UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
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July 12, 2024 **Refer to NMFS No: WCRO-2024-01447**

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Re: Endangered Species Act Section 7(a)(2) Concurrence Letter and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Bureau of Ocean Energy Management's Offshore Wind Leasing Activities for Oregon: Site Characterization and Assessment for the Coos Bay and Brookings Wind Energy Areas

Dear Ms. Zaleski and Mr. Krug:

On April 18, 2024, NOAA's National Marine Fisheries Service (NMFS) received your request for a written concurrence that the Bureau of Ocean Energy Management's (BOEM) proposed issuance of offshore wind leases, including subsequent site characterization and assessment activities, offshore of southern Oregon pursuant to the Energy Policy Act of 2005, is not likely to adversely affect (NLAA) species listed as threatened or endangered or critical habitats designated, or species proposed for listing, under the Endangered Species Act (ESA). On June 25, 2024, BOEM notified NMFS that the Corps had requested consultation with NMFS as an additional action agency since the Corps will need to issue permits for some site characterization and assessment activities related to the proposed action.

This response to your request was prepared by NMFS pursuant to section 7(a)(2) of the ESA and implementing regulations at 50 CFR 402. Updates to the regulations governing interagency consultation (50 CFR part 402) were effective on May 6, 2024 (89 Fed. Reg. 24268). We are applying the updated regulations to this consultation. The 2024 regulatory changes, like those from 2019, were intended to improve and clarify the consultation process, and, with one exception from 2024 (offsetting reasonable and prudent measures), were not intended to result in changes to the Services' existing practice in implementing section 7(a)(2) of the Act. 84 Fed. Reg. at 45015; 89 Fed. Reg. at 24268. We have considered the prior rules and affirm that the substantive analysis and conclusions articulated in this letter of concurrence would not have been any different under the 2019 regulations or pre-2019 regulations.

This letter of concurrence includes an analysis of effects on sunflower sea star, a species proposed for listing under the ESA (50 CFR 223.102).

NMFS also received your request for essential fish habitat (EFH) consultation. NMFS reviewed the proposed action for potential effects on EFH pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), implementing regulations at 50 CFR 600.920, and agency guidance for use of the ESA consultation process to complete EFH consultation. We have concluded that the action would adversely affect EFH designated under the Pacific Coast Salmon, Coastal Pelagic Species, Pacific Coast Groundfish, and Highly Migratory Species Fishery Management Plans (FMPs). NMFS has provided four EFH conservation recommendations.

This letter underwent pre-dissemination review using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available within two weeks at the Environmental Consultation Organizer (https://www.fisheries.noaa.gov/resource/tool-app/environmental-consultation-organizer-eco). A complete record of this consultation is on file at NMFS' WCR in Long Beach, California.

Consultation History

On April 18, 2024, BOEM submitted a Biological Assessment (BA) and EFH assessment (EFHA). NMFS requested clarification and additional information from BOEM both verbally and via email regarding their proposed action and effects analysis within the BA and EFHA. Several meetings were held between BOEM and NMFS during May 2024 to discuss potential updates to the BA and EFHA.

On May 30, 2024, BOEM provided an updated BA and EFHA via email in response to the comments and clarifications requested by NMFS. BOEM's email to NMFS on May 30 contained several points of clarification, including that Project Design Criteria 1 (Hard Bottom Avoidance; Table 6) will apply to all activities where contact with the bottom is anticipated. On May 30, 2024, informal consultation and EFH consultation was initiated for those species and critical habitats in Table 7.

On June 17, 2024, NMFS requested clarification via email regarding which species BOEM was requesting concurrence on a "not likely to adversely affect" determination. On June 18, 2024, BOEM provided clarification via email that the ESA listed species identified in the BA (BOEM 2024) that might occur in the action area were those species that BOEM was requesting NMFS to concur with their "not likely to adversely affect" determinations. BOEM clarified that those species identified in the BA (BOEM 2024) as "unlikely to occur in the action area" and "excluded from analysis" were intended to represent the species that would not be affected by the proposed action.

On June 20 and June 21, 2024, NMFS requested clarification via email regarding which designated critical habitats for salmon and steelhead species BOEM was determining the proposed action may affect and was intending to seek NMFS concurrence with their "not likely to adversely affect" determinations. On June 21, 2024, BOEM responded via email confirming which designated critical habitats for listed salmon or steelhead species may be affected by the Project and were seeking concurrence from NMFS.

On June 25, 2024, BOEM contacted NMFS and the Corps (Portland District), requesting that NMFS add the Corps as an action agency to the consultation given the Corps needs to also permit some site assessment and characterization activities. On June 25, 2024, the Corps confirmed their regulatory authority, permitting options, and Regional Conditions that would apply to any future Corps permits issued for these activities.

Proposed Action and Action Area

The need for this proposed action is to analyze anticipated site assessment activities that will occur in and around the Brookings Wind Energy Area (WEA) and the Coos Bay WEA, offshore southern Oregon, including transit routes to and from Brookings and the Coos Bay to any associated ports deemed necessary for vessels to be deployed from in conducting these activities (Figure 1). Site characterization activities considered in this consultation include geophysical and geotechnical surveys, collection of seafloor samples, and biological surveys conducted from a ship or autonomous underwater vehicle (AUV). The surveys are necessary to collect data to support the potential future siting of offshore wind turbines, cables, and associated offshore facilities such as substations or service platforms.

Action Agencies

The activities considered in this consultation may be authorized by BOEM and the Corps. The authorities and roles for these action agencies are described below.

BOEM

The Energy Policy Act of 2005, Public Law 109-58 added Section 8(p)(1)(C) to the Outer Continental Shelf Lands Act (OCSLA), which grants the Secretary of the Interior the authority to issue leases, easements, or rights-of-way on the OCS for the purpose of renewable energy development (43 U.S.C. § 1337(p)(1)(C). The Department of the Interior announced the final regulations for the OCS Renewable Energy Program in April, 2009, which was authorized by the Energy Policy Act. The OCSLA, as amended, mandates the Secretary of the Interior, through BOEM, to manage the siting and development in the OCS of renewable energy facilities. BOEM is delegated the responsibility for overseeing offshore renewable energy development in Federal waters (30 C.F.R. 585). Through these regulations, BOEM oversees responsible offshore renewable energy development.

BOEM proposes to issue commercial wind energy leases with associated easements within the Brookings WEA and Coos Bay WEA offshore southern Oregon (maximum of one lease per WEA), and the granting of related rights of way (ROWs) and rights of use and easements (RUEs). ROWs, RUEs, and easements would be within the Oregon Outer Continental Shelf (OCS) and may include corridors from the OCS through State waters to the onshore energy grid. Under the Proposed Action, BOEM may issue easements associated with each lease and issue grants for subsea cable corridors and associated offshore collector/converter platforms.

BOEM expects lease issuance will be followed by site characterization and assessment activities conducted by the lessee(s). A lease allows a lessee to submit plans for environmental data collection through site assessment and site characterization. Site characterization typically includes geophysical and geotechnical surveys, collection of seafloor samples, and biological surveys conducted from a ship or AUV. Site assessment involves data collection on wind, typically through the temporary placement of meteorological and oceanographic buoys (i.e., metocean buoys) within a WEA; thus, this activity involves temporary installation, operation, and decommissioning of metocean buoys. BOEM reviews site characterization survey plans (survey plans), and all comments from BOEM must be resolved prior to a lessee conducting survey activities. BOEM also reviews site assessment plans (SAPs) from lessees, and lessees must have BOEM's approval of SAPs to proceed. All survey plans and SAPs are reviewed to ensure inclusion of appropriate protective measures.

Together, site assessment and site characterization activities collect information to inform the development of a Construction and Operations Plan (COP), which BOEM expects to be submitted by lessees in the future. A separate consultation will occur between NMFS and BOEM related to any proposed COP(s). As such, the proposed action does not include cable installation or connection to shore-based facilities, or construction or operation of commercial-scale wind energy facilities. After lessees are identified, they may propose construction to operate a commercial scale wind energy facility within the two WEAs where they would submit a COP to BOEM – this would be considered a separate action under the National Environmental Policy Act and would require separate ESA and EFH consultations.

<u>Corps</u>
Of the activities considered in this consultation, the deployment of metocean buoys, Acoustic Doppler Current Profilers (ADCP's), and conducting geotechnical and geophysical surveys may require authorization from the Corps. The Corps has regulatory responsibilities under Section 10 of the Rivers and Harbors Act of 1899 to approve/permit any structures or activities conducted below the mean high-water line of navigable waters of the United States. The Corps also has responsibilities under Section 404 of the Clean Water Act (CWA) to regulate the discharge of dredged and/or fill material within waters of the United States. A Corps Nationwide Permit (NWP) 5 for Scientific Measurement Devices, or Individual Permit may be required for devices and scientific equipment affixed to the seafloor whose purpose is to record scientific data through such means as meteorological stations (which would include buoys); water recording and biological observation devices, water quality testing and improvement devices, and similar structures. The Portland District's Regional Conditions for NWP 5 indicate the "Permittee shall remove all scientific measurement devices including all associated structures and fills including anchoring devices, buoys, and cables within 30 days after the device is no longer being used for its intended purpose (Corps 2022)."

Action Area

The action area includes waters from the Oregon coast (including several bays and harbors) to the outer boundary of the OCS off Oregon, bounded on the north by Astoria, Oregon and on the south by San Francisco, California (Figure 1). The action area encompasses the two proposed WEAs offshore southern and central Oregon, as well as other portions of the action area for NMFS' consultation with BOEM on the California WEAs in 2022 (BOEM 2022, NMFS 2022a). We expect the only proposed activity that will overlap with the action area from NMFS previous consultation with BOEM on California WEAs is vessel traffic to and from areas off the Oregon coast. The Coos Bay WEA consists of approximately 61,203 acres, and the Brookings WEA consists of approximately 133,792 acres, for a total of 194,995 acres (about 79,000 hectares (ha)).

The action area incorporates the possible transit routes to and from ports/harbors to the WEAs, and site assessment and characterization activities within the WEAs and along the possible cable routes to shore. BOEM assumes that a lessee would stage activities from the ports close to the WEAs but that vessels associated with the proposed action could originate from ports as far north as Astoria, Oregon and as far south as San Francisco, California. BOEM does not have regulatory authority to approve any activities in State waters and onshore areas, or apply mitigation measures outside of the OCS.

Overview of Site Characterization and Assessment Activities

- Lessees would likely survey the entire proposed lease area during the 5-year site assessment term (which includes 3 years of site characterization surveys and 1-5 years of buoy deployment) to collect required information for the siting of up to six metocean buoys (per lease) and potential commercial wind facilities.

- Site characterization surveys will be conducted before installation of metocean buoys, and may also be conducted after installation of buoys.
- Lessees would perform High Resolution Geophysical (HRG) surveys, which will not include the use of air guns.
- BOEM will require vessels conducting lease characterization studies, surveys, metocean buoy installation, maintenance, or decommissioning or any other survey activities to travel at speeds no more than 10 knots during all related activities including vessel transit within the action area.

Site Characterization Survey Assumptions

Site characterization activities involve geological, geotechnical, and geophysical surveys of the seafloor to ensure that mooring systems, turbines, and cables can be properly located, as well as to look for shallow hazards and for surveying archaeological (i.e., historic property) resources. Biological surveys are also part of site characterization surveys that collect data on potentially affected habitats, marine mammals, birds, sea turtles, and fishes. Guidelines for Information Requirements for a Renewable Energy SAP (BOEM 2019) are available at http://www.boem.gov/Final-SAP-Guidelines. BOEM national survey guidelines for some resources can be found at http://www.boem.gov/Survey-Guidelines/.

Lessees will conduct HRG surveys and geotechnical sampling within WEAs and ROW/RUE routes (i.e., the corridors from WEAs to the onshore energy grid; potential cable easement routes) during the 5-year site assessment term. It is assumed that the ROW/RUE routes would consist of a minimum 300-meter-wide corridor centered on anticipated cable locations. Because any ROW or RUE grants considered as part of this undertaking have not been issued, BOEM is uncertain of the locations of cable corridor surveys. Surveys can be conducted before and after metocean buoy installation to collect data for a COP.

<u>Collection of Geotechnical/Sub-bottom Information Assumptions</u>

Site characterization activities include geotechnical surveys such as dredging, gravity cores, piston cores, vibracores, deep borings, and cone penetration tests (CPT), among other geotechnical exploration methods such as benthic videography conducted with remotely operated vehicles (ROVs) (Table 1). Geotechnical surveys generally use active acoustic sources and may have associated low-level ancillary sounds. Samples for geotechnical evaluation are collected using shallow-bottom coring and surface sediment sampling devices taken from a small marine drilling vessel. CPTs and bore sampling are often used together because they provide different data on sediment characteristics. A CPT provides a fairly precise stratigraphy of the sampled interval, plus other geotechnical data, but does not allow for capture of undisturbed soil samples. Bore holes can provide undisturbed samples, but only when used in conjunction with CPT so that the sample depths can be pre-determined. A CPT is suitable for use in clay, silt, sand and granule-sized sediments as well as some consolidated sediment and colluvium. Bore sampling methods can be used in any sediment type and in bedrock, while vibracores are suitable for extracting continuous sediment samples from unconsolidated sand, silt, and clay-sized sediment up to 33 feet below the seafloor.

Figure 1. Map of the action area which extends north and south of the two Oregon Wind Energy Areas (black striped polygons near Coos Bay and Brookings, OR) and the Humboldt lease areas (gray-striped polygons near Eureka, CA; BOEM 2024).

The Brookings and Coos Bay WEAs will include only one lease in each WEA. BOEM assumed individual geotechnical sampling events (e.g., collection of a core or grab sample) and placement of anchors for metocean buoys or ADCP moorings could disturb up to 10 m^2 of seafloor, although some activities may cause smaller disturbances (Table 1). BOEM (2024) determined the number of samples collected by one lessee will likely be 100 or fewer, representing a maximum of 1,000 m^2 (0.1 ha; 0.25 acres) of seafloor disturbance. The majority of the expected seafloor contacts are from the proposed geotechnical samples; at 100 samples per lease issued. Additional seafloor disturbance per lease could come from anchoring for up to 6 metocean buoys and up to 10 ADCP moorings per lease, for a total of 116 contacts from anchors and geotechnical sampling. BOEM (2024) increased and rounded up from 116 contacts to 150 to avoid an underestimate: 150 contacts x 10 m^2 = 1,500 m^2 of potential seafloor disturbance. BOEM (2024) did not describe how seafloor disturbance estimates for anchoring of metocean buoys and ADCP moorings were derived. BOEM (2024) also estimated seafloor disturbance from Underwater Transponder Positioning devices (UTPs), or similar technology as a maximum of 64 m^2 per lease. Based on the above contact numbers, BOEM estimated 1,564 m^2 sediment disturbance per lease issued, and 3,128 m^2 of benthic disturbance for two leases.

Table 1. Potential geotechnical sampling methods, associated sounds, and estimated seabed disturbance (BOEM 2024).

Geotechnical Method	Use	Description of Equipment and Methods	Acoustic Noise	Seabed Disturbance
Dredge	Collect upper 5–10 cm of sediment (direct sampling)	Spring loaded dredge is lowered to the seabed by hand or with a small winch. Interaction with the seabed causes spring to release and tension on the line provides the closing force for the dredge. Useful for identifying the type of seabed sediment.	None	< 1 m^2

Box Cores	Collect undisturbed "box" of sediment up to 0.5 m x 0.5 m x 1.0 m (direct sampling)	A box core is lowered to the seabed 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. This type of equipment is also used for benthic studies.	Ultra-short baseline (USBL) beacon for positioning	< 4 m^2
Gravity / Piston Coring / Jumbo Piston Coring	Collect a core of sediments for analysis. 3–4" diameter, 10 m–20 m (direct sampling)	Coring is typically conducted off a survey vessel. Gravity coring uses a weighted core barrel to take a sample. Piston coring uses a trigger to drop the weighted core barrel into the seabed with a piston that attempts to preserve the seabed. A jumbo piston core is a larger piston corer with increased diameter and length.	USBL beacon for positioning	< 4 m^2
Cone Penetrometer (CPT)	Measure several properties including tip resistance, pore water pressure, sleeve resistance, among others. (in situ)	An electrically operated machine pushes a coiled rod into the seabed with a cone penetrometer at the tip. Typically deployed from survey vessels. They are winched to the seabed and remain connected to the survey vessel via cables for data transmission and power.	USBL beacon for positioning. Motor noises during operation.	< 10 m^2

Stinger CPT	Measure several properties including tip resistance, pore water pressure, sleeve resistance, among others. (in situ)	A hydrodynamic dart with a cone penetrometer at the tip. CPT Stingers are typically deployed from survey vessels, much like a gravity core. The CPT records as the equipment embeds into the seafloor. It may then push the CPT further into the seafloor.	USBL beacon for positioning. Motor noises during operation.	< 4 m^2
Vibracore	Obtain samples of unconsolidated sediment; may also be used to gather information to aid archaeological interpretation of features identified through HRG surveys/direct sampling (BOEM 2020)	Vibracore samplers typically consist of a core barrel and an oscillating driving mechanism that propels the core barrel into the sub-bottom. Once the core barrel is driven to its full length, the core barrel is retracted from the sediment and returned to the deck of the vessel. Typically, cores up to 6 m long with 8 cm diameters are obtained, although some devices have been modified to obtain samples up to 12 m long.	Vibrations from the motor.	< 10 m^2

Borings	Sampling and characterizing the geological properties of sediments at the maximum expected depths of the structure foundations (MMS 2007) (direct sampling)	A drill rig is used to obtain deep borings. The drill rig is mounted over a moon pool on a dynamically positioned vessel with active heave compensation. Geologic borings can generally reach depths of 30–61 m within a few days (based on weather conditions). The acoustic levels from deep borings can be expected to be in the low-frequency bands and below the 160-dB threshold established by NMFS to protect marine mammals (Erbe and McPherson 2017).	Vessel and drill noise.	$< 10\ m^2$

Collection of Geophysical Information Assumptions

Site characterization will include HRG surveys for charting bathymetry, archaeological resources, and benthic zone hazards (following BOEM's guidelines for geophysical data requirements: 30 CFR 585.610(b)(2) and 30 CFR 585.610(b)(3)). HRG surveys can inform site selection for geotechnical sampling and whether hazards will interfere with future construction phases.

HRG surveys use electrically-induced sonar transducers to emit and record acoustic pulses, and do not use air or water compression to generate sound. HRG survey equipment may include swath bathymetry systems, magnetometers/gradiometers, side-scan sonar, multibeam echosounders, shallow penetrating seismic sub-bottom profiler systems, and medium penetrating impulsive seismic systems such as boomers or sparkers (Table 2). This equipment does not contact the seafloor and is expected to be towed from a moving survey vessel or onboard unmanned vehicles (e.g., ROVs, AUVs), or Human Occupied Vehicles (HOVs, i.e., submersibles).

Improved HRG survey technologies that may become available must meet requirements for SAPs (30 CFR § 585.606(5)). If new technology is proposed by lessees for site characterization or SAPs, and if the potential impacts from this new technology are similar or less than those analyzed for the equipment described in this document, BOEM may approve the survey plans without reinitiating consultation.

The line spacing guidelines for HRG surveys described in BOEM (2024) varies depending on the survey goal. To collect geophysical data for shallow hazards assessments (including multibeam echosounder, side-scan sonar, and sub-bottom profiler systems), BOEM recommends surveying at a 150-m (492-ft) primary line spacing and a 500-m (1,640-ft) tie-line spacing over the proposed lease area. For the collection of geophysical data for archaeological resources assessments (including magnetometer, multibeam echosounder, side-scan sonar, and sub-bottom profiler systems), BOEM recommends surveying at a 30-m (98-ft) primary line spacing and a 500-m (1640-ft) tie-line spacing over potential pre-contact archaeological sites once part of the terrestrial landscape that has since inundated by global sea level rise during the Pleistocene and Holocene, generally thought to be in waters less than 100 m depth, which is typically in cable landing areas.

Several survey methods can be used to collect high resolution geophysical data, as summarized below. Typically, these methods are based on the water depth of the survey area. However, limitations on equipment availability may affect which survey methods are chosen.

- AUVs are autonomous (non-tethered) submersibles with their own power supply and basic navigation logic. An AUV can run many geophysical sensors at once and typically would consist of a multibeam echosounder, side-scan sonar, magnetometer, and a sub-bottom profiler. AUVs also have forward looking sonar for terrain avoidance, a doppler velocity logger for velocity information, an internal navigation system for positioning, an ultra-short baseline pinger for positioning, and an acoustic modem for communication with a surface survey vessel. For single AUV operations the surface survey vessel follows the AUV, keeps in communication via the acoustic modem, provides navigation information to the AUV, and monitors the health of the AUV. During multiple AUV surveys, several AUVs are deployed at once. These AUVs run independently from the survey vessel. Navigation updates and modem communication are provided by a network of UTPs. These transponders are deployed to the seabed in known locations. In both methods of operation, the survey vessel recovers, maintains, and launches the AUVs and UTPs (see also BOEM 2024). A survey vessel may deploy AUVs and UTPs through a moon pool, which is a large opening through the hull from the deck and to the bottom of a vessel for lowering tools and instruments into the sea.

- Towed surveys include a vessel towing underwater instruments. Towed instrumentation may include side-scan sonar, passive acoustic, seismic, magnetometers and/or gradiometers with winches to provide altitude adjustments. In shallower water, the survey vessel usually has hull mounted multibeam echosounders, a sub-bottom profiler, and an ultra-short baseline system. In deeper water, the vessel tows survey instruments at depth with a large weight (depressor) followed by a side-scan, sub-bottom, and potentially a multibeam. In deep waters, the survey vehicle might be 8–10 km behind the survey vessel, sometimes requiring the use of a chase vessel to provide USBL navigation for the survey vehicle. Vessels maintain slower speeds of 0–4.5 knots when towing equipment.

- Uncrewed Surface Vessels (USV) are remote controlled vessels that are controlled by operators on shore or from another vessel. USVs can be simple with a single instrument, designed for shallow waters, and controlled by an operator that maintains visual contact with the USV. USVs can also be larger, the size of a small survey vessel, are operated over the horizon, could tow instruments, and use radar and cameras to operate safely and monitor for protected species. USVs can be electrically powered with batteries, sail/solar powered, and/or use diesel motors and generators.

Table 2. HRG survey equipment that could be used during geophysical surveys for site characterization (BOEM 2024).

Equipment Type	Expected Uses	Equipment Description
Bathymetry/depth sounder (multibeam echosounder)	Collection of bathymetric data for shallow hazards, archaeological resources, and benthic habitats	A depth sounder is a microprocessor-controlled, high-resolution survey-grade system that measures precise water depths in both digital and graphic formats. Records with a sweep appropriate to the range of water depths expected in the survey area. Multibeam bathymetry systems may be more appropriate than other tools for characterizing areas with complex bathymetric features or sensitive benthic habitats, such as hard bottom areas.
Gradiometer	Collection of geophysical data for shallow hazards and archaeological resources assessments. Help identify objects with distinct magnetic signatures.	Used to detect and aid in the identification of objects with a distinct magnetic signature. The gradiometer sensor is typically towed close to the seafloor at no more than approximately 6 m (20 ft) above the seafloor. This methodology is not anticipated to be used at this time in the WEA since depths are 500 m or greater, but may be used to survey potential cable routes in depths < 500 m.

Side-scan sonar	Collection of geophysical data for shallow hazards and archaeological resource assessments. Evaluation of surface sediments, seafloor morphology, and potential surface obstructions (MMS 2007).	Used to evaluate surface sediments, seafloor morphology, and potential surface obstructions (MMS 2007). A typical side-scan sonar system consists of a top-side processor, tow cable, and towfish with transducers (or "pingers") on the sides which generate and record the returning sound that travels through the water column at a known speed. BOEM assumes that lessees would use a digital dual-frequency side-scan sonar system with ≥300–500 kHz frequency ranges to record continuous planimetric images of the seafloor.
Shallow and medium (seismic) penetration sub-bottom profilers	Collection of geophysical data for shallow hazards and archaeological resource assessments, and profile views of subsurface sediments for geologic cross-sections under tracklines.	A high-resolution Compressed High Intensity Radar Pulse (CHIRP) system sub-bottom profiler (a narrow frequency around 5.7 kHz) can generate a profile view below the bottom of the seabed used to develop a geologic cross-section of subsurface sediment conditions under the trackline surveyed. Also, medium penetration systems, such as boomers, sparkers (2.7 kHz), and bubble pulsers (4.3 kHz), or other impulse-type systems. Sub-bottom profilers are capable of penetrating sediment depth ranges of 3 m (10 ft) to > 100 m (328 ft).

Biological Survey Assumptions

Site characterization surveys for animals (birds, bats, marine mammals, sea turtles, fishes, and invertebrates) may involve visual observations from vessels or from the air and technologies to detect animals (Table 5). Biological resource surveys (30 CFR 585.610(b)(5)) for birds, fishes, marine mammals, and sea turtles from vessels are typically done during daylight hours, with day trips lasting about 10 hours. These surveys may occur at the same time from the same vessel, but not concurrently with HRG surveys. Benthic habitat trips are assumed to be 24-hr operations.

Site Assessment Assumptions

Instrumentation and Power Requirements

Metocean buoys are anchored at fixed locations to monitor and evaluate the viability of wind as an energy source. These buoys may include floating light detection and ranging (LiDAR) to measure wind speeds at multiple heights, and anemometers, vanes, barometers, temperature transmitters and other devices may be mounted on a buoy. A metocean buoy could also accommodate environmental monitoring equipment such as avian monitoring equipment including thermal imaging cameras, tagging receivers, acoustic monitoring for marine mammals, data logging computers, visibility sensors, water measurements including temperature, and communications equipment. Onboard power supply sources for buoys may include solar arrays, lithium or lead-acid batteries, and diesel generators, which require an onboard fuel storage container with appropriate spill protection and an environmentally sound method to perform refueling activities.

The speed and direction of ocean currents will likely be assessed with ADCPs. ADCPs are a remote sensing technology that transmits sound waves at a constant frequency and measures the ricochet of the sound wave off fine particles or zooplanktons suspended in the water column. A typical ADCP has 3 to 4 acoustic transducers that emit and receive acoustical pulses from different directions, with frequencies ranging from 300-600 kHz and a sampling rate of every one to 60 minutes.

Metocean Buoy and ADCP Designs and Anchoring Systems

Discus-shaped, boat-shaped, and spar buoys (Figure 5 in BOEM 2024) are the buoy types that would most likely be adapted for offshore wind data collection. Mooring depends on hull type, location, and water depth (National Data Buoy Center 2012). On the OCS, a larger discus-type or boat-shaped hull buoy may require a combination of a chain, nylon, and buoyant polypropylene materials designed with one or two weights. Moorings will be designed to minimize or remove entanglement risk for protected species. In 2020, Pacific Northwest National Laboratory (PNNL) installed two LiDAR buoys off California that had a boat-shaped hull moored with a solid cast iron anchor weighing approximately 4,990 kg (11,000 lbs.) with a 2.3 m^2 footprint. The mooring line consisted of chain, jacketed wire, nylon rope, polypropylene rope and subsurface floats to keep the mooring line taut to semi-taut. The mooring line was approximately 1,200 m long in the Humboldt WEA (PNNL 2019). BOEM anticipates that LiDAR buoys deployed as part of the proposed action will be very similar to these LiDAR buoys deployed by PNNL.

The ADCPs may be mounted independently on the seafloor, attached to a buoy, or have multiple instruments deployed as a subsea current mooring. A seafloor mounted ADCP would likely be located near a metocean buoy. A 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 is about one to two feet high and one to two feet wide. Its mooring, base, or cage (surrounding frame) will be several feet wider. Based on information from existing West Coast lessees, BOEM anticipates up to three ADCP moorings could be installed in each lease area, and up to seven may be installed along the export cable routes.

Buoy Installation, Operations and Maintenance, and Decommissioning Assumptions
As described above, BOEM and the Corps may approve and authorize the deployment of metocean buoys under SAPs, and NWP 5 or Individual Permit. Buoys are typically towed or carried aboard a vessel to the installation location. The buoy is then lowered to the ocean from the deck of the transport vessel or placed over the final location and the mooring anchor dropped. The buoy is anchored to the seafloor with a solid cast iron anchor weighing approximately 11,000 lb (2.3 m^2 footprint). The approximate 1,650-meter-long mooring line is composed of various components and materials, including chain, jacketed wire, nylon rope, polypropylene rope, and subsurface floats to keep the mooring line taut to semi-taut, reduce slack, and eliminate looping. The buoy will have a watch circle (i.e., excursion radius) of approximately 1,250 m. After installation, the transport vessel would likely remain in the area for several hours while technicians configure proper operation of all systems (PNNL 2019). Metocean buoy installation will take approximately one day (BOEM 2024).

Monitoring information transmitted to shore would include systems performance information such as battery levels and charging systems output, the operational status of navigation lighting, and buoy positions. Additionally, all data gathered via sensors would be fed to an onboard radio system that transmits the data string to a receiver onshore (Tetra Tech EC Inc. 2010). On-site inspections and preventative maintenance (e.g., marine fouling, wear, or lens cleaning) are expected to occur yearly. Decommissioning is expected to be completed within one day per buoy equipment recovery in year 6 or 7 after lease issuance (≤ 5 years of total deployment). A vessel(s) equivalent in size and capability to the vessel used for installation would be used for decommissioning (BOEM 2024).

Vessel Characterization and Traffic Assumptions

Vessel trips are anticipated for both site assessment and site characterization activities (Tables 3-5). A vessel trip represents one vessel moving in the action area for up to 24 hours. Some vessel use activities, such buoy installation or maintenance, may be completed within a 24-hour period (i.e., one trip). Other activities, such as HRG or biological surveys, could require the deployment of a vessel for several days or weeks to complete the survey, which would be recorded as many trips. Buoy installation vessels will be approximately 65 to 100 ft (20 to 30 m) in length (Table 3). Crew boats used for buoy operations and maintenance will be 51 to 57 ft (16 to 17 m) long with 400 to 1,000-horsepower engines and 1,800-gallon fuel capacity. Vessels for HRG and biological surveys will vary in size and other specifications. There will be approximately 2,000 vessel trips for all proposed activities associated with two leases over a 5-yr period, an average of 1.1 trips per day (BOEM 2024).

Non-fishing vessel traffic within the Brookings and Coos Bay WEAs based on 2019 Automatic Identification System (AIS) data was in the range of 26-100 vessels for the year, depending on the portion of the WEA (BOEM 2024). For comparison, traffic slightly further offshore from the

WEAs in 2019 was 101-125 vessels, and within Coos Bay was 201-1,125 vessels. In 2019, multiple tracks of up to at least 125 vessels each crossed the action area (BOEM 2024).

Table 3. Vessel trips and information for site assessment metocean buoy activities based on one lease with 6 buoys (BOEM 2024).

Survey Task	Estimated Round Trips (per lease)	Total Trips (for both leases)	Vessel Length
Buoy installation	6	12	65 to 100 ft (20 to 30 m)
Buoy maintenance at once per year per buoy for 5 years	30	60	51 to 57 ft (16 to 17 m)
Metocean buoy decommissioning	6	12	65 to 100 ft (20 to 30 m)
Additional maintenance trips as needed (e.g., if severe weather)	60	120	51 to 57 ft (16 to 17 m)
Total	102	204	Range: 51 to 100 ft (16 to 30 m)

Table 4. Estimated number of vessel trips (up to 24 hrs) for site characterization HRG (geophysical) surveys and geotechnical sampling for one leased area, and potential cable corridors for that area, based on a representative survey plan (BOEM 2024).

Survey Task	Vessel Trips
HRG surveys per lease	280
Geotechnical sampling per lease	400
Total estimated # survey days for 1 lease	680

Table 5. Estimated number of vessel trips for biological resources. A range has been provided when data or information was available to determine an upper and lower number of round trips. Otherwise, only a maximum value was determined. Number of vessel trips are intended to be conservative estimates of survey requirements, with actual numbers likely to be lower (BOEM 2024).

Biological Resources	Survey Methods	Trips For One Lease	Total Trips
Birds	Aerial digital imaging; visual observation; radar; thermal or acoustic monitoring	30–60	120
Bats	Ultrasonic detectors installed on buoy and survey vessels, radar, thermal monitoring	0	0
Marine mammals, sea turtles	Aerial or vessel-based surveys, acoustic monitoring	30–60	120
Fishes, some invertebrates	Underwater imagery; acoustic monitoring; eDNA	8–370	740
Benthic habitats	Grab sampling; benthic sled; underwater imagery/ sediment profile imaging; ROV; AUV	50	100
Total Range	All	118-540	1,080

Project Design Criteria (PDC) and Best Management Practices (BMPs)

BOEM has developed project design criteria (PDC) and best management practices (BMPs) for site assessment and site characterization activities (Table 6). BOEM developed PDCs to avoid and minimize potential environmental risks to or conflicts with protected resources from activities that are part of the proposed action. Through coordination with stakeholders, BOEM developed BMPs for implementation of PDCs.

Mechanisms for implementing BMPs include lease stipulations, individual plan reviews, and incidental take authorization requirements for marine mammals (including ESA-listed species) under the Marine Mammal Protection Act. BOEM will ensure implementation of BMPs through review of SAPs and survey plans through standard operating conditions (SOCs). BOEM's project-specific reviews may result in additional BMPs to clarify these conditions or to further minimize and avoid impacts to threatened or endangered species or their habitats. If changes to existing BMPs are proposed, BOEM should contact NMFS to determine whether reinitiation of consultation is needed. Appendix A of BOEM (2024) includes the specific PDCs and BMPs intended to minimize effects to ESA-listed species and EFH for site characterization and assessment activities to support offshore wind development. We have condensed them below, as they are considered part of the proposed action and will be used to assess effects to ESA-listed species and EFH.

Table 6. BOEM's proposed PDCs for protected species and EFH. These PDCs are in addition to existing statutory and regulatory requirements, review procedures, and other BMPs that may apply. These measures are summarized here and can be referenced in full in Appendix A (BOEM 2024).

#	Project Design Criteria	Applicable to	Purpose
1	Hard Bottom Avoidance: Metocean Buoy Anchoring Plan and Prohibition of Trawling	Employees and all at-sea contract personnel and vessels	Metocean Buoy Anchoring: To protect rocky reefs, a Habitat of Particular Concern for Pacific Groundfish EFH, which will reduce adverse effects associated with habitat alteration to minimally adverse levels by relying on a 12m (40 feet) buffer from hard substrates. No Trawling: To reduce possibility of bycatch of protected fish species and to protect benthic habitats.
2	Marine Debris Awareness and Elimination	All at-sea and dockside operations	To provide informational training to all employees and contract personnel on the proper storage and disposal practices at-sea to reduce the likelihood of accidental discharge of marine debris that can impact protected species through entanglement or incidental ingestion.
3	Minimize Interactions with ESA-listed Species during Geophysical Survey Operations	Any survey vessel operating high-resolution geophysical survey equipment to obtain data associated with a lease and operating such equipment at or below 180 kHz	This PDC will avoid injury of ESA-listed species and minimize the likelihood of adverse effects associated with potential disturbance to discountable levels through the establishment of pre-clearance, exclusion zones, shut-downs, PSO monitoring, and other BMPs to avoid and reduce exposure of ESA-listed species to underwater survey noise.

4	Minimize Vessel Interactions with ESA-listed species	All vessels	To avoid injuring or disturbing ESA-listed species by establishing minimum separation distances between vessels and marine protected species; and operational protocols for vessels when animals are sighted.
5	Entanglement Avoidance	Mooring and anchoring systems for buoys and metocean data collection devices.	To use the best available mooring systems using anchors, chain, cable, or coated rope systems that prevent or reduce to discountable levels any potential entanglement of marine mammals and sea turtles.
6	Protected Species Observers	Geophysical Surveys	To require PSO training; to require PSO approval requirements by NMFS prior to deployment on a project.
7	Reporting Requirements	PSOs and any project-related personnel who observe a dead and/or injured protected species.	To document and record monitoring requirements for geophysical surveys, project-related incidents involving ESA-listed species, and to report any impacts to protected species in a project area whether or not the impact is related to the project.

Other Activities

We considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it could cause the following activities: marine technology companies may install meteorological buoys or instrumentation near the WEA's to collect information that could be later sold to lessees. We are aware that previous BOEM lease sales (for central and northern California) have resulted in private companies installing instrumentation near the WEA's for subsequent sales of data later. However, those activities are occurring outside our immediate visibility, and the extent of these activities that have happened is uncertain. We acknowledge that many of these potential activities are similar to the actions evaluated in this consultation (and correspondingly, so would most of the potential effects), including deployment and anchoring of instruments on the seafloor (in particular metocean buoys), and that these effects are described in the entanglement, benthic disturbance, and vessel collisions sections in this consultation. Generally, we do assume similar effects are possible. However, given the uncertainty in exactly which activities may occur, and at what intensity, duration, or location, we cannot analyze the potential consequences of those activities further at this time.

Background and Action Agency's Effects Determination

BOEM has evaluated what effects survey and data collection activities associated with offshore renewable energy leasing may have on ESA-listed species of whales, sea turtles, fish, and their critical habitats. Additionally, BOEM has evaluated what effects to EFH are associated with the proposed action and has consolidated their analysis with the ESA consultation. BOEM's BA and EFH assessment (BOEM 2024) describes the proposed action, identifies those threatened and endangered species (Table 7), designated critical habitats, species proposed for ESA-listing, and essential fish habitat, likely to be affected by the action, identifies potential impact producing factors, and analyzes potential effects, including cumulative effects.

BOEM has determined that the proposed action is not likely to adversely affect any ESA-listed species or designated critical habitat, or species proposed for ESA-listing.

Table 7. ESA listed species, their scientific names, ESA listing status, and critical habitat designation for those species or critical habitats that may be affected by the proposed action. Note: N/A indicates critical habitat has not been designated, while blank cells indicate that the project will not impact existing critical habitat.

Common Name	Scientific Name	ESA Status	Citations for ESA Listing	Citations for Critical Habitat Designation
Baleen Whales				
Blue whale	*Balaenoptera musculus*	Endangered	50 CFR 224.101	N/A
Fin whale	*Balaenoptera physalus*	Endangered	50 CFR 224.101	N/A
Sei whale	*Balaenoptera borealis*	Endangered	50 CFR 224.101	N/A
Humpback whale - Central America distinct population segment (DPS)	*Megaptera novaeangliae*	Endangered	50 CFR 224.101	50 CFR 226.227

Humpback whale - Mexico DPS	*Megaptera novaeangliae*	Threatened	50 CFR 224.101	50 CFR 226.227
Gray whale - Western North Pacific stock	*Eschrichtius robustus*	Endangered	50 CFR 224.101	N/A
Toothed Whales				
Sperm whale	*Physeter macrocephalus*	Endangered	50 CFR 224.101	N/A
Southern resident killer whale	*Orcinus orca*	Endangered	50 CFR 224.101	50 CFR 226.206
Sea Lions and Seals				
Steller sea lion - Eastern DPS	*Eumetopias jubatus*	Delisted (but critical habitat still in effect)	N/A	50 CFR 226.206
Guadalupe fur seal	*Arctocephalus townsendi*	Threatened	50 CFR 223.102	N/A
Sea Turtles				
Leatherback sea turtle	*Dermochelys coriacea*	Endangered	50 CFR 224.101	50 CFR 226.207
Loggerhead sea turtle - North Pacific DPS	*Caretta caretta*	Endangered	50 CFR 224.101	N/A
Chinook salmon - 9 ESUs				
Sacramento River winter-run Chinook salmon ESU	*Oncorhynchus tshawytscha*	Endangered	50 CFR 224.101	

Central Valley spring-run Chinook salmon ESU	*Oncorhynchus tshawytscha*	Threatened	50 CFR 223.102	
California Coastal Chinook salmon ESU	*Oncorhynchus tshawytscha*	Threatened	50 CFR 223.102	50 CFR 226.211
Lower Columbia River Chinook salmon ESU	*Oncorhynchus tshawytscha*	Threatened	50 CFR 223.102	50 CFR 226.212
Upper Columbia River Spring-run Chinook salmon ESU	*Oncorhynchus tshawytscha*	Endangered	50 CFR 223.102	
Snake River Fall Chinook salmon ESU	*Oncorhynchus tshawytscha*	Threatened	50 CFR 223.102	50 CFR 226.212
Snake River Spring/Summer-Run Chinook ESU	*Oncorhynchus tshawytscha*	Threatened	50 CFR 226.205	50 CFR 226.205
Upper Willamette River Chinook salmon ESU	*Oncorhynchus tshawytscha*	Threatened	50 CFR 223.102	50 CFR 226.212
Puget Sound Chinook salmon ESU	*Oncorhynchus tshawytscha*	Threatened	50 CFR 226.212	
Coho salmon - 4 ESUs				
Central California Coast coho salmon ESU	*Oncorhynchus kisutch*	Endangered	50 CFR 224.101	

Southern Oregon/Northern California Coast coho salmon ESU	*Oncorhynchus kisutch*	Threatened	50 CFR 223.102	50 CFR 226.210
Lower Columbia River coho salmon ESU	*Oncorhynchus kisutch*	Threatened	50 CFR 223.102	50 CFR 226.212
Oregon Coast coho salmon ESU	*Oncorhynchus kisutch*	Threatened	50 CFR 223.102	50 CFR 226.212
Steelhead - 11 DPSs				
California Central Valley steelhead DPS	*Oncorhynchus mykiss*	Threatened	50 CFR 223.102	
Central California Coast steelhead DPS	*Oncorhynchus mykiss*	Threatened	50 CFR 223.102	
South-Central California Coast steelhead DPS	*Oncorhynchus mykiss*	Threatened	50 CFR 223.102	
Southern California steelhead DPS	*Oncorhynchus mykiss*	Endangered	50 CFR 224.101	
Northern California steelhead DPS	*Oncorhynchus mykiss*	Threatened	50 CFR 223.102	50 CFR 226.211
Lower Columbia River steelhead DPS	*Oncorhynchus mykiss*	Threatened	50 CFR 223.102	50 CFR 226.212

Middle Columbia River steelhead DPS	*Oncorhynchus mykiss*	Threatened	50 CFR 223.102	50 CFR 226.212
Upper Columbia River steelhead DPS	*Oncorhynchus mykiss*	Endangered	50 CFR 223.102	50 CFR 226.212
Puget Sound steelhead DPS	*Oncorhynchus mykiss*	Threatened	49 CFR 223.102	
Snake River steelhead DPS	*Oncorhynchus mykiss*	Threatened	50 CFR 223.102	50 CFR 226.212
Upper Willamette River steelhead DPS	*Oncorhynchus mykiss*	Threatened	50 CFR 223.102	50 CFR 226.212
Chum Salmon - 2 ESUs				
Columbia River chum salmon ESU	*Oncorhynchus keta*	Threatened	50 CFR 226.212	50 CFR 226.212
Hood Canal summer-run chum salmon ESU	*Oncorhynchus keta*	Threatened	50 CFR 226.212	
Non-salmonid fish species				
North American Green Sturgeon Southern DPS	*Acipenser medirostris*	Threatened	50 CFR 223.102	50 CFR 226.219
Pacific Eulachon Southern DPS	*Thaleichthys pacificus*	Threatened	50 CFR 223.102	

Invertebrates				
Sunflower sea star	*Pycnopodia helianthoides*	Candidate - Threatened*	88 FR 16212 (proposed)	N/A
*Although the listing of sunflower sea stars under the ESA is currently proposed, it is expected to be listed in 2024; therefore, activities associated with the proposed action are expected to occur after the listing.				

Life History and use of the Action Area by Listed Species

<u>Marine Mammals</u>

Large whales that may be found within the action area that may be affected by the proposed action include blue whales, fin whales, sei whales, two DPSs of humpback whales, Western North Pacific gray whales, sperm whales, and Southern Resident killer whales. Calambokidis et al. (2024) integrated data from visual sightings, tagged animals, and habitat-based density models to delineate Biologically Important Areas (BIAs) for cetaceans along the U.S. West Coast. A BIA is an area and time of year that is important to cetacean feeding, reproduction, or migration. Except for gray whales, each defined BIA is composed of a larger "parent BIA" within which an area of more intensive use, termed a "core BIA" is also delineated.

The Eastern North Pacific Stock of blue whales ranges from the northern Gulf of Alaska to the eastern tropical Pacific (Carretta et al. 2022). Calambokidis et al. (2024) defined a parent BIA for blue whales from June to November that extends from the Southern California Bight to waters off the coast of Florence, Oregon. This area overlaps much of the southern portion of the action area, including nearly all of the Brookings WEA, but does not overlap the Coos Bay WEA. The parent BIA covers 98% of documented sightings of blue whale feeding, and 87% of the area used by tagged blue whales. The more intensively used core BIA for blue whales makes up only 30% of the parent BIA, but accounts for 73% of documented feeding sightings and 50% of the area used by tagged blue whales. The core BIA includes much of the action area from the southern boundary off San Francisco Bay to the Oregon border, but does not overlap either the Brookings or Coos Bay WEAs.

NMFS expects that most of this stock migrates south to spend the winter and spring in high productivity areas off Baja California, in the Gulf of California, and on the Costa Rica Dome. Therefore, we would anticipate that during the summer and late fall, blue whales may occur within the action area.

Based on updated photographic identification data through 2018 using mark-recapture methods, Calambokidis and Barlow (2020) estimated the current blue whale abundance for the U.S. West Coast feeding component of the Eastern North Pacific stock at 1,898 whales. This is considered the best estimate, as summarized in the final 2022 Stock Assessment Report (SAR) (Carretta et al. 2023). With a minimum population size of approximately 1,767 blue whales, and an approximate annual rate of increase of 4%, the potential biological removal (PBR) allocation for U.S. waters is 4.1 whales per year (Carretta et al. 2023).

The North Pacific population of fin whales summers from the Chukchi Sea to California and winters from California southward, although less is known about their wintering areas. Fin whales occur year-round off California, Oregon, and Washington in the California Current, with aggregations in southern and central California (Carretta et al. 2023). While long-range movements along the U.S. West Coast have been documented, not all fin whales undergo such long migrations. As documented by photo identification studies, fin whales undertake short-range seasonal movements in the spring and fall. Association with the continental slope is common (Schorr et al. 2010). Fin whales feed on planktonic crustaceans, including Thysanoessa sp. euphausiids and Calanus sp. copepods, and schooling fish, including herring, capelin and mackerel (Aguilar 2009).

Calambokidis et al. (2024) defined a BIA for fin whales from June to November, with the parent BIA extending from the Southern California Bight to offshore waters of northern California, Oregon, and Washington. The parent BIA overlaps all of the Coos Bay WEA, nearly all of the Brookings WEA, and much of the California portion of the action area. About 95% of documented feeding sightings occurred within the parent BIA, which accounts for 89% of the area used by tagged fin whales. The more intensively used core BIA accounts for 74% of documented sightings of fin whale feeding, and 61% of the area used by tagged whales. The fin whale core BIA overlaps the western edge of the Coos Bay WEA, the action area immediately north of it, and the southwestern corner of the action area off of San Francisco Bay, but does not include the Brookings WEA.

The best estimate of fin whale abundance in California, Oregon, and Washington waters out to 300 nm is 11,065 whales, using species distribution models generated from fixed and dynamic ocean variables from 1991 through 2018. Using this abundance estimate, the minimum population estimate is 7,970 whales, with a calculated PBR of 80 whales per year. The population off the U.S. West Coast has been increasing an average of 7.5 percent per year based on data from 1991 to 2014 (Carretta et al. 2023).

Sei whales occur worldwide across all major ocean basins. They are mainly distributed in temperate offshore waters, but do occur in polar and tropical regions. Line-transect surveys of the central and eastern North Pacific west of 135°W longitude estimated sei whale abundance at

29,632 animals (Hakamada et al. 2017). Sightings of this species along the U.S. West Coast are rare. The two most recent line transect surveys of California, Oregon, and Washington waters estimated the abundance of sei whales at 311 in 2008, and 864 in 2014. The best estimate of abundance in this region is the unweighted geometric mean of these estimates, 519 sei whales (Barlow 2016). This species is listed as endangered under the ESA, and consequently the eastern North Pacific stock is also considered a depleted and strategic stock under the MMPA.

Humpback whales are found in all oceans of the world and migrate from high latitude feeding grounds to low latitude calving areas. They primarily occur near the edge of the continental slope and deep submarine canyons, where upwelling concentrates zooplankton near the surface for feeding. They are most abundant off the U.S. West Coast from spring through fall, with most animals migrating to lower latitude breeding areas located primarily off Mexico and Central America in the winter (Calambokidis et al. 2000). The proportion of humpbacks that migrate to the main breeding grounds varies by latitude. For example, it is estimated that most Central America DPS whales use California and Oregon waters for feeding, while the Mexico DPS feeds off the entire U.S. West Coast as well as British Columbia and Alaska (Wade 2021). Humpback whales often feed in shipping lanes which makes them susceptible to mortality or injury from vessel strikes (Douglas et al. 2008).

Calambokidis et al. (2024) defined a parent BIA for humpback whales from March to November spanning coastal waters from the Channel Islands to Canada. This area, which covers 20% of the West Coast EEZ and most of the action area, accounts for 93% of feeding sightings and 98% of the area used by tagged humpback whales. The core BIA covers 27% of the parent area, but accounts for 74% of feeding sightings and 60% of the area used by tagged whales. It has some overlap with the southeastern portion of the Brookings WEA, but does not overlap the Coos Bay WEA. Nevertheless, the nearshore location of the core BIA for humpback whales likely includes areas that will be used by vessels serving the WEAs.

Critical habitat has been designated for the two ESA-listed humpback whale DPSs that forage off the U.S. West Coast (86 FR 21082; April 21, 2021) that overlaps the entirety of the Brookings WEA and much of the Coos Bay WEA, with the nearshore boundary off Oregon defined by the 50-meter isobath and the nearshore boundary off California defined by the 50-meter isobath, except from 38° 40’ N to 36° 00’N where the nearshore boundary is defined closer to shore, at 15-m isobaths.

As mentioned above, the two humpback whale DPSs that forage off California, Oregon and Washington include the endangered Central America DPS and the threatened Mexico DPS. There is some mixing between these populations on the foraging grounds although they are still considered distinct populations. However, when the DPSs were designated, the MMPA stock assessments for humpback whales were not aligned with the identified ESA DPSs (i.e., some stocks were composed of whales from more than one DPS) which led NMFS to reevaluate stock structure under the MMPA. The recent reevaluation resulted in the delineation of demographically independent populations (DIP) as well as “units” that may contain one or more DIPs, where demographic independence is defined as “…the population dynamics of the affected group is more a consequence of births and deaths within the group (internal dynamics) rather than immigration or emigration (external dynamics)” (Carretta et al. 2023). From these DIPs and units, NMFS designated five new humpback whale stocks in the North Pacific, two of which may be present in the Proposed Action Area: the “Central America/Southern Mexico-CA-OR-WA” stock (from the Central America DPS), and “Mainland Mexico/CA-OR-WA” stock (from the Mexico DPS) (Carretta et al. 2023). The Central America DIP’s wintering ground is understood to extend into southern Mexico, and therefore we consider the inclusion of southern Mexico humpbacks and the abundance estimate recently published by Curtis et al. (2022), using photo-identification data collected in their wintering area from 2019 to 2021, as effectively representing the Central America DPS population. However, NMFS will continue to evaluate the relationship between the humpback whale DPSs and recognized DIPs moving forward.

Recently, Curtis et al. (2022) published new information regarding the abundance estimate of the Central America/Southern Mexico DPS, which has resulted in significant changes to the final 2022 SAR (Carretta et al. 2023). Using spatial capture-recapture methods based on photographic data collected between 2019 and 2021, researchers estimated the abundance of this stock to be 1,496 (CV=0.171) whales, which represents the best estimate of the Central America/Southern Mexico-CA/OR/WA stock of humpback whales. In the 2022 SAR, the PBR for this stock was calculated to be 5.2 animals. Assuming 8 months of residency time as described above, the total PBR for this stock (5.2) is prorated by two-thirds (8/12 months), to yield a PBR in U.S. waters of 3.5 whales per year (Carretta et al. 2023).

Given the Curtis et al. (2022) abundance estimate for whales wintering in southern Mexico and Central America (1,496) and the most recent estimate of humpback whales foraging off the U.S. West Coast (4,973; Calambokidis and Barlow 2020), the estimated abundance for the Mainland Mexico-CA/OR/WA stock is 3,477 animals. Assuming 8 months of residency time in U.S. West Coast waters, or 2/3 of the year, this yields a PBR in U.S. waters of 43 whales per year for this stock (Carretta et al. 2023). At this time, the current total abundance of the entire Mexico DPS is currently unknown, beyond the estimates of 6,000-7,000 made using data from over fifteen years ago (Calambokidis et al. 2008). Likely, given the growth rates that have been observed for the portion of this DPS that occurs off the U.S. West Coast since that time, the population of the DPS has likely increased significantly as well.

Sperm whales are found throughout the north Pacific Ocean, with year-round occurrence off California, and occurrence off Oregon and Washington during every season except winter. Off California they reach peak abundance from April through mid-June, and then from the end of

August through mid-November (Carretta et al. 2023). Sperm whales are typically found foraging in deep water, canyons and escarpments and could be found in the action area, although they are generally found further offshore. Using a trend-based model, Moore and Barlow (2014) estimated the abundance of the California/Oregon/Washington stock of sperm whales to be 1,997 animals, with an uncertain but presumed stable trend. With a minimum estimate of 1,270 whales, PBR for this sperm whale stock is currently 2.5 animals (Carretta et al. 2023).

Two populations of gray whales are found in the Pacific Ocean, the eastern North Pacific (ENP) stock found primarily along the west coast of North America, and the western North Pacific (WNP) stock found primarily along the coast of eastern Asia. ENP gray whales are not listed under the ESA, but are protected under the MMPA. They undergo coastal yearly migrations along the U.S. West Coast, from their breeding/calving grounds in Mexico to northern feeding grounds along the West Coast and primarily in Alaska. The most recent population abundance estimate is around 27,000 whales (from 2015-16; Carretta et al. 2023).

The Western North Pacific gray whale population is listed as endangered under the ESA. As summarized in the final 2022 SAR (Carretta et al. 2023), information from tagging, photo-identification and genetic studies show that some WNP whales identified off Russia have been observed in the eastern North Pacific, including coastal waters of Canada, the U.S. and Mexico. The number of whales documented moving between the WNP and ENP represents 14% of gray whales identified off Sakhalin Island and Kamchatka according to Urban 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. Cooke et al. (2019) note that the fraction of the WNP population that migrates to the ENP is estimated at 45-80% and note "therefore it is likely that a western breeding population that migrates through Asian waters still exists."

The population size from photo-identification data for Sakhalin and Kamchatka in 2016 was estimated at 290 whales (90% percentile intervals = 271–311; Cooke et al. 2017, Cooke et al. 2018). Of these, 175-192 whales are estimated to be predominantly part of a Sakhalin feeding aggregation. From a minimum population estimate of 271 whales, PBR for the WNP gray whales is 0.12 whales per year, or approximately one whale every 8 years (Carretta et al. 2023).

The BIAs for gray whales defined by Calambokidis et al. (2024) are concentrated in nearshore waters and do not overlap the Brookings or Coos Bay WEAs. Depending on season, vessels may have to transit migratory BIAs. Within the action area, the parent gray whale migratory BIA spans November to June and includes all waters out to 15 km from shore along the Oregon coast and 10 km from shore along the California coast. Three subset BIAs were defined based on direction and life stage of the migrating whales. From November to February, a BIA for southbound gray whales extends to 10 km offshore along the whole U.S. West Coast. From

January to May, a BIA for northbound whales (primarily adults and juveniles) extends to 15 km from shore along the Oregon coast and to 8 km along the California portion of the action area. An additional northbound BIA for migrating mother-calf pairs is defined from March to May, extending 5 km from shore within the action area.

Southern Resident killer whales (SRKWs) occur along the outer coasts of Oregon and California, and may be found within the action area. They are one of NMFS' ten "Species in the Spotlight" given their high risk of extinction. There are fewer than 75 animals left in the endangered SRKW DPS[1] (minimum population estimate of 74 animals in the final 2022 SAR; Carretta et al. 2023). With such a small population, the PBR for SRKWs is 0.13 whales per year, or approximately 1 animal every 7 years. The abundance of this DPS grew steadily from the mid-1980s to mid-1990s, reaching a peak of 98 animals in 1995. This was followed by a decline coinciding with low salmon abundance from 1995 to 2001. Abundance has fluctuated since, but exhibits an overall negative trend.

This population consists of three pods, identified as J, K, and L pods. Two (K and L) of the three pods have been documented using areas off the coast of Oregon and northern California; primarily from January through April. Satellite telemetry, opportunistic sightings, and acoustic recordings suggest that SRKWs spend nearly all of their time on the continental shelf within 34 km (21.1 miles) from shore in waters less than 200 meters deep (Hanson et al. 2017). Satellite telemetry has shown that tagged whales use a relatively narrow band of coastal waters, with 75% of locations occurring in a band from 2 to 12 km from shore along the Oregon coast, and from 2 to 5 km from shore along the California coast.

Critical habitat for SRKW has been designated off the U.S. West Coast from Cape Flattery, Washington to Point Sur, California between the 6.1-meter and 200-meter depth contours (86 FR 41668; August 2, 2021), which are inshore of both the Brookings and Coos Bay WEAs but within the action area. Physical and biological features include: 1) water quality to support growth and development; 2) prey species of sufficient quantity, quality, and availability to support individual growth, reproduction and development, as well as overall population growth; and 3) passage conditions to allow for migration, resting and foraging. Designated critical habitat for SRKW that overlaps the action area includes: Area 3 (Central/Southern Oregon Coast Area, with passage being the primary feature), Area 4 (Northern California coast, from the Oregon/California border south to Cape Mendocino, with prey being the primary feature), and Area 5 (north/central California coast area from Cape Mendocino south to Pigeon Point, with passage being the primary feature) (NMFS 2021a).

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[1] Recent census data by the Center for Whale Research is that the population stands at 74 whales as of Jan, 2024. https://www.whaleresearch.com/orca-population

Calambokidis et al. (2024) used this designated critical habitat, and similar designations by DFO Canada to define a parent BIA for SRKWs. Within the action area, the parent BIA is the same as the critical habitat described above. A year-round core BIA was also defined that extends from Washington into waters of northern Oregon, including the northeastern corner of the action area. The core SRKW BIA does not overlap the Brookings or Coos Bay WEAs.

Guadalupe fur seals, an otariid species designated as threatened in 1985, may be found in the action area, although they are generally considered rare particularly compared to the vast abundance of non-listed pinnipeds found in the area. Guadalupe fur seals pup and breed primarily at Guadalupe Island, Mexico. In 1997, a small number of births was discovered at Isla Benito del Este, Baja California, and a pup was born at San Miguel Island, California (Melin and DeLong 1999). Since 2008, individual adult females, subadult males, and between one to three pups have been observed annually on San Miguel Island, and an adult male has regularly been found at San Nicolas Island (NMFS-National Marine Mammal Lab unpublished data). Researchers know little about the whereabouts of Guadalupe fur seals during the non-breeding season from September through May, but they are presumably solitary when at sea. While distribution at sea is relatively unknown, data from observations of tagged individuals indicates Guadalupe fur seals may migrate at least 800 km from the rookery sites (Norris and Elorriaga-Verplancken, 2019). Strandings of Guadalupe fur seals have occurred along the entire U.S. West Coast, particularly in recent years, suggesting that Guadalupe fur seals may be expanding their range (Hanni et al. 1997; NMFS-West Coast Region-stranding program unpublished data). Due to extreme ocean warming (marine heat waves) that likely resulted in suboptimal prey conditions, Guadalupe fur seals began stranding in higher numbers in 2015 through 2021, during which NOAA Fisheries declared an "unusual mortality event" for the species[2].

Since the 1950s, the species has recovered from an estimated population of 200-500 animals to approximately 20,000 in 2010 (Carretta et al. 2022; Aurioles-Gamboa et al. 2017). In 2010, approximately 17,000 were counted on Guadalupe Island and 2,500 counted on San Benito Archipelago (García-Capitanachi 2011). Garcia-Aguilar et al. (2018) argues this was an underestimate, and suggested an updated estimate of 34,000-44,000 individuals in 2013. The current minimum population estimate is 31,019, and PBR is 1,062 animals (Carretta et al. 2023). The best available estimated annual growth rate of the Guadalupe fur seal from 1984-2013 is 5.9% (Garcia-Aguilar et al., 2018; in Carretta et al. 2022). Critical habitat has not been designated for the Guadalupe fur seal. In its 1984 status review (Seagars 1984), NMFS considered critical habitat for this species. However, at that time the only known breeding area was in Mexico, which is outside U.S. jurisdiction. In its final rule, NMFS reviewed the available data and relevant comments related to the reoccupation of the Northern Channel Islands and determined that the protections afforded by the U.S. Navy and the National Park Service

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[2]https://www.fisheries.noaa.gov/national/marine-life-distress/2015-2021-guadalupe-fur-seal-and-2015-northern-fur-seal-unusual). This event was closed in 2021 when strandings decreased.

provided sufficient conservation of Guadalupe fur seals. NMFS concluded that there were no areas within U.S. jurisdiction considered essential to the conservation of the species (December 16, 1985; 50 FR 51252).

Sea Turtles

Based on our stranding records (1958-present), observer program reports (1990-present), and research/sightings, Pacific leatherbacks and the North Pacific loggerhead DPS of sea turtles may be found in the action area and may be affected by the proposed action.

Leatherback turtles lead a completely pelagic existence, foraging widely in temperate and tropical waters except during the nesting season when gravid females return to tropical beaches to lay eggs. Leatherbacks are highly migratory, exploiting convergence zones and upwelling areas for foraging in the open ocean, along continental margins, and in archipelagic waters. Satellite tracking of post-nesting females and foraging males and females, as well as genetic analyses of leatherback turtles caught in U.S. West Coast fisheries or stranded on the U.S. West Coast indicate that leatherbacks found off the Pacific Northwest and the California coast are from the western Pacific nesting population (Benson et al. 2007, 2011). Benson et al. (2018) compared the estimated abundance of leatherbacks off central California from aerial surveys conducted during 1990-2003 and 2004-2016 and found an overall population decline of 3.7% annually, although there was interannual variability in abundance that could be related to ocean condition, prey availability, and remigration intervals. Martin et al. (2020) provided a median estimate of the total number of nesting females at the two main nesting beaches in the western Pacific (Jeen Yessa and Jeen Suab, formerly Jamursba Medi and Wermon, respectively) of 799 females (95% credible interval of 666 to 942 females). Given that this represents 50 to 75 percent of the nesting females in the western Pacific, a conservative application of 75 percent results in a total number of nesting females of 1,054 leatherbacks (95% credible interval of 888 to 1,256 females).

Leatherbacks rarely strand off California and Oregon, although they have recently been reported in this area entangled in fixed gear fisheries and struck by vessels, particularly in the central California area where they are likely hit by ships entering the San Francisco Bay/Oakland Bay ports. Leatherback critical habitat was designated in 2012 (77 FR 4170) that overlaps portions of the action area, specifically: 1) the area north of Cape Blanco, Oregon east of the 2,000 meter depth contour, which includes the entirety of the Coos Bay WEA; and 2) the area south of Point Arena, California east of the 3,000 meter depth contour; and 3) the area bounded by San Francisco Bay north to Point Arena, California along the 200-meter isobath, where vessels may travel from San Francisco Bay to the Brookings or Coos Bay WEAs. Critical habitat includes waters from the ocean surface down to a maximum depth of 80 m (262 feet), based on known information about foraging depth of leatherbacks off the U.S. West Coast (NMFS 2012a). The primary constituent element considered essential for the conservation of leatherbacks is “the occurrence of prey species, primarily scyphomedusae of the order Semaeostomeae (Chrysaora, Aurelia, Phacellophora, and Cynea), of sufficient condition, distribution, diversity, and density necessary to support individual as well as population growth, reproduction, and development of leatherbacks."

North Pacific loggerhead DPS animals have been documented off the U.S. West Coast within the action area, but are primarily found south of Point Conception, California. These turtles originate from nesting beaches in Japan, where the number of females returning to deposit their nests have been increasing in recent years. The most recent estimate of abundance is 8,733 nesting females, with an increasing population growth of 2.3 percent annually (Martin et al. 2020). Loggerheads have been captured in the California DGN fishery (1990-present; NMFS observer program), although their presence appears to be closely correlated with anomalously warm sea surface temperatures, such as during El Niño conditions. NMFS conducted aerial surveys of the Southern California Bight in 2015 (a year when the sea surface temperatures were anomalously warm, and an El Niño was occurring) and estimated more than 70,000 loggerheads were present throughout the area (Eguchi et al. 2018), likely feeding on their preferred prey of pelagic red crabs and pyrosomes.

<u>Marine and Anadromous Fish and Invertebrates</u>

The ESA-listed fish species expected to occur within the action area are salmonids (Chinook salmon, coho salmon, chum salmon, and steelhead) from the various ESUs and DPSs that mix in the oceanic environment, SDPS green sturgeon, and SDPS Pacific eulachon (Table 7). Listed marine invertebrates that occur within the action area include black abalone and sunflower sea star (proposed for listing). However, BOEM excluded black abalone from their analyses and therefore this consultation does not include effects to black abalone or their designated critical habitat.

Chinook salmon occur along the Pacific coast and inland from the Ventura River in California to Point Hope, Alaska. Juvenile Chinook salmon tend to occur closer inshore than other juvenile salmonid species, generally within the 100-meter isobaths, and are occasionally found within the surf zone. Adult Chinook salmon can be found from the surface of the ocean to several hundred meters depth (Hinke et al. 2005, Walker et al. 2007, Sabal et al. 2023). Within the action area, nine ESUs of Chinook salmon individuals may occur that are either threatened or endangered under the ESA (see Table 7), and the only designated critical habitat that occurs are within estuaries, ports, or harbors where vessel traffic might occur. Juvenile, sub-adult, and adult life stages are expected to occur throughout the action area.

Coho salmon occur in the North Pacific Ocean and inland from Santa Barbara, California to Point Hope, Alaska. Juvenile salmonids are pelagic and typically surface-oriented, most often found in the upper 20 meters of the water column (Beamish et al. 2000). Adult coho salmon tend to occur at shallower depths (< 40 meters) than adult Chinook salmon (Walker et al. 2007).

Within the action area, four ESUs of coho salmon individuals may occur that are either threatened or endangered under the ESA (see Table 7), and the only designated critical habitat that occurs are within estuaries, ports, or harbors where vessel traffic might occur. Juvenile, sub-adult, and adult life stages are expected to occur throughout the action area.

While at sea, steelhead occur in pelagic waters principally within 10 meters from the surface, though they sometimes travel to greater depths (Light et al. 1989). Within the action area, 11 DPSs of steelhead individuals may occur that are either threatened or endangered under the ESA (see Table 7), and the only designated critical habitat that occurs are within estuaries, ports, or harbors where vessel traffic might occur. Juvenile, sub-adult, and adult life stages are expected to occur throughout the action area.

Spatial and temporal distribution and abundance of salmonids within offshore waters of the action area are not well understood. Salmonids may pass through waters offshore of the Oregon Coast during migrations to or from northern feeding grounds, or may actively feed in these waters during certain times of year. Most studies of juvenile salmonid ocean distribution have focused on the nearshore environment (within several kilometers of shore), with information on salmonids in offshore waters much more limited. One study that included offshore waters by Harding et al. (2021) analyzed NMFS salmonid trawl survey data collected in 2010-2015 from Heceta Head, Oregon to Pigeon Point (including areas near or in WEAs and proposed cable routes). Trawl stations for the study were along transect lines to approximately 20 miles (~32 km) from shore, although in some years trawls were not conducted at some of the further offshore stations. Sampling occurred in June or July and, in some years, fall months. The main survey target was juvenile Chinook, although other juvenile and subadult salmonids were captured. Catches of juvenile salmonids (less than 250 mm in length) decreased with distance from shore, although catches occurred in small numbers at the furthest offshore stations. This trend of decreasing abundance with distance from shore was not as clear for subadult salmonids (fish greater than 250 mm in length), and steelhead greater than 250 mm generally had the highest catches at the trawl stations furthest offshore. Several studies examined adult salmonid distribution in the ocean, typically through analysis of recreational and commercial fisheries data; however, few studies describe distributions in the offshore ocean environment in the action area. Bycatch data from some commercial fisheries demonstrate adult Chinook salmon occur off the Oregon coast at depths from near the surface to several hundred meters and, while they are more common in areas closer to shore, also occur well into offshore waters (Sabal et al. 2023). In summary, available data on salmonid distribution suggest juveniles and adults may be found in offshore waters, and abundance may vary by life stage and species.

The life history of SDPS green sturgeon is summarized by NMFS (2021b). Green sturgeon are anadromous and adults of the southern DPS spawn in the upper Sacramento River. After rearing in freshwater or the estuary of their natal origin for 1-4 years, SDPS green sturgeon transition to the subadult stage and move from estuarine to coastal marine waters. Green sturgeon are benthic feeders, and often feed on invertebrates found in estuary and marine habitats with mud or sand substrate (NMFS 2021b). Subadult and adult green sturgeon have a marine and coastal range that extends from the Bering Sea, Alaska (Colway and Stevenson 2007) to El Socorro, Baja California, Mexico (Rosales-Casian and Almeda-Juaregui 2009). Green sturgeon have been observed in large concentrations in the summer and autumn within coastal bays and estuaries along the west coast of the U.S., including the Columbia River estuary, Willapa Bay, Grays Harbor, San Francisco Bay and Monterey Bay (Huff et al. 2012; Lindley et al. 2008; Lindley et al. 2011; Moser and Lindley 2007). Green sturgeon typically occupy depths of 20 to 70 m while in marine habitats (Erickson and Hightower 2007, Huff et al. 2011). Therefore, SDPS green sturgeon are expected within portions of the action area during project activities, including nearshore marine waters and several bays and harbors where vessel transits and surveys of potential cable routes may occur. However, green sturgeon are not expected in WEAs, as they primarily forage on the seafloor and their depth range is not known to include the depths found in the WEAs.

Critical habitat for SDPS green sturgeon was designated from Monterey Bay north to Cape Flattery, Washington, and is restricted to the nearshore areas of the ocean in depths of less than 60-fathoms. SDPS green sturgeon critical habitat also includes some estuaries, such as Coos Bay and Winchester Bay. The action area overlaps with the SDPS green sturgeon critical habitat where vessel traffic and surveys along cable routes are expected to occur.

SDPS eulachon are those that spawn in rivers south of the Nass River in British Columbia to the Mad River in California. Larvae are transported rapidly by spring freshets from rivers where spawning occurs to estuaries and juveniles disperse onto the continental shelf within the first year of life (Hay and McCarter 2000). Eulachon are caught in research trawl surveys beginning at age-1+ over the continental shelf off the U.S. West Coast and most often at depths between 50 and 200 m (NWFSC Eulachon Workgroup 2012) but have been observed to 500 m depth (Hay and McCarter 2000). Adult eulachon spend most of their lives in schools between the nearshore and the outer continental shelf environments (CDFW 2008). Their potential occurrence in the action area is expected within portions of the WEA's, nearshore areas, and cable routes. Eulachon critical habitat exists in several rivers and estuaries in California and Oregon, and does not overlap the action area.

The sunflower sea star occupies intertidal and subtidal marine waters up to at least 450 meters, and potentially up to 1,170 meters, deep[3] from Adak Island, Alaska, to Bahia Asunción, Baja California Sur, Mexico (Lowry et al. 2022, Appendix A). The species is a habitat generalist, occurring over sand, mud, and rock bottoms both with and without appreciable vegetation. Prey include a variety of epibenthic and infaunal invertebrates, and the species also excavates clams

[3] https://www.webapps.nwfsc.noaa.gov/data/map

from soft substrates. It is a well-known urchin predator and plays a key ecological role in controlling urchin populations. Individuals are expected to be present throughout the action area.

ENDANGERED SPECIES ACT

Effects of the Action

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. 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 (50 CFR 402.02). When evaluating whether the proposed action is not likely to adversely affect listed species or critical habitat, NMFS 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 critical habitat. 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.

Vessel Collision Risk

<u>Marine Mammals and Sea Turtles</u>

Vessel strikes of marine mammals and sea turtles periodically occur along the California and Oregon coast. We do not have precise information on the rate at which collisions occur each year for specific species; however, vessel collisions are identified as known or possible cause of death for several ESA-listed large whales, including fin whales, gray whales, humpback whales, and blue whales. We consider the risk of a vessel strike to a Guadalupe fur seal to be extremely low, given their nimble maneuverability and our lack of any reports of any injury or death to these species due to a vessel strike. Our estimates of vessel strikes of large whales is based on known incidents over the past 30 years, and is considered a minimum. However, using a novel application of a naval encounter model, researchers estimated ship strike mortality of humpbacks, fin whales, and blue whales to be considerably higher than the minimum estimates available from stranding records (Rockwood et al. 2017). Whale carcasses can sink and ships may not detect a whale strike, although this is more likely to be the case with large container vessels and tankers. As described earlier, BOEM has stated that the vessels used for surveys, operation and maintenance range between 50 and 100 feet in length (16-30 meters), whereas container vessels and tankers can range from around 800 feet (~240 meters) maximum length to around 970 to 1,200 feet (and longer), respectively.

Based on the most recent final SAR (2022: Carretta et al. 2023), SRKWs are rarely struck by vessels, and all of the known strikes (or indications of blunt trauma) have been in the Pacific Northwest (e.g., Georgia Strait, Haro Strait). Protective management measures to reduce the risk of vessel disturbance, auditory masking, and ship strikes in the Pacific Northwest have been put into place by NMFS and Canada, which likely have reduced the overall threat to SRKWs foraging and migrating in areas commonly used by vessels . In addition, SRKWs are much smaller (16-26 feet in length, depending on sex) compared to humpback whales (typically 43-49 feet in length), so they are likely more nimble, with less surface area to come into contact with a vessel. Similarly, sperm whales are rarely reported struck by ships, but there was a report of a ship strike in Oregon, and another one with a sablefish longline vessel (at idle speed, no injuries), both in 2007. Sperm whales are typically found in deeper waters, which reduces the co-occurrence with vessel traffic along the U.S. West Coast. From what we have learned from sperm whale entanglement in the California drift gillnet fishery, all bycatch events occurred in waters deeper than approximately 1,600 meters. Thus, compared to more coastal whale species such as humpbacks and gray whales, there is likely reduced spatial overlap between vessels associated with this proposed action and sperm whales (and therefore less risk). For the most recent 5-year period in the SAR for sperm whales (2013-2017), there were no reported ship strikes of sperm whales (Carretta et al. 2023), so while it may be un-reported or underestimated, we believe that it is a rare event. Sei whales are distributed far offshore in temperate waters and do not appear to be associated with coastal features, which reduces their risk of vessel strikes associated with the proposed action, since vessels will typically be traveling from various ports ranging from Astoria, OR to San Francisco, CA to the offshore WEAs. That said, there was one documented ship strike of a sei whale during the most recent time period in the sei whale SAR(2012-2016) summarized in Carretta et al. (2023).

Given that the ENP (and a much smaller number of WNP) gray whales migrate relatively close to shore, they are much more vulnerable to vessels traveling to and from ports and harbors, and given the wide swath of ports that vessels may travel to and from the WEAs as part of the proposed action, this species may be the most vulnerable to vessel strikes. Not surprisingly, during the most recent five-year period in the gray whale SARs (2014-2018), serious injury and mortality of ENP gray whales attributed to vessel strikes totaled 9 animals, but noting caution from Rockwood et al. (2017) in underestimating actual vessel strikes. Given humpback whales' preference for feeding in relatively shallow waters (nearshore to ~200-400 m), they are also vulnerable to vessel strikes with 14 whales struck, with most (13.2) resulting in death or serious injury, between 2016 and 2020 (nearly 3 whales/year). Carretta et al. (2023) used the Rockwood et al. (2017) estimate of 22 humpback whale deaths annually, and prorated mortality/serious injury to an estimated 6.45 Central America/Southern Mexico humpback whale stock (as defined under the MMPA but assumed for this consultation to be the Central America DPS), with most of the reported strikes to occur off California and Oregon (5.98 animals). Similarly, Carretta et al. (2023) estimated that 10.15 Mainland Mexico-CA/OR/WA humpback whale stock (assumed to be from the Mexico DPS) are killed annually due to vessel strikes. Blue whales are also susceptible to vessel strikes, with significant variability reported from year to year. From 2015-2019, four blue whale vessel strike deaths were observed (Carretta et al. 2023), and since 2007, as many as five individuals have been reported struck in one year (2007). Most of the reported strikes have been in southern California or off San Francisco, where blue whales seasonally forage close to shipping ports. Again, these values are likely underestimates since detection rates of cetacean carcasses are consistently quite low (Carretta et al. 2023). Lastly, fin whales have been reported struck by vessels along the U.S. West Coast, with 7 whales killed from 2015-2019 (Carretta et al. 2023).

In addition, vessels, especially adjacent to the entrance into the ports of San Francisco/Oakland have reportedly struck sea turtles, particularly leatherback sea turtles in central California. Off California over the last 40 years, approximately 15 leatherbacks have reported stranded due to vessel collisions (around 1 every 3 years), and that rate has increased in recent years (R. LeRoux, NMFS-SWFSC, unpublished data). Sea turtles rarely strand off Oregon. Loggerhead sea turtles are primarily found in the southern California bight, and there are few, if any, documented vessel strikes of these relatively small, juvenile turtles.

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). Research has shown that lethality for whales, defined as mortality or serious injury, increases with vessel speed with the most dramatic increase in lethality occurring between 8.6 and 15 knots, where the probability of a lethal injury to a large whale increases from approximately 20 percent to nearly 80 percent. At 11.8 knots, the probability of a lethal injury declines to below 50 percent (Vanderlaan and Taggart 2007). Because some whale species can avoid slower-moving vessels or can survive the collision if they are hit, reducing vessel speed is a practical measure for reducing the frequency and severity of collisions between vessels and marine mammals. For instance, Wiley et al. (2011) determined that NMFS' implementation of a 10-knot 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.

BOEM estimates that as many as 1,964 vessel trips may take place over a 5-year period within the action area for the Brookings and Coos Bay WEAs. This includes 204 trips for site assessment activities (Table 3), 680 for geophysical (HRG) and geotechnical surveys (Table 4), and 1080 trips for biological surveys (Table 5). During the proposed action, BOEM's BMP states that all vessels transiting to and from ports, conducting site characterization studies, surveys, metocean buoy installation, maintenance, or decommissioning will travel at speeds no more than 10 knots during all related activities. BOEM has included vessel strike avoidance measures in their BMPs (Appendix A of the BA) which include, but are not limited to: 1) maintaining a vigilant watch for ESA-listed species; 2) maintaining a 500-m minimum separation distance for ESA-listed whales or other identified large marine mammal or 100-m from any sea turtle visible at the surface (Vessel Strike Avoidance Zone); and 3) adhering to specific strike avoidance measures, as detailed in PDC 4 of the BA (Minimize Vessel Interactions with ESA-listed species).

Vessels serving the WEAs may be transiting to and from ports in Oregon and California (Newport, Coos Bay, Port Orford, Brookings, Crescent City, Humboldt Bay and San Francisco Bay). As noted earlier, the action areas for both WEAs overlap numerous critical habitats and biologically important areas for large whales and leatherback sea turtles. In addition, we have identified areas of vulnerability for ESA-listed whales and leatherbacks to vessel strikes, particularly the area within and adjacent to the entrance to San Francisco Bay, where humpbacks, blue whales, gray whales, and leatherback turtles are particularly vulnerable especially when there are aggregations of prey.

In requiring all vessels operating within the action area to transit at speeds of 10 knots or less, regardless of whether they are within State or Federal waters, as well as requiring specific conservative BMPs for all vessel operators and crew, the risk of vessel strikes with ESA-listed species is greatly reduced, so that vessels strikes are extremely unlikely to occur. As summarized earlier, the reduction of vessel speeds significantly reduces the lethality of a strike. In addition, at slower speeds, captain, crew, and protected species observers will have more time to observe large marine mammals and sea turtles within a Vessel Strike Avoidance Zone and react accordingly. For example, if a large whale(s) is detected within 500 m of the forward path of any vessel, the operator will steer a course away from the animal(s) or stop their vessel to avoid any strike. If a sea turtle is sighted within the vessel's forward path, the vessel operator must slow to 4 knots (unless unsafe to do so) and steer away as possible.

While we anticipate the risk of a vessel strike with large whales and leatherbacks to increase when vessels are transiting to and from the San Francisco Bay area, we expect that these trips may constitute only a fraction of the trips associated with the Brookings and Coos Bay WEAs. San Francisco Bay is over 300 mi (480 km) from the Brookings WEA, and over 450 mi (724 km) from the Coos Bay WEA. We expect that cost and time may factor into planning for site characterization and assessment as well as deployment, maintenance and decommissioning of metocean buoys. However, regardless of which specific ports may be used, the 10-knot maximum speed requirement and employment of the BMPs for vessel operation, will reduce the risk of vessel collisions with ESA-listed species to extremely unlikely, and therefore discountable, levels.

Marine and Anadromous Fish and Invertebrates

The only fish or invertebrate species likely to have a possibility of colliding with a vessel or propeller are SDPS green sturgeon, especially during Project-related vessel traffic within ports or estuaries. The most recent five-year status review for SDPS green sturgeon indicated that ship strikes have become a factor affecting the continued existence of SDPS green sturgeon (NMFS 2021b). In April 2018, a white sturgeon mortality from a propeller strike was documented in the Carquinez Strait (Demetras et al. 2020). In early 2020, an interagency team was formed to better understand sturgeon mortality associated with propeller and vessel strikes in San Francisco Bay. As of February 2021, in less than one year, the group had received reports of 23 sturgeon carcasses in the Carquinez Strait from members of the public (NMFS 2021b). Propeller and vessel strikes are known to be a limiting factor in the recovery of Atlantic sturgeon on the East Coast (Brown and Murphy 2010) and are now a growing concern for SDPS green sturgeon.

The hull of the vessel itself may hit sturgeon that fail to avoid a vessel and cause injury or mortality. It seems likely that the chance of injury and death by impact increases with the vessel’s speed and mass, but there is no clear speed in which mortality occurs for different types of vessels or for different sizes of sturgeon. Fast vessels have been implicated in shortnose sturgeon vessel strikes, but there is no information available to suggest a threshold speed at which a sturgeon is injured or killed by a vessel hull. More often observed is evidence that vessel strike mortalities occur when a propeller hits a sturgeon.

Not all fish entrained by a propeller will necessarily be injured or killed. Killgore et al. (2011) in a study of fish entrained in the propeller wash from a towboat in the Mississippi River, found that 2.4 percent of all fish entrained and 30 percent of shovelnose sturgeon entrained showed direct signs of propeller impact (only estimated for larger specimens). The most common injuries were a severed body/severed head, and lacerations. This is consistent with injuries reported for sturgeon carcasses in the Carquinez Strait of San Francisco Bay (Demetras et al. 2020) and other studies on Atlantic sturgeon (Balazik et al. 2021, Brown and Murphy 2010).

Killgore et al. (2011) found that the probability of propeller-induced injury (i.e. propeller contact with entrained fish) depends on the propeller's revolution per minute (RPM) and the length of the fish. Simply put, the faster the propeller revolves around its axis, the less time a fish has to move through the propeller without being struck by a blade. Similarly, the longer the fish is, the longer time it needs to move through the propeller, thereby increasing the chance that a blade hits it. Because the amount of vessel traffic is expected to be relatively small within the areas (estuaries or embayments) where green sturgeon from the southern DPS are expected to be most common, and because of a 10-knot vessel speed limit, NMFS expects that vessel or propeller collisions for marine and anadromous fish and invertebrates will be extremely unlikely, and therefore discountable.

Noise

Here we consider the effects of noise from proposed activities on ESA-listed species. In order for a sound to be potentially disturbing or injurious, it must be able to be heard by an animal. Effects on an animal's hearing ability or disturbance can result in disturbance of important biological behaviors, including migration, feeding, communication, and breeding. Expected noise sources associated with geophysical and geotechnical surveys include propulsion (vessels, AUVs, ROVs), geotechnical equipment (see Table 1), and HRG equipment (see Table 11).

The vessels used for the proposed action will 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. A study of sounds produced by a 150 ft long HRG survey vessel on the U.S. East Coast found propulsion and dynamic positioning thruster noise varied from 9.5 Hz to several kHz (Rand Acoustics 2024). This study measured vessel noise at 126.5 dBrms re 1uPa at 0.5 nautical miles (NM); vessel noise was highly audible from 2 NM, but audible and measurable up to 4 NM from the vessel.

While noise produced by propulsion as well as HRG equipment for seafloor mapping (e.g., multi-beam) is fairly continuous, geotechnical sampling and some seismic survey sources produce noise intermittently, often at much higher levels. Seismic equipment such as sparkers produce acoustic expansion pulses (i.e., impulses) that are typically transient, brief (less than 1 second), broadband, possibly repetitive, and consist of high peak sound pressure (SPLpeak) with rapid rise time and rapid decay (Popper et al. 2019). Impulsive sources near the seafloor can generate substrate waves that may travel great distances, especially at very low frequencies.

Hearing ranges for ESA-listed species expected within the action area vary considerably. Baleen whales hear lower frequency sounds, while sperm whales and some marine fish species hear higher frequency sounds (Table 8). Hearing and acoustic perception in sea turtles as well as most marine and anadromous fish and invertebrates is within a much lower-frequency range.

Our analysis of the potential for physical injury (i.e., PTS, or permanent hearing damage) to ESA-listed marine mammals, sea turtles, fish, and invertebrates focused on potential impacts from HRG surveys, since noise from propulsion and geotechnical equipment are not anticipated to physically impair these species (as discussed further below). Table 11 provides a summary of PTS exposure distances (in meters) for marine mammals and sea turtles from mobile HRG sources towed or moving autonomously at a speed of 4.5 knots, as well as the Onset of Physical Injury distance from an impulse source for fish. Source levels and frequencies of HRG equipment were measured under controlled conditions and represent the best available information for HRG sources (Crocker and Fratantonio 2016). BOEM produced the maximum impact scenarios, using the highest power levels and the most sensitive frequency settings for each hearing group. A geometric spreading model, together with calculations of absorption of high frequency acoustic energy in sea water, when appropriate, was used to estimate injury and disturbance distances for ESA-listed species. Because the spreadsheet and geometric spreading models do not consider the tow depth and directionality of the sources, these are likely overestimates of the distances at which actual injury and disturbance could occur. All sources were analyzed at a tow speed of 4.5 knots, and some equipment (multi-beam echosounder, CHIRP sub-bottom profiler, etc.) are expected to be primarily operated from an AUV and concentrate noise near the bottom of the ocean.

Due to the different hearing sensitivities of different species groups, NMFS uses different sets of acoustic thresholds to consider effects of noise on ESA-listed species. Below, we present information on thresholds considered for ESA-listed whales, Guadalupe fur seals, sea turtles, fish and invertebrates considered in this consultation.

ESA-listed Whales and Otariids (Guadalupe fur seals)

NMFS' *Technical Guidance for Assessing the Effects of Anthropogenic Noise on Marine Mammal Hearing* compiles, interprets, and synthesizes the scientific literature to produce acoustic thresholds to assess how anthropogenic sound affects the hearing of all marine mammals under NMFS' jurisdiction (NMFS 2018). Specifically, the guidance identifies the received levels, or thresholds, at which individual marine mammals are predicted to experience temporary or permanent changes (onset of temporary threshold shift (TTS) or permanent threshold shift (PTS), respectively) in their hearing sensitivity for acute, incidental exposure to underwater anthropogenic sound sources. These thresholds (Table 8) represent the best available scientific information on acoustic impacts for marine mammals. We note that NMFS is in the process of developing technical guidance for assessing the effects of underwater anthropogenic sound on marine mammal behavioral disturbance (currently being peer-reviewed).

These thresholds are a dual metric for impulsive sounds; with one threshold based on peak sound pressure level (0-pk SPL) that does not incorporate the duration of exposure, and another based on cumulative sound exposure level (SELcum) that does incorporate exposure duration. The two metrics also differ in regard to considering information on species hearing. The cumulative sound exposure criteria incorporate auditory weighting functions, which estimate a species group's hearing sensitivity, and susceptibility to TTS and PTS, over the exposed frequency range, whereas peak sound exposure level criteria do not incorporate any frequency dependent auditory weighting functions.

Potential for Injury: As shown in Table 11, for marine mammals expected to occur in the proposed action area, the distances at which PTS might occur are small, ranging from 0 to ~13 meters. Considering the cumulative threshold (24-hour exposure) noise levels, the equipment resulting in the greatest horizontal range (in meters) to the marine mammal PTS threshold is the sparker (12.7 m for baleen whales, 0.2 m for sperm whales and 0.1 m for Guadalupe fur seals). Animals in the survey area during the HRG surveys are extremely unlikely to incur any hearing impairment due to the characteristics of the sound sources, considering the source levels and generally very short pulses and duration. Individuals would have to make a very close approach and also remain very close to vessels operating these sources (<13 meters) in order to receive multiple exposures at relatively high levels, as would be necessary to have the potential to result in any hearing impairment. In reality, a whale swimming through the beam of devices used in HRG surveys moves in different directions, thus rarely making its way through the beam center. The purpose of PDC 3 is to minimize the impacts during geophysical survey operations; therefore, prior detection of a whale and shut down procedures will mitigate impacts to any ESA-listed marine mammals in the area. Finally, the restricted beam shape of many of the HRG survey devices planned for use makes it extremely unlikely that an animal would be exposed more than briefly during the passage of the vessel.

We note that the mitigation and monitoring proposed in PDC 3 is intended to reduce exposure of marine mammals and sea turtles to *towed* sound sources. Since AUVs are operated independently from the vessel, the use of PSOs and Clearance/Shutdown zones is not proposed by BOEM for use of AUVs. AUVs typically operate at speeds from 2-6 knots; they travel at around 3.5 knots during survey operations, and they have a 60-80 hour endurance. As described in BOEM's March 19, 2024, memorandum to NMFS regarding an Equinor/Atlas Wind site characterization survey plan, AUVs typically fly at 40 feet (~12 meters) or less above the seafloor. AUVs could be deployed in conjunction with UTPs, which operate at low power and produce very short pings, only when interrogated. BOEM states that an AUV can run many geophysical sensors at once and typically would consist of a multibeam echosounder (mobile, non-impulsive intermittent sound source), side-scan sonar (mobile, non-impulsive intermittent sound sound), magnetometer, and a sub-bottom profiler (mobile, impulsive intermittent sound source). Although some sub-bottom profilers are expected to be onboard AUVs, and therefore operating near the seafloor, we assume boomers and sparkers will be towed behind survey vessels, likely within 5 meters of the ocean surface (see Crocker and Fratantonio 2016). We assume that the lessees may use any or all of these HRG sources, but that the use of boomers, bubble guns, and sparkers will not be used by lessees on AUVs; so, this will not be further analyzed in this consultation.

For HRG survey devices that are associated with the use of AUVs, sound levels are expected to be concentrated at the sea floor, and not transmitted throughout the water column, reducing the risks of exposure to high levels of sound for ESA-listed marine mammals that may be in the vicinity of AUVs. For towed HRG surveys, the potential for exposure to noise that could result in PTS is further reduced by the Clearance Zone (600 m) and Shutdown Zone (500 m) and the use of PSOs to call for a shutdown of equipment operating within the hearing range of ESA-listed whales and sea turtles should they be detected. Given the bottom-orientation of HRG sound sources used with AUVs, and the shutdown requirements when ESA-listed marine mammals are sighted within 500 meters of towed HRG surveys, the risk of PTS occurring for any marine mammals from HRG surveys is extremely unlikely.

Ruppel et al. (2022) used physical criteria (e.g., sound source level, transmission frequency, directionality, beam width and pulse repetition rate) to analyze the effects of various HRG sources on marine mammals; specifically, whether the sound levels received by marine mammals cause certain behavioral responses. Four tiers were developed to inform regulatory evaluation, with Tier 1 and Tier 2 including high-energy air guns, which are not included in the proposed action. Tier 4 includes most HRG sources, which are considered unlikely to result in the incidental take of marine mammals and are therefore considered *de minimis*. BOEM included in the proposed action for this consultation the use of AUVs, UTPs, USBLs, ADCPs, acoustic releases, ROVs, and similar technology in this category (Table 8 in BOEM 2024). Tier 3 in Ruppel et al. (2022) included most non-airgun impulsive HRG seismic surveys, which may not meet the *de minimis* category without an analysis of factors such as radiated sound pressure levels, beam patterns, beam width, directionality, etc. .Within Tier 3, BOEM is including medium penetration sub-bottom profilers as part of the proposed action, and is applying PDC 3 as its mitigation and monitoring, including required use of PSOs, shutdown and clearance zones for towed systems.

As summarized in the BA, the exposure distances from the CHIRP sub-bottom profiler for baleen whales and mid-frequency toothed whales (e.g., sperm whales and SRKWs) for the potential for injury (PTS) is 1.2 meters and 0.3 meters respectively. For otariids (i.e., Guadalupe fur seals) the PTS exposure distance from this sound source is effectively zero, indicating that Guadalupe fur seals are not at risk of injury from the CHIRP sub-bottom profiler. Even though the application of PDC 3 is not proposed for AUVs, the potential for injury to ESA-listed whales when the CHIRP sub-bottom profiler is deployed from an AUV is extremely unlikely, given the small PTS threshold distance (less than 2 meters). In addition, since AUVs primarily operate in deeper waters and at depths of ~12 meters or less above the seafloor, with bottom-oriented directionality, the likelihood that an ESA-listed marine mammal will be anywhere near the sound source is extremely low.

For the multibeam echosounder (100 kHz), the exposure distance for the potential for injury (PTS) for toothed whales only is 0.5 meters, with no risk of injury to baleen whales and otariids (i.e., Guadalupe fur seals). As mentioned above, BOEM is applying PDC 3 as its mitigation and monitoring, including required use of PSOs, shut-down and clearance zones for towed systems. Even though the application of PDC 3 is not proposed for AUVs, the potential for injury to ESA-listed toothed whales when the multibeam echosounder is deployed from an AUV is extremely unlikely, given the small PTS threshold distance (less than 1 meters), and expected operation near the seafloor with bottom-oriented directionality.

The general frequency range for vessel noise (10 to 1000 Hz) 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 would therefore be audible to these species. Vessels without ducted propeller thrusters would produce levels of noise of 150 to 170 dB re 1 µPa-1 meter at frequencies below 1,000 Hz, while the expected sound-source level for vessels with ducted propeller thrusters level is 177 dB (RMS) at 1 meter (BOEM 2015, Rudd et al. 2015). The description of the proposed action did not specify whether vessels would have ducted propeller thrusters, but given that these ducted propeller thrusters produce louder sounds into the water column, we assume that vessels would use these thrusters in order to avoid underestimating the effects. For ROVs, source levels may be as high as 160 dB (BOEM 2021). Given that the noise associated with the operation of project vessels is below the thresholds that could result in injury (Table 8), no injury is expected.

Potential for TTS: As discussed earlier, marine mammals exposed to high intensity sound repeatedly or for prolonged periods of time can experience hearing threshold shift, which is the loss of hearing sensitivity at certain frequency ranges. Animals may experience TTS, in which their hearing threshold would recover over time, and thus, TTS is not considered an injury (NMFS 2018). In general, TTS can last from a few minutes to days, be of varying degree, and occur across different frequency bandwidths, all of which determine the severity of the impacts on the affected individual. Thus, the impact of TTS depends on the frequency and duration of TTS, as well as the biological context in which it occurs. TTS of limited duration, occurring in a frequency range that does not coincide with that used for recognition of important acoustic cues, would have little to no effect on an animal's fitness. TTS of a sufficient degree can manifest as behavioral harassment, as reduced hearing sensitivity and the potential reduced opportunities to detect important signals (conspecific communication, predators, prey) may result in behavior patterns that would not otherwise occur. Repeated sound exposures that lead to TTS could cause PTS.

Table 8 shows the impulsive acoustic thresholds identifying the onset of PTS and TTS for the various hearing groups of marine marine mammals. Exposure to high intensity sound pressure levels that may result in PTS versus TTS differ by around 6 dB re 1µPa, depending on the hearing group. While there is a low probability of temporary changes in hearing from exposure to some of the more intense sound sources associated with HRG, given the most recent data and guidance, animals would have to be very close and remain near sources for many repeated pings to receive overall exposures sufficient to cause the onset of TTS (NMFS 2018; Finneran and Schlundt 2010). In other words, an animal would have to approach closer to the source or remain in the vicinity of the sound source appreciably longer to increase the received sound exposure levels. The mitigation and monitoring required in PDC 3 is intended to reduce the risk of behavioral disturbance to marine mammals exposed to high intensity sound associated with the HRG surveys; this level of protection will also minimize any risk of a marine mammal incurring TTS. While PDC 3 does not apply to HRG equipment operated from an AUV, AUVs primarily operate in deeper waters and at depths of ~12 meters or less above the seafloor, with bottom-oriented directionality. If behavioral responses typically include the temporary avoidance that might be expected (see below), the potential for TTS is extremely low so as to be discountable relative to the proposed operation of HRG survey equipment.

Masking: Masking is the obscuring of sounds of interest to an animal by other sounds, typically at similar frequencies. Marine mammals are highly dependent on sound, and their ability to recognize sound signals amid other sounds is important in communication and detection of both predators and prey (Tyack 2000). Although masking is a phenomenon which may occur naturally, the introduction of loud anthropogenic sounds into the marine environment at frequencies important to marine mammals increases the severity and frequency of the occurrence of masking. In the open ocean, ambient noise levels are between about 60 and 80 dB re 1 μPa 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 μPa. When the noise level generated from an activity is above the sound of interest to marine life, 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.

The components of background noise that are similar in frequency to the signal in question primarily determine the degree of masking of that signal. In general, masking effects are expected to be less severe when sounds are transient (such as with HRG surveys) than when they are continuous. Masking is typically of greater concern for those marine mammals that communicate using low-frequency sound, such as baleen whales, because of the long distance these sounds propagate. Of the mobile HRG sources included in BOEM's proposed action, boomers, sparkers, bubble guns and the CHIRP sub-bottom profiler operate in the low to mid-frequency range (2.7 to 5.7 kHz). NMFS has previously concluded (86 FR 22160, 88 FR 48196, NMFS 2022a) that marine mammal communications would not likely be masked appreciably by HRG surveys given the directionality of the signals for most HRG survey equipment types considered in this proposed action, and the brief period short duration of the period when an individual marine mammal is likely to be within its beam. Based on this, we conclude that any effects on masking of ESA-listed whales resulting from the proposed action will be insignificant.

Potential for Disturbance: The distances at which animals might be disturbed depend on the equipment and the species present (Table 12). The range of disturbance distances for all ESA-listed marine mammal species expected to occur in the proposed action area ranges from 40 to 502 meters, with sparkers producing the upper limit of this range. Given that the distance to the 160 dB re 1μPa rms threshold extends slightly (2 m) beyond the required Shutdown Zone, it is possible that ESA-listed whales will be exposed to potentially disturbing levels of noise during the surveys considered as part of the proposed action.

For the CHIRP sub-bottom profiler, the maximum disturbance distance for all whales and Guadelupe fur seals is 282 meters. We assume that for sub-bottom profilers used on towed systems, PSOs (and clearance and shut-down zones) will be employed to avoid significant behavioral responses of marine mammals exposed to the sound source from sub-bottom profilers.

The maximum disturbance distance from the multibeam echosounder is 370 meters for toothed whales. Since high frequency sounds are outside of the hearing range of baleen whales and Guadalupe fur seals, we assume they would be unaffected and undisturbed. As mentioned earlier, sperm whales are primarily found in submarine canyons and deep waters offshore, and likely will not be exposed to a multibeam echosounder placed on an AUV in the 100 kHz frequency range. SRKWs however, are coastal species and could be exposed to sound pressure levels emitted by the echosounder, particularly when foraging and/or migrating between and within areas with high conservation value during April through October and in depth ranges of 200 meters or less, as described in the SRKW biological report to support revised critical habitat (NMFS 2021a). Satellite telemetry and acoustic detections of SRKWs showed high-use areas, primarily off the Washington outer coast with occasional use of areas off Oregon and California. Therefore, SRKWs could be present in the area where multibeam echosounders may be operating from an AUV.

We reviewed the marine site characterization plans submitted to date by lessees for surveying areas off California and considered the March 19, 2024, memorandum from BOEM to NMFS. Using NMFS' level B harassment isopleth calculator and the sound sources for operation of the AUV and UTP devices proposed by lessees, disturbance distance for marine mammals in one of the California plans was within 45-48 meters of the AUV and UTP devices. The AUVs are transitory and used intermittently for a few seconds at a time, and the acoustic sources are intended to map the seafloor, so sounds will be directionally facing downward. In addition, AUVs primarily operate in deeper waters and at depths of ~12 meters or less above the seafloor. Thus, marine mammal species such as SRKWs and humpback whales that are targeting pelagic prey such as salmonids, sardines, anchovies and herring will likely be undisturbed by AUVs and UTPs. If behavioral responses typically include the temporary avoidance that might be expected (see below), the potential for disturbance is extremely low so as to be discountable relative to the proposed operation of HRG survey equipment.

As determined in our interim guidance on the ESA term "harass" (NMFS 2016a), we interpret it to mean "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering." We have determined that, in this case, the exposure to noise above the MMPA Level B harassment threshold (160 dB re 1µPa rms) will result in effects that are insignificant. We expect that the result of this exposure would result in, at worst, a temporary avoidance of the area with underwater noise louder than this threshold, which is a reaction that is considered to be of low severity with no lasting biological consequences (e.g., Southall et al. 2007). The noise sources of concern will be moving. This means that any co-occurrence between a whale, even if it is stationary, will be brief and temporary. Given that exposure will be short (no more than a few seconds, given that the noise signals themselves are short and intermittent and because the vessel towing the noise source is moving) and that the reaction to exposure is expected to be limited to changing course and swimming away from the noise source only far/long enough to depart the ensonified area (502 m or less, depending on the noise source), the effect of this exposure and resulting response will be so small that it will not be able to be meaningfully detected, measured, or evaluated with respect to the effect to an animal's health and fitness; and therefore, is insignificant. As described above, the use of HRG sources from AUVs will generally limit the range and extent of potential exposure of marine mammals to elevated sound levels given the bottom-orientation and directionality associated with those activities. Visual monitoring requirements of a 500-m exclusion zone for ESA-listed large whales, together with limited exposure to elevated sound levels and response for ESA-listed marine mammals that is anticipated, even if animals are not detected within the monitoring and exclusion zone, will ensure that any potential effects to these species related to disturbance from noise generated by HRG survey equipment from towed surveys will be reduced to insignificant levels.

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 or other marine mammal 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 action area would be short term and intermittent, and therefore unlikely to result in any substantial costs or consequences to individual animals or populations.

Based on the best available information, ESA-listed whales and Guadalupe fur seals are either not likely to respond 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 significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding or sheltering. Exposure will be generally short and temporary and any reaction to exposure to vessel noise is expected to be limited. The effect of this exposure and resulting response will be so small that it will not be able to be meaningfully detected, measured, or evaluated with respect to an animal's health and fitness, and therefore, is insignificant.

Table 8. Impulsive acoustic thresholds identifying the onset of PTS and TTS for marine mammals (NMFS 2018).

Hearing Group	Generalized Hearing Range	PTS Onset Thresholds (Received Level)	TTS Onset Thresholds (Received Level)
Low-Frequency Cetaceans (LF: baleen whales)	7 Hz to 35 kHz	219 dB re 1μPa 183 dB re 1μPa^{2}sec	213 dB re 1μPa 179 dB re 1μPa^{2}sec
Mid-Frequency Cetaceans (MF: sperm whales)	150 Hz to 160 kHz	230 dB re 1μPa 185 dB re 1μPa^{2}sec	224 dB re 1μPa 178 dB re 1μPa^{2}sec
Otariid Pinnipeds (Underwater)	60 Hz to 39 kHz	232 dB re 1μPa 203 dB re 1μPa^{2}sec	226 dB re 1μPa 199 dB re 1μPa^{2}sec

<u>Sea Turtles</u>

In order to evaluate the effects of exposure to the survey noise by sea turtles, we rely on the available scientific literature. Sea turtles are low frequency hearing specialists, typically hearing frequencies from 30 Hz to 2 kHz, with a range of maximum sensitivity between 100 to 800 Hz (Ridgway et al. 1969; Lenhardt 1994; Bartol et al. 1999; Lenhardt 2002; Bartol and Ketten 2006). Currently the best available data regarding the potential for noise to cause behavioral disturbance come from studies by O'Hara and Wilcox (1990) and McCauley et al. (2000), who experimentally examined behavioral responses of sea turtles in response to seismic airguns. When exposed to sound pressure levels of around 175 to 176 dB re 1μPa (rms) in a shallow canal, loggerhead turtles exhibited avoidance behavior (O'Hara and Wilcox 1990), while McCauley et al. (2000) reported a noticeable increase in swimming behavior for both green and loggerhead turtles at received levels of 166 dB re 1 μPa. Both species displayed increased swimming speed and increasingly erratic behavior when sound pressure levels increased to 175 dB re 1μPa. Based on these two studies, we assume that sea turtles may exhibit a behavioral response when exposed to received levels of 175 dB re 1 μPa and higher (Table 9).

In order to evaluate the effects of exposure to the survey noise by sea turtles that may result in physical impacts, we relied on the available literature related to the noise pressure levels that would be expected to result in sound-induced hearing loss (i.e., TTS or PTS). We relied on the

U.S. Navy's programmatic approach (Phase III) evaluating the environmental effects of their military readiness activities and estimating the acoustic thresholds for PTS and TTS when sea turtles were exposed to impulsive sounds (U.S. Navy 2017).

In order to estimate received levels from airguns and other impulsive sources expected to produce TTS in sea turtles, the U.S. Navy compiled all sea turtle audiograms available in the literature in order to create a composite audiogram for sea turtles as a hearing group. Since these data were insufficient to successfully model a composite audiogram via a fitted curve as was done for marine mammals, median audiogram values were used in forming the hearing to TTS. Data from fishes were used since there is currently no data on TTS for sea turtles, and fish are considered to have hearing more similar to sea turtles than marine mammals (Popper et al. 2014). Assuming a similar relationship between TTS onset and PTS onset (considering the available data for humans and marine mammals), an extrapolation to PTS susceptibility of sea turtles was made based on methods proposed by Southall et al. (2007). From these data and analyses, dual metric thresholds were established similar to those for marine mammals, one threshold based on 0-peak SPL that does not incorporate the auditory weighting function nor the duration of exposure, and another based on SELcum that incorporates both the auditory weighting function and the exposure duration (Table 9).

Potential for Injury: None of the equipment being operated for these surveys that overlaps with the hearing range (30 Hz to 2 kHz) for sea turtles has source levels loud enough to result in PTS or TTS based on the peak or cumulative exposure criteria (Table 11). Therefore, physical effects to sea turtles are extremely unlikely to occur, and are discountable.

Potential for Disturbance: The distances at which sea turtles might be disturbed by survey equipment are listed in Table 12. The range of disturbance distances for all ESA-listed sea turtle species expected to occur in the proposed action area ranges from 40 to 90 meters, with sparkers producing the upper limit of this range.

As explained earlier, we assume that sea turtles would exhibit a behavioral response when exposed to received levels of 175 dB re 1µPa RMS that are within their hearing range (below 2 kHz). For boomers and bubble guns, the distance to this threshold is 40 m; for sparkers, the distance is 90 m; and for CHIRPs, the distance is 50 m. Therefore, a sea turtle would need to be within 90 m of the source to be exposed to potentially disturbing levels of noise. We expect that sea turtles would react to this exposure by swimming away from the sound source; this would limit exposure to a short time period, including the few seconds it would take an individual to swim away to avoid the noise.

The risk of exposure to potentially disturbing levels of noise is reduced by the use of PSOs to monitor for sea turtles. As required by PDC 3 (Appendix A of BOEM (2024)), a Clearance Zone of 600 m in all directions must be monitored for ESA-listed species during HRG surveys operating and towing equipment at a frequency of less than 180 kHz. At the start of a survey, equipment cannot be turned on until the Clearance Zone is clear for at least 30 minutes. This requirement is expected to reduce the potential for sea turtles to be exposed to noise that may be disturbing. Because the area where increased underwater noise will be experienced is transient and therefore will only be experienced in a particular area for a few seconds, we expect any effects to behavior to be minor and limited to a temporary disruption of normal behaviors, temporary avoidance of the ensonified area, and minor additional energy expenditure spent while swimming away from the area. As described earlier, mitigation and monitoring described in PDC 3 will not be required for HRG surveys using AUVs. The CHIRP sub-bottom profiler is the only HRG source that may be used on AUVs and may disturb sea turtles within a maximum of 50 meters of the sound source. Since AUVs primarily operate in deeper waters and at depths of ~12 meters or less above the seafloor, the likelihood that a sea turtle will be anywhere near the sound source is extremely low. Sea turtles foraging off Oregon are targeting prey in the mid to upper-water column and would therefore not be disturbed by HRG sources operated by an AUV. Using NMFS' level B harassment isopleth calculator and the sound sources for operation of the AUV and UTP devices proposed by lessees, disturbance distance for sea turtles in one of the California plans was within 9 meters.

Given the intermittent and short duration of exposure to any potentially disturbing noise from HRG equipment, major shifts in habitat use or distribution or foraging success are not expected. Effects to individual sea turtles from brief exposure to potentially disturbing levels of noise are expected to be minor and limited to a brief startle, short increase in swimming speed and/or short displacement, and will therefore have little to no effect on their health and fitness that can be meaningfully measured, detected or evaluated; and therefore, effects are insignificant.

Per Anderson (2021), ESA-listed turtles could be exposed to a range of vessel noises within their hearing abilities. Depending on the context of exposure, potential responses of leatherback and loggerhead sea turtles to vessel noise disturbance would include startle responses, avoidance, or other behavioral reactions, and physiological stress responses. Very little research exists on sea turtle responses to vessel noise disturbance. Currently, there is nothing in the available literature specifically aimed at studying and quantifying sea turtle response to vessel noise. However, a study examining vessel strike risk to green sea turtles suggested that sea turtles may habituate to vessel sound and may be more likely to respond to the sight of a vessel rather than the sound of a vessel, although both may play a role in prompting reactions (Hazel et al. 2007). Regardless of the specific stressor associated with vessels to which turtles are responding, they only appear to show responses (avoidance behavior) at approximately 10 m or closer (Hazel et al. 2007).

Therefore, the noise from project vessels is not likely to affect sea turtles from further distances, and disturbance may only occur if a sea turtle hears a vessel nearby or sees it as it approaches. These responses appear limited to non-injurious, minor changes in behavior based on the limited information available on sea turtle response to vessel noise.

For all of these reasons above, vessel noise that is expected to be generated by the proposed action is expected to cause only minimal disturbance to sea turtles. If a sea turtle detects a vessel and avoids it or has a stress response from the noise disturbance, these responses are expected to be temporary and only endure while the vessel transits through the area where the sea turtle encountered it. Therefore, sea turtle responses to vessel noise disturbance are considered insignificant (i.e., so minor that the effect cannot be meaningfully evaluated), and a sea turtle would be expected to return to normal behaviors and stress levels shortly after the vessel passes by the animal.

Table 9. Impulsive acoustic thresholds identifying the onset of PTS, TTS and behavioral response for sea turtles (U.S. Navy 2017).

Hearing Group	Generalized Hearing Range	PTS Onset	TTS Onset	Behavioral Response
Sea Turtles	30 Hz to 2 kHz	230 dB re 1μPa Peak 204 dB re μPa^2-sec cSEL	226 dB re 1 μPa Peak 189 dB re 1 μPa^2-sec cSEL	175 dB re 1 μPa (rms)

<u>Marine and Anadromous Fish and Invertebrates</u>

To date, studies indicate that hearing ranges of most marine and anadromous fishes do not extend below 50 Hz or above 4 kHz (Mann et al. 2001, Kasumyon 2005, Chapuis et al. 2019). Hearing in the infrasound (<20 Hz) range has been documented for a few species, including Atlantic salmon (Knudson et al. 1992) and Atlantic cod (Astrup and Møhl 1998). Hearing in the ultrasound range (>20 kHz) is currently only documented in clupeids (e.g., herrings, shads) and Atlantic cod (Mann et al. 2001), with the highest frequency physiological sensitivity in American shad (180 kHz; Mann et al. 1998). However, hearing thresholds for less than 100 fish species (~0.3% of known fish species) have been determined, and this does not include all ESA-listed species expected to be within the action area (Kasumyon 2005, Neenan et al. 2016; Table 9). Many fish species, including salmonids and sturgeon species, are well adapted to detecting lower frequency sounds (<1 kHz), which overlap with sound frequencies from activities such as shipping or dredging (Neenan et al. 2016). Fishes residing in environments where there is little light, such as the deep sea, may have a greater reliance on sound to sense their environments (Marshall 1967); however, ESA-listed fish species are unlikely to be found in the deep sea portions of the action area.

Many fish species sense particle motion rather than sound pressure; however, some fish species wherein the swim bladder is directly involved in hearing (e.g., clupeids) can detect both types (Popper et al. 2019). Fishes with a swim bladder generally have better sensitivity to sound and can detect higher frequencies than fishes without a swim bladder (Popper & Fay 2011; Popper et al. 2014). Salmonids and green sturgeon have swim bladders, but are likely to only sense particle motion, so these species may have roughly similar hearing ranges. Hearing for some of these species have been studied but full hearing ranges are not yet established (Table 10). Eulachon do not possess a swim bladder (Gustafson et al. 2022), which likely makes them comparatively less sensitive to noise impacts; however, the hearing range for this species is currently unknown.

Recent studies have revealed that a wide diversity of invertebrates are also sensitive to sounds, especially via sensory organs whose original function is to allow maintaining equilibrium in the water column and to sense gravity (Solé et al. 2023). Some invertebrates change their behavior when exposed to chronic shipping noise (Murchy et al. 2019). Cephalopods (Packard et al. 1990) and crustaceans (Heuch & Karlsen 1997) possess acute infrasound sensitivity, while some bivalves can detect sound over a range similar to many fishes (e.g., 30 - 1000 Hz; Sole´ et al. 2023). Hearing thresholds for sea stars (members of phylum echinodermata) have not yet been established, although Solan et al. (2016) demonstrated that some echinoderms can detect sounds.

There are no criteria developed for considering noise effects to ESA-listed fish or invertebrates from geophysical and geotechnical surveys such as those in the proposed action. However, for seismic survey impulse sources (e.g., boomers, sparkers), it is reasonable to use the criteria developed for impact pile driving and explosives when evaluating the effects of exposure of fish to this equipment. Unlike pile driving, however, which produces repetitive impulsive noise in a single location, the geophysical survey sound sources are moving; therefore, the potential for repeated exposure to multiple pulses is much lower when compared to pile driving. We expect those ESA-listed fish exposed to noise disturbance to move away from the sound source; however, avoidance may not always occur. NMFS' observations during impact pile driving activities indicate salmonids startle but may not necessarily flee from the noise source, and at times move toward pile driving to seek shelter (personal communication, Mike Kelly, 2020). Depending on the direction a given fish and the noise source move in relation to one another, exposure may be very brief or prolonged. NMFS currently does not use criteria for determining effects to invertebrates from impulsive noise sources.

Potential for Disturbance: We use 150 dB re 1 µPa rms as a threshold for examining the potential for behavioral (or disturbance) responses by individual ESA-listed fish to noise with a frequency less than 1 kHz. This is supported by information provided in a number of studies (Andersson et al. 2007, Wysocki et al. 2007a, Purser and Radford 2011). Responses to temporary exposure of noise above this threshold is expected to be a range of responses indicating that a fish detects the sound (brief startle responses) or may completely avoid the area ensonified above 150 dB re

1μPa rms. Popper et al. (2014) does not identify a behavioral threshold but notes that the potential for behavioral disturbance decreases with distance from the source. BOEM (2024) estimated behavioral response distances for fish exposed to HRG survey noise sources, which includes large distances for some equipment (Table 12). However, as HRG equipment typically operates at frequencies above 1 kHz, the NMFS criteria (described above) does not apply. Equipment included in the proposed action that is expected to produce noise below 1 kHz, which is within the approximate hearing range of most ESA-listed fish species, includes survey vessel and AUV/ROV propulsion and positioning as well as geotechnical sampling.

Vessel traffic and AUVs involved with project activities within the action area may startle individual fish on the rare occasion when noise associated with propulsion comes into close proximity of individuals. Disturbance from this noise is expected to primarily occur in the upper water column, as well as within bays and harbors that may be used as ports for survey vessels from the lower Columbia River to San Francisco Bay. AUVs will be used primarily close to the seafloor within the WEAs and along the deeper portions of potential cable routes to shore. AUV noise will primarily affect ESA-listed fish and invertebrates that are associated with the benthos; this would typically include green sturgeon and sunflower sea star, but also any salmonids or eulachon near the seafloor in shallower portions of the action area.

We assume that geotechnical sampling will be brief and limited to deep water where exposure to ESA-listed fish species is not expected. ESA-listed fish exposure to noise from survey vessels and AUVs/ROVs is expected to be brief because these sources will be moving, which will not likely disrupt normal behavior patterns of listed species for extended periods, nor affect their fitness or subsequent survival. Therefore, NMFS expects that noise-induced changes in behavior of listed marine fish and sunflower sea stars to be insignificant.

Potential for Injury: Injury and mortality is only known to occur when fish are very close to the noise source, and the sound is very loud and typically associated with pressure changes, such as with impact pile driving or blasting .The Fisheries Hydroacoustic Working Group (FHWG) was formed in 2004 and consists of biologists from NMFS, USFWS, the Federal Highway Administration, the Corps, and the California, Oregon and Washington Department of Transportation, supported by national experts on underwater sound producing activities that affect fish and wildlife species of concern. In June 2008, the agencies signed a memorandum of agreement documenting interim criteria for assessing the physiological effects of impact pile driving on fish. The interim criteria were developed for the acoustic levels at which the onset of physiological effects to all fish species could be expected.

The interim criteria are: Peak SPL: 206 dB re 1μPa; SELcum: 187 dB re 1μPa2-sec for fish 2 grams or larger; and SELcum: 183 dB re 1μPa2-sec for fish less than 2 grams. The use of the 183 dB re 1μPa2-sec cumulative SEL is not appropriate for this consultation because all ESA-listed fish within the action area are larger than 2 grams. Currently, these criteria represent the best available information on the thresholds at which physiological effects to ESA-listed marine fish are likely to occur. We note that physiological effects may range from minor injuries from which individuals are anticipated to completely recover with no impact, to fitness to significant injuries that may lead to death. The severity of injury is related to the distance from the noise source as well as the duration of the exposure. The closer to the source and the longer duration of the exposure, the higher likelihood of significant injury.

While active acoustic benthic surveys are widespread, relatively few studies examine the effects of HRG equipment used in seafloor habitat mapping (e.g., echosounders, sonars, and related technologies) on fishes and invertebrates (Mooney et al. 2020). As described above, the hearing range of most fish and invertebrates, including ESA-listed species in the action area, is below 1 kHz. High frequency (>100 kHz) equipment expected to be used for habitat mapping (e.g., multi-beam or side-scan sonar) is non-impulsive and not expected to overlap with hearing frequencies of most fish and invertebrate species, including ESA-listed species, in the action area. Impulsive sound sources can cause impacts to fish and invertebrates even outside of their hearing ranges. Although sound levels for all HRG survey equipment summarized by BOEM (2024) exceed NMFS criteria for injury to fish (Table 11), habitat mapping equipment is not considered impulsive so the NMFS criteria would not apply. Despite the paucity of data on this subject, available scientific information does not suggest injury to fish or invertebrate species is likely from high-frequency HRG activities used in habitat mapping.

Impacts to fish from seismic or impulse sources used in geophysical surveys, such as boomers and sparkers, are not well understood (Mooney et al. 2020). Sound levels for all HRG seismic survey equipment summarized by BOEM (2024) exceed NMFS criteria for injury to fish (Table 11). BOEM (2024) indicated that physical injury to fish could occur within a short distance from impulses from boomers or bubble guns (3.2 m; 10 ft) and sparkers (9 m; 30 ft), but physical injury distance for CHIRP sub-bottom profilers was not estimated (Table 11). The method used by BOEM (2024) to derive the estimates in Table 11 was not specified, including which parameters were considered (e.g., number and duration of impulses). Nevertheless, information presented in Table 11 suggests fish could be harmed by operation of boomers, bubble guns, or sparkers if they are close enough to the noise source. Although some sub-bottom profilers are expected to be onboard AUVs, and therefore operating near the seafloor, we assume boomers and sparkers will be towed behind survey vessels, likely within 5 meters of the ocean surface (see Crocker and Fratantonio 2016). Although it is not certain which ESA-listed fish species will overlap spatially and temporally with seismic surveys operating within the WEAs and potential cable routes, we expect that overlap could occur with fish species listed in Table 7. Salmonids are expected to migrate and feed primarily in the upper water column, and could be very near the surface at times, therefore individuals could be within the impact range of towed seismic equipment. Although salmonids could occur in the proposed WEAs, they are much more common in the nearshore ocean environment. We assume that seismic equipment would primarily be used in WEAs rather than along cable routes in the nearshore ocean, which would reduce the chance of exposure for salmonids. Eulachon are not expected to be common in offshore waters, and therefore are unlikely to be impacted by proposed activities within the WEAs. Green sturgeon (if present) typically occur near the seafloor in the ocean, and therefore are expected to be beyond the impact range of any towed seismic equipment such as boomers or sparkers.

BOEM (2024) did not analyze potential impacts to sunflower sea stars from noise; rather indicating this species occurs at depths too shallow to overlap with noise impacts. Sunflower sea stars occur at depths up to 1,170 m, which could overlap with WEAs, but could certainly overlap with shallower survey areas within potential cable routes. Although the distance for onset of physical injury is unknown for this species, sunflower sea stars occur on the seafloor, making it less likely they would be within range of injurious noise produced by towed seismic equipment. Seismic equipment operating on AUVs would be close to the seafloor (~20m), but we do not expect impacts from this equipment that operates at lower levels and higher frequencies than boomers or sparkers. Few studies exist on potential for injury to invertebrates from noise sources in the proposed action. Naval ordinance was detonated and found to kill abalone in close proximity (Aplin 1947); however, we expect sound impulse waveforms and amplitudes used in HRG surveys to be much less detrimental than those found in the Aplin study.

NMFS does not expect there to be any injuries to ESA listed fish or sunflower sea stars due to the intermittent use of boomers, bubble guns, or sparkers, which are the instruments likely to cause the highest levels of impulsive acoustic noise. All of the other survey techniques or instruments produce sounds that ESA-listed fishes or invertebrates in the action area would not likely be able to detect. Sparkers or boomers would be deployed at sampling stations spaced 1-2 km apart, leaving short periods of time in between deployments. Based on BOEM's analysis, for an individual fish to be injured, they must be present within 9 meters (or less) of the noise source. NMFS does not expect listed fish to be present within 9 meters of sparkers given the intermittent and pulsed character of deployments occurring in the WEAs. Although we do not have criteria for determining noise effects to invertebrates, NMFS does not expect any injury to occur for sunflower sea stars. Exposure to near-source noise impacts from boomers or sparkers, which we assume will be towed at the surface in deep water, is not expected to reach the area where benthic invertebrates such as sunflower sea stars. Therefore, NMFS anticipates the possibility of injuries or mortalities to ESA-listed fish or sunflower sea stars to be discountable.

Table 10. Hearing range of ESA-listed species in the action area or related species (sources listed within table) as well as criteria for onset of injury and behavioral response due to impulsive acoustic noise sources (FHWG 2008).

Species	Generalized Hearing Range	Onset of Injury	Behavioral Response
Chinook Salmon (smolts)	At least 100 - 600 Hz (Halvorsen et al. 2009)	Peak SPL: 206 dB re 1µPa; SELcum: 187 dB re 1µPa2-sec	150 dB re 1µPa
Rainbow trout/steelhead	At least 100 - 600 Hz (Wysocki et al. 2007b)	Peak SPL: 206 dB re 1µPa; SELcum: 187 dB re 1µPa2-sec	150 dB re 1µPa
Atlantic Salmon	At least 10 - 800 Hz (Knudson et al. 1992, Harding et al. 2016)	Peak SPL: 206 dB re 1µPa; SELcum: 187 dB re 1µPa2-sec	150 dB re 1µPa
Acipenser (sturgeon genus)	~100 - 1000 Hz (Popper et al. 2005)	Peak SPL: 206 dB re 1µPa; SELcum: 187 dB re 1µPa2-sec	150 dB re 1µPa

Table 11. PTS Exposure Distances (in meters) for marine mammal hearing and sea turtle hearing groups from mobile HRG sources towed at 4.5 knots for impulsive and non-impulsive sources (BOEM 2024). Also included is the Onset of Physical Injury Distance (meters) for fishes from an impulsive source (BOEM 2024). NA reflect that criteria for impacts to fish from non-impulsive sources are not available, and situations where the frequency of sounds produced by equipment do not overlap the hearing ranges associated with species/group.

HRG Source	Highest Source Level (dB re 1 µPa)	Low Frequency 7 Hz to 35 kHz (e.g., Baleen Whales)	Mid-Frequency 150 Hz to 160 kHz (e.g., Sperm Whales)	Otariids 60 Hz to 39 kHz (sea lions and fur seals)	Sea Turtles 30 Hz to 2 kHz	Fishes
Boomers, Bubble Guns (4.3 kHz)	176 dB SEL, 207 dB RMS, 216 peak	0.3	0	0	0	3.2
Sparkers (2.7 kHz)	188 dB SEL, 214 dB RMS, 115 peak	12.7	0.2	0.1	0	9.0

CHIRP Sub-Bottom Profilers (5.7 kHz)	193 dB SEL, 209 dB RMS, 214 peak	1.2	0.3	0	NA	NA
Multi-beam echosounder (100 kHz)	185 dB SEL, 224 dB RMS, 228 peak	0	0.5	0	NA	NA
Multi-beam echosounder (>200 kHz)	182 dB SEL, 218 dB RMS, 223 peak	NA	NA	NA	NA	NA
Side-scan sonar (>200 kHz)	184 dB SEL, 220 dB RMS, 226 peak	NA	NA	NA	NA	NA

Table 12. Maximum disturbance distances (in meters) for marine mammal and sea turtle hearing groups from mobile HRG sources towed at 4.5 knots for impulsive and non-impulsive sources (BOEM 2024). Also included is the behavioral response distance (meters) for fish from an impulsive source (BOEM 2024). NA reflect that criteria for impacts to fish from non-impulsive sources (e.g., multi-beam) are not available, and situations where the frequency of sounds produced by equipment do not overlap the hearing ranges associated with species/group.

HRG Source	Low Frequency (e.g., Baleen Whales)	Mid-Frequency (i.e., Sperm Whales)	Otariids (sea lions and fur seals)	Sea Turtles	Fishes
Boomers, Bubble Guns (4.3 kHz)	224	224	224	40	708
Sparkers (2.7 kHz)	502	502	502	90	1,585
CHIRP Sub-Bottom Profilers (5.7 kHz)	282	282	282	50	NA

Multi-beam Echosounder (100 kHz)	NA	370	NA	NA	NA
Multi-beam Echosounder (>200 kHz)	NA	NA	NA	NA	NA
Side-scan Sonar (>200 kHz)	NA	NA	NA	NA	NA

Entanglement in ROV Cables or Metocean Buoy and ADCP Moorings

As described in the BA, BOEM anticipates up to six buoys will be deployed in and near to each leased area in the Oregon WEAs, for a possible total of 12 buoys (if BOEM issues two leases) (BOEM 2024). In addition, there is potential for up to 20 additional ADCP moorings to be deployed (if BOEM issues two leases), if ADCP aren't incorporated into metocean buoy mooring systems directly. For this proposed action, NMFS considers the likelihood that any ESA-listed species could become entangled in ROV cables or metocean buoy and ADCP mooring lines given that marine mammals and sea turtles are documented as being entangled in lines and other gear throughout the world, and off the U.S. West Coast (and within the action area). The type/size of line used and the relative size/weight of the buoy and anchors for the proposed action are different from what is typically used in the U.S. West Coast fixed gear fisheries, in that somewhat heavier line and much larger and heavier gear is involved with deployment of metocean buoys. BOEM anticipates the PNNL LiDAR buoy that employed a 4,990 kilogram anchor, chain, jacketed wire, nylon rope, and subsurface floats to maintain tensions from taut to semi-taut would be similar to those associated with the proposed action (PNNL 2019). As described earlier, ADCPs may be associated with metocean buoy systems, although they may also be independently mounted on the seafloor. These independent configurations are expected to constitute a relatively low profile off the bottom, as they aren't designed or intended to be suspended all the way to the surface.

In spite of the differences between fishing gear and the equipment proposed for use, in order to avoid underestimating the effects of this action we will assume that entanglement risks of any vertical line placed in the water are relatively similar to that of fixed gear fisheries and other known sources of entanglements on the U.S. West Coast. We also consider that the proposed use of gear (i.e. cables associated with buoys) has been involved with entanglements in the past (see more information below), and there is limited information available to improve our ability to more precisely distinguish their risk from other sources of entanglements at this time. Given this, we consider the difference in the relative scale of effort of fixed gear fisheries along the U.S. West Coast that are known to entangle ESA-listed species compared to the proposed action in terms of the combination of the number of vertical lines associated with anchors that are in the water and the length of time those lines are in the water. Reported entanglements on the U.S. West Coast have primarily been associated with fixed fishing gear, yet entanglements with other types of gear and or equipment do occur (e.g., Waverider buoy).

NMFS WCR has been responding to and tracking the entanglement of whales through reports received through the WCR Marine Mammal Health and Stranding Response Program (MMHSRP). Data from 1982-2017 illustrates the magnitude of this risk to whales throughout the U.S. West Coast with 429 reports of entangled whales confirmed, with an average of 12 annual confirmed reports over the thirty-five-year time period analyzed, and reported increases since 2010 (Saez et al. 2021). The authors noted that reported entanglements do not necessarily indicate where the interaction occurred, but where it was observed and subsequently reported. California had the majority of confirmed reports with 85 percent of the reports from the U.S. West Coast originating in this state, while only 6 percent of confirmed entanglement reports were reported off Oregon, where the Brookings and Coos Bay WEAs are located. Central California, within the action area and including San Francisco/Oakland port, was also an area with relatively high reports of large whale entanglements, with 134 confirmed reports between 1982 and 2017. Of the confirmed entanglements along the U.S. West Coast, from 1982-2017, there were 7 entangled blue whales (all between 2015-2017), 7 entangled fin whales, 208 entangled gray whales (elevated in the mid-1980s and from 2012-2017, on average), 165 entangled humpbacks (significantly elevated from 2014-2017), 3 entangled killer whales, and 14 entangled sperm whales (10 documented in the California drift gillnet fishery). Humpbacks are most often detected and confirmed as entangled in central California, with 66 animals reported entangled between 2014 and 2017. For the entire WCR over 35 years, when the entangling gear was identified, humpback whales were confirmed to be entangled with pot gear in 73% of the 167 cases reported over that time period (Saez et al. 2021). While entanglement data from more recent years (2018-2023) hasn't been comprehensively summarized in a similar form, a review of the annual entanglement summaries available from the WCR indicate these patterns have remained consistent.[4]

In 2014, a humpback whale was reported entangled in a Waverider buoy (also a wave measurement buoy) deployed well offshore the Monterey Bay area (approx. 25 miles) in deep water (>500 fathoms). In this instance, the entanglement was described as a humpback whale "caudal peduncle wrapped in bungie between 10 ft chain and line that runs to 300 lb anchor" (NMFS unpublished stranding data). Subsequent follow up with the entanglement response team indicated that this buoy mooring system included the apparent presence of significant amounts of

[4] https://www.fisheries.noaa.gov/west-coast/marine-mammal-protection/west-coast-large-whale-entanglement-response-program#reports

slack line and bungee that was involved in the entanglement. In 2019, a second entanglement of a humpback whale associated with a Waverider buoy occurred. In this instance the whale already had fishing gear (crab pot) wrapped around the caudal peduncle. The preliminary data shows that the trailing fishing gear then became entangled around the buoy mooring line – which we define as secondary entanglement (NMFS unpublished stranding data). To our knowledge, these events represent the only entanglements associated with wave buoys or other similarly deployed scientific oceanographic equipment along the U.S. West Coast since at least 1975 when the program involved with these buoys began.

Secondary entanglements are not extremely rare on the U.S. West Coast. NMFS WCR unpublished stranding data includes reports that indicate multiple gear types attached to entangled whales indicating that some (primarily) entangled whales become entangled in additional gear (secondary entanglement). WCR MMHSRP records documented at least 17 secondary entanglements from 2014-2020, all of which primarily had buoys and associated lines from various fixed gear fisheries and two ocean monitoring buoys as was mentioned above. It is likely that numerous other entanglements reported have involved secondary entanglements, but the level of documentation obtained did not allow for confirmation that multiple pieces of gear were involved.

All of the available information described above relate to the presence of whales interacting with fixed gear in this region, and the potential risk of both primary and secondary entanglement of whales with project gear, including the metocean buoys, and any additional moorings for ADCP, used for this proposed action.

Currently, it is not possible to equate the absolute risk, presented from the risk of entanglement, posed by any specific lines or mooring systems deployed anywhere in the ocean. However, using the relative scale of U.S. West Coast fixed gear fisheries and reported entanglements associated with those fisheries, we can generally assess the relative risk of the proposed project in terms of differences in relative orders of magnitude between these fisheries and the amount of gear and length of time it is deployed for any given proposed action. In previous consultations on deployment of ocean monitoring buoys and other similar gear (e.g., NMFS 2016b; NMFS 2017; NMFS 2019, NMFS 2022a), NMFS has used this information to examine the number of line-days associated with a proposed action as a proxy for the likelihood of entanglements occurring for ESA-listed species.

Although specific estimates of the number of lines in the water are not available for U.S. West Coast fixed gear fisheries, it is expected that over 400,000 traps/lines may be deployed just in the Dungeness crab fishery alone along the U.S. West Coast based on the allowable trap limitation programs that exist in California, Oregon, and Washington, where one trap corresponds to one "buoy line" (i.e., one vertical line attached to pot/trap connected to a buoy). There are numerous other fixed gear fisheries that deploy similar gear as well, further increasing the total exposure of vertical lines in the water to ESA-listed species across the U.S. west coast well into the tens (10's) of millions of line-days over the course of a year. We have noted that the entanglements of ESA-listed species such as whales and sea turtles along the U.S. West Coast that are reported each year are on the order of tens (10's) of animals each year; generally, between 20 and 60 each year since 2014 (NMFS 2024). While there are numerous origins associated with these entanglements, we have been able to identify the origin of ~50% of these reported entanglements in recent years, and the origins are most commonly associated with U.S. West Coast fixed gear fisheries (Saez et al 2021). Consequently, we can calculate a relative entanglement risk associated with any given line-day assuming 10's of reported entanglements per year in U.S. West Coast fixed gear fisheries given tens of millions of line-days per year (10's of entanglements reported /10,000,000's of line-days = 0.000001 entanglements reported per line-day[5]).

For comparison, we calculate the order of magnitude of line-days per year for the proposed action. This calculation applied to the projected 5-year duration for metocean buoys deployment (5 x 365 days) results in a maximum of 1,825 days. Up to twelve metocean buoys, and 20 independent ADCP mooring lines deployed for 1,825 days results in 58,400 line-days for this component of the proposed action; equivalent to an order of magnitude of 10's of thousands of line-days. As a result, we conservatively estimate that the resulting entanglement risk from metocean deployment is very low using the order of magnitude assessment of risk over this five-year deployment (0.000001 entanglements per line-day * 10,000 line-days = 0.01 entanglements); on the order of magnitude of 1 chance out of 100 that an entanglement of ESA-listed species would be expected to occur.

Importantly, we note this general approach is more reflective of the risk of entanglements with the lines associated with West Coast fixed fishing gear, which is different than the lines and gear associated with the proposed action. In addition, it is likely that some, if not most, of the ADCP moorings will be deployed in association with the metocean buoy configurations, and these are much lower profile mooring system deployments that are not expected to extend far through the water column. The metocean buoys and ADCP mooring have been designed to minimize the risk of entanglements compared to the standard lines used for West Coast fixed gear fisheries, and their proposed use includes measures that further mitigate entanglement risk compared to these standard lines. In addition, BOEM's PDC 5 and its related BMPs are designed to reduce the risk of ESA-listed species' potential entanglement in mooring systems. These mitigation measures include: 1) monitoring a clearance zone of 600 m around the ROVs for a duration of 30 minutes to ensure the absence of protected species; 2) using the best available mooring systems with all buoy lines attached to the seafloor, including anchor lines (i.e., ensuring the designs prevent any potential entanglement of ESA-listed species, considering the safety and integrity of the structure

[5] For this analysis, we specifically define this as a general order of magnitude of entanglement risk associated with any line deployed for one day anywhere on the West Coast, irrespective of location of deployment, in the general risk assessment framework.

or device); and 3) using the shortest practicable lengths, rubber sleeves for rigidity, weak-links, chains, cables, coated rope systems, or similar equipment types that prevent lines from looping, wrapping, or entrapping protected species. For all mooring system deployment and retrieval, equipment will be lowered and raised slowly to minimize risk to ESA-listed species and benthic habitat. Furthermore, monitoring for ESA-listed species in the area prior to and during deployment and retrieval work will ensure that work will be stopped if ESA-listed species are observed within 500 m of the vessel.

Based on the very small number of entanglements that have been documented with ocean measurement buoys in the past (2 reported in the last 40 years (described above), with one of those being a secondary entanglement (1982-present; NMFS-WCR MMHSRP)), along with the design features included with the proposed metocean buoys (explained above), we conclude that the risk of entanglements with metocean buoys and ADCP moorings is less than the already very low risk assumed in our line-day order of magnitude analysis above.

Given the very low probability that an entanglement would be expected to occur with any type and number of lines deployed for the length of the time proposed, combined with the construction and design of the metocean buoys and ADCP moorings, and the use of PDC 5 (Appendix A (BOEM 2024)), we conclude the risk of ESA-listed species becoming entangled with metocean buoys and ADCP moorings is extremely unlikely; and therefore discountable.

Accidental Release of Pollutants and Marine Debris

As described in the PDC 2, Appendix A BOEM (2024)), “marine debris” is defined as any object or fragment of wood, metal, glass, rubber, plastic, cloth, paper or any other solid, man-made item or material that is lost or discarded in the marine environment by the lessee or an authorized representative of the lessee while conducting activities on the OCS in connection with a lease, grant, or approval issued by the DOI. Marine debris can raise the risk of entanglement to protected species under some circumstances and conditions. Due to this possibility, BOEM’s Marine Debris Awareness and Prevention PDC 2 (BOEM 2024) includes the training of staff, marking of gear from the proposed action, recovery of identified marine debris, and subsequent timely reporting. With respect to gear marking, all lessees are required to make durable identification markings on equipment, tools, containers (especially drums), and other material (30 CFR 250.300(c)). Also, the presence of marine debris adds to the risk of ingestion of these items by protected resources; for this reason, the recovery of marine debris is identified as a best management practice.

BOEM requires lessees to recover marine debris that is lost or discarded while performing OCS activities in order to avoid entanglement or ingestion by marine species. BOEM has addressed these increased risks by the potential presence of marine debris in their PDC 2 (Appendix A BOEM 2024) on the proper storage and disposal practices at-sea to reduce the likelihood of accidental discharge of marine debris. These PDCs and BMPs reduce the risk of ESA-listed species ingestion and entanglement to discountable levels.

Metocean buoys need a power source to take measurements of interest to inform the site assessments, and this can be from multiple sources including solar or diesel fuels. As diesel fuel is of lesser density than seawater, it may float atop the water's surface if released during the proposed project, and is expected to dissipate rapidly, evaporate, and biodegrade within a few days (MMS 2007).

In the unlikely event of an accidental oil or chemical spill from potential sources of chemical pollution related to the proposed action from collisions with the metocean buoy and/or a spill during fuel transfer to the generator on the metocean buoy, there is risk of contaminants entering the waters of the U.S. USCG (2011) characterized the average fuel spill size from 2000-2009 for vessels, other than tank ships and barges, at 88 gallons; and BOEM assumes a similar volume for this analysis. The volume anticipated would dissipate and reach a concentration of 0.05 percent, in 0.5-2.5 days dependent on wind; which would limit the impacts to the environment from a similar spill, if it were to occur. For these reasons, we consider the risk of contaminants entering the waters of the United States to be discountable and insignificant.

Benthic Disturbance and Turbidity

The deployment of metocean buoys, ADCPs, and other sampling and surveying work will contact the bottom and disrupt sediments, likely causing elevated levels of turbidity for brief periods of time. Larger contacts with the bottom, such as metocean buoys, may cause a slightly higher magnitude and duration of elevated turbidity in the benthic portion of the water column. These larger anchors may also cause scour of the surrounding seabed, which would also increase suspended sediments and turbidity in the benthic portion of the water column. Scour may occur around anchors and produce elevated turbidity during periods of higher current. NMFS expects small numbers of salmonids (juvenile, sub-adult, and adult life stages), as well as most life stages of sunflower sea stars, to be present and exposed to the activities occurring within the WEAs. Larger numbers of salmonids (juvenile, sub-adult, and adult) and sunflower sea stars (all life stages) are expected to be present and exposed in the nearshore areas associated with cable route surveys. SDPS green sturgeon and SDPS Pacific eulachon would also be expected to be present and exposed to activities occurring closer to shore along the cable routes. The benthic disturbance expected within the WEA's and nearshore environment are expected to be small in size relative to the action area, and allow for individual animals to select areas that have not been disturbed.

The primary prey of leatherback sea turtles, jellyfish, relies upon the need for hard substrate during the benthic stage (polyp) of their life cycle (Suchman and Brodeur 2005). While little information exists on their populations in open coastal systems, including the California Current upwelling system, it is generally understood that ultimately the benthic polyp stages contribute to seasonal and annual population variation of the adult medusae (NMFS 2012b), and that recruitment success during the juvenile (planula, polyp and ephyrae) stages of the life cycle can have a major effect on the abundance of the adult (medusa) population (Lucas et al. 2012). In total, geotechnical sampling of the bottom, buoy anchors, anchor chain sweep/chafe, and biological sampling activities are anticipated to impact as much as 3,128 m^2 of the bottom, which will likely either kill or displace any prey or other living habitat features, including any jellyfish polyps present, if this impact occurred on hard substrate. BOEM (2024) requires lessees to develop plans that ensure seafloor areas of hard substrate will be fully protected from bottom contact, which would prevent the possible disruption of the jellyfish life cycle within the action area.

Given the minimal extent of disturbance and bottom contact anticipated, along with the measures required to minimize or prevent impacts, NMFS expects the consequences of suspended sediments, elevated turbidity, disturbance, and contact with the bottom community to be insignificant.

Effects on Pacific Leatherback Critical Habitat

Critical habitat for leatherback turtles for waters off the U.S. West Coast is defined at 50 CFR 226.207 and was designated in 2012 (77 FR 4170). Critical habitat stretches along the California coast from Point Arena to Point Arguello east of the 3,000 meter depth contour, and also includes around 25,000 square miles stretching from Cape Flattery, Washington to Cape Blanco, Oregon, east of the 2,000 meter depth contour. In the final rule designating leatherback critical habitat, 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 Semaeostomeae (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 proposed action area overlaps with leatherback critical habitat, with a complete overlap with the Coos Bay WEA. Critical habitat extends to a water depth of 80 m from the ocean surface. None of the activities in the proposed action would adversely affect the adult prey (medusa) of Pacific leatherbacks, although the potential impact to juvenile stages of jellyfish along the bottom could occur, if those activities impact hard substrate in depths less than 80 m (as described above), which is not expected. Any displacement of prey species or individuals as a result of limited vessel surveys and transits to and from the WEAs to their respective and/or alternative ports are anticipated to be short-term and temporary. Given that impacts to hard substrate/juvenile jellyfish habitat are expected to be avoided, and the limited extent of displacement of prey/foraging that could occur, we conclude the potential effects will be insignificant to designated critical habitat for leatherback sea turtles.

Effects on Humpback Whale Critical Habitat

Critical habitat for the endangered Central America DPS and the threatened Mexico DPS of humpback whales within waters off the U.S. West Coast was designated on April 21, 2021 (86 FR 21082). Essential features for both DPSs were identified as prey species, including euphausiids and small pelagic schooling fishes such as Pacific sardine (*Sardinops sagax*), northern anchovy (*Engraulis mordax*) and Pacific herring (*Clupea pallasii*). Critical habitat for the Central America DPS of humpback whales contains approximately 48,521 square nautical miles (nmi^2) of marine habitat in the North Pacific Ocean within the portions of the California Current off the coasts of Washington, Oregon, and California. Specific areas designated as critical habitat for the Mexico DPS of humpback whales contain approximately 116,098 nmi^2 of marine habitat in the North Pacific Ocean, including areas within portions of the eastern Bering Sea, Gulf of Alaska, and California Current Ecosystem. The action areas associated with the Coos Bay and Brookings WEAs both overlap nearly entirely with humpback whale critical habitat (Figure 8 in BOEM (2024)). Any displacement of prey species as a result of vessel transits and surveys conducted as part of the Proposed Action are anticipated to be short-term and temporary; and therefore, insignificant to designated critical habitat for ESA-listed humpback whales.

Effects on Southern Resident Killer Whale Critical Habitat

The SRKW was federally listed as endangered in 2005 (70 FR 69903). Critical habitat for this DPS was designated in the summer core area in Haro Strait and waters around the San Juan Islands, Puget Sound, and the Strait of Juan de Fuca (79 FR 69054). In August 2021, additional critical habitat was designated along the U.S. West Coast from the Canadian border to Point Sur, California, including offshore of the action area for the Brookings and Coos Bay WEAs between depths of 6.1–200 m (20–656 ft; 86 FR 41668). Essential features for SRKW 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, SRKWs show a strong preference for salmonids, particularly larger, older age class Chinook (79 FR 69054). Any displacement of prey species or individuals as a result of limited vessel transits, to and from the WEAs to their respective and/or alternative ports as well as limited and temporary introduction of contaminants, conducted as part of the proposed action, are anticipated to be short-term and temporary; and therefore, insignificant to designated critical habitat for the SRKWs.

Effects on Steller Sea Lion Critical Habitat

Critical habitat for Steller sea lions was designated in 1993, and includes Sugarloaf Island, Cape Mendocino, Southeast Farallon Island, and Año Nuevo Island in California (NMFS 1993). The Steller sea lion was federally listed as threatened in 1990 (NMFS 1990). In 1997, the eastern population (i.e., east of 144° W longitude) was listed as threatened, and the western population (i.e., west of 144° W longitude) was listed as endangered (NMFS 1997). The eastern DPS has since recovered and is no longer listed (78 FR 66139).

Although the proposed action area includes areas that remain associated with designated critical habitat, we do not expect that any individuals from the currently listed western population 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 critical habitat in Oregon or California (Bickham et al. 1996; Raum-Suryan et al. 2002). Additionally, there is no evidence that would suggest that the western DPS would need to expand into these areas in Oregon or California for recovery. As a result, we do not anticipate that the proposed project activities could lead to adverse effect to the listed species, or will affect physical or biological features essential to the conservation of the currently listed western Steller sea lion DPS because the proposed action's effects are limited to areas outside the current or anticipated range of the western DPS. Therefore, any effects to designated critical habitat within the action area would be insignificant.

Effects on Critical Habitat of ESA Listed Marine and Anadromous Fish

The critical habitat designations for coho salmon, Chinook salmon, steelhead, and SDPS green sturgeon use the term primary constituent element or essential feature. The new critical habitat regulations (81 FR 7414) replace this term with physical or biological features (PBFs). This shift in terminology does not change the approach used in conducting our analysis, whether the original designation identified primary constituent elements, physical or biological features, or essential features. In this consultation, we use the term PBF to mean primary constituent element or essential feature, as appropriate for the specific critical habitat. Critical habitat for the sunflower sea star is not being proposed.

<u>Salmonid Critical Habitat</u>

Within the range of the SONCC coho salmon, the life cycle of the species can be separated into five PBFs or essential habitat types: (1) juvenile summer and winter rearing areas; (2) juvenile migration corridors; (3) areas for growth and development to adulthood; (4) adult migration corridors; and (5) spawning areas. Within these areas, essential features of coho salmon critical habitat include adequate substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions (NMFS 1999). The PBFs of coho salmon critical habitat associated with this Project relate to all PBFs with the exception of: (5) spawning areas. The essential features that may be affected by the proposed action include water quality, food, cover/shelter, and safe passage.

The PBFs of Chinook salmon critical habitat and the PBFs of steelhead critical habitat within the action area is limited to the estuarine area with: (1) water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; (2) natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and (3) juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation (NMFS 2005). The essential features that may be affected by the proposed action include water quality and forage/food resources.

The only element of the proposed action expected to occur in, or potentially affect, critical habitat for ESA-listed salmonids is vessel traffic within estuaries, ports, or harbors. Effects to salmonid critical habitat PBFs described above from vessel traffic are expected to be temporary and return to baseline conditions relatively shortly; and are therefore insignificant.

<u>SDPS Green Sturgeon Critical Habitat</u>
Critical habitat for SDPS green sturgeon includes PBFs for freshwater/riverine, estuarine, and marine environments. The PBFs of the estuarine areas includes: (1) food resources; (2) water flow (only pertaining to portions of San Francisco Bay); (3) water quality; (4) migratory corridor; (5) depth; and (6) sediment quality. The PBFs of the coastal marine areas includes: (1) migratory corridor; (2) water quality; and (3) food resources (NMFS 2006). The PBFs of freshwater riverine systems are not applicable.

The only elements of the proposed action that are expected to occur in, or potentially affect, SDPS green sturgeon critical habitat are vessel traffic while vessels transit or enter ports, or from the proposed bottom sampling activities along the cableway that connects the leases to shore. Softer substrates are expected to recover quickly after bottom samples are collected, and the avoidance measures proposed for hard substrates are expected to ensure hard substrates are not subjected to bottom-disturbing sampling. Therefore, the effects to SDPS green sturgeon critical habitat are expected to be temporary and return to baseline conditions relatively shortly; and are therefore insignificant.

Conclusion

Based on this analysis, NMFS concurs with BOEM and the Corps that the proposed action is not likely to adversely affect the subject listed species and designated critical habitats.

Reinitiation of Consultation

Reinitiation of consultation is required and shall be requested by BOEM and/or the Corps, where discretionary federal involvement or control over the action has been retained or is authorized by law and (1) the proposed action causes take; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the written concurrence; or (4) a new species is listed or critical habitat designated that may be affected by the identified action (50 CFR 402.16). This concludes the ESA consultation.

This letter of concurrence includes an analysis of effects on sunflower sea star, a species proposed for listing under the ESA (50 CFR 223.102). If sunflower sea star is listed, BOEM and the Corps must confirm with NMFS whether reinitiation is needed or if analysis within this LOC can serve as our concurrence that the proposed action is not likely to adversely affect sunflower sea star.

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of threatened and endangered species. The Bureau of Ocean Energy Management and the Corps also have the same responsibilities, and informal consultation offers action agencies an opportunity to address their conservation responsibilities under section 7(a)(1). We have no further conservation measures to suggest, other than our Essential Fish Habitat Conservation Recommendations below.

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

Section 305(b) of the MSA directs federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species' contribution to a healthy ecosystem. For the purposes of the MSA, EFH means "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity", and includes the associated physical, chemical, and biological properties that are used by fish (50 CFR 600.10). Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects may result from actions occurring within EFH or outside of it and may include direct, indirect, site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) of the MSA also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset the adverse effects of the action on EFH (50 CFR 600.905(b)).

EFH Affected by the Proposed Action

The proposed project occurs within EFH for various federally managed fish species within the following fishery management plans (FMPs): Pacific Coast Salmon (Pacific Fishery Management Council (PFMC) 2016), coastal pelagic species (PFMC 2019a), Pacific Coast Groundfish (PFMC 2019b), and Highly Migratory Species (PFMC 2018). The Pacific Coast

Groundfish EFH includes all waters from the mean high water line, and the upriver extent of saltwater intrusion in river mouths, along the coasts of Washington, Oregon, and California seaward to the boundary of the EEZ (PFMC 2019b). The east-west geographic boundary of Coastal Pelagic EFH is defined to be all marine and estuarine waters from the shoreline along the coasts of California, Oregon, and Washington offshore to the limits of the EEZ and above the thermocline where sea surface temperatures range between 10ºC and 26ºC. The southern extent of Coastal Pelagic EFH is the United States-Mexico maritime boundary. The northern boundary of the range of Coastal Pelagic EFH is the position of the 10ºC isotherm, which varies both seasonally and annually (PFMC 2019a). In estuarine and marine areas, Pacific Coast Salmon EFH extends from the nearshore and tidal submerged environments within state territorial waters out to the full extent (200 miles) of the U.S. Exclusive Economic Zone (EEZ) offshore of Washington, Oregon, and California north of Point Conception to the Canadian border (PFMC 2016).

In addition, the project occurs within, or in the vicinity of estuaries, seagrass, rocky reef, and canopy kelp, which are designated as habitat areas of particular concern (HAPCs) for various federally managed fish species within the Pacific Coast Salmon and Pacific Coast Groundfish FMPs. HAPC are described in the regulations as subsets of EFH which are rare, particularly susceptible to human-induced degradation, especially ecologically important, or located in an environmentally stressed area. Designated HAPC are not afforded any additional regulatory protection under the MSA; however, federal projects with potential adverse impacts on HAPC will be more carefully scrutinized during the consultation process.

Adverse Effects on EFH

NMFS determined the proposed action would adversely affect EFH as follows: The proposed action will introduce a variety of disturbances and impacts which will adversely affect EFH. Most of the effects are temporary and minor, although some effects will be rather long lasting and may disrupt HAPCs designated by the Pacific Coast Groundfish FMP. Effects to habitat features and prey are most profound for the benthic community, which overlaps most with EFH designated for the Pacific Coast Groundfish FMP, but also may occur for habitats near the ocean surface.

Geotechnical sampling of the bottom, buoy anchors, anchor chain sweep/chafe, and biological sampling activities are anticipated to impact as much as 3,128 m^2 of the bottom. This area of the seafloor is expected to be disturbed by sampling equipment or occupied by anchors, which will likely either kill or displace any prey or other living habitat features such as corals, sponges, and sea pens. The area of benthic habitat that will be altered by the Project are expected to require one to several years to recover, with a limited number of organisms (such as some sea pens) being mobile and able to relocate. Deep sea corals are fragile and sensitive to disturbance, and the deep water area off the coast of Southern Oregon is known to host solitary and branching corals. Various amendments to the Pacific Coast Groundfish FMP have prioritized protection of these deep water habitat features and closed these areas to bottom trawling by establishing EFH Conservation Areas (PFMC 2019b). Effects occurring over softer bottom substrates are expected to recover in less time, although the quality and quantity of habitat available will be temporarily diminished.

BOEM (2024) requires lessees to develop plans that ensure seafloor areas of hard substrate, rock outcroppings, seamounts, or deep-sea coral/sponge habitat will be fully protected from bottom contact. Proposed activities that could contact the seafloor include: anchoring of metocean buoys, anchoring of ADCP moorings, anchoring of UTPs, anchoring of project-related vessels, geotechnical surveys, and benthic sampling. BOEM proposed that protection of the sensitive seafloor resources (listed above) from bottom contact activities will be achieved if lessees include in their plans a 12 m (40 ft) buffer area, in addition to a description of the navigation equipment used to ensure anchors are accurately set and anchor handling procedures to prevent or minimize anchor dragging. Given the scale of sensitive seafloor habitat features listed above within the action area, a 40-foot buffer is likely not adequate to provide adequate protections for buoy and vessel anchoring activities. Some proposed activities lack precision, such as free fall deployments of metocean buoy anchors, due to the horizontal drift experienced between the time of release at the surface and contact on the seafloor. Due to the potential of unforeseen conditions during deployment of equipment, we consider this margin of error to be high and the risk to sensitive habitats also high. Additionally, the sediment plume and turbidity expected from larger bottom contacts is expected to have negative consequences on benthic suspension feeders like corals and sponges. It is expected that large anchors, like those used for metocean buoys, will cause scour around the anchor and result in suspended sediments and elevated turbidity. We expect that turbidity effects will extend well beyond the proposed 40 ft buffer area, which could have effects on sensitive and irreplaceable habitats. Lastly, we expect that anchor chain sweep or anchor dragging could extend impacts along the seafloor beyond 40 ft from the initial anchor site, resulting in potential damage to sensitive seafloor habitats.

The acoustic survey work introduces noise and sound levels that, as previously described in the ESA portion of this document, may affect individual fish which are prey resources that comprise EFH for all four of the PFMC's FMP's. Most life stages (including early life history stages) of both managed species and their prey will be exposed to sound levels as a result of the proposed action that will alter behaviors. Several studies have demonstrated that human-generated sounds may affect the behavior of fishes. BOEM (2024) indicated behavioral response effects to fish could occur at large distances from sparkers and boomers used during proposed seismic surveys and did not estimate distances for effects from other HRG equipment (Table 12).

As described in the ESA section of this letter, the underwater noise generated by airgun arrays is considerably louder than the equipment proposed for the HRG surveys. However, the response by fish to particular sound pressure levels produced by airguns is useful in assessing the response to HRG seismic equipment included in the proposed action. Engås et al. (1996) examined movement of fishes during and after a seismic airgun study by tracking the catch rate of haddock and Atlantic cod as an indicator of fish behavior and found a significant decline in catch rate of both species that lasted for several days after termination of airgun use. More recent work (Slotte et al. 2004) showed similar results for several additional pelagic species, including blue whiting and Norwegian herring. Unlike earlier studies, sonar was used to observe behavior of the local fish. They reported that fishes in the area of the airguns appeared to go to greater depths after the airgun exposure. Moreover, the abundance of animals approximately 30-50 km (18-31 miles) away increased, suggesting that migrating fish would not enter the zone of activity. Similarly, Skalski et al. (1992) showed a 52 percent decrease in rockfish (Sebastes sp.) catch when the area of catch was exposed to a single airgun emission at 186-191 dB re 1 Pa (mean peak level).

Based on the effects from airguns described above, and analysis of HRG seismic equipment effects in BOEM (2024), we expect that impacts from the use of sparkers or boomers will occur to habitat for Coastal Pelagic Species, Pacific Coast Groundfish, and Highly Migratory Species. Species from these FMPs are expected to use waters in WEAs within the behavioral disturbance distances from sparkers and boomers presented in BOEM (2024). Fish are expected to leave the area where impulsive noise sources are used, temporarily reducing their ability to successfully complete critical life history functions such as foraging or migration. The timeframe for this disruption will likely vary by species and life-stage as well as the number and strength of impulses produced in a given area during the HRG seismic surveys.

If survey and sampling of the WEA is incomplete or collected at a resolution that will not allow for avoidance of habitat features or micro-siting of anchors, the inadequate survey coverage or poor resolution may prevent appropriate mitigation measures that could be applied to avoid sensitive and irreplaceable resources, such as deep sea corals. Therefore, the survey and sampling coverage or intensity, and resolution of the data being collected are essential to avoid and minimize impacts in the future that likely cannot be replaced. BOEM has indicated that the Brookings WEA was designed to be larger in area because BOEM expected that some areas would not be available for construction, and therefore would require higher resolution surveys to identify opportunities for development. Adverse effects in the future could be set into motion during the survey work if the data being collected is not sufficient to employ the mitigation hierarchy as required by NOAA's Mitigation Policy for Trust Resources (NOAA 2023).

EFH Conservation Recommendations

NMFS determined that the following conservation recommendations are necessary to avoid, minimize, mitigate, or otherwise offset the impact of the proposed action on EFH.

1. BOEM and the Corps should ensure that all bottom contacting activities avoid any hard bottom substrate by requiring a suitable buffer to ensure any direct (e.g., chain sweep, anchor dragging, sediment sampling) or indirect impacts (e.g., sediment smothering of suspension feeders such as corals and sponges, re-suspension of pollutants) to sensitive or irreplaceable habitats are avoided. It is unclear how BOEM's proposed PDC-1 buffer for hard substrate (12 m, or 40 ft) can achieve its intended purpose to avoid damage to these habitats. Furthermore, BOEM has previously proposed and required a buffer of 500 feet in the Gulf of Mexico (see below) to protect similar habitats from all bottom disturbance associated with offshore wind site assessment and characterization activities:

   > *"2.2 Protocol. All bottom-disturbing activities shall be distanced at least [...] 500 ft from any other sensitive benthic features including chemosynthetic communities, topographic banks, pinnacles, live bottoms (e.g., submerged aquatic vegetation [SAV] and oyster beds), or any other hard bottom benthic feature(s). The lessee shall also maintain a minimum vertical clearance of at least 15 ft for mooring or anchoring lines, chains, and/or cables that cross sensitive benthic features. [...]"*

   During consultation with BOEM on the California WEAs, NMFS had previously recommended a buffer of 500 m. NMFS requests a meeting with BOEM and the Corps to seek agreement on a suitable buffer distance that ensures protection of these valuable habitats.

2. If the Corps issues an Individual Permit, the Corps should require that all metocean buoy anchors or other scientific measurement devices (e.g., ADCP moorings) are removed from the seafloor within 30 days after the device is no longer being used for its intended purpose.

3. BOEM should require that HRG survey coverage of the Brookings WEA conforms to the recommendations developed by NMFS in the Greater Atlantic Regional Field Office, and employ multi-beam echosounder resolution of 0.5 meters or better, and side scan sonar resolution of 0.25 meters or better. Survey coverage of the WEA should be planned so that the line spacing of HRG surveys ensure a minimum of 100% of the area being covered. Tighter spacing of survey lines should be used when proximal to habitat features of concern.

4. Based on BOEM's analysis (Table 11), injury could occur to fish if they are close enough to sparkers or boomers used in seismic surveys. We expect this equipment could cause impacts to habitat for Coastal Pelagic Species, Pacific Coast Groundfish, and Highly Migratory Species, as species from these FMPs are expected near the ocean surface within WEAs. NMFS recommends that BOEM exclude sparkers and boomers from future survey plans, and requests a meeting with BOEM to discuss suitable mitigation measures to reconcile this adverse effect if the use of sparkers or boomers cannot be excluded.

Fully implementing these EFH conservation recommendations would protect EFH and HAPC, by avoiding or minimizing the adverse effects described above.

Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, BOEM and the Corps must provide a detailed response in writing to NMFS within 30 days after receiving EFH Conservation Recommendations. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS' EFH Conservation Recommendations unless NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency response. The response must include a description of measures proposed by the agency for avoiding, minimizing, mitigating, or otherwise offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the Conservation Recommendations, the Federal agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects (50 CFR 600.920(k)(1)).

Supplemental Consultation

BOEM and the Corps must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations (50 CFR 600. 920(l)).

Please direct questions regarding the letter or other ESA or MSA questions to Tina Fahy via electronic mail at Christina.Fahy@noaa.gov or Matt Goldsworthy via electronic mail at Matt.Goldsworthy@noaa.gov.

Sincerely,

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