DPS eulachon (76 FR 65324), with the designated areas being a combination of freshwater creeks and rivers and their associated estuaries which do not overlap with the Action Area. Southern DPS eulachon are those that spawn in rivers south of the Nass River in British Columbia to the Mad River in California (NMFS 2016). Eulachon eat krill, cumaceans, and copepods. Eulachon faces threats from climate change, dams and water diversions, bycatch, predation, and water quality (Gustafson et al. 2022).

4.21 Scalloped Hammerhead Shark (*Sphyrna lewini*)

The scalloped hammerhead shark, (*Sphyrna lewini*), Eastern Pacific DPS, was listed as endangered under the ESA on July 3, 2014 (79 FR 38214). On November 17, 2015, NMFS found that there are no marine areas within the jurisdiction of the United States that meet the definition of CH for the Eastern Pacific DPS of scalloped hammerhead shark (80 FR 71774).

Sphyrna lewini is a semi-oceanic and cosmopolitan species globally distributed throughout tropical and warm temperate seas. Distribution in the eastern Pacific Ocean extends from the coast of southern California (U.S.), including the Gulf of California, to Ecuador and possibly Peru, and off waters of Hawaii (U.S.) and Tahiti (Miller et al. 2014). As either solitary individuals or in aggregations, it occurs over continental and insular shelves, as well as adjacent deep waters, but is seldom found in waters cooler than 22° C (Miller et al. 2014). It ranges from the intertidal and surface to depths of up to 450–512 m, with

occasional dives to even deeper waters. It has also been documented entering enclosed bays and estuaries (Miller et al. 2014). The scalloped hammerhead shark is an apex predator and opportunistic feeder with a diet that includes a wide variety of teleost fishes, cephalopods, crustaceans, and rays (Miller et al. 2014). Adult hammerhead sharks are threatened by commercial fishing, mainly for the shark fin trade. Juveniles may be threatened by pollution and degradation of water quality (Miller et al. 2014).

4.22 Green Sturgeon (*Acipenser medirostris*)

The North American green sturgeon is an anadromous fish that occurs in the nearshore eastern Pacific Ocean from Alaska to Mexico (Huff et al. 2012). Green sturgeons are long-lived, late-maturing, iteroparous, anadromous species that spawn infrequently in natal streams, and spend substantial portions of their lives in marine waters. NMFS has identified two DPS of green sturgeon: northern and southern (Israel et al. 2009). In 2006, NMFS determined that the Southern DPS of green sturgeon warranted listing as a threatened species under the ESA (71 FR 17757). Green sturgeon have been observed in large concentrations in the summer and autumn within coastal bays and estuaries along the U.S. West Coast, including the Columbia River estuary, Willapa Bay, Grays Harbor, San Francisco Bay and Monterey Bay (Moser and Lindley 2007; Lindley et al. 2008; Lindley et al. 2011; Huff et al. 2012).

On October 9, 2009, NMFS designated CH for the Southern DPS of green sturgeon (74 FR 52300; **Figure 17**). CH is designated in coastal U.S. marine waters within 110 m (60 fathoms) depth from Monterey Bay, California (including Monterey Bay), north to Cape Flattery, Washington, including the Strait of Juan de Fuca, Washington, to its United States boundary; the Sacramento River, lower Feather River, and lower Yuba River in California; the Sacramento-San Joaquin Delta and Suisun, San Pablo, and San Francisco bays in California; the lower Columbia River estuary; and certain coastal bays and estuaries in California (Humboldt Bay), Oregon (Coos Bay, Winchester Bay, Yaquina Bay, and Nehalem Bay), and Washington (Willapa Bay and Grays Harbor). The portion of the CH that lies within marine coastal zone overlaps with the Action Area on the West Coast.

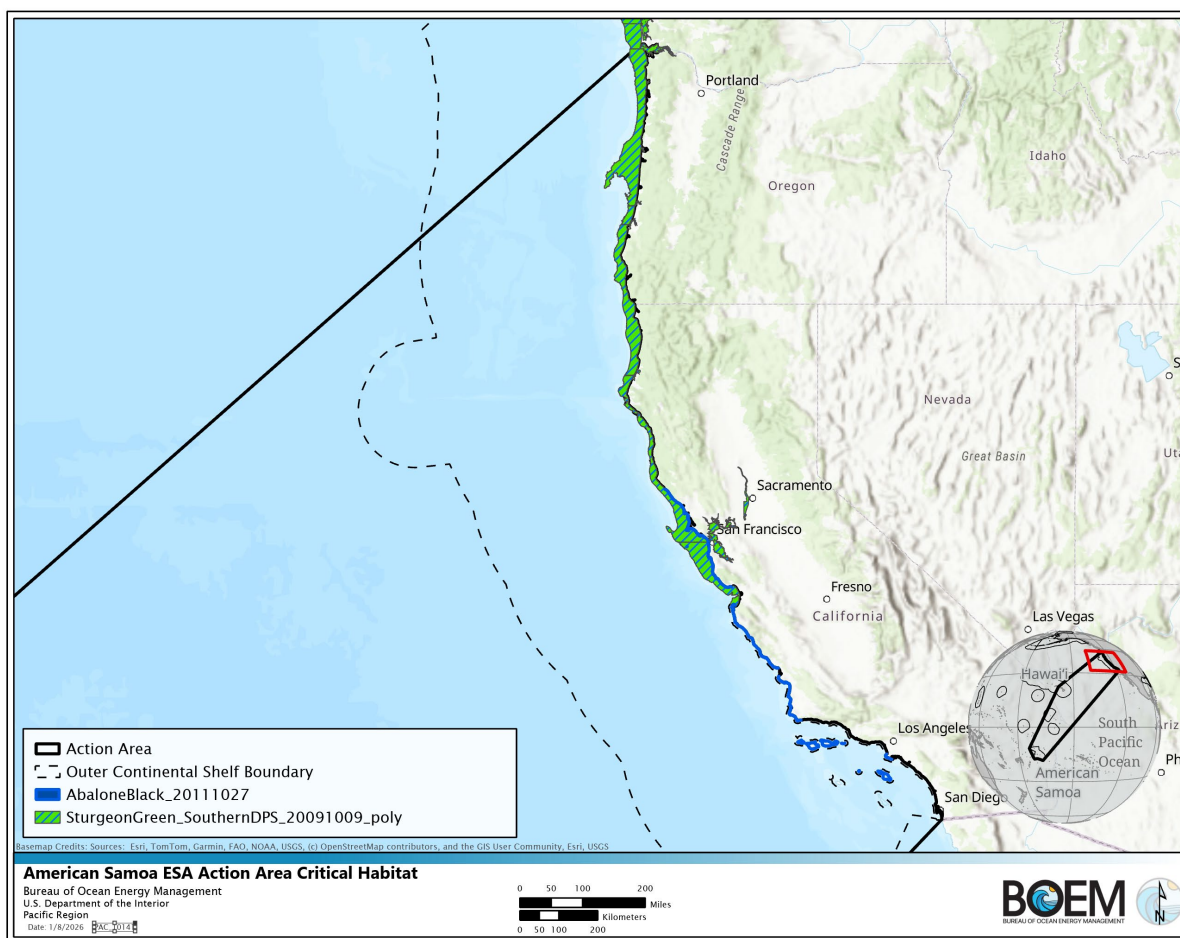


Figure 17. Locations of black abalone and green sturgeon CH overlapping the Action Area.

4.23 Salmonid Fishes

Chinook Salmon (*Oncorhynchus tshawytscha*)

Chinook salmon are an anadromous fish species that are found along the Pacific Coast and inland from Ventura River in California to Point Hope, Alaska and in northeast Asia. On occasion, they have been found further south. Like other Pacific salmon species, they are semelparous and spawning occurs in freshwater from August through February. Chinook salmon can spend up to a year in freshwater before migrating downstream to the ocean. They spend 2 to 8 years in the ocean before migrating back to natal freshwater rivers and streams to spawn.

Given this widespread geographic distribution, Chinook salmon have developed diverse and complex life-history strategies. Chinook salmon can be categorized as either “stream-type” or “ocean-type” strategists. Stream-type Chinook salmon reside in freshwater for a year or more following emergence, whereas “ocean-type” Chinook salmon migrate to the ocean predominantly within their first year. In addition to differences in freshwater life histories, there appears to be differing ocean use patterns between these stream-type and ocean-type Chinook salmon. Stream-type populations appear to undertake extensive

offshore ocean migrations while ocean-type Chinook salmon undertake distinct, coastally oriented, ocean migrations (Good et al. 2005).

Juvenile Chinook salmon exhibit a patchy distribution in U.S. West Coast waters; in pelagic trawl surveys conducted in summer and fall along Oregon and Washington, half of all juvenile salmonids were collected in about 5% of the surveys, and none were collected in about 40% of the surveys (Peterson et al. 2010). In general, salmonids are low in abundance in U.S. West Coast waters when compared to other fish, as evidenced by: (1) the low numbers of juvenile salmonids captured in directed pelagic surface/ subsurface research trawls relative to other nekton (Brodeur et al. 2004; Brodeur et al. 2005; Trudel et al. 2009; Peterson et al. 2010; Fisher et al. 2014), and (2) the low numbers of adult and subadult salmonids captured as bycatch in midwater trawls (e.g., commercial trawls for whiting, see Lomeli and Wakefield 2014).

Juvenile salmonids are pelagic and typically surface-oriented, most often found in the upper 20 m of the water column (Emmett et al. 2004; Beamish et al. 2005; Walker et al. 2007). Adult coho salmon tend to occur at shallower depths (< 40 m) than adult Chinook salmon (Walker et al. 2007). Juvenile Chinook salmon tend to occur closer inshore than other juvenile salmonid species, generally within the 100-m isobath (Brodeur et al. 2004; Peterson et al. 2010), and they occasionally have been found in the surf zone (Marin Jarrin et al. 2009). Once in the ocean, Chinook salmon feed upon small crustaceans, other invertebrates as juveniles, and larval and juvenile fish as adults (Love 1996).

Within the Action Area, nine evolutionary significant units (ESUs) may occur that are either threatened or endangered under the ESA.

Sacramento River Winter-run Chinook ESU (Endangered)

The listing status for this Chinook salmon ESU was determined to be endangered on January 4, 1994, (59 FR 440). CH was designated on June 16, 1993, (58 33212) and does not overlap with the Action Area. This ESU includes winter-run Chinook salmon spawning naturally in the Sacramento River and its tributaries, as well as winter-run Chinook salmon that are part of the conservation hatchery program at the Livingston Stone National Fish Hatchery.

Upper Columbia River Spring-run Chinook ESU (Endangered)

The listing status for this Chinook salmon ESU was determined to be endangered on March 24, 1999 (64 FR 14308) and June 28, 2005 (70 FR 37159); updated April 14, 2014 (79 FR 20802). CH was designated on September 2, 2005 (70 FR 52630) and does not overlap with the Action Area. This ESU includes naturally spawned spring-run Chinook salmon originating from Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam (excluding the Okanogan River subbasin). This ESU also includes Chinook salmon from several artificial propagation programs.

California Coastal Chinook ESU (Threatened)

The listing status for this Chinook salmon ESU was determined to be threatened on September 16, 1999 (64 FR 50394). CH was designated on September 2, 2005 (70 FR 52488) and does not overlap with the Action Area. On June 28, 2005, (70 FR 37159) NMFS confirmed the listing of California Coastal Chinook salmon as threatened under the ESA and also added seven artificially propagated populations from the

following hatcheries or programs to the listing. This ESU includes all naturally spawned populations of Chinook salmon from rivers and streams south of the Klamath River (Humboldt County, CA) to the Russian River (Sonoma County, CA).

Central Valley Spring-run Chinook ESU (Threatened)

The listing status for this Chinook salmon ESU was determined to be endangered on September 16, 1999 (FR 64 50394). CH was designated on September 2, 2005 (70 FR 52630) and does not overlap with the Action Area. This ESU includes naturally spawned spring-run Chinook salmon originating from the Sacramento River and its tributaries, and also spring-run Chinook salmon from the Feather River Hatchery Spring-run Chinook Salmon Program.

Lower Columbia River Chinook ESU (Threatened)

The listing status for this Chinook salmon ESU was determined to be threatened on May 24, 1999 (64 FR 14308) and June 28, 2005 (70 FR 37160); updated April 14, 2014 (79 FR 20802). CH was designated on September 2, 2005 (70 FR 52630) and does not overlap with the Action Area. This ESU includes all includes naturally spawned Chinook salmon originating from the Columbia River and its tributaries downstream of a transitional point east of the Hood and White Salmon Rivers, and any such fish originating from the Willamette River and its tributaries below Willamette Falls. This ESU also includes Chinook salmon from several artificial propagation programs.

Puget Sound Chinook ESU (Threatened)

The listing status for this Chinook salmon ESU was determined to be threatened on March 24, 1999 (64 FR 14308) and June 28, 2005 (70 FR 37160); updated April 14, 2014 (79 FR 20802). CH was designated on September 2, 2005 (70 FR 52630) and does not overlap with the Action Area. This ESU includes naturally spawned Chinook salmon originating from rivers flowing into Puget Sound from the Elwha River (inclusive) eastward, including rivers in Hood Canal, South Sound, North Sound and the Strait of Georgia. This ESU also includes Chinook salmon from several artificial propagation programs.

Snake River Fall-run Chinook ESU (Threatened)

The listing status for this Chinook salmon ESU was determined to be threatened on April 22, 1992 (57 FR 14653) and June 28, 2005 (70 FR 37160); updated April 14, 2014 (79 FR 20802). CH was designated on December 28, 1993 (58 FR 68543) and does not overlap with the Action Area. This ESU includes all naturally spawned fall-run Chinook salmon originating from the mainstem Snake River below Hells Canyon Dam and from the Tucannon River, Grande Ronde River, Imnaha River, Salmon River, and Clearwater River subbasins. This ESU also includes Chinook salmon from several artificial propagation programs.

Snake River Spring/Summer-run Chinook ESU (Threatened)

The listing status for this Chinook salmon ESU was determined to be threatened on April 22, 1992 (57 FR 14653) and June 28, 2005 (70 FR 37160); updated April 14, 2014 (79 FR 20802). CH was designated on October 25, 1999 (64 FR 57399) and does not overlap with the Action Area. This ESU includes all naturally spawned spring/summer-run Chinook salmon originating from the mainstem Snake River and the Tucannon River, Grande Ronde River, Imnaha River, and Salmon River subbasins. This ESU also includes Chinook salmon from several artificial propagation programs.

Upper Willamette River Chinook ESU (Threatened)

The listing status for this Chinook salmon ESU was determined to be threatened on March 24, 1999 (64 FR 14308) and June 28, 2005 (70 FR 37160); updated April 14, 2014 (79 FR 20802). CH was designated on September 2, 2005 (70 FR 52629) and does not overlap with the Action Area. This ESU includes naturally spawned spring-run Chinook salmon originating from the Clackamas River and from the Willamette River and its tributaries above Willamette Falls. This DPS also includes Chinook salmon from several artificial propagation programs.

Chum Salmon (Oncorhynchus keta)

Chum salmon are found throughout the North Pacific Ocean and range from the Arctic coast of Canada and throughout the northern coastal regions of North America and Asia. In the United States, chum salmon are found throughout Alaska and as far south as Yaquina Bay, Oregon, on the West Coast.

They are anadromous—they hatch in freshwater streams and rivers then migrate out to the saltwater environment of the ocean to feed and grow. Chum salmon do not reside in fresh water for an extended period and young chum salmon (fry) typically migrate directly to estuarine and marine waters soon after they are born. As they grow larger, they migrate offshore across the North Pacific Ocean. As they approach sexual maturity, they migrate back into coastal waters and return to the freshwater area where they were born to spawn, typically spawn between the ages of 3 and 6 years. They spawn from late summer to March, with peak spawning concentrated in early winter when the river flows are high. They usually nest in areas in the lowermost reaches of rivers and streams, within 60 mi of the ocean. Young chum salmon feed on insects as they migrate downriver and on insects and marine invertebrates in estuaries and nearshore marine habitats. Adults eat copepods, fishes, mollusks, squid, and tunicates.

Within the Action Area, two ESUs may occur that are threatened under the ESA.

Columbia River Chum ESU (Threatened)

The listing status for this coho salmon ESU was determined to be threatened March 25, 1999 (64 FR 14508) and June 28, 2005 (70 FR 37160); updated April 14, 2014 (79 FR 20802). CH was designated on September 2, 2005 (70 FR 52630) and does not overlap with the Action Area. This ESU naturally spawned chum salmon originating from the Columbia River and its tributaries in Washington and Oregon. Coho salmon originating from three artificial propagation programs also are included. This ESU also includes fish from a number of artificial propagation programs.

Hood Canal Summer-run Chum ESU (Threatened)

The listing status for this coho salmon ESU was determined to be threatened on March 25, 1999 (64 FR 14508) and June 28, 2005 (70 FR 37160); updated April 14, 2014 (79 FR 20802). CH was designated on September 2, 2005 (70 FR 52630) and does not overlap with the Action Area. This ESU includes naturally spawned summer-run chum salmon originating from Hood Canal and its tributaries as well as from Olympic Peninsula rivers between Hood Canal and Dungeness Bay (inclusive). This ESU also includes fish from a number of artificial propagation programs.

Coho Salmon (*Oncorhynchus kisutch*)

Coho salmon are found in the North Pacific Ocean and inland from Monterey Bay, California to Point Hope, Alaska, and north Asia. They are semelparous and spawning takes place in freshwater from September through late January. Coho salmon typically exhibit a three-year life history, divided between 18 months in freshwater and 18 months in saltwater phases. In freshwater, coho salmon spawn and rear in small streams with stable gravels and complex habitat features, such as backwater pools, beaver dams, and side channels. Marine survival and growth of coho salmon are linked to food availability, environmental conditions, and stressors present in the nearshore environment. Juvenile coho salmon disperse from their natal streams to coastal waters; their ocean distribution changes with time, with juveniles typically moving northward or farther offshore (Brodeur et al. 2004). Ocean dispersal rates for yearling Columbia River coho salmon averaged between 3.2 and 6.6 km/d (Fisher et al. 2014). Juvenile salmonids are pelagic and typically surface-oriented, most often found in the upper 20 m of the water column (Emmett et al. 2004; Beamish et al. 2005; Walker et al. 2007). Adult coho salmon tend to occur at shallower depths (< 40 m) than adult Chinook salmon (Walker et al. 2007).

In general, juvenile salmonids are low in abundance in U.S. West Coast waters when compared to other fish, as evidenced by the low numbers of juvenile salmonids captured in directed pelagic surface/subsurface research trawls relative to other nekton (Brodeur et al. 2004; Brodeur et al. 2005; Peterson et al. 2010; Fisher et al. 2014). Juvenile coho salmon exhibit a patchy distribution in U.S. West Coast waters; in pelagic trawl surveys conducted in summer and fall along Oregon and Washington, half of all juvenile salmonids were collected in about 5% of the surveys, and none were collected in about 40% of the surveys (Peterson et al. 2010). Juvenile coho salmon occur in coastal waters, usually further offshore than juvenile Chinook salmon (Brodeur et al. 2004; Peterson et al. 2010). While in the ocean, coho salmon primarily feed upon fish and planktonic invertebrates (Love 1996).

Within the Action Area four ESUs may occur that are either threatened or endangered under the ESA.

Central California Coast Coho ESU (Endangered)

The listing status for this coho salmon ESU was determined to be threatened under the ESA on October 31, 1996 (64 FR 56138); NMFS reclassified the ESU as endangered on June 28, 2005 (70 FR 37160); updated April 14, 2014 (79 FR 20802). CH was designated on May 5, 1999 (64 FR 24049) and does not overlap with the Action Area. This ESU includes naturally spawned coho salmon originating from rivers south of Punta Gorda, California, up to and including Aptos Creek, as well as such coho salmon originating from tributaries to San Francisco Bay. Coho salmon from three artificial propagation programs are included in this ESU.

Lower Columbia River Coho ESU (Threatened)

The listing status for this coho salmon ESU was determined to be threatened under the ESA on June 28, 2005 (70 FR 37160); updated April 14, 2014 (79 FR 20802). CH was designated on February 24, 2016 (81 FR 9251) and does not overlap with the Action Area. This ESU includes naturally spawned coho salmon originating from the Columbia River and its tributaries downstream from the Big White Salmon and Hood Rivers (inclusive) and any such fish originating from the Willamette River and its tributaries below Willamette Falls. Coho salmon that originate from a number of artificial propagation programs are also included.

Oregon Coast Coho ESU (Threatened)

The listing status for this coho salmon ESU was determined to be threatened on August 10, 1998 (63 FR 42587) and June 20, 2011 (76 FR 35755); updated April 14, 2014 (79 FR 20802). CH was designated on February 11, 2008 (73 FR 7815) and does not overlap with the Action Area. This ESU includes naturally spawned coho salmon originating from coastal rivers south of the Columbia River and north of Cape Blanco. This ESU also includes coho salmon from the Cow Creek Hatchery Program.

Southern Oregon and Northern California Coasts Coho ESU (Threatened)

The listing status for this coho salmon ESU was determined to be threatened under the ESA on May 6, 1997 (62 FR 24588). The listing was revisited and confirmed as threatened on June 28, 2005 (70 FR 37160); updated April 14, 2014 (79 FR 20802). CH was designated on May 5, 1999 (64 FR 24049) and does not overlap with the Action Area. This ESU includes naturally spawned coho salmon originating from coastal streams and rivers between Cape Blanco, Oregon, and Punta Gorda, California. Coho salmon that originating from three artificial propagation programs also are included.

Steelhead (*Oncorhynchus mykiss irideus*)

Steelhead originally ranged from northern Mexico to southeastern Alaska and inland. They are iteroparous and spawning takes place in the spring. Juveniles typically spend 2 years in freshwater before migrating downstream the ocean. While in the ocean, steelhead feed upon insects, mollusks, crustaceans, fish eggs, and other small fishes (Love 1996).

Steelhead are rainbow trout that exhibit an anadromous life-history pattern. By migrating to the ocean, steelhead grow to much larger sizes than their resident rainbow trout cohorts. Anadromous steelhead and resident rainbow trout can be considered to be from the same population, as anadromous parents can produce resident offspring and resident parents can produce anadromous offspring. This adaptive life history makes steelhead flexible to changing habitat conditions. Also, unlike other Pacific salmonids, they can spawn more than one time.

After emergence, young steelhead rear in freshwater streams for 1 to 4 years before migrating out to the ocean. After reaching the ocean in the spring, juvenile steelhead tend to move offshore quickly rather than use nearshore waters like other salmon. For example, Daly et al. (2014) captured tagged juvenile steelhead that migrated greater than 55 km offshore of the Columbia River within 3 days. While at sea, steelhead are found in pelagic waters of the Gulf of Alaska principally within 10 m from the surface, though they sometimes travel to greater depths (Light et al. 1989).

Within the Action Area, 11 DPSs may occur that are either threatened or endangered under the ESA.

Southern California Steelhead DPS (Endangered)

The listing status for this steelhead DPS was determined to be endangered on August 18, 1997 (62 FR 43937) and January 5, 2006 (71 FR 834); range extension on May 1, 2002 (67 FR 21586); updated April 14, 2014 (79 FR 20802). CH was designated on September 2, 2005 (70 FR 52536) and does not overlap with the Action Area. The Southern California Coast Steelhead DPS is comprised of a suite of anadromous steelhead populations that inhabit coastal stream networks from the Santa Maria River system south to the U.S. border with Mexico.

California Central Valley Steelhead DPS (Threatened)

The ESA listing status for this steelhead DPS was threatened on March 19, 1998 (62 FR 13347); reaffirmed January 5, 2006 (71 FR 834). CH was designated September 2, 2005 (70 FR 52630) and does not overlap with the Action Area. This DPS includes naturally spawned anadromous populations originating below natural and man-made impassable barriers from the Sacramento and San Joaquin Rivers and their tributaries; excludes such fish originating from San Francisco and San Pablo Bays and their tributaries. Steelhead from the following artificial propagation programs are also included within the DPS: Coleman National Fish Hatchery Program, Feather River Fish Hatchery Program, and Mokelumne River Hatchery Program.

Central California Coast Steelhead DPS (Threatened)

The ESA listing status for this steelhead DPS was threatened on August 18, 1997 (62 FR 43937) and January 5, 2006 (71 FR 834); updated April 14, 2014 (79 FR 20802). CH was designated September 2, 2005 (70 FR 52630) and does not overlap with the Action Area. This DPS includes naturally spawned anadromous populations originating below natural and man-made impassable barriers from the Russian River to and including Aptos Creek, and all drainages of San Francisco and San Pablo Bays eastward to Chippis Island at the confluence of the Sacramento and San Joaquin Rivers. Steelhead from the following artificial propagation programs are also included within the DPS: Don Clausen Fish Hatchery Program and Kingfisher Flat Hatchery Program (Monterey Bay Salmon and Trout Project).

Lower Columbia River Steelhead DPS (Threatened)

The ESA listing status for this steelhead DPS was threatened on March 19, 1998 (63 FR 13347) and January 5, 2006 (71 FR 834); updated April 14, 2014 (79 FR 20802). CH was designated September 2, 2005 (70 FR 52630) and does not overlap with the Action Area. This DPS includes naturally spawned anadromous *O. mykiss* (steelhead) originating below natural and man-made impassable barriers from rivers between the Cowlitz and Wind Rivers (inclusive) and the Willamette and Hood Rivers (inclusive); excludes such fish originating from the upper Willamette River basin above Willamette Falls. This DPS also includes fish from a number of artificial propagation programs.

Middle Columbia River Steelhead DPS (Threatened)

The ESA listing status for this steelhead DPS was threatened on March 25, 1999 (64 FR 14517) and January 5, 2006 (71 FR 834); updated April 14, 2014 (79 FR 20802). CH was designated September 2, 2005 (70 FR 52630) and does not overlap with the Action Area. This DPS includes naturally spawned anadromous *O. mykiss* (steelhead) originating below natural and man-made impassable barriers from the Columbia River and its tributaries upstream of the Wind and Hood Rivers (exclusive) to and including the Yakima River; excludes such fish originating from the Snake River basin. This DPS also includes fish from a number of artificial propagation programs.

Northern California Steelhead DPS (Threatened)

The ESA listing status for this steelhead DPS was threatened on June 07, 2000 (65 FR 36074) and January 5, 2006 (71 FR 834); updated April 14, 2014 (79 FR 20802). CH was designated on September 2, 2005 (70 FR 52630) and does not overlap with the Action Area. This DPS includes naturally spawned

anadromous steelhead originating below natural and man-made impassable barriers in California coastal river basins from Redwood Creek to and including the Gualala River.

Puget Sound Steelhead DPS (Threatened)

The ESA listing status for this steelhead DPS was threatened on May 11, 2007 (72 FR 26722); updated April 14, 2014 (79 FR 20802). CH was designated February 24, 2016 (81 FR 9252) and does not overlap with the Action Area. This DPS includes naturally spawned anadromous *O. mykiss* (steelhead) originating below natural and man-made impassable barriers from rivers flowing into Puget Sound from the Elwha River (inclusive) eastward, including rivers in Hood Canal, South Sound, North Sound, and the Strait of Georgia. This DPS also includes fish from a number of artificial propagation programs.

Snake River Steelhead DPS (Threatened)

The ESA listing status for this steelhead DPS was threatened on August 18, 1997 (62 FR 43937) and January 5, 2006 (71 FR 834); updated April 14, 2014 (79 FR 20802). CH was designated September 2, 2005 (70 FR 52630) and does not overlap with the Action Area. This DPS includes all naturally spawned anadromous *O. mykiss* (steelhead) originating below natural and man-made impassable barriers from the Snake River basin. This DPS also includes fish from a number of artificial propagation programs.

South-Central California Coast DPS (Threatened)

The ESA listing status for this steelhead DPS was threatened on August 18, 1997 (62 FR 43937) and January 5, 2006 (71 FR 834); updated April 14, 2014 (79 FR 20802). CH was designated September 2, 2005 (70 FR 52630) and does not overlap with the Action Area. This DPS includes naturally spawned anadromous steelhead originating below natural and man-made impassable barriers from the Pajaro River to (but not including) the Santa Maria River.

Upper Columbia River Steelhead DPS (Endangered)

The ESA listing status for this steelhead DPS was endangered on August 18, 1997 (62 FR 43937); reclassified to threatened on January 5, 2006 (71 FR 834) and August 24, 2009 (74 FR 42605); updated April 14, 2014 (79 FR 20802). CH was designated September 2, 2005 (70 FR 52630) and does not overlap with the Action Area. This DPS includes naturally spawned anadromous *O. mykiss* (steelhead) originating below natural and man-made impassable barriers from the Columbia River and its tributaries upstream of the Yakima River to the U.S.-Canada border. This DPS also includes fish from a number of artificial propagation programs.

Upper Willamette River Steelhead DPS (Threatened)

The ESA listing status for this steelhead DPS was threatened on March 25, 1999 (64 FR 14517) and January 5, 2006 (71 FR 834); updated April 14, 2014 (79 FR 20802). CH was designated September 2, 2005 (70 FR 52630) and does not overlap with the Action Area. This DPS includes naturally spawned anadromous winter-run steelhead originating below natural and man-made impassable barriers from the Willamette River and its tributaries upstream of Willamette Falls, to and including the Calapooia River.

4.24 Chambered Nautilus (*Nautilus pompilius*)

The chambered nautilus (*Nautilus pompilius*) was listed as threatened in 2018 (83 FR 48976). NMFS found designation of CH was not prudent (85 FR 5197 January 29, 2020). Distribution and life-history information are summarized by (Miller 2018). Chambered nautilus are native to the tropical Indo-Pacific, including the waters of American Samoa, and are typically found near coral reefs and steep fore-reef slopes as well as associated soft-bottom substrates. They inhabit 100- to 500-m depths during the day to avoid predators and ascend to shallower depths at night to forage. Nautilus are long-lived (15 to 20 yrs), slow-growing, and have low reproductive rates. They use olfaction and chemotaxis to locate prey such as carrion, crustaceans, and small fish.

The primary threat to this species is overharvesting for their ornate shells to meet the demand for the international nautilus shell trade. Chambered nautilus shells, which have a distinctive coiled interior, are traded as souvenirs to tourists and shell collectors and also used in jewelry and home décor items (where either the whole shell is sold as a decorative object or parts are used to create shell-inlay designs).

Given their slow growth, late maturity, low reproductive output, and low mobility, chambered nautilus are particularly vulnerable to overfishing. Efforts to address overutilization of the species through regulatory measures appear inadequate, with evidence of targeted fishing of and trade in the species, particularly in Indonesia, Philippines, and China, despite prohibitions.

4.25 Black Abalone (*Haliotis cracherodii*)

The black abalone (*Haliotis cracherodii*) was listed as endangered under the ESA on January 14, 2009 (74 FR 1937), and CH was designated by NMFS on November 28, 2011 (76 FR 66806; **Figure 17**).

Black abalone distribution ranges from approximately Point Arena, Mendocino County, California, south to Bahia Tortugas and Isla Guadalupe in Mexico (VanBlaricom et al. 2009). This species primarily feeds on algae, is long-lived (up to 30 years), and possesses a planktonic larval stage of 4–10 days before settling on benthic substrate (VanBlaricom et al. 2009). The majority of black abalone live on rocky substrates in the high to low intertidal zone, and it is rarely found deeper than 6 m of water (VanBlaricom et al. 2009). CH for black abalone consists of rocky intertidal zones and shallow subtidal areas (< 6m) along Coastal California where they find shelter and access to food (NMFS 2011a). The spatial distribution of CH is discontinuous and includes the areas between Del Mar Landing Ecological Reserve and Natural Bridges State Beach; Pacific Grove and Cayucos; Montaña De Oro State Park and just south of Government Point; Palos Verdes/Torrance Border and Los Angeles Harbor; and Farallon, Año Nuevo, San Miguel, San Rosa, Santa Cruz, Anacapa, Santa Barbara, and Santa Catalina Islands (NMFS 2011a). The largest threats to the black abalone include suboptimal water temperatures, low density, disease, and illegal take (Neuman et al. 2010).

4.26 White Abalone (*Haliotis sorenseni*)

The white abalone (*Haliotis sorenseni*) was listed as endangered under the ESA on May 29, 2001 (FR 66 FR 29046). NMFS determined that designation of CH for white abalone was not prudent, because a designation would not provide significant benefits that outweigh the increased risk of poaching that may

result from identifying the species' CH (66 FR 29046; May 29, 2001). Distribution and life-history information are summarized by NMFS (2008; 2018b).

White abalone occur on the North American west coast along offshore islands and banks (particularly Santa Catalina and San Clemente Islands) and along the mainland coast from Point Conception, California, south to Punta Abreojos, Baja California, Mexico. This species primarily feeds on algae, is long-lived (35–40 years), and possesses a planktonic larval stage that lasts for about 2 weeks before settling on benthic substrate. Adults occupy open, low relief rocky reefs or boulder habitat surrounded by sand. Because suitable habitat is patchy, the distribution of white abalone is also patchy. White abalone are the deepest living abalone species on the North American west coast, occupying depths from 5–60 m. Current remnant populations are most common between 30 and 60 m in depth, and surveys found the highest densities at depths of 40–50 m. Threats to the white abalone include overfishing, low reproduction rates, habitat destruction, and disease.

4.27 Sunflower Sea Star (*Pycnopodia helianthoides*)

The sunflower sea star (*Pycnopodia helianthoides*) was proposed for listing as threatened under the ESA in 2023 (88 FR 16212); a final rule has not been issued nor has CH been designated. The species is a large, fast moving, many-armed sea star, native to the eastern Pacific Ocean from Baja California, Mexico to the Aleutian Islands, Alaska. The species is most abundant in the waters off eastern Alaska and British Columbia. Between 2013 and 2017, sea star wasting syndrome killed an estimated 90% of the population (Lowry et al. 2022).

The sunflower sea star has no clear associations with specific habitat types or features and is considered a habitat generalist (Lowry et al. 2022). Sunflower sea stars occupy a wide range of benthic substrates including mud, sand, shell, gravel, and rocky bottoms while roaming in search of prey (Lowry et al. 2022). The diet of adult sunflower sea stars generally consists of benthic and mobile epibenthic invertebrates, including sea urchins, snails, crab, sea cucumbers, and other sea stars (Lowry et al. 2022), and appears to be driven largely by prey availability.

Lowry et al. (2022) reviewed 27 datasets on the distribution and abundance of sunflower sea stars and described the depth distribution as the low intertidal and subtidal zones to a depth of 435 m but that these sea stars are most common at depths less than 25 m and rare in waters deeper than 120 m. However, sunflower sea star has been observed at depths beyond 435 m offshore of Oregon and central California, with a gradual decline through ~600 m and sporadic occurrence to a maximum depth of 1,158 m (NMFS 2024e). Lowry et al. (2022) notes that, from all depths along the entire U.S. West Coast, *P. helianthoides* “density peaked in 2013, declined suddenly in 2014, and went to essentially zero in 2015 with no sign of recovery. The survey recorded 2,618 *P. helianthoides* from 2003–2014 but only seven individuals from 2015–2021. While there is some variation with latitude, the majority of hauls with *P. helianthoides* were from waters less than 250 m.” Due to extremely low sunflower sea star density at depths deeper than 250 m, these data were excluded from the multivariate autoregressive state space models that were used to estimate abundance trends. In summary, this abundance information suggests that, although there may be potential habitat in the Action Area, the probability of sunflower sea stars occurring there is extremely low. Furthermore, any individuals that could be found there would be exposed to mortality risk due to being

trawled up by ongoing groundfish commercial fishers who operate off the U.S. West Coast (Wang et al. 2024).

Threats to the sunflower sea star were broadly grouped into the five ESA Section 4(a)(1) categories of: 1) present or threatened destruction, modification, or curtailment of habitat or range; 2) overutilization for commercial, recreational, scientific, or educational purposes; 3) competition, disease, or predation; 4) adequacy of existing regulatory mechanisms; and 5) other natural or man-made factors affecting continued existence (Lowry et al. 2022).

4.28 Coral Species

Acropora globiceps

A. globiceps was listed as threatened on September 10, 2014 (79 FR 53852). In 2025, NMFS designated CH for this species on Tutuila and its offshore banks, Ofu-Olosega, and Ta'u between 0–20-m depth; Rose, Palmyra, and Johnston Atolls, and Lalo (FFS) between 0–10-m depth; and Guam, Rota, Aguijan, Tinian, Saipan, Alamagan, Pagan, Asuncion, Maug Islands, and Uracas between 0–12-m depth (90 FR 31800, 90 FR 39339; **Figure 18**). Designated CH supports the reproduction, recruitment, growth, and maturation of *A. globiceps*, providing substrate for larval settlement and the water conditions that are suitable for survival.

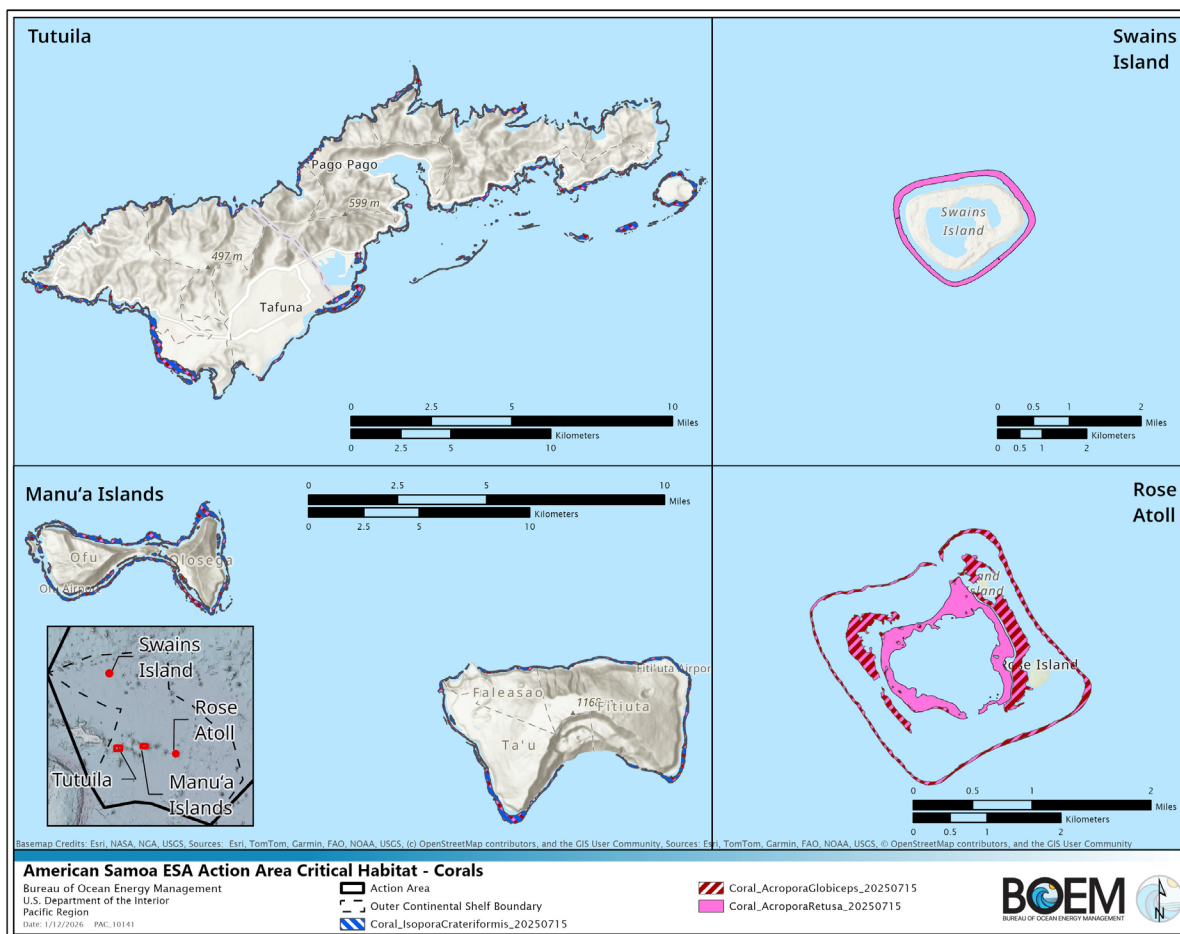


Figure 18. Action Area in American Samoa waters and location of the CH of the listed coral species

Distribution and life-history information are summarized by (NMFS 2023c). *A. globiceps* has a relatively broad geographic distribution, occurring on Guam, CNMI, American Samoa, Pacific Remote Island Areas (PRIA), and the NWHI within U.S. waters. The species inhabits shallow forereefs, as well as backreef areas, pools, and lagoons with high wave energy. Its depth distribution ranges from 0–20 m, although it is typically found shallower than 8-m depth. Generally, *Acropora* species have rapid skeletal growth and low tolerance to stress. They are hermaphroditic broadcast spawners that can recruit quickly and compete for space but are susceptible to disturbance.

Threats to *A. globiceps* include ocean warming, ocean acidification, disease, fishing, land-based sources of pollution, and collection and trade, which are all projected to worsen in the foreseeable future.

Acropora retusa

A. retusa was listed as threatened on September 10, 2014 (79 FR 53852). In 2025, NMFS designated CH for this species from 0–2-m depth on Tutuila and its offshore banks, Ofu-Olosega, Ta'u, Rose Atoll, Swains, and Guam (90 FR 31800, 90 FR 39339; **Figure 18**). Designated CH supports the reproduction, recruitment, growth, and maturation of *A. retusa*, providing substrate for larval settlement and the water conditions that are suitable for survival.

Distribution and life-history information are summarized by (NMFS 2023c). *A. retusa* has a relatively broad geographic distribution; within U.S. waters, it occurs on American Samoa and PRIA (Wake Atoll). It is typically found on shallow forereefs and other shallow, high-energy environments. Its depth distribution ranges from 0–29 m. There is little known about *A. retusa* life history but, in general, *Acropora* species have rapid skeletal growth, low tolerance to stress, and are hermaphroditic broadcast spawners.

Threats to *A. retusa* include ocean warming, ocean acidification, disease, fishing, land-based sources of pollution, and collection and trade, which are all projected to worsen in the foreseeable future.

Acropora speciosa

A. speciosa was listed as threatened on September 10, 2014 (79 FR 53852). In 2025, NMFS designated CH for this species from 20–50-m depth on Tutuila and its offshore banks (90 FR 31800, 90 FR 39339; **Figure 18**). Designated CH supports the reproduction, recruitment, growth, and maturation of *A. speciosa*, providing substrate for larval settlement and the water conditions that are suitable for survival.

Distribution and life-history information are summarized by (NMFS 2023c). This species occurs on walls and steep slopes between 12–65-m depth. They are most often found between 30–60 m, although can occur in shady shallower waters. They inhabit various types of rocky substrates (e.g., reef slopes, limestone mounds) with clear waters and protection from wave exposure. There is little known about *A. speciosa* life history but, in general, *Acropora* species have rapid skeletal growth, low tolerance to stress, and are hermaphroditic broadcast spawners. With U.S. waters, it has only been recorded on Tutuila in American Samoa.

Threats to *A. speciosa* include ocean warming, ocean acidification, disease, fishing, land-based sources of pollution, and collection and trade, which are all projected to worsen in the foreseeable future.

***Fimbriaphyllia paradviva* (formerly *Euphyllia paradviva*)**

F. paradviva was listed as threatened on September 10, 2014 (79 FR 53852). In 2025, NMFS designated CH for this species from 20–50-m depth on Tutuila and its offshore banks (90 FR 31800, 90 FR 39339; **Figure 18**). Designated CH supports the reproduction, recruitment, growth, and maturation of *F. paradviva*, providing substrate for larval settlement and the water conditions that are suitable for survival.

Distribution and life-history information are summarized by (NMFS 2023c). *F. paradviva* occurs in low light, low wave energy environments between 5–75 m. It can be found in shallow turbid bays, shallow reefs, and mesophotic reefs of a wide range of substrates, such as mud, sand, rubble, and rock. *F. paradviva* is a broadcast spawner that is slow-growing, stress-tolerant, and highly competitive for space. With U.S. waters, it has only been recorded on Tutuila in American Samoa, but its geographic distribution may be underestimated due to lack of surveys in its typical habitat.

Threats to *F. paradviva* include ocean warming, ocean acidification, disease, fishing, land-based sources of pollution, and collection and trade, which are all projected to worsen in the foreseeable future.

Isopora crateriformis

I. crateriformis was listed as threatened on September 10, 2014 (79 FR 53852). In 2025, NMFS designated CH for this species from 0–20-m depth on Tutuila and its offshore banks, Ofu-Olosega, and

Ta'u (90 FR 31800, 90 FR 39339; **Figure 18**). Designated CH supports the reproduction, recruitment, growth, and maturation of *I. crateriformis*, providing substrate for larval settlement and the water conditions that are suitable for survival.

Distribution and life-history information are summarized by (NMFS 2023c). This species is typically found on shallow forereefs but may also occur in backreef areas with clear water and strong wave action. It has a relatively limited geographic distribution in the western equatorial Pacific Ocean and, within U.S. waters, has been documented on Tutuila (where it is locally dominant on some upper reef slopes), Ofu-Olosega, and Ta'u. *I. crateriformis* has a depth range between 0–25 m and is most common in the upper 12 m water depth. Based on other *Isopora* species, this species is likely a hermaphroditic brooder.

Threats to *I. crateriformis* include ocean warming, ocean acidification, disease, fishing, land-based sources of pollution, and collection and trade, which are all projected to worsen in the foreseeable future.

4.29 Giant Clam Species

Horse's Hoof Clam (*Hippopus hippopus*)

The horse's hoof clam (*Hippopus hippopus*), also known as the bear paw or strawberry clam, was proposed for listing as threatened under the in 2024 (89 FR 60498). Distribution and life-history information are summarized by (Rippe et al. 2024). The species is widely distributed throughout the Indo-Pacific, including the U.S. territories of American Samoa, Guam, and CNMI. It was locally extinct in American Samoa, although a government hatchery was established to reintroduce the species for meat with unknown success. It occurs frequently in Australia, Palau, and Vanuatu.

This species of giant clam inhabits shallow, nearshore reef patches, sandy areas, seagrass beds, and lagoonal reefs, but can be found as deep as 10 m. Giant clams are protandrous hermaphrodites, maturing first as males and then later developing ovaries to function as both; spawning season seems to vary with species and location. Although they may be capable of self-fertilization, they are broadcast spawners with high fecundity but high mortality and low natural recruitment. Like other giant clams, the horse's hoof clam is a suspension feeder with symbiotic dinoflagellates (or zooxanthellae) in its mantle, which provides a large proportion of its trophic requirements. However, this species derives less nutrition from its symbionts in comparison to other giant clams.

The main threat to the horse's hoof clam is historical and ongoing overexploitation that has led to low abundance and negative population trajectories, complicated by low natural productivity.

Smooth Giant Clam (*Tridacna derasa*)

The smooth giant clam (*Tridacna derasa*) was proposed for listing as endangered under the ESA in 2024 (89 FR 60498). Distribution and life-history information are summarized by Rippe et al. (2024). This species historically occurred and reportedly extirpated in CNMI and Guam, but has been introduced in both locations, American Samoa, and other areas of the central and western Pacific Ocean as a local food source.

The smooth giant clam occurs in clear offshore waters away from large island masses and freshwater runoff. It is often found on or adjacent to coral reefs between 4–25-m depth. Like other giant clams, it is a

protandrous hermaphrodite and broadcast spawner. In waters shallower than 20 m, the smooth giant clam can rely on its zooxanthellae for all its nutrition.

Threats to the smooth giant clam are historical and ongoing overexploitation leading to low abundance and negative population trajectory, and habitat alteration from ocean warming and ocean acidification impacts to corals.

True Giant Clam (*Tridacna gigas*)

The true giant clam (*Tridacna gigas*) was proposed for listing as endangered under the ESA in 2024 (89 FR 60498). Distribution and life-history information are summarized by (Rippe et al. 2024). It historically occurred and may be extirpated in CNMI and Guam; it has been reintroduced in both places, as well as American Samoa and Hawai'i for local harvest. This species has been reportedly observed near Johnston and Wake Atolls.

The true giant clam is found in tropical waters shallower than 20 m throughout the Indo-Pacific and Great Barrier Reef. It is typically associated with coral reefs and can be found in a variety of habitats, such as high- and low-islands, atoll lagoons, and fringing reefs. The true giant clam is long-lived (up to 63 years) with a relatively fast growth rate (8–12 cm per year). Like other giant clams, it is a protandrous hermaphrodite and broadcast spawner. Although the true giant clam is able to release hundreds of millions of eggs in a single spawning event, this species may have the lowest levels of recruit survival of all animals (less than 1%) and delayed sexual maturity. Compared to other giant clam species, the true giant clam exhibits high photosynthetic efficiency. As they grow larger, the relative contribution of heterotrophic nutrition decreases; large adults may be able to solely rely on their zooxanthellae.

Threats to the true giant clam are historical and ongoing overexploitation leading to low abundance and negative population trajectory, and habitat alteration from ocean warming and ocean acidification impacts to corals.

Other Giant Clams

In 2024, the small (*T. maxima*) and fluted (or scaly, *T. squamosa*) giant clams were proposed for listing as threatened under Section 4(e) of the ESA, which would only prohibit the import and export of derivative parts and products for which the species of origin cannot be visually determined, due to their similarity of appearance to other giant clam species (89 FR 60498).

5 BA: Effects of the Action

Under the ESA, “effects of the action” are all consequences to listed species or CH that are caused by the Proposed Action, including the consequences of other activities that are caused by the Proposed Action (see 50 CFR 402.02). A consequence is caused by the Proposed Action if it would not occur but for the Proposed Action, and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.17). When evaluating whether the Proposed Action is likely to adversely affect listed species or CH, BOEM considers whether the effects are expected to be completely beneficial, insignificant, or discountable. *Completely beneficial* effects are contemporaneous positive effects without any adverse effects to the species or CH. *Insignificant effects* relate to the size of the impact and should never reach the scale where take occurs. Effects are considered *discountable* if they are extremely unlikely to occur.

The following **Sections 5.1 to 5.6** are effects of the action to marine mammals and sea turtles. **Section 5.7** focuses on effect of the action to fishes and invertebrates. **Section 5.8** covers impacts to CH.

5.1 Acoustic Sound Sources

Noise can impact animal hearing and/or behavioral disturbance, resulting in interruption or cessation of important behaviors such as migration, feeding, resting, communication, or breeding (Reese et al. 2023). The assessment of potential hearing effects to marine mammals, sea turtles and fish is based on NMFS’ updated acoustic technical guidance (NMFS 2024a) and other acoustic information (NMFS 2025b; 2025c) and tools (NOAA Fisheries 2025; 2026) for assessing the effects of anthropogenic sounds on marine mammals, sea turtles and fish (**Table 7**).

The methodology developed by the U.S. Navy is currently thought to be the best available approach to evaluate the effects of survey noise exposure to sea turtles (U.S. Navy Marine Mammal Program 2017; NMFS 2021a; Accomando et al. 2025). Sea turtle hearing capabilities and potential effects to sea turtles from sound sources are provided in **Table 8**.

For determining injury for protected fish, NMFS’ ESA acoustic threshold summary was used (NMFS 2025b). NMFS does not distinguish among fish taxa but rather divide impacts by fish mass (greater or less than 2 g; **Table 9**). Onset of physical injury and potential behavioral disturbance for the two fish categories are also listed in **Table 9**. More detailed effect analyses to fishes and invertebrates can be found in **Section 5.7.3.6**.

Table 7. Marine mammal functional hearing groups and acoustic thresholds identifying the onset of auditory injury for marine mammals from impulsive and non-impulsive sound sources

Hearing Group	Generalized Hearing Range	Onset of Auditory Injury from Impulsive Sound	Onset of Auditory Injury from Non-Impulsive Sound
Low frequency (e.g., Baleen Whales)	7 Hz to 36 kHz	222 dB Peak 183 dB cSEL	197 dB cSEL
High-frequency (e.g., Toothed Whales)	150 Hz to 160 kHz	230 dB Peak 193 dB cSEL	201 dB cSEL
Very High frequency (e.g., Porpoise)	200 Hz to 165 kHz	202 dB Peak 159 dB cSEL	181 dB cSEL
Phocid pinnipeds (True Seals) (underwater)	40 Hz to 90 kHz	223 dB Peak 183 dB cSEL	195dB cSEL
Otariid pinnipeds (Sea Lions and Fur Seals) (underwater)	60 Hz to 68 kHz	230 dB Peak 185dB cSEL	199 dB cSEL

Notes: Created using NMFS (2025c)

cSEL = Cumulative sound exposure level (decibel referenced to 1 micropascal squared seconds [dB s]), Peak = Peak sound pressure level (decibel referenced to 1 micropascal [dB re 1 μ Pa]); dB = decibels; Hz = hertz; kHz = kilohertz

Table 8. Hearing capabilities and acoustic thresholds identifying the onset of auditory injury of sea turtles from impulsive and non-impulsive sound sources

Sea Turtle Species	Life Stage	Range of Audibility (Hz)	Range of Highest Sensitivity (Hz)	Onset of Auditory Injury from Impulsive Sound	Onset of Auditory Injury from Non-Impulsive Sound	Source
Green (<i>Chelonia mydas</i>)	Juvenile	50–1,600	200–400	230 dB Peak 184 dB cSEL	198 dB cSEL	Ridgway et al. (1969); Bartol and Ketten (2006); Piniak et al. (2012b); Piniak et al. (2016)
Hawksbill (<i>Eretmochelys imbricata</i>)	Hatchling	50–1,600	400	230 dB Peak 184 dB cSEL	198 dB cSEL	Piniak (2012)
Kemp's ridley (<i>Lepidochelys kempi</i>)	Juvenile	100–500b	100–500 ^a	230 dB Peak 184 dB cSEL	198 dB cSEL	Bartol and Ketten (2006)
Leatherback (<i>Dermochelys coriacea</i>)	Hatchling	50–1,200	300	230 dB Peak 184 dB cSEL	198 dB cSEL	Piniak (2012); Piniak et al. (2012a)
Loggerhead (<i>Caretta caretta</i>)	Post-Hatchling ^b	50–1,100	200	230 dB Peak 184 dB cSEL	198 dB cSEL	Bartol et al. (1999); Lenhardt (2002); Martin et al. (2012); Lavender et al. (2014)

Sea Turtle Species	Life Stage	Range of Audibility (Hz)	Range of Highest Sensitivity (Hz)	Onset of Auditory Injury from Impulsive Sound	Onset of Auditory Injury from Non-Impulsive Sound	Source
Loggerhead	Juvenile	50–1,100	50–800	230 dB Peak 184 dB cSEL	198 dB cSEL	Bartol et al. (1999); Lenhardt (2002); Martin et al. (2012); Lavender et al. (2014)
Loggerhead	Adult	35–1,131	100–400	230 dB Peak 184 dB cSEL	198 dB cSEL	Bartol et al. (1999); Lenhardt (2002); Martin et al. (2012); Lavender et al. (2014)

Source: Bartol et al. (1999); Lavender et al. (2012); Martin et al. (2012); Lavender et al. (2014); Papale et al. (2020); Reese et al. (2023)

Data adapted from Papale et al. (2020) and Reese et al. (2023) based on highest and lowest frequency of underwater audibility that was reported for each species including both auditory evoked potential and behavioral studies.

^a Only in-air measurements are available for Kemp's ridley sea turtles.

^b Post-hatchling refers to the size classification given to hatchlings when they reach a straight maximum length of 5 cm.

Table 9. Acoustic thresholds identifying the onset of physical and behavioral injury for fish

Fish Size	Onset of Physical Injury for Impulsive Sources	Potential Onset of Behavioral Disturbance ¹
Fishes ≥ 2g	206 dB Peak 187 dB cSEL	150 dB
Fishes < 2g	206 dB Peak 183 dB cSEL	150 dB

Notes: dB =decibels (NMFS 2025b)

¹ While this is not a “formal” threshold, it serves as a level where one can begin to look at potential behavioral responses

A peer-reviewed paper by Ruppel et al. (2022), “Categorizing Active Marine Acoustic Sources Based on Their Potential to Affect Marine Animals,” uses physical criteria about various HRG sources, such as source level, transmission frequency, directionality, beamwidth, and pulse repetition rate to evaluate the potential impacts to protected species. Ruppel et al. (2022) divided marine acoustic sources into four tiers that could inform regulatory evaluation (**Table 10**). Tier 4 includes most high-resolution geophysical, oceanographic, and communication/tracking sources, which are considered unlikely to result in incidental take of marine mammals and therefore termed *de minimis*. The Operational National Mitigation Protocol (ONMP) and its adoption within the 2025 Biological Opinion formalized this tiered system for categorizing geophysical sound sources based on their relative potential to affect marine mammals (BOEM 2026). All the acoustic sources under this Proposed Action fall into this *de minimis* category. Use of these equipment types does not injure or disturb marine mammals, turtles, or fishes and mitigations are therefore not required. Some types of MBES systems and sub-bottom profiler systems can potentially cause acoustic injury and/or disturbance to marine mammals when operated at certain source levels, transmission frequencies, directionalities, beamwidths, tow depths, and pulse repetition rates. Therefore, the precise equipment types, equipment settings and uses of planned surveys will be submitted to BOEM

30 days or more prior to use for review to confirm that the sources comply with the *de minimis* criteria described in Ruppel et al. (2022) and the ONMP. If Lessees propose to use equipment not described in the Proposed Action, and which exceeds impacts covered by this analysis, BOEM will not permit the activity or use of equipment, and consultation with NMFS would be reinitiated.

Table 10. Ranked classification of acoustic sources based on impacts to marine mammals

Category	Active Acoustic Sources: Short Descriptions	Example Sources
Tier 1	High-energy airgun surveys (includes GI guns)	Airguns— arrays larger than 12 airguns
Tier 2	Low / intermediate energy airgun surveys (includes GI guns)	Airguns
Tier 3	HRG seismic sources (most)	Some sparkers, bubble guns, some boomers
Tier 4	<i>De minimis</i> sources (not likely to result in incidental take)	MBES, SSS, hull-mounted sub-bottom profiler (SBP); towed SBP evaluated here; parametric SBP; SBES (EK60/80), ADCP, pingers (locators), acoustic releases, seafloor/water column navigational/tracking acoustics for ROVs, AUVs, etc.

Notes: This table was reproduced from Table 3 of Ruppel et al. (2022).

Vessel Noise

The sound generated from individual vessels can contribute to overall ambient noise levels in the marine environment on variable spatial scales. The survey vessels would contribute to the overall noise environment by transmitting noise through both air and water. Underwater noise produced by vessels is a combination of narrow-band (tonal) and broadband sound. Tones typically dominate up to about 50 Hz, whereas broadband sounds may extend to 100 kHz. According to Southall (2004) and Richardson et al. (1995), vessel noise typically falls within the range of 100–200 Hz. In the frequency range of 20–500 Hz, distant shipping is the primary source of ambient noise (DOSITS 2025). Spray and bubbles associated with breaking waves are the main contributions to ambient noise in the 500–100,000 Hz range. At frequencies greater than 100,000 Hz, “thermal noise” caused by the random motion of water molecules is the primary source. Ambient noise sources, especially noise from wave and tidal action, can cause coastal environments to have particularly high ambient noise levels.

The vessels used for the Proposed Action would produce low-frequency, broadband, underwater sound below 1 kHz (for larger vessels), and higher-frequency sound between 1 kHz to 50 kHz (for smaller vessels), although the exact level of sound produced varies by vessel type. The general frequency range for vessel noise (10 to 1000 Hz; Richardson et al. 1995) overlaps with the generalized hearing range for blue, fin, sei, humpback (7 Hz to 35 kHz) and sperm whales (150 Hz to 160 kHz) and therefore would be audible. Vessels without ducted propeller thrusters would produce levels of noise of 150 to 170 dB re 1 μ Pa-1 m at frequencies below 1,000 Hz, while the expected sound-source level for vessels with ducted propeller thrusters level is 177 dB (root mean square) at 1 m (BOEM 2015; Rudd et al. 2015). For ROVs, source levels may be as high as 160 dB (NMFS 2021a). Given that the noise associated with the operation of project vessels is below the thresholds that could result in injury, no injury is expected.

Vessel noise has the potential to disturb marine mammals and elicit an alerting, avoidance, or other behavioral reaction. These reactions are anticipated to be short term, likely lasting the amount of time the vessel and the whale are in close proximity (Watkins 1981; Richardson et al. 1995; Magalhães et al. 2002), and not consequential to the animals. Additionally, short-term masking could occur. Masking by passing ships or other sound sources transiting the Proposed Action Area would be short term and intermittent, and therefore unlikely to result in any substantial costs or consequences to individual animals or populations. Areas with increased levels of ambient noise from anthropogenic noise sources such as areas around busy shipping lanes and near harbors and ports may cause sustained levels of masking for marine mammals, which could reduce an animal's ability to find prey, find mates, socialize, avoid predators, or navigate (NMFS 2021a). Since protected species and vessels in these areas are continually moving, these masking effects are not likely to adversely affect ESA-listed species.

A comprehensive review of the literature on marine mammals and vessel noise (Richardson et al. 1995; Erbe et al. 2019) revealed that changes in behavior vary widely across species. Despite a number of demonstrable examples of short-term biological consequences in individuals (Holt et al. 2015), it is still very challenging to draw conclusions regarding potential long-term or population-level effects. Vessel noise associated with the Proposed Action may affect marine mammals, but the vessel noise is not expected to substantially add to the local noise in the operating area. The limited amount of project-related vessel traffic relative to the existing vessel traffic in the American Samoa area as well as Hawaii and the West Coast regions would contribute an insignificant amount to the overall noise levels in the area. Therefore, vessel noise could result, at most, in a localized minor and temporary impact. Any contribution is likely small in the overall environment of regional ambient sound levels. A vessel's transit past an individual animal will be brief and is not likely to impact any individual's ability to feed, reproduce, or avoid predators. Brief interruptions in sheltering or communication via masking are possible, but unlikely given the ability of marine mammals to move away from vessel disturbances and to quickly resume normal behaviors. Given the above justifications and the BMPs in place, vessel noise effects on marine mammals are not likely to adversely affect ESA-listed species.

Per NMFS (2021a) ESA-listed sea turtles could be exposed to a range of vessel noises within their hearing range. Their response from vessel noise exposure include avoidance, startle responses, altered submergence patterns, masking of biologically relevant sounds, and physiological stress (Samuel et al. 2005; National Science Foundation 2011). These responses may disrupt essential activities like feeding, migration and breeding behavior. However, these responses are only evident from vessels 10 m or closer, suggesting their detection of approaching vessels relies more on visual than on acoustic cues (Hazel et al. 2007). Similarly, Lester et al. (2013) showed that the diamondback terrapin did not alter its behavior in response to recorded boat noise. Díaz et al. (2024) found that traveling green sea turtles increased vigilance with increasing vessel noise. However, those resting on the seabed did not exhibit increased vigilance, suggesting that sea turtles may also respond differently when in different behavioral states.

Current evidence indicates that sea turtles respond to vessel noise at very close ranges, making population-level impacts unlikely. Therefore, the noise from vessels is not likely to affect sea turtles at further distances, and if a sea turtle hears a vessel nearby or sees it as it approaches, they would likely avoid it. If sea turtles were to have a response from the vessel noise exposure, the available literature on sea turtle response from vessel noise suggests their responses are limited to temporary non-injurious changes in behavior and only endured while the vessel transits through the area where the sea turtle

encountered it. Therefore, impacts to sea turtles from vessel noise exposure are expected to be insignificant (i.e., minor and temporary effects that cannot be meaningfully evaluated).

Geotechnical Survey Noise

Geotechnical surveys (vibracores, piston cores, gravity cores) related to the Proposed Action are typically numerous, but very brief, sampling activities that introduce relatively low levels of sound into the environment. General vessel noise is produced from vessel engines and DP to keep the vessel stationary while equipment is deployed, and sampling conducted. DP systems produce continuous noise, but unlike transiting vessels, this source is usually stationary. DP systems use propellers and thrusters for station-keeping (e.g., holding station over a specific seafloor location), docking, and other precise maneuvering during operations. DP uses input from gyrocompasses, motion sensors, Global Positioning System (GPS), active acoustic positioning systems, and wind sensors to determine relative movement and the environmental forces at work. Most of the noise generated by DP systems (low frequency and high amplitude) comes from the vessel thrusters. As with propulsion, source levels during the use of DP vary greatly based on size and type of vessel, type of thruster, and operational conditions including both weather and oceanographic conditions. DP systems typically do not have a high peak sound pressure and rapid rise time compared to impulsive sounds but can still produce significant acoustic energy, most of which is below 1,000 Hz, with tones related to engine and propeller size and type (National Institute for Occupational Safety and Health 1998; Acoustical Society of America 2008). The sound can also vary directionally, and this directionality is much more pronounced at higher frequencies. Because this is a dynamic operation, the sound levels produced will vary based on the specific operation, the exact system used (e.g., jet or propeller rotation, versus a rudder or steering mechanism), and factors such as the blade rate, blade pitch and cavitation, and material condition of the system.

Representative sound field measurements from the use of DP are difficult to obtain because the sound transmitted is often highly directional and context specific. The direction of sound propagation may change as different DP needs requiring different configurations are applied. Vessel noise can potentially mask vocalizations and other biologically important sounds (e.g., sounds of prey or predators) that marine mammals rely on. Potential masking can vary depending on the ambient noise level within the environment, the received level and frequency of the vessel noise, and the received level and frequency of the sound of biological interest. In the open ocean, ambient noise levels are between about 60 and 80 dB re 1 μ Pa in the band between 10 Hz and 10 kHz due to a combination of natural (e.g., wind) and anthropogenic sources (Urick 1983), while inshore noise levels, especially around busy ports, can exceed 120 dB re 1 μ Pa. When the noise level is above the sound of interest, and in a similar frequency band, masking could occur. This analysis assumes that any sound that is above ambient noise levels and within an animal's hearing range may potentially cause masking. However, the degree of masking increases with increasing noise levels; a noise that is just detectable over ambient levels is unlikely to cause any substantial masking.

Recent analyses of the potential impacts to protected species exposed to noise generated during geotechnical survey activities determined that effects to protected species from exposure to this noise source are extremely unlikely to occur (NMFS 2021a). Hence we expect impacts associated with geotechnical survey noise as part of the Proposed Action to be discountable.

Aircraft Traffic Noise

Other than vessels, aircraft are an alternative means of crew transport. Aircraft noise has the potential to propagate underwater at levels that could be detected by marine mammals, sea turtles and fish. Air-to-water transmission depends on 1) the receiver depth, and 2) the altitude, aspect, and strength of the source (Richardson et al. 1995). The angle of incidence at the water surface, water depth, and bottom conditions also strongly influence the propagation and levels of underwater sound from passing aircraft; propagation is attenuated in shallow water, especially when the bottom is reflective (Richardson et al. 1995).

The effects of underwater transmission of airborne noise from helicopters or fixed-wing aircraft are minimal and unlikely to affect marine species. Petel et al. (2006) evaluated helicopter and fixed-wing aircraft noise levels to determine potential effects to Weddell seals (*Leptonychotes weddellii*). They determined that in-water transmission of sound was greatest when aircraft landings and takeoffs took place on surface ice. Underwater transmission was otherwise inaudible or barely audible. Above the water's surface, airborne sound was more substantial and could be heard from aircraft traveling at altitudes up to 914 m (3,000 ft). Marine mammals may also react to the visually observable presence of an aircraft; however, large whales spend the majority of their time foraging and traveling underwater and therefore should not be significantly affected by helicopter activity overhead. If they are disturbed, they are likely to dive but not in a way that would significantly affect their behavior. Sea turtles may also respond to aircraft overflights. Based on sea turtle sensory biology (U.S. Navy Marine Mammal Program 2017; NMFS 2021a; Accomando et al. 2025), sound from low flying aircraft could be heard by sea turtles that are at or near the surface. Turtles might also detect low flying aircraft via visual cues such as the aircraft's shadow. Auditory response testing by Moein et al. (1993) showed sound-induced swimming and sound-induced head movements in most, but not all Atlantic Loggerhead test subjects. In a study of responses to unoccupied aerial systems (UASs or drones), Bevan et al. (2018) studied behaviors of three species of sea turtle, including green turtles, flatback turtles (*Natator depressus*), and hawksbill turtles (*Eretmochelys imbricata*), to a small commercially available (1.4 kg) multirotor drone. Juvenile green and hawksbill turtles foraging on shallow algae-covered reefs in nearshore waters off nesting beaches or in foraging habitats exhibited no evasive behaviors (e.g., rapid diving) in response to the drone at or above 20-30 m altitude, and at or above 10 m altitude, respectively.

Sound produced from aircraft may impact ESA-listed species. If there are any behavioral responses from individuals exposed to sound produced from aircraft, at most those would likely constitute a short-term disturbance, and individuals would be expected to resume their behaviors and activities. Moreover, due to the relatively low numbers of aerial surveys expected in addition to the temporary duration of the aerial survey activity, BOEM expects sound effects from aerial surveys, if any, would be temporary and insignificant.

Conclusion on Effects from Sound Sources

Although there are several sound sources added to the Action Area as part of the Proposed Action (e.g., sounds from geotechnical surveys, vessel noise, etc.), as described above, these sources are all insignificant to ESA-listed species. Therefore, sound impacts from the Proposed Action **may affect but not likely to adversely affect** (NLAA) ESA-listed species. If Lessees propose to use equipment not described

in the Proposed Action, and which exceeds impacts covered by this analysis, BOEM will not permit the activity or use of equipment, and consultation with NMFS would be reinitiated.

5.2 Allisions and Vessel Collisions

There is some risk of allisions with buoys for marine mammals and sea turtles. However, through U.S. Coast Guard (USCG) Private Aids to Navigation requirements and aerial surveys (if necessary) would not be conducted during periods of reduced visibility conditions, as flying at low elevations could pose a safety risk during storms, we anticipate that occurrence of allisions would be extremely unlikely. Thus, we anticipate effects of marine mammals and sea turtles from allision with buoys is discountable.

Vessel collisions represent a key hazard to marine mammals (Byrnes and Dunn 2020). Marine mammals are more likely to be struck by a vessel that is large (i.e., 80 m [262.5 ft] 34 or longer) or traveling at high speed (Laist et al. 2001; Hazel et al. 2007; Vanderlaan and Taggart 2007; Conn and Silber 2013). Although collisions most frequently involve larger marine mammals, smaller species have also been reported (Van Waerebeek et al. 2007). However, these smaller species tend to be more agile swimmers and more capable of avoiding collisions with oncoming vessels. Vessel strikes also pose a threat to the West Pacific population of leatherback sea turtles that are known to be around the Action Area. Of leatherback strandings documented in central California between 1981 and 2016, 11 were determined to be the result of vessel strikes (7.3% of total; NMFS and FWS 2020a). However, information on leatherback vessel strikes for other locations is not available (NMFS and FWS 2020a). Additionally, although vessel strikes are a known threat, specific vessel strike incidents of other sea turtle species are not documented. For marine mammals, reports of three entanglements (see below for details) have been documented around American Samoa waters but no ship strikes.

The number of vessel trips for surveys within the Proposed Action Area is a conservative estimate (**Table 6**), meaning that BOEM included a higher number of trips than is likely in its estimate. As stated in **Appendix B**, vessel speeds must be reduced to 10 kn or less when mother-calf pairs, pods, or large assemblages (greater than three) of any marine mammal are observed near a vessel, whether in a lease area or traveling between a port to the lease area. Operators shall be particularly vigilant to watch for turtles at or near the surface in areas of known or suspected turtle activity, and if practicable, reduce vessel speed to 5 kn or less. These BMPs for Vessel Strike Avoidance and Injured/Dead Protected Species Reporting (**Appendix B**) will minimize the risk of vessel strikes to ESA-listed species. Additionally, wherever available, lessees will be required to ensure all vessel operators check for daily information regarding ESA-listed species sighting locations. These media could include, but are not limited to Channel 16 broadcasts, whalesafe.com, and the Whale/Ocean Alert App. BMPs align with recommended types of enhanced conservation measures to decrease ship strike mortality (Rockwood et al. 2017).

Although the project-related vessel traffic would increase the overall vessel traffic and risk of collision with ESA-listed species in the Action Area, BMPs and reporting requirements in place would minimize risks to ESA-listed species. Thus, BOEM anticipates that the effects to ESA-listed species from vessel collision would be minor and therefore insignificant. Therefore, potential effects from allisions and with buoys and vessel collision from the Proposed Action **may affect but not likely to adversely affect (NLAA)** ESA-listed species.

5.3 Entanglement and Entrapment

Most entanglements are never observed, and confirmed entanglements underestimate the true number of entangled whales, as many entangled whales go undetected (e.g., not observed while entangled and die at sea; NMFS 2024d). However, there are reports of large whales (including humpback, right, and fin whales) interacting with commercial or recreational fishing gear (e.g., buoys with identifiable marks, traps, nets and monofilament line), anchor moorings of yachts and other vessels, towing small yachts from their moorings or becoming entangled in anchor chains, sometimes with lethal consequences (Blue Water Sailing 2012; Love 2013; Saez et al. 2020; NMFS 2024d). A photographic-based scar study of humpback whales of American Samoa stock has been initiated, and there is some indication of healed entanglement and ship strike wounds (NMFS 2009). Two false killer whales and one rough-toothed dolphin were entangled near 40-Fathom Bank south of the islands by the American Samoa-based longline fishery in 2008 (NMFS 2011b; 2011c). American Samoa longline fishery also interacted with sea turtles with documentation of 59 interactions with leatherback sea turtles between 2010 and 2017 (NMFS and FWS 2020a).

Meteorological anchoring buoys will be used as part of the Proposed Action. A line connects the buoy to the anchor, which is comprised of materials including chain, jacketed wire, nylon rope, polypropylene rope, and subsurface floats (used to keep the mooring line taut to semi-taut, reduce slack, and eliminate looping). The Proposed Action also includes the use of HRG survey equipment, which includes lines that pose an entanglement risk, including deep tow lines (**Chapter 2, Tables 1 and 2**). BOEM will work with lessees and requires the use of the best available mooring systems, using the shortest practicable line lengths, anchors, chain, cable, or coated rope systems, to prevent and/or reduce potential entanglement of marine mammals and sea turtles. BOEM reviews each buoy design and methods for use of HRG survey equipment to ensure that reasonable low risk designs are used. Although there are potential impacts to marine mammal and sea turtle species from entanglement related to buoys and lines associated with meteorological anchoring and the HRG survey equipment, the use of these types of equipment is temporary and considering the use of BMPs, the effects, if any, would be temporary and minimal. Thus, the entanglement effects from using these types of equipment are expected to be insignificant.

Lost or derelict fishing gear could become entangled in the meteorological buoy lines and present an entanglement risk to ESA-listed species. Approximately two meteorological buoys per lease area could be deployed as part of the Proposed Action. From 1982 to 2017, direct entanglements in fishing gear were most attributed to unidentifiable gear, netting, and pot/traps (Saez et al. 2020). Changes in gillnet fishing regulations helped address the 1980s increase, which was primarily gray whales entangled with gillnets (Saez et al. 2020). Due to the BMPs in place (**Appendix B**), likelihood of entanglement related to buoy deployment and operations is expected to be extremely unlikely and is therefore discountable.

Moon pool usage presents a potential for marine mammals and sea turtles to become entrapped. Moon pools may be used in the Action Area to deploy and/or retrieve equipment (e.g., ROVs, AUVs). Although four instances of sea turtle entrapment (two loggerhead and two leatherback turtles) in moon pools have been documented aboard vessels operating in the Gulf of Mexico, with all animals released alive (NMFS 2020a), we anticipate that the risk of moon pool entrapment for the Proposed Action will be extremely low because the intensity of survey activity in the Gulf of Mexico (NMFS 2020a; NMFS and FWS 2020b) where the entrapment occurred greatly exceed those of the Proposed Action. Moreover, there is no known record of entrapment of ESA-listed species in the moon pools in the Pacific. We also have BMPs in place

that minimize risks including protocols for monitoring for the presence of ESA-listed species, limiting the amount of time that moon pool doors are left open when ESA-listed species may be present. Given the lower intensity of survey activity in the Action Area compared with the Gulf of Mexico, no known cases of entrapment in the Pacific, and implementation of the BMPs, BOEM believes entrapment of ESA-listed species within moon pools is extremely unlikely to occur and is therefore discountable.

Any potential displacement of fishing effort, as a result of the Proposed Action are expected to be limited in spatial scope, considering the temporary Proposed Action and existing fishing grounds. Thus, entanglement impacts on marine mammals and sea turtles due to displaced fishing effort, are extremely unlikely to occur and are thus discountable.

As discussed above, the low likelihood of entanglement/entrapment and having BMPs in place, we conclude the risk of ESA-listed species becoming entangled/entrapped is either insignificant or discountable. Thus, we anticipate that the Proposed Action **may affect but not likely to adversely affect (NLAA)** ESA-listed species.

5.4 Disturbance to Feeding or Modified Prey Abundance

Ports in Hawaii and the West Coast may be used to transport the vessel to American Samoa, but this Proposed Action only adds a small amount of vessel activity to the existing vessel traffic in Hawaii and the West Coast. Although feeding behavior or prey abundance may be impacted from the Proposed Action in Hawaii and/or the West Coast, the effect would be insignificant because the Proposed Action is so minimal compared to the existing vessel activity in those places.

Green and hawksbill turtles possibly feed in and around the American Samoa waters within the Action Area where most of the Proposed Action of survey activities will occur (Becker et al. 2019; Murakawa et al. 2024). Leatherbacks, olive ridleys, and loggerheads may also feed in this area (Conant et al. 2009; NMFS and FWS 2014; 2020a). Marine mammal species may also use this area for feeding. Prey types vary by species, but they include jellyfish, crabs, mollusks, and fish for sea turtles and fish, invertebrates and plankton for marine mammals.

Proposed Action may disrupt the feeding behavior of marine mammals and sea turtles. If the Proposed Action occurs while the sea turtles and marine mammals are feeding, they may avoid the area and miss an opportunity to consume their prey. Moreover, prey may be impacted by the Proposed Action. For instance, survey activities may push the prey to go elsewhere. If the prey of sea turtles and marine mammals are no longer available, marine mammals and sea turtles would also miss an opportunity to feed. Decreased amount of prey consumption in either scenario would lead to decreased calorie intake. If this persists, the marine mammals and sea turtles would lead to decreased levels of adipose tissue that would then lead to emaciation. Two possible pathways can occur thereafter. First path is emaciation leading to decreased energy availability for breeding (i.e., decreased reproductive success) which then results in decreased population levels. The second pathway from emaciation leading to increased vulnerability to disease (i.e., decrease immune system) which could result in higher likelihood of animals resulting injury and/or mortality including stranding/mortality events.

Above scenarios may occur if the decreased prey quantity persists. However, the Proposed Action is temporary and changes in prey abundance/availability and prolonged disturbance to the feeding behavior

are not expected (i.e., minor effects, if any). Although impacts from decreased prey availability and disturbance to feeding grounds may affect marine mammals and sea turtles, especially if the Proposed Action occurs in the marine mammal BIAs, the Proposed Action would be temporary and insignificant to marine mammals and sea turtles. Thus, BOEM believes that the Proposed Action **may affect but not likely to adversely affect** (NLAA) feeding behavior and feeding availability for marine mammals and sea turtles.

5.5 Habitat Disturbance

Several sea turtles are known to be present in and around the Action Area where most of the surveys are expected to take place near the American Samoa waters. For example, green and hawksbill turtles nest in American Samoa (Tuato'o-Bartley et al. 1993; Grant et al. 1997; Murakawa et al. 2024), and these species also migrate and possibly feed in and around same area (Becker et al. 2019; Murakawa et al. 2024). Specific behaviors of leatherbacks, olive ridleys, and loggerheads around American Samoa waters is uncertain, but their ranges include this area (Conant et al. 2009; NMFS and FWS 2014; 2020a). Several marine mammal species are most likely also present in the Action Area where survey activities will occur.

Due to the known nesting of green and hawksbill in American Samoa, nesting behavior may be affected by the Proposed Action; however, nesting typically occurs terrestrially which does not overlap with the Action Area. Vessels could cause some disturbance to breeding sea turtles, with the potential to adversely affect egg and nesting mortality, if a vessel approached too close to a breeding turtle. However, survey activities would not occur close enough to land to affect sea turtle nests on beaches. Survey vessels are anticipated to transit from a shore base to offshore to conduct various Proposed Actions. The vessel routes used for the Proposed Action are the same as the established vessels paths, and it is not anticipated that sea turtles would use those areas for nesting. In addition, noise generated from the survey vessels and equipment would typically dissipate prior to reaching the coastline and the nesting habitats of sea turtles. Although nesting and breeding behavior could be impacted from the Proposed Action, vessel paths would not be close to the nesting areas and breeding turtles would unlikely be disrupted by the vessels transiting in the already existing vessel paths. Thus, BOEM anticipates that the nesting and breeding effects, if any, would be minor and temporary and thus insignificant.

Habitat where sea turtles and marine mammals use for feeding and migration may be affected by the Proposed Action, especially in the American Samoa water where most of the Proposed Action will be occurring. Breeding of marine mammals and sea turtles may also be occurring in the Action Area, particularly in areas where the survey activities will be taking place. However, BMPs are designed to reduce risks to marine mammals and sea turtles (**Appendix B**); thus, potential impacts to feeding, migrating, and breeding sea turtles/marine mammals, if any, are expected to be temporary and minimal, thus insignificant.

If equipment is lost, grapnel lines (e.g., hooks, trawls) may be used to retrieve them and bottom disturbance could result from dragging the line along the bottom until it hooks the lost equipment. In addition, after the line catches the lost equipment, components are dragged along the seafloor until recovery which may result in additional bottom disturbance. For example, a broken vibracore rod that cannot be retrieved need to be cut and capped 1–2 m below the seafloor. However, if equipment is lost, BOEM would work with the lessee/operator to ensure the process minimizes the risk to ESA-listed species. Thus, we anticipate that the habitat disturbance, if any, would be temporary and minor because

BOEM would work with the lessees/operators to minimize risks to ESA-listed species that may result from bottom disturbance. Considering the low likelihood of losing gear and authority of BOEM to require removal if it occurred, any effects would be minor and temporary. Thus, we anticipate that effects to ESA-listed species from retrieving lost equipment would be insignificant.

Ports in Hawaii and the West Coast may be used to transport the vessel to American Samoa, but only the existing ports will be used. Although habitat disturbance may occur from vessel traffic, especially in the BIAs of marine mammals, vessel numbers included in the Proposed Action are minimal (maximum of six boats) and effects from vessel traffic, if any, are expected to be minor and temporary. Thus, we expect insignificant impacts from vessel traffic to habitat of marine mammals and sea turtles in these two locations.

Thus, the Proposed Action is anticipated to have insignificant effects to marine mammals and sea turtles with regards to their migration/breeding/feeding behavior. Additionally, retrieving lost equipment may have insignificant effects to marine mammals/sea turtles. Therefore, BOEM believes that the Proposed Action **may affect but not likely to adversely affect** (NLAA) habitat of feeding/migrating/breeding marine mammals and sea turtles.

5.6 Accidental Release of Pollutants and Marine Debris

The Proposed Action may generate trash comprised of paper, plastic, wood, glass, and metal. Records of interactions between anthropogenic marine debris and wildlife have been increasing rapidly in recent decades and are a cumulative source of impacts on ESA-listed species and other marine life. In the marine environment alone, the number of species reported to be affected by debris increased by more than 159% during 1995–2015 (Fossi et al. 2018). Sea turtles and marine mammals are reported to be ingesting large amounts of debris worldwide (Schuyler et al. 2013; Murphy et al. 2025). However, companies operating offshore have developed and implemented trash and debris reduction and improved handling practices to reduce the amount of offshore trash that could potentially be lost into the marine environment. In addition, all authorizations for shipboard surveys would include guidance for marine debris awareness. The guidance would be similar to the Bureau of Safety and Environmental Enforcement's (BSEE's) Notice to Lessees (NTL) No. 2015-G03 ("Marine Trash and Debris Awareness and Elimination") or any NTL that supersedes this NTL. Moreover, lessees are prohibited from deliberately discharging containers and other similar materials (i.e., trash and debris) into the marine environment (30 C.F.R. 250.300(a) and (b)(6)) and are required to make durable identification markings on equipment, tools, containers (especially drums), and other material (30 C.F.R. 250.300(c)). The intentional jettisoning of trash has been the subject of strict laws such as the International Convention for the Prevention of Pollution from Ships (MARPOL) Annex V and the Marine Plastic Pollution Research and Control Act, and regulations imposed by various agencies including USCG and the Environmental Protection Agency. BOEM also requires that operators ensure that all offshore employees and those contractors actively engaged in their offshore operations complete awareness training that includes viewing a training video or slide show (specific options are outlined in the NTL). Although the likelihood of producing debris from the Proposed Action would be extremely unlikely, if it occurred, the amount of trash and debris dumped offshore would be expected to be minimal and temporary. Although marine debris could pose a risk to marine mammals and sea turtles through entanglement and ingestion due to the extremely unlikelihood of producing trash and debris, placement of BMP and BSEE's guidance (including continued training and awareness of marine debris and its impacts)

as well as minimal and temporary effects if it were to occur, the overall effects to marine mammals and sea turtles from trash and debris are expected to be insignificant.

If equipment is lost, BOEM is required to work with the lessee/operator to ensure an effective retrieval process. Selection of a mitigation strategy would depend on the nature of the lost equipment, and further consultation with stakeholders could be necessary. Potential impacts associated with recovery of lost survey equipment could include vessel trips, noise and lighting, air emissions, and routine vessel discharges from a single vessel. However, we anticipate that these impacts, if any, would be temporary and minor because BOEM would work with the lessees/operators to ensure procedures will result in no or minimal risk to ESA-listed species. Considering the low likelihood of losing equipment and that any effects would be minor and temporary, we anticipate that effects to ESA-listed species from retrieving lost equipment would be insignificant.

An accidental incident could result in release of fuel or diesel by a survey vessel used as part of the Proposed Action. BOEM used NOAA's Automated Data Inquiry for Oil Spills to predict dissipation of a maximum spill of 2,500 barrels, a spill far greater than what is assumed as a non-routine event during the Proposed Action. Results of the modeling analysis showed that dissipation of spilled diesel fuel is rapid. The amount of time it took to reach diesel fuel concentrations of less than 0.05% varied between 0.5 and 2.5 days, depending on ambient wind direction and speed (Tetra Tech Inc. 2015), suggesting that 88 gallons would reach similar concentrations faster and limit the potential environmental impact. Modern meteorological buoys do not use petroleum, further reducing the possibility of a spill. Any vessels used to conduct survey activities would be required to comply with USCG spill prevention requirements and follow 33 CFR Parts 151, 154, and 155, which contain guidelines for spill response plans and shipboard oil pollution emergency plans. Further, a spill would be expected to dissipate rapidly and then evaporate and biodegrade within a day or two, limiting the potential impacts to a localized area for a short duration. Marine mammals and sea turtles are susceptible to oiling impacts because 1) they breathe at the surface of the water, and if oil is present, they can inhale oil and its vapors into their lungs; 2) they can also be exposed to oil and its components by ingesting oiled prey; 3) breeding can be disturbed if sea turtle nests or breeding ground(s) for marine mammals are oiled; and 4) sufficient exposure to oil can lead to mortality events (Frasier et al. 2020). However, modeling demonstrated that dissipation of spilled diesel fuel is rapid and would be a temporary event in a small area if it occurred, meteorological buoys not using petroleum limiting exposure, and compliance with USCG spill prevention would limit impacts from spill events. Due to the extremely unlikely occurrence of oil spill incidents, we expect that effects to marine mammals and sea turtles from an accidental fuel or diesel spill would be discountable.

In summary, Proposed Action could lead to an accidental fuel or diesel spill as well as produce marine debris (including lost equipment). However, effects from these incidents are either insignificant or discountable to marine mammals and sea turtles as discussed above. Therefore, BOEM believes that the Proposed Action associated with producing marine debris and accidental spills **may affect but not likely to adversely affect** (NLAA) marine mammals and sea turtles.

5.7 Impacts to Fishes and Invertebrates

5.7.1 Introduction

This section evaluates the potential impacts of the Proposed Action, including all preliminary mineral activities and associated vessel operations, on ESA-listed fish and invertebrate species and their habitats, including those designated as EFH under the Magnuson-Stevens Act. The analysis is based on the best available scientific information, incorporates enforceable BMPs, and is structured to address each impact-producing factor (IPF) identified as relevant to listed species and EFH.

5.7.2 Regulatory and Biological Context

The Action Area encompasses deep oceanic habitats (1,400–6,000 m) offshore American Samoa, as well as vessel transit corridors through the U.S. West Coast and Hawaiian EEZs. Listed fish and invertebrate species potentially present include scalloped hammerhead shark (*Sphyrna lewini*), oceanic whitetip shark (*Carcharhinus longimanus*), green sturgeon (*Acipenser medirostris*), eulachon (*Thaleichthys pacificus*), multiple salmonid ESUs/DPSS, chambered nautilus (*Nautilus pompilius*), black and white abalone (*Haliotis* spp.), sunflower sea star (*Pycnopodia helianthoides*), ESA-listed corals (*Acropora globiceps*, *A. retusa*, *A. speciosa*, *Fimbriaphyllia paradviva*, *Isopora crateriformis*), and several giant clam species (*Hippopus hippopus*, *Tridacna* spp.).

The Proposed Action is limited to preliminary activities (bathymetric, geophysical, and mapping surveys; seafloor sampling; mooring and lander deployment; vessel operations) and does not include commercial-scale mining. As in the above section regarding effects to marine mammals and sea turtles, if leases or grants are issued, BOEM will require the lessee to comply with BMPs through lease stipulations to minimize potential impacts to ESA-listed species. These BMPs, which minimize or eliminate potential effects from preliminary activities to ESA-listed species are described in **Appendix B**.

5.7.3 IPFs and Analysis

5.7.3.1 Habitat Disturbance

Nature of Impact

Direct disturbance to benthic habitats will occur from the deployment of box cores, free fall grabs, landers, moorings, and UTP units. For two leases, the aggregate seafloor disturbance is estimated at ~1,456 m², concentrated on abyssal plains at depths of 1,400–6,000 m (**Tables 4 and 5**). This is a very small fraction of the total lease area and is well below the depth range of listed species.

Biological Consequences

Habitat disturbance may have indirect effects to listed species. Localized removal or compaction of sediments and nodules may cause mortality of infauna and epifauna, including rare or slow-growing taxa (Simon-Lledó et al. 2019). Sessile megafauna and microbial assemblages may require decades to recover from disturbance (Vonnahme et al. 2020). However, the spatial scale of disturbance is orders of magnitude too small to generate population-level effects or compromise regional ecosystem integrity (i.e., insignificant effects). Sensitive habitats (e.g., deep-sea coral and sponge aggregations, seamounts) will be avoided through pre-survey planning and BMPs (**Appendix B**).

Conclusion

Habitat disturbance is considered insignificant for listed fish and invertebrate species given the limited spatial extent, avoidance of sensitive habitats, and enforceable BMPs.

5.7.3.2 Sediment Resuspension and Turbidity

Nature of Impact

Sediment resuspension will occur where box cores, free fall grabs, landers, and moorings contact the seabed, temporarily increasing near-bottom turbidity. *In situ* studies show that most disturbed sediment remains within 2 m of the seabed and redeposits locally (Muñoz-Royo et al. 2022).

Biological Consequences

Elevated suspended sediment can affect filter feeders and visual predators, but the magnitude and duration of plumes from preliminary activities are insufficient to affect pelagic species occupying the upper water column (Wilber and Clarke 2001; van der Grient and Drazen 2022). Fine-particle deposition could impair filter feeders if work occurred directly atop sensitive coral or sponge communities, but survey design and BMPs require avoidance of such habitats (**Appendix B**).

Conclusion

Sediment resuspension and turbidity effects, if any, are minor and temporary and thus are insignificant to listed species.

5.7.3.3 Fish Aggregating Device (FAD) Effect

Nature of Impact

Surface buoys and moored structures may function as incidental FADs, temporarily aggregating pelagic fishes in the upper water column. Studies indicate that floating objects can alter tuna movement and residency, but the effect is localized and short term, with residence times typically ranging from hours to days (Dempster and Taquet 2005; Robert et al. 2013).

Biological Consequences

The Proposed Action involves at most four surface buoys, with most moorings subsurface and less visible. No directed fishing is associated with these buoys, and the spatial and temporal footprint is minimal. While FADs can alter local predator-prey dynamics and increase vulnerability to fishing, the absence of associated fishing effort and the limited number of buoys make the effect insignificant (Morgan 2011).

Conclusion

The FAD effect is considered insignificant for listed species.

5.7.3.4 Entanglement

Nature of Impact

Lines, chains, and ancillary attachments used for moorings and equipment deployment pose a limited entanglement hazard to large fishes, such as mobulid rays and sharks. Documented cases of manta ray entanglement in mooring lines highlight the risk (Hilbourne and Stevens 2023). For sharks, large-scale entanglement has been associated with net-based drifting FADs rather than taut mooring lines (Filmlalter et al. 2013).

Biological Consequences

The Proposed Action differs from fisheries FAD deployments: moorings are few, deep, taut, and lack netting. BMPs require the shortest practicable line lengths, rigid sleeves or weak links, and real-time monitoring during deployment and retrieval (**Appendix B**). These measures align with international best practices and have been shown to reduce entanglement risk (Murua et al. 2016; Grande et al. 2025).

Conclusion

Incident of entanglement is extremely unlikely due to the BMPs in place; thus, effects from entanglement are discountable.

5.7.3.5 Marine Debris

Nature of Impact

Accidental loss of small components during deployment, operation, or retrieval of equipment could introduce marine debris, posing entanglement or ingestion risks to fishes and invertebrates (Cole et al. 2013; Kühn et al. 2015).

Biological Consequences

The Proposed Action incorporates stringent BMPs: annual training, gear labeling, immediate recovery efforts, and reporting requirements (**Appendix B**). The operational context (deep, remote waters, few moorings, and defined retrieval procedures) further limits debris inputs. Any effects, if any, would be rare, minimal, localized, and short-lived (i.e., insignificant).

Conclusion

Marine debris effects are insignificant for listed species and EFH.

5.7.3.6 Noise

Nature of Impact

Underwater sound from vessels, HRG systems, and AUV/ROV operations is limited to high-frequency, directional sources classified as *de minimis* (Ruppel et al. 2022). Fishes primarily detect particle motion, and most project equipment operates above the hearing range of many EFH species (Popper and Fay 2011; Popper et al. 2014). Noise associated with aircraft may also affect listed fish and invertebrates.

Biological Consequences

Vessel noise may cause stress or affect fish behavior by causing them to startle, swim away from an occupied area, change swimming direction and speed, or alter schooling behavior (Engås et al. 1995; Engås et al. 1998; Mitson and Knudsen 2003). Physiological responses have also been documented for fish exposed to increased boat noise. Nichols et al. (2015) demonstrated acute physiological stress effects from increased noise (playback of boat noise) on coastal giant kelpfish. Other studies have also shown exposure to continuous or chronic vessel noise may elicit stress responses indicated by increased cortisol levels (Scholik and Yan 2001; Wysocki et al. 2006). Because of the characteristics of vessel noise, sound produced from vessels is unlikely to result in direct injury, hearing impairment, or other trauma to ESA-listed fish. In the near field, fish are able to detect water motion as well as visually locate an oncoming vessel. In these cases, most fishes located in close proximity that detect the vessel either visually, via sound and motion in the water would be capable of avoiding the vessel or move away from the area affected by vessel sound. Thus, fish are more likely to react to vessel noise at close range than to vessel

noise emanating from a greater distance away. Auditory masking due to vessel noise can potentially mask biologically important sounds that fish may rely on. However, vessel noise is predominantly low frequency, and the incremental contribution from project vessels is small relative to existing traffic (McKenna et al. 2012). BMPs require slow speeds, routing awareness, and monitoring, further reducing risk (**Appendix B**). Due to a small number of vessels resulting in minimal contribution of vessel noise from the Proposed Action, we expect that the impacts, if any, would be minor and temporary (i.e., insignificant), and that such responses would not be expected to compromise the general health or condition of individual fish.

Very little information is available about fish responses to aircraft. One study found substantial effects from a sonic boom above a fish hatchery (Gladwin et al. 1988), but routine overflights are highly unlikely to elicit a similar response. Fish are more likely to respond to an aerial predator with short-term evasive movements. For instance, in response to a passing helicopter shadow, fish may dive or change direction. This type of response is within the normal pattern of fish behavior and is unlikely to cause unusual or severe stress response (i.e., insignificant effects).

As described in Section 5.1, Ruppel et al. (2022) categorize marine acoustic sources into four tiers to support regulatory evaluation (Table 10). Tier 4 includes most high-resolution geophysical, oceanographic, and communication/tracking sources, which are considered *de minimis* because they are unlikely to result in incidental take of ESA-listed species. All acoustic sources proposed under this action fall within this *de minimis* category. These types of equipment are not expected to injure or disturb fish, and no mitigation measures are required.

Some MBES and sub-bottom profiler systems may cause acoustic injury and/or disturbance when operated at certain source levels, frequencies, directionalities, beamwidths, tow depths, or pulse repetition rates. Therefore, Lessees must submit detailed information on the planned equipment types, settings, and survey methods to BOEM at least 30 days prior to use. BOEM will review this information to confirm that the proposed sources meet the *de minimis* criteria in Ruppel et al. (2022) and the ONMP.

If a lessee proposes equipment or technology not explicitly described in the Proposed Action, BOEM may approve its use without reinitiating consultation with NMFS provided that BOEM determines the potential effects do not exceed those analyzed in this BA. If the proposed equipment would exceed the impact levels assessed here, BOEM would initiate consultation with NMFS before approving its use.

Because invertebrate species lack gas-filled structures within their bodies, they are less sensitive to anthropogenic noise sources compared to fishes, although many taxa appear to have morphological structures (e.g., hair cells) that can be sensitive to particle motion (Popper and Hawkins 2018). A recent review indicates that some invertebrates change their behavior when exposed to chronic shipping noise (Murchy et al. 2019). Much more research needs to be done to determine if such behavior changes translate into population-level effects. The low levels of expected anthropogenic noise are not known to permanently alter characteristics of pelagic or benthic habitats. Due to the shallow distribution of listed invertebrate species, they will be minimally exposed to noise from HRG surveys, buoy installation and retrieval, and geological and/or biological collections, and thus will have no effect on listed species.

Conclusion

Overall, the level of disturbance from noise associated with vessels and aircrafts to fish is insignificant. Moreover, survey equipment used under the Proposed Action are all under Tier 4 (i.e., *de minimis*

category); thus, impacts from use of survey equipment would be insignificant to ESA-listed fish. For invertebrates, we expect no effects from the Proposed Action due to their lower sensitivity to noise compared to fishes.

5.7.3.7 Artificial Light

Nature of Impact

Artificial light from vessels, AUVs, ROVs and equipment may disrupt diel vertical migration of zooplankton and micronekton, potentially altering predator-prey dynamics (Berge et al. 2020; Marangoni et al. 2022). Many zooplankton and micronekton migrate nightly to feed in surface waters and return to depth during the day. Artificial light can suppress this behavior, altering predator-prey dynamics and carbon flux (Berge et al. 2020; Marangoni et al. 2022).

As depth increases, the role of vision transitions from dominant (epipelagic) to highly specialized (meso- and bathypelagic) to largely diminished (abyssal habitats) (Haddock and Choy 2024). In the mesopelagic zone, visual interactions are particularly important and have driven the evolution of sensitive eyes and bioluminescent signaling. In deeper zones, the scarcity of light leads to a shift toward other sensory modalities, although bioluminescence remains a key adaptation in many midwater species. Artificial light from AUVs or ROVs may disturb visually sensitive species such as gelatinous zooplankton and deep-sea fishes.

Biological Consequences

Lighting is limited in scope and duration. The small number of illuminated assets, brief use, and deep settings ensure that any light-induced changes to pelagic habitats are short-lived and spatially limited, with no measurable impact at the regional scale (i.e., insignificant).

Conclusion

Artificial light effects are insignificant for listed species.

5.7.3.8 Electromagnetic Field (EMF) Alteration

Nature of Impact

EMF sources are limited to low-power electronics and navigation transponders. Laboratory and field studies show that behavioral responses to EMF are species- and exposure-dependent, with greatest concern focused on high-capacity transmission cables, not low-power scientific devices (Gill et al. 2014; Hutchison et al. 2020).

Biological Consequences

BMPs restrict work to *de minimis* equipment and require survey plan review (**Appendix B**). Any EMF-related effects would be highly localized and minor (i.e., insignificant).

Conclusion

EMF-related effects are insignificant to listed species or EFH.

5.7.3.9 Vessel Strike

Nature of Impact

Vessel strikes can affect large fishes, including sharks and rays, but the risk is minimized by slow

operational speeds, low vessel density, and remote, deepwater settings (Schoeman et al. 2020; Womersley et al. 2022).

Biological Consequences

BMPs require speed limits, continuous monitoring, and avoidance protocols (**Appendix B**). Any strike-related effects on pelagic species would be highly localized and effects, if any, are expected to be minor and temporary due to the low number of vessels included in the Proposed Action. Thus, effects from vessel strike to listed species or EFH would be insignificant.

Conclusion

Effects from vessel strike are insignificant for listed species.

5.7.3.10 Oil Spills

Nature of Impact

Accidental releases of petroleum products could affect pelagic or shallow-water species sensitive to polycyclic aromatic hydrocarbons (PAHs) (Incardona et al. 2014).

Biological Consequences

The plausible spill scenario is limited to small volumes of marine diesel, which disperses rapidly. BMPs require spill prevention and response planning (**Appendix B**). Any accidental release would be short-lived, spatially constrained, and unlikely to overlap with sensitive spawning events. Therefore, effects, if any, would be brief/temporary, localized, and minor (i.e., insignificant).

Conclusion

Effect from oil spill risk is anticipated to be insignificant for listed species.

5.7.3.11 Invasive Species

Nature of Impact

The Proposed Action is expected to generate survey vessel traffic in and out of American Samoa, as well as vessel transits from Hawai'i and the U.S. West Coast. Project vessels, biofouling, and equipment transfers could accidentally introduce non-native species. However, the project will implement a biofouling-management approach consistent with International Maritime Organization (IMO) guidelines, including antifouling systems, regular inspection, and cleaning of AUVs/ROVs (Davidson et al. 2016; International Maritime Organization 2023).

Biological Consequences

A previous study found 28 non-native marine species in American Samoa; 20 were only found in the inner harbor of Pago Pago, likely introduced through vessels (Coles et al. 2003). However, they have not been found to be invasive to coral reef areas (Coles et al. 2003), so are expected to be insignificant to American Samoa invertebrate populations and their habitats. Similarly, there are non-native species along the U.S. West Coast, but they are generally not invasive (Zabin et al. 2018). Given the deep, remote setting, limited surface infrastructure, and enforceable BMPs for hull/equipment biofouling and debris control, the probability of successful introduction and spread of non-indigenous species is low. Any effects on EFH or Habitat Areas of Particular Concern (HAPCs), if any, would be short term, minor and localized (i.e., insignificant).

Conclusion

Invasive species risk is insignificant for listed species.

5.7.3.12 Species-Specific Considerations

Scalloped Hammerhead Shark (*Sphyrna lewini*) and Oceanic Whitetip Shark (*Carcharhinus longimanus*)

Both species are highly mobile, pelagic predators that may transit the Action Area. The primary risks are from entanglement (in mooring lines), vessel strike, and FAD effects. However, due to the limited number of moorings, deepwater setting, and BMPs in place, incidents of entanglement and vessel strike are extremely unlikely to occur and thus discountable. Due to the absence of associated fishing effort and the small number of buoys, we anticipate no effects to the FAD.

Green Sturgeon (*Acipenser medirostris*), Eulachon (*Thaleichthys pacificus*), and Salmonids

These anadromous species are present primarily in the U.S. West Coast transit corridors. The main risks are from vessel noise, strike, and invasive species. Given the limited number of vessel trips, slow speeds, and BMPs, risks are insignificant. No activities occur in freshwater or estuarine critical habitats.

Chambered Nautilus (*Nautilus pompilius*), Black and White Abalone (*Haliotis spp.*), Sunflower Sea Star (*Pycnopodia helianthoides*), Corals, and Giant Clams

These taxa are primarily associated with benthic habitats that do not overlap with the proposed lease areas. The limited and highly localized nature of seafloor disturbance, avoidance of sensitive habitats, and BMPs ensure that risks are insignificant. No commercial-scale mining is authorized.

5.7.4 Cumulative and Indirect Effects

Cumulative effects from other activities (e.g., commercial fishing, shipping, potential future mineral development) are expected to be minor and temporary (i.e., insignificant) relative to the Proposed Action. The incremental contribution of the Proposed Action to overall risk to listed species is insignificant, given the deep, remote setting, limited number of assets, and robust BMP approach in place.

5.7.5 Conclusion

Based on a comprehensive review of the Proposed Action, the best available scientific information, and the implementation of enforceable BMPs, the Proposed Action is either discountable or insignificant and thus **may affect but not likely to adversely affect (NLAA)** listed fish and invertebrate species or their designated EFH. All potential impacts are not anticipated to have population-level or long-term effects.

5.8 Impacts to CH

Steller Sea Lion CH

Steller sealion CH have been designated (50 FR 226.202, 50 FR 30715) and the Action Area overlaps with the Steller sea lion designated CH. Project vessels could expose the aquatic and terrestrial habitats associated with the designated CH to vessel noise if those vessels transit nearby heading into or out of port. While vessel noise could potentially impact resting, foraging, and refuge features on and surrounding

the islands where CH is designated within the Action Area, no ESA-listed Steller sea lions are expected to occupy any of these sites. Nonetheless, we consider the potential impacts of vessel noise on Steller sea lion behavior based on the anticipated sound exposures and acoustic disturbance distances that could occur if ESA-listed Steller sea lions were present. As none of the West Coast area containing CH are the subject of proposed survey activities, we anticipate that acoustic exposures would occur while vessels are in transit and would thus be brief and temporary. Considering the acoustic disturbance distances for otariids (**Table 7**), Steller sea lions are either not likely to respond to this limited exposure to vessel noise that is expected to be generated by the Proposed Action, or are not likely to measurably respond to it in ways that would alter or disrupt normal behavior patterns such as resting or foraging. Given that we do not anticipate that the Proposed Action could lead to measurable or meaningful effects to the physical or biological features essential to the conservation of the currently listed Steller sea lion DPS, we conclude the potential effects to designated CH within the Action Area would be insignificant. Thus, BOEM believes that the Proposed Action **may affect but not likely to adversely affect** (NLAA) designated CH of Steller sea lions.

Southern Resident Killer Whale CH

CH of Southern Resident killer whales was designated (79 FR 69054) off the West Coast (**Figure 10**), and similar to the Steller sea lions, only vessel transit would be occurring in this area as part of the Proposed Action. Any displacement of prey species or individuals as a result of possible limited vessel transits, to and from the West Coast as well as limited and temporary introduction of debris and contaminants, conducted as part of the Proposed Action, are anticipated to be short term and temporary; and therefore, insignificant to designated CH for the Southern Resident killer whales. Thus, BOEM believes that the Proposed Action **may affect but not likely to adversely affect** (NLAA) designated CH of Southern Resident killer whales.

Humpback Whale CH

Both CHs of Central America DPS and Mexico DPS of humpback whales were listed on the West Coast (86 FR 21082), and these overlap with the Action Area (**Figure 10**). Any displacement of prey species or individuals as a result of possible limited vessel transits, to and from the West Coast as well as limited and temporary introduction of debris and contaminants, conducted as part of the Proposed Action, are anticipated to be short term and temporary; therefore, insignificant to designated CH for ESA-listed humpback whales. Thus, BOEM believes that the Proposed Action **may affect but not likely to adversely affect** (NLAA) designated CH of humpback killer whales.

North Pacific Right Whale CH

CH of North Pacific right whale designated in 2008 (74 FR 190000) is located in waters of Alaska which does not overlap with the Action Area. Thus, no effects to the CH are expected.

False Killer Whale and Hawaiian Monk Seal CH

CH of False killer whale (83 FR 35062) and Hawaiian monk seals (50 CFR 226.201) have been designated in and around the Hawaiian waters which overlap with the Action Area (**Figure 16**). Any displacement of prey species or individuals as a result of possible limited vessel transits, to and from the Hawaii as well as limited and temporary introduction of debris and contaminants, conducted as part of the Proposed Action,

are anticipated to be short term and temporary; and therefore, insignificant to designated CH for false killer whales and Hawaiian monk seals. Thus, BOEM believes that the Proposed Action **may affect but not likely to adversely affect** (NLAA) designated CH of false killer whales and Hawaiian monk seals.

Pacific Leatherback CH

The Proposed Action Area overlaps with leatherback CH (77 FR 4169; **Figure 10**). CH extends to a water depth of 80 m from the ocean surface. However, none of the activities in the Proposed Action would adversely affect the adult prey (medusa) of Pacific leatherbacks. Any displacement of prey species or individuals as a result of vessel transits to and from the West Coast to their respective and/or alternative ports or to the survey areas in American Samoa are anticipated to be short term and temporary. Given the limited extent of displacement of prey/foraging that could occur, we conclude the potential effects will be insignificant to designated CH of leatherback sea turtles. Thus, BOEM believes that the Proposed Action **may affect but not likely to adversely affect** (NLAA) designated CH of leatherback sea turtles.

Salmonid CH

CH for all salmonids is focused on freshwater habitats (e.g., river and stream channels and reaches, floodplains) and occasionally estuaries and not in marine ports or offshore areas included in the Action Area. Therefore, the salmonid CHs do not overlap with the Proposed Action, and **no adverse effects** are expected to salmonid critical habitat.

Black Abalone CH

Black abalone CH has been designated (76 FR 66806), which overlaps with the Action Area. No preliminary activities would occur in black abalone CH, so potential impacts would be associated only with vessels transiting from the U.S. West Coast. Any potential impacts to CH are further limited to the risk of accidental events (i.e., introduction of non-native species, release of pollutants and marine debris) and, therefore, discountable. Thus, BOEM believes that the Proposed Action **may affect but not likely to adversely affect** (NLAA) designated CH of black abalone.

Coral CH

CH for five coral species (*A. globiceps*, *A. retusa*, *A. speciosa*, *F. paradivisa*, and *I. crateriformis*) have been designated (90 FR 31800, 90 FR 39339), which overlaps with the Action Area. No preliminary activities would occur in the coral CH, so potential impacts would be associated only with vessel traffic in and out of American Samoa. Any potential impacts to CH are limited to the risk of accidental events (i.e., introduction of non-native species, release of pollutants and marine debris) and, therefore, discountable. Thus, the Proposed Action **may affect but not likely to adversely affect** (NLAA) designated CH of *A. globiceps*, *A. retusa*, *A. speciosa*, *F. paradivisa*, and *I. crateriformis*.

6 BA: Cumulative Effects and Conclusions for ESA-Listed Species

6.1 Cumulative Effects

“Cumulative effects” are those effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the Action Area of the federal action subject to consultation [50 CFR 402.02 and 402.17(a)]. Future federal actions that are unrelated to the Proposed Action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Some continuing non-federal activities are reasonably certain to contribute to the overall environmental health and habitat quality within the Action Area. However, it is challenging to distinguish between the Action Area’s future environmental conditions caused by global climate change that are properly part of the environmental baseline vs. cumulative effects. Therefore, all relevant future climate-related environmental conditions in the Action Area are described earlier in **Section 3.5** (*Climate Change*).

We did not identify additional state or private activities that are reasonably certain to occur within the Action Area, do not involve federal activities (including permitting), and could result in cumulative effects to ESA-listed species and designated CH within the Action Area. Activities that may occur in these areas will likely consist of actions related to ocean use policy and management of public resources. However, none of these potential state, local, or private actions, can be anticipated with any reasonable certainty in the Action Area at this time, and most actions in marine waters would likely involve federal involvement (e.g., permitting) of some type.

6.2 Conclusion

Due to the nature of the Proposed Action, as well as the BMPs employed as part of the Proposed Action (**Appendix B**), BOEM has determined that the impacts to ESA-listed species and CH from the Proposed Action will be insignificant or discountable. Therefore, the Proposed Action may affect but **not likely to adversely affect (NLAA)** ESA-listed species and their designated CH. **Table 11** summarizes BOEM’s determinations for each of the list of ESA-listed species and designated CH evaluated in this BA. Status of the ESA listing, species and CH citations, and whether CH overlap with the Action Area or not are also included.

Table 11. Summary of BOEM’s determinations for NMFS ESA-listed species and CH as *no effect or may affect, but not likely to be adversely affected* (NLAA) by the Proposed Action

N/A indicates CH was not listed as of 2025. NA indicates Not Applicable. NLAA indicates Not Likely to Be Adversely Affected.

Common Name	Stock or ESU/DPS	ESA Status	Citations for ESA Listing	Determination of Species	CH Designation	CH Overlap	Determination of CH
Blue whale	Eastern North Pacific, Central North Pacific	Endangered	35 FR 18319 (1970)	NLAA	N/A	NA	NA
Fin whale	CA/OR/WA, Hawaii, Northeast Pacific	Endangered	35 FR 8491 (1970)	NLAA	N/A	NA	NA
Sei whale	Eastern North Pacific, Hawaii	Endangered	35 FR 12024 (1970)	NLAA	N/A	NA	NA
Sperm whale	CA/OR/WA, Hawaii, North Pacific	Endangered	35 FR 18319 (1970)	NLAA	N/A	NA	NA
False killer whale	MHI Insular	Endangered	77 FR 70915 (2012)	NLAA	83 FR 35062 (2018)	Yes	NLAA
Southern Resident killer whale	CA/OR/WA	Endangered	70FR69903 (2005)	NLAA	71 FR 69054 (2006), 86 FR 41668 (2021)	Yes	NLAA
North Pacific right whale	Throughout range	Endangered	35 FR 8491 (1970), 73 FR 12024 (2008)	NLAA	73 FR 19000 (2008)	No	No effects
Hawaiian monk seal	Throughout range	Endangered	41 FR 51611 (1976)	NLAA	80 FR 50925 (2015)	Yes	NLAA
Humpback whale	Mexico	Threatened	81 FR 62260 (2016). 1991 Recovery Plan	NLAA	86 FR 21082 (2021)	Yes	NLAA
Humpback whale	Central America	Endangered	81 FR 62260 (2016). 1991 Recovery Plan	NLAA	86 FR 21082 (2021)	Yes	NLAA
Gray whale	Western North Pacific	Endangered	59 FR 31094 (1994)	NLAA	N/A	NA	NA
Guadalupe fur seal	Throughout range	Threatened	50 FR 51252 (1985)	NLAA	N/A	NA	NA
Steller sea lion	Eastern	Delisted but CH still in effect	55 FR 49204 (1990), 62 FR 24345 (1997), Delisted 78 FR 66139 (2013)	NA	58 FR 45269 (1997)	Yes	NLAA
Green turtle	Central North Pacific	Threatened	43 FR 32800 (1978), 81 FR 20057 (2016)	NLAA	Proposed 88 FR 46572 (2023)	NA (i.e., proposed)	NA
Green turtle	Central South Pacific	Endangered	43 FR 32800 (1978), 81 FR 20057 (2016)	NLAA	Proposed 88 FR 46572, July 19 (2023)	NA (i.e., proposed)	NA

Common Name	Stock or ESU/DPS	ESA Status	Citations for ESA Listing	Determination of Species	CH Designation	CH Overlap	Determination of CH
Green turtle	Central West Pacific	Endangered	43 FR 32800 (1978), 81 FR 20057 (2016)	NLAA	Proposed 88 FR 46572 (2023)	NA (i.e., proposed)	NA
Green turtle	East Pacific DPS	Threatened	43 FR 32800 (1978), 81 FR 20057 (2016)	NLAA	Proposed 88 FR 4657 (2023)	NA (i.e., proposed)	NA
Green turtle	East Indian-West Pacific	Threatened	43 FR 32800 (1978), 81 FR 20057 (2016)	NLAA	Proposed 88 FR 46572 (2023)	NA (i.e., proposed)	NA
Green turtle	Southwest Pacific	Threatened	43 FR 32800 (1978), 81 FR 20057 (2016)	NLAA	Proposed 88 FR 46572 (2023)	NA (i.e., proposed)	NA
Hawksbill turtle	Throughout range	Endangered	35 FR 8491 (1970)	NLAA	63 FR 46693 (1998)	No (Puerto Rico only)	No effect
Leatherback turtle	West Pacific	Endangered	35 FR 8491 (1970)	NLAA	77 FR 4170 (2012)	Yes	NLAA
Loggerhead turtle	North Pacific	Endangered	76 FR 58868 (2011)	NLAA	N/A	NA	NA
Loggerhead turtle	South Pacific	Endangered	43 FR 32800 (1978), 76 FR 58868 (2011)	NLAA	N/A	NA	NA
Olive ridley turtle	Population other than Mexico's Pacific Coast breeding population	Threatened	43 FR 32800 (1978)	NLAA	N/A	NA	NA
Oceanic whitetip shark	Throughout range	Endangered	83 FR 4153 (2018)	NLAA	Not prudent (85 FR 12898)	NA	NA
Giant manta ray	Throughout range	Threatened	83 FR 2916 (2018), 88 FR 81351 (2023)	NLAA	Not prudent (84 FR 66652)	NA	NA
Scalloped hammerhead shark	Indo-west Pacific	Endangered	79 FR 38213 (2014)	NLAA	Not prudent (80 FR 71774)	NA	NA
Chambered nautilus	Throughout range	Threatened	83 FR 48976 (2018)	NLAA	Not prudent (5 FR 5197)	NA	NA
Coral <i>Acropora globiceps</i>	Throughout range	Threatened	79 FR 53852 (2014)	No effect	90 FR 31800; 90 FR 39339	Yes	NLAA
Coral <i>Acropora retusa</i>	Throughout range	Threatened	79 FR 53852 (2014)	No effect	90 FR 31800; 90 FR 39339	Yes	NLAA
Coral <i>Acropora speciosa</i>	Throughout range	Threatened	79 FR 53852 (2014)	No effect	90 FR 31800; 90 FR 39339	Yes	NLAA

Common Name	Stock or ESU/DPS	ESA Status	Citations for ESA Listing	Determination of Species	CH Designation	CH Overlap	Determination of CH
Coral <i>Fimbriaphyllia paradivisa</i>	Throughout range	Threatened	79 FR 53852 (2014)	No effect	90 FR 31800; 90 FR 39339	Yes	NLAA
Coral <i>Isopora crateriformis</i>	Throughout range	Threatened	79 FR 53852 (2014)	No effect	90 FR 31800; 90 FR 39339	Yes	NLAA
Fluted giant clam	-	Proposed threatened	Proposed (89 FR 60498)	N/A	N/A	NA	NA
Horse's hoof clam	-	Proposed threatened	Proposed (89 FR 60498)	N/A	N/A	NA	NA
Small giant clam	-	Proposed threatened	Proposed (89 FR 60498)	N/A	N/A	NA	NA
Smooth giant clam	-	Proposed endangered	Proposed (89 FR 60498)	N/A	N/A	NA	NA
True giant clam	-	Proposed endangered	Proposed (89 FR 60498)	N/A	N/A	NA	NA
Chinook salmon	Sacramento River winter-run	Endangered	Threatened 54 FR 32085 (1989), 55 FR 46515 (1990); Endangered 59 FR 440 (1994)	NLAA	58 FR 33212 (1993)	NA	NA
Chinook salmon	Central Valley spring-run	Endangered	64 FR 50394 (1999)	NLAA	70 FR 52630 (2005)	NA	NA
Chinook salmon	California Coastal	Threatened	64 FR 50394 (1999); 70 FR 37159 (2005)	NLAA	70 FR 52488 (2005)	NA	NA
Chinook salmon	Lower Columbia River	Threatened	64 FR 14308 (1999), 70 FR 37160 (2005), 79 FR 20802 (2014)	NLAA	70 FR 52630 (2005)	NA	NA
Chinook salmon	Upper Columbia River Spring-run	Endangered	64 FR 14308 (1999), 70 FR 37159 (2005); 79 FR 20802 (2014)	NLAA	70 FR 52630 (2005)	NA	NA
Chinook salmon	Snake River Fall	Threatened	57 FR 14653 (1992), 70 FR 37160 (2005), 79 FR 20802, (2014)	NLAA	58 FR 68543 (1993)	NA	NA
Chinook salmon	Snake River Spring/Summer Run	Threatened	57 FR 14653 (1992), 70 FR 37160 (2005), 79 FR 20802, (2014)	NLAA	64 FR 57399 (1999)	NA	NA

Common Name	Stock or ESU/DPS	ESA Status	Citations for ESA Listing	Determination of Species	CH Designation	CH Overlap	Determination of CH
Chinook salmon	Upper Willamette River	Threatened	64 FR 14308 (1999), 70 FR 37160 (2005), 79 FR 20802 (2014)	NLAA	70 FR 52629 (2005)	NA	NA
Chinook salmon	Puget Sound	Threatened	64 FR 14308 (1999), 70 FR 37160 (2005), 79 FR 20802 (2014)	NLAA	70 FR 52630 (2005)	NA	NA
Coho salmon	Central California Coast	Endangered	Threatened 61 FR 56138 (1996); endangered 70 FR 37160 (2005), 79 FR 20802 (2014)	NLAA	64 FR 24049 (1999)	NA	NA
Coho salmon	Southern Oregon/Northern California Coast	Threatened	62 FR 24588 (1997), 70 FR 37160 (2005), 79 FR 20802 (2014)	NLAA	64 FR 24049 (1999)	NA	NA
Coho salmon	Lower Columbia River	Threatened	70 FR 37160 (2005), 79 FR 20802 (2014)	NLAA	81 FR 9251	NA	NA
Coho salmon	Oregon Coast	Threatened	63 FR 42587 (1998), 76 FR 35755 (2011), 79 FR 20802 (2014)	NLAA	73 FR 7815 (2008)	NA	NA
Steelhead trout	California Central Valley	Threatened	62 FR 13347 (1998); 71 FR 834 (2006)	NLAA	70 FR 52630 (2005)	NA	NA
Steelhead trout	Central California Coast	Threatened	62 FR 43937 (1997), 71 FR 834 (2006), 79 FR 20802 (2014)	NLAA	70 FR 52630 (2005)	NA	NA
Steelhead trout	Southern California	Endangered	62 FR 43937 (1997), 71 FR 834 (2006); range extension 67 FR 21586 (2002), 79 FR 20802 (2014)	NLAA	70 FR 52536 (2005)	NA	NA
Steelhead trout	South-Central California Coast	Threatened	62 FR 43937 (1997), 71 FR 834 (2006), 79 FR 20802 (2014)	NLAA	70 FR 52630 (2005)	NA	NA
Steelhead trout	Northern California	Threatened	65 FR 36074 (2000); 71 FR 834 (2006); 79 FR 20802 (2014)	NLAA	70 FR 52630 (2005)	NA	NA

Common Name	Stock or ESU/DPS	ESA Status	Citations for ESA Listing	Determination of Species	CH Designation	CH Overlap	Determination of CH
Steelhead trout	Lower Columbia River	Threatened	63 FR 13347 (1998), 71 FR 834 (2006), 79 FR 20802 (2014)	NLAA	70 FR 52630 (2005)	NA	NA
Steelhead trout	Middle Columbia River	Threatened	64 FR 14517 (1999), 71 FR 834 (2006), 79 FR 20802 (2014)	NLAA	70 FR 52630 (2005)	NA	NA
Steelhead trout	Upper Columbia River	Endangered	Endangered 62 FR 43937 (1997); reclassified to Threatened 71 FR 834 (2006) and 74 FR 42605 (2009), 79 FR 20802 (2014)	NLAA	70 FR 52630 (2005)	NA	NA
Steelhead trout	Puget Sound	Threatened	72 FR 26722 (2007), 79 FR 20802 (2014)	NLAA	81 FR 9252 (2016)	NA	NA
Steelhead trout	Snake River	Threatened	62 FR 43937 (1997), 71 FR 834 (2006), 79 FR 20802 (2014)	NLAA	70 FR 52630 (2005)	NA	NA
Steelhead trout	Upper Willamette River	Threatened	64 FR 14517 (1999), 71 FR 834 (2006), 79 FR 20802 (2014)	NLAA	70 FR 52630 (2005)	NA	NA
Chum salmon	Columbia River	Threatened	64 FR 14508 (1999); 70 FR 37160 (2005); 79 FR 20802 (2014)	NLAA	70 FR 52630 (2005)	NA	NA
Chum salmon	Hood Canal summer-run	Threatened	64 FR 14508 (1999); 70 FR 37160 (2005); 79 FR 20802 (2014)	NLAA	70 FR 52630 (2005)	NA	NA
Green sturgeon	North American Southern	Threatened	71 FR 17757 (2006)	NLAA	74 FR 52300 (2009)	Yes	NLAA
Eulachon	Pacific Southern	Threatened	75 FR 13012 (2010)	NLAA	76 FR 65324 (2011)	No	No effect
Black abalone	Throughout range	Endangered	74 FR 1937 (2009)	NLAA	76 FR 66806 (2011)	Yes	NLAA
White abalone	Throughout range	Endangered	66 FR 29046 (2001)	NLAA	Not prudent (66 FR 29046)	NA	NA
Sun flower sea star	NA	Proposed threatened	88 FR 16212 (2024)	NLAA	N/A	NA	NA

7 EFH Assessment

Prepared by the BOEM for the NMFS in accordance with the Magnuson-Stevens Fishery Conservation and Management Act, as amended in 1996

7.1 Purpose

Under Section 305 (b) (2) of the Magnuson Fishery Conservation and Management Act (16 U.S.C. 1801 et seq.) as amended by the Sustainable Fisheries Act on October 11, 1996, federal agencies are required to consult with the Secretary of Commerce on any actions that may adversely affect EFH. On December 19, 1997, the Department of Commerce published an interim final rule (50 CFR Part 600) in the Federal Register that detailed the procedures under which federal agencies would fulfill their consultation requirements. These regulations were updated in 2002 (67 FR 2376). As set forth in the regulations, EFH Assessments must include: 1) a description of the action; 2) an analysis of the potential adverse effects, including cumulative effects, of the action on EFH and managed species; 3) the federal agency's conclusions regarding the effects of the action on EFH; and 4) proposed mitigation, if applicable.

7.2 Project Description

This EFH Assessment covers lease issuance and preliminary activities for the Commercial Leasing for Minerals Offshore American Samoa. Details of the Proposed Action and maps of the Action Areas are provided in **Sections 2 and 3** of this document.

7.3 EFH

EFH is defined in the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1802(10)) as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” The implementing regulations (50 C.F.R. Part 600, Subpart J) require that Fishery Management Plans describe, identify, and map EFH (§ 600.815(a)(1)). HAPCs are discrete subsets of EFH that meet one or more of the following criteria: they are ecologically significant, sensitive to human-induced degradation, stressed by development, or rare. Their designation under § 600.815(a)(8) does not impose additional regulatory restrictions beyond those applicable to EFH but highlights priority areas for conservation and consultation.

EFH within the Action Area will experience different IPFs depending on whether they are located within potential lease areas or transit corridors. Two fisheries managed by the WPRFMC, the American Samoa Fishery Ecosystem Plan (FEP), and the Pelagic FEP, overlap with the potential lease areas. An additional two fisheries managed by the WPRFMC overlap with the transit corridor and include the Hawaiian Archipelago FEP and the Pacific Remote Island FEP. Four fisheries managed by the Pacific Fishery Management Council (PFMC) overlap with the transit corridor and include the Coastal Pelagic Species (CPS) Fishery Management Plan (FMP), The Highly Migratory Species FMP, the Pacific Groundfish FMP, and the Pacific Salmon FMP. EFH managed by these councils are summarized in **Tables 12 and 13**.

Table 12. Management unit species for EFH within the U.S. Pacific Islands

Management Unit Species	EFH for Eggs and Larvae	EFH for Juveniles and Adults
Bottomfish	Water column down to 400-m depth from shoreline out to the 200-mi U.S. EEZ boundary	Water column and all bottom from shoreline down to 400-m depth
Seamount Groundfish	Water column down to 200-m depth of all EEZ waters bounded by 29–35° N and 171° E to 179° W	Water column down to 200-m depth of all EEZ waters bounded by 29–35° N and 171° E to 179° W
Pelagics	Water column down to 200-m depth from shoreline out to EEZ boundary	Water column down to 1,000-m depth from shoreline out to EEZ boundary
Precious Corals	Known precious coral beds in the Hawaiian Islands located at: Keāhole point, between Miloli'i and South Point, the 'Au'au Channel, Makapu'u, Ka'ena point, the southern border of Kaua'i, Wespac bed, Brooks bank bed, and 180 Fathom Bank	Known precious coral beds in the Hawaiian Islands located at: Keāhole point, between Miloli'i and South Point, the 'Au'au Channel, Makapu'u, Ka'ena point, the southern border of Kaua'i, Wespac bed, Brooks bank bed, and 180 Fathom Bank
Coral Reef Ecosystems	Water column and all bottom down to 100-m depth from shoreline out to EEZ boundary	Water column and all bottom down to 100-m depth from shoreline out to EEZ boundary
Crustaceans	Lobsters/crab: water column down to 150-m depth from shoreline out to EEZ boundary Deepwater shrimp: outer reef slopes between 300- to 700-m depth	Lobsters/crab: bottom from shoreline down to 100-m depth Deepwater shrimp: outer reef slopes between 550- to 700-m depth

Source: NOAA Fisheries (2025)

Table 13. EFH within the U.S. West Coast EEZ

Fishery / Species	EFH for Eggs & Larvae	EFH for Juveniles & Adults	Footnotes
Pacific Coast Groundfish	All waters and substrate $\leq 3,500$ -m depth from mean higher high water line to upriver saltwater intrusion; includes seamounts $> 3,500$ m	Same as eggs/larvae (all life stages)	50 CFR 660.75
Pacific Sardine, Northern Anchovy, Pacific Chub Mackerel, Jack Mackerel (CPS)	Marine/estuarine waters from shoreline to EEZ above thermocline, SST 10–26 °C	Same as eggs/larvae	PFMC Amendment 8
Market Squid (CPS)	Assemblage EFH as above; benthic spawning on sand/mud substrates < 100 -m depth	Pelagic waters within CPS EFH	PFMC EFH Review 2023
Krill (CPS)	Upper surface layer from nearshore to shelf-break isobaths	Same upper pelagic layer	PFMC Amendment 12
Highly Migratory Species (HMS)	Species-specific; most spawning and larval habitat outside EEZ	Pelagic waters seaward of ~12-m depth to EEZ	PFMC HMS EFH Appendix
Pacific Coast Salmon—Chinook & Coho	Freshwater EFH: all water bodies currently/historically occupied; estuarine EFH	Marine EFH: estuarine/nearshore to EEZ north of Point Conception	50 CFR 660.412
Puget Sound Pink Salmon	Freshwater EFH: Puget Sound, Strait of Juan de Fuca/Georgia	Marine EFH: Puget Sound and EEZ waters north of 48° N	50 CFR 660.412

Source: NOAA Fisheries (2024)

7.3.1 American Samoa FEP

The WPRFMC first designated EFH (and HAPC) for its fisheries via an omnibus amendment in 1998–1999 and carried these designations forward when it reorganized the species-based FMPs into place-based FEPs, including the American Samoa FEP (originally implemented in 2009). EFH in American Samoa spans a broad depth gradient and includes habitats essential for spawning, growth, and survival of managed species. HAPC designations focus on areas of high biodiversity, structural complexity, and ecological sensitivity, such as coral reef MPAs, Rose Atoll, shallow banks, and precious coral beds. These habitats are integral to sustaining fishery resources and maintaining ecosystem resilience in the face of anthropogenic and climate-related pressures.

The American Samoa FEP encompasses four major fishery management units: Bottomfish, Coral Reef Ecosystem, Crustaceans, and Precious Corals. Each fishery has distinct EFH and HAPC designations.

Bottomfish Management Unit Species. EFH for bottomfish species includes benthic habitats from the shoreline to approximately 400-m depth. These habitats consist of hard-bottom areas, reef slopes, rocky outcrops, and seamount features that provide shelter and foraging grounds for juveniles and adults. Eggs and larvae occupy surface waters from the shoreline to 100-m depth, where oceanographic conditions facilitate dispersal and recruitment. While no discrete HAPC has been formally designated for bottomfish in American Samoa, areas with high structural complexity, such as steep reef slopes and promontories, are considered ecologically sensitive and functionally critical for sustaining bottomfish populations.

Coral Reef Ecosystem Management Unit Species. EFH for coral reef species encompasses all coral reef habitats from the shoreline to approximately 100-m depth, including reef flats, fore reefs, lagoons, and patch reefs. These habitats support a diverse assemblage of reef fishes, invertebrates, and associated organisms throughout their life cycles. Coral reefs provide spawning sites, nursery areas, and feeding grounds essential for growth and survival. HAPC within this fishery includes all designated MPAs and reserves identified in the FEP, notably the Rose Atoll Marine National Monument, which is recognized for its exceptional biodiversity and ecological integrity. Areas with high coral cover and structural complexity are prioritized as HAPC due to their vulnerability to physical damage and climate-related stressors.

Crustaceans Management Unit Species. EFH for spiny lobsters (*Panulirus* spp.) includes shallow reef slopes and rocky crevices from the shoreline to approximately 150-m depth, which provide shelter and foraging habitat. Deepwater shrimp (*Heterocarpus* spp.) occupy outer reef slopes and deep benthic habitats between 300- and 700-m depth, where substrate composition and water column conditions support their life-history requirements. HAPC for crustaceans includes banks and reef structures with summits shallower than 30 m, which serve as CH for spiny lobster populations. No specific HAPC has been designated for deepwater shrimp, although their habitats are considered sensitive due to depth and limited spatial distribution.

Precious Corals Management Unit Species. EFH for precious corals is defined by the occurrence of discrete coral beds on hard substrates at depths ranging from approximately 350 to 1,500 m. These habitats support species such as pink coral (*Corallium secundum*), red coral (*Corallium regale*), and other commercially valuable taxa. Precious coral beds are inherently rare and highly vulnerable to physical disturbance from harvest activities. Consequently, all known precious coral beds within the American

Samoa EEZ are considered HAPC due to their ecological uniqueness, structural role in deepwater ecosystems, and susceptibility to degradation.

7.3.2 Pelagic FEP

The WPRFMC first designated EFH and HAPC for its fisheries via an omnibus amendment in 1998–1999 and carried these designations forward when it reorganized the species-based FMPs into place-based FEPs, including the Pelagic FEP (originally implemented in 2009).

EFH within the Pelagic FEP covers all pelagic management unit species managed in the Pelagic FEP, including tunas, billfishes, wahoo, mahi-mahi (dolphinfish), oceanic sharks, moonfish, pomfrets, oilfish, and pelagic squids across the U.S. EEZ surrounding American Samoa, Hawai'i, Guam, the Commonwealth of the Northern Mariana Islands, and the PRIA. EFH for Western Pacific Pelagic FEP species is defined as the upper ~200 m water column (eggs/larvae) and the surface to ~1,000 m water column (juveniles/adults), extending from the shoreline to the EEZ boundary. Within this EFH, HAPC are designated over seamounts and banks with summits shallower than ~2,000 m, recognizing their critical ecological functions for aggregation, feeding, and growth. The Pelagic FEP further recognizes the dynamic nature of EFH, emphasizing fronts, eddies, and current systems as essential habitat features.

7.3.3 The Hawai'i Archipelago FEP

The Hawai'i Archipelago FEP consolidates EFH designations for these sectors: bottomfish and seamount groundfish, coral reef ecosystem species, crustaceans, and precious corals within the U.S. EEZ around Hawai'i. Pelagic species are managed separately under the Pelagic FEP and are not included here. EFH definitions and HAPC priorities were first set in the 2009 Hawai'i Archipelago FEP and subsequently refined in 2016 for bottomfish and seamount groundfish by Amendment 4 to reflect improved life-history and habitat information.

Bottomfish Management Unit Species. EFH spans the water column and bottom habitats from the shoreline to ~400-m depth, with life-stage specificity: eggs/post-hatch pelagic use the surface to complex-specific depths out to the EEZ, while post-settlement and sub-adult/adult stages occupy benthic/benthopelagic zones within depth bands that reflect newly defined shallow (0–240 m), intermediate (40–320 m), and deep (80–400 m) assemblages. Species-level EFH descriptors (zone, depth, extent) are provided in Amendment 4 (e.g., *Etelis* spp., *Pristipomoides* spp., *Hyporthodus quernus*, *Aphareus rutilans*). HAPC for bottomfish were refined to seven priority areas where nursery or multi-species habitat functions, sensitivity, and/or rarity are documented: Ka'ena Point, Kāne'ohe, Makapu'u, Penguin Bank, Pailolo Channel, North Kaho'olawe, and Hilo (with site-specific boundaries and notes). These HAPC are intended to focus consultation and conservation on nursery flats, canyon/pinnacle complexes, drowned reef terraces, and coral/sponge beds important to bottomfish species.

Seamount Groundfish Management Unit Species (armorhead, alfonsin, raftfish). EFH encompasses the water column to ~600 m and, for settled/sub-adult/adult stages, 120–600 m, in waters west of 180° W and north of 28° N, aligning with the Hancock Seamounts Ecosystem Management Area (retaining a moratorium due to overfished status of armorhead). HAPC is designated around Hancock Seamount summits and slopes (rare, small, isolated habitat supporting the complex); Cross Seamount was considered but excluded from preferred HAPC due to broader species occurrence.

Crustaceans Management Unit Species (spiny/slipper lobsters, Kona crab, deepwater shrimp). EFH includes eggs/larvae in the water column to ~150 m and juveniles/adults on all bottom habitat to ~100 m. HAPC emphasizes Northwest Hawaiian Island banks with summits $\leq$ ~30 m, recognizing susceptibility of shallow banks and biogenic structures to anchors/gear.

Precious Coral Management Unit Species (pink/red, gold, bamboo, black corals). EFH is confined to specific beds and depth strata documented in the main Hawaiian Islands and northwest Hawaiian Islands (e.g., Makapu'u, Brooks Bank, 180-Fathom Bank; Au'au Channel for black corals). These beds and associated slopes are designated HAPC due to ecological importance, sensitivity, and rarity of slow-growing deep corals.

Coral Reef Ecosystem (CRE) Management Unit Species. EFH comprises the water column and all benthic substrate $\leq$ 91 m (50 fathoms) from shore to the EEZ, covering reef flats, fore-reef slopes, channels, and adjacent soft bottoms used by various CRE species. HAPC under the FEP highlight no-take MPAs and site-specific nearshore areas across the main and NWHI where ecological function, sensitivity, and development stress are high (e.g., Pupukeya/Shark's Cove Marine Life Conservation District, Molokini, and other listed sites). These HAPC help focus mitigation for actions that could degrade nearshore reef EFH (e.g., dredging, sedimentation, construction, invasive species pathways).

7.3.4 Pacific Remote Islands Area (PRIA) FEP

The FEP for the PRIA reorganized demersal fisheries management around place-based ecosystem boundaries and consolidates the provisions formerly contained in the four sectors of Bottomfish and Seamount Groundfish, Crustaceans, Precious Corals, and Coral Reef Ecosystems. The PRIA FEP identifies EFH and HAPC for the demersal fisheries under WPRFMC authority, and pelagic species are managed separately under the Pelagic FEP. The PRIA FEP applies across The U.S. EEZ (0–200 nm) surrounding each island/atoll and overlays National Wildlife Refuge boundaries. The spatial overlap of the PRIA FEP managed area with the Action Area includes only transit corridors within the EEZ surrounding Palmyra Atoll, Kingman Reef, and Jarvis Island (**Figure 1**). EFH is described for the different fishery sectors below and summarized in **Table 14**.

Bottomfish Management Unit Species. EFH comprises hard-bottom slopes, pinnacles, promontories, and other high-relief features typically between ~73 and 265 m (~40 and 145 fathoms), where adult snappers, jacks, and groupers aggregate; distributions are patchy and closely tied to structural complexity and current flow, which enhance food availability. Juvenile snappers occupy relatively shallow, flat, soft-bottom habitats (often 40–80 m), distinct from adult grounds.

CRE Management Unit Species. EFH in PRIA encompasses reef and associated shallow habitats (generally $\leq$ 91 m or $\leq$ 50 fathoms) supporting high coral and fish diversity, apex predators, planktivores, and invertebrates. Because these ecosystems sit within minimally developed island settings, EFH quality is strongly shaped by regional oceanography (e.g., upwelling, equatorial currents) rather than land-based runoff.

Crustacean Management Unit Species. EFH includes rocky reef and high-energy reef-front habitats used by spiny lobsters and slipper lobsters for shelter and foraging. Spiny lobster larvae are pelagic for months and widely dispersed by currents, while settlement and subsequent growth occur in crevice-rich, nearshore reef zones used by adults. Thus, EFH forms a continuum from oceanic larval transport to

reef-structured benthic nurseries. Kona crab EFH is associated with sandy bottoms from ~24–115 m for adults, with larvae pelagic in the water column.

Precious Coral Management Unit Species. EFH around Palmyra Atoll, Kingman Reef, and Jarvis Island has been poorly described. It is thought that two principal deep-water zones for EFH occur: approximately 350–475 m and 1,000–1,500 m, typically on solid substrates in areas swept by moderate to strong bottom currents that minimize sediment accumulation and facilitate feeding and larval settlement. It is likely that the standing crops, depth ranges, and growth rates illustrate the slow-growing, long-lived nature of these colonies and their sensitivity to sedimentation and substrate erosion.

HAPCs. The PRIA FEP identifies HAPCs for demersal management unit species where habitats meet criteria of ecological importance, sensitivity, exposure to development stress, or rarity. CRE HAPCs are recognized in PRIA, leveraging the overlay of National Wildlife Refuges and the Pacific Remote Islands Marine National Monument to restrict or prohibit fishing and other activities that could degrade EFH. These designations prioritize protection of reef habitats and associated biota where vulnerability and ecological value are highest.

Palmyra Atoll, Kingman Reef, and Jarvis Island. EFH and HAPC considerations are particularly notable around these sites. PRIA coral reef ecosystems are generally healthy and productive, with large apex predators common; the west sides of the equatorial islands (Jarvis, Baker, Howland) show high densities of small planktivorous fishes linked to upwelling from the Equatorial Undercurrent, highlighting pelagic–benthic coupling within EFH. Coral species diversity is substantially higher at Palmyra and Kingman, likely due to larval transport via the Equatorial Countercurrent, underscoring their role as biodiversity hubs warranting HAPC emphasis. At Kingman, crown-of-thorns starfish aggregations and a reported decline in large fish densities in 2004 signal sensitivities that strengthen the case for precautionary habitat protection; Palmyra exhibited crown-of-thorns aggregations earlier (2001–2002) that subsequently dissipated, illustrating dynamic pressure regimes inside EFH.

7.3.5 Coastal Pelagic Species (CPS) FMP

CPS species include Pacific sardine, Pacific/chub mackerel, northern anchovy, jack mackerel, market squid, and all euphausiid (krill) species occurring within the U.S. West Coast EEZ. CPS finfish and market squid are primarily pelagic, inhabiting the upper mixed layer of the ocean above the thermocline and generally occurring near the surface rather than in association with the seafloor. For EFH purposes, these species are treated as a complex because of their similar life histories and habitat requirements.

The EFH for CPS finfish is defined by a thermal range and geographic area that encompasses waters where these species occur at any life stage, where they have historically occurred under similar environmental conditions, or where conditions do not preclude colonization. Because CPS distributions vary widely over time in response to ocean temperature, EFH boundaries are dynamic. The east–west extent of EFH for CPS finfish includes all marine and estuarine waters from the shoreline along the coasts of California, Oregon, and Washington offshore to the limits of the EEZ, above the thermocline, where sea surface temperatures range between 10°C and 26°C. The southern boundary is the U.S.–Mexico maritime border, while the northern boundary is defined by the position of the 10°C isotherm, which shifts seasonally and annually.

For krill species, EFH extends along the entire West Coast from the shoreline to the 1,000-fathom isobath and to a depth of approximately 400 m. This designation is based on the distribution of the two principal species, *Euphausia pacifica* and *Thysanoessa spinifera*, whose larvae tend to occur closer to shore over the continental shelf. These boundaries approximate areas of highest population concentrations and major upwelling zones that support consistently high phytoplankton productivity, although krill are not strictly associated with fixed bottom topography.

At present, no HAPCs have been incorporated into the CPS FMP.

7.3.6 Highly Migratory Species (HMS) FMP

Within the U.S. West Coast EEZ, HMS EFH is primarily associated with pelagic and epipelagic waters rather than benthic habitats, reflecting the highly mobile and oceanic nature of these species. These habitats occur in temperate waters of the PFM region, generally beyond the 100-fathom isobath and extending offshore to the EEZ boundary. The distribution and abundance of HMS within these waters varies seasonally and interannually in response to oceanographic conditions such as sea surface temperature, current patterns, and prey availability. EFH for most life stages is linked to open-ocean features, including upwelling zones, thermal fronts, and convergence boundaries that concentrate prey and provide favorable conditions for growth and survival.

Species-specific EFH designations reflect these pelagic preferences. For example, albacore tuna occupy epipelagic waters beyond the 100-fathom contour from the U.S.–Mexico border north to Canada, typically associated with sea surface temperatures between 10°C and 20°C. Bigeye tuna and yellowfin tuna are concentrated in the Southern California Bight, primarily south of Point Conception, in waters beyond the 200-fathom isobath where temperatures range from 17°C to 22°C for bigeye and up to 31°C for yellowfin. Pacific bluefin tuna occur farther offshore beyond the 183-m contour, with juveniles feeding on northern anchovy and squid in waters between 14°C and 23°C. Swordfish and striped marlin utilize oceanic waters of the Southern California Bight, often above the thermocline and beyond the 200- to 400-fathom isobaths. Sharks such as common thresher and shortfin mako use epipelagic waters from nearshore to offshore, including the Southern California Bight, and likely depend on pupping areas within the southern portion of the EEZ. Blue sharks range widely in epipelagic waters from Mexico to Canada, primarily beyond the 183-m contour.

At present, no HAPCs have been designated for HMS. However, the FMP provides a framework for future identification of HAPCs based on ecological importance, rarity, and vulnerability. Potential HAPCs include shark pupping grounds, core nursery areas, key migratory corridors, and feeding aggregations, particularly for thresher and mako sharks. Research is needed to locate these areas, which may concentrate pups and pregnant females at certain times of the year, making them highly susceptible to habitat disturbances.

7.3.7 Pacific Coast Groundfish (PCG) FMP

EFH for the PCG FMP encompasses all waters and substrates from the shoreline (mean higher high water or upriver extent of saltwater intrusion) seaward to areas with depth $\leq 3,500$ m within the U.S. West Coast EEZ. This EFH is implemented in regulation at 50 CFR § 660.75 and is protected through gear and area-based measures updated by Amendment 28 (84 CFR 63966). Amendment 28 and associated regulations include coastwide EFH restrictions seaward of the 1,280 m (700 fathom) contour for bottom

trawl gear (50 CFR § 660.112(a)(5)(ii)), plus specific Essential Fish Habitat Conservation Areas (EFHCAs) where bottom-contact gear is prohibited (e.g., Davidson Seamount EFHCA) to protect deep-water habitats.

Pacific Groundfish HAPCs include hard substrate and habitat-forming invertebrates (corals, sponges), including those developing on methane-seep carbonates as these areas provide attachment, refuge, foraging, and spawning functions for multiple commercial groundfish (e.g., sablefish, thornyheads, Dover sole). Biogenic microhabitats at seeps (bacterial mats, tube-worm beds, carbonate boulders) that attract higher densities of WPRFMC-managed species relative to off-seep transects are also HAPC.

PFMC implements HAPC-like protections through EFHCA, which are discrete subsets of EFH designated in regulation that prioritize sensitive habitat types (hard substrate, canyons, seamounts, coral/sponge, methane seeps) for gear restrictions and area closures. These EFHCAs function as HAPCs because they meet Magnuson-Stevens Fishery Conservation and Management Act criteria (high ecological function, rarity, sensitivity, and threat exposure). Amendment 28 re-configured West Coast EFHCAs and other bottom-contact gear restrictions to minimize adverse effects of fishing on EFH. It includes large closures to bottom trawling (and, in specified sites, closures to all bottom-contact gears), while reopening some lower-sensitivity grounds. EFHCAs and coastwide restrictions are codified in 50 CFR §§ 660.76–660.79, 660.12, 660.112.

7.3.8 Pacific Coast Salmon FMP

The following EFH descriptions were developed by the [PFMC](#) for the three species of Pacific salmon managed under the Pacific Coast Salmon FMP: (*Oncorhynchus tshawytscha*), coho (*O. kisutch*), and Puget Sound pink salmon (*O. gorbuscha*). EFH spans freshwater, estuarine, and marine environments historically or currently occupied by these species. Key habitat features across species are those with good connectivity across habitat types, clean gravel, cool water, riparian cover, structural complexity from woody debris, floodplain complexity, unpolluted estuarine transition zones, and productive nearshore marine habitats.

Chinook Salmon. Freshwater EFH includes all currently or historically occupied habitats within Washington, Oregon, Idaho, and California, excluding areas upstream of designated impassable dams. Key features include clean gravel for spawning, cool, well-oxygenated water, and complex habitats such as floodplains, side channels, and off-channel ponds. Estuarine EFH includes ocean-type juveniles rear for weeks to months in tidal channels, marsh edges, and shallow nearshore habitats. Marine EFH includes nearshore and offshore waters from state territorial seas to the EEZ north of Point Conception. It also includes Alaska-designated EFH. Juveniles concentrate along the continental shelf and adults range widely across the North Pacific.

Coho Salmon. Freshwater EFH includes spawning in small streams with coarse gravel and moderate currents; juveniles rear for one year in low-gradient alluvial channels, pools with large woody debris, and off-channel habitats such as beaver ponds. Estuarine EFH includes intertidal and pelagic habitats with cover and prey availability where juveniles will reside for days to months. Marine EFH includes nearshore and offshore waters within the EEZ north of Point Conception; juveniles initially occupy coastal waters before migrating north.

Puget Sound Pink Salmon. Freshwater EFH includes spawning habitats that occur in riffles and pool-riffle transitions with clean gravel and moderate currents, typically within 50 km of tidewater. Estuarine EFH

includes habitats where fry are found, but they generally migrate quickly through estuaries, although some briefly use shallow tidal channels. Marine EFH includes nearshore habitats in Puget Sound, Strait of Juan de Fuca, and Strait of Georgia. EFH extends to U.S. EEZ waters north of 48° N latitude and includes Alaska-designated EFH.

Habitat Areas of Particular Concern (HAPCs). For Pacific Coast Salmon HAPCs are those habitat subtypes highly sensitive to degradation. For Pacific salmon, the following HAPCs are designated:

- *Complex Channels and Floodplain Habitats.* Meandering, braided channels, side channels, sloughs, wetlands, and areas with abundant large woody debris that support spawning and juvenile rearing.
- *Thermal Refugia.* Cool-water habitats such as tributary junctions, groundwater seeps, and deep pools that provide refuge during periods of elevated temperature.
- *Spawning Habitat.* Clean gravel substrates with adequate intragravel flow and oxygenation, typically in low-gradient stream reaches.
- *Estuaries.* Semi-enclosed waters with tidal influence, providing critical rearing and transition zones for juveniles.
- *Marine and Estuarine Submerged Aquatic Vegetation.* Eelgrass and kelp beds that offer cover, migration corridors, and prey resources.

7.4 Potential IPFs

BOEM proposes to issue up to two leases for preliminary seabed mineral exploration activities in the proposed lease area. Preliminary activities include marine vessel traffic; HRG surveys; sediment sampling; buoy and mooring deployment, operation, and retrieval; AUV and ROV surveys; and other low-impact technologies. Although these activities would not result in commercial-scale disturbance, they may generate a suite of potential IPFs that may affect EFH, and include habitat disturbance, sediment resuspension and turbidity, FAD effect, entanglement, marine debris, vessel strike, noise, artificial light, EMF alteration, vessel strike, oil spills, and introduction of invasive species. Vessel transit corridors have fewer IPFs and include those associated with marine transportation activities, especially noise, vessel strike, introduction of invasive species, and oil spills.

A summary description of each impacting source, the potential effects on EFH, and proposed mitigation and BMPs is included in the following section.

7.5 Effects on EFH and Mitigations and BMPs

Habitat Disturbance. Seafloor contact from box cores, free-fall grabs, landers, moorings, and UTP units would create small, discrete footprints spread over very large areas. Under the two-lease scenario, estimated seabed disturbance is ~977 m² from box-core/free-fall sampling plus ~479 m² from moorings/landers/UTPs (total ~1,456 m²), concentrated on abyssal plains between ~1,400–6,000 m depth. These depths lie below EFH for demersal WPRFMC fisheries (generally ≤400 m) and beyond pelagic EFH usage for juveniles/adults (surface to ~1,000 m), so direct EFH impacts are unlikely. Transit corridors and

any seamount flanks with EFH/HAPC sensitivity are addressed through avoidance and operational controls (**Appendix B**).

Local biological consequences at disturbance points include removal/compaction of sediments and any nodules present, causing mortality of infauna/epifauna and disruption of microbial assemblages. Evidence from long-term experiments indicates that sessile megafauna and suspension feeders can remain depressed decades after disturbance, and microbial functions may require >50 years to recover (Simon-Lledó et al. 2019; Vonnahme et al. 2020). Abyssal nodules themselves accrete extremely slowly (mm–cm per million years), so any nodule removal represents habitat loss on human timescales (Hein et al. 2020). Moreover, many abyssal megafauna exhibit strong associations with hard substrata provided by nodules (Amon et al. 2016).

Given the very small aggregate footprint of preliminary activities and their dispersion across vast lease blocks, the scale of disturbance is orders of magnitude below that required to cause population-level effects or to compromise EFH functions regionally. Implementation of BOEM’s BMPs of Pre-survey planning, sensitive-habitat avoidance (including deep-sea corals/sponges and seamount features) further constrains interaction with EFH/HAPCs and focuses work away from mapped sensitive areas.

In conclusion, with the proposed spatially limited sampling and the BMP suite in place, habitat disturbance from preliminary activities would result in minimal adverse effects to EFH and, where present, HAPCs.

Sediment Resuspension and Turbidity. Sediment resuspension will occur where box cores, free-fall grabs, landers, and moorings contact the seabed, generating short-lived, near-bottom plumes confined to abyssal depths within the lease areas. In deep-sea settings, plume behavior is dominated by low-lying turbidity currents; in situ measurements show that only a small fraction of disturbed sediment rises ≥ 2 m above the bed for hours, with the majority remaining within 2 m and depositing locally, indicating limited vertical exposure to pelagic EFH occupied above ~200–1,000 m (Muñoz-Royo et al. 2022).

Potential biological consequences of elevated suspended sediment are well described from shallow-water studies. Responses scale with concentration and exposure duration, and include behavioral change, reduced feeding success in visual predators, and sublethal physiological stress (Newcombe and Jensen 1996; Wilber and Clarke 2001). Because the suspended sediment concentration in the deep sea is extremely low, small absolute increases can be proportionally meaningful (van der Grint and Drazen 2022). However, the Proposed Action’s preliminary activities disturb orders-of-magnitude less sediment than collector-vehicle mining tests, and the resulting plumes are localized at the seabed, making interaction with EFH used by eggs/larvae in the upper water column and by pelagic species in the epipelagic zone unlikely.

Within EFH/HAPCs that include deep-sea coral-sponge communities on seamount features, fine-particle deposition could impair filter feeders if work occurred directly atop sensitive patches; the analysis controls this risk through survey design and stipulations to avoid sensitive habitats and minimize slack line and contact duration (**Appendix B**).

Given the abyssal location of disturbance, the short duration and limited vertical extent of plumes, and implementation of BOEM BMPs, sediment resuspension and turbidity from preliminary activities would result in minimal adverse effects to EFH and, where present, HAPCs.

FAD Effect. Surface buoys and moored structures associated with preliminary oceanographic surveys can function as incidental FADs, temporarily aggregating pelagic fishes in the epipelagic to upper mesopelagic, where EFH for tunas and other managed species occurs (eggs/larvae ~0–200 m; juveniles/adults to ~1,000 m). Studies show that floating objects alter tuna movement and residency, with individuals exhibiting short transits and multi-day associations and residence times at anchored or drifting FADs often range from hours to several days and can extend longer depending on array density and local conditions (Dempster and Taquet 2005; Robert et al. 2013; Baidai et al. 2020; Pérez et al. 2020).

For this Proposed Action, at most four surface buoys would be deployed, and subsurface moorings, with taut configurations and limited slack, are expected to be more common in deep water, substantially reducing the visibility and aggregating potential compared to purpose-built FAD arrays. While localized increases in fish density around any surface buoy could briefly modify foraging or predator-prey interactions within Pelagic FEP EFH, the small number, short deployment durations, and lack of directed fishing effort at these buoys constrain the spatial and temporal footprint. Moreover, regional fishery bodies have discouraged fishing on data buoys, acknowledging their incidental FAD effect but managing access to minimize impacts (Morgan 2011).

Entanglement. Lines, chains, and ancillary attachments used to deploy buoys, moorings, landers, and UTP units could pose a limited entanglement hazard to large fishes in pelagic EFH, particularly mobulid rays and some sharks whose morphology or ram-ventilation behavior makes escape difficult once fouled. Documented cases of manta entanglement in mooring lines in the Maldives demonstrate how thin vertical lines can cause rapid mortality in obligate swimmers (Hilbourne and Stevens 2023), and sublethal injuries from fishing lines are among the most common anthropogenic wounds observed in manta populations (Strike et al. 2022). For sharks, large-scale entanglement has been associated with net-based drifting FADs rather than taut mooring lines. Silky shark mortality at FADs was a major concern a decade ago (Filmatler et al. 2013), but adoption of non-entangling designs has dramatically reduced ghost-fishing risk (Grande et al. 2025; International Seafood Sustainability Foundation 2025). Purse seine fisheries are not present in the proposed lease areas.

The Proposed Action differs materially from fisheries FAD deployments: moorings are few, deep, and configured to remain taut with minimal slack; no netting is used; and deployment/retrieval is controlled from vessels operating far offshore in abyssal waters. BMPs require the shortest practicable line lengths, rigid sleeves or weak links to prevent loops, slow and controlled lowering/raising, and real-time monitoring to halt operations if protected species are near the gear (**Appendix B**). These measures directly target the mechanisms implicated in manta/shark fouling and reflect current international best practice shown to lower entanglement risk at floating structures (Murua et al. 2016; Pilling et al. 2017).

Consequences to EFH are therefore expected to be limited to rare, localized encounters with individual animals in the pelagic water column; no alteration of EFH structure or function is anticipated, and benthic HAPCs (e.g., seamount coral/sponge communities) are avoided by design and proposed stipulation. Given the small number of moorings, deep deployments, and enforceable BMPs, the entanglement IPF would be temporary and unlikely to cause population-level effects. BOEM concludes the proposed activities would result in minimal adverse effects to EFH and, where present, HAPCs.

Marine Debris. Observations from previous ROV dives indicate that the highest density of deep-sea debris in the Central and Western Pacific was recorded within the American Samoa EEZ (Amon et al. 2016).

Marine debris associated with preliminary activities could arise from the accidental loss of small components (e.g., lines, shackles, floats) during deployment, operation, or retrieval of buoys, moorings, landers, and UTP units. Lost items may pose entanglement risks to large pelagic fishes that use the epipelagic EFH, including mobulid rays and sharks; sublethal injuries and impaired feeding from line fouling are widely documented across taxa (Boerger et al. 2010; Cole et al. 2013; Rochman et al. 2013; Kühn et al. 2015; Watts et al. 2015). Although these studies primarily address coastal and surface-water debris, they highlight mechanisms, such as entanglement, ingestion, and contaminant transfer, that can occur wherever debris intersects EFH.

The Proposed Action incorporates multiple, enforceable BMPs that substantially limit debris generation and persistence. Marine Trash and Debris Prevention requires annual training, labeling of gear, immediate recovery efforts, monthly reporting, and 48-hour incident reports for potentially harmful losses, coupled with recovery plans and time-bound retrieval (**Appendix B**). Moreover, taut-line configurations, shortest practicable line lengths, rigid sleeves/weak links are mandated to prevent loops, controlled lowering/raising, and real-time observation during deployment/retrieval, reducing the primary pathways for entanglement and gear loss. These measures complement MARPOL Annex V and related prohibitions on persistent solid waste discharge.

Operational context also constrains risk. Work occurs in deep, remote waters with a small number of moored structures and defined retrieval procedures for any lost equipment (“Lost Survey Equipment”), limiting debris inputs and enabling targeted recovery. Sensitive HAPCs (e.g., shallow seamount coral/sponge assemblages) are avoided by siting and stipulation. Debris introduction into those habitats is therefore unlikely, and any incident would trigger notification, reporting, and corrective actions under **Appendix B** within the Protection of Biological Resources.

Considering the limited scale of activities, stringent training, labeling and recovery requirements, and engineering controls that minimize slack and snagging, potential debris-related effects are expected to be rare, localized, and short-lived. The Proposed Action would not measurably alter EFH function or HAPC condition. BOEM concludes that risk of introducing marine-debris associated with the Proposed Action will result in minimal adverse effects on EFH and, where present, HAPCs.

Noise. Underwater sound from survey vessels, HRG systems (e.g., multibeam echosounders, ADCPs, USBL), AUV/ROV operations, and routine vessel transits constitute a potential impacting factor for EFH across pelagic and demersal habitats. Fishes primarily detect particle motion, with pressure sensitivity enhanced in some taxa via swim-bladder and ear specializations. Relevant biological effects include masking, behavioral change, stress, temporary threshold shift, and, at very close ranges, injury (Popper and Fay 2011; Popper et al. 2014; Hawkins and Popper 2017; Popper and Hawkins 2019). Because particle motion, not pressure, is the dominant cue for most fishes and is rarely measured, conservative assessment is warranted. For example, indirect inference from pressure is often invalid in shelf seas and shallow waters (Nedelec et al. 2016).

The Proposed Action limits acoustic sources to Tier-4 *de minimis* HRG systems and explicitly excludes boomers, sparkers, and other low-frequency impulse sources. BOEM’s classification and equipment list indicate primarily high-frequency, directional tools whose attributes (frequency, beamwidth, duty cycle) reduce the likelihood of fish exposure above behavioral thresholds (Crocker et al. 2019; Ruppel et al. 2022). In deep pelagic EFH (Pelagic FEP) and over abyssal plains of the lease areas, these sources

are expected to elicit, at most, short-lived, localized behavioral responses and no population-level impacts are anticipated. Avoidance of HAPCs (e.g., seamount coral/sponge communities) further reduces risk. Sound exposure from the project's HRG use would be intermittent and brief, with BMP-required clearance/shutdown procedures for any non-*de minimis* configuration providing additional safeguards (**Appendix B**).

Marine vessel noise during transits is predominantly low-frequency cavitation noise (<1 kHz), which can propagate widely and contribute to ambient conditions that mask biologically relevant cues (McKenna et al. 2012a; Erbe et al. 2019). Regional studies show shipping raises low-frequency levels by >10–15 dB during high-traffic periods (McKenna et al. 2012b; ZoBell et al. 2024), but changes scale with ship counts as incremental noise from the limited number of project vessel trips is expected to be small relative to existing traffic in the American Samoa–Hawai'i–U.S. West Coast corridors (McKenna et al. 2012b; ZoBell et al. 2024). BMPs require slow speeds, routing awareness, and monitoring, which are measures that reduce source levels and audibility ranges (**Appendix B**).

For fishes, sensitivity is greatest at lower frequencies and near sources, and high-frequency MBES/sonars potentially used in the Proposed Action are generally above the hearing range of many EFH species, while directional beams and short pings limit exposure duration (Hastings and Popper 2005; Popper et al. 2014; Crocker et al. 2019). Where hearing-specialist clupeids or CPS species occur in West Coast EFH, the dominant risk is masking from continuous vessel noise rather than brief HRG signals. Minimizing speed and avoiding prolonged engine loads in sensitive areas mitigates this concern (McKenna et al. 2012b; Popper and Hawkins 2019).

Acoustic-risk controls include: (i) use of Tier-4 *de minimis* sources; (ii) submission of survey-equipment parameters for BOEM review; (iii) clearance/shutdown procedures where warranted; and (iv) speed management and observer protocols during transits. These measures align with best available science on fish bioacoustics and reduce the probability of adverse effects to EFH/HAPCs (Popper et al. 2014; Ruppel et al. 2022).

In conclusion, given the limited duration and number of acoustic activities, the exclusion of low-frequency impulse sources, implementation of BMPs, and the deep, remote setting of lease-area operations, noise-related effects are expected to be localized, short-term, and not measurably alter EFH function or HAPC condition in either the lease areas or transit corridors. The Proposed Action would result in minimal adverse effects to EFH and, where present, HAPCs.

Artificial Light. Artificial light associated with night operations on vessels, buoys, AUV/ROV platforms, and work decks can alter underwater lightscapes and disrupt diel vertical migration (DVM), a process that structures pelagic EFH by governing predator-prey encounters and carbon flux. Experimental work during polar night shows that standard ship working-lights change fish and zooplankton behavior down to at least 200 m and over areas >0.125 km², indicating sensitivity of pelagic communities to point sources of illumination (Berge et al. 2020). Light-defined isolumens vertically organize zooplankton on diel to seasonal timescales and shifting light levels can compress or displace the migrating layer, with potential knock-on effects for visually hunting fishes that occupy EFH in the upper 200–1,000 m (Hobbs et al. 2021).

Across marine ecosystems, artificial light at night is recognized to inhibit zooplankton DVM, alter predation rates, and change community interactions; these effects are most pronounced near light sources and

depend on intensity, spectrum, and exposure duration (Davies et al. 2014; Marangoni et al. 2022). Pelagic fishes are highly responsive to light intensity, with activity and dispersion varying predictably across day–night transitions which suggests that artificial lighting can therefore modify local schooling, foraging, and energy budgets, but impacts diminish rapidly with distance and depth (Didrikas and Hansson 2009; Kaartvedt et al. 2019).

Within the Proposed Action, lighting is limited in scope and duration: work occurs in remote, deep waters; operations are intermittent; and HRG surveys rely primarily on acoustic rather than flood-lighting. Survey planning, speed management, and avoidance of HAPCs on shallow banks or seamount flanks further reduce the likelihood that artificial light intersects sensitive coral/sponge assemblages designated as HAPCs.

Considering the small number of illuminated assets, the brief use, and deep settings, any light-induced changes to pelagic EFH (e.g., transient layer displacement, local behavior shifts) would be short-lived, spatially limited, and not measurable at EFH/HAPC scales in either lease areas or transit corridors. The Proposed Action is therefore expected to have minimal adverse effects on EFH and, where present, HAPCs.

EMF Alteration. EMFs introduced by marine activities can affect taxa that use electro- or magneto-reception for orientation and foraging (e.g., elasmobranchs, some teleosts, invertebrates). Laboratory and field studies near energized subsea power cables show behavioral responses such as attraction or altered movement in skates and lobsters, though population-level impacts have not been demonstrated (Normandeau Associates Inc. et al. 2011; Hutchison et al. 2020). Evidence for benthic invertebrates indicates limited or no adverse effects under static magnetic exposures orders of magnitude higher than natural geomagnetic variation (Bochert and Zettler 2004). Reviews conclude that responses are species-, life stage-, and exposure-dependent, with greatest concern focused on high-capacity AC/DC transmission cables rather than low-power scientific devices (Gill et al. 2014; Albert et al. 2020; Naisbett-Jones and Lohmann 2022).

Under the Proposed Action, EMF sources are limited to vessel/ROV electronics, seafloor transponders used for navigation (USBL/LBL), ADCPs, and other low-energy equipment deployed intermittently and at depth; magnetometers, if present, are passive sensors. These emissions are highly localized compared to subsea power transmission, and operations avoid medium-penetration HRG sources and export-cable infrastructure. EFH most plausibly intersected includes pelagic EFH within the upper 1,000 m and deep benthic features that may qualify as HAPCs (e.g., coral/sponge communities on seamount flanks), but any EMF-related effects would be limited to short-duration, small spatial scales at device proximity, with no mechanism for broad habitat alteration.

BMPs in the lease stipulations further constrain risk by restricting work to low-energy, *de minimis* equipment, requiring survey plan review with equipment specifications, and avoiding sensitive benthic habitats during seafloor device placement. In combination with deep-water settings, sparse assets, and intermittent use, these measures ensure that potential EMF interactions with electro/magneto-sensitive species within EFH and any HAPCs encountered remain minimal. Based on the small number and low power of EMF-emitting devices, their limited deployment, and enforceable BMPs, the Proposed Action is expected to result in minimal (i.e., insignificant) effects to EFH and, where present, HAPCs.

Vessel Strike. Vessel strikes occur when boats collide with marine animals; although most literature emphasizes whales, collisions affect at least 75 species, including some large sharks and mobulid rays that spend prolonged periods near the surface for feeding or cleaning, increasing exposure to traffic (Schoeman et al. 2020). Propeller and blunt-force injuries to reef manta rays (*Mobula alfredi*) have been documented and can heal rapidly, which may mask strike prevalence in photo-ID datasets (McGregor et al. 2019). Regional analyses show anthropogenic injuries, including boat strikes, are concentrated at sites with heavier tourism and vessel activity; for *M. alfredi* in the Maldives, injury likelihood was higher at cleaning stations and populated atolls (Strike et al. 2022), and in French Polynesia the majority of sub-lethal injuries at inhabited islands were consistent with propeller strikes (Carpentier et al. 2019).

For large sharks, global tracking and AIS data indicate extensive overlap with large-vessel traffic ($\approx 92\%$ of horizontal space use), with modeled collision-risk hotspots in major shipping corridors where collisions are often undetected and can be lethal (Womersley et al. 2022). Collectively, these studies demonstrate that pelagic EFH in the upper water column, often used by manta rays and sharks for feeding, cleaning, and migration, can be affected by vessel strike, while deeper HAPCs (e.g., seamount flanks supporting coral/sponge communities) are not exposed.

Under the Proposed Action, survey vessels tow equipment slowly ($\approx 4\text{--}6$ kn) and operate in remote, deep OCS waters far from nearshore aggregation sites, with limited trips and intermittent presence. Risk is further reduced by enforceable BMPs : speed limits ≤ 10 kn when feasible and slower when mammals and turtles are spotted, continuous monitoring and strike-avoidance zones around whales and other protected species, and use of trained Protected Species Observers within the potential lease areas with authority to slow/stop operations (**Appendix B**). Lower speeds are consistently linked to lower lethality in vessel-animal interactions, especially for medium vessels typical of survey fleets (Garrison et al. 2025).

Considering slow operational speeds, low vessel density, remote deep-water settings, and application of BMPs to detect and avoid animals, any strike-related effects on pelagic EFH used by manta rays and sharks would be short term and highly localized. Effects on HAPCs, if present along transit routes, are unlikely. The Proposed Action is expected to result in minimal adverse effects to EFH (and HAPCs, if applicable).

Oil Spills. Accidental releases of petroleum products from survey vessels could affect EFH, particularly pelagic spawning habitats where fish eggs and larvae are highly sensitive to PAHs. Experimental exposures to crude oil from *Deepwater Horizon* caused dose-dependent cardiotoxicity and developmental defects in embryos of tunas and amberjack at environmentally realistic PAH concentrations, indicating elevated mortality risks for early life stages in surface waters used as EFH (Incardona et al. 2014). Field studies in oiled marshes likewise documented persistent sublethal physiological and reproductive impairment in resident fishes despite low hydrocarbon residues, underscoring that even weathered oil can produce biologically meaningful effects (Whitehead et al. 2011). Reef-associated corals are also vulnerable: laboratory tests show condensate and aromatic hydrocarbons can inhibit coral larval metamorphosis at concentrations measured after large spills, with ultraviolet light amplifying toxicity; fertilization and settlement of *Acropora* spp. are inhibited by dispersed oils at sub-mg L⁻¹ levels, which could degrade coral-reef HAPCs if exposure coincides with spawning (Negri and Heyward 2000; Negri et al. 2016). Long-term ecosystem syntheses following major spills further demonstrate persistent, indirect and chronic effects that can delay recovery of coastal communities (Peterson et al. 2003).

For this Proposed Action, the plausible spill scenario is limited to small volumes of marine diesel or lubricants from a small number of slow-moving vessels conducting intermittent deep-water operations far offshore. Diesel weathers and disperses rapidly, and small spills at sea typically evaporate and dilute within days; acute toxicity arises mainly where entrainment exposes organisms directly, especially in surface layers (NOAA guidance). The Action includes enforceable BMPs that minimize spill likelihood and consequence: a site-specific Spill Prevention and Response Plan, a Contingency Plan defining operational limits and response authority, and marine-debris/contamination controls (**Appendix B**). These measures require immediate reporting, containment, and recovery where feasible, with emphasis on preventing releases during fueling and deck operations and curtailing activities under adverse conditions.

Given the remote location, deep-water setting, low traffic, limited fuel inventories, and implementation of BMPs, any accidental release would be short-lived, spatially constrained, and unlikely to overlap temporally with sensitive spawning events or coral recruitment. Therefore, effects on pelagic EFH would be brief and localized, and exposure pathways to reef HAPCs along transit routes are improbable. Conclusion: the Proposed Action is expected to result in minimal adverse effects to EFH (and HAPCs, if present).

Invasive Species. The principal pathway of potential invasive species effects is translocation of non-indigenous organisms and pathogens via vessel biofouling (hulls, niche areas, moorings) and equipment moved between regions; ballast water is a secondary pathway (Ruiz et al. 2000; Molnar et al. 2008). Biofouling transfers diverse taxa and associated microbes across bioregions, and even limited project fleets can act as vectors if proactive management is absent (Davidson et al. 2016; Georgiades et al. 2021). Observation-class ROV/AUV systems can also carry fouling biota unless cleaned between sites (Thaler et al. 2015).

Within the Action Area, pelagic EFH (eggs/larvae in the upper water column; juveniles/adults to ~1,000 m) and coral-reef EFH/HAPCs near American Samoa could be affected if biofouling organisms detach and colonize suitable near-surface habitats; precious-coral HAPCs are sensitive to introductions that alter benthic community structure (see EFH descriptions). Risk is moderated by the deep-water location, small number of vessels, and remote operations far offshore of Rose Atoll.

The project will implement a biofouling-management approach consistent with the IMO 2023 Biofouling Guidelines (MEPC.378(80)), including voyage-planning to avoid high-risk stops, selection/maintenance of effective antifouling systems, regular inspection of hull/niche areas, and avoidance of uncontained in-water cleaning (Davidson et al. 2016; International Maritime Organization 2023). ROV/AUVs will be inspected and cleaned of all organic material prior to each deployment, with pre-/post-dive checks and decontamination when moving between sites (C.2.8; Thaler et al. 2015). Where cleaning is required, capture systems or shore-based facilities will be used to prevent release (Davidson et al. 2016; International Maritime Organization 2023). The BMPs also require marine-debris prevention, spill contingency, and protected-species observers—reducing ancillary vectors (**Appendix B**).

Given the deep, remote setting, limited surface infrastructure, and enforceable BMPs for hull/equipment biofouling and debris control, the probability of successful introduction, establishment, and spread of non-indigenous species or pathogens is low. Any effects on pelagic EFH or coral-reef/precious-coral HAPCs would be short-term and localized. The Proposed Action is expected to result in minimal adverse effects to EFH (and HAPCs, if applicable).

7.6 Cumulative Analysis

This section describes the projects and activities considered in the cumulative analysis for the Proposed Action. Possible sources of cumulative impacts specific to managed species and EFH are those that degrade the environment via one or more of the IPFs discussed in previous sections.

BOEM considered activities that may spatially and temporally overlap with proposed activities and lease areas. They include seabed mineral development, commercial fishing, marine vessel traffic, nonpoint sources of ocean discharges. Dynamic oceanographic and climate conditions are also considered. Potential cumulative impacts are discussed below.

Seabed Mineral Development. The Cook Islands' EEZ, which is adjacent to the proposed lease areas, harbors an estimated 6.7 billion tonnes of polymetallic nodules that are rich in cobalt, nickel, manganese, copper, and rare earths. To date, three companies hold exploration licenses, but no commercial mining is underway. Over the next five years, the Cook Islands are expected to collaborate with international partners to continue exploration and baseline science, but commercial extraction is unlikely within this timeframe, with full-scale operations tentatively scheduled for post-2032 pending further approvals.

Commercial Fishing. Commercial fishing activity occurs throughout the American Samoa EEZ. Commercial fishing is the most widespread human exploitative activity in the marine environment, generating significant impacts to habitats and populations (Jennings and Kaiser 1998). Proposed activities would only incrementally add to the impacts relative to fishing, and those impacts would be temporary.

Marine Vessel Traffic. Commercial shipping has seen rapid growth in recent years and is expected to increase (Kaplan and Solomon 2016). The Action Area is adjacent to a maritime traffic corridor (**Figures 1 and 3**). Noise from this shipping traffic can vary considerably according to regulatory and economic events (McKenna et al. 2012b), but it is an ongoing activity that occurs throughout the year. The proposed activities are only expected to produce a temporary increase in anthropogenic sound in the Action Area.

Nonpoint Source Discharges. Turbidity can increase in marine environments from terrestrial runoff, especially during storm events. The nearest nonpoint sources of pollution are rivers and creeks which empty into the ocean along the mainland coast. The proposed activities are only expected to produce a temporary and incrementally small increase in turbidity within the Action Area.

Dynamic Oceanographic and Climate Conditions. Dynamic oceanographic and climate conditions may have significant impacts to marine life stemming from large shifts in ocean temperature, circulation, stratification, nutrient input, oxygen content, and ocean acidification (Doney et al. 2012; Penn and Deutsch 2022). In the short term, the minimally adverse consequences from project activities shall incrementally and temporarily increase the negative pressures faced by marine life and habitats that are experiencing these dynamic conditions.

Cumulative Conclusion

The impacts from the IPFs associated with project activities would be temporary and incremental and will not generate population-level consequences to managed species. Only minor adverse effects to EFH are expected, and these will be reduced through implementation of BMPs.

7.7 EFH Conclusion

Based on a comprehensive review of the proposed preliminary activities for commercial mineral leasing offshore American Samoa, and a synthesis of the best available scientific information, the BOEM concludes that the Proposed Action will result in minimal adverse effects to EFH and, where present, HAPCs.

The analysis demonstrates that the spatial and temporal footprint of all project activities, including seafloor sampling, mooring and lander deployment, vessel operations, and associated support actions, will be extremely limited relative to the vast lease areas and the dynamic, deepwater environment in which they occur. Direct disturbance to benthic habitats is restricted to small, discrete patches on abyssal plains, well below the depth range of demersal EFH and outside the core usage zones for pelagic EFH. The areal extent of seafloor disturbance is orders of magnitude too small to generate population-level impacts or compromise EFH functions at the regional scale. Where seamount flanks or other features with EFH/HAPC designations may be present, avoidance measures and operational controls are in place to prevent significant interaction.

Potential indirect effects, such as sediment resuspension and turbidity, are predicted to be short-lived and highly localized, with negligible vertical transport into the water column zones where pelagic eggs, larvae, and juveniles reside. The best available evidence from deep-sea plume studies and shallow-water sediment impact research supports the conclusion that the magnitude and duration of any such effects are insufficient to cause measurable harm to EFH or HAPC resources.

Other potential impacting factors, including the FAD effect, entanglement, marine debris, noise, artificial light, EMF alteration, vessel strike, oil spills, and invasive species, have each been evaluated in detail. The analysis incorporates peer-reviewed literature on the ecological mechanisms and sensitivities relevant to each IPF, with special attention to vulnerable taxa such as manta rays, sharks, and coral communities. In every case, the combination of project design, operational protocols, and enforceable BMPs ensures that risks are minimized. These BMPs include, but are not limited to, pre-survey planning and habitat avoidance; use of non-entangling mooring designs; strict marine debris prevention and recovery protocols; vessel speed limits and protected species observer requirements; downward-directed and shielded lighting; EMF minimization through low-power, intermittent use of scientific equipment; spill prevention and response planning; and comprehensive biofouling management to prevent invasive species introductions.

The cumulative analysis further supports the conclusion that, even when considered in the context of other ongoing and reasonably foreseeable activities in the region (such as commercial fishing, shipping, and potential future mineral development), the incremental contribution of the Proposed Action to overall EFH risk is minor and temporary. The deep, remote setting, limited number of assets, and robust mitigation framework collectively ensure that the structure, function, and ecological integrity of EFH and HAPCs will be maintained.

In summary, BOEM determines that the Proposed Action, as described and conditioned by the full suite of BMPs, will have minimal adverse effects on EFH and HAPCs.

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Appendix A: Bureau of Ocean Energy Management Identification and Survey Assumption Memorandums



United States Department of the Interior
BUREAU OF OCEAN ENERGY MANAGEMENT
Pacific OCS Region
760 Paseo Camarillo, Suite 102
Camarillo, CA 93010-6064

Memorandum

To: Matthew N. Giacona
Acting Director

From: Douglas P. Boren
Regional Director, Pacific Regional Office

Subject: Area Identification Recommendation for the American Samoa Outer Continental Shelf (OCS) Mineral Leasing Process

DOUGLAS
BOREN

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DOUGLAS BOREN
Date: 2025.10.15
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Area Identification (Area ID) is a major step in the Bureau of Ocean Energy Management's (BOEM) Outer Continental Shelf (OCS) mineral leasing process to develop a recommendation for an area to be carried forward for further leasing consideration and environmental analysis offshore American Samoa. Pursuant to 30 CFR 581.14, after considering the available OCS mineral resources, environmental data, and information, and the comments received from interested parties, including through the Request for Information and Interest (RFI), BOEM recommends tracts to be considered for a proposed lease offering. The recommended tracts would be considered in the forthcoming environmental analysis conducted for the activities that would be permissible under the proposed lease offering.

This memorandum documents your Area ID decision in accordance with 30 CFR 581.14. As noted above, your decision identifies the tracts to be carried forward for further leasing consideration and environmental analysis. The Area ID decision is not a final decision to lease nor is it an irreversible or irretrievable commitment of resources. The Area ID decision to support a potential OCS mineral lease sale offshore American Samoa is documented by your signature and marking your choice on the last page of this memorandum. A copy of this memorandum and the associated attachment will be made available on BOEM's website for public viewing and downloading.

I. Background

On April 8, 2025, BOEM received an unsolicited request from Impossible Metals Inc., for OCS minerals to be offered for lease in an area offshore American Samoa. After reviewing the request, BOEM determined it was appropriate to initiate the first steps that could potentially lead to a lease sale and on June 16, 2025, BOEM issued an RFI for commercial leasing for OCS seabed critical minerals offshore American Samoa ([90 Fed. Reg. 25,369](#)). The RFI requested information and comments on, and indications of interest in, the leasing of OCS minerals in and around the RFI Area. The RFI Area is the area of interest identified in the unsolicited lease sale request, located near the eastern limit of the American Samoa OCS bordering the Cook Islands Exclusive Economic Zone. It comprises approximately 18.1 million acres (73,222 square

kilometers [km²]) with approximate water depths ranging from 4,600–20,000 feet (1,400–6,000 meters). BOEM considered available OCS mineral resources, environmental data, and information and interest received in response to the RFI when considering whether to proceed with additional steps leading to a potential OCS mineral lease sale offshore American Samoa.

II. Comments Received in Response to the RFI

In response to the RFI, BOEM received comments both opposing and supporting the proposed commercial lease sale in and around the RFI Area. BOEM received a total of 76,443 public comment submissions in response to the RFI. Of the total 76,443 public submissions, 1,085 were identified as unique, 73,586 copies were associated with 27 form letter campaigns, and 1,772 were considered duplicate or not germane. Pursuant to 30 CFR 581.14, BOEM considered these comments in developing an Area ID recommendation for a proposed lease sale for OCS minerals offshore American Samoa. **Attachment 1 provides an RFI comment summary.** Key highlights of the comments received are noted below:

- Governor Pulaali'i Nikolao Pula communicated that key leaders of the American Samoa Government reached a unified position of opposition to the proposed commercial leasing within the American Samoa EEZ, consistent with the concerns raised by residents and traditional leaders.² The Governor also indicated that the American Samoa Government continues to support collaboration and open dialogue with the Department of the Interior (DOI) and BOEM. He urged BOEM to fully consider the territorial moratorium on seabed mining and opposition to commercial leasing in the territory's EEZ, requested that no activity proceed without territorial consent, and emphasized collaboration grounded in environmental integrity, scientific integrity, and equitable consultation.
- American Samoa Congresswoman Uifa'atali Aumua Amata Coleman Radewagen requested all OCS mineral activities occur at least 50 miles from any of the islands of American Samoa, Rose Atoll, and Swains Island.
- Commenters raised environmental concerns related to the potential impacts to marine ecosystems, fisheries, and biodiversity; potential impacts from sediment plumes; potential disruption of food webs, habitat fragmentation and destruction, and impacts to coastal resilience; and potential impacts to fish populations, migration patterns, and breeding grounds, which could affect economically important species, such as tuna.
- Commenters requested that comprehensive environmental studies be conducted before issuing a lease, including baseline studies, full environmental surveys, comprehensive science-based environmental assessments, impact modeling, an assessment of onshore and offshore logistical impacts, and a Programmatic Environmental Impact Statement for all potential exploration, development and production activities, and that any future exploration be Indigenous-led, science-based, and subject to transparent environmental safeguards aligned with global best practices.
- Commenters expressed concerns about cross-boundary effects on the Cook Island waters, Tonga's tourism and economy, and the impacts on sea life within the Phoenix Island Protected Area.

² American Samoa Government - PR001-06232025. Leadership United: Governor and Lieutenant Governor Lead Unified Effort on Seabed Mining. June 23, 2025. <https://www.americansamoa.gov/leadershipunited>.

- Commenters raised cultural concerns that the waters off American Samoa hold deep cultural significance for Pacific Islanders and are integral to Fa'a Samoa, the Samoan way of life.
- Commenters also raised concerns about possible impacts to underwater cultural heritage, traditional use areas, and the ability to continue practicing sacred cultural practices that could be sensitive to potential environmental impacts.
- Commenters stated that meaningful consultation with the Indigenous communities of American Samoa and the American Samoa Government should be conducted before any leasing process is considered.
- Commenters emphasized that the American Samoan economy relies on tuna fishing, tuna fish processing, and related industries, which provide significant employment and food security and support the local economy and livelihoods.
- Commenters raised socioeconomic concerns related to the current federal framework which they stated offers no guaranteed benefit to the local communities and the people of American Samoa and violates Indigenous rights and Pacific Island sovereignty, and requested to incorporate revenue sharing agreements for all leases, royalties, and profits with American Samoa which could support local communities and strengthen economic resilience.
- Commenters from the deep-sea mining industry provided recommendations on royalty rates and rental payments, auction formats, lease size, and lease contraction. Other non-industry commenters suggested a lease contraction process under certain circumstances, disagreed with suspension of rental payments, and recommended a benchmarking review of royalties in other jurisdictions, including the International Seabed Authority, the Cook Islands, and relevant onshore regimes.
- Commenters raised concerns that deep-sea mining faces uncertain economic viability due to current mineral prices, emerging alternatives and recycling, untested technology, and the lack of a U.S. processing and supply chain for critical minerals.
- Commenters advocated for a balanced approach with the recommendation that facts be gathered, risks assessed, and exploration of whether deep-sea mining can be pursued responsibly to secure a diversified, sustainable future for the territory.

III. Indications of Interest Received in Response to the RFI

BOEM received comments from industry and industry groups expressing interest in the OCS mineral leasing process offshore American Samoa. In addition to Impossible Metals Inc. confirming their interest in leasing, BOEM received indications of interest from several other companies in response to the RFI. Several indications of interest identified preferences for areas in and around the RFI Area and for expanding the area of consideration to the southwest of the RFI Area, as shown in the Indications of Interest Heat Map (Figure 1).

Collectively, the indications of interest are entirely encompassed by the available acreage/blocks in the Area ID recommendation. Indications of interest and comments identified polymetallic nodules deposits as the primary target for commercial development due to their potential to contain commercially viable quantities of cobalt, nickel, copper, manganese, zinc, rare earth elements, and other minerals that may prove economically viable to extract and process in the future.

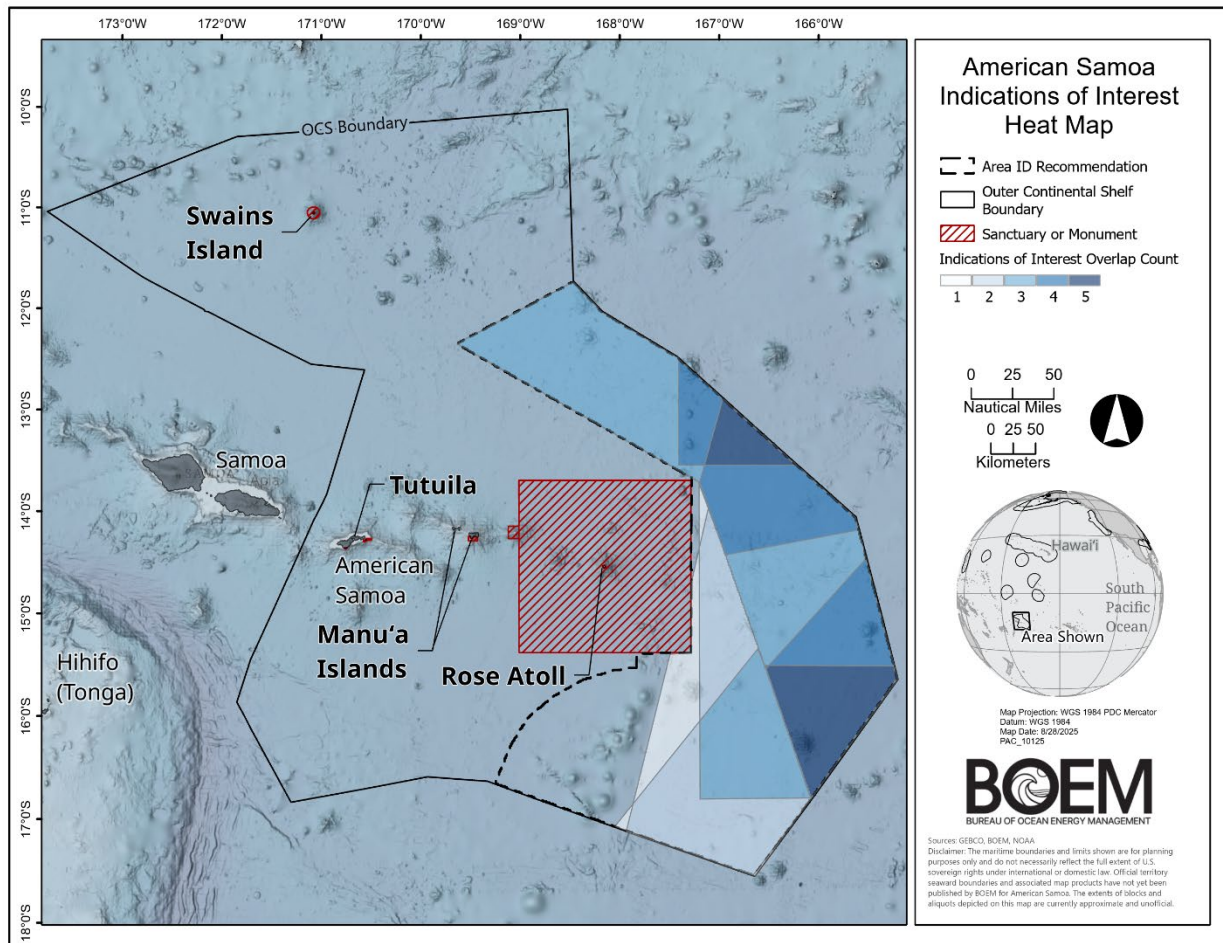


Figure 1: Indications of Interest Heat Map. The highest priority areas are shown as dark blue, lower priority areas shown in lighter shades of blue, and the lowest priority area shown in white.

IV. Recommendation

In formulating the Area ID recommendation, BOEM considered the available OCS mineral resource information, environmental data and information, comments received in response to the RFI, and indications of interest in OCS mineral leasing. The presence of any minable orebody is unknown, and additional prospecting is needed to discover and delineate OCS minerals, hence, the size of the tracts for potential leasing is relatively large. The recommended area is consistent with indications of interest and prospective seabed mineral regions identified by the U.S. Geological Survey (USGS) in and around the RFI Area for ferromanganese crusts and polymetallic nodules, as shown in the American Samoa Marine Minerals Prospective Regions

Map (Figure 2), which is based on the USGS Global Marine Mineral Prospective Regions Map.³ With the inclusion of potentially available OCS mineral resources and the indications of interest, the recommended area is approximately 15,000,000 acres larger than the RFI Area. The selected tracts will be considered in the environmental analysis conducted for the proposed lease offering and BOEM will consider available environmental information and comments received through the RFI that inform the environmental review of activities permissible under a lease which are preliminary activities⁴ needed to prepare plans for comprehensive technical and environmental review by BOEM. The comments received in response to the RFI will also inform future project specific environmental analysis if leases are issued and plans are submitted by lessees for work under their lease.

We recommend that you consider for potential leasing and environmental analysis all available blocks within the American Samoa RFI Area plus an additional contiguous area to the southwest of the RFI Area that extends to the southern boundary of the EEZ, as shown in the American Samoa Area ID Map (Figure 3). This Area ID recommendation constitutes an area of approximately 6,069 whole and partial blocks covering approximately 33,136,060 acres. This Area ID recommendation does not commit DOI to future leasing or a specific number of blocks or acreage to be offered at the lease sale stage.

- This Area ID recommendation provides flexibility as BOEM completes the required consultations, environmental analyses, and development of reasonable alternatives pursuant to NEPA and other statutes.
- The environmental analysis, which will be completed before making any decisions to hold a lease sale, will inform potential exclusions and mitigations that can be applied to leases issued in an American Samoa OCS mineral lease sale.
- The process allows for consultation with Indigenous communities of American Samoa that gives meaningful consideration to local concerns and respects self-governance.
- This Area ID recommendation is consistent with a request from American Samoa Congresswoman Aumua Amata Coleman Radewagan to ensure that any potential OCS mineral activities be located no closer than 50 miles from the islands of American Samoa, Rose Atoll, and Swains Island.

³ USGS Coastal and Marine Hazards and Resources Program. Global Marine Mineral Prospective Regions Map. January 31, 2025. <https://www.usgs.gov/media/images/global-marine-mineral-prospective-regions-map>.

⁴ Preliminary activities are bathymetric, geological, geophysical, mapping, and other surveys necessary to develop a comprehensive Delineation, Testing, or Mining Plan. 30 CFR 582.21(d).

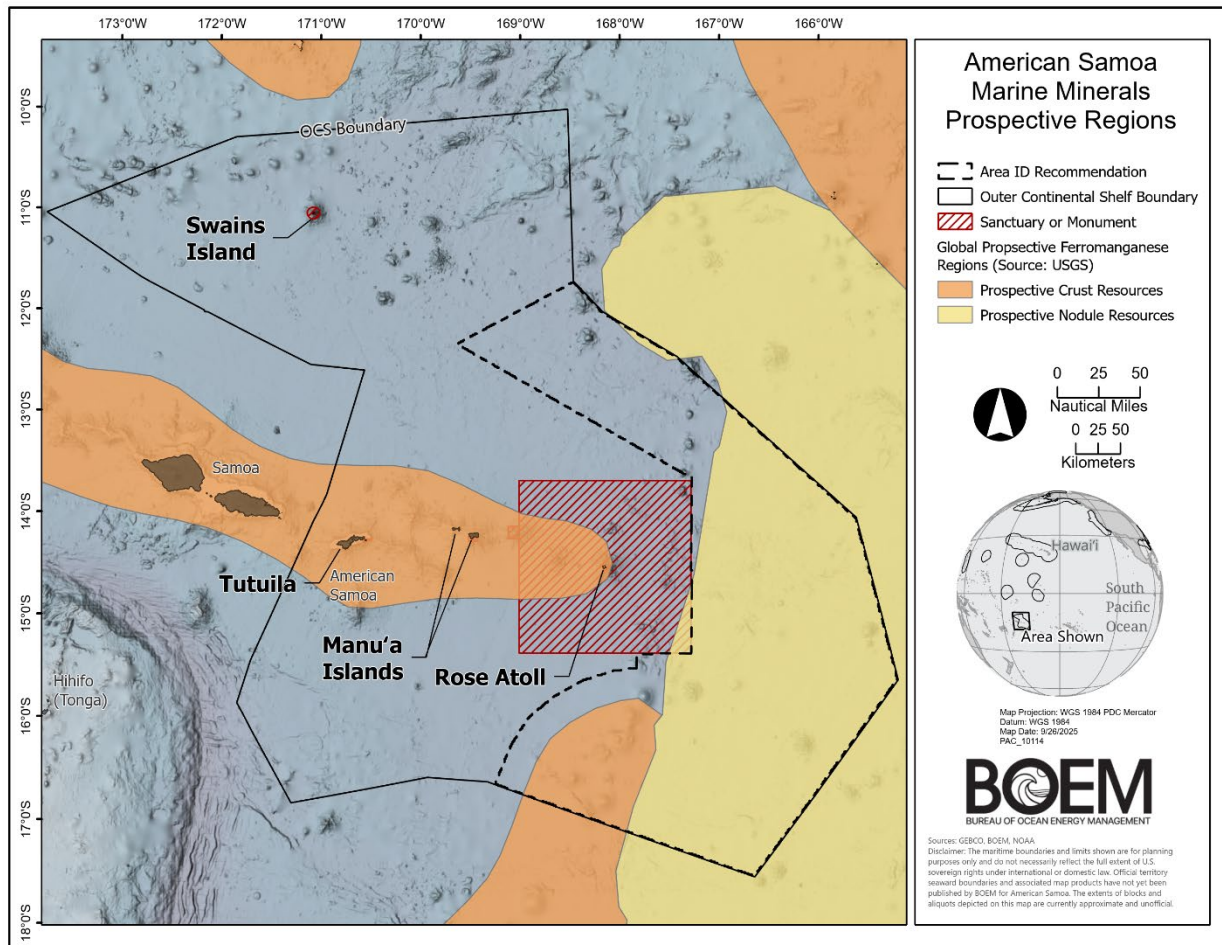


Figure 2: American Samoa Marine Minerals Prospective Regions Map. Global prospective ferromanganese regions for crusts are shown in orange, and prospective ferromanganese regions for nodules are shown in yellow, based on the USGS Global Marine Mineral Prospective Regions Map.⁵

⁵ USGS Coastal and Marine Hazards and Resources Program. Global Marine Mineral Prospective Regions Map. January 31, 2025. <https://www.usgs.gov/media/images/global-marine-mineral-prospective-regions-map>.

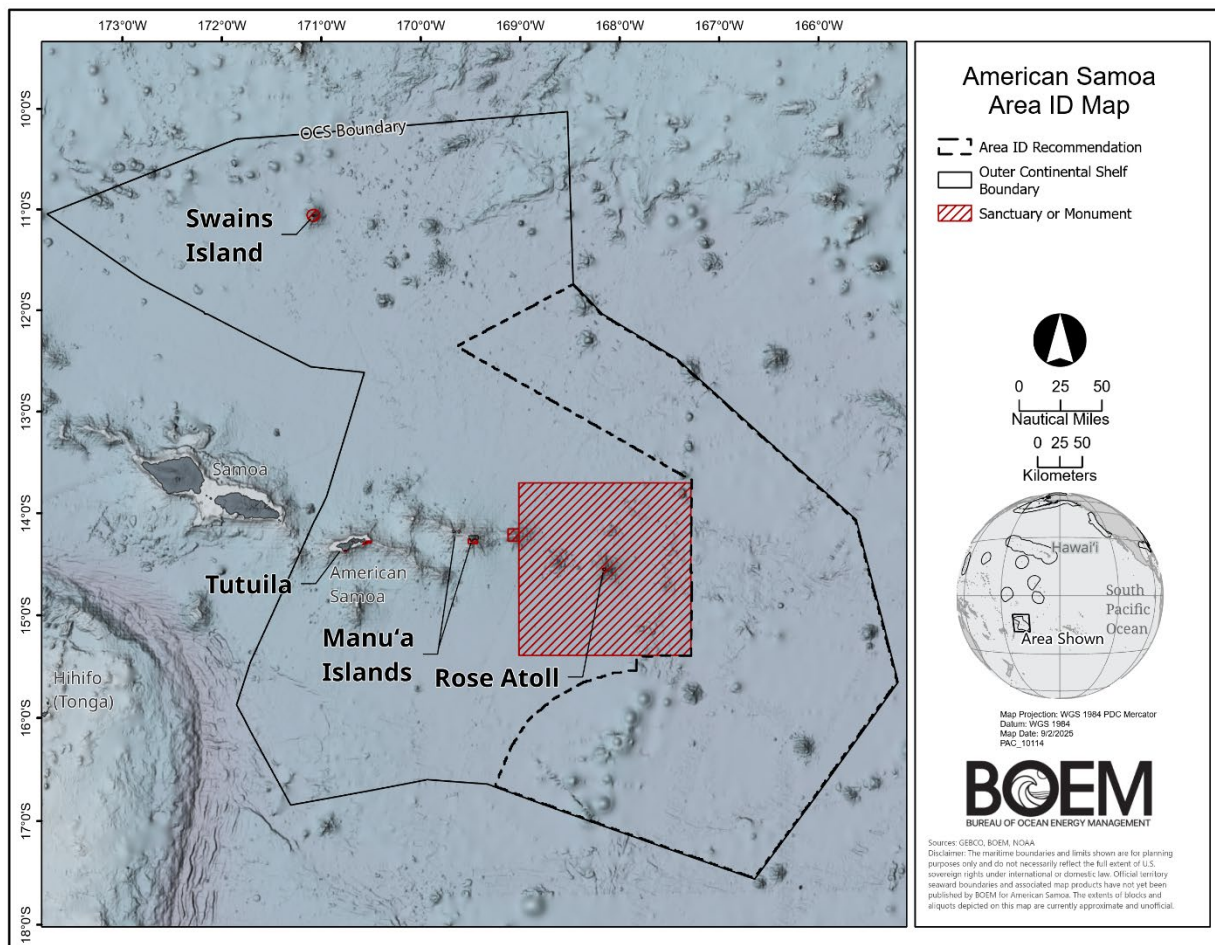


Figure 3: American Samoa Area ID Map.

V. Decision Options

Please indicate your decision by signing and dating this memorandum and marking appropriately below:

- ☒ I concur with the recommendation. Please continue with the Area ID announcement.
- ☐ I have made edits to modify the Area ID recommendation; please finalize and continue with the Area ID announcement.
- ☐ Please stop preparations for the Area ID announcement.

MATTHEW
GIACONA

Digitally signed by
MATTHEW GIACONA
Date: 2025.10.15
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Matthew N. Giacona
Acting Director
Bureau of Ocean Energy Management

Attachment 1. BOEM American Samoa Request for Information and Interest (RFI) Comment
Summary

*U.S. Department of the Interior
Bureau of Ocean Energy Management*

**BOEM Commercial Leasing for Outer Continental
Shelf Minerals Offshore American Samoa
Request for Information and Interest
Public Comment Period**

Docket BOEM-2025-0035

Summary Report

September 29, 2025

**Prepared by
ICF**

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Introduction

On April 8, 2025, the Bureau of Ocean Energy Management (BOEM) received an unsolicited request for Outer Continental Shelf (OCS) minerals to be offered for lease in an area offshore American Samoa. BOEM published a notice in the Federal Register (Fed. Reg.) on June 16, 2025 (90 Fed. Reg. 25,369) requesting information and comments on, and indications of interest in, the leasing of OCS minerals in and around the area submitted in the unsolicited lease sale request. The comment period was extended on July 17, 2025, and closed on August 15, 2025.

Through August 29, 2025, BOEM received a total of 76,443 public comment submissions in response to the Request for Information and Interest (RFI) (Docket BOEM-2025-0035). Of the total 76,443 public submissions, 1,085 have been identified as unique (311 substantive and 774 non-substantive), 73,586 copies were associated with 27 form letter campaigns, and 1,772 were considered duplicative or not germane. The 311⁶ substantive submissions and form letter campaigns are reflected in today's report. BOEM will use data and information received during the recent Request for Information and Interest public comment process ([BOEM-2025-0035](#)) to determine and document the proposed action's scope of environmental effects, alternatives or effects, and relevant information with respect to BOEM's action and regulatory authority.

⁶ One substantive commenter submitted 15 additional submissions that only contained reference or supporting material with no additional comment text. These comments were flagged for "Cites data, reference or publications" but do not appear in this report as they are not coded to an issue. The total count of substantive comments with text included in this report is 296.

General Comments

A commenter said that they support BOEM's RFI because it acts as a critical step toward advancing U.S. national security interests, fostering economic diversification for the Territory of American Samoa, and countering growing foreign influence in the Pacific region, while emphasizing the need for robust environmental safeguards to protect vital resources such as the tuna fisheries.

Commenters referenced American Samoa Executive Order 006-2024, issued by former Governor Lemanu Peleti Mauga, which established a moratorium on deep seabed mining, extracting, removing, or any exploration activities in the waters offshore American Samoa. Several commenters stated that this moratorium remains in full force and effect and has been reaffirmed by current Governor Pulaali'i Nikolao Pula and other territorial leaders.

Several commenters stated that over 800 individuals and more than 40 organizations in American Samoa, over 37 countries, multiple U.S. states, 37 financial institutions, more than 65 major corporations, and over 940 marine experts have signed petitions opposing deep sea mining, indicating a growing global consensus for a moratorium on deep sea mining.

Many commenters called for respect of Indigenous rights and sovereignty in decision-making about ocean resources, while some commenters cited principles, such as Free, Prior, and Informed Consent (FPIC) and the United Nations Declaration on the Rights of Indigenous Peoples.

Commenters requested 30- and 120-day extensions to the comment period.

Background

Concerns Over the Necessity and Efficiency of Deep Sea Mining

Some commenters questioned the RFI's justification for the need for critical minerals, saying:

- Emerging technologies and innovations in recycling are beginning to replace the need for deep sea minerals;
- Assertions that deep sea mining is essential for the renewable energy transition are misleading because sufficient terrestrial sources of critical minerals already exist and their extraction is far more efficient; and
- Deep sea mining is unnecessary and inefficient for meeting clean energy goals.

Commenters said that deep sea mining is economically infeasible due to falling demand and prices for key minerals, rising operational costs, and advances in battery technology that reduce reliance on seabed resources. A commenter stated that seabed mining on the American Samoa OCS is not consistent with national needs, as required by Outer Continental Shelf Lands Act (OCSLA).

Multiple commenters expressed concern and skepticism about the economic benefits of deep sea mining for American Samoa. A territory agency stated that the current Federal framework offers no guaranteed benefit to the people of American Samoa, with no commitments to hire locally, share royalties, or build capacity within American Samoa. A few commenters said that the economic benefits of deep sea mining would primarily accrue to external entities rather than local communities.

Commenters expressed concerns about the technological feasibility of deep sea mining operations, particularly with regard to the high calcium carbonate content of the water. A few commenters specifically questioned the technological capabilities and financial stability of Impossible Metals.

Legal Authority and Expanded Definition of Outer Continental Shelf

A commenter stated that applying OCSLA to American Samoa through the Inflation Reduction Act's (IRA) expanded definition of "State" constitutes a unilateral imposition. The commenter remarked that this approach treats the territory as a "resource colony," enabling Federal extraction without adequate local consent or equitable benefit. A commenter said that Congress added American Samoa to OCSLA's definition of "State" only for wind leasing under the IRA and emphasized that any mineral leasing must meet OCSLA's requirements for environmental safeguards, safe operations, protection of fisheries, and alignment with national and local interests—standards that seabed mining in American Samoa cannot meet.

A commenter wrote that BOEM lacks statutory authority under OCSLA to lease the seafloor for the extraction of polymetallic nodules, cobalt-rich ferromanganese crusts, or seafloor massive sulfides. They stated that these mineral types fall outside the scope of the leasing regime established by OCSLA, which defines "mineral" narrowly to include only oil, gas, sulfur, certain geothermal resources, or minerals authorized by a separate act of Congress for production from public lands. A commenter remarked that applying this expanded interpretation to American Samoa overlooks its unique territorial status and limits local influence over decisions affecting its marine environment.

Historical, Cultural, and Indigenous Rights Considerations; Deeds of Cession

A commenter discussed the Deeds of Cession (1900, 1904) that transferred sovereignty to the United States under commitments to protect Samoan lands, customs, and governance. They said that these deeds impose an implicit trust obligation on the United States to protect Samoan communal governance and Fa'aSamoa, the Samoan way of life. A territory-level elected official asserted the American Samoa legislature's authority in defining policies that protect the land and waters entrusted to their care, ensuring that all decisions regarding resource management align with legal, scientific, and cultural mandates.

Strategic and Geopolitical Considerations

A commenter stated that there are serious geopolitical risks associated with the United States pursuing deep sea mining outside the United Nations Convention on the Law of the Sea (UNCLOS) framework. They wrote that ignoring international governance undermines the United States' ability to demand compliance from other states on issues like illegal fishing and maritime navigation and weakens our legitimacy on the international scale. A commenter expressed concern about the potential for deep sea mining to create new geopolitical vulnerabilities, suggesting that issuing permits for the potential commercial recovery of seabed minerals in international waters could open the door to a race for control over ocean resources by foreign powers.

Coordination and Consultations

Government of American Samoa and U.S. Federal Agencies

Commenters referenced specific legal requirements for consultation under the OCSLA, stating that it guarantees American Samoa a meaningful opportunity to participate in policy and planning decisions related to OCS mineral development.

A commenter said that consultation on the technical kinds of issues relevant to the RFI requires significant scientific expertise and investment; the commenter therefore recommended that BOEM provide funding and technical assistance to the Government of American Samoa to ensure full and effective participation in the consultation process.

Commenters requested that the formal opposition of the Government of American Samoa be fully considered in BOEM's decision-making process, and that no commercial leasing or exploration activity should proceed in the American Samoa Exclusive Economic Zone (EEZ) without the expressed support of the territorial government.

A Federal agency wrote that it is prepared to coordinate with BOEM to close information gaps, such as in benthic habitat mapping, protected species distribution, and small-boat fisheries, and to support risk-informed leasing decisions.

An industry commenter recommended that BOEM should establish default separation distances between mining activities and existing submarine cables, relying on guidance from the Federal Communications Commission's Communications, Security, Reliability, and Interoperability Council.

Indigenous Peoples of American Samoa and other Indigenous Groups

Many commenters generally said that BOEM must fully consult with the people of American Samoa as part of any leasing process around American Samoa and incorporate their input in any future decision, including by giving significant weight to local concerns, holding public hearings with adequate advance notice and language support, providing culturally appropriate educational resources, and generally assisting local communities in assessing risks and benefits. Another commenter wrote that to ensure equitable access to information, all documents and presentations should be translated into Samoan.

Numerous commenters wrote that the United States must respect American Samoa's right to self-governance and FPIC. A commenter said that the American Samoa Government and village councils (Fono) must have the authority to reject proposals that threaten their way of life, arguing that consultation without the power to say "no" is not true consent. A commenter recommended that BOEM should coordinate with a Pacific Indigenous Advisory Council, established under 43 U.S.C. §1344, to provide ongoing input on leasing programs.

Other Coordination and Consultations

Commenters recommended that BOEM seek input from scientists and practitioners of traditional ecological knowledge; establish a standing advisory panel with representation from American Samoa's fishing, cultural, and scientific sectors; consult with American Samoa's fishing communities; identify submarine cable operators and service providers; and build public-private partnerships, including academia, private researchers, community leaders, government representatives, and industry experts, while ensuring representation of American Samoan residents, to advise on the responsible development of offshore mineral resources.

A commenter said that BOEM should include more than one public comment and consultation opportunity in its leasing process, such as after a lease is issued and environmental impact statements are developed. A commenter urged BOEM to ensure that it sufficiently informs the public and allows meaningful participation in the National Environmental Policy Act (NEPA) environmental impact analysis phase of the leasing process.

Leasing Process

A Federal agency agreed that BOEM should develop a clear leasing schedule to allow for the incorporation of ongoing data collection efforts. A couple of commenters suggested that BOEM develop a permitting track for exploration leases, similar to that devised by the International Seabed Authority (ISA), as part of a phased leasing process.

An industry commenter proposed that BOEM follow a leasing process similar to what has been implemented in the Cook Islands, which places a greater emphasis on a due diligence phase for the screening and qualification of applicants and requires the approval of a work plan for all approved lessees, among other requirements that differ from the process defined in OCSLA.

Rental and Royalty Rates

An industry commenter expressed support for BOEM's proposal not to charge rent during the first five years of leases and encouraged BOEM to suspend rental payments while BOEM reviews testing and exploitation plans. The commenter favored a structure that relies more heavily on royalty payments, similar to the structure employed in the Cook Islands. An industry commenter and a public interest organization said that it is premature to set rental rates because there needs to be some reconnaissance work to determine whether there is profitable mineral exploitation in this area. In expressing their opposition to minerals exploration, a couple of individual commenters suggested a rate of \$500 million per square meter beginning in the first year, increasing at a rate of 15 percent per year.

An individual commenter stated that there should be rent due within the first five years, citing 30 CFR 581.25(b), which states: "unless otherwise specified in the leasing notice and subsequently issued lease." The commenter said that this means that as long as the notice and lease provide for rental payments in the first five years, they can and should be charged.

Industry and other commenters suggested royalty rates:

- No higher than 3 percent, and that also incorporates a lower royalty rate of 1.5 percent for the first five years of paying royalties;
- Approaching the 12.5 percent rate in the oil and gas industry over time, but lower initial rates; and/or
- Based on revenues generated, not on the nodules themselves.

Commenters said that it is premature to recommend precise royalty percentages due to the early stage of the industry and variability in operating costs, and that calculating a fair rate for these resources is "very difficult, if not impossible" due to the lack of data on the profitability of a deep sea mining operation.

Commenter recommended a benchmarking review of both terrestrial royalties and deep sea mining royalties, including ISA proposals and Cook Islands regulations, when available.

Auction Format and Lease Size

Industry and other commenters expressed support for transparent, competitive bidding mechanisms, such as an ascending oral bid auction with low minimum bid levels. Another industry bidder favored a sealed bid format. A couple of industry commenters expressed support for allowing companies to bid on multiple tracts.

Commenters suggested potential lease sizes:

- Any lease should be limited to a very, very small area of less than 1 km² per every 1600 km² due to the potential risk of environmental damage;
- 75,000 km² leases would be consistent with other ISA exploration contracts; and
- Minimum areas of 25,000 km² if smaller areas are necessary.

Lease Contraction Clauses

Commenters reasoned that leases should include an automatic and binding contraction clause to reduce the leased area if economic, environmental, or other damage is recorded or if other hazards occur and should be allowed to be reduced if portions of the tract are shown to not be economically viable. An industry commenter said that five years seems like a reasonable amount of time for lease contraction clauses.

Liability and Bonding Concerns

Commenters raised concerns about the liability of companies for environmental, economic, and cultural damages from their actions and recommended that BOEM require all applicants to post restoration bonds sufficient to remediate plume damage if deep sea mining ever proceeds.

Baseline Data Collection and Environmental Assessment

Many commenters emphasized the lack of comprehensive baseline data in the RFI area. A commenter said that the eastern margin of American Samoa's EEZ lacks publicly available high-resolution bathymetric data. The commenter said that there are no publicly available data on mineral contents from anywhere within the eastern American Samoa EEZ currently under consideration for leasing.

Commenters said that baseline data are needed to characterize habitats, document species and their interactions, and quantify existing anthropogenic impacts on the local deep sea ecosystem so that impacts from deep sea mining can be prevented and mitigated.

Survey Technologies and Methodologies

An industry commenter described various technologies for underwater mapping, positioning, and monitoring, including Autonomous Underwater Vehicles (AUVs), underwater positioning and communication systems, seabed mapping technology, water column acoustic technology, and inspection and monitoring technology.

RFI Area Information

A commenter said that the National Oceanic and Atmospheric Administration (NOAA) Ocean Exploration Cooperative Institute recently conducted two expeditions to map and sample the area that contains the RFI area, during which the high-resolution surveys for the eastern abyssal plain region of the American Samoa EEZ noted the presence of manganese nodules.

The same commenter recommended extending the lease sale area beyond the area of interest identified in the unsolicited request as indicated by a diagram in their comment letter. Another commenter recommended expanding the RFI area near the eastern limit of OCS Mining Area Block 1 to include additional prospective tracts as defined by the coordinates identified in their comment letter.

A commenter suggested comprehensive exclusion of seafloor sulfide and cobalt-rich crust seabed mineral resources from consideration for future mining leases and discussed the invasive effects mining would have on the area. Some commenters stated that the RFI should focus only on polymetallic nodules.

Seabed Hazards

A commenter said that the most notable hazards and environmentally and geologically sensitive areas are the shelf areas that have a significant change in bathymetry and the seamounts, which should be treated as exclusionary zones for any proposed activity. A commenter expressed concern that deep sea mining will negatively harm unidentified shipwrecks or aircraft wreck sites by either accidental extraction due to placement and activities and other possible disruptions in the seabed and ocean chemistry caused by deep sea mining. A few commenters discussed concern regarding volcanic areas and impacts of earthquakes along subduction zones.

Disruption to Subsea Cables

An industry commenter said that deep seabed mining poses risks to the Southern Cross Cable Network (SCCN), including disturbance or abrasion of the cables through contact with minerals and sediments during exploration and extraction, and impedes access to the water column and seafloor during repairs and recovery when the SCCN goes out of service. Another industry commenter stated that the installation of a subsea telecommunications cable is scheduled for September 2025. According to the commenter, the cable will traverse the southern portion of the RFI lease block area and expressed concern about the potential for deep seabed mining to damage subsea cables both within and adjacent areas of deep seabed mining operations. The commenter also provided details regarding the Bulikula subsea cable system under construction.

Other Uses of the RFI Area

Commenters stated that other uses of the RFI area include ports and shipping, marine tourism, marine trades, commercial and recreational fishing, marine navigation, and ocean recreation. Additional uses include education and research in marine science.

Impacts on Ecosystems and Species

Rose Atoll and Other Areas of Concern

Multiple commenters described the Rose Atoll as one of the most pristine atolls in the world, supporting unique ecosystems rich in biodiversity and expressed concerns about the proximity of the RFI area to the Rose Atoll. Commenters reasoned that many of the species living in the Rose Atoll are threatened or endangered, and that the area provides a critical habitat for these animals.

A few commenters asserted that areas of special concern, such as the Rose Atoll and Swains Island, also provide subsistence resources and are of cultural significance to American Samoans.

A commenter requested that any form of the process does not occur within 50 miles of any of the islands of American Samoa, Rose Atoll, and Swains Island.

Commenters expressed concerns about:

- The Phoenix Island Protected Area (PIPA);

- The Muli‘āva unit of the National Marine Sanctuary of American Samoa (NMSAS), which overlays the Rose Atoll Marine National Monument;
- The Vailulu‘u Seamount, the only hydrothermally active seamount within American Samoa's waters that could eventually breach the surface within decades;
- The Malulu Seamount, saying that much less is known about this deeper feature; and
- Swains Island, Ta‘u Island, and Aunu‘u Island.

Air and Water Quality

A group of Indigenous Pacific Islanders, as part of a form letter campaign, stated that onshore processing facilities and increased vessel traffic could introduce respiratory and other health issues.

Several commenters described sediment plumes as detrimental to water quality first, by disturbing and redistributing sediment on the seafloor and smothering benthic communities while mining and second, by discharging any unwanted mud, silt, and debris from the above-surface mining vessel. Commenters said that, with ocean currents, sediment discharge and plumes can travel hundreds of miles or kilometers.

Several commenters said that mining could release heavy metals and toxins into the water.

Pelagic and Benthic Communities

A commenter shared concerns over the health of different phytoplankton and zooplankton species that live in the pelagic habitats of American Samoa, stating that plankton form the base of the food web, with the larvae of many marine species, including most coral reef invertebrates, feeding on them. A few commenters shared concerns over disruptions to migrations and natural movements throughout the water column caused by mining. A commenter stated that deep sea mining activities could disrupt the migratory pathways and alter foraging behaviors of pelagic species like tuna, marine mammals, and turtles.

A commenter wrote that there is a major gap in knowledge regarding the species that inhabit the abyssal, bathypelagic, and mesopelagic zones, along with the role that these species play in endangered species survival, atmospheric qualities, or the health of commercial fisheries.

Several commenters discussed the biodiversity and sensitivity of benthic communities, including endemic and rare species, as well as countless undescribed and undiscovered benthic species. Commenters referenced scientific expeditions that found American Samoa’s deep sea biological communities to be distinct from other regions in the Pacific, with unique assemblages of deep sea sponges, echinoderms, and corals. Citing the length of recovery and growth time in benthic communities and habitats, several commenters remarked that the impacts from deep sea mining will be essentially permanent.

Commenters stated that American Samoa is home to hundreds of coral species, with estimates ranging from 200 to over 300 and wrote that coral reefs provide habitat for algae and other abundant invertebrates such as crustaceans, mollusks, tunicates, and sponges. Commenters remarked that there are over 900 species of reef-associated fish in American Samoa.

Commenters likewise described the ecosystem services that nodules offer benthic communities. A commenter said that up to 50 percent of larger macrofauna, like corals and sponges, live directly on nodules. More generally, another individual said that around half of all deep water species rely on nodules for some part of their development, such as deep sea octopuses, who deposit their eggs on nodules. Considering nodules as important habitats, several commenters wrote that the disturbance of nodules could threaten different forms of marine life.

Environmental Sensitivity

Commenters generally discussed the relative environmental sensitivity and marine productivity in and around the American Samoa RFI, including but not limited to rich and biodiverse ecosystems, abundance of distinct species, some of which are endangered, and important national monuments, like Rose Atoll.

A commenter discussed in detail critical ecosystem services in the RFI area that support biodiversity and broader ocean processes, especially carbon cycling and the role of deep sea microbes in immobilizing and detoxifying metals and reasoned that deep sea mining could interrupt these processes and disrupt ecological connectivity.

Commenters generally discussed the environmental impacts of seabed mining, including but not limited to damage to habitats, sediment disturbance, impacts on fisheries and tourism, food chain disruptions, effects on fish density, lack of ecosystem recovery and even permanent ecological and biodiversity loss, and more.

Fish and Essential Fish Habitat

Commenters discussed fish species in American Samoa that could be impacted by deep sea mining:

- Species occurring within coral reefs or in Rose Atoll and Swains Island;
- International fishery-important tuna species; and
- Other migratory species like grouper and swordfish.

A Federal agency described the Essential Fish Habitat (EFH) for Pacific pelagic fisheries as the marine water column from the surface to a depth of 1,000 meters, and from the shoreline to the outer boundary of the EEZ for juveniles and adults, while the surface to 200 meters of depth is designated EFH for egg/larval stages. They added that, for the American Samoa Bottomfish fishery, the water column from the surface to a depth of 400 meters is designated EFH for all life stages.

Impact Producing Factors (IPFs)

Noise and Light Pollution, Vibrations

Several commenters said that noise from equipment, such as riser and lift systems, collector vehicles, and above-surface vessels, can impact the behavior of species who use sound to navigate and communicate. A public interest organization reasoned that further research must be done to understand if the noise transmitted by mining equipment can be mitigated. Commenters said that the lights from mining support vessels may attract and disorient seabirds and disrupt bioluminescence and disorient the behavior of diving cetaceans, vertically migrating zooplankton, and seafloor invertebrates. Commenters said that seafloor equipment will produce vibrations, which may disturb organisms that bury or attach themselves to the seafloor.

Vessel Traffic and Deep Sea Vehicles

Commenters stated that increased vessel traffic could disrupt the movements of migratory species and elevates the risk of ship strikes for marine species. Several commenters stated that the movement and impact of mining vehicles cause direct destruction to benthic communities and habitats from dredging and trawling that damages the seafloor. Several commenters referenced past studies showing little ecosystem recovery or growth following vehicle impacts.

Cross-Boundary Impacts

Commenters expressed concern about cross-boundary effects on:

- The Cook Island waters from mining in American Samoa waters;
- The island of Tonga's tourism and economy; and
- Sea life within the Phoenix Island Protected Area.

Mitigation

A commenter said that it would be difficult to mitigate the pollution of intertidal zone habitats. A public interest organization asked that BOEM take appropriate measures to minimize the adverse and cumulative effects of deep sea mining. An individual asserted that there are no “scientifically validated methods” to mitigate damage from deep sea mining. A public interest organization asserted that the mitigation strategies proposed by Impossible Metals are “lacking in substantive detail.” An industry commenter discussed their core technology program for minimizing ecological disruption while mining critical minerals, which includes low-impact system design, environmental monitoring via an autonomous underwater vehicle, and a collaborative oversight framework.

Endangered Species Act (ESA), Marine Mammal Protection Act (MMPA), NEPA, Coastal Zone Management Act (CZMA), National Historic Preservation Act (NHPA)

Commenters generally discussed the intent and need of the ESA and the incidence of endangered species in and around the waters of American Samoa, including green, hawksbill, leatherback, and olive ridley sea turtles, numerous species of dolphins and whales, the bumphead parrotfish, coral species, and several “candidate species” being considered for listing as endangered or threatened. A commenter asserted that deep sea mining in the RFI area would require consultation with National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service under the ESA due to the presence of numerous ESA-protected species, federally protected critical habitat for ESA-listed species, and likely harm to ESA-listed species from deep sea mining.

A commenter asserted that the proposed deep sea mining in the project area would violate the MMPA, unless BOEM were to specifically obtain take authorization.

Commenters reasoned that BOEM should prepare a programmatic Environmental Impact Statement (EIS) to comply with NEPA before issuing mineral leases. They added that under NEPA, BOEM must also include measures to potentially mitigate adverse effects from deep sea mining, and that it cannot “short-circuit” the NEPA process under any emergency procedures. An industry commenter recommended that BOEM consider a comprehensive assessment of the costs/benefits of deep sea mining versus traditional, land-based mining during the NEPA required alternatives analysis.

A couple of commenters expressed concern that deep sea mining and OCS mineral leasing would likely conflict with the goals of the American Samoa Coastal Zone Management Program, which protects marine resources and cultural heritage. The commenters stated that such activities could present a legal barrier under the CZMA, which requires Federal actions affecting the coastal zone to be consistent with approved territorial programs.

A couple of commenters asserted that the proposed program would trigger Section 106 of the NHPA, under which BOEM is required to consider the effects of its actions on historic properties and to consult with relevant stakeholders. Some commenters added that consultation with American Samoa's historic

preservation office and other Samoan parties must occur before any issuing of leases, and that consultation must be coordinated with NEPA review.

Cultural and Socioeconomic Information

Cultural Significance of the Ocean to Samoan Identity; Traditional Governance and Sovereignty

Several commenters remarked that the ocean is not only a resource but a fundamental part of Samoan identity (Fa'asinomaga) and cultural heritage. The commenters described the ocean as an ancestor, provider, protector, and living entity that connects Samoans across generations and islands. Commenters stated that Fa'a Samoa (Samoan way of life) is deeply intertwined with the ocean through traditional practices, ceremonies, legends, and spiritual beliefs that date back approximately 3,000 years.

Several commenters described the traditional Matai system (chiefly system) and Fa'amatai as governance structures that have managed marine resources sustainably for generations. A commenter remarked on Customary Marine Tenure as a traditional approach where village Matai maintain stewardship over marine resources from shoreline to reef flat, including spatial and temporal bans on specific areas or species and protocols for outsiders requesting permission to harvest resources.

Subsistence and Commercial Fisheries

Numerous commenters expressed concern that deep sea mining would threaten subsistence fishing practices that are essential for food security in American Samoa, stating that fishing provides a significant portion of protein in traditional diets.

Several commenters stated that fishing accounts for approximately 20 percent of all jobs in the territory and 18 percent of total labor income, with each dollar's worth of fish landed generating \$3.30 in additional output in the local economy. A few commenters stated that the cannery accounts for 99.5 percent of American Samoa's exports and 84 percent of private employment in the territory. A commenter said that in 2023, the American Samoa longline fishery generated an estimated \$2.82 million in landed value. A commenter stated that American Samoa exports roughly \$353 million in tuna annually, with a projected value of \$17.65 billion over 50 years.

Numerous commenters expressed concern about the potential impacts of deep sea mining on fisheries, including from sediment plumes that could increase the concentration of suspended particles in the water column, directly disrupting tuna physiology and harming the plankton and micronekton that form the base of their food supply. Other concerns include release of metals and toxins, noise and light pollution, and disruption to EFH and HAPC.

A few commenters expressed support for deep sea mining as a means of economic diversification away from the tuna canning industry on which it is heavily reliant. A commenter stated that leasing and development of critical minerals in the EEZ offshore American Samoa could create skilled jobs, support critical infrastructure, and generate sustained economic value in the region.

Impacts on Other Industries

A commenter stated that the National Park of American Samoa attracted 28,893 visitors in 2016, generating \$1.68 million in spending and supporting 21 local jobs, with visitor spending increasing in 2022. The commenter further stated that neighboring Samoa has seen strong gross domestic product (GDP) growth (9.2 percent in Fiscal Year 2023, 9.4 percent in Fiscal Year 2024) driven by a tourism rebound, and that visitors are drawn by the culture, history, relaxing atmosphere, and the clean environment.



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Information Memorandum

Subject: Calculation of Geotechnical Sampling and Geophysical Survey Effort for Deep Water Critical Mineral Development.

Summary: The Bureau of Ocean Energy Management (BOEM) Pacific Region's Engineering and Technical Review Section (ETRS) has developed a model to calculate the amount of geotechnical sampling and geophysical survey that would likely be conducted by lessees as approved preliminary activities in their leased areas, in preparation of a delineation, testing, or mining plan. This model produces estimates of survey effort (days and trips), and bottom disturbance (in m² and % of lease) for these preliminary activities. These estimates are required for production of an environmental analysis of OCS mineral leasing actions.

Background: Federal actions resulting in critical mineral leasing in American Samoa's Exclusive Economic Zone (EEZ) require an environmental analysis. In support of this, a model was produced by BOEM Pacific ETRS to calculate an estimate for geophysical survey and geotechnical sampling effort that would provide enough data to inform a delineation, testing or mining plan submission. This model is based on surveys and assessments designed to locate and determine the abundance of polymetallic manganese nodules (PMN) in both the Cook Island EEZ and the Clarion Clipperton Zone (CCZ). In addition, this model uses public bathymetry data, reprocessed by BOEM, to determine the performance of hydrographic instruments in the deep Pacific Ocean.

BOEM currently doesn't have published geophysical and geotechnical (G&G) guidelines for critical mineral surveys. In addition, the International Seabed Authority (ISA) doesn't provide guidelines on the survey methods required for submission to them. However, critical mineral assessments have been made throughout the Pacific, and those reports detail the surveys that were conducted. In summary, most prospecting efforts include large scale surveys with low resolution deepwater multibeam bathymetry (MBES) in conjunction with seabed sampling, typically in the form of free fall grab samplers. Once the presence of polymetallic nodules (PMN) is determined, additional surveys detailing the seabed resource are conducted with higher resolution. It is common to have multiple surveys efforts conducted over several years to identify mining resources, develop technical plans, and meet permitting requirements. Detailed below are the three PMN assessments ETRS used to create the model.

Cook Islands Polymetallic Nodule Deposit: Over several decades the Cook Islands Seabed Minerals Authority has partnered with other nations for seabed PMN exploration. Some 33 individual surveys were conducted over 58 years. These surveys were conducted for a variety of reasons and with different technologies. Free fall grab samplers and box cores were the preferred method for geotechnical sampling. The first surveys, used to determine the general location of a deposit were spaced on a 100x100km grid pattern. Interestingly, at each site a free fall grab sampler was deployed three times, likely to determine a more statically relevant abundance of nodules. Once the general location of a deposit was determined a finer sampling grid was used to

delineate a resource. As multibeam echosounder (MBES) didn't exist until the late 1980s, most of these early surveys were heavy on direct sampling of the seabed and camerawork. Later surveys did employ more modern G&G work, and work still continues. (Tay, Brown, Bertoli, 2023)

Initial Assessment of the NORI Property, Clarion-Clipperton Zone: Nauru Ocean Resources Inc (NORI) hold exploration rights to areas of the CCZ granted by the International Seabed Authority (ISA). These leases are sponsored by the Republic of Nauru. In 2012 NORI began exploration surveys in their four areas. The initial exploration survey used an EM120 12kHz hull mounted MBES and collected almost 100% coverage of multibeam in four areas. A dredge was deployed by the same vessel in two of the areas. Follow on surveys focused on a smaller section in one of the leased areas, NORI-D. In this section "reconnaissance" level HRG survey was conducted with an AUV, collecting sidescan sonar (SSS), subbottom profiler (SBP), MBES, and photos of the seabed. These reconnaissance surveys were conducted as a 7x7km grid and did not get 100% sonar coverage. Box cores were taken at the intersection of the 7km spaced lines. Camera work from the AUV was also conducted on the same grid, but during a different AUV dive as the vehicle needs to be closer to the seabed for photography. A smaller area was then chosen for a future equipment testing effort. This area was surveyed with the AUV at 3.5km line spacing, with box cores at the intersections of the grid, and camerawork from the AUV. The remaining NORI-D area, outside of the reconnaissance survey was sampled with box cores on a 10x10km grid. In addition, two mooring sights for current meters and two preservation reference zones (PRZ) were surveyed with the AUV. (Deep Green Metals, 2021)

TOML Clarion Clipperton Zone Project, Pacific Ocean: Tonga Offshore Mining Limited (TOML), has an ISA Exploration Area in the CCZ. They are sponsored by the government of the Kingdom of Tonga. TOML has five areas, four of which were explored in 2013 and 2015 on two different surveys. The first survey was an MBES survey, using an EM120, of all the areas with nearly 100% coverage. The second was a box coring, deep tow photo, dredging, and deep-tow sonar survey. In four of the surveyed areas, a smaller area of interest (AOI) was chosen from the MBES backscatter and was investigated in closer detail. Box cores were collected in the AOI on a 7x7km grid. Camera, deep tow HRG, and dredge were all used outside the AOI, in a much coarser fashion. (Lipton et al, 2019)

Differences in ISA's regulations and BOEM 30 CFR 580. 581 and 582: Using surveys conducted for applications to the ISA might differ to surveys conducted for BOEM, it is useful to understand the goals of each organization. The aim of the ISA as described in "The Law of the Sea" is to run the seabed mineral extraction "for the benefit of mankind" (ISA, 2001, Article 140). For developed states wishing to use "The Area" (the area of the sea that is not in an EEZ) for mineral exploration they must apply for exploration contract (ISA, 2015, Part III). The ISA doesn't hold lease sales, instead a developed state must prove to the ISA that a section of The Area contains seabed minerals in a mineable abundance. The developed state achieves this by conducting prospecting surveys (ISA, 2015, Regulation 2). Using a prospecting survey, the applying state needs to find a suitable 150,000km² "Reserve Area" of the Area that, when split, is "Sufficiently large and of sufficient estimated commercial value to allow two mining operations." (ISA, 2015, Regulation 17) Half of this area will become an exploration contract for the contributing state; the other half becomes a reserved area for a developing state. Exploration

surveys follow, which are higher resolution surveys, eventually determining the mineable areas of the exploration contract.

The ISA effectively mandates that developed states conduct their own prospecting surveys first. Once an exploration contract is issued these states remain in control of the exploration area. Typically, a state will sponsor a private mining company to conduct the “plans of work” in the exploration area at this time (ISA, 2015, Regulation 11). The sponsored mining company does get access to the prospecting data and therefore has an indication of the size and quality of the resource in the exploration area. This differs from BOEMs current process where there is a lack of available data on the available resources, and it is left to private companies to conduct the prospecting and exploration after leasing. ISA exploration surveys are higher resolution and similar to the BOEM preliminary activities and activities that would take place under a Delineation Plan (30 CFR 582.22). The ISA does allow some testing of mining equipment with an exploration contract, and recovery of a “reasonable amount of nodules” for assay.

Methods: The ISA does not detail the exact survey methods for a prospecting survey. These guidelines are currently being written for the “mining code”. The ISA relies on the “Legal and Technical Commission”, an organ of the ISA, to determine if submissions are acceptable (ISA, 2015, Regulation 17). Without direct guidance from the ISA, and a lack of guidance from BOEM, ETRS had to reverse engineer the assessments mentioned above to determine what a typical prospecting survey consists of and to what to expect during preliminary activities before submission of a delineation, testing, or mining plan.

ETRS then designed a model that would determine bottom disturbance and survey duration. The model is based on several parameters (Table 1). Most parameters were assigned a low, most likely, and high value. For instance, “Vessel Speed while MBES Surveying” was assigned a low of 6 knots, a most likely of 8 knots, and a high of 10 knots. The most likely value was determined from experience processing MBES deepwater surveys from the Pacific. Almost every parameter was assigned a range. These values were used in MS Excel with an @Risk plugin. @Risk would then make a pert distribution of values that could exist for each parameter. ETRS then designed a calculation for each of the various survey efforts. A latin hypercube simulation was then run with 50,000 iterations. The end product is a range of probability. As an example, the output for “Duration of a EM122 Multibeam Prospecting survey over the entire tract”, the simulation gave the following probabilities: 5% chance that the survey would take *less than* 41.6 days, 50% chance *less than* 51.5 days, and 95% chance *less than* 64.4 days. This range of values is helpful as the exact survey method, the amount of weather downtime, the speed of operations, and many more variables, are unknown and not constant throughout the survey. Throughout the rest of this document any value that has a range will be described as %50 value (5% to 95%) value. With the above example of survey days, the duration of a prospecting survey using a EM122 MBES was less than 51.4 (41.6 to 64.4) days. Assumptions for an oceanographic survey area also presented in Table 2 and Table 3.

A Table of Assumptions

Assumptions	Low	Most Likely	High	Units
Length of mineral tract - x		1340		km
Length of mineral tract - y		100		km
Percent of Lease for Preliminary Activities (PA) AOI Fine Survey	10	20	30	percent
EM124 MBES line spacing	8	10	12	km
EM304 MBES Line Spacing	4	5	6	km
Prospecting Free Fall Grab Grid	10	15	30	km
Free Fall Grab Retrieve/Deploy	0.25	0.5	1	hours
Prospecting Box Core Grid	25	50	75	km
PA Box Core Grid - Medium Survey - Entire Lease	5	10	25	km
PA Box Core Grid - Fine Survey - AOI	5	7	10	km
Vessel Speed While MBES Surveying	6	8	10	knots
Vessel Speed While Transiting	8	10	11	knots
Vessel Speed While Dredging	1	1.5	1.75	knots
Number of Dredges per Lease		8		count
Dredge length	0.5	2	8	km
Dredge width	0.75	1	1.5	m
AUV survey speed	3	4	5	knots
AUV Daily Turnaround	2	4	6	hours
Preliminary Activities AUV linespacing - Medium Survey	0	15	30	km
Preliminary Activities AUV Fine Survey AOI Survey Grid	5	7	10	km
Survey Maintenance %	5	10	25	percent
Survey Weather %	5	10	25	percent
Days Per CTD	2	4	6	count
Hours Per CTD/Core	6	8	10	hours
Bottom Disturbance per Box Core	0.5	1	1.5	m sq
Bottom Disturbance per Free Falling Grab Sample	0.25	0.5	0.75	m sq
Multiple AUVs count	2	4	5	count
UTP Grid	6	8	10	km
Transit Distance for Mobilization	2895	7600	9000	km
Length of Transit from Pago Pago to Survey Area	300	450	600	km
Days between Crew Changes	20	30	42	days
Days between Failures Requiring Return to Port	20	25	30	days

Table 1: Assumptions of various values used in the calculations.

A Table of Assumptions for Oceanographic Surveys

Assumptions - Oceanographic Surveys	5 Lease	2 Lease	Tract	Units
Mooring Per Lease	3.1	8	15.9	count
Water Sampling Stations	5.3	13.3	26.2	count
Landers	2.1	5.3	10.6	count

Table 2: Assumptions for preliminary activities concerning oceanographic surveys.

A Table of Assumptions for the Bottom Disturbance of Oceanographic Survey Deployments

Assumptions - Oceanographic Surveys Bottom Disturbance	Low	Most Likely	High	Units
Bottom Disturbance Moorings	12.6	28.3	78.5	m sq
Bottom Disturbance Landers	1	2	3	m sq

Table 3: Assumed amounts of oceanographic moorings and environmental landers.

Research into previous critical mining assessments has shown that depending on the stage of the project, different densities of geophysical data would be collected. A calculation was run to see the expected duration of the surveys. For geophysical survey work this was calculated by combining the following factors: (1) the expected duration of the actual survey work using the calculated line miles and expected velocity, (2) the number and duration of line turns, (3) the expected daily time for deck work, such as AUV retrieval or CTD operations, and (4) the amount of downtime, both mechanical and weather. The sum of these factors would approximate the survey duration.

Calculating the duration of geotechnical work was similar. The expected transit distance between sample locations was calculated. The transit duration was calculated with an expected transit velocity. The duration of each sampling deployment, plus any additional mechanical and weather downtime.

Calculating “trips” between the survey area and a port in American Samoa was determined via the length of the survey, the expected days till crew change, and the expected days till a critical failure would require the vessel to return to port.

Calculating bottom disturbance for each survey effort was also straightforward. Once the model determined the number of geotechnical stations for a survey, a bottom disturbance could be calculated from a range of potential values of bottom disturbance.

ETRS Representative Survey Plan: Using the history of the three assessments efforts BOEM Pacific ETRS designed a likely survey effort that would be employed by a lessee under approved preliminary activities. This includes a coarse, medium, and fine survey in preparation for submission of a delineation, testing, or mining plan. In addition, oceanographic surveys, for deployment of current meters, water sampling, and environmental monitoring of PRZs were considered.

Sizes of the Survey Areas: While the Cook Islands effort was for their entire EEZ, the two efforts in the CCZ were on exploration contracts sanctioned by the ISA. These exploration contracts are not above 75,000 km² in total and can be in several separate areas of the CCZ. Generally, the assessments seemed to indicate that only about 20% of the exploration area was of interest, with test areas being significantly smaller than that. During the American Samoa Request for Information comment period, one industry commenter suggested they only believed that 5% of the lease area would be commercially mineable (BOEM-2025-0035-1577). For this memo ETRS proposes that preliminary activities extend to an AOI of about 20% of the leased area. Delineation of the actual mining site, estimated at approximately 5% of the lease, is expected to occur with submission of a Delineation Plan, and is not covered in this memo.

Estimated sizes for the tract and the potential leases are included in Table 4. The lease areas were determined by dividing from the total km as defined in the BOEM American Samoa Area Identification Memo, and have been calculated for two cases, one with two leases and one with five. The reasoning for the two and five lease scenario is that two leases provide each lessee with an area approximately the size of an ISA exploration contract. Five leases provide the lessee with an area about the size of the NORI-D area.

Assumed Sizes of Federal Leasing Tract

Survey Area Size	Sq KM
Mining Tract	134,000
Lease Area – Two Leases	67,000
Lease Area – Five Leases	26,800
Area Of Interest – Two Leases	13400 (9240 to 17560)
Area Of Interest – Five Leases	5360 (3690 to 7030)

Table 4: Assumed sizes of the federal mining tract as identified in BOEM's area identification memo. Lease size given anticipating two or five lease scenarios. Area of Interest is a smaller area within the lease.

Coarse Survey: The coarse survey is expected to be very similar to what an ISA prospecting survey would entail. Seabed samples at this stage of the program are critical, however they are more widely spaced. Box cores are used in a limited fashion as the time to deploy them to the seabed is a limiting factor. The ISA has suggested that most of their samples were provided by use of free floating grab samplers. Preliminary activities for the mining tract are also given in this table, in case a state would want to survey about 134,000km² of deepwater pacific. Table 5 presents the calculated values for a coarse survey. These estimates were developed using the three assessments described above along with an assessment of performance of publicly available bathymetric datasets (KM1009 and NA167). ETRS determined appropriate ranges for linespacing for 100%+ coverage with the EM122 and/or EM302 MBES systems.

Calculated values for Preliminary Activities during the Coarse Survey

Preliminary Activities - Coarse Survey	Entire Tract	2 Lease	5 Lease	Units
Line Spacing - Low Frequency MBES	10 (8.8 to 11.2)	10 (8.8 to 11.2)	10 (8.8 to 11.2)	km
Line Spacing - Medium Frequency MBES	5 (4.4 to 5.6)	5 (4.4 to 5.6)	5 (4.4 to 5.6)	km
Number of Free Fall Grab Samples (15km grid)	506 (250.1 to 1008.1)	253 (125 to 504.1)	101 (50 to 201.6)	count
Number of Box core 50km	54 (31.2 to 112.8)	27 (15.6 to 56.4)	11 (6.2 to 22.6)	count
Survey Duration Low Freq MBES	51.4 (41.6 to 64.4)	26.4 (21.5 to 33.1)	11.5 (9.4 to 14.2)	days
Survey Duration Medium Freq MBES	101.1 (83.2 to 124.7)	52.5 (43 to 65)	22.6 (18.6 to 27.7)	days
Survey Duration Free Fall Grab	76.4 (49.7 to 118.5)	38.2 (24.8 to 59.5)	15.3 (9.9 to 23.7)	days
Survey Duration 50km Box Core	28.8 (17.6 to 56.9)	14.4 (8.8 to 28.4)	5.8 (3.5 to 11.4)	days
Trips - Low Frequency MBES	4.8 (4 to 5.9)	2.9 (2.5 to 3.5)	1.8 (1.7 to 2.1)	trips
Trips - Medium Frequency MBES	8.5 (6.9 to 10.5)	4.9 (4.1 to 6)	2.7 (2.3 to 3.1)	trips
Trips - Free Fall Grab Samplers	6.6 (4.6 to 9.9)	3.8 (2.8 to 5.4)	2.1 (1.7 to 2.8)	trips
Trips - Box Cores	3.1 (2.3 to 5.2)	2.1 (1.6 to 3.1)	1.4 (1.3 to 1.8)	trips

Table 5: Calculated values for preliminary activities, for the entire tract, 2 and 5 lease scenarios.

Medium Survey: ETRS used the layout of the Deep Sea Vision AUV survey (DSV) conducted by The Government of American Samoa as a potential example survey that might happen at this stage. An AUV, flying at 30-40m above the seabed, conducts a HRG survey with SSS, SBP, and MBES. As with the DSV survey the AUV would take long 20km transects to a “node” where a box of HRG data would be collected, with 200% coverage on the SSS and 100%+ for the MBES. A series of very close lines would then be flown for low altitude camera work. There are no crosslines in this survey. The AUV would then continue to the next node. Table 6 gives the survey durations, AUV line miles, number of box cores, and trips calculated for these surveys.

Calculated values for medium survey – Per Lease

Preliminary Activities - Lease Area - Medium Survey	Entire Tract	2 Lease	5 Lease	Units
Lease Area AUV 15km Survey Duration	79.4 (47.3 to 212.2)	38.5 (22.9 to 102.4)	15.9 (9.5 to 42.4)	days
LeaseArea AUV 15km Survey Linemiles	8933.2 (5509.2 to 23599.2)	4466.6 (2754.6 to 11799)	1786.6 (1101.8 to 4719.8)	km
Lease Area Number of 10km Box Core	1053.8 (406.8 to 3143.5)	527 (203.4 to 1571.8)	210.8 (81.4 to 628.7)	count
Lease Area Survey Duration 10km Box Core	462.1 (182.8 to 1352.6)	230.6 (91.2 to 676.4)	92.4 (36.6 to 270.5)	days
Trips - Lease Area 10km Box Core	39 (18.4 to 105.5)	18 (7.7 to 50.9)	7.8 (3.7 to 21.1)	trips
Trips - Lease Area AUV 15km Survey	10.9 (8.4 to 20.8)	3.8 (2.7 to 8.6)	2.2 (1.7 to 4.2)	trips

Table 6: Calculated values for the medium survey, using the 2 and 5 lease scenarios.

Area of Interest Survey: Once a lessee has determined that an area is likely to have suitable abundance of nodules, they will likely proceed to a higher resolution survey. ETRS believes a AUV survey on a 7 km grid, with one pass as an HRG survey, and a second pass for camera work. Then box cores at the intersections of the 7km AUV grid. Multiple AUVs would likely be used at this stage, requiring the use of underwater transponder positioning (UTP). Calculated values are presented in Table 7.

Table of calculated values for the Area of Interest Fine Survey – Per Lease

Preliminary Activities - Area of Interest- Fine Survey	Entire Tract	2 Lease	5 Lease	Units
AOI AUV Survey Linemiles	7484.1 (4928.4 to 10721.5)	3740.7 (2472.6 to 5354.3)	1496.8 (985.7 to 2144.3)	km
AOI AUV Survey Duration	313.1 (237.4 to 394.3)	122.1 (90.9 to 157.9)	62.6 (47.5 to 78.9)	days
AOI Multiple AUV Survey Duration	81.7 (56.9 to 120.7)	31.9 (21.8 to 48)	16.3 (11.4 to 24.1)	days
Number of UTP stations for Multiple AUV	416.3 (261.8 to 647.7)	208.1 (131.1 to 323.4)	83.3 (52.4 to 129.5)	count
Number AOI Box Core	521.1 (303 to 893.8)	261 (151.5 to 446.1)	104.2 (60.6 to 178.8)	count
Duration AOI Box Core	222.6 (127.4 to 387.9)	111.3 (63.9 to 194)	44.5 (25.5 to 77.6)	days
Trips - AOI AUV Survey	28 (22.1 to 35)	10 (7.5 to 13)	5.6 (4.4 to 7)	trips
Trips - AOI Multiple AUV Survey	11 (9.1 to 14.1)	3.3 (2.6 to 4.6)	2.2 (1.8 to 2.8)	trips
Trips - AOI Box Cores	21.4 (14.2 to 34)	9.2 (5.6 to 15.4)	4.3 (2.8 to 6.8)	trips

Table 7: Calculated values for the Area of Interest Fine Survey

Oceanography survey: The NORI-D assessment also highlighted chemical and physical oceanographic work that was conducted. They deployed two oceanographic moorings, with a suite of instruments. Seven ADCPs were attached, along with three single point current meters, and two sediment traps. In addition, 5 sites were selected for water sampling with a CTD and niskin bottle rosette. NORI-D also performed HRG surveys over the mooring sites with an AUV, and selected two sites for Preservation Reference Zones (PRZ). It was suggested in the NORI-D assessment that landers for a long term monitoring camera were to be deployed in the PRZ. ETRS used these values to calculate the duration of the oceanographic surveys for both the 2 and 5 lease scenarios. Table 8 presents the calculated values.

Table of calculated values for the Oceanographic survey – Per Lease

Oceanography Survey	Entire Tract	2 Lease	5 Lease	Units
Water Sampling, Current Meter Deployments, Lander Deployments	125.3 (105.5 to 146.3)	62.7 (52.7 to 73.2)	25.1 (21.1 to 29.3)	days
Water Sampling, Current Meter Retrieval, Lander Retrieval	125.3 (105.5 to 146.3)	62.7 (52.7 to 73.2)	25.1 (21.1 to 29.3)	days
Mooring AUV Survey	9.9 (9 to 11.2)	4.9 (4.5 to 5.6)	2 (1.8 to 2.2)	days
PRZ AUV Survey	58.3 (51.4 to 67.9)	29.2 (25.7 to 33.9)	11.7 (10.3 to 13.6)	days
Water Sampling, Current Meter Deployments, Lander Deployments	10.2 (8.5 to 12.3)	5.6 (4.7 to 6.6)	2.8 (2.5 to 3.3)	trips
Water Sampling, Current Meter Retrieval, Lander Retrieval	10.2 (8.5 to 12.3)	5.6 (4.7 to 6.6)	2.8 (2.5 to 3.3)	trips
Mooring AUV Survey	1.7 (1.6 to 1.9)	1.4 (1.3 to 1.4)	1.1 (1.1 to 1.2)	trips
PRZ AUV Survey	5.3 (4.6 to 6.2)	3.6 (2.8 to 3.6)	1.9 (1.7 to 2)	trips

Table 8: Calculated values for the oceanographic survey in 2 and 5 lease scenarios.

Types of samples: Various methods have been used for direct sampling of PMN. Nearly every standard geotechnical sampling method has been deployed to sample manganese nodules: free fall grab samplers, box cores, gravity cores, dredges, ROV/manned submersible manipulator. Free fall grab samplers have been used extensively and will likely be used again as they are much faster than a box core lowered to the seabed with a winch. The free fall grab sampler is a device that has flotation (glass spheres) and carries ballast so it will sink to the seabed. The grab sampler operates after it impacts the seabed and the ballast is released. Once positively buoyant it returns to the surface for recovery. There are several issues with free fall grab samplers, first, they deposit ballast on the seafloor, and second, grab sampling methodology is not as rigorous as a box core. Material can leak out of a grab sampler, or the grab sampler might not retrieve larger PMN. Once a resource is found the most popular method in the literature is the “spade corer” a box core that has a large blade that rotates under the box core and seals the sample in the box. These types of box cores can sample up to 1m² of seabed. For this simulation we used a range of bottom disturbance for box core stations of 1.0 (0.5 to 1.5) m² and 0.5 (0.25 to 0.75) m² for free fall grab samplers. Cameras, CTDs, Optical Back Scatter (OBS), fluorometers, and dissolved oxygen sensors have been attached to both devices. A box core will typically also have a USBL transponder, while a free fall grab sampler might have a GPS transmitter, radar reflector, and a flag for positioning.

Dredges are also used in prospecting. A dredge is simply lowered to the seafloor and towed for some distance where it collects material that is larger than a certain size. The finer material will pass through. Dredges can collect a large amount of critical minerals; however, the exact location

of the deposit is somewhat unknown. Cameras have been added to most modern dredges. The typical length of the sampling run is unknown for this method. ETRS went with a large range of 0.5 to 8km. The opening of the dredge was given a range of 0.75 – 1.5m. The ISA requires an environmental analysis for dredge lengths over 10km.

Bottom Disturbance: ETRS calculated a range of bottom disturbance for each survey and method, including the use of UTPs. Table 9 and Table 10 present the simulated amount of bottom disturbance.

Number of Ships required: A question brought up during the calculating of the survey effort was “how many ships would be used”. It is unknown how fast lessees will want to develop their leases. A safe assumption would be within five years. If all the possible surveys in this document were conducted, on the entire tract, the total survey effort in days would be 1776.5 (1326.7 to 2819.7) days. If only half the year was suitable for surveys, weather wise, that would leave only 912.5 days of survey. Therefore, it would take 1.9 (1.5 to 3.1) ships working over five years to complete the entire surveys proposed in this document. It is likely that these ships will have tenders that would assist with consumables, with one being assigned per working vessel. Doubling the number of ships comes out to be 3.9 (2.9 to 6.2) ships working in the tract, on average, during the survey seasons that are available.

To calculate the peak number of vessels that could potentially be in the tract at any time is more difficult. ETRS came to the consensus that operationally there could be two to three ships working in a lease during a moment of peak effort. These moments where multiple ships working in the tract would likely to be brief and perhaps unplanned. Additional vessels working as supply vessels and crew boats would likely be present as well, perhaps doubling this number. At a peak ETRS believes that there could be four to six survey vessels working in the tract with associated tender vessels. This is based on ETRS experience with offshore surveys and BOEM experience with offshore energy development.

Conclusion: Out of the potential seabed sampling methods, dredging is by far most likely to disturb the most amount of seabed. The other sampling methods, while they might have large numbers of stations associated with them, simply don’t disturb the seabed much when compared to the size of federal seabed mineral tracts. Time is also an issue, with large amounts of box cores taking up to 230.6 (91.2 to 676.4) days for the 2-lease scenario. Lessees are likely to pick methods, like the free fall grab sampler, that decreases their exposure to lengthy offshore surveys. It has been noticed, on ISA’s deepdata website, a repository for sampling data, that sampling grids are sometimes not constant throughout a lease. Many of the exploration areas are sampled very coarsely, with samples taken in a very concentrated pattern over a resource. This model didn’t account for that, however the number of samples we have determined is slightly more than the average number for samples in the ISAs exploration contracts. The remoteness of American Samoa, the size of the leases, and the depth of the mineral resources will all be issues for future surveys. However, massive amounts of work has been completed inside the CCZ for the ISA, and in the Cook Islands EEZ, proving that exploration is very possible and safe.

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Bottom disturbance for the various bottom disturbing methods

Bottom Disturbance	2 Leases	5 Leases	Total For Tract m ²
Dredging	85698.2 (34347.5 to 171883.9)	34334.4 (13662.2 to 68666.4)	171672.2 (68311 to 343332.2)
Free Fall Grab - Coarse Survey	124.4 (56.9 to 265)	99.7 (45.8 to 211.4)	248.6 (114.2 to 527.6)
Box Core - Coarse Survey	26.7 (13.9 to 58.7)	10.6 (5.6 to 23.5)	53.2 (27.8 to 117.6)
Box Core - Medium Survey	518.9 (188.5 to 1610.2)	207.6 (75.9 to 644.3)	1037.8 (379.6 to 3221.7)
Box Core - Fine Survey	256.6 (134.9 to 477.9)	102.7 (54.2 to 190.5)	513.4 (270.9 to 952.4)
UTP Deployments	196.1 (98.6 to 348.3)	78.4 (39.5 to 139.5)	392 (197.5 to 697.5)
Moorings	261.1(138.4 to 442.4)	104.4 (55.4 to 177)	522.2 (276.8 to 884.9)
Landers	10.7 (7.3 to 14)	4.3 (2.9 to 5.6)	21.3 (14.7 to 27.9)
Total Bottom Disturbance (Incl. Dredging)	87075.8 (35550.6 to 173364.5)	34914.8 (14241 to 69267.8)	174573.9 (71204.9 to 346339)
Total Bottom Disturbance (Without Dredging)	1190.6 (717.4 to 2305.7)	533.4 (317.1 to 995.5)	2666.8 (1585.3 to 4977.5)

Table 9: Bottom disturbance for the 2 and 5 lease scenarios.

Percentage bottom disturbance vs the size of the lease

Percentage Bottom Disturbance	Entire Tract
Dredging	0.000119403%
Free Fall Grab - Coarse Survey	0.000000222%
Box Core - Coarse Survey	0.000000040%
Box Core - Medium Survey	0.000001000%
Box Core - Fine Survey	0.000000408%
UTP Deployments	0.000000313%
Moorings	0.000000337%
Landers	0.000000016%
Total w/o Dredging	0.000001928%

Table 10: Percentage bottom disturbance vs the size of the leases.

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Appendix B: BMPs for Protection of ESA-Listed Species

If leases or grants are issued, BOEM will require the Lessee to comply with BMPs through lease stipulations to minimize potential impacts to ESA-listed species. BMPs described below have been developed through years of conventional energy operations and consultations with the NMFS, including vessel strike avoidance BMPs, visual monitoring, and reporting. These BMPs minimize or eliminate potential effects from preliminary activities to ESA-listed species. The Lessee, its operators, personnel, and contractors will be required to satisfy requirements related to ESA-listed species by complying with the BMPs outlined below.

Vessel Speed Requirements

Summary

Vessel speeds must be reduced to 10 knots or less when mother-calf pairs, pods, or large assemblages (greater than three) of any marine mammal are observed near a vessel, whether in a Lease Area or traveling between a port to the Lease Area. Operators shall be particularly vigilant to watch for turtles at or near the surface in areas of known or suspected turtle activity, and if practicable, reduce vessel speed to 5 knots or less.

Justification

Studies show that slower vessel speed is associated with lower risk for animal injury and mortality. Vessels traveling at slower speeds will have more time to notice and avoid ESA-listed species, reducing the risk of ship strikes. Even if observers are posted to watch for ESA-listed species, marine mammals and sea turtles spend the majority of their time underwater and may not be sighted as vessels approach. The slower vessel speed allows ESA-listed species more time to move out of the path of vessels and reduces the risk of injury and mortality if a vessel strikes an animal.

Vessel Strike Avoidance Zone

Summary

All vessels associated with Lessee activity must have a Protected Species Observer (PSO) or trained observer monitoring the vessel strike avoidance zone for ESA-listed species at all times. If sperm whales are detected at or within 100 meters, any baleen whale is detected within 500 meters, or any other ESA-listed species is detected within 50 meters, including sea turtles, and large jellyfish aggregations, the vessel shall slow down, stop, or alter course, as appropriate and regardless of vessel size to avoid striking any ESA-listed species. The only exception is when the safety of the vessel or crew necessitates deviation from these requirements.

Justification

The vessel strike avoidance zone is recommended to reduce the risk of ship strikes by providing more time for vessel operators to adjust course or slow down to avoid marine mammals and sea turtles. Additionally, avoiding animals seen at the surface may also reduce risk of collision with other nearby

animals underwater. These vessel strike avoidance zone distances mirror the nationwide policy recommended by BOEM's Center for Marine Acoustics, which reflects prior NMFS consultations. The 500m vessel strike avoidance zone is a precautionary approach due to the uncertainty and data gaps surrounding ESA-listed species abundance and distribution in these areas.

Protocols

- a. For all vessels associated with Lessee activity and operating in the Lease Area (including while surveying and transiting), a PSO must monitor a vessel strike avoidance zone (100 m or greater for sperm whales; 500m or greater for all baleen whales; 50m or greater for any other ESA-listed species, including sea turtles) in all directions to ensure detection of that animal in time to take necessary measures to avoid striking the animal. If an animal is detected at or within the above vessel strike avoidance zones, the vessel shall slow down, stop, or alter course, as appropriate and regardless of vessel size to avoid striking any ESA-listed species.
- b. For all vessels transiting to a Lease Area, a PSO or a trained vessel captain or trained crew member must watch for ESA-listed species and when detected at or within the vessel strike avoidance zones listed above, the vessel shall slow down, stop, or alter course, as appropriate and regardless of vessel size to avoid striking any ESA-listed species
- c. All PSOs monitoring the strike avoidance zone must have completed an NMFS-approved commercial PSO training course. Documentation of the most recent training certificates of individual PSOs' successful completion of an NMFS-approved commercial PSO training course with an overall examination score of 90% or greater must be provided upon request. Instructions and application requirements to become a NMFS-approved PSO can be found at <http://www.fisheries.noaa.gov/national/endangered-species-conservation/protected-speciesobservers>
- d. All observers (trained captain or crew) monitoring the strike avoidance zone must have completed an NMFS-approved training course for ESA-listed species observers.
 - i. PSOs and trained vessel captain and crew observers must maintain a vigilant watch for all ESA-listed species and slow down, stop their vessel, or alter course, as appropriate and regardless of vessel size, to avoid striking any ESA-listed species. The presence of a single individual at the surface may indicate the presence of submerged animals in the vicinity; therefore, precautionary measures should always be exercised.
- e. Survey plans must include identification of vessel strike avoidance measures, including procedures for equipment shut down and retrieval, communication between PSOs/observers, equipment operators, and the captain, and other measures necessary to avoid vessel strike while maintaining vessel and crew safety. If any circumstances are anticipated that may preclude the implementation of this BMP, they must be clearly identified in the survey plan and alternative procedures outlined in the plan to ensure minimum distances are maintained and vessel strikes can be avoided. This includes the use of ancillary and autonomous surface vessel (ASV) or uncrewed surface vessels (USVs).

- f. All vessel crew members must be briefed on the identification of ESA-listed species that may occur in the survey area and in regulations and best practices for avoiding vessel collisions. Reference materials must be available aboard all project vessels for identification of ESA-listed species. The expectation and process for reporting of ESA-listed species sighted during surveys must be clearly communicated and posted in highly visible locations aboard all project vessels, so that there is an expectation for reporting to the designated vessel contact (such as the lookout or the vessel captain), as well as a communication channel and process for crew members to do so.
- g. The vessel strike avoidance zones are a minimum of 100 m or greater for sperm whales; 500m or greater for all baleen whales; and 50m or greater for any other ESA-listed species, including sea turtles and must be maintained around all surface vessels at all times.
- h. If an ESA-listed species is identified within 500 m of the forward path of any vessel, the vessel operator must steer a course away from the animal at 10 kn or less until the minimum vessel strike avoidance zone separation distance has been established (as required above). Vessels may also shift to idle if feasible.
- i. If an ESA-listed species is sighted within 200 m of the forward path of a vessel, the vessel operator must reduce speed and shift the engine to neutral. Engines must not be engaged until the animal has moved outside of the vessel's path and beyond the appropriate vessel strike avoidance zone. If stationary, the vessel must not engage engines until the animal has moved beyond the appropriate vessel strike avoidance zone.
- j. When ESA-listed species are sighted while a vessel is underway, the vessel shall take action as necessary to avoid violating the relevant separation distance (e.g., attempt to remain parallel to the animal's course, avoid excessive speed or abrupt changes in direction until the animal has left the area, reduce speed, and shift the engine to neutral). This does not apply to any vessel towing gear or any vessel that is navigationally constrained. These requirements do not apply in any case where compliance would create an imminent and serious threat to a person or vessel or to the extent that a vessel is restricted in its ability to maneuver and, because of the restriction, cannot comply.
- k. All observations by observers must be recorded per reporting requirements.
- l. Vessels underway must not divert their course to approach any ESA-listed species.
- m. Lessees are directed to NMFS' [Marine Life Viewing Guidelines](#), which highlight the importance of these measures for avoiding impacts to mother/calf pairs.
- n. Wherever available, lessees will ensure all vessel operators check for daily information regarding ESA-listed species sighting locations. These media may include, but are not limited to: Channel 16 broadcasts, whalesafe.com, and the Whale/Ocean Alert App.

Moon Pools

Summary

During all times of year when a vessel is equipped with a moon pool, there must be a hull door that can be kept closed as much as possible (to prevent species from entering) and monitored prior to and after closure.

Justification

Any vessel with a moon pool must keep the hull door closed as much as possible to avoid ESA-listed species being trapped within the moon pool.

Protocols

- a. Closure of the hull door
 - i. Should the moon pool have a hull door that can be closed, the operator(s) should keep the doors closed as much as reasonably practicable when no activity is occurring within the moon pool, unless the safety of crew or vessel require otherwise. This will prevent ESA-listed species from entering the confined area during periods of non-activity.
 - ii. Should the moon pool have a hull door that can be closed, then, prior to and following closure, the moon pool must be monitored continuously by a dedicated crew observer with no other tasks to ensure that no individual ESA-listed species is present in the moon pool area. If visibility is not clear to the hull door from above (e.g., turbidity or low light), 30 minutes of monitoring is required prior to hull door closure.
 - iii. If an ESA-listed species is observed in the moon pool prior to closure of the hull door, the hull door must not be closed, to the extent practicable. If the observed animal leaves the moon pool, the operator may commence closure. If the observed animal remains in the moon pool, contact NMFS prior to closure of the hull doors according to reporting requirements (see below under Protected Species within an Enclosed Moon Pool Reporting).
- b. Movement of the vessel (no hull door) and equipment deployment/retrieval
 - i. Prior to movement of the vessel and/or deployment/retrieval of equipment, the moon pool must be monitored continuously for a minimum of 30 minutes, by a dedicated crew observer with no other tasks, to ensure no individual ESA-listed species is present in the moon pool area.
 - ii. If an ESA-listed species is observed in the moon pool prior to movement of the vessel, the vessel must not be moved and equipment must not be deployed or retrieved, except for human safety considerations. If the observed animal leaves the moon pool, the operator may commence activities. If the observed animal remains in the moon pool, contact BSEE prior to planned movement of the vessel according to reporting

requirements (see Reporting Requirements under Protected Species within an Enclosed Moon Pool Reporting).

- c. BOEM does not advocate the lowering of crew members into the moon pool to free ESA-listed species. NMFS should be contacted if ESA-listed species are encountered in the moon pool.

Equipment Deployment and Retrieval

Summary

Any mooring systems used during autonomous underwater vehicle and/or remotely operated vehicles (AUV/ROV) usage, buoy deployment, operations, equipment retrieval, and any survey activities should be configured to prevent any potential entanglement of ESA-listed species. PSOs should monitor for ESA-listed species in the area prior to and during deployment and retrieval of equipment, including AUVs and ROVs, buoys, and other equipment. Work should be stopped if ESA-listed species are observed to minimize entanglement risk. In the unlikely event that entanglement does occur, ensure proper reporting of entanglement events according to the measures specified below. BOEM must review survey equipment to be used by the Lessee on a case-by-case basis to determine which BMPs are required for that specific equipment use.

Justification

The equipment deployment and retrieval requirements are designed to minimize entanglement, injury and disturbance risk to ESA-listed species.

Protocols

- a. Ensure that any buoys attached to the seafloor use the best available mooring systems. Buoys, lines (chains, cables, or coated rope systems), swivels, shackles, and anchor designs must prevent any potential entanglement of ESA-listed species while ensuring the safety and integrity of the structure or device. Avoid using floating lines at the surface.
- b. All mooring lines and ancillary attachment lines must use one or more of the following measures to reduce entanglement risk: reduced number of lines as much as possible; shortest practicable line length; and rubber sleeves, weak links, chains, cables or similar equipment types that prevent lines from looping (i.e., reduce amount of slack in lines), wrapping, or entrapping ESA-listed species.
- c. Any equipment must be attached by a line within a rubber sleeve for rigidity and recommend using sheaths, chains, acoustic releases and weak links if possible. The length of the line must be as short as necessary to meet its intended purpose.
- d. During all buoy deployment and retrieval operations, buoys should be lowered and raised slowly to minimize risk to ESA-listed species and benthic habitat. Additionally, PSOs should monitor for ESA-listed species in the area prior to and during deployment and retrieval and work should be stopped if protected species are observed to minimize entanglement risk.

- e. If a live or dead marine ESA-listed species becomes entangled, the Lessee must immediately contact the applicable NMFS stranding coordinator using the reporting contact details (see Reporting Requirements section) and provide any on-water assistance requested.
- f. All buoys must be properly labeled with owner and contact information.

Protected Species Observers (PSOs)

Summary

A minimum of one qualified third-party PSO is located on each vessel to conduct observations while the vessel is in the Lease Area. The number of observers per vessel must be sufficient to ensure complete viewing coverage of the surrounding marine environment. The Lessee must ensure that observers have the safety and monitoring equipment adequate to conduct their activities (including night-vision equipment for nighttime survey operations). All PSOs must have completed an NMFS-approved commercial PSO training course to act as a PSO.

The Lessee must ensure that the observers have the authority to stop any activity that could result in harm to an ESA-listed species, except when the stopping of the activity would put the safety of the vessel or crew at risk. In the event that an ESA-listed species is struck by a vessel or survey equipment or becomes entangled in any cable or lines, the Lessee must ensure that the observer immediately notifies NMFS so that appropriate response measures can be implemented. Similarly, if the vessel or its crew causes any harassment or harm to an ESA-listed species, an observer immediately notifies NMFS.

Justification

A PSO requirement reduces the risk of injury or death to ESA-listed species. PSOs are trained professionals, certified by NMFS with standardized training and [qualifications](#), who are independent specialists whose sole responsibility is to provide continuous monitoring for protected species. A PSO will reduce the risk of a contact or collision incident by detecting and alerting for the presence of wildlife using methods that allow the vessel to have the time to avoid contact. A PSO also ensures compliance with related procedures of avoidance zones, clearance and shutdown zones, deck operations, and data collection.

The PSO NMFS certification ensures objective compliance that interactions with wildlife will be reported and that the required data reporting will include standardized data details. Due to the lack of data in marine mammal and sea turtle population densities and behaviors in the Action Area, data collection by PSOs inform ongoing and future project management in the Action Area.

Protocols

- a. All PSOs must have completed an NMFS-approved commercial PSO training course to act as a PSO for preliminary activity surveys. Documentation of the most recent training certificates of individual PSOs' successful completion of an NMFS-approved commercial PSO training course with an overall examination score of 90% or greater must be provided upon request. Instructions and application requirements to become a NMFS-approved PSO can be found at

<http://www.fisheries.noaa.gov/national/endangered-species-conservation/protected-speciesobservers>

- b. PSOs deployed for preliminary survey activities must be employed by a third-party observer provider. While the vessel is underway, they must have no other tasks than to conduct observational effort, record data, and communicate with and instruct relevant vessel crew to the presence of ESA-listed species and associated requirements. PSOs on duty must be clearly listed on daily data logs for each shift.
- c. A minimum of one PSO must be on duty observing for ESA-listed species at all times that noise-producing equipment of concern is operating, or the survey vessel is actively transiting in the lease areas during daylight hours (i.e., from 30 minutes prior to sunrise and through 30 minutes following sunset). One PSO must be on duty during nighttime operations, unless more are needed to adequately monitor the required nighttime vision equipment. A PSO schedule showing that the number of PSOs used is sufficient to effectively monitor the affected area for the project (e.g., surveys) and record the required data must be provided to BOEM. PSOs must not be on watch for more than 4 consecutive hours, with at least a 2-hour break after a 4-hour watch. PSOs must not be on active duty observing for more than 12 hours in any 24-hour period.
- d. Visual monitoring must occur from the most appropriate vantage point on the associated operational platform that allows for 360-degree visual coverage around the vessel. When the viewing bandwidths of all the PSOs on watch are combined, there must be full 360-degree visual coverage around the vessel.
- e. The most suitable and appropriate equipment must be available to each PSO to adequately observe the full extent of the clearance and shutdown zones during all vessel operations and to meet all reporting requirements. PSO equipment and protocols should include the following:
 - i. Visual observations must be conducted using binoculars and the naked eye while free from distractions and in a consistent, systematic, and diligent manner.
 - ii. Rangefinders (at least one per PSO, plus backups) or reticle binoculars (e.g., 7 x 50) of appropriate quality (at least one per PSO, plus backups) to estimate distances to ESA-listed species located in proximity to the vessel and Clearance and Shutdown Zone(s).
 - iii. Digital full frame cameras with a telephoto lens that is at least 300 mm or equivalent. The camera or lens should also have an image stabilization system. The cameras should be used to record sightings and verify species identification whenever possible.
 - iv. A laptop or tablet to collect and record data electronically.
 - v. GPS if data collection/reporting software does not have built-in positioning functionality.
 - vi. Any other tools deemed necessary to adequately perform PSO tasks.
 - vii. PSO data must be collected in accordance with standard data reporting, software, tools, and electronic data submission standards approved by BOEM for the particular activity.

Protected Species Reporting

Summary

The Lessee must submit a final report summarizing the results of monitoring activities to BOEM and other appropriate agencies no more than 90 days following yearly upon completion of survey activities. Yearly completion dates must be defined in the associated survey plan. The report must, at a minimum, include: (a) an evaluation of the effectiveness of monitoring protocols and (b) reporting of: (i) marine mammal, sea turtle, and other wildlife sightings (species and numbers); (ii) any wildlife behavioral changes; and (iii) any interactions or conflict with marine wildlife, including reporting of any project delays or cessation of operations due to the presence in the project area of marine wildlife species subject to protection

Justification

To ensure compliance and evaluate effectiveness of BMPs and mitigation measures, regular reporting of survey activities and information on all ESA-listed species will be required as stated below in the Protocols.

Protocols

- a. Data from all PSO and other observer (captain or vessel crew members) observations must be recorded based on standard PSO collection and reporting requirements. PSOs must use standardized electronic data forms to record data. The following information must be reported electronically in a format approved by BOEM:
 - i. Visual effort
 - a. Vessel name;
 - b. Dates of departures and returns to port with port name;
 - c. Lease number;
 - d. PSO/observer names and affiliations;
 - e. PSO ID (if applicable);
 - f. PSO/observer location on vessel;
 - g. Height of observation deck above water surface (in meters);
 - h. Visual monitoring equipment used;
 - i. Dates and times (Greenwich Mean Time) of survey on/off effort and times corresponding with PSO on/off effort;
 - j. Vessel location (latitude/longitude, decimal degrees) when survey effort begins and ends; vessel location at beginning and end of visual PSO duty shifts; recorded at 30 second intervals if obtainable from data collection software, otherwise at practical regular interval;
 - k. Vessel heading and speed at beginning and end of visual PSO duty shifts and upon any change;

- l. Water depth (if obtainable from data collection software) (in meters);
 - m. Environmental conditions while on visual survey (at beginning and end of PSO shift and whenever conditions change significantly), including wind speed and direction, Beaufort scale, Beaufort wind force, swell height (in meters), swell angle, precipitation, cloud cover, sun glare, and overall visibility to the horizon;
 - n. Factors that may be contributing to impaired observations during each PSO shift change or as needed as environmental conditions change (e.g., vessel traffic, equipment malfunctions); and
 - o. Survey activity information, such as type of survey equipment in operation, acoustic source power output while in operation, and any other notes of significance (i.e., preclearance survey, ramp up, shutdown, end of operations, etc.).
- ii. Visual Sighting (all Visual Effort fields plus the following)
- a. Watch status (sighting made by PSO on/off effort, opportunistic, crew, alternate vessel/platform);
 - b. Vessel/survey activity at time of sighting;
 - c. PSO/PSO ID/observer who sighted the animal;
 - d. Time of sighting;
 - e. Initial detection method;
 - f. Sightings cue;
 - g. Vessel location at time of sighting (decimal degrees);
 - h. Direction of vessel's travel (compass direction);
 - i. Direction of animal's travel relative to the vessel;
 - j. Identification of the animal (e.g., genus/species, lowest possible taxonomic level, or unidentified); also note the composition of the group if there is a mix of species;
 - k. Species reliability;
 - l. Radial distance;
 - m. Distance method;
 - n. Group size; estimated number of animals (high/low/best);
 - o. Estimated number of animals by cohort (adults, yearlings, juveniles, calves, group composition, etc.);
 - p. Description (as many distinguishing features as possible of each individual seen, including length, shape, color, pattern, scars or markings, shape and size of dorsal fin, shape of head, and blow characteristics);
 - q. Detailed behavior observations (e.g., number of blows, number of surfaces, breaching, spyhopping, diving, feeding, traveling; as explicit and detailed as possible; note any observed changes in behavior);

- r. Mitigation Action; Description of any actions implemented in response to the sighting (e.g., delays, shutdown, ramp up, speed or course alteration, etc.) and time and location of the action.
 - s. Behavioral observation to mitigation;
 - t. Equipment operating during sighting;
 - u. Source depth (in meters);
 - v. Source frequency;
 - w. Animal's closest point of approach and/or closest distance from the center point of the acoustic source;
 - x. Time entered shutdown zone;
 - y. Time exited shutdown zone;
 - z. Time in shutdown zone; and
 - aa. Photos/Video.
- b. Final Report: The project proponent must submit a final monitoring report to BOEM within 90 days after completion of survey activities. The report must fully document the methods and monitoring protocols, summarize the survey activities and the data recorded during monitoring, estimate the number of ESA-listed species that may have been taken during survey activities, and describe, assess and compare the effectiveness of monitoring and mitigation measures. PSO/observer sightings, effort data and trackline data in Excel spreadsheet format must also be provided with the final monitoring report.
- c. Vessel Strike: In the event of a vessel strike of an ESA-listed species by any survey vessel, the project proponent must immediately report the incident to BOEM (details to be provided) and NMFS (details to be provided). Sea turtle and marine mammal strikes must be reported to the NOAA Marine Wildlife Hotline: (888) 256-9840. The report must include the following information:
- i. Name, telephone, and email of the person providing the report;
 - ii. Vessel name;
 - iii. Lease Number;
 - iv. Time, date, and location (latitude/longitude) of the incident;
 - v. Species identification (if known) or description of the animal(s) involved;
 - vi. Vessel speed during and leading up to the incident;
 - vii. Vessel course/heading and what operations were being conducted (if applicable);
 - viii. Status of all sound sources in use;
 - ix. Description of avoidance measures/requirements that were in place at the time of the strike and what additional measures were taken, if any, to avoid strike;
 - x. Environmental conditions (wave height, wind speed, light, cloud cover, weather, water depth);
 - xi. Estimated size and length of animal that was struck;
 - xii. Description of the behavior of the species immediately preceding and following the strike;

- xiii. If available, description of the presence and behavior of any other protected species immediately preceding the strike;
 - xiv. Disposition of the animal (e.g., dead, injured but alive, injured and moving, blood or tissue observed in the water, last sighted direction of travel, status unknown, disappeared); and
 - xv. To the extent practicable, photographs or video footage of the animal(s).
- d. Protected Species within an Enclosed Moon Pool—It is unlikely that an ESA-listed species would come in contact with a moon pool, but the following applies: If an ESA-listed species is observed within an enclosed moon pool and does not demonstrate any signs of distress or injury or an inability to leave the moon pool of its own volition, measures described in this section must be followed (only in cases where they do not jeopardize human safety). Although this particular situation may not require immediate assistance and reporting, an ESA-listed species could potentially become disoriented with their surroundings and may not be able to leave the enclosed moon pool of their own volition. Within 24 hours of any observation, and daily after that for as long as an individual ESA-listed species remains within a moon pool (i.e., in cases where ESA-listed species has entered a moon pool, but entrapment or injury has not been observed), reporting is required.
- i. For initial reporting associated with activities within the moon pool, the following information is required:
 - a. Time, date, and location (latitude/longitude) of the first discovery (and updated location information if known and applicable);
 - b. Species identification (if known) or description of the animal(s) involved;
 - c. Condition of the animal(s) (including carcass condition if the animal is dead);
 - d. Observed behaviors of the animal(s), if alive;
 - e. If available, photographs or video footage of the animal(s); and
 - f. General circumstances under which the animal was discovered.
 - ii. After the initial report (see above), the following reporting measures must be followed, and information must be reported to BSEE (contact details to be provided) for operations requiring use of a moon pool to continue:
 - a. Describe the animal's status to include external body condition (e.g., note any injuries or noticeable features), behaviors (e.g., floating at surface, chasing fish, diving, lethargic, etc.), and movement (e.g., has the animal left the moon pool and returned on multiple occasions?);
 - b. Describe the animal's status to include external body condition (e.g., note any injuries or noticeable features), behaviors (e.g., floating at surface, chasing fish, diving, lethargic, etc.), and movement (e.g., has the animal left the moon pool and returned on multiple occasions?);
 - c. Describe the animal's status to include external body condition (e.g., note any injuries or noticeable features), behaviors (e.g., floating at surface, chasing fish, diving, lethargic,

etc.), and movement (e.g., whether the animal left the moon pool and returned on multiple occasions);

- d. Any additional photographs or video footage of the animal, if possible; and
 - e. Guidance received and followed from NMFS liaison or stranding hotline that was contacted for assistance.
- e. Sightings of any injured or dead ESA-listed species must be immediately reported, regardless of whether the injury or death is related to survey operations, to BOEM (details to be provided), and the NOAA West Coast stranding hotline at 1-866-767-6114 and 562-506-4315. If the project proponent's activity is responsible for the injury or death, they must ensure that the vessel assist in any salvage effort as requested by NMFS. When reporting sightings of injured or dead ESA-listed species, the following information must be included:
- a. Time, date, and location (latitude/longitude) of the first discovery (and updated location information if known and applicable);
 - b. Species identification (if known) or description of the animal(s) involved;
 - c. Condition of the animal(s) (including carcass condition if the animal is dead);
 - d. Observed behaviors of the animal(s), if alive;
 - e. If available, photographs or video footage of the animal(s); and
 - f. General circumstances under which the animal was discovered.
- f. Reporting and contact Information—injurious takes of endangered and threatened species:
- a. NOAA Marine Wildlife Hotline: (888) 256-9840
 - b. BOEM Office of Environment, Pacific Region Regional Supervisor

Remote Operated Vehicles (ROVs)/Autonomous Underwater Vehicle (AUV) Usage

Summary

All ROVs and AUVs must have a deployment plan.

Justification

All ROVs and AUVs must have a deployment plan to minimize risk of entanglement, strike, disturbance, injury or mortality to ESA-listed species.

Protocols

- a. A submersible dive plan will be in place for each dive that details each mission, locations, and deployment/recovery times to minimize the potential for collision with the substrate or groundings.
- b. All AUV deployment missions will have a deployment and retrieval plan to minimize lag time in water and ensure that the AUV is properly retrieved.

- c. In order to minimize malfunction, prior to operations employing submersibles, a pre-deployment test of all operating systems should be run to ensure that equipment is operating correctly, there are no visually apparent physical defects, and conditions are conducive to operations.
- d. In order to minimize the spread of invasive species, all ROVs/AUV's will be inspected and cleaned of any organic material including algae and other organisms prior to deployment.
- e. Keep any ROV lines as taut as practicable and deployed only as long as needed to properly accomplish the required task.
- f. Use any ROV/AUV cameras, if available and practicable, to ensure no presence of ESA-listed species in and around large debris pieces prior to lifting.
- g. Acoustic Analyses must be completed prior to the operation(s) using the [User Spreadsheet Tool](#) when AUVs emit any type of sonar or acoustics that may be within the hearing range of ESA-listed species. Operations cannot commence until reviewed by NMFS staff through technical assistance with the NMFS Office of Protected Resources or BOEM's Center for Marine Acoustics.

Passive Acoustic Monitoring

Summary

Lessees are required to complete (or pay a BOEM-approved third party to complete) at least one year of year-round baseline information (e.g., presence, distribution) about soniferous species and the ambient acoustic environment of the Lease Area sufficient to inform any future Delineation, Testing, and/or Mining Plan reviews. PAM monitoring should include representative depth, spatial, and temporal coverage of the Lease Area. Notice of sampling protocols must be submitted for review to the Lessor at least 30 days prior to deployment of any units. The Lessee must also submit a log of species detections as well as ambient noise metrics to BOEM within six (6) months after completion of any PAM deployments. BOEM may request a copy of the raw data from the Lessee.

Justification

The Lessee should expect and be prepared to deploy and maintain long-term passive acoustic monitoring (PAM) across all phases of the lease lifecycle. During the pre-extraction phase, the goal would be to obtain baseline information (e.g., presence, distribution, abundance) about soniferous species and the ambient acoustic environment of the Lease Area. During test mining, recordings of mining equipment should be obtained. During the extraction and post extraction phases, the goal would be to assess for potential changes in the biological communities and acoustic environment due to the extraction activity compared to the baseline. Detailed specifications for the pre-extraction (baseline) phase are provided in this document. Because requirements for the extraction phase will be issued by the regulator at a later date, the current PAM requirements are subject to change; future changes may include additional instrumentation, expanded spatial or temporal coverage, and/or adaptive monitoring measures informed by baseline results.

Contamination of Marine Environment

To understand the type and amount of marine debris generated, and to minimize the risk of entanglement in and/or ingestion of marine debris by ESA-listed species, lessees must implement the following BMPs:

- a. A contingency plan to control toxic materials is required.
- b. Appropriate materials to contain and clean potential spills shall be stored at the work site and be readily available.
- c. All project-related materials and equipment placed in the water shall be free of pollutants.
- d. The project manager and heavy equipment operators shall perform daily pre-work equipment inspections for cleanliness and leaks. All heavy equipment operations shall be postponed or halted should a leak be detected and shall not proceed until the leak is repaired and equipment cleaned.
- e. Fueling of land-based vehicles and equipment shall take place at least 50 feet away from the water, preferably over an impervious surface. Fueling of vessels shall be done at approved fueling facilities.
- f. Turbidity and siltation from project-related work shall be minimized and contained through the appropriate use of erosion control practices, effective silt containment devices, and the curtailment of work during adverse weather and tidal/flow conditions.
- g. A plan shall be developed to prevent debris and other wastes from entering or remaining in the marine environment during the project.

Protection of Biological Resources

Lessee shall avoid unnecessary or substantial disturbance to sensitive seabed habitats and biodiversity hotspots, including but not limited to seamounts, hydrothermal vent fields, cold seeps, deep-sea coral and sponge aggregations, and areas of high megafaunal density and or productivity, except as otherwise authorized by BOEM. The Lessee shall identify sensitive marine environmental avoidance areas in survey plans. The Lessor may update or impose new timing or location restrictions based on new information and/ or survey findings to ensure consistency with ESA, Marine Mammal Protection Act, and OCSLA authority to protect the marine environment from irreparable harm as per 30 CFR 582.20. Sensitive seabed habitats and areas of high megafaunal density shall be defined in accordance with BOEM-approved ecological criteria and may be updated based on new information or site-specific surveys. In areas designated by BOEM as suitable for mineral extraction, disturbance to seabed substrates may be permitted, provided that such activities are conducted in a manner that minimizes adverse environmental impacts.

BOEM may, at its discretion, require Lessee to submit an Environmental Management and Monitoring Plan or equivalent documentation at any point prior to or during operations, based on the nature of the proposed activity, the sensitivity of the environment, or the results of environmental monitoring. Any such plan shall include appropriate mitigation measures, monitoring protocols, and adaptive management strategies as determined by BOEM, pursuant to its authority under 43 U.S.C. § 1334 and 30 CFR § 582.1(a).

If previously unidentified sensitive habitats or biological communities are discovered, Lessee must notify the BOEM Regional Director within 48 hours. BOEM may require the Lessee to modify or suspend operations, implement additional mitigation measures, or relocate activities, and may also require a buffer of up to 500 m around designated sensitive features unless otherwise justified by site-specific conditions

Fisheries and Wildlife Awareness Training

To reduce the potential conflicts with fishers and minimize adverse interactions with wildlife during lease activities, the Lessee must ensure that all personnel and contractors who will be present on vessels or platforms within the Lease Area complete a Fisheries and Wildlife Awareness Training prior to marine operations (e.g., transit, surveys, equipment deployments), consistent with vessel and worker safety. This training must address: (1) identification of common wildlife species; (2) best practices for avoiding vessel strikes and minimizing noise and light impacts; (3) protocols for reporting wildlife sightings and entanglements; and (4) cultural and economic importance of regional fisheries. Training must also include a briefing by the Lessee's environmental compliance officer or designated representative on the importance of minimizing conflicts with local fishers and adhering to all applicable environmental protection measures. The Lessee must ensure that a copy of the environmental lease stipulations and related ESA, EFH, and the Marine Mammal Protection Act (if applicable) conditions of approvals are made available and reviewed with all appropriate personnel aboard every project-related vessel.



U.S. Department of the Interior (DOI)

DOI protects and manages the Nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities.



Bureau of Ocean Energy Management (BOEM)

BOEM's mission is to manage development of U.S. Outer Continental Shelf energy, mineral, and geological resources in an environmentally and economically responsible way.