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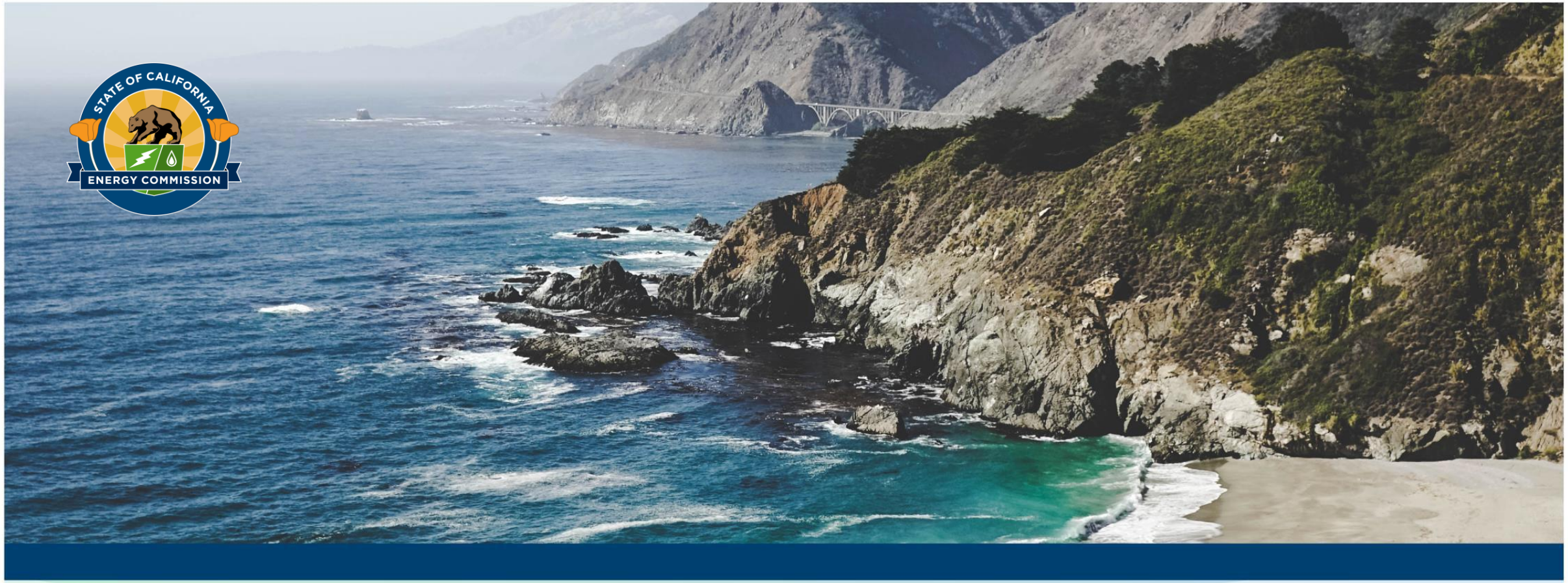


AB 525 Workshop
Identifying Additional Suitable Sea Space and Assessing Impacts and Mitigations for Offshore Wind Energy Development

June 1, 2023

AM Workshop Schedule

1. Welcome
2. Overview of AB 525
3. Purpose of Workshop
4. BOEM Leasing Process
5. Department of Defense Review Process
6. Sea Space Identification
7. Break
8. Panel Discussion
9. Lunch Break

PM Workshop Schedule

1. Welcome Back
2. Impacts and Mitigations: Overview
3. Impacts and Mitigations: Coastal Resources
4. Impacts and Mitigations: Fisheries
5. Break
6. Panel Discussion
7. Public Comment

Overview of AB525
Rachel MacDonald

AB 525 Legislative Findings

If developed at scale, offshore wind can:

- ✓ Provide economic and environmental benefits.
- ✓ Advance progress toward California's renewable and climate goals.
- ✓ Diversify the state's energy portfolio.
- ✓ Realize economic and workforce development benefits.
- ✓ Contribute to renewable resource portfolio that can serve electricity needs and improve air quality in disadvantaged communities.
- ✓ Offer career pathways and workforce training opportunities.

Offshore wind should be developed in a manner that protects coastal and marine ecosystems.

AB 525 Strategic Plan Requirements

- **Identify suitable Sea Space** for wind areas in federal waters sufficient to accommodate the planning goals.
- Develop a plan to **improve ports and waterfront facilities** and **workforce development.**
- Assess the **transmission** investments and upgrades necessary, including subsea transmission options, to support the offshore wind planning goals.
- Address **permitting** and develop a Permitting Roadmap for offshore wind deployment
- **Potential impacts** on coastal resources, fisheries, Native American and Indigenous peoples, and national defense, **and strategies for addressing those potential impacts.**

AB 525 Required Interim Work Products

August 10, 2022

- Evaluate and quantify maximum feasible capacity of offshore wind
- Establish megawatt planning goals for 2030 and 2045

February 28, 2023

- Complete a preliminary assessment of economic benefits related to seaports and workforce development needs and standards

May 10, 2023

- Develop a permitting roadmap

Purpose of Workshop
Danielle Mullany

Sea Space Requirements Corresponding to Planning Goals

AB 525 directs the CEC to work with state, local, and federal agencies, stakeholders, and the offshore wind industry to identify sea space in two primary steps:

1. Identify the sea space established by BOEM in its 2018 call for nominations to achieve the offshore wind planning goal of **2-5 GW by 2030**

2. Identify suitable sea space for a future phase of offshore wind leasing to accommodate the offshore wind planning goal of **25 GW by 2045**

Idrissa Boube
Bureau of Ocean Energy Management

BOEM Bureau of Ocean Energy Management

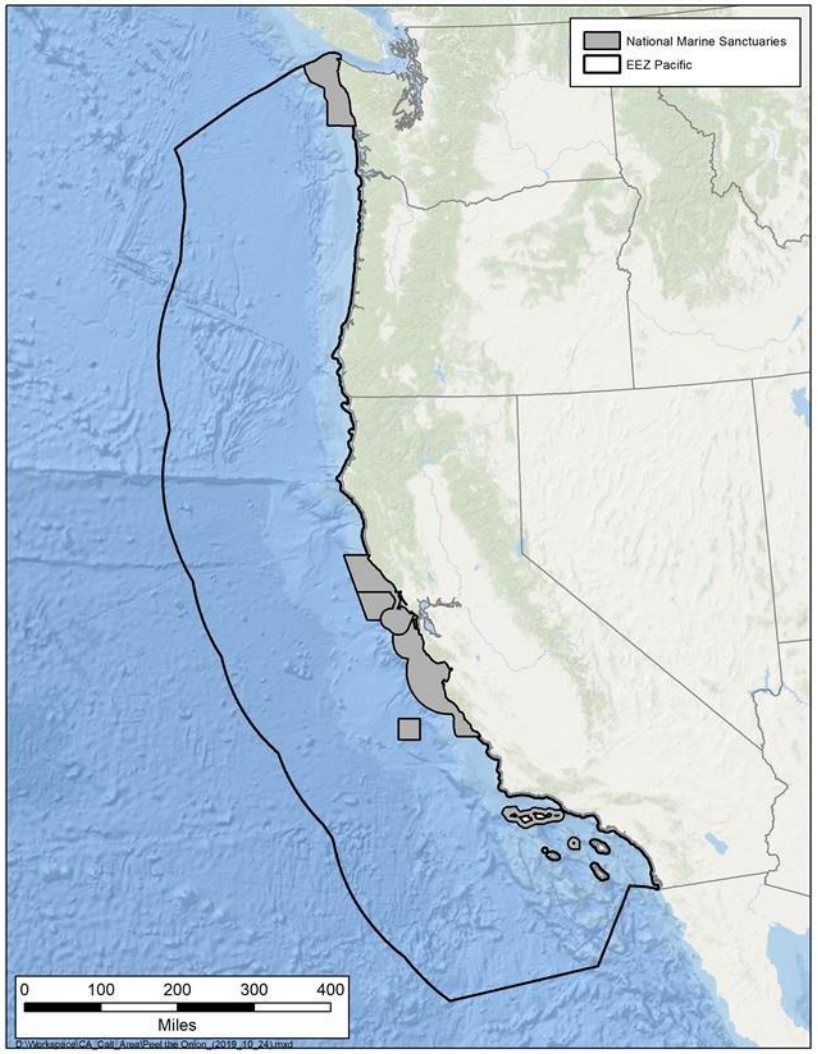
Federal Offshore Wind Energy Leasing Process

Federal Process and Timelines

June 1, 2023

Idrissa Boube | CEC AB 525 Workshop on Suitable Sea Space and Impacts

Bureau of Ocean Energy Management (BOEM)



Mission: Manage the development of U.S. Outer Continental Shelf (OCS) energy and mineral resources in an environmentally and economically responsible way

Jurisdiction on the U.S. West Coast

- OCS extends from 3 to 200 nautical miles off the coast of California, Oregon, and Washington
- Excludes National Marine Sanctuaries

BOEM's Regulatory Authority

Energy Policy Act of 2005

- Amends Outer Continental Shelf Lands Act (OCSLA) to authorize DOI to act as "lead" agency for certain alternative energy and marine-related uses on the OCS
- DOI delegated OCSLA authority to then Minerals Management Service (now BOEM)

Requires development of regulatory regime that:

- Ensures consultation with Tribes, states, local government, and other stakeholders
- Grants leases, easements, and rights-of-way
- Enforces regulatory compliance
- Requires financial security
- Provides fair return to the Nation

BOEM's Staged Offshore Wind Energy Authorization Process

Planning & Analysis

~ 2 YEARS

- Intergovernmental Task Force
- Request for Information or Call for Information and Nominations
- Area Identification
- Environmental Reviews

Leasing

~ 1-2 YEARS

- Publish Leasing Notices
- Conduct Auction or Negotiate Lease Terms
- Issue Lease(s)

Site Assessment

UP TO 5 YEARS

- Site Characterization
- Site Assessment Plan

Construction & Operations

~ 3 YEARS (+25)

- Construction & Operations Plan
- Facility Design Report and Fabrication & Installation Report
- Decommissioning
- Environmental and Technical Reviews

BOEM coordinates and consults with affected Tribal, State, and local governments and other Federal agencies

Multiple opportunities for public input

Renewable Energy Process: Call, Wind Energy Areas, and Lease Areas

- Call for Information and Nominations (Call)
  - Calls for formal public comment about the area, uses, and concerns
  - Requests nominations of interest for development
- Wind Energy Area (WEA)
  - An area within a Call Area identified by BOEM for environmental review
  - Basis for a lease area(s)
- Lease Area
  - Areas BOEM would offer for lease during a Lease Sale

Approach for Initial Offshore Wind Energy Planning in California

- BOEM California Intergovernmental Renewable Energy Task Force
- Offshore Wind Energy Gateway for data collection in publicly accessible website
- Conduct extensive outreach and engagement with ocean users
- Coordinate with Tribal Governments, State of California, Federal agencies, and state agencies
- Employ scientific studies and analyses to support informed decision-making
- Publish Call for Information and Nominations in the Federal Register

Tribal and Stakeholder Engagement – 2018 and 2021 CA Call Example

- Established BOEM California Intergovernmental Renewable Energy Task Force (2016)
- Coordination between BOEM and State of California (2016 to date)
- State-wide coordination, outreach, and engagement guided by Data Gathering and Stakeholder Engagement Plan with Tribal Governments, State of California, and public stakeholders
- Created Offshore Wind Energy Gateway for data collection in publicly accessible website: https://caoffshorewind.databasin.org/
- The outreach effort and input received are documented in Outreach summary reports:
  - September 2018 – California Offshore Wind Energy Planning Outreach Summary Report
  - June 2021 – Outreach Summary Report Addendum

Engagement Meetings – CA Call Example

Beginning in 2017, BOEM and the State of California conducted outreach and held meetings with the following groups to inform offshore winds energy Call Areas off California:

- Fishing community
- Elected officials
- Academics
- Tribes
- Environmental groups
- Maritime community

Public meetings, webinars, and Task Force meetings were also held to inform identification of Call Areas.

BOEM/NOAA NCCOS Partnership

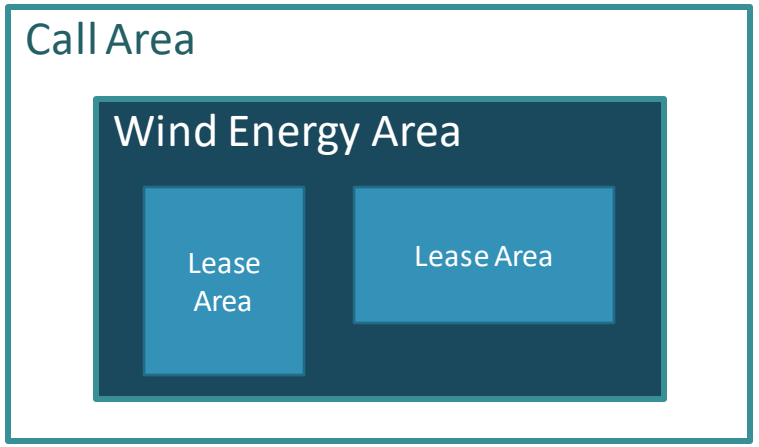
On September 16, 2022, BOEM announced that it was enhancing its process to identify future Wind Energy Areas (WEAs):

- Incorporate best available science and modeling, including application of NOAA NCCOS spatial modeling
- Leverage existing data
- Provide draft WEAs for public comment prior to completion of Area Identification

NCCOS | NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE

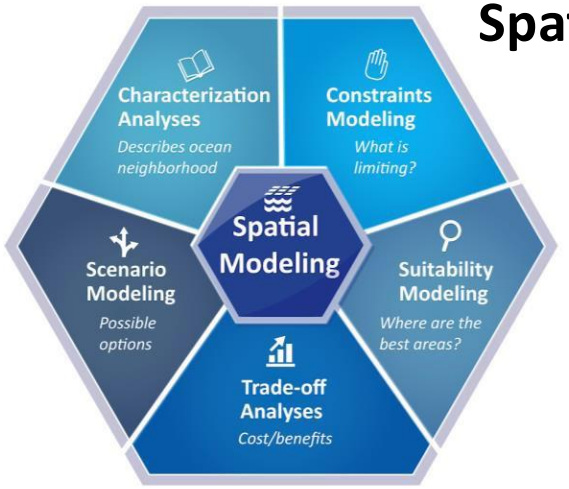
BOEM
Bureau of Ocean Energy Management

BOEM California Planning Process – Draft Wind Energy Areas

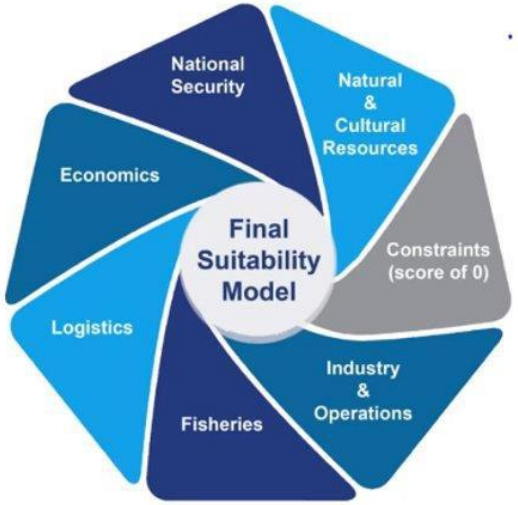


Spatial Suitability Model

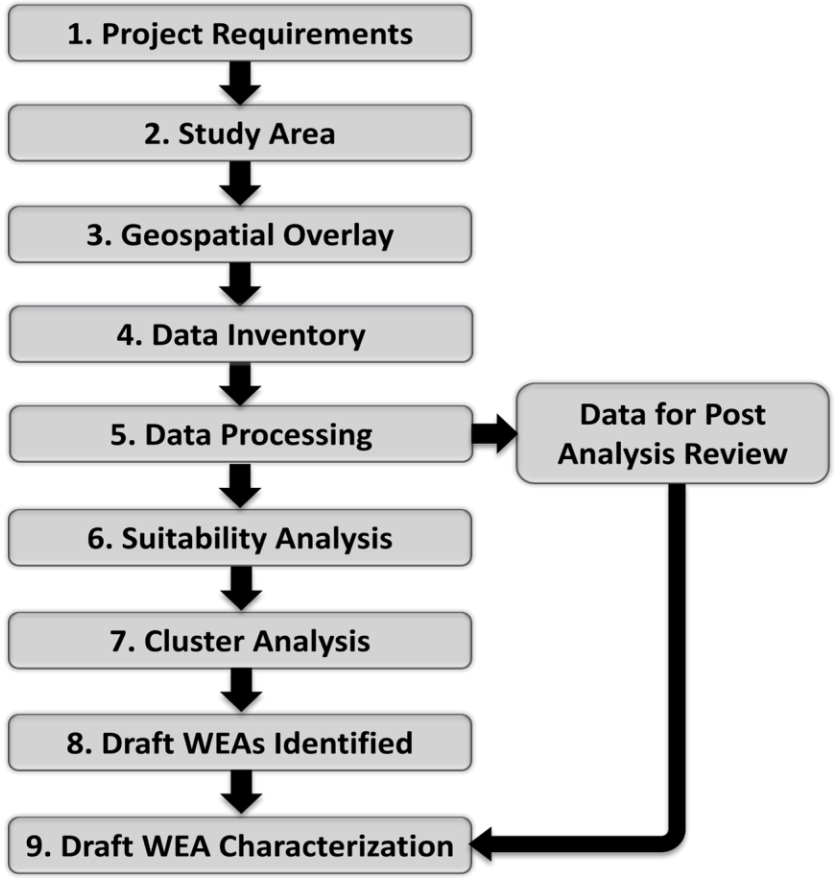
- A suitability model is a model that weighs locations relative to each other based on given criteria
- A common scale allows for meaningful values to be produced when the criteria are combined
- Data must be transformed into a common scale so the criteria can be compared
- Suitability modeling allows us to analyze the "whole ecosystem" and identify hotspots of conflict and opportunity
- Provides defensible and transparent methods
- Allows for scenario planning
- Available tool to inform identification of Wind Energy Areas



Relative Suitability Analysis Submodels



Spatial Planning Workflow



Offshore Wind Energy Planning Post Call

- Review Call comments, finalize qualification reviews
- Publish draft Wind Energy Areas
- Review comments and identify final Wind Energy Areas
- Conduct Environmental Analysis
- Publish Proposed Sale Notice
- Publish Final Sale Notice
- Lease Auction

BOEM

Bureau of Ocean Energy Management

BOEM.gov

Idrissa Boube | idrissa.boube@boem.gov | (504) 731-1531

Steve Sample
U.S. Department of Defense

Scott Flint
California Energy Commission

CEC AB 525 Objectives for Identification of Suitable Sea Space

- Identify new areas of sea space with potential for offshore wind development
- Describe how the existing lease areas and potential new areas will contribute to California's energy goals
- Determine how potential conflicts may affect the energy generation potential of the sea space areas
- Identify data gaps and research needed to further assess the identified sea space

Identification of Suitable Sea Space: Process

Identify Wind Potential

Identify Wind and Technical Characteristics and Assumptions

Screen with Available Data

Analyze and Assess FOSW Potential with Best Available Data and Information

Summarize Results

Describe, Characterize and Summarize Results

Geospatial Data- Identify Wind and Technical Characteristics

Offshore Wind Characteristics

- Wind Speed
- Peak Wind - Time of Day
- Wind Consistency
- Wind Capacity Factor

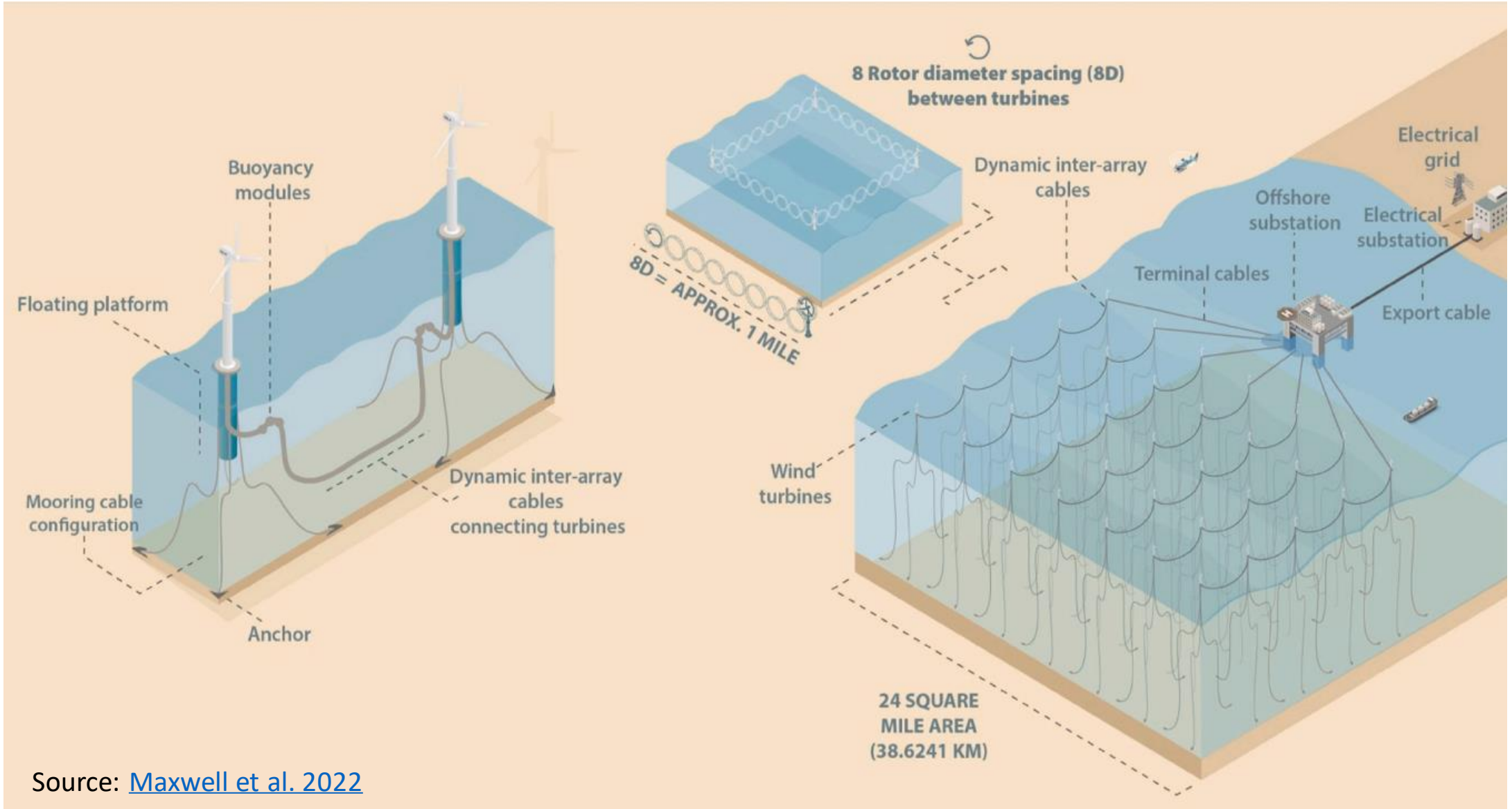
Ocean Characteristics that Can Affect Offshore Wind Technology

- Ocean Bottom Depth
- Ocean Bottom Slope
- Area Distance to Transmission
- Area Distance to Port Facilities

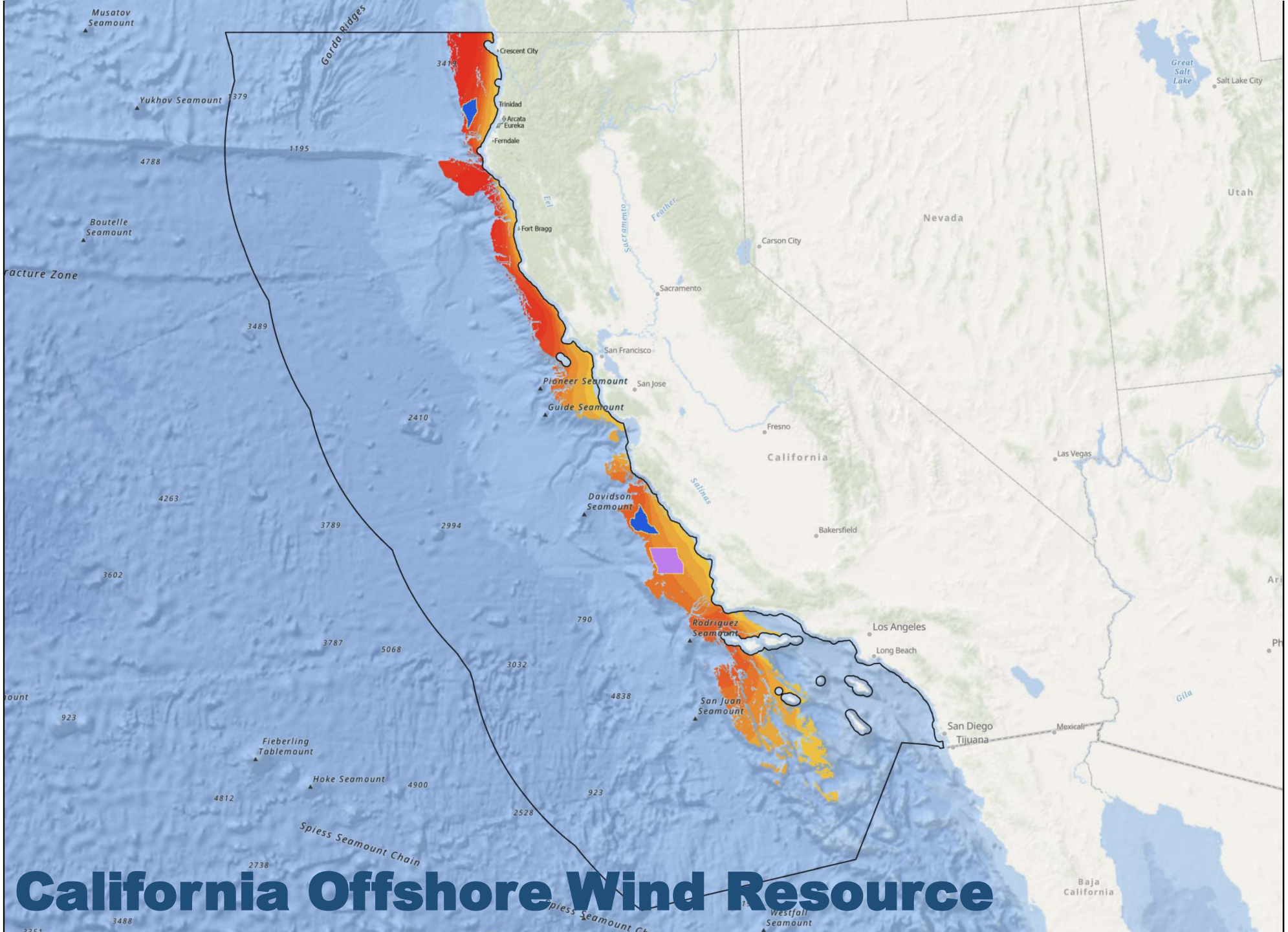
Protected Areas- exclusions for development

- National Marine Sanctuaries
- CA Marine Protected Areas
- Essential Fish Habitat

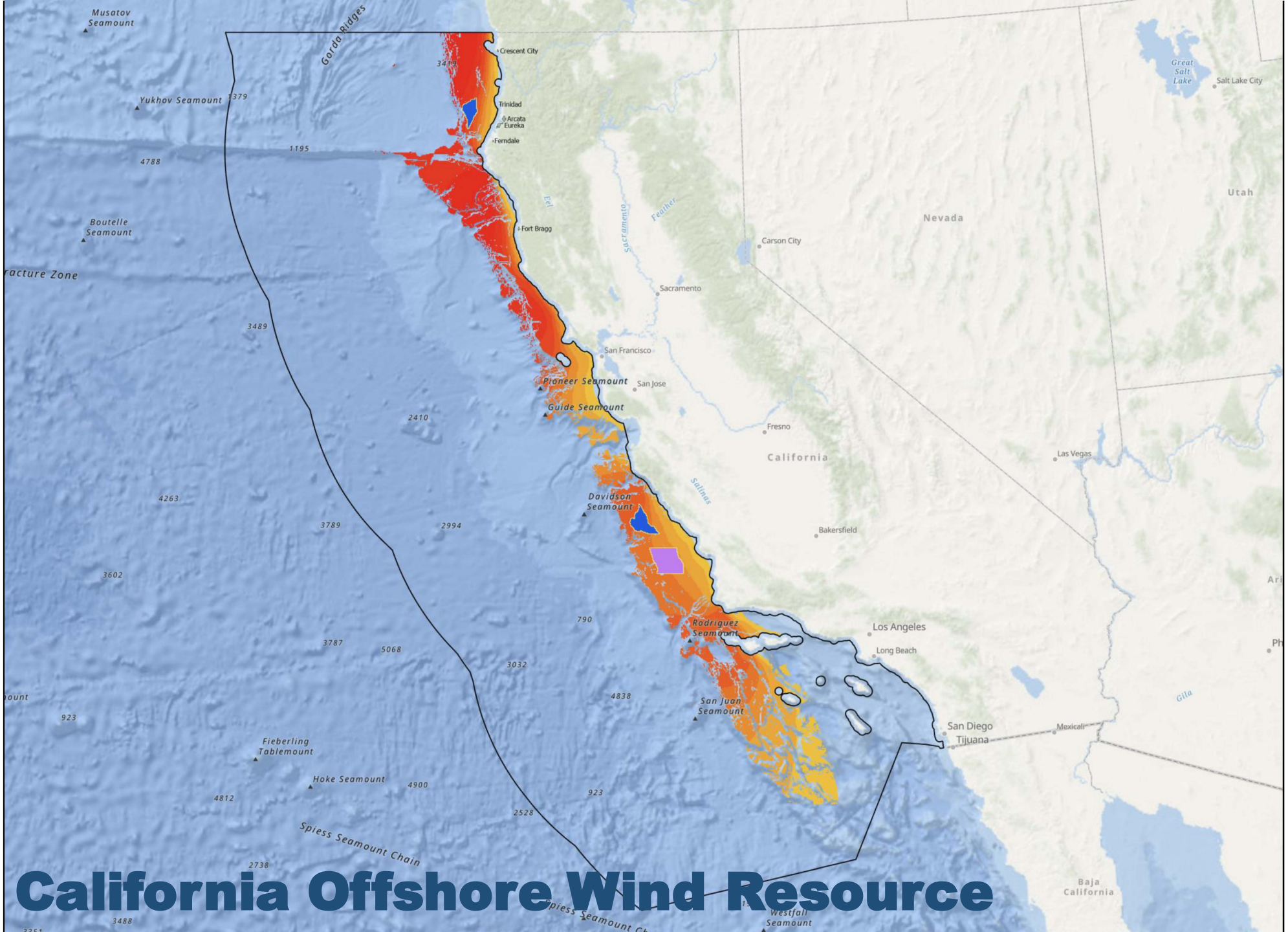
Example of a Floating Offshore Wind Energy Development



Source: [Maxwell et al. 2022]



California Offshore Wind Resource



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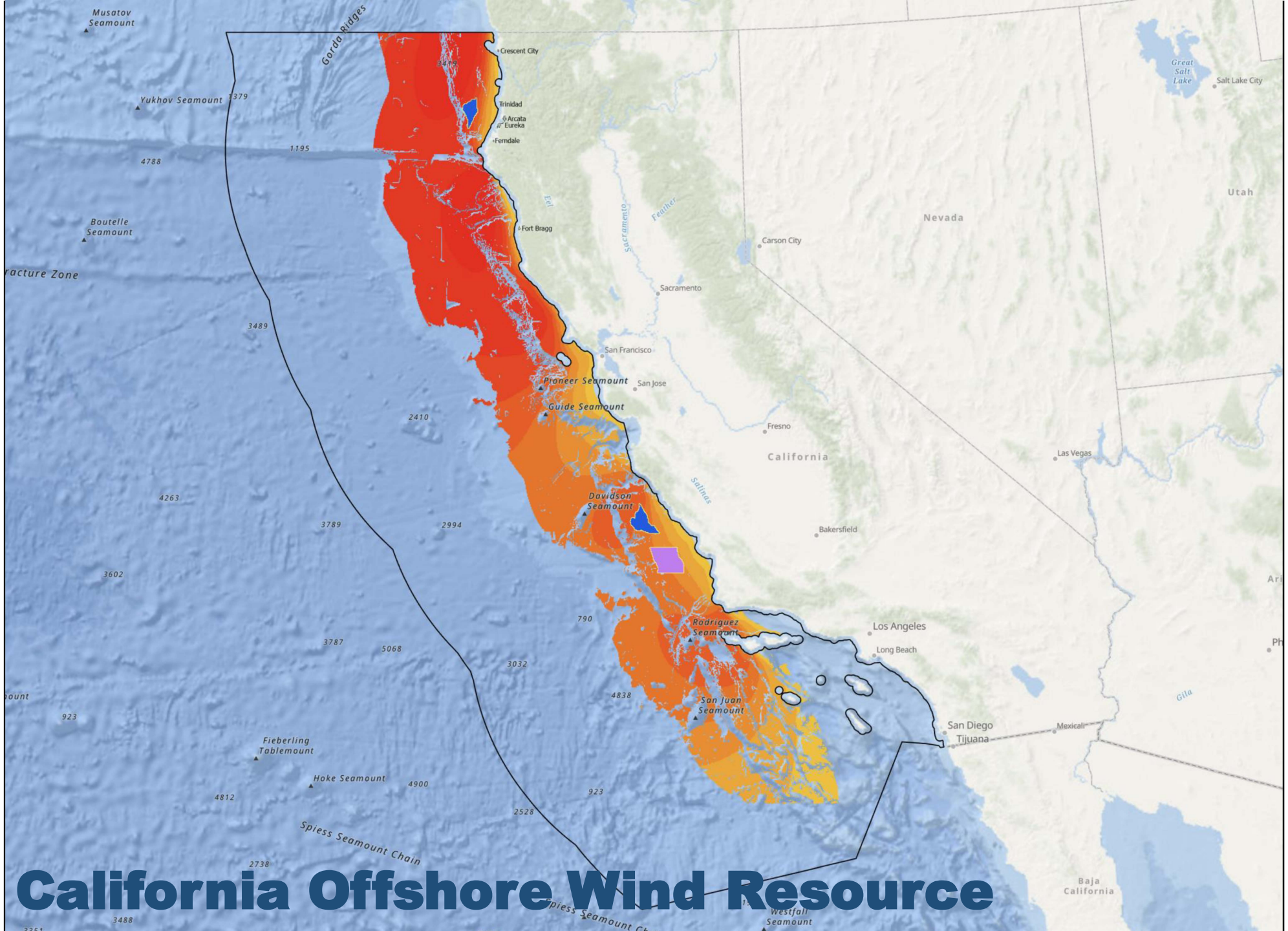

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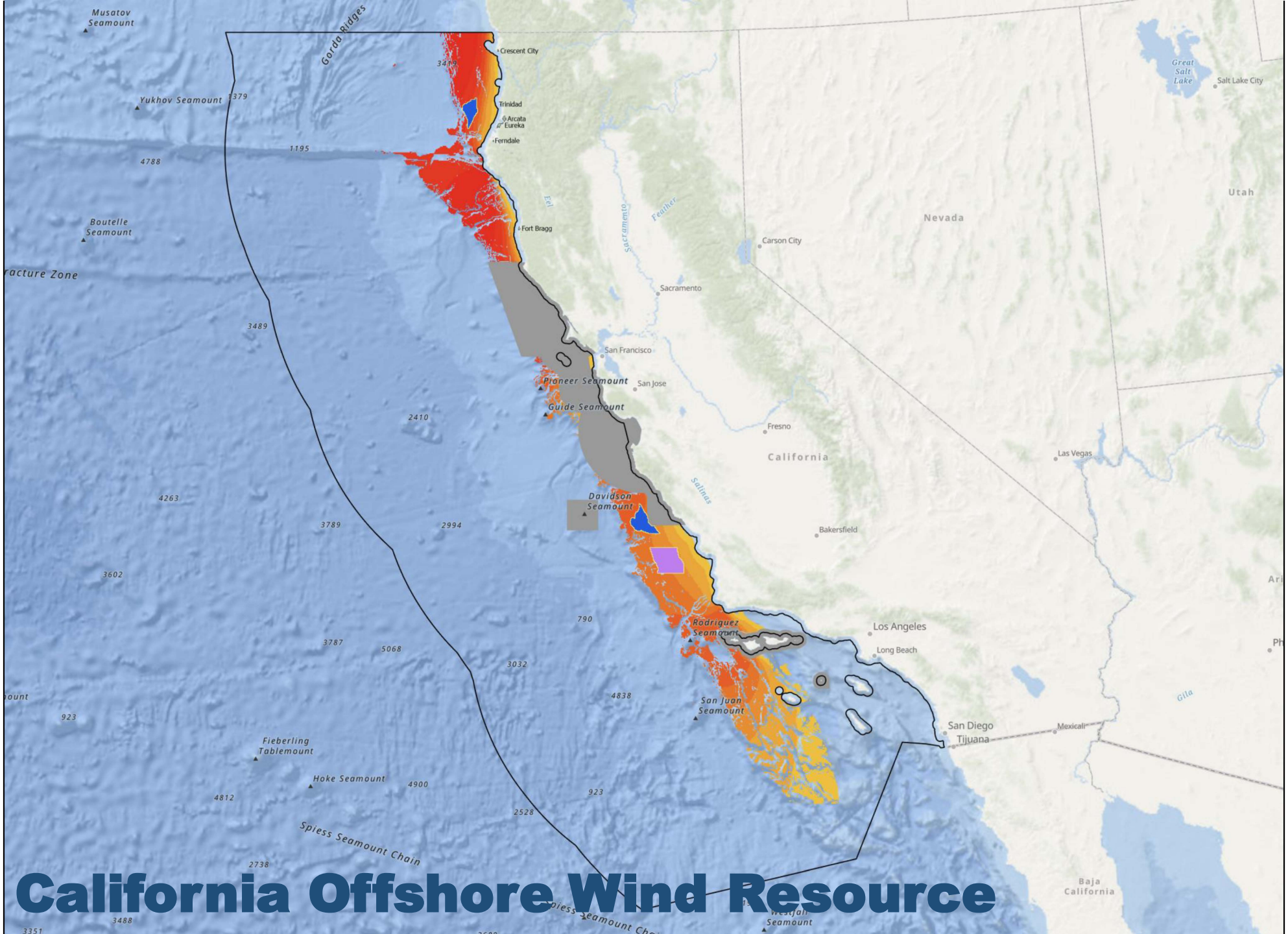

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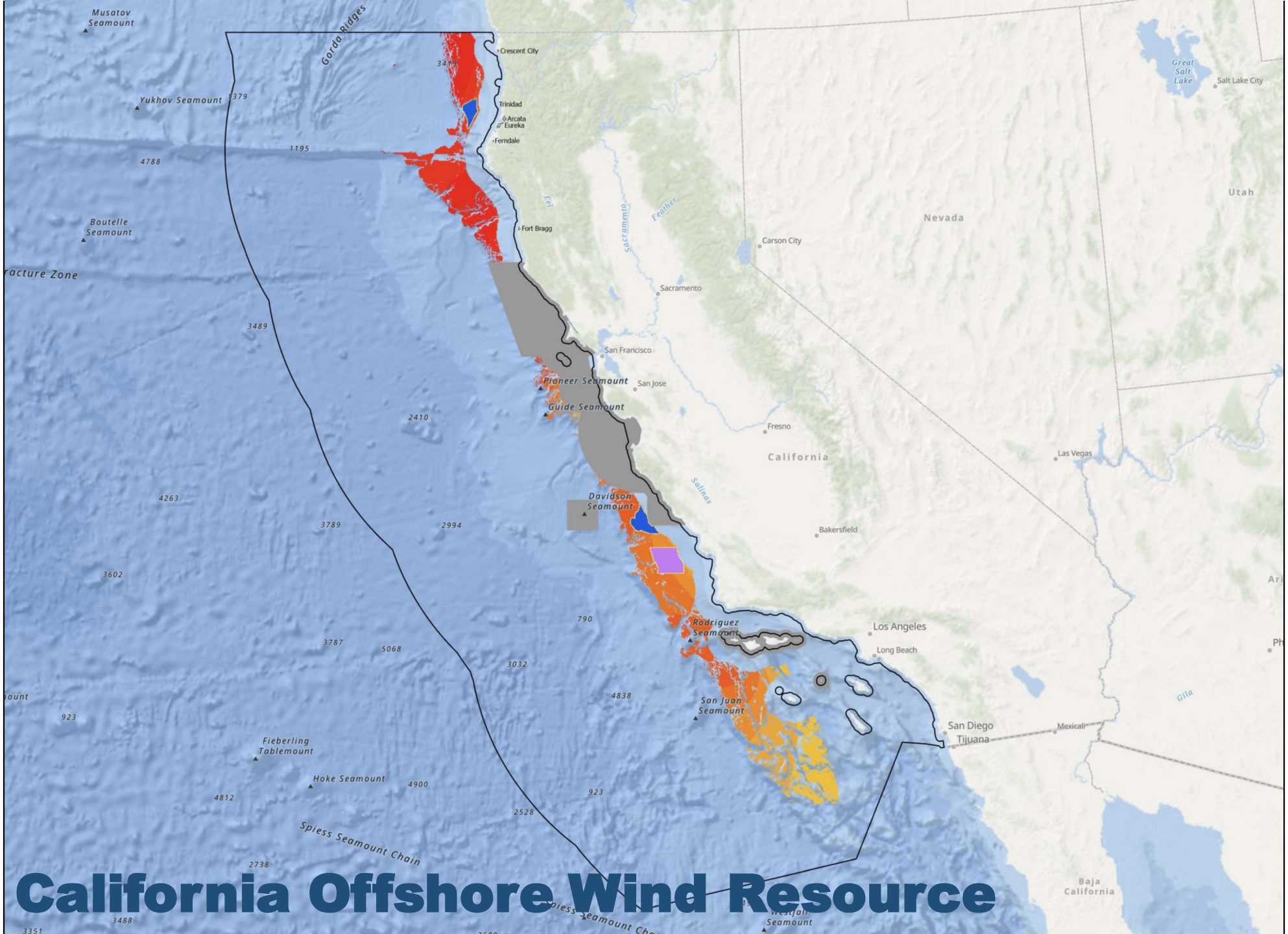

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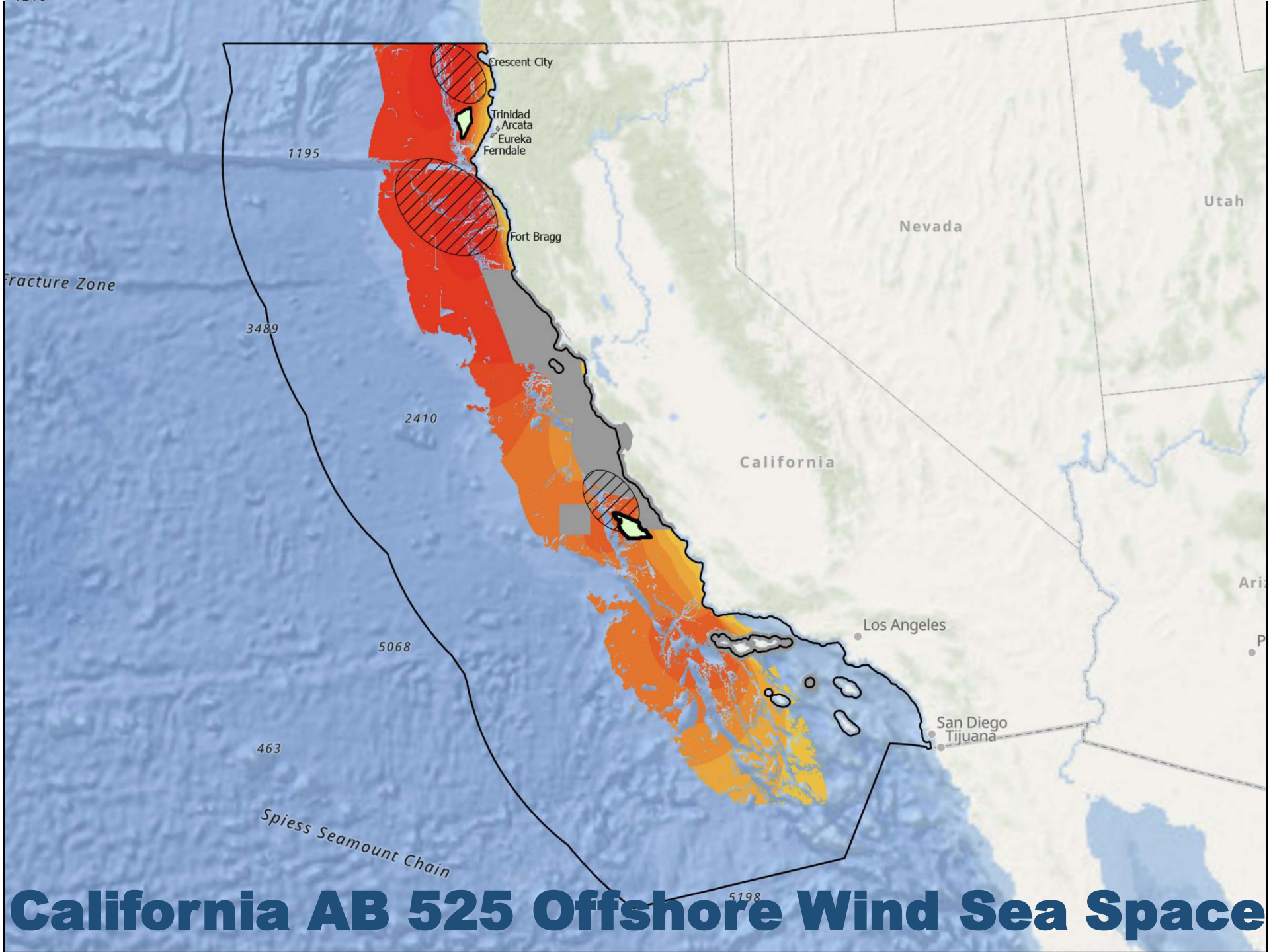
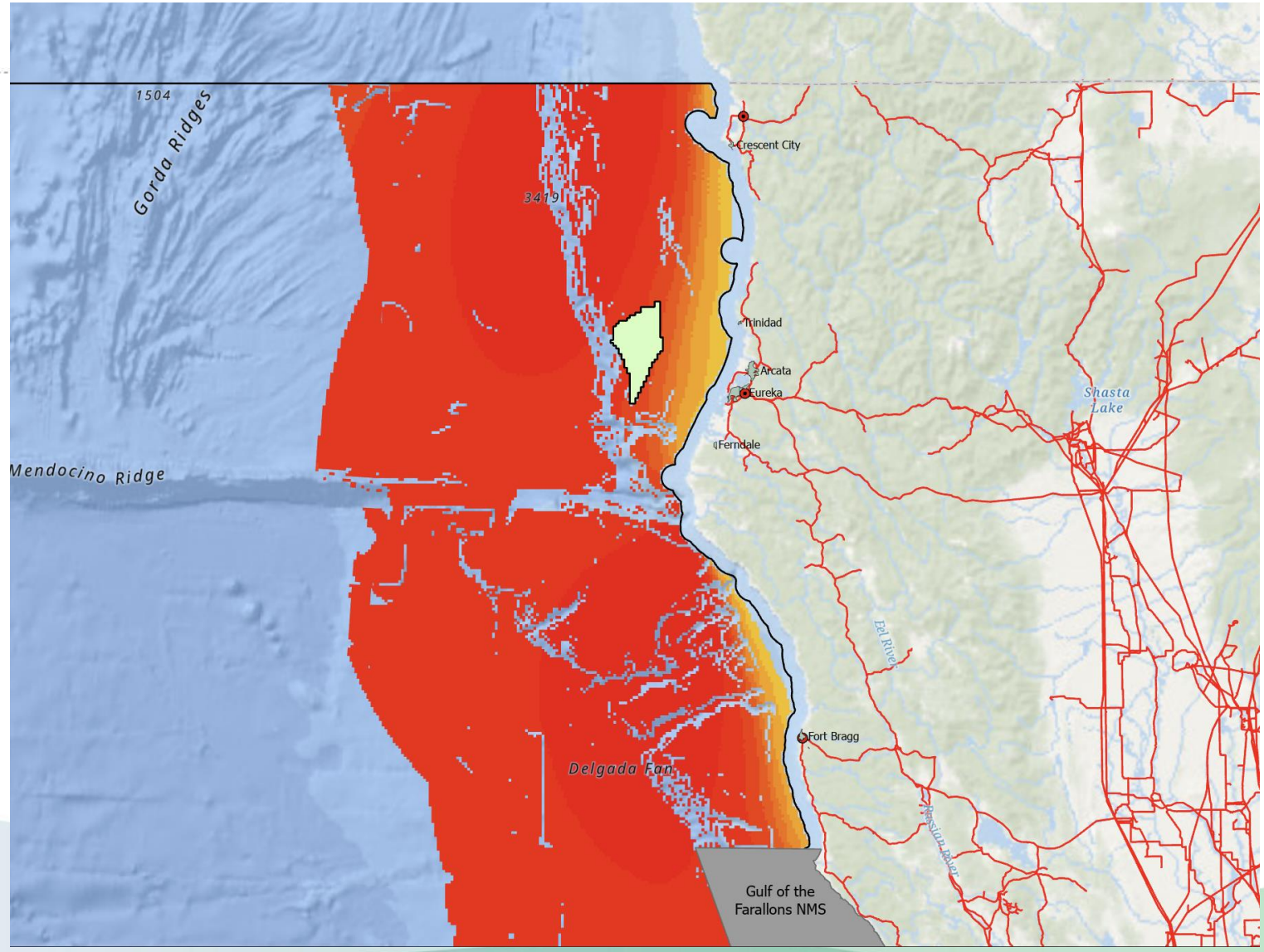


California AB 525 Offshore Wind Sea Space

Offshore Wind Resource – North Coast

- Wind Speed 10m/s or better
- Wind Speed Consistency
- Wind Speed 5-9 PM



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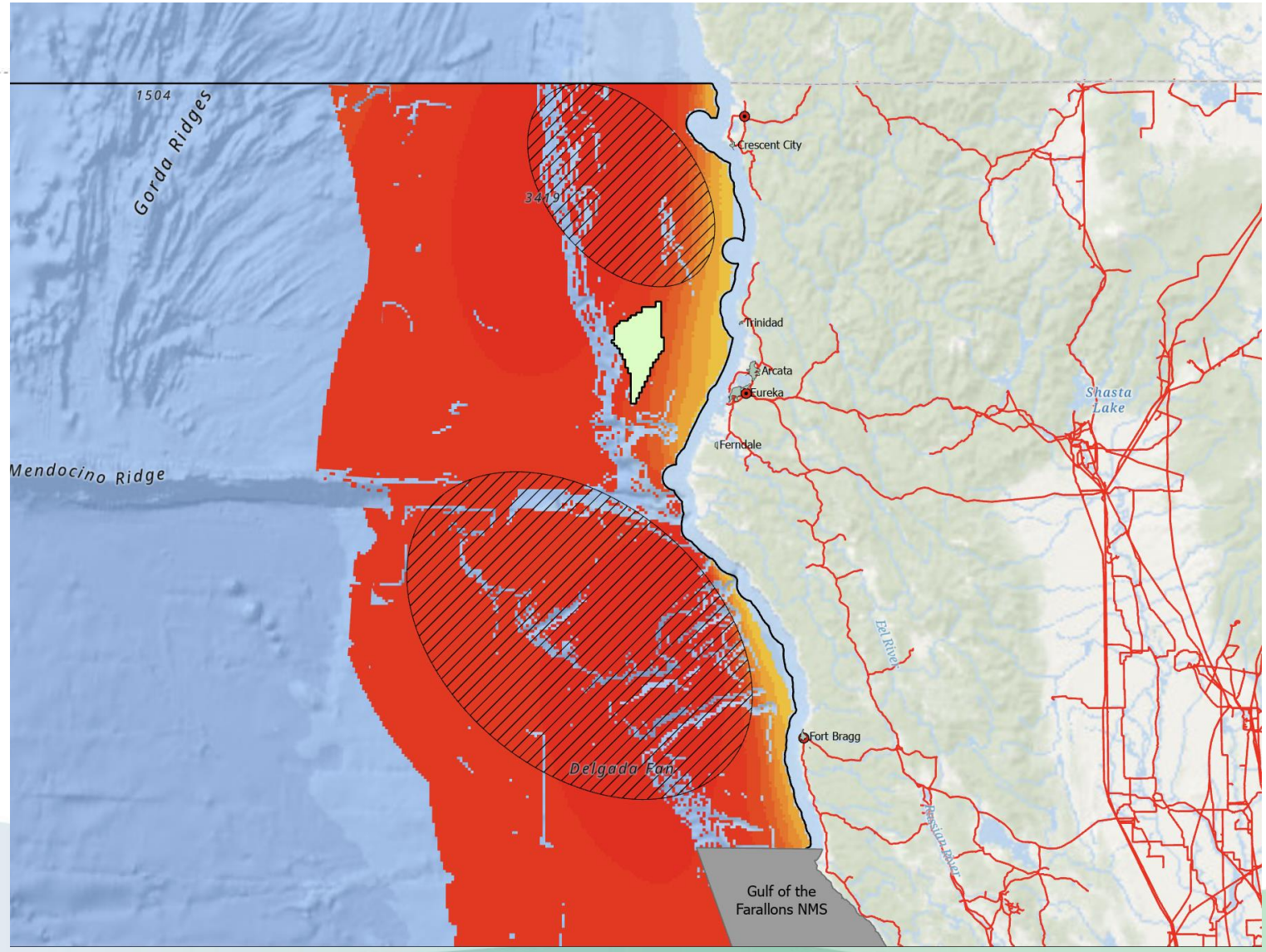
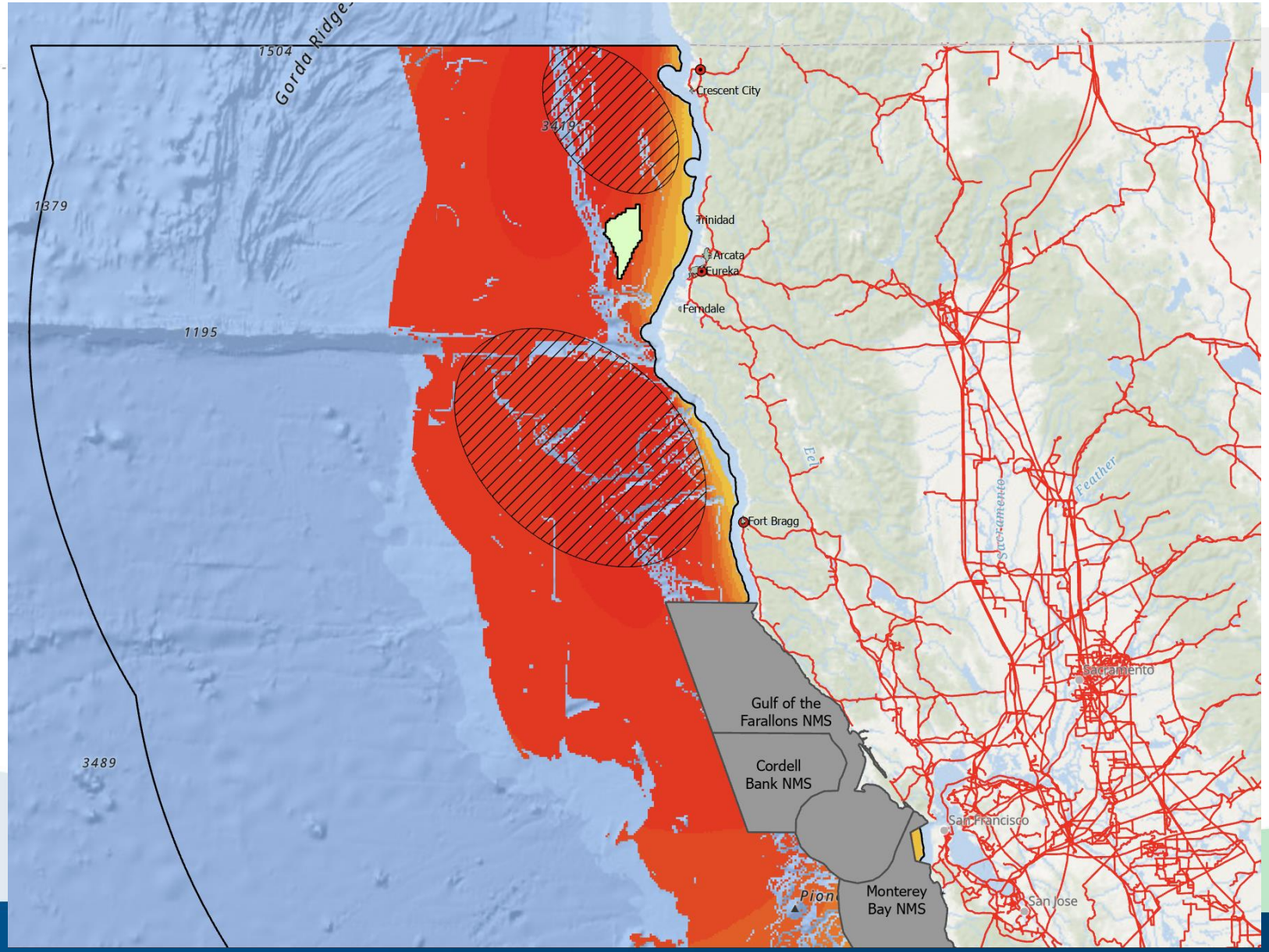


AB 525 Sea Space – North Coast

Near-Shore

- Wind Speed 10m/s or better
- Water Depth – approximately 800m to 2600m
- Distance from Shore – approximately 20-70 miles



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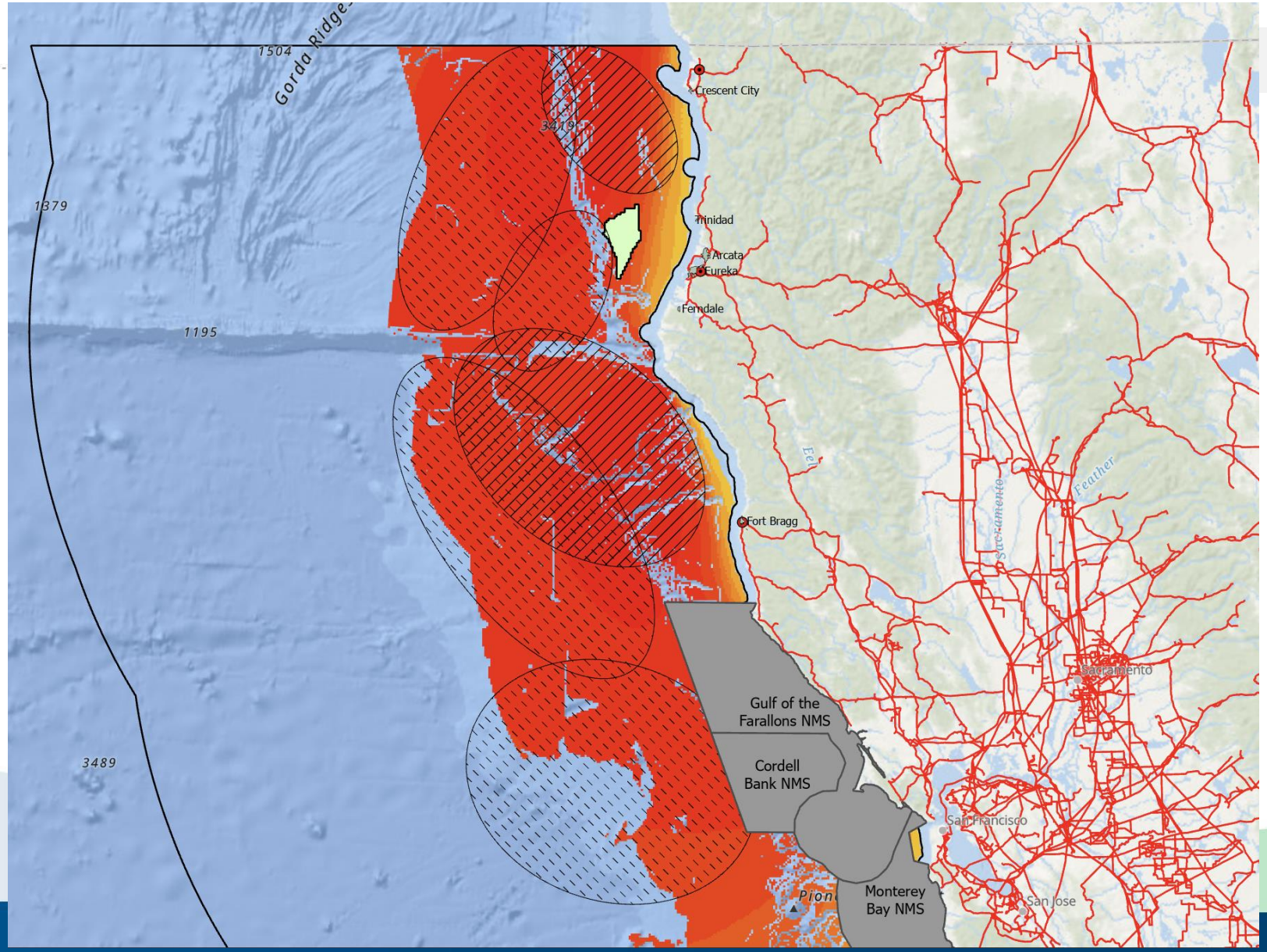
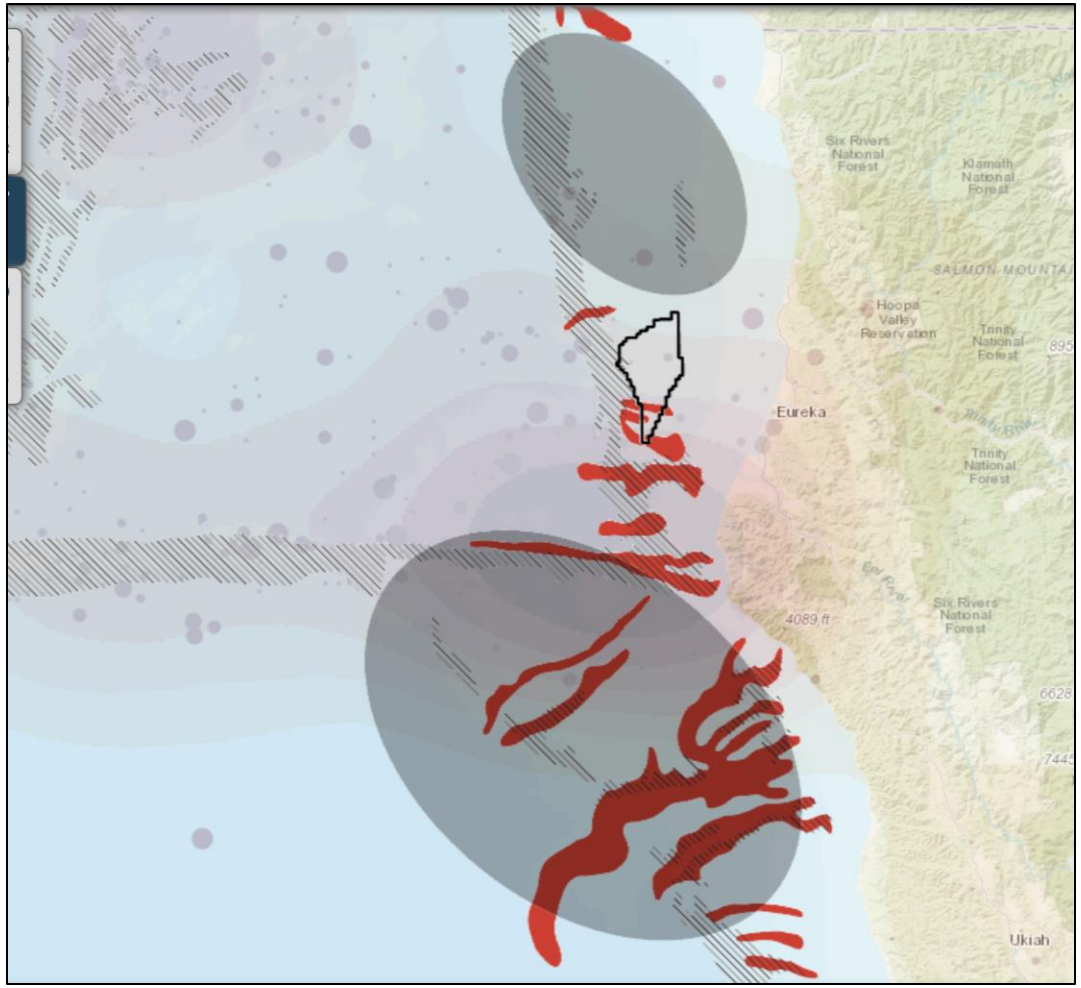
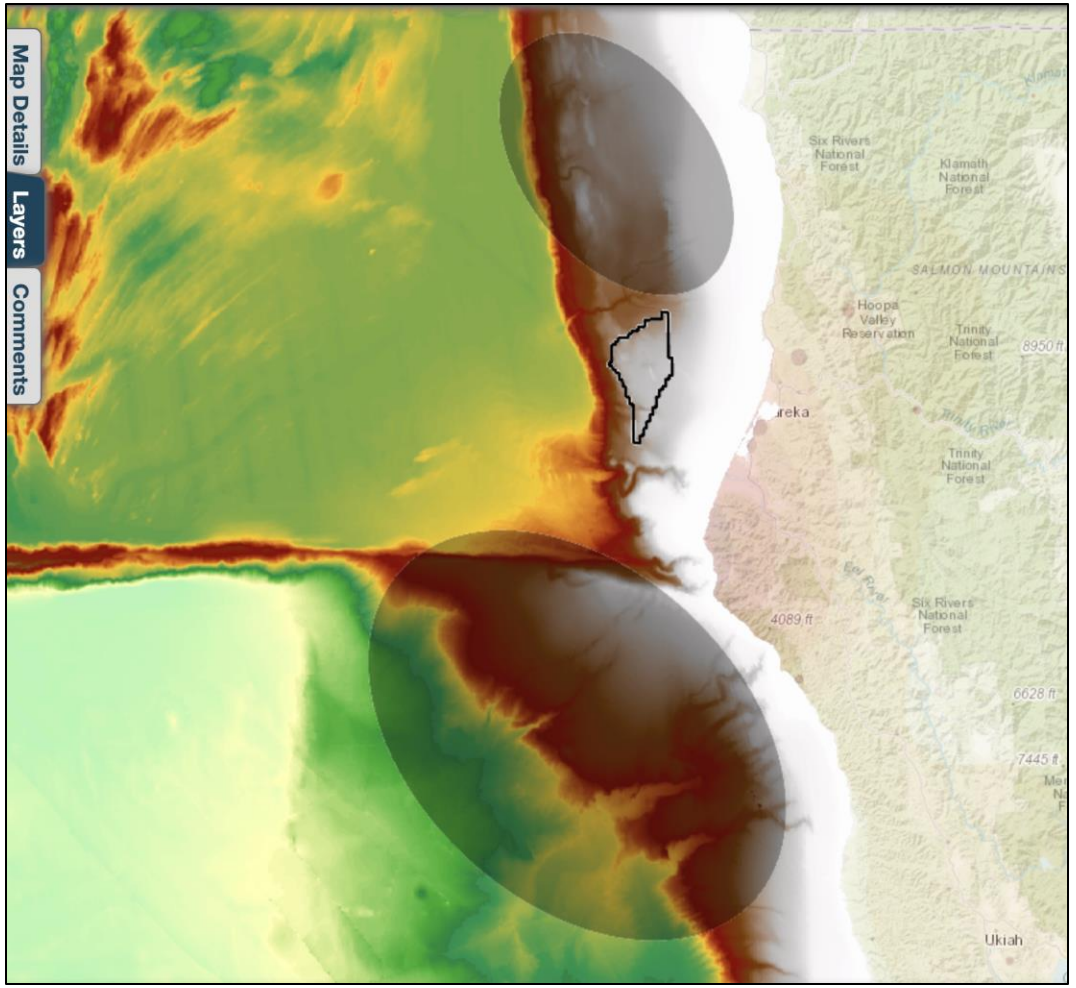


Geophysical Characteristics





Geospatial Data - Screen for Conflicts

Ocean Uses

- Commercial Fishing Activity
- Shipping Lanes
- Shipping Traffic
- Military Operations
- Cultural and Historical Resources

Existing Infrastructure

- Cables
- Pipelines
- Platforms
- Existing Leases and rights-of-way

Benthic (Ocean Bottom) Habitats

- Hard bottom areas
- Corals and sponges
- Seamounts

Marine Mammals

- Species Density
- Migratory Routes
- Important Biological Areas

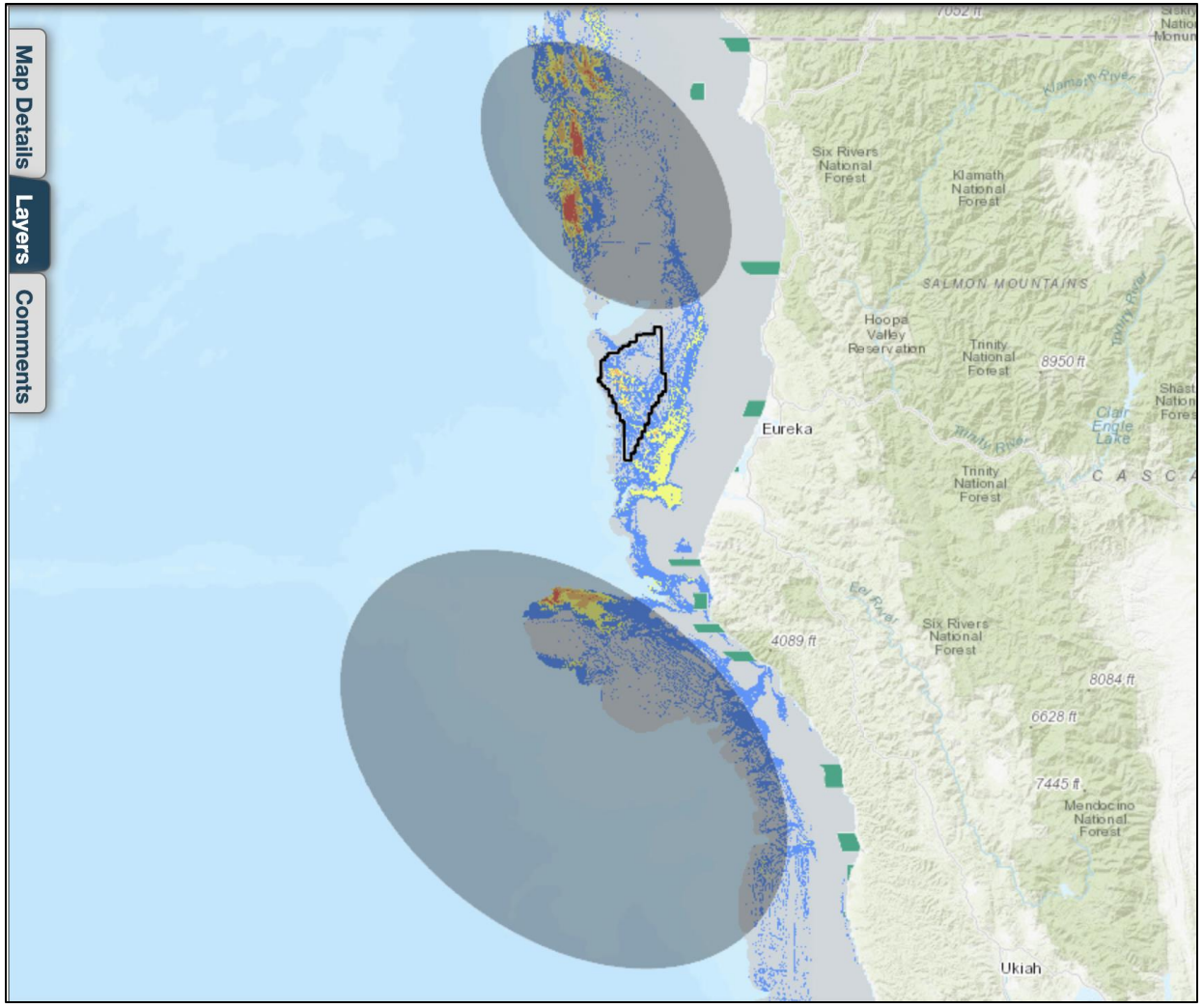
Marine Birds

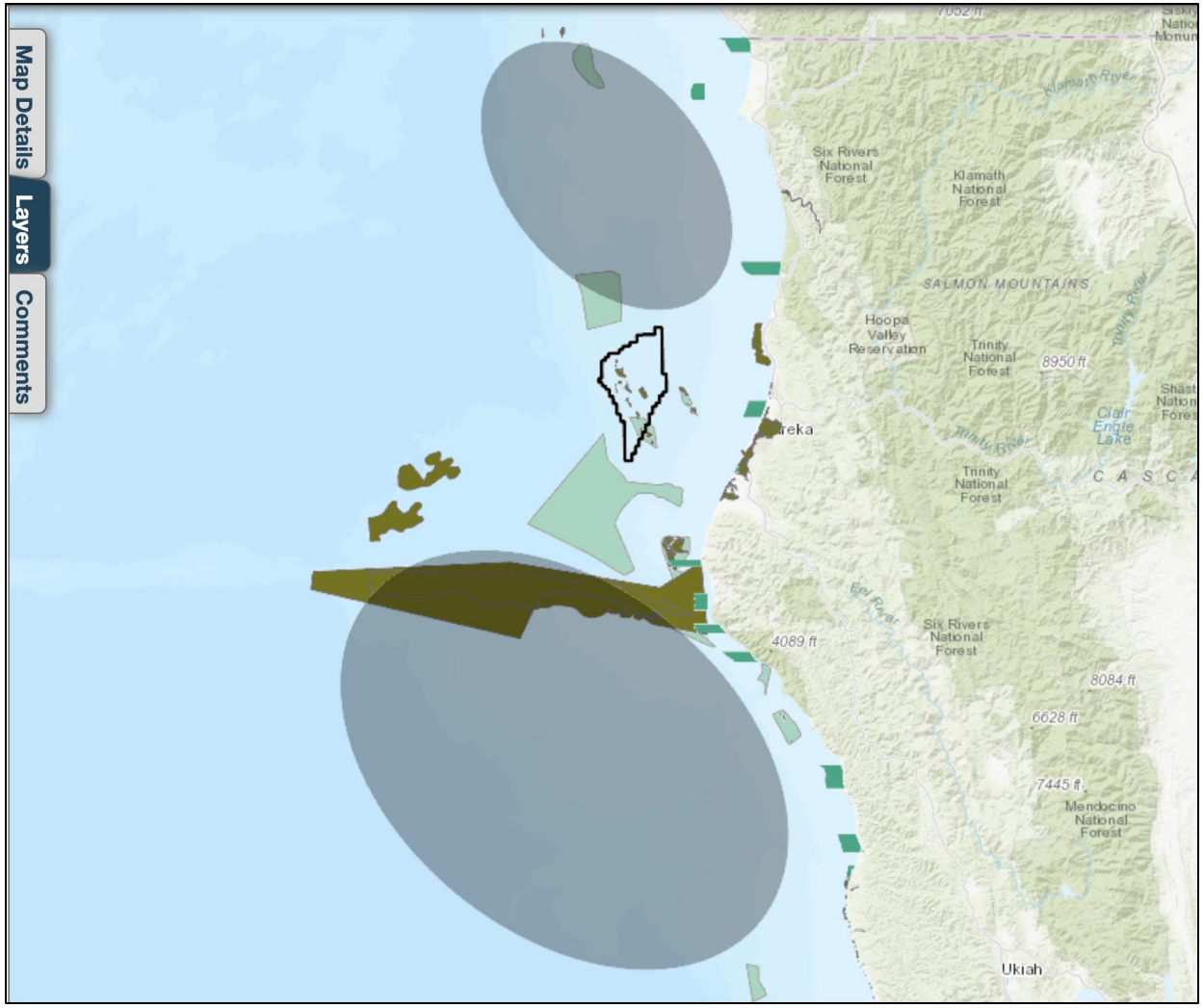
- Species Density
- Occurrence of Sensitive Species Groups

Marine Turtles

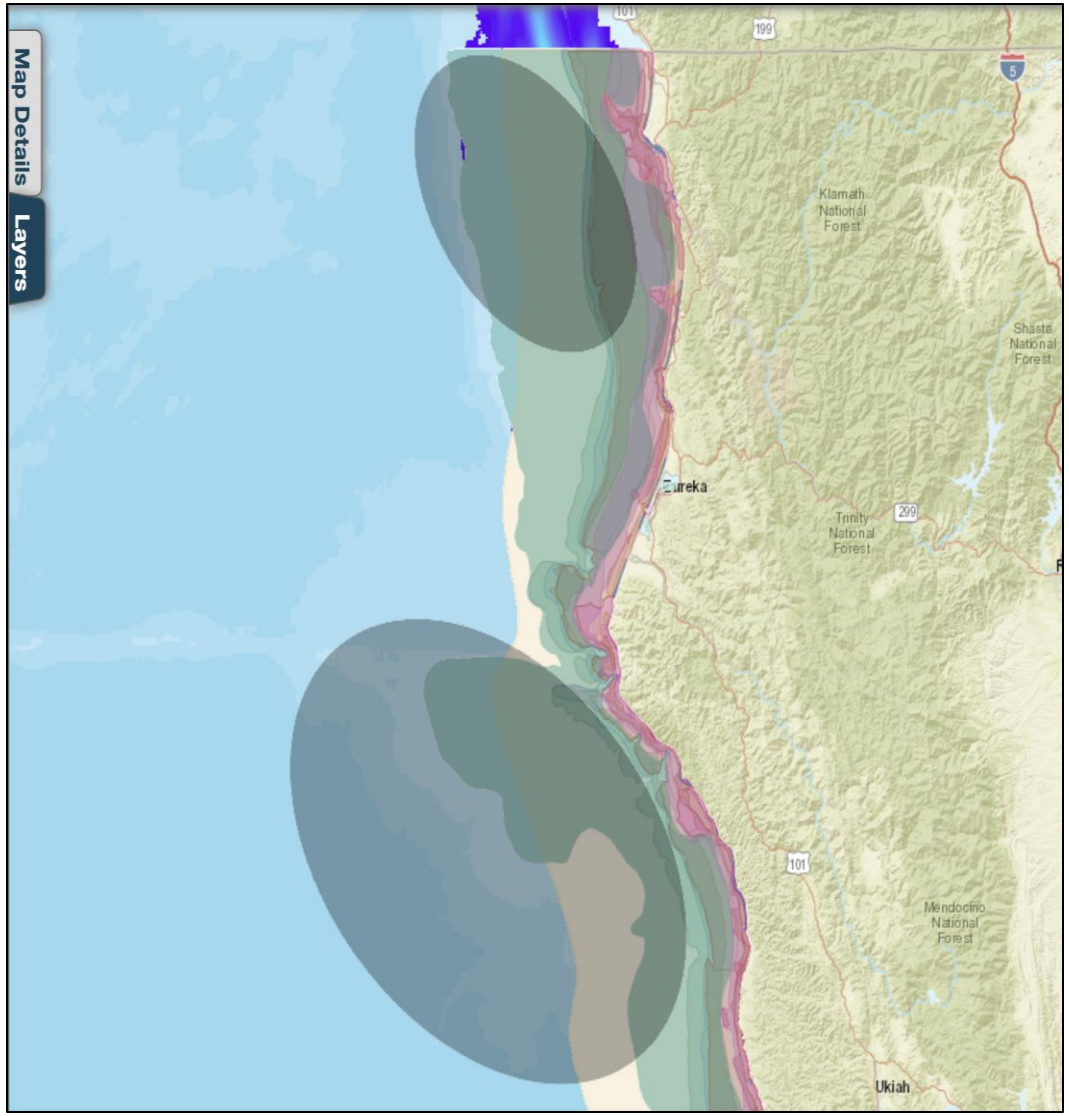
- Species Distribution
- Critical Habitat

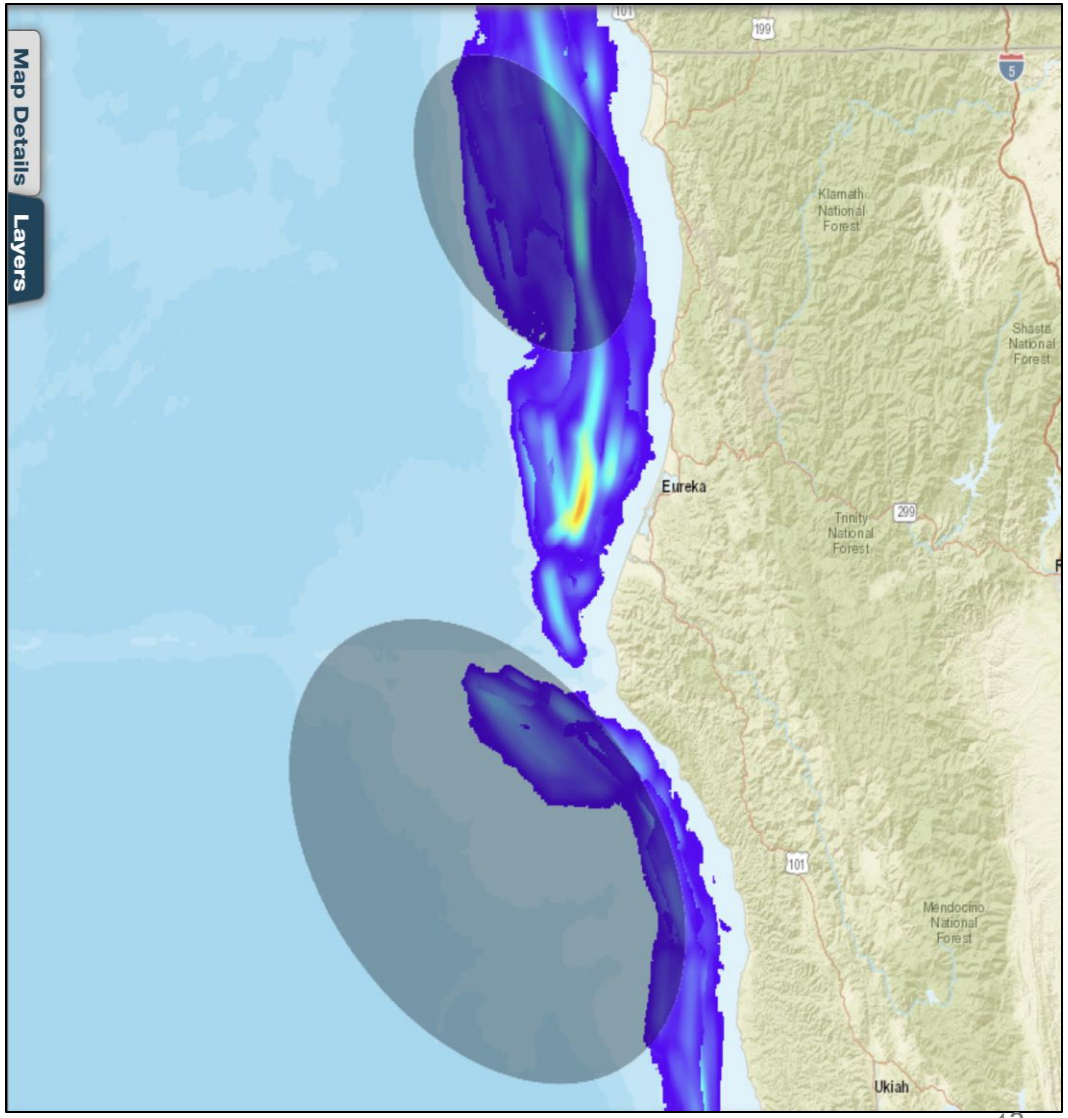
Benthic Habitat and Protected Areas



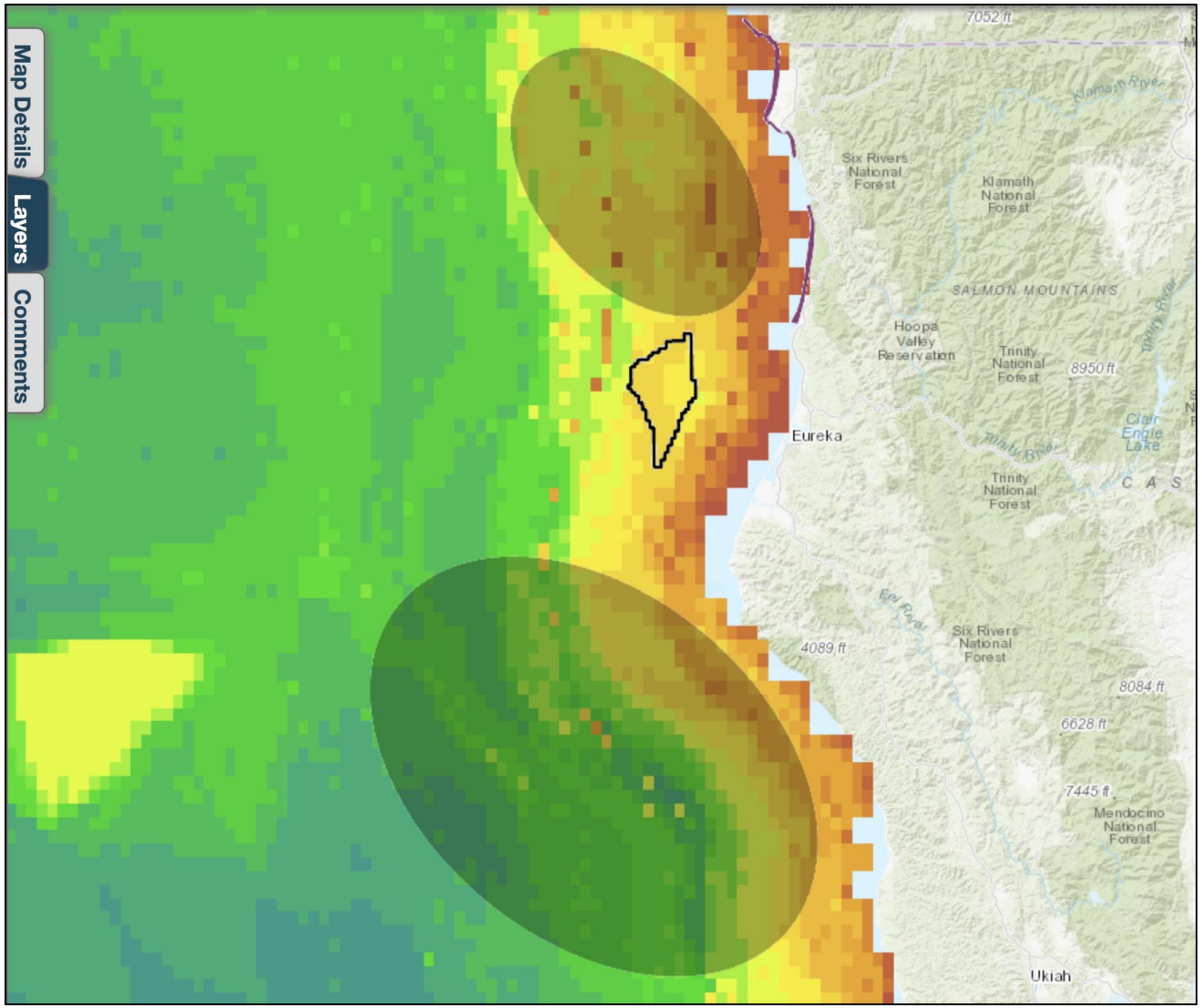


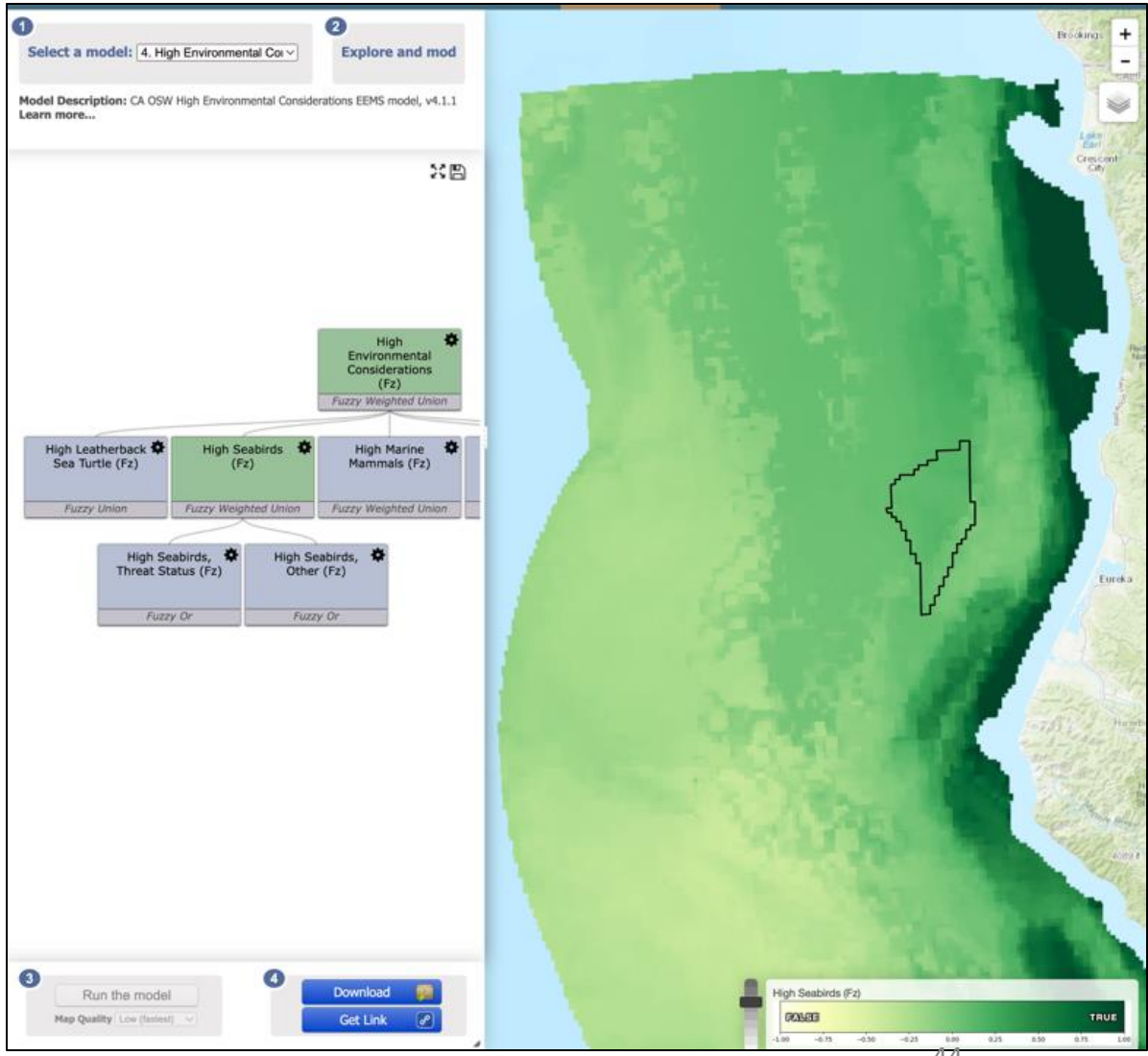
Commercial Fisheries



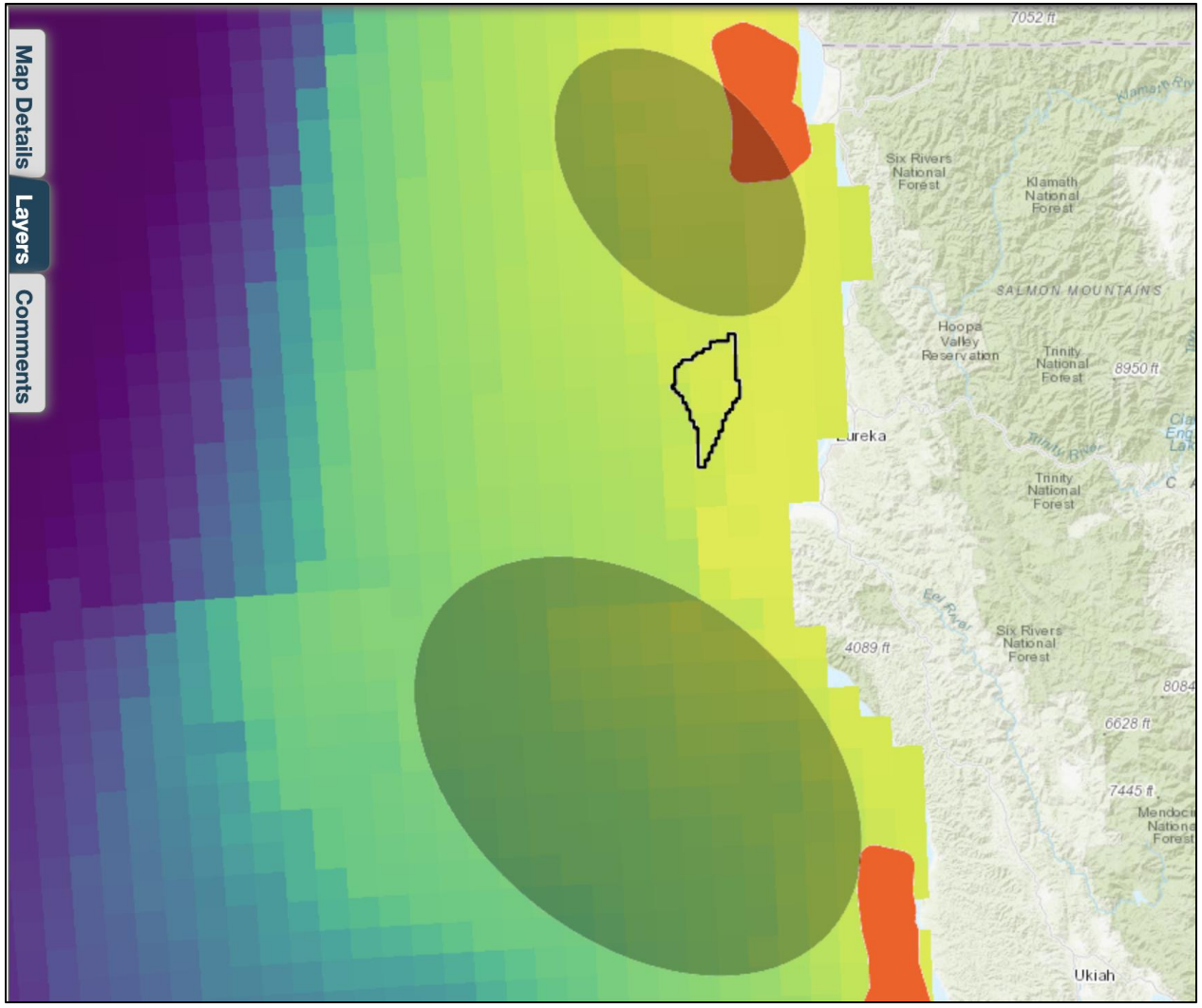


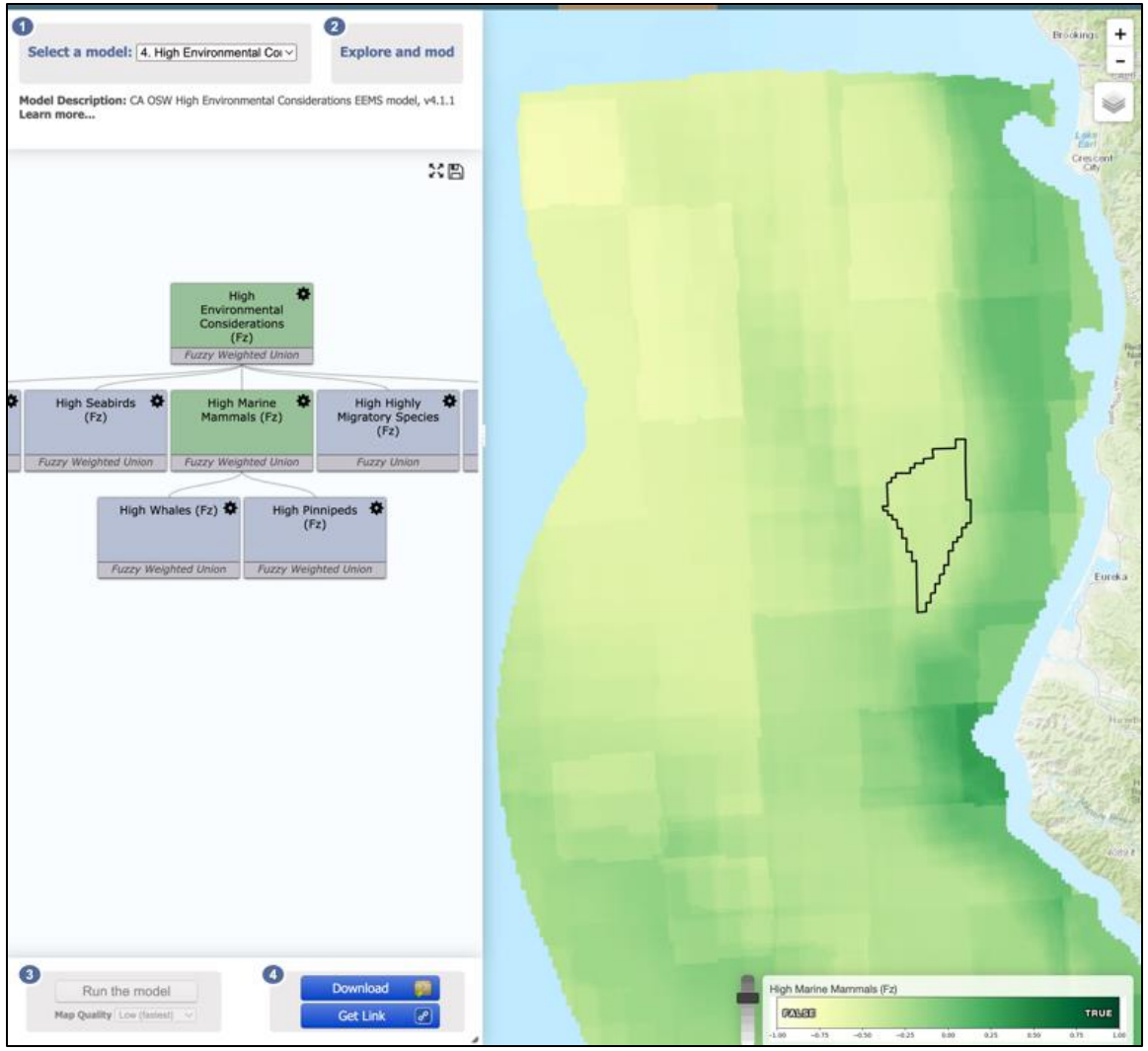
Marine Birds



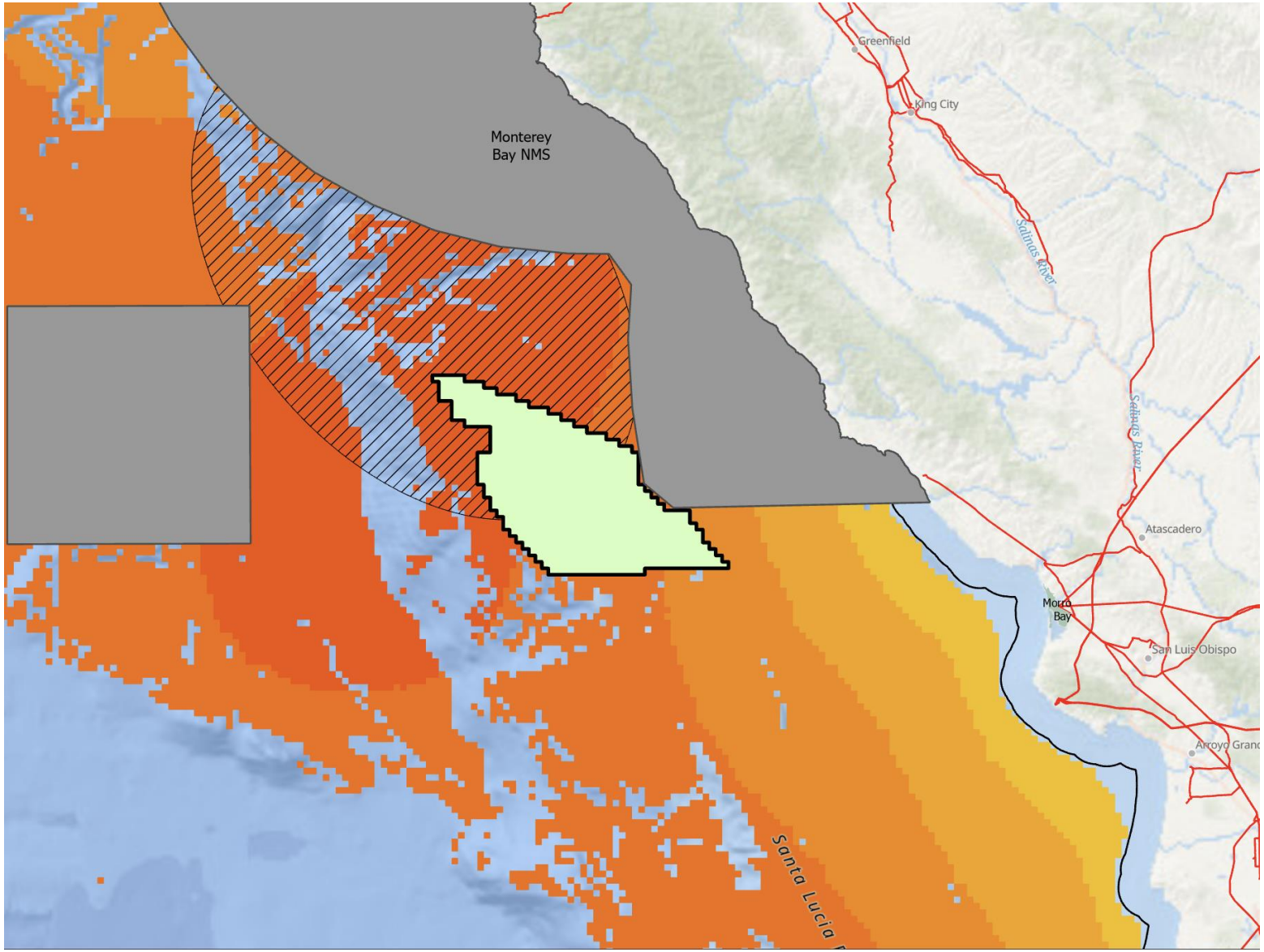


Marine Mammals





AB 525 Sea Space – South Central Coast



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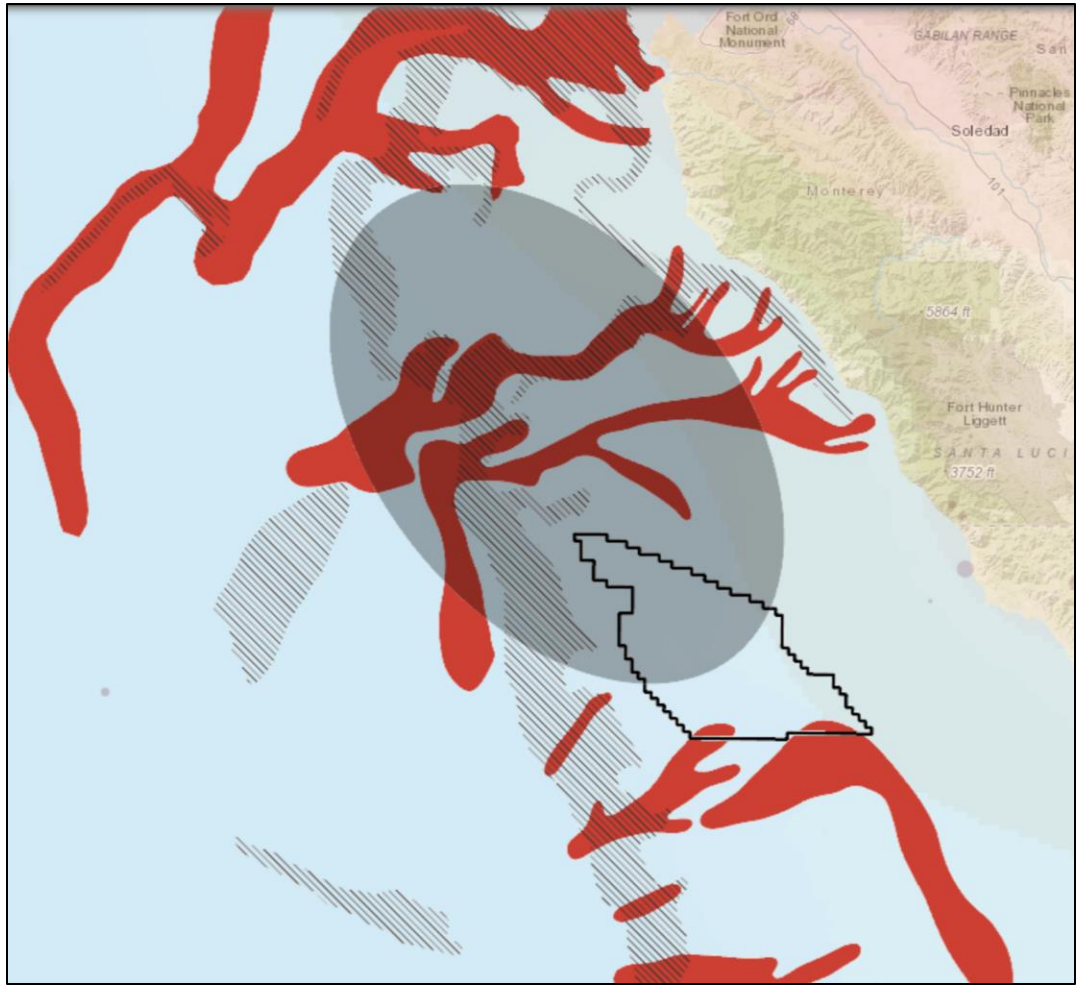

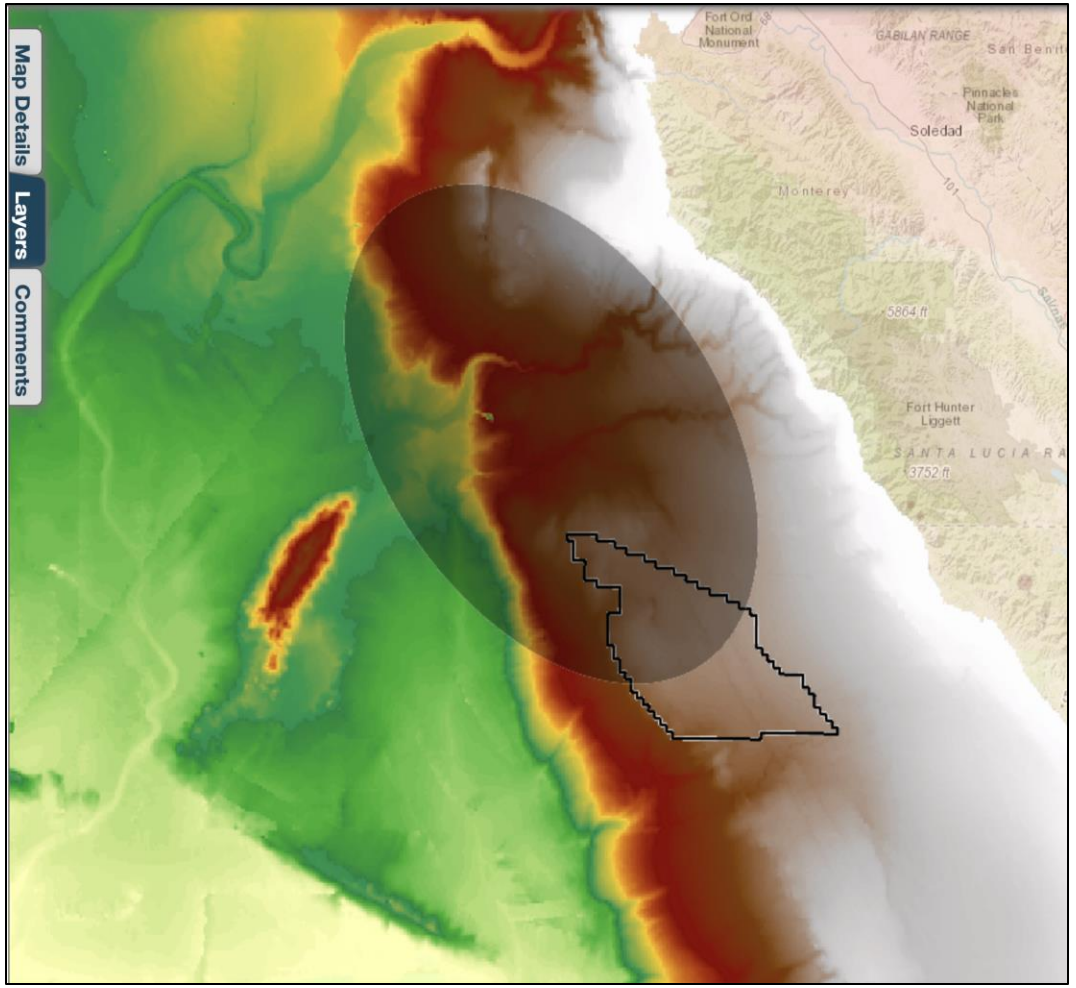

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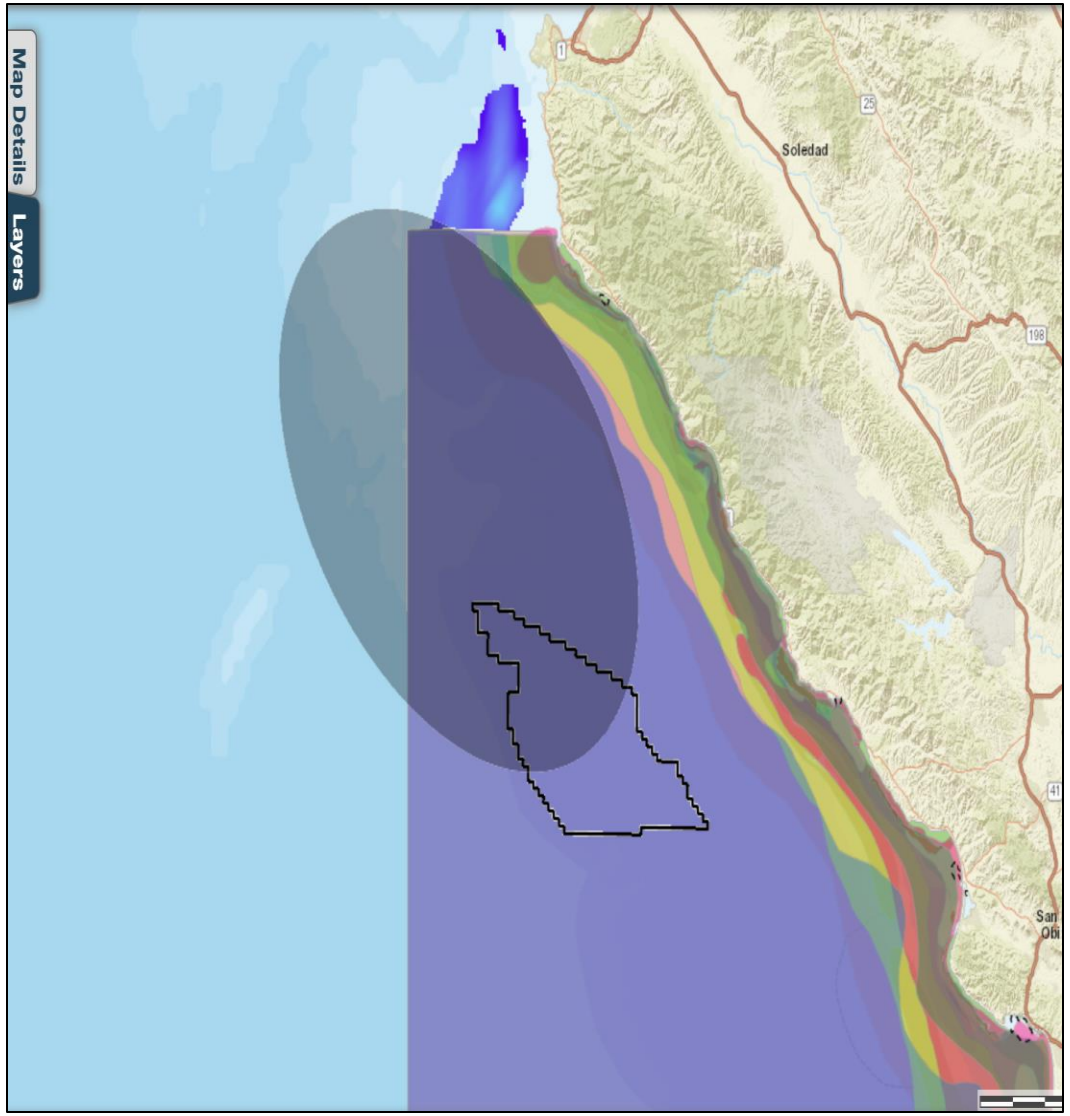

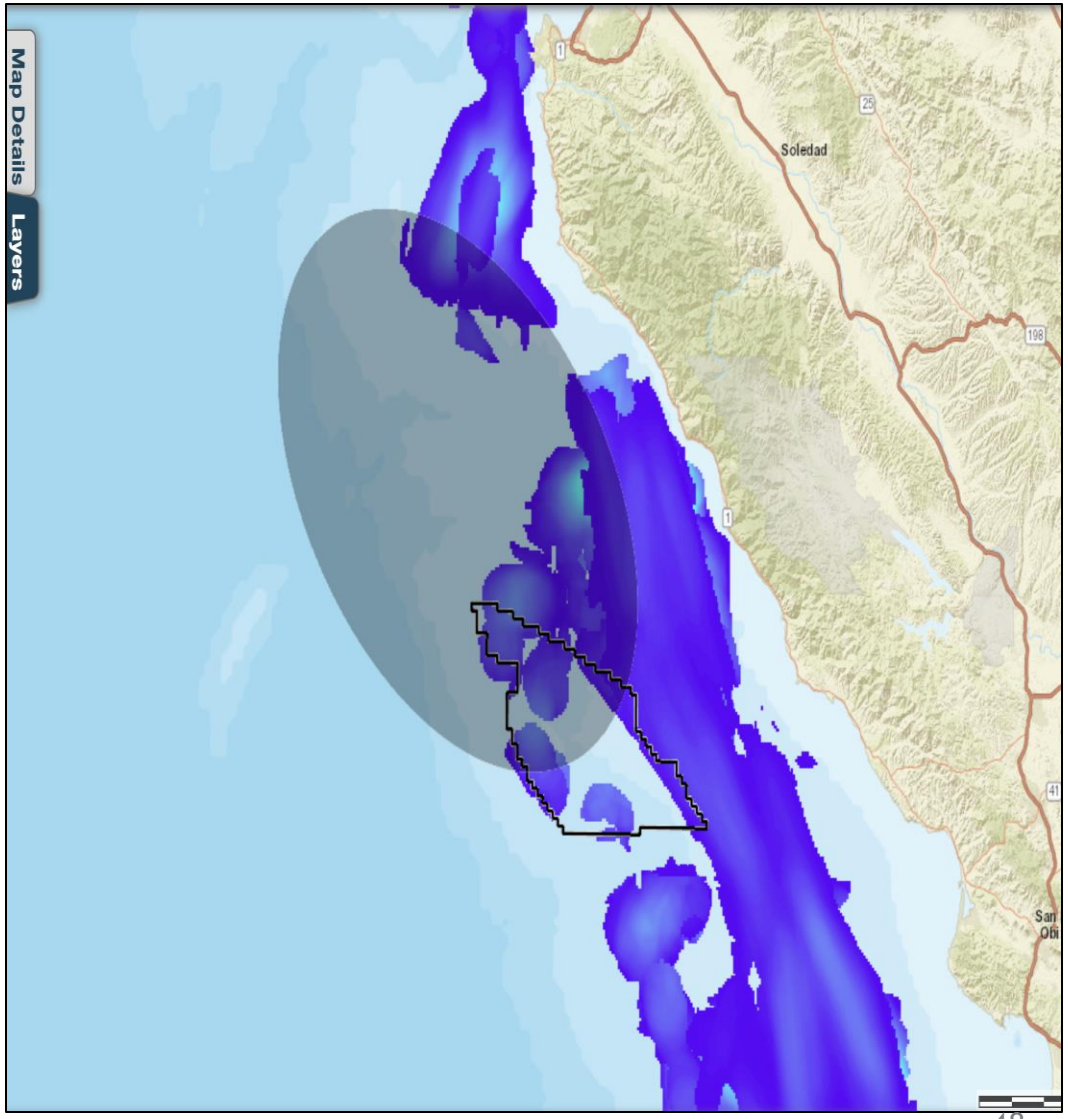

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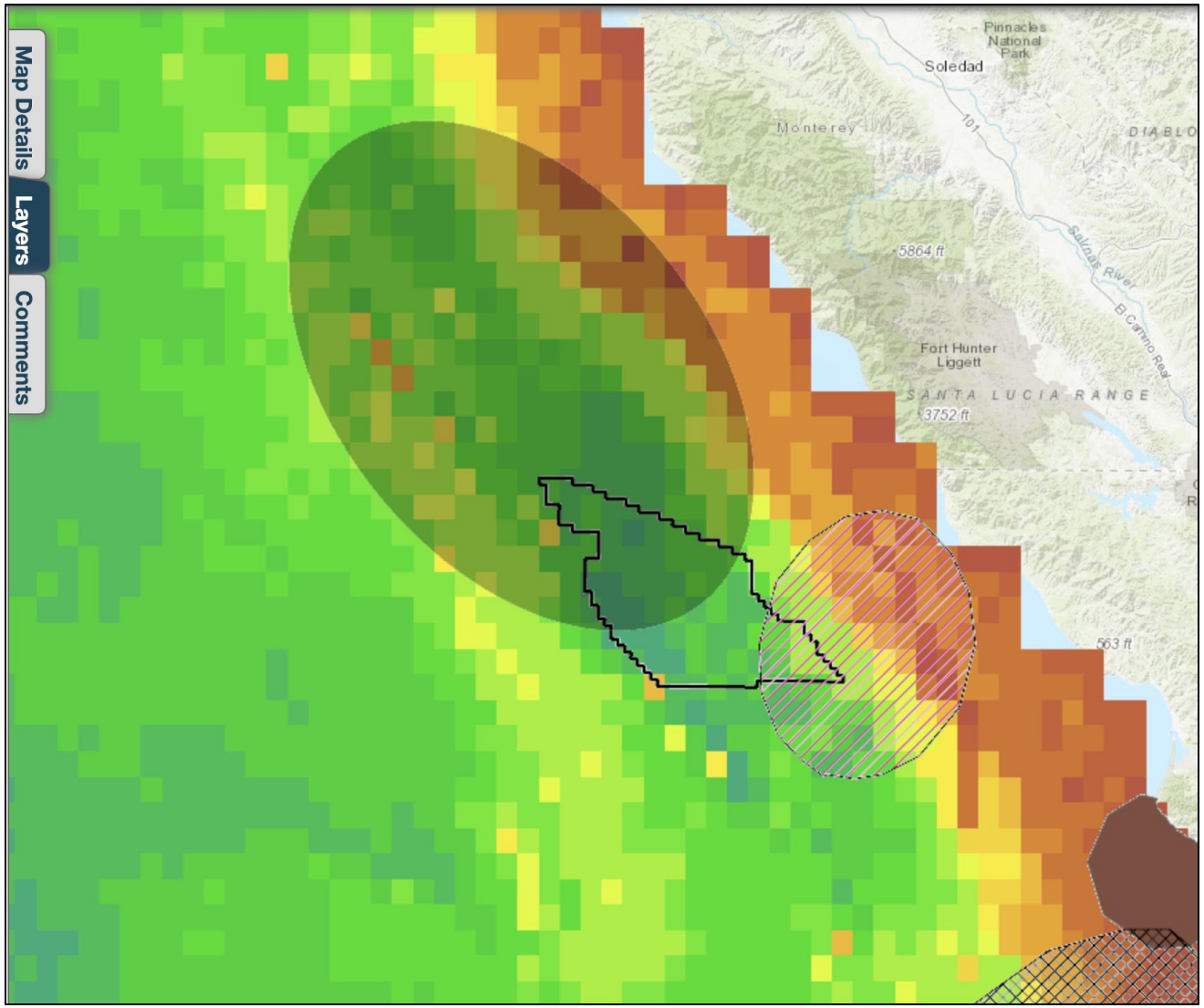

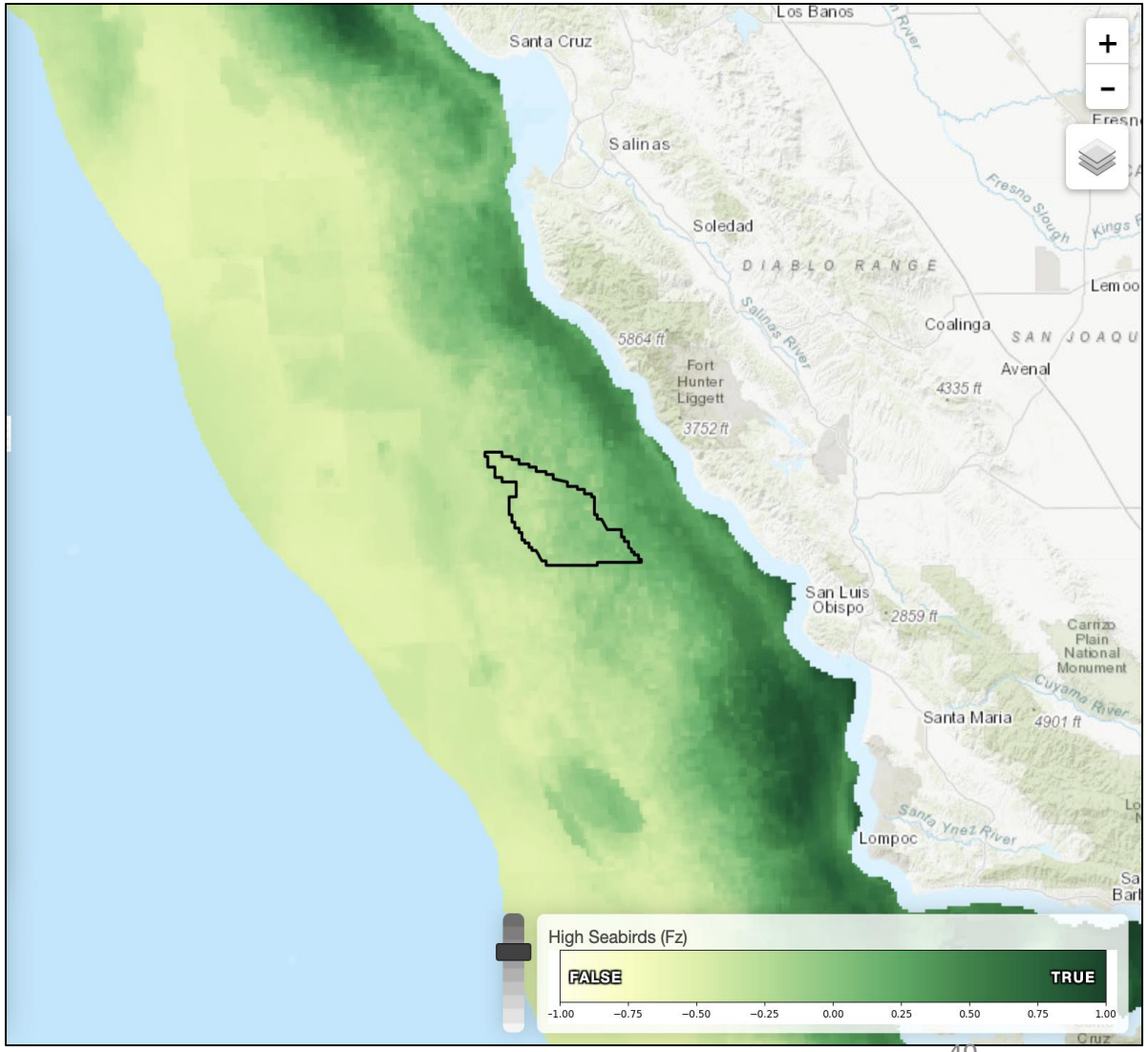

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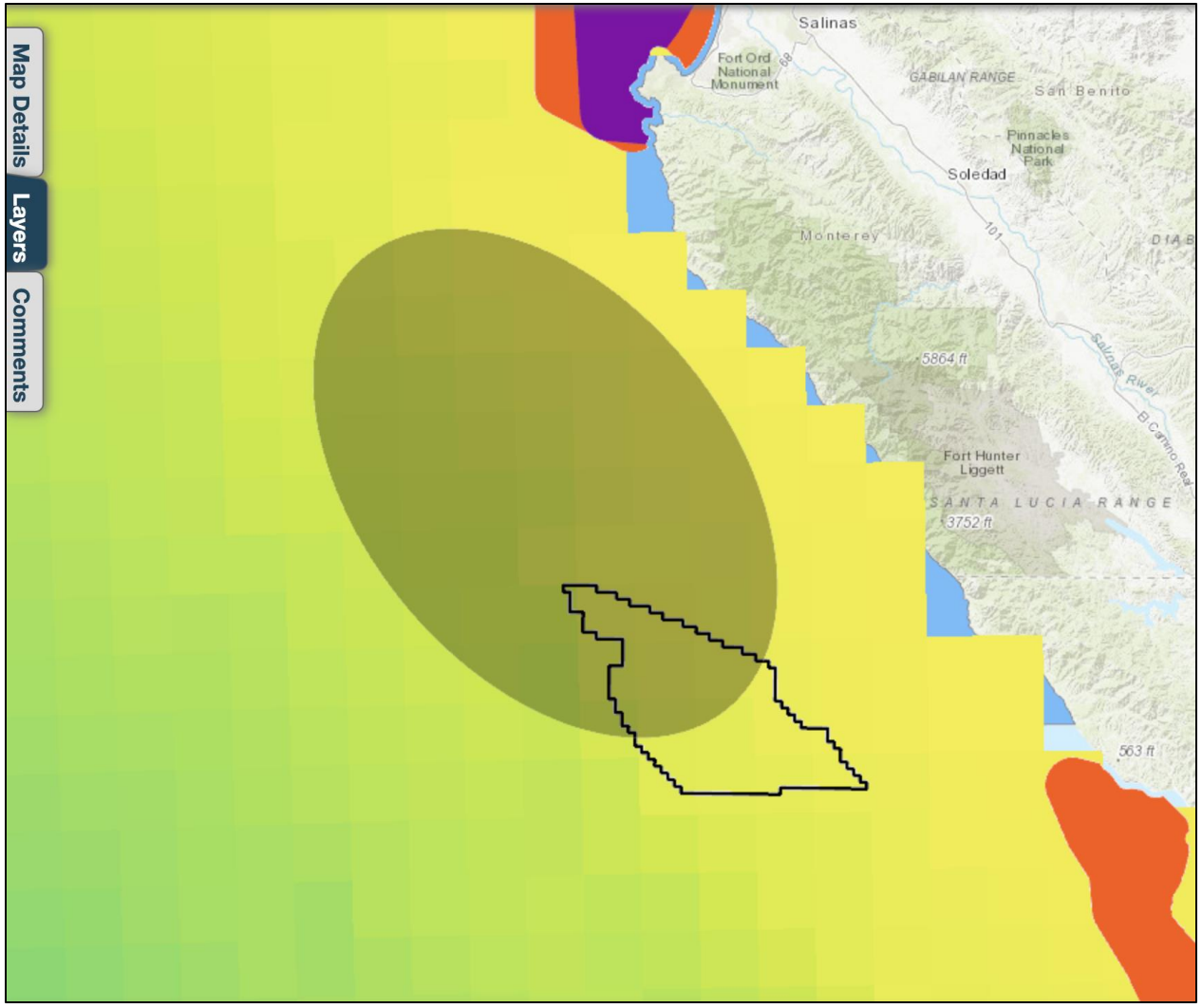
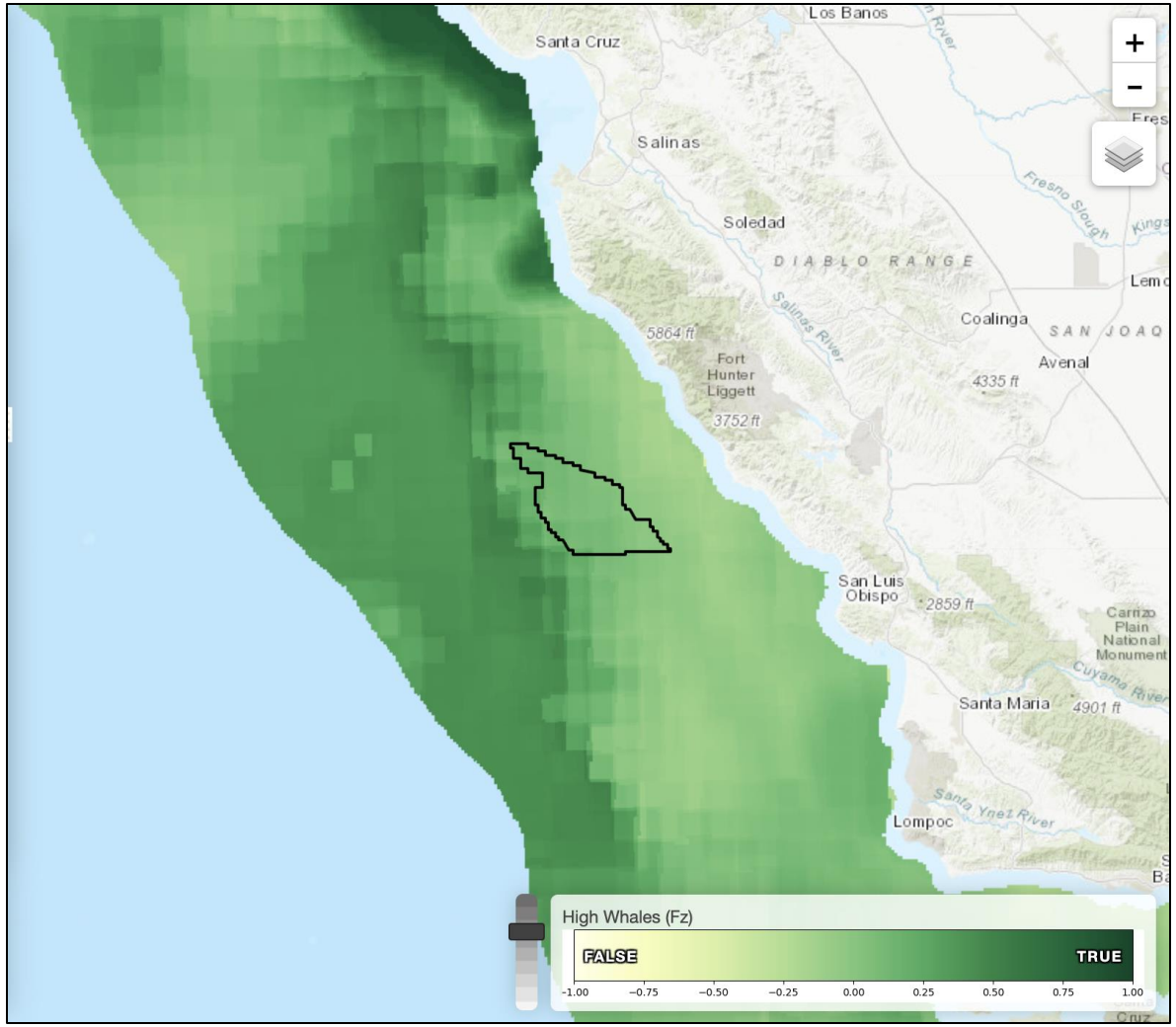
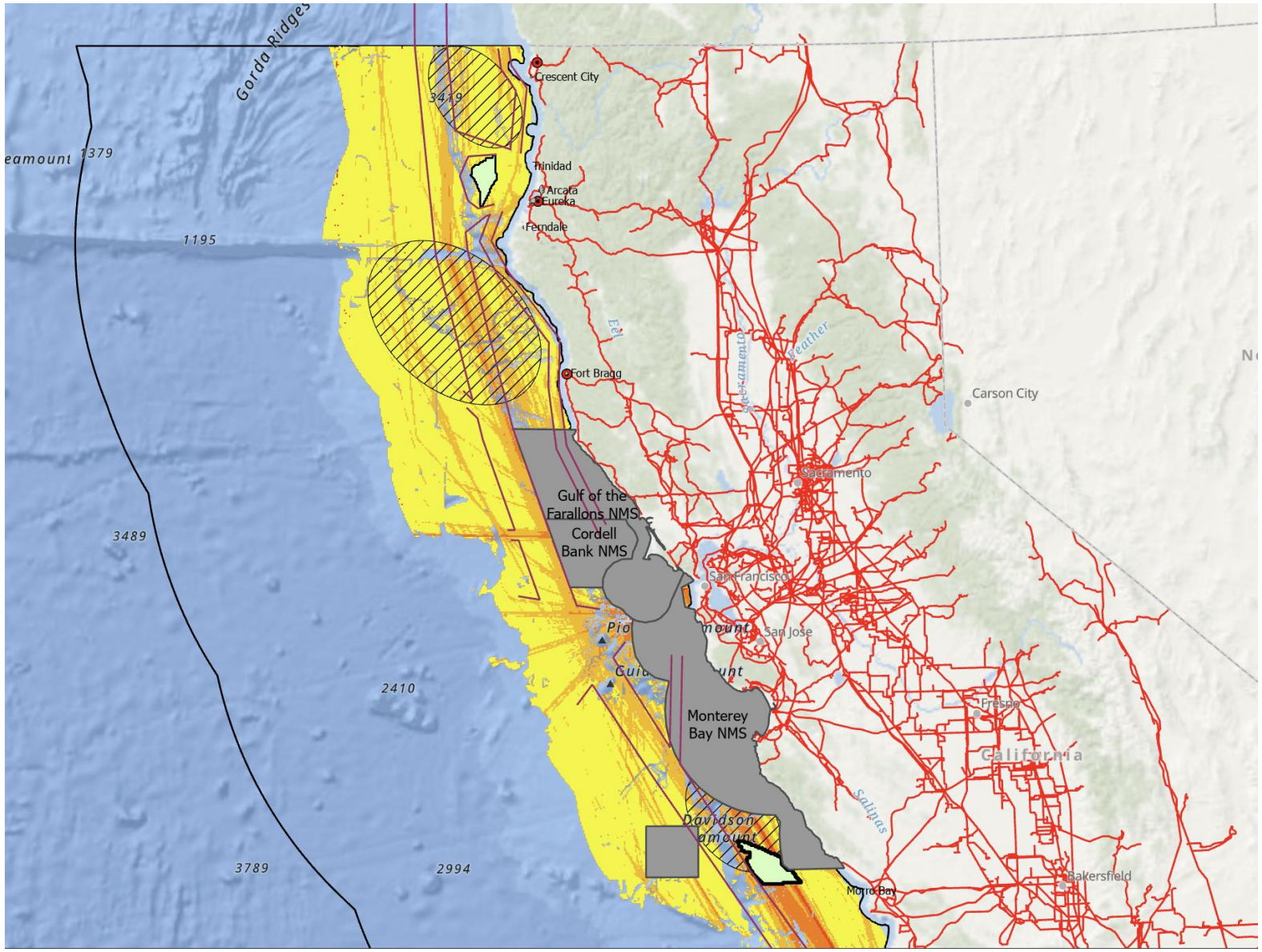




Commercial Shipping



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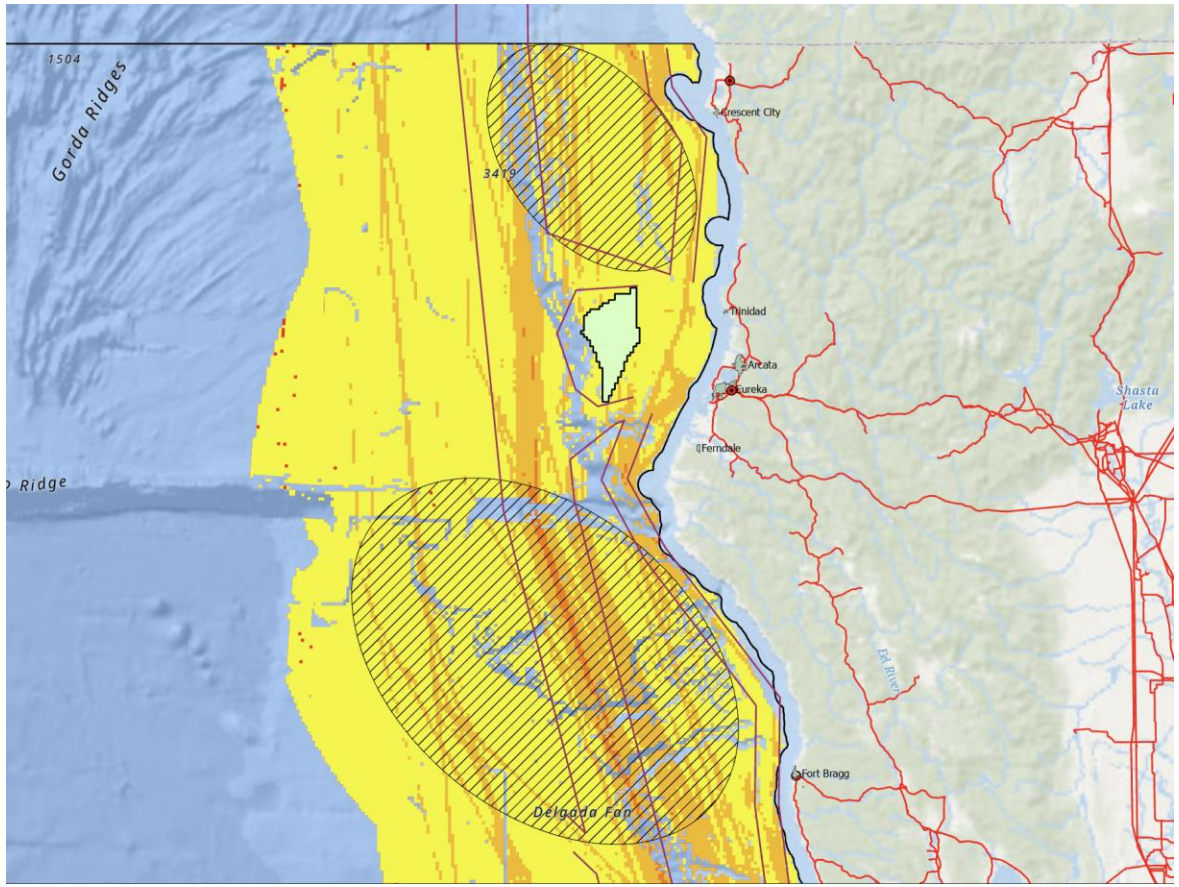
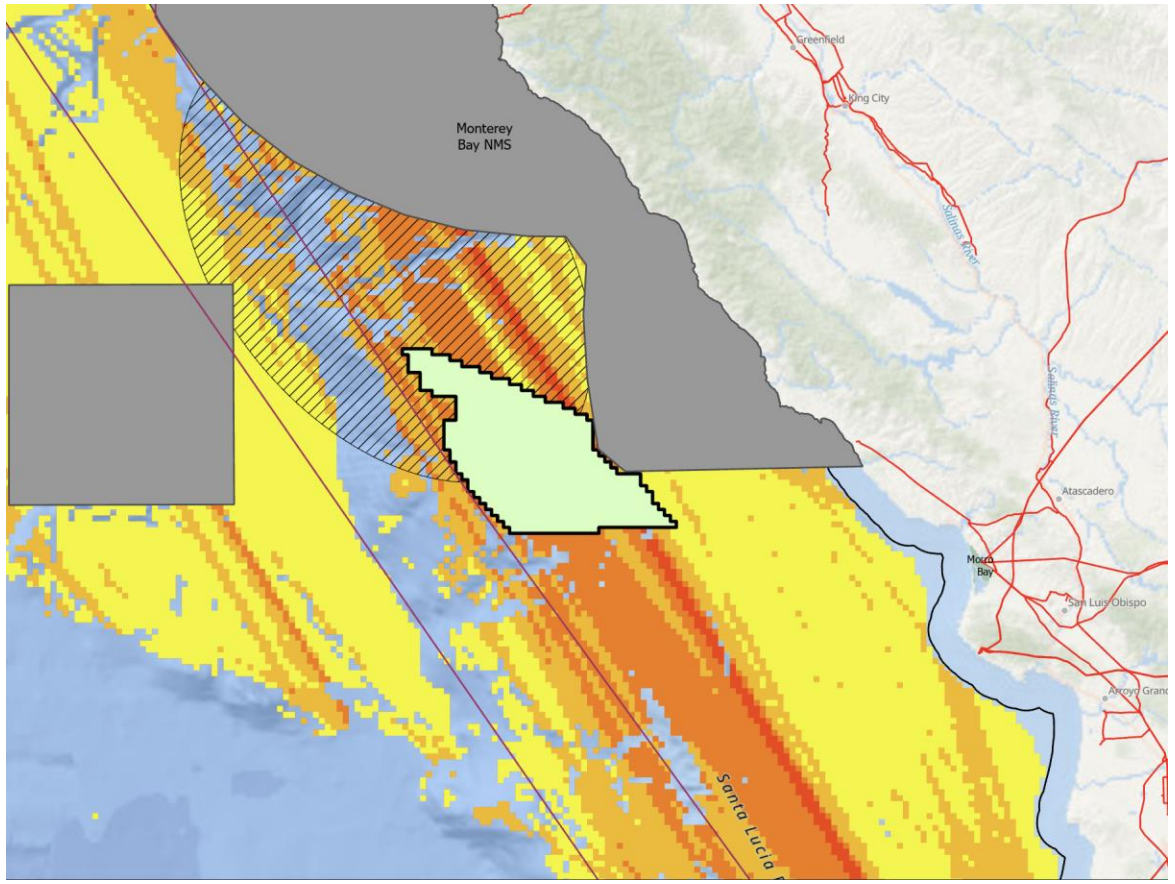
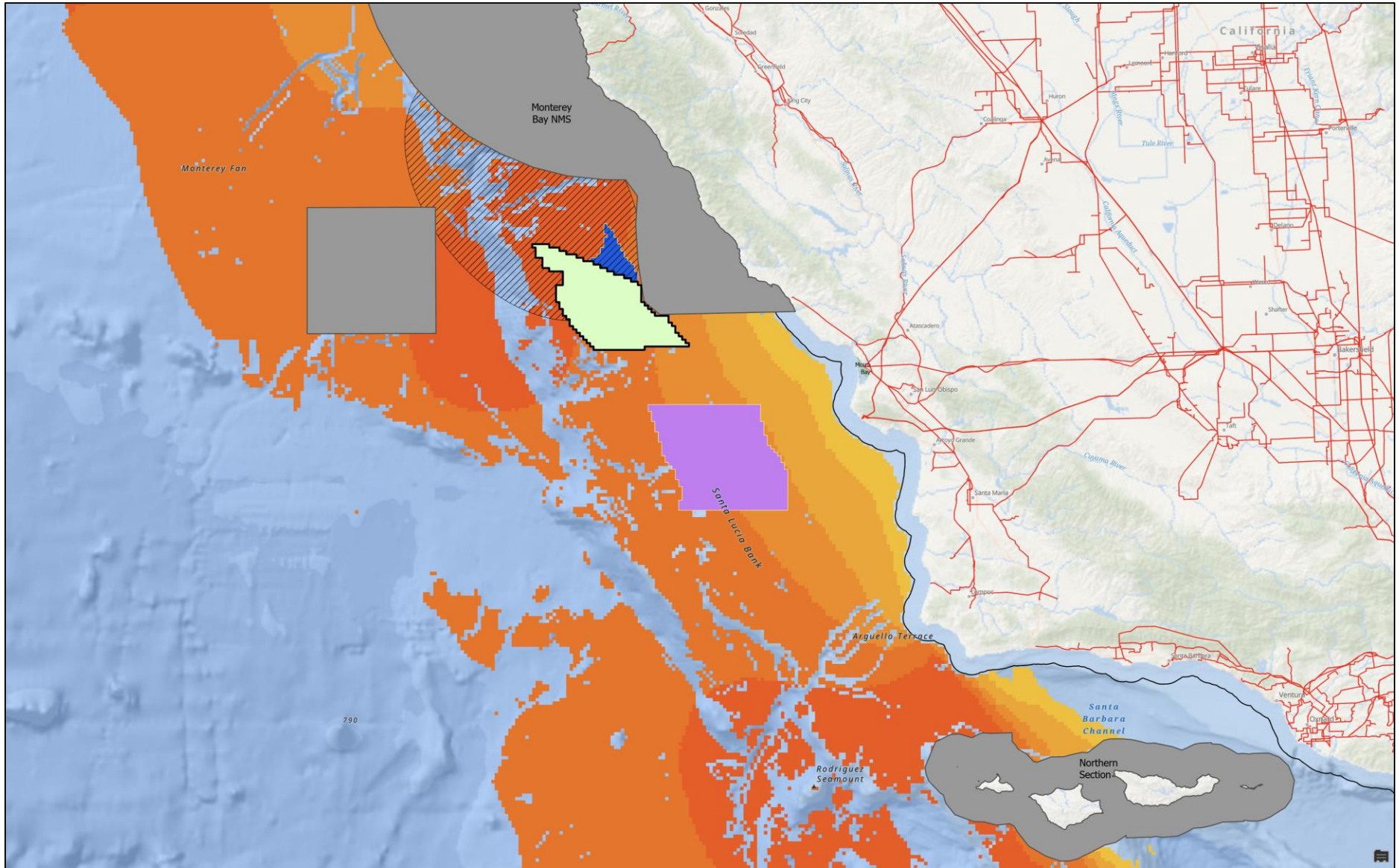
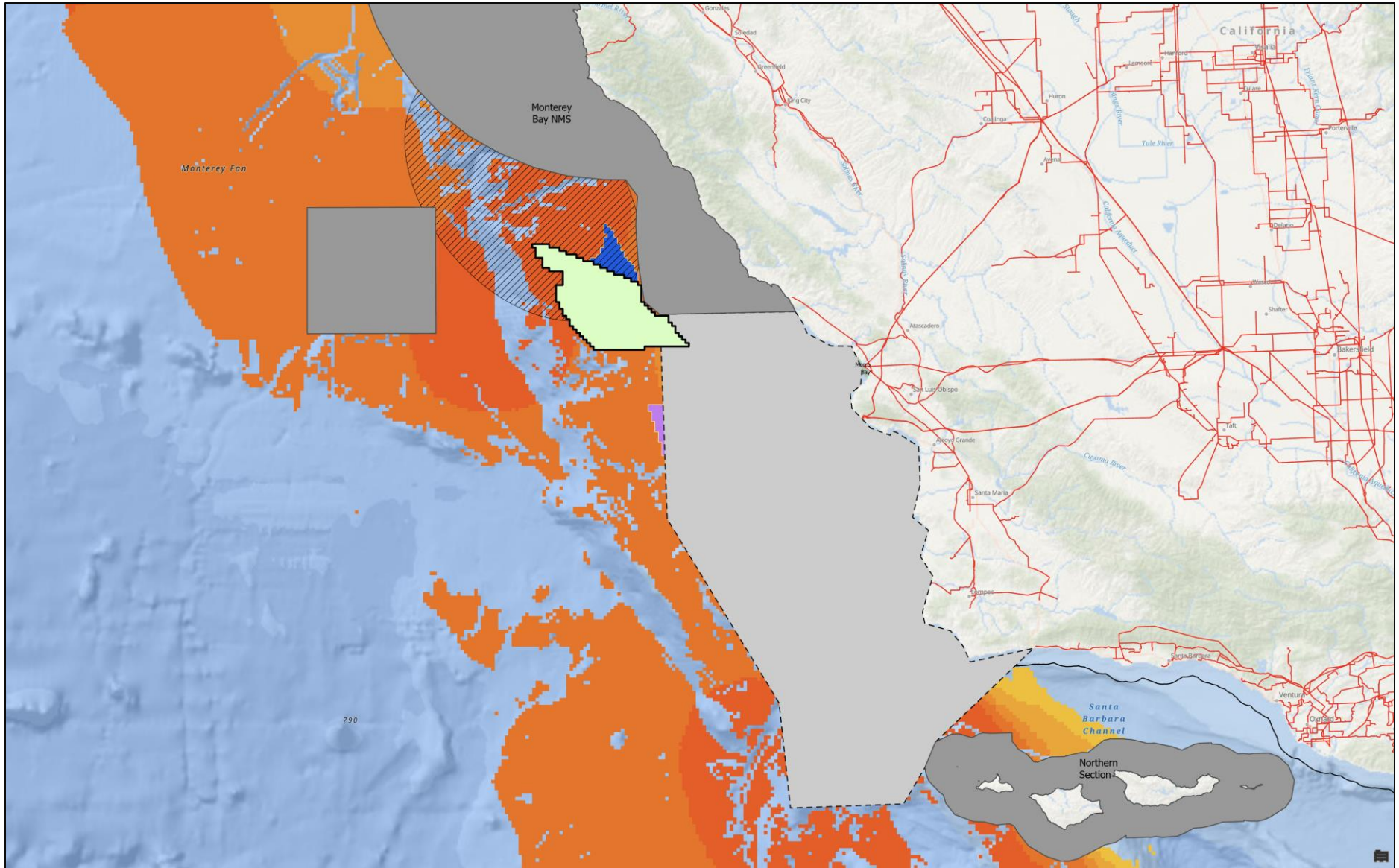




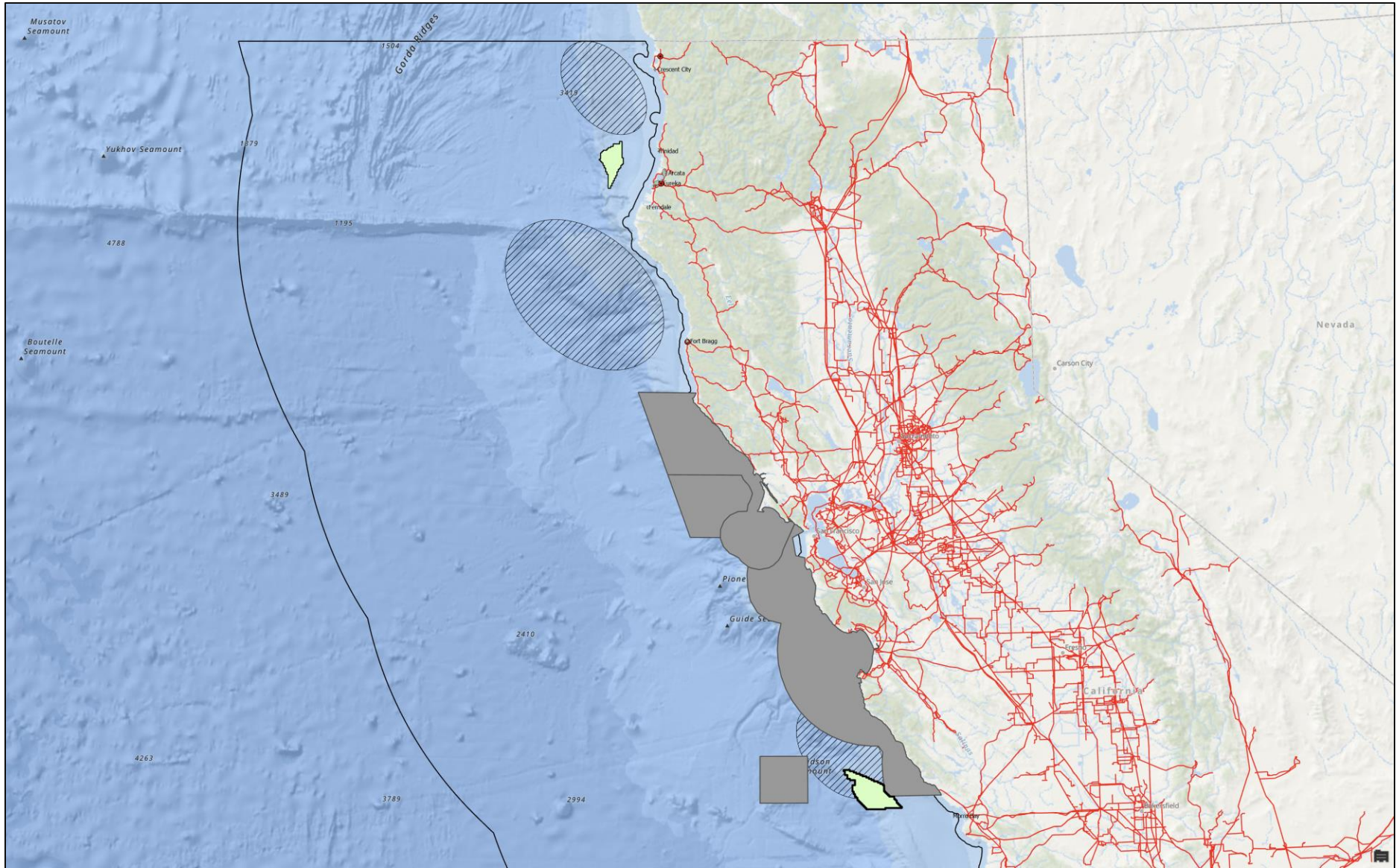
South Central Coast - Sea Space



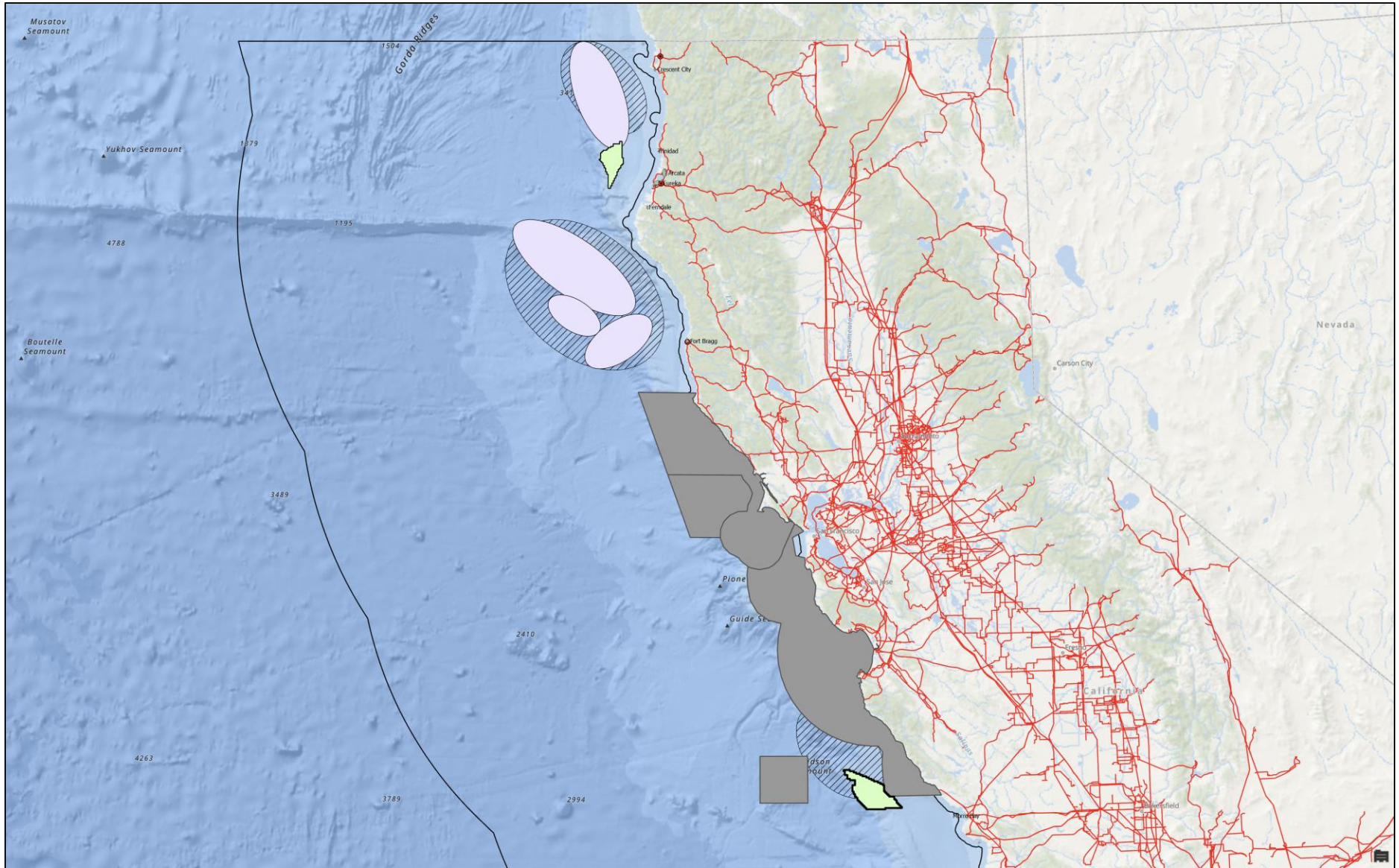
South Central Coast - Sea Space



AB 525 Sea Space



AB 525 Sea Space



Identified Conflicts and Issues

Cultural and Biological Resources

- Ancestral Landscapes
- Culturally Sensitive Areas
- Fishing

- Benthic Habitats and Habitat Areas of Particular Concern
- Marine Birds
- Marine Mammals
- Marine Turtles

Existing Ocean Uses

- Commercial Fisheries
- Commercial Shipping Traffic
- Department of Defense

Sea Space Technical Characteristics and Generation Potential

LOCATION	SEA SPACE AREA	INSTALLATION CAPACITY		AREA SIZE		OCEAN DEPTH		DISTANCE TO SHORE
		LOW ESTIMATE (GW)	HIGH ESTIMATE (GW)	Square Kilometers	Square Miles	Meters	Miles	Miles
North Coast								
	Humboldt Leases	1.6	3.0	536	207	500-1,100	0.31-0.68	21-35
	AB 525 Sea Space	27.0	45.0	8,950	3,456	980-2,350	0.61-1.46	33-43
Total		28.6	48.0	9,486.0	3,663			
South Coast								
	Morro Bay Leases	3.0	6.0	975	376	900-1,300	0.56-0.81	26-45
	AB 525 Sea Space	3.5	6.0	1,150	444	900-2,900	0.56-1.74	11-55
Total		6.5	12.0	2,125	820			
Area Totals		35.1	60.0	11,611	4,483			

5 Minute Break

Panel Discussion

Hayes Framme, Head of New Markets & Supply Chain, Orsted

Jacqueline Moore, Vice President, Pacific Merchant Shipping Association

Ken Bates, Executive Director, California Fishermen Resiliency Association and career commercial fishermen

Rikki Eriksen, Ph.D., Director of Marine Programs, California Marine Sanctuary Foundation

Ørsted

Developer Perspective

California Energy Commission Workshop on Seaspace Planning

Hayes Framme
Head of New Markets, Americas
Thursday June 1, 2023

Orsted at a Glance

Ørsted's global business areas

Offshore

- Global leader in offshore wind
- Develop, construct, own and operate offshore wind farms

Onshore, solar PV & storage

- Building a leadership position in onshore renewables
- Energy storage solutions and solar

Bioenergy & other

- Presence in Europe, including bioenergy plants, legacy gas activities and patented waste-to-energy technology

Renewable hydrogen and green fuels

- Emerging platform with 10+ pipeline projects (+3 GW)
- Ambition to become a global leader in renewable hydrogen and green fuels by 2030

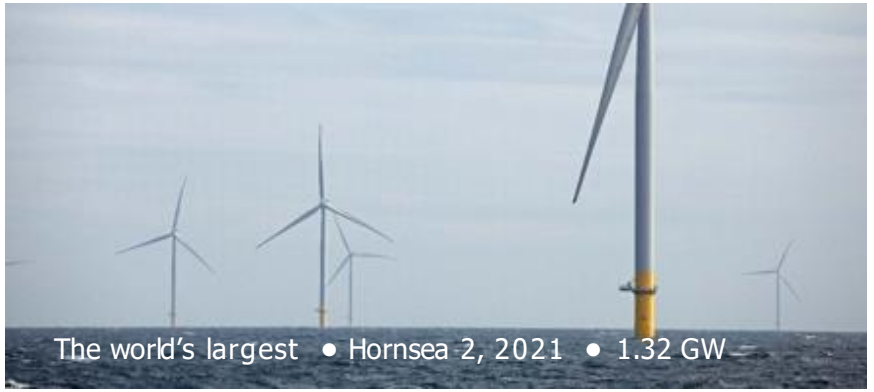
The global leader

8.9 GW
installed globally

~5GW
U.S. portfolio

1,500+
turbines spinning

30+ years
industry experience



as of April 2023

Ørsted

Leasing in the US

Balance of Conditions and Factors

Site Conditions to Consider:

- High winds
- Water depth
- Proximity to shore
- Grid access
- Proximity to ports
- Gigawatt scale potential

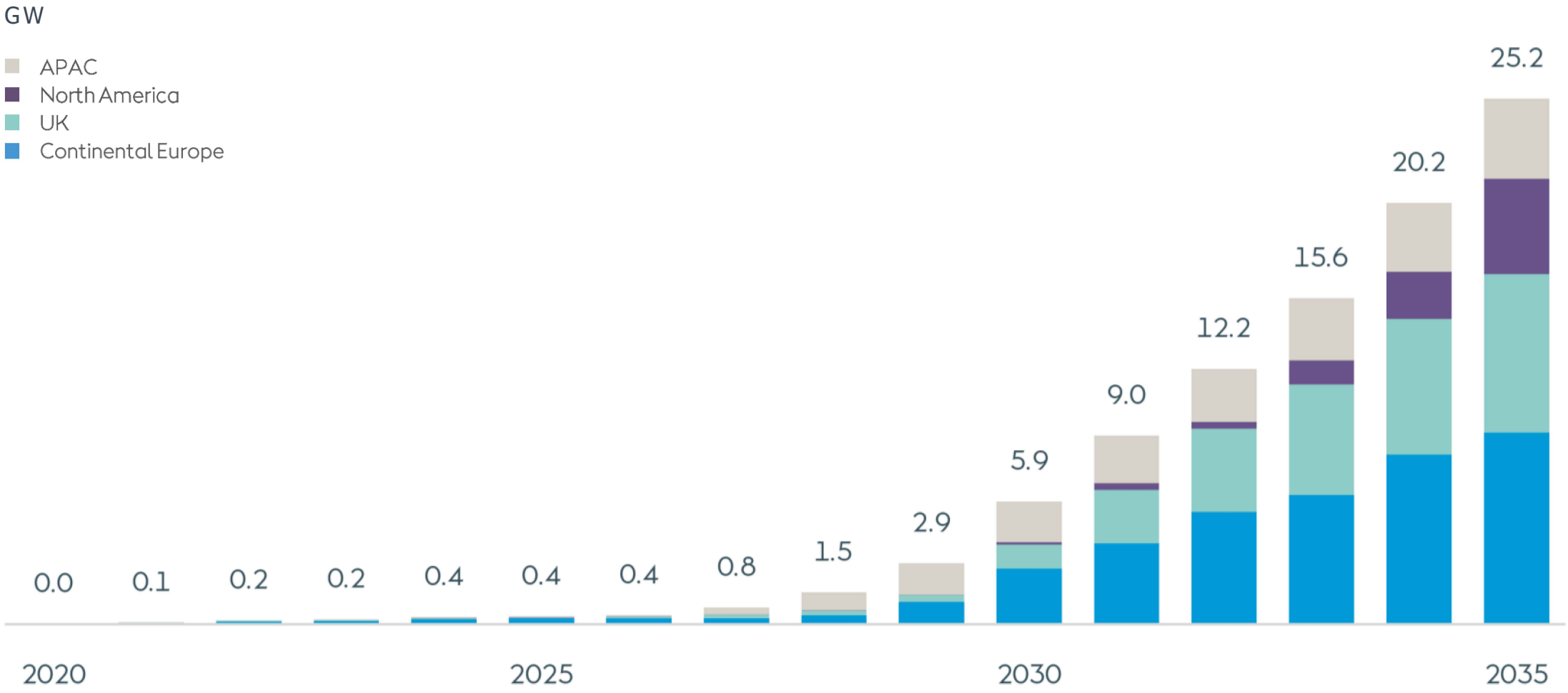
Siting Factors to Balance:

- Contiguous/adjacent space
- "Deconflicting"
- Coexistence with existing ocean users
- Marine species activities
- Mitigation
- Avoidance

Perspective on Floating Offshore Wind

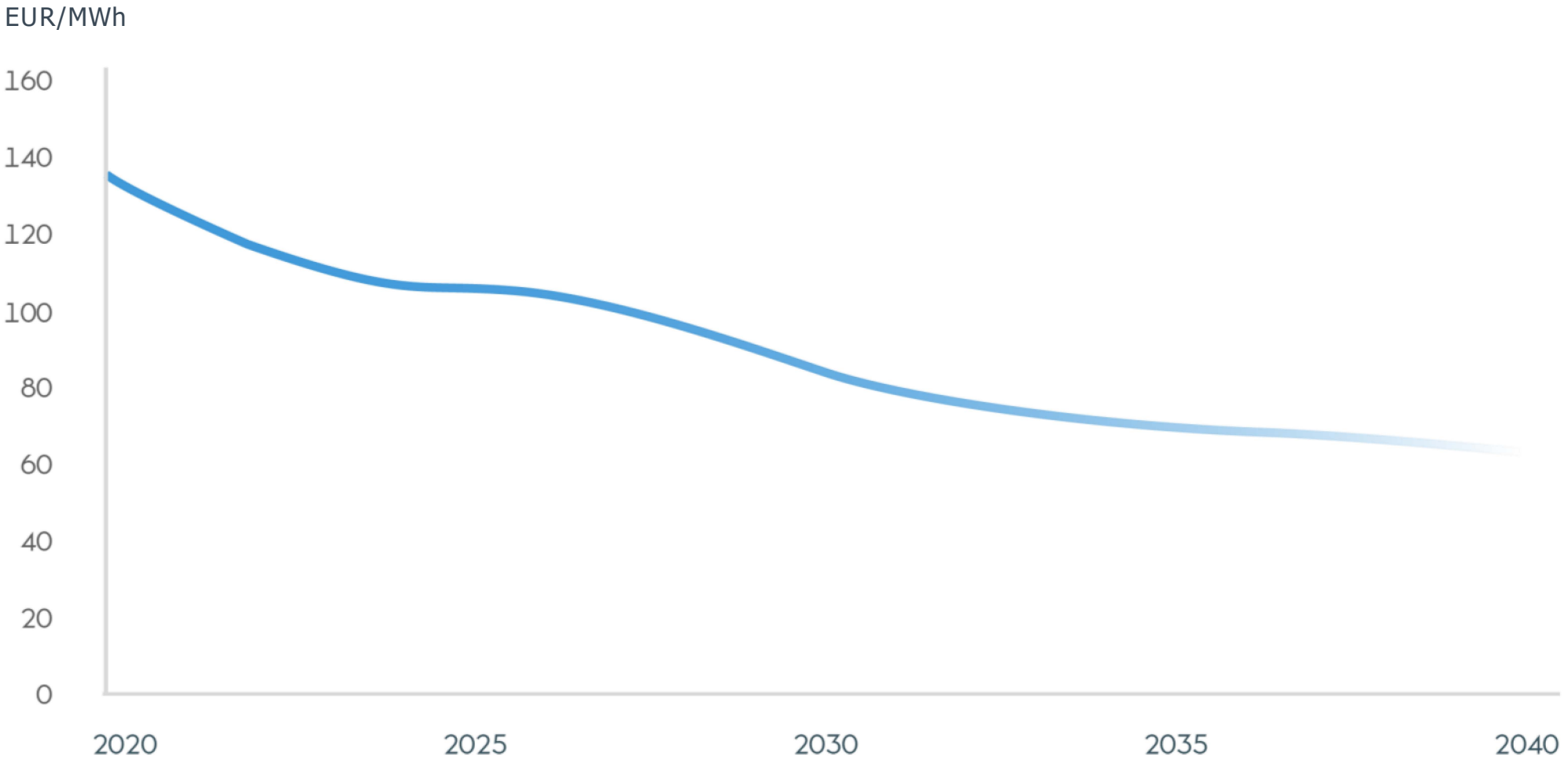
Ørsted

Cumulative global installations of floating offshore wind



Ørsted

Projected Levelised Cost of Energy
Floating offshore wind



Floating offshore wind

Floating Offshore Wind Cost Drivers

Wind Resource	• Wind speed • Wind direction • Lease location and orientation
Technology innovation	• Materials quantity • Standardization of design – turbines, foundations, moorings, O&M, vessels • Location of assembly, maintenance
Scale	• Market volume and volume sequence – industrialization of manufacturing • Size of individual wind farms • Size of potential contract awards for projects
Distance from shore	• Travel time to site; water depth • Materials quantity – cables, anchors • Installation complexity, safety
Risk	• Permitting clarity/certainty • Landfall and interconnection • Availability of feasible seaspace – uncertainty of constructability
Pipeline of opportunity	• State level procurement/award clarity and certainty in timing and process • Amount of available/auctioned seaspace • Revenue contract/offtake agreement certainty – contractual risk

Floating designs and their advantages

Tension leg platform
Highly stable with small seabed footprint

Semi submersible
Most common type, adapted to a wide range of conditions

Barge
Similar to semi submersible but with a larger surface area in contact with the water

Spar buoy
Stable with little movement

Ørsted

Floating offshore wind – operation

as of April 2023

PACIFIC MERCHANT SHIPPING ASSOCIATION

Sea Space Identification & Vessel Navigation

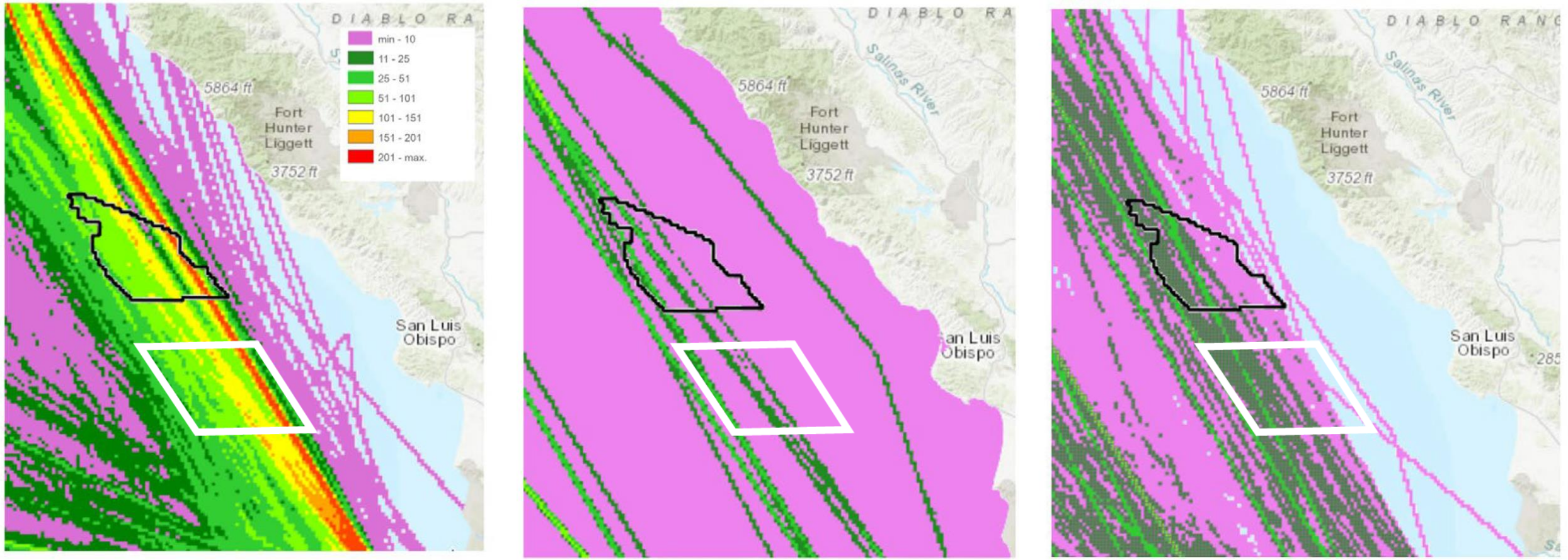
Jacqueline M. Moore

Vice President

Pacific Merchant Shipping Association

jmmoore@pmsaship.com

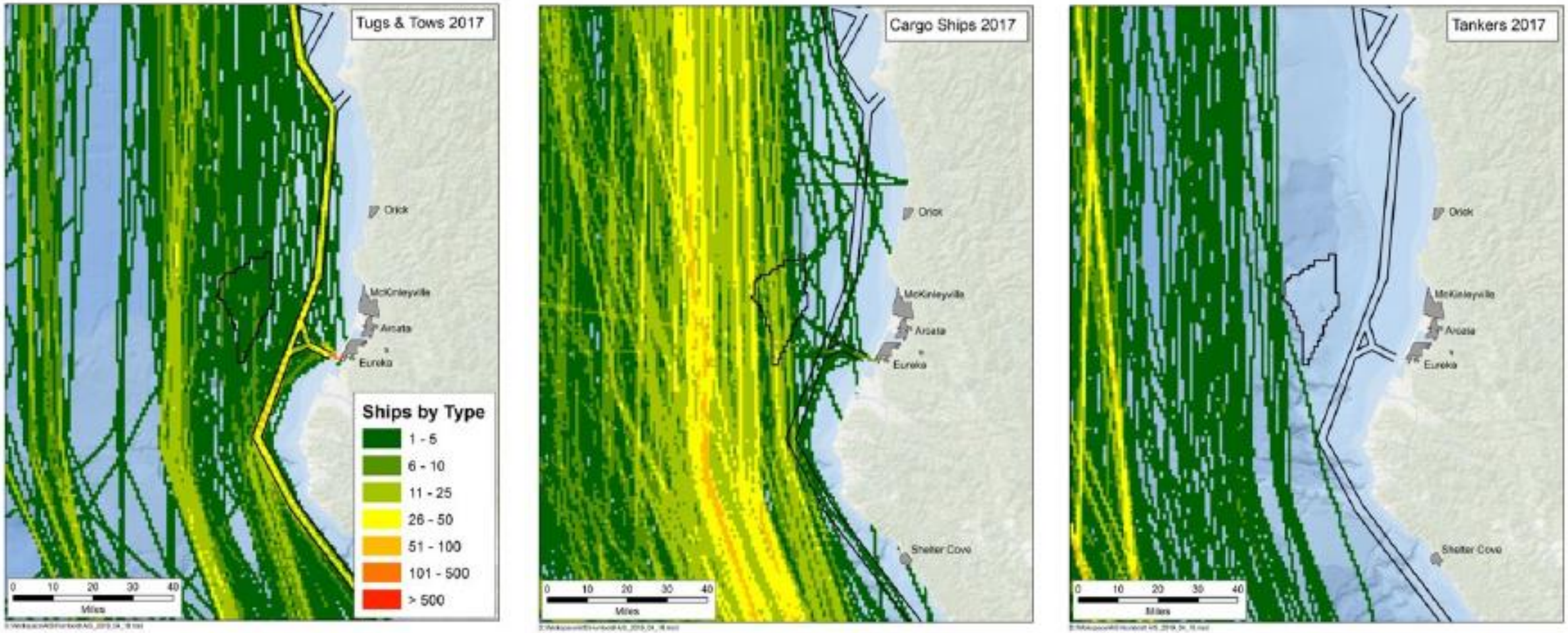
Morro Bay WEA & Vessel Traffic



Vessel traffic for cargo, tug/tow and tanker vessels for Morro Bay Wind Energy Area, in black, and the proposed Diablo Canyon Call Area, in white.

Source: PMSA. Maps created utilizing 2017 AIS Shipping Vessel Traffic data at databasin.org.
Diablo Canyon Call Area is for illustrative purposes only.

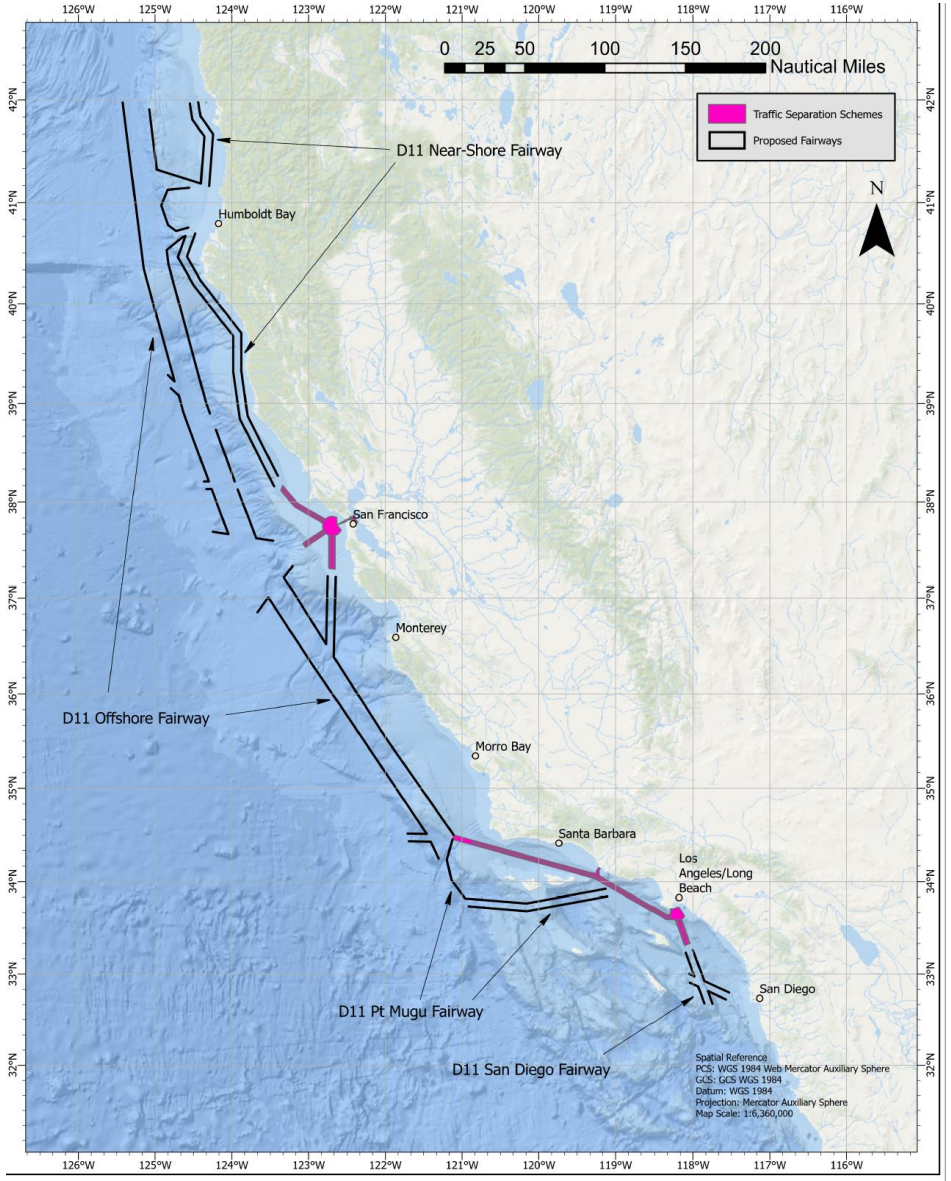
Humboldt WEA & Vessel Traffic



Vessel traffic for tug/tow, cargo and tanker vessels near Humboldt Wind Energy Area, in black.

Source: BOEM. Maps created utilizing 2017 AIS Shipping Vessel Traffic data.

US Coast Guard
Pacific Coast Port Access Route Study (PAC-PARS)



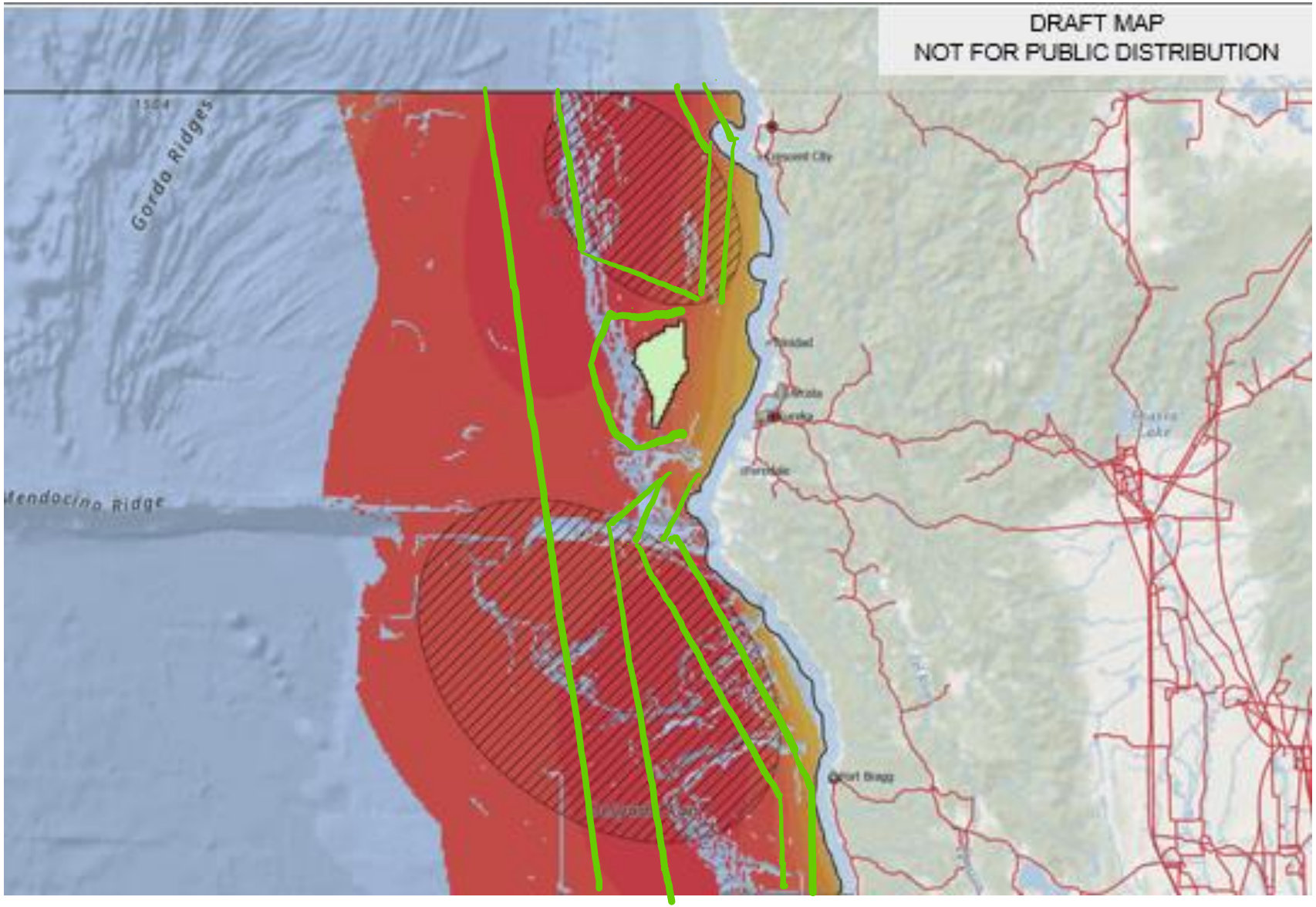
Port Access Route Studies are undertaken by the US Coast Guard to ensure safety of navigation due to coastal waters development:

- Development of aquaculture farms
- Offshore renewable energy
- Increased commercial traffic
- Expansion of marine sanctuaries

Concludes with routing recommendations. These fairways would be voluntary.

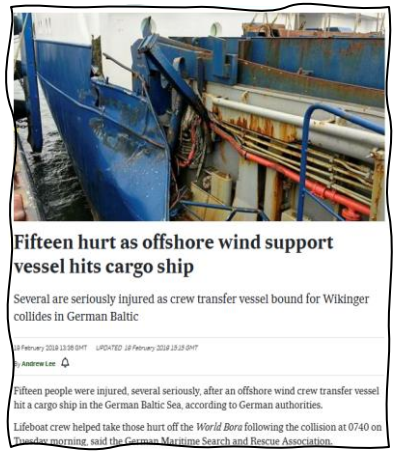
Source: USCG. Draft map, not to be cited.
Will be superseded by impending Final USCG PAC-PARS.

Other Areas of Interest



Draft map and drawing for illustrative purposes only. Not to scale. Not to be cited.

Offshore Sea Space Siting Impacts to the Shipping industry



Fifteen hurt as offshore wind support vessel hits cargo ship

Several are seriously injured as crew transfer vessel bound for Wikinger collides in German Baltic

Fifteen people were injured, several seriously, after an offshore wind crew transfer vessel hit a cargo ship in the German Baltic Sea, according to German authorities.

Lifeboat crew helped take those hurt off the *World Bora* following the collision at 0740 on Tuesday morning, said the German Maritime Search and Rescue Association.

- Risk of allisions and collisions between
  - vessels and turbines
  - Safety of personnel
  - Interference with radar
  - Possible increased emissions
  - Potential impacts to marine life

Vattenfall Shows Damage Caused by Cargo Ship Adrift at Hollandse Kust Zuid Offshore Wind Farm

WIND FARM UPDATE

February 2, 2022, by Adnan Durakovic

Julietta D, the bulk carrier that had drifted in the Hollandse Kust Zuid wind farm offshore the Netherlands for several hours on Monday, 31 January, collided with one of the wind turbine monopile foundations at the 1.5 GW wind farm.

Vattenfall

A reconnaissance flight carried out on Tuesday, 1 February, has revealed the

argo Ship Arrives in Germany with Large Hole After Striking Wind Farm

Maritime Executive

26 April 2023

Germany's water police are investigating what they believe may be the first case in whi erchant ship underway struck a North Sea wind turbine. The captain of the vessel ac olice has so far not explained how his vessel received a hole the "size of a barn door" tarboard side of the ship.

Strategies

- Coordination with *all* stakeholders and state-feds
  - Communication plans
- Creation of a maritime working group (industry, USCG, agencies)
  - Methodologies for identification and analyzation of impacts

Lists are not inclusive.

Panel Discussion

Hayes Framme, Head of New Markets & Supply Chain, Orsted

Jacqueline Moore, Vice President, Pacific Merchant Shipping Association

Ken Bates, Executive Director, California Fishermen Resiliency Association and career commercial fishermen

Rikki Eriksen, Ph.D., MPAs Director, California Marine Sanctuary Foundation

Lunch Break
Return at 1:30 pm

Welcome Back
Danielle Mullany

PM Workshop Schedule

1. Welcome Back
2. Impacts and Mitigations: Overview
3. Impacts and Mitigations: Coastal Resources
4. Impacts and Mitigations: Fisheries
5. Break
6. Panel Discussion
7. Public Comment

Susan Lee
Aspen Environmental Group

AB 525
Impacts and Mitigation Strategies

CEC Workshop June 1, 2023

Prepared by: Susan Lee
SLee@aspeneg.com

Date: June 1, 2023

Aspen environmental group

Overview

- Requirements of AB 525
- Approach to identifying impacts
- Approach to defining mitigation strategies
- Environmental resources and disciplines considered
- Key issues:
  - Concerns of Native American and Indigenous peoples
  - Coastal and marine resources (separate presentation)
  - Fisheries (separate presentation)
  - National defense

AB 525 Requirements

- Section 1 requires that:
  - (m) Offshore wind should be developed in a manner that protects coastal and marine ecosystems. The State of California should use its authority under state programs and policies to ensure (1) avoidance, minimization, and mitigation of significant adverse impacts, and (2) monitoring and adaptive management for offshore wind projects and their associated infrastructure.
- Strategic Plan contents:
  - Section 25991(c)(5) requires that the Strategic Plan address potential impacts on coastal resources, fisheries, Native American and Indigenous peoples, and national defense, and strategies for addressing those potential impacts.
  - Section 25991.2 (e) requires that the Strategic Plan … "make recommendations regarding potential significant adverse environmental impacts and use conflicts, such as avoidance, minimization, monitoring, mitigation, and adaptive management, consistent with California's long-term renewable energy, greenhouse gas emission reduction, and biodiversity goals.

Approach to Identifying Impacts & Mitigation

- Challenges
  - No commercial floating OSW turbines in the U.S.
  - No west coast seaport facilities dedicated to the industry
  - Potentially affected resources will be defined in surveys and research not yet completed
- Resources and Examples
  - BOEM Environmental Assessments for Morro Bay and Humboldt Wind Energy Areas (WEAs)
  - CA State Lands Commission Preliminary Environmental Assessment for Vandenberg Wind Energy Projects
  - BOEM EISs for east coast wind projects
  - Team experience

Resources and Disciplines Considered

KEY RESOURCES	• **Marine Biological Resources** • **Fisheries**	• **Cultural and Tribal Resources** • **National Defense**
Other Resources and Disciplines	• Aesthetics • Air Quality and Greenhouse Gas Emissions • Agriculture and Forestry Resources • Biological Resources – Terrestrial • Department of Defense Operations • Economic and Environmental Justice • Geology, Soils, and Paleontological Resources • Hazards, Safety, and Hazardous Materials • Hydrology and Water Quality	• Land Use and Planning • Mineral Resources • Noise and Vibration • Population and Housing • Public Services • Recreation and Tourism • Transportation, Shipping Lanes • Utilities and Service Systems • Wildfire

Ongoing Consultation with Native American Tribes

- Engagement and consultation with California Native American Tribes ongoing with CEC, CSLC, CCC, BOEM
- CCC Consistency Determination Condition 6 defines:
  - Lessee engagement with California Native American Tribes
  - Lessee development of an engagement framework that addresses compensation for member participation in engagement and events
  - Lessee retention a qualified tribal liaison
  - Lessee coordination regarding survey protocols and actions to be taken if potential tribal resources are discovered
  - Lessee coordination with Tribes on infrastructure needs and economic development

Native American and Indigenous Peoples

- Concerns and Potential Impacts
  - Retaining reasonable use of lease areas for subsistence and commercial food gathering activities
  - Preserving traditional species that use or pass through the lease areas
  - Degradation of viewshed during construction and operation
  - Direct effects on physical resources such as prehistoric habitation sites and the presence of burial areas, tools, pottery, or other artifacts
  - Potential disproportionate impact to North Coast tribes
  - Proposed Chumash Heritage National Marine Sanctuary; coastal and offshore sacred places

Cultural and Tribal Resources

- Typical programmatic or project-specific mitigation includes:
  - Government-to-Government consultation to hear project-specific concerns and tribal recommendations for mitigation and monitoring strategies
  - Community benefits agreements to provide energy to tribal lands, employment and job training opportunities
  - Completion of pedestrian and geophysical surveys to identify resources that could be disturbed or destroyed by construction activities
  - Tribal participation in survey efforts
  - Development of a plan for discovery of human remains or unanticipated resources

National Defense – Impacts to DOD Activities

- Marine vessels using marine transit lanes create increased potential for vessel collision, conflict with DOD vessels, and conflict with DOD training areas.
- The increase in marine vessel traffic may increase the number of events requiring search and rescue actions by the Coast Guard.
- Turbines can alter radar signals and preclude large areas of the sea for use in DOD training exercises.
- Risk of collision with the turbines and DOD marine vessels or aircraft; risk of snagging mooring cables, inter-array cables, and turbine anchor systems.
- In ports and harbors, construction and O&M would compete with DOD uses of port facilities and traffic lanes.
- Onshore transmission lines can present hazards to low-altitude training flights.

National Defense – Mitigation Strategies

- Coordination among DOD, BOEM, and OSW project proponents will be required to avoid conflict with DOD coastal, marine, and air operations during leasing, siting, and construction activities.
- Facility and component design should focus on avoidance of conflicts, considering potential interference with navigational radar, risk of collisions with infrastructure (including anchoring systems and floating turbine structures), risk of electromagnetic emissions conflict, and risk of snagging or being entangled with underwater cables.
- Coordination in advance of offshore facility construction and operation should also include the development of communications plans and vessel transit routes to facilitate vessel lane management, law enforcement, and search and rescue activities by the USCG.

Introduction of Experts

- Marine resources: Sharon Kramer of H. T. Harvey & Associates
- Fisheries: Steven Hackett of Cal Poly Humboldt/Aspen

Sharon Kramer, Ph.D.
H. T. Harvey & Associates

H. T. HARVEY & ASSOCIATES

Ecological Consultants

CEC Workshop: AB 525 Impacts and Mitigation Strategies

Prepared by: Sharon Kramer, PhD
Senior Marine Ecologist, Principal
skramer@harveyecology.com
June 1, 2023

Impacts and Mitigation Strategies for Coastal Resources

Overview

Potential impacts of offshore wind energy development on coastal resources

- seabirds
- marine mammals
- sea turtles
- food chains
- coastal habitats

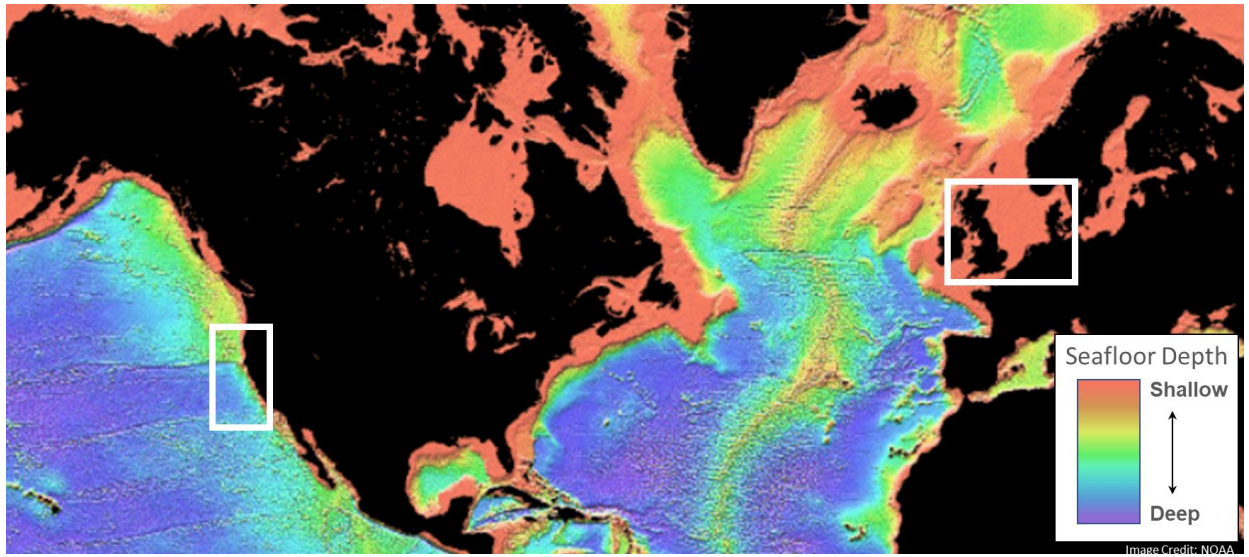
Types of **mitigation**

- avoidance
- minimization
- compensatory

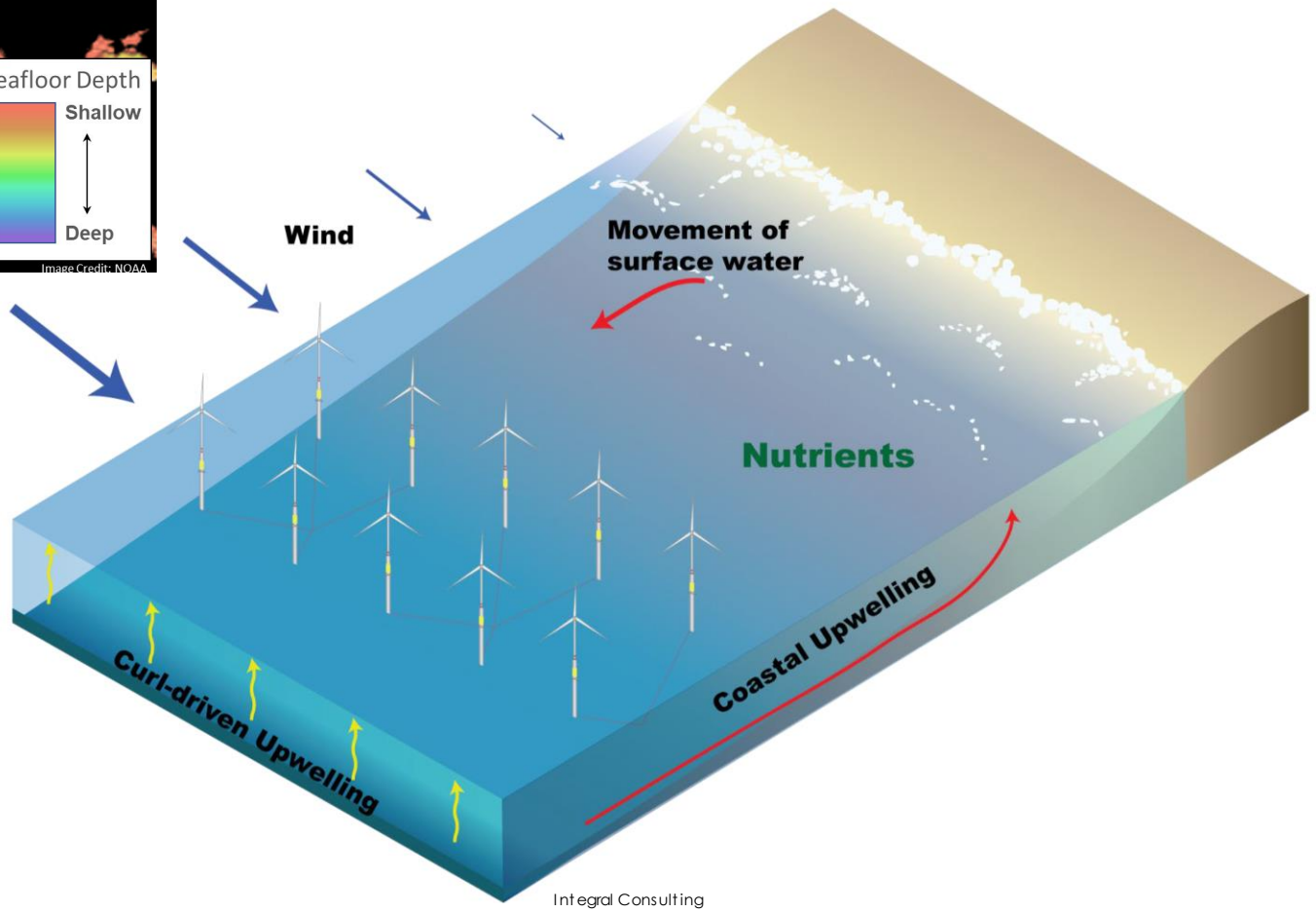
The role of **monitoring and adaptive management**

Image Credit : Integral Consulting

Our Setting: California Current Ecosystem

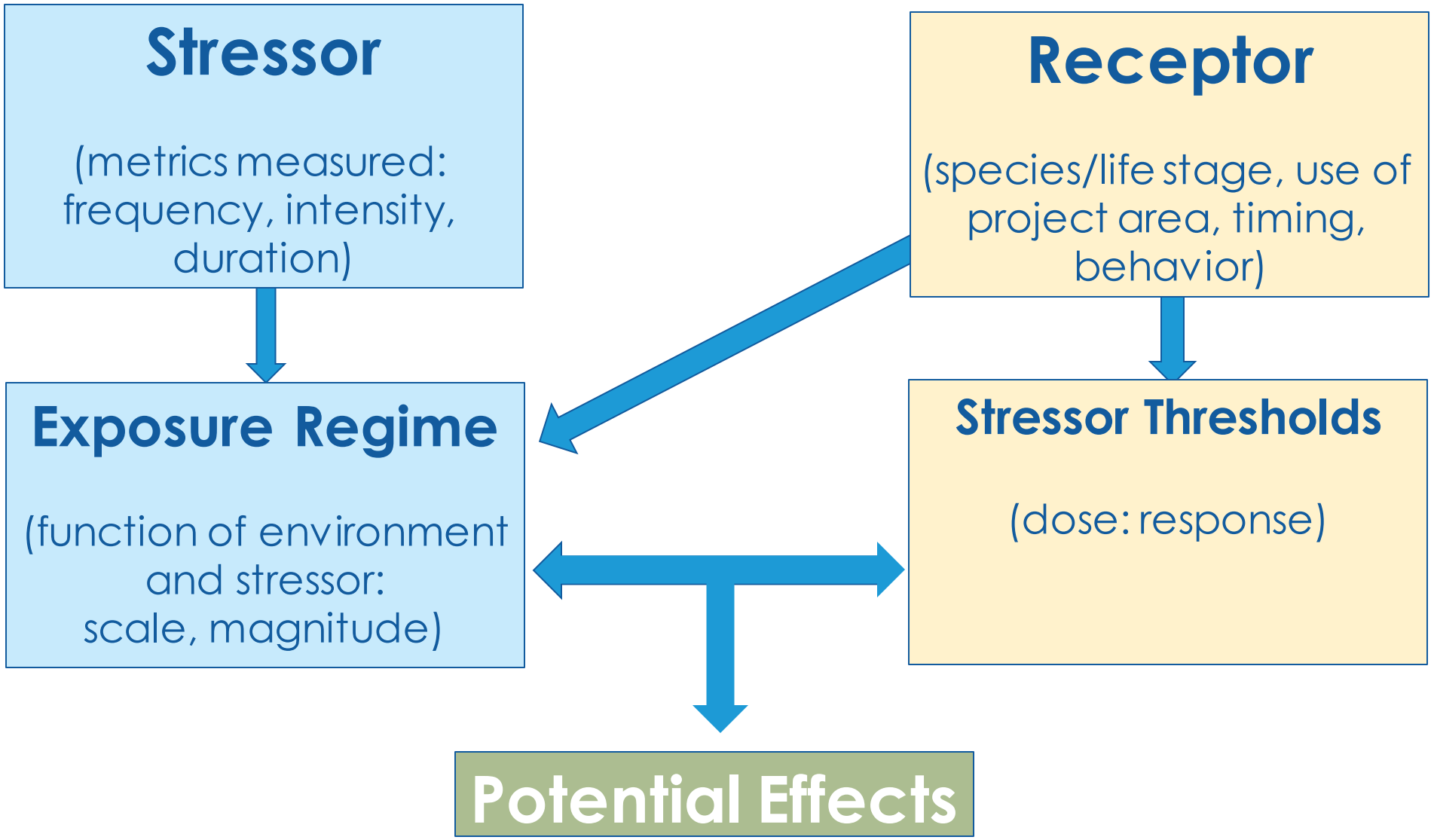


Characterized by a narrow shelf and upwelling



Little precedent available on the West Coast: Findings from the Atlantic have limited application

Stressor ⇨ **Interaction** ⇦ Receptor

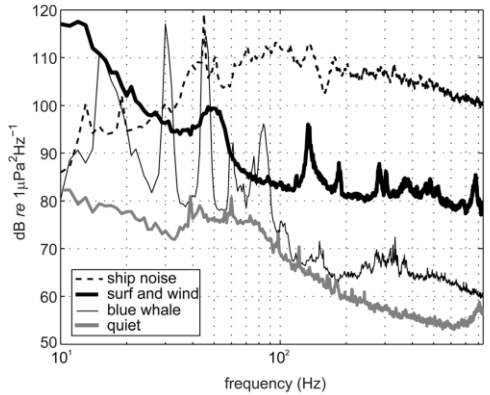


In-Water Project Phases

Phase 1	Phase 2	Phase 3	Phase 4
Site Assessment and characterization	**Construction**	**Operations and maintenance (O&M)**	**Decommissioning**
Collecting information needed to design and permit a project [weeks]	Cable laying, anchoring, mooring, and device deployment [months-years]	Monitoring and maintenance activities [years]	Project removal [months – years]

Potential Interactions: Site Characterization and Construction

- Site characterization surveys and construction disturbance
- Underwater acoustics



Haxel et al. 2013. J. Acoust. Soc. Am. 133 (5)

- Vessel collisions
- Artificial lighting

Fig. 1. Wheel cutter (left); Plough (centre) and Towed Jetting Vehicle (right) (courtesy: www.ldtravocean.com).

Example: Cable Lay Vessel
https://www.vanoord.com/activities/cable-laying-vessel

Potential Interactions: Operations and Maintenance

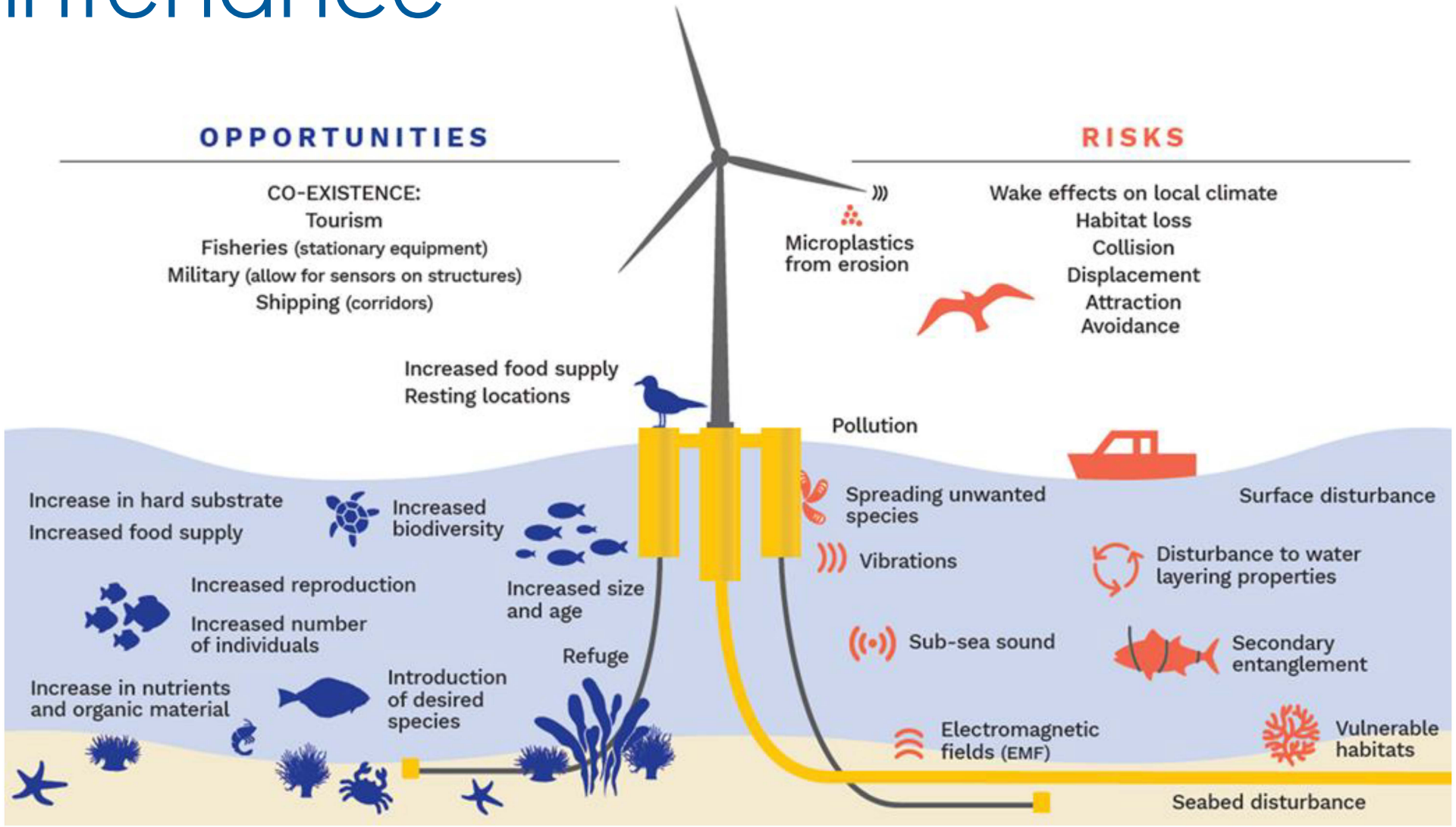


Image Credit : Mainstream Renewable Power CEC EPC-19-008

Potential Interactions: Operations and Maintenance

Changes in wind, currents, waves, and sediment transport due to presence of wind turbines

- Potential effects to ocean upwelling, nutrient availability, and larval transport
- High uncertainty about effects to food chains

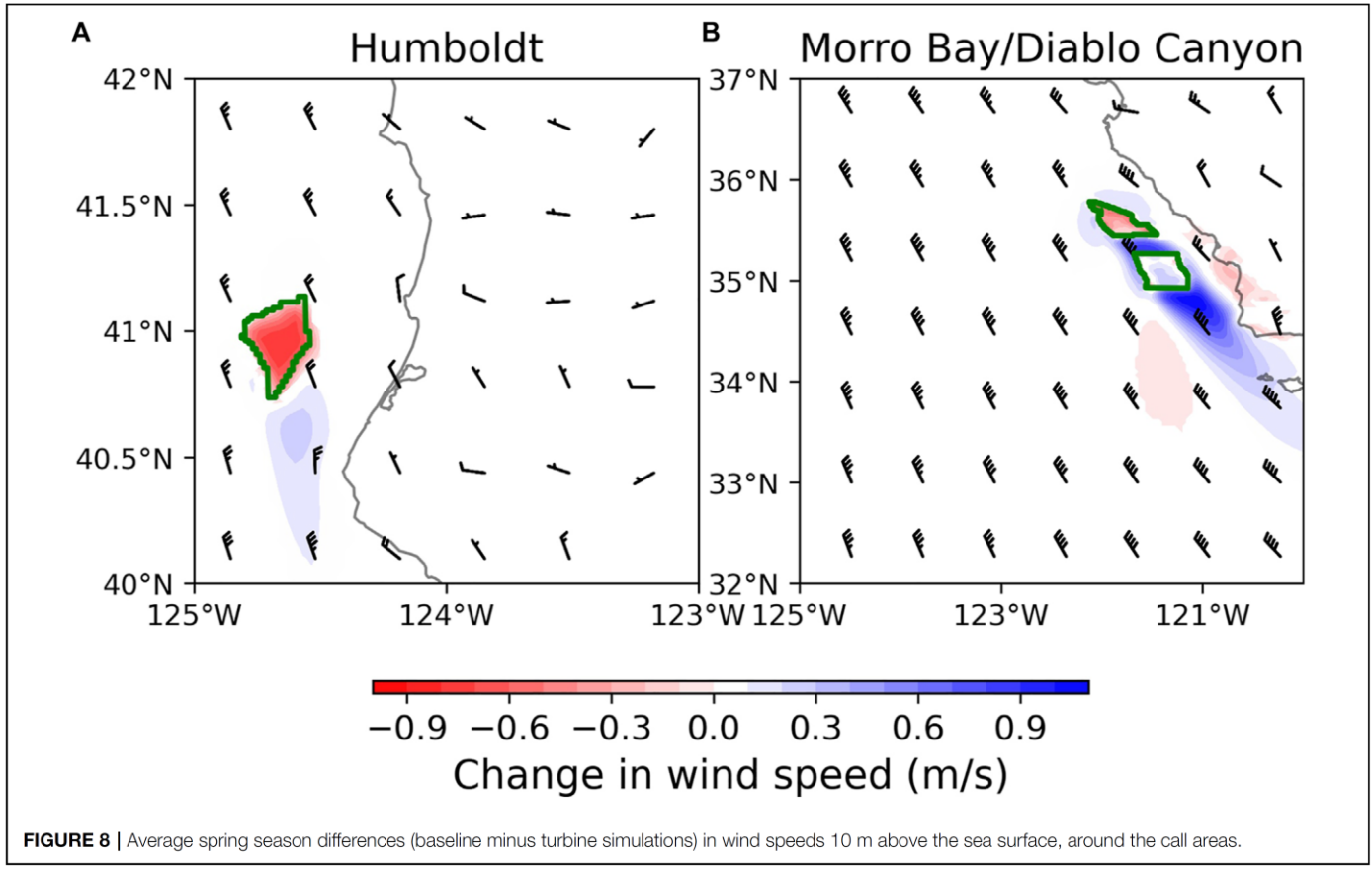


FIGURE 8 | Average spring season differences (baseline minus turbine simulations) in wind speeds 10 m above the sea surface, around the call areas.

Raghukumar et al. 2022. Effect of Floating Offshore Wind Turbines on Atmospheric Circulation in California. Front. Energy Res. 10:863995

Potential Interactions: Operations and Maintenance

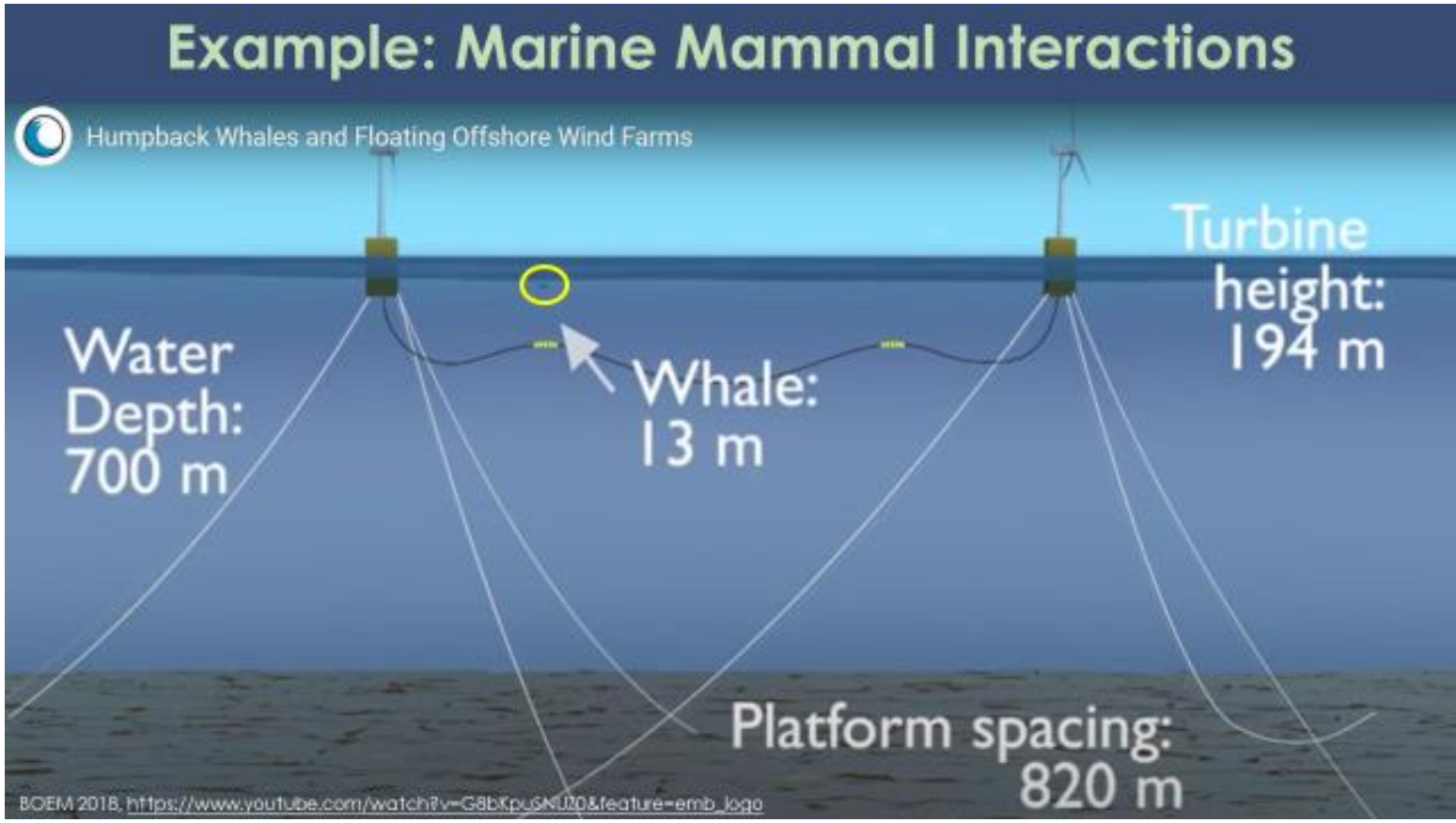
Marine mammal and sea turtle interactions

Entanglement

- Lost fishing gear on interarray cables and mooring lines

Collision

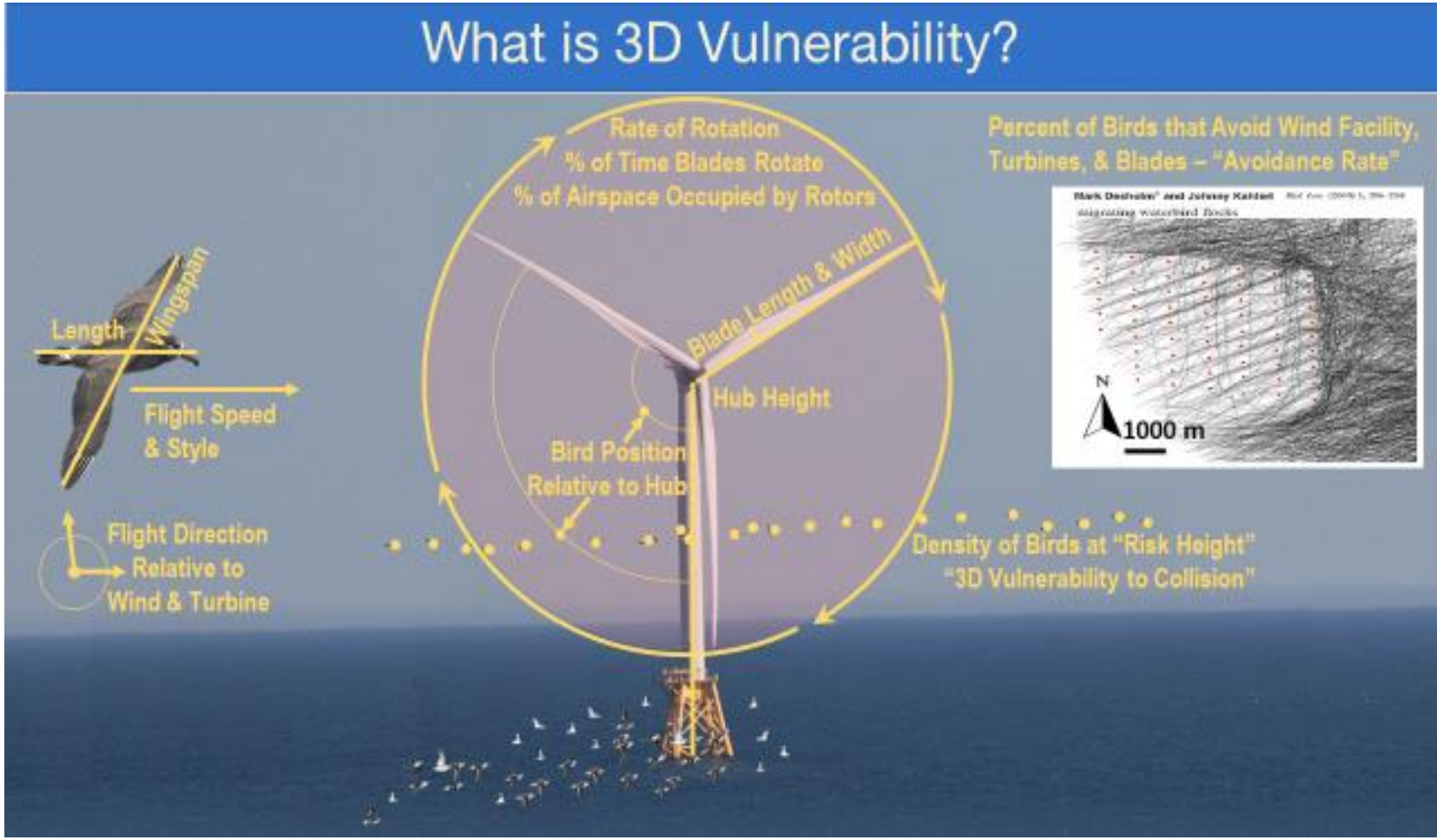
- Underwater structures and large cetaceans



Potential Interactions: Operations and Maintenance

Seabird and bat interactions

- Collision with rotor swept areas
- Avoidance or Displacement

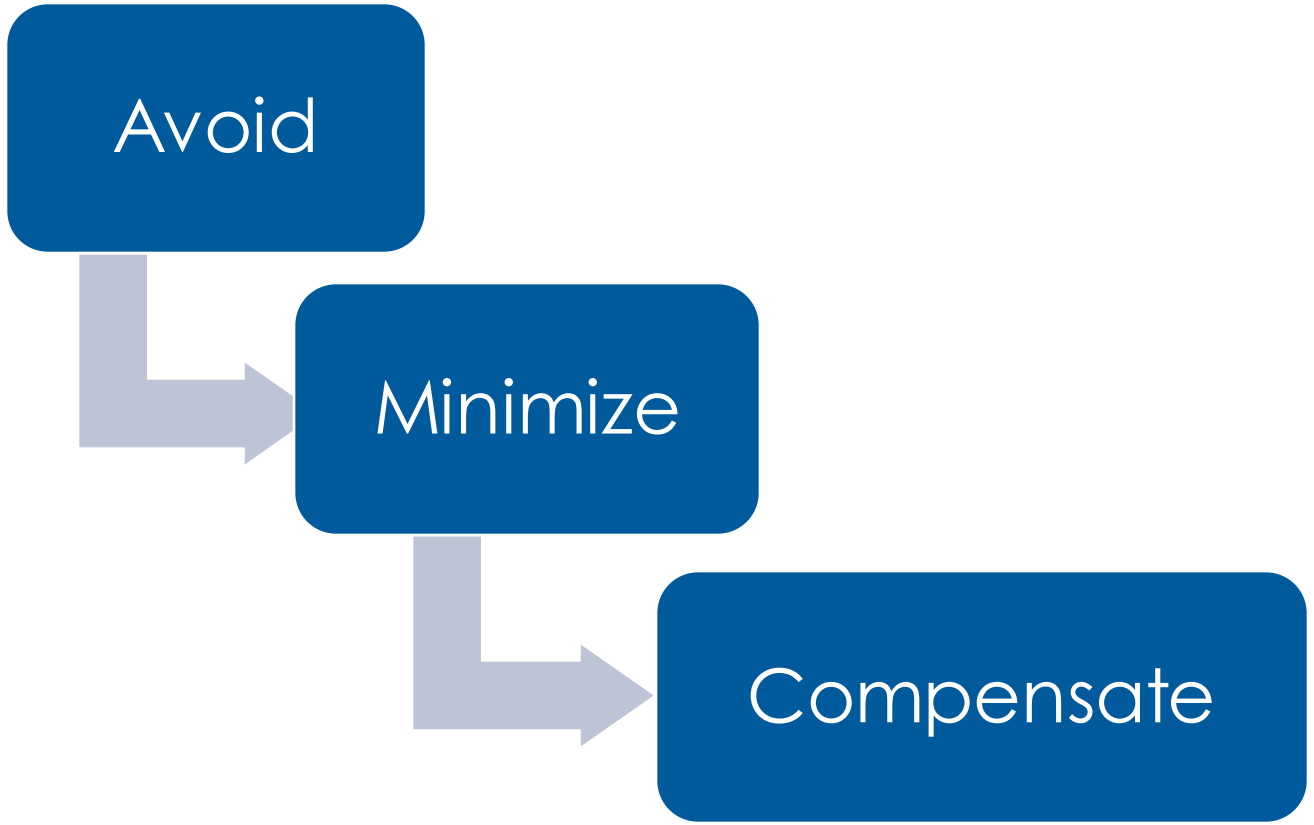


Potential Interactions: Ports and Harbors

- Shoreline and terrestrial reconfiguration
- Deepening/dredging
- Acoustic impacts: Pile driving, vessel operations
- Biofouling
- Vessel wakes

Mitigation Objectives

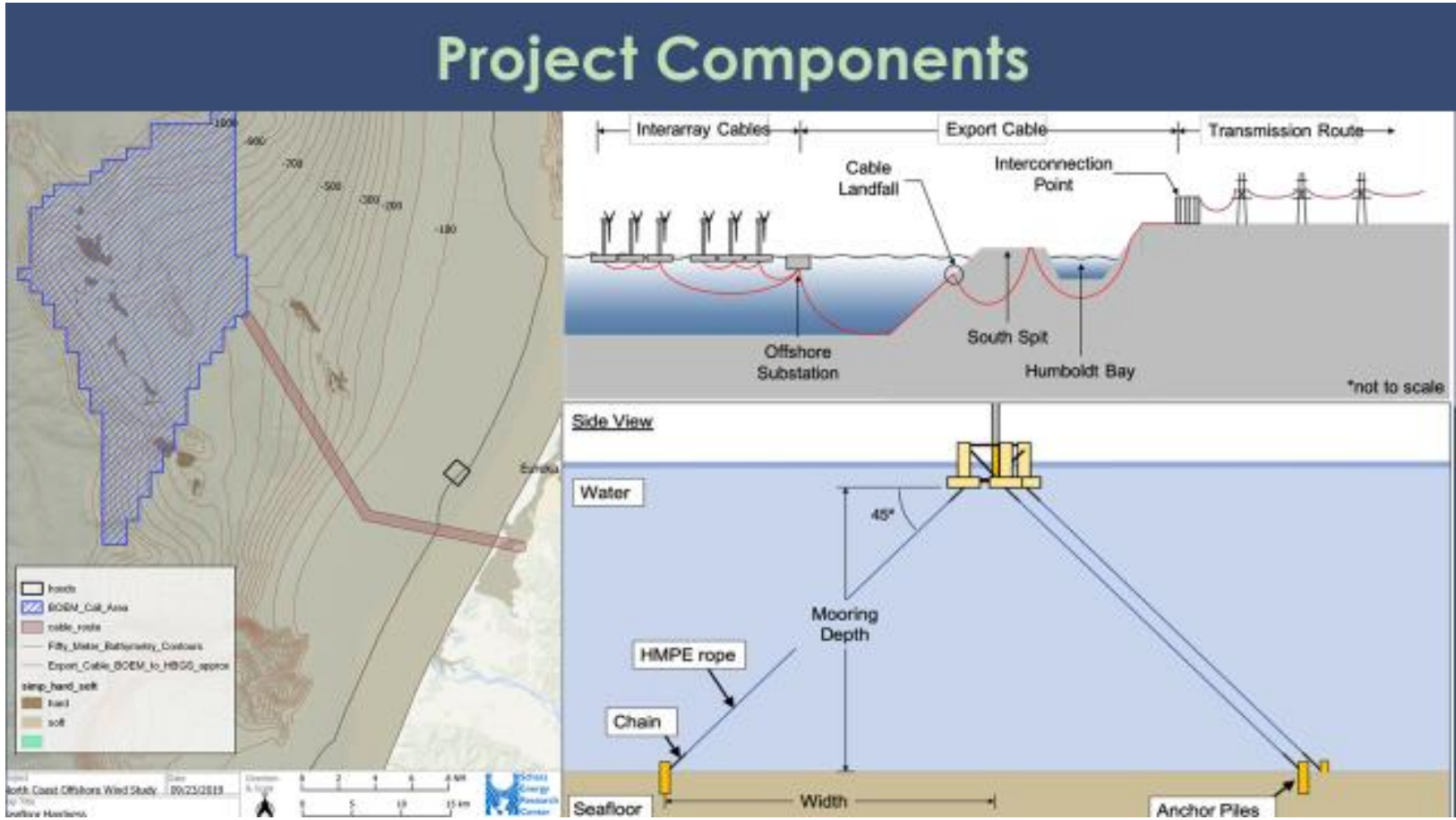
Mitigation is dependent on level of impact and the type of permit/authorization



Avoidance

Siting to avoid or minimize impacts to sensitive coastal resources

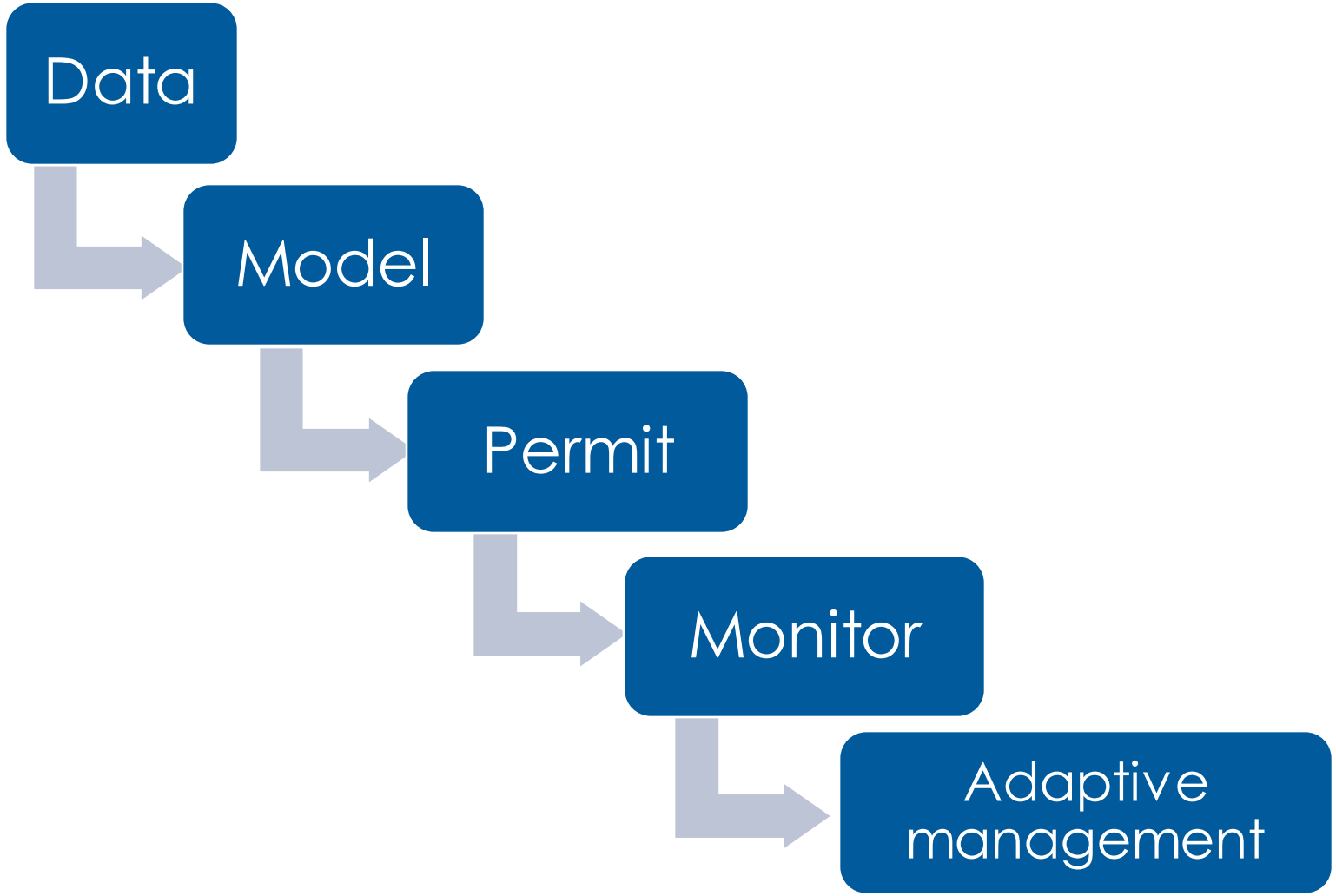
Seasonal restrictions for construction



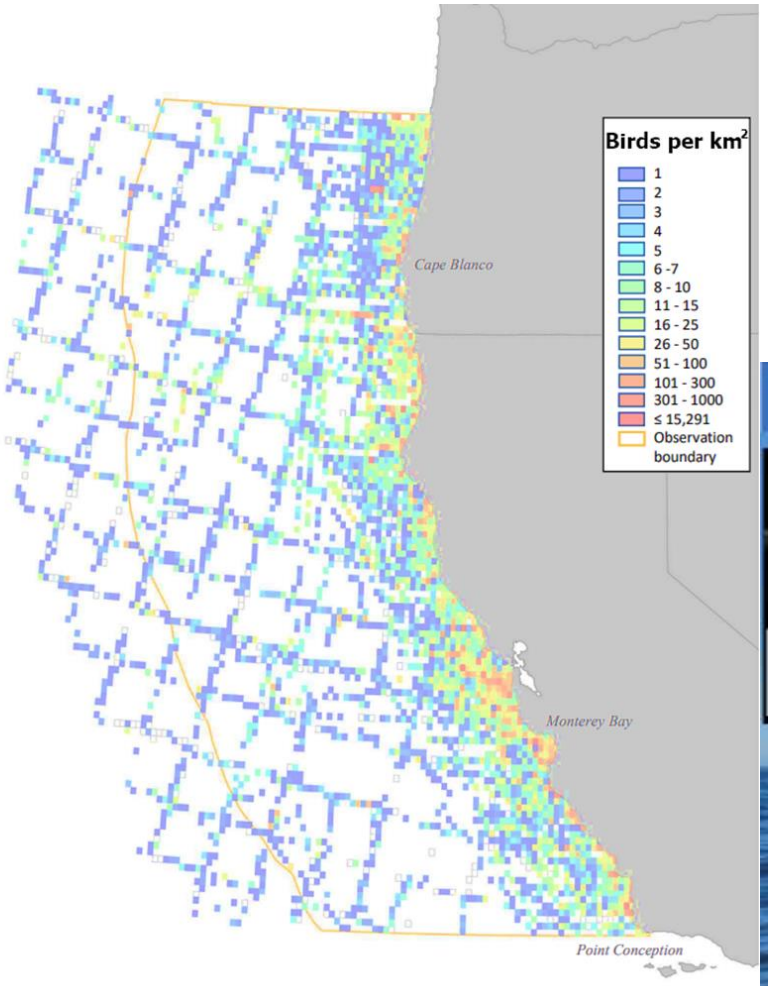
Minimization

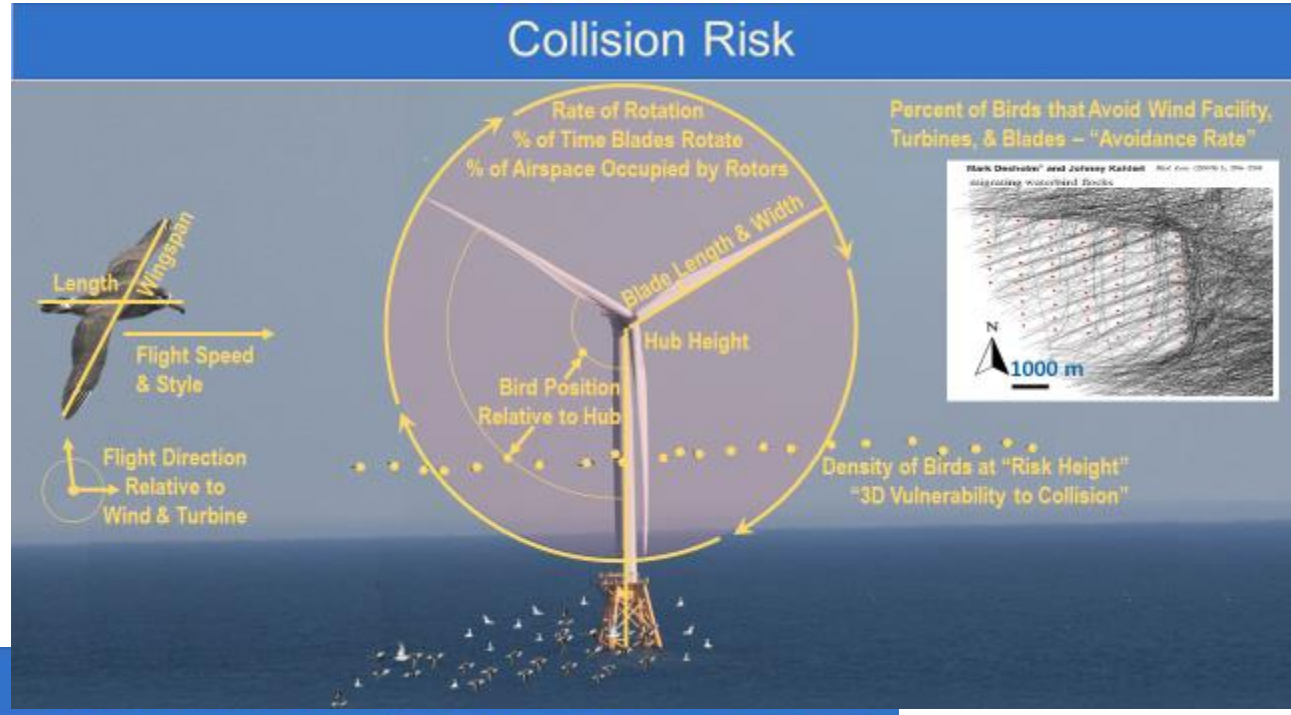
Stressors

- Rotor collision
- Acoustic
- Electric and magnetic fields (EMF)
- Seabed disturbance



Birds and Bats





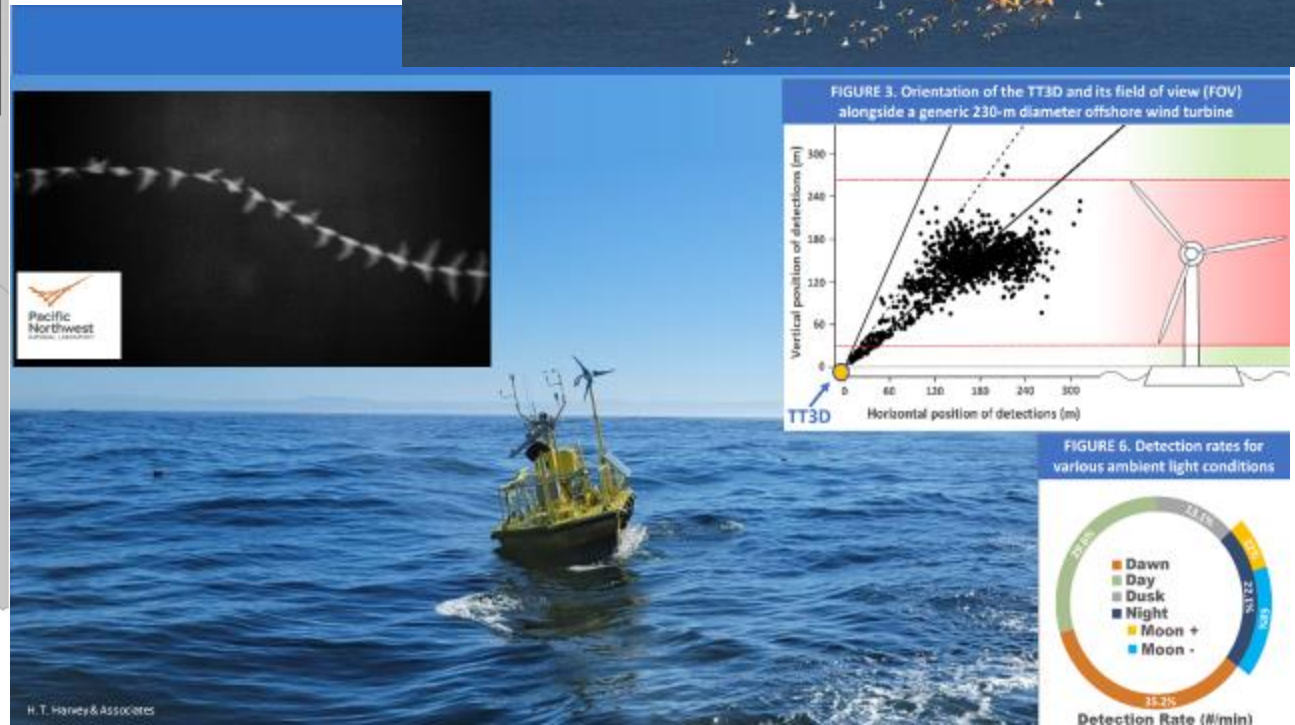
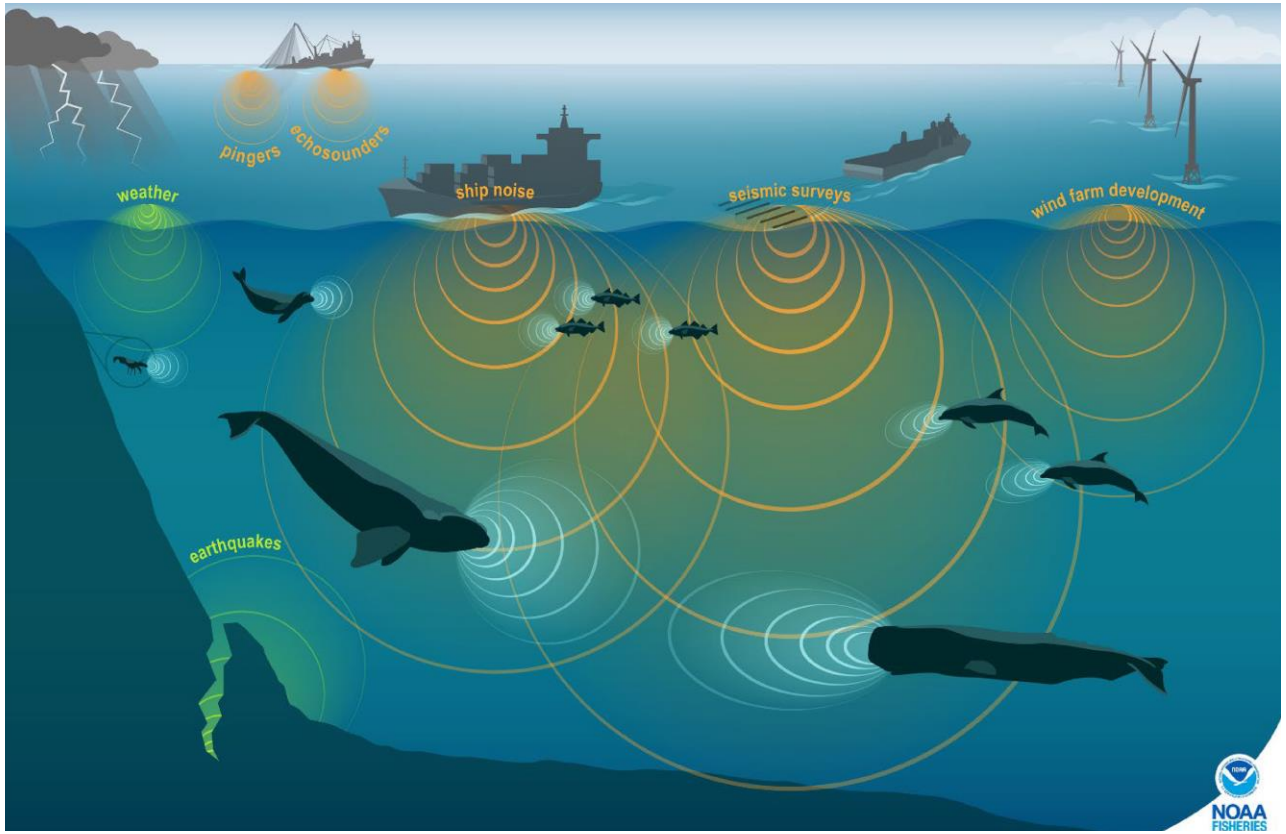
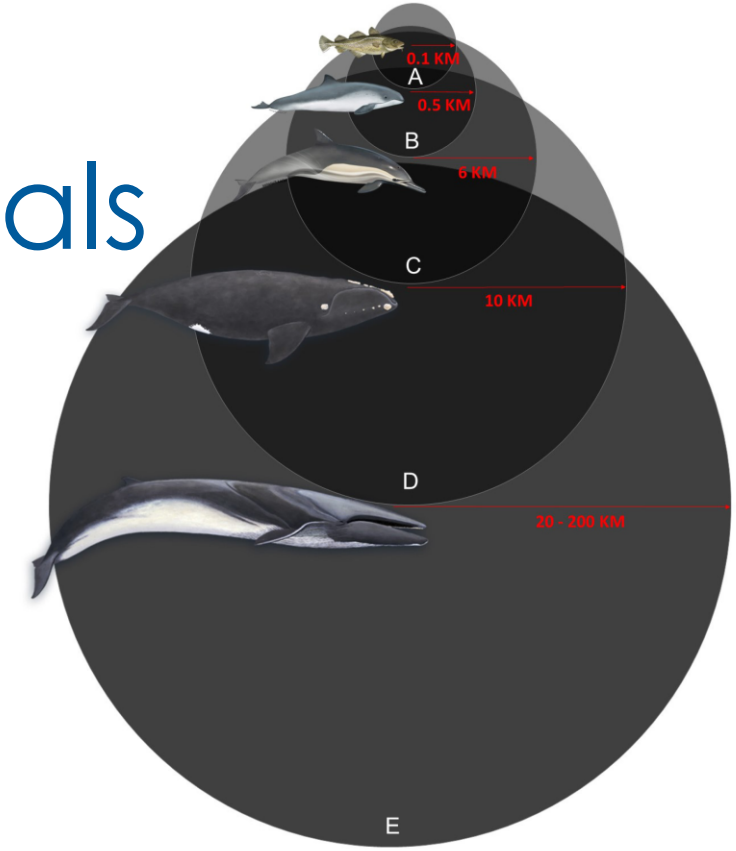


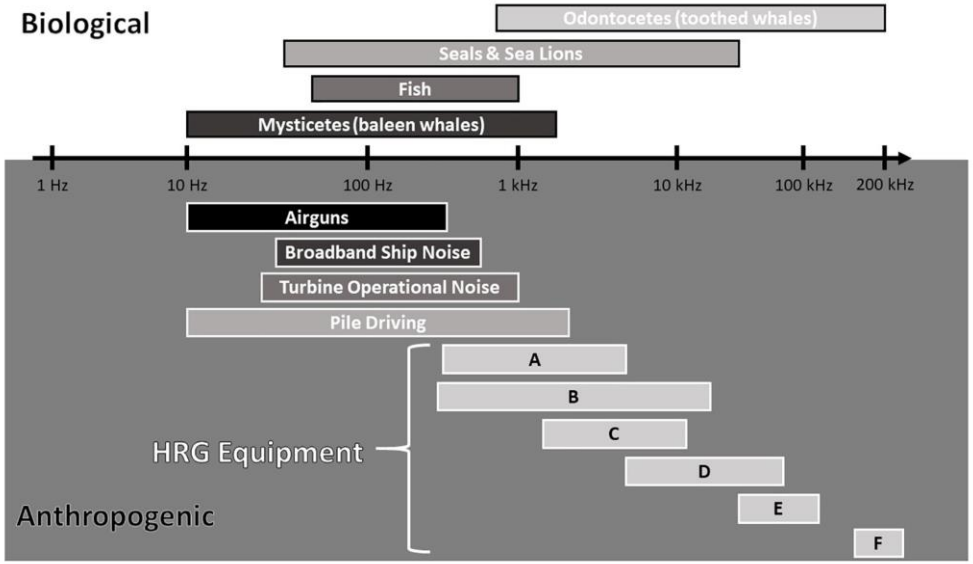
FIGURE 3. Orientation of the TT3D and its field of view (FOV) alongside a generic 230-m diameter offshore wind turbine

FIGURE 6. Detection rates for various ambient light conditions

Acoustics and Marine Mammals







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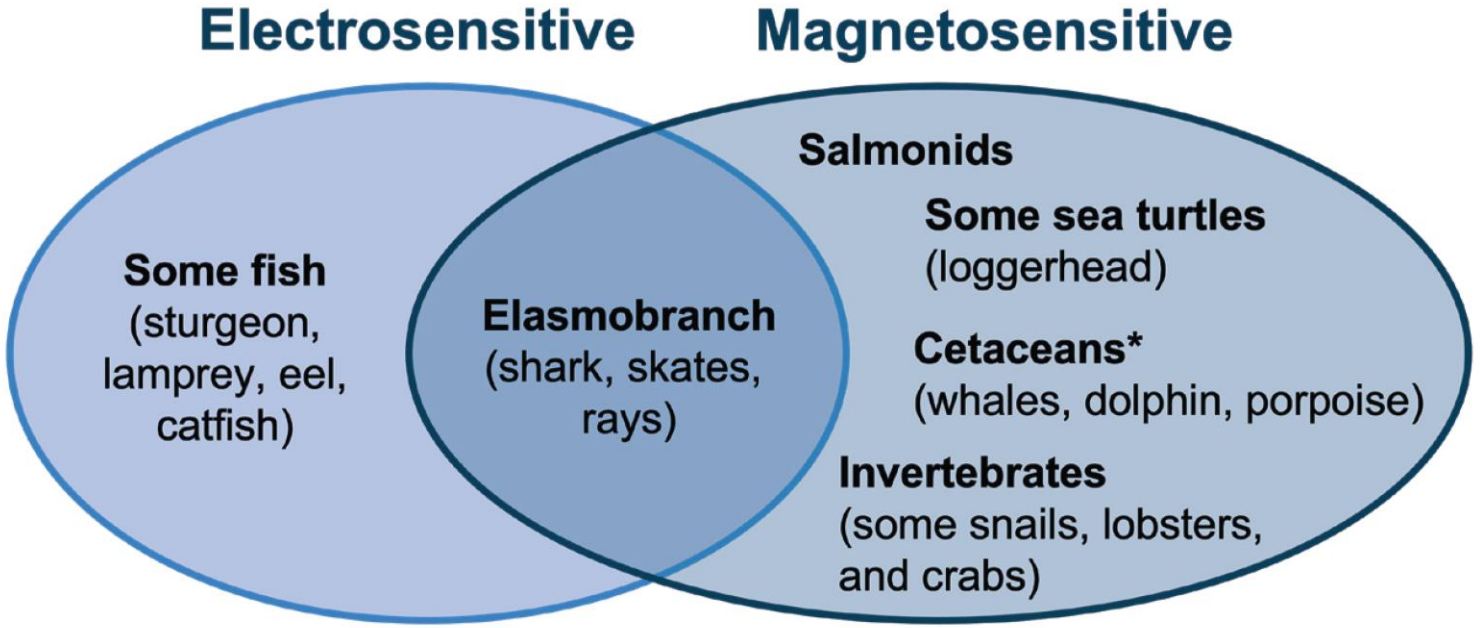
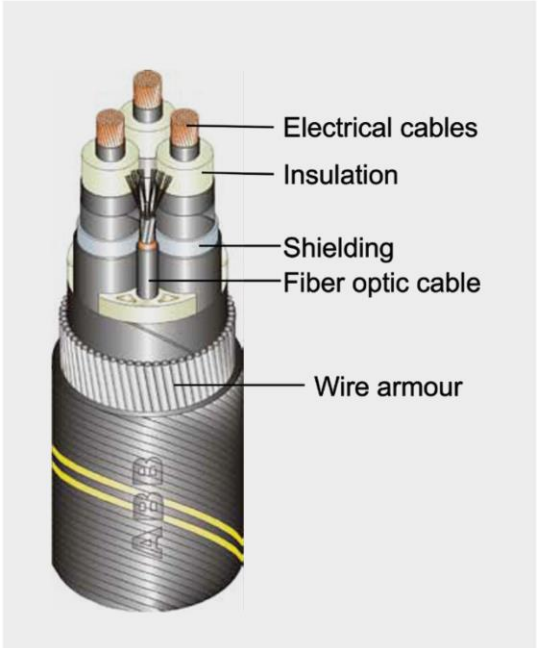
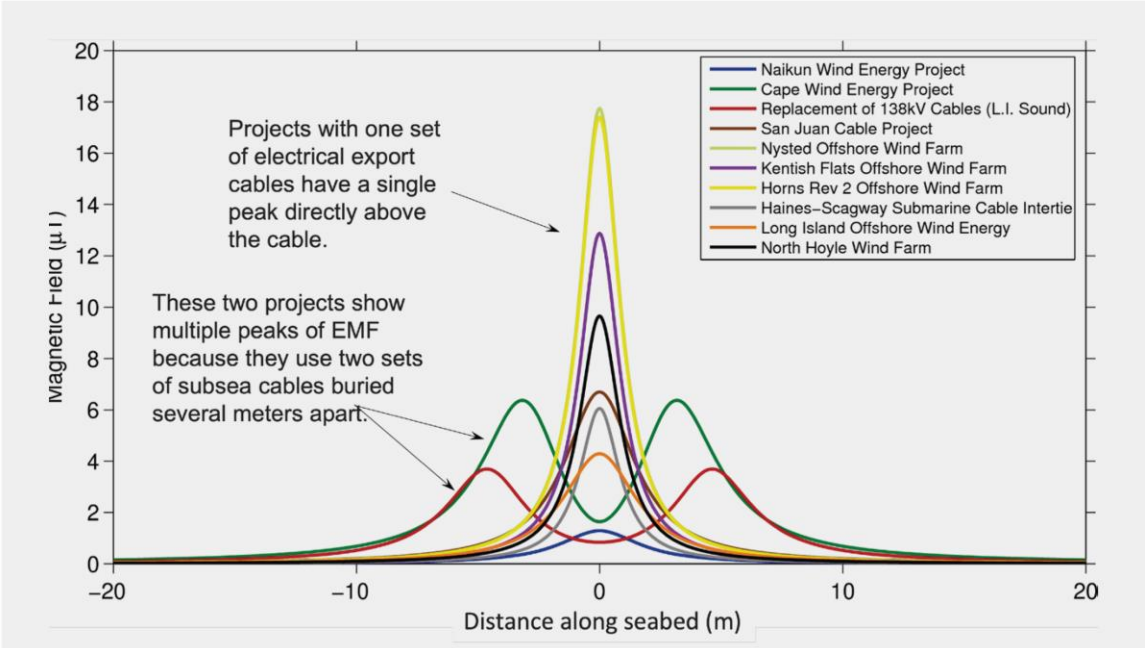
NMFS. 2018. 2018 Revisions to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts. U.S. Dept. of Commer., NOAA. NOAA Technical Memorandum NMFS-OPR-59, 167 p.

EMF

- Models
- Shielding
- Burial
- Placement







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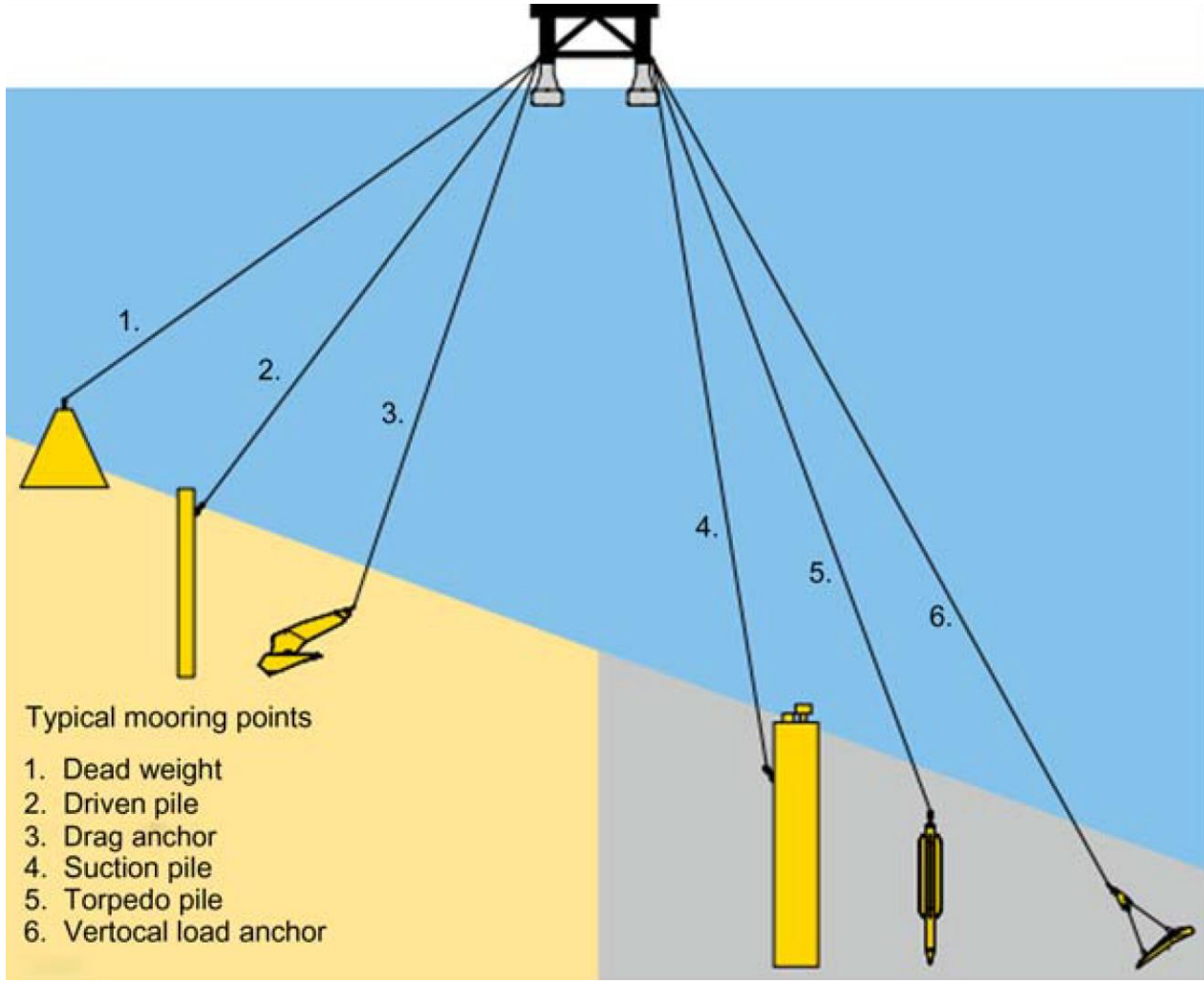
Seabed Disturbance

- Models of sediment transport
- Minimize anchor/mooring footprint
- Limit the number of anchors
- Placement in less sensitive habitats



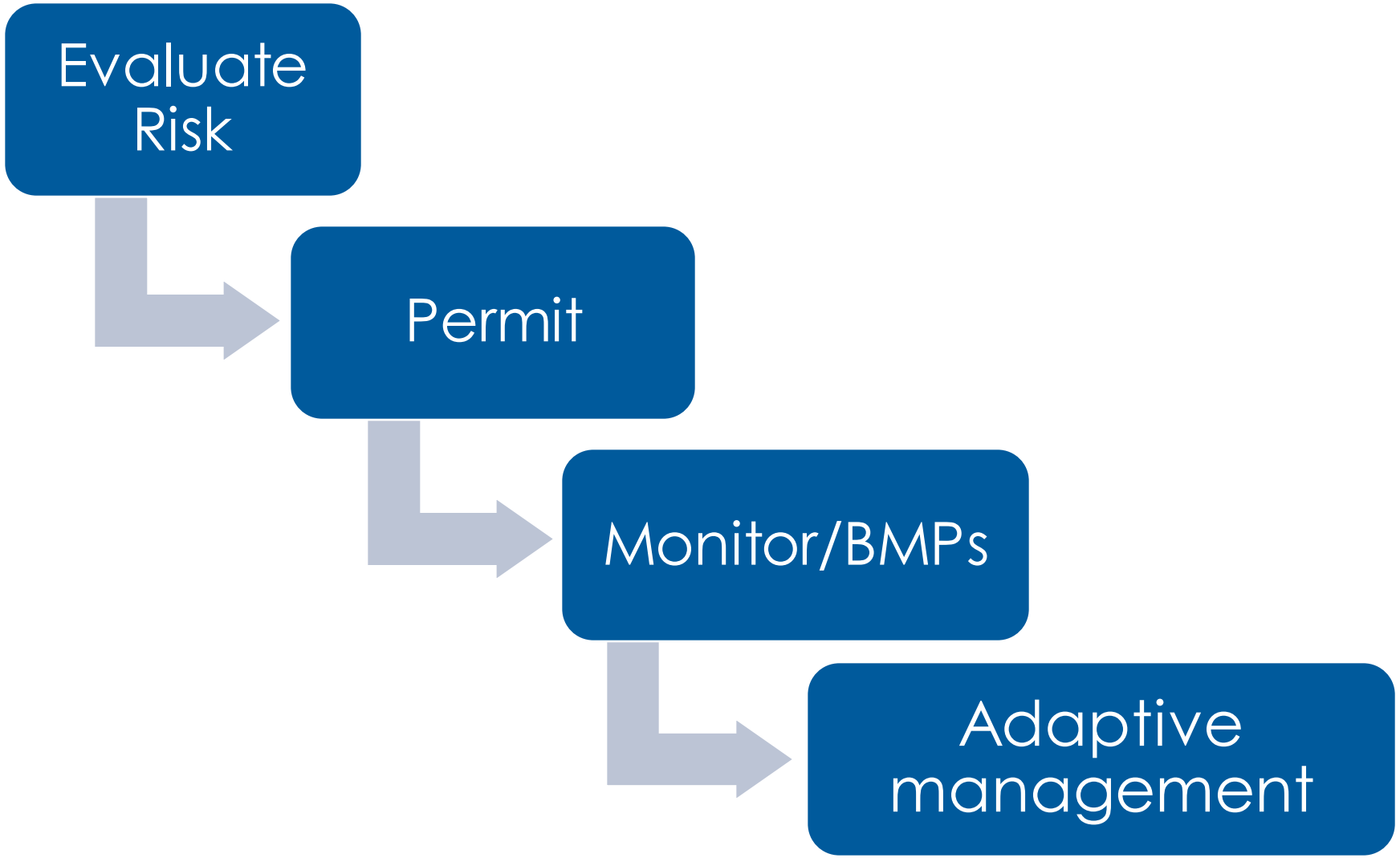
Ma et al. 2019. Mooring system engineering for offshore structures. Published by Elsevier

SEER. 2022. Benthic Disturbance from Offshore Wind Foundations, Anchors, and Cables. Report by National Renewable Energy Laboratory and Pacific Northwest National Laboratory for the U.S. Department of Energy, Wind Energy Technologies Office. Available at https://tethys.pnnl.gov/seer.

Minimization: Best Management Practices

Stressors

- Entanglement
- Lighting
- Water quality
- Marine vessels



Minimization Continued: Examples

Image Credit : Integral Consulting

Monitoring and Management

Entanglement

Marine vessels

Best Management Practices

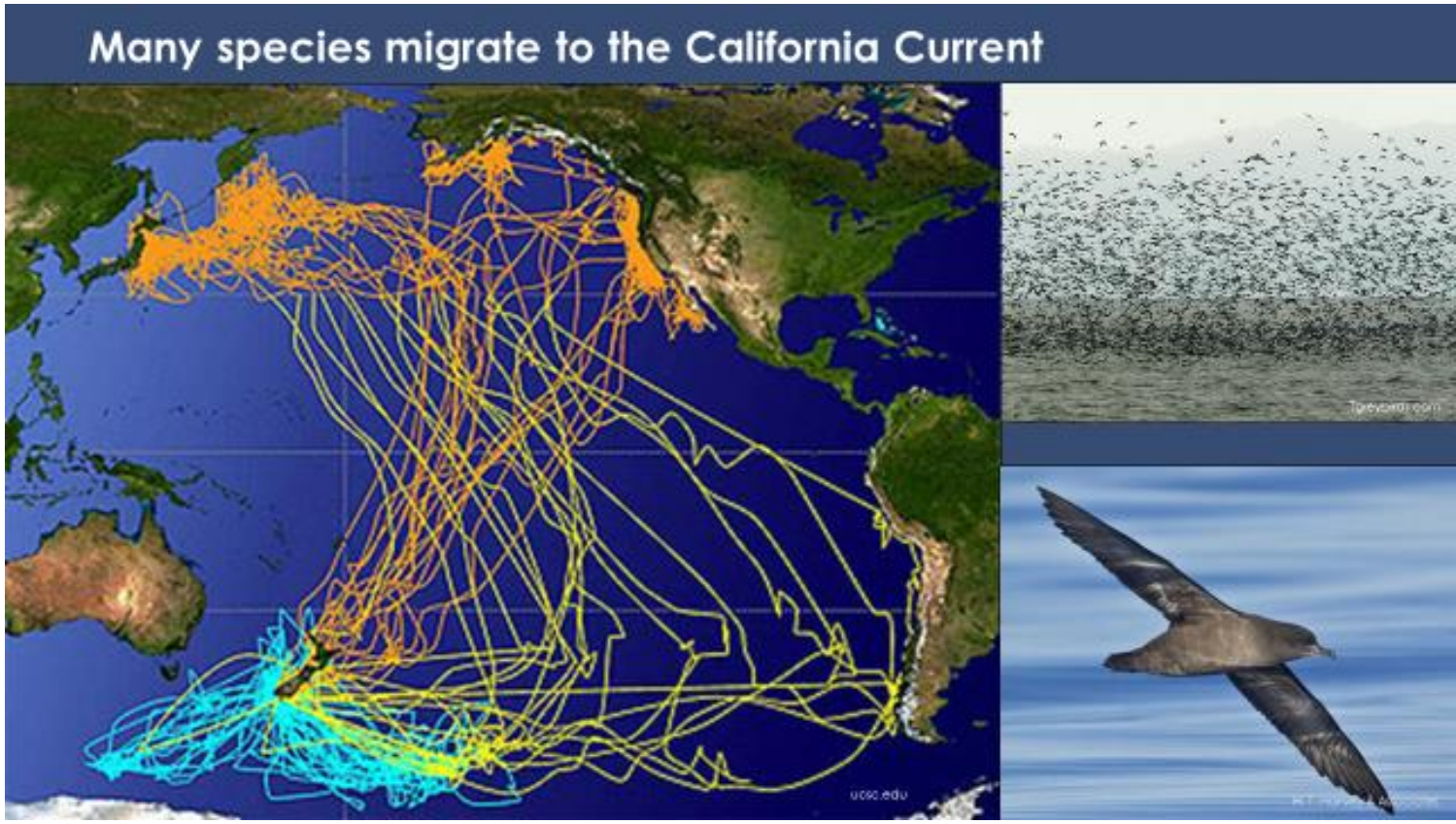
Lighting

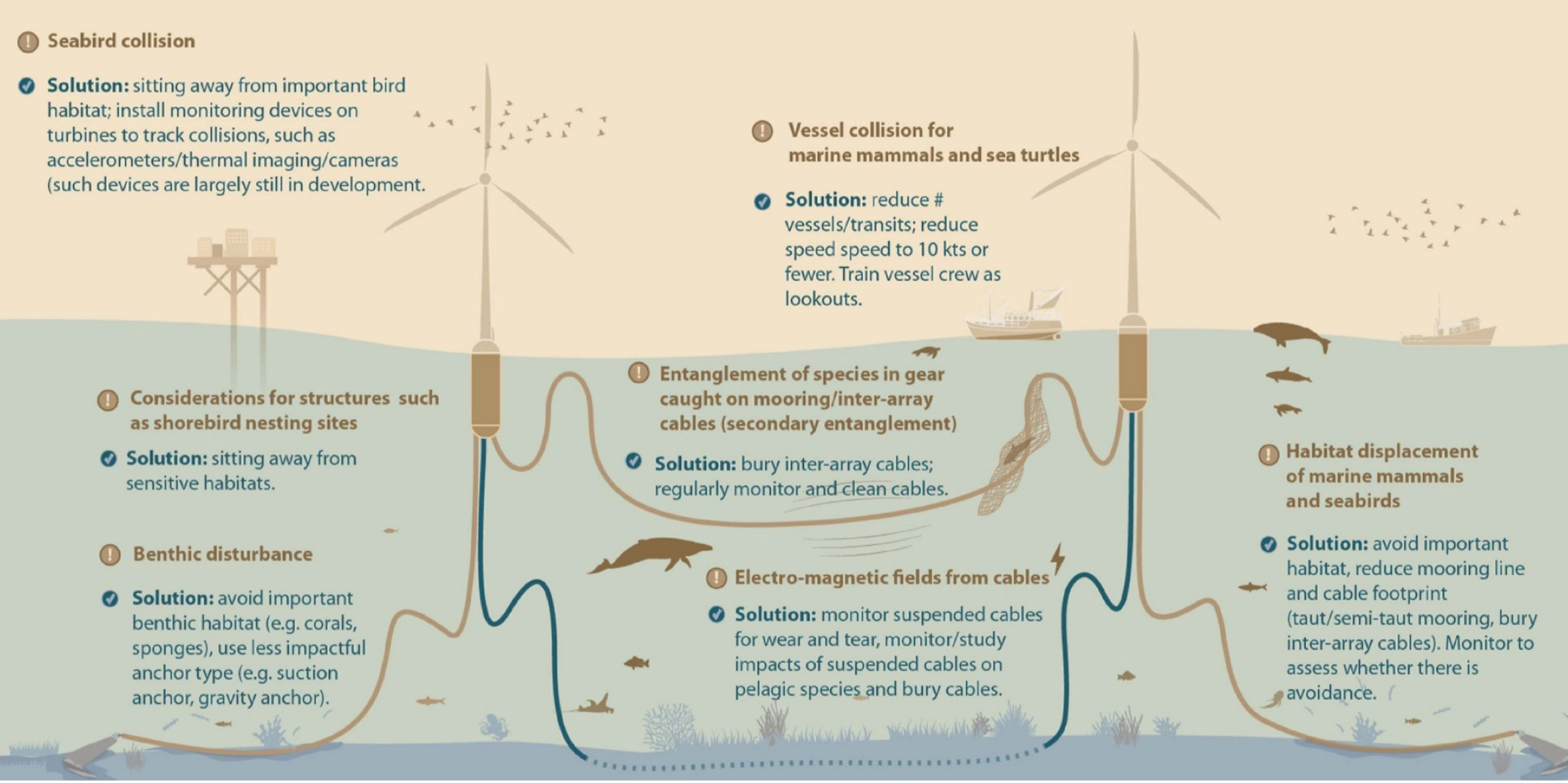
Water quality

Compensatory Mitigation

Example: Seabirds

- Protect, restore and create nesting habitat
- Remove predators from nesting habitat
- Minimize other impacts: Fishing incidental bycatch



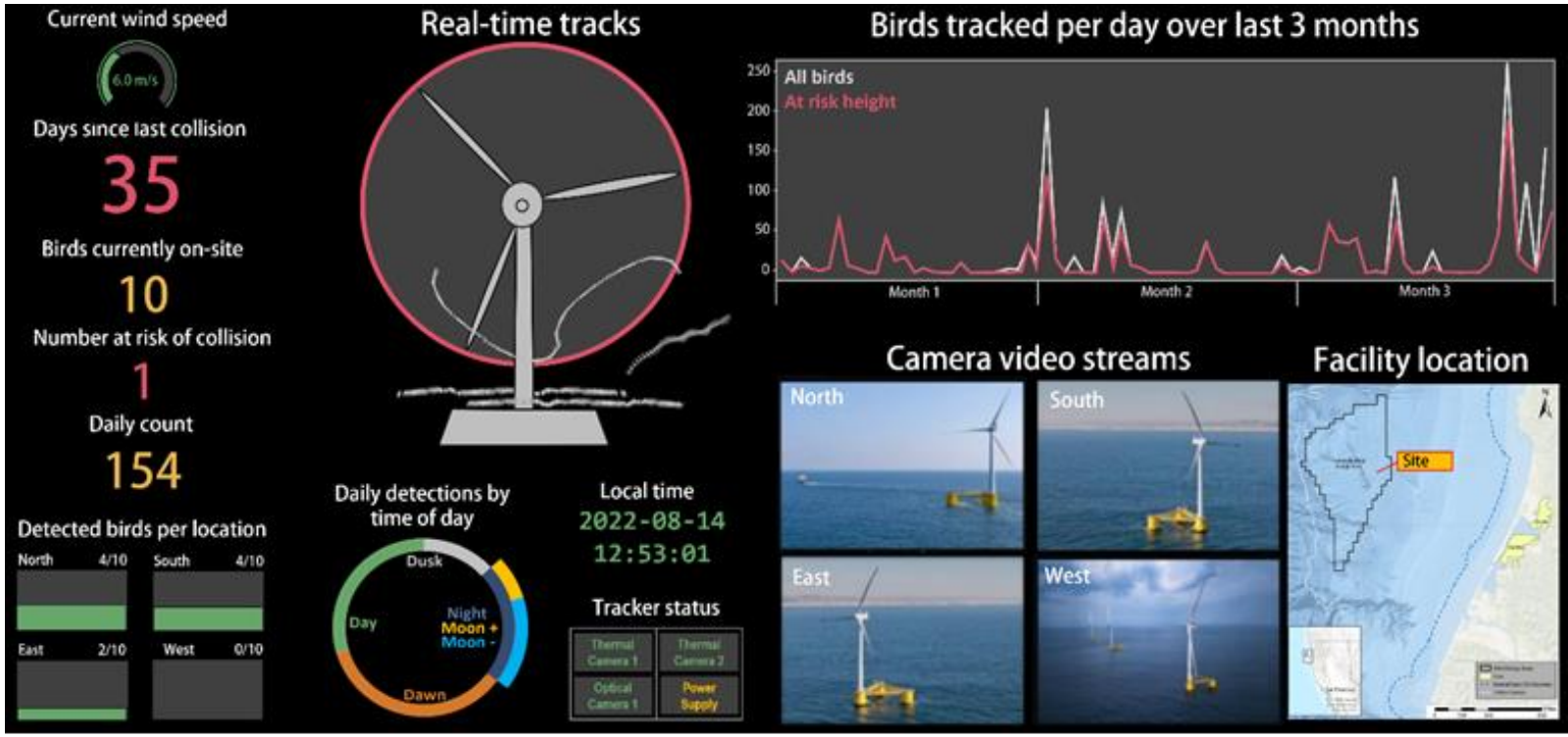


Maxwell et al. 2022. Potential impacts of floating wind turbine technology for marine species and habitats. J. Env. Mgmt. 307 (2022) 114577

Monitoring and Adaptive Management

Approach to address uncertainties of stressor: receptor interactions

- Characterize existing conditions
- Studies to identify and quantify stressor: receptor interactions
- Adaptive management
- Monitoring technology development

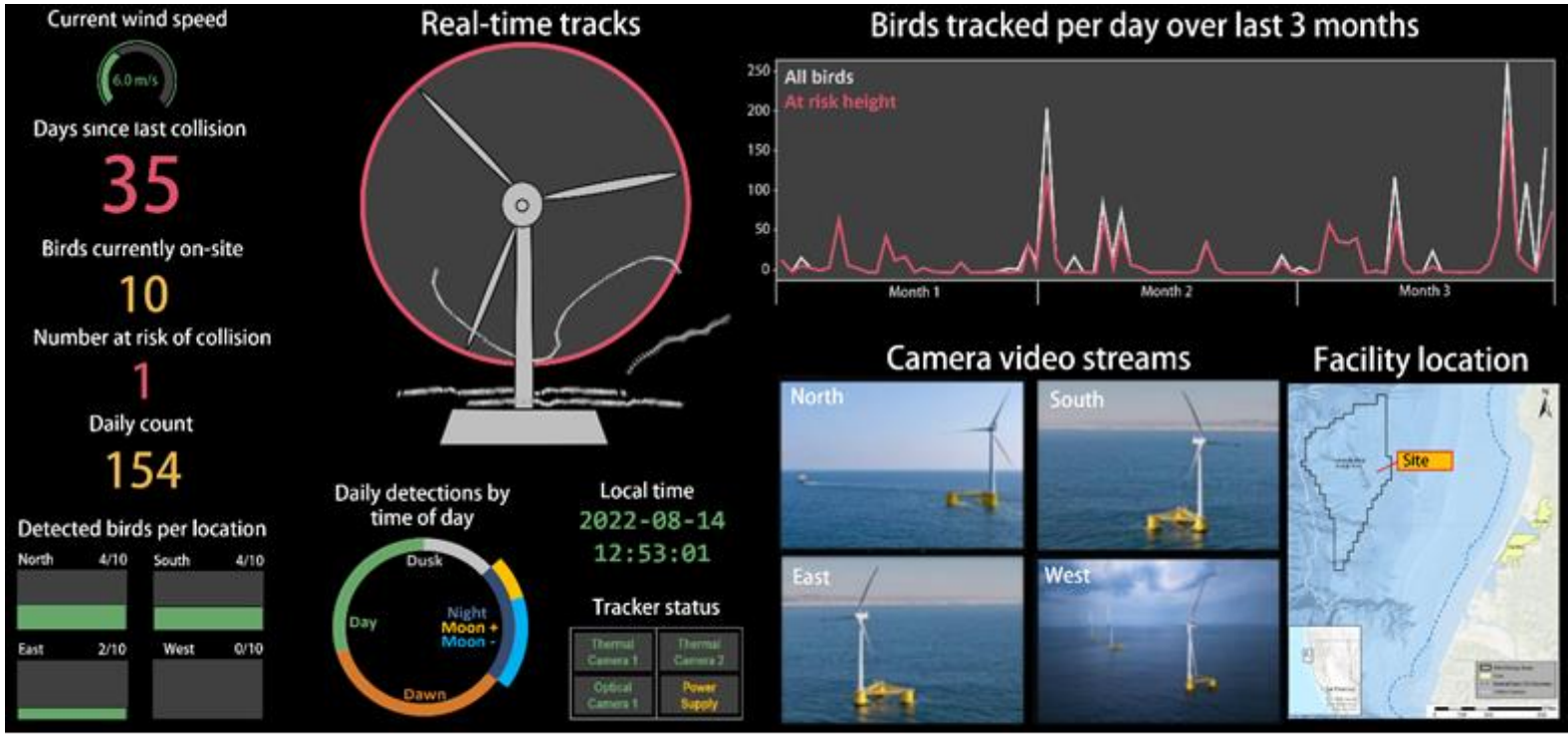


Credit: HT Harvey & Associates

Adaptive Management Framework

Develop and implement an Adaptive Management Framework to make decisions on coastal resource mitigation

- Anticipate likely interaction outcomes
- Develop objective-driven, rigorous study designs
- Develop approach to identify and address unanticipated adverse effects
- Work collaboratively with the coastal resource agencies



Credit: HT Harvey & Associates

Key Takeaways

Construction impacts on- and off-shore

- Shorter-term, localized

Operations and maintenance impacts

- Long-term
- Uncertainty for seabirds and marine mammals
- Monitoring challenges

Image Credit: Mainstream Renewable Energy

Key Next Steps

- Invest in developing monitoring technology
- Integrate OSW systems integrity monitoring with environmental monitoring
- Work collaboratively with coastal communities

Steven C. Hackett, Ph.D.
Cal Poly Humboldt/Aspen

AB 525
Impacts & Mitigation Strategies for Fisheries

CEC Workshop June 1, 2023

Prepared by: Steven C. Hackett, PhD
Professor Emeritus of Economics
Cal Poly Humboldt / Aspen Environmental Group

Date: June 1, 2023

Overview

- Potential Impacts of Offshore Wind Energy Development on Fisheries
- Some Key Source Materials Informing Strategy Development
- Defining Mitigation
- Mitigation Strategy Vision
- Mitigation Strategy Goals, and Individual Mitigation Strategies For Each Goal
- Areas of Integration

Potential Impacts of OSW Energy Development on Fisheries

Offshore Impacts

- Loss of access to productive fishing grounds in and around OSW lease areas during construction and operations, due to presence of floating turbines or substations, undersea electric cables, anchors, and mooring cables.
- Hazards to navigation from increased vessel traffic, and transit corridors lost to OSW lease areas.
- Potential fishing gear entanglement on cables, anchors, and lost or abandoned OSW equipment.
- Interference with fishing success due to electro-magnetic cables and depressed fish catches in the vicinity of OSW operations.

Potential Impacts of OSW Energy Development on Fisheries

Potential Impacts at Ports and Harbors

- Potential for loss of productive fishing grounds adversely affects fishery participants and the industry cluster supporting them (fish processors; ship chandlers; ice, bait, and fuel providers, etc.), with ripple effects on marina and other fishing infrastructure and the broader community.
- Increased hazards to navigation due to increased vessel traffic in dredged channels, the mooring of vessels, barges, and OSW components, and from competition for access to the harbor entrance during favorable tides, seas, and weather.
- Dredging and deepening of channels or shoreline reconfiguration could impact bedforms and currents resulting in increased hazardous conditions for fishing vessels entering and existing port facilities.

Potential Impacts of OSW Energy Development on Fisheries

Potential Impacts at Ports and Harbors, Continued

- Development of seaport facilities to support OSW could displace fishing fleets due to competition for berths, vessel and gear storage, and marine services.
- Existing marina operations may be disrupted or displaced by construction.
- Displacement of or restrictions on in-harbor fisheries (e.g., live bait).

Potential Impacts of OSW Energy Development on Fisheries

Potential Onshore Impacts

- Transmission line or industrial facility construction may interfere with the movement of resident or migratory fish species, or reduce the habitat for fish species, affecting fisheries.
- Construction and operation of onshore manufacturing, assembly, storage, and staging facilities for OSW could result in competition for working space and congestion of roadways.

Key Source Materials

- Summaries of **agency outreach meetings** with fishery participants prior to 2022 lease auctions (BOEM 2018, 2021; CDFW 2021)
- **California Fishermen's Resiliency Association** (CFRA) draft minimization and mitigation plan (2021), and draft proposed fishing Community Benefit Agreement (CBA, 2022)
- **Humboldt Bay Harbor, Recreation, and Conservation District** (HBHRCD) Humboldt Bay Offshore Wind and Heavy Lift Marine Terminal Master Plan (2021); HBHRCD-Crowley Port Wind Terminal press release (2021); interviews with HBHRCD Executive Director Larry Oetker and Commissioner/fishery participant Aaron Newman (April 2023)
- **Regional Economic Action Coalition** (REACH) Central Coast Emerging Industries: Waterfront Siting + Infrastructure Study (2022); Diablo Canyon Clean Tech Vision (2023)
- **Pacific Fishery Management Council** (PFMC) letters to BOEM concerning OSW energy development impacts (2023)
- **Responsible Offshore Development Alliance** (RODA) Impact Fees for Commercial Fishing from Offshore Wind Development: Considerations for a National Framework (2021)
- **Public hearings** (e.g., the California Senate Joint Committee on Fisheries and Aquaculture's *The Future of Fisheries and Offshore Wind Energy in the Golden State,* 17 May 2023)

Defining Mitigation

"Mitigation" in this context encompasses the full suite of activities to:

- Avoid impacts where possible.
- Minimize those impacts that cannot be avoided.
- Compensate for impacts that remain.

Mitigation Strategy Vision

- Successful coexistence of viable utility-scale offshore wind energy farms with sustainable commercial and recreational fisheries.
- Thriving communities in the Central and North Coast regions of California.

Mitigation Goals - Overview

1. **Coordination:** Effective and adaptive coordination, communication, and information flow among fishing industry participants, the offshore wind energy industry, relevant federal, state, and local government, coastal communities, and tribes.

2. **Fishing Grounds Access or Compensation:** Sustained and substantially unimpaired access to productive fishing grounds and aquaculture production areas, and compensatory mitigation provided for fishery participants when such access is impaired or reduced.

3. **Port and Harbor Use:** Coordinated and substantially unimpaired use of port facilities and associated infrastructure, wet storage and staging sites, turning basins, and navigable ship channels accommodating the industry complexes for offshore wind energy, commercial and recreational fishing, and aquaculture.

4. **Hazard Prevention:** Substantially unimpaired sea lanes and transit corridors providing safe offshore access to port facilities with minimal preventable hazards. Minimization of gear entanglement risk from electric transmission cables running from lease areas to landfall.

Mitigation Goal 1

Coordination

Effective and adaptive coordination, communication, and information flow among fishing industry participants, the offshore wind energy industry, relevant federal, state, and local government, coastal communities, and tribes.

Mitigation Strategies, Goal 1

- **Mitigation strategy 1.1**: Establish a California Offshore Wind Energy Fisheries Working Group with broad stakeholder representation to coordinate, communicate, identify research needs, address emerging problems, and provide input to adaptive port, wind farm, and fisheries management.
- **Mitigation strategy 1.2**: Facilitate negotiation of mutually beneficial fishing Community Benefit Agreements (CBAs) between affected fishery participant organizations and offshore wind energy developers/operators to fund and promote long term beneficial cooperation, minimize harmful interactions, and facilitate mitigation of impacts from planning through operations to decommissioning.

Mitigation Strategies, Goal 1, Continued

- **Mitigation strategy 1.3**: Develop memoranda of understanding and similar coordination agreements between relevant federal, state, and local agencies to prioritize and accelerate mitigation efforts.
- **Mitigation strategy 1.4**: With cooperation from the California Department of Fish and Wildlife, Ocean Protection Council, the Pacific States Marine Fisheries Commission, and the Pacific Fishery Management Council, utilize appropriate habitat modeling research as input to the configuration of offshore wind farms to avoid and minimize impacts, and implement effective ongoing monitoring and reporting on impacts to fisheries.

Mitigation Goal 2

Fishing Grounds Access or Compensation

Sustained and substantially unimpaired access to productive fishing grounds and aquaculture production areas, and compensatory mitigation provided for fishery participants when such access is impaired or reduced.

Mitigation Strategies, Goal 2

- **Mitigation strategy 2.1:** Partner with affected fishery participants and industry members to create inclusive and predictable plans for distributing compensatory mitigation payments associated with offshore wind energy development, including reduced catch, cost of transit to more distant grounds, and relevant transitional vessel and gear costs and permits.
- **Mitigation strategy 2.2:** Design floating-platform mooring systems, inter-array cables, and associated aids to navigation that foster safety and minimize potential for gear entanglement on the periphery of wind farm areas.

Mitigation Strategies, Goal 2, continued

- **Mitigation strategy 2.3:** Establish and fund a gear loss/damage compensation plan for fishery participants, including standardized, neutrally arbitrated processes to address fishing gear interactions with offshore wind energy structures.
- **Mitigation strategy 2.4:** Fund decommissioning/equipment removal accounts early in a wind energy project's operational life to account for unanticipated events such as catastrophic equipment losses, changing economic conditions, and bankruptcy.

Mitigation Goal 3

Port and Harbor Use

Coordinated and substantially unimpaired use of port facilities and associated infrastructure, wet storage and staging sites, turning basins, and navigable ship channels accommodating the industry complexes for offshore wind energy, commercial and recreational fishing, and aquaculture.

Mitigation Strategies, Goal 3

- **Mitigation strategy 3.1:** Provide for adequate and spatially separate offshore wind energy industry and fishery participant port and shore-side facilities, as well as aquaculture production and processing sites.
- **Mitigation strategy 3.2:** Address potential future cumulative offshore wind energy impacts and the imperative to sustain fishery participants through preemptive investments and improvements to marina infrastructure, shore-side fishing gear and equipment storage sites, and anticipated direct adaptation costs borne by fishery and aquaculture participants.

Mitigation Strategies, Goal 3, continued

- **Mitigation strategy 3.3:** Assure that offshore wind site bidders receiving a bid credit for a Lease Area Use CBA expend a significant portion of the bid credit in funding those CBAs.
- **Mitigation strategy 3.4:** Create protocols for coordinated joint use of shared navigable channels, turning basins, and entrance channels as needed to foster safety and minimize congestion and delays.

Mitigation Strategies, Goal 3, continued

- **Mitigation strategy 3.5:** Where appropriate, designate and maintain "bypass channels" with navigational aids for shallow-draft fishing and other vessels potentially delayed by offshore wind equipment transport in port-area navigation channels.
- **Mitigation strategy 3.6:** Provide alternative sites and other mitigations for displaced port-area uses such as aquaculture production resulting from bay waters being converted to wind energy floating storage and staging areas.

Mitigation Goal 4

Hazard Prevention

Substantially unimpaired sea lanes and transit corridors providing safe offshore access to port facilities with minimal preventable hazards, and minimization of gear entanglement risk from electric transmission cables running from lease areas to landfall.

Mitigation Strategies, Goal 4

- **Mitigation strategy 4.1:** Foster coordination agreements for safe joint use of shared sea lanes and transit routes as needed to minimize congestion, conflicts, hazards, and delays.
- **Mitigation strategy 4.2:** Develop agreements between offshore wind energy developers and a broad representation of fishery participants, linked to permits to route shore-bound wind energy electric transmission cables, in order to avoid or minimize impacts and compensate participants for any remaining impacts.
- **Mitigation strategy 4.3**: In collaboration with fishery participants, develop and maintain effective navigational aids marking offshore wind farm areas and transit corridors, such as lighting, buoys, and horns, and also clearly visible on marine electronics and navigational devices.

Areas of Integration

- Integrate state fishery mitigation strategies with
  - Research funding priorities;
  - BOEM wind energy area lease auction practices;
  - Practices and policies of other federal agencies with relevant oversight;
  - New and proposed federal law;
  - Practices and policies of other state agencies;
  - New and proposed state law (e.g., SB 286);
  - Local practices, policies, agreements, and investments (Tribes, counties, harbor districts, municipalities, and fishing industry groups)
  - Emerging fishing Community Benefit Agreements

Coastal Commission Consistency Determination: Condition 7(c)

- BOEM must implement the following conditions to reduce impacts to Fishing and Fishing Communities
  - Lessees must establish an independent fishing liaison
  - Lessees must report on engagement with fishing communities
  - BOEM, the Coastal Commission, and other agencies will develop and facilitate a working group to develop a strategy for avoidance, minimization, and mitigation of impacts to fishing and fisheries
- The Working Group process is now being developed

5 Minute Break

Panel Discussion

Irene Gutierrez, Senior Attorney, Natural Resources Defense Council

Hayes Framme, Head of New Markets & Supply Chain, Orsted

Jacqueline Moore, Vice President, Pacific Merchant Shipping Association

Steve Scheiblauer, Consultant to California Commercial Fishing Industry

Mike Conroy, West Coast Director, Responsible Offshore Development Alliance

Next Steps

- Public comments due June 16, 2023
- Upcoming AB 525 Workshop:
  - June 2, 2023 – Permitting Roadmap
- Recent Workshops and content on webpage:
  - May 23 – Ports and Workforce
  - May 25 – Transmission

Public Comment Instructions

Rules

- 3 minutes per person

Zoom

- Click “raise hand”

Telephone

- Press *9 to raise hand
- Press *6 to (un)mute

When called upon

- Unmute, spell name, state affiliation, if any

Written Comments:

- Due: June 16, 2023, by 5:00 p.m.
- Docket: 17-MISC-01
- Submit at: https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=17-MISC-01

3-MINUTE TIMER

Thank You!

- Danielle Mullany: Danielle.Mullany@energy.ca.gov
- Scott Flint: Scott.Flint@energy.ca.gov
- Rachel MacDonald: Rachel.MacDonald@energy.ca.gov

CEC offshore wind docket:
https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=17-MISC-01

CEC offshore wind page:
https://www.energy.ca.gov/programs-and-topics/topics/renewable-energy/offshore-renewable-energy

Please submit comments by June 16th, 2023