OCS Study
BOEM 2022-073

Port of Coos Bay Port Infrastructure Assessment for Offshore Wind Development

U.S. Department of the Interior
Bureau of Ocean Energy Management
BOEM Pacific OCS Region, Camarillo, CA

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Port of Coos Bay
Port Infrastructure Assessment for Offshore Wind Development

October 2022

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DISCLAIMER

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ABOUT THE COVER

Photo Description: Aerial photo of Terminal 1 at the Port of Coos Bay.

Photo Credit: Oregon International Port of Coos Bay.

ACKNOWLEDGMENTS

The following port development organizations and offshore wind industry experts were consulted as part of this study:

- National Renewable Energy Laboratory (NREL)
- Oregon Coast Energy Alliance Network (OCEAN)
- Oregon Department of Energy (ODOE)
- Oregon Department of Land Conservation and Development (DLCD)
- Oregon International Port of Coos Bay
- Pacific Ocean Energy Trust (POET)
- Sause Bros.
- South Coast Development Council (SCDC)

- Aker Offshore Wind
- Diamond Offshore Wind
- EnBW
- Equinor
- Ørsted
- Principle Power
- SBM Offshore
- Siemens Gamesa
- Simply Blue Group
- Trident Winds
- Vestas

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List of Abbreviations and Acronyms

AACE	American Association of Cost Engineering
ABS	American Bureau of Shipping
ACI	American Concrete Institute
Airport Authority	Coos County Airport Authority
AISC	American Institute for Steel Construction
AMD	Advanced Maintenance Dredging
API	American Petroleum Institute
ASCE	American Society of Civil Engineers
AWS	American Welding Society
BOEM	Bureau of Ocean Energy Management
CDIP	Coastal Data Information Program
CEC	California Energy Commission
CFR	Code of Federal Regulations
cfs	cubic feet per second
CMECS	Coastal and Marine Ecological Classification Standard
CTV	Crew transfer vessel
DLCD	Department of Land Conservation and Development
DNV	Det Norske Veritas
EL	Elevation
ESA	Endangered-Species Act
ESRI	Environmental Systems Research Institute
FAA	Federal Aviation Administration
ft	feet
GIS	Geographic Information System
GW	Gigawatts
IFPs	Instrument flight procedures
IPaC	Information for Planning and Consultation
M	Million
M&N	Moffatt & Nichol
MBTA	Migratory Bird Treaty Act
MEG4	Mooring Equipment Guidelines
MF	Manufacturing / fabrication facility
MHHW	Mean Higher High Water
MHW	Mean High Water
MLLW	Mean Lower Low Water
MLW	Mean Low Water

MOUs	Mobile Offshore Units
MSL	Mean Sea Level
MTL	Mean Tide Level
MW	Megawatt
N	North
NA	Not authorized
NAVD88	North American Vertical Datum of 1988
NFPA	National Fire Protection Association
NNE	North-northeast
NNW	North-northwest
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NREL	National Renewable Energy Laboratory
O&M	Operation and Maintenance facility
OARRA	Oregon Archaeological Records Remote Access
OCEAN	Oregon Coast Energy Alliance Network
OCIMF	Oil Companies International Marine Forum
OCS	Outer Continental Shelf
ODA	Oregon Department of Aviation
ODFW	Oregon Department of Fish and Wildlife
ODOE	Oregon Department of Energy
OEESC	Oregon Energy Efficiency Specialty Code
OEM	Original equipment manufacturer
OESC	Oregon Electrical Specialty Code
OMSC	Oregon Mechanical Specialty Code
ORS	Oregon Revised Statute
ORWD	Oregon Water Resources Department
OSSC	Oregon Structural Specialty Code
OTH	Southwest Oregon Regional Airport located in Coos Bay, Oregon
Pacific OCS	Outer Continental Shelf off the coasts of California, Oregon, Washington, and Hawaii
Part 77	Code of Federal Regulations Part 77
PIANC	Permanent International Association of Navigation Congresses
POET	Pacific Ocean Energy Trust
Port	Oregon International Port of Coos Bay
psf	pounds per square foot
RM	River Mile
RORO	Roll-on / roll-off
S	South
S&I	Staging and integration facility

SCDC	South Coast Development Council
Schatz	Schatz Energy Research Center
SE	Southeast
SHPO	State Historic Preservation Offices
SOV	Service operations vessel
SW	Southwest
TCP	Traditional Cultural Property
TERPS	Terminal instrument procedures
TEUs	Twenty Equipment Units
UFC	Unified Facilities Criteria
USACE	United States Army Corps of Engineers
USDOE	U.S. Department of Energy
USGS	U.S. Geological Survey

Executive Summary

Study Background

The Bureau of Ocean Energy Management (BOEM), as mandated by the Outer Continental Shelf (OCS) Lands Act, administers exploration and development of energy and mineral resources in federal waters. This includes the responsibility of issuing leases, easements or right-of-ways for offshore energy and mineral resources in federal waters off the coasts of California, Oregon, Washington, and Hawaii – the Pacific OCS Region. BOEM has identified the need to gather data on the infrastructure required to develop offshore wind energy in the Pacific OCS. Specifically, the infrastructure outside of the offshore energy facility itself, such as ports, navigation, transmission, and supply chain. This study focuses on an assessment of the port infrastructure in Coos Bay, Oregon to support the construction and operation of offshore wind areas in the Pacific OCS Region.

The Pacific OCS is characterized by rapidly increasing water depths that exceed the feasible limits of traditional fixed offshore wind turbines. Thus, floating offshore wind technology is more suitable for this region. To construct floating offshore wind turbines, the turbine components will need to be fabricated, assembled, and transported from an onshore port to the offshore wind area. Existing port infrastructure on the U.S. West Coast is not adequate to support these activities and significant port investment is required to develop the following offshore wind facilities:

- Staging and Integration (S&I) Facility: a site to receive, stage/store, assemble, and prepare for tow out of the completed offshore wind turbine system.
- Manufacturing / Fabrication (MF) Facility: a site that receives raw materials via road, rail, or waterborne transport and creates larger components in the offshore wind supply chain. Generally located on the water to export completed components via waterborne transport – this site typically has factory and/or warehouse buildings.
- Operation and Maintenance (O&M) Facility: a home port site for operation and maintenance vessels and supporting warehouse/offices during the operation period of the offshore wind farm.

Study Scope

This study identifies potential sites within the Oregon International Port of Coos Bay (Port) that could be developed to support offshore wind. The following tasks were completed as part of this study:

- Review existing applicable and available literature (Section 2)
- Conduct outreach meetings with port development organizations, offshore wind developers, original equipment manufacturers (OEMs), and federal and state agencies related to floating offshore wind port requirements (Section 3)
- Perform outreach with the Port to identify potential development sites and prepare a basis of analysis to screen and assess the sites (Section 4)
- Identify existing infrastructure and planned infrastructure improvement projects at the Port that may impact offshore wind industry use (Section 5)
- Screen, categorize, and rank sites within the Port for offshore wind development (Sections 6, 7)
- Recommend next steps including additional studies (Section 8)

Offshore Wind Port Requirements

Currently, 12 megawatt (MW) offshore wind turbine systems are commercially available; however, the anticipated size of turbine systems to be installed on the U.S. West Coast will be on the order of 15 MW or larger. **Table ES.1** summarizes the anticipated dimensions for a floating turbine system with capacity of up to 20 – 25 MW. Turbine device dimensions provided in **Figure ES.1** are relative to the future industry needs for 15 to 25 MW size devices. Smaller size devices (beam, draft) are currently in development but are at reduced turbine capacity. The values outlined in the table are those recommended for planning a major port terminal on a 50-year time horizon to meet the anticipated needs of the continuously developing offshore wind industry. Refer to **Section 4.5** for additional information.

Table ES.1. Floating offshore wind turbine dimensions

Floating Offshore Wind Turbine	Approximate Dimension
Foundation Beam / Width	Up to 425 ft x 425 ft [Up to 130 m x 130 m]
Foundation Draft (Before Integration)	15 – 25 ft [4.5 – 7.5 m]
Foundation Draft (After integration)	20 – 50 ft [6 – 15 m]
Hub/Nacelle Height (from Water Level)	Up to 600 ft [Up to 183 m]
Tip Height (from Water Level)	Up to 1,100 ft [Up to 335 m]
Rotor Diameter	Up to 1,000 ft [Up to 305 m]

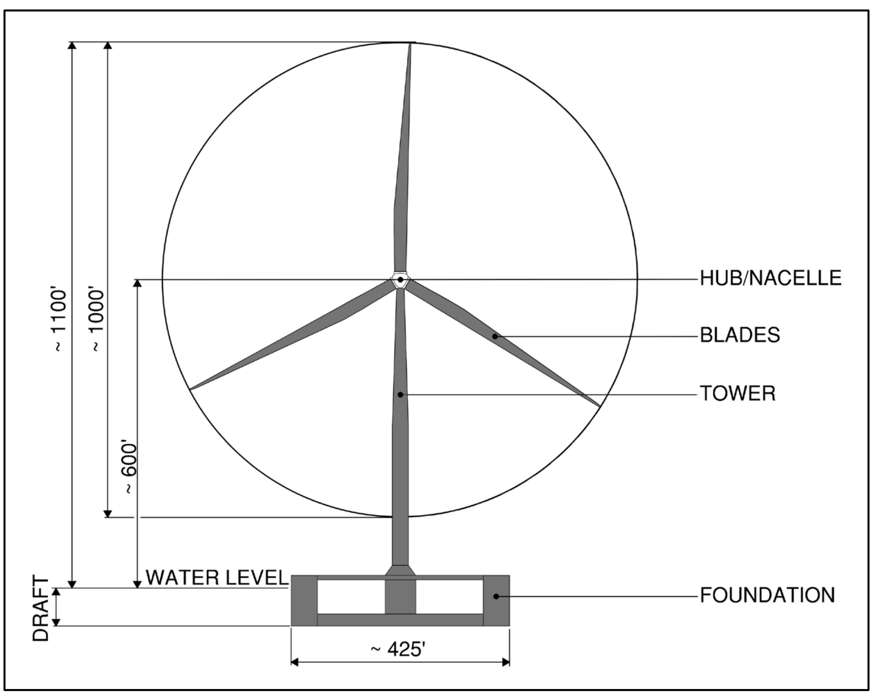

Figure ES.1. Floating offshore wind turbine dimensions

Based on the expected dimensions for floating turbines, the requirements shown in **Table ES.2** were identified for the various port facilities – staging and integration, component manufacturing, and operations and maintenance sites. Refer to **Section 4.5** for additional information.

Table ES.2. Offshore wind port infrastructure requirements

Floating Offshore Wind Turbine	Approximate Criteria for Staging & Integration	Approximate Criteria for Component Manufacturing	Approximate Criteria for O&M
Acreage, minimum	30 – 100 acres	30 – 100 acres	5 – 10 acres
Wharf Length	1,500 ft [1]	800 ft	300 ft
Minimum Draft at Berth	38 ft	38 ft	20 – 30 ft
Draft at Sinking Basin [2]	40 – 100 ft	N/A	N/A
Wharf Loading	> 6,000 psf [3]	Up to 6,000 psf	100 – 500 psf
Uplands / Yard Loading (for WTG components)	> 2,000 – 3,000 psf	> 2,000 – 3,000 psf	N/A

[1] Minimum length for integration of two turbine systems and delivery of components.
[2] Options for transfer of floating foundation from land to water include use of semi-submersible barge and sinking basin, ramp system, or direct transfer methods (lifting portions or complete foundation units from land into water).
[3] Wharf loading under the crane.

The information shown in **Figure ES.2** is summarized below.

Staging & Integration (S&I) Sites:

- Good candidate sites: Henderson Ranch (7) and Jordan Cove West (8)
- Moderate candidate sites: Former Sitka Dock (1) and Jordan Cove East (10)
- Not a candidate: all other sites not listed

Manufacturing / Fabrication (MF) Sites:

- Good candidate sites: Henderson Ranch (7), Jordan Cove West (8), Eastside Port Parcel (14), and Terminal 1 Site (15)
- Moderate candidate sites: Former Sitka Dock (1), Jordan Cove East (10), and Al Pierce Lumber Co (11)
- Not a candidate: all other sites not listed

Operations & Maintenance (O&M) Sites:

- Good candidate sites: Former Sitka Dock (1), Henderson Ranch (7), Jordan Cove West (8), Ocean Terminals Dock (12), Eastside Port Parcel (14), and Terminal 1 Site (15)
- Moderate candidate sites: Jordan Cove East (10) and Al Pierce Lumber Co (11)
- Not a candidate: all other sites not listed

Port Site Screening

In close coordination with the Port, a list of 15 sites were identified as potential candidates for offshore wind development. Refer to **Figure ES.2** for the results of the site screening process.

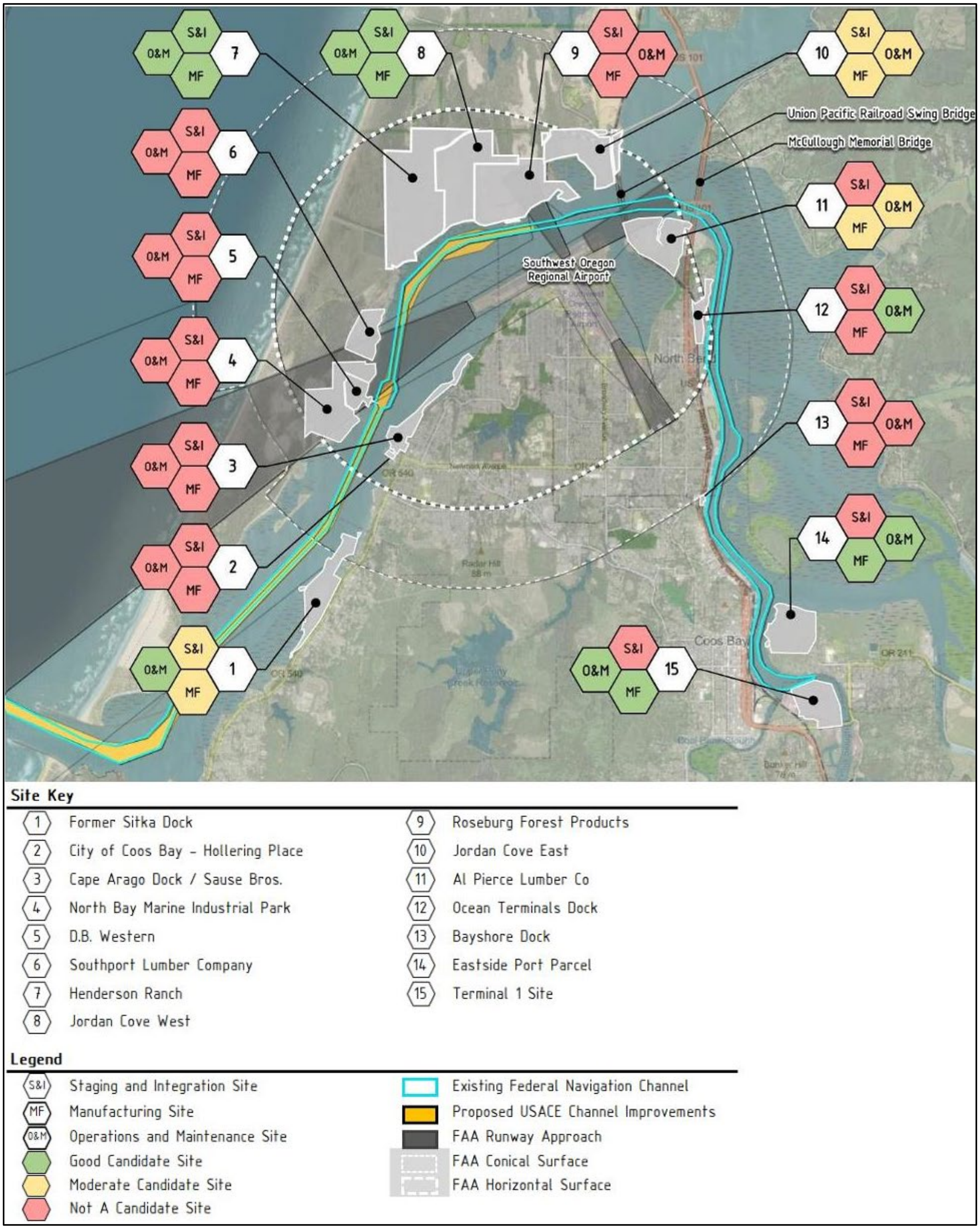

Figure ES.2. Port of Coos Bay site screening plan

Port Improvements Assessment

For the highest ranked sites, an evaluation was completed to determine the required improvements and estimated cost to develop the site for offshore wind industry use. See **Figure ES.3** for a potential build out scenario of the Port to include Staging & Integration at Jordan Cove West and Henderson Ranch, blade manufacturing site at Terminal 1, and tower and nacelle manufacturing site at Eastside Port Parcel.

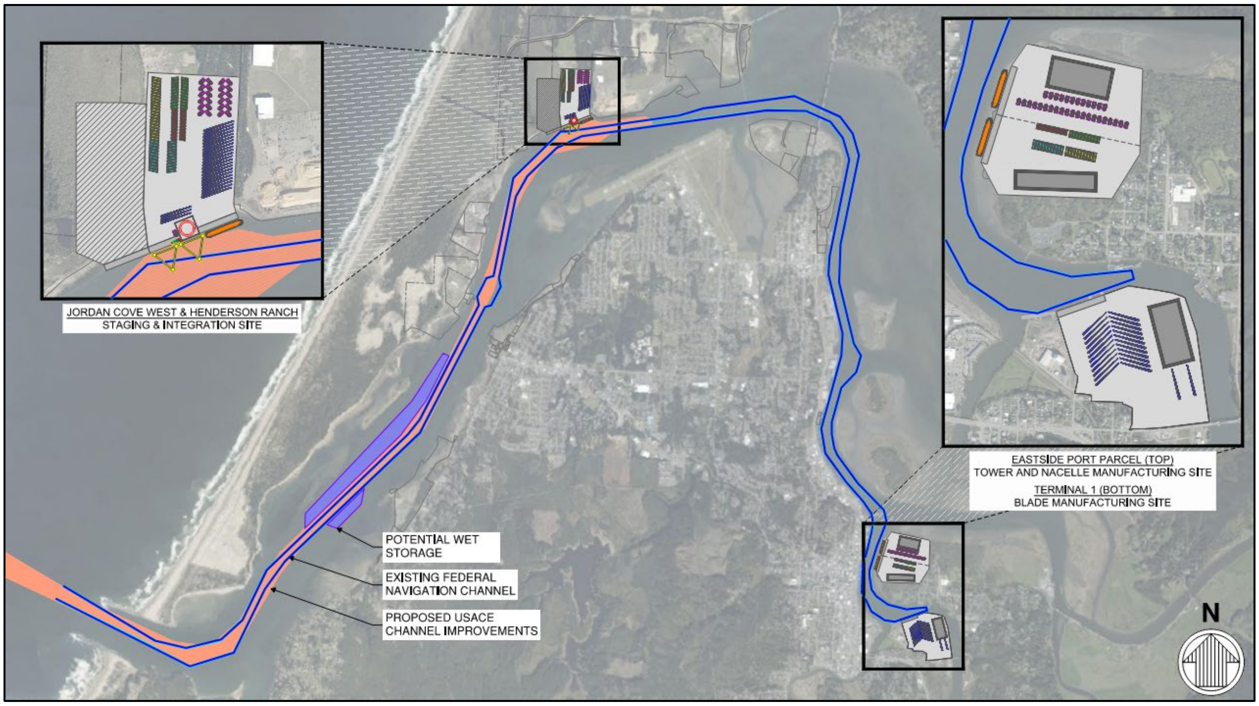

Figure ES.3. Coos Bay offshore wind port potential build out scenario plan

Table ES.3. Summary of infrastructure improvements and cost at top ranked sites

Item	Jordan Cove West	Henderson Ranch	Terminal 1
Site Type	Staging & Integration	Staging & Integration	Manufacturing
Wharf Improvement	1,500-ft-long wharf 6,000 psf capacity	750-ft-long wharf 6,000 psf capacity	800-ft-long wharf 6,000 psf capacity
Uplands Improvement	80 acres to EL +15 ft 2,000 – 3,000 psf capacity	60 acres to EL +15 ft 2,000 – 3,000 psf capacity	90 acres to EL +15 ft 2,000 – 3,000 psf capacity
Dredging	Berth Pocket -38 ft MLLW	Berth Pocket -38 ft MLLW	Berth Pocket -38 ft MLLW
Cost Estimate	$400M	$230M	$260M
Cost Accuracy Range	$200M - $800M (-50% / +100%)	$115M - $460M (-50% / +100%)	$130M - $520M (-50% / +100%)

Table ES.3 shows a budgetary cost estimate prepared to an American Association of Cost Engineering (AACE) Class 5 level of accuracy where the typical expected variation in the low range is -20% to -50% and +30% to +100% on the high range. The cost estimate does not include improvements for the United States Army Corps of Engineers (USACE) Proposed Channel Modification Project (refer to **Section 4.3**) or any additional channel improvements to support the offshore wind industry, such as wet storage or additional widening and deepening. Cost to dredge a sinking basin varies based on depth required with the following estimated costs: 60-ft-deep sinking basin is approximately $75 million ($40 – $150 million with -50% to +100% accuracy), 80-ft-deep sinking basin is approximately $175 million ($90 – $350 million with -50% to +100% accuracy), and 100-ft-deep sinking basin is approximately $330 million ($165 – $660 million with -50% to +100% accuracy).

Airport Considerations

From the preliminary screening analysis, it was identified that all potential staging and integration sites within the Port of Coos Bay will impact the Southwest Oregon Regional Airport (OTH) Part 77 surfaces, runway end and threshold siting standards, and/or the terminal instrument procedures (TERPS). However, before a decision can be made about the viability of the offshore wind industry coexisting with OTH, further analysis with the Federal Aviation Administration (FAA), Airport Authority, Port, BOEM, and other project stakeholders is required based on the findings of this preliminary analysis. Upon electing to move forward with the project, additional collaboration with the Airport Authority should take place followed by Port submittal of the FAA Form 7460-1 for the chosen site(s) for formal FAA and Oregon Department of Aviation (ODA) determination of project impacts. Stakeholders should be prepared to discuss potential mitigation options at the local level, followed by additional discussions at higher levels of the FAA depending on the extent of impacts noted in the determination(s).

Recommended Next Steps

Existing port infrastructure on the U.S. West Coast is not adequate to support offshore wind and significant port investment is required. The Port of Coos Bay is well situated to support commercial scale build-out of offshore wind in Oregon. It is best to invest within the Port rather than an alternative greenfield site outside of the established port due to synergies such as the existing labor workforce, existing fleet of tugs and workboats, repair shipyards, navigable waterway and protected harbor, and availability of industrial zoned land for development. The largest risk to development is verifying that the offshore wind industry can coexist with the existing airport operations.

At a minimum, the **USACE Proposed Channel Modification Project, as currently proposed, will be required to support the offshore wind industry.** It is possible that additional channel improvements beyond what is proposed in the USACE Proposed Channel Modification Project will be required to support the offshore wind industry.

The following actions are recommended as next steps to confirm feasibility and to continue to progress plans for developing the Port to be an offshore wind hub:

- **Deployment Targets:** Determine required quantity and investment required for port sites to support federal and state goals for deployment (gigawatts [GW] and timeline) of offshore wind in Oregon.
- **OTH Airport Operations:**
    - Submit FAA Form 7460-1 to begin formal coordination between the FAA, Airport Authority, Port, and BOEM to determine airport impacts and strategies to mitigate at the proposed terminal, wet storage improvement locations, and during tow out of the turbines.
    - Complete trade-off analysis to determine financial/economic and environmental impacts for airport operations to coexist with offshore wind or to relocate airport operations.
- **Navigation Channel:**
    - Evaluate proposed navigation channel improvements to confirm adequacy for offshore wind industry use or if additional improvements will be required.
    - Evaluate required space and improvements required to provide adequate wet storage within the Port.

    - Evaluate maritime use and navigational impact to other maritime users within the channel and at the channel entrance.
    - Evaluate potential for downtime for facilitating deployment to the wind farm relative to metocean and bar channel conditions.
    - Coordinate with U.S. Coast Guard regarding "dead ship" towing operations to solicit input for development of a navigation tow out plan.
    - Evaluate the need and depth of a sinking basin for transfer of floating foundations from land to water.
- **Wet Storage Requirements:** Evaluate the quantity and corresponding locations for wet storage based on outcomes of deployment target and navigation channel assessment work.
- **Multi-Port Assessment:** Evaluate additional port sites in Oregon that could support the offshore wind industry in coordination with Port of Coos Bay to provide a robust offshore wind supply chain.
- **Engagement and Outreach:** Complete outreach and engage with all potential port development stakeholders including, but not limited to fisheries, Native American and Indigenous peoples, local communities, OTH airport, Port maritime users, federal and state agencies, and other stakeholders.
- **Port Strategic Plan:** Develop a strategic plan for port development in Oregon to support the offshore wind industry including an impact trade-off analysis that evaluates potential development impacts to coastal resources, incorporates stakeholder feedback, evaluates economic benefits and workforce development requirements, and considers socioeconomic and environmental justice concerns.
- **Supply Chain and Workforce Assessments:** Perform an assessment of the workforce opportunity within the local region and/or state to develop a high-level roadmap of the workforce needs and training lead times with respect to the timeline of offshore wind development within the state. This will strengthen Oregon's workforce to serve offshore wind and inform a strategic workforce development plan. Similarly, an assessment of the local and/or state-wide supply chain would be beneficial in understanding opportunities for local content and the requirement and impacts for supply chain development programs.

1 Introduction

BOEM, as mandated by the OCS Lands Act, administers exploration and development of energy and mineral resources in federal waters. This includes the responsibility of issuing a lease, easement, or right-of-way for offshore energy and mineral resources in federal waters off the coasts of California, Oregon, Washington, and Hawaii – the Pacific OCS Region. BOEM has identified the need to gather data on the infrastructure required to develop offshore wind energy in the Pacific OCS. Specifically, the infrastructure outside of the offshore energy facility itself, such as ports, navigation, transmission, and supply chain.

The Pacific OCS is characterized by rapidly increasing water depths that exceed the feasible limits of traditional fixed offshore wind turbines. Thus, floating offshore wind technology is more suitable for this region. To construct floating offshore wind turbines, the turbine components will need to be fabricated, assembled, and transported from an onshore port to the offshore wind site. Existing port infrastructure on the U.S. West Coast is not adequate to support these activities and significant port investment is required to develop offshore wind port facilities.

BOEM has identified two offshore wind call areas off the state of Oregon, the Coos Bay Call Area and Brookings Call Area (see Figure 1). The Port is a deepwater port in the State of Oregon that is strategically located near both call areas and can potentially be used for the manufacturing, installation, service, and decommissioning of floating offshore wind turbines. This study focuses on an assessment of the port infrastructure in Coos Bay, Oregon to support the construction and operation of offshore wind areas in the Pacific OCS Region.

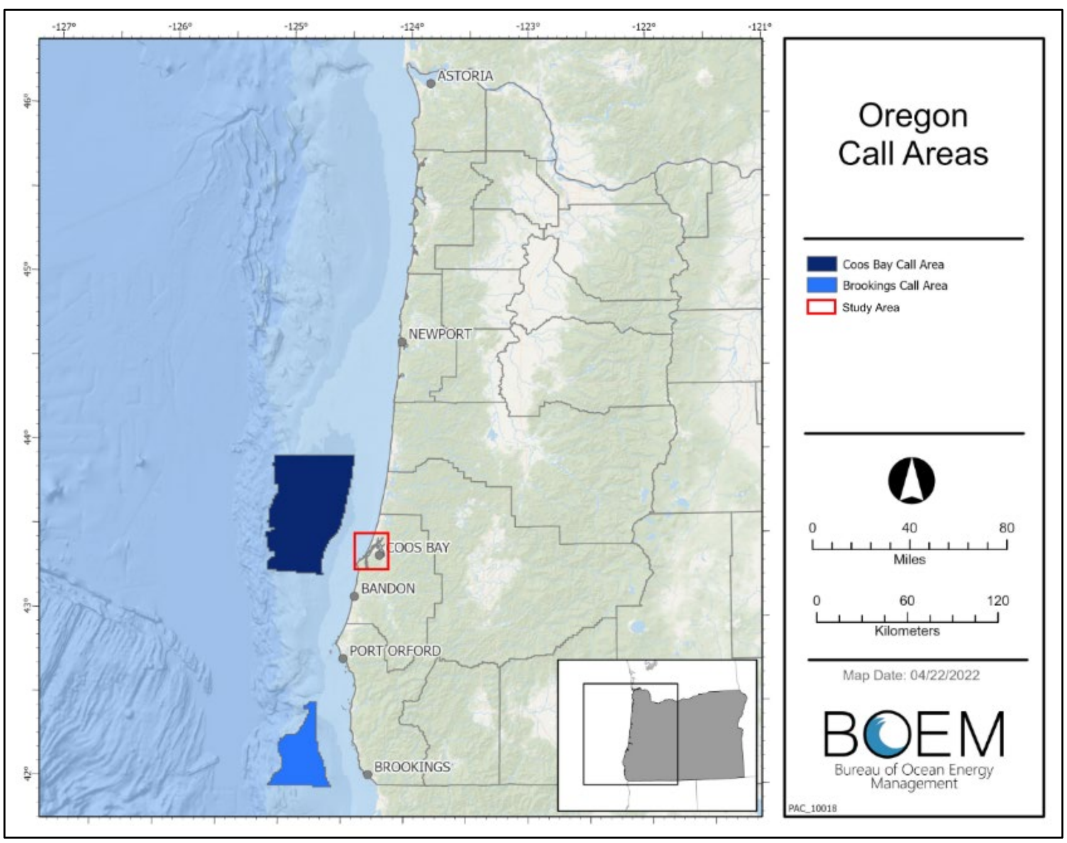

Figure 1. Oregon call areas (BOEM 2022)

2 Literature Review

The following lists the information and data gathered from a range of offshore wind industry and government sources to provide a baseline of best available information on offshore wind and the Port.

Bureau of Ocean Energy Management (BOEM):

- Determining the Infrastructure Needs to Support Offshore Floating Wind and Marine Hydrokinetic Facilities on the Pacific West Coast and Hawaii (BOEM 2016-011)
- Floating Offshore Wind in California: Gross Potential for Jobs and Economic Impacts from Two Future Scenarios (BOEM 2016-029)
- Floating Offshore Wind Turbine Development Assessment: Final Report and Technical Summary (BOEM 2021-030)
- Potential Offshore Wind Energy Areas in California: An Assessment of Locations, Technology, and Costs (BOEM 2016-074)

California Energy Commission (CEC):

- AB 525 Goals – Resources Considered as of March 3, 2022 (CEC 2022)
- Commission Report – Offshore Wind Energy Development off of California Coast (CEC 2022)
- Presentations – AB 525 Workshop (CEC 2022)

National Renewable Energy Laboratory (NREL):

- 2014-2015 Offshore Wind Technologies Market Report (NREL 2015)
- 2016 Offshore Wind Energy Resource Assessment of the United States (NREL 2016)
- 2017 Offshore Wind Technologies Market Update (NREL 2018)
- 2019 Offshore Wind Technology Data Update (NREL 2019)
- 2020 Offshore Wind Resource Assessment for the California Pacific Outer Continental Shelf (NREL 2020)
- An Assessment of the Economic Potential of Offshore Wind in the United States from 2015 to 2030 (NREL 2017)
- Cost of Floating Offshore Wind Energy Using New England Aqua Ventus Concrete Semisubmersible Technology (NREL 2020)
- Definition of the IEA Wind 15-Megawatt Offshore Wind Turbine (NREL 2020)
- Large-Scale Offshore Wind Power in the United States: Assessment of Opportunities and Barriers (NREL 2010)
- The Cost of Floating Offshore Wind Energy in California Between 2019 and 2032 (NREL, 2020)
- The Demand for a Domestic Offshore Wind Energy Supply Chain (NREL, 2022)

Schatz Energy Research Center (Schatz):

- American Jobs Project: The California Offshore Wind Project: A Vision for Industry Growth (Schatz 2019)
- California North Coast Offshore Wind Studies (Schatz 2020)
- Del Norte County Offshore Wind Preliminary Feasibility Assessment: Final Report (Schatz 2021)
- Port Infrastructure Assessment Report (Schatz 2020)

U.S. Department of Energy (USDOE):

- Assessment of Ports for Offshore Wind Development in the United States (USDOE 2014)

- National Offshore Wind Strategy (USDOE 2016)
- Offshore Wind Market Report: 2021 Edition (USDOE 2021)

Port of Coos Bay:

- Coos Bay Harbor Safety Plan (Coos Bay Harbor Safety Committee 2018)
- Channel Dredging River Mile 12 to 15 (Port of Coos Bay 2019)
- Channel Modification Frequently Asked Questions (Port of Coos Bay 2020)
- Port of Coos Bay Enters into Memorandum of Understanding with Development Firm to Construct Multimodal Container Terminal (Port of Coos Bay 2021)
- Coos Bay Rail Line Bridge Rehabilitation (Port of Coos Bay 2022)
- https://www.portofcoosbay.com/

Industry Reports:

- A Guide to Mapping Intertidal Eelgrass and Nonvegetated Habitats in Estuaries of the Pacific Northwest USA (U.S. Environmental Protection Agency 2007)
- Environmental Assessment Coos Bay Maintenance Dredging (Moffatt & Nichol 2015)
- Oregon International Port of Coos Bay Strategic Business Plan, Volume 1 Summary (BergerABAM 2015)
- Coastal Wave Modeling for Jetty Rehabilitation at Coos Bay (Coastal Engineering Proceedings 2018)
- Coos Estuary and Shoreline Atlas (University of Oregon Institute for Policy Research and Engagement 2019)
- Oregon International Port of Coos Proposed Section 204(f)/408 Channel Modification Project (USACE 2019)
- Coos Bay Offshore Wind Port Infrastructure Study (TotalEnergies SBE US 2022)

3 Industry Outreach

In addition to the literature review, Moffatt & Nichol (M&N) and BOEM conducted outreach meetings with port development organizations, offshore wind developers, OEMs, and federal and state agencies. Note that significant additional outreach is required to obtain feedback from all port development stakeholders including, but not limited to, fisheries, Native American and Indigenous peoples, local communities, OTH airport, Port maritime users, federal and state agencies, and other stakeholders. Meetings held as part of this study are summarized here.

Port Development Meetings:

- 19 October 2021: Meeting with the Oregon International Port of Coos Bay
- 20 October 2021: Meeting with Pacific Ocean Energy Trust (POET)
- 02 November 2021: Meeting with Oregon Coast Energy Alliance Network (OCEAN)
- 12 November 2021: Meeting with Sause Bros.
- 15 November 2021: Meeting with Oregon Department of Energy (ODOE)
- 18 November 2021: Meeting with South Coast Development Council (SCDC)
- 19 November 2021: Meeting with Department of Land Conservation and Development (DLCD)
- 14 December 2021: Meeting with the Oregon International Port of Coos Bay Pilots

Offshore Wind Industry Meetings:

- 13 January 2022: Meeting with SBM Offshore
- 21 January 2022: Meeting with Trident Winds
- 24 January 2022: Meeting with Simply Blue Group
- 26 January 2022: Meeting with Aker Offshore Wind
- 09 February 2022: Meeting with Ørsted
- 15 February 2022: Meeting with EnBW
- 21 March 2022: Meeting with Equinor
- 21 March 2022: Meeting with Diamond Offshore Wind
- 21 March 2022: Meeting with the National Renewable Energy Laboratory (NREL)
- 08 April 2022: Meeting with Vestas
- 19 May 2022: Meeting with Siemens Gamesa
- 19 May 2022: Meeting with Principle Power

During these meetings the following topics were discussed to help develop the basis of analysis in the next section.

- Type and size of offshore wind components/equipment
- Port requirements for component delivery and integration of finished components
- Device integration operational requirements
- Installed wind farm operational and maintenance needs

4 Basis of Analysis

The following basis of analysis outlines the requirements and design criteria for assessing the Port's ability to support the floating offshore wind industry. The following type of offshore wind port sites are envisioned:

- **Staging and Integration (S&I) Facility:** a site to receive, stage/store, assembly, and load out offshore wind components.
- **Manufacturing/Fabrication (MF) Facility:** a site that receives raw materials via road, rail, or waterborne transport and creates larger components in the offshore wind supply chain. Generally located on the water to export completed components via waterborne transport – this site typically has factory and/or warehouse buildings.
- **Operation and Maintenance (O&M) Facility:** a home port site for operation and maintenance vessels & supporting warehouse/offices during the operation period of the offshore wind farm.

The environmental, bathymetric, and geotechnical conditions are summarized based on the information provided in the *Oregon International Port of Coos Bay, Proposed Section 204(f)/408 Channel Modification Project* (USACE 2019).

4.1 Governing Codes, Standards, and References

The following codes, standards, and references govern the design of port infrastructure.

American Bureau of Shipping (ABS):

- Guide for Building and Classing Floating Offshore Wind Turbine Installation, updated July 2020

American Concrete Institute (ACI):

- ACI 318-19, Building Code Requirements for Structural Concrete

American Institute for Steel Construction (AISC):

- AISC 303-16, Code of Standard Practice for Steel Buildings and Bridges
- AISC 341-16, Seismic Provisions for Structural Steel Buildings
- AISC 360-16, Specification for Structural Steel Buildings

American Petroleum Institute (API):

- API RP 2A-LRFD, Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms – Load and Resistance Factor Design

American Society of Civil Engineers (ASCE):

- ASCE 7-16, Minimum Design Loads for Buildings and Other Structures
- ASCE 61-14, Seismic Design of Piers and Wharves

American Welding Society (AWS):

- AWS D1.1, Structural Welding Code, 2015

Oregon State Building Code:

- 2021 Oregon Electrical Specialty Code (OESC)
- 2021 Oregon Energy Efficiency Specialty Code (OEESC)
- 2022 Oregon Mechanical Specialty Code (OMSC)
- 2022 Oregon Structural Specialty Code (OSSC)

National Fire Protection Association (NFPA):

- NFPA 307, Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves

Oil Companies International Marine Forum (OCIMF):

- Mooring Equipment Guidelines (MEG4), 4th Edition, 2018

Permanent International Association of Navigation Congresses (PIANC):

- PIANC WG 121, Harbour Approach Channels – Design Guidelines, 2014
- PIANC WG 33, Guidelines for the Design of Fenders Systems, 2002
- PIANC WG 34, Seismic Design Guidelines for Port Structures, 2001
- PIANC WG 153, Recommendations for the Design & Assessment of Marine Oil & Petrochemical Terminals, 2016

United States Army Corps of Engineers (USACE):

- USACE EM 1110-2-1100, Coastal Engineering Manual, 2002
- USACE EM 1110-2-1613, Hydraulic Design of Deep-Draft Navigation Projects, 2006
- USACE EM 1110-2-2502, Retaining and Flood Walls, 1989

Unified Facilities Criteria (UFC):

- UFC 4-152-01 Design: Piers and Wharves, 2017
- UFC 4-159-03 Design: Moorings, 2020

4.2 Environmental Conditions

The following environmental conditions are summarized from the Oregon International Port of Coos Bay, Proposed Section 204(f)/408 Channel Modification Project (USACE 2019).

Coos Bay channel is influenced by winds, water levels, waves, currents, tsunamis, riverine inflows, and groundwater. This section provides a review of the available data to establish existing conditions in the estuary and along the coast.

Wind and water level data stations managed by the National Oceanic and Atmospheric Administration (NOAA) Center for Operational Oceanographic Products and Services are shown in Figure 2. These data stations are used to characterize the tides and winds in the Port.

Figure 2. NOAA tide gauges in and near the Coos Bay Estuary (USACE 2019)

4.2.1 Hydraulics and Hydrology

Coos Bay is an estuary formed at the junction of the Coos River with a number of smaller tributaries, including South Slough, Isthmus Slough, Kentuck and Willanch Sloughs, and North Slough. The estuary is a drowned river valley that was inundated by tidal waters when sea levels rose at the end of the last ice age, between 10,000 and 20,000 years ago. The topography of the Coos Bay estuary is a combination of rugged mountain terrain and extensive sand dunes adjacent to the ocean on the north side.

Coos Bay is the second largest estuary in Oregon. The estimated surface water area is 10,973 acres at high tide and 5,810 acres at low tide. The estuary is relatively shallow, with an average depth of 7 feet below mean lower low water (MLLW) with broad expanses of tide flats and mud that are exposed at low tide.

Coos Bay is a highly complex system composed of numerous sloughs and bays and some 30 tributaries. The bay drains a total area of 605 square miles and yields 2.2 million acre feet of fresh water annually. Freshwater inflows average approximately 500 cubic feet per second (cfs) during the summer and 4,000 cfs during the winter; peak flood flows can be ten times higher. However, these fresh water flows into the Coos Bay Estuary are small compared to the tidal flows and have little effect on the hydrodynamics in the study area. Stream gauge and watershed gauge data can be accessed from the Coos Watershed Association website and the U.S. Geological Survey (USGS) National Water Information System website.

4.2.2 Groundwater

Groundwater generally follows precipitation patterns, rising with winter rains and declining during the dry season. Groundwater is bound by impermeable rock underlying the sediment deposits and by impermeable bedrock hills to the east. Fresh water saturates the sand from the water table down to the impermeable bedrock; saline water has not been found in any of the wells developed and monitored by Brown and Newcomb (Brown and Newcomb 1963) in the sand-dune area just north of Coos Bay.

The groundwater elevation at one of the wells within the Oregon Water Resources Department (ORWD) Database, named Coos 1993 and measured from January 2000 through December 2010, is shown in

Figure 3. As shown, the groundwater elevation varied between 6.0 ft mean sea level (MSL) (10 ft MLLW) and 14.0 ft MSL (18 ft MLLW).

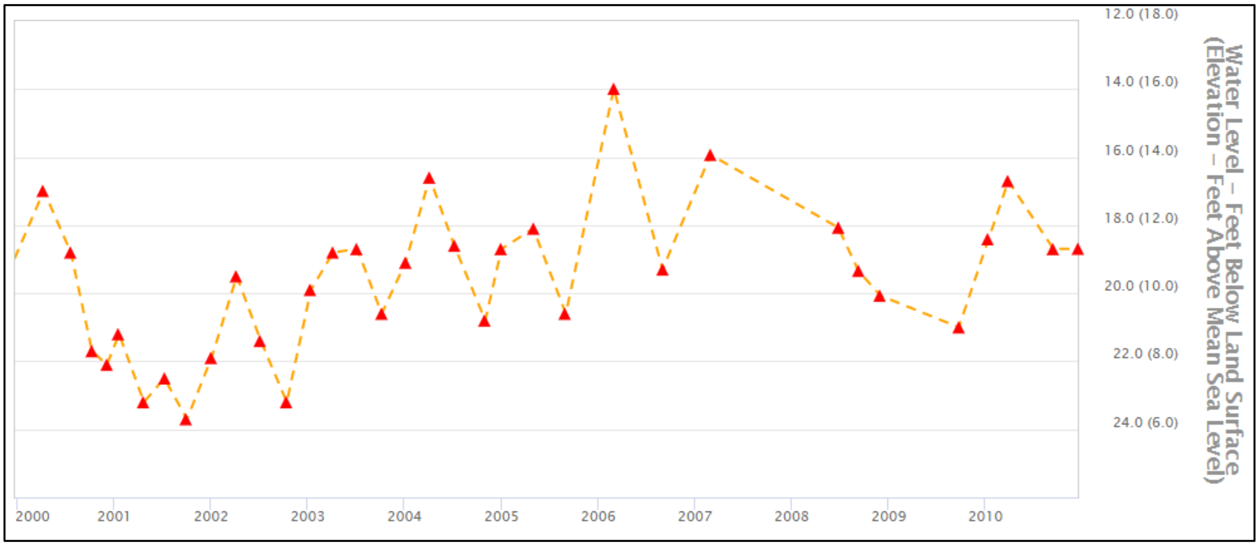

Figure 3. Groundwater elevations at Well Coos 1993 (USACE 2019)

4.2.3 Winds

The wind at Coos Bay is generalized based on measurements by NOAA stations at Cape Arago, Charleston, and North Bend. Generally, there is strong north-south directionality within the harbor and just off the coast. In the channel, the strongest winds are from the north.

Sustained wind speeds at Cape Arago are strongest between the three stations and are most characteristic of offshore winds. Thus, this station was selected to represent the wind climate of the Entrance Channel. Similarly, the winds observed at North Bend are stronger than those observed at Charleston and are characteristic of winds within the estuary; therefore, this station was selected to represent the winds in the inner channel. **Table 1** provides typical to high wind conditions (not extreme storms) at the two locations.

Table 1. Typical wind conditions (hourly mean) (USACE 2019)

Wind Condition (General Range)	Entrance Channel Anemometer Location	Inner Channel Anemometer Location
Typical summer wind	10-15 knots, N to NNE	15-20 knots, NNW to N
High summer wind	20 knots, N	25 knots, N
Typical winter wind	15-20 knots, SW to S	5-10 knots, S to SE
High winter wind	30 knots, SW to S	20 knots, SW to S

4.2.4 Tides

The tides at Coos Bay are based off the NOAA/NOS tide gauge number 9432780, in Charleston. As shown in **Table 2**, the tidal range can be large in Coos Bay with mean higher high water (MHHW) being 7.62 ft above MLLW.

Table 2. Tidal datums for Station 9432780, Charleston, Oregon: 1983 – 2001 epoch (USACE 2019)

Datum	Elevation (ft, MLLW)
Highest Observed Water Level (1/26/1983)	11.18
Mean Higher High Water (MHHW)	7.62
Mean High Water (MHW)	6.96
Mean Tide Level (MTL)	4.11
Mean Sea Level (MSL)	4.08
Mean Low Water (MLW)	1.27
North American Vertical Datum of 1988 (NAVD88)*	0.50
Mean Lower Low Water (MLLW)	0.00
Lowest Observed Water Level (6/1/1973)	-3.08
Highest Observed Water Level (1/26/1983)	11.18

Note: *NAVD88 is a geodetic datum rather than a tidal datum.

4.2.5 Sea Level Change

Per the USACE Proposed Channel Modification Project, it is recommended to consider future sea level change of approximately 2.6 ft at Coos Bay. This corresponds to a medium-high projection 50 years into the future.

4.2.6 Currents

Coos Bay is an ebb-dominant estuary, with the maximum depth-averaged ebb currents being 4.5 ft/s from RM 0.0 to 7.0 and the maximum flood currents being 2.5 ft/s from RM 0.0 to 11.0 in the navigation channel. **Figure 4** and Figure 5 show the maximum depth-averaged currents for the entire domain for ebb and flood flows, respectively.

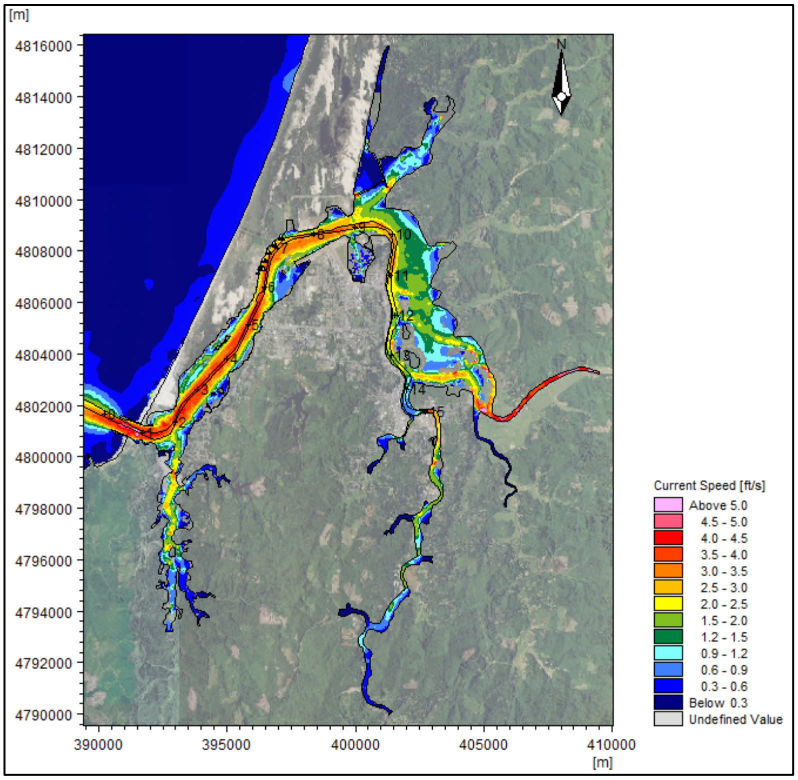

Figure 4. Maximum (99th percentile) depth-averaged currents for ebb tides (USACE 2019)

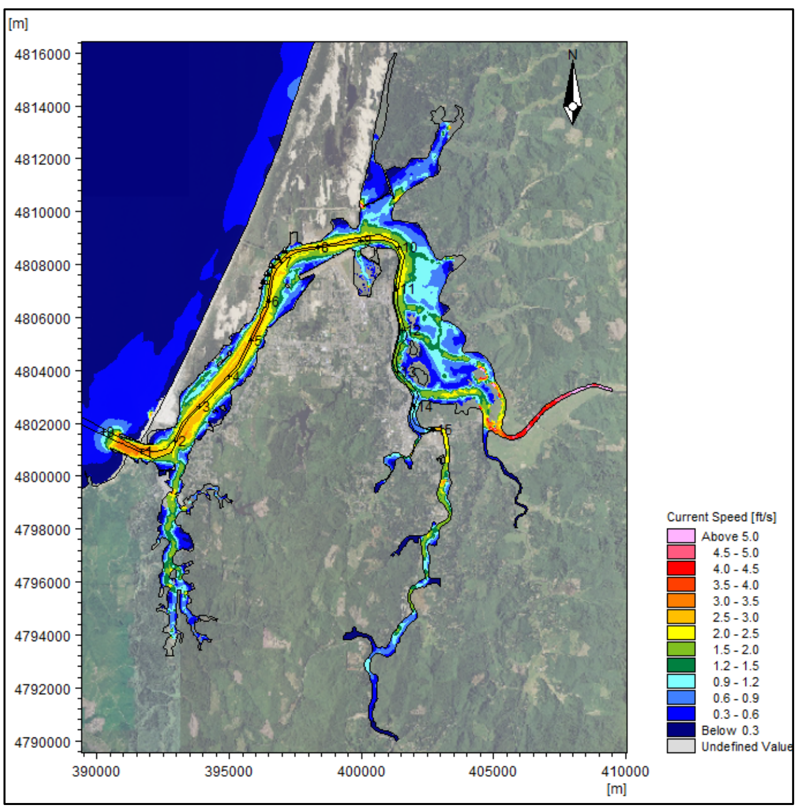

Figure 5. Maximum (99th percentile) depth-averaged currents for flood tides (USACE 2019)

4.2.7 Waves

Buoys operated by Coastal Data Information Program (CDIP) of the Scripps Institution of Oceanography are used to quantify the offshore wave climate. CDIP Buoy 139p1 is the closest buoy to Coos Bay. Spectral data are available at 30-minute resolution and 3-degree directional resolution.

Annual wave roses for Buoy 139p1 show that most offshore waves originate from a westerly and northwesterly direction. Wave heights from the dominant directional sectors occur most frequently within the 3-13 ft range. The winter storms have two directional peaks: (1) the majority of waves approach from west to west-northwest and (2) is a secondary peak from the southwest. The west to west-northwest waves are generated by distant storms and are long period swell waves with periods of 16 to 20 seconds. The southwest waves originate from nearby storms and have periods generally less than 15 seconds – this southwest peak accounts for the highest storm waves. The maximum recorded wave height is 37.1 ft from 270° (directly west) on 10 December 2015.

In the Coos Bay Offshore Wind Port Infrastructure Study by Mott MacDonald (Mott MacDonald 2022), a conceptual assessment was performed to identify the offshore installation season based on wave conditions. A limiting wave height of 8.2 ft was assumed as the threshold for safe operations. This assessment determined warmer weather months to have lower wave heights and be more suitable to offshore wind activities such as tow outs and major repairs - **Figure 6**.

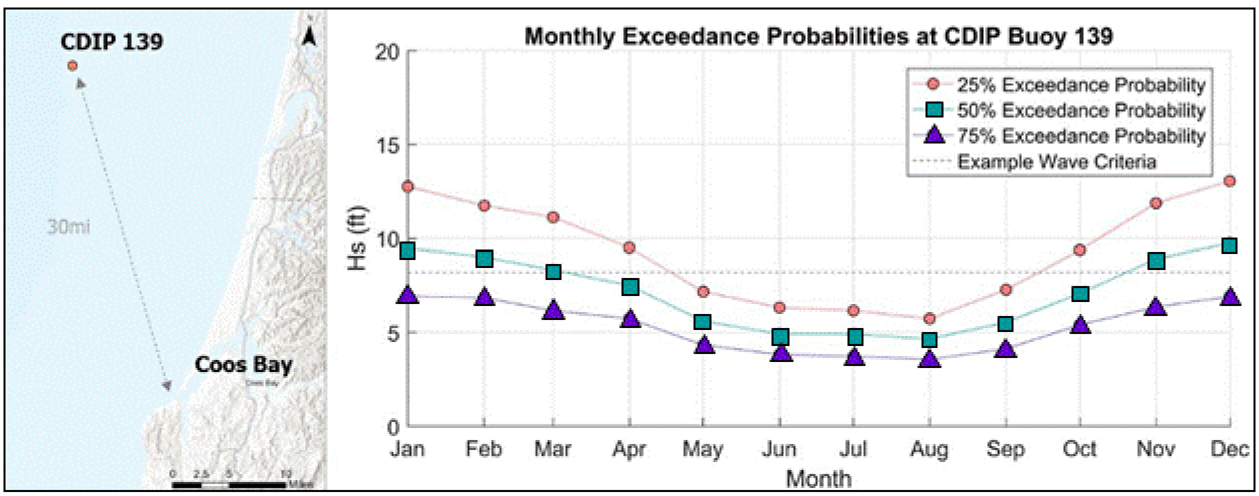

Figure 6. Monthly wave height exceedance probabilities at CDIP Buoy 139 (Mott MacDonald 2022)

4.3 Bathymetric Conditions

The following geotechnical and sediment conditions are summarized from the Oregon International Port of Coos Bay, Proposed Section 204(f)/408 Channel Modification Project (USACE 2019).

Currently, the Coos Bay Federal Navigation Channel has a depth of -47 to -37 ft, MLLW. The USACE Proposed Channel Modification Project, proposes to increase the channel depth and width from the offshore extent of the channel at River Mile (RM) -1 to approximately RM 8.2, as shown in **Figure 7**. The proposed channel will have a width of 1,180 ft and a depth of -57 ft MLLW at its offshore entrance and decreases to a width of 600 ft by RM 0.3. The Entrance Channel has a 600-ft width from RM 0.3 through RM 1. Upstream of RM 1, the channel will taper down to a nominal width of 450 ft and a depth of -45 ft MLLW. Channel dimensions for the existing condition and proposed project are shown in Table 3.

The proposed project will also create a vessel-turning basin from RM 7.3 to RM 7.8. At its full width, the proposed vessel-turning basin is 1,400-ft-long and 1,100-ft-wide, with a depth of -37 ft MLLW. The portion of the proposed channel that runs through the turning basin will have a depth of -45 ft MLLW.

Per the Port of Coos Bay, the estimated completion date of the USACE Proposed Channel Modification Project is approximately 2027/2028.

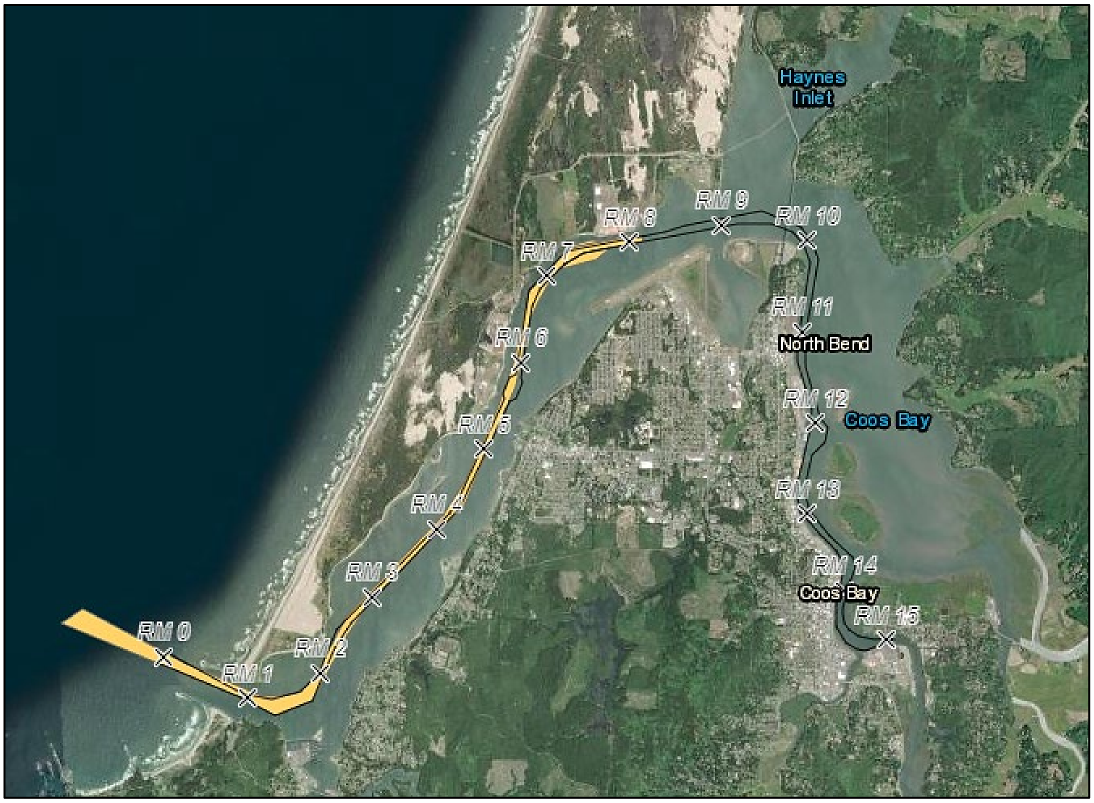

Figure 7. Federal Navigation Project improvements (USACE 2019)

Table 3. Channel depths for existing and proposed project (USACE 2019)

Range(s) and River Mile (RM)	Existing Navigation Depth (ft, MLLW)	Proposed Navigation Depth (ft, MLLW)	Existing Advanced Maintenance Dredging (ft)	Proposed Advanced Maintenance Dredging (ft)	Existing Channel Widths (ft)	Proposed Channel Widths (ft)
Offshore Inlet (Offshore Limit of Navigation Channel to RM 0.3)	-47	-57	5	6	700 to 550	1,180 to 600
Entrance Range (RM 0.3 to 1.0)	-47 to -37	-57 to -45	Varies 5 to 3 [1]	Varies 1 or 6 [2]	550 to 300	600
Entrance Range and Turn (RM 1.0 to 2.0)	-37	-45	1	1	Up to 740	Up to 740
Inside Range (RM 2.0 to 2.5)	-37	-45	1	1	300	500
Coos Bay Range to Lower Jarvis Range (RM 2.5 to 6.8)	-37	-45	1	1	300	450
Jarvis Turn (RM 6.8 to 7.3)	-37	-45	1	1	400	500
Upper Jarvis Range (RM 7.3 to 8.2)	-37	-45	1	1	300	450 to 300
Turning Basin (RM 7.3 to 7.8)	None [3]	-37 [3]	None	1	None	1,100 x 1,400

[1] AMD of 5 ft starts at the offshore daylight line, approximately RM -0.6 and continues to RM 0.7.
[2] AMD of 6 ft starts at the offshore daylight line. The AMD will be 1 ft in areas where Guano Rock is present (RM 0.7 to RM 1).
[3] Under the Existing Condition, there is no formal turning basin; vessels currently turn in existing deeper water at this location. Incoming vessels will enter the channel and turn under ballast load.

4.4 Geotechnical Conditions

The following geotechnical and sediment conditions are summarized from the Oregon International Port of Coos Bay, Proposed Section 204(f)/408 Channel Modification Project (USACE 2019).

The continental shelf off Coos Bay is approximately 14-miles-wide. Regional offshore bathymetric contours generally run northeast to southwest, parallel to the coastline. Much of the Coos Bay channel system, from the entrance to the Upper Jarvis Range (RM 8), has a bed of relatively clean, fine-grained sand that is underlain by extremely soft to soft weathered sandstone. Outcroppings of harder, unweathered sandstone are found at the entrance.

Rock underlies the existing channel footprint at depths ranging from -20 to -55 feet MLLW. The vast majority of the rock underlying the channel is extremely soft to soft weathered sandstone and siltstone. The exception is the relatively hard rock in the vicinity of Guano Rock (RM 1) and another hard rock outcropping near RM 5.8.

Unconsolidated sediment in Coos Bay is sand or sandy silt. Typically, Coos Bay sediments exhibit a high percentage (98 percent to 99 percent) of coarse materials too large to pass through a #200 sieve. The density of the sand varies from loose to very dense. The sand and marine sedimentary rock do not accumulate or generate contaminants in the marine estuarine environment.

Additional geotechnical conditions for the area designated as Jordan Cove West are summarized below from the Final Environmental Impact Statement for the Jordan Cove Energy Project (FERC 2019). The site is underlain by loose to dense fill and a relatively clean, fine-grained dune sand, followed by a very dense silt-sand. Fill depths are generally 10 to 15 feet with thicknesses of over 100 feet. The sand-silt layer present beneath the native sand is at elevations from -110 to -140 feet. Bedrock consisting of Eocene marine interbedded siltstones and sandstones of the Coaledo Formation are under these sands. The upper portion of this layer consists of gray, coarse to fine-grained weathered, very dense, weekly cemented sandstone with silt and minor amounts of coal.

4.5 Turbine Size

Currently 12 MW offshore wind turbine systems are commercially available; however, the anticipated size of turbine systems to be installed on the U.S. West Coast will be on the order of 15 MW or larger. **Table 4** summarizes the anticipated dimensions for a floating turbine system with capacity of up to 20 – 25 MW. Turbine device dimensions provided are relative to the future industry needs for 15 to 25 MW size devices. Smaller size devices (beam, draft) are currently in development but are at reduced turbine capacity. The values outlined in the table are those recommended for planning a major port terminal on a 50-year time horizon to meet the anticipated needs of the continuously developing offshore wind industry. In addition, **Figure 8** shows a depiction of the turbine dimensions.

Table 4. Floating offshore wind turbine dimensions

Floating Offshore Wind Turbine	Approximate Dimension [ft]	Approximate Dimension [m]
Foundation Beam / Width	Up to 425 ft x 425 ft	Up to 130 m x 130 m
Draft (Before Integration)	15 – 25 ft	4.5 – 7.5 m
Draft (After integration)	20 – 50 ft	6 – 15 m
Hub/Nacelle Height (from Water Level)	Up to 600 ft	Up to 183 m
Tip Height (from Water Level)	Up to 1,100 ft	Up to 335 m
Rotor Diameter	Up to 1,000 ft	Up to 305 m

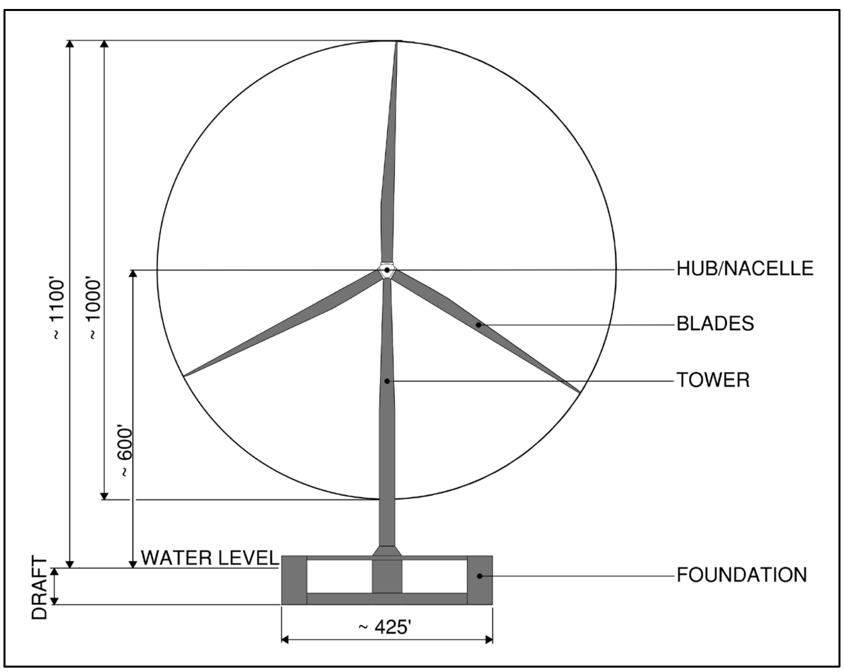

Figure 8. Floating offshore wind turbine dimensions

4.6 Port Requirements

The following parameters document the required port infrastructure to unload, store, pre-commission, and pre-assemble floating offshore wind farm components in Coos Bay.

4.6.1 Port Wharf and Loading Requirements

Per discussions with industry, the staging and integration wharf shall accommodate the delivery of components and at least two turbine assemblies moored adjacent to one another, resulting in approximately 1,500 ft of quayside space, as summarized in Table 5. For O&M and component manufacturing facilities, the length of the wharf is dependent on the vessel type it serves. For example, service operations vessel (SOV) and crew transfer vessel (CTV) for O&M facilities and delivery vessels and delivery barges for component manufacturing facilities.

In general, the wharf and uplands area for component manufacturing sites shall have a capacity of 2,000 – 3,000 pounds per square foot (psf) to support offshore wind components. At staging and integration sites, the wharf loading will be higher where the crane for turbine assembly is located. Existing crawler cranes, such as the Liebherr 1300, are not large enough to assemble turbines greater than 15 MW. Thus, ring cranes or larger crawler or mobile cranes will likely be required to integrate components, requiring a loading capacity of 6,000 psf on the wharf. Loading at O&M facilities is expected to range from 100 – 500 psf.

The size of a site is also dependent on the type of facility it is. For an O&M facility, the site shall be approximately 5 – 10 acres. For component manufacturing and staging and integration sites, a range of 30 – 100 acres is requested depending on the developer and their use.

Table 5. Port infrastructure requirements

Floating Offshore Wind Turbine	Approximate Criteria for Staging & Integration	Approximate Criteria for Component Manufacturing	Approximate Criteria for O&M
Acreage, minimum	30 – 100 acres	30 – 100 acres	5 – 10 acres
Wharf Length	1,500 ft [1]	800 ft	300 ft
Minimum Draft at Berth	38 ft	38 ft	20 – 30 ft
Draft at Sinking Basin [2]	40 – 100 ft	N/A	N/A
Wharf Loading	> 6,000 psf [3]	Up to 6,000 psf	100 – 500 psf
Uplands / Yard Loading (for WTG components)	> 2,000 – 3,000 psf	> 2,000 – 3,000 psf	N/A

[1] Minimum length for integration of two turbine systems and delivery of components.
[2] Options for transfer of floating foundation from land to water include use of semi-submersible barge and sinking basin, ramp system, or direct transfer methods (lifting portions or complete foundation units from land into water).
[3] Wharf loading under the crane.

4.6.2 Floating Foundation Type and Transfer to Water Activity

A semi-submersible floating foundation, constructed of either concrete, steel, or a hybrid combination, is the most probable technology to be used on the U.S. West Coast. A major challenge the industry identified is the transfer of the completed floating foundation from the assembly wharf into the water. Several options are available to overcome this challenge and each developer may prefer a different option; however, a few common approaches were identified:

- Semi-Submersible Barge: The floating foundation is moved from the wharf onto the barge and the barge is moved to a 40 – 100-ft-deep sinking basin where the foundation is floated off the barge.
- Ramp System: the floating foundation is moved onto a rail system and travels down a sloped ramp into the water. This methodology is similar to a marine railway ship launching system.
- Direct Transfer: Methods that include lifting the floating foundation directly from the wharf into the water (includes methods that involve placing pieces of the foundation into the water and finalizing the construction in the wet).

4.6.3 Wet Storage Requirements

Wet storage space is also required in addition to the water frontage and upland acreage. Ports must have locations where floating foundation or integrated turbines can be safely moored to the mitigate risk of weather downtime, vessel traffic, entrance channel congestion, and other transportation risks. This also allows the developers to store completed units to ensure they can deliver the lease area on schedule. The size of the wet storage area is dependent on the developer's strategy, deployment schedule, and downtime risk.

4.6.4 Additional Port Requirements

Several additional port requirements include the following:

- **Roll-on / Roll-off Capabilities:** Port sites shall have roll-on / roll-off (RORO) capability built into the wharf and yard to allow for a range of fabrication and assembly needs. Of particular importance would be to allow for inside port transfers between multiple facilities. This may require the construction of a sinking basin deeper than the proposed navigation channel depth.
- **Green Port:** New port terminals shall have infrastructure and equipment to support state and federal carbon reduction initiatives including electrification of the terminal operations and the ability to accommodate vessel shore power. Considering greenhouse gas emission reduction initiatives and desire to develop green ports, considerable load on the transmission grid may be needed. An assessment of power grid upgrades for the proposed development site will be needed to assess the range of power transmission upgrades needed to meet the vessel and terminal operational needs.
- **Shoreside Vessel Services**: Port sites will require all standard ship services (e.g., potable water), shore power and security requirements.
- **Buildings**: Indoor storage/warehouses are required for some items (e.g., floating foundation mechanical equipment, painting, welding, etc.).

4.7 Design Life

All new marine structures at the Port shall be designed for a 50-year service life. Design service life is generally considered as the period of time during which a properly built and maintained structure is expected to operate as designed without requiring major replacement or rehabilitation. With the typical service life of an offshore wind farm being at least 33 years, a 50-year service life for the port infrastructure is appropriate.

5 Existing and Planned Infrastructure Considerations

The Oregon International Port of Coos Bay is the largest deep-water coastal Port between San Francisco and the Puget Sound. Its strategic geographic position offers just 1-2 hours transit from the harbor to open water, providing approximately one day shorter transit times to major Asian ports than southern California Ports. The Coos Bay Federal Navigation Channel is just 15 miles in length with an authorized depth of -37 ft MLLW and 300-ft nominal width. The Port is working in partnership with the USACE on a project to deepen and widen the channel to -45 ft MLLW and 450-ft nominal width to accommodate larger vessel traffic from the channel entrance to RM 8.2 – as mentioned in **Section 4.3**. The project is currently at detailed engineering phase.

The Port owns approximately 2,000 acres within its district, much of which is industrially zoned for water dependent use. Much of this property is located on Coos Bay's North Spit, an area which the Port has identified as an optimal location for future industrial development. Properties in this area of the harbor are adjacent to the area of the Coos Bay Navigation Channel that is slated for deepening and widening activities, as well as adjacent or within close proximity to an industrial lead of the Coos Bay Rail Line. As global port congestion continues to persist, Coos Bay has available property that is ready for development.

The Port owns and operates the Coos Bay Rail Line, a short line railroad connecting to Class I rail service and the National Railway Network through the Union Pacific Yard in Eugene. The Coos Bay Rail Line is 134 miles in length and has received approximately $100 million in infrastructure improvements in the ten years the Port has owned the line, with another $35 million in repairs and rehabilitation work scheduled over the next two years. The Port currently has a grant pending through the newly established MEGA grant program that, if funded, would facilitate an additional $500 million in investment into the line, expanding tunnel clearances, providing full rehabilitation of the track, and addition of sidings to facilitate increased volumes.

Located directly on Highway 101, the Port connects to the I-5 corridor through a series of east-west State Highway corridors, including Highways 42, 38, and 126. OTH provides direct commercial flights to San Francisco International Airport year-round and seasonally to Denver International Airport.

Some of the existing and planned infrastructure projects at the Port set vertical and horizontal constraints on the movement of components (nacelle, towers, and blades) and fully assembled turbine through the Port. This includes features like bridges, FAA air restrictions, future projects, and the limits of the navigation channel, as shown in **Figure 9**.

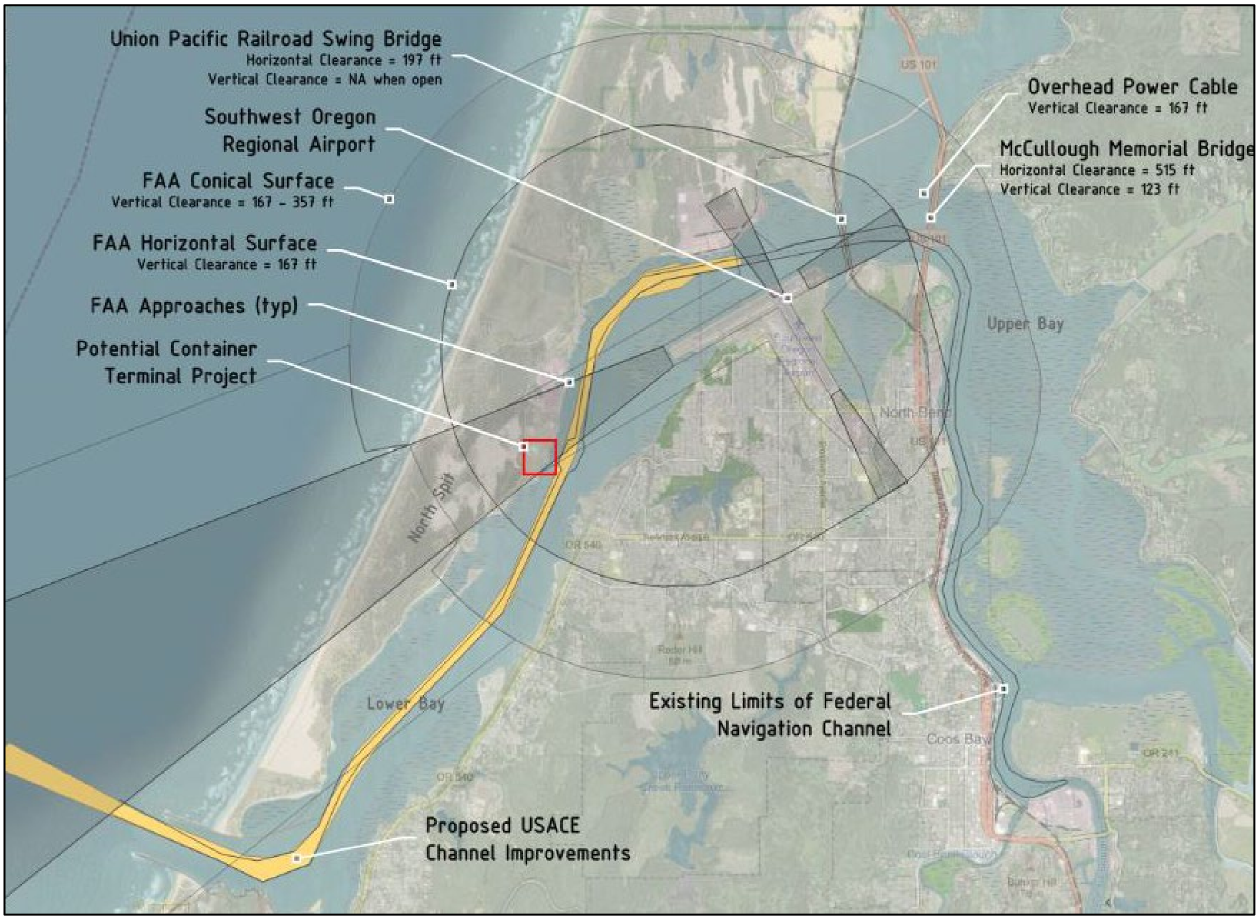

Figure 9. Existing and planned infrastructure considerations at Port of Coos Bay

5.1 Bridges / Navigational Restrictions

Two bridges cross over the navigation channel at the Port. The first bridge, located approximately at RM 9, is the Union Pacific Railroad Swing Bridge – refer to Figure 10 – and the second, at approximately RM 9.8, is the McCullough Memorial Bridge for Highway 101 – refer to **Figure 11**. In addition, just west of the McCullough Memorial Bridge, at 9.6 miles into the channel, there is an overhead power cable. The following outlines the horizontal clearances between the bridge piers and vertical clearance to pass under the bridges and overhead power cable.

- Union Pacific Railroad Swing Bridge
  - Horizontal Clearance = 197 ft
  - Vertical Clearance = Not applicable when open

- McCullough Memorial Bridge
  - Horizontal Clearance = 515 ft
  - Vertical Clearance = 123 ft

- Overhead Power Cable
  - Authorized Vertical Clearance = 167 ft

Based on these restrictions, the S&I sites must be located west of the bridges to allow for unrestricted vertical clearances during integration and tow out. Component manufacturing facilities (nacelles, towers, and blades) will not service fully assembled floating offshore wind turbines and, therefore, do not have these same air draft restrictions and can be located "behind" or east of the bridges.

Figure 10. Union Pacific Railroad swing bridge

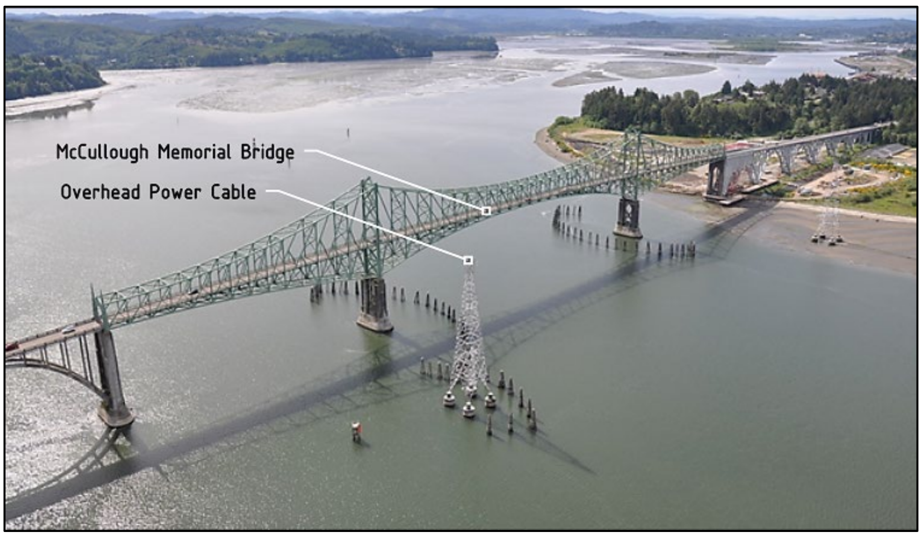

Figure 11. McCullough Memorial Bridge (Highway 101) and overhead power cable

5.2 Southwest Oregon Regional Airport

Located in North Bend in the Port of Coos Bay is the OTH. The OTH covers approximately 619 acres of land and has four approaches. With the navigation channel wrapping around the airport, potential port sites to support the offshore wind industry may be within the vicinity of the OTH. Determining the compatibility of these sites with aircraft and airport operations is the responsibility of the FAA, ODA, and Coos County Airport Authority (Airport Authority).

One of the governing codes that provides standards for identifying obstructions to air navigation and outlines the primary, approach, transitional, horizontal, and conical surfaces is the Code of Federal Regulations (CFR) Part 77 (Part 77). Based on initial assessment, the fully assembled turbines will exceed the criteria set by Part 77 when towed through the navigation channel, triggering the requirement to notify the FAA in advance of any construction activities. The Part 77 criteria is listed below and depicted in **Figure 9** and **Figure 12**. **Section 7.5** summarizes the preliminary analysis of potential impacts OTH has on offshore wind development.

- Part 77 Horizontal Surface Elevation = 167 ft
- Part 77 Conical Surface Elevation = 167 – 357 ft (Slope = 20:1)
- Part 77 Approach Slope = 40:1

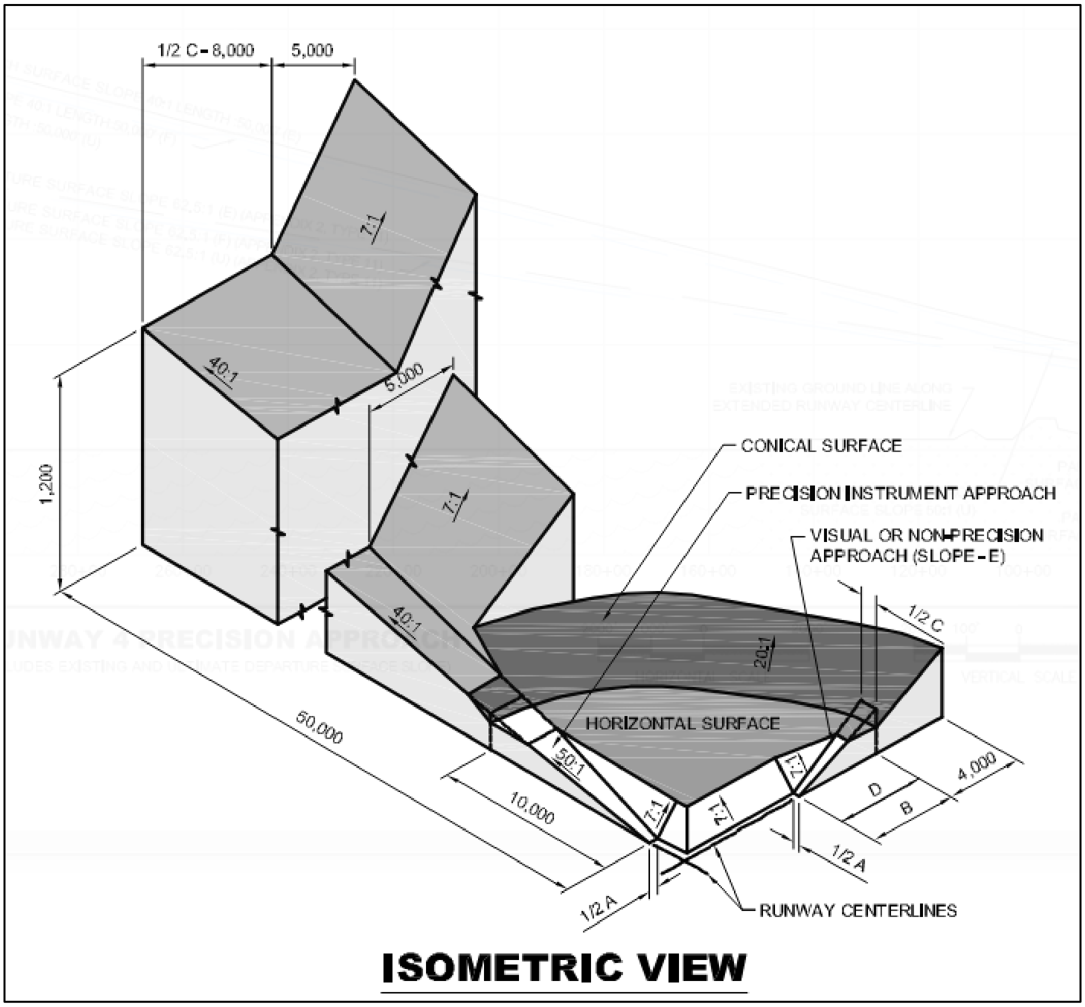

Figure 12. FAA Part 77 surfaces for Southwest Oregon Regional Airport (OTH 2013)

5.3 Federal Navigation Channel

The Coos Bay Federal Navigation Channel is just 15 miles in length with an authorized depth of -37 ft MLLW and 300-ft nominal width. The Port is working in partnership with the USACE on a project to deepen and widen the channel to -45 ft MLLW and 450 ft nominal width to accommodate larger vessel traffic from the channel entrance to River Mile 8.2 – as mentioned in **Section 4.3**. Completion of the USACE Proposed Channel Modification Project is critical for meeting the needs of the offshore wind industry at the Port. Relying on the existing channel, 37-ft-deep by 300-ft-wide would result in a significant constraint on the type and size of device that can be assembled within the Port of Coos Bay and subsequently towed out of the Port. Per the Port of Coos Bay, the estimated completion date of the USACE Proposed Channel Modification Project is approximately 2027/2028.

Traditionally, the necessary navigation channel width is on the order of 1.5 to 2 times the vessel or device beam. For new navigation channels this can be designed for; however, with existing channels, such as that at the Port, developers will need to confirm the foundation/device type and size that can safely navigate the channel. Ultimately this will be determined with a maneuvering study customized for the foundation / device, tug operations plan, hydrodynamic conditions, and wind conditions at the time of tow out.

The following should also be further evaluated:

- Evaluate proposed navigation channel improvements to confirm adequacy for offshore wind industry use or if additional improvements will be required.
- Evaluate required space and improvements required to provide adequate wet storage within the Port.
- Evaluate maritime use and navigational impact to other maritime users within the channel and at the channel entrance.
- Evaluate potential for downtime for facilitating deployment to the wind farm relative to metocean and bar channel conditions.
- Coordinate with U.S. Coast Guard regarding "dead ship" towing operations to solicit input for development of a navigation tow out plan.
- Evaluate the need and depth of a sinking basin for transfer of floating foundations from land to water.

5.4 Potential Container Terminal Project

Within the Port of Coos Bay on the North Spit, as shown in **Figure 9**, there is the potential for the development of a container terminal. The proposed container terminal is planned for more than 1 million 40-foot containers (2 million twenty equipment units (TEUs)) per year of throughput (Snow 2022). If the project moves forward, close coordination will be needed to balance vessel traffic between container and offshore wind operations.

6 Site Screening Analysis

On 18 May 2022, BOEM, the Port of Coos Bay, and M&N, along with subconsultants Precision Approach and Harris Environmental Group, held a screening workshop to screen and rank 15 potential sites. **Figure 9** shows the locations of these sites.

1. Former Sitka Dock
2. City of Coos Bay Hollering Place
3. Cape Arago Dock / Sause Brothers
4. North Bay Marine Industrial Park
5. D.B. Western
6. Southport Lumber Company
7. Henderson Ranch
8. Jordan Cove West
9. Roseburg Forest Products
10. Jordan Cove East
11. Al Pierce Lumber Company
12. Ocean Terminals Dock
13. Bayshore Dock
14. Eastside Port Parcel
15. Terminal 1

Sites were screened down based on the following criteria including environmental considerations, OTH impacts, and port infrastructure requirements. Although there are other important factors to consider prior to selecting a site, such as robust stakeholder engagement, this study is focused on screening criteria that reduces the quantity of sites based on operational, engineering feasibility, and high level environmental / permitting impacts.

6.1 Environmental Considerations

Harris Environmental Group, Inc. (Harris Environmental) provided environmental review of the 15 sites for potential development of the offshore wind energy infrastructure at Port of Coos Bay, Oregon. The review included research and investigation of environmental and biological resources related to the proposed scope of work via desktop review, with the results presented in a tabular/matrix format to facilitate comparisons between sites. Refer to **Appendix A** for the full assessment.

Environmental and biology-specific considerations included research into land use, critical habitat, Endangered-Species Act (ESA) listed species, water dependent designations, known aquatic vegetation (eelgrass/macroalgae), nesting shorebirds, and marine mammal haul out sites.

Land use was a high-level query of land use classifications, with parcel-specific data collected from an Environmental Systems Research Institute (ESRI)-supported online map service maintained by Coos County. Critical habitat and ESA-listed species information, including endangered, threatened, and candidate species, was obtained through individual parcel-specific queries with the U.S. Fish and Wildlife Service through the agency's Information for Planning and Consultation (IPaC) service. Information related to water dependent designations, including known wetlands, floodplains, designated coastal areas, and important farmland was also gathered from the IPaC queries, but also included calculations of wetland types and total wetland areas within each parcel to determine what percentage of each parcel contained wetlands. The latter was completed through GIS with wetland data and surface waters as defined by Cowardin et al. (1979) from the National Wetlands Inventory.

The review of known aquatic vegetation included the use of the Oregon Coastal Atlas to investigate into the potential for aquatic plants such as eelgrass or macroalgae. The presence of "Biotic Group: Seagrass Bed," which includes tidal aquatic vegetation beds dominated by seagrass or eelgrass species, was noted in the tabular matrix if the bed existed within or near-to the parcel shoreline. Additionally, the total number of distinct Coastal and Marine Ecological Classification Standard (CMECS) codes for each parcel was provided. Nesting shorebirds was a high-level review of the confirmed sightings of ESA-listed species as well as known sightings of nesting birds protected under the Migratory Bird Treaty Act

(MBTA 1918) on the EBird online database. The review also included whether each parcel was within or deemed "close" to Western Snowy Plover Management Areas, with distances provided. Marine mammal haulout sites for pinniped (seal and sea lion) species were gathered from survey maps provided by Oregon Department of Fish and Wildlife (ODFW).

All 15 of the potential sites are located either within, or immediately adjacent to a large Traditional Cultural Property (TCP) that encompasses the entirety of Coos Bay and its tributaries. The Oregon Archaeological Records Remote Access (OARRA) database, the main source of information for this analysis, does not have information on this TCP, but indicates that one should "Contact tribe for copy of nomination." Tribes to be contacted/consulted are the Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians, and the Coquille Indian Tribe. Each potential project site was researched and ranked with three levels, red, yellow, and green, depending on the number and types of sites that are located either within their borders or immediately adjacent to their borders. Green-level sites are clear of previous cultural resources, and several have been previously (negatively) surveyed. Nevertheless, they will require consultation with State Historic Preservation Offices (SHPO) and tribes to develop. The yellow-level sites have previously identified archaeological deposits within their boundaries, and many will require excavation permits and extensive SHPO and tribal consultation to disturb/develop within them. The red-level sites contain previously documented human remains – either a cemetery site or a reported shell midden with human remains, and development within them should be avoided.

6.2 OTH Impacts

The analysis performed by Precision Approach Engineering, Inc. was limited to a preliminary evaluation of airspace and airport impacts and informal discussions with several FAA Lines of Business in May and June of 2022. The following codes, standards, and references were used to screen potential sites. Refer to **Section 7.5** and **Appendix B** for this analysis.

- 14 Code of Federal Regulations (CFR) Part 77 (Part 77) – Safe, Efficient Use, and Preservation of the Navigable Airspace
    - Provides standards for identifying obstructions to air navigation.
    - Part 77 describes the primary, approach, transitional, horizontal, and conical surfaces.
- FAA Order 8260.3E - United States Standard for Terminal Instrument Procedures (TERPS)
    - Prescribes criteria to design and evaluate Instrument Flight Procedures.
    - Specifies the minimum measure of obstacle clearance to provide a satisfactory level of vertical protection from obstructions for Instrument Flight Procedures.
- FAA Advisory Circular 150/5300-13B – Airport Design
    - Prescribes the criteria to evaluate runways serving only visual operations.
    - Provides basic planning surfaces for instrument runways to protect select TERPS surfaces.
- Oregon Revised Statute 836.535 (ORS 836.535) – Hazards to Air Navigation Prohibited, Exceptions; 2021 edition
    - Prohibits hazards to air navigation with exceptions as noted in the statute.

6.3 Site Screening

Sites were further screened and ranked based on port infrastructure requirements. Site characteristics such as water frontage, upland acreage, site elevation, and required upland improvements were compared with the necessary requirements identified in **Section 4.6**. Location and impacts from existing infrastructure such as the airport and bridges were also considered.

The following color-coding system is used to identify a site's potential for offshore wind development per facility type, as shown in **Figure 13**. **Table 6** documents the 'Pros' and 'Cons' for each site, select items are bolded to signify what helped categorize the site.

The information shown in **Figure 13** is summarized below.

Staging & Integration (S&I) Sites:

- Good candidate sites: Henderson Ranch (7) and Jordan Cove West (8)
- Moderate candidate sites: Former Sitka Dock (1) and Jordan Cove East (10)
- Not a candidate: all other sites not listed

Manufacturing / Fabrication (MF) Sites:

- Good candidate sites: Henderson Ranch (7), Jordan Cove West (8), Eastside Port Parcel (14), and Terminal 1 Site (15)
- Moderate candidate sites: Former Sitka Dock (1), Jordan Cove East (10), and Al Pierce Lumber Co (11)
- Not a candidate: all other sites not listed

Operations & Maintenance (O&M) Sites:

- Good candidate sites: Former Sitka Dock (1), Henderson Ranch (7), Jordan Cove West (8), Ocean Terminals Dock (12), Eastside Port Parcel (14), and Terminal 1 Site (15)
- Moderate candidate sites: Jordan Cove East (10) and Al Pierce Lumber Co (11)
- Not a candidate: all other sites not listed

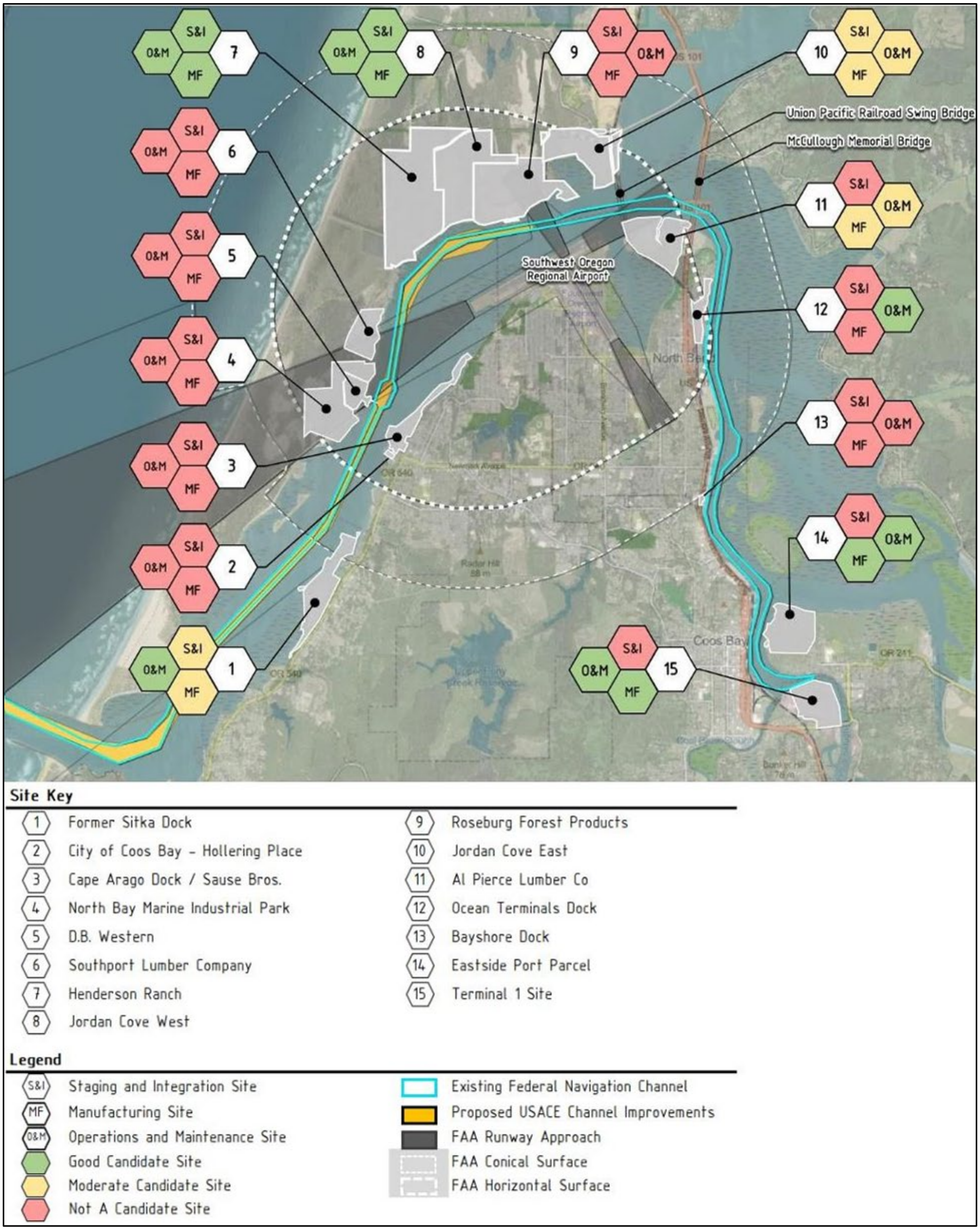

Figure 13. Port of Coos Bay site screening plan

Table 6. Site screening for offshore wind development

Site	Pros	Cons
1. Former Sitka Dock	• 2,000 feet of waterfront • Unrestricted air draft from bridges • Land use is zoned industrial with improvements • **Outside of FAA Part 77 Horizontal Surface**	• **40 acres** • Needs heavy lift wharf, upland improvements, and significant berth pocket dredging • Privately owned • Currently an RV resort • **Located near residential areas** • Potential eelgrass, large vegetation bed along the coast • Potential cultural resource sites • Marine mammal haul outs • Site has wetlands • Approximately 600 ft of the northern portion of the site is within FAA Part 77 conical surface, majority of site is outside of conical surface
2. City of Coos Bay Hollering Place	• Unrestricted air draft from bridges • No cultural resource sites • No shorebirds • No marine mammal haul outs • No wetlands	• **2 acres** • 200 feet of waterfront • Needs heavy lift wharf, upland improvements, and berth pocket dredging • Land use is miscellaneous • Owned by the City • **Historical site** • **Located near residential areas** • Potential eelgrass, large vegetation bed along the coast • Inside FAA Part 77 horizontal and conical surface
3. Cape Arago Dock / Sause Brothers	• 2,000 feet of waterfront • Unrestricted air draft from bridges • Land use is zoned industrial with improvements • No marine mammal haul outs • No shorebirds	• 20 acres • Needs heavy lift wharf, upland improvements, and berth pocket dredging • Land use is miscellaneous • Privately owned • **Known cultural resources** • **Located near residential areas** • Needs heavy lift wharf, upland improvements, and berth pocket dredging • Site has wetlands. • Inside FAA Part 77 horizontal and conical surface
4. North Bay Marine Industrial Park	• 160 acres • 1,500 feet of waterfront • Owned by the Port • Unrestricted air draft from bridges • No marine mammal haul outs • Minimal wetlands	• Needs heavy lift wharf, upland improvements, and berth pocket dredging • Land use is miscellaneous • Known cultural resource site • Potential eelgrass, large vegetation bed along the coast • Shorebirds • Site has wetlands. • **Inside FAA Flight Path** • **Inside FAA Part 77 approach, horizontal, and conical surface**

Site	Pros	Cons
5. D.B. Western	• 1,500 feet of waterfront • Unrestricted air draft from bridges • Land use is zoned industrial with improvements • No cultural resource sites • No marine mammal haul outs • No shorebirds • Minimal wetlands	• 40 acres • Needs heavy lift wharf, upland improvements, and berth pocket dredging • Privately owned • Planned for future development for containers • Shorebirds • ESA listed endangered, threatened, and candidate species are found on or near area • **Inside FAA Flight Path** • **Inside FAA Part 77 approach, horizontal, and conical surface**
6. Southport Lumber Company	• 1,500 feet of waterfront • Unrestricted air draft from bridges • Land use is zoned industrial with improvements • No cultural resource sites • No marine mammal haul outs • Minimal wetlands	• 30 acres • Needs heavy lift wharf, upland improvements, and berth pocket dredging • Privately owned • Active mill site • Potential eelgrass, small bed in northeast corner of site • Shorebirds • **Inside FAA Flight Path** • **Inside FAA Part 77 horizontal, and conical surface**
7. Henderson Ranch	• **350 acres** • **5,000 feet of waterfront** • Owned by the Port • Unrestricted air draft from bridges • No marine mammal haul outs	• Needs heavy lift wharf, upland improvements, and berth pocket dredging • Land use is miscellaneous • Known cultural resource site • Potential eelgrass, small bed in southeast corner of site • Shorebird • **Site has wetlands** • Inside FAA Part 77 horizontal and conical surface
8. Jordan Cove West	• **200 acres** • **1,500 feet of waterfront** • Unrestricted air draft from bridges • Land use is zoned industrial with improvements • No shorebirds • No marine mammal haul outs • **Minimal wetlands**	• Needs heavy lift wharf, upland improvements, and berth pocket dredging • Privately owned • **Known cultural resource site** • Inside FAA Part 77 horizontal and conical surface
9. Roseburg Forest Products	• 230 acres • 1,500 feet of waterfront • Unrestricted air draft from bridges • Land use is zoned industrial with improvements • No shorebirds • No marine mammal haul outs • Minimal wetlands	• Needs heavy lift wharf, upland improvements, and berth pocket dredging • Privately owned • **Known cultural resource site** • **Inside FAA Flight Path** • Inside FAA Part 77 horizontal and conical surface

Site	Pros	Cons
10. Jordan Cove East	• **150 acres** • **2,000 feet of waterfront** • Unrestricted air draft from bridges • Land use is zoned industrial with improvements • No shorebirds • No marine mammal haul outs	• Needs heavy lift wharf, upland improvements, and berth pocket dredging • Privately owned • **Known cultural resource site** • **Potential eelgrass, large bed along south shoreline** • ESA listed endangered, threatened, and candidate species are found on or near area • **Site has wetlands** • Inside FAA Part 77 horizontal and conical surface
11. Al Pierce Lumber Company	• **100 acres** • **3,000 feet of waterfront** • Land use is zoned industrial • No cultural resources • No marine mammal haul outs	• 197 feet vertical air draft restriction • Needs heavy lift wharf, upland improvements, and berth pocket dredging • Privately owned • **Potential eelgrass, large bed along north shore** • Shorebirds • **Site has wetlands** • **Within the OTH runway** • Inside FAA Part 77 horizontal and conical surface
12. Ocean Terminals Dock	• 40 acres • 2,000 feet of waterfront • Land use is zoned industrial with improvements • No cultural resources • No shorebirds • Minimal wetlands	• 123 feet vertical navigation restriction • 515 feet horizontal navigation restriction • Needs heavy lift wharf, upland improvements, and berth pocket dredging • **Privately owned** • Marine mammal haul out • Inside FAA Part 77 horizontal and conical surface
13. Bayshore Dock	• 500 feet of waterfront • Land use is zoned industrial with improvements • No cultural resources • No shorebirds • Minimal wetlands • Outside FAA Part 77 horizontal and conical surface	• **3 acres** • 123 feet vertical navigation restriction • 515 feet horizontal navigation restriction • Needs heavy lift wharf, upland improvements, and berth pocket dredging • **Privately owned** • Marine mammal haul out
14. Eastside Port Parcel	• **120 acres** • **2,500 feet of waterfront** • **Owned by the Port** • No cultural resources • No marine mammal haul outs • **Outside FAA Part 77 horizontal and conical surface**	• 123 feet vertical navigation restriction • 515 feet horizontal navigation restriction • Land use is zoned as miscellaneous/residential • Needs heavy lift wharf, upland improvements, and berth pocket dredging • Greenfield site • Shorebirds • **Significant amount of wetlands**

Site	Pros	Cons
15. Port of Coos Bay Terminal 1 Site	• **100 acres** • **3,000 feet of waterfront** • **Owned by the Port** • Partially developed • No cultural resources • No marine mammal haul outs • Minimal wetlands • **Outside FAA Part 77 horizontal and conical surface**	• 123 feet vertical navigation restriction • 515 feet horizontal navigation restriction • Land use is zoned as miscellaneous/residential • Needs heavy lift wharf, upland improvements, and berth pocket dredging • Shorebirds

7 Port Improvements Assessment

Based on the site screening analysis, the top ranked sites for each facility type were identified. The following sections describe how these sites were determined and the required infrastructure upgrades needed to support offshore wind. Conceptual layouts and cost estimates are also provided for three of the sites.

7.1 Staging and Integration Sites

The ranking of potential staging and integration sites is as follows:

1. Jordan Cove West
2. Henderson Ranch
3. Former Sitka Dock

Staging and integration sites must be located west of the existing bridges so fully assembled turbines can be towed out to sea without any vertical or horizontal clearance issues. Thus, Sites #11 – 15 were eliminated for staging and integration. Furthermore, due to being within the flight path for the main runway and instrument approach of the OTH, North Bay Marine Industrial Park, D.B. Western, Southport Lumber Company, and Roseburg Forest Products (Sites #4, 5, 6, and 9) are also eliminated for staging and integration. Due to site size and cultural resources, the City of Coos Bay – Hollering Place (Site #2) and Cape Arago Dock / Sause Brothers were screened out for staging and integration.

Jordan Cove West and Henderson Ranch are ranked above the Former Sitka Dock site because they both have ample acreage for staging components compared to the 40 acres at Former Sitka Dock. Jordan Cove West is ranked above Henderson Ranch because it has less wetlands, which in turn means less environmental mitigation is needed to develop the site.

Figure 14 shows a conceptual layout of a staging and integration site at Jordan Cove West. This figure also includes Henderson Ranch as available space for floating offshore wind facility expansion. A larger layout can be found in **Appendix C**. The following necessary upgrades were identified to develop the two sites for the offshore wind industry.

Jordan Cove West Upgrades:

- Heavy lift wharf that can withstand 6,000 psf (1,500 ft)
- Upland improvements that can withstand 3,000 psf (80 acres)
- Dredging at the berth pocket down to -38 ft MLLW
- Environmental mitigation

Henderson Ranch Upgrades:

- Heavy lift wharf that can withstand 6,000 psf (750 ft)
- Upland improvements that can withstand 3,000 psf (60 acres)
- Dredging at the berth pocket down to -38 ft MLLW
- Environmental mitigation

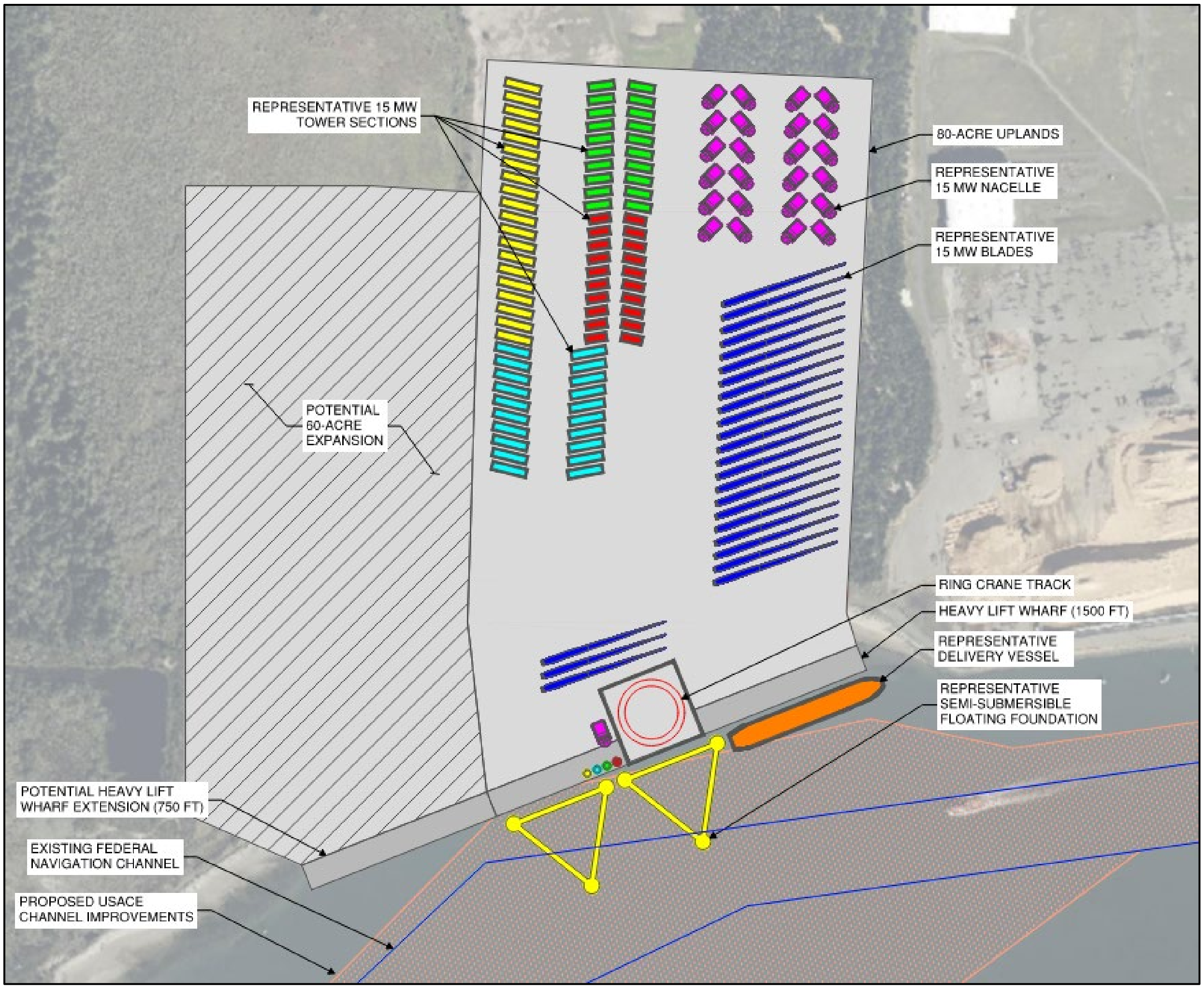

Figure 14. S&I site at Jordan Cove West & Henderson Ranch

A 3D rendering of a potential S&I site at Jordan Cove West from the Coos Bay Offshore Wind Port Infrastructure Study by Mott MacDonald (Mott MacDonald 2022) is shown in **Figure 15.**

Figure 15. 3D rendering of example integration facility at Jordan Cove West (Mott MacDonald 2022)

7.2 Component Manufacturing Sites

The ranking of potential component manufacturing sites is as follows:

1. Terminal 1
2. Eastside Port Parcel

Since manufacturing sites do not have the same air draft navigation limitations as S&I sites, they can be located behind the bridges. Of the potential manufacturing sites, Terminal 1 and Eastside Port Parcel are the most optimal because they are already owned by the Port and have at least 100 acres of space. Terminal 1 is preferrable over Eastside Port Parcel because it is not a greenfield location and there has been some previous development. The following upgrades are needed for both sites:

- Heavy lift wharf that can withstand 3,000 psf
- Upland improvements that can withstand 3,000 psf
- Dredging at the berth pocket down to -38 feet MLLW
- Manufacturing facility
- Environmental mitigation

Figure 16 shows a conceptual layout of Port of Coos Bay Terminal 1 as a blade manufacturing site and **Figure 17** shows Eastside Port Parcel as a nacelle and tower manufacturing site. **Figure 18** shows the offshore wind development potential at the Port of Coos Bay. Larger layouts can be found in **Appendix C**.

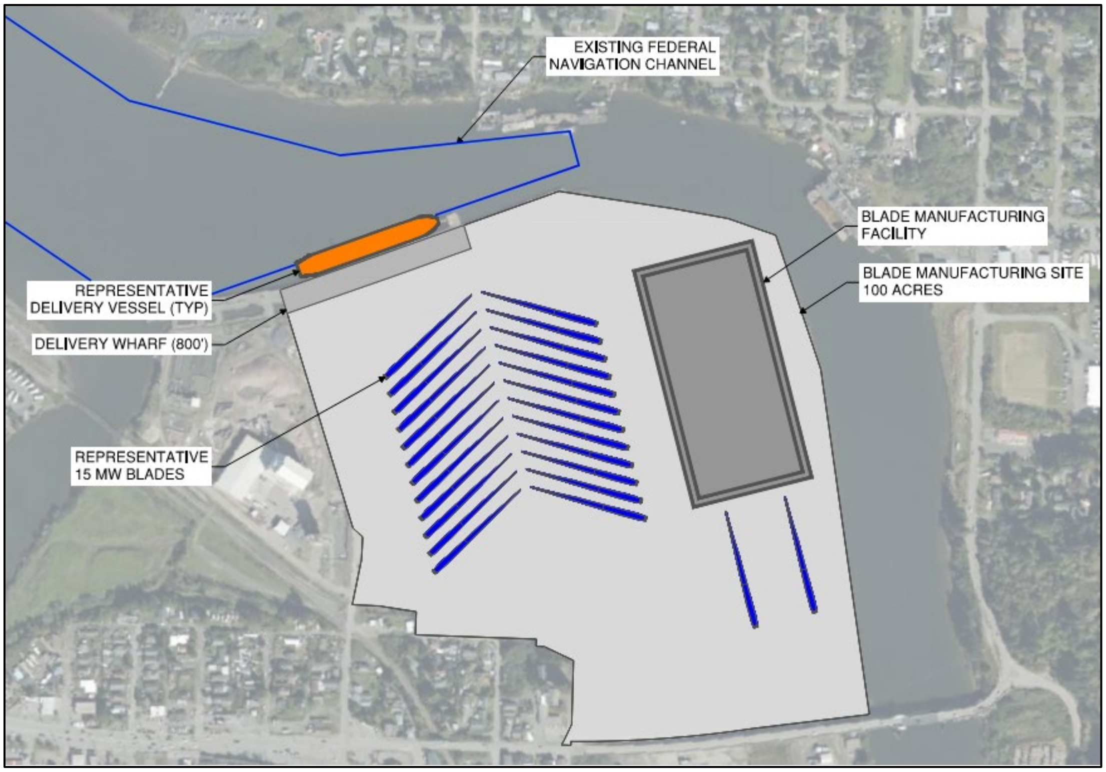

Figure 16. Blade manufacturing site at Terminal 1

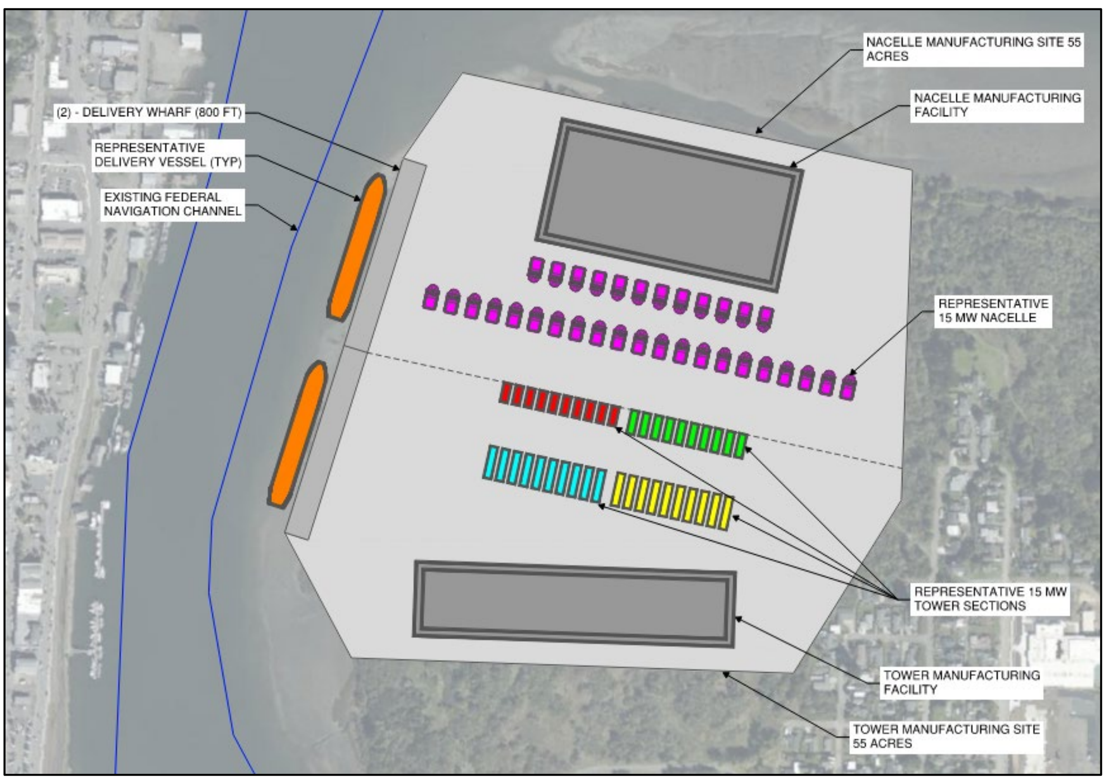

Figure 17. Tower and nacelle manufacturing site at Eastside Port Parcel

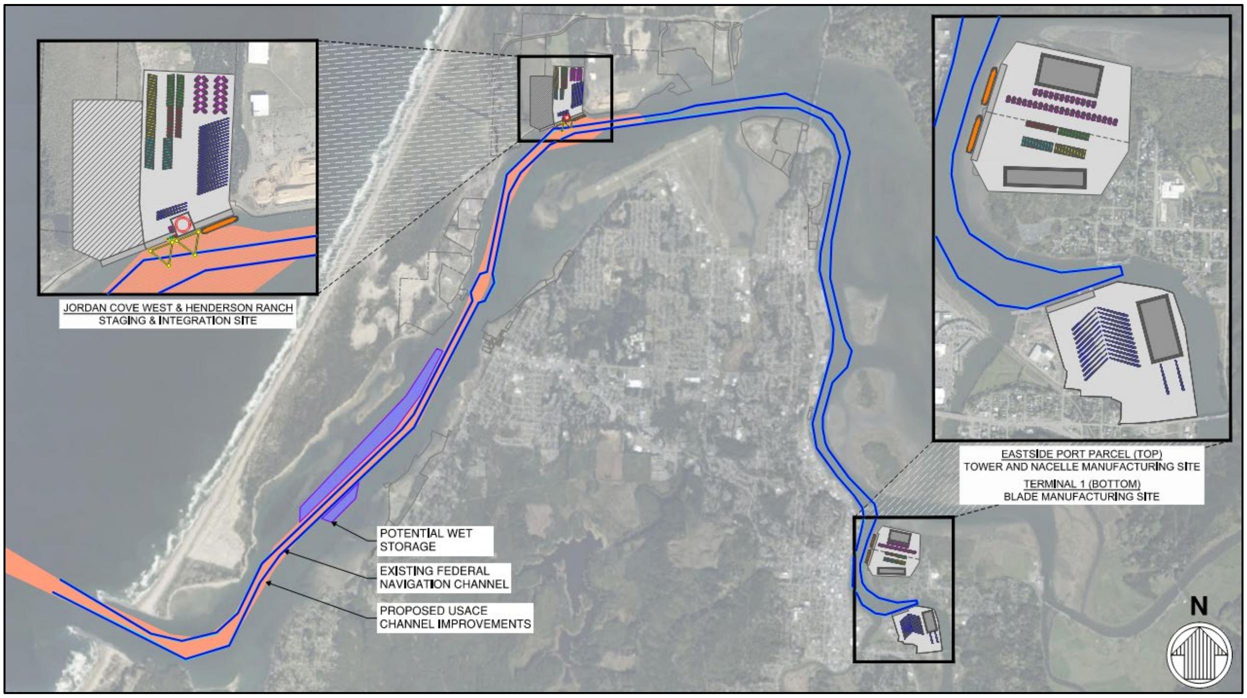

Figure 18. Coos Bay offshore wind port with selected sites

7.3 Operations and Maintenance Sites

The ranking for O&M sites are as follows:

1. Jordan Cove West
2. Terminal 1
3. Henderson Ranch

Since O&M sites do not require significant acreage or a heavy lift wharf, it is likely that O&M sites will be added onto an already developed staging and integration site or manufacturing site. As shown in **Figure 9**, sites that have been identified as candidates for S&I sites or component manufacturing sites, are also possible candidates for O&M facilities. General infrastructure upgrades for an O&M facility include:

- Wharf / dock
- Dredging at the berth pocket down to -25 feet MLLW

7.4 Cost Estimates

For the highest ranked sites, an evaluation was completed to determine the required improvements and estimated cost to develop the site for offshore wind industry use. See **Table 7** for a potential build out scenario of the Port to include S&I at Jordan Cove West and Henderson Ranch, blade manufacturing site at Terminal 1, and tower and nacelle manufacturing site at Eastside Port Parcel.

Table 7. Summary of infrastructure improvements and cost at top ranked sites

Item	Jordan Cove West	Henderson Ranch	Terminal 1
Site Type	Staging & Integration	Staging & Integration	Manufacturing
Wharf Improvement	1,500-ft-long wharf 6,000 psf capacity	750-ft-long wharf 6,000 psf capacity	800-ft-long wharf 6,000 psf capacity
Uplands Improvement	80 acres to +15 ft 2,000 – 3,000 psf capacity	60 acres to +15 ft EL 2,000 – 3,000 psf capacity	90 acres to +15 ft EL 2,000 – 3,000 psf capacity
Dredging	Berth Pocket -38 ft MLLW	Berth Pocket -38 ft MLLW	Berth Pocket -38 ft MLLW
Cost Estimate	$400M	$230M	$260M
Cost Accuracy Range	$200M - $800M (-50% / +100%)	$115M - $460M (-50% / +100%)	$130M - $520M (-50% / +100%)

A budgetary cost estimate was prepared to an AACE Class 5 level of accuracy where the typical expected variation in the low range is -20% to -50% and +30% to +100% on the high range. The cost estimate does not include improvements for the USACE Proposed Channel Modification Project or any additional channel improvements to support the offshore wind industry, such as wet storage or additional widening and deepening. Cost to dredge a sinking basin varies based on depth required with the following estimated costs: 60-ft-deep sinking basin is approximately $75 million ($40 – $150 million with -50% to +100% accuracy), 80-ft-deep sinking basin is approximately $175 million ($90 – $350 million with -50% to +100% accuracy), and 100-ft-deep sinking basin is approximately $330 million ($165 – $660 million with -50% to +100% accuracy).

7.5 OTH Airport Impacts Preliminary Analysis

From the preliminary screening analysis, it was identified that all potential staging and integration sites within the Port of Coos Bay will impact the OTH Part 77 surfaces, runway end and threshold siting standards, and/or TERPS. Of the identified sites, the Former Sitka Dock, Henderson Ranch, and Jordan Cove West have the least impacts on the airport. **Table 8** summarizes these impacts.

Table 8. OTH impacts preliminary analysis summary

Preliminary Analysis Element	Former Sitka Dock	Henderson Ranch	Jordan Cove West
14 CFR Part 77	3 ~601' penetration to Part 77.17 (1) Surface and a portion of the site lies within the conical surface	3 ~950' penetration to horizontal surface at southern edge of site	3 ~950' penetration to horizontal surface at southern edge of site
AC 150/5300-13B Section 3.6 Runway End and Threshold Siting Standards; Large airplane surface 3, IFR circling surface 4, and instrument departure surface 7	1 Outside of horizontal limits of surfaces	1 Majority of site is outside of horizontal limits of surfaces (Northeast portion within horizontal limits of instrument departure surface 7 – Surface El. ~205' MSL at critical location)	3 Easternmost portion within horizontal limits of large airplane surface 3 and IFR Circling surface 4 (Surface El. ~280' MSL at critical location) North quarter of site within horizontal limits of instrument departure surface 7 (Surface El. ~145' MSL at critical location)
Terminal Instrument Procedures (TERPS)	2 Increase in Cat A/B/C/D Circling vertical minimums and horizontal visibility	3 Increase in Cat A/B Circling vertical minimums and horizontal visibility All Instrument Approaches Not Authorized (NA) during transit times	3 Increase in Cat A/B Circling vertical minimums and horizontal visibility All Instrument Approaches Not Authorized (NA) during transit times
Preliminary OSW staging and integration sites ranking for airspace and airport compatibility	**Lesser degree of impacts**	**Significant degree of impacts**	**Significant degree of impacts**

Color Coding Legend

1 Site is not anticipated to have a significant impact to element listed.
2 Site is anticipated to impact element listed to a lesser degree and mitigation with limited impacts to airport operations may be possible. Further discussion with FAA and project stakeholders is required to determine the extent of impacts and potential mitigation options.
3 Site is anticipated to impact element listed to a significant degree and ability to mitigate impacts is unknown at this time. Further discussion with FAA and stakeholders is required to determine the extent of the impacts and potential mitigation options.

To notify the FAA of any proposed project, the FAA Form 7460-1 must be submitted. Since the proposed project is anticipated to exceed the criteria contained in Part 77, an airspace case will be initiated and circulated within the FAA and to the public. Oregon law, ORS 836.535, also requires notification of the proposal. The FAA and ODA will analyze the proposal's impact on airspace, airport operations, navigational aids, and instrument flight procedures (IFPs). The FAA analysis will include the proposal's effect with respect to Part 77, TERPS surfaces, and the runway end and threshold siting standards. The FAA's determination of whether an obstruction is a "hazard to air navigation" may only be made after a formal airport airspace analysis.

The FAA has no authority to direct any action concerning the height or location of an object, even if it is determined to be a hazard. However, the agency may recommend modifications to runway ends or landing thresholds, list the object in appropriate FAA publications, amend or cancel IFPs, raise the angle of visual approach aids, or require obstruction marking and lighting. With the FAA having no direct authority to prohibit a project, state and local zoning codes will determine if a project proceeds or not. Typically, jurisdictions and agencies will not approve a project if the FAA has issued a finding of "hazard to air navigation."

Before a decision can be made about the viability of the offshore wind industry coexisting with OTH, further analysis with the FAA, Airport Authority, Port, BOEM, and other project stakeholders is required based on the findings of this preliminary analysis. Upon electing to move forward with the project, additional collaboration with the Airport Authority should take place followed by Port submittal of the FAA Form 7460-1 for the chosen site(s) for formal FAA and ODA determination of project impacts. Stakeholders should be prepared to discuss potential mitigation options at the local level, followed by additional discussions at higher levels of the FAA depending on the extent of impacts noted in the determination(s).

Airport Relocation

During industry outreach, project stakeholders have asked about the possibility of relocating OTH if the impacts associated with the development of the offshore industry at the Port of Coos Bay cannot be satisfactorily mitigated. Generally, relocating a public use commercial service airport is a complicated and costly undertaking involving in-depth planning, environmental studies, permitting, engineering and cost analysis. Federal, state, and local coordination would be required.

OTH was transferred from the U.S. War Assets Administration to the City of North Bend in 1947 by an Instrument of Transfer numbered WAA-32-RPD-171. Transfers of this type were authorized under Regulation 16 of the 1946 Airport Act, "That upon a breach of any of the reservations, restrictions, or conditions by the immediate or any subsequent transferee, the title, right of possession, or other right transferred shall at the option of the Government revert to the Government upon demand;…" which required the return of the property to the U.S. Government if the property is no longer used as an airport.

Prior to any relocation work, the airport sponsor would review the original transfer document to determine if this clause is in effect. If it is, only FAA Headquarters can release this condition and allow the airport sponsor to relocate an existing airport without reversion of the property to the U.S. Government. In addition to the possible loss of the property, the airport sponsor will incur other substantial costs to relocate an airport.

Airport sponsors typically accept numerous FAA grants for airport development. The grants come with the obligation to operate and maintain the facilities funded with FAA funds for 20 years and keep land purchased with FAA funds in perpetuity, otherwise a pro-rated amount of the federal investment must be paid back to the Airport and Airway Trust Fund. Depending on the specific terms, notice may need to be placed in the Federal Register and public hearings may be required.

Aside from the Federal obligations, an airport sponsor will have to negotiate revisions to the aviation service contracts, leases and agreements of the commercial air carrier, fixed base operator, hangar tenants and other related airport businesses.

Siting and construction of a new airport is increasingly difficult and includes site selection, environmental studies, permitting, land acquisition, engineering, and construction. Agreements for FAA navigational aids and air traffic control would have to be negotiated and funded. For past airport relocations, the FAA has required the airport owner to sell the existing airport at fair market value and invest the proceeds in the new airport.

Before a decision can be made about the viability of the offshore wind industry coexisting with OTH, further analysis with the FAA, Airport Authority, Port, BOEM, and other project stakeholders is required based on the findings of this preliminary analysis. Upon electing to move forward with the project, additional collaboration with the Airport Authority should take place followed by Port submittal of the FAA Form 7460-1 for the chosen site(s) for formal FAA and ODA determination of project impacts. Stakeholders should be prepared to discuss potential mitigation options at the local level, followed by additional discussions at higher levels of the FAA depending on the extent of impacts noted in the determination(s).

Appendix B provides more details on the preliminary analysis of the OTH airspace and airport compatibility with the potential offshore wind sites at the Port of Coos Bay.

8 Recommended Next Steps

The Port of Coos Bay is well situated to support commercial scale build-out of offshore wind in Oregon. The largest risk to development is verifying that the offshore wind industry can coexist with the existing airport operations. Additionally, it is anticipated that the proposed channel improvement project as currently proposed will be required and it is likely additional channel improvements are required to support the offshore wind industry. The following actions are recommended as next steps to confirm feasibility and to continue to progress plans for developing the Port to be an offshore wind hub:

- **Deployment Targets:** Determine required quantity and investment required for port sites to support federal and state goals for deployment (GW and timeline) of offshore wind in Oregon.
- **OTH Airport Operations:** Submit FAA Form 7460-1 to begin formal coordination between the FAA, Airport Authority, Port, and BOEM to determine airport impacts and strategies to mitigate at the proposed terminal, wet storage improvement locations, and during tow out of the turbines.
- **Navigation Channel:**
    - Evaluate proposed navigation channel improvements to confirm adequacy for offshore wind industry use or if additional improvements will be required.
    - Evaluate required space and improvements required to provide adequate wet storage within the Port.
    - Evaluate maritime use and navigational impact to other maritime users within the channel and at the channel entrance.
    - Evaluate potential for downtime for facilitating deployment to the wind farm relative to metocean and bar channel conditions.
    - Coordinate with U.S. Coast Guard regarding "dead ship" towing operations to solicit input for development of a navigation tow out plan.
    - Evaluate the need and depth of a sinking basin for transfer of floating foundations from land to water.
- **Wet Storage Requirements:** Evaluate the quantity and corresponding locations for wet storage based on outcomes of deployment target and navigation channel assessment work.
- **Multi-Port Assessment:** Evaluate additional port sites in Oregon that could support the offshore wind industry in coordination with Port of Coos Bay to provide a robust offshore wind supply chain.
- **Engagement and Outreach:** Complete outreach and engage with all potential port development stakeholders including, but not limited to fisheries, Native American and Indigenous peoples, local communities, OTH airport, Port maritime users, federal and state agencies, and other stakeholders.
- **Port Strategic Plan:** Develop a strategic plan for port development in Oregon to support the offshore wind industry including an impact trade-off analysis that evaluates potential development impacts to coastal resources, incorporates stakeholder feedback, evaluates economic benefits and workforce development requirements, and considers socioeconomic and environmental justice concerns.
- **Supply Chain and Workforce Assessments:** Perform an assessment of the workforce opportunity within the local region and/or state to develop a high-level roadmap of the workforce needs and training lead times with respect to the timeline of offshore wind development within the state. This will strengthen Oregon's workforce to serve offshore wind and inform a strategic workforce development plan. Similarly, an assessment of the local and/or state-wide supply chain would be beneficial in understanding opportunities for local content and the requirement and impacts for supply chain development programs.

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Appendix A: Environmental Analysis

Table A-1: Environmental Matrix for the 15 Sites

#	SITE	Land Use	RT	WT	SC	DOC	Archaeological Sites	RT	WT	SC	DOC	Tribal Affiliation	RT	WT	SC	DOC	Known Aquatic Vegetation	RT	WT	SC	DOC
1	Former Sitka Dock	Industrial w/Improvements	1	1	1	*	2 Sites	2	3	6	CRS1	Confed Tribes	1	1	1	OARRA	3, Yes	3	2	6	**
2	City of Coos Bay - Hollering Place	Misc.	2	1	2	*	0 Sites	1	3	3	CRS2	Confed Tribes	1	1	1	OARRA	0, No	1	2	2	**
3	Cape Arago Dock / Sause Bros.	Industrial	1	1	1	*	1 Cemetery	3	3	9	CRS3	Confed Tribes	1	1	1	OARRA	1, No	1	2	2	**
4	North Bay Marine Industrial Park	Misc.	2	1	2	*	0 Sites	2	3	6	CRS4	Confed Tribes	1	1	1	OARRA	5, Yes	2	2	4	**
5	D.B. Western	Industrial w/Improvements & Misc.	1	1	1	*	0 Sites	1	3	3	CRS5	Confed Tribes	1	1	1	OARRA	3, Yes	1	2	2	**
6	Southport Forest Products and Barge Facility	Industrial w/Improvements	1	1	1	*	0 Sites	1	3	3	CRS6	Confed Tribes	1	1	1	OARRA	3, Yes	1	2	2	**
7	Henderson Ranch	Misc.	2	1	2	*	3 Sites	2	3	6	CRS7	Confed Tribes	1	1	1	OARRA	4, Yes	1	2	2	**
8	Jordan Cove West	Industrial	1	1	1	*	2 Sites	3	3	9	CRS8	Confed Tribes	1	1	1	OARRA	2, No	1	2	2	**
9	Roseburg Forest Products	Industrial w/Improvements	1	1	1	*	2 Sites	3	3	9	CRS9	Confed Tribes	1	1	1	OARRA	1, No	1	2	2	**
10	Jordan Cove East	Industrial w/Improvements & Misc.	1	1	1	*	1 Site	3	3	9	CRS10	Confed Tribes	1	1	1	OARRA	3, Yes	2	2	4	**
11	Al Pierce Lumber Co.	Industrial	1	1	1	*	0 Sites	1	3	3	CRS11	Confed Tribes	1	1	1	OARRA	3, Yes	3	2	6	**
12	Ocean Terminals Dock	Industrial w/Improvements	1	1	1	*	0 Sites	1	3	3	CRS12	Confed Tribes	1	1	1	OARRA	1, No	1	2	2	**
13	Bayshore Dock	Industrial & Misc.	1	1	1	*	0 Sites	1	3	3	CRS13	Confed Tribes	1	1	1	OARRA	1, No	1	2	2	**
14	Eastside Port Parcel	Misc.	2	1	2	*	0 Sites	1	3	3	CRS14	Confed Tribes	1	1	1	OARRA	4, Yes	1	2	2	**
15	Port of Coos Bay Terminal 1 Site	Misc.	2	1	2	*	0 Sites	1	3	3	CRS15	Confed Tribes	1	1	1	OARRA	1, No	1	2	2	**

#	Shorebirds	RT	WT	SC	DOC	Marine Mammals Haulout	RT	WT	SC	DOC	Critical Habitat	RT	WT	SC	DOC	ESA-Listed Species	RT	WT	SC	DOC	Water Dependent Designations	RT	WT	SC	DOC	Total Score
1	1 ESA, 0 Nest	2	1	2	ODFW, Ebird	2 HSEA	2	1	2	ODFW	0 CH	1	3	3	CH1	6 Species	2	2	4	CH1	4Wet(41.68%) 0CBR/NWR/FH	2	3	6	CH1/WD1	31
2	0 ESA, 0 Nest	1	1	1	ODFW, Ebird	0 Haulouts	1	1	1	ODFW	0 CH	1	3	3	CH2	6 Species	2	2	4	CH2	0Wet(0.0%) 0CBR/NWR/FH	1	3	3	CH2/WD2	20
3	0 ESA, 0 Nest	1	1	1	ODFW, Ebird	0 Haulouts	1	1	1	ODFW	0 CH	1	3	3	CH3	6 Species	2	2	4	CH3	5Wet(64%) 0CBR/NWR/FH	2	3	6	CH3/WD3	28
4	2 ESA, 0 Nest	2	1	2	ODFW, Ebird	0 Haulouts	1	1	1	ODFW	0 CH	1	3	3	CH4	6 Species	2	2	4	CH4	4Wet(23.29%) 0CBR/NWR/FH	1	3	3	CH4/WD4	26
5	2 ESA, 0 Nest	2	1	2	ODFW, Ebird	0 Haulouts	1	1	1	ODFW	0 CH	1	3	3	CH5	6 Species	2	2	4	CH5	2Wet(13.82%) 0CBR/NWR/FH	1	3	3	CH5/WD5	20
6	2 ESA, 0 Nest	2	1	2	ODFW, Ebird	0 Haulouts	1	1	1	ODFW	0 CH	1	3	3	CH6	6 Species	2	2	4	CH6	3Wet(14.00%) 0CBR/NWR/FH	1	3	3	CH6/WD6	20
7	1 ESA, 0 Nest	2	1	2	ODFW, Ebird	0 Haulouts	1	1	1	ODFW	0 CH	1	3	3	CH7	9 Species	3	2	6	CH7	6Wet(54.65%) 0CBR/NWR/FH	2	3	6	CH7/WD7	29
8	0 ESA, 1 Nest	2	1	2	ODFW, Ebird	0 Haulouts	1	1	1	ODFW	1 CH	3	3	9	CH8	6 Species	2	2	4	CH8	3Wet(17.85%) 0CBR/NWR/FH	1	3	3	CH8/WD8	32
9	0 ESA, 0 Nest	1	1	1	ODFW, Ebird	0 Haulouts	1	1	1	ODFW	0 CH	1	3	3	CH9	6 Species	2	2	4	CH9	5Wet(27.79%) 0CBR/NWR/FH	1	3	3	CH9/WD9	25
10	0 ESA, 0 Nest	1	1	1	ODFW, Ebird	0 Haulouts	1	1	1	ODFW	0 CH	1	3	3	CH10	6 Species	2	2	4	CH10	6Wet(52.78%) 0CBR/NWR/FH	2	3	6	CH10/WD10	30
11	1 ESA, 0 Nest	2	1	2	ODFW, Ebird	0 Haulouts	1	1	1	ODFW	0 CH	1	3	3	CH11	6 Species	2	2	4	CH11	5Wet(47.34%) 0CBR/NWR/FH	2	3	6	CH11/WD11	27
12	0 ESA, 0 Nest	1	1	1	ODFW, Ebird	1 HSEA	2	1	2	ODFW	0 CH	1	3	3	CH12	6 Species	2	2	4	CH12	3Wet(15.07%) 0CBR/NWR/FH	1	3	3	CH12/WD12	20
13	0 ESA, 0 Nest	1	1	1	ODFW, Ebird	1 HSEA	2	1	2	ODFW	0 CH	1	3	3	CH13	6 Species	2	2	4	CH13	1Wet(17.65%) 0CBR/NWR/FH	1	3	3	CH13/WD13	20
14	1 ESA, 0 Nest	2	1	2	ODFW, Ebird	0 Haulouts	1	1	1	ODFW	0 CH	1	3	3	CH14	5 Species	1	2	2	CH14	4Wet(93.17%) 0CBR/NWR/FH	3	3	9	CH14/WD14	25
15	1 ESA, 0 Nest	2	1	2	ODFW, Ebird	0 Haulouts	1	1	1	ODFW	0 CH	1	3	3	CH15	5 Species	1	2	2	CH15	4Wet(5.70%) 0CBR/NWR/FH	1	3	3	CH15/WD15	19

1

2 ***RT: Environmental Considerations/Restrictions Rating (0= N/A | 1=Low | 2=Med | 3=High - Relative to other Sites WT: Weight Rating (1-3 Multiplier - Relative to other Environmental Elements***

3 ***SC: Weighted Environmental Rating Score (1-3=Green | 2-6=Yellow | 7-9=Red) DOC: Appendix ID (Example: Archaeological Sites Documentation = AS1, AS2, AS3) TS: Total Score for Site***

4

5 *Land Use: General Land Use Classifications* (https://www.arcgis.com/home/webmap/viewer.html?webmap=1be7dbc77f8745d78fc5f3e8e85fc05e&extent=-124.8585%2C42.6536%2C-122.6914%2C43.6326)*
Archaeological Site: Previously Recorded Archaeological Sites (CR Sites 1-15, CR Literature Review)

6 *Tribal Affiliation: Affiliated Tribes (Oregon Archaeological Records Remote Access database)*

7 *Known Aquatic Vegetation: Potential Eelgrass/Macroalgae** (Coastal Atlas - https://www.coastalatlas.net/estuarymaps/)*
Shorebirds: Potential Nesting Shorebirds (ODFW/eBird)

8 *Marine Mammals Haulout: Known Haulout Sites (ODFW)*

9 *Critical Habitat: Designated/Proposed Critical Habitat (USFWS IPaC)*

10 *ESA-Listed Species: ESA-Listed Endangered, Threatened, & Candidate Species (USFWS IPaC)*

11 *Water Dependent Designations: Known Wetlands, Floodplains, Coastal Areas, & Important Farmland*

12

13 *CBR: Coastal Barrier Resource (Coastal Barrier Resources System) ESA: Endangered Species Act*

14 *FH: Fish Hatchery HSEA: Harbor Seal*

15 *NWR: National Wildlife Refuge Wet: Wetland Types*

Table A-2: Known Aquatic Vegetation for the 15 Sites

SITE#	Known Aquatic Vegetation	Comment
1	3, Yes	CMECS Codes: **2.5** "Aquatic Vegetation Bed" extensive bed all along shoreline, **2.6.1** "Emergent Tidal Marsh", **2.7.1** "Tidal Scrub-Shrub Wetland", **2.8.1** "Tidal ForestWoodland"
2	0, No	No aquatic biota
3	1, No	CMECS Codes: **2.6.1.1** "Brackish Marsh" very small
4	5, Yes	CMECS Codes: **2.5** "Aquatic Vegetation Bed" large bed just offshore of entire southern shoreline, **2.6.1** "Emergent Tidal Marsh", **2.6.1.1** "Brackish Marsh", **2.7.1** "Tidal Scrub-Shrub Wetland", **2.8.1** "Tidal ForestWoodland".
5	3, Yes	CMECS Codes: **2.5** "Aquatic Vegetation Bed" small bed outside SE corner, **2.6.1** "Emergent Tidal Marsh", **2.7.1.1** "Brackish Tidal Scrub-Shrub"
6	3, Yes	CMECS Codes: **2.5** "Aquatic Vegetation Bed" small bed outside NE corner, **2.6.1** "Emergent Tidal Marsh", **2.7.1** "Tidal Scrub-Shrub Wetland"
7	4, Yes	CMECS Codes: **2.5** "Aquatic Vegetation Bed" small bed in SE corner, **2.6.1** "Emergent Tidal Marsh", **2.7.1** "Tidal Scrub-Shrub Wetland", **2.8.1** "Tidal ForestWoodland"
8	2, No	CMECS Codes: **2.6.1** "Emergent Tidal Marsh", **2.7.1** "Tidal Scrub-Shrub Wetland", only a sliver of each
9	1, No	CMECS Codes: **2.6.1.1** "Brackish Marsh"
10	3, Yes	CMECS Codes: **2.5** "Aquatic Vegetation Bed" large bed along S shoreline; **2.6.1** "Emergent Tidal Marsh", **2.6.1.1** "Brackish Marsh"; **2.7.1** "Tidal Scrub-Shrub Wetland"
11	3, Yes	CMECS Codes: **2.5** "Aquatic Vegetation Bed" larger bed all along N shore and sporadic in estuary flats; **2.6.1** "Emergent Tidal Marsh"; **2.7.1** "Tidal Scrub-Shrub Wetland"
12	1, No	CMECS Codes: **2.6.1** "Emergent Tidal Marsh" very small
13	1, No	CMECS Codes: **2.6.1** "Emergent Tidal Marsh" around dock
14	4, Yes	CMECS Codes: 2.5 "Aquatic Vegetation Bed" spotty patches ~250m offshore NW, **2.6.1** "Emergent Tidal Marsh"; **2.6.1.1** "Brackish Marsh"; **2.7.1** "Tidal Scrub-Shrub Wetland", only a sliver of each
15	1, No	**2.6.1.1** "Brackish Marsh" very small

CMECS: Coastal and Marine Ecological Classification Standard
Source: [Estuary Planning Tool (coastalatlas.net)]

Table A-3: Presence of Shorebirds at the 15 Sites

SITE#	Shorebirds	Source	Comment
1	Marbled Murrelet	Ebird; PCB_OS_Plover_SouthCoastBeachesMap_2020.pdf (oregon.gov)	**Not** within Western Snowy Plover Management Area. **Yes** Ebird ESA sightings:Marbled Murrelet, 2007.
2	N/A	Ebird; PCB_OS_Plover_SouthCoastBeachesMap_2020.pdf (oregon.gov)	**Not** within Western Snowy Plover Management Area. **No** Ebird sightings.
3	N/A	Ebird; PCB_OS_Plover_SouthCoastBeachesMap_2020.pdf (oregon.gov)	**Not** within Western Snowy Plover Management Area. **No** ESA Ebird sightings ornests.
4	Marbled Murrelet, Snowy Plover	Ebird; PCB_OS_Plover_SouthCoastBeachesMap_2020.pdf (oregon.gov)	**Close** (740m) to Western Snowy Plover Management Area. **Yes** Ebird ESA sightings:Snowy Plover, 2021; Marbled Murrelet, 2016.
5	Marbled Murrelet, Snowy Plover	Ebird; PCB_OS_Plover_SouthCoastBeachesMap_2020.pdf (oregon.gov)	**Close** (1.2km) to Western Snowy Plover Management Area. **Yes** Ebird ESA sightings:Snowy Plover, 2021; Marbled Murrelet, 2016.
6	Marbled Murrelet, Snowy Plover	Ebird; PCB_OS_Plover_SouthCoastBeachesMap_2020.pdf (oregon.gov)	**Close** (1km) to Western Snowy Plover Management Area, (300m) Ebird hotspot "North Spit--Weyco Settling Pond & deflation plain". **Yes** Ebird ESA sightings: Snowy Plover, 2021; Marbled Murrelet, 2020.
7	Marbled Murrelet	Ebird; PCB_OS_Plover_SouthCoastBeachesMap_2020.pdf (oregon.gov)	**Not** within Western Snowy Plover Management Area, (50m) Ebird hotspot "North Spit--Weyco Settling Pond & deflation plain". **Yes** Ebird ESA sightings: Snowy Plover, 2021; Marbled Murrelet 2020, 2021.
8	1 Nesting Double Crested Cormorant	Ebird; PCB_OS_Plover_SouthCoastBeachesMap_2020.pdf (oregon.gov)	**Not** within Western Snowy Plover Management Area. Ebird: Double-crestedCormorant nesting in bay.
9	N/A	Ebird; PCB_OS_Plover_SouthCoastBeachesMap_2020.pdf (oregon.gov)	**Not** within Western Snowy Plover Management Area. **No** Ebird sightings.
10	N/A	Ebird; PCB_OS_Plover_SouthCoastBeachesMap_2020.pdf (oregon.gov)	**Not** within Western Snowy Plover Management Area. **No** ESA Ebird sightings.
11	Marbled Murrelet	Ebird; PCB_OS_Plover_SouthCoastBeachesMap_2020.pdf (oregon.gov)	**Not** within Western Snowy Plover Management Area. Borders Ebird hotspot "PonySlough". **Yes** ESA Ebird sightings: Marbled Murrelet, 2001.
12	N/A	Ebird; PCB_OS_Plover_SouthCoastBeachesMap_2020.pdf (oregon.gov)	**Not** within Western Snowy Plover Management Area. Borders Ebird hotspot "North Bend Boardwalk". **No** ESA Ebird sightings or nesting.
13	N/A	Ebird; PCB_OS_Plover_SouthCoastBeachesMap_2020.pdf (oregon.gov)	**Not** within Western Snowy Plover Management Area. **No** Ebird sightings.
14	Marbled Murrelet	Ebird; PCB_OS_Plover_SouthCoastBeachesMap_2020.pdf (oregon.gov)	**Not** within Western Snowy Plover Management Area. Ebird hotspot "Eastside BoatRamp", and borders hotspot "Millicoma Marsh". **Yes** Ebird ESA sightings: Marbled Murrelet, 2022.
15	Marbled Murrelet	Ebird; PCB_OS_Plover_SouthCoastBeachesMap_2020.pdf (oregon.gov)	**Not** within Western Snowy Plover Management Area. Close to (715m) Ebird hotspot "Eastside Boat Ramp", and (715m) hotspot "Millicoma Marsh". **Yes** Ebird ESA sightings: Marbled Murrelet, 2022.

Table A-4: Presence of ESA Species at the 15 Sites

SITE	Critical Habitat	*Pacific marten (T)*	*marbled murrelet (T)*	*northern spotted owl (T)*	*western snowy plover (T)*	*leatherback sea turtle (E)*	*loggerhead sea turtle (E)*	*olive Ridley sea turtle (T)*	*monarch butterfly (C)*	*western lily (E)*
1	N/A	YES	YES	YES	YES	NO	NO	NO	YES	YES
2	N/A	YES	YES	YES	YES	NO	NO	NO	YES	YES
3	N/A	YES	YES	YES	YES	NO	NO	NO	YES	YES
4	N/A	YES	YES	YES	YES	NO	NO	NO	YES	YES
5	N/A	YES	YES	YES	YES	NO	NO	NO	YES	YES
6	N/A	YES	YES	YES	YES	NO	NO	NO	YES	YES
7	N/A	YES	YES	YES	YES	YES	YES	YES	YES	YES
8	Pacific marten	YES	YES	YES	YES	NO	NO	NO	YES	YES
9	N/A	YES	YES	YES	YES	NO	NO	NO	YES	YES
10	N/A	YES	YES	YES	YES	NO	NO	NO	YES	YES
11	N/A	YES	YES	YES	YES	NO	NO	NO	YES	YES
12	N/A	YES	YES	YES	YES	NO	NO	NO	YES	YES
13	N/A	YES	YES	YES	YES	NO	NO	NO	YES	YES
14	N/A	YES	YES	YES	YES	NO	NO	NO	YES	NO
15	N/A	YES	YES	YES	YES	NO	NO	NO	YES	NO

C: Candidate
T: Threatened
E: Endangered

Appendix B: Airspace Analysis

AIRSPACE AND AIRPORT IMPACTS PRELIMINARY ANALYSIS

APPENDIX

for the

PORT OF COOS BAY INFRASTRUCTURE ASSESSMENT FOR OFFSHORE WIND DEVELOPMENT

June 29, 2022

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INTRODUCTION AND BACKGROUND

Potential sites to support the offshore wind (OSW) industry at the Port of Coos Bay are in the vicinity of the Southwest Oregon Regional Airport (SWORA). Multiple sites are anticipated to be required to support OSW activities, including industrial use, staging and integration, operations and maintenance, and decommissioning.

Determining the compatibility of these sites with aircraft and airport operations is the responsibility of the Federal Aviation Administration (FAA), Oregon Department of Aviation (ODA), and Coos County Airport Authority (Airport Authority). This appendix provides a preliminary analysis of SWORA airspace and airport compatibility with sites identified by others as capable of supporting the OSW industry at the Port of Coos Bay.

GOVERNING CODES, STANDARDS, AND REFERENCES USED IN THIS PRELIMINARY ANALYSIS

- 14 Code of Federal Regulations (CFR) Part 77 (Part 77) – Safe, Efficient Use, and Preservation of the Navigable Airspace https://www.ecfr.gov/current/title-14/chapter-I/subchapter-E/part-77
  - Provides standards for identifying obstructions to air navigation.
  - Part 77 describes the primary, approach, transitional, horizontal, and conical surfaces.
- FAA Order 8260.3E - United States Standard for Terminal Instrument Procedures (TERPS), https://www.faa.gov/documentLibrary/media/Order/Order_8260.3E.pdf
  - Prescribes criteria to design and evaluate Instrument Flight Procedures.
  - Specifies the minimum measure of obstacle clearance to provide a satisfactory level of vertical protection from obstructions for Instrument Flight Procedures.
- FAA Advisory Circular 150/5300-13B – Airport Design https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5300-13B-Airport-Design.pdf
  - Prescribes the criteria to evaluate runways serving only visual operations.
  - Provides basic planning surfaces for instrument runways to protect select TERPS surfaces.
- Oregon Revised Statute 836.535 (ORS 836.535) – Hazards to Air Navigation Prohibited, Exceptions; 2021 edition https://www.oregonlegislature.gov/bills_laws/ors/ors836.html
  - Prohibits hazards to air navigation with exceptions as noted in the statute.

Portions of this project will exceed the criteria contained in paragraph 77.5 of Part 77, triggering the requirement to notify the FAA and ODA in advance of any construction activities. FAA Form 7460-1 is used to notify the FAA and ODA of the proposal. Since the proposal will exceed the criteria contained in Part 77, an airspace case will be initiated and circulated within the FAA and to the public. Oregon law, ORS 836.535, also requires notification of the proposal. The FAA and ODA will analyze the proposal’s impact on airspace, airport operations, navigational aids, and instrument flight procedures (IFPs).

The FAA presumes obstructions are hazards to air navigation unless further aeronautical study concludes otherwise. FAA policy and guidance materials and comments received are used to determine if the obstruction is a hazard to air navigation. The FAA analysis will include the proposal’s effect with respect to Part 77, TERPS surfaces, and the runway end and threshold siting standards contained in AC 150/5300-13B. The FAA’s determination may only be made after a formal airport airspace analysis.

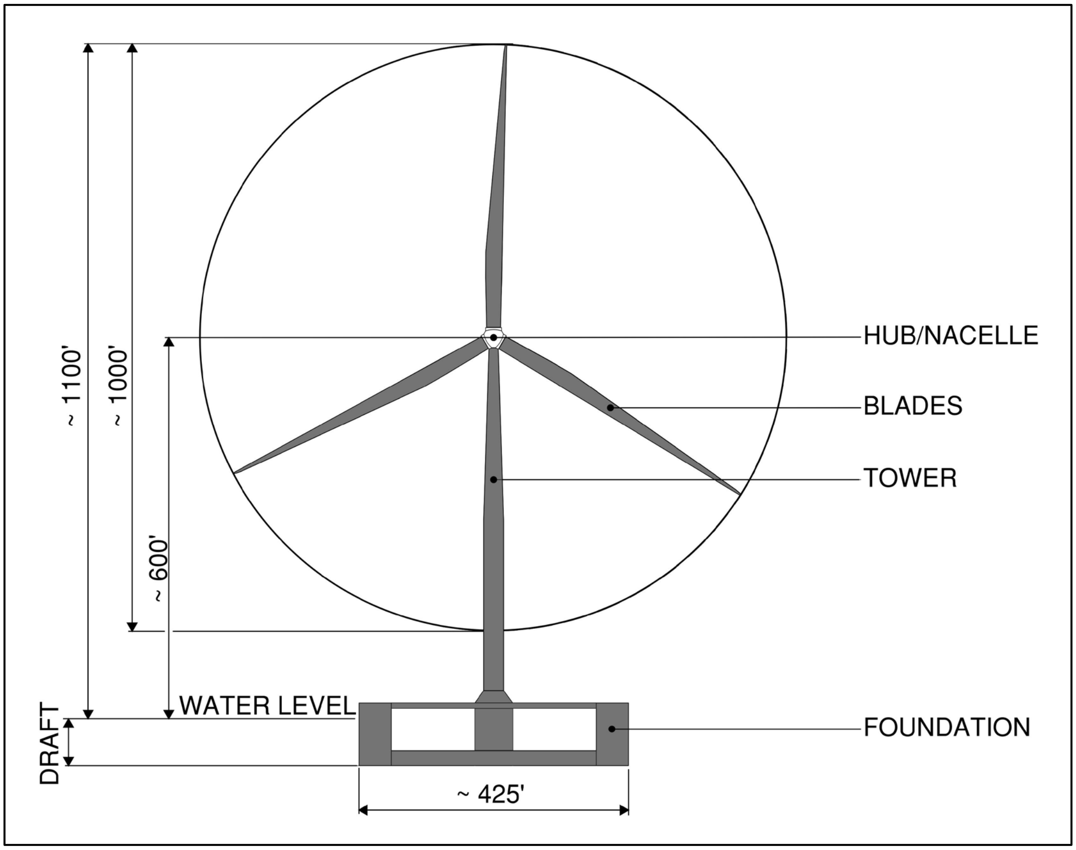
The FAA has no authority to direct any action concerning the height or location of an object, even if it is determined to be a hazard. The agency may recommend modifications to runway ends or landing thresholds, list the object in appropriate FAA publications, amend or cancel IFPs, raise the angle of visual approach aids or require obstruction marking and lighting.

With the FAA having no direct authority to prohibit a project, state and local zoning codes, especially airport protection zones, typically determine if a project proceeds. Many jurisdictions and agencies will not approve a project if the FAA has issued a finding of “hazard to air navigation.”

AIRSPACE AND AIRPORT IMPACTS PRELIMINARY ANALYSIS

At the request of project stakeholders, the analysis performed by Precision Approach Engineering, Inc. was limited to a preliminary evaluation of airspace and airport impacts and informal discussions with several FAA Lines of Business in May and June of 2022. Submittal of the potential sites to the FAA for a formal airspace analysis was beyond our scope of work. The preliminary analysis was based on the dimensions shown in Figure 1.

Figure 1:
OSW Turbine Dimensions Used for Airspace Analysis



This analysis assumes that the Wind Turbine Generators (WTGs) will be constructed and transported from the staging and integration area to the ocean deployment site at the rate of one per week for a substantial period of time. It was also assumed that five to eight completed WTGs might need to be held in “wet storage” awaiting favorable weather conditions. Based on the information provided, this proposal will penetrate Part 77 and Airport Design surfaces and will require an adjustment to IFP minimums.

The activities conducted on the OSW industrial use sites being considered will likely not include operations with significant heights above the existing ground levels. The industrial use sites are approximately 3 miles from the nearest runway end. The industrial use sites are not anticipated to impact SWORA airspace or operations.

The locations and planned activities at the OSW staging and integration sites being considered are anticipated to result in penetrations of Part 77 surfaces (See Figure 2), runway end and threshold siting standards (See Figure 3), and TERPS surfaces (See Figure 4).

Figure 2:
OTH Part 77 Surface Limits with OSW Staging and Integration Sites Under Consideration

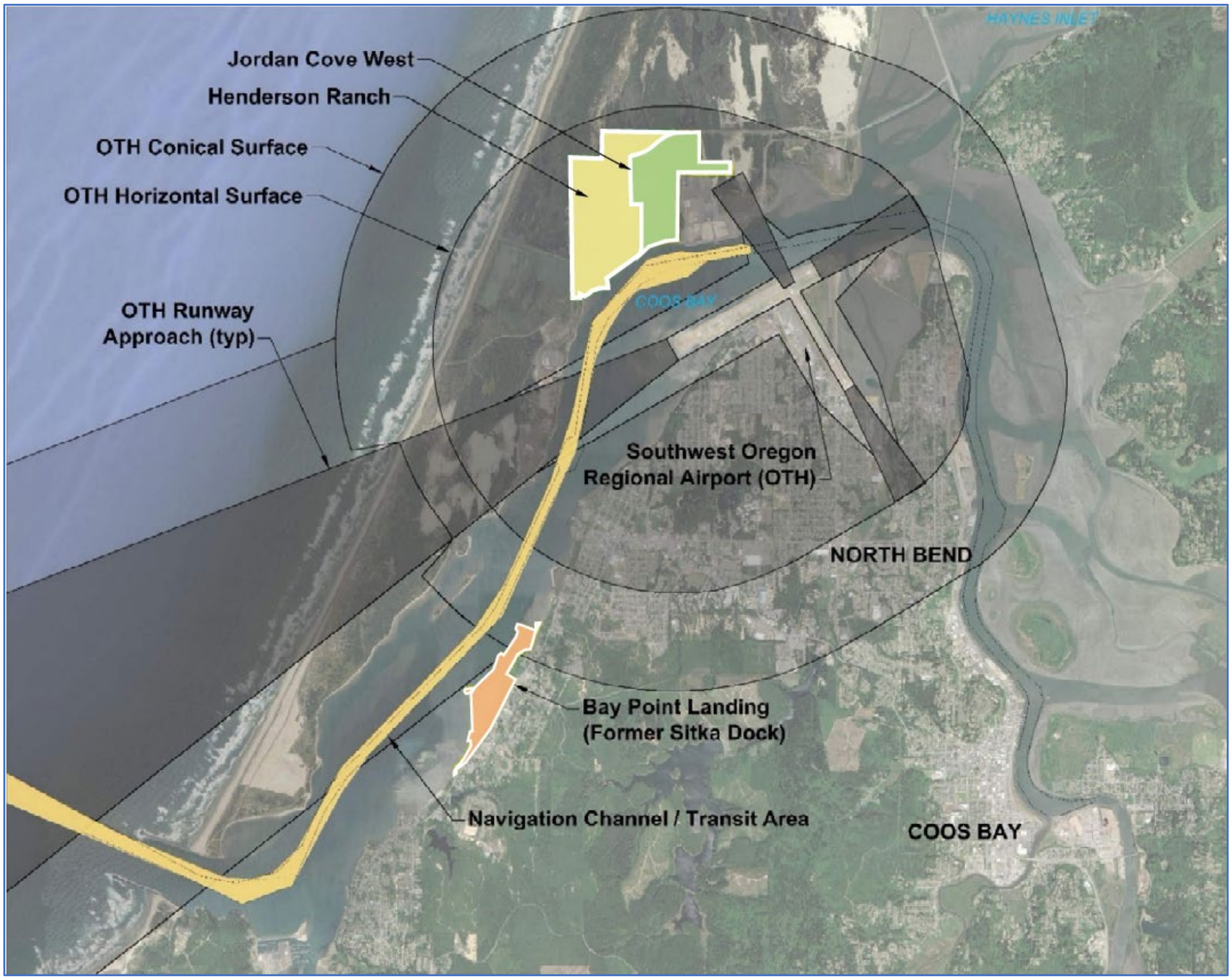
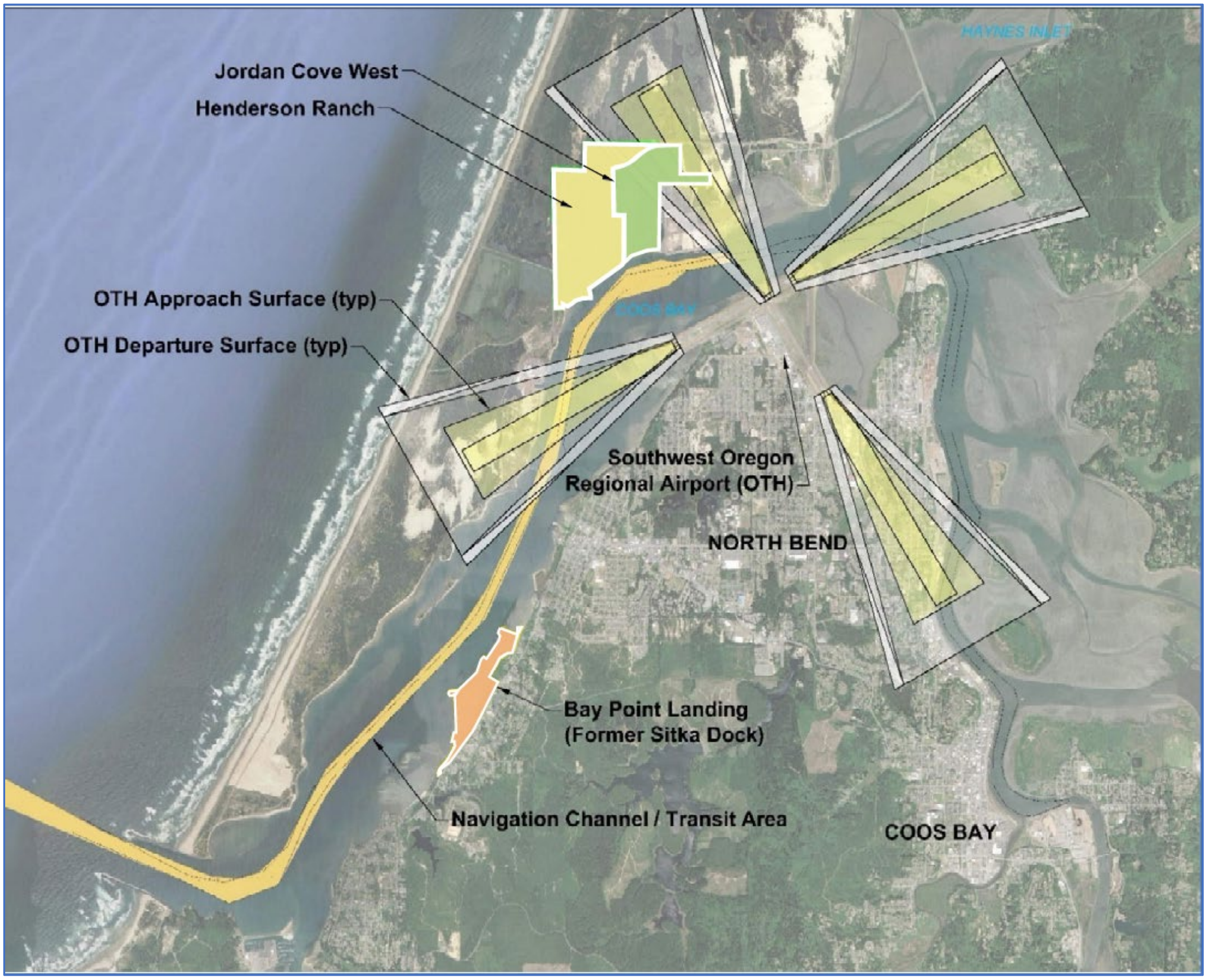
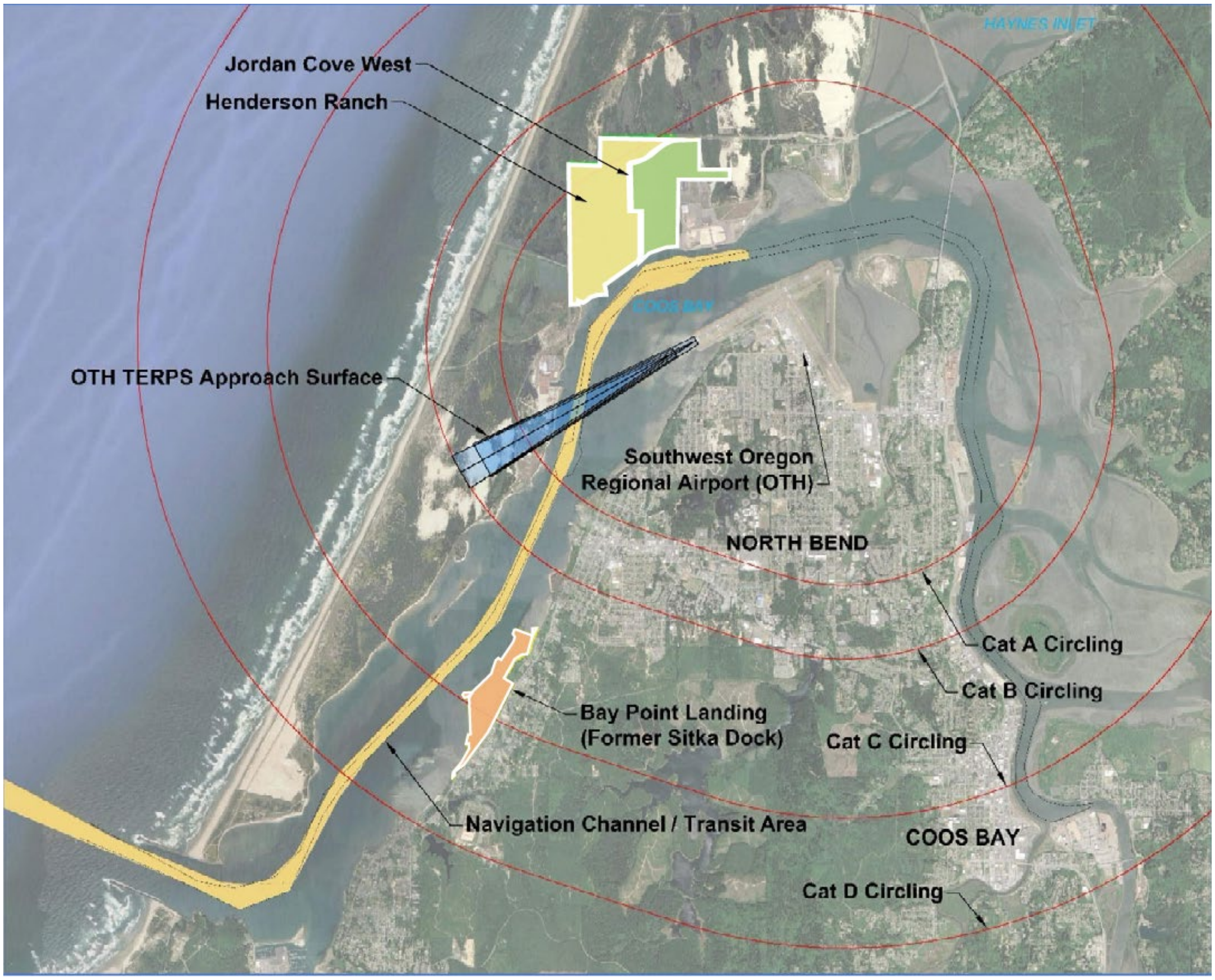


Figure 3:
OTH Runway End and Threshold Siting Standards with OSW Staging and Integration Sites Under Consideration



Only AC 150/15300-13B Section 3.6 large airplane surface 3, IFR circling surface 4, and instrument departure surface 7 shown in figure.

Figure 4:
OTH TERPS Surfaces with OSW Staging and Integration Sites Under Consideration



Only TERPS ILS Runway 5 vertical guidance surface and aircraft approach category A/B/C/D circling areas shown in figure.

Only the FAA and ODA can make a final determination if a proposal results in a "hazard to air navigation," however, a preliminary analysis of the anticipated impacts for each staging and integration site is provided in Tables 1 through 3 using the following color coding:

Preliminary Airspace and Airport Impacts Analysis Color Coding Legend

[1] Site is not anticipated to have any significant impact to element listed.
[2] Site is anticipated to impact element listed to a lesser degree and mitigation with limited impacts to airport operations may be possible. Further discussion with FAA and project stakeholders is required to determine the extent of impacts and potential mitigation options.
[3] Site is anticipated to impact element listed to a significant degree and ability to mitigate impacts is unknown at this time. Further discussion with FAA and stakeholders is required to determine the extent of the impacts and potential mitigation options.

Note: Extent of impacts are anticipated based on preliminary analysis, limited informal FAA discussions, and prior experience for similar situations. A formal FAA 7460-1 submittal and subsequent FAA/ODA determination will be required to obtain the actual extent of impacts.

Table 1
OTH Part 77 Impacts Preliminary Analysis, Coos Bay OSW Staging and Integration Sites Under Consideration

Part 77 Surfaces	Bay Point Landing (Former Sitka Dock) Site	Henderson Ranch Site	Jordan Cove West Site
Horizontal Surface (Elev. = 167' MSL)	[1] Not Applicable - Site is outside surface horizontal limits	[3] ~950' penetration at southern edge of site	[3] ~950' penetration at southern edge of site
Conical Surface (Elev. Varies 167' – 367')	[2] Majority of the site is outside the surface horizontal limits (Northernmost portion lies within surface)	[1] Not Applicable - Site is outside surface horizontal limits	[1] Not Applicable - Site is outside surface horizontal limits
Part 77.17 (1) Surface (Height = 499' Above Ground Level)	[3] ~601' penetration	[1] Not applicable for this site – Part 77 Horizontal Surface controls	[1] Not applicable for this site – Part 77 Horizontal Surface controls

Table 2
OTH Runway End and Threshold Siting Standards Preliminary Analysis, Coos Bay OSW Staging and Integration Sites Under Consideration

Surface	Bay Point Landing (Former Sitka Dock) Site	Henderson Ranch Site	Jordan Cove West Site
Surface 3 (Large Airplanes >12,500 lbs)	[1] Outside surface horizontal limits	[1] Outside surface horizontal limits	[2] Easternmost portion within horizontal limits of surface (Surface Elev. ~280' MSL at critical location)
Surface 4 (IFR Circling)	[1] Outside surface horizontal limits	[1] Majority of site is outside surface horizontal limits (Small northeastern portion lies within surface)	[2] Easternmost portion within horizontal limits of surface (Surface Elev. ~280' MSL at critical location)
Surface 7 (Instrument Departure Surface)	[1] Outside surface horizontal limits	[1] Majority of site is outside surface horizontal limits (Northeast portion within horizontal limits of surface – Surface El. ~205' MSL at critical location)	[3] North quarter of site within horizontal limits of surface (Surface Elev. ~145' MSL at critical location)

Notes:
MSL – Mean Sea Level
AC 150/5300-13B Surfaces 1 and 2 do not control
AC 150/5300-13B Surfaces 5 and 6 are addressed in the TERPS Preliminary Analysis (Table 3)

Table 3
OTH TERPS Preliminary Analysis, Coos Bay OSW Staging and Integration Sites Under Consideration

Approach	Notes	Bay Point Landing (Former Sitka Dock) Site	Henderson Ranch Site	Jordan Cove West Site	Transit Area Within Bay Site
ILS or Loc RWY 5	Circling to Land: Cat A/B only, RWY 13, 31 NA at night,	[2] Circling Cat A: Increase vertical minimum +780'; increase horizontal visibility ¼ mile Circling Cat B: Increase vertical minimum +640'; increase horizontal visibility ¼ mile	[2] Circling Cat A: Increase vertical minimum +780'; increase horizontal visibility ¼ mile Circling Cat B: Increase vertical minimum +640'; increase horizontal visibility ¼ mile	[2] Circling Cat A: Increase vertical minimum +780'; increase horizontal visibility ¼ mile Circling Cat B: Increase vertical minimum +640'; increase horizontal visibility ¼ mile	[3] NA during transit times from Henderson Ranch and Jordan Cove West Sites
RNAV (RNP) Z RWY 5	No Circling to Land; Authorization required	[2] No input from FAA at present, anticipate impacts similar to ILS RWY 5	[2] No input from FAA at present, anticipate impacts similar to ILS RWY 5	[2] No input from FAA at present, anticipate impacts similar to ILS RWY 5	[3] NA during transit times from Henderson Ranch and Jordan Cove West Sites
RNAV (GPS) Y RWY 5	Circling to Land: Cat A/B/C/D, RWY 13, 31 NA at night,	[2] No input from FAA at present, anticipate impacts similar to ILS RWY 5	[2] No input from FAA at present, anticipate impacts similar to ILS RWY 5	[2] No input from FAA at present, anticipate impacts similar to ILS RWY 5	[3] NA during transit times from Henderson Ranch and Jordan Cove West Sites
VOR B	Circling to Land: Cat A/B/C/D, RWY 13, 31 NA at night,	[2] Circling Cat A: Increase vertical minimum +780'; increase horizontal visibility ¼ mile Circling Cat B: Increase vertical minimum +640'; increase horizontal visibility ¼ mile Circling Cat C: Increase vertical minimum +360'[1] Circling Cat D: Increase vertical minimum +280'	[2] Circling Cat A: Increase vertical minimum +780'; increase horizontal visibility ¼ mile Circling Cat B: Increase vertical minimum +640'; increase horizontal visibility ¼ mile	[2] Circling Cat A: Increase vertical minimum +780'; increase horizontal visibility ¼ mile Circling Cat B: Increase vertical minimum +640'; increase horizontal visibility ¼ mile	[3] NA during transit times from Henderson Ranch and Jordan Cove West Sites
Departure Surface	RWY 13, 31, 4, 22 have departure surfaces	[1] Outside surface horizontal limits	[1] No input from FAA at present (Estimate result similar to Table 2, Surface 7)	[3] No input from FAA at present (Estimate result similar to Table 2, Surface 7)	[3] NA during transit times from Henderson Ranch and Jordan Cove West Sites

Notes:
NA – Approach Not Authorized during periods noted in table
Cat – Aircraft Approach Category (A- Approach speed less than 91 knots; B – Approach speed 91 knots or more but less than 121 knots; C – Approach speed 121 knots or more but less than 141 knots; D – Approach speed 141 knots or more but less than 166 knots)
Per informal discussions with Western Flight Procedures Team, Aircraft Approach Category C Impacts may be eliminated, see Western Flight Procedures Team summary for additional information

Following is a summary of limited comments received from informal discussions with various FAA lines of business in May and June 2022. It must be understood these comments are preliminary and do not constitute an official FAA determination. As the overall project proponent, the Port of Coos Bay (Port) must submit a FAA Form 7460-1 for review by all FAA lines of business in order to receive a formal determination regarding project impacts to airspace and airports in the area if this project moves forward. If the official FAA finding is similar to this informal analysis, this project will result in impacts to airspace and airport operations of varying degrees depending on which staging and integration site(s) are developed.

Western Flight Procedures Team

The Western Flight Procedures Team (WFPT) is responsible for developing instrument flight procedures (IFPs) and reviewing proposals that may affect established IFPs.

The WFPT informal evaluation indicated that circling minimums could be up to 780 feet higher vertically with visibility ¼ mile higher than currently published.

During the transit of the turbines from the Jordan Cove West or Henderson Ranch sites, the structures will cross through multiple airspace surfaces. During this transit time, all instrument approach procedures are anticipated to be Not Authorized (NA). The WFPT anticipates this weekly disruption in addition to the impacts of the circling minima noted above, will require operational measures to mitigate the impact on the IFPs. If the FAA, Airport Authority, and project stakeholders cannot agree on these measures, the availability of the IFPs may be jeopardized.

For this reason, the WFPT indicated the least impact would be the use of the Bay Point Landing (Former Sitka Dock) Site. If tower erection takes place outside the Aircraft Approach Category (AAC) C (Approach Speed 121 knots or more but less than 141 knots) circling evaluation area (tall elements limited to the southern half of the Bay Point Landing site, see Figure 4), only the AAC D (Approach Speed 141 knots or more but less than 166 knots) minimums would need to be raised to mitigate IFR procedure effects. The Bay Point Landing Site would also result in the transit area not crossing through the Runway 5/23 approach/departure surfaces within the bay, thus operational procedures during transit would likely not be required.

Obstruction Evaluation Group

The Obstruction Evaluation Group (OEG) is responsible for evaluating the project for impacts associated with Part 77 surface penetrations. Personnel from the OEG were unable to provide any feedback on the project without a Form 7460-1 submittal.

Airports Division

The Airports Division (ARP) compliance officer advises the Airports District Office when questions arise concerning an airport's grant assurances and works with FAA headquarters on complex issues. The grant assurances are a part of every FAA grant agreement and are binding on the airport owner. The assurances are available at https://www.faa.gov/airports/aip/grant_assurances/ and include general Federal requirements, orders and regulations, sponsor (Airport Authority) responsibilities, planning and public consultation requirements, airport operation and maintenance, compatible land use, nondiscrimination, airport revenue, civil rights and rules for disposal of land.

The ARP representative indicated that while the operational measures needed to move the structures through the runway approach surface could be developed and have been used to accommodate construction and other short-term closures, the frequency and duration being proposed would necessitate additional evaluation before FAA could make a determination. Based on this informal discussion, the Bay Point Landing site would seem to be preferable, founded on the WFPT informal evaluation that only minimal aircraft operational mitigation measures are likely to be required.

Airports District Office

The Airports District Office (ADO) has the responsibility to receive FAA Form 7460-1 submittal(s), coordinate review by other FAA lines of business, and return a consolidated determination to the proponent. In addition, Section 163 of the FAA Reauthorization Act of 2018 requires a review of construction proposals that impact the safe and efficient operation of aircraft at the airport, that adversely affect the safety of people and property on the ground or adversely affect the value of prior Federal investments.

The ADO also noted that a significant project such as the one proposed could trigger a National Environmental Protection Act process. Additionally, any operational agreements needed to safely move the structures through the runway approach would have to be negotiated among all involved parties.

Technical Operations

The FAA Technical Operations office (Tech Ops) reviews FAA Form 7460-1 submittal(s) for effects the proposal could have on FAA visual and navigational aids. In conjunction with informal discussions, the Tech Ops specialist indicated that any FAA owned visual and navigation aids, including the Instrument Landing System (ILS) Localizer and Very High Frequency Omni-Directional Range (VOR) signals, would be analyzed in relation to the size, location, and material of the structures. Theoretical calculations of reflections and signal interference would be considered in their determination. Any initial "no hazard" determination would likely be conditioned on FAA flight check after construction to confirm signal integrity.

Airport Traffic Control Tower

The Airport Traffic Control Tower (ATCT) controls approach, departure and ground traffic at the airport. While Notices to Airmen (NOTAMs) are filed and closed by the Airport Authority, the ATCT would be responsible for traffic control during any operational measures required to accommodate the movement of the structures during transit operations. ATCT did not provide feedback on the project as part of this preliminary analysis.

AIRPORT RELOCATION

During discussions of this proposal, project stakeholders have asked about the possibility of relocating SWORA if the impacts associated with the development of the OSW industry at the Port of Coos Bay cannot be satisfactorily mitigated. Generally, relocating a public use commercial service airport is a complicated and costly undertaking involving in-depth planning, environmental studies, permitting, engineering and cost analysis. Federal, state and local coordination would be required. Listed below is an outline of the typical process for relocation of an existing airport. It is beyond the scope of this study to develop steps specific to this site or to estimate the magnitude of costs involved in this process.

SWORA was transferred from the U. S. War Assets Administration to the City of North Bend in 1947 by an Instrument of Transfer numbered WAA-32-RPD-171. Transfers of this type were authorized under Regulation 16 of the 1946 Airport Act, “That upon a breach of any of the reservations, restrictions, or conditions by the immediate or any subsequent transferee, the title, right of possession, or other right transferred shall at the option of the Government revert to the Government upon demand;…” which required the return of the property to the U.S. Government if the property is no longer used as an airport.

Prior to any relocation work, the airport sponsor would review the original transfer document to determine if this clause is in effect. If it is, only FAA Headquarters can release this condition and allow the airport sponsor to relocate an existing airport without reversion of the property to the U. S. Government. In addition to the possible loss of the property, the airport sponsor will incur other substantial costs to relocate an airport.

Airport sponsors typically accept numerous FAA grants for airport development. The grants come with the obligation to operate and maintain the facilities funded with FAA funds for 20 years and keep land purchased with FAA funds in perpetuity, otherwise a pro-rated amount of the federal investment must be paid back to the Airport and Airway Trust Fund. Depending on the specific terms, notice may need to be placed in the Federal Register and public hearings may be required.

Aside from the Federal obligations, an airport sponsor will have to negotiate revisions to the aviation service contracts, leases and agreements of the commercial air carrier, fixed base operator, hangar tenants and other related airport businesses.

Siting and construction of a new airport is increasingly difficult and includes site selection, environmental studies, permitting, land acquisition, engineering and construction. Agreements for FAA navigational aids and air traffic control would have to be negotiated and funded.

For past airport relocations, the FAA has required the airport owner to sell the existing airport at fair market value and invest the proceeds in the new airport.

SUMMARY

OTH Impacts Preliminary Analysis, Coos Bay OSW Staging and Integration Sites Under Consideration Summary Table

Preliminary Analysis Element	Bay Point Landing (Former Sitka Dock) Site	Henderson Ranch Site	Jordan Cove West Site
14 CFR Part 77	[3] ~601' penetration to Part 77.17 (1) Surface and a portion of the site lies within the conical surface	[3] ~950' penetration to horizontal surface at southern edge of site	[3] ~950' penetration to horizontal surface at southern edge of site
AC 150/5300-13B Section 3.6 Runway End and Threshold Siting Standards; Large airplane surface 3, IFR circling surface 4, and instrument departure surface 7	[1] Outside of horizontal limits of surfaces	[1] Majority of site is outside of horizontal limits of surfaces (Northeast portion within horizontal limits of instrument departure surface 7 – Surface El. ~205' MSL at critical location)	[3] Easternmost portion within horizontal limits of large airplane surface 3 and IFR Circling surface 4 (Surface El. ~280' MSL at critical location) North quarter of site within horizontal limits of instrument departure surface 7 (Surface El. ~145' MSL at critical location)
Terminal Instrument Procedures (TERPS)	[2] Increase in Cat A/B/C/D Circling vertical minimums and horizontal visibility	[3] Increase in Cat A/B Circling vertical minimums and horizontal visibility All Instrument Approaches Not Authorized (NA) during transit times	[3] Increase in Cat A/B Circling vertical minimums and horizontal visibility All Instrument Approaches Not Authorized (NA) during transit times
Preliminary OSW staging and integration sites ranking for airspace and airport compatibility	Lesser degree of impacts	Significant degree of impacts	Significant degree of impacts

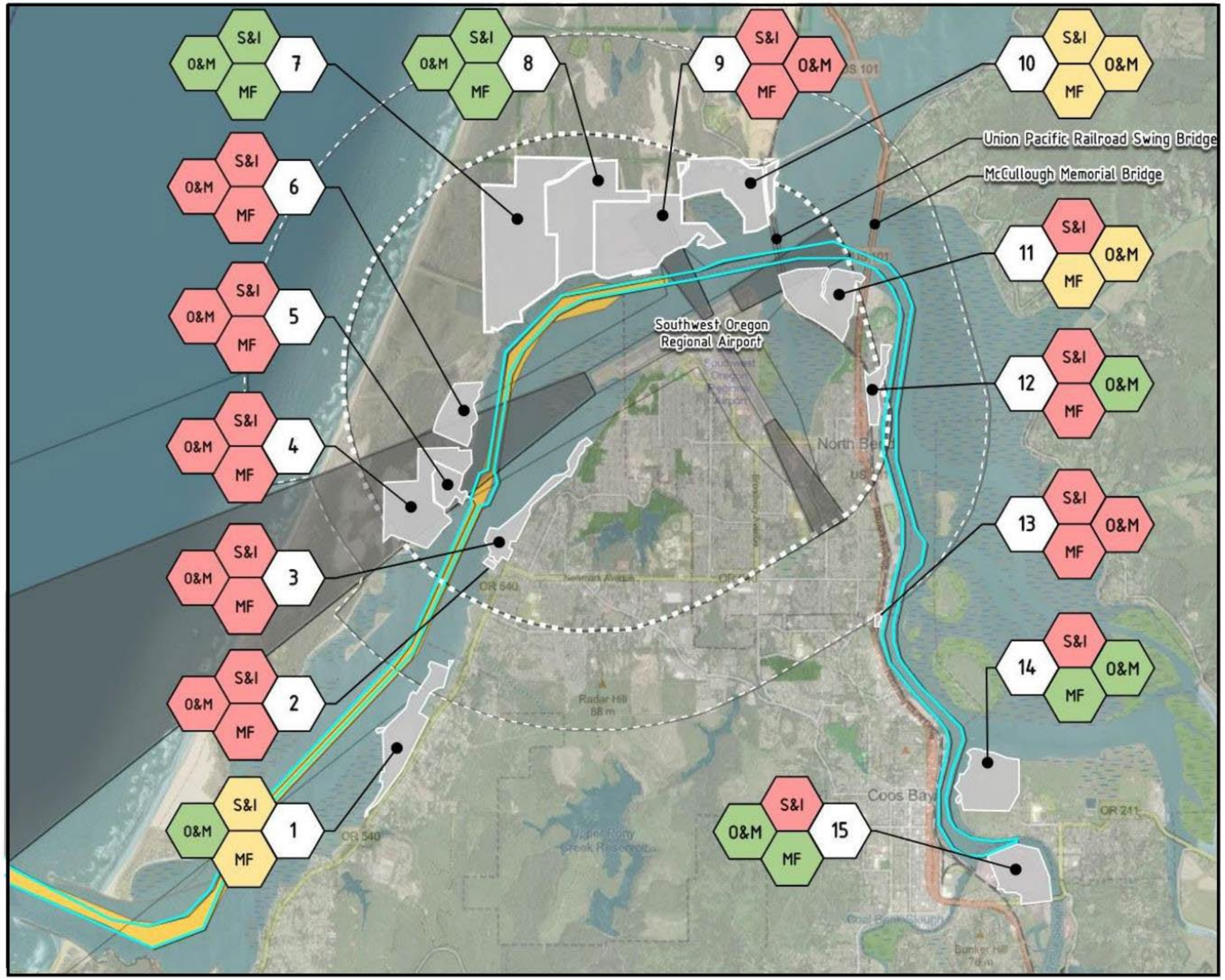
Notes:
MSL – Mean Sea Level
Cat – Aircraft Approach Category (A- Approach speed less than 91 knots; B – Approach speed 91 knots or more but less than 121 knots; C – Approach speed 121 knots or more but less than 141 knots; D – Approach speed 141 knots or more but less than 166 knots)
Extent of impacts are anticipated based on preliminary analysis, limited informal FAA discussions, and prior experience for similar situations. A formal FAA 7460-1 submittal and subsequent FAA/ODA determination will be required to obtain the actual extent of impacts.

Color Coding Legend

[1] Site is not anticipated to have any significant impact to preliminary analysis element.
[2] Site is anticipated to impact preliminary analysis element to a lesser degree and mitigation with limited impacts to airport operations may be possible. Further discussion with FAA and project stakeholders is required to determine the extent of impacts and potential mitigation options.
[3] Site is anticipated to impact analysis element to a significant degree and ability to mitigate impacts is unknown at this time. Further discussion with FAA and stakeholders is required to determine the extent of the impacts and potential mitigation options.

Before a decision can be made about the viability of the offshore wind industry coexisting with the Southwest Oregon Regional Airport (OTH), further analysis with the FAA, Airport Authority, Port, Bureau of Ocean Energy Management (BOEM), and other project stakeholders is required based on the findings of this preliminary analysis. Upon electing to move forward with the project, additional collaboration with the Airport Authority should take place followed by Port submittal of the FAA Form 7460-1 for the chosen site(s) for formal FAA and ODA determination of project impacts. Stakeholders should be prepared to discuss potential mitigation options at the local level, followed by additional discussions at higher levels of the FAA depending on the extent of impacts noted in the determination(s).

Appendix C: Conceptual Site Layouts



Site Key

1. Former Sitka Dock
2. City of Coos Bay - Hollering Place
3. Cape Arago Dock / Sause Bros.
4. North Bay Marine Industrial Park
5. D.B. Western
6. Southport Lumber Company
7. Henderson Ranch
8. Jordan Cove West
9. Roseburg Forest Products
10. Jordan Cove East
11. Al Pierce Lumber Co
12. Ocean Terminals Dock
13. Bayshore Dock
14. Eastside Port Parcel
15. Terminal 1 Site

Legend

- S&I – Staging and Integration Site
- MF – Manufacturing Site
- O&M – Operations and Maintenance Site
- Good Candidate Site
- Moderate Candidate Site
- Not A Candidate Site
- Existing Federal Navigation Channel
- Proposed USACE Channel Improvement
- FAA Runway Approach
- FAA Conical Surface
- FAA Horizontal Surface

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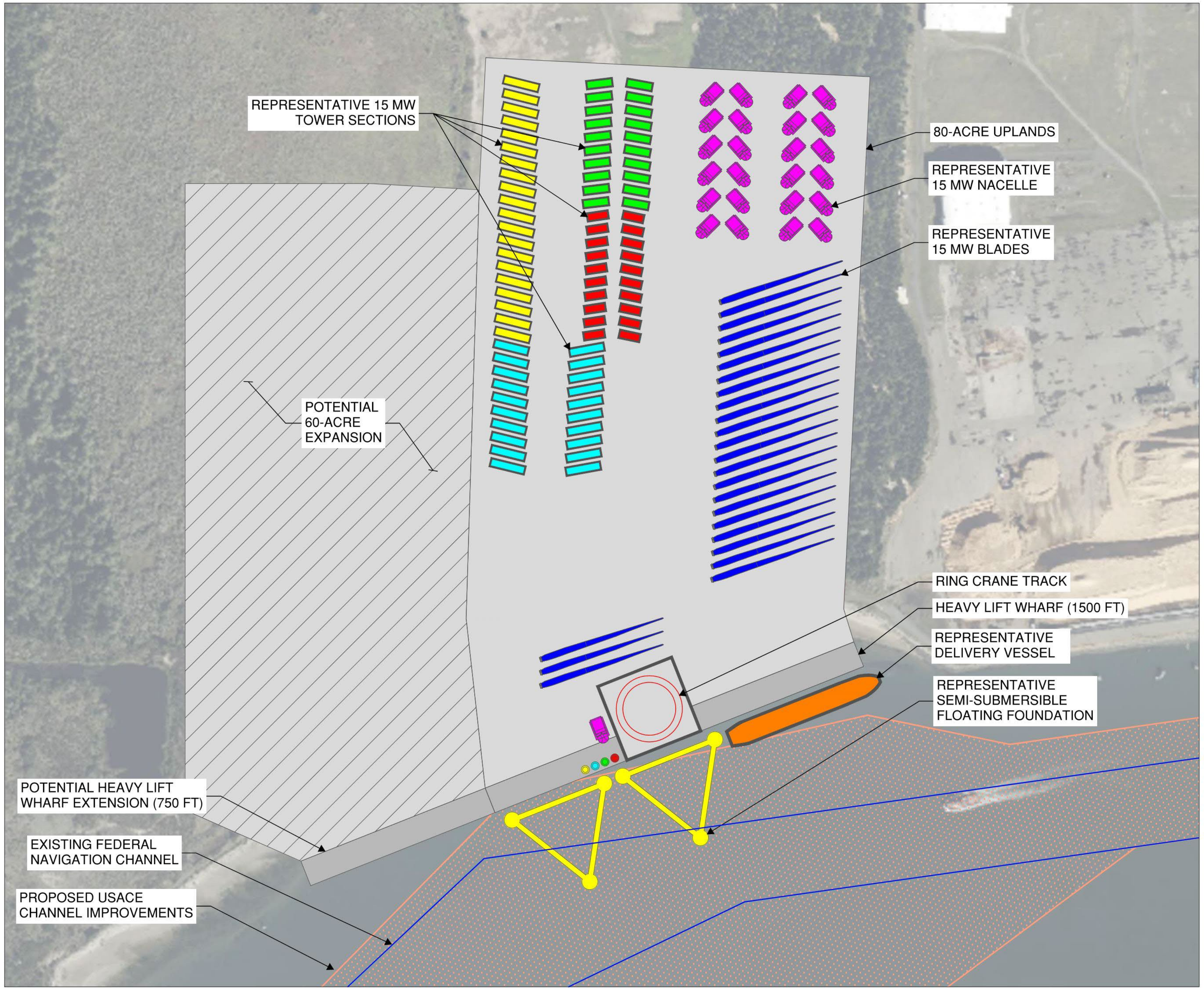
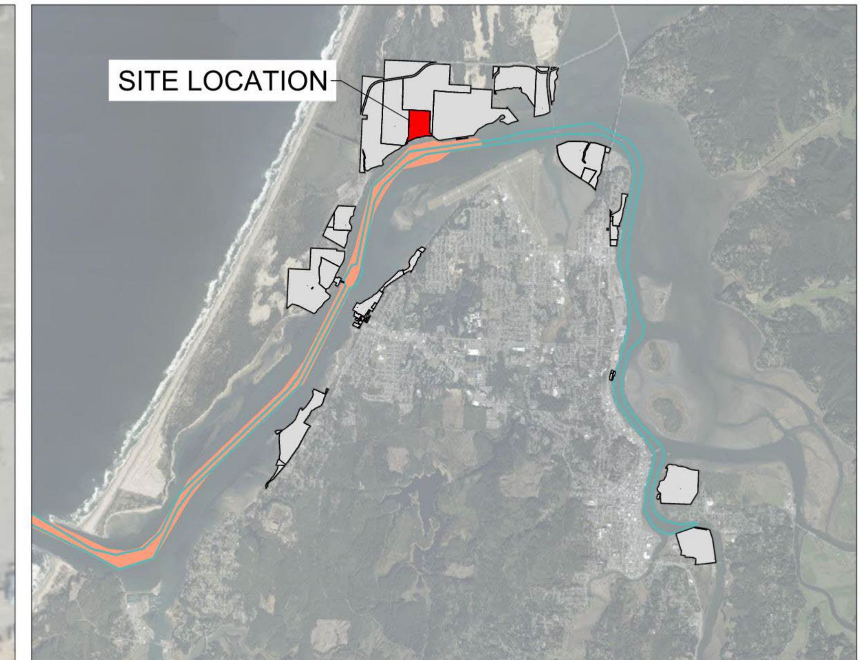
PORT OF COOS BAY
SITE PLAN
October 3, 2022

BOEM
Bureau of Ocean Energy Management

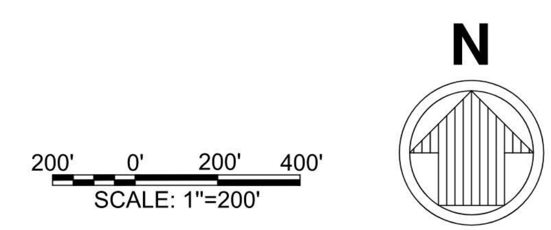




VICINITY MAP
NTS

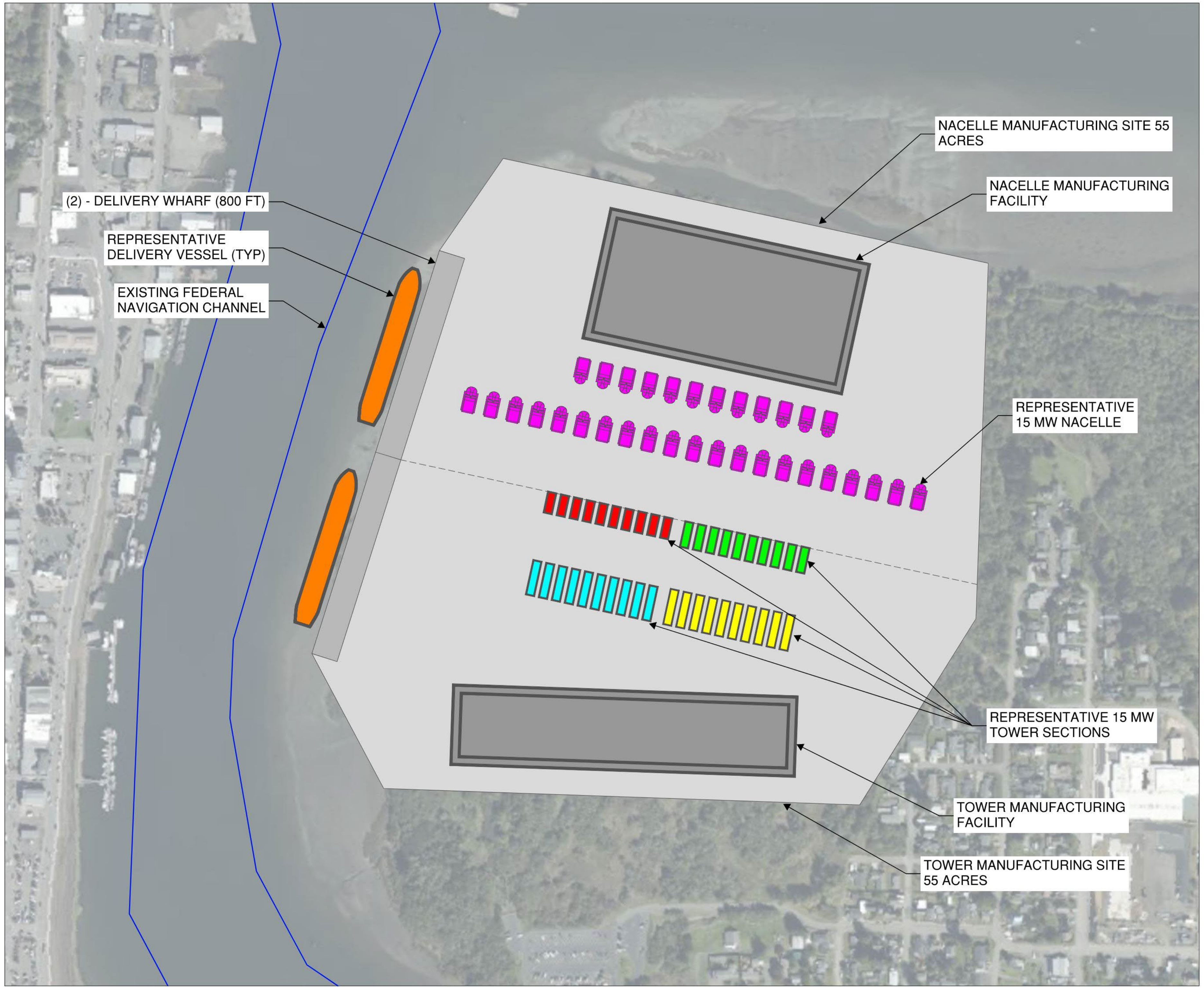
NOTES:

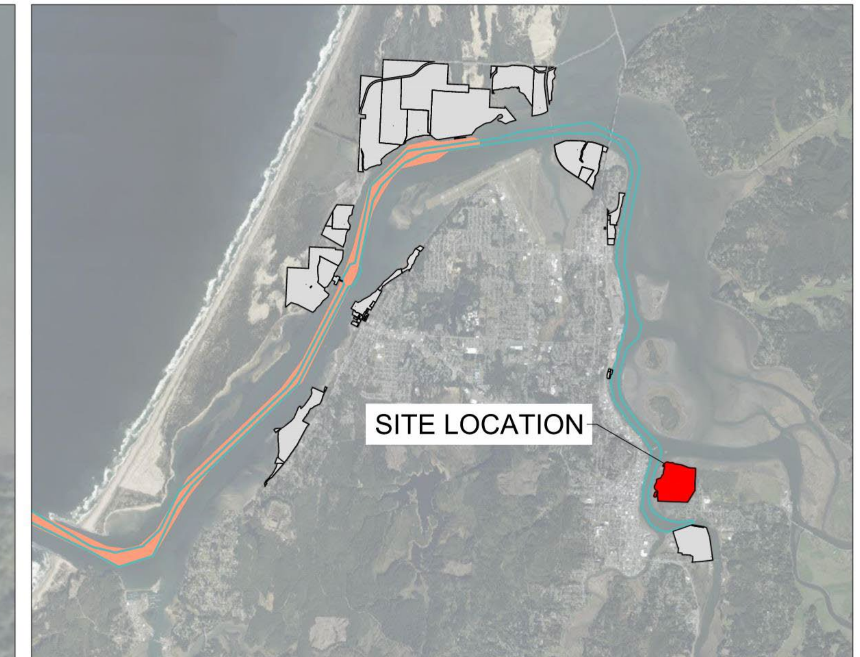
1. LAYOUT SHOULD BE CONSIDERED PRELIMINARY. FINAL LAYOUT REQUIRES FURTHER MODELING AND ANALYSIS.
2. LAYOUT SHOWN ASSUMES A15MW WIND TURBINE GENERATION COMPONENTS.
3. IT IS ASSUMED THAT A 15MW TURBINE WILL USE 4 TOWER SECTIONS.
4. COMPONENT SIZES ARE REPRESENTATIVE BASED ON AVAILABLE INFORMATION.



PORT OF COOS BAY
JORDAN COVE WEST & HENDERSON RANCH
STAGING AND INTEGRATION CONCEPTUAL LAYOUT
July 12, 2022

Bureau of Ocean Energy Management





VICINITY MAP
NTS

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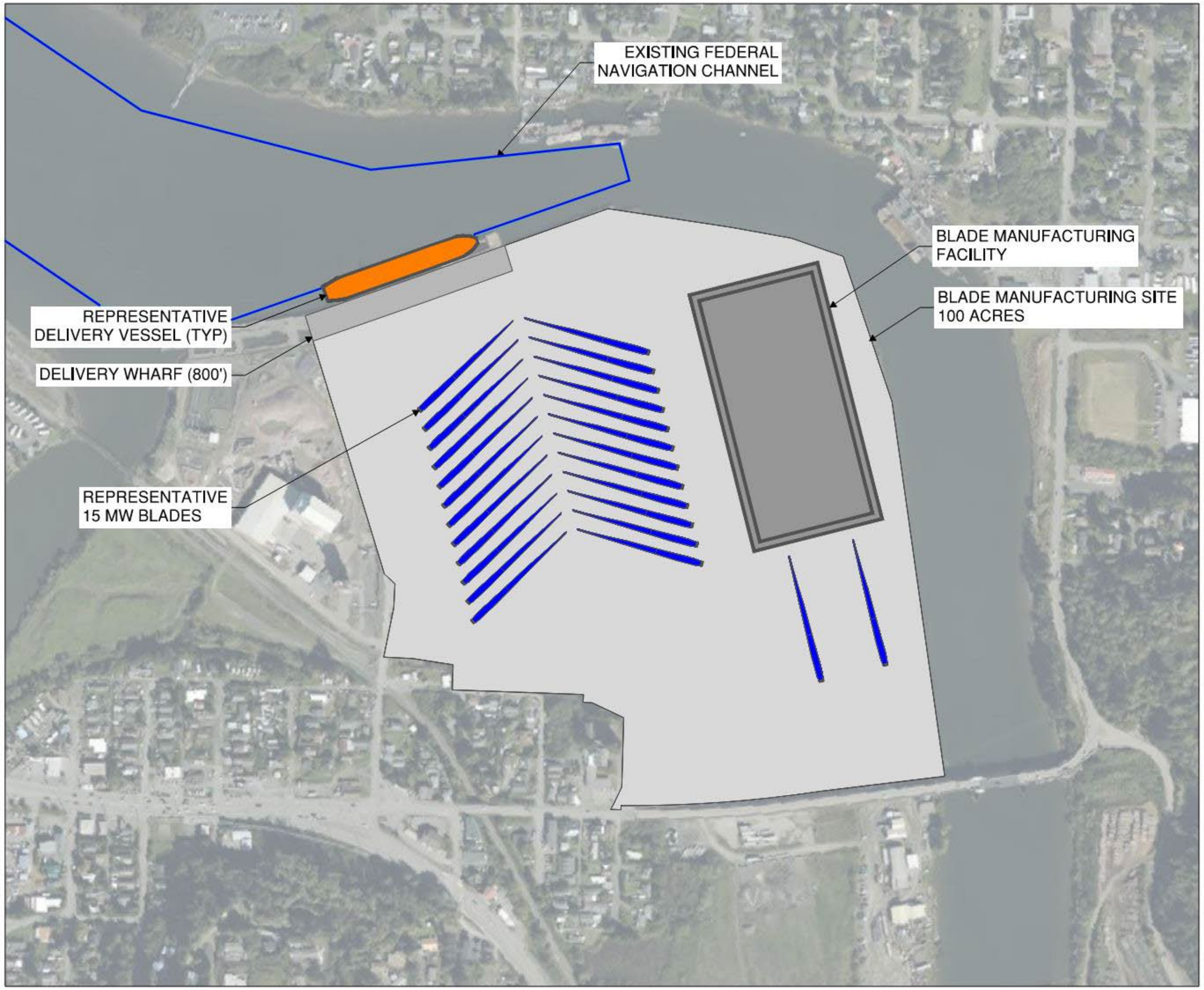
2. LAYOUT SHOWN ASSUMES A15MW WIND TURBINE GENERATION COMPONENTS.
3. IT IS ASSUMED THAT A 15MW TURBINE WILL USE 4 TOWER SECTIONS.
4. COMPONENT SIZES ARE REPRESENTATIVE BASED ON AVAILABLE INFORMATION.

200' 0' 200' 400'
SCALE: 1"=200'

N

PORT OF COOS BAY
EASTSIDE PORT PARCEL
TOWER AND NACELLE MANUFACTURING SITE
July 12, 2022

BOEM
BUREAU OF OCEAN ENERGY MANAGEMENT



VICINITY MAP
NTS

NOTES:

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2. LAYOUT SHOWN ASSUMES A15MW WIND TURBINE GENERATION COMPONENTS.
3. IT IS ASSUMED THAT A 15MW TURBINE WILL USE 4 TOWER SECTIONS.
4. COMPONENT SIZES ARE REPRESENTATIVE BASED ON AVAILABLE INFORMATION.

200' 0' 200' 400'
SCALE: 1"=200'

N

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PORT OF COOS BAY
TERMINAL 1
BLADE MANUFACTURING SITE
July 12, 2022

BOEM
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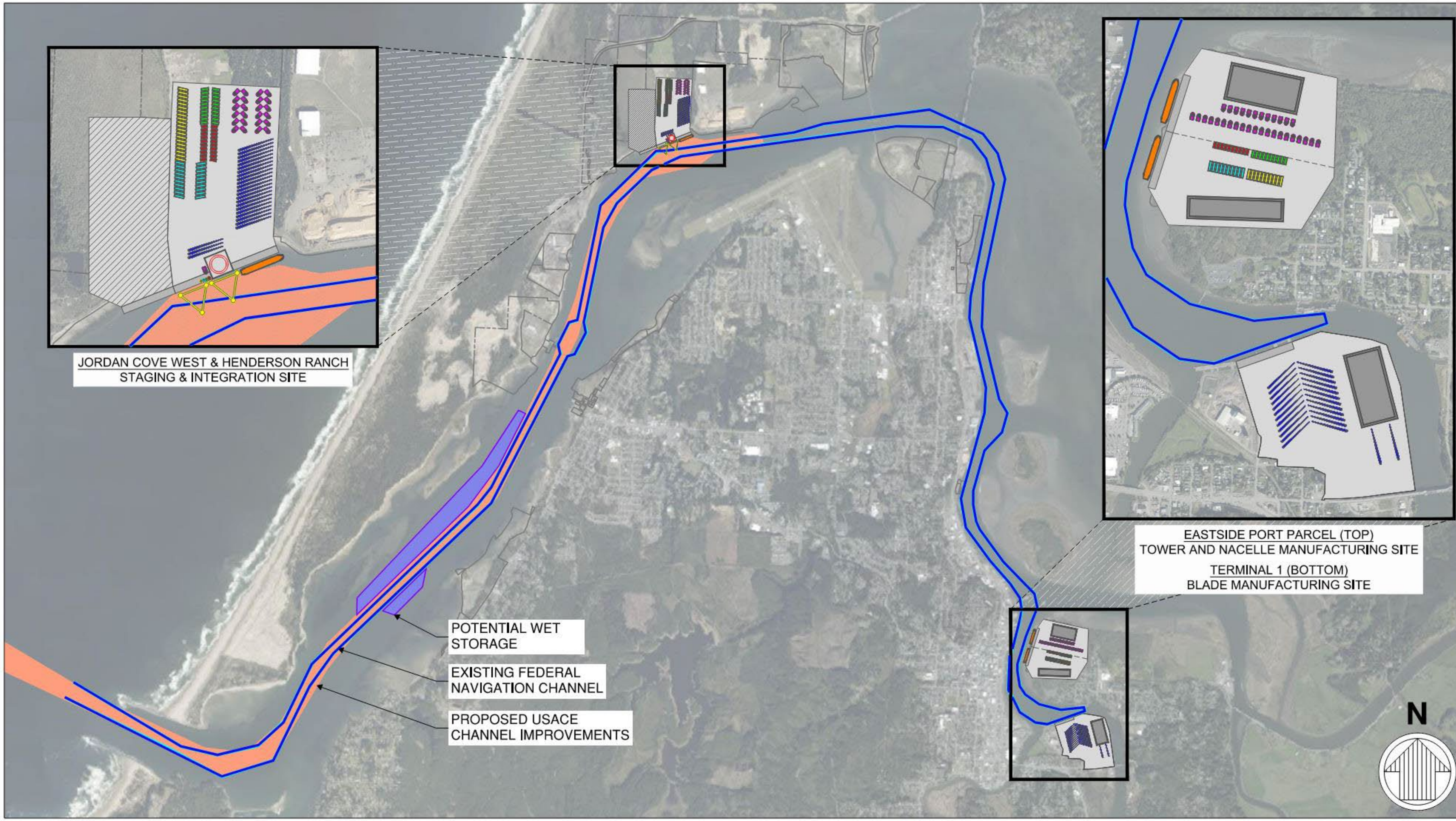

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PORT OF COOS BAY
COOS BAY OFFSHORE WIND PORT
SELECTED SITES
July 12, 2022

BOEM
BUREAU OF OCEAN ENERGY MANAGEMENT

U.S. Department of the Interior (DOI)
DOI protects and manages the Nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities.

Bureau of Ocean Energy Management (BOEM)
BOEM's mission is to manage development of U.S. Outer Continental Shelf energy and mineral resources in an environmentally and economically responsible way.