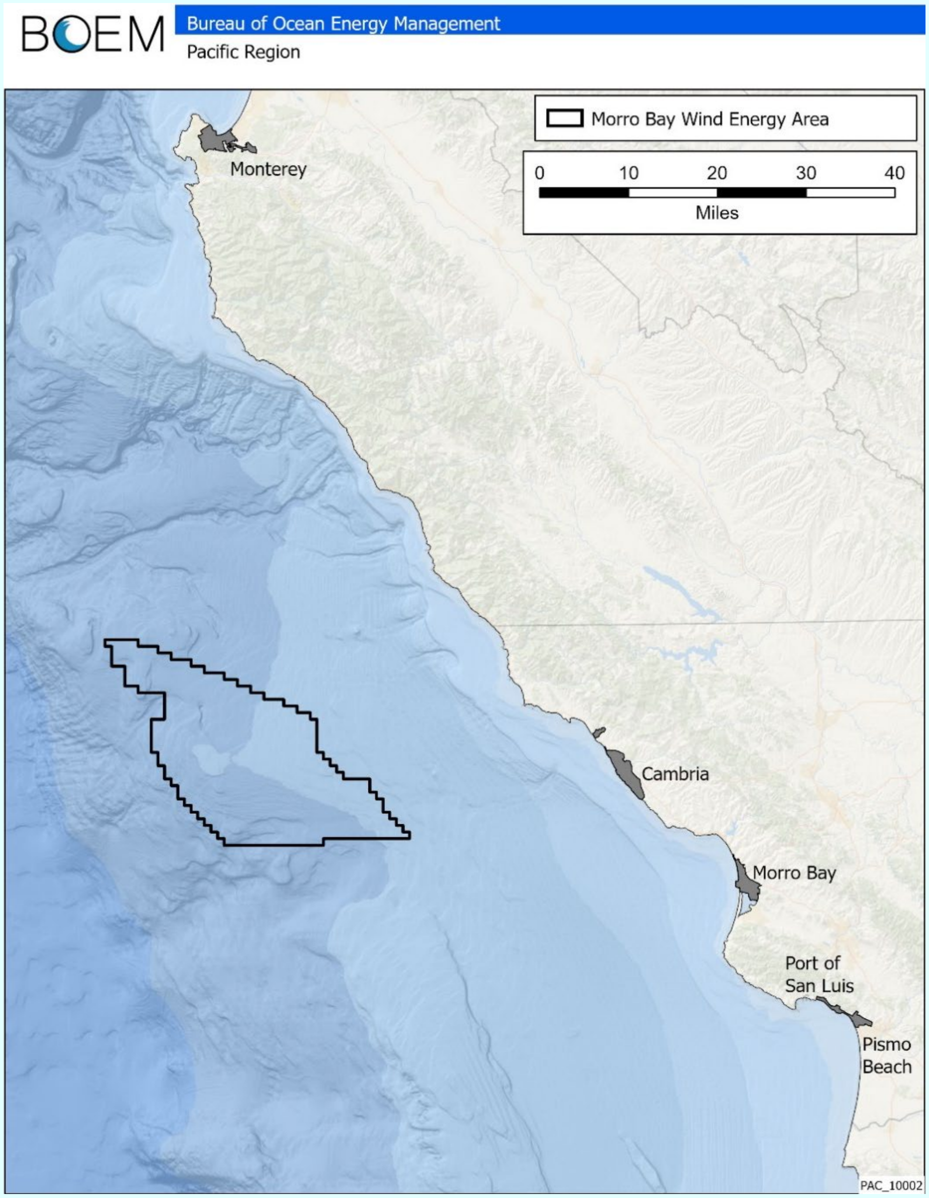
# FINAL ENVIRONMENTAL ASSESSMENT

**Commercial Wind Lease and Grant Issuance and Site Assessment Activities on the Pacific Outer Continental Shelf, Morro Bay Wind Energy Area, California**




**October 2022**

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

**OCS EIS/EA**
**BOEM 2022-024**

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# Commercial Wind Lease and Grant Issuance and Site Assessment Activities on the Pacific Outer Continental Shelf Morro Bay Wind Energy Area, California Final Environmental Assessment

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# Abbreviations and Acronyms

| | |
|---|---|
| ac | acres |
| ADCP | acoustic Doppler current profiler |
| AIS | Automated Identification System |
| APCD | Air Pollution Control District |
| AUV | autonomous underwater vehicle |
| BIA | biologically important areas |
| BMP | Best Management Practice |
| BOEM | Bureau of Ocean Energy Management |
| BSEE | Bureau of Safety and Environmental Enforcement |
| CalEPA | California Environmental Protection Agency |
| CD | Consistency Determination |
| CDFW | California Department of Fish and Wildlife |
| CEQ | Council on Environmental Quality |
| CESA | California Endangered Species Act |
| CFR | Code of Federal Regulations |
| CHIRP | compressed high intensity radar pulse |
| CO | carbon monoxide |
| $CO_2$ | carbon dioxide |
| COP | Construction and Operations Plan |
| cSEL | cumulative sound exposure level |
| CWA | Clean Water Act |
| dB | decibels |
| DoD | Department of Defense |
| DPS | Distinct Population Segment |
| EA | Environmental Assessment |
| EFH | essential fish habitat |
| EIS | Environmental Impact Statement |
| EJ | environmental justice |
| EPA | U.S. Environmental Protection Agency |
| ESA | Endangered Species Act |
| FLiDAR | floating light detection and ranging |
| ft | foot or feet |
| G&G | geological and geophysical |
| GDP | Gross Domestic Product |
| GHG | greenhouse gas |
| HAP | hazardous air pollutant |
| HRG | high-resolution geophysical |
| Hz | hertz |
| IPF | impact-producing factors |
| kg | kilograms |

| | |
|---|---|
| kHz | kilohertz |
| km | kilometers |
| $km^2$ | square kilometers |
| kn | knots |
| lb | pounds |
| LEP | Limited English Proficiency |
| LiDAR | light detection and ranging |
| µPa | micropascal |
| m | meters |
| $m^2$ | square meters |
| MBPC | Morro Bay Port Complex |
| mi | miles |
| $mi^2$ | square miles |
| MISLE | Marine Information for Safety and Law Enforcement |
| MMPA | Marine Mammal Protection Act |
| MRTFB | Major Range and Test Facility Base |
| MW | megawatt |
| MWh | megawatt hours |
| NA | not applicable |
| NAAQS | National Ambient Air Quality Standards |
| NAHC | Native American Heritage Commission |
| NEPA | National Environmental Policy Act |
| NHPA | National Historic Preservation Act |
| NMFS | National Marine Fisheries Service |
| nmi | nautical miles |
| $NO_2$ | nitrogen dioxide |
| $NO_x$ | nitrogen oxide |
| NOAA | National Oceanic and Atmospheric Administration |
| NOMAD | Naval Oceanographic and Meteorological Automated Devices |
| NTL | Notice to Lessees |
| NRHP | National Register of Historic Places |
| m/s | meters per second |
| OCS | Outer Continental Shelf |
| OCSLA | Outer Continental Shelf Lands Act |
| PA | Programmatic Agreement |
| PACPARS | Pacific Coast Port Access Route Study |
| PCB | polychlorinated biphenyls |
| PFMC | Pacific Fishery Management Council |
| PM | particulate matter |
| PMSR | Point Mugu Sea Range |
| PNNL | Pacific Northwest National Laboratory |
| PSO | Protected Species Observer |
| PTS | Permanent Threshold Shift |

| | |
|---|---|
| RMS | root mean square |
| ROV | remotely-operated vehicle |
| ROW | right-of-way |
| RUE | rights-of-use and easement |
| SAP | Site Assessment Plan |
| SEL | sound exposure level |
| SHPO | State Historic Preservation Officer |
| $SO_2$ | sulfur dioxide |
| $SO_X$ | sulfur oxides |
| TSS | Traffic Separation Schemes |
| TTS | Temporary Threshold Shift |
| USCG | U.S. Coast Guard |
| USFWS | U.S. Fish and Wildlife Service |
| VGP | Vessel General Permit |
| VMS | vessel monitoring system |
| WEA | Wind Energy Area |

# 1 Purpose and Need for the Proposed Action

The U.S. Department of the Interior's Bureau of Ocean Energy Management (BOEM) prepared this environmental assessment (EA) to determine whether the issuance of a lease and grants within the Wind Energy Area (WEA) in Morro Bay would lead to significant impacts on the environment, which would require the preparation of an environmental impact statement prior to lease issuance (Figure 1-1).

The purpose and need of the Proposed Action is to issue up to three commercial renewable energy leases within the Morro Bay WEA and grant rights-of-way (ROWs) and rights-of-use and easements (RUEs) in the region of the Outer Continental Shelf (OCS) of central California. BOEM's issuance of these leases and granting of ROWs and RUEs is needed to (a) confer to the lessee the exclusive right to submit Site Assessment Plans (SAPs) to BOEM for review and conduct site characterization and site assessment activities necessary to determine the suitability of their leases, easements, and ROWs for commercial offshore wind production and/or transmission and (b) ensure that site characterization and assessment activities are conducted in a safe and environmentally responsible manner. The issuance of a lease by BOEM to the lessee conveys no right to proceed with construction of a wind energy facility.

On November 10, 2021, BOEM released the Announcement of Area Identification Memorandum (Appendix A). The Memorandum documents the analysis and rationale in support of the recommended designation of a WEA offshore Morro Bay, California for environmental analysis and consideration for leasing. The Morro Bay Call Area was identified in the Call for Information and Nominations (Call) published on October 19, 2018, and two extensions published on July 29, 2021. The Morro Bay WEA is approximately 240,898 total ac (376 $mi^2$) and located approximately 20 mi from shore. Water depths across the WEA range from approximately 900–1,300 m (2,953–4,265 ft) (Table 1-1).

**Table 1-1: Recommended Morro Bay Wind Energy Area Descriptive Statistics**

| Acres | Installation Capacity[1] | Homes Powered[2] | Power Production (MWh/year): 40% Capacity Factor[3] | Power Production (MWh/year): 60% Capacity Factor[4] | Maximum Depth (meters) | Minimum Depth (meters) |
|---|---|---|---|---|---|---|
| 240,898 | 2,924 | 1,023,623 | 10,245,696 | 15,368,544 | 1,300 | 900 |

Notes:

1 Megawatts (MW) based upon 3 MW/$km^2$

2 Homes powered based upon 350 homes per MW

3 Formula = Capacity (MW) × 8,760 (hrs/yr) × 0.4 (capacity factor)

4 Formula = Capacity (MW) × 8,760 (hrs/yr) × 0.6 (capacity factor)

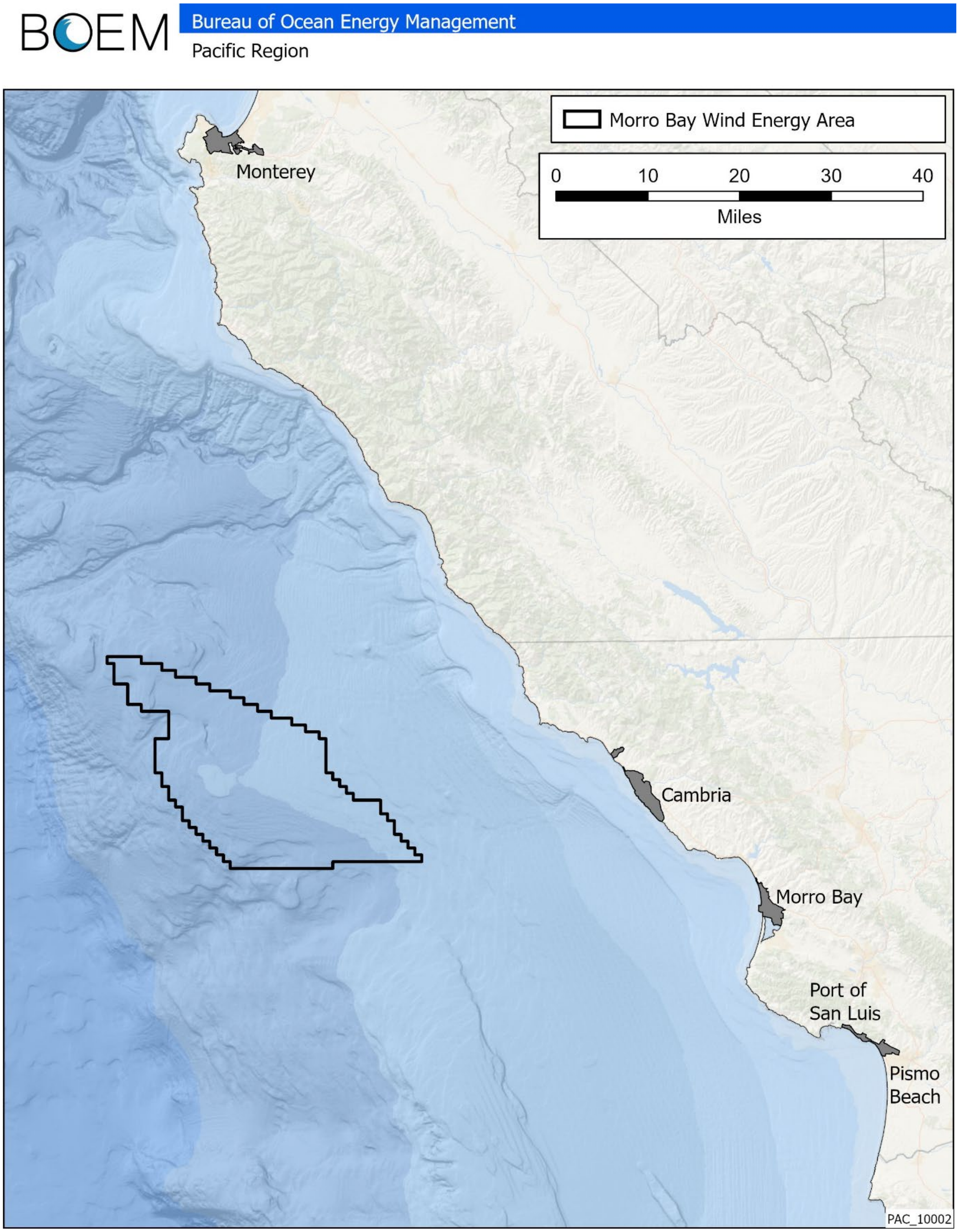



**Figure 1-1: Map of Morro Bay Wind Energy Area Offshore California**

# 2 Alternatives – Proposed Action and No Action

## 2.1 Proposed Action

The Proposed Action for this EA is the issuance of commercial wind energy leases and associated easements within the WEA that BOEM designated on the OCS in the vicinity of San Luis Obispo County, California. This EA analyzes BOEM's issuance of up to three commercial leases within the Morro Bay WEA, as well as the issuance of easements and grants associated with each lease for subsea cable corridors and areas for associated offshore collector/converter platforms. The ROWs and RUEs would all be located within the California OCS, extending from the WEA through to the boundary of state waters. Site assessment activities and site characterization activities focused within the leases and easements are expected to take place after the Proposed Action. A lessee is expected to submit a SAP to describe site assessment activities for BOEM's review (30 Code of Federal Regulations (CFR) 585.605-613). Site assessment activities would most likely include the temporary placement of meteorological buoys (i.e., metocean or met buoys) and scientific sampling equipment. Site characterization activities would most likely include geophysical, geotechnical, biological, archaeological, and ocean use surveys. BOEM does not have regulatory authority to approve any activities in state waters and onshore areas or apply mitigation measures outside of the OCS.

BOEM does not consider the issuance of a lease to constitute an irreversible and irretrievable commitment of agency resources; therefore, this analysis does not consider the impacts associated with the siting, construction, and operation of any commercial wind power facilities.

The issuance of a lease only grants the lessee the exclusive right to submit to BOEM a SAP and Construction and Operations Plan (COP). The lease does not, by itself, authorize any activity within the lease area. After lease issuance, a lessee would conduct surveys and, if authorized to do so pursuant to an approved SAP, install meteorological measurement devices to characterize the site's weather conditions and to assess the wind resources in the proposed lease area. A lessee would collect this information to determine whether the site is suitable for commercial development and, if so, submit a COP with its project-specific design parameters. BOEM would evaluate the impacts of the activities described in the COP in a separate National Environmental Policy Act (NEPA) process, likely an Environmental Impact Statement (EIS). The EIS process would include, but is not limited to, required consultations with the appropriate Federal, Tribal, state, and local entities; public involvement including public meetings and comment periods; collaboration with the BOEM California Intergovernmental Renewable Energy Task Force; and preparation of an independent, comprehensive, site- and project-specific impact analysis using the best available information. BOEM would use the information and analysis provided through the EIS process to determine whether to approve, approve with modification, or disapprove a lessee's COP pursuant to 30 CFR 585.628. After lease issuance but prior to project implementation, BOEM retains the authority to prevent the environmental impacts of a commercial wind power facility from occurring by disapproving a COP for failure to meet the statutory standards set forth in the Outer Continental Shelf Lands Act (OCSLA).

Based on the experiences of the offshore wind industry in northern Europe, project design and the resulting environmental impacts are often geographically- and design-specific, and it would therefore be premature to analyze environmental impacts related to potential approval of any future COP (Michel et al. 2007; Musial and Ram 2010). A number of design parameters would be identified in a COP including turbine size, anchoring type, project layout, installation methods, and associated onshore facilities.

However, the development of these parameters would be determined by information collected by the lessee during site assessment and site characterization activities, and potential advances in technology during the extensive time period between lease issuance and COP approval. Each design parameter, or combination of parameters, would have varying environmental effects. Therefore, additional analyses under NEPA would be required before any future decision is made regarding construction of wind energy facilities on the OCS in the Morro Bay WEA.

The timing of lease issuance, as well as weather and sea conditions, would be the primary factors influencing timing of site assessment and site characterization survey activities. Under the reasonably foreseeable scenario, BOEM could issue leases in early 2023. SAPs are expected to be submitted to BOEM within one year of lease issuance (30 CFR 585.601). For leases issued in early 2023, surveys would likely begin in spring of 2023. Lessees have up to 5 years to perform site assessment activities before they must submit a COP (30 CFR 585.235(a)(2)). Therefore, for leases issued in early 2023, site assessment activities could continue through early 2028.

## 2.2 Information Considered in Developing this Environmental Assessment

### 2.2.1 Military Use

The Department of Defense (DoD) conducts offshore testing, training, and operations within and adjacent to the Morro Bay Wind Energy Area; the following information concerning military interests in the vicinity of the Morro Bay WEA has been identified through engagement with the DoD, including text to incorporate into the EA provided in its letter to BOEM during public review and comment on the draft EA (https://www.regulations.gov/comment/BOEM-2021-0044-0154). The DoD has identified several concerns related to national security, military testing, and training activities in the WEA, including potential impacts of military activities on existing ocean uses such as commercial fishing, environmental and cultural resources, maritime vessel traffic, and coastal parks and tourism. The WEA is located within at-sea warning areas W-285 and W-532 as designated by the Federal Aviation Administration. The warning areas have the purpose of warning non-participating pilots of potential danger from hazardous activities such as military training and testing. W-285 and W-532 are utilized daily for aviation training, which support strike fighter wing squadrons based at Naval Air Station Lemoore. Carrier strike groups also utilize the area for training and certification exercises. Navy and Marine Corps Amphibious Ready Group/Marine Expeditionary Units train in this area due to training opportunities at Fort Hunter Liggett. W-532 is also part of the Point Mugu Sea Range (PMSR). PMSR is the DoD's largest and most instrumented over-water range and provides unique capabilities to DoD and allied forces. PMSR is recognized as part of the DoD Major Range and Test Facility Base (MRTFB). MRTFB designates the core set of DoD test and evaluation infrastructure and associated workforce that must be preserved as a national asset to provide test and evaluation capabilities to support DoD.

### 2.2.2 Maritime Navigation

The majority of commercial vessels that traverse the Morro Bay WEA carry Automated Identification System (AIS) transmitters. BOEM conducted a review of 2011, 2017, and 2019 AIS vessel information provided to BOEM from the U.S. Coast Guard (USCG). AIS vessel traffic information is available online here: *2017 AIS Vessel Traffic by Type* and *2011 AIS Vessel Traffic by Type*.

BOEM analyzed AIS trackline and density data within the WEA to determine vessel traffic patterns and identify how they may conflict with potential offshore wind energy development. Vessel traffic patterns moved closer to shore between 2011 and 2017 with changes to air quality regulations for vessels within

24 nmi from shore. More vessels traversed the Morro Bay WEA in 2017 and 2019 than in 2011. The majority of AIS vessels traveling through the Morro Bay WEA were cargo ships.

On July 28, 2021, the USCG announced it will conduct a "Pacific Coast Port Access Route Study" (PACPARS) to evaluate safe access routes for the movement of vessel traffic proceeding to or from ports along the western seaboard to determine whether a Shipping Safety Fairway and/or routing measures should be established, adjusted, or modified (https://www.regulations.gov/document/USCG-2021-0345-0001). The PACPARS will help the USCG determine what impacts, if any, the siting of offshore wind facilities may have on existing maritime users and any potential impacts to vessel traffic and maritime navigation. The USCG released the draft PACPARS in July 2022. The proposed Shipping Safety Fairways do not overlap with the Morro Bay WEA. BOEM has coordinated closely with the USCG throughout its planning and siting process and will continue this coordination to address potential maritime impacts from any future offshore wind development. The USCG released a draft of the PACPARS for public comments on August 25, 2022 and is accepting comments through October 25, 2022 (https://www.regulations.gov/document/USCG-2021-0345-0070).

### 2.2.3 Offshore Infrastructure

Offshore infrastructure in the vicinity of the Morro Bay WEA is shown in Figure 2-1. Relevant coastal anthropogenic features identified by BOEM while preparing the Morro Bay EA include submarine telecommunication cables, oil and gas platforms and pipelines, and proposed wind energy areas in California State Waters near Vandenberg Space Force Base. The Morro Bay WEA is partially bordered in the east by the Monterey Bay National Marine Sanctuary. Additionally, the proposed Chumash Heritage National Marine Sanctuary, if officially designated a marine sanctuary in the future by the National Oceanic and Atmospheric Administration (NOAA), may bound the Morro Bay WEA in the southeast, depending on the final configuration of a designated sanctuary. Geospatial data for these coastal features were compiled from the NOAA Marine Cadastre web portal, and the BOEM and California State Lands Commission websites. See Appendix B for additional details.

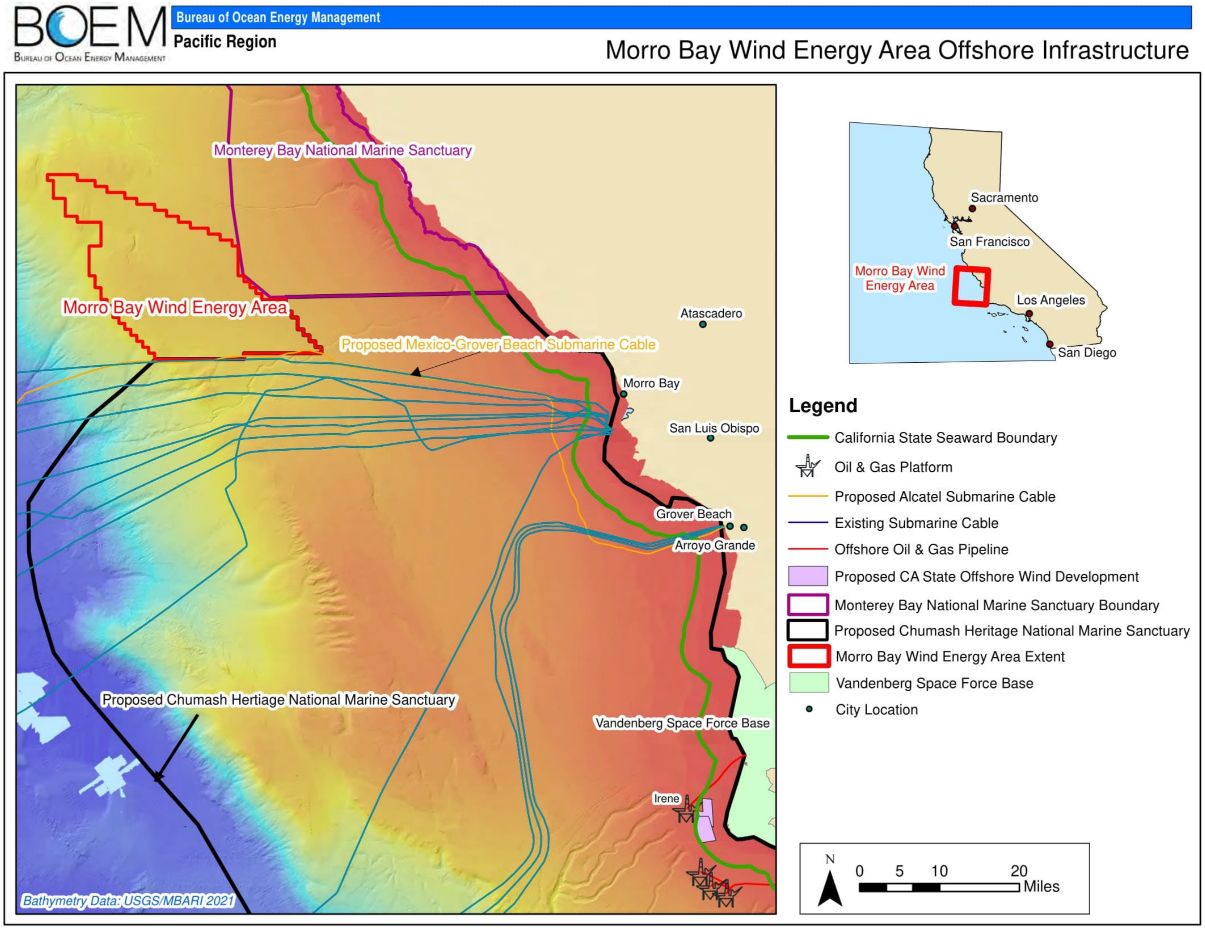



**Figure 2-1: Morro Bay Wind Energy Area Offshore Infrastructure**

This EA considers information collected through the ongoing outreach efforts and prior EA scoping process including:

- Engagement with Tribes through consultation under Section 106 of the National Historic Preservation Act and government-to-government consultation.
- Ongoing consultation and coordination since 2016 with the members of the BOEM California Intergovernmental Renewable Energy Task Force.
- Comments received in response to the October 19, 2018 and July 29, 2021 Calls for Information and Nominations associated with wind energy planning in California.
- California Offshore Wind Energy Planning Outreach Summary Report and Addendum updated June 2021.
- Public response to the November 11, 2021 Notice to Stakeholders to prepare this EA from two online public scoping meetings held December 1, 2021 and January 5, 2022, and public input via www.regulations.gov, Docket Number BOEM-2021-0044.
- Information from https://caoffshorewind.databasin.org/.

- Information collected through the California's Marine Renewable Energy Working Group (https://www.opc.ca.gov/2010/05/offshore-wave-energy-development).

### 2.2.4 Foreseeable Activities and Impact-Producing Factors

The analysis in this EA considers the effects of lease issuance and routine activities associated with lease and grant site assessment activities (i.e., meteorological buoy deployment, operation, and decommissioning) within the WEA and potential easements associated with surveyed transmission cable corridors and site characterization activities (e.g., biological, geological, geophysical, geotechnical, and archaeological surveys focused in the WEA).

This analysis does not consider construction and operation of any commercial wind power facilities on a lease or grant in the identified WEA, which would be evaluated separately if a lessee submits a COP.

Impact-producing factors (IPFs) associated with the various activities in the Proposed Action that could affect resources include:

- Noise
- Bottom disturbance
- Entanglement
- Vessel traffic and routine discharges
- Economic impacts
- Equipment, generator, and vessel air emissions
- Lighting

BOEM is not aware of the type of site characterization and site assessment activities future lessees intend to perform because BOEM does not receive survey plans or a SAP until after a lease is issued. The following sections describe assumptions about, and expected scenarios of, reasonably foreseeable site characterization and site assessment activities based on regulations, relevant experience on the Pacific OCS, and SAPs submitted to BOEM for the Atlantic OCS.

#### *2.2.4.1 Surveying and Sampling Assumptions*

- Lessees would likely survey the entire proposed lease area during the 5-year site assessment term 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 high-resolution geophysical (HRG) surveys, which do not include the use of air or water compression devices that generate acoustic pulses.
- Survey vessels would travel at a speed of 4.5 kn.

#### *2.2.4.2 Installation, Decommissioning, and Operations and Maintenance Assumptions*

- 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.

#### *2.2.4.3 Noise Generation Assumptions*

The following activities can be expected to generate noise:

- HRG survey equipment.
- Coring and sediment sample collection as part of geotechnical sampling.
- Vessel engines during site characterization surveys and metocean buoy(s) installation, maintenance, and decommissioning.
- Diesel engines on metocean buoy(s) where solar/wind are not used for power.

#### *2.2.4.4 Port Facilities Assumptions*

BOEM assumes that during the site assessment and site characterization stages, a lessee will stage from the Port of Morro Bay, which is approximately 32.2 km (20 mi) east of the Morro Bay WEA.

BOEM has identified the Port of Morro Bay as a deep-water port with the potential to be a Quick Reaction Port (a port that is within 2 hours by boat to the project site) (Porter and Phillips 2016).

#### *2.2.4.5 Vessel Traffic*

Vessel trips are anticipated for both site assessment and site characterization activities (Table 2-3). This EA assumes that the AIS generated vessel traffic from 2019 represents most commercial vessels that traverse the area and is a reasonable level of estimated activity for analysis.

The Pacific Northwest National Laboratory (PNNL) deployed LiDAR (light detection and ranging) buoys off of California in the Humboldt and Morro Bay WEAs (PNNL 2019). A 1,000-ft marine vessel was used to tow the LiDAR buoy at 5 kn from Morro Bay to the WEA where they lowered the anchor, mooring line, attached the buoy, and then traveled back to shore in one day. PNNL planned for three vessel trips for a 12-month deployment (deployment, mid-year maintenance, recovery).

Additional vessel traffic assumptions are shown in Table 2-3 in Section 2.4.4.7, and Table 2-4 in Section 2.4.4.8.

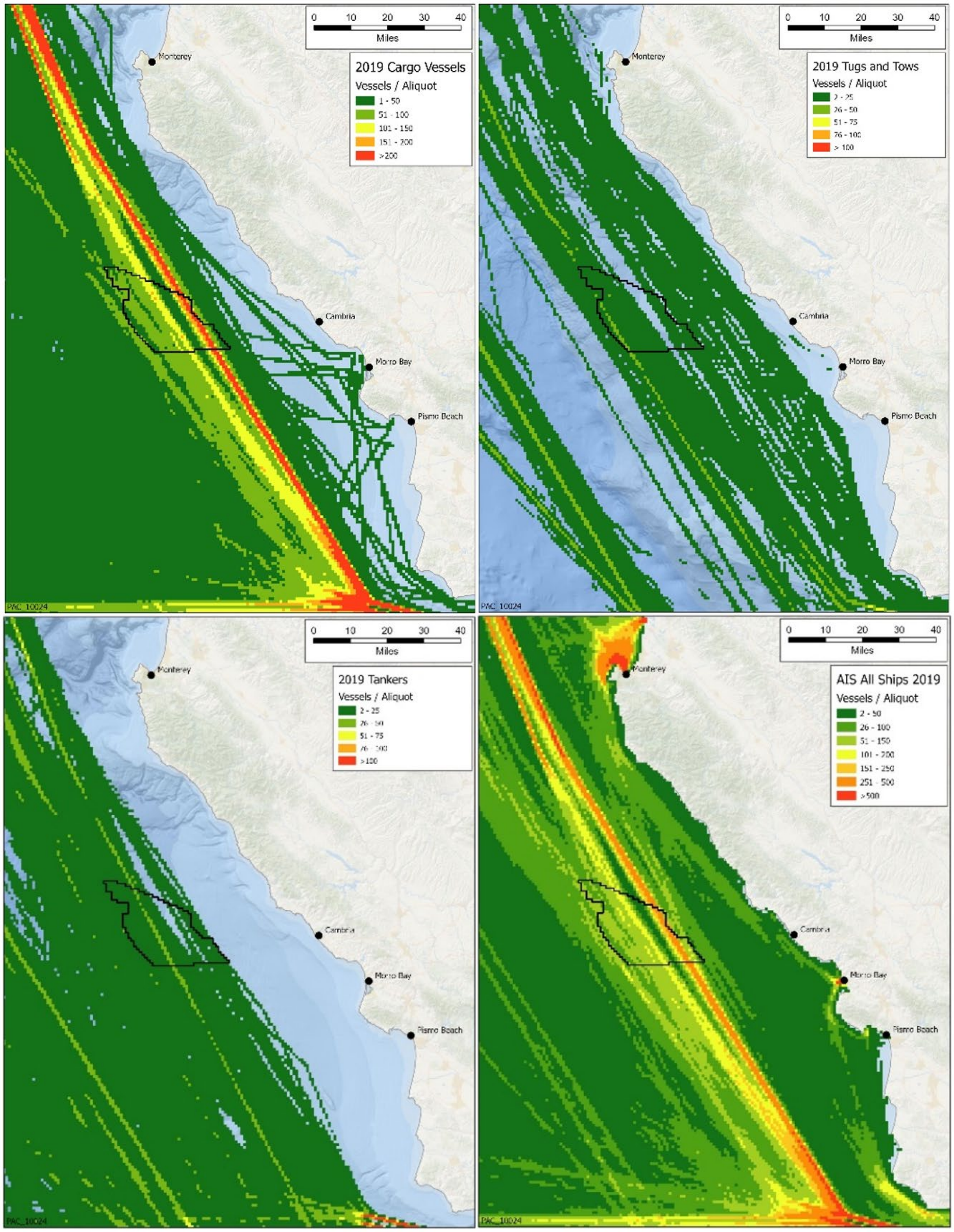



**Figure 2-2: Vessel Traffic from 2019 for Tugs and Tows, Cargo, and Tankers In and Near the Morro Bay Wind Energy Area**

#### *2.2.4.6 Site Characterization Surveys*

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 look for shallow hazards. These survey methods can also be used for surveying archaeological and historic resources. Biological surveys are also part of site characterization surveys and collect data on potentially affected habitats, marine mammals, birds, sea turtles, and fishes.

BOEM regulations require that the lessee provide the results of several surveys with its SAP (30 CFR 585.610–611). Table 2-1 describes the types of site characterization surveys, types of equipment and/or methods used, and which resources the survey information would be used to inform. If applicable survey data is available, additional surveys may not be necessary.

BOEM guidelines provide recommendations to lessees for acquiring the information required for a SAP under 30 CFR 585.610–611. BOEM 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/. National guidelines are applicable for certain resource areas along the U.S. West Coast. For the purpose of the Proposed Action scenario, BOEM assumes that the lessee would employ these methods to acquire the information required under 30 CFR 585.610–611 and that these activities would not be conducted concurrently with biological surveys for marine mammals and sea turtles.

**Table 2-1: Proposed Site Characterization Survey Details for the Morro Bay Wind Energy Area**

| Survey Type | Survey Equipment and/or Method | Resource Surveyed or Information Used to Inform |
|---|---|---|
| High-resolution geophysical surveys | Side-scan sonar, sub-bottom profiler, magnetometer, multi-beam echosounder | Shallow hazards,[1] archaeological,[2] bathymetric charting, benthic habitat |
| Geotechnical/sub-bottom sampling[3] | Vibra, piston, and gravity cores; cone penetration tests | Geological[4] |
| Biological[5] | Grab sampling; benthic sled; underwater imagery/ sediment profile imaging; ROV; AUV | Benthic habitats |
| Biological[5] | Aerial digital imaging; visual observation from boat or airplane; radar; thermal and acoustic monitoring | Avian |
| Biological[5] | Ultrasonic detectors installed on buoy and survey vessels used for other surveys, radar, thermal monitoring | Bats |
| Biological[5] | Aerial and/or vessel-based surveys and acoustic monitoring | Marine mammals and sea turtles |
| Biological[5] | Direct sampling using vessel-based surveys; underwater imagery; acoustic monitoring; environmental DNA | Fishes and some invertebrates |

Notes:

[1] 30 CFR 585.610(b)(2)
[2] 30 CFR 585.610(b)(3)
[3] 30 CFR 585.610(b)(1)
[4] 30 CFR 585.610(b)(4)
[5] 30 CFR 585.610(b)(5)

ROV = remotely operated vehicle AUV = autonomous underwater vehicle

#### *2.2.4.7 Collection of Geophysical Information*

HRG surveys would be performed to determine siting for geotechnical sampling, whether hazards will impact seabed support of the turbines, 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 Tables 2-1 and 2-2. Vessel traffic assumptions for site characterization are shown in Table 2-3. 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 EA and are approved by BOEM prior to conducting surveys.

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

- For the collection of 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;
- For the collection of geophysical data for archaeological resources assessments, the lessee would likely use 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

- For bathymetric charting, the lessee would likely use a multi-beam echosounder at a line spacing appropriate to the range of depths expected in the survey area.

**Table 2-2: High-Resolution Geophysical Survey Equipment and Methods**

| Equipment Type | Data Collection and/or Survey Types | Description of the Equipment |
|---|---|---|
| Bathymetry/depth sounder (multi-beam 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 multi-beam bathymetry systems, which may be more appropriate than other tools for characterizing those lease areas containing 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 is not anticipated to be used at this time 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 (seismic) 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 trackline 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. |

Notes:
CHIRP = Compressed High Intensity Radar Pulse kHz = kilohertz

**Table 2-3: Projected Maximum Vessel Trips for Site Characterization over a 3-Year Period**

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

Notes:

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, marine mammal, and 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 this many trips will take place.

HRG = high-resolution geophysical

#### *2.2.4.8 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. To obtain these data, scientific measurement devices consisting of anemometers, vanes, barometers, and temperature transmitters would be mounted either directly on a buoy or on a buoy's instrument support arms. In addition to conventional anemometers, floating light detection and ranging (FLiDAR) and sonic detection and ranging equipment may be used to obtain meteorological data. To measure the speed and direction of ocean currents, acoustic Doppler current profilers (ADCPs) would most likely be installed. 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 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 2-4.

**Table 2-4: Example of Projected Maximum Vessel Trips for Metocean Buoy(s)**

| Site Assessment Activity | Round Trips | Formula |
|---|---|---|
| Metocean buoy installation | 3 | 1 round trip x 3 buoys |
| Metocean buoy yearly maintenance trips | 15 | 3 buoys x 5 years |
| Metocean buoy decommissioning | 3 | 1 round trip x 3 buoys |
| Total buoy trips over 5-year period | 21–30 | Number includes additional trips for maintenance/weather challenges |

This instrumentation, along with associated telemetry systems, will require a reliable energy source with a capacity for long autonomy offshore deployments. To supply this energy, 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.

#### *2.2.4.9 Buoy Hull Types and Anchoring Systems*

To accommodate the required onboard instrumentation and power systems, the buoys must be properly sized and anchored. 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 buoys for weather data collection for many years (Figure 2-3).

The choice of hull type used usually depends on its intended installation location and measurement requirements. To ensure optimum performance, a specific mooring design is produced based on hull type, location, and water depth (National Data Buoy Center 2012). For example, a smaller buoy 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 (National Data Buoy Center 2020). Moorings will be designed to minimize or remove entanglement risk for protected species.

Discus-shaped, boat-shaped, and spar buoys (Figures 2-3, 2-4, and 2-5) are the buoy types that would most likely be adapted for offshore wind data collection. A large discus-shaped hull buoy has a circular hull ranging between 10 and 12 m (33 and 40 ft) in diameter and is designed for many years of service (National Data Buoy Center 2012). The boat-shaped hull buoy is an aluminum-hulled buoy that provides long-term survivability in severe seas (National Data Buoy Center 2012).

Some deep ocean moorings have operated without failure for more than 10 years (National Data Buoy Center 2012). In 2020, PNNL installed two LiDAR buoys off California that had a boat-shaped hull and were moored with a solid cast iron anchor weighing approximately 4,990 kg (11,000 lb) with a 2.3-$m^2$ 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 Morro Bay WEA (PNNL 2019).

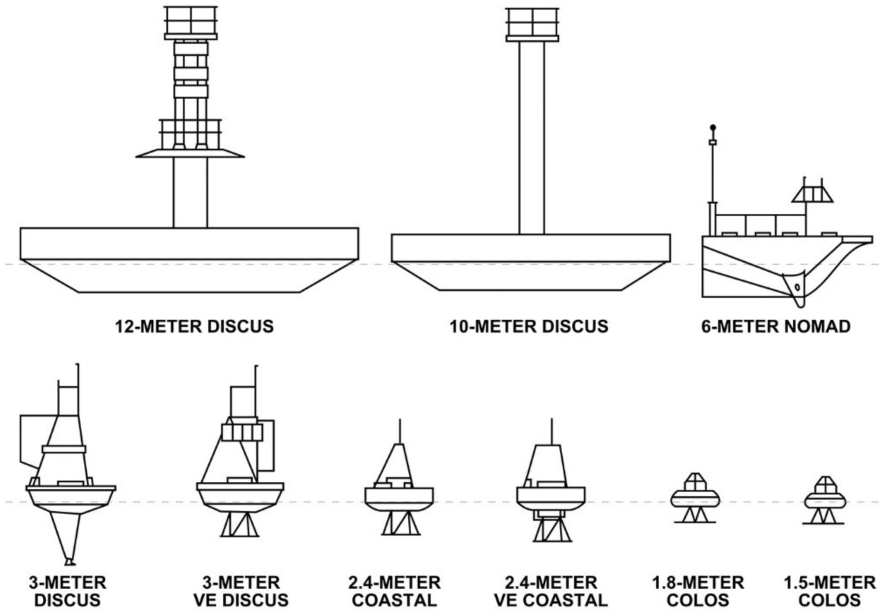



**Figure 2-3: Buoy Schematic**

Source: (National Data Buoy Center 2020)

**Figure 2-4: 10-Meter Discus-Shaped Hull Buoy**

Source: National Data Buoy Center (2012)

**Figure 2-5: 6-Meter Boat-Shaped Hull Buoy**

Source: National Data Buoy Center (2012)

*2.2.4.10 Buoy Installation and Operation*

Buoys would typically take approximately one day to install.

Onshore activity (fabrication, staging, or launching of crew/cargo vessels) related to the installation of buoys is expected to use existing ports that can support this activity. Because buoy transport and deployment do not require the extensive large-scale infrastructure that would be required for construction of a full-scale offshore floating wind energy facility, placing metocean buoys into service can happen at most boat access points in the area.

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. The buoy is anchored to the seafloor with a solid cast iron anchor weighing approximately 11,000 lb (2.3 $m^2$ footprint). The approximate 1,650-meter-long mooring line is comprised of various components and materials, including chain, jacketed wire, nylon rope, polypropylene rope, and subsurface floats to keep the mooring line taut to semi-taut, reduce slack, and eliminate looping. The buoy will have a watch circle (i.e., excursion radius) of approximately 1,250 m. After installation, the transport vessel would likely remain in the area for several hours while technicians configure proper operation of all systems.

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 on-board radio system that transmits the data string to a receiver onshore (Tetra Tech EC Inc. 2010).

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

#### *2.2.4.11 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. The mooring chain would be recovered to the deck using a winching system. The system and the anchor on the seafloor would be removed in accordance with the applicable BOEM regulations at 30 CFR 585.902. The buoy would then be towed to shore (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 re-used or recycled (PNNL 2019).

### 2.2.5 Non-Routine Events

Reasonably foreseeable non-routine and low-probability events and hazards that could occur during site characterization and site assessment-related activities include the following: (1) allisions and collisions between the site assessment structures or associated vessels and other marine vessels or marine life; (2) spills from collisions or fuel spills resulting from generator refueling; and (3) recovery of lost survey equipment.

#### *2.2.5.1 Allisions and Collisions*

An allision occurs when a moving object (i.e., a vessel) strikes a stationary object (e.g., metocean buoy); a collision occurs when two moving objects strike each other. A metocean buoy in the WEA could pose a risk to vessel navigation. An allision between a ship and a buoy could result in the damage or loss of the buoy and/or the vessel, as well as loss of life and spillage of petroleum product. Although considered unlikely, vessels associated with site assessment and site characterization activities could collide with other vessels, resulting in damages, petroleum product spills, or capsizing. Risk of allisions and collisions is reduced through routing measures such as Traffic Separation Schemes (TSS) and safety fairways, as well as U.S. Coast Guard (USCG) Navigation Rules and Regulations.

BOEM anticipates that aerial surveys (if necessary) would not be conducted during periods of reduced visibility conditions as flying at low elevations would pose a safety risk during storms and times of low visibility.

Collisions between vessels and allisions between vessels and metocean buoys are considered unlikely since vessel traffic is controlled by routing measures such as safety fairways, TSSs, and anchorages. Higher traffic areas were excluded from the WEA. Risk of allisions with metocean buoys would be further reduced by USCG-required marking and lighting.

#### *2.2.5.2 Spills*

A spill of petroleum product could occur as a result of hull damage from allisions with a metocean buoy, collisions between vessels, accidents during the maintenance or transfer of offshore equipment and/or crew, or due to natural events (i.e., strong waves or storms). From 2000 to 2009, the average spill size for vessels other than tank ships and tank barges was 88 gallons (USCG 2011); should a spill from a vessel associated with the Proposed Action occur, BOEM anticipates that the volume would be similar. Diesel fuel is lighter than water and may float on the water's surface or be dispersed into the water column by waves. Diesel would be expected to dissipate very rapidly, evaporate, and biodegrade within a few days (MMS 2007).The NOAA's Automated Data Inquiry for Oil Spills (an oil weathering model) was used to predict dissipation of a maximum spill of 2,500 barrels, a spill far greater than what is assumed as a non-routine event during the Proposed Action. Results of the modelling analysis showed that dissipation of spilled diesel fuel is rapid. The amount of time it took to reach diesel fuel concentrations of less than 0.05 percent varied between 0.5 and 2.5 days, depending on ambient wind (Tetra Tech EC Inc. 2015), suggesting that 88 gallons would reach similar concentrations much faster and limit the environmental impact of such a spill.

Vessels are expected to comply with USCG requirements relating to prevention and control of oil spills, and most equipment on the metocean buoys would be powered by batteries charged by small wind turbines and solar panels. BOEM expects that each of the vessels involved with site assessment and site characterization activities would minimize the potential for a release of oils and/or chemicals in accordance with 33 CFR Parts 151, 154, and 155, which contain guidelines for implementation and enforcement of vessel response plans, facility response plans, and shipboard oil pollution emergency plans. Based on the size of the spill, it would be expected to dissipate very rapidly and would then evaporate and biodegrade within a day or two (at most), limiting the potential impacts to a localized area for a short duration.

#### *2.2.5.3 Recovery of Lost Survey Equipment*

Equipment used during site assessment and site characterization activities (e.g., towed HRG survey equipment, cone penetration test components, grab sampler, buoys, lines, cables) could be accidentally lost during survey operations. Additionally, it is possible, although unlikely, that a metocean buoy could disconnect from the clump anchor. In the event of lost equipment, recovery operations may be undertaken to retrieve the equipment. Recovery operations may be performed in a variety of ways, including ROVs and grapnel lines, depending on water depth and equipment lost. If grapnel lines (e.g., hooks, trawls) are used to retrieve lost equipment, extensive bottom disturbances could result from dragging the line along the bottom until it hooks the lost equipment. This may require multiple passes in a given area. In addition, after the line catches the lost equipment, components will be dragged along the seafloor until recovery.

Where lost survey equipment is not able to be retrieved because it is either small or buoyant enough to be carried away by currents or is completely or partially embedded in the seafloor (for example, a broken vibracore rod), a potential hazard for bottom-tending fishing gear may occur, and additional bottom disturbance may occur. A broken vibracore rod that cannot be retrieved may need to be cut and capped 1–2 m (3–6.5 ft) below the seafloor. For the recovery of lost survey equipment, BOEM will work with the lessee/operator to develop an emergency response plan. Selection of a mitigation strategy would depend on the nature of the lost equipment, and further consultation may be necessary.

IPFs associated with recovery of lost survey equipment may include vessel traffic, noise and lighting, air emissions, and routine vessel discharges from a single vessel. Bottom disturbance and habitat degradation may also occur as a result of recovery operations.

## 2.3 No Action Alternative

Under the No Action Alternative, no leases or grants would be issued in the Morro Bay WEA at this time. Site characterization surveys and off-lease site assessment activities as described in the Proposed Action do not require BOEM approval and could still be conducted under the No Action Alternative, but these activities would not be likely to occur without a commercial wind energy lease or grant. The No Action Alternative will serve as the shifting baseline (changes over time) of current conditions (described in

Section 3, Description of Affected Environment and Environmental Impacts) against which action alternatives are evaluated.

## 2.4 Alternatives Considered but Not Analyzed Further

BOEM has not identified any additional action alternatives that could result in meaningful differences in impacts to the various resources analyzed in this Final EA. In addition, public comments did not suggest alternatives that met the purpose and need of issuing up to three commercial renewable energy leases within the WEAs and grant ROWs and RUEs in the WEA. Alternatives that do not meet the purpose and need are not considered in a NEPA analysis; thus, alternate methods of combating climate change suggested in public comments, such as reducing energy use, implementing other forms of energy development such as nuclear or solar, or including water desalinization plants on wind energy platforms are not evaluated in this EA.

# 3 Description of Affected Environment and Environmental Impacts

## 3.1 GEOLOGY

### 3.1.1 Affected Environment

The Holocene marine geology of the Morro Bay WEA reflects the Cenozoic regional tectonics and depositional stages unique to the offshore Santa Maria Basin. Local geologic features of interest within the WEA identified during recent United States Geological Survey marine geological and geophysical research cruises include active faulting, submarine landslides, steep seafloor slopes, seafloor pockmarks, and rock outcrops (Figures 3-1, 3-2, 3-3). The Big Sur pockmark field mapping was extended (Lundsten et al. 2019) with more than 15,000 seafloor pockmarks covering much of the subaerial extent of the proposed Morro Bay WEA.

Within regulations outlined in 30 CFR 585, BOEM requires a lessee to submit a SAP as part of the development process of a renewable energy lease. With the SAP, the lessee is required to provide marine site characterization survey and sampling information to ascertain local geologic and geotechnical conditions that may impact the design and installation of SAP facilities. For the Morro Bay WEA, BOEM anticipates these site characterization surveys to include high-resolution multibeam bathymetry, side-scan sonar, magnetometer, sub-bottom profiler, medium penetration seismic system, sediment grab samples, piston cores, and cone penetrometer tests. These site characterization activities will also be performed to generate information to be used for the preparation and submittal of a COP.

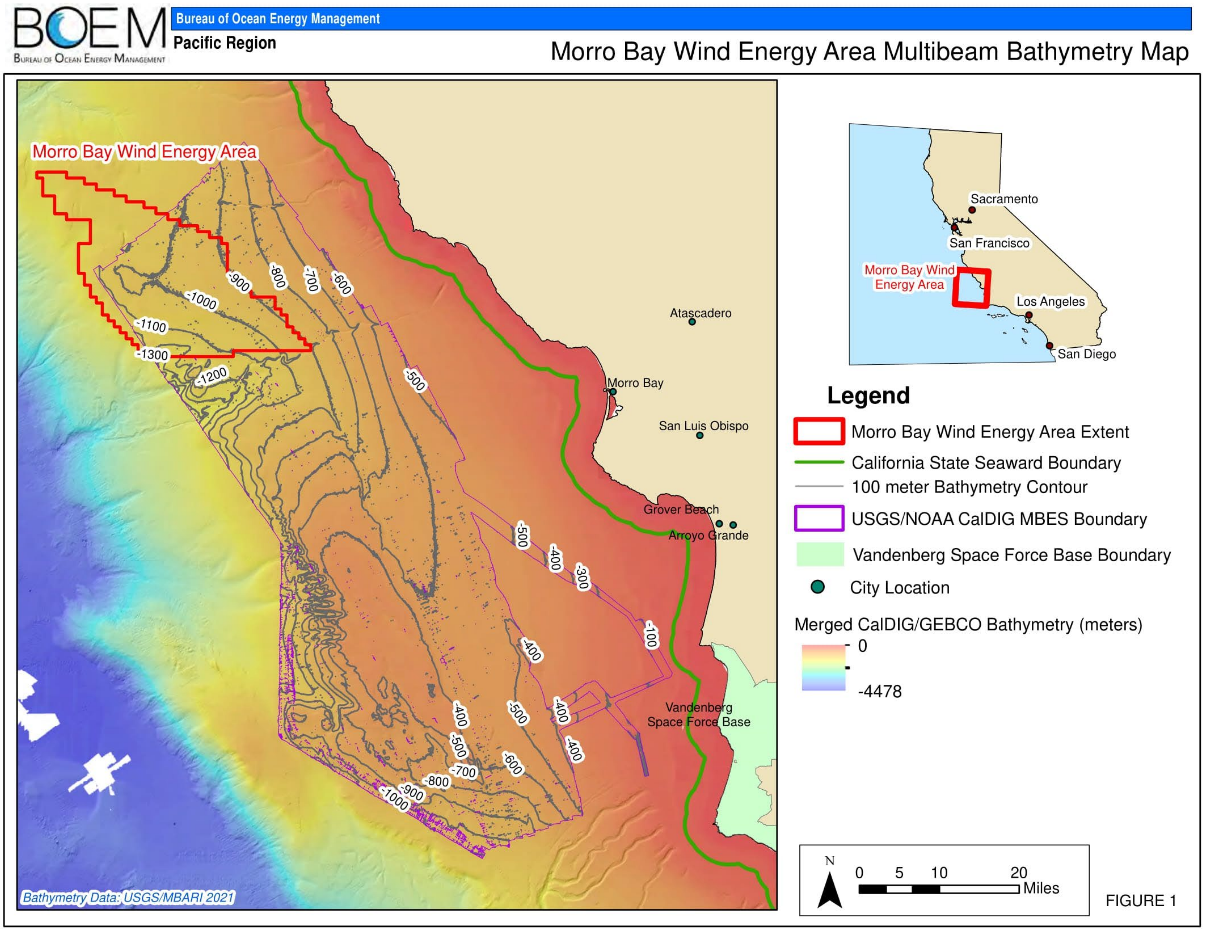



**Figure 3-1: Central California Multibeam Bathymetry Released by the U.S. Geological Survey**

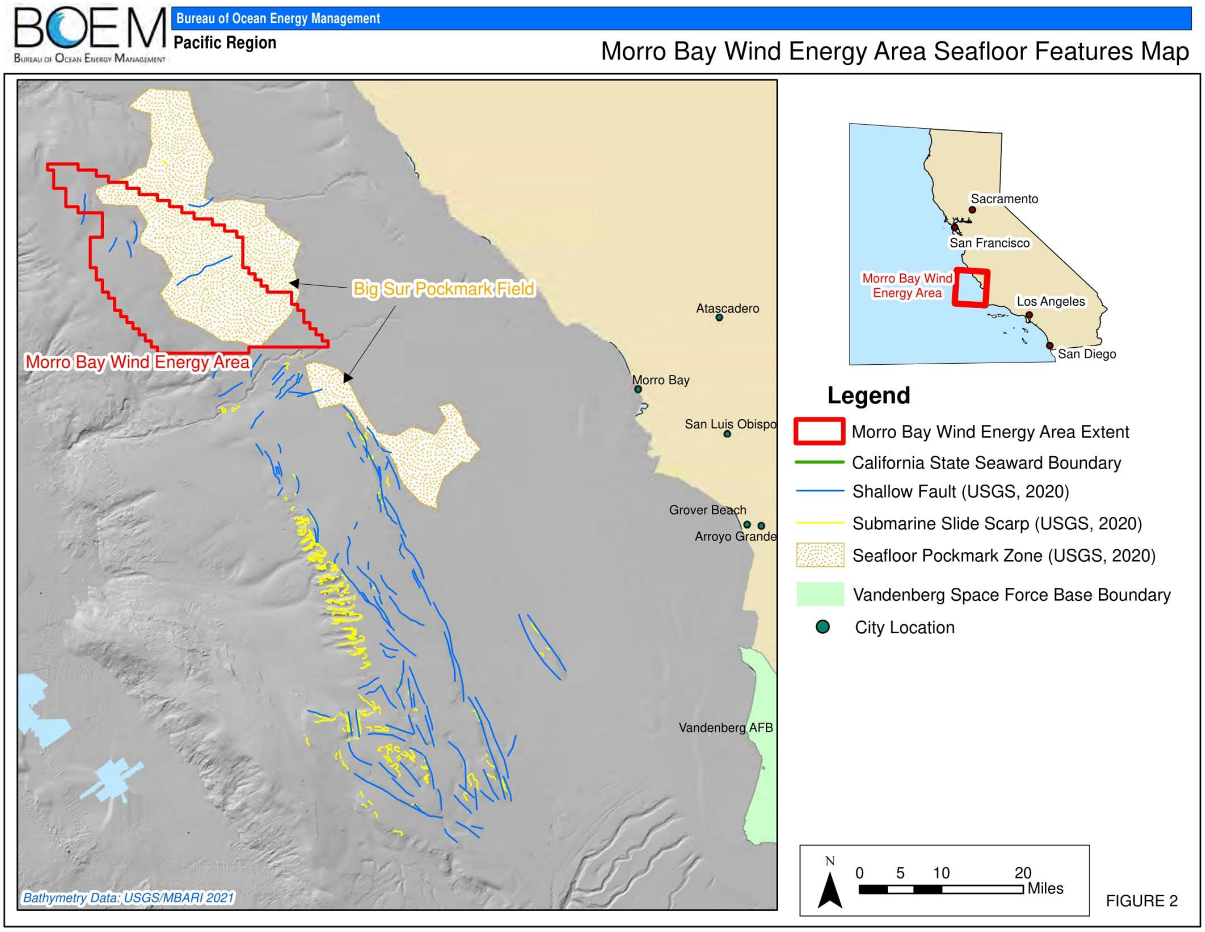



**Figure 3-2: Morro Bay Wind Energy Area Seafloor Features**

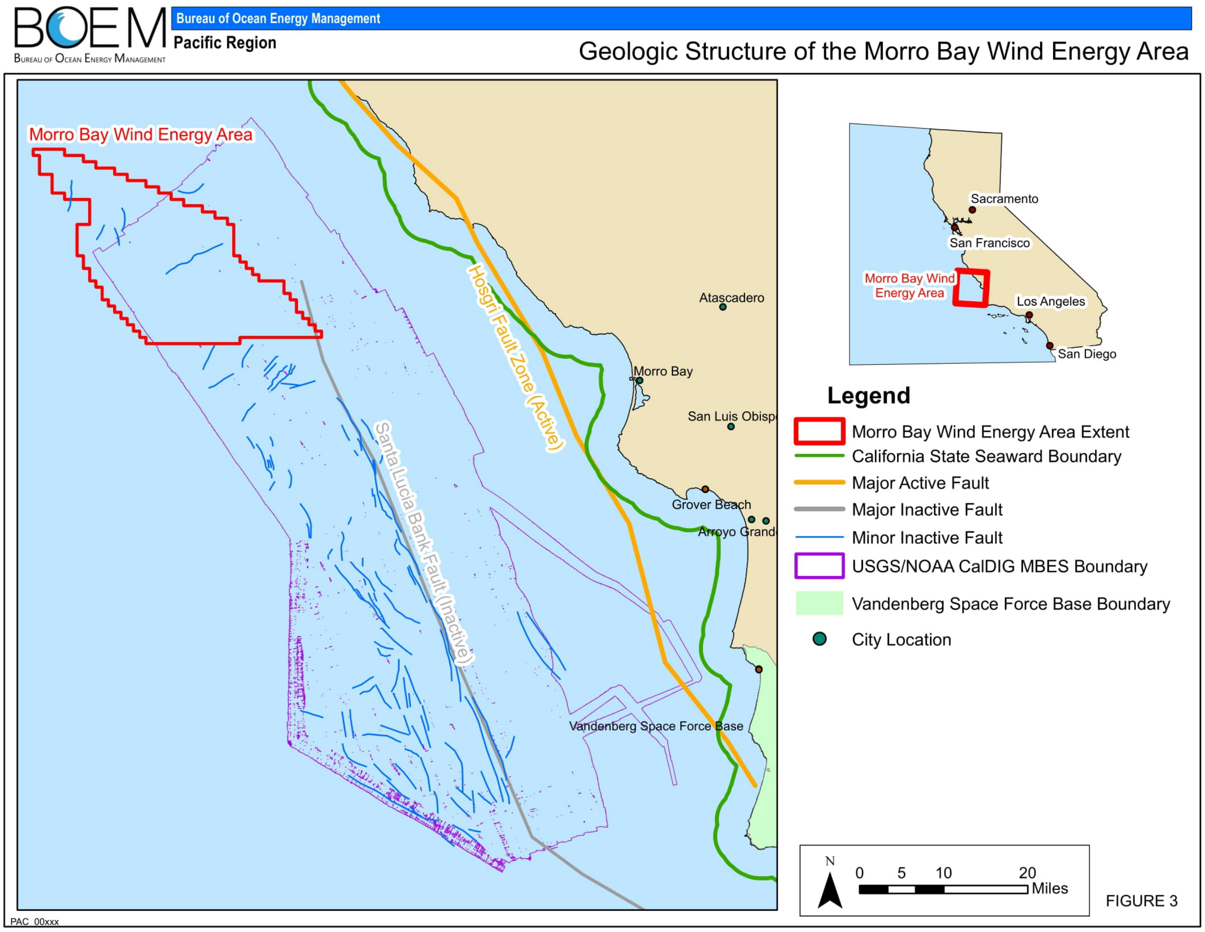



**Figure 3-3: Morro Bay Wind Energy Area Geologic Structure**

### 3.1.2 Impacts of the Proposed Action

Although the geology of the Morro Bay WEA is complex, the anticipated impact to the local geologic resources by activities performed as part of a SAP and site characterization activities would be negligible. No marine geophysical data acquisition would impact the seafloor or subseafloor geology, and any shallow geotechnical sampling within the WEA would result in only minor, temporary disturbance of the upper 25 m (82 ft) of Quaternary sediment that underlies the seafloor.

### 3.1.3 No Action Alternative

Under this alternative, commercial leases and grants would not be issued in the Morro Bay WEA. The implementation of the No Action Alternative would mean that the minor, temporary disturbances to local geological resources associated with the Proposed Action would not occur. BOEM expects ongoing activities and planned actions to have continuing regional impacts on geological resources over the timeframe considered in this EA.

# 3.2 AIR QUALITY

## 3.2.1 Affected Environment

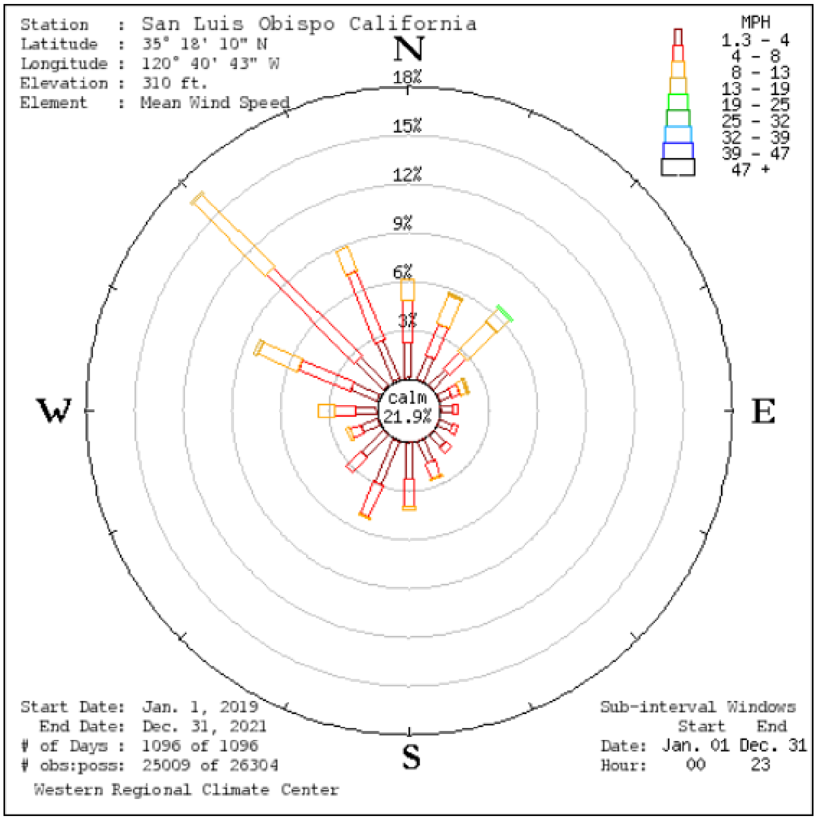
Air quality is defined by the concentration of pollutants, including greenhouse gases (GHGs), in the ambient atmosphere. Pollutant concentrations are determined by a variety of factors, including the quantity and timing of pollutants released by emitting sources, atmospheric conditions such as wind speed and direction, presence of sunlight, and barriers to transport such as mountain ranges.

The Proposed Action's potential area of impact on the human environment is the western portion of San Luis Obispo County, California, which is the corresponding onshore area with respect to the Morro Bay WEA. Depending on wind velocity, the Silver Peak Wilderness in south Monterey County may also be a receptor area. Silver Peak Wilderness is not a Class 1 Wilderness Area and does not have special air quality protections afforded by Section 162(a) of the Clean Air Act.

Air pollutants can be classified as criteria pollutants, hazardous air pollutants (HAPs), and greenhouse gases. The criteria pollutants are carbon monoxide(CO), lead, ground-level ozone, particulate matter (PM), nitrogen dioxide ($NO_2$), and sulfur dioxide ($SO_2$), which are all regulated under the health-based National Ambient Air Quality Standards (NAAQS). HAPs are those pollutants that are known to cause cancer or other serious health effects. These pollutants are frequently associated with specific industries or equipment, for example, benzene from oil and gas operations. GHGs are gases that trap heat in the atmosphere. The primary GHGs are carbon dioxide ($CO_2$), methane, and nitrous oxide. Fossil fuel combustion represents the vast majority of the energy-related GHG emissions, with $CO_2$ being the primary GHG (EPA 2022b). In contrast to the NAAQS and HAPs contaminants, which have more local impacts, GHGs have a global impact.

Air pollutants are transported primarily by wind, so the wind speed and direction are significant factors to consider in determining adverse impacts. Figure 3-4 shows a wind rose for a monitoring station located in the city of San Luis Obispo for the period of January 1, 2019, through December 31, 2021 (Western Regional Climate Center 2022). According to this data, wind direction is predominantly from the northwest. This indicates that pollutant emissions created in the Morro Bay WEA will tend to drift southeast towards Morro Bay.

The Federal and state attainment status for San Luis Obispo County NAAQS contaminants is found at 40 CFR 81.305. San Luis Obispo County is in attainment or unclassifiable for all NAAQS, with the exception of the Federal ozone standard for East San Luis Obispo County. San Luis Obispo County Air Pollution Control District (APCD) has been delegated by the U.S. Environmental Protection Agency (EPA) to regulate air pollution on the OCS in accordance with Section 328(a)(3) of the Clean Air Act (SLO Co. APCD 1994).




## San Luis Obispo California - Wind Frequency Table (percentage)

Latitude : 35° 18' 10" N
Longitude : 120° 40' 43" W
Elevation : 310 ft.
Element : Mean Wind Speed

Start Date : Jan. 1, 2019
End Date : Dec. 31, 2021
# of Days : 1096 of 1096
# obs : poss : 25009 of 26304

Sub Interval Windows
Start End
Date Jan. 01 Dec. 31
Hour 00 23

**Figure 3-4: San Luis Obispo Windrose**

Source: Western Regional Climate Center (2022)

### 3.2.2 Impacts of the Proposed Action

The factors associated with this project that can potentially produce adverse impacts on air quality are summarized in Table 3-1. The primary contaminants emitted are CO, $NO_2$, $SO_2$, fine particulate matter ($PM_{2.5}$), marine diesel, lube oils, and GHGs, though these emissions would be generated in very low quantities.

CO, $NO_2$, $SO_2$, and PM are criteria pollutants that are regulated under the NAAQS, which are health-based standards. Marine diesel and lube oils may contain HAPs, primarily benzene, and have adverse human health effects; they are also hydrocarbons, which, if volatilized, become precursors of photochemical smog (i.e., ozone, another NAAQS contaminant). $NO_2$, in the presence of sunlight, is also an ozone precursor. The primary GHG emitted is carbon dioxide. GHGs, in contrast to the other contaminants in Table 3-1, have a global, rather than local, impact. $CO_2$traps heat in the atmosphere and creates adverse impacts such as climate change, ocean acidification, and sea level rise.

**Table 3-1: Factors that Can Potentially Produce Adverse Impacts on Air Quality**

| Source | Impact-Producing Factors (IPFs) | Primary Contaminants |
|---|---|---|
| Marine vessels | • Stack emissions<br>• Fugitive emissions[1]<br>• Fuel and lubricant spills | CO, $NO_2$, $PM_{2.5}$, $SO_2$,<br>marine diesel, lube oils, greenhouse gases |
| Auxiliary engines | • Stack emissions<br>• Fugitive emissions[1]<br>• Fuel and lubricant spills | CO, $NO_2$, $PM_{2.5}$, $SO_2$,<br>marine diesel, lube oils, greenhouse gases |
| Buoy back-up generators | • Stack emissions<br>• Fugitive emissions[1]<br>• Fuel and lubricant spills | CO, $NO_X$, $PM_{2.5}$, $SO_2$,<br>marine diesel, lube oils, greenhouse gases |
| Trucks and locomotives | • Engine exhaust | CO, $NO_X$, and $PM_{2.5}$, $SO_2$, greenhouse gases |
| Goods-movement equipment | • Engine exhaust | CO, $NO_X$, and $PM_{2.5}$, $SO_2$, greenhouse gases |

Notes:

[1] Fugitive emissions are those emissions which could not reasonably pass through a stack, chimney, vent, or other functionally-equivalent opening (40 CFR 70.2).

$NO_X$ = Oxides of nitrogen

#### *3.2.2.1 Marine Vessels*

Marine vessels are the source of stack emissions from the main exhaust stack of the engine that is used to propel the vessel. These emissions are primarily the products of combustions: CO, nitrogen oxides ($NO_X$), and $PM_{2.5}$, oxides of sulfur ($SO_X$), and GHGs. Fugitive hydrocarbon emissions may occur from the transfer and storage of fuel. Hydrocarbon emission may also result from fuel and lubricant spills.

All marine vessels used for surveys are expected to comply with California Air Resources Board regulations for engine upgrade requirements, as well as monitoring, recordkeeping, and reporting requirements (California Air Resources Board 2017).

#### *3.2.2.2 Auxiliary Engines*

Auxiliary engines are those internal combustion engines that are not used for the propulsion of the vessel and are used to power onboard equipment such as cranes, electrical generators, pumps, and compressors. Air emissions from auxiliary engines include CO, $NO_X$, and $PM_{2.5}$, and GHGs, primarily carbon dioxide. Fugitive hydrocarbon emissions may occur from the transfer and storage of fuel. Hydrocarbon emission may also result from fuel and lubricant spills.

#### *3.2.2.3 Back-up Generator for Buoy(s)*

Buoys may be deployed with onboard back-up generators in case the buoy batteries or battery recharging system fail. Buoy back-up generators are generally powered by diesel fuel. Air emissions are primarily CO, $NO_X$, and $PM_{2.5}$, and GHGs. The possibility of a fuel spill also exists during filling operations and if the generator’s fuel tank is ruptured.

#### *3.2.2.4 Truck and Locomotive Traffic*

Trucks and trains may be used to transport equipment and personnel to and from the onshore staging area(s). Associated air emissions would include CO, NOx, $PM_{2.5}$, $SO_X$, and GHGs.

#### *3.2.2.5 Goods-Movement Equipment*

Goods-movement equipment includes cranes, gantries, and winches, and are used to load and unload equipment and materials onto docks, boats, barges, or intermodally. Associated air emissions would be CO, NOx, $PM_{2.5}$, $SO_X$, and GHGs.

**Conclusion**

The assumptions are that there will be one to three leases granted, with each lease requiring the use of two or three marine vessels, and each vessel being powered by two diesel engines in the 1,000 horsepower (hp) range. Each vessel will have onboard two or more auxiliary engines in the range of 20 to 60 kW. If the buoy(s) have onboard generators, they will be small, probably in the 15 hp range. Vessel activity will primarily take place between 20 and 50 mi offshore and, if there are multiple leases granted, survey activity may not occur simultaneously.

The anticipated level of activity will result in air emissions that will have negligible adverse impacts on the corresponding onshore area. Emissions will mix in the ambient atmosphere, be quickly dissipated, and will be indistinguishable from the emissions created by other daily vessel traffic offshore San Luis Obispo County.

Quantification of emissions from comparable wind energy project site assessments and site characterizations can be found in various BOEM studies. For example, BOEM EA 2015-038 (Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore North Carolina) estimates emissions in Table 3-2.

**Table 3-2: Example Emissions from WEA Site Characterization and Site Assessment**

| Activity | CO | $NO_X$ | VOCs | $PM_{10}$ | $PM_{2.5}$ | $SO_X$ | $CO_2$ | $N_20$ | $CH_4$ | $CO_2e$ |
|---|---|---|---|---|---|---|---|---|---|---|
| Site Characterization Surveys | 3.50 | 37.99 | 1.46 | 2.07 | 2.07 | 3.74 | 1,828.78 | 0.05 | 0.24 | 1,900.47 |
| <u>Site Assessment</u>: Construction of Meteorological Towers[1] | 0.36 | 2.11 | 0.43 | 0.14 | 0.14 | 0.20 | 131.33 | 0.003 | 0.04 | 144.39 |
| <u>Site Assessment</u>: Operation of Meteorological Towers | 4.03 | 22.04 | 1.85 | 1.47 | 1.47 | 1.64 | 790.99 | 0.01 | 0.04 | 801.83 |
| <u>Site Assessment</u>: Decommissioning of Meteorological Towers[1] | 0.36 | 2.75 | 0.44 | 0.16 | 0.17 | 0.27 | 164.32 | 0.00 | 0.04 | 176.07 |
| **Sum of emissions from all sources[2]** | **8.26** | **64.89** | **4.18** | **3.85** | **3.85** | **5.86** | **2,915.42** | **0.07** | **0.35** | **3,022.77** |

Notes: Units are tons per year (Metric tons per year for greenhouse gases) in a single year.
[1] Towers are not being considered but this serves as a conservative (high) estimate for construction, deployment, and decommissioning of meteorological buoys and equipment.
[2] Sum of individual values may not equal summary value because of rounding.
CO = carbon monoxide $NO_X$ = nitrogen oxides VOCs = volatile organic compounds
$PM_{10}$ = particulate matter with aerodynamic diameters of 10 microns or less
$PM_{2.5}$ = particulate matter with aerodynamic diameters of 2.5 microns or less
$SO_X$ = sulfur oxides $CO_2$ = carbon dioxide $N_2O$ = nitrous oxide $CH_4$ = methane
$CO_2e$ = carbon dioxide equivalent
Source: BOEM (2015)

Air emissions from vessels, onboard auxiliary engines, and buoys are expected to be either negligible or minor. Survey vessels and ancillary equipment emit a variety of air pollutants, including nitrogen oxides, sulfur oxides, particulate matter, volatile organic compounds, carbon monoxide, and greenhouse gases. The air emissions from this project are anticipated to be primarily from the survey vessels' propulsion engines and engines that power ancillary equipment. Lesser amounts of air pollutants may be emitted from trucks, locomotives, and goods-movement equipment if they are used to transport equipment and personnel to the project staging area.

The air emissions from trucks, locomotives, and goods-movement equipment will be negligible due to the infrequent nature of the activities associated with this project (e.g., unloading and loading a buoy) and the expected level of emissions. The GHG emissions from this action will be from one or two marine vessels operating per lease and while this level of emissions would be additive to the global inventory, it is not expected to have any measurable impacts on the local environment.

### 3.2.3 No Action Alternative

Under this alternative, commercial leases and grants would not be issued in the Morro Bay WEA, and geological and geophysical (G&G) activities would not occur pursuant to wind energy development. However, BOEM expects ongoing activities and planned actions to have continuing regional impacts on air quality. Impacts from urban development and increasing air, vessel, and onshore traffic will continue to contribute to climate change and will have negative impacts on air quality. Implementation of the No Action Alternative would not meaningfully reduce ongoing impacts to air quality from existing and potential future actions.

## 3.3 WATER QUALITY

### 3.3.1 Affected Environment

The affected environment for water quality spans central California coastal waters to 3 nmi from shore, OCS marine waters within the WEA, and navigation routes between the lease area and the Port of Morro Bay. Physical and chemical properties intrinsic of a water's quality are essential in providing life with essential elements and as such, water and influencing sediment quality for both coastal and marine waters are provided below.

#### *3.3.1.1 Coastal Waters*

The central California Current System is highly productive due to wind-driven upwelling of nutrient-rich water (Ryan et al. 2009). Common during spring and early summer, upwelling periods are characterized by strong winds from the north and northwest that convey high nutrient, low oxygen, low temperature, and moderately high saline waters to the nearshore environment, including estuaries (Brown and Nelson 2015). During low wind periods, common in late summer and early fall, the southerly set California Current moves closer to shore bringing low nutrient concentrations, higher temperatures, and moderate salinities to the nearshore environment. Strong southerly winds common in late fall and winter coupled to the northerly set Davidson Current convey waters to the nearshore environment with moderate nutrient concentrations, high sediment loads, low salinity, and oxygen saturation. Although these hydrographic conditions are associated with broad seasonal climatic shifts, these events have been observed to occur at any time of the year. Sea surface temperatures in the central California coast region reflect the upwelling conditions more than they do seasonal heating and cooling (Kaplan et al. 2010). Nearshore coastal waters generally have higher turbidities than offshore marine waters, particularly during spring runoff or storm events when resuspension of small sediment particles result from an increase of riverine input, waves, and currents (EPA 1995).

#### *3.3.1.2 Morro Bay Watershed*

The Morro Bay region experiences a variety of land-use and water-based activities that are contributing sources for point and non-point source pollution to sediment, and fresh and marine water quality. Recreation, industrial enterprises, agriculture, mariculture, fishing, dredging, shipping, and urban development are common affairs in the Morro Bay Region; local land use includes about 60 percent ranchland, 19 percent brushland, 7 percent urban areas (City of Morro Bay, Los Osos, and Baywood), 7 percent agriculture (crops), and 7 percent woodland (USACE 2013). Located in the central area of coastal San Luis Obispo County, the Morro Bay Watershed, is composed of two major sub-watersheds that drain into Chorro and Los Osos Creeks. The Chorro Creek sub-watershed accounts for about 60 percent of the total land area draining into the Morro Bay estuary (San Luis Obispo County 2014).

##### *3.3.1.2.1 Morro Bay Estuary*

Morro Bay, the largest estuary in San Luis Obispo County, is a 2,300 ac semi-enclosed body of water bordered to the west by a four-mile vegetated natural sand spit that separates Morro Bay from the Pacific Ocean. The estuary environment encompasses the lower reaches of Chorro and Los Osos creeks, a wide range of wetlands, salt and freshwater marshes, intertidal mud flats, eelgrass beds, and other subtidal habitats. Dredging and sediment bypassing in the vicinity of, and from the entrance of Morro Bay has occurred since the 1940s.

##### *3.3.1.2.2 Clean Water Act (CWA) Section 303(d) List of Impaired Waterbodies*

Pursuant to CWA Sections 303(d) and 305(b) (33 U.S.C. §§ 1313(d), 1315(b)), California is required to report to the EPA on the overall quality of the waters within its boundaries.

Previously, surface water impairments in the Morro Bay watershed have included pollutant exceedances of California water quality standards for *E. coli*, fecal coliform, temperature, nutrients, sediment, pathogens, nitrate, and low dissolved oxygen (EPA 2011; Kitts et al. 2002; North Carolina Cooperative Extension Service 1994; San Luis Obispo County 2014; SWRCB 2021a). In response to these elevated pollutant levels, Chorro Creek, Los Osos Creek, and Morro Bay (including the Morro Bay Estuary) have been listed on the CWA Section 303(d) list as impaired resulting in State and Central Coast Regional Water Quality Control Boards adopting pollutant specific Total Maximum Daily Loads for these waterbodies (CalEPA 2006; Central Coast Regional Water Quality Control Board 2002; Coastal San Luis Resource Conservation District 2020; EPA 2004; 2009).

Morro Bay continues to be listed on the 303(d) list for impairment of water quality by sedimentation/siltation with agriculture, grazing, land development, and habitat modification identified sources for increasing sedimentation/siltation into Morro Bay (SWRCB 2021b). The California Environmental Protection Agency (CalEPA) 2020–2022 Integrated Draft Staff Report (SWRCB 2021b) has recommended revisions to the 303(d) list for surface waters in the Morro Bay watershed, with some pollutants pending approval for delisting. The Final CalEPA 2020–2022 Integrated Report with the approved 303(d) list of impaired waterbodies, including the Morro Bay watershed, was adopted by the State Water Board on January 19, 2022 and approved by the EPA on May 11, 2022 (SWRCB 2021a). Recognizing the need for protection from polluted runoff, the California Coastal Commission has designated Morro Bay, Chorro Creek, and Los Osos Creek as Critical Coastal Areas (San Luis Obispo County 2014).

#### *3.3.1.3 Marine Water*

Water quality generally improves from coastal to marine locations, as onshore contaminants more commonly impact nearshore coastal waters than contaminants originating in marine waters. In the National Coastal Condition Report IV, EPA assessed the overall water quality of the West Coast region based on an index derived from five water quality parameters: nutrient concentrations, (as indicated by nitrogen and phosphorus), dissolved oxygen, water clarity, and chlorophyll *a* (EPA 2012). The overall rating for the West Coast coastal waters was “Good” including coastal waters in the Morro Bay Region (EPA 2012).

Included in EPA’s National Coastal Condition Report IV (EPA 2012) is an assessment and rating of West Coast sediment quality. Based on three sediment quality indicators (sediment toxicity, sediment contaminants, and sediment total organic carbon), the marine sediment quality index was rated as “Fair” for the West Coast region (EPA 2012). However, the sediment quality index rating for coastal waters around the Morro Bay region was rated as “Poor,” due to measurements of sediment toxicity (EPA 2012). EPA (2012) acknowledges that although the sediment toxicity results in support of the National Coastal Condition Report IV should be considered provisional for a variety of reasons and the interpretation of the results as “Unclear,” the sediment toxicity indicator for this period was virtually identical to previous periods. The other two sediment quality indicators, sediment contaminants and sediment total organic carbon, were both rated “Good” for coastal waters in the Morro Bay region (EPA 2012).

### 3.3.2 Impacts of the Proposed Action

Routine activities associated with the Proposed Action impacting coastal and marine waters and sediment quality include vessel discharges (including bilge and ballast water, and sanitary waste), geotechnical and benthic sampling, and installation and decommissioning of meteorological buoys. Oil and petroleum hydrocarbon spills are non-routine events that would impact water quality.

Under the CWA, it is unlawful for any person to discharge any pollutant from a point source into navigable waters without a permit under its provisions. The EPA regulates discharges incidental to the normal operation of all non-recreational, non-military vessels greater than 24 m (79 ft) in length into U.S. waters, under Section 402 of the CWA (EPA 2013). Small vessels and fishing vessels of any size must follow ballast water discharge requirements established in the EPA 2013 Vessel General Permit (VGP) and the USCG ballast water regulations at 33 CFR 151.10. Short-term and localized impacts to coastal and marine waters from vessel discharges by the introduction of total suspended solids, nutrients, organics, and oil and grease would be expected to diffuse rapidly in the water column without settling to the seafloor. Adherence to applicable permits and regulatory requirements for vessel discharges by local authorities, State of California, USCG, and EPA serves to minimize and mitigate discharges with no lasting impacts to water quality expected.

Coring, and collection of bottom samples associated with geotechnical surveys and benthic sampling would cause localized seafloor disturbance temporarily by increasing turbidity and reducing water clarity from resuspension of sediments into the water column. Collection of bottom samples is estimated to impact up to 10 $m^2$ (108 $ft^2$) per sample, although the core or grab sample extraction area may be much smaller (BOEM 2014). Short-term and localized resuspension of seafloor sediment into the water column is not expected to result in any lasting impact to water or sediment quality in either the WEA or along any surveyed projected transmission cable route. Upon cessation of the sampling, suspended sediment would immediately begin to settle to the seafloor with water quality promptly returning to ambient conditions.

Anchoring, installation, and decommissioning of metocean buoys results in a 2.3 $m^2$ footprint on the seafloor (PNNL 2019). A temporary resuspension of sediments into the water column would be expected during the one-day metocean buoy anchoring, installation, and decommissioning activities. This projected short-term duration would result in no lasting impact to water or sediment quality with ambient conditions likely throughout the operation and following decommissioning of the buoys. In the unlikely event of recovering lost equipment, seafloor disturbance and the resultant resuspension of sediments into the water column would be expected during the recovery operation. Transient and localized resuspension of sediment would temporarily impact water quality, but a return to ambient conditions would be expected immediately following the termination of the recovery operation.

Accidental releases of oil and petroleum products (e.g., diesel, lubricates) due to non-routine events are likely to result in small, short-term impacts on water quality over a localized area in the immediate vicinity of the release/spill.

Impacts to water quality from vessel discharges, sediment disturbance from geotechnical surveys, benthic sampling, metocean buoy installation/decommissioning, recovery of lost equipment, and oil spills in coastal and marine water quality would be minor, with any impacts being small in magnitude, highly localized, and short-term.

### 3.3.3 No Action Alternative

Under this alternative, commercial leases and grants would not be issued in the Morro Bay WEA. However, BOEM expects ongoing activities and planned actions to have continuing regional impacts on water quality over the timeframe considered in this EA. Impacts from urban development, mariculture, vessel discharge, and increasing vessel traffic will continue to contribute to climate change and will have negative impacts on water quality. Implementation of the No Action Alternative would not meaningfully reduce ongoing impacts to water quality from existing and potential future actions.

## 3.4 MARINE AND COASTAL HABITATS AND ASSOCIATED BIOTIC ASSEMBLAGES

### 3.4.1 Affected Environment

The Morro Bay WEA contains a variety of subtidal habitats (Argonne National Laboratory 2019). The proximity of the WEA to a major biogeographic break, Point Conception, enhances regional biodiversity due to the contribution of species from both the cool-temperate Oregonian and warm-temperate Californian Biogeographic Provinces (Burton 1998). Large-scale upwelling at Point Conception brings dissolved nutrients to the surface which in turn enhances biological productivity within the region (Dugdale and Wilkerson 1989). General references that describe the study region or the relevant ecological patterns within the California Current System include Arthur D. Little Inc. (1985), Allen et al. (2006), SAIC (1986), and SAIC (1992), and studies that specifically examine the WEA include Kuhnz et al. (2021) and Walton et al. (2021). These studies are incorpated by reference into this section. The Morro Bay WEA does not include any Area of Special Biological Significance, National Park, or National Marine Sanctuary. Key habitats and their characteristic species which may be affected by the proposed project are sumarized below. The Pacific Fishery Management Council (PFMC) classifies all of the regional habitats as essential fish habitat (EFH) for one or more federally managed fisheries (PFMC 2016; 2018; 2019; 2020).

#### *3.4.1.1 Outer Shelf and Upper Slope Habitats*

The ecosystem here is defined as the soft and hard substrates at depths between 100 m and 1,500 m (328 ft and 4,921 ft) and includes a few meters of the water column immediately above the seabed. The WEA benthos is entirely comprised of upper slope habitats between 900 m and 1,300 m (2,953 ft and 4,265 ft). Interpreted seafloor features (geoforms) and associated groups of biological communities were collected from remote sensing and ROV surveys (Cochrane et al. 2022; Kuhnz et al. 2021; Walton et al. 2021). Within the larger study region, soft sediments (sand, mud) cover most of the area and are interspersed with infreqent outcrops of hard substrate (Figure 3-5, left). Depth and substrate type are key structuring processes for invertebrate communities. For example, sediments on the continental shelf generally consist of sandy habitats nearshore and are dominated by filter-feeding organisms. Progressively deeper environments of silt and clay sediments follow, along with an increase in deposit feeders. At the shelf break, where the continental slope begins, the sediment becomes completely silt and clay (e.g., mud). There are three distinct community groups, called biotas, associated within the soft sediments of the Morro Bay WEA and surrounding area (Figure 3-5, right). Of note is that species community groups were similar in and out of pockmark features. The larger invertebrates species inhabiting the WEA seabed include echinoderms (e.g., sea cucumbers, sea stars, brittle stars, urchins, and crinoids), cnidarians (e.g., sea pens and anemones), and a variety of crustaceans, molluscs, brachiopods, and sponges (Kuhnz et al. 2021). Invertebrate prey serve as a forage base for larger piscine predators, some of which are commercially harvested, and include a variety of flatfishes (e.g., Dover and rex sole), thornyheads, sablefish, and hagfishes. Structure-forming invertebrates such as corals and sponges provide both habitat and food for other species. At all depths, fish assemblages at rock outcrops consist primarily of rockfishes (*Sebastes* spp.) (Allen et al. 2006). Within the WEA, thornyheads (*Sebastalobus* spp.) dominate (Kuhnz et al. 2021). Special habitats in the region include bacterial mats, submarine canyons, and pockmark fields (Kuhnz et al. 2021; Marsaglia et al. 2019; Walton et al. 2021). No chemosynthetic communities were obseved in the WEA (Kuhnz et al. 2021).

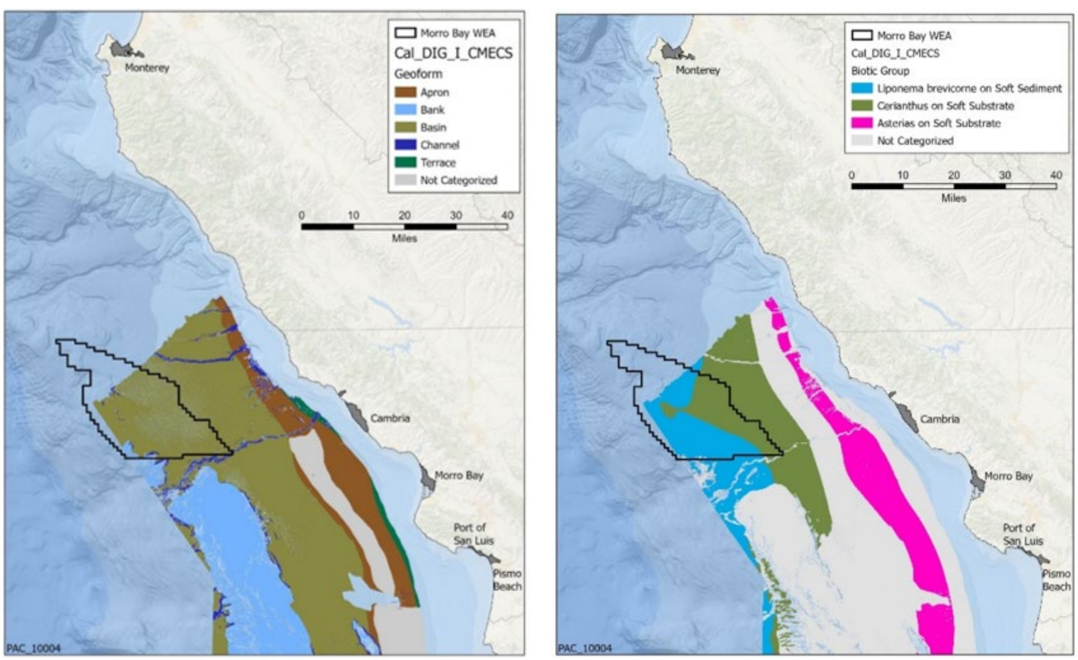



**Figure 3-5: Seafloor Features (Geoforms, left) and Statistically Distinct Biological-based Soft Sediment Habitats (Biotic Group, right) Offshore Central California**

Source: Cochrane et al. (2022)

#### *3.4.1.2 Pelagic Environments*

The pelagic environment is defined in this document as all open water habitat seaward of coastal habitats. Phytoplankton and zooplankton communities in the region are diverse and vary according to depth, season, and oceanographic conditions. Arthur D. Little Inc. (1985) further described these communities, and the California Cooperative Oceanic Fisheries Investigations maintains datasets that describe decadal patterns of oceanographic and plankton trends (Rebstock 2003). The pelagic environment also hosts a variety of larger animals including jellyfishes, krill, macro-invertebrate and fish larvae, forage fishes (e.g., myctophids, etc.), squid, tuna, sharks, marine mammals, and sea turtles.

#### *3.4.1.3 Coastal and Intertidal Habitats*

The coastal zone is defined in this document as benthic and water column habitats and fish and invertebrate species that reside seaward of intertidal habitats and out to the 100 m (328 ft) delineation depth. Intertidal habitats are defined as the interface between terrestrial and marine zones. Two types of intertidal habitats exist: soft sediments (e.g., sandy and cobble beaches, mudflats, etc.), and hard substrate (e.g., rocky outcrops, human-made structures such as rock walls, etc.). Key references that summarize details concerning regional coastal habitats are contained within Shaughnessy et al. (2017). Coastal features that are Habitat Areas of Particular Concern (a type of EFH) include rocky reefs, kelp forests, and seagrass beds. Of particular regional significance is Morro Bay Estuary, a 2,300 ac area where freshwater flowing from the land mixes with the saltwater of the sea. The estuary environment encompasses salt and freshwater marshes, intertidal mud flats, eelgrass beds, and other subtidal habitats. It is one of the least disturbed wetland systems on the central and southern California coast, and is the second largest enclosed bay in California.

##### *3.4.1.3.1 Threatened and Endangered Species*

Eleven taxa that occur or potentially occur in the region's coastal and marine habitats are listed as either threatened or endangered under the Endangered Species Act (ESA) (Table 3-3). Project activities are not expected to overlap with black abalone or tidewater goby depth range or critical habitat and are not further discussed in this assessment. Under Section 7 of the ESA, BOEM prepared a Biological Assessment for the National Marine Fisheries Service to ensure that project activities will not jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitats. Listed salmon species and green sturgeon are expected to be rare within the project footprint, and the WEA does not overlap with any listed fish species' critical habitat (BOEM 2022b). Because the Proposed Action avoids or minimizes potential negative effects through Best Management Practices (BMPs), BOEM has determined that the impacts to protected species and critical habitat from site characterization surveys and site assessment activities will be negligible and not likely to adversely affect ESA-listed protected species or associated critical habitat (BOEM 2022b). NMFS concurred with this determination (NMFS 2022).

**Table 3-3: Taxa Listed as Threatened and Endangered Under the ESA**

| Common Name | Scientific Name | Federal Status and Critical Habitat (CH) |
|---|---|---|
| Black abalone | *Haliotis cracherodii* | Endangered/CH |
| Green sturgeon, Southern DPS | *Acipenser medirostris* | Threatened |
| Chinook salmon | *Oncorhynchus tshawytscha* | |
| Sacramento River winter-run ESU | | Endangered/CH |

| Common Name | Scientific Name | Federal Status and Critical Habitat (CH) |
|---|---|---|
| Central Valley spring-run ESU | | Threatened/CH |
| California Coastal ESU | | Threatened/CH |
| Coho salmon | *Oncorhynchus kisutch* | |
| Central California Coast ESU | | Endangered/CH |
| Steelhead | *Oncorhynchus mykiss* | |
| California Central Valley DPS | | Threatened |
| Central California Coast DPS | | Threatened |
| South-Central California Coast Steelhead DPS | | Endangered |
| Southern California DPS | | Threatened |
| Tidewater goby | *Eucycloglobius newberryi* | Threatened |

Notes:

DPS refers to Distinct Population Segment as defined under the ESA.

ESU = Evolutionarily Significant Unit CH = Critical Habitat

### 3.4.2 Impacts of the Proposed Action

#### *3.4.2.1 Outer Shelf and Upper Slope Habitats*

A metocean buoy is estimated to disturb a maximum of 2.3 $m^2$ (25 $ft^2$) of sea floor from its solid cast iron anchor (PNNL 2019). Impacts to the outer shelf and upper slope habitats, including EFH, would be crushing or smothering of organisms by an anchor. Sediment suspension by buoy anchor placement would cause temporary turbidity in the water column and could interfere with filter-feeding invertebrates and the respiration and feeding of fishes. Physical sampling methods (grab samplers, benthic sleds, bottom cores, deep borings) may disturb, injure, or cause mortality to benthic resources and EFH in the immediate sampling area. Data collection buoys and associated mooring systems may act as small artificial reefs situated within an area that may exclude fishing (see discussion in Section 3.7), and this may provide a benefit to local benthic and fish assemblages associated with hard substrate. Decommissioning of the buoy may create short-term sediment suspension and will remove the artificial reef effect.

In the unlikely event of recovering lost equipment, seafloor disturbance would be expected during the recovery operation. Impacts to the outer shelf and upper slope habitats, including EFH, would be crushing or smothering of organisms by the dragging of grapnel lines to retrieve the lost item(s). If a vibracore rod cannot be retrieved, there would be additional bottom disturbance during the cutting and capping of the rod.

#### *3.4.2.1 Pelagic Environments*

Noise from HRG surveys and project vessels may alter fish behavior within the WEA, but the effect would be temporary, and is not expected to affect viability of regional fish or invertebrate populations (Staaterman, unpublished data).

#### *3.4.2.2 Coastal and Intertidal Habitats*

Impacts to benthic resources in coastal habitats are not expected for site assessment and site characterization activities. Any impacts that could occur would be from accidental events, such as vessel grounding or collision. Impacts to fishes and EFH may occur from noise generated by project vessels and potential introduction of invasive species from non-local project vessels. Impacts to benthic resources, EFH, and fishes in intertidal habitats are not expected for site assessment and site characterization activities. Any impacts that could occur would be from accidental events, such as vessel grounding or collision.

#### *3.4.2.3 Threatened and Endangered Species*

The regional population viability of species listed in Table 3-3 is not expected to be adversely affected by IPFs associated with the Proposed Action, and thus no additional conservation measures are proposed. For listed species that have critical habitat within or nearby the affected area, project activities are expected to have either no or minimal and temporary effects.

**Conclusion**

Impacts to benthic resources would be limited to the immediate footprint of the anchors or direct sampling. Sediment suspension would be temporary and short-term. Noise impacts from HRG surveys and project vessels to EFH and fishes would be minimal and temporary in duration. The artificial reef effect may provide a local, short-term (less than 5 years) benefit to fish populations.

### 3.4.3 No Action Alternative

Under this alternative, commercial leases and grants would not be issued in the Morro Bay WEA. However, BOEM expects ongoing activities and planned actions to have continuing regional impacts on marine and coastal habitats and associated biotic assemblages over the timeframe considered in this EA. Urban development, mariculture, shipping and vessel discharges, and dredging will continue to contribute to climate change and will have commensurate negative impacts on marine and coastal habitats and associated biotic assemblages. Implementation of the No Action Alternative would not meaningfully reduce ongoing impacts to coastal habitats and associated biotic assemblages from existing and potential future actions.

## 3.5 MARINE MAMMALS AND SEA TURTLES

### 3.5.1 Affected Environment

There are approximately 40 species of marine mammal species known to occur in California waters including 8 baleen whale species, 25 toothed whale and dolphin species, 6 species of seals and sea lions, and the northern and southern sea otter. Four listed species of sea turtles may occur in waters offshore California. Detailed species descriptions, including state, habitat ranges, population trends, predator/ prey interactions, and species-specific threats are described in H.T. Harvey & Associates (2020). This document is incorporated by reference, and a summary of relevant information and conclusions for marine mammals and sea turtles is provided below.

Species that are unlikely to be present in the Proposed Action Area – due to its location outside of these species' current and expected range of normal occurrence – will not be considered further in this document. Biologically important areas (BIAs) for Blue and Humpback whales fall outside of the Proposed Action Area, which includes the Morro Bay WEA, cable route, and vessel transit routes to and from the Port of Morro Bay (Calambokidis et al. 2015)

The following marine species have been documented using migratory corridors or BIAs, or have critical habitat in proximity to the Proposed Action Area (Table 3-4).

**North Pacific Right Whales** (listed as Endangered under the ESA): Outside of the Bering Sea and Gulf of Alaska, from 1950–2001, there have been at least four sightings of North Pacific right whales from the eastern population from Washington, 12 from California, 3 from Hawaii, 1 from British Columbia, and 2 from Baja California, Mexico. More recently, one North Pacific right whale was seen off La Jolla, California in April 2017, and a different animal was sighted off the Channel Islands in May 2017. Farther north, there were two sightings off British Columbia in 2013 and one in June 2018. Sightings have occurred in Mexican waters and thus there is some evidence that North Pacific right whales travel through California waters to reach Southern California or Mexico in the summer months, though by what route and in what number species utilize this unconfirmed migratory route is unknown. Critical habitat in the Bering Sea and Gulf of Alaska was designated in 2008 (73 FR 19000). Low numbers of sightings of individuals from a very small population makes any kind of demographic analysis challenging. Current knowledge of the low number of sightings offshore California in the last 68 years (14 sightings from 1950–2018, even with increased survey efforts), and the small population size (approximately 31 individuals) indicates that North Pacific right whales are unlikely to be present in the Morro Bay WEA.

**Blue Whales** (listed as Endangered under the ESA): Although feeding also occurs further to the north and south of the U.S. West Coast, it remains an important feeding area for blue whales in the summer and fall. As such, nine BIAs have been identified, including three areas in central California. Most of this Eastern North Pacific Stock is thought to migrate south to take advantage of high productivity in the waters of Baja California, the Gulf of California, and the Costa Rica Dome during the winter and spring. The amount of blue whale habitat that overlaps with the Morro Bay WEA varies according to the data source; however, no blue whale BIAs or core use areas overlap with the Morro Bay WEA.

**Fin Whales** (listed as Endangered under the ESA): Fin whales occur in both pelagic and coastal waters, where they feed primarily on krill and fish. Current research suggests that only some fin whales undergo long-distance migrations, with some individuals remaining resident in warmer waters of the Southern California Bight. The variability in movements make BIAs difficult to define and thus none are yet defined. Satellite-tracked fin whales seemed to favor nearshore habitats along the mainland coast, and in the northern Catalina basin in autumn and winter, and then disperse to the outer waters of the Southern California Bight, offshore and further north in spring and summer. Habitat suitability models suggest the Morro Bay WEA falls within suitable fin whale summer and fall habitat (average density of 0.0071–0.700 whales per 10 $km^2$), with lower habitat suitability/occurrence in the spring and winter.

**Humpback Whales** (listed as Endangered under the ESA): Humpback whales undertake two migrations per year between mostly polar, cold water feeding grounds in the summer months, and sub-tropical mating and calving grounds in the winter months. During these migrations in the Pacific, concentrations of humpback whales increase with proximity to shore. Although the Morro Bay WEA does not overlap with humpback whale feeding BIAs, critical habitat was designated for the Central America and Mexico Distinct Population Segments (DPSs) in April 2021 (86 FR 21082), encompassing much of the West Coast of the U.S. The Morro Bay WEA comprises approximately 0.3 percent of this critical habitat. NOAA Southwest Fisheries Science Center density models, which are based on ship-based surveys, predict that humpback whales are likely to occur in the Morro Bay WEA (0.0006–1 whale per 10 $km^2$ or 5–8 percent of the Central American DPS, or 1 percent of the entire population).

**Gray Whales** (listed as Endangered under the ESA): Gray whale feeding BIAs occur on the OCS and in coastal nearshore waters further north of the Morro Bay WEA, primarily in Washington and Oregon. As such, the WEA does not overlap with gray whale feeding BIAs. Similarly, migratory corridors occur close to shore (within 5.4 nmi). It is important to note that in defining migratory BIAs, Calambokidis et al.

(2015) included a 25.4 nmi buffer for gray whales. The buffer represents the potential path of some individuals that move farther offshore during annual gray whale migrations.

**Harbor Porpoise:** BIAs for two harbor porpoise stocks are located in Central and Northern California. The most southern of these is the Morro Bay resident BIA (for the Morro Bay Stock), which extends from Point Sur to Point Conception and from land to the 200-m isobath, although the vast majority of harbor porpoise seen in California were recorded within the 0–50 fathom (91 m) depth range. Genetic analyses have shown the various stocks are genetically dissimilar and do not interbreed or migrate. The Morro Bay Stock is estimated between 2,737–4,255 animals. The Morro Bay WEA does not overlap with harbor porpoise habitat, but vessels surveying potential cable routes and transiting to and from the Port of Morro Bay are likely to transit through portions of the Morro Bay Stock habitat.

**Northern Elephant Seals:** These seals breed and give birth, primarily on offshore islands, in California and Baja California, Mexico. Males migrate to the Gulf of Alaska and western Aleutian Islands along the continental shelf to feed on benthic prey species, whereas females migrate to more pelagic areas in the Gulf of Alaska and the central North Pacific to feed on pelagic prey. Adults remain on land between March and August to molt. The Piedras Blancas Rookery is located further north on the San Simeon shores, where large numbers of seals are seen in January, April, and October, and a haul out site is at Santa Rosa Island further to the south. A breeding colony occurs in Cambria, California, which is adjacent to the Morro Bay WEA. While elephant seals may be found on the rookery year-round, there are biologically sensitive time periods associated with their presence. Females arrive on the rookery in late December– early January, giving birth through February. Weaning continues concurrent with mating activities, with most of the adults/subadults leaving the beach at the end of February. Newborn seals will remain on the beach for a couple of months until they are ready to begin feeding for months in the offshore waters. Molting season begins in April, lasting several months, through August. More seals arrive throughout the late summer and fall, with early births and mating activities beginning in mid-December. In general, the pupping/molting season is most sensitive for northern elephant seals and, thus, disturbance to the rookery should be avoided from mid-December through the early summer months. Results of a tagging study suggest that there is potential for Northern elephant seals to occur in small numbers in the Proposed Action Area.

**Leatherback Sea Turtles** (listed as Endangered under the ESA): Leatherback sea turtles have the most extensive range of any living reptile and have been reported circumglobally throughout the oceans of the world. Migratory routes of leatherbacks are not entirely known. However, turtles tagged after nesting in July at Jamursba-Medi, Indonesia, arrived in waters off California and Oregon during July–August coincident with the development of seasonal aggregations of jellyfish. Other studies similarly have documented leatherback sightings along the Pacific coast of North America during the summer and fall months, when large aggregations of jellyfish form. NMFS published a final rule designating critical habitat for leatherback sea turtles in 2012 (77 FR 4169). This critical habitat contains the main feeding habitat for leatherback sea turtles and stretches along the California coast from Point Arena to Point Arguello east of the 3,000-meter depth contour; and 25,004 $mi^2$ (64,760 $km^2$) stretching from Cape Flattery, Washington to Cape Blanco, Oregon east of the 2,000-m depth contour. The Morro Bay WEA overlaps with 284 $nmi^2$ of feeding critical habitat for leatherback sea turtles, however no sightings of leatherbacks have been made in the WEA. Vessels transiting from the Port of Morro Bay would also intersect with leatherback critical habitat; however, this area has few recorded sightings and is not anticipated to have high numbers of leatherback sea turtle occurrence (NMFS 2012).

**Table 3-4: Protected Marine Mammal and Sea Turtle Species Expected to Occur in the Proposed Action Area**

**Baleen Whales**

| Common Name | Scientific Name | Stock | ESA/MMPA Status | Occurrence |
|---|---|---|---|---|
| Blue whale[3] | *Balaenoptera musculus* | Eastern North Pacific | Endangered/Depleted | Late summer and fall |
| Fin whale[3] | *Balaenoptera physalus* | California, Oregon, and Washington | Endangered/Depleted | Year-round |
| Sei whale[3] | *Balaenoptera borealis* | Eastern North Pacific | Endangered/Depleted | Uncommon |
| Bryde's whale | *Balaenoptera acutorostrata* | NA | NA | Sporadic summer-early winter |
| Minke whale[3] | *Balaenoptera acutorostrata* | California, Oregon, and Washington | - | Occasional |
| Humpback whale | *Megaptera novaeangliae* | California, Oregon, and Washington (Central American DPS and Mexico DPS) | Endangered/Threatened | Spring to fall |
| North Pacific Gray Whale[3] | *Eschrichtius robustus* | Eastern North Pacific | - | Oct–Jan and March–May |

**Toothed and Beaked Whales**

| Common Name | Scientific Name | Stock | ESA/MMPA Status | Occurrence |
|---|---|---|---|---|
| Sperm whale[3] | *Physeter macrocephalus* | California, Oregon, and Washington | Endangered/Depleted | Year-round |
| Killer whale | *Orcinus orca* | Eastern North Pacific Transient/ West Coast Transient[1] | - | Sporadic |
| Killer whale – southern resident | *Orcinus orca* | Southern Resident | Endangered | Uncommon |
| Baird's beaked whale | *Berardius bairdii* | California, Oregon, and Washington | - | |
| Cuvier's beaked whale | *Ziphius cavirostris* | California, Oregon, and Washington | - | Uncommon |
| Stejneger's beaked whale | *Mesoplodon stejnegeri* | California, Oregon, and Washington | - | |
| Risso's dolphin | *Grampus griseus* | California, Oregon, and Washington | - | Year-round |
| Rough-toothed dolphin | *Steno bredanensis* | NA[2] | - | |
| Northern right whale dolphin | *Lissodelphis borealis* | California, Oregon, and Washington | - | Year-round |
| Pacific white-sided dolphin | *Lagenorhynchus obliquidens* | California, Oregon, and Washington | - | Year-round |
| Dall's porpoise | *Phocoenoides dalli* | California, Oregon, and Washington | - | Year-round |
| Harbor porpoise | *Phocoena phocoena* | Morro Bay stock | - | Late spring to early fall |

**Sea Lions and Seals**

| Common Name | Scientific Name | Stock | ESA/MMPA Status | Occurrence |
|---|---|---|---|---|
| Steller sea lion | *Eumetopias jubatus* | Eastern DPS | De-listed with critical habitat | Year-round |
| California sea lion | *Zalophus californianus* | U.S. Stock | - | Year-round |
| Northern elephant seal | *Mirounga angustirostris* | California | - | Year-round |
| Harbor seal | *Phoca vitulina richardsi* | California | - | Year-round |
| Guadalupe fur seal[3] | *Arctocephalus townsendi* | Throughout its range | Threatened | Spring/summer, seasonal low numbers |

**Sea Otters**

| Common Name | Scientific Name | Stock | ESA/MMPA Status | Occurrence |
|---|---|---|---|---|
| Southern sea otter | *Enhydra lutris nereis* | Southern | Threatened | Inshore/coastal year-round |

**Sea Turtles**

| Common Name | Scientific Name | Stock | ESA/MMPA Status | Occurrence |
|---|---|---|---|---|
| Leatherback sea turtle | *Dermochelys coriacea* | Throughout range | Endangered | June–Oct; limited sightings |
| Green sea turtles | *Chelonia mydas* | East Pacific DPS | Threatened | Extralimital |
| Loggerhead sea turtle | *Caretta caretta* | North Pacific DPS | Endangered | Limited occurrence possible in summer–fall |
| Olive ridley sea turtle | *Lepidochelys olivacea* | Breeding colony populations on the Pacific coast of Mexico | Endangered | Expected during warming events, like El Niño |
| Olive ridley sea turtle | *Lepidochelys olivacea* | Wherever found, except where listed as Endangered | Threatened | Expected during warming events, like El Niño |

Notes:

DPS refers to Distinct Population Segment as defined under the ESA.

[1] This stock is mentioned briefly in the Pacific Stock Assessment Report (Carretta et al. 2018; Carretta et al. 2016) and referred to as the "Eastern North Pacific Transient" stock; however, the Alaska Stock Assessment Report contains assessments of all transient killer whale stocks in the Pacific and the Alaska Stock Assessment Report refers to this same stock as the "West Coast Transient" stock (Muto et al. 2016; 2018).

[2] Rough-toothed dolphin has no recognized stock for the U.S West Coast.

[3] Critical habitat has not been designated for these ESA-listed species.

ESA = Endangered Species Act MMPA = Marine Mammal Protection Act

### 3.5.2 Impacts of the Proposed Action

The potential impacts for marine mammals and sea turtles associated with the Proposed Action include noise from HRG and geotechnical surveys, the potential for collision with project-related vessels, and potential entanglement in mooring systems associated with the installation of a metocean buoy.

BOEM recommends lessees incorporate BMPs into their plans. These have been developed through years of conventional energy operations and refined through BOEM's renewable energy program and consultations with NMFS, including vessel strike avoidance BMPs, visual monitoring, and shutdown and reporting. These BMPs, which will minimize or eliminate potential effects from site assessment and site characterization activities to protected marine mammal and sea turtle species, are found in Appendix D.

In compliance with Section 7 of the ESA, BOEM consulted with NMFS regarding the potential impacts of the Proposed Action to ESA-listed species. The analysis presented below in this EA is reflected in the consultation with NMFS. NMFS concurred with BOEM's determination that the impacts to protected species and critical habitat from site characterization surveys and site assessment activities will be negligible and not likely to adversely affect ESA-listed protected species or associated critical habitat (BOEM 2022b; NMFS 2022).

#### *3.5.2.1 HRG Surveys*

For a sound to be potentially disturbing, it must be able to be heard by the animal. Effects on hearing ability or disturbance can result in disturbance of important biological behaviors such as migration, feeding, resting, communication, and breeding. Baleen whales hear lower frequencies; sperm whales, beaked whales and dolphins hear mid-frequencies; porpoise hear high frequencies (Table 3-5); seals hear frequencies from 50 Hz to 86 kHz; sea lions hear frequencies from 60 Hz to 39 kHz (NMFS 2016; 2018); and sea otters have auditory capabilities most similar to the California sea lions (Ghoul and Reichmuth 2014). Sea turtles are low frequency hearing specialists with a range of maximum sensitivity between 100 and 800 Hz (Bartol and Ketten 2006; Bartol et al. 1999; Lenhardt 1994; 2002; Ridgway et al. 1969) (Table 3-5).

The assessment of potential hearing effects in marine mammals is based on NMFS' technical guidance for assessing acoustic impacts, defined as Permanent Threshold Shift (PTS) and Temporary Threshold Shift (TTS) (NMFS 2018) (Table 3-4). PTS results in permanent hearing loss while TTS is a temporary loss in hearing function related to the exposure level and durations. The methodology developed by the U.S. Navy is currently thought to be the best available data to evaluate the effects of exposure to survey noise by sea turtles that could result in physical effects (NMFS 2021; U.S. Navy 2017) (Table 3-5).

**Table 3-5: Impulsive Acoustic Thresholds Identifying the Onset of PTS and TTS for Marine Mammals and Sea Turtle Species**

| Hearing Group | Generalized Hearing Range | Permanent Threshold Shift Onset | Temporary Threshold Shift Onset |
|---|---|---|---|
| Low frequency (e.g., Baleen Whales) | 7 Hz to 35 kHz | 219 dB Peak<br>183 dB cSEL | 213 dB Peak<br>179 dB cSEL |
| Mid-frequency (e.g., Dolphins and Sperm Whales) | 150 Hz to 160 kHz | 230 dB Peak<br>185 dB cSEL | 224 dB Peak<br>178 dB cSEL |
| High frequency (e.g., Porpoise) | 275 Hz to 160 kHz | 202 dB Peak<br>155 dB cSEL | 148 dB Peak<br>153 dB cSEL |
| Phocid pinnipeds (True Seals) (underwater) | 50 Hz to 86 kHz | 218 dB Peak<br>185 dB cSEL | 212 dB Peak<br>181 dB cSEL |
| Otariid pinnipeds (Sea Lions and Fur Seals) and Sea Otters (underwater) | 60 Hz to 39 kHz | 232 dB Peak<br>203 dB cSEL | 226 dB Peak<br>199 dB cSEL |
| Sea Turtles | 30 Hz to 2 kHz | 230 dB Peak<br>204 dB cSEL | 226 dB Peak<br>189 dB cSEL |

Notes:
cSEL = cumulative sound exposure level dB = decibels Hz = hertz kHz = kilohertz
Sources: mammals: NMFS (2018); sea turtles: U.S. Navy (2017)

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). Using 19 HRG source levels (excluding side-scan sonars operating at frequencies greater than 180 kHz, and other equipment that is unlikely to be used for data collection/site characterization surveys associated with offshore renewable energy) with NOAA's sound exposure spreadsheet tool, injury (PTS) and disturbance ranges were calculated for listed species. To provide the maximum impact scenarios, the highest power levels and most sensitive frequency setting for each hearing group was used. 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 listed marine mammals. The spreadsheet and geometric spreading models do not consider the tow depth and directionality of the sources; therefore, these are likely overestimates of actual injury and disturbance distances. All sources were analyzed at a tow speed of 2.315 m/s (4.5 kn), based on the same activities in the Atlantic (Baker and Howson 2021).

**<u>Potential for injury</u>:** For marine mammal species expected to occur in the Proposed Action Area, PTS distances are generally small ranging from 0 to 47 m (0 to 154 ft). The largest possible PTS distance is 251.4 m (825 ft) for porpoise species, only when the 100 MHz multi-beam echosounder is used (Table 3-6). However, this range is likely an overestimate since it assumes the unit is operated in full power mode and that it is an omnidirectional source. Additionally, the range does not take the absorption of sound over distance into account. With the requirements for qualified Protected Species Observers (PSOs) to monitor a 1,000 m (3,280 ft) monitoring zone, for vessels to maintain 500 m (1,640 ft) from marine mammals, as well as the shutdown requirements when ESA-listed marine mammal species are sighted within 500 m, BOEM believes that the risk of PTS occurring in any protected marine mammal species from HRG surveys is discountable.

PTS exposure thresholds (calculated for 204 cSEL and 23 dB peak criteria (U.S. Navy 2017)) are higher for sea turtles than for marine mammals. Based on the PTS exposure thresholds for sea turtles, HRG sound source levels are not likely to result in PTS. The predicted distances from these mobile sound sources indicate the sound sources are transitory and have no risk of exposure to levels of noise that could result in PTS for sea turtles (NMFS 2021).

**Table 3-6: Summary of Permanent Threshold Shift Exposure Distances for Protected Marine Mammal Species from Mobile HRG Sources Towed at a Speed of 4.5 Knots**

**Mobile, Impulsive, Intermittent Sources**

| HRG Source | Highest Source Level (dB re 1 µPa) | DISTURBANCE DISTANCE (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Low Frequency (e.g., Baleen Whales)[1] | Mid-Frequency (e.g., Dolphins and Sperm Whales)[1] | High Frequency (e.g., Porpoise) | Phocids (True Seals) | Otariids (Sea Lions and Fur Seals) and Sea Otters | Sea Turtles |
| Boomers, Bubble Guns (4.3 kHz) | 176 dB SEL<br>207 dB RMS<br>216 peak | 0.3 | 0 | 5.0 | 0.2 | 0 | 0 |
| Sparkers (2.7 kHz) | 188 dB SEL<br>214 dB RMS<br>225 peak | 12.7 | 0.2 | 47.3 | 6.4 | 0.1 | 0 |
| CHIRP Sub-Bottom Profilers (5.7 kHz) | 193 dB SEL<br>209 dB RMS<br>214 peak | 1.2 | 0.3 | 35.2 | 0.9 | 0 | NA |

**Mobile, Non-Impulsive, Intermittent Sources**

| HRG Source | Highest Source Level (dB re 1 µPa) | DISTURBANCE DISTANCE (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Low Frequency (e.g., Baleen Whales)[1] | Mid-Frequency (e.g., Dolphins and Sperm Whales)[1] | High Frequency (e.g., Porpoise) | Phocids (True Seals) | Otariids (Sea Lions and Fur Seals) | Sea Turtles |
| Multibeam echosounder (100 kHz) | 185 dB SEL<br>224 dB RMS<br>228 peak | 0 | 0.5 | 251.4* | 0 | 0 | NA |
| Multibeam echosounder (>200 kHz) | 182 dB SEL<br>218 dB RMS<br>223 peak | NA | NA | NA | NA | NA | NA |
| Side-scan sonar (>200 kHz) | 184 dB SEL<br>220 dB RMS<br>226 peak | NA | NA | NA | NA | NA | NA |

Notes:

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).

* This range is conservative as it assumes full power, an omnidirectional source, and does not consider absorption over distance.

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

**Potential for disturbance:** Using the same sound sources as for the PTS analysis, the disturbance distances to 160 dB re 1 µPa RMS for marine mammals and 175 dB re 1 µPa RMS for sea turtles were calculated using a spherical spreading model (20 LogR). These results describe maximum disturbance exposures for protected species to each potential sound source (Table 3-7).

The disturbance distances depend on the equipment and the species present. The range of disturbance distances for all protected species expected to occur in the Proposed Action Area is from 40 to 502 m

(131 to 1,647 ft), with sparkers producing the upper limit of this range. Disturbance distances to protected species are conservative, as explained above, and any behavioral effects will be intermittent and short in duration. In addition, visual monitoring requirements of a 500 m (1,640 ft) exclusion zone for ESA-listed large whales will ensure that any potential impacts to these species from noise generated by HRG survey equipment are negligible.

**Table 3-7: Summary of Maximum Disturbance Distances (in Meters) for Protected Marine Mammal Species from Mobile Hl mRG Sources Towed at a Speed of 4.5 Knots**

**Mobile, Impulsive, Intermittent Sources**

| HRG Source | DISTURBANCE DISTANCE (m) | | | | | |
|---|---|---|---|---|---|---|
| | Low Frequency (e.g., Baleen Whales)[1] | Mid-Frequency (e.g., Dolphins and Sperm Whales)[1] | High Frequency (e.g., Porpoise) | Phocids (True Seals) | Otariids (Sea Lions and Fur Seals) and Sea Otters | Sea Turtles |
| Boomers, Bubble Guns (4.3 kHz) | 224 | 224 | 224 | 224 | 224 | 40 |
| Sparkers (2.7 kHz) | 502 | 502 | 502 | 502 | 502 | 90 |
| CHIRP Sub-Bottom Profilers (5.7 kHz) | 282 | 282 | 282 | 282 | 282 | 50 |

**Mobile, Non-Impulsive, Intermittent Sources**

| HRG Source | DISTURBANCE DISTANCE (m) | | | | | |
|---|---|---|---|---|---|---|
| | Low Frequency (e.g., Baleen Whales)[1] | Mid-Frequency (e.g., Dolphins and Sperm Whales)[1] | High Frequency (e.g., Porpoise) | Phocids (True Seals) | Otariids (Sea Lions and Fur Seals) and Sea Otters | Sea Turtles |
| Multibeam Echosounder (100 kHz) | NA | 370 | 370 | NA | NA | NA |
| Multibeam Echosounder (>200 kHz) | NA | NA | NA | NA | NA | NA |
| Side-scan Sonar (>200 kHz) | NA | NA | NA | NA | NA | NA |

Notes:

[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.

#### *3.5.2.2 Geotechnical Surveys*

Geotechnical surveys (vibracores, piston cores, gravity cores) related to offshore renewable energy activities are typically numerous, but very brief, sampling activities that introduce relatively low levels of sound into the environment. General vessel noise is produced from vessel engines and dynamic positioning to keep the vessel stationary while equipment is deployed, and sampling is conducted. Recent analyses of the potential impacts to protected species exposed to noise generated during geotechnical survey activities determined that effects to protected species from exposure to this noise source are extremely unlikely to occur (NMFS 2021).

#### *3.5.2.3 Project-related Vessel Traffic*

Vessel strikes pose a threat to the West Pacific DPS of leatherback sea turtles. Of leatherback strandings documented in central California between 1981 and 2016, 11 were determined to be the result of vessel strikes (7.3 percent of total; NMFS unpublished data). The range of the DPS overlaps with many high-density vessel traffic areas and it is possible that the vast majority of vessel strikes are undocumented. However, information on leatherback vessel strikes for other locations is not available (NMFS and USFWS 2020). While some risk of a vessel strike exists for large whales in all the U.S. West Coast waters, 74 percent of blue whale, 82 percent of humpback whale, and 65 percent of fin whale known vessel strike mortalities occur in the shipping lanes associated with the ports of San Francisco and Los Angeles/Long Beach (Rockwood et al. 2017). Along the California coast, from 1998–2001, out of 105 carcasses assessed, 5 southern sea otter deaths were assigned to high-speed vessel strikes (Kreuder et al. 2003). Stranding data indicate that from 2015–2019, 12 sea otters were struck by vessels (U.S. Geological Survey and CDFW unpublished data).

The total number of round trips for project-related vessels over a 3-year period will range from 150 to 555 assuming 24-hour operations, and 464 to 873 assuming 10-hour daily operations. Since BOEM has not received any survey plans in the Pacific to date, the number of surveys within the Proposed Action Area is a highly conservative estimate, meaning the highest possible number of trips is assumed even though it is unlikely this many trips will take place. An additional 21–30 round trips will be conducted over a 5-year period for the deployment, maintenance, and decommissioning of three metocean buoys. According to industry practice, vessel speeds during site characterization surveys within the Proposed Action Area will be limited to less than 5 kn (2.57 m/s). 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 kn during all related activities, unless unsafe to do so. If future consultation with NMFS, U.S. Fish and Wildlife Service (USFWS), or other state or Federal agency results in different vessel speed requirements, BOEM will work with California Coastal Commission staff to ensure that any new requirements remain consistent and do not diminish the level of resource protection provided by this requirement.

*Best Management Practices for Vessel Strike Avoidance and Injured/Dead Protected Species Reporting* (Appendix D) are meant to minimize the risk of vessel strikes to protected species. These include: vessel speed restrictions to 10 kn within the Proposed Action Area; immediate operator reporting of a vessel strike of any ESA-listed marine animal; reporting observations of injured or dead protected species; having qualified PSOs on board (or dedicated crew) to monitor a vessel strike avoidance zone for protected species; steering a course at 10 kn or less away from any whale detected within 500 m of the forward path of any vessel; or stopping the vessel to avoid striking protected species. If a sea turtle or sea otter is sighted within the operating vessel’s forward path, the vessel operator must slow down to 4 kn (unless unsafe to do so) and steer away as possible. Crews must report sightings of any injured or dead protected species (marine mammals and sea turtles) immediately, regardless of whether the injury or death is caused by their vessel, to the West Coast Stranding Hotline. In addition, if it was the operator’s vessel that collided with a protected species, the Bureau of Safety and Environmental Enforcement (BSEE) must be notified within 24 hours of the strike. Currently, the same survey activities have been ongoing for multiple years in the Atlantic, and the same BMPs have resulted in no impacts to protected species from vessel strikes. Lessees will also be directed to NMFS’ Marine Life Viewing

Guidelines, which highlight the importance of these BMPs for avoiding impacts to mother/calf pairs (https://www.fisheries.noaa.gov/topic/marine-life-viewing-guidelines#guidelines-&-distances).

Additionally, 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.

Although the project-related vessel traffic would increase the overall vessel traffic and risk of collision with protected marine mammal and sea turtle species in the Proposed Action Area, vessels associated with vessel strikes on the U.S. West Coast do not have mandated vessel strike avoidance protocols. BOEM's BMPs align with recommended types of enhanced conservation measures to decrease ship strike mortality (Rockwood et al. 2017). Similar activities have taken place since at least 2012 in association with BOEM's renewable energy program in the Atlantic OCS, following similar BMPs, and there have been no reports of any vessel strikes of marine mammals and sea turtles. BOEM believes that impacts to protected species from vessel interactions will be negligible because of vessel strike avoidance BMPs, as well as reporting requirements (Appendix D).

#### *3.5.2.4 Entanglement*

Most entanglements are never observed, but there are many cases of entangled whales with unidentified gear (International Whaling Commission 2016). There are reports of large whales (including humpback, right, and fin whales) interacting with anchor moorings of yachts and other vessels, towing small yachts from their moorings or becoming entangled in anchor chains, sometimes with lethal consequences (Benjamins et al. 2014; Love 2013; Richards 2012; Saez et al. 2021). Animals may swim into moorings accidentally or actively seek out anchor chains or boats as a surface to scratch against (Benjamins et al. 2014).

Reviews of entanglements of large whales and sea turtles have resulted in a number of recommendations to reduce the risk of entangling animals (International Whaling Commission 2016; NMFS 2015), some of which are practicable for marine industries in general. General recommendations to reduce entanglement risks include reduced number of buoy lines and no floating lines at the surface, which have a high risk of interacting with turtles and whales that spend a good deal of time at the surface of the water. Other recommendations include reducing the amount of slack in line, and using sinking lines, rubber-coated lines, sheaths, chains, acoustic releases, weak links, and other potential solutions to lower entanglement risk. Weak links may not be feasible if there is a risk of the data buoy being lost, but they may be feasible on ancillary lines that will not affect the integrity of the buoy mooring. However, there are several best practices available that can reduce risks on all mooring types and it is a BOEM BMP to use the best available technologies to greatly reduce the risk of entanglement.

The PNNL deployed two LiDAR metocean buoys—one in the Proposed Action Area and one in the Humboldt WEA (PNNL 2019). Including the multiple metocean buoys deployed along the Northeast Atlantic coast associated with site assessment activities, no incidents of entanglement have been reported to date. BOEM continues to work with lessees and requires the use of the best available mooring systems, using the shortest practicable line lengths, anchors, chain, cable, or coated rope systems, to prevent or reduce to discountable levels any potential entanglement of marine mammals and sea turtles. BOEM reviews each buoy design to ensure that reasonable low risk mooring designs are used. Potential impacts on protected marine mammal species from entanglement related to buoy operations are thus expected to be discountable.

Lost or derelict fishing gear may become entangled in the metocean buoy lines and present an entanglement risk to protected species. Approximately six metocean buoys will be deployed as part of the Proposed Action. From 1982 to 2017, direct entanglements in fishing gear were most attributed to unidentifiable gear, netting, and pot/traps (Saez et al. 2021). Changes in gillnet fishing regulations helped address the 1980's increase which was primarily gray whales entangled with gillnets (Saez et al. 2021). Considering the general inshore deployment (~200 ft water depth) and weight of pot traps, it is unlikely that these will be moved in such a way as to become entangled in six offshore metocean buoy lines and present an entanglement risk to protected species. Risk of secondary entanglement related to buoy deployment and operations are thus expected to be discountable.

Any potential displacement of fishing effort, as a result of leasing and site characterization and site assessment activities, are described in Section 3.7.2 and are expected to be limited in spatial scope, considering existing fishing grounds, and short-term. Entanglement impacts to marine mammals and sea turtles, as a result of displaced fishing effort, are expected to be discountable.

#### *3.5.2.5 Impacts to Critical Habitat*

Effective May 21, 2021, NMFS issued an updated final rule to designate critical habitat for the endangered Central America DPS and the threatened Mexico DPS of humpback whales (*Megaptera novaeangliae*) (86 FR 21082). Critical habitat for these DPSs serve as feeding habitat and contain the essential biological feature of humpback whale prey. Critical habitat for the Central America DPS of humpback whales contains approximately 48,521 $nmi^2$ of marine habitat in the North Pacific Ocean within the portions of the California Current Ecosystem off the coasts of Washington, Oregon, and California. Specific areas designated as 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 Morro Bay WEA consists of approximately 284 $nmi^2$ and overlaps with humpback whale critical habitat. Any displacement of prey species as a result of vessel transits and surveys conducted as part of the Proposed Action is anticipated to be short-term and temporary and is not anticipated to destroy or adversely modify critical habitat.

Critical habitat (feeding) for leatherback sea turtles stretches along the California coast from Point Arena to Point Arguello east of the 3,000-meter depth contour; and 25,004 $mi^2$ (64,760 $km^2$) stretching from Cape Flattery, Washington to Cape Blanco, Oregon east of the 2,000-m depth contour. The Morro Bay WEA overlaps with approximately 284 $nmi^2$ of critical habitat for leatherback sea turtles. A few leatherback sightings have been made in the vicinity of the WEA, but no sightings of leatherbacks have been recorded in the Morro Bay WEA (NMFS 2012) and 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 are not anticipated to destroy or adversely modify critical habitat.

**Conclusion**

BOEM places stipulations in leases that protect the environment during proposed activities, including stipulations resulting from consultations required under other Federal statutes (described in detail in Appendix D). Due to these stipulations, and to the nature of the proposed activities, the impacts to critical habitat and protected marine mammal and sea turtle species from site assessment and site characterization activities related to noise from HRG and geotechnical surveys, collisions with project-related vessels, and entanglement in metocean buoy moorings are anticipated to be negligible.

### 3.5.3 No Action Alternative

Of the approximately 40 species of marine mammals known to occur in California waters, 24 marine mammal and a single sea turtle species (leatherback sea turtle) are likely to occur within the Proposed Action Area. Eight of these species (blue, fin, sei, humpback, gray, sperm whales, and leatherback sea turtles) are listed as endangered under the ESA and the southern sea otter and Guadalupe fur seal are listed as threatened. Detailed species descriptions, including status, habitat ranges, population trends, predator/prey interactions, and species-specific threats are described in H.T. Harvey & Associates (2020); this document is incorporated by reference.

Marine mammals and sea turtles in the Proposed Action Area are subject to a variety of ongoing anthropogenic impacts that overlap with the Proposed Action including collisions with vessels (ship strikes), entanglement, fisheries bycatch, anthropogenic noise, disturbance of marine and coastal environments, effects on benthic habitat, and climate change (Carretta et al. 2021). Climate change has the potential to impact the distribution and abundance of marine mammal prey due to changing water temperatures, ocean currents, and increased acidity (Meyer-Gutbrod et al. 2021; Sydeman et al. 2015). Additionally, bottom trawling and benthic disruption have the potential to result in impacts on prey availability and distribution.

Under this alternative, commercial leases and grants would not be issued in the Morro Bay WEA and the negligible to minor impacts to marine mammals and sea turtles from the Proposed Action will not occur. However, BOEM expects ongoing activities and planned actions to have continuing regional impacts on marine mammal and sea turtle species over the timeframe considered in this EA.

## 3.6 COASTAL AND MARINE BIRDS

### 3.6.1 Affected Environment

The marine and coastal bird population off central California is both diverse and complex, being composed of as many as 165 species (eBird 2022e). Of the many different types of birds that occur in this area, three groups are generally the most sensitive to the potential impacts of the Proposed Action: marine birds (e.g., loons, grebes, shearwaters, storm-petrels, cormorants, gulls, terns, and alcids), waterfowl (geese and ducks), and shorebirds (e.g., plovers and sandpipers). While some of these species breed in the area, others may spend their non-breeding or "wintering" period there or may simply pass through during migration. This analysis considers Morro Bay and its shorelines, and the offshore cable routes and WEA.

Nearshore species generally occupy relatively shallow waters inshore of the continental slope waters. These species spend almost their entire time on the water surface. In the Proposed Action Area, the most common nearshore species are Red-throated, Pacific and Common Loons (*Gavia stellata, G. pacifica*, and *G. immer*); Western Grebes (*Aechmophorus occidentalis*); Surf and White-winged Scoters (*Melanitta perspicillata* and *M. deglandi*); and Brandt's and Pelagic Cormorants (*Phalacrocorax penicillatus* and *P. pelagicus*). Other species associated with nearshore waters include nearshore terns, such as summering Caspian Terns (*Hydroprogne caspia*) and postbreeding Elegant Terns (*Thalasseus elegans*). Brown Pelicans (*Pelecanus occidentalis*) are another common postbreeding visitor in nearshore waters. Several species of gulls and Common Murres (*Uria aalge*) are abundant seasonally in nearshore waters, and Red-necked (*Phalaropus lobatus*) and Red (*Phalaropus fulicarius*) Phalaropes occur during migration. The Marbled Murrelet (*Brachyramphus marmoratus*), listed as threatened under Federal ESA and endangered under the California Endangered Species Act (CESA), breeds in coastal old growth forests north of Monterey Bay but disperses south to the nearshore waters off the San Luis Obispo County coastline. In central California, nearshore species occur in highest numbers during the winter months; relatively few remain during the summer except for those species that breed locally or disperse northward from southern breeding colonies in the summer.

Pelagic species generally occupy deeper waters over the continental shelf break (>200 m (656 ft)) and can occur in substantial densities far from shore (Ainley and Terrill 2022). These species spend much of their time on the water surface or diving for food. In the Proposed Action Area, common offshore species include Sooty, Pink-footed, Buller's, and Black-vented Shearwaters (*Ardenna griseus, A. creatopus, A. bulleri*, and *Puffinus opisthomelas*); Northern Fulmars (*Fulmarus glacialis*); and Pomarine, Parasitic, and Long-tailed Jaegers (*Stercorarius pomarinus, S. parasiticus*, and *S. longicaudus*). Shearwaters are found primarily in spring–fall, Northern Fulmars in winter, and jaegers during the spring and fall migrations. Species characteristic of the deep-water pelagic zone include several species of albatross including the Black-footed Albatross (*Phoebastria nigripes*), the rarer Laysan Albatross (*Phoebastria immutabilis*), and the rare and federally endangered Short-tailed Albatross (*Phoebastria albatrus*). Several species of alcids occur off the central California coast, including the Common Murre (*Uria aalge*), Cassin's Auklet (*Ptychoramphus aleuticus*), and Rhinoceros Auklet (*Cerorhinca monocerata*). Nonbreeding South Polar Skuas (*Stercorarius maccormicki*) occur in the summer and fall. Offshore gulls and terns in this zone include Western Gulls (*Larus occidentalis*); migrating Sabine's Gulls (*Xema sabini*), Common Terns (*Sterna hirundo*) and Arctic Terns (*Sterna paradisaea*); and wintering Short-billed Gulls (*Larus canus*), California Gulls (*Larus californicus*), Herring Gulls (*Larus argentatus*), Glaucous-winged Gulls (*Larus glaucescens*), and Black-legged Kittiwakes (*Rissa tridactyla*). Gadfly petrels (*Pterodroma spp.*) are rare over deep pelagic waters beyond the continental shelf break and include the federally listed Hawaiian Petrel (*Pterodroma sandwichensis*), Cook's Petrel (*Pterodroma cookii*), and Murphy's Petrel (*Pterodroma ultima*). Although these species typically occur in deep water west of the Proposed Action Area, they have all been observed over the continental shelf break on a number of occasions off central California (eBird 2022f).

In addition to seabirds, there are a number of waterbirds and shorebirds that occupy coastal and estuarine habitats in the vicinity of the Proposed Action. Morro Bay is an important wintering area for Black Brant (*Branta bernicla nigricans*), with as many as 5,000 occurring there (Chipley et al. 2003). Other waterfowl found from fall through spring include Canada Goose (*Branta canadensis*), Blue-winged Teal (*Spatula discors*), Cinnamon Teal (*Spatula cyanoptera*), Northern Shoveler (*Spatula clypeata*), Gadwall (*Mareca strepera*), American Wigeon (*Mareca americana*), Mallard (*Anas platyrhynchos*), Northern Pintail *(Anas acuta*), Green-winged Teal (*Anas crecca*), and Bufflehead (*Bucephala albeola*). Large numbers of shorebirds are present during much of the year with tens of thousands stopping over during migration (Chipley et al. 2003). Shorebirds wintering in large numbers include Marbled Godwits (*Limosa fedoa*), Willets (*Tringa semipalmata*), and Long-billed Curlews (*Numenius americanus*). Nearly 40 shorebird species use a variety of habitats in the Morro Bay area. Many of the locally occurring shorebirds are migratory in this area with the majority occurring during the spring and fall migrations and during the winter; very few shorebirds breed in this area. Although most shorebirds occupy coastal wetlands, including estuaries, lagoons, and salt and freshwater marshes, they also utilize other coastal habitats, including sandy beaches, rocky shores, and open ocean. Other common shorebird species in central California and the Proposed Action Area include American Avocets (*Recurvirostra americana*), Black Oystercatchers (*Haematopus bachmani*), Black-bellied Plovers (*Pluvialis squatarola*), Semipalmated Plovers (*Charadrius semipalmatus*), Whimbrels (*Numenius phaeopus*), Black Turnstones (*Arenaria melanocephala*), Surfbirds (*Calidris virgata*), Sanderlings (*Calidris alba*), Dunlins (*Calidris alpina*), Least Sandpipers (*C. minutilla*), Western Sandpipers (*Calidris mauri*), Short-billed and Long-billed

Dowitchers (*Limnodromus griseus* and *L. scolopaceus*), and Greater Yellowlegs (*Tringa melanoleuca*). The federally threatened Western Snowy Plover (*Charadrius nivosus nivosus*) nests and winters on sandy beaches along the San Luis Obispo County coastline.

Several bird species that have the potential to occur within the Proposed Action Area have been afforded protected status by the state and/or Federal governments due to declining populations and/or habitats. In addition, all native birds within the area are protected by the Migratory Bird Treaty Act of 1918, which is enforced by the USFWS. Special-status marine bird species found within the vicinity of the proposed activities are listed in Table 3-8 below.

**Table 3-8: Special-Status Marine and Coastal Birds Within or near the Proposed Action Area**

| Common Name | Scientific Name | Federal Status | State Status |
|---|---|---|---|
| Brant | *Branta bernicla* | - | SSC |
| Harlequin Duck | *Histrionicus histrionicus* | - | SSC |
| Black Oystercatcher | *Haematopus bachmani* | BCC | - |
| Mountain Plover | *Charadrius montanus* | BCC | SSC |
| Western Snowy Plover | *Charadrius nivosus nivosus* | T, BCC | SSC |
| Marbled Godwit | *Limosa fedoa* | BCC | - |
| Red Knot | *Calidris canutus* | BCC | - |
| Short-billed Dowitcher | *Limnodromus griseus* | BCC | - |
| Willet | *Tringa semipalmata* | BCC | - |
| Marbled Murrelet | *Brachyramphus marmoratus* | T | E |
| Scripps’s Murrelet | *Synthliboramphus scrippsi* | - | T |
| Guadalupe Murrelet | *Synthliboramphus hypoleucus* | BCC | T |
| Craveri's Murrelet | *Synthliboramphus craveri* | BCC | - |
| Ancient Murrelet | *Synthliboramphus antiquus* | BCC | - |
| Cassin’s Auklet | *Ptychoramphus aleuticus* | - | SSC |
| Rhinoceros Auklet | *Cerorhinca monocerata* | - | WL |
| Tufted Puffin | *Fratercula cirrhata* | - | SSC |
| Heermann’s Gull | *Larus heermanni* | BCC | - |
| Western Gull | *Larus occidentalis* | BCC | - |
| California Gull | *Larus californicus* | - | WL |
| California Least Tern | *Sternula antillarum browni* | E | E, FP |
| Laysan Albatross | *Phoebastria immutabilis* | BCC | - |
| Black-footed Albatross | *Phoebastria nigripes* | BCC | - |
| Short-tailed Albatross | *Phoebastria albatrus* | E | SSC |
| Fork-tailed Storm-Petrel | *Hydrobates furcatus* | - | SSC |
| Ashy Storm-Petrel | *Hydrobates homochroa* | BCC | SSC |
| Black Storm-Petrel | *Hydrobates melania* | BCC | SSC |
| Murphy's Petrel | *Pterodroma ultima* | BCC | - |
| Hawaiian Petrel | *Pterodroma sandwichensis* | E | - |
| Cook's Petrel | *Pterodroma cookii* | BCC | - |
| Buller's Shearwater | *Ardenna bulleri* | BCC | - |
| Pink-footed Shearwater | *Ardenna creatopus* | BCC | - |
| Black-vented Shearwater | *Puffinus opisthomelas* | BCC | - |

| Common Name | Scientific Name | Federal Status | State Status |
|---|---|---|---|
| Brandt's Cormorant | *Urile penicillatus* | BCC | - |
| Double-crested Cormorant | *Phalacrocorax auritus* | - | WL |
| Brown Pelican | *Pelecanus occidentalis* | DE | DE, FP |

Status: E = Endangered T = Threatened DE = Delisted (formerly Endangered) C = Candidate
BCC = Bird of Conservation Concern SSC = Species of Special Concern WL = Watch List
FP = Fully Protected

#### *3.6.1.1 Threatened and Endangered Birds That Could Occur in the Vicinity of the Proposed Action Area*

Short-tailed Albatross. The Short-tailed Albatross (*Phoebastria albatrus*) was federally listed as endangered on June 2, 1970 (35 FR 8491). It is also a California species of special concern. This species is a large pelagic bird with long narrow wings adapted for soaring just above the water surface. As of 2020, 84 percent of the known breeding population uses a single colony, Tsubamezaki, on Torishima Island off Japan. The remaining population nests on other islands surrounding Japan, primarily the Senkaku Islands, and a single pair nested on Midway Atoll from 2008 to 2015. During the non-breeding season, the Short-tailed Albatross regularly ranges along the Pacific Rim from southern Japan to the Gulf of Alaska, primarily along continental shelf margins. It is rare to casual but increasing offshore from British Columbia to southern California (Howell 2012). All recent records along the West Coast have been Stage 1 immatures (Howell 2012), which travel more broadly throughout the north Pacific than adults (USFWS 2014). Most individuals found off California in recent years have been during the fall and early winter with a few records in late winter and early spring (Hamilton et al. 2007). The diet of this species is not well studied; however, research suggests that—at sea during the nonbreeding season—squid, crustaceans, and fish are important prey (USFWS 2008).

The global population is currently estimated to be 7,365 birds (USFWS 2020). There have been 42 records of the species off California since 1977 with 38 records between 1998 and 2020; six of these are off the San Luis Obispo County coast (Tietz and McCaskie 2022). Based on satellite tracking of 99 individuals between 2002 and 2012, juveniles generally range in shallower, nearer-to-shore waters than adults (e.g., less than 200 m (656 ft) depth) and are more likely than adults to occur off the West Coast of the U.S. and Canada (Deguchi et al. 2012; Suryan et al. 2008; Suryan et al. 2007; Suryan and Fischer 2010; Suryan et al. 2006; USFWS 2014). The extreme rarity of this species off the California coast indicates that the Short-tailed Albatross is highly unlikely to be in the offshore portions of the Proposed Action Area; its presence is anticipated to be limited to occasional occurrences even as the population continues to grow.

Hawaiian Petrel. The Hawaiian Petrel (*Pterodroma sandwichensis*) was federally listed as endangered on March 11, 1967 (32 FR 4001). The species breeds on larger islands in the Hawaiian chain where they nest in burrows on vegetated cliffs, volcanic slopes, and lava flows. The global population is comprised of approximately 52,186 individuals (95 percent Confidence Interval 39,823–67,379), including juveniles and subadults (Joyce 2013; USFWS 2017). The species is absent from Hawaiian waters from November to April when it disperses to the eastern tropical Pacific. Individuals have been recorded off Oregon and California from May to September with most records occurring during July and August (Howell et al. 2014). The first of California's 66 accepted records occurred in May 1992. Records of Hawaiian Petrels have increased such that they are no longer a review species for the California Bird Records Committee. Records were reviewed through 2013; one accepted record was off the San Luis Obispo County coast (Tietz and McCaskie 2022). A review of eBird shows five additional records along the shelf edge off San Luis Obispo County between 2011–2018 (eBird 2022b). This species is typically encountered offshore in deep water, but occasionally individuals are observed over the continental shelf break. In addition to the rarity of the Hawaiian petrel off the California coast, the presence of this species in the offshore portions of the Proposed Action Area would likely be limited to rare occurrences.

Western Snowy Plover. The Pacific Coast population of the Western Snowy Plover (*Charadrius nivosus nivosus*) was listed as threatened on March 5, 1993 (58 FR 12864). The primary reasons for listing this population were loss and degradation of habitat, and human disturbance. A final recovery plan was signed August 13, 2007. Critical habitat for the species was originally designated in 1999 (64 FR 68507), revised in 2005 (70 FR 56970), and revised again in 2012 (77 FR 36728).

The Pacific Coast population of the Western Snowy Plover breeds on the Pacific Coast from southern Washington to southern Baja California, Mexico. The bird is found on beaches, open mudflats, salt pans and alkaline flats, and sandy margins of rivers, lakes, and ponds. It nests in depressions in the sand above the drift zone on coastal beaches, sand spits, dune-backed beaches, sparsely vegetated dunes, beaches at creeks and river mouths, and salt pans at lagoons and estuaries. The breeding season extends from early March to late September, with birds at more southerly locations beginning to nest earlier in the season than birds at more northerly locations (64 FR 68507). In most years, the earliest nests on the California coast generally occur during the first to third week of March. Peak nesting in California occurs from mid-April to mid-June, while hatching lasts from early April through mid-August. There are eight designated critical habitat units for the Western Snowy Plover along the San Luis Obispo County coastline (77 FR 36728), and nesting has been observed at a minimum of 14 locations along the coast with the highest numbers at the Morro Bay Sandspit and Oceano Dunes (USFWS unpublished survey data 2018).

In winter, the taxon is found on many of the beaches used for nesting as well as on beaches where they do not nest, in man-made salt ponds, and on estuarine sand and mud flats. The winter range is somewhat broader and may extend to Central America (Page et al. 1995). The majority of birds along the coast winter south of Bodega Bay, California (Page et al. 1986). This taxon may be found wintering at any beach with suitable habitat along the California coast, including several locations in the Proposed Action Area. Western Snowy Plovers were reported during winter surveys of beaches in San Luis Obispo County between 2003-2015, including San Simeon State Beach, Estero Bluffs State Beach, Morro Strand State Beach, Morro Bay Sandspit, and Ocean Dunes (USFWS unpublished survey data 2015, 2019).

Marbled Murrelet. The Marbled Murrelet (*Brachyramphus marmoratus*) was federally listed as threatened on October 1, 1992, within the states of Washington, Oregon, and California (57 FR 45328). Populations of the species in Alaska and British Columbia were not listed under the ESA. The Marbled Murrelet is a small seabird that spends most of its life in the nearshore marine environment, but nests and roosts inland in low-elevation old growth forests, or other forests with remnant large trees. Critical habitat for the species was designated on May 24, 1996 (61 FR 26256) and was later revised in a final rule published on October 5, 2011 (76 FR 61599). A final determination published on August 4, 2016 (81 FR 51348) determined that the critical habitat for the Marbled Murrelet, as designated in 1996 and revised in 2011, meets the statutory definition of critical habitat under the ESA. No marine areas were designated as critical habitat.

While the species does not nest in the vicinity of the Proposed Action Area, individuals from the population nesting in the Santa Cruz Mountains (and perhaps from more northerly populations) do disperse to the coast and offshore waters of San Luis Obispo County. Marantz (1986) characterized them as a rare transient and winter visitant offshore, but possibly regular in late summer in San Luis Obispo County. In a study where Marbled Murrelets nesting in the Santa Cruz Mountains were radiomarked (Peery et al. 2008), 3 of 46 birds (7 percent) radiomarked during the breeding season dispersed considerable distances (138–220 km, 86–137 mi) to the San Luis Obispo County coast. Nine of the 20 murrelets radiomarked in the post-breeding season dispersed long distances, 8 of which were relocated along the San Luis Obispo County coast after traveling 192–288 km (119–179 mi). Their results indicate that the San Luis Obispo coast extending south to Point Sal in Santa Barbara County is an important wintering area for the species in central California (Peery et al. 2008).

A review of records in eBird (2022d) shows observations along the coast from Arroyo de la Cruz in northern San Luis Obispo County to the Purisima Point area on Vandenberg Air Force Base. Areas with concentrations of Marbled Murrelet observations include Piedras Blancas, Arroyo Laguna, San Simeon Bay, offshore of San Simeon State Park, Cayucos, Morro Bay, San Luis Obispo Bay, and off the Santa Maria River mouth. These records show peaks of occurrence along this stretch of coast in mid-January, May–early June, and mid-August–early November.

Marbled Murrelets forage at sea by pursuit diving in relatively shallow waters, usually between 20 and 80 m (66 to 262 ft) in depth with the majority of birds found as singles or pairs in a band 300–2,000 m (984-6562 ft) from shore (Strachan et al. 1995). After the breeding season, some birds disperse and are less concentrated in nearshore coastal waters, as is the case with some other alcids. Ainley et al. (1995) conducted ship-based surveys off central California and detected most Marbled Murrelets within 7 km of shore with the largest number occurring 3–5 km (1.9–3.1 mi) offshore. They observed one individual 24 km (15 mi) offshore near the edge of the continental shelf break.

California Least Tern. The California Least Tern (*Sterna antillarum browni*) was listed as endangered on October 13, 1970 (35 FR 16047). The recovery plan for the species was published in 1980 (USFWS 1980) and a revised recovery plan was later published in 1985 (USFWS 1985). Critical habitat has not been designated. The primary reasons for listing this species were loss of habitat, human disturbance, and predation. On October 2, 2006, the USFWS announced the completion of a 5-year review of the status of the California Least Tern, wherein they recommended it for downlisting from endangered to threatened (USFWS 2006). However, a proposed rule to downlist the species has not been published to date so the status of the taxa remains endangered throughout its range.

The California Least Tern is a summer visitor to California that breeds on sandy beaches close to estuaries and embayments discontinuously along the California coast from San Francisco Bay south to San Diego County and south into Baja California. The earliest spring migrants arrive in the San Diego area after the first week in April and reach the greater San Francisco Bay area by late April (Small 1994). Nesting colonies are usually located on open expanses of sand, dirt, or dried mud, typically in areas with sparse or no vegetation. Colonies are also usually in close proximity to a lagoon or estuary where they obtain most of the small fish they consume, although they may also forage up to 3–5 km (2–3 mi) offshore. In project vicinity, California Least Terns breed along the coast of San Luis Obispo County at Oceano Dunes and Guadalupe-Nipomo Dunes; there are very few local records of this taxa north of Pismo Beach (eBird 2022c). Fall migration begins the last week of July and first week of August (USFWS 2006) when the subspecies departs for its wintering grounds in Central and South America. Most individuals are gone from southern California by mid-September.

Studies conducted at some of the larger colonies in southern California show that at least 75 percent of all foraging activity during breeding occurs in the ocean (Atwood and Minsky 1983). Approximately 90–95 percent of ocean feeding occurred within 1 mi of shore in water depths of 60 ft or less. California Least Terns were rarely seen foraging at distances between 1–2 mi from shore and were never encountered farther than 2 mi offshore (Atwood and Minsky 1983). However, there is evidence of some migration off California that occurs as far as 20 mi offshore or more based on observations off southern

California (Pereksta, pers obs.). Further evidence offshore Mexico possibly corroborates these observations (Howell and Engel 1993; Ryan and Kluza 1999).

Scripps's Murrelet. The Scripps's Murrelet (*Synthliboramphus scrippsi*) was listed as threatened under CESA on December 22, 2004. At the time of listing, the Scripps's Murrelet was known as Xantus's Murrelet and considered conspecific with the Guadalupe Murrelet (now *Synthliboramphus hypoleucus*); therefore, most of the existing literature on Scripps's Murrelet is associated with its former name (H.T. Harvey & Associates 2020). The breeding range of this small black and white alcid is restricted to 12 nesting islands or groups of islands over a distance of 500 mi in southern California and Baja Mexico (Pacific Seabird Group 2002). The estimated remaining global population of 5,000–20,000 birds is concentrated during the breeding season near the breeding colonies on the Channel Islands and off the coast of northern Baja California. The species typically nests in crevices, caves, under large rocks, on steep cliffs and canyons of offshore islands. The species disperses from breeding areas in late summer and autumn, when they move primarily northward (Whitworth et al. 2000). At this time of year, they are found from southern Baja California to Vancouver Island, British Columbia, with the bulk between central Oregon and central Baja California. The highest numbers of the Scripps's Murrelet have been reported from Point Conception to Monterey Bay and Point Año Nuevo, typically 20–100 km (12–62 mi) offshore, although it is occasionally seen from shore (Briggs et al. 1987). Scripps's Murrelet is considered casual to rare in the offshore portions of the Proposed Action Area. Central California records have occurred from the continental shelf, shelf break, and beyond the shelf break; typically, during the summer to mid-fall postbreeding dispersal period. The Scripps's Murrelet may occur in the offshore portions of the Proposed Action Area but based on the species' known distribution it should only rarely occur during the postbreeding dispersal period, with a higher probability of potential occurrences during warm water years (e.g., El Niño years).

Guadalupe Murrelet. The Guadalupe Murrelet was listed as threatened under CESA on December 22, 2004. The Guadalupe Murrelet was known as Xantus's Murrelet at the time of listing and regarded as conspecific with the Scripps's Murrelet. Of the three species in this genus, the Guadalupe Murrelet is the rarest and most geographically restricted, breeding only on Guadalupe and San Benito Islands off Baja California. Postbreeding dispersal north occurs primarily to waters off southern California, but birds rarely occur north to the pelagic zone off central California, especially during warm water events. There are four records from the Proposed Action Area vicinity in eBird with three of those from the Davidson Seamount (eBird 2022a).

### 3.6.2 Impacts of the Proposed Action

BOEM has conducted several NEPA reviews (e.g., BOEM (2012), BOEM (2014), BOEM (2015), BOEM (2016), BOEM (2020)) for geophysical and geological surveys and offshore wind site assessment activities offshore the Atlantic coast that evaluate impacts to birds that could occur as a result of those activities. This analysis incorporates some of the elements of those analyses while building upon them with specifics for the Morro Bay WEA. The impacts to bird species considered in this EA would be similar to those considered in these recent reviews due to the similarity of impact-causing factors and of bird species composition. This section discusses the potential impacts of routine events associated with the preferred alternative on marine and coastal birds. IPFs for marine and coastal birds include (1) active acoustic sound sources, (2) vessel and equipment noise and vessel traffic, (3) aircraft traffic and noise, (4) metocean buoys, (5) trash and debris, and (6) accidental fuel spills.

#### 3.6.2.1 Active Acoustic Sound Sources

The primary potential for impact to marine and coastal birds from active acoustic sound sources is to marine birds and waterfowl that dive below the water surface and are exposed to underwater noise (Turnpenny and Nedwell 1994), including the Marbled Murrelet as well as other alcids, loons, cormorants, storm-petrels, shearwaters, petrels, grebes, and sea ducks. Among the threatened and endangered species, Western Snowy Plovers are shorebirds that are unlikely to come into contact with HRG surveys. Marbled, Scripps's, and Guadalupe Murrelets are more likely to come into contact with HRG surveys, as they forage offshore and feed by diving. The Short-tailed Albatross and Hawaiian Petrel may occur in the area but generally feed by snatching prey from the sea surface. Only those species that dive are at risk of exposure to active acoustic sound sources since pulses are directed downward and are highly attenuated near the surface. In addition, active acoustic sound sources such as side-scan sonar and sub-bottom profilers are highly directive (e.g., downward, towards the seafloor), with beam widths as narrow as a few degrees; this directivity and narrow beam width also diminishes the risk to bird species other than diving species. Because of these factors, other species of seabirds, waterfowl, and shorebirds would not be affected by active acoustic sound sources and are not discussed further for this IPF.

Birds have a relatively restricted hearing range for airborne noise, from a few hundred hertz to about 10 kHz (Dooling et al. 2000). Data regarding bird hearing range for underwater noise is limited; however, a recent study using psychophysics found that Great Cormorants (*Phalacrocorax carbo*) learned to detect the presence or absence of a tone while submerged (Hansen et al. 2017). The greatest sensitivity was found at 2 kHz, with an underwater hearing threshold of 71 dB re 1 µPa RMS. The hearing thresholds are comparable to seals and toothed whales in the frequency band 1–4 kHz, which suggests that cormorants and other aquatic birds make special adaptations for underwater hearing and make use of underwater acoustic cues (Hansen et al. 2017).

Active acoustic sound sources usually have one or two (sometimes three) main operating frequencies. The frequency ranges for representative sources are 100 and 400 kHz for the side-scan sonar; 3.5, 12, and 200 kHz for the chirp sub-bottom profiler; and 240 kHz for the multibeam depth sounder. The low frequency underwater noise generated by several types of survey equipment (e.g., sub-bottom profilers) would fall within the airborne hearing range of birds, whereas noise generated by other types of survey equipment (e.g., side-scan sonar, depth sounders) is outside of their airborne hearing range, which may be more limited underwater, and should be inaudible to birds.

Some marine birds and waterfowl, including gulls, terns, pelicans, and sea ducks, either rest on the water surface or shallow-dive for only short durations. Most of these birds would be resting on the water surface in the area surrounding survey vessels or would be dispersed; therefore, they would not come into contact with the active acoustic sounds. However, those birds that shallow-dive could come into contact with active acoustic sounds, with the majority of the sound energy directed towards the seafloor. Therefore, the energy level that these diving birds could be exposed to would be for such a short time and have a lower sound energy that it would result in a negligible impact.

Diving marine birds and waterfowl such as alcids, loons, cormorants, storm-petrels, shearwaters, petrels, grebes, and sea ducks could be susceptible to active acoustic sounds generated from survey equipment, especially those species that would likely dive, rather than fly away from a vessel (e.g., grebes, loons, alcids, and some diving ducks). However, seismic pulses are directed downward and highly attenuated near the surface; therefore, there is only limited potential for direct impact from the low frequency noise associated with active acoustic sound sources to affect diving birds. In addition, active acoustic sound sources such as side-scan sonar and sub-bottom profilers are highly directive, with beam widths as narrow as a few degrees or narrower; the ramifications of this directionality include a lower risk of high-level exposure to diving birds that may forage close to (but lateral to) a survey vessel.

Investigations into the effects of acoustic sound sources on seabirds are extremely limited, however studies performed by (Stemp 1985) and (Lacroix et al. 2003) did not observe any mortality to the several species of seabirds studied when exposed to seismic survey noise; further, they did not observe any differences in distribution or abundance of those same species as a result of seismic survey activity. Based on the directionality of the sound and the low frequency equipment used for HRG surveys, it is expected that there would be no mortality or life-threatening injury and little disruption of behavioral patterns or other non-injurious effects of any diving marine birds or waterfowl from this direct impact, resulting in a negligible impact.

###### *3.6.2.1.1* Vessel and Equipment Noise and Vessel Traffic

The primary potential impacts to marine and coastal birds from vessel traffic and noise are from underwater vessel and equipment noise, attraction to vessels and subsequent collision or entanglement, disturbance to nesting or roosting, and disturbance to feeding or modified prey abundance (Schwemmer et al. 2011). Since all survey activities are performed from vessels, with the exception of those conducted via aircraft, most survey activities have the potential to impact marine and coastal birds from vessel traffic and the associated vessel and equipment noise.

###### *3.6.2.1.2* Underwater Noise

The sound generated from individual vessels can contribute to overall ambient noise levels in the marine environment on variable spatial scales. As stated above, birds have a relatively restricted hearing range, from a few hundred hertz to about 10 kHz (Dooling et al. 2000) for airborne noise, with few data available regarding bird hearing range for underwater noise. The survey vessels would contribute to the overall noise environment by transmitting noise through both air and water. Underwater noise produced by vessels is a combination of narrow-band (tonal) and broadband sound. Tones typically dominate up to about 50 Hz, whereas broadband sounds may extend to 100 kHz. According to Southall (2005) and Richardson et al. (1995), vessel noise typically falls within the range of 100–200 Hz. Noise levels dissipate quickly with distance from the vessel. The underwater noise generated from the survey vessels would dissipate prior to reaching the coastline and the shore/beach habitats of shorebirds, including the threatened Western Snowy Plover. Because of the dissipation of underwater noise from survey vessels prior to reaching the shore/beach habitat, it is expected that underwater noise would produce negligible impacts to shorebird species, including the Western Snowy Plover.

Some marine birds—including gulls, terns, pelicans, albatrosses, shearwaters, and petrels, as well as the endangered California Least Tern, Short-tailed Albatross and Hawaiian Petrel—either rest on the water surface, skim the water surface, or shallow-dive for only short durations. Because of these behaviors, members of these families would not come in contact with underwater vessel and equipment noise generated from HRG survey vessels, or the contact would be for such a short time that it would result in little disruption of behavioral patterns or other non-injurious effects. Therefore, impacts to these marine birds (including the California Least Tern, Short-tailed Albatross, and Hawaiian Petrel) from vessel and equipment noise would be negligible.

Diving marine birds and waterfowl—including the Marbled, Scripps's, and Guadalupe Murrelets as well as alcids, loons, grebes, cormorants, storm-petrels, shearwaters, petrels, and sea ducks—could be susceptible to underwater noise generated from HRG survey vessels and equipment. Site assessment-related surveys typically use a single vessel. This level of vessel activity per survey event is not a significant increase in the existing vessel and equipment noise, the vessels are typically moving at slow speeds, and noise levels dissipate quickly with distance from the vessel. Machinery noise can be continuous or transient, and variable in intensity. Because of this noise dissipation, only a very small area would experience vessel and equipment noise and potential associated disruption. Therefore, impacts of underwater noise from survey vessels to the Marbled, Scripps's, and Guadalupe Murrelets and other diving marine birds and waterfowl are expected to be negligible.

#### *3.6.2.2 Vessel Attraction*

A single vessel is typically involved in a site assessment-related survey. This level of vessel traffic is not a significant increase when compared to existing vessel traffic in nearshore or offshore waters. In addition, vessels performing surveys are relatively slow moving (approximately 7.4–11.1 km/hr [4–6 kn]), which allows for marine and coastal birds to easily move out of the way of survey vessels.

The potential for bird strikes on a vessel is not expected to be significant to individual birds or their populations. However, a number of marine bird species, including members of the gulls, terns, albatrosses, storm-petrels, shearwaters, petrels, pelicans, and alcids, are generally attracted to offshore rigs and vessels. The attraction of some of these bird species is due to light attraction at night (Black 2005; Montevecchi 2006; Montevecchi et al. 1999; Wiese et al. 2001b). However, some birds engage in ship following as a foraging strategy, especially with commercial or recreational fishing vessels. In addition, in an open environment like the ocean, objects are easy to detect and birds locate vessels easily from long distances and approach to investigate. Bird mortality has been documented as a result of light-induced attraction and subsequent collision with vessels. Birds exhibiting this behavior are typically alcids and petrels, with bird strikes typically occurring at night and occasionally resulting in mortality (Black 2005). In addition, alcids may also dive to escape disturbance, increasing their potential for collision with a vessel or gear in the water. Vessels will have down-shielded lighting to minimize the potential attraction of birds (typical mitigation measures listed below and in Appendix D). However, even if Marbled, Scripps's, and Guadalupe Murrelets or other birds were attracted to the survey vessels or dove near a survey vessel, there is a very low potential for either vessel collision or entanglement since the vessels are moving relatively slowly (7.4–11.1 km/hr [4–6 kn]) and the gear is towed from 1 to 3.5 m (3.3 to 11.5 ft) below the surface. There is no empirical evidence indicating that these types of marine and coastal birds could become entangled in HRG survey gear in spite of the potential for attraction to this gear. Given the low potential for collision or gear entanglement, the impacts are not expected to result in mortality or serious injury to individual birds and are therefore expected to have a negligible impact to these types of seabirds from vessel attraction.

Shorebirds including the Western Snowy Plover that reside along the shorelines are not known to be attracted to vessels. Therefore, there would not be impacts to shorebirds from vessel attraction. The Short-tailed Albatross and Hawaiian Petrel are members of Family *Procellariidae*, which are highly pelagic, and could be attracted to survey vessels offshore. However, as discussed above for other pelagic bird families, there is a low potential of impact from vessel collision or gear entanglement; therefore, the impacts are expected to be negligible to individual birds and their populations, as the Short-tailed Albatross and Hawaiian Petrel are rarely present in the vicinity of the Morro Bay WEA.

##### *3.6.2.2.1* Disturbance to Nesting or Roosting

There is the potential for impact to marine and coastal birds from the potential disturbance of breeding colonies by airborne noise from vessels and equipment (Turnpenny and Nedwell 1994). Most marine and coastal bird species nest and roost along the shore and on coastal islands. Survey vessels for renewable energy projects are expected to make daily round trips to their shore base in Morro Bay.

If a vessel approached too close to a breeding colony, vessels could cause a disturbance to breeding birds, with the potential to adversely affect egg and nestling mortality. Surveys would not occur close enough to land to affect marine and coastal bird breeding colonies during survey activities. However, survey vessels are anticipated to transit from a shore base to offshore and return daily. The expectation is that this daily vessel transit would occur at one of the shore bases identified or at other established ports, which have established transiting routes for ingress and egress in the coastal areas and existing vessel traffic. Because of this existing vessel traffic, it is not anticipated that marine and coastal birds would roost in adjacent areas, or if they did already roost nearby, the addition of survey vessels would not significantly increase the existing vessel traffic. In addition, noise generated from the survey vessels and equipment would typically dissipate prior to reaching the coastline and the nesting habitats of coastal birds. Impacts of airborne vessel and equipment noise to nesting or roosting marine and coastal birds would be negligible.

The Western Snowy Plover and California Least Tern are ground nesters along the shoreline. As discussed above, these taxa are not expected to nest in areas that would be disturbed by survey vessels transiting from port to offshore or coastal locations; therefore, there would be no impact to the nesting of these taxa. The Marbled Murrelet, Scripps's Murrelet, Guadalupe Murrelet, Short-tailed Albatross, and Hawaiian Petrel do not breed anywhere near the Proposed Action Area; therefore, these species would not experience nesting impacts from survey activities.

##### *3.6.2.2.2* Disturbance to Feeding or Modified Prey Abundance

Marine and coastal birds require specialized habitat requirements for feeding (Kushlan et al. 2002). Survey vessel and equipment noise could cause pelagic bird species, including gulls, terns, jaegers, alcids, pelicans, storm-petrels, albatrosses, shearwaters, and petrels, to be disturbed by the survey vessel and equipment noise and relocate to alternative areas, which could result in a localized, temporary displacement and disruption of feeding. These alternative areas may not provide food sources (prey) or habitat requirements similar to that of the original (preferred) habitat and could result in additional energetic requirements expended by the birds and diminished foraging opportunity. However, it is expected that if these species temporarily moved out of the area it would be limited to a very small portion of a bird's foraging range, and it would be unlikely that this temporary relocation would affect foraging success. Impacts to pelagic birds from disturbance associated with vessel and equipment noise would be negligible.

Morro Bay and the San Luis Obispo County coastline are extremely important for transient shorebirds during both northbound and southbound migrations. Possible indirect impacts to marine and coastal birds from vessel and equipment noise may include relocation of some prey species, which is primarily linked to seasonality. During their annual migrations, a number of marine and coastal birds have very specific stopover locations for species-specific foraging to accumulate fat reserves. Because of the noise produced from survey vessels, there is the potential for an indirect impact of modified prey abundance and distribution that migrating birds rely on for the accumulation of fat reserves to fuel their migration, which could result in additional energetic requirements for the migrating birds. However, it is unlikely that bird prey species would be affected by survey vessels to a level that would affect foraging success. As noted previously, surveys would not take place within coastal nearshore areas or within bays (e.g., Morro Bay). If prey species exhibit avoidance of the area in which a survey is performed, it is expected to be limited to a very small portion of a bird's foraging range and for a limited duration. Therefore, there is the potential for minor, temporary displacement of species from a portion of preferred feeding grounds during migration and minor, short-term displacement of marine and coastal bird species from non-critical activities during non-migration seasons resulting in minor impacts.

Western Snowy Plovers feed along the shoreline and would not be impacted by vessel and equipment noise. Marbled Murrelets and California Least Terns forage in nearshore waters, generally within 4 km (2.5 mi) of shore and could be temporarily displaced from preferred foraging areas by transiting vessels. Short-tailed Albatrosses and Hawaiian Petrels are only present while on long-distance foraging trips or during the non-breeding season and would experience temporary displacement. This would be limited to a very small portion of a bird's foraging range. It is unlikely that this temporary relocation resulting from survey vessel noise would affect foraging success of Short-tailed Albatrosses and Hawaiian Petrels.

#### *3.6.2.3 Aircraft Traffic and Noise*

Potential impacts to marine and coastal birds from aircraft traffic include noise disturbance and collision. Noises generated by project-related survey aircraft that are directly relevant to birds include airborne sounds from passing aircraft for both individual birds on the sea surface and birds in flight above the sea surface. Both helicopters and fixed-wing aircraft generate noise from their engines, airframe, and propellers. The dominant tones for both types of aircraft are generally below 500 Hz (Richardson et al. 1995) and are within the airborne auditory range of birds. Aircraft noise entering the water depends on aircraft altitude, the aspect (direction and angle) of the aircraft relative to the receiver, and sea surface conditions. The level and frequency of sounds propagating through the water column are affected by water depth and seafloor type (Richardson et al. 1995). Because of the expected airspeed (250 km/hr [135 kn]), noise generated by survey aircraft is expected to be brief in duration, and birds may return to relaxed behavior within 5 minutes of the overflight (Komenda-Zehnder et al. 2003); however, birds can be disturbed up to 1 km (0.6 mi) away from an aircraft (Efroymson et al. 2000).

The physical presence of low-flying aircraft can disturb marine and coastal birds, including those on the sea surface as well as in flight. Behavioral responses to flying aircraft include flushing the sea surface into flight or rapid changes in flight speed or direction. These behavioral responses can cause collision with the survey aircraft. However, Efroymson et al. (2000) reported that the potential for bird collision decreases for aircrafts flying at speed greater than 150 km/h.

Considering the relatively low numbers of aerial surveys, along with the short duration of potential exposure to aircraft-related noise, physical disturbance, and potential collision to marine and coastal birds, it is expected that potential impacts from this activity would range from negligible to minor.

#### *3.6.2.4 Metocean Buoys*

Potential impacts to marine and coastal birds from metocean buoys include noise disturbance/lighting, collisions, loss of habitat, and decommissioning. Noise and other disturbance generated by the installation or decommissioning of metocean buoys are expected to be short-term and localized, resulting in negligible impacts to birds. Because buoy height is anticipated to be up to approximately 12 m (40 ft) above the ocean surface, collisions with buoys are unlikely. Although seabirds, including terns, gulls, and cormorants may roost on buoys, roosting on buoys does not pose a threat to these birds. Thus, overall impacts to birds from metocean buoys are expected to be negligible. Although it is possible that Peregrine Falcons could use a tower as a perch to opportunistically prey on seabirds, this predation would be expected to have a negligible impact on birds overall.

Due to their excellent vision, birds flying during daytime hours are unlikely to collide with metocean buoys. However, night-flying or flying under other conditions that would impair their vision, birds could potentially collide with metocean buoys, leading to injury or death. Managing the type of lighting present on the buoys can minimize collisions.

Because the metocean buoys would be 34 km (21 mi) or more from the shoreline, the chances of birds colliding with the buoys would be rare, resulting in minor impacts on marine and coastal bird populations. Because the metocean buoys would be removed after the site assessment activities are concluded or at the end of the lease, any impacts on birds from the buoys would be temporary and thus negligible.

#### *3.6.2.5 Trash and Debris*

Plastic is found in the surface waters of all of the world's oceans and poses a potential hazard to marine birds through entanglement or ingestion (Laist 1987). The ingestion of plastic by marine and coastal birds can cause obstruction of the gastrointestinal tract, which can result in mortality. Plastic ingestion can also include blockage of the intestines and ulceration of the stomach. In addition, plastic accumulation in seabirds has also been shown to be correlated with the body burden of polychlorinated biphenyls (PCBs), which can cause lowered steroid hormone levels and result in delayed ovulation and other reproductive problems (Pierce et al. 2004).

Site characterization activities may generate trash comprising paper, plastic, wood, glass, and metal. Most trash is associated with galley and offshore food service operations. However, over the last several years, companies operating offshore have developed and implemented trash and debris reduction and improved handling practices to reduce the amount of offshore trash that could potentially be lost into the marine environment. These trash management practices include substituting paper and ceramic cups and dishes for those made of Styrofoam, recycling offshore trash, and transporting and storing supplies and materials in bulk containers when feasible, and have resulted in a reduction of accidental loss of trash and debris. In addition, all authorizations for shipboard surveys would include guidance for marine debris awareness. The guidance would be similar to BSEE's Notice to Lessees (NTL) No. 2015-G03 ("Marine Trash and Debris Awareness and Elimination") or any NTL that supersedes this NTL. Therefore, the amount of trash and debris dumped offshore would be expected to be minimal, as only accidental loss of trash and debris is anticipated, some of which could float on the water surface. Therefore, impacts from trash and debris on marine and coastal birds, as generated by site characterization vessels or sampling and other site characterization related activities, would be negligible.

#### *3.6.2.6 Impacts of Accidental Fuel Spills*

An accidental event could result in release of fuel or diesel by a survey vessel. Spills occurring at the ocean surface would disperse and weather. Volatile components of the fuel would evaporate. Fuel and diesel used for operation of survey vessels is light and would float on the water surface. There is the potential for a small proportion of the heavier fuel components to adhere to PM in the upper portion of the water column and sink. This accidental spill could occur either offshore or nearshore, and the marine and coastal bird species affected, and the type of effect, would differ depending on the location of the spill (Castege et al. 2007; Wiese et al. 2001a). If the accident occurred in nearshore waters, shorebirds (including Western Snowy Plovers, Marbled Murrelets, California Least Terns, and waterfowl) and coastal seabirds (such as gulls, terns, loons, pelicans, cormorants, and grebes) could be impacted either directly or indirectly. Direct impacts would include physical oiling of individuals. The effects of oil spills on coastal and marine birds include the potential of tissue and organ damage from oil ingested during feeding and grooming from inhaled oil, and stress that could result in interference with food detection, predator avoidance, homing of migratory species, and respiratory issues.

Indirect effects could include oiling of nesting and foraging habitats and displacement to secondary locations. The potential of a vessel collision occurring is quite low, with the potential for a resultant spill even lower. An accidental event could result in release of fuel or diesel by a survey vessel, but such an event has a remote probability of occurring. Therefore, an accidental fuel spill within nearshore waters would not be expected to result in significant impacts to these types of coastal and marine birds. Impacts to birds from accidents are unlikely; however, if they occur, there could be possible impacts on their food supply. Impacts to shorebirds, waterfowl, and marine bird species would range from negligible to minor depending on timing and location. Since the populations of the Western Snowy Plover, Marbled Murrelet, and California Least Tern are already in peril, if an accidental fuel spill occurred that affected any of these species or their food supply, there would be a moderate impact to these species since birds are very susceptible to oiling impacts.

If the accidental event occurred in offshore waters, fuel and diesel would float on the water surface. There is potential for oceanic and pelagic seabirds, such as alcids, storm-petrels, albatrosses, shearwaters, and petrels, to be directly and indirectly affected by spilled diesel fuel. Impacts would include oiling of plumage and ingestion (resulting from preening). Indirect impacts could include oiling of foraging habitats and displacement to secondary locations. The potential of a vessel collision occurring is quite low, with the potential for a resultant spill even lower. Dispersal, weathering, and evaporation would reduce the amount of fuel remaining on the sea surface. Impacts to oceanic and pelagic birds from a spill incident involving survey vessels within offshore waters would range from negligible to minor. However, since populations of Short-tailed Albatross and Hawaiian Petrel are already imperiled, if an accidental fuel spill occurred that affected them, there would be a moderate impact to that species since birds are very susceptible to oiling impacts.

#### *3.6.2.7 Measures to Minimize Potential Adverse Impacts to Birds*

To minimize the potential for adverse impacts on birds, BOEM has developed measures to reduce or eliminate the potential risks to or conflicts with specific environmental resources. If leases or grants are issued, BOEM may require the lessee to comply with these measures, as deemed appropriate at the time of review, through lease stipulations and/or as conditions of SAP approval. The following measures are intended to ensure that the potential for adverse impacts on birds is minimized, if not eliminated.

- The lessee will use only red flashing strobe-like lights for aviation obstruction lights and must ensure that these aviation obstruction lights emit infrared energy within 675–900 nanometers wavelength to be compatible with DoD night vision goggle equipment.
- Any lights used to aid marine navigation by the lessee during construction, operations, and decommissioning of a meteorological tower or buoys must meet USCG requirements for private aids to navigation (Form CG-2554: https://www.dcms.uscg.mil/forms/smdsearch4081/2554/).
- For any additional lighting not described in (1) or (2) above, the lessee must use such lighting only when necessary, and the lighting must be hooded downward and directed when possible, to reduce upward illumination and illumination of adjacent waters.
- An annual report shall be provided to BOEM documenting any dead birds found on vessels and structures during construction, operations, and decommissioning. The report must contain the following information: the name of species, date found, location, a picture to confirm species

identity (if possible), and any other relevant information. Carcasses with Federal or research bands must be reported to the U.S. Geological Survey's Bird Band Laboratory, available at https://www.pwrc.usgs.gov/BBL/bblretrv/.

- Anti-perching devices must be installed on the metocean buoys in order to minimize the attraction of birds.

**Conclusion**

Overall, impacts to birds would be negligible. The construction, presence, and decommissioning of metocean buoys would pose minimal threats to birds. Loss of water column habitat, benthic habitat, and associated prey abundance are expected to have negligible impacts because of the small area affected by buoys. Impacts to birds in coastal waters from vessel traffic are expected to be negligible due to the amount of existing vessel traffic. Impacts on birds from site characterization surveys are expected to be negligible. Impacts to birds from trash or debris releases and from accidental fuel spills would be moderate for species that have special status designations and are susceptible to spills, but since it is an accidental impact and unlikely to happen, the impact to birds in general are expected to be negligible. Potential noise impacts from metocean buoy deployment could have localized, short-term minor impacts on birds foraging near or migrating through the construction site, and noise impacts from decommissioning are expected to be negligible. The risk of collision with the metocean buoy would be negligible because of the buoy's height and distance from shore. Additionally, lessees operating on the OCS can reduce impacts to birds by following the Best Management Practices outlined in this document and Appendix D.

### 3.6.3 Bats

#### *3.6.3.1 Impacts of the Proposed Action*

While bats are expected to be rare in the Morro Bay WEA, bats could have avoidance or attraction responses to vessels and buoys due to noise, lighting, and the possible presence of insects. Bats have been recorded as using offshore ships as opportunistic stopover sites (Pelletier et al. 2013); thus, while it is undocumented, it is possible that vessels could unintentionally transport bats into the offshore environment.

The bat species that could occur offshore over Federal waters are the hoary bat (*Lasiurus cinereus*) and western red bat (*Lasiurus blossevillii*) (H.T. Harvey & Associates 2020). Hoary bats are known to migrate south in autumn offshore and along the coast of central California, and western red bats are also known to migrate offshore of central California (Cryan and Brown 2007). Some species of bats hunt for insects in offshore areas where they normally migrate across open ocean areas, such as the Baltic Sea, and have been found to forage for flying insects around, and rest on, offshore wind turbines (Ahlén et al. 2007). No other species of bats are expected to occur in the marine portion of the Proposed Action area based on the lack of museum records and literature.

##### *3.6.3.1.1* Site Characterization Activities

Impacts to bats from site characterization activities would be limited to avoidance or attraction responses to the vessels (or aircraft) conducting surveys. Lights and noise from vessels associated with site characterization activities could potentially disturb migrating or feeding bats and affect a bat's ability to forage, navigate, and communicate easily (Schaub et al. 2008). However, site characterization activities would not be concentrated and the noise and light from vessels are not likely to be intense.

Few bats are expected to migrate or forage in the WEA, and activity, if any, is most likely to occur during a short period during migration in the late summer or early fall. Therefore, any impacts on bats from site characterization activities would be negligible.

#### *3.6.3.1.2* Site Assessment Activities

Lights and noise from the vessels associated with construction, operation, and decommissioning of the metocean buoy(s) could affect a bat's ability to forage, navigate, and communicate easily and influence the behavior of migrating or feeding bats (Schaub et al. 2008; Stone et al. 2009).

No studies of the effects of intense light have focused on the bat species that may be found in the WEA. From light tolerance studies, Myotis species appear to be the species most intolerant of intensely lighted areas (Lacoeuilhe et al. 2014; Stone et al. 2009) and most likely to have foraging and migratory behavior affected. Few Myotis, if any, are expected to occur in the WEA.

Red aviation lighting does not attract invertebrate prey (Bennett and Hale 2014). A study of the effects on bats from red aviation lighting on wind turbines found that hoary bats are neither attracted nor repelled from such lighting, and the eastern red bat is not attracted to aviation lights (Bennett and Hale 2014). No evidence suggests that the hoary bat or western red bat is repelled by light.

Some species of bats, particularly passive listening bats such as Myotis, can be repelled from areas with constant broadband noise (Schaub et al. 2008). Species using passive listening (using prey generated sound to detect prey) continue to emit echolocation calls while approaching prey (Russo et al. 2007), which suggests that, although foraging success in Myotis species could be affected by noise, there is no reason that navigation and communication will be affected. A study by Bunkley and Barber (2015) concluded that Myotis species were not affected by compressor noise, which is broadband in nature and may be assumed to be similar to generator noise. Acoustic deterrent research has inferred through collision mortality comparisons that broadband ultrasonic broadcasts can reduce bat activity, with silver-haired bats and hoary bats avoiding areas with such broadcasts (Arnett et al. 2013). Broadband ultrasonic noise is dissimilar from any noise anticipated from vessels associated with construction, operation, and decommissioning of a metocean buoy.

Not all bat species are equally affected by either light or noise, or by the same types of light and noise, and data show some species of bat continuing to forage in both lighted and noisy suburban habitats, while foraging efficiency of other species has been adversely affected (Arnett et al. 2013; Bunkley and Barber 2015; Bunkley et al. 2015; Rydell 1991; Threlfall et al. 2012). No studies specifically address the effect of audible acoustic noise on the bat species expected to be found most often in the offshore environment—western red bat and hoary bat—so it is unknown if these species could be repelled or unaffected by noise. However, because bats do not depend on food or resting opportunities in the WEA, and because site assessment activities will be largely during daylight hours and of short duration, impacts to bats in the WEA are expected to be negligible.

The metocean buoy(s) could potentially provide a roosting opportunity not only for bats, but also birds that prey on bats such as gulls and Peregrine Falcons (Speakman 1991). If bats were active during daylight and early dusk hours near the tower or buoys, there would be an opportunity for predation on bats while they forage or migrate offshore. Given the scarcity and distribution of both bats and predatory birds in the WEA, predation on bats is remote and unlikely, and impacts are expected to be negligible.

It is rare but possible that migrating bats may be driven into offshore OCS waters by a storm or high winds and subsequently into a buoy. Bat collisions with stationary structures, including meteorological towers, have been reported and are most likely to occur during stormy weather (Crawford and Wilson Baker 1981). However, the land-based roosting, breeding, and foraging behavior of bats, as well as their limited home ranges and echolocation sensory systems, suggest that there is little risk of a bat being blown that far out of its habitat range. In the unlikely event that a bat blown off course returns from the open ocean in the vicinity of the buoy in the WEA, the chances of the bat striking the tower or buoy are very small and would therefore be negligible.

The impacts from accidental fuel spills should not interfere with any aspect of bat behavior offshore, and impacts would therefore be negligible.

**Conclusion**

To the extent that there would be any impacts on individual bats, the overall impact on bats would be negligible. There is evidence to suggest that two species of migratory tree bats, none of which are state or federally listed, could migrate through the WEA in very low abundance, and mostly during the late summer and early fall. Myotis species could potentially occur in the WEA, although occurrence is anticipated to be rare. During periods of high vessel activity, particularly nocturnal activities, there is a small chance that bats might avoid any areas associated with the Proposed Action. The metocean buoy could serve as a roosting structure for bats and birds. The presence of a predatory bird at the tower or buoys could increase the possibility of predation if bird presence coincides with bat migration or foraging before darkness. The likelihood of collision between bats and boats or the buoy would be remote. Instances of bat collisions with towers are reported infrequently at terrestrial sites, and distribution and scarcity of bats in the offshore environment further reduce the potential for a collision with a comparatively small and isolated buoy offshore. The BMPs for birds listed in Appendix D, including lighting restrictions and installation of anti-perching devices, may also reduce potential impacts on bats.

### 3.6.4 No Action Alternative

Coastal and marine birds and bats in the geographic analysis area are subject to a variety of ongoing human-caused impacts that overlap with the Proposed Action, including fisheries bycatch in gill-net and other fisheries, oil spills, various contaminants, plastics pollution, anthropogenic noise, habitat destruction, introduced predators, disturbance of marine and coastal environments, and climate change. Many coastal and marine bird migrations cover long distances, and these factors can have impacts on individuals over broad geographical scales. Climate change has the potential to impact the distribution and abundance of coastal and marine bird prey due to changing water temperatures, ocean currents, and increased acidity.

Bats are subject to a variety of ongoing human-caused impacts, including white-nose syndrome and other diseases, wind energy, habitat loss, pesticides, disturbance, persecution, and climate change. However, these threats are largely confined to terrestrial areas, so these potential stressors are not expected to overlap with the Proposed Action, except for climate change. It is not known how changes in weather patterns or other climate change-driven events like heat waves, droughts, wildfires, and intense storms may affect the presence of bats offshore. The bat species that could occur in the Proposed Action Area are highly migratory species, which could have their migratory patterns and subsequent presence offshore influenced by climate change-driven effects.

Under this alternative, commercial leases and grants would not be issued in the Morro Bay WEA. However, BOEM expects ongoing activities and planned actions to have continuing regional impacts on coastal and marine birds over the timeframe considered in this EA. Impacts from urban development and increasing air, vessel, and onshore traffic will continue to contribute to climate change and will have negative impacts on coastal and marine birds. Implementation of the No Action Alternative would not meaningfully reduce ongoing impacts to coastal and marine birds from existing and potential future actions. The largest ongoing contributors to impacts on coastal and marine birds and bats stem from habitat destruction, disturbance of marine and coastal environments, and commercial and recreational fishing activities, primarily through bycatch.

## 3.7 COMMERCIAL FISHING

### 3.7.1 Affected Environment

The waters offshore California support numerous types of fishing, and stakeholders place high cultural and economic significance on these activities. Lisa Wise Consulting (2008; 2015) and California Department of Fish and Wildlife (CDFW 2021) describe the characteristics of commercial fishing in the Morro Bay region and these citations are incorporated by reference for this assessment. During 2010–2019, the ex-vessel value of all marine commercial fisheries landings within California averaged approximately $226 million per year (CDFW 2021) (Table 3-9). Within this same period, the Morro Bay Port Complex (MBPC) contributed about 4 percent to this total and ranked last in ex-vessel landings value among the nine port complexes defined by the State of California. Within the MBPC, commercial fishers primarily land their catch at two places, Morro Bay and Port San Luis, and use several smaller locations with less consistency. Sablefish and Dungeness crab dominate the value of landings at Morro Bay, and Dungeness crab and two species of nearshore rockfishes are most important at Port San Luis. Twenty-one other taxa recorded at least 1 percent of value landed at one or more of the local harbors. Gear and methods fishers use to ply the waters offshore California include trawl, pot/trap, net, harpoon, diving, longline, and other hook-and-line gear (jigs, bait, or trolling). The marine and coastal habitats and associated biotic assemblages that support regional fisheries are described in Section 3.4.

**Table 3-9: Ex-vessel Value (2021$) of Landings for Some California Commercial Fisheries**

| Location/Fishery | Average Annual Ex-vessel Landings Value (2021$) 2010–2019* | Statewide Value % | Regional MBPC Value % | Local Harbor Value % | Depth (m) or Offshore Range (km) of Potential Fishing Grounds† | Call Area Overlap with Potential Fishing Grounds? |
|---|---|---|---|---|---|---|
| **California Statewide** | 225,829,270 | 100% | - | - | - | - |
| **Morro Bay Port Complex (MBPC)** | 9,285,995 | 4% | 100% | - | - | - |
| **Morro Bay** | 6,984,695 | 3% | 75% | 100% | - | - |
| Sablefish | 2,122,075 | 1% | 23% | 30% | 57 to 1,524 m | Yes |
| Dungeness Crab | 1,461,022 | < 1% | 16% | 21% | Less than 230 m | No |
| Market Squid | 643,946 | < 1% | 7% | 9% | Less than 100 m | No |
| Thornyheads | 442,973 | < 1% | 5% | 6% | 26 to 1,524+ m | Yes |
| Chinook Salmon | 345,726 | < 1% | 4% | 5% | 0 to 46 km offshore | Yes |
| Hagfishes | 322,751 | < 1% | 3% | 5% | 9 to 1,067 m | Yes |
| Spot Prawn | 289,953 | < 1% | 3% | 4% | 122 to 329 m | No |
| Swordfish | 153,889 | < 1% | 2% | 2% | EEZ and int'l waters | Yes |
| Gopher Rockfish | 126,582 | < 1% | 1% | 2% | Less than 81 m | No |
| Ocean (Pink) Shrimp | 116,961 | < 1% | 1% | 2% | 73 to 229 m | No |
| Cabezon | 99,865 | < 1% | 1% | 1% | Less than 91 m | No |
| Petrale Sole | 84,523 | < 1% | < 1% | 1% | 18 to 458 m | No |
| Blackgill Rockfish | 70,514 | < 1% | < 1% | 1% | 88 to 768 m | No |
| Grass Rockfish | 68,407 | < 1% | < 1% | 1% | Less than 46 m | No |
| Black-and-Yellow Rockfish | 66,809 | < 1% | < 1% | 1% | Less than 37 m | No |
| *All other species* | 516,627 | < 1% | < 1% | 7% | - | - |
| **Port San Luis** | 2,126,675 | 1% | 23% | 100% | - | - |
| Dungeness Crab | 574,225 | < 1% | 6% | 27% | Less than 230 m | No |
| Brown Rockfish | 274,751 | < 1% | 3% | 13% | Less than 122 m | No |
| Gopher Rockfish | 225,725 | < 1% | 2% | 11% | Less than 81 m | No |
| Chinook Salmon | 181,411 | < 1% | 2% | 9% | 0 to 46 km offshore | Yes |
| Hagfishes | 147,316 | < 1% | 2% | 7% | 9 to 1,067 m | Yes |
| Sablefish | 97,275 | < 1% | 1% | 5% | 57 to 1,524 m | Yes |
| Cabezon | 94,876 | < 1% | 1% | 4% | Less than 91 m | No |
| Rock Crabs | 92,525 | < 1% | 1% | 4% | Less than 100 m | No |
| Black-and-Yellow Rockfish | 77,220 | < 1% | < 1% | 4% | Less than 37 m | No |
| California Halibut | 57,714 | < 1% | < 1% | 3% | Less than 91 m | No |
| Lingcod | 51,865 | < 1% | < 1% | 2% | Less than 397 m | No |
| Grass Rockfish | 44,686 | < 1% | < 1% | 2% | Less than 46 m | No |
| Vermilion Rockfish | 38,119 | < 1% | < 1% | 2% | Less than 427 m | No |
| Treefish | 35,300 | < 1% | < 1% | 2% | Less than 46 m | No |

| Location/Fishery | Average Annual Ex-vessel Landings Value (2021$) 2010–2019* | Statewide Value % | Regional MBPC Value % | Local Harbor Value % | Depth (m) or Offshore Range (km) of Potential Fishing Grounds† | Call Area Overlap with Potential Fishing Grounds? |
|---|---|---|---|---|---|---|
| Barred Surfperch | 23,956 | < 1% | < 1% | 1% | Less than 73 m | No |
| *All other species* | 109,713 | < 1% | < 1% | 5% | - | - |
| **All Other Locations** | 89,809 | < 1% | 1% | 100% | - | - |
| Ridgeback Prawn | 50,203 | < 1% | < 1% | 56% | 46 to 300 m | No |
| Spot Prawn | 19,428 | < 1% | < 1% | 22% | 122 to 329 m | No |
| Market Squid | 7,588 | < 1% | < 1% | 8% | Less than 100 m | No |
| Rock Crab | 2,297 | < 1% | < 1% | 3% | Less than 100 m | No |
| Warty Sea Cucumber | 1,761 | < 1% | < 1% | 2% | Less than 100 m | No |
| Sablefish | 1,093 | < 1% | < 1% | 1% | 57 to 1,524 m | Yes |
| California Halibut | 1,073 | < 1% | < 1% | 1% | Less than 91 m | No |
| Thornyheads | 1,059 | < 1% | < 1% | 1% | 26 to 1,524+ m | Yes |
| California Spiny Lobster | 927 | < 1% | < 1% | 1% | Less than 91 m | No |
| *All other species* | 4,380 | < 1% | < 1% | 5% | - | - |

Note: * Landing data downloaded from https://www.wildlife.ca.gov/Fishing/Commercial/Landings and adjusted to June 2021 values using the Consumer Price Index Inflation Calculator https://data.bls.gov/cgi-bin/cpicalc.pl.
† Depth data obtained from (1) Status of the Fisheries reports at https://www.wildlife.ca.gov/Conservation/Marine/Status for Blackgill Rockfish, Brown Rockfish, Cabezon, California Halibut, California Spiny Lobster, Dungeness Crab, Gopher Rockfish, Lingcod, Ocean (Pink) Shrimp, Pacific Hagfish, Petrale Sole, Ridgeback Shrimp, Spot Prawn, and Vermilion Rockfish; (2) Miller and Lea (1976) for Barred Surfperch, Black Hagfish, Black-and-Yellow Rockfish, Longspine Thornyhead, Sablefish, Shortspine Thornyhead, and Treefish; and (3) Miller et al. (2017) for Market Squid, Rock Crab, and Warty Sea Cucumber. Chinook Salmon offshore range obtained from Industrial Economics Inc. (2012). Original data converted to metric units when necessary.

Miller et al. (2017) analyzed California Department of Fish and Wildlife (CDFW) landing receipts (also known as “fish tickets”) and demonstrated that fishing effort and economic productivity reflect biological productivity. Species that may be harvested within the WEA are part of fisheries that generally have extensive fishing grounds. Pacific groundfish that form at least 1 percent of a harbor’s landings value during 2010–2019 (Table 3-9) include sablefish, Dover sole, petrale sole, thornyheads, hagfishes, and black rockfish. Within Federal waters, the spatial and depth distribution of fishing effort during 2002–2017 which targeted Pacific Coast groundfish is described by Somers et al. (2020). Frawley et al. (2021) described the distribution of the West Coast albacore fishery between 1974 and 2016. Bellinger et al. (2015) provides some spatial information on the offshore extent of Chinook salmon fishing.

Vessel monitoring system (VMS) data describe the relative offshore distributions of commercial fishing activity for many important fisheries. BOEM funded the development of VMS data for the West Coast and provisional VMS data of all vessels and selected fisheries from 2010 to 2017 are available on Databasin website (https://caoffshorewind.databasin.org/datasets/2884e26d19c54691baa7589228ac985a/). Within the WEA, bottom trawling for Pacific Coast groundfishes shows the greatest activity and within the likely transit zone between ports and offshore areas, fishing activity occurs for most of the other targeted species.

### 3.7.2 Impacts of the Proposed Action

Data collection buoys and vessel traffic associated with the Proposed Action may generate space-use conflicts and interfere with fishing operations by (1) making the area occupied by metocean buoys no longer accessible as fishing grounds, (2) reducing fishing efficiency, and/or (3) causing economic losses associated with gear entanglement. Data collection buoys emplaced within leases may inadvertently be spatially incompatible with nearby fishing operations, particularly for bottom trawling, due to the challenge of navigating and deploying/retrieving fishing gear near fixed structures. Fishers may suffer decreased efficiency when trying to avoid buoys during their operations. If fishers fail to avoid buoys, subsequent entanglement may result in damage to or loss of fishing gear. If damage to a data collection buoy or its scientific instrumentation occurs because of fishing operations, the fishing vessel captain could be held financially responsible. The spatial extent of fishing grounds that may be impacted by buoys and traffic is estimated using, as an analog, USCG safety zone considerations for OCS facilities (33 CFR §147.1), where 500 m (1,640 ft) safety zones were established to promote the safety of life and property (e.g., 33 CFR §147.1109). This approach estimates a 0.785 $km^2$ (0.303 $mi^2$) circular zone per buoy—a fraction of the total fishing grounds available for the Pacific Coast Groundfish Fishery (PFMC 2020), the Pacific Coast Salmon Fishery (PFMC 2016), and the West Coast albacore fishery (Frawley et al. 2021). Given that harvest strategies vary among individual fishers, potential impacts may also vary.

Site characterization and assessment activities and Proposed Action marine vessels mobilizing and transiting from ports to the WEA may reduce efficiency of fishing operations due to time delays associated with congestion or avoidance. Marine vessels associated with the Proposed Action may accidentally damage fishing gear (e.g., by cutting trap floats) or release marine debris which could cause entanglement or interfere with other fishing operations. The MBPC and its nearshore waters host a variety of marine operations and numerous fishers, so the expected increase in activity from Proposed Action vessels will be small compared to the overall level of effort. Lessees have 5 years to complete their surveys; buoy deployments typically last 1 year and a single survey is days or weeks.

Many of the region's important fishing grounds are in depths less than 900 m (2,953 ft), so a buoy within the WEA (900 m and 1,300 m [2,953 ft and 4,265 ft] depth) decreases conflict with the fishing industry due to its offshore location. At the end of the 5-year term data collection instrumentation will be decommissioned, and large marine debris objects removed so any space-use conflict will be eliminated. Vessel operators are required to comply with pollution regulations outlined in 33 CFR 151.51-77 so only accidental loss of trash and debris is anticipated. To enhance navigational safety, lessees will develop a SAP that will include site-specific Best Management Practices (Appendix D) to mitigate navigational concerns, which could become terms and conditions of SAP approval. In addition, lessees will develop a Fisheries Communications Plan with a designated liaison. Other measures may include a Local Notice to Mariners, vessel traffic corridors, lighting specifications, incident contingency plans, or other appropriate measures. Some of these navigational safety measures are also expected to reduce negative interactions between fishers and project vessels.

Geophysical survey equipment that will be used for site characterization of renewable energy leases emits lower energy levels than the airgun surveys used in the past to define petroleum reserves, which required deep penetration of acoustic signals into the seabed. For site characterization, there is either no acoustic penetration into the seabed (e.g., side-scan sonar) or shallow penetration (e.g, sparkers, boomers). There is no evidence that tissue trauma occurs to fishes or invertebrates from the energy levels emitted from foreseeable geophysical survey methods described in this EA.

Compared to marine mammals, fish and invertebrate species use different sensory systems and primarily perceive particle motion rather than sound pressure levels. Behavioral response to anthropogenic noise is expected to be less for fish and invertebrate species than for marine mammals. Recent evidence suggests that noise generated by fishing activity (e.g., seal bombs, bottom trawling, echosounders, vessel noise, etc.) may have a greater acoustic impact to the environment than the expected noise levels generated by site characterization activities described in this EA (Daly and White 2021; Wiggins et al. 2020). BOEM anticipates further investigation to all these anthropogenic noise sources in preparation for future environmental review of a COP.

Including historical vessel traffic data from current fisheries, or from additional fisheries such as albacore tuna, would not change the conclusions of the EA since site characterization activities are only temporary, and only occur within a small proportion of the total available fishing grounds that would be affected at any time.

**Conclusion**

The impact analysis for ascertaining space-use conflicts with commercial fishing considered marine shipping, marine protected areas, and the IPFs associated with the Proposed Action. Potential impacts to commercial fishing from the Proposed Action are expected to be minor and temporary in duration (5 years or less, meaning that although lessees have 5 years to complete their surveys, the surveys themselves will not take 5 years), and primarily associated with a spatial incompatibility around the data collection buoy(s) and interactions with project vessels, which is comparatively small in size when compared to the full extent of available fishing grounds. BOEM recommends lessees to incorporate Best Management Practices that will aim to minimize adverse effects to commercial fishing from their site assessment and site characterization activities.

### 3.7.3 No Action Alternative

Under this alternative, commercial leases and grants would not be issued in the Morro Bay WEA. However, BOEM expects ongoing activities and planned actions to have continuing regional impacts on commercial fishing over the timeframe considered in this EA. Impacts from urban development and increasing air, vessel, and onshore traffic will continue to contribute to climate change and will have negative impacts on commercial fishing. Implementation of the No Action Alternative would not meaningfully reduce ongoing impacts to commercial fishing from existing and potential future actions.

## 3.8 RECREATION AND TOURISM

### 3.8.1 Affected Environment

Marine-based tourism and recreation contribute significantly to San Luis Obispo and Ventura counties' economies. Tourism is San Luis Obispo county's largest industry and a notable contributor to Ventura County's economy. Both coastal land and ocean activities and attractions are utilized by locals and tourists. Shore-based activities include visiting historic towns and landmarks, biking, bird watching, and beach going. Ocean activities include swimming, diving, surfing, kayaking, boating, sailing, and fishing. Recreational fisheries for highly migratory species, such as tuna and billfish, take place in waters deeper than 200 meters (656 ft).

#### *3.8.1.1 Economic Importance of Ocean Recreation and Tourism*

For California's San Luis Obispo County, the total ocean economy is a significant component of the county's total economy. The total ocean economy is a measure of all ocean economic activities within a geography. For San Luis Obispo County, the total ocean economy in 2018 was 3.0 percent of the total economy when measured by Gross Domestic Product (GDP), bringing in $447.9 million, with an average of $49,500 GDP per employee. Of the total ocean economy for San Luis Obispo County as measured by GDP, tourism and recreation made up 91.1 percent, or $407.8 million, with an average of $47,400 GDP per employee. Tourism and recreation are defined as eating and drinking establishments, hotels, marinas, campsites and RV parks, scenic water tours, boat dealers and charters, manufacture of sporting goods, amusement and recreation services, recreational fishing, zoos, and aquariums (NOAA 2022).

Employment based on the ocean economy made up 8 percent of the San Luis Obispo County's total economy in 2018. A total of 9,451 people were employed in the total ocean economy with 402 people being self-employed. Tourism and recreation accounted for 95.2 percent of the total ocean economy when measured by employment with 8,749 people employed, 138 being self-employed (NOAA 2022).

Business establishments based on the total ocean economy account for 5 percent of the county's total economy in 2018, centered around 569 establishments with an average number of 16 employees per establishment. Of that 5 percent, the total San Luis Obispo County economy when measured by establishments, 93.1 percent of that was focused on tourism and recreation. This amounted to 530 establishments with an average of 16 employees per establishment (NOAA 2022).

Wages based on the total ocean economy accounted for 3.8 percent of the county's total economy in 2018, with $214.9 million in wages paid with an average of $23,700 per employee. San Luis Obispo County's total ocean economy wages, tourism, and recreation took 90.4 percent of the total. Wages totaled $194.3 million, with an average of $22,600 per employee (NOAA 2022).

For California's Ventura County, the total ocean economy is a significant component of the county's total economy. The total ocean economy is a measure of all ocean economic activities within a geography. For Ventura County, the total ocean economy in 2018 was 2.6 percent of the total economy when measured by GDP, bringing in $1.2 billion, with an average of $69,000 GDP per employee. Of the total ocean economy for Ventura County as measured by GDP, tourism and recreation made up 56.5 percent, or $677.5 million, with an average of $44,600 GDP per employee (NOAA 2022).

Employment based on the ocean economy made up 5 percent of the Ventura County's total economy in 2018. A total of 17,367 people were employed in the total ocean economy with 560 people being self-employed. Tourism and recreation accounted for 87.4 percent of the total ocean economy when measured by employment with 15,182 people employed, 105 being self-employed (NOAA 2022).

Business establishments based on the total ocean economy account for 4 percent of the county's total economy in 2018, centered around 1,000 establishments with an average number of 17 employees per establishment. Of that 4 percent (the total Ventura County economy when measured by establishments), 84.8 percent was focused on tourism and recreation. This amounted to 848 establishments with an average of 18 employees per establishment (NOAA 2022).

Wages based on the total ocean economy accounted for 2.8 percent of the county's total economy in 2018, with $498.7 million in wages paid with an average of $28,700 per employee. Ventura County's total ocean economy wages, tourism, and recreation represent 65.3 percent of the total. Wages totaled $325.7 million, with an average of $21,500 per employee (NOAA 2022).

### 3.8.2 Impacts of the Proposed Action

#### *3.8.2.1 Routine Activities*

Previous studies have shown that the main IPF associated with site characterization surveys would be the generation of trash and debris. Compliance with Federal regulations and the relative amount of added vessel traffic compared to existing vessel traffic would reduce accidental generation of trash and debris to a minimum. Site assessment activities and site characterization surveys would add a small amount of vessel traffic (see Section 2.2.4.5 and Tables 2-3 and 2-4) and, therefore, the proposed activities are not expected to have a measurable impact on tourism and recreation.

#### *3.8.2.2 Non-Routine Events*

Previous projects have studied the effects of accidental fuel spills on recreation and tourism. Diesel spills were expected to disperse rapidly and the impacts on recreation and tourism were expected to be negligible to minor, depending on the location of the spill.

**Conclusion**

Site assessment activities and site characterization surveys would not impact viewsheds. Based on this, in addition to the relatively small total vessel traffic associated with site characterization surveys and site assessment activities, and the negligible potential impacts from accidental fuel spills, the overall impacts to recreation and tourism are expected to be negligible.

### 3.8.3 No Action Alternative

Under this alternative, commercial leases and grants would not be issued in the Morro Bay WEA. However, BOEM expects ongoing activities and planned actions to have continuing regional impacts on tourism and recreational activity over the timeframe considered in this EA. Impacts from urban development and increasing air, vessel, and onshore traffic will continue to contribute to climate change and will have negative impacts on tourism and recreational activity. Implementation of the No Action Alternative would not meaningfully reduce ongoing impacts to tourism and recreational activity from existing and potential future actions.

## 3.9 SOCIOECONOMICS

### 3.9.1 Affected Environment

#### *3.9.1.1 Population and Demographics*

This section presents an overview of major socioeconomic characteristics and trends to provide a context from which to assess impacts of the Proposed Action. County selection is based on those with ports which may be used by a lessee. Demographic and economic characteristics and trends are presented at the county level. Ports that lessees may use include Morro Bay, Avila Beach, and Port Hueneme due to the proximity of the proposed leases. Both Morro Bay and Avila Beach are within San Luis Obispo County. Port Hueneme is in Ventura County. Both San Luis Obispo County and Ventura County are likely to experience economic impacts associated with the development of offshore leases. Larger ports to the north and south which may be used include Long Beach/Port of Los Angeles and the Port of San Francisco.

San Luis Obispo County is located on California's central coast. The county is bordered on the north by Monterey, on the east by Kern, and to the south by Santa Barbara. San Luis Obispo has several tourist attractions and recreational areas, including Hearst Castle in San Simeon, visited by more than 70,000 people annually. Morro Bay is the only all-weather small craft commercial and recreational harbor between Santa Barbara and Monterey. Currently, there is an interest in developing an offshore commercial wind farm in this area.

Ventura County is located along the southern coast of California. Surrounding counties include Kern County to the north, Los Angeles County to the south and east, and Santa Barbara to the northwest. There are hundreds of miles of national and state parks and forests in Ventura County. The Los Padres National Forest makes up most of the northern half of the county; two major lakes, Lake Casitas and Lake Piru, also lie within Ventura's boundaries. Port Hueneme is the only deep-water port between Los Angeles and San Francisco.

The Port of San Francisco is located approximately 200 mi to the north of the Morro Bay lease area. This port complex was the 10th largest port in the U.S. in 2020. A substantial number of ocean economy-based industries are located within the Port. The surrounding counties contain a large and diverse set of economic activities. Within the greater bay area, the population exceeds 7 million people in nine counties. Impacts from economic development of the Morro Bay leases would be insufficient to have a perceptible impact on local employment and population.

The Ports of Los Angeles and Long Beach located in Los Angeles County are approximately 200 mi to the south of the Morro Bay lease area. These two ports are the 1st and 3rd busiest ports in the U.S. and a substantial number of ocean economy-based industries are located within these ports. Located on the southern coast of the state, Los Angeles County covers over 4,000 $m^2$ and includes San Clemente and Santa Catalina islands. Neighboring counties include Orange, Kern, San Bernardino, and Ventura. Los Angeles county alone has a population of more than 10 million. The surrounding counties also have large populations. Economic development of the Morro Bay leases would be insufficient to have a perceptible impact on local employment and population.

Population and labor force statistics for San Luis Obispo County, Ventura County, and the State of California are presented in Table 3-10. San Luis Obispo and Ventura counties have lower unemployment rates, smaller populations, and lower per capita income when compared to statewide data.

**Table 3-10: Population, Labor Force, and Employment Statistics**

| Area | Population* | Labor Force | Employed | Unemployed | Unemployment Rate | Per Capita Income* |
|---|---|---|---|---|---|---|
| San Luis Obispo County | 277,276 | 133,700 | 128,800 | 4,900 | 3.6% | $61,004 |
| Ventura County | 844,213 | 411,900 | 394,600 | 17,300 | 4.2% | $64,715 |
| California | 39,761,195 | 19,178,900 | 18,138,400 | 1,040,500 | 5.4% | $66,619 |

Source: California Employment Development Department (2021)
*Population and Per Capita Income data are from 2019. All other data (Labor Force, Employed, Unemployed, and Unemployment Rate) are from 2021.

The National Ocean Economics Program publishes datasets on employment and establishments compiled from the Bureau of Labor Statistics on economic activity that typically takes place in the ocean. The industrial sectors for which the data are compiled include living resources, tourism and recreation, and transportation. Data classified as "other" contains information that is aggregated.

As of 2018, ocean-related jobs make up 8 percent of employment within San Luis Obispo County and 5 percent of employment in Ventura County, compared to 3 percent statewide (Table 3-11). In San Luis Obispo and Ventura Counties, over 95 percent and 87 percent of these jobs, respectively, are centered on the tourism and recreation sector, with living resources, transportation, and other jobs comprising the remainder. On a relative basis, the ocean economy provides a relatively high number of jobs at the county level when compared to the total employment within California.

**Table 3-11: Ocean Economy Employment**

| Area | % of Total Economy | Employment | Living Resources | Tourism & Recreation | Transportation | Other |
|---|---|---|---|---|---|---|
| San Luis Obispo County | 8.0% | 9,451 | 1.1% | 95.2% | 1.0% | 2.7% |
| Ventura County | 5% | 17,367 | 1.0% | 87.4% | 4.7% | 6.9% |
| California | 3.0% | 602,454 | 1.5% | 75.3% | 19.3% | 3.9% |

Source: NOAA (2022)

As of 2018, ocean-related wages within San Luis Obispo and Ventura Counties make up 3.8 percent and 2.8 percent of the total economy, respectively, compared to 2.1 percent statewide (Table 3-12). On a relative basis, the ocean economy provides a modestly higher portion of wages at the county level, when compared to the total coastal wages within California. However, wages per employee are significantly below the coastal statewide average in both counties.

**Table 3-12: Ocean Economy Wages**

| Area | % of Total Economy | Wages ($ millions) | Wages per Employee |
|---|---|---|---|
| San Luis Obispo County | 3.8% | $214.9 | $23,700 |
| Ventura County | 2.8% | $499 | $28,700 |
| California | 2.1% | $24,800 | $42,400 |

Source: NOAA (2022)

As of 2018, ocean-related GDP is 3 percent of the total economy for San Luis Obispo County and 2.6 percent for Ventura County compared to 1.7 percent statewide (Table 3-13). On a relative basis, the ocean economy provides a slightly higher portion of GDP at the county level, when compared to the total coastal GDP within California. However, GDP per employee is significantly below and moderately below the coastal statewide average in San Luis Obispo County and Ventura County, respectively.

**Table 3-13: Ocean Economy GDP**

| Area | % of Total Economy | GDP ($ millions) | GDP per Employee |
|---|---|---|---|
| San Luis Obispo County | 3.0% | $447.9 | $49,500 |
| Ventura County | 2.6% | $1,200 | $69,000 |
| California | 1.7% | $49,100 | $83,800 |

Source: NMFS (2018)

## 3.9.2 Impacts of the Proposed Action

Temporary increases in employment from Proposed Action activities, such as surveying, tower and buoy fabrication, and construction would occur in various local economies associated with onshore- and offshore-related industries in the coastal counties of California. An analysis of similar projects on the east coast (BOEM 2014) found that the small number of workers (approximately 10–20 people) directly employed in site characterization surveys would be insufficient to have a perceptible impact on local employment and population.

BOEM expects any beneficial impacts to employment, population, and the local economies in and around San Luis Obispo and Ventura counties to be short-term and imperceptible. When taking into consideration the distribution of activities and the time frame over which they would occur, the impacts would be negligible. Although the approximate number of workers directly employed would be measurable, benefits to the local economy would be difficult to measure; and the overall beneficial impacts to the local economy, and therefore to demographics and employment, would be negligible.

**Conclusion**

BOEM anticipates that the Proposed Action would have beneficial, short-term impacts to demographics and employment in San Luis Obispo and Ventura counties and adjacent areas, but impacts would be imperceptible and are expected to be negligible. Impacts to the Port of San Francisco and Los Angeles/Long Beach ports would be imperceptible and are also expected to be negligible.

### 3.9.3 No Action Alternative

Under this alternative, commercial leases and grants would not be issued in the Morro Bay WEA. However, BOEM expects ongoing activities and planned actions to have continuing regional impacts on economic activity over the timeframe considered in this EA. Impacts from urban development and increasing air, vessel, and onshore traffic will continue to contribute to climate change and will have negative impacts on the region's economy. Implementation of the No Action Alternative would not meaningfully reduce ongoing impacts to economic activities from existing and potential future actions.

## 3.10 HISTORIC PROPERTIES

Historic properties are defined as any pre-contact period or historic period district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP) (54 USC § 300308). This can also include properties of traditional religious and cultural importance to a Tribe that meet criteria for inclusion in the NRHP (54 USC § 302706). Both site assessment activities (i.e., installation of meteorological buoys) and site characterization (i.e., HRG survey and geotechnical exploration) have the potential to affect historic properties. Construction activities associated with the placement of site assessment structures that disturb the ocean bottom have the potential to affect historic properties on or under the seabed. Vessel traffic associated with surveys and construction, although indistinguishable from existing ocean vessel traffic could, at times, be visible from coastal areas, potentially impacting historic properties onshore. Similarly, although indistinguishable from other lighted structures on the OCS, some meteorological buoys might be visible from historic properties onshore.

### 3.10.1 Affected Environment

Historic properties within or nearby the WEA include potential submerged pre-contact sites dating back at least 15,000 years and shipwrecks dating from at least the $16^{th}$ through mid-$20^{th}$ centuries. Based on the current understanding of sea level rise and the earliest date of human occupation in the western hemisphere, any submerged pre-contact site on the Pacific OCS would be located shoreward of the 130 m (427 ft) bathymetric contour line (Clark et al. 2014; ICF International et al. 2013). Additionally, pre-contact period sites would most likely be found in the vicinity of paleochannels or river terraces that offer the highest potential of site preservation; however, preservation conditions are variable and depend on local geomorphological conditions and the speed of sea level rise. Water depths across the WEA range from approximately 860–1,300 m (2,821–4,265 ft), therefore, the potential for submerged pre-contact period sites is non-existent within the WEA. There is, however, the potential for submerged pre-contact sites to exist within a yet to be determined transmission cable corridor extending from the WEA toward shore.

According to the BOEM Pacific Shipwreck Database, there are no reported shipwreck losses within or near the Morro Bay WEA. The California State Lands Commission, which maintains a database of shipwreck losses within state waters, does not report any shipwreck losses within the Morro Bay WEA, however, six shipwrecks are reported to have been lost directly east of the WEA within state waters, all of which date to the mid-20th century. The most significant of these vessel losses is SS *Montebello*, an oil tanker that was torpedoed and sunk during World War II by a Japanese submarine. *Montebello* was en route to Vancouver, BC, carrying over 3 million gallons of crude oil when the vessel was lost on December 23, 1941. The vessel was listed on the National Register of Historic Places in 2016 and is located approximately 18 mi east of the Morro Bay WEA (NOAA 2021).

The information presented in this section is based on existing and available information and is not intended to be a complete inventory of historic properties within the affected environment. The WEA has not been extensively surveyed and that, in part, is the reason that BOEM requires the results of historic property identification surveys to be submitted with a SAP and COP. Additional background information on potential historic properties near the WEA and an overview of the types of cultural resources that might be expected on the Pacific OCS may be found in the BOEM-funded report Inventory and Analysis of Coastal and Submerged Archaeological Site Occurrence on the Pacific Outer Continental Shelf (ICF International et al. 2013).

## 3.10.2 Impacts of the Proposed Action

### *3.10.2.1 Site Characterization*

As described in Section 2.1 above, site characterization activities include shallow hazards assessments, and geological, geotechnical, archaeological, and biological surveys, and may include installation, operation, and decommissioning of data collection buoys. HRG surveys do not impact the seafloor and therefore have no ability to impact cultural resources. Geotechnical testing and sediment sampling does impact the bottom and, therefore, does have the ability to impact cultural resources. However, if the lessee conducts HRG surveys prior to conducting geotechnical/sediment sampling, the lessee may avoid impacts on historic properties by relocating the sampling activities away from potential cultural resources. Therefore, BOEM assumes the lessee will conduct HRG surveys prior to conducting geotechnical/sediment sampling, and, when a potential historic property is identified, the lessee will avoid it.

BOEM recommends lessees to incorporate Best Management Practices into their plans. These practices are typical mitigation measures developed through years of conventional energy operations and refined through BOEM’s renewable energy program and consultations as a part of Section 106 of the National Historic Preservation Act. These measures, which will minimize or eliminate potential effects from site assessment and site characterization activities, protect historic properties and are found in Appendix D. BOEM intends to include the following elements in the lease(s) that will ensure avoidance of historic properties:

The Lessee may only conduct geotechnical exploration activities, including geotechnical sampling or other direct sampling or investigation techniques, in areas of the leasehold in which an analysis of the results of geophysical surveys have been completed for that area. The geophysical surveys must meet BOEM's minimum standards (see BOEM Archaeological Survey Guidelines), and the analysis must be completed by a qualified marine archaeologist who meets both the Secretary of the Interior's Professional Qualifications Standards (48 Federal Register (FR) 44738–44739) and has experience analyzing marine geophysical data. This analysis must include a determination whether any potential archaeological resources are present in the area and the geotechnical (sub-bottom) sampling activities must avoid potential archaeological resources by a minimum of 50 m (164 ft). The avoidance distance must be calculated from the maximum discernible extent of the archaeological resource. In no case may the Lessee's actions impact a potential archaeological resource without BOEM's prior approval.

Additionally, during all ground-disturbing activities, including geotechnical exploration, BOEM requires that the lessee observe the unanticipated finds requirements stipulated in 30 CFR 585.802. If the lessee, while conducting activities, discovers a potential archaeological resource while conducting construction activities or other activities, the lessee must immediately halt all seafloor-disturbing activities within the area of discovery, notify BOEM within 72 hours of the discovery, and keep the location of the discovery confidential and not take any action that may adversely affect the resource until BOEM has made an evaluation and instructed the lessee on how to proceed.

Finally, vessel traffic associated with survey activities, although indistinguishable from existing ocean vessel traffic, could at times be within the viewshed of onshore historic properties. These effects would be limited and temporary.

#### *3.10.2.2 Site Assessment*

As described above, site assessment activities consist of construction, operation, and decommissioning of up to three meteorological buoys. To assist BOEM in complying with the National Historic Preservation Act (NHPA) and other relevant laws (30 CFR 585.611(a), and (b)(6)), the SAP must contain a description of the archaeological resources that could be affected by the activities proposed in the plan. Under its Programmatic Agreement (PA) (Appendix C), BOEM will then consult to ensure potential effects to historic properties are avoided, minimized, or mitigated under Section 106 of the NHPA.

BOEM anticipates that bottom disturbance associated with the installation of meteorological buoys would disturb the seafloor in a maximum radius of 239 m (784 ft) around each buoy anchor location. This includes all anchorages and appurtenances of the support vessels. Impacts on archaeological resources within 239 m (784 ft) of each meteorological buoy could result in direct destruction or removal of archaeological resources from their primary context. Although this would be extremely unlikely given that site characterization surveys described above would be conducted prior to the installation of any structure (see e.g., 30 CFR 585.610-611), should contact between the activities associated with site assessment and a historic property occur, there may be damage or loss to archaeological resources.

Should the surveys reveal the possible presence of an archaeological resource in an area that may be affected by its planned activities, the applicant would have the option to demonstrate through additional investigations that an archaeological resource either does not exist or would not be adversely affected by the seafloor/bottom-disturbing activities (see 30 CFR 585.802(b) and the PA in Appendix C). Although site assessment activities have the potential to affect cultural resources either on or below the seabed or on land, existing regulatory measures, coupled with the information generated for a lessee's initial site characterization activities and presented in the lessee's SAP, make the potential for bottom-disturbing activities (e.g., anchoring, installation of meteorological buoys) to cause damage to cultural resources very low.

Installation of meteorological buoys would likely not be visible from shore based on the low profile of the structure; distance from shore; and earth curvature, waves, and atmosphere. Visual impacts to onshore cultural resources would be limited and temporary in nature and would consist predominately of vessel traffic, which most likely also would not be distinguishable from existing vessel traffic. Therefore, the likelihood of impacts on onshore cultural resources from meteorological structures and from construction vessel traffic would also be very low.

**Conclusion**

Bottom-disturbing activities have the potential to affect historic properties. However, existing regulatory measures, information generated for a lessee's initial site characterization activities, and the unanticipated discoveries requirement make the potential for bottom-disturbing activities (e.g., coring, anchoring, installation of meteorological buoys) to have an adverse effect (i.e., cause significant impact or damage) on historic properties very low. Visual impacts on onshore cultural resources from meteorological structures, and vessel traffic associated with surveys and structure construction, are expected to be negligible and temporary in nature.

### 3.10.3 No Action Alternative

Under the No Action Alternative, no leases or grants would be issued in the Morro Bay WEA at this time, and therefore no lease-related site assessment and characterization impacts on offshore cultural, historical, or archaeological resources would occur. Although leases would not be issued under the No Action Alternative, BOEM expects ongoing activities (such as bottom trawling) and changing environmental conditions to have continuing impacts on historic resources.

## 3.11 ENVIRONMENTAL JUSTICE

Environmental justice (EJ) is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

The effects of this Federal action on minority and low-income populations were analyzed in accordance with Executive Order 12898—*Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations* (Federal Register 1994); Executive Order 13166—*Improving Access to Services for Persons with Limited English Proficiency* (Federal Register 2000); CEQ's Environmental Justice Guidance Under the National Environmental Policy Act (CEQ 1997); and EPA's Technical Guidance for Assessing Environmental Justice in Regulatory Analysis (EPA 2016).

### 3.11.1 Affected Environment

This Federal action's potential area of impact on the human environment is San Luis Obispo County, California, which is the corresponding onshore area with respect to the Morro Bay WEA. Depending on wind velocity, parts of the coastline north of San Luis Obispo County may be downwind of the WEA; however, that area in south Monterey County is part of the Silver Peak Wilderness, is sparsely populated, and has negligible potential for EJ impacts.

#### *3.11.1.1 Demographics*

Demographic analysis of San Luis Obispo County shows that there are no minority populations that exceed 50 percent of the total county population, and that the minority population percentage of the county is generally lower than the minority population percentage of California (Table 3-14).

**Table 3-14: Demographic for San Luis Obispo County and California**

| Category | San Luis Obispo County | California |
|---|---|---|
| Total population | 283, 159 | 39,237,836 |
| White alone | 88.4% | 71.1% |
| Black or African American alone | 2.2% | 6.5% |
| American Indian and Alaska Native alone | 1.4% | 1.7% |
| Asian alone | 4.1% | 15.9% |
| Native Hawaiian and Other Pacific Islander alone | 0.2% | 0.5% |
| Hispanic or Latino | 223.8% | 40.2% |
| White alone, not Hispanic or Latino | 67.5% | 35.2% |
| Persons in poverty | 10.6% | 12.3% |
| Language other than English spoken at home age 5 years + | 17.1% | 43.9% |

Source: U.S. Census Bureau (2021)

EJ issues most often occur on a localized, sub-county scale. Therefore, additional analyses were performed using the EPA's EJSCREEN screening and mapping tool to focus on local demographics in communities adjacent to Morro Bay and Avila Beach (Table 3-15). Demographics were determined for 5-mile radii centered on Los Osos Middle School (located east of Morro Bay), Monte Young Park (north of Morro Bay), and Avila Beach Pier (located at Avila Beach) (Table 3-15). These locations were chosen because they are likely to experience the highest concentrations of air emissions from marine service vessels associated with WEA site characterization and site assessment activities. Again, there were no indications of minority or low-income neighborhoods that might be disproportionately adversely impacted.

California Men's Colony, located northwest of San Luis Obispo, was identified as having a concentrated minority population. However, it is not considered to be a potential receptor that might be adversely impacted because it is located approximately 6 mi east of Morro Bay.

**Table 3-15: Micro-demographics for Selected Areas**

| Category | Los Osos Middle School | Monte Young Park | Avila Beach Pier |
|---|---|---|---|
| Population | 25,246 | 27,582 | 4,956 |
| White | 89% | 91% | 90% |
| Black | 1% | 0% | 1% |
| American Indian | 1% | 1% | 0% |
| Asian | 3% | 3% | 2% |
| Pacific Islander | 0% | 0% | 0% |
| Other | 2% | 2% | 3% |
| Total Hispanic Population | 15% | 14% | 9% |
| Speak English Less Than "Very Well" | 5% | 5% | 1% |
| Spanish Spoken at Home | 14% | 9% | 5% |

| Category | Los Osos Middle School | Monte Young Park | Avila Beach Pier |
|---|---|---|---|
| Household Income Base <$25,000 | 17% | 17% | 11% |
| Household Income Base <$50,000 | 47% | 36% | 28% |

Source: EPA (2022a)

### 3.11.2 Impacts of the Proposed Action

This Federal action involves vessels for each lease conducting survey operations and deploying or servicing buoys. The IPFs with respect to EJ are primarily related to air and water pollutant releases. The air emissions are derived primarily from internal combustion engines used for propulsion of marine vessels, and auxiliary engines used for powered equipment such as cranes and winches. These emissions are primarily $NO_2$, $SO_2$, CO, and PM. Greenhouse gases are also produced, primarily in the form of $CO_2$. Other sources are the emission of hydrocarbons from fuel and lubricants. Fuel and lubricants can be released during both normal operations and as a result of emergency events. In the unlikely event of a marine vessel capsize or hull breach, hydrocarbons will enter the marine environment and either vaporize, become entrained in the seawater, or, if met with an ignition source, would create combustion contaminants, including visible emissions and odors. Liquid and gaseous pollutants can also be released during the vessel refueling process and as breathing losses from both onboard and onshore storage tanks. The possibility of hydrogen releases from buoy lead-acid batteries exists but is negligible.

Vessel operations during activities will be limited in scope and short in duration. Most of the routine emissions from normal vessel operations will be emitted more than 20 mi offshore and will be diluted by normal atmospheric mixing action prior to heading to shore. Emissions will be indistinguishable from those of other marine vessels traversing offshore Morro Bay and will not significantly impact the air quality in San Luis Obispo County, and therefore not affect EJ.

**Limited English Proficiency (LEP)**

Limited English Proficiency refers to persons who are not fluent in English. Hispanic and/or Latino comprise 22.5 percent of the population of San Luis Obispo County, and approximately one-half of the linguistically isolated households in the county speak Spanish. During the G&G operations in the Morro Bay WEA, the frequency with which LEP individuals come in contact with aspects of this Federal action is expected to be minimal. The importance of the G&G operations will be moderate because the activity may lead to the construction and operation of wind energy facilities offshore Morro Bay. Translation of vital documents and interpretation of vital information may be provided at BOEM's discretion and in accordance with resource availability.

**Conclusion**

- Due to the limited scope and short duration of the proposed project activities, the project is not expected to cause any significant adverse effects in the communities surrounding Morro Bay, nor in any other portions of San Luis Obispo County. Therefore, no significant disproportionately high adverse human health or environmental effects on minority and low-income populations are expected.
- The population of the affected area is overwhelmingly non-Hispanic white, and the proportions of minorities and persons in poverty are all below California percentages.
- Two of the basic tenets of EJ are disclosure and public participation in government environmental permitting processes. There is a significant Hispanic population in San Luis

Obispo County, and a significant number of people may have LEP. This potential problem may be resolved by providing translation and interpretation services to the public, as needed, and as BOEM resources permit.

### 3.11.3 No Action Alternative

Under the No Action Alternative, leases and grants would not be issued for the Morro Bay WEA and there would be no G&G activities pursuant to conducting wind energy activities. Adoption of the No Action Alternative would have negligible impacts on minority and low-income populations in San Luis Obispo County. Ambient concentrations of air contaminants would remain unchanged, subject to future changes in the economy, regulations, technology, and population.

The site assessment and site characterization activities occurring within the WEA would not have disproportionately high or adverse environmental or health effects on minority or low-income populations.

## 3.12 TRIBES AND TRIBAL RESOURCES

### 3.12.1 Affected Environment

A number of Tribes have ancestral and current connections to central California coasts, offshore areas, and marine species and ecosystems. Tribes' connections to the region include their traditional and ancestral homelands, customary uses of marine resources for food and cultural connections, and stewardship of resources and ecosystems within their ancestral homelands and waters (Cordero et al. 2016; Northern Chumash Tribal Council 2015). Coastal landscapes and seascapes, including viewsheds, are integral and sacred elements of Tribal cultural connections to the region. Additionally, as discussed in Section 3.10 Historic Properties, before the last rise in sea levels, the coastline of the region extended beyond the present-day coast to include now-submerged areas that were likely inhabited by ancestors of California Tribes.

Coastal and offshore areas of central California near Morro Bay and the Morro Bay WEA are within or near the traditional cultural regions of several Tribes and cultural groups. These include Chumash-, Salinan-, and Esselen-affiliated Tribes. Chumash-affiliated Tribes identified on the California Native American Heritage Commission (NAHC) digital atlas are the Barbareño/Ventureño Band of Mission Indians, Chumash Council of Bakersfield, Coastal Band of the Chumash Nation, Northern Chumash Tribal Council, San Luis Obispo County Chumash Council, Santa Ynez Band of Chumash Indians, Tejon Indian Tribe, and yak tityu tityu yak tiłhini Northern Chumash Tribe (NAHC 2022a). Salinan-affiliated Tribes are the Salinan Tribe of Monterey, San Luis Obispo Counties and the Xolon Salinan Tribe (NAHC 2022c). Esselen-affiliated Tribes are the Esselen Tribe of Monterey County and the Ohlone/Costanoan-Esselen Nation (NAHC 2022b). Cultural affiliations of Tribes listed by the California NAHC are self-reported by Tribes (NAHC 2022a; 2022b; 2022c). Among the Tribes identified by the NAHC in the Morro Bay region, one Tribe, the Santa Ynez Band of Chumash Indians, is federally recognized (the Tejon Indian Tribe, located farther inland, in Kern County, is also federally recognized).

Chumash ancestral territory encompasses approximately 7,000 $m^2$ on the central California coastline from what is today Malibu to Paso Robles, including the four northern Channel Islands, and inland to the western edge of the San Joaquin Valley (Santa Ynez Band of Chumash Indians 2021a; UXL Encyclopedia of Native American Tribes 2008). The Chumash were traditionally, and continue to be, inextricably connected to the marine environment. They are recognized as one of the few ocean-going indigenous peoples on the California coast (Northern Chumash Tribal Council 2015), traveling to sea, to the Channel Islands, and along the coast in traditional plank canoes called tomols. Coastal Chumash traditionally harvested an array of marine resources such as abalone and other shellfish, Olivella shells, fish, kelp and other seaweeds, and marine mammals (Kennett 2005). A number of Chumash individuals and organizations describe the importance of coastal areas of the central California region to Chumash culture and work to revive coastal- and ocean-based cultural traditions (Northern Chumash Tribal Council 2015):

> "Chumash descendants are in the midst of a cultural revival that is a testament to their rich cultural heritage... The Chumash way of life is interwoven with the ocean and the many clans who still exist and thrive on the Central Coast. Today, Chumash people celebrate their ancestral ocean voyages in tomol canoes to honor their ancestors' crossings to the offshore islands and continue to honor ceremonial sites within their historic areas."

Coastal and marine-based cultural activities include a renewal of tomol voyages from the mainland to Santa Cruz Island and associated ceremonies, among other activities (Cordero et al. 2016). The Chumash are a maritime culture, and the tomol crossings are significant to Chumash culture and the restoration of Chumash maritime heritage (Cordero 2021; Northern Chumash Tribal Council 2015; Pagaling 2018). Representatives of Chumash Tribes have expressed to BOEM that many locations along the central coast region are considered sacred places (BOEM and CEC 2021). In particular, Morro Rock and the surrounding waters have been identified as a culturally significant place (BOEM and CEC 2021). The Channel Islands and surrounding waters and Point Conception are also identified as significant places for Chumash Tribes (Cordero et al. 2016; Northern Chumash Tribal Council 2015). Tribes often choose to hold sacred or culturally important places confidential, and BOEM recognizes that many other coastal and offshore locations are important to Tribes. The mention of a few publicly identified locations here is not intended to imply these are the only important places.

The ancestral territory of Salinan-speaking groups covers the areas of the central California coast inland to the Temblor and Diablo ranges, including the Santa Lucia range and the areas encompassing the Salinas River (Salinan Tribe of Monterey and San Luis Obispo Counties 2020; Xolon Salinan Tribe 2019). The Salinan were a hunter-gatherer society who utilized abundant resources, such as acorns, pine nuts, and sage seeds, and a variety of land and marine animals (Chung 2018; Taylor 2021). Among the first Native Americans in California to be impacted by Europeans, the establishment of Missions by the Spanish in the region greatly disrupted the lifeways and social structures of Salinan cultural groups (Rivers and Jones 1993; Taylor 2021). Present-day Salinan-affiliated Tribes and individuals work to maintain cultural practices connected to the natural environment (Salinan Tribe of Monterey and San Luis Obispo Counties 2020; Xolon Salinan Tribe 2019). In addition to other culturally important places in the central California region, Morro Rock, and the surrounding Morro Bay area, is identified as a sacred place by many Salinan (Herrera 2017; Shuman 2021; Taylor 2021). Farther north of the Morro Bay WEA, the cultural region of Esselen-affiliated Tribes covers areas of the Monterey Bay region, including the Monterey Peninsula, the northern Salinas Valley, the Santa Lucia Mountains and Carmel Valley, and the Big Sur coast (Esselen Tribe of Monterey County c2018; Laverty 2003; Ohlone Costanoan-Esselen Nation 2021). Many descendants of several villages and bands in the region have chosen to enroll in the state-recognized Tribes of the Ohlone/Costanoan-Esselen Nation or the Esselen Tribe of Monterey County.

Tribes in central California were displaced from much of their ancestral homelands with the arrival of several waves of European, Mexican, and American colonists and settlers. Native bands in the central California coastal region were among the first indigenous peoples in California to encounter Europeans when Spanish explorers arrived in the mid-1500s. Chumash, Salinan, and Esselen peoples were heavily impacted by the establishment of several Spanish missions in the region in the late 1700s and later the arrival of Mexican and American settlers and ranchers (Chung 2018; Milliken and Johnson 2005). The subsequent onslaught of disease, removals from homeplaces to missions, forced labor, and vigilante violence and genocide resulted in tremendous population declines and displacement from Tribal lands. Today, many of the Tribes in the central California coastal region do not have formal ownership or management of lands within their ancestral territories. However, the Santa Ynez Band of Chumash Indians has a historic Reservation of 99 acres since 1906 which was increased to 137 acres in the 1980s and most recently was increased by an additional 1,500 acres in 2019 (Santa Ynez Band of Chumash Indians 2021b). Other Tribes work with non-profit and government organizations to regain or protect areas of their homelands. The yak tityu tityu yak tiłhini Northern Chumash Tribe includes regaining ancestral homelands as part of the mission of their non-profit organization (YTT Northern Chumash 2020). In 2020, the Esselen Tribe of Monterey County gained ownership of almost 1,200 ac of ancestral homeland through partnership with the State of California and a non-profit land conservancy (Esselen Tribe of Monterey County c2018). In addition to efforts to regain or conserve ancestral lands, the Northern Chumash Tribal Council has been leading an effort for several years to advance establishment of a Chumash Heritage National Marine Sanctuary through the National Oceanic and Atmospheric Administration's National Marine Sanctuaries program (NOAA 2021).

Many Tribes in the region include as their mission the preservation and revitalization of cultural heritage through traditional practices, language, customary gathering of natural resources, and other means (Esselen Tribe of Monterey County c2018; Salinan Tribe of Monterey and San Luis Obispo Counties 2020; Santa Ynez Band of Chumash Indians 2021a; Xolon Salinan Tribe 2019). Tribes work to protect sacred sites and artifacts through advocacy and formal regulatory processes (e.g., NHPA, Native American Graves Protection and Repatriation Act). Additionally, several Tribes indicate they identify as the original stewards and caretakers of their natural environment and recognize a cultural mandate to care for and maintain a relationship with traditional ecosystems (Cordero et al. 2016; Esselen Tribe of Monterey County c2018; Northern Chumash Tribal Council 2015). Some Tribes recognize an interconnection and relationship between humans and the natural world, including marine species and ecosystems. For example, "Chumash worldview holds that all living and non-living beings are relatives. This includes plants, animals, water, land, fire, wind, etc. Humans are neither at the apex nor the center of this worldview, but are part of a large extended family," (Cordero et al. 2016).

Tribes in central California are facing changing environmental conditions stemming from climate change and related processes and effects. Increases in extreme drought conditions and decreases in stream flows and groundwater levels impact Tribes that manage land or water resources. Drought and reduced stream flows also impact Tribal resources such as culturally important plant and fish species. For example, the Santa Ynez Band of Chumash Indians noted the loss of steelhead in the stream that runs through their reservation land (Romero 2021). Shifts in plant and animal species away from Tribal lands or traditional use areas could impact Tribes' access to culturally important resources, including basketry materials, traditional medicines, and plants and seeds (Brittain et al. 2011; Romero 2021). Marine resources such as abalone, seaweed and sea grass, and Olivella shells have become less abundant from both overharvesting and changes in marine ecosystems relating to ocean warming and acidification (Cordero et al. 2016; Romero 2021). Reductions in abundance and loss of access to traditional marine and terrestrial species can strain Tribes' efforts to maintain and revitalize traditional cultural practices. Additionally, changes in sea level and coastal erosion threaten Tribal cultural resources and culturally important places along coastlines. Increased wildfire frequency, size, and intensity, as well as extreme heat events, impact the health of Tribal members and put strains on Tribal resources (Wiecks et al.

2021). Climate change impacts experienced by Tribes are compounded and complicated by remaining effects of colonization, including Tribes' loss of management of traditional lands and waters and a shift toward extractive models of resource management (Goode et al. 2018; Whyte et al. 2021).

### 3.12.2 Impacts of the Proposed Action

This analysis considers impacts from issuance of leases in the Morro Bay WEA, including site assessment and site characterization activities. Development, construction, and operation of a wind energy project is not included in this assessment; such activities would be analyzed following submission of a COP by a lease holder. Impacts on Tribes and Tribal resources of lease issuance, site assessment, and site characterization are assessed in the context of spatial and temporal considerations and the potential for avoidance or reduction of impacts through mitigation. The assessment of potential impacts to Tribes is informed by communications between Tribes and BOEM through a number of informational and consultation meetings broadly relating to offshore energy development in California over several years. While the topic of these meetings varied over time, the issues raised by Tribes are informative of potential impacts of energy development activities in the region. BOEM and the California Renewable Energy Task Force held several meetings with California Tribes to discuss potential issues and concerns related to offshore wind in general; these meetings and the issues raised are summarized in BOEM and CEC (2018; 2021). In addition, a summary of Government-to-Government consultations with Tribes and other outreach to Tribal communities regarding the Morro Bay WEA is provided in Section 4.3, Consultation.

Tribal representatives have expressed to BOEM that Tribes identify themselves as part of their inter-related coastal ecosystems and they often consider impacts to other elements of the ecosystem to be impacts on the Tribe since they view everything as interconnected. Additionally, because the Morro Bay WEA is adjacent to the northern portion of the area nominated for the proposed Chumash Heritage National Marine Sanctuary, some Tribes would likely be interested in impacts of the Proposed Action on the marine sanctuary designation process. NOAA's Office of Marine Sanctuaries is considering designation of the proposed Chumash Heritage National Marine Sanctuary in accordance with the National Marine Sanctuaries Act designation processes (NOAA 2021). The Proposed Action would not impact the designation process for the proposed marine sanctuary.

Impacts on Tribes and Tribal resources in the region could occur through impacts on biological or archaeological resources important to Tribes from noise, bottom disturbance, and marine mammal entanglements. Tribes may also be impacted by nearshore survey vessel traffic and changes in coastal viewsheds.

#### *3.12.2.1 Noise*

In discussions with BOEM about offshore wind in California, some Tribal representatives expressed an interest in understanding the impacts of noise during site characterization surveys on marine species. Tribes may identify impacts to Tribal resources if fish, marine mammals, and other marine organisms are affected by noise produced during HRG surveys. As described in Section 3.4, Marine and Coastal Habitats and Associated Biotic Assemblages, impacts to fish and EFH from HRG surveys and vessels are expected to be localized and temporary in duration. No fish species are identified as potentially experiencing population-level impacts from HRG survey or vessel noise. Impacts to marine mammals, along with Best Management Practices to reduce impacts, are described in Section 3.5, Marine Mammals and Sea Turtles. Noise impacts on marine mammals from HRG surveys are expected to be negligible and consist primarily of short, intermittent behavioral effects on individual animals. Overall, impacts of noise on marine species potentially valued by Tribes are expected to be negligible to minor. Throughout the leasing and site assessment process, BOEM will continue to engage with Tribes interested in HRG surveys, associated noise, and potential effects on marine organisms.

#### *3.12.2.2 Bottom Disturbance and Entanglements*

Bottom disturbance associated with seafloor and sub-bottom sampling, metocean buoy anchoring, and recovery of lost survey equipment has potential to impact Tribal resources through effects on submerged and buried archaeological sites and cultural resources, and through impacts on biological resources from benthic disturbance. As described in Section 3.10, Historic Properties, areas off the coast that were once above sea level may contain submerged landscapes that were once inhabited by pre-contact Native peoples. These paleolandscapes, and any potential archaeological and cultural resources they may contain, could hold cultural importance for central California Tribes. As identified in Section 3.10, Historic Properties, water depths in the Morro Bay WEA preclude potential for submerged paleolandforms or pre-contact archaeological resources, although cable route survey activities or recovery of lost survey equipment along cable routes have potential to impact such resources in shallower water depths (less than approximately 120 m [393 ft]). Impacts on archaeological resources from seafloor disturbance would be avoided or mitigated by the requirement for an archaeological survey prior to the occurrence of any seafloor-disturbing activities within the lease area.

Section 3.4, Marine and Coastal Habitats and Associated Biotic Assemblages, describes impacts of bottom disturbance from site assessment and characterization activities on fish and invertebrates as being localized to the area of sampling or survey equipment recovery and the buoy anchors, and temporary in duration. In addition, Section 3.5, Marine Mammals and Sea Turtles, identifies potential impacts to marine mammals from entanglement with survey equipment or metocean buoy mooring systems to be discountable. Overall, impacts of bottom disturbance or entanglements from site assessment and characterization activities on potential Tribal resources are expected to be negligible.

#### *3.12.2.3 Vessels*

Vessels associated with site assessment and characterization have potential to impact Tribes through interference with Tribal uses of offshore areas for cultural activities. BOEM assumes vessels supporting surveys and metocean buoy installation would launch from an existing port facility in central California, and no additional onshore infrastructure would be needed. Depending on which port facilities are used, lease-related vessels may be temporarily visible from nearshore areas of Morro Bay, Point Conception, and other culturally important coastal locations. However, BOEM expects the types of vessels and the level of vessel activity transiting in nearshore areas to be mostly indistinguishable from the existing level of vessel activity. After departing ports, vessels would transit directly to the leased area(s) within the WEA, approximately 32 km (20 mi) from shore. Therefore, survey-related vessels would only be potentially visible from coastal locations for short periods of time and would not represent a change from exiting vessel activity observable from shore.

Survey vessels transiting from ports to the WEA lease area(s) also have potential to coincide with nearshore Tribal cultural activities including tomol voyages and customary harvest activities. In recent years, the Chumash community has celebrated crossings of a tomol from the mainland to Santa Cruz Island. The tomol crossing typically takes place in fall, and the route is approximately 20 mi (32 km) across Santa Barbara Channel. The tomol departs from Channel Islands Harbor in Oxnard and arrives at Swaxil (Scorpion Valley) on Limuw (now known as Santa Cruz Island). The tomol is typically accompanied by a support vessel that sets the course, hosts resting paddlers, and protects the tomol from vessel traffic (NOAA 2019). Depending on which port facility survey vessels depart from, there is potential for survey vessels to coincide with a tomol or its support vessel. However, given the limited level of vessel activity associated with site assessment and characterization activities, overlap between tomol crossings and survey vessels would likely be temporary and avoidable through communication and coordination, and general vessel safety measures. Tomol crossings to date have been completed with co-occurring activities in the Santa Barbara Channel for offshore energy projects, shipping, commercial fishing, and recreational activities.

A number of Tribes in California maintain rights to customary subsistence and commercial fisheries, including marine fisheries and other harvest activities (West Coast Ocean Tribal Caucus 2020). As with other fishing groups, there is potential for Tribal fishers, and Tribal members participating in other customary gathering activities, to experience reduced efficiency from increased vessel congestion in ports and nearshore areas. Overlap between survey vessels and fishing and gathering activities is expected to be minimal because most survey activity would occur within the WEA, farther offshore from nearshore fishing or coastal gathering activities. The level of increased vessel activity and associated potential space-use conflicts with Tribal fishers and marine resource harvesters would likely result in few short-term occurrences or would be indistinguishable from existing levels of vessel activity in nearshore areas. Overall, impacts from vessel activities are anticipated to be negligible to minor given the limited total number of vessel trips expected in the context of existing levels of activity in the Morro Bay region.

#### *3.12.2.4 Changes in Coastal Viewsheds*

Changes in coastal viewsheds could impact Tribes for whom unobstructed coastal views and absence of vessel traffic hold important cultural and spiritual significance. However, at the lease issuance and site assessment and characterization phase, visual impacts on coastal viewsheds are not anticipated. BOEM does not have the authority to exclude vessel traffic from state or Federal waters. The Morro Bay WEA is approximately 20 mi from shore, and the metocean buoy(s) is not expected to be noticeably visible from shore. A visual resource impact assessment of installed wind turbines would be included in the analyses of specific COP(s) should lessee(s) choose to submit a COP.

**Conclusion**

Potential impacts to Tribes and Tribal resources from effects of noise, bottom disturbance, and entanglements on resources important to Tribes are expected to be negligible based on the impact assessment of these factors on fish, marine mammals, and historic properties. Impacts of increased vessel activity on Tribal uses of coastal and nearshore areas would be negligible to minor because vessel activity would likely be mostly indistinguishable from existing levels, or would be temporary, and would not extend beyond the immediate timeframe of survey activities. In addition, lessees must develop a Native American Tribal Communications Plan that describes the strategies that the Lessee intends to use for communicating with Tribes. No impacts from changes in coastal viewsheds are anticipated for site assessment and characterization activities. Overall, impacts to Tribes and Tribal resources from the Proposed Action are expected to be negligible to minor.

### 3.12.3 No Action Alternative

Under the No Action Alternative, BOEM would not hold a lease sale within the Morro Bay WEA, and no lease-related site assessment and characterization activities would occur. Although leases would not be issued under the No Action Alternative, BOEM expects ongoing activities and planned actions, along with changing environmental conditions, to have continuing local and regional impacts on Tribes and Tribal resources over the timeframe considered in this EA.

Ongoing and expected future actions that may impact Tribes and marine Tribal resources include continued commercial and recreational vessel traffic, port utilization and maintenance, offshore oil and gas activities and decommissioning, commercial and recreational fishing, DoD operations, and nearshore maintenance and development projects. These actions have potential to produce space-use conflicts or impacts on resource availability for Tribal members; however, such impacts are, for the most part, expected to represent a continuation of existing conditions and impact levels. The largest current and anticipated future contributors to impacts on Tribes and Tribal resources stem from ongoing changes in environmental conditions related to climate change, combined with other factors. Such impacts include declines in abundance and availability of culturally important species, coastal erosion, and continuation of recent patterns of increased drought conditions and wildfire frequency and severity (Goode et al. 2018). Over the timeframe considered in this EA, impacts on Tribes and Tribal resources of ongoing activities and planned actions are expected to range from minor for most ongoing and planned actions, to moderate—with potential for more severe impacts—when considering climate change. Implementation of the No Action Alternative would not meaningfully reduce or increase ongoing impacts to Tribes and Tribal resources from existing and potential future actions.

# 4 Consultation and Coordination, and Stakeholder Comments

## 4.1 PUBLIC INVOLVEMENT

In May 2021, the White House, the Departments of the Interior and Defense, and the State of California jointly announced an agreement to advance areas for offshore wind off the northern and central coasts of California in line with the National goal of 30 gigawatts of offshore wind energy by 2030. The BOEM Pacific Regional Office convened the first California Intergovernmental Renewable Energy Task Force (Task Force) meeting on October 16, 2016. The Task Force is a partnership of members of state, local, and federally recognized Tribal governments and Federal agencies. The Task Force first met in 2016 and serves as a forum to discuss stakeholder issues and concerns; exchange data and information about biological and physical resources, ocean uses, and priorities; and facilitate early and continual dialogue and collaboration opportunities.

BOEM worked in partnership with the State of California to outreach and involve the public in wind energy planning offshore California starting in 2016. In addition to public comment opportunities, BOEM and the State of California organized additional outreach and engagement with Tribal Governments and public stakeholders in over 80 in-person meetings. An outreach document summarizes these activities through 2020 in the CA Offshore Wind Energy Planning Outreach Summary Report. An addendum was published in June 2021 to document the outreach from 2020.

In May 2021, the White House, the Departments of the Interior and Defense, and the State of California jointly announced an agreement to advance areas for offshore wind off the northern and central coasts of California in line with the national goal of 30 gigawatts of offshore wind energy by 2030. The agreement recognized the critical nature of current and future military testing, training, and operations, and acknowledged that ensuring the operational integrity thereof is a national security imperative. The U.S. Department of the Interior agreed to work with DoD to ensure long-term protection of military testing training, and operations off the California Central Coast, while pursuing new domestic clean energy sources.

## 4.2 SUMMARY OF PUBLIC COMMENTS

During the public 60-day public scoping period from November 11, 2021 to January 11, 2022, BOEM received 1,262 comments from the public, agencies, and other interested groups and stakeholders. This included 88 unique submissions, with 1,175 form letters and additional unique oral comments from two virtual public comment meetings. During the 40-day public comment period on the Draft EA from April 4 to May 16, 2022, BOEM received a total of 43 public comment submissions in Docket No. BOEM-2021-0044 and 23 public comments from two virtual public meetings. Meetings in-person with commercial fishing groups were held with California state agency representatives and BOEM on November 29 and 30, 2021, and again on May 16 and 17, 2022, in Santa Barbara and Morro Bay, California. Virtual meetings with BOEM staff were held when requested and BOEM met with shipping and environmental group representatives. Appendix E provides a summary of the comments and BOEM's responses.

## 4.3 CONSULTATION

### 4.3.1 Endangered Species Act (ESA) and Marine Mammal Protection Act (MMPA)

Section 7(a)(2) of the ESA requires each Federal agency to ensure that any action that they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the adverse modification of designated critical habitat. To satisfy its ESA obligations, BOEM consults with NMFS and USFWS regarding potential impacts to listed species and designated critical habitat under the jurisdiction of the Services.

BOEM concluded ESA consultation with NMFS on the Proposed Action is expected to occur in the lease areas (NMFS 2022). If the lessee intends to design and conduct biological or other surveys to support offshore renewable energy plans that could interact with ESA-listed species, the surveys must be within the scope of activities described in existing ESA consultations, or the lessee must consult further with BOEM and the Services (NMFS and USFWS). Additional time should be allowed for consultation and/or permits authorizing proposed activities which are outside of the scope of existing consultations/authorizations.

To ensure compliance with the MMPA, per BOEM regulation 30 CFR§ 585.801(b), BOEM will require that lease holders must not conduct any activity under their lease that may result in an incidental taking of marine mammals until the appropriate authorization has been issued under the MMPA of 1972 as amended (16 U.S.C. 1361 et seq.).

Operators in the OCS will incorporate Best Management Practices to minimize or eliminate potential effects from site assessment and site characterization activities to protected marine mammal and sea turtle species, including vessel strike avoidance measures, visual monitoring, and shutdown and reporting (Appendix D). These practices have been developed through years of conventional energy operations and refined through BOEM’s renewable energy program and consultations with NMFS. All survey plans and SAPs will be reviewed by BOEM to ensure inclusion of appropriate Best Management Practices.

The Lessee must comply with the Best Management Practices identified by the Lessor through its ESA consultation process, as well as those prescribed by any relevant authorization under the MMPA. These measures may be updated as a result of statutory, regulatory, or other consultation processes, including but not limited to consultation under the ESA or the MMPA. The Lessor will provide up-to-date information at the pre-survey meeting, during survey plan review, or at another time prior to survey activities as requested by the Lessee. At the Lessee’s option, the Lessee, its operators, personnel, and contractors may satisfy these survey requirements related to protected species by complying with the NMFS-approved measures to safeguard protected species that are most current at the time an activity is undertaken under this lease, including but not limited to new or updated versions of the ESA consultation, or through new or activity-specific consultations.

### 4.3.2 Essential Fish Habitat (EFH) Consultation

The Magnuson-Stevens Fishery Conservation and Management Act (as amended) requires Federal agencies to consult with NMFS regarding actions that may adversely affect designated EFH. As for ESA, BOEM concluded consultation with NMFS on activities described in the EA (NMFS 2022).

### 4.3.3 Coastal Zone Management Act (CZMA)

The Coastal Zone Management Act requires that Federal actions that are reasonably likely to affect any land or water use or natural resource of the coastal zone be "consistent to the maximum extent practicable" with relevant enforceable policies of the state's federally approved coastal management program (15 CFR 930 Subpart C). BOEM prepared a Consistency Determination (CD) under 15 CFR 930.36(a) to determine whether issuing leases and site assessment activities (including the construction/installation, operation and maintenance, and decommissioning of meteorological buoys) in the Morro Bay WEA was consistent to the maximum extent practicable with the provisions identified as enforceable by the Coastal Zone Management Programs of the State of California. The California Coastal Commission held an informational hearing in September 2022 and held a decisional hearing on June 8, 2022. Concurrence is needed prior to lease issuance and a Conditional Concurrence was issued by the California Coastal Commission.

### 4.3.4 National Historic Preservation Act

Section 106 of the NHPA (54 U.S.C. § 306108) and its implementing regulations (36 CFR 800) require Federal agencies to consider the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation an opportunity to comment. BOEM has determined that issuing commercial or research leases within the Morro Bay WEA and granting ROWs and RUEs within the region constitutes an undertaking subject to Section 106 of the NHPA (16 U.S.C. 470f) and its implementing regulations (36 CFR § 800) as the resulting site characterization and site assessment activities have the potential to cause effects on historic properties.

BOEM has implemented a PA pursuant to 36 CFR § 800.14(b) to fulfill its obligations under Section 106 of the NHPA for renewable energy activities on the OCS offshore California. BOEM initiated consultation through letters on November 24, 2021, with the California State Historic Preservation Office (SHPO), Advisory Council on Historic Preservation, and the following federally recognized Tribal Nation: Santa Ynez Band of Chumash Indians. BOEM further identified potential consulting parties pursuant to 36 CFR § 800.3(f) through a November 24, 2021, letter to over forty (40) non-recognized Tribal governments, certified local governments, historical preservation societies, and museums, which solicited public comment and input regarding the identification of, and potential effects on, historic properties for the purpose of obtaining public input for the Section 106 review (36 CFR § 800.2(d)(3)) and invited them to participate as a consulting party. BOEM issued a Finding of No Historic Properties Affected for the Issuance of a Commercial Lease within the Morro Bay Wind Energy Area on the Outer Continental Shelf Offshore California on July 25, 2022 (BOEM 2022a).

# 5 List of Preparers and Reviewers

The individuals responsible for preparing this EA are listed below:

| Name | Role in NEPA Process |
|---|---|
| Meghan Cornelison | Tribes and Tribal Resources |
| Desray Reeb | Marine Mammals and Sea Turtles |
| Susan Zaleski, Donna Schroeder | Marine and Coastal Habitats and Associated Biotic Assemblages |
| David Pereksta | Coastal and Marine Birds |
| Donna Schroeder | Marine and Coastal Habitats and Associated Biotic Assemblages and Commercial Fishing |
| Tim Harper | Socioeconomics, Recreation and Tourism |
| Robert Dame | Geology |
| Pamela Grefsrud | Water Quality |
| Katsumi Keeler | Air Quality, Environmental Justice |
| Melanie Hunter | NEPA Coordinator |
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| Lisa Gilbane, Susan Zaleski | Project Supervisor |
| Natalie Dayal | Technical Writer/Editor |

# 6 References


Ahlén I, Bach L, Baagøe HJ, Pettersson J. 2007. Bats and offshore wind turbines studied in southern Scandinavia. Stockholm (Sweden): Swedish Environmental Protection Agency. 37 p. Report No.: 5571.

Ainley D, Allen S, Spear L. 1995. Offshore occurrence patterns of Marbled Murrelets in central California. In: Ralph CJ, Hunt GL, Raphael MG, Piatt JF (Eds). Ecology and conservation of the Marbled Murrelet. Albany (CA): USDA Forest Service. 361-369 p. Report No.: General technical report PSW-152.

Ainley D, Terrill S. 2022. Seabirds and shorebirds. Monterey Bay National Marine Sanctuary site characterization. Monterey (CA): Monterey Bay National Marine Sanctuary; [accessed 2022 Mar 25]. https://montereybay.noaa.gov/sitechar/bird.html.

Allen LG, Pondella II DJ, Horn MH, (eds). 2006. The ecology of marine fishes: California and adjacent waters. 1st ed. Berkeley (CA): University of California Press. 660 p.

Argonne National Laboratory. 2019. Environmental setting of the southern California OCS planning area. 231 p.

Arnett EB, Hein CD, Schirmacher MR, Huso MM, Szewczak JM. 2013. Evaluating the effectiveness of an ultrasonic acoustic deterrent for reducing bat fatalities at wind turbines. PloS ONE. 8(6):e65794.

Arthur D. Little Inc. 1985. Union Oil/Exxon project shamrock and central Santa Maria basin area study EIS/EIR, Technical appendix A-geology and Technical appendix E-marine biology. Santa Barbara (CA). 811 p. Report No.: OCS Study MMS #85-0020. Prepared for: County of Santa Barbara, U.S. Minerals Management Service, California State Lands Commission, California Coastal Commission, California Office of Offshore Development.

Atwood J, Minsky D. 1983. Least tern foraging ecology at three major California breeding colonies. Western Birds. 14:57-72.

Baker K, Howson U. 2021. Data collection and site survery activities for renewable energy on the Atlantic Outer Continental Shelf biological assessment. U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs. 152 p.

Bartol S, Ketten D. 2006. Turtle and tuna hearing. Honolulu, HI: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Pacific Islands Fisheries Science Center. 98-105 p. Report No.: NOAA-TM-NMFS-PIFSC-7.

Bartol S, Musick J, Lenhardt M. 1999. Auditory evoked potentials of the loggerhead sea turtle (Caretta caretta). Copeia. 3:836-840.

Bellinger M, Banks M, Bates S, Crandall E, Garza J, Sylvia G, Lawson P. 2015. Geo-referenced, abundance calibrated ocean distribution of chinook salmon (Oncorhynchus tsahawytscha) stocks across the west coast of North America. PLoS One. 10(7):25. doi:10.1371/journal.pone.0131276.

Benjamins S, Harnois V, Smith HCM, Johanning L, Greenhill L, Carter C, Wilson B. 2014. Understanding the potential for marine megafauna entanglement risk from renewable marine energy developments. Perth: Scottish National Heritage. 95 p. Report No.: 791.

Bennett VJ, Hale AM. 2014. Red aviation lights on wind turbines do not increase bat–turbine collisions. Animal Conservation. 17(4):354–358.

Black A. 2005. Light induced seabird mortality on vessels operating in the Southern Ocean: incidents and mitigation measures. Antarctic Science. 17(1):67–68. doi:10.1017/S0954102005002439.

[BOEM] Bureau of Ocean Energy Management. 2012. Commercial wind lease issuance and site assessment activities on the Atlantic Outer Continental Shelf offshore New Jersey, Delaware, Maryland, and Virginia: final environmental assessment. Sterling (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 366 p. Report No.: OCS EIS/EA BOEM 2012-003.

BOEM. 2014. Atlantic OCS proposed geological and geophysical activities Mid-Atlantic and South Atlantic planning areas: final programmatic environmental impact statement. New Orleans (LA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 3 vols. 788 p. Report No.: OCS EIS/EA BOEM 2014-001.

BOEM. 2015. Commercial wind lease issuance and site assessment activities on the Atlantic Outer Continental

Shelf offshore North Carolina: revised environmental assessment. Sterling (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 353 p. Report No.: OCS EIS/EA BOEM 2015-038.

BOEM. 2016. Commercial wind lease issuance and site assessment activities on the Atlantic Outer Continental Shelf offshore New York.: revised environmental assessment. Sterling (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 449 p. Report No.: OCS EIS/EA BOEM 2016-070.

BOEM. 2019. Guidelines for information requirements for a renewable energy site assessment plan (SAP). U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy. 60 p.

BOEM. 2020. Guidelines for providing geophysical, geotechnical, and geohazard information pursuant to 30 CFR Part 585. Sterling (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 32 p.

BOEM. 2022a. Finding of no historic properties affected for the issuance of a commercial lease within the Morro Bay Wind Energy Area on the Outer Continental Shelf offshore California. Camarillo (CA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 20 p.

BOEM. 2022b. Offshore wind lease issuance, site characterization, and site assessment: central and northern California. Camarillo (CA): U.S. Department of the Interior, Bureau of Ocean Energy Management, Pacific Regional Office. 119 p.

BOEM and [CEC] California Energy Commission. 2018. Outreach summary report: California offshore wind energy planning. U.S. Department of the Interior, Bureau of Ocean Energy Management. 42 p.

BOEM and CEC. 2021. Outreach summary report addendum, California offshore wind energy planning. U.S. Department of the Interior, Bureau of Ocean Energy Management. 19 p.

Briggs KT, Tyler WB, Lewis DB, Carlson DR. 1987. Bird communities at sea off California: 1975 to 1983. Lawrence (KS): Cooper Ornithological Society Inc. 79 p.

Brittain A, Evan S, Giroux A, Hammargren B, Treece B, Willis A. 2011. Climate action on tribal lands: a community based approach [Group Project Report]. University of California, Santa Barbara.

Brown C, Nelson W. 2015. A method to identify estuarine water quality exceedances associated with ocean conditions. Environ Monit Assess. 187(3):1-14.

Bunkley JP, Barber JR. 2015. Noise reduces foraging efficiency in pallid bats (Antrozous pallidus). Ethology. 121(11):1-6. doi:10.1111/eth.12428.

Bunkley JP, McClure CJ, Kleist NJ, Francis CD, Barber JR. 2015. Anthropogenic noise alters bat activity levels and echolocation calls. Global Ecology and Conservation. 3:62–71. doi:10.1016/j.gecco.2014.11.002.

Burton RS. 1998. Intraspecific phylogeography across the Point Conception biogeographic boundary. Evolution. 52(3):734-745.

Calambokidis J, Steiger G, Curtice C, Harrison J, Ferguson M, Becker E, DeAngelis M, Van Parijs S. 2015. Biologically important areas for selected cetaceans within U.S waters West Coast region. Aquatic Mammals. 41(1):39-53. doi:10.1578/AM.41.1.2015.39.

CalEPA. 2006. Revision of the Clean Water Act Section 303(d) list of water quality limited segments. Sacramento (CA): California Environmental Protection Agency, State Water Resources Control Board, Division of Water Quality. 363 p.

California Air Resources Board. 2017. Compliance guidelines for the commercial harbor craft regulation. California Environmental Protection Agency, California Air Resources Board. 6 p.

California Employment Development Department. 2021. Labor market info. State of California, Employment Development Department; [accessed 2022 Mar 31]. https://www.labormarketinfo.edd.ca.gov/cgi/databrowsing/localAreaProfileQSResults.asp?selectedarea=San+Luis+Obispo+County&selectedindex=40&menuChoice=localAreaPro&state=true&geogArea=0604000079&countyName=.

Carretta JV, Forney KA, Oleson EM, Weller DW, Lang AR, Baker J, Muto MM, Hanson B, Orr AJ, Huber H, et al. 2018. U.S. Pacific marine mammal stock assessments: 2017. Springfield (VA): U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center. 161 p. Report No.: NOAA-TM-NMFS-SWFSC-602.

Carretta JV, Oleson EM, Baker J, Weller DW, Lang AR, Forney KA, Muto MM, Hanson B, Orr AJ, Huber H, et al. 2016. U.S. Pacific marine mammal stock assessments: 2015. Springfield (VA): U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center. 426 p. Report No.: NOAA-TM-NMFS-SWFSC-561.

Carretta JV, Oleson EM, Forney KA, Muto MM, Weller DW, Lang AR, Baker J, Hanson B, Orr AJ, Barlow J, et al. 2021. U.S. Pacific marine mammal stock assessments: 2020. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center. 394 p. Report No.: NOAA-TM-NMFS-SWFSC-646.

Castege I, Lalanne Y, Gouriou V, Hemery G, Girin M, D'Amico F, Mouchès C, D'Elbee J, Soulier L, Pensu J. 2007. Estimating actual seabirds mortality at sea and relationship with oil spills: lesson from the "Prestige" oil spill in Aquitaine (France). Ardeola. 54(2):289–307.

[CDFW] California Department of Fish and Wildlife. 2021. Poundage and value of landings of commercial fish into California by area, 2010-2019, tables 15 and 21mb. Monterey (CA): California Department of Fish and Wildlife, Marine Region (Region 7); [accessed 2021 Feb 1]. https://wildlife.ca.gov/Fishing/Commercial/Landings#26004325-2010.

Central Coast Regional Water Quality Control Board. 2002. Morro Bay total maximum daily load for sediment (including Chorro Creek, Los Osos Creek and the Morro Bay Estuary). San Luis Obispo (CA): California Environmental Protection Agency, California Water Boards, Central Coast Regional Water Quality Control Board. 88 p.

[CEQ] Council on Environmental Quality. 1997. Environmental justice guidance under the National Environmental Policy Act. Washington (DC): Council of Environmental Quality. 64 p.

Chipley RM, Fenwick GH, Parr MJA. 2003. The American Bird Conservancy Guide to the 500 most important bird areas in the United States: key sites for birds and birding in all 50 states. New York (NY): Random House Trade Paperbacks.

Chung A. 2018. Atascadero historical report. City and Regional Planning, Caifornia Polytechnic University.

Clark J, Moitrovica J, Alder J. 2014. Coastal paleogeography of the California–Oregon–Washington and Bering Sea continental shelves during the latest Pleistocene and Holocene: implications for the archaeological record. Journal of Archaeological Science. 52:12-23. doi:10.1016/j.jas.2014.07.030.

Coastal San Luis Resource Conservation District. 2020. Los Osos Creek wetland restoration initial study/mitigate negative declaration. Morro Bay (CA): Coastal San Luis Resource Conservation District. 211 p.

Cochrane G, Kuhnz L, Gilbane L, Dartnell P, Walton M, Paull C. 2022. California deepwater investigations and groundtruthing (Cal DIG) I, volume 3: benthic habitat characterization offshore Morro Bay, California. Reston (VA): U.S. Department of the Interior, U.S. Geological Survey. 18 p. Report No.: U.S. Geological Survey Open-File Report 2022–1035 [also released as Bureau of Ocean Energy Management OCS Study BOEM 2021–045].

Cordero A, Isha Waiya L, Sanchez G, Diaz S, Jaimes M, Moreno M, Sanchez D, Valenzuela D, Vasquez V, Ward Olmstead J. 2016. Chumash ecosystem services assessment, in Channel Islands national marine sanctuary condition report, 2016. In: National Oceanic and Atmospheric Administration NMS, editor. Monterey, CA: National Oceanic and Atmospheric Administration, National Marine Sanctuaries.

Cordero R. 2021. Full circle Chumash cross channel in tomol to Santa Cruz Island. National Oceanic and Atmospheric Administration, National Marine Sanctuaries, Channel Islands National Marine Sanctuary; [accessed 2022 Jan 6]. https://channelislands.noaa.gov/maritime/chumash1.html.

Crawford RL, Wilson Baker W. 1981. Bats killed at a north Florida television tower: a 25-year record. Journal of Mammalogy. 62(3):651–652.

Crocker S, Fratantonio F. 2016. Characteristics of sounds emitted during high-resolution marine geophysical surveys. Newport (RI): U.S. Department of the Interior, Bureau of Ocean Energy Management and Naval Undersea Warfare Center Division. 266 p. Report No.: OCS Study BOEM 2016-044, NUWC-NPT Technical Report 12,203.

Cryan PM, Brown AC. 2007. Migration of bats past a remote island offers clues toward the problem of bat fatalities at wind turbines. Biological Conservation. 139:1–11.

Daly E, White M. 2021. Bottom trawling noise: are fishing vessels polluting to deeper acousting habitats? Marine Pollution Bulletin. 162:13. doi:10.1016/j.marpolbul.2020.111877.

Deguchi T, Jacobs J, Harada T, Perriman L, Watanabe Y, Sato F, Nakamura N, Ozaki K, Balogh G. 2012. Translocation and hand-rearing techniques for establishing a colony of threatened albatross. Bird Conservation International. 22(1):66–81. doi:10.1017/S0959270911000438.

Dooling RJ, Lohr B, Dent ML. 2000. Hearing in birds and reptiles. Comparative hearing: birds and reptiles. New York (NY): Springer. p. 308–359.

Dugdale R, Wilkerson F. 1989. New production in the upwelling center at Point Conception, California: temporal and spatial patterns. Deep Sea Research Part A Oceanographic Research Papers. 36(7):985-1007.

eBird. 2022a. Guadalupe Murrelet, sightings map. Ithaca (NY): Cornell Lab of Ornithology; [accessed 2022 Jan 11]. https://ebird.org/map/xanmur1?neg=true&env.minX=&env.minY=&env.maxX=&env.maxY=&zh=false&gp=false&ev=Z&excludeEx=&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2022.

eBird. 2022b. Hawaiian Petrel, sightings map, 2011-2018. Ithaca (NY): Cornell Lab of Ornithology; [accessed 2022 Jan 4]. https://ebird.org/map/hawpet1?neg=true&env.minX=-124.46775968506185&env.minY=35.67377993358722&env.maxX=-119.89744718506185&env.maxY=37.43209474871995&zh=true&gp=false&ev=Z&excludeEx=&mr=1-12&bmo=1&emo=12&yr=range&byr=2011&eyr=2018.

eBird. 2022c. Least Tern, sightings map. Ithaca (NY): Cornell Lab of Ornithology; [accessed 2022 Jan 10]. https://ebird.org/map/leater1?neg=true&env.minX=-127.36854016496999&env.minY=33.311600851328365&env.maxX=-114.71229016496999&env.maxY=38.702129832780415&zh=true&gp=false&ev=Z&excludeEx=&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2022.

eBird. 2022d. Marbled Murrelet, sightings map. Ithaca (NY): Cornell Lab of Ornithology; [accessed 2022 Jan 10]. https://ebird.org/map/marmur?neg=true&env.minX=&env.minY=&env.maxX=&env.maxY=&zh=false&gp=false&ev=Z&excludeEx=&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2022.

eBird. 2022e. San Luis Obispo, California, U.S. sightings. Ithaca (NY): Cornell Lab of Ornithology; [accessed 2022 Jan 11]. https://ebird.org/region/US-CA-079?yr=all.

eBird. 2022f. San Luis Obispo, California, U.S. sightings map. Ithaca (NY): Cornell Lab of Ornithology; [accessed 2022 Jan 11]. https://ebird.org/hotspots?env.minX=-121.353615&env.minY=34.898122&env.maxX=-119.47403&env.maxY=35.799623&yr=all&m=.

Efroymson RA, Rose WH, Nemeth S, Suter II GW. 2000. Ecological risk assessment framework for low-altitude overflights by fixed-wing and rotary-wing military aircraft. Oak Ridge (TN): Oak Ridge National Laboratory. Report No.: ORNL/TM-2000/289.

[EPA] U.S. Environmental Protection Agency. 1995. Designation of an ocean dredged material disposal site off Humboldt Bay, California: final environmental impact statement. San Francisco (CA): U.S. Environmental Protection Agency, and Jones & Stokes Associates, Inc. 308 p.

EPA. 2004. Total maximum daily loads for pathogens and sediments in Morro Bay, Los Osos Creek, and Chorro Creek, California [official communication; letter from Alexis Strauss, USEPA Water Division, to Celeste Cantu, State Water Resources Control Board, on 2004 Jan 26]. 6 p.

EPA. 2009. Watershed restoration efforts improve dissolved oxygen levels. Washington (DC): U.S. Environmental Protection Agency, Office of Water. 2 p. Report No.: EPA 841-F-09-001R.

EPA. 2011. EPA's final letter and enclosure for California's 2008-2010 Section 303(d) list [official communication; letter and enclosure from Alexis Strauss, USEPA Water Division, to Tom Howard, State Water Resources Control Board, on 2011 Oct 11]. 35 p.

EPA. 2012. National coastal conditions, report IV. Washington (DC): U.S. Environmental Protection Agency, Office of Research and Development/Office of Water. 334 p. Report No.: EPA-842-R-101-003.

EPA. 2013. Vessel general permit for discharges incidental to the normal operation of vessels (VGP). U.S.

Environmental Protection Agency. 194 p.

EPA. 2016. Technical guidance for assessing environmental justice in regulatory analysis. U.S. Environmental Protection Agency. 120 p.

EPA. 2022a. EJScreen ACS summary report for Los Osos Middle School, Monte Young Park, and Avila Beach Pier. Washington (DC): U.S. Environmental Protection Agency; [accessed 2022 Jan 8]. https://ejscreen.epa.gov/mapper/.

EPA. 2022b. Global greenhouse gas emissions data. U.S. Environmental Protection Agency; [accessed 2022 Aug 31]. https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data.

Esselen Tribe of Monterey County. c2018. Esselen Tribal lands conservation project. Esselen Tribe of Monterey County; [accessed 2021 Dec 29]. https://www.esselentribe.org/our-land.

Federal Register. 1994. Federal actions to address environmental justice in minority populations and low-income populations, Executive Order 12898. Executive Office of the President. 7629-7633 p. Report No.: 59 FR 7629.

Federal Register. 2000. Improving access to service for persons with limited English proficiency, Executive Order 13166. Executive Office of the President. 50119-50122 p. Report No.: 65 FR 50121.

Frawley T, Muhling B, Brodie S, Fisher M, Tommasi D, Le Fol G, Hazen E, Stohs S, Finkbeiner E, Jacox M. 2021. Changes to the structure and function of an albacore fishery reveal shifting social-ecological realities for Pacific Northwest fishermen. Fish and Fisheries. 22(2):280-297.

Ghoul A, Reichmuth C. 2014. Hearing in the sea otter (Enhydra lutris): auditory profiles for an amphibious marine carnivore. Journal of Comparative Physiology A. 200(11):967-981. doi:10.1007/s00359-014-0943-x.

Goode R, Gaughen S, Fierro M, Hankins D, Johnson-Reyes K, Middleton B, Red Owl T, Yonemura R. 2018. Summary report from tribal and indigenous communities within California. Sacramento, CA: State of California. 69 p.

H.T. Harvey & Associates. 2020. Existing conditions and potential environmental effects. Arcata (CA): Schatz Energy Research Center. 191 p.

Hamilton RA, Patten MA, Erickson RA. 2007. Rare birds of California: a work of the California Bird Records Committee. Camarillo (CA): Western Field Ornithologists, California Bird Records Committee; [accessed 2022 Mar 25]. https://rarebirds.westernfieldornithologists.org/.

Hansen KA, Maxwell A, Siebert U, Larsen ON, Wahlberg M. 2017. Great cormorants (Phalacrocorax carbo) can detect auditory cues while diving. The Science of Nature. 104(45):1-7. doi:10.1007/s00114-017-1467-3.

Herrera A. 2017 December 13. In California, Salinan Indians are trying to reclaim their culture and land. National Public Radio. Sect. All Things Considered: [accessed 2021 Decemeber 16]. https://www.npr.org/2017/12/13/570208941/in-california-salinan-indians-are-trying-to-reclaim-their-culture-and-land.

Howell S, Engel S. 1993. Seabird observations off western Mexico. Western Birds. 24:167-181.

Howell SN. 2012. Petrels, albatrosses, and storm-petrels of North America. Princeton (NJ): Princeton University Press.

Howell SN, Lewington I, Russell W. 2014. Rare birds of North America. Princeton (NJ): Princeton University Press.

ICF International, Southeastern Archaeological Research, Davis Geoarchaeological Research. 2013. Inventory and analysis of coastal and submerged archaeological site occurrence on the Pacific Outer Continental Shelf. Camarillo (CA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 366 p. Report No.: OCS Study BOEM 2013-0115.

Industrial Economics Inc. 2012. Identification of Outer Continental Shelf renewable energy space-use conflicts and analysis of potential mitigation measures. Herndon (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 414 p. Report No.: OCS Study BOEM 2012-083.

International Whaling Commission. 2016. Report of the scientific committee, Annex J: report of the working group on non-deliberate human-induced mortality of cetaceans. Bled (Slovenia). 23 p.

Joyce T. Forthcoming 2013. Abundance estimates of the Hawaiian Petrel (Pterodroma sandwichensis) and Newell's

Shearwater (Puffinus newelli) based on data collected at sea, 1998-2011 [unpublished report]. La Jolla (CA): Scripps Institution of Oceanography.

Kaplan B, Beegle-Krause C, French McCay D, Copping A, Geerlofs S. 2010. Updated summary of knowledge: selected areas of the Pacific Coast. Camarillo (CA): U.S. Department of the Interior, Bureau of Ocean Energy Management, Regulation, and Enforcement, Pacific Outer Continental Shelf Region. 939 p. Report No.: OCS Study BOEMRE 2010-014.

Kennett DJ. 2005. The Island Chumash: behavioral ecology of a maritime society. Berkeley and Los Angeles (CA): University of California Press. 310 p.

Kitts C, Moline M, Schaffner A, Samadpour M, McNeill K, Duffield S. 2002. Identifying the sources of Escherichia coli contamination to the shellfish growing areas of the Morro Bay estuary: final report. In: California and the World Ocean 2002; 2022 Oct 27-30; Santa Barbara (CA). 36 p.

Komenda-Zehnder S, Cevallos M, Bruderer B. 2003. Effects of disturbance by aircraft overflight on waterbirds–an experimental approach. In: International Bird Strike Committee; 2003 May 5–9; Warsaw, Poland. p. 157–168.

Kreuder C, Miller M, Jessup D, Lowenstine L, Harris M, Ames J, Carpenter T, Conrad P, Mazet J. 2003. Patterns of mortality in southern sea otters. Journal of Wildlife Diseases. 39(3):495-509.

Kuhnz L, Gilbane L, Cochrane G, Paull C. 2021. California deepwater investigations and groundtruthing (Cal DIG) I, volume 1: biological site characterization offshore Morro Bay. Camarillo (CA): U.S. Department of the Interior, Bureau of Ocean Energy Management, Pacific Outer Continental Shelf Region. 72 p. Report No.: OCS Study BOEM 2021-037.

Kushlan JA, Steinkamp MJ, Parsons KC, Capp J, Cruz MA, Coulter M, Davidson I, Dickson L, Edelson N, Elliot R. 2002. Waterbird conservation for the Americas: the North American waterbird conservation plan, version 1. Washington (DC): U.S. Fish and Wildlife Service. 78 p.

Lacoeuilhe A, Machon N, Julien J-F, Le Bocq A, Kerbiriou C. 2014. The influence of low intensities of light pollution on bat communities in a semi-natural context. PloS one. 9(10):e103042. doi:10.1371/journal.pone.0103042.

Lacroix DL, Lanctot RB, Reed JA, McDonald TL. 2003. Effect of underwater seismic surveys on molting male long-tailed ducks in the Beaufort Sea, Alaska. Canadian Journal of Zoology. 81(11):1862–1875.

Laist DW. 1987. Overview of the biological effects of lost and discarded plastic debris in the marine environment. Marine Pollution Bulletin. 18(6):319–326.

Laverty P. 2003. The Ohlone/Costanoan-Esselen nation of Monterey, California: dispossession, federal neglect, and the bitter irony of the federal acknowledgment process. Wicazo Sa Review. 18(2):41-77.

Lenhardt M. 1994. Seismic and very low frequency sound induced behaviors in captive loggerhead marine sea turtles (Caretta caretta). In: Bjorndal KA, Bolten AB, Johnson DA, Eliazar PJ, editors. Proceedings of the fourteenth annual symposium on sea turtle biology and conservation; Hilton Head, SC. Miami (FL): U.S. Department of Commerce, National Oceanic and Atmospheric Administration. 238-241 p. Report No.: NOAA Technical Memorandum NMFS-SEFSC-35 1.

Lenhardt M. 2002. Sea turtle auditory behavior. The Journal of the Acoustical Society of America. 112(2312). doi:10.1121/1.1526585.

Lisa Wise Consulting. 2008. Morro Bay and Port San Luis commercial fisheries business plan. 118 p.

Lisa Wise Consulting. 2015. Morro Bay commercial fisheries 2015 economic impact report working waterfornt edition. San Luis Obispo (CA). 23 p.

Love G. 2013. Whale pulled my chain. [accessed 2021 May 05]. https://www.youtube.com/watch?v=MtnK3DHJOaI.

Lundsten E, Paull C, Caress D, Gwiazda R, Cochrane G, Walton M, Nieminski N. 2019. Commingled seafloor pockmarks and micro depressions offshore Big Sur, California. In: American Geophysical Union, Fall meeting 2019; 2019 Dec 9-13; San Francisco, CA.

Marantz C. 1986. The birds of San Luis Obispo, California: their status and distribution. Biological Sciences

Department, School of Science and Mathematics, California Polytechnic State University, San Luis Obispo. p. 184.

Marsaglia K, Rodriguez B, Weeraratne D, Greene H, Shintaku N, Kohler M. 2019. Tracing the Arguello submarine canyon system from shelf origins to an abyssal sink. Journal of Sedimentary Research. 17(1):87-101.

Meyer-Gutbrod EL, Greene CH, Davies KTA, Johns DG. 2021. Ocean regime shift is driving collapse of the North Atlantic right whale population. Oceanography. 34:22-31. doi:10.5670/oceanog.2021.308.

Michel J, Dunagan J, Boring C, Healy E, Evans W, Dean J, McGillis A, Hain J. 2007. Worldwide synthesis and analysis of existing information regarding environmental effects of alternative energy uses on the Outer Continental Shelf. Herndon (VA): U.S. Department of the Interior, Minerals Management Service. 269 p. Report No.: OCS Study MMS 2007-038.

Miller D, Lea R. 1976. Guide to the coastal marine fishes of California. San Diego (CA): State of California, Department of Fish and Game. 252 p.

Miller R, Field J, Santora J, Monk M, Kosaka R, Thomson C. 2017. Spatial valuation of California marine fisheries as an ecosystem service. Canadian Journal of Fisheries and Aquatic Sciences. 74(11):1732-1748.

Milliken R, Johnson J. 2005. An ethnogeography of Salinan and Northern Chumash Communities, 1769-1810. Davis, CA: Prepared for Far Western Anthropological Research Group, Inc. Report No.: Prepared for Caltrans Contract No. 06A0148 & 06A0391.

MMS. 2007. Programmatic environmental impact statement for alternative energy development and production and alternate use of facilities on the Outer Continental Shelf: final environmental impact statement, 4 vols. Herndon (VA): U.S. Department of the Interior, Minerals Management Service. Report No.: OCS EIS/EA MMS 2007-046.

Montevecchi WA. 2006. Influences of artificial light on marine birds. In: Rich C, Longcore T, editors. Ecological Consequences of Artificial Night Lighting. Washington (DC): Island Press. p. 94–113.

Montevecchi WA, Wiese F, Davoren G, Diamond A, Huettmann F, Linke J. 1999. Seabird attraction to offshore platforms and seabird monitoring from offshore support vessels and other ships: literature review and monitoring designs. Calgary (AB): Canadian Association of Petroleum Producers. 56 p.

Musial W, Ram B. 2010. Large-scale offshore wind power in the United States, assessment of opportunities and barriers. Golden (CO): U.S. Department of Energy, National Renewable Energy Laboratory. 240 p. [accessed 2022 Mar 25]. https://www.google.com/books/edition/Large_Scale_Offshore_Wind_Power_in_the_U/sveic3pTegsC?hl=en&gbpv=1.

Muto MM, Helker VT, Angliss RP, Allen BA, Boveng PL, Breiwick JM, Cameron MF, Clapham PJ, Dahle SP, Dahlheim ME, et al. 2016. Alaska marine mammal stock assessments, 2015. Springfield (VA): U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center. 309 p. Report No.: NOAA Technical Memorandum NMFS-AFSC-323.

Muto MM, Helker VT, Angliss RP, Allen BA, Boveng PL, Breiwick JM, Cameron MF, Clapham PJ, Dahle SP, Dahlheim ME, et al. 2018. Alaska marine mammal stock assessments, 2017. Springfield (VA): U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center. 391 p. Report No.: NOAA Technical Memorandum NMFS-AFSC-378.

[NAHC] Native American Heritage Commission. 2022a. Chumash. West Sacramento (CA): State of California, Native American Heritage Commission; [accessed 2021 Nov 15]. http://nahc.ca.gov/cp/p08chumash/.

NAHC. 2022b. Esselen. West Sacramento (CA): State of California, Native American Heritage Commission; [accessed 2021 Dec 13]. http://nahc.ca.gov/cp/p12esselen/.

NAHC. 2022c. Salinan. West Sacramento (CA): State of California, Native American Heritage Commission; [accessed 2021 Nov 9]. http://nahc.ca.gov/cp/p41salinan/.

National Data Buoy Center. 2012. Can you describe the moored buoys?; [accessed 2022 Aug 3]. https://www.ndbc.noaa.gov/hull.shtml.

National Data Buoy Center. 2020. Moored buoy program. Stennis Space Center (MS): U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, National Data Buoy Center; [accessed 2022 Aug 1]. https://www.ndbc.noaa.gov/mooredbuoy.shtml.

[NMFS] National Marine Fisheries Service. 2012. Final biological report: final rule to revise the critical habitat designation for leatherback sea turtles. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 34 p.

NMFS. 2015. Sea turtles and vertical lines in the northeast region issue statement and research needs. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service; [updated July 2018; accessed 2018 Jul 12].

NMFS. 2016. Cook Inlet beluga whale recovery plan (Delphinapterus leucas). Juneau (AK): U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Region, Protected Resources Division. 284 p.

NMFS. 2018. 2018 revisions to: technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing (version 2.0). Underwater thresholds for onset of permanent and temporary threshold shifts. Silver Spring (MD): U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 178 p. Report No.: NOAA Technical Memorandum NMFS-OPR-59.

NMFS. 2021. Final Programmatic NLAA for OSW site assessment and site characterization activities. Gloucester, MA: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 68 p.

NMFS. 2022. 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 [official communication; letter of concurrence from Dan Lawson, Protected Resources Division, to Lisa Gilbane, BOEM Pacific OCS Region, on 2022 Sept 21]. 65 p.

NMFS and USFWS. 2020. Endangered Species Act status review of the leatherback turtle (Dermochelys coriacea): report to the National Marine Fisheries Service Office of Protected Resources and U.S. Fish and Wildlife Service. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, and U.S. Department of the Interior, U.S. Fish and Wildlife Service. 396 p.

[NOAA] National Oceanic and Atmospheric Administration. 2019. Homecoming: Journey to Limuw. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service; [accessed 2022 Jan 7]. https://sanctuaries.noaa.gov/earthisblue/wk259-stories-from-the-blue-chumash.html.

NOAA. 2021. Proposed Designation of Chumash Heritage National Marine Sanctuary. U.S. Department of Commerce, National Oceanic and Atmospheric Administration; [accessed 2021 Dec 29]. https://sanctuaries.noaa.gov/chumash-heritage/.

NOAA. 2022. ENOW Explorer: total ocean economy. Silver Spring (MD): U.S. Department of Commerce, National Oceanic and Atmospheric Administration; [accessed 2022 Mar 31]. https://coast.noaa.gov/enowexplorer/#/employment/tourism/2018/06079.

North Carolina Cooperative Extension Service. 1994. Morro Bay watershed (California) 319 national monitoring program project. Raleigh (NC): North Carolina State University College of Agricultural and Life Sciences, North Carolina Cooperative Extension Service, NCSU Water Quality Group. 8 p.

Northern Chumash Tribal Council. 2015. Chumash Heritage National Marine Sanctuary Nomination. Nomination submitted to NOAA National Marine Sanctuaries Office. Monterey, CA: National Oceanic and Atmospheric Administration, National Marine Sanctuaries. p. 69.

Ohlone Costanoan-Esselen Nation. 2021. Ohlone/Costanoan-Esselen Indians of the Greater Monterey Bay Area. Ohlone/ Costanoan-Esselen Nation; [accessed 2021 Dec 29]. http://www.ohlonecostanoanesselennation.org/index.html.

Pacific Seabird Group. 2002. Petition to list the Xantus's murrelet (Synthliboramphus hypoleucus) as threatened under the Endangered Species Act [unpublished].

Pagaling E. 2018. Dark water journey: power of memories guides paddler on historic crossing. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Sanctuaries, Channel Islands National Marine Sanctuary; [accessed 2022 Jan 6]. https://sanctuaries.noaa.gov/news/nov18/dark-water-journey-chumash-tomol-crossing.html.

Page G, Bidstrup F, Ramer R, Stenzel L. 1986. Distribution of wintering snowy plovers in California and adjacent states. Western Birds. 17(4):145–170.

Page G, Warriner J, Warriner J, Paton P. 1995. Snowy plover. The Birds of North America. (154):1–24.

Peery M, Henkel L, Becker B, Newman S, Harvey J, Thompson C, Beissinger S. 2008. Effects of rapid flight-feather molt on post-breeding dispersal in a pursuit-diving seabird. The Auk. 125(1):113-123.

Pelletier SK, Omland KS, Watrous KS, Peterson TS. 2013. Information synthesis on the potential for bat interactions with offshore wind facilities, final report. Herndon (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 112 p. Report No.: OCS Study BOEM 2013-01163.

[PFMC] Pacific Fishery Management Council. 2016. Pacific coast salmon fishery management plan for commercial and recreational salmon fisheries off the coasts of Washington, Oregon, and California as revised through Amendment 19. Portland (OR). 90 p.

PFMC. 2018. Fishery management plan for U.S. West Coast fisheries for highly migratory species as amended through Amendment 5. Portland (OR). 78 p.

PFMC. 2019. Coastal pelagic species fishery management plan as amended through Amendment 17. Portland (OR). 49 p.

PFMC. 2020. Pacific coast groundfish fishery management plan for the California, Oregon, and Washington groundfish fishery. Portland (OR). 147 p.

Pierce KE, Harris RJ, Larned LS, Pokras MA. 2004. Obstruction and starvation associated with plastic ingestion in a northern gannet Morus bassanus and a greater shearwater Puffinus gravis. Marine Ornithology. 32:187–189.

[PNNL] Pacific Northwest National Laboratory. 2019. California LiDAR buoy deployment biological assessment/essential fish habitat assessment. Richland (WA): U.S. Department of Energy, Pacific Northwest National Laboratory. 39 p.

Porter A, Phillips S. 2016. Determining the infrastructure needs to support offshore floating wind and marine hydrokinetic facilities on the Pacific West Coast and Hawaii. Camarillo (CA): U.S. Department of the Interior, Bureau of Ocean Energy Management, Pacific OCS Region. 256 p. Report No.: OCS Study BOEM 2016-011.

Rebstock GA. 2003. Long-term change and stability in the California current system: lessons from CalCOFI and other long-term data sets. Deep Sea Research Part II: Topical Studies in Oceanography. 50(14-16):2583-2594.

Richards S. 2012. Whale in a tangle with visiting yacht's mooring. Blue Whale Sailing; [accessed 2022 Aug 3]. https://www.bwsailing.com/whale-in-a-tangle-with-visiting-yachts-mooring/.

Richardson W, Greene C, Malme C, Thompson D. 1995. Marine mammals and noise. San Diego (CA): Academic Press.

Ridgway S, Wever E, McCormick J, Palin J, Anderson J. 1969. Hearing in the giant sea turtle Chelonia mydas. Proceedings of the National Academy of Science. 64(3):884-890. doi:10.1073/pnas.64.3.884.

Rivers B, Jones T. 1993. Walking along deer trails: a contribution to Salinan ethnogeography based on the field notes of John Peabody Harrington. Journal of California and Great Basin Anthropology. 15(2):146-175.

Rockwood R, Calambokidis J, Jahncke J. 2017. High mortality of blue, humpback and fin whales from modeling of vessel collisions on the U.S. West Coast suggests population impacts and insufficient protection. PLoS One. 12(8):24. doi:10.1371/journal.pone.0183052.

Romero T. 2021. Southern Californial listening sessions: summary indicators of climate change in California, 2021 March 9-10 and April 13-14. In: Teresa Romero ED, Santa Ynez Band of Chumash Indians, editor. p. 18.

Russo D, Jones G, Arlettaz R. 2007. Echolocation and passive listening by foraging mouse-eared bats Myotis myotis and M. blythii. Journal of Experimental Biology. 210(1):166–176.

Ryan J, Fischer A, Kudela R, Gowe J, King S, Marin III R, Chavez F. 2009. Influences of upwelling and downwelling winds on red tide bloom dynamics in Monterey Bay, California. Continental Shelf Research. 29:785-795. doi:10.1016/j.csr.2008.11.006.

Ryan T, Kluza D. 1999. Additional records of the Least Tern from the West Coast of Mexico. Western Birds. 30:175-176.

Rydell J. 1991. Seasonal use of illuminated areas by foraging northern bats Eptesicus nilssoni. Ecography. 14(3):203–207.

Saez L, Lawson D, DeAngelis M. 2021. Large whale entanglements off the West Coast, from 1982-2017. 64 p. Report No.: NOAA Technical Memorandum NMFS-OPR-63A.

[SAIC] Science Applications International Corporation. 1986. Assessment of long-term changes in the biological communities in the Santa Maria Basin and Western Santa Barbara Channel. La Jolla (CA). 933 p. Report No.: OCS Study MMS-86-0012.

SAIC. 1992. Taxonomic atlas of the benthic fauna of the Santa Maria Basin and Western Santa Barbara Channel. Woods Hole, MA. 161 p. Report No.: OCS Study MMS 92-0042.

Salinan Tribe of Monterey and San Luis Obispo Counties. 2020. About our tribe. Salinan Tribe of Monterey and San Luis Obispo Counties; [accessed 2021 Dec 16]. https://salinantribe.com/?page_id=55.

San Luis Obispo County. 2014. San Luis Obispo County 2014 integrated regional water management plan. San Luis Obispo (CA): San Luis Obispo County, San Luis Obispo Regional Water Management Group. 776 p.

Santa Ynez Band of Chumash Indians. 2021a. Our History. [accessed 2021 Dec 10]. https://www.santaynezchumash.org/chumash-history.

Santa Ynez Band of Chumash Indians. 2021b. Our Home. Santa Ynez Band of Chumash Indians; [accessed 2021 Dec 29]. https://www.santaynezchumash.org/the-santa-ynez-reservation.

Schaub A, Ostwald J, Siemers BrM. 2008. Foraging bats avoid noise. Journal of Experimental Biology. 211(19):3174–3180.

Schwemmer P, Mendel B, Sonntag N, Dierschke V, Garthe S. 2011. Effects of ship traffic on seabirds in offshore waters: implications for marine conservation and spatial planning. Ecological Applications. 21(5):1851–1860.

Shaughnessy F, Mulligan T, Kramer S, Kullmann S, Largier J. 2017. Baseline characterization of biodiversity and target species in estuaries along the north coast of California. Final report. La Jolla (CA): California Sea Grant, California Ocean Protection Council, California Department of Fish and Wildlife, and California Ocean Science Trust. 112 p.

Shuman M. July 15. Should Native Americans climb Morro Rock? SLO County supervisor's resolution revives debate. San Luis Obispo Tribune. [accessed 2021 Sept 29]. https://www.sanluisobispo.com/news/local/article252740293.html.

SLO Co. APCD. 1994. U.S. EPA-San Luis Obispo County APCD agreement for delegation of authority for outer continental shelf air regulations (40 CFR Part 55). San Luis Obispo County Air Pollution Control District. 8 p.

Small A. 1994. California birds: their status and distribution. Vista (CA): Ibis Publishing Company. 360 p.

Somers K, Whitmire C, RIcherson K, Jannot J, Tuttle V, McVeigh J. 2020. Fishing effort in the 2002-17 Pacific Coast groundfish fisheries. Seattle (WA): U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northwest Fisheries Science Center. 55 p. Report No.: NOAA Technical Memorandum NMFS-NWFSC-153.

Southall BL. 2005. Shipping noise and marine mammals: a forum for science, management, and technology. In: Final Report of the National Oceanic and Atmospheric Administration (NOAA) International Symposium 2005; 2004 May 18–19; Arlington, VA. 40 p.

Speakman J. 1991. The impact of predation by birds on bat populations in the British Isles. Mammal Review. 21(3):123-142.

Stemp R. 1985. Observations on the effects of seismic exploration on seabirds. In: Proceedings of the Workshop on the Effects of Explosives Use in the Marine Environment; p. 29–31.

Stone EL, Jones G, Harris S. 2009. Street lighting disturbs commuting bats. Current Biology. 19(13):1123–1127.

Strachan G, McAllister M, Ralph C. 1995. Marbled Murrelet at-sea and foraging behavior. In: Ecology and Conservation of the Marbled Murrelet (C. J. Ralph, G. L. Hunt, Jr., M. G. Raphael, and J. F. Piatt, Eds.). Albany (CA): U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 247-254 p. Report No.: Forest Service General Technical Report PSW-GTR-152.

Suryan RM, Anderson DJ, Shaffer SA, Roby DD, Tremblay Y, Costa DP, Sievert PR, Sato F, Ozaki K, Balogh GR. 2008. Wind, waves, and wing loading: morphological specialization may limit range expansion of endangered albatrosses. PLoS One. 3(12):e4016.

Suryan RM, Dietrich KS, Melvin EF, Balogh GR, Sato F, Ozaki K. 2007. Migratory routes of short-tailed albatrosses: use of exclusive economic zones of North Pacific Rim countries and spatial overlap with commercial fisheries in Alaska. Biological Conservation. 137(3):450–460.

Suryan RM, Fischer KN. 2010. Stable isotope analysis and satellite tracking reveal interspecific resource partitioning of nonbreeding albatrosses off Alaska. Canadian Journal of Zoology. 88(3):299–305.

Suryan RM, Sato F, Balogh GR, Hyrenbach KD, Sievert PR, Ozaki K. 2006. Foraging destinations and marine habitat use of short-tailed albatrosses: a multi-scale approach using first-passage time analysis. Deep Sea Research Part II: Topical Studies in Oceanography. 53(3–4):370–386.

[SWRCB] State Water Resources Control Board. 2021a. 2018 integrated report for Clean Water Act Sections 303(d) and 305(b), final staff report. Sacramento (CA): California Environmental Protection Agency, California Water Boards, State Water Resources Control Board. 81 p.

SWRCB. 2021b. 2020-2022 integrated report for Clean Water Act Sections 303(d) and 305(b), draft staff report. Sacramento (CA): California Environmental Protection Agency, California Water Boards, State Water Resources Control Board. 89 p.

Sydeman WJ, Poloczanska E, Reed TE, Thompson SA. 2015. Climate change and marine vertebrates. Science: Oceans and Climate. 350(6262):772-777.

Taylor SP. 2021. The Salinan people. Mission San Miguel Archangel; [accessed 2021 Dec 27]. https://www.missionsanmiguel.com/history/salinans.html.

Tetra Tech EC Inc. 2010. Garden State offshore energy project plan for the deployment and operation of a meteorological data collection buoy within interim lease site, Block 7033. Prepared for Deepwater Wind, LLC.

Tetra Tech EC Inc. 2015. USCG final environmental impact statement for the Port Ambrose Project deepwater port application, vol I and II. Washington (DC): U.S. Coast Guard Vessel and Facility Operating Standards. 202 p. Report No.: USCG-2013-0363.

Threlfall CG, Law B, Banks PB. 2012. Influence of landscape structure and human modifications on insect biomass and bat foraging activity in an urban landscape. PloS ONE. 7(6):e38800.

Tietz J, McCaskie G. 2022. Update to rare birds of California, 1 January 2004–22 January 2021. Camarillo (CA): Western Field Ornithologists, California Bird Records Committee; [accessed 2022 Mar 25]. https://www.californiabirds.org/cbrc_book/update.pdf.

Turnpenny AW, Nedwell J. 1994. Consultancy report. The effects on marine fish, diving mammals and birds of underwater sound generated by seismic surveys. Fawley Aquatic Research Laboratories Ltd. 50 p.

U.S. Census Bureau. 2021. Quick facts, San Luis Obispo County, California, and California, United States. Washington (DC): U.S. Department of Commerce, U.S. Census Bureau; [updated 2021 Jul 01; accessed 2022 Aug 31]. https://www.census.gov/quickfacts/sanluisobispocountycalifornia.

U.S. Navy. 2017. Criteria and thresholds for U.S. Navy acoustic and explosive effects analysis (phase III), technical report. San Diego (CA): U.S. Navy, SSC Pacific. 194 p.

USACE. 2013. Draft environmental assessment Morro Bay six year federal maintenance dredging program, San Luis Obispo, California. Los Angeles (CA): U.S. Army Corps of Engineers. 275 p.

[USCG] U.S. Coast Guard. 2011. Table 386: oil spills in U.S. water-number and volume. In: Pollution incidents in and around U.S. waters, a spill/release compendium: 1969–2004 and 2004–2009. U.S. Coast Guard, Marine Information for Safety and Law Enforcement (MISLE) System. 1 p.

[USFWS] U.S. Fish and Wildlife Service. 1980. California least tern recovery plan. Portland (OR): U.S. Fish and Wildlife Service. 65 p.

USFWS. 1985. Revised California least tern recovery plan. Portland (OR): U.S. Fish and Wildlife Service. 108 p.

USFWS. 2006. California least tern (Sternula antillarum browni) five-year review summary and evaluation. Carlsbad (CA): U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office. 35 p.

USFWS. 2008. Short-tailed albatross recovery plan. Anchorage (AK): U.S. Department of the Interior, U.S. Fish and Wildlife Service. 105 p.

USFWS. 2014. Short-tailed albatross 5-year review: summary and evaluation. Anchorage (AK): U.S. Department of the Interior, U.S. Fish and Wildlife Service, Anchorage Fish and Wildlife Field Office. 43 p.

USFWS. 2017. Biological opinion for the oil and gas activities associated with Lease Sale 244: consultation with Bureau of Ocean Energy Management and Bureau of Safety and Environmental Enforcement. Anchorage (AK): U.S. Department of the Interior, U.S. Fish and Wildlife Service, Anchorage Fish and Wildlife Conservation Office. 166 p.

USFWS. 2020. Short-tailed albatross 5-year review: summary and evaluation. Anchorage (AK): U.S. Department of the Interior, U.S. Fish and Wildlife Service, Anchorage Fish and Wildlife Field Office. 47 p.

UXL Encyclopedia of Native American Tribes. 2008. Chumash. UXL Encyclopedia of Native American Tribes; California and the Pacific Northwest. 2 ed.: Gale eBooks.

Walton M, Paull C, Cochrane G, Addison J, Caress D, Gwiazda R, Kennedy D, Lundsten E, Papesh A. 2021. California deepwater investigations and groundtruthing (Cal DIG) I, volume 2: fault and shallow geohazard analysis offshore Morro Bay. Camarillo (CA): U.S. Department of the Interior, Bureau of Ocean Energy Management, Pacific Outer Continental Shelf Region. 55 p. Report No.: OCS Study BOEM 2021-044.

West Coast Ocean Tribal Caucus. 2020. Guidance and responsibilities for effective Tribal consultation, communication, and engagement. A guide for agencies working with West Coast Tribes on ocean & coastal issues. West Coast Ocean Tribal Caucus. 45 p.

Western Regional Climate Center. 2022. Station wind rose San Luis Obispo California. Western Regional Climate Center; [accessed 2022 Mar 25]. https://raws.dri.edu/cgi-bin/rawMAIN.pl?caCSLO.

Whitworth DL, Takekawa JY, Carter HR, Newman SH, Keeney TW, Kelly PR. 2000. Distribution of Xantus' murrelet Synthliboramphus hypoleucus at sea in the Southern California Bight, 1995–97. Ibis. 142(2):268–279.

Whyte K, Gaughen S, Hardison H, Jones C, Marks-Marino D, Morishima G, Mullen H, Walker A. 2021. Worldviews, knowledges, and social impacts. Institute for Tribal Environmental Professionals. 34-45 p.

Wiecks J, Avery C, Boetcher A, Cooley C, Cruz M, Hardison P, Jones C, Kriebs C, Marks-Marino D. 2021. Air. In: The status of tribes and climate change report. Institute for Tribal Environmental Professionals. 81-97 p.

Wiese FK, Jones IL, Nettleship D. 2001a. Experimental support for a new drift block design to assess seabird mortality from oil pollution. The Auk. 118(4):1062–1068.

Wiese FK, Montevecchi W, Davoren G, Huettmann F, Diamond A, Linke J. 2001b. Seabirds at risk around offshore oil platforms in the north-west Atlantic. Marine Pollution Bulletin. 42(12):1285–1290.

Wiggins SM, Rafter M, Krumpel A, LeRoy DM, Baumann-Pickering S, Hildebrand JA. 2020. Comparison of Fisheries and Naval Explosions in the SOCAL Range Complex. La Jolla (CA): University of California San Diego, Marine Physical Laboratory/Scripps Institution of Oceanography. 33 p. Report No.: Marine Physical Laboratory Technical Memorandum 638.

Xolon Salinan Tribe. 2019. About us. Xolon Salinan Tribe; [accessed 2021 Dec 16]. https://www.xolonsalinantribe.org/.

YTT Northern Chumash. 2020. Nonprofit, Our Mission. yak tityu tityu yak tiłhini Northern Chumash Tribe; [accessed 2022 Jan 5]. https://www.yttnorthernchumash.org/copy-of-meet-the-board.

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