



## Pacific Fishery Management Council

---

7700 NE Ambassador Place, Suite 101 Portland, OR 97220-1384  
Phone 503-820-2280 | Toll free 866-806-7204 | Fax 503-820-2299 | [www.pcouncil.org](http://www.pcouncil.org)  
Marc Gorelnik, Chair | Merrick J. Burden, Executive Director

August 1, 2022

Mr. Doug Boren  
Pacific Regional Director  
Bureau of Ocean Energy Management  
760 Paseo Camarillo, Suite 102  
Camarillo, CA 93010

Re: Bureau of Ocean Energy Management's *Pacific Wind Lease Sale 1 (PACW-1) for Commercial Leasing for Wind Power on the Outer Continental Shelf in California—Proposed Sale Notice*

Dear Mr. Boren,

The Pacific Fishery Management Council (Council) appreciates the opportunity to comment on the Bureau of Ocean Energy Management's (BOEM) Pacific Wind Lease Sale 1 (PACW-1) for Commercial Leasing for Wind Power on the Outer Continental Shelf in California—Proposed Sale Notice (PSN). The Council offers the following comments which address concerns surrounding impacts to commercial and recreational fishing activities, fishing-dependent coastal communities, and vital marine habitats and species of the California Current Ecosystem (CCE). We provide some general comments followed by responses to some but not all of the specific questions posed in the PSN.

First, however, we wish to make clear that serious concerns about the process remain. One concern is that the process continues to move too quickly. It has outpaced the information needed for decision-making, leaving the decision-making process so far under-informed at best. The community benefit agreement (CBA) concept included in the PSN provides one example. They may hold promise. At the same time, they are something the Council would take considerable time to develop, with at least a three-meeting process for considering alternatives, analysis, and public input. More fundamentally, there is concern that the focus on CBAs signals a shift in emphasis to compensating for fisheries losses instead of where it properly belongs—on avoiding and minimizing them. The right to fishing and interpreting BOEM's mandates so as not to affect it is embedded in the Outer Continental Shelf Lands Act's congressional declaration of policy (43 U.S.C. § 1332(2)).

In addition, the sequence of decision-making and environmental impact analysis under BOEM's process remains of highest concern. The public does not have detailed analysis on what developing these areas would mean for the marine ecosystem or fisheries. We understand the reasons for this and know that BOEM plans more detailed analysis for later stages. However, when more detailed analysis is conducted it may show that the impacts are unacceptable or that other areas also would be desirable and suitable for wind energy development and yet have lower impact to fisheries and the environment. The BOEM process should not foreclose that possibility.

---

We continue to believe that a programmatic, marine spatial planning approach would be preferable for public process. We recently learned that BOEM has plans for such a programmatic approach to environmental impact analysis for the New York Bight. We applaud BOEM adopting this well-used approach for the first time; the Council has significant experience participating in programmatic environmental review in our work with other Federal agencies. That said, the time to use this approach is prior to lease sales, and ideally prior to establishment of Wind Energy Areas. That is the time when use of this approach can most meaningfully result in avoidance or minimization of impacts to resources. However, we are encouraged that BOEM is considering more comprehensive approaches and encourage use of these approaches on the West Coast. Again, the Council continues to recommend that the agency take a more comprehensive, marine spatial planning type approach to best support its decision-making and the public's involvement in it.

## **Council Authorities and Responsibilities**

### *Essential Fish Habitat*

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) authorizes the Council to identify, conserve, and enhance essential fish habitat (EFH) for species managed under the Council's fishery management plans (FMPs). The MSA defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The MSA includes additional provisions to designate Habitat Areas of Particular Concern (HAPC) for habitats of ecological significance, sensitivity, vulnerability to degradation, or rare occurrence. The Council has identified EFH throughout the Pacific Coast region for species managed under each of its FMPs and has designated HAPC for groundfish (rocky reefs, estuaries, canopy kelp, seagrasses, offshore banks, seamounts, canyons, and areas of interest) and salmon (estuaries, marine and estuarine submerged aquatic vegetation, and other habitat features). The Council has also designated Essential Fish Habitat Conservation Areas (EFHCAs) for groundfish species in its Groundfish FMP, which are spatially discrete areas closed to bottom trawl fishing and/or all bottom contact fishing, to protect fragile habitats from the effects of some types of bottom fishing.

The MSA further authorizes the Council to comment on any Federal or state activity that may affect the habitat, including EFH, of a marine or anadromous fishery resource under its authority. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions.

### *Fishing, Coastal Communities, and MSA National Standards*

The MSA includes ten National Standards (NS) that are principles to be followed in any FMP to ensure sustainable and responsible fishery management. The National Marine Fisheries Service (NMFS) has developed regulatory guidance for the ten NS (50 CFR Part 600 Subpart D). With those standards in mind, the Council **recommends** that any analysis of the effects of offshore wind (OSW) energy development activities consider four NS with particular relevance to the siting, design, and configuration of OSW lease areas:

- The effects of the proposed action on the ability of fisheries to continue to achieve optimum yield from managed wild fish stocks (NS1 - 50 CFR § 600.310).
- The effects of the proposed action on scientific information which informs conservation and management measures. Scientific information specifically includes "data compiled directly

from surveys or sampling programs, and models that are mathematical representations of reality constructed with primary data.” (NS2 – 50 CFR § 600.315).

- The effects of the proposed action on the sustained availability of fishery resources to fishing communities near any proposed lease sale areas, and on the sustained participation of those fishing communities in fisheries, including minimizing adverse economic impacts to fishing communities (NS8E - 50 CFR § 600.345).
- The effects of the proposed action on fishing vessel safety of navigation and safety of human life at sea (NS10 - 50 CFR § 600.355).

Our comments below are focused on potential impacts to habitats and the CCE, and impacts to commercial and recreational fishing activities, fishing-dependent coastal communities, and associated industries such as transportation, seafood trade, and recreation. We offer the following comments specific to questions contained in the PSN.

## II. Area Proposed for Leasing

The PSN notes that the U.S. Coast Guard (USCG) is conducting a Port Access Route Study on the Pacific Coast from Washington to California (PAC-PARS) to evaluate safe access routes for the movement of vessel traffic proceeding to or from ports along the western seaboard, and specifically to determine whether a Shipping Safety Fairway and/or routing measures should be established, adjusted, or modified.

### II.b. Potential Future Restrictions to Ensure Navigational Safety Measures

- USCG Navigational Safety Measures.* The Council is aware of the USCG PAC-PARS initiative and is supportive of the USCG establishing navigational fairways and other vessel routing measures to ensure safe and efficient navigation for all manner of maritime vessel traffic. We **encourage** BOEM to accommodate the results and timeline of the PAC-PARS initiative before finalizing OSW lease areas.
- Measures for Vessel Transit.* The PSN states that BOEM may “*consider designating portions of the proposed Lease Areas as areas of no surface occupancy to facilitate vessel transit and continuance of existing uses.*” The Council supports BOEM’s consideration of this important issue and **recommends** that BOEM require corridors of sufficient size to accommodate fishing vessel and research vessel transit and research activities, including routes to facilitate access to USCG-established Fairways and transit corridors as well as to access fishing areas, and for search and rescue activities. We **support** the NMFS recommendation of a four-kilometer corridor width, as described in a comment letter on the Oregon Call Areas Notice.<sup>1</sup> BOEM should also consider minimum depth levels of any subsurface infrastructure used during site assessment and site characterization activities. These minimum depth levels should be informed by discussions with all maritime uses known to operate in and around the lease areas.

## IV. Questions for Stakeholders

### IV.a: Number, Size, Orientation, and Location of the Proposed Lease Area

---

<sup>1</sup><https://www.federalregister.gov/documents/2022/04/29/2022-09000/call-for-information-and-nominations-commercial-leasing-for-wind-energy-development-on-the-outer>

The Council is extremely concerned about impacts to commercial and recreational fishing as well as fishing-dependent coastal communities, for lease sites in both the Humboldt and Morro Bay WEAs. OSW development within the WEAs means that access to fishing areas will be precluded, transit will be impacted, and research activities will be impacted. The Council recommends (as stated above) that BOEM establish, or require Lessees to establish, corridors of sufficient size to accommodate fishing vessel and research vessel transit and research activities.

The Council is equally concerned with potentially significant impacts to habitat resources in the Morro Bay and Humboldt proposed lease sale areas. Lease areas in both WEAs are located in designated EFH for Pacific Coast groundfish, coastal pelagic species, salmon, and highly migratory species. The majority of the Morro Bay WEA is located in the Big Sur Coast/Port San Luis EFHCA and includes designated rocky reef HAPC. Likewise, the Humboldt WEA overlaps with much of the Samoa Deepwater EFHCA and contains designated HAPC (rocky reefs and rocky banks) as well as concentrations of methane seep plume sites. The Humboldt WEA is also within two nautical miles of the Mad River Rough Patch EFHCA, which may be relevant in establishing cable routes. Both EFHCAs are known hotspots of deep-sea corals and sponges. EFHCA and HAPC designations indicate the ecological significance and sensitivity of these locations and should be protected by excluding them from OSW activities.

As stated in previous Council letters, fine-scale seafloor mapping surveys and a comprehensive habitat classification map are needed throughout the Morro Bay WEA, Humboldt WEA, and cable corridors to identify benthic habitats that have not been previously mapped (including methane seep sites, corals and sponges, and rocky substrate). Habitat data should be classified using the ecological components of the Coastal and Marine Ecological Classification Standard (CMECS). The information from these surveys should be shared with the Council and the National Oceanic and Atmospheric Administration (NOAA) to both improve the body of public information on the identification of EFH and to help identify habitats within lease areas that may warrant exclusion from OSW activities.

As noted in our previous comments, extensive multibeam sonar surveys and mapping of methane seeps and carbonate deposits conducted off Washington, Oregon, and northern California in 2011, 2016, 2017, and 2018 led to the discovery of over 1,000 new methane emission sites and over 3,000 associated bubble streams on the Cascadia Margin from the Strait of Juan de Fuca to Cape Mendocino. (Merle et al. 2021). This includes bubble streams along the center-most rocky outcrop in the Humboldt WEA and Samoa Deepwater EFHCA. This network of methane seeps is the focus of ongoing oceanographic and climate research. The Council designated methane seeps as groundfish EFH for the ability of methane seeps and underlying methane hydrates to form carbonate hardgrounds (i.e., fish habitat) and support diverse biological communities (PFMC 2019). OSW activities could potentially damage seep sites or interfere with ongoing research and must be carefully considered. Additionally, the potential for slope instability around methane seep areas is discussed in Merle et al (2021) and may be relevant to site assessment and effects analysis. Additional seafloor mapping data have become available from NOAA Fisheries and the NOAA Pacific Marine Environmental Laboratory (PMEL) since the publication of data in Merle et al. (2021) that may be relevant to the Humboldt WEA and cable corridors (NOAA PMEL Ocean Environment Division). BOEM and Lessees should consult with NOAA PMEL to evaluate existing gaps in the mapping of these features, and coordinate with PMEL and other researchers on additional

mapping needs to identify unmapped seeps, hydrates, carbonate deposits, and other sensitive habitat types in the Humboldt WEA and shoreward.

If fine-scale mapping is not completed by BOEM prior to lease sales, the Council **recommends** that BOEM include a lease stipulation that requires Lessees to conduct these mapping activities as part of their Site Assessment Plan. This would ensure the Lessee's Construction and Operation Plan designs any OSW facility configuration in a manner that excludes OSW activities in or adjacent to important and sensitive habitats. Important and sensitive habits include, but are not limited to, bacterial mats, submarine canyons, pockmark fields, biogenic habitats (e.g., corals and sponges), steep slope terrain, rocky reef habitat, methane seep sites, and underlying methane hydrates.

The Council also **recommends** that if important or sensitive habitats cannot be entirely excluded from lease areas or cable corridors that BOEM apply and/or require Lessees to establish sufficiently sized buffer zones around these habitats to minimize impacts from OSW activities. Modeling and/or surveys may be necessary to determine the size of buffers to ensure adequate protection during all phases of OSW activities (i.e., site assessment/characterization, installation, operations, and decommissioning).

It is also essential that BOEM require Lessees to analyze and avoid the coastal and onshore and port impacts of activities needed to support OSW development related to these areas. This includes channel deepening that can dramatically alter estuarine hydrology and ecosystems. Estuaries, eelgrasses, and other submerged aquatic vegetation are HAPCs which will be affected by such activities.

### **Wake effects and Upwelling**

The Council remains concerned with wake effects from OSW farms reducing upwelling in the proposed lease areas. Wind-driven coastal upwelling is a primary driver of productivity in the CCE. Disruption of upwelling could also exacerbate deepwater hypoxia since upwelling (and downwelling) processes are a major driver of oxygen renewal conditions in coastal environments. Wake effects can also impact temperature, salinity, and stratification. The Humboldt WEA may be particularly susceptible to changes in oceanographic processes because it is located within the oxygen minimum zone of the upper slope of the continental shelf (600-1200 meters), a unique area where oxygen concentrations are naturally and consistently low. Periodically, these low oxygen waters move onto the shelf and contribute to widespread hypoxic events.

Recent modeling efforts show about a five percent reduction in wind speeds found in the lee of wind farms, which leads to an approximately 10 to 15 percent decrease in upwelled volume transport and resulting nutrient supply to the coastal zone in the vicinity of the Morro Bay and Diablo Canyon Call Areas (Integral Consulting 2021). Model simulations for wind farms in the southern North Sea demonstrate large-scale attenuation in the wind forcing and associated alterations in the local hydro- and thermodynamics (Christiansen et al. 2022). Other recent analyses indicate that turbine arrays can create wind deficits downwind of the arrays up to 100 kilometers and may affect ocean dynamics and ecosystem function in surrounding areas (Akhtar et al. 2021, Lloret et al. 2022).

Understanding wind deficit effects on ecosystem processes in this region will be important to BOEM's decision on whether to permit OSW off the West Coast, as well as the placement and

configuration of lease sale areas. Results from these and future studies should be used to inform the location of lease sales to minimize the impacts to upwelling, ocean stratification, and prevailing currents in the California Current. We consider the potential impact of wind wakes on the productivity of the California Current to be a foundational issue which should be completely understood before OSW development activities occur. The Council **recommends** that BOEM stipulate as part of the lease sale that the Lessee's Construction and Operation Plan includes an analysis of wind wake effects and identifies lease areas and site designs that generate the least amount of wake effect on upwelling or other oceanographic processes.

IV.b: Engaging Underserved Communities

The Council supports efforts to advance equity for underserved and disadvantaged communities, including Tribal fishery participants and local community members. We note that the fishing and seafood industries include historically disadvantaged, underserved, or marginalized community members. Therefore, impacts to the fishing and seafood industries would necessarily impact such community members and should be considered in the context of environmental justice and spurring economic development opportunities.

IV.c: Bidding Credits

BOEM proposes to grant bidding credits to establish a community benefit agreement (CBA) with a community or stakeholder group whose use of the geographic space of the Lease Area, or whose use of resources harvested from that geographic space, is directly impacted by the Lessee's potential offshore wind development.

The Council has serious concerns about the potential impacts of OSW development on fishing-dependent communities. These impacts may result in the permanent loss of fisheries, processing plants, jobs, and related enterprises. We are cautiously supportive of CBAs as vehicles, if sufficiently funded and implemented, to provide support to coastal communities or stakeholder groups that would be impacted by OSW development. Fishing-dependent communities stand to suffer significantly more than most other coastal community sectors, and the Council is encouraged by BOEM's recognition of the potentially severe impacts that fishing communities will endure, on an indefinite basis. CBAs should extend and be guaranteed for the lifetime of the project and possibly beyond. CBAs should be required as a condition of the lease and should remain in place if a lease or OSW facility is transferred or sold to a different entity.

The PSN proposes a bidding credit of 2.5 percent for bidders who have an "*existing CBA or a commitment to enter into a new CBA with a community or stakeholder group...*". The CBA would be designed, in part '*particularly to assist fishing and related industries to manage transitions, gear changes, or other similar impacts which may arise from the development of the Lease Area.*' We support the inclusion of 'related industries' as being directly affected by OSW activities, and we consider processing plants, transportation, retail businesses, as well as out-of-area fishing participants that are at least partially dependent on fish resources in the area, to be related industries directly affected by OSW development.

The Council has several concerns about the proposed CBA structure. First, noting that the workforce training/supply chain bidding credit requires an explicit financial guarantee, we suggest exploring the possibility of requiring a financial guarantee associated with a CBA, rather than leaving it to be

negotiated later with representatives of the affected community. Such a guarantee would not need to mimic the guarantee for the workforce/supply chain bidding credit but should provide assurance of financial commitment to the affected community and industries. Although the PSN's Bidder Financial Form Addendum does propose a penalty if the Lessee fails to adequately adhere to the CBA, that penalty only applies after ten years of operations. Therefore, the Council **recommends** that a financial guarantee, a down payment of sorts, should be required to ensure that a CBA would be functional and funded soon after a lease is awarded.

Second, we **recommend** that BOEM require CBAs to remain in place and that financial benefits to the CBA should be provided annually throughout the lifetime of the OSW project, including decommissioning, and as long as infrastructure or OSW-related activities remain. There will be ongoing effects, and there will be associated needs to update equipment, nautical maps, port infrastructure, and more. A one-time financial pulse could provide short-term benefits but long-term regrets.

Third, the 2.5 percent bidding credit for a CBA may be insufficient to provide long-term support for the affected industries and community. The nature, magnitude, and duration of impacts is not yet known, and there are likely to be unanticipated impacts. The Council **recommends** that BOEM consider increasing that 2.5 percent to a substantially higher value.

We also note that benefits associated with a CBA should not be a substitute for mitigation and/or compensation through the NEPA process or via other agreements between the developers and affected parties. OSW development will have a multitude of impacts and there is no one-size-fits-all approach. The Council is committed to ensuring a sustainable seafood supply, protecting important habitats, and supporting coastal communities. Insulation against impacts from OSW, will require a multi-pronged, long-term commitment from both BOEM and OSW developers.

#### IV.c(vi) General Questions Regarding CBA Credits

##### *1) How should BOEM evaluate the agreements?*

The Council notes that the PSN does not include specific requirements regarding the value of CBAs. We suggest that BOEM consider factors that 1) maximize the financial benefits to the affected communities, and 2) provide the strongest assurance of implementation over the long term.

##### *On what metrics can BOEM evaluate CBAs?*

BOEM should consider the scope of the CBA, with preference given to CBAs that benefit a broad range of affected stakeholders. For example, while it is important that CBAs benefit the affected fishing industry and related industries (as discussed above), there may be unanticipated impacts to other industries or community members that could also be impacted. Therefore, metrics that recognize a broader range of affected stakeholders should be prioritized.

##### *How can BOEM verify actions to be undertaken pursuant to the CBA?*

While the Council does not offer specific mechanisms to verify that actions pursuant to a CBA are implemented, we recommend that BOEM develop an enforceable, legally binding structure to ensure that OSW developers faithfully implement objectives and actions described in CBAs. BOEM may wish to require that CBAs include a Federal or state official to help ensure accountability and implementation of the CBA.

4) *If BOEM grants a bidding credit for a CBA, at what point in BOEM's renewable energy leasing process must the CBA be executed?*

If a bidding credit is awarded for a CBA, BOEM should require that Lessees immediately begin negotiating those CBAs. BOEM should require executed CBAs with all communities or stakeholder groups whose use of the geographic space of the Lease Area, or whose use of resources harvested from that geographic space, is directly impacted by the Lessee's potential offshore wind development within 90 days from the Lease Execution by a Lessee. Implementation of the CBA should begin upon execution of the CBA.

6) *Should executed CBAs be posted publicly?*

Yes. The Council supports an open transparent process for developing and executing CBA, which would serve to increase trust between the community, the fishing and seafood industry, OSW developers, and BOEM. Further, any CBA **should** follow practices that are transparent and open to the public, and should consist of annual detailed reports documenting activities, finances, decision-making, and other relevant information.

8) *Should BOEM explicitly allow a Lessee's CBA to include payments into a mitigation or innovation fund?*

The Council supports allowing a Lessee's CBA to include payments into a mitigation or innovation fund, especially to the extent that such payments support gear changes, navigation technology improvements, and other efforts to improve safety, navigation, and otherwise compensate the fishing and related industries that would be harmed by OSW development. These actions would help build resilient fishing-dependent communities. A mitigation or innovation fund does not substitute for other forms of mitigation or compensation. For example, fishing industry members who can no longer operate a profitable fishing enterprise as a result of the impacts from OSW won't benefit from such a fund and should be directly financially compensated.

#### Section IV.f: Tribal Governments, Ocean Users, Underserved Communities, Agencies, and Other Stakeholders Engagement and Reporting

The Council supports BOEM's proposed lease requirements to ensure early and regular engagement with Tribal governments, ocean user, underserved communities, agencies, and other stakeholders that may be affected by OSW development. Engagement opportunities should occur at least quarterly, with public notice and opportunities for meaningful discussion and engagement. We encourage Lessees to enlist an independent facilitator to implement these meetings. We also support the requirement of a regular progress report, publicly available, as part of the communication plans for fisheries, Tribes, agencies, and other community members, as well as a requirement that all data collected be made publicly available to the above parties. Transparent and timely data is critical for allowing government, fishing industry, Tribal, and community scientists and groups to understand the impacts of wind energy and hold lease holders accountable.

#### Section IV.h: New industry standards (e.g., technology standards, vessel standards, etc.) for environmental protection for any phase of development

As stated above, delineation of lease sale areas will require additional detailed habitat resource and bathymetric mapping. Habitat data should be classified using the ecological components of the CMECS. The combined CMECS codes (subclass, subgroup, and modifier) provide the ecological relevance for describing benthic habitats. The Council **recommends** that all seafloor data be interpreted using the CMECS codes noted above and be merged into an updated seafloor habitat

map to provide the best available information for ecological and technical analyses, area identification, and leasing decisions.

## **VII: Lease terms and conditions**

***VII.b(i): Commercial Fisheries:*** The Council supports the proposed lease stipulation to require development of a Fisheries Communications Plan (FCP), including the requirement that a Lessee contact potentially affected commercial fishing communities prior to submitting its Construction and Operations Plan. We **recommend** including in any FCP, a requirement to work collaboratively with local fishing industry representatives to identify optimum transmission and interarray cable routes. We also recommend the FCP require Lessees to engage with representatives from affected fishing industry sectors to schedule site assessment and/or site characterization activities during times when fisheries utilizing the proposed lease areas are not being prosecuted to minimize potential impacts. BOEM should consider having NMFS or BOEM help produce standard administrative guidelines and provide an appeal or arbitration mechanism if needed.

The Council appreciates the inclusion of the stipulations described under this section in the PSN. The stipulation to identify dock space and transit routes should be helpful in avoiding some fishing industry and developer space conflicts, both in port and in the lease area(s). It is important to be aware that, in some ports, dock space used by fishing vessels include access to their mooring spaces, access to processor(s), access to public docks that may be used for loading/offloading equipment or products, and access to ice plant or marine supply facilities. These spaces may not be adjacent to each other, depending on the port.

The Council also appreciates the inclusion of incorporating Federal and State climate change adaptation strategies for fisheries. The Council **recommends** that BOEM consider the Council's work regarding climate change, described in the Council's Fishery Ecosystem Plan<sup>2</sup> which includes a future scenario planning exercise developed as part of the Council's Climate and Communities Initiative.

The PSN lists commercial and recreational fishing as first among "existing uses and resources with the highest potential to be affected by offshore wind energy development activities in the Call Areas." California's recreational fishing industry is at least as important economically and to coastal communities as its commercial fishing industry. Yet the proposed lease stipulation states only that Lessees shall work with "commercial fishing communities" prior to submitting proposals "to discuss potential conflicts between seasonal fishing operations and the Lessee's survey and development activities." That requirement is appropriate but should also apply to recreational fishing communities.

The Council **recommends** that BOEM place the recreational fishing community on equal footing with the commercial fishing industry in lease stipulations and every other point in this process where fishery impacts are in issue.

The Council appreciates the opportunity to provide comment on the PSN for California Lease Areas. If you have any questions, please contact Kerry Griffin on Council staff ([Kerry.griffin@noaa.gov](mailto:Kerry.griffin@noaa.gov); 503-820-2409).

---

<sup>2</sup> The FEP can be found at <https://www.pcouncil.org/the-fishery-ecosystem-plan/>

Sincerely,



Marc Gorelnik  
Council Chairman

KFG:kma

Cc: Council Members  
Susan Chambers  
Mike Conroy  
Corianna Flannery  
Steve Scheiblaue

### References

Akhtar, N., Geyer, B., Rockel, B., Sommer, P.S. and Schrum, C., 2021. Accelerating deployment of offshore wind energy alter wind climate and reduce future power generation potentials. Scientific reports, 11(1), pp.1-12.

Christiansen, N., Daewel, U., Djath, B. and Schrum, C., 2022. Emergence of large-scale hydrodynamic structures due to atmospheric offshore wind farm wakes. *Frontiers in Marine Science*, p.64.

Integral Consulting, Inc. 2021. An Assessment of the Cumulative Impacts of Floating Offshore Wind Farms. Prepared for the California Ocean Protection Council. December 2021.

Lloret, J., Turiel, A., Solé, J., Berdalet, E., Sabatés, A., Olivares, A., Gili, J.M., Vila-Subirós, J. and Sardá, R., 2022. Unravelling the ecological impacts of large-scale offshore wind farms in the Mediterranean Sea. *Science of the Total Environment*, 824, p.153803.

Merle Susan G., S.W. Embley, H.P. Johnson, T.K. Lau, B.J. Phrampus, N.A. Raineault, and L.J. Gee. 2021. Distribution of Methan Plumes on Cascadia Margin and Implications for the Landward Limit of Methane Hydrate Stability. *Frontiers in Earth Science*. 24p.

PFMC 2019. Pacific Coast Groundfish Fishery Management Plan, Appendix B Part 2. Pacific Fishery Management Council, Portland, Oregon.