UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

September 21, 2022

Lisa Gilbane
Environmental Analysis Section Chief
Pacific OCS Region
Bureau of Ocean Energy Management
760 Paseo Camarillo; Suite 102
Camarillo, California 93010-6064

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 Lease Issuance, Site Characterization and Assessment for the Morro Bay and Humboldt Wind Energy Areas

Dear Ms. Gilbane:

On June 6, 2022, NOAA's National Marine Fisheries Service (NMFS) received your request via electronic mail for written concurrence that the Bureau of Ocean Energy Management's (BOEM) proposed issuance of offshore wind leases, site characterization and assessment activities in central and northern California 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 under the Endangered Species Act (ESA). This response to your request was prepared by NMFS' West Coast Region (WCR) pursuant to section 7(a)(2) of the ESA implementing regulations at 50 CFR Part 402.

Thank you also for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1855(b)) for this action.

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 concurrence letter[1] will be available through NMFS' Environmental Consultation Organizer [https://www.fisheries.noaa.gov/resource/tool-app/environmental-consultation-organizer-eco]. A complete record of this consultation[2] is on file at NMFS' WCR in Long Beach, California.

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[1] WCRO-2022-01796

[2] Administrative Record Number: 151422WCR2022PR00145

**Consultation History**

On April 6, 2022, BOEM requested an ESA-listed species list from NMFS WCR and on April 7, 2022, identified the four Fishery Management Plans (FMPs) that may contain EFH affected by the proposed action. Following NMFS' identification of ESA-listed species that may be found within the action area, on May 6, 2022, BOEM submitted a draft Biological Assessment (BA) and draft EFH assessment for review by NMFS. Subsequently, NMFS submitted multiple comments, edits, and questions to BOEM regarding the proposed action, action area (and maps), and effects analysis. On June 6, 2022, BOEM requested an expedited process for informal consultation under the ESA and NMFS' concurrence that the proposed action (i.e., issuance of commercial wind energy leases and easements for the Humboldt and Morro Bay Wind Energy Areas and site assessment and characterization activities associated with the lease issuance) is not likely to adversely affect ESA-listed species/critical habitat and would have temporary and minimal adverse effects on managed species and EFH. On July 22, 2022, BOEM submitted their final BA and EFH assessment, and NMFS agreed that sufficient information was provided to initiate consultation.

Two earlier consultations, discussed below, cover the activities associated with the deployment of LiDAR buoys, and information derived from the deployment, operation, maintenance and recovery of these buoys is used in this current consultation, particularly since they occurred in the proposed action areas associated with this current consultation.

In 2019, NMFS completed an informal consultation and EFH assessment with the Department of Energy (DOE) and BOEM on the deployment of two light detection and ranging (LiDAR) buoys off California, one off the Humboldt Call Area and one off the Morro Bay Call Area (WCRO-2019-02259; October 7, 2019). The proposed action included the operation, maintenance and recovery activities associated with the deployment. Based on our effects analyses, NMFS concurred with BOEM that the proposed action was not likely to adversely affect ESA-listed species and designated critical habitats. In addition, NMFS determined that any adverse effects to EFH would be minimal in nature, and did not provide any additional Conservation Recommendations.

On October 14, 2021, NMFS received a request for expedited review and concurrence from the DOE and BOEM on activities associated with the deployment of the two LiDAR buoys off California. DOE reinitiated the consultation due to minor project updates and the recently designated humpback whale critical habitat. On November 17, 2021, NMFS concurred with the DOE's conclusions that the proposed action was not likely to adversely affect NMFS ESA-listed species and/or designated critical habitat (WCRO-2021-02885).

On July 5, 2022, the U.S. District Court for the Northern District of California issued an order vacating the 2019 regulations adopting changes to 50 CFR part 402 (84 FR 44976, August 27, 2019). On September, 21, 2022, the U.S. Court of Appeals for the Ninth Circuit granted a temporary stay of the district court's July 5 order. As a result, the 2019 regulations are once again in effect, and we are applying the 2019 regulations here. For purposes of this consultation, we considered whether the substantive analysis and conclusions articulated in the letter of concurrence would be any different under the pre-2019 regulations. We have determined that our analysis and conclusions would not be any different.

**Proposed Action and Action Area**

Pursuant to the Energy Policy Act of 2005, BOEM proposes to issue up to five leases for both Wind Energy Areas (WEAs): Humboldt WEA (2 leases) and Morro Bay WEA (3 leases). Included within the leases are the rights of way (ROWs) and rights of use and easements (RUEs) granted in support of wind energy development. Within these leases or grants, the proposed action also considers the execution of associated site characterization and site assessment activities.

Site characterization activities include both high-resolution geophysical (HRG) surveys, non-seafloor-disturbing activities, as well as geotechnical investigations and biological surveys, which may include seafloor-disturbing activities. BOEM anticipates HRG surveys would be conducted using the following systems: swath bathymetry, magnetometer/gradiometer, side-scan sonar, and shallow and medium (seismic) sub-bottom profiler. The HRG equipment does not come in contact with the seafloor as it is towed from a moving survey vessel without anchoring. Geotechnical testing or sampling involves seafloor disturbing activities. Geotechnical investigation may include the using equipment such as gravity cores, piston cores, vibracores, deep borings, and cone penetration tests (CPT), among others.

Although BOEM does not receive Site Assessment Plans (SAPs) until after the lease has been procured, the following assumptions and scenarios are reasonably foreseeable activities of both site assessment and site characterization from regulations and experience on the Outer Continental Shelf (OCS) and SAPs that BOEM has received from the Atlantic OCS.

The proposed action does not include cable installation or connection to shore-based facilities, or consideration 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 Construction and Operations Plan to BOEM – this would be considered a separate action under the National Environmental Policy Act and considered under separate ESA and EFH consultations. Site assessment activities are conducted with scientific instrumentation attached to buoys (metocean buoys) to collect oceanographic, meteorological, and biological data on the lease. In general, metocean buoys are used to monitor and evaluate the viability of wind as an energy source.

*Surveying and Sampling Assumptions*

- 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 three metocean buoys and potential commercial wind facilities.
- Site characterization surveys may be conducted before and after the installation of metocean buoys.
- Lessees would perform HRG surveys, which do not include the use of air guns.
- Survey vessels will travel at speeds no greater than 4.5 knots. In addition, 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.
- Survey vessels would be sourced from within the California Current region.

*Installation, Decommissioning, and Operations and Maintenance Assumptions*

As described in the Consultation History section, in 2019, the Pacific Northwest National Lab (PNNL) (2019) used a 65 ft tugboat to tow LiDAR buoys to the Humboldt and Morro Bay WEAs. The tugboat traveled at 5 knots to the WEAs, and for each installation, lowered the anchor, mooring line, and attached the buoy, then returned to Humboldt/Morro Bay in one day. As such, this helped inform the following assumptions for metocean buoy installation, maintenance (including on-site inspections) and decommissioning (projected vessel trips summarized in Table 4):

- Metocean buoy installation would take approximately one day (PNNL 2019).
- One buoy maintenance trip each year per buoy (PNNL 2019).
- Buoy decommissioning would take one day (PNNL 2019) and occur in Year 6 or Year 7 after lease execution.
- On-site inspections and preventative maintenance (e.g., marine fouling, wear, or lens cleaning) are expected to occur yearly.

*Vessel Characterization and Traffic Assumptions*

Vessel trips are anticipated for both site assessment and site characterization activities (Table 3). Traffic patterns based on 2017 Automatic Identification System (AIS) data are more concentrated further to sea and closer to shore than in the Humboldt and Morro Bay WEAs (Figure 2 in BOEM (2022b)). We note that tug and tow vessels do traverse the Morro Bay and Humboldt WEAs; however, they are more concentrated in the nearshore tow lane and further offshore. Cargo ships also traverse the WEAs, but their traffic is concentrated further offshore.

For the proposed action, BOEM has clarified that crew boats used for operations and maintenance activities will be approximately 51 to 57 ft (16 to 17 m) long with 400 to 100-horsepower engines and 1,800-gallon fuel capacity. Surveying (e.g., biological, geotechnical and geophysical surveys) and buoy installation vessels used for these activities are anticipated to be approximately 65 to 100 ft (20 to 30 m) in length (D. Reeb, BOEM, personal communication, September, 2022).

*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 used 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/. Table 2 describes the types of site characterization surveys, the survey equipment and/or methods used, along with which resources would be surveyed and the information that would be used to inform BOEM of shallow hazards, identify archaeological sites, and ensure that mooring systems, turbines and cables can be properly located.

*Collection of Geotechnical/Sub-bottom Information Assumptions*

Site characterization activities include geotechnical surveys such as cone penetrometer testing (CPT), boring, vibracoring, and other geotechnical exploration methods such as grab samples and benthic videography with ROVs. Geotechnical surveys generally do use active acoustic sources and may have some low-level ancillary sounds associated with them. 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.

The Humboldt WEA will include up to 2 leases while the Morro Bay WEA will include up to 3 leases. Assumptions for estimates of benthic disturbance from geotechnical/sub-bottom sampling are based on BOEM's 2021 Biological Assessment for the same activities (BOEM 2021): (1) Up to a 75 km (40.5 nmi) cable route to shore for each lease, with one sub-bottom sample every nautical mile of transmission cable corridor, amounting to ~41 samples per lease; and (2) The area of seabed disturbed by individual sampling events (e.g., collection of a core or grab sample) is estimated to range from 1-10 $m^2$.

Up to 3 metocean buoys may be placed in each WEA. Assumptions for estimates of benthic disturbance from metocean buoy anchors are derived from data from PNNL's 2019 LiDAR buoy deployments to the Humboldt and Morro Bay WEAs and modified in BOEM's 2022 Consistency Determination for Leasing Wind Energy Areas Offshore Morro Bay, California (BOEM 2022a) to create conservative estimates of a potential maximal scenario: (1) metocean buoy weight in depths over 1,000 m may be distributed over 2 separate anchors, so the proposed action covers 12 potential anchoring events; (2) anchor radius is conservatively calculated by doubling the anchor radius of known metocean buoys to increase the area from 2.3 to 9.3 $m^2$; and (3) maximum chain sweep area was estimated by tripling the current 1.8 m (6 ft) of chain used to 5.5 m (18 ft). This guidance assumes one sample per 1-2 $km^2$ within the Humboldt and Morro Bay WEAs to provide the best available information, although likely an overestimate. Maximum sampling area for grab sampling, using the largest Van Veen grab currently available (1,000 $cm^2$), is anticipated to be 0.1$m^2$ per sample. The maximum area of benthic disturbance from geotechnical and biological sampling, and metocean buoy anchor embedment across the entire action area is anticipated to be between 391 to 3453 $m^2$ (Table 1).

*Collection of Geophysical Information Assumptions*

HRG surveys would be performed to obtain geophysical hazards information, including information to determine siting for geotechnical sampling, whether hazards will impact seabed support of the turbines, information pertaining to the presence or absence of archaeological and habitat resources, and to conduct bathymetric charting.

Assuming the Lessee follows BOEM's guidelines to meet the geophysical data requirements at 30 CFR §§ 585.610–611, BOEM anticipates that the surveys would be undertaken using the equipment to collect the required data as described in Table 2. Vessel traffic assumptions for site characterization are shown in Table 3. Equivalent technologies to those shown in these tables may be used if their potential impacts are similar to those analyzed for the equipment described in the BA and are approved by BOEM prior to conducting surveys.

**Table 1. Estimated Benthic Disturbance from Geotechnical and Biological Sampling, and Metocean Buoy Anchor Embedment Activities in the Action Area**[3]

| | **Humboldt WEA** (2 leases) | **Morro Bay WEA** (3 leases) | **California WEAs** (5 leases) |
|---|---|---|---|
| Size of WEA ($km^2$) | 536 | 97 | 1,363 |
| Number of geotechnical/sub-bottom | 82 | 123 | 205 |

[3] Table 2A in BOEM 2022b.

| | | | |
|---|---|---|---|
| sampling events (~41 samples per lease) | | | |
| Affected Area for geotechnical/sub-bottom sampling events ($m^2$) | 82 to 820 | 123 to 1,230 | 205 to 2,050 |
| Number of biological samples per 1 $km^2$ | 536 | 975 | - |
| Maximum area of 1 biological sample disturbance ($m^2$) | 0.1 | 0.1 | - |
| Maximum area of biological survey disturbance ($m^2$) | 53.6 | 97.5 | 53.6-151.1 |
| Met buoy anchor radius ($m^2$) | 3 to 55.8 | 3 to 55.8 | 6 to 111.6 |
| Chain sweep and/or placement ($m^2$) | 63 to 570 | 63 to 570 | 126 to 1,140 |
| **Total estimated area of benthic disturbance** | | | **391 to 3,453 $m^2$** |

The line spacing for HRG surveys would vary depending on the data collection requirements of the different HRG survey types:

- geophysical data for shallow hazards assessments (including magnetometer, side-scan sonar, and sub-bottom profiler systems) - BOEM recommends surveying at a 150-m (492-ft) line spacing over the proposed lease area;
- geophysical data for archaeological resources assessments, survey methods at a line spacing appropriate for the range of depths expected in the survey area, as long as the sonar system is capable of resolving small, discrete targets 0.5 m (20 inches) in length at maximum range; and
- bathymetric charting, a multi-beam echosounder at a line spacing appropriate to the range of depths expected in the survey area.

**Table 2. High-Resolution Geophysical Survey Equipment and Methods[4]**

| Equipment Type | Data Collection and/or Survey Types | Description of the Equipment |
|---|---|---|
| Bathymetry/depth sounder (multibeam echosounder) | Collection of geophysical data for shallow hazards, archaeological resources, benthic habitats, and bathymetric charting | A depth sounder is a microprocessor-controlled, high- resolution survey-grade system that measures precise water depths in both digital and graphic formats. The system would be used in such a manner as to record with a sweep appropriate to the range of water depths expected in the survey area. This EA assumes the use of multibeam bathymetry systems, which may be more appropriate than other tools for characterizing those lease areas containing |

[4] Table 3 in BOEM 2022b.

| | | |
|---|---|---|
| | | complex bathymetric features or sensitive benthic habitats such as hardbottom areas. |
| Magnetometer | Collection of geophysical data for shallow hazards and archaeological resources assessments | Magnetometer surveys would be used to detect and aid in the identification of ferrous or other objects having a distinct magnetic signature. The magnetometer sensor is typically towed as near as possible to the seafloor and anticipated to be no more than approximately 6 m (20 ft) above the seafloor. This methodology will not be used in the WEA since depths are 500 m or greater, but will be used to survey potential cable routes that will occur in depths shallower than 500 m. |
| Side-scan sonar | Collection of geophysical data for shallow hazards and archaeological resource assessments | This survey technique is 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") located on the sides which generate and record the returning sound that travels through the water column at a known speed. BOEM assumes that the Lessee would use a digital dual-frequency side-scan sonar system with 300–500 kHz frequency ranges or greater to record continuous planimetric images of the seafloor. |
| Shallow and medium penetration sub-bottom profilers | Collection of geophysical data for shallow hazards and archaeological resource assessments and to characterize subsurface sediments | Typically, a high-resolution CHIRP* System sub-bottom profiler is used to generate a profile view below the bottom of the seabed, which is interpreted to develop a geologic cross-section of subsurface sediment conditions under the track line surveyed. Another type of sub-bottom profiler that may be employed is a medium penetration system such as a boomer, bubble pulser or impulse-type system. Sub-bottom profilers are capable of penetrating sediment depth ranges of 3 m (10 ft) to greater than 100 m (328 ft), depending on frequency and bottom composition. |

*CHIRP = Compressed High Intensity Radar Pulse kHz = kilohertz

**Table 3. Projected Maximum Vessel Trips for Site Characterization over a 3-Year Period in the Action Area[5]**

| Survey Task | Number of Survey Days/Round Trips[1] | | | |
|---|---|---|---|---|
| | Based on 24-hour Days | | Based on 10-hour Days | |
| | Humboldt | Morro Bay | Humboldt | Morro Bay |
| HRG surveys of all OCS blocks within lease area(s) | 64 | 64 | 153 | 153 |
| Geotechnical sampling | 18 | 18 | 247 | 247 |
| Avian surveys | 24–48[2] | 30-54[2] | 24–48[2] | 30-54[2] |
| Fish surveys | 8-365[3] | 8-365[3] | 8-365[3] | 8-365[3] |
| Marine mammal and sea turtle surveys | 24–48[2] | 30-54[2] | 24–48[2] | 30-54[2] |
| Total: | 138-543 | 150-555 | 456-861 | 464-873 |

[1] 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.
[2] Avian and marine mammal/sea turtle surveys are most likely to occur at the same time, from the same vessel. However, since it is possible that they may occur separately, totals include vessel trips for both.
[3] Number of surveys are conservative estimates, meaning the highest possible number of trips is assumed even though it is unlikely that this many trips will take place.

*Site Assessment Assumptions*

Instrumentation and Power Requirements

Metocean buoys would be anchored at fixed locations in potential commercial lease areas in order to conduct site assessment activities to monitor and evaluate the viability of wind as an energy source. The activities may include data gathering on wind velocity, barometric pressure, atmospheric and water temperatures, and current and wave measurements.

Data would be obtained by: scientific measurement devices consisting of anemometers, vanes, barometers, and temperature transmitters that would be mounted either directly on a buoy or on a buoy's instrument support arms. Floating light detection and ranging (FLiDAR) and sonic detection and ranging equipment may be used to obtain meteorological data. Acoustic Doppler Current Profilers (ADCPs) would most likely be installed to measure the speed and direction of ocean currents. Buoys could also accommodate environmental monitoring equipment, such as bird and bat monitoring equipment (e.g., radar units, thermal imaging cameras), visual or acoustic monitoring equipment for marine mammals and fishes, data logging computers, power

[5] Table 4 in BOEM 2022b

supplies, visibility sensors, water measurement equipment (e.g., temperature, salinity), communications equipment, material hoist, and storage containers. Projected vessel traffic in support of metocean buoy placement is shown in Table 4.

**Table 4. Projected Maximum Vessel Trips for Metocean Buoy(s)[6]**

| Site Assessment Activity | Round Trips | Formula |
|---|---|---|
| Metocean buoy installation | 6 | 1 round trip x 6 buoys |
| Metocean buoy yearly maintenance trips | 30 | 6 buoys x 5 years |
| Metocean buoy decommissioning | 6 | 1 round trip x 6 buoys |
| Total buoy trips over 5-year period | 42–50 | Adds on additional maintenance/weather challenges |

To supply a reliable energy source, the buoys may be equipped with some combination of solar arrays, lithium or lead acid batteries, and diesel generators. If diesel generators are used, they will require an onboard fuel storage container with appropriate spill protection and an environmentally sound method to perform refueling activities.

Buoy Hull Types and Anchoring Systems

Buoys must be properly sized and anchored to accommodate instrumentation and power systems. NOAA has successfully used boat-shaped hull buoys (known as Naval Oceanographic and Meteorological Automated Devices (NOMAD)) and the newer Coastal Buoy and Coastal Oceanographic Line-of-Sight (COLOS) buoys. Hull type depends on intended installation location and measurement requirements. Smaller buoys in shallow coastal waters may be moored using an all-chain mooring. 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 for many years of ocean service (NDBC 2012). Moorings will be designed to minimize or remove entanglement risk for protected species. Discus-shaped, boat-shaped, and spar buoys (Figures 3-5, respectively in BOEM 2022b) are the buoy types that would most likely be adapted for offshore wind data collection.

Large discus-shaped hull buoy has a circular hull ranging between 10 and 12 m (33 and 40 ft) in diameter (NDBC 2012). Some deep ocean moorings have operated without failure for more than 10 years (NDBC 2012). The boat-shaped hull buoy is an aluminum-hulled buoy that provides long-term survivability in severe seas (NDBC 2012). In 2020, PNNL installed two LiDAR buoys off California that had a boat-shaped hull moored with a solid cast iron anchor weighing approximately 4,990 kgs (11,000 lbs.) with a 2.3 square meter ($m^2$) footprint. The mooring line was comprised 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

[6] Table 5 in BOEM 2022b.

Humboldt WEA (PNNL 2019). BOEM anticipates that LiDAR buoys deployed as part of the proposed action will be very similar to the LiDAR buoys deployed by PNNL.

Buoy Installation and Operation

Buoys would typically take approximately one day to install. Boat-shaped and discus-shaped buoys are typically towed or carried aboard a vessel to the installation location. Once at the location site, the buoy would be either lowered to the surface from the deck of the transport vessel or placed over the final location, and then the mooring anchor dropped. After installation, the transport vessel would likely remain in the area for several hours while technicians configure proper operation of all systems. Transport and installation vessel anchoring for one day is anticipated for these types of buoys (PNNL 2019).

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 (TetraTech EC Inc 2010).

Limited space on the buoy would restrict the amount of equipment requiring a power source; therefore, this equipment may be powered by small solar panels or wind turbines. Diesel generators may also be used, which would require periodic vessel trips for refueling.

Decommissioning

Decommissioning is assumed to be essentially the reverse of the installation process. Equipment recovery would be performed with the support of a vessel(s) equivalent in size and capability to that used for installation (Installation section above). Due to water depths, it may not be possible to recover the anchors, as PNNL reported following the decommissioning of their LIDAR buoys. However, BOEM requires the avoidance of hard bottom, so any remaining anchors left on the sea floor would not impact hard bottom. Thus, during decommissioning, the mooring chain would be recovered to the deck using a winching system and the anchor may be left on the seafloor, depending on the water depth. There is a “release mechanism” on the chain that would result in a small length of chain remaining behind with the anchor, should it be left on the seafloor (D. Reeb, BOEM, personal communication, September 2022). The buoy would then be transported to shore by towing (PNNL 2019).

Buoy decommissioning is expected to be completed within one day. Buoys would be returned to shore and disassembled or reused in other applications. BOEM anticipates that the mooring devices and hardware would be reused or recycled (PNNL 2019).

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

For impacts that cannot be entirely avoided, BOEM has developed PDCs to avoid and minimize the potential environmental risks to or conflicts with protected resources (Table 5). The PDCs summarized below, and the associated BMPs that further describe how the PDCs will be implemented (Appendix A of BOEM 2022b), are part of the proposed action to minimize or avoid impacts on threatened and endangered marine mammals, sea turtles, and fishes. These BMPs were developed by BOEM through consultation with NMFS and through coordination and feedback from stakeholders.

BOEM proposes to implement these BMPs through a combination of procedures including lease stipulations, individual plan reviews, and incidental take permit requirements for ESA-listed species under the Marine Mammal Protection Act (if needed for the Lessees). Recommended BMPs may be updated in the future through coordination with NMFS.

The current BMPs are fully described in Appendix A of BOEM (2022b) and are discussed in the relevant sections of this letter. 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.

**Table 5. BOEM's proposed Project Design Criteria for protected species and EFH**[7]

| **Project Design Criteria** | **Applicable to** | **Purpose** |
|---|---|---|
| Hard Bottom Avoidance and Metocean Buoy Anchoring Plan | Employees and all at-sea contract personnel and vessels | 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. |
| 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. |
| HRG Survey Vessel Constraints | Any survey vessel operating high-resolution geophysical survey equipment to obtain data associated with a lease and operating such equipment 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, Protected Species Observers (PSO) monitoring, and other BMPs to avoid and reduce exposure of ESA-listed species to underwater survey noise. |

[7] Table 6 in BOEM 2022b.

| | | |
|---|---|---|
| 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 [including speed restrictions]. |
| 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 help prevent or reduce the chance of entanglement with marine mammals and sea turtles. |
| Protected Species Observers | Geophysical Surveys | To require PSO training; to require PSO approval requirements by NMFS prior to deployment on a project. |
| 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. |
| Prohibition of Trawling for Biological Surveys | Employees and all at-sea contract personnel and vessels | To reduce the possibility of bycatch of protected fish species and to protect benthic habitats. |

Appendix A of BOEM (2022b) includes the specific project design criteria and best management practices 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.

<u>Hard Bottom Avoidance and Metocean Buoy Anchoring Plan</u>

As part of any SAP, the Lessee shall submit to BOEM the details of how these activities will avoid contact with hard bottom including how the Lessee will avoid placing anchors on sensitive ocean floor habitats and shall include the following information: 1) detailed maps showing proposed anchoring sites that are located at least 12 m (40 ft) from hard substrate and other anthropogenic features (e.g. power cables), if present; 2) a description of the navigation equipment that would be used to ensure anchors are accurately set; and 3) anchor handling procedures that would be followed to prevent or minimize anchor dragging, such as placing and removing all anchors vertically, whenever possible. Depending on the water depths, anchors may not be recoverable but would not impact sensitive ocean floor habitats.

Marine Debris Awareness and Prevention

1. Training - All vessel operators, employees, and contractors performing OCS survey activities on behalf of the Lessee must complete marine trash and debris awareness training annually by January 31 of each year. The Lessee must submit to the Department of the Interior (DOI) an annual report signed by the Lessee that describes its marine trash and debris awareness training process and certifies that the training process has been followed for the previous calendar year.

2. Marking of items used in OCS activities which are of such shape or configuration that they are likely to snag or damage fishing devices, and could be lost or discarded overboard, must be clearly marked with the vessel or facility identification and properly secured to prevent loss overboard.

3. Recovery: Lessees must recover marine trash and debris that is lost or discarded in the marine environment while performing OCS activities.

4. Reporting: The Lessee must report all marine trash and debris lost or discarded to DOI (using the email address listed on DOI's most recent incident reporting guidance).

Minimize Interactions with ESA-listed species during Geophysical Survey Operations

To avoid injury of ESA-listed species and minimize any potential disturbance, the following measures will be implemented for all vessels operating impulsive survey equipment that emits sound at frequency ranges <180 kHz (within the functional hearing range of marine mammals) as well as CHIRP sub-bottom profilers. The Clearance Zone (defined as 1,000 m for all ESA-listed species) is the area around the sound source that needs to be visually cleared of ESA-listed species for 30 minutes before the sound source is turned on. The Clearance Zone is equivalent to a minimum visibility zone for survey operations to begin (BMP 6). The Shutdown Zone (500 m for ESA-listed whales visible at the surface) is defined as the area around the sound source that must be monitored for possible shutdown upon detection of ESA-listed whale species within or entering that zone. For both the Clearance and Shutdown Zones, these are minimum visibility distances. For situational awareness, PSOs should observe beyond this area when possible. When technically feasible, a "ramp up" of the electromechanical survey equipment must occur at the start or re-start of geophysical survey activities. Further details on these best management practices can be found in Appendix A of BOEM (2022b) (PDC 3).

Minimize Vessel Interactions with ESA-listed species

All vessels associated with survey activities (transiting [i.e., traveling between a port and the survey site] or actively surveying) must comply with the vessel strike avoidance measures specified below. The only exception is when the safety of the vessel or crew necessitates deviation from these requirements. If any such incidents occur, they must be reported as outlined below under Reporting Requirements. The Vessel Strike Avoidance Zone is defined as 500 m or greater from any sighted ESA-listed marine mammal species or other unidentified large marine mammal.

Best management practices (PDC 4 of BOEM (2022b); Appendix A)

1. Vessel captain and crew must maintain a vigilant watch for all protected species and slow down, stop their vessel, or alter course, as appropriate and regardless of vessel size, to avoid striking any ESA-listed species.
2. Any time a survey vessel is underway (transiting or surveying), the vessel must maintain a 500 m minimum separation distance and a PSO must monitor a Vessel Strike Avoidance Zone (500 m or greater from any sighted ESA-listed whale species or other unidentified large marine mammal, or 100 m from any sea turtle visible at the surface) to ensure detection of that animal in time to take necessary measures to avoid striking the animal.
3. To monitor the Vessel Strike Avoidance Zone, a PSO (or crew lookout if PSOs are not required) must be posted during all times a vessel is underway (transiting or surveying) to monitor for ESA-listed species in all directions.
4. Vessels underway must not divert their course to intentionally approach any ESA-listed species.
5. Lessees are directed to NMFS' Marine Life Viewing Guidelines, which highlight the importance of these measures for avoiding impacts to mother/calf pairs (https://www.fisheries.noaa.gov/topic/marine-life-viewing-guidelines#guidelines-&-distances).
6. Wherever available, Lessees will ensure all vessel operators check for daily information regarding protected species sighting locations. These media may include, but are not limited to: Channel 16 broadcasts, whalesafe.com, and the Whale/Ocean Alert App.

Minimize Risk During ROV usage, Buoy Deployment, Operations, and Retrieval

Any mooring systems used during survey activities should prevent any potential entanglement of ESA-listed species, and in the unlikely event that entanglement does occur, Lessees should ensure proper reporting of entanglement events according to the measures specified in PDC 5 of BOEM (2022b) (Appendix A).

Protected Species Observers

Qualified third-party PSOs to observe Clearance and Shutdown Zones and other PDCs and BMPs must be used as outlined in the conditions described in PDC 6 of BOEM (2022b) (Appendix A).

Reporting Requirements

To ensure compliance and evaluate effectiveness of mitigation measures, regular reporting of survey activities and information on all protected and ESA-listed species will be required as described in PDC 7 of BOEM (2022b) (Appendix A). Data from all PSO observations must be recorded based on standard PSO collection and reporting requirements. PSOs must use standardized electronic data forms to record data in a format approved by BOEM and NMFS.

Prohibition of Trawling for During Project Activities

Lessees will characterize site-specific parameters within the WEAs to inform their site assessment plan and to generally describe local conditions, including biological attributes. Lessees and their contractors may employ a range of methods to accomplish these goals, but may not employ trawling methodology (as defined under the definition of "Fishing gear," in 50 CFR§ 660.11(11)) to conduct these activities.

Action Area

Site characterization survey activities are anticipated to occur within the Humboldt and Morro Bay WEAs. The eastern boundary of the Humboldt WEA is located approximately 34 kilometers (km, 21 miles (mi)) offshore of the city of Eureka and measures 45 km (28 mi) north to south and 23 km (14 mi) east to west, totaling approximately 206 square miles. Water depths across the WEA range from approximately 500 to 1,100 meters ((m) 1,640-3,609 feet)). The Morro Bay WEA is located approximately 20 miles from shore and is approximately 376 square miles. Water depths across the WEA range from approximately 900 to 1,300 m (2,953-4,265 ft).

The action area for the Humboldt WEA considers the remoteness of the Port of Humboldt Bay, and includes the closest alternative harbors to the WEA, which include Coos Bay, Oregon (approximately 349 km (217 mi)) to the north, Crescent City (approximately 145 km (90 mi)) to the north), and San Francisco Bay (approximately 368 km (229 mi)) to the south. The closest port (Humboldt Bay) is approximately 32.2 km (20 mi) east of the Humboldt Bay WEA. The Port of Morro Bay (approximately 32.2 km (20 mi) east of the Morro Bay WEA) would likely be used by vessels traveling to the WEA. Figure 1 shows the action areas for both the Humboldt WEA and the Morro Bay WEA, respectively, including possible vessel transit routes.

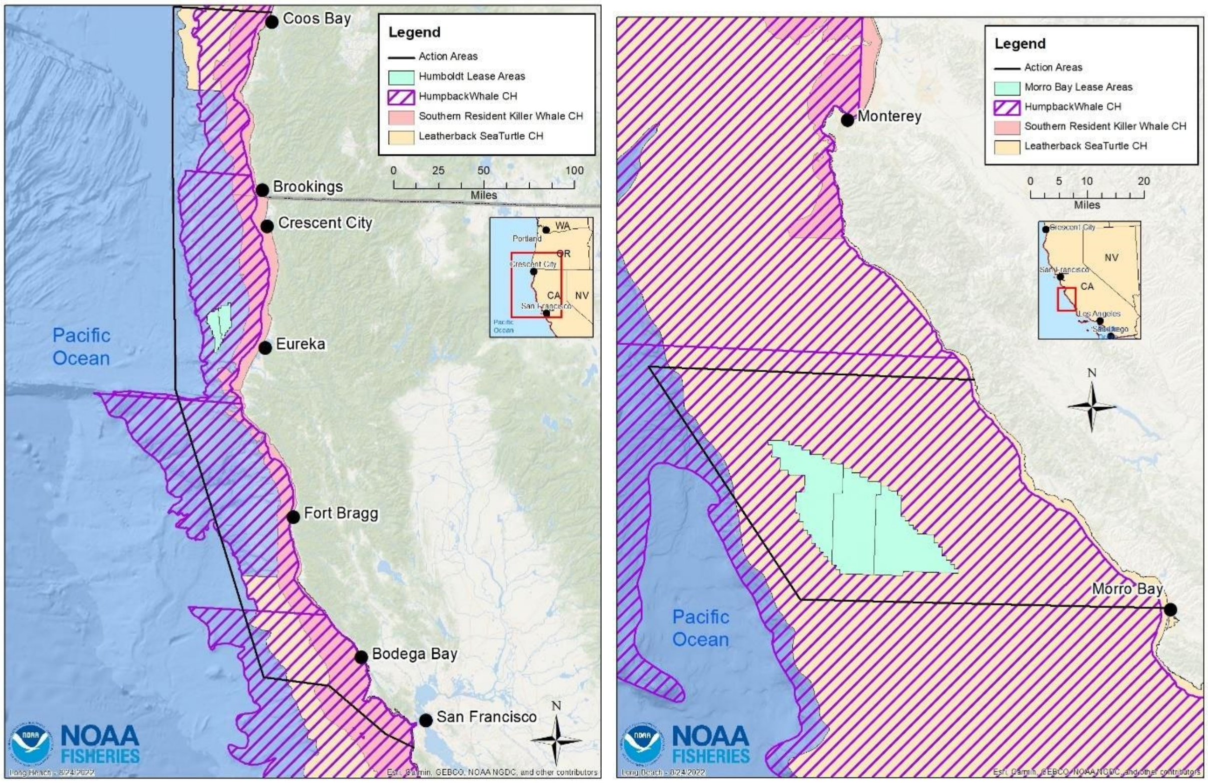


**Figure 1. The Action Area consists of Humboldt (left) and Morro Bay (right) Wind Energy Areas, the transit routes to and from the Ports of Humboldt Bay and Morro Bay as well as transit routes to and from the alternative ports.**

**Background and Action Agency's Effects Determination**

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 of 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.

The need for this proposed action is to analyze anticipated activities that will occur in and around the two BOEM designated WEAs offshore California, the Humboldt WEA and the Morro Bay WEA, including transit routes to and from Humboldt Bay and Morro Bay to any associated ports deemed necessary for vessels to be deployed from in conducting these activities (Figure 1). These surveys are necessary to collect data to make informed business and engineering decisions regarding the development of renewable energy projects; collectively referred to as site characterization and site assessment activities.

Site characterization surveys are conducted from a vessel and may include sonar surveys, geotechnical sampling, magnetometer surveys, biological surveys, and archeological surveys. As mentioned earlier, site assessment activities are conducted with scientific instrumentation attached to buoys to collect oceanographic, meteorological, and biological data on the lease. Consequently, the proposed action also includes the temporary installation, operation, and decommissioning of site assessment structures fixed to the seafloor.

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.

BOEMs BA and EFH assessment (BOEM 2022b) describes the proposed action, identifies those threatened and endangered species (Table 6) and essential fish habitat most likely to be affected by the action, identifies potential impact producing factors, and analyzes potential effects, and including cumulative effects.

The following ESA-listed species occur in the action area and are considered in this consultation:

**Table 6. ESA-listed species and critical habitat that may be affected by the proposed action**

| Species | ESA Listing | Citation listing determination | Critical Habitat |
|---|---|---|---|
| Blue whale (*Balaenoptera musculus*) | Endangered | 35 FR 18319; December 2, 1970 | N/A |
| Fin whale (*B. physalus*) | Endangered | 35 FR 18319; December 2, 1970 | N/A |
| Gray whale (*Eschrichtius robustus*) Western North Pacific Distinct Population Segment (DPS) | Endangered | 35 FR 18319; December 2, 1970 | N/A |
| Humpback whale (*Megaptera novaeangliae*) – Mexico DPS | Threatened | 81 FR 62260; September 8, 2016 | 86 FR 21082; April 21, 2021 |
| Humpback whale – Central America DPS | Endangered | 81 FR 62260; September 8, 2016 | 86 FR 21082; April 21, 2021 |

| Species | ESA Listing | Citation listing determination | Critical Habitat |
|---|---|---|---|
| Southern Resident killer whale (*Orcinus orca*) | Endangered | 70 FR 69903; November 18, 2005 | 86 FR 14668; August 2, 2021 |
| Sperm whale (*Physeter macrocephalus*) | Endangered | 35 FR 18319; December 2, 1970 | N/A |
| Guadalupe fur seal (*Arctocephalus townsendi*) | Threatened | 50 FR 51252; December 16, 1985 | N/A |
| Leatherback sea turtle (*Dermocheyls coriacea*) | Endangered | 35 FR 8491 June 2, 1970 | 77 FR 4170 January 26, 2012 |
| North Pacific loggerhead sea turtle (*Caretta caretta*) DPS | Endangered | 76 FR 58868 September 22, 2011 | N/A |
| Chinook salmon (*Oncorhynchus tshawytscha*) - Sacramento River winter-run Evolutionarily Significant Unit (ESU) | Endangered | 70 FR 37160; June 28, 2005<br>77 FR 19552; April 2, 2012 | N/A |
| Chinook salmon - Central Valley spring-run ESU | Threatened | 87 FR 22141; April 14, 2022 | N/A |
| Chinook salmon - California Coastal ESU | Threatened | 87 FR 22141; April 14, 2022 | 70 FR 52536; September 2, 2005 |
| Coho salmon (*O. kisutch*) Southern Oregon/Northern California Coast ESU | Threatened | 62 FR 24588; May 6, 1997<br>70 FR 37160; June 28, 2005 | 64 FR 24049; May 5, 1999 |
| Coho salmon - Central California Coast ESU | Endangered | 70 FR 37160; June 28, 2005<br>77 FR 19552; April 2, 2012 | N/A |
| Steelhead (*O. mykiss*) – Northern California DPS | Threatened | 65 FR 36074; June 7, 2000 | 70 FR 52629; September 2, 2005 |

| Species | ESA Listing | Citation listing determination | Critical Habitat |
|---|---|---|---|
| | | 71 FR 833; January 5, 2006 | |
| Steelhead – California Central Valley DPS | Threatened | 87 FR 22141; April 14, 2022 | N/A |
| Steelhead – Central California Coast DPS | Threatened | 87 FR 22141; April 14, 2022 | N/A |
| Steelhead – South-Central California Coast DPS | Threatened | 87 FR 22141; April 14, 2022 | N/A |
| Steelhead – Southern California DPS | Endangered | 70 FR 37160; June 28, 2005<br>77 FR 19552; April 2, 2012 | N/A |
| North American Green sturgeon (*Acipenser medirostris*)–Southern DPS | Threatened | 71 FR 17757; April 7, 2006 | 74 FR 52300; October 9, 2009 |
| Eulachon (*Thaleichthys pacificus*) – Southern DPS | Threatened | 75 FR 13012; March 18, 2010 | N/A |

BOEM has determined that the proposed action is not likely to adversely affect any of these species or destroy or adversely modify any designated critical habitat based on the rationale presented below.

## ENDANGERED SPECIES ACT

### Effects of the Action

Under the ESA implementing regulations, "effects of the action" means 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 discountable, insignificant, or completely beneficial. 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. Discountable effects are those extremely unlikely to occur.

The survey activities that are considered here consist of HRG and geotechnical surveys designed to characterize benthic and subsurface conditions; deployment, operation, and retrieval of environmental data collection buoys; and marine life surveys. All activities considered here will comply with the BMPs and PDCs described above (see also BOEM 2022b, Appendix A). We also consider the effects of vessel traffic associated with these activities. All vessels carrying out these activities, including during transits, will comply with measures outlined in Appendix A regardless the equipment used or the sound levels/frequency at which equipment is operating. The effects of the proposed action include the risk of vessel strikes, noise disturbance due to geophysical surveys, entanglement in metocean buoys, and contaminants.

### *Marine Mammals*

Large whales that may be found within the action area that may be affected by the proposed action include blue whales, fin whales, Western North Pacific gray whales, two DPSs of humpback whales, Southern Resident killer whales, and sperm whales.

The Eastern North Pacific Stock of blue whales ranges from the northern Gulf of Alaska to the eastern tropical Pacific (Carretta et al. 2016). Calambokidis et al. (2015) identified nine biologically important areas (BIAs) for blue whales feeding off California, with two of those areas located in the action area associated with the Humboldt WEA, and none overlapping with the action area of the Morro Bay WEA. The authors identified two areas along the shelf edge, one from Point Arena north to Fort Bragg, California as an area of high density during August through November, and a second area in the Gulf of the Farallones, from July through November. The Gulf of the Farallones BIA encompasses the area north including Cordell Bank and waters west of Bodega Bay, where high concentrations of blue whale are centered along areas near the shelf edge. All nine blue whale BIAs combined represent 2 percent of U.S. waters off the U.S. West Coast, but encompass 87 percent of the documented sightings of blue whales. 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. High concentrations of blue whales feeding almost exclusively on euphausiids have been sighted in areas near the shelf edge, with some concentrations farther offshore or sometimes in the near shore (e.g. the deep waters in Monterey Canyon, California).

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 stock component of the Eastern North Pacific stock at 1,898 whales. This is considered the best estimate, as summarized in the final 2021 Stock Assessment Report (SAR) (Carretta et al. 2022). 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[8]) allocation for U.S. waters is 4.1 whales per year (Carretta et al. 2022).

The North Pacific population of fin whales summer 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. 2022). 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).

The best estimate of fin whale abundance in California, Oregon, and Washington waters out to 300 nm is 11,065 whales for 2018, 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 is increasing an average of 7.5 percent per year based on data from 1991 to 2014 (Carretta et al. 2022).

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

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[8]As defined under section 3 of the Marine Mammal Protection Act, the "potential biological removal" level is the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population.

whales often feed in shipping lanes which makes them susceptible to mortality or injury from vessel strikes (Douglas et al. 2008).

Similar to the methodology used for blue whales (i.e., reviewing records of high concentration areas of feeding animals observed from small boat surveys, ship surveys and opportunistic sources), Calambokidis et al. (2015) identified seven BIAs for humpbacks off the U.S. West Coast; representing only 3 percent of waters within the U.S. EEZ combined but encompassing nearly 90 percent of sightings. Three of the BIAs overlap with the action area of the Humboldt WEA including: (1) Point St. George (seasonal occurrence from July-November); (2) Fort Bragg to Point Arena (July-November); and (3) Gulf of the Farallones-Monterey Bay (July-November), constituting the largest in area of the BIAs. One BIA overlaps with the southern extent of the Morro Bay WEA action area Morro Bay to Point Sal (April-November).

Critical habitat for the two ESA-listed humpback whale DPSs that forage off the U.S. West Coast was recently designated (86 FR 21082; April 21, 2021) that nearly entirely overlaps with both the Humboldt and Morro Bay WEA action areas, 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 (within the Humboldt WEA action area) where the nearshore boundary is defined closer to shore, at 15-m isobaths. From 36°00' N to 34°30' N (within the Morro Bay WEA action area), the nearshore boundary is defined by the 30-m isobath.

As mentioned above, the two DPSs that forage off California (and 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. The most recent abundance estimates using a multi-strata model for these two populations is 2,913-4,910 animals in the Mexico DPS and 431-755 animals in the Central American DPS (Wade et al. 2021), but we note that these estimates are based on data from 15+ years ago. The current abundance estimate for the California/Oregon/Washington stock of humpback whales is 4,973 whales, which includes animals from Central America and Mexico (estimated proportions of 42 percent and 58 percent, respectively; Wade 2021), using the most recent (2014-2018) mark-recapture data (Calambokidis and Barlow 2020). These two DPSs are currently delineated into the same "stock," as defined under the MMPA. With a minimum population estimate of 4,776 whales, the final 2021 SAR for the CA/OR/WA stock provided a PBR of 28.7 whales, with an increasing trend of 8.2 percent (although this may reflect negatively-biased estimates during 2009 to 2014 due to less representative sampling compared with 2018; Carretta et al. 2022).

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. 2022). Sperm whales are typically found foraging in deep water, canyons and escarpments and could be found in both the action area for the Humboldt WEA and the Morro Bay WEA, although they are generally found 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. 2022).

There are two populations of gray whales found in the Pacific Ocean. The eastern north Pacific (ENP) gray whales are not listed under the ESA but are protected under the MMPA. They undergo coastal yearly migrations along the 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. 2022).

As summarized in the final 2021 SAR (Carretta et al. 2022), information from tagging, photo-identification and genetic studies show that some whales identified in the western North Pacific (WNP) gray whale population 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-ID 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. 2022).

Southern resident killer whales (SRKWs) occur along the outer coasts of Oregon and California, and may be found within the action area of the Humboldt Bay WEA. They are one of NMFS' nine "Species in the Spotlight," given their high risk of extinction. There are less than 75 animals left in the endangered SRKW DPS (minimum population estimate of 72 animals in the final 2021 SAR; Carretta et al. 2022). With such a small population, the PBR for SRKWs is 0.13 whales per year, or approximately 1 animal every 7 years. Over the last decade, the DPS's population trend has been decreasing.

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 northern California coast; 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). Off the California coast, satellite telemetry shows that tagged whales used a relatively narrow north-south corridor off the coast of California, with a median depth of waters at 45 m and a median distance from shore at 6.3 km, which is well inshore of the Humboldt WEA but within the action area.

Critical habitat for SRKW was recently designated off the U.S. west coast, from Cape Flattery, Washington south to Point Sur, California between the 6.1-meter and 200-meter depth contours (86 FR 14668; August 2, 2021), which are inshore of both the Humboldt and Morro Bay WEAs but within the action area of the Humboldt WEA. 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 Humboldt WEA action area includes: Unit 3 (Central/Southern Oregon Coast Area, with *passage* being the primary feature), Unit 4 (northern California coast, from the Oregon/California border south to Cape Mendocino, with *prey* being the primary feature), and Unit 5 (north/central California coast area from Cape Mendocino south to Pigeon Point, with *passage* being the primary feature) (NMFS 2021).

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, recent data indicates Guadalupe fur seals may migrate at least 800 km from the rookery sites, based on observations of tagged individuals (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 (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.

Since the 1950s, the species has recovered from an estimated population of 200-500 animals to approximately 20,000 in 2010, and researchers estimate the population was increasing at a rate of 10.3% annually over the last 55 years (Carretta et al. 2017; García-Capitanachi 2011; Aurioles-Gamboa et al. 2017). In 2010, approximately 17,000 were counted on Guadalupe Island and 2,500 counted on San Benito Archipelago. 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. 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 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), which is declining at an alarming rate (Talipatu et al. 2013). Recently, 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 (Jamursba Medi and Wermon) 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) and is located within portions of the Humboldt WEA action area; specifically: 1) the area bounded by Cape Blanco north to Coos Bay, Oregon east of the 2,000 meter depth contour (where vessels may travel between Coos Bay and the Humboldt WEA); 2) the nearshore area from Point Arena, California south to the San Francisco Bay area east of the 3,000 meter depth contour (but exclusive of #3; where vessels may travel from ports in Crescent City, Humboldt Bay, and San Francisco Bay to the WEA); 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 Humboldt WEA (Figure 1). Leatherback critical habitat also overlaps entirely within the Morro Bay WEA action area's northern and southern borders and including the port of Morro Bay. 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 2012). 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 in the Bight (south of the Morro Bay WEA). 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 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.

### *Marine Fish*

The listed marine fish expected to occur within the action area are salmonids (Chinook salmon, coho salmon, and steelhead) from the various ESUs and DPSs who mix in the oceanic environment (see Table 6), SDPS green sturgeon, and SDPS Pacific eulachon.

Chinook salmon are found 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 down to depths commonly greater than 40 m (Walker et al. 2007). Within the action area, three ESUs of Chinook salmon individuals may occur in each WEA that are either threatened or endangered under the ESA (see Table 6), and only the CC Chinook salmon has designated critical habitat in the action area (Humboldt Bay).

Coho salmon are found in the North Pacific Ocean and inland from Monterey Bay, 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, two ESUs of coho salmon individuals may occur in each WEA that are either threatened or endangered under the ESA (see Table 6), and only the SONCC coho salmon has designated critical habitat in the action area (Humboldt Bay).

While at sea, steelhead are found 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, five DPSs of steelhead individuals may occur in each WEA that are either threatened or endangered under the ESA (see Table 6). Only the NC steelhead has designated critical habitat within the action area (Humboldt Bay).

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 San Francisco and Humboldt Bay. The action area for the Humboldt Bay WEA overlaps with the SDPS green sturgeon critical habitat, but the action area for the Morro Bay WEA does not. However, the distribution of SDPS green sturgeon and potential occurrence includes both WEAs.

Southern DPS eulachon are those that spawn in rivers south of the Nass River in British Columbia to the Mad River in California. SDPS eulachon tend to reside in shallow nearshore oceanic waters (20 to 200 meters of depth), and there is no critical habitat which overlaps the action area. Their potential occurrence is expected within the Humboldt Bay WEA. The only reported commercial catch of eulachon in Northern California occurred in 1963 when a combined total of 56,000 pounds was landed (Odemar 1964). Since 1963, the run size within Northern California watersheds has declined to the point that only a few individual fish have been caught in recent years. Between six and seven eulachon have been captured during sampling at the mouth of the Klamath River in January in both 2007 and 2011 (McCovey 2011). In 2022, several eulachon were captured in Little River by the Green Diamond Resource Company's downstream salmonid migrant studies, which represent the third consecutive year of eulachon captured in Little River (Zontos 2022).

### *Vessel Collision Risk*

Given that marine fish are highly maneuverable and vessels will be traveling at 10 knots or less, the risk to fish from vessel strikes is discountable.

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. Over the past 30 years, our known (and considered minimum) estimate of vessel strikes of these large whales is considered low. However, using a novel application of a naval encounter model, researchers recently 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 (2021: Carretta et al. 2022), 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 and likely have been relatively successful in the low reported incidents of vessel strikes. 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 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 and sperm whales (and therefore less risk). For the most recent 5-year period (2013-2017), there have been no reported ship strikes of sperm whales (Carretta et al. 2022), so we believe while it may be un-reported or underestimated, that it is a rare event.

Given that the ENP (and a much smaller number of WNP) gray whale migrates 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 Humboldt WEA 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 (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 11 whales struck, including 7 deaths and 1.8 serious injuries, between 2015 and 2019 (around 2 whales/year). Rockwood et al. (2017) estimated an annual number of vessel strike deaths to be 22 humpbacks in the U.S. West Coast EEZ, which highlights the vulnerability of this species to vessel traffic. 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, and since 2007, 14 blue whales have been reported struck with as many as 5 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 underestimates since detection rates of cetacean carcasses are consistently quite low (Carretta et al. 2022). Using the encounter theory model described above, Rockwood et al. (2017) estimated that 18 blue whales may be killed annually. Lastly, fin whales have been reported struck by vessels along the U.S. west coast, with 7 whales killed from 2015-2019. Similar to the analysis conducted for blue and humpback whales, Rockwood et al. (2017) estimated that 43 fin whales may be killed annually.

In addition, vessels, especially adjacent to the entrance into the ports 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.

Table 3 includes the projected maximum vessel trips for site characterization over a 3-year period within the action area. There are two projections for HRG surveys; one based on 24-hour days (constituting fewer round trips) and another based on 10-hour days (constituting significantly more round trips). BOEM estimates 64 round trips for 24-hour days and 153 round trips based on 10-hour days for each action area associated with Humboldt and Morro Bay WEA. For geotechnical sampling over 3-years, BOEM estimates 18 round trips for each of the Humboldt and Morro Bay WEAs based on 24-hour days, and approximately 247 round trips for each WEA based on 10-hour days. For biological surveys (avian, fish, and marine mammal/sea turtles), BOEM similarly estimates the same number of survey days/round trips based on either a 24-hour day or a 10-hour day. In addition, BOEM notes that avian and marine mammal/sea turtle surveys are likely to occur at the same time and from the same vessel (footnote 2 in Table 4). Conservatively (i.e. assuming 10-hour days), the number of round trips for project-related vessels over a 3-year period will range up to 861 trips in the Humboldt project area and up to 873 trips in the Morro Bay project area. Table 5 in BOEM (2022b) lists the projected maximum round trips for vessels installing, maintaining, and decommissioning metocean buoy(s) over a 5-year period, totaling up to 50 round trips. BOEM notes that because the agency has not received any survey plans in the Pacific to date, the number of surveys within the action area is a highly conservative estimate.

Within California state waters, 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. As described earlier, these vessels range in length between 50-100 feet (16-30 meters), so they are highly maneuverable compared to much larger vessels such as container ships and tankers. On August 10, 2022, in part due to considerations from NMFS and the California Coastal Commission, BOEM updated this speed requirement to apply to the action areas associated with both Humboldt and Morro Bay WEAs (i.e., all vessels must transit at speeds less than or equal to 10 knots within the action area). During HRG surveys, vessel speeds will be limited to less than 5 knots. In addition, 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).

As part of the site characterization and assessment of the two WEAs located off California, vessels may be transiting to and from four alternative ports (Coos Bay, Crescent City, Humboldt Bay and San Francisco Bay) for the Humboldt WEA, and may be transiting to/from Morro Bay for the Morro Bay WEA. 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 of 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 two action areas for Humboldt and Morro Bay 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 estimated 860 round trips associated with the Humboldt WEA. San Francisco Bay (and Coos Bay, Oregon) is over 350 km from the WEA, while Crescent City and Humboldt Bay are only 145 km and 32 km, respectively from the 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, even with a slightly higher risk of vessel strikes in central California, 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 discountable levels.

### *Noise*

Here we consider the effects of noise associated with HRG and vessel traffic 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. As shown in Table 7, baleen whales hear lower frequency sounds, while sperm whales hear mid-frequency sounds. Sea turtles are low-frequency hearing specialists, while cartilaginous fish are known to be sensitive to low-frequency sounds up to 1.5 kHz, peaking between 200 and 600 Hz, depending on the species (Chapuis et al. 2019).

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, and fish 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 (TSS) or permanent threshold shift (PTS), respectively) in their hearing sensitivity for acute, incidental exposure to underwater anthropogenic sound sources. These thresholds (Table 7) represent the best available scientific information on acoustic impacts for marine mammals.

**Table 7. Impulsive acoustic thresholds identifying the onset of PTS and TTS for ESA-listed whales and otariids (eared pinnipeds) (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<br>183 dB re 1μPa$^2$sec | 213 dB re 1μPa<br>179 dB re 1μPa$^2$sec |
| Mid-Frequency Cetaceans (MF: sperm whales) | 150 Hz to 160 kHz | 230 dB re 1μPa<br>185 dB re 1μPa$^2$sec | 224 dB re 1μPa<br>178 dB re 1μPa$^2$sec |
| Otariid Pinnipeds (Underwater) | 60 Hz to 39 kHz | 232 dB re 1μPa<br>203 dB re 1μPa$^2$sec | 226 dB re 1μPa<br>199 dB re 1μPa$^2$sec |

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 ($SEL_{cum}$) 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.

Sea Turtles

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.[9] 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.

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

[9] Airguns are used to map and locate offshore oil and gas reserves deep beneath the seafloor and usually involve a high-powered array of airguns that produce continuous underwater noise (around every 10 seconds). The underwater noise is considerably louder than the equipment proposed for high-resolution geophysical surveys (i.e., side-scan sonar, shallow and medium penetration sub-bottom profiler, magnetometer, multi-beam echosounder). However, the response by sea turtles to particular sound pressure levels produced by airguns is useful in assessing response to equipment used in the proposed high-resolution geophysical surveys.

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 peak sound pressure level (0-peak SPL) that does not incorporate the auditory weighting function nor the duration of exposure, and another based on cumulative sound exposure level ($SEL_{cum}$) that incorporates both the auditory weighting function and the exposure duration (Table 8).

**Table 8. Acoustic thresholds identifying the onset of permanent threshold shift and temporary threshold shift for sea turtles exposed to impulsive sounds (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<br><br>204 dB re µPa$^2$-sec cSEL | 226 dB re 1 µPa Peak<br><br>189 dB re 1 µPa$^2$-sec cSEL | 175 dB re 1 µPa (rms) |

<u>Marine Fish</u>

There are no criteria developed for considering effects to ESA-listed fish specific to HRG surveys. However, all of the equipment that operates will produce only intermittent or impulsive sounds. Therefore, it is reasonable to use the criteria developed for impact pile driving, seismic, and explosives when considering effects of exposure 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 who are exposed to react to the noise that is disturbing by moving away from the sound source and avoiding further exposure and to experience brief periods of interrupted feeding. 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 1966). 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 U.S. Army Corps of

Engineers, 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 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
- $SEL_{cum}$: 187 dB re 1µPa$^2$-sec for fish 2 grams or larger
- $SEL_{cum}$: 183 dB re 1µPa$^2$-sec for fish less 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. The use of the 183 dB re 1µPa$^2$-sec cumulative SEL is not appropriate for this consultation because all ESA-listed fish within the action area are larger than 2 grams.

We use 150 dB re 1µPa rms as a threshold for examining the potential for behavioral 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. 2007; Purser and Radford 2011). Responses to temporary exposure of noise of this level 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.

Potential for Injury

Table 9 provides a summary of PTS exposure distances (in meters) for marine protected species from mobile HRG sources towed at a speed of 4.5 knots. 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 actual injury and disturbance distances. All sources were analyzed at a tow speed of 4.5 knots.

**Table 9. Summary of PTS Exposure (all sound exposure levels (SELs) Distances (in meters) for ESA-listed species from Mobile, Impulsive, Intermittent Sources (first three rows) and Mobile, Non-Impulsive, Intermittent Sources (last three rows) from HRG Sources Towed at a Speed of 4.5 knots.**

| HRG SOURCE | Highest Source Level (dB re 1 µPa) | Low Frequency (e.g., Baleen Whales)[1] | Mid-Frequency (e.g., Sperm Whales)[1] | Otariids (sea lions and fur seals) | Sea Turtles | 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 225 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 |

[1]PTS injury distances for listed marine mammals were calculated with NOAA's sound exposure spreadsheet tool using sound source characteristics for HRG sources in Crocker and Fratantonio (2016).

NA = not applicable due to the sound source being out of the hearing range for the group

RMS=root mean square SEL=sound exposure level

As shown in Table 9, 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 isopleth 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. Kremser et al. (2005) noted that the probability of a whale swimming through the area of exposure when a sub-bottom profiler emits a pulse is small. The ear of a whale can be exposed to one pulse only, but the probability is small that a whale will swim through when the device emits a pulse. In reality, a whale swimming through the beam of the device 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. The potential for exposure to noise that could result in PTS is even further reduced by the Clearance Zone (1,000 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. With the shutdown requirements when ESA-listed marine mammals are sighted within 500 meters, the risk of PTS occurring for any marine mammals and sea turtles from HRG surveys is extremely unlikely to occur.

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. 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. NMFS has previously concluded that marine mammal communications would not likely be masked appreciably by the sub-bottom profiler signals given the directionality of the signals for most HRG survey equipment types considered in this proposed action, and the brief period when an individual marine mammal is likely to be within its beam (see for example, 86 FR 22160). Based on this, any effects on masking of ESA-listed whales will be insignificant.

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. Therefore, physical effects to sea turtles are extremely unlikely to occur, and are discountable.

Potential for Disturbance

Using the same sound sources as for the PTS analysis, the maximum disturbance distances to the non-frequency weighted 160 dB re 1 μPa RMS threshold for marine mammals, 175 dB re 1 μPa for sea turtles and 150 dB re 1 μPa RMS for fish were calculated using a spherical spreading model (20 Log R; R=radius). These results describe the maximum disturbance exposures for

ESA-listed marine mammals, sea turtles, and fish to each potential sound source (Table 10, below).

**Table 10. Summary of Maximum Disturbance Distances (in meters) for ESA-listed Species from Mobile, Impulsive Intermittent (first 3 rows) and Mobile, Non-Impulsive Intermittent (last 3 rows) Sources.**

| 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 |

The distances at which animals might be disturbed depend on the equipment and the species present. The range of disturbance distances for all ESA-listed marine mammal and sea turtle species expected to occur in the proposed action area ranges from 40 to 502 meters, with sparkers producing the upper limit of this range. For equipment that operates within the functional hearing range (7 Hz to 35 kHz) of baleen whales, the area ensonified by noise greater than 160 dB re 1µPa rms will extend no more than 502 m from the source (sparkers). For equipment that operates within the functional range of sperm whales (150 Hz to 160 kHz), the area ensonified by noise greater than 160 dB re 1µ rms will extend no further than 502 m from the source, and this is true as well for Guadalupe fur seals.

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. 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. Visual monitoring requirements of a 500-m exclusion zone for ESA-listed large whales will ensure that any potential impacts to these species from noise generated by HRG survey equipment will be reduced to insignificant levels.

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, just 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 (2022b)), a Clearance Zone of 1,000 m in all directions must be monitored for ESA-listed species during HRG surveys operating 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.

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 cannot be meaningfully measured, detected or evaluated; and therefore, effects are insignificant.

ESA-listed fish are primarily expected to be exposed to those portions of the proposed action which are occurring nearshore associated with assessment work for the proposed cableway. The HRG and other assessment work will occur over rather deep waters where the typical distributions of these fishes do not significantly overlap with the majority of the actions occurring within the WEA. Sampling proposed along the shallower portions of the action area (the cableway) would be where most exposures of ESA-listed fish would occur. The peak and accumulated sound levels are expected to temporarily cause changes in the behaviors of individual ESA listed marine fish who are exposed. Because the vessels will be moving while conducting the survey work, the exposure will be temporary and will therefore have little to no effect on their health and fitness that cannot meaningfully measured, detected or evaluated; and therefore, the effects of HRG and other sound producing activities upon ESA-listed fish is insignificant.

Vessel noise (including from geotechnical surveys)

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.

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. 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 be conservative in our analysis. 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, no injury is expected.

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.

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 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.

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.

The low-level acoustics produced by project vessels are not likely to result in any negative physiological response or injury to any of the life stages of the ESA listed marine fish species exposed to acoustics in the action area. In the shallower nearshore portions of the action area, vessel traffic may startle individual fish on the rare occasion when vessel traffic comes into close proximity of individuals. This brief startle response is not expected to result in any fitness consequence or increase rates of predation. Therefore, acoustics and associated disturbance of vessel traffic is expected to be insignificant to the ESA-listed marine fish.

### *Entanglement in ROV Cables and Metocean Buoy Moorings*

For this proposed action, NMFS considers the likelihood that any ESA-listed species could become entangled in 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 coast of California in particular. The type/size of line used and the relative size/weight of the buoy and anchors for the proposed action are quite different than what is typically used in 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). However, 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 with no better analysis available, which is conservative. 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 in the WCR 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. Southern California reported the majority of entanglements, with 209 confirmed reports, including 40 confirmed humpback whales reports over the time period (Saez et al. 2021). Central California, within the action area for the Humboldt WEA and Morro Bay WEA, 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 2015-17), 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).

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 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, albeit one not actually involving the mooring line entangling the whale.

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 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 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 2022). 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 per line-day[10]).

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. Six metocean buoys lines deployed for 1,825 days results in 10,950 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

[10] 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.

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. The metocean buoys 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 metocean buoys and associated lines. These mitigation measures include: 1) monitoring a clearance zone of 1,000 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 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 buoy deployment and retrieval, buoys 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 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 the use of PDC 5 (Appendix A (BOEM 2022b)), we conclude the risk of ESA-listed species becoming entangled with metocean buoys is extremely unlikely; and therefore discountable.

### *Accidental Release of Pollutants and Marine Debris*

As described in the PDC 2, Appendix A BOEM (2022b)), "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 (2022) 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 2022b) 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 (WOTUS) to be discountable and 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 (both the northern and southern areas of the Humboldt WEA action area and the Morro Bay WEA action area) overlaps with leatherback critical habitat. 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 prey of Pacific leatherbacks; 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; and is therefore 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 Humboldt and Morro Bay WEAs both overlap nearly entirely with humpback whale critical habitat (Figure 1). 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 Humboldt County 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 CC Chinook, SONCC Coho Salmon, and NC Steelhead Critical Habitat

The critical habitat designations for SONCC coho salmon, CC Chinook salmon, NC steelhead, and Southern DPS 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.

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 CC Chinook salmon critical habitat and the PBFs of NC 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 elements of the proposed action that are expected to occur in, or potentially affect, critical habitat for ESA-listed salmonids is vessel traffic while vessels transit to the Humboldt Bay WEA from Humboldt Bay. Vessels may originate from other ports or harbors within the Humboldt Bay WEA action area (such as Coos Bay, Oregon or San Francisco Bay, California); however, BOEM anticipates that all of the vessel traffic and round trips (see Table 3 and 4) required during the site assessment work and operation of buoys would occur from either Humboldt or Morro Bay. Vessel traffic and its associated risk of contamination are not expected to affect the water quality, food resources, natural cover, nor any migratory corridors of those PBF's of salmonid critical habitat inside Humboldt Bay; and are therefore discountable.

### Effects on Southern DPS Green Sturgeon Critical Habitat

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 is 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 to the Humboldt Bay WEA from various ports within the Humboldt WEA action area, or from the proposed bottom sampling activities along the cableway that connects the Humboldt WEA to shore near Humboldt Bay. BOEM is proposing one bottom-disturbing sample (each sample disrupting approximately one-meter of substrate) per linear mile of cableway corridor, and anticipates as many as three bottom-disturbing samples to be collected within the SDPS green sturgeon critical habitat. 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 substrate is not subjected to bottom-disturbing sampling. Therefore, the effects to SDPS green sturgeon critical habitat are expected to be short-term and temporary, return to baseline conditions relatively shortly; and are therefore discountable.

## Conclusion

Based on this analysis, NMFS WCR concurs with BOEM's determination that the proposed action to issue up to five leases (including site characterization and assessment) within the Morro Bay and Humboldt WEAs in support of wind energy development offshore Central and Northern California may affect, but is not likely to adversely affect: endangered blue whales, endangered fin whales, the endangered Central America humpback whale and the threatened Mexico humpback whale DPSs (including their designated critical habitat), endangered sperm whales, endangered WNP gray whales, endangered Southern Resident killer whales (including their designated critical habitat), threatened Guadalupe fur seals, endangered leatherback sea turtles (including their designated critical habitat), the endangered North Pacific loggerhead turtle DPS, endangered/threatened chinook salmon, coho salmon and steelhead, the threatened green sturgeon southern DPS and the threatened eulachon southern DPS (including their critical habitats).

## Reinitiation of Consultation

Reinitiation of consultation is required, and shall be requested by BOEM or by NMFS WCR, 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). If any take of an ESA-listed species occurs, reinitiation of consultation is immediately required. This concludes the ESA 7(a)(2) consultation.

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. NMFS also has the same responsibilities, and informal consultation offers action agencies an opportunity to address their conservation responsibilities under section 7(a)(1).

There has been a significant increase in the number of whale entanglements reported to NMFS WCR since 2014. Numerous state and federal commercial and recreational fisheries have been implicated, as have some non-fishery origins, although only ~50% of these reports have been attributed to a known source. In response, there has been substantial activity surrounding this issue, including research efforts, management actions, and litigation. While NMFS and other stakeholders are getting their arms around the issue with some success, there is work that needs to be done to make sure current and future efforts to minimize the risk of entanglements of whales and other protected species are focused on the predominant origins.

One avenue that is being discussed coastwide in a number of different applications is the marking of gear lines that will be effective at identifying the origins from available documentation in entanglement reports, as well as feasible for fishermen and other ocean users to implement and maintain. All West Coast ocean uses that involve the deployment of lines (especially lines fixed in place for extended periods of time) that are known to have been and/or are capable of being involved in entanglements of whales and other protected species should consider implementing a line marking scheme that increases the probability that gear could be identified if involved in an entanglement to minimize the uncertainty associated with the origins. As such, BOEM could work with Lessee to ensure that any lines deployed in associated with the proposed action have distinctive markings that would be easily identifiable if involved in an entanglement that is documented and reported. Staff from NMFS WCR Protected Resources Division are available to help BOEM and Lessee develop and implement a line marking scheme upon request.

## MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT RESPONSE

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. The MSA (section 3) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." 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 on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) 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)).

Habitat Areas of Particular Concern (HAPC) are described in the regulations as subsets of EFH that are identified based on one or more of the following considerations: the importance of the ecological function provided by the habitat; the extent to which the habitat is sensitive to human-induced environmental degradation; whether, and to what extent, development activities are, or will be stressing the habitat type; and the rarity of the habitat type (50 CFR 600.815(a)(8)). Designated HAPC are not afforded any additional regulatory protection under MSA; however, federal projects with potential adverse impacts to HAPC are more carefully scrutinized during the consultation process. The EFH consultation mandate applies to all species managed under a Fishery Management Plan (FMP) that may be present in the action area.

### Essential Fish Habitat Affected by the Project

This analysis is based, in part, on the EFH assessment provided by BOEM and descriptions of EFH for 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). Thus, the proposed project occurs within EFH for various Federally-managed species in the Pacific Coast Salmon, Pacific Coast Groundfish, Coastal Pelagic Species, and Highly Migratory Species FMPs. Furthermore, the action area contains areas that have been designated as a HAPC for Pacific Coast Salmon (estuary, seagrass), and Pacific Coast Groundfish (rocky reef, seagrass, kelp, estuaries, and areas of interest).

**Adverse Effects on Essential Fish Habitat**

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 HAPC's and EFH Conservation Areas 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.

Bottom sampling, buoy anchors, anchor chain sweep/chafe, and biological sampling activities are anticipated to impact as much as 3,453 square meters 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 and sea pens. The 3,453 square meters 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 sea pens being mobile and able to relocate. Deep sea corals are fragile and sensitive to disturbance, and the deep water areas off the coasts of Humboldt and Morro Bay are expected 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).

BOEM anticipates that Lessees will be able to develop plans that ensure areas of hard bottom or hard substrate would be avoided using a 40-foot buffer. Given the scale of these features, a 40-foot buffer is likely not adequate to protect those softer bottom ecotones which surround hard bottom areas. These transitional 'edge' areas or ecotones are known to have high biodiversity and abundance. Edge effects were originally defined by Odum (1958) as the tendency for increased population density and species richness at the junction between two communities. The boundaries or transition zones between habitat types often exhibit abrupt changes in physical structure, community biomass, and assemblage composition (Johannes 1978). The majority of the effects to the seafloor will likely occur over softer bottom areas, which will not be avoided. Pennatulids (sea pens) occur over soft bottom areas, and will be displaced or crushed during the proposed action. Effects occurring over softer bottom substrates are expected to recover quickly, although the quality and quantity of habitat available will be temporarily diminished.

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. As noted in the Section 7 analyses (footnote #9), airguns are used to map and locate offshore oil and gas reserves deep beneath the seafloor. The underwater noise generated by airgun arrays is considerably louder than the equipment proposed for the high-resolution geophysical surveys. However, the response by fish to particular sound pressure levels produced by airguns is useful in assessing the response to equipment used 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).

**Essential Fish Habitat 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 should ensure that the metocean buoy anchors avoid any hard bottom substrate (and adjacent transitional ecotone areas, as described above) by requiring a 500-meter buffer from any hard bottom substrates given the duration of time the metocean buoys are expected to be in place within the WEAs.

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 must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation. 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)).

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

**Supplemental Consultation**

BOEM 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)).

Thank you for consulting with NMFS. If you have any questions pursuant to this letter or other ESA or MSA issues, please contact Tina Fahy via electronic mail at Christina.Fahy@noaa.gov or Matt Goldsworthy via electronic mail at Matt.Goldsworthy@noaa.gov.

Sincerely,

Dan Lawson
Long Beach Office Branch Chief
Protected Resources Division

cc: Administrative File: 151422WCR2022PR00145

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