HECATE ENERGY
CASCADIA OFFSHORE WIND PROJECT

Unsolicited Application for an Outer Continental Shelf Renewable Energy Lease

Washington State Federal Waters

US Department of the Interior, Bureau of Ocean Energy Management

March 29, 2022

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Hecate: /hek uh tee/ - The Greek goddess of the solar system, sub-surface earth and the oceans. She is represented as a three-faceted goddess that evokes the crossroads. Hecate Energy's logo captures this essence both in design and color and reflects our mission of developing power generation resources at the crossroads of traditional natural gas power plants, proven solar technology, and emerging energy storage solutions.

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Executive Summary

Hecate Energy LLC (Hecate) is pleased to submit this unsolicited request in accordance with 30 Code of Federal Regulations 585.230 for the requested lease area, which is located approximately 15 nautical miles (nm) off the coast of the state of Washington in federal waters.

Renewable energy generation has been a priority in the state of Washington since the Washington Energy Independence Act of 2006 and State Bill 5116 of 2019, the Clean Energy Transformation Act. As such, the state of Washington aims to meet a 100% carbon-free energy mandate by 2045; and there is a significant wind resource available from the Pacific coast out to 50 nm to support this mission (State Ocean Caucus 2018).

Hecate's objective is to generate affordable, cost-effective renewable electricity for millions of Washington households and businesses. To achieve this objective, Hecate will develop offshore wind energy facilities, consisting of wind turbine generators (WTGs), inter-array electrical collection systems, offshore substations, and high-voltage electrical export cable systems connected to one or more onshore points-of-interconnection (POI) substations. Hecate has preliminarily evaluated potential lease areas off the coast of Washington and has determined the most suitable location for offshore wind energy development based on existing wind resources, distance to POI, and environmental conditions. The area of interest (AOI) considered herein represents approximately 1,044 square kilometers; however, the project itself may occupy a smaller area within a portion of the AOI. Accordingly, the requested lease area would consist of up to 134 floating WTGs, each with a capacity of 15 MW, resulting in an overall capacity of approximately 2,000 megawatts (MW).

If this requested lease area is awarded, further study of geotechnical and geophysical environment, navigational hazards, protected areas, marine mammal presence and behavior, birds and bats, cultural resources, and other resources in the requested lease area and areas associated with the potential subsea cable routes would be necessary prior to developing an offshore wind energy project. In addition, coordination with the Washington state government, the Department of Defense, the U.S. Department of the Navy, the U.S. Air Force, local communities, and other stakeholders will be required to avoid and mitigate potential impacts during the development process.

Abbreviations

§ or §§	section or sections
~	approximately
AIS	Automatic Identification System
AOI	area of interest
ASW	anti-submarine warfare
ATBA	Area to Be Avoided
BOEM	Bureau of Ocean Energy Management
CFR	Code of Federal Regulations
CT DEEP	Connecticut Department of Energy and Environmental Protection
DoD	Department of Defense
DOE	U.S. Department of Energy
dwt	deadweight tonnage
EFH	essential fish habitat
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FMPs	fishery management plans
ft	feet
GW	gigawatt(s)
HAPC	Habitat Areas of Particular Concern
Hecate	Hecate Energy LLC
I-937	Washington Energy Independence Act
km	kilometer
m	meter
m/s	meters per second
MBTA	Migratory Bird Treaty Act
MMPA	Marine Mammal Protection Act
MOA	Military Operations Area
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSP	Marine Spatial Plan
MTR	military training route
MW	megawatt(s)
MWac	megawatt(s) alternating current
MWh	megawatt hour
Navy	U.S. Department of the Navy
NOAA	National Oceanic and Atmospheric Administration
nm	nautical miles
NREL	National Renewable Energy Laboratory
NYSERDA	New York State Energy Research and Development Authority
OCNMS	Olympic Coast National Marine Sanctuary
OCS	outer continental shelf
OOI	Ocean Observatories Initiative
POI	points of interconnection

PPA	power purchase agreement
PV	photovoltaic
QIN	Quinault Indian Nation
SB	Senate Bill
SDIC	State Development and Investment Corporation
SERL	SeaEnergy Renewables Limited
SWH	significant wave height
U.S.	United States
USAF	U.S. Air Force
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
VR	Visual Route
WA	Warning Area
WDFW	Washington Department of Fish and Wildlife
WTG	wind turbine generator

1.0 Introduction

As the United States and global energy markets continue to demand green energy increases, it is often the case that delivering renewable energy to customers becomes the greater challenge rather than generating renewable energy. Hecate is actively engaged in several offshore wind projects, both nationally and internationally, that can meet this challenge. We leverage years of forward thinking and development experience across a variety of platforms to deliver a product that includes offshore wind that positions us as leaders in project development for offshore wind technology. As an example, Hecate recently announced initiation of a 10,000-megawatt (MW) offshore wind project in the North Atlantic that will deliver power to the United Kingdom grid via a substantial high voltage direct current transmission system.

Renewable energy generation has been a priority in Washington since the Washington Energy Independence Act (I-937) was enacted in 2006 that requires electric utilities serving 25,000 or more retail customers use renewable energy and set a renewable energy target of 15 percent by 2020. I-937 was established to "stabilize electricity prices for Washington residents, provide economic benefits for Washington counties and farmers, create high-quality jobs in Washington, provide opportunities for training workers in the renewable energy field, protect clean air and water, and position Washington as a national leader in clean energy technologies" (Washington Utilities and Transportation Commission 2020).

Washington's renewable electricity generation goal of 15 percent was met as of September 2020, with hydroelectric power making up a large percentage of the portfolio. To continue the renewable energy generation growth trajectory, Washington seeks to replace current coal-fired electric generating capacity with renewable energy and has enacted a carbon-free energy mandate of 100% by 2045 as part of State Bill (SB) 5116 of 2019, the Clean Energy Transformation Act. Exploring offshore wind energy development is an essential component in reaching this goal. In addition, the current governor of Washington, Jay Inslee, ran on a platform of converting to 100 percent clean energy and published a 100% Clean Energy For America Plan. The plan included goals to use federal lands, offshore waters, and facilities to deploy more renewable energy and transmission. The plan referenced that harnessing 1 percent of our nation's technical offshore wind resources could potentially power more than 6 million homes.

The Hecate team is highly experienced in developing utility-scale energy generation and transmission projects in complex environments. We have a full understanding of west coast outer continental shelf (OCS) development opportunities and constraints and Bureau of Ocean Energy Management (BOEM) commercial leasing processes and guidelines. We are confident in our ability to exceed the legal, technical, and financial requirements to execute a lease with BOEM.

2.0 Description of Objectives and Facilities

2.1 Objectives

Hecate's objective is to generate affordable, cost-effective renewable electricity for millions of Washington households and businesses. To achieve this objective, Hecate will develop offshore wind energy facilities, consisting of wind turbine generators (WTGs), inter-array electrical collection systems, offshore substations, and high-voltage electrical export cable systems connected to one or more onshore points-of-interconnection (POI) substations. Several and diverse support facilities will be necessary to construct, operate, maintain, and eventually decommission the offshore wind energy facilities, including existing or new manufacturing facilities, ports, depots/staging areas, and operation and maintenance centers. Developing this facility will advance the national offshore wind goal of 30 GW by 2030, which is a recent goal established in 2021 (White House 2021), as well as the state's renewable energy mandate of 100% by 2045 as part of the Clean Energy Transformation Act.

2.2 Area Requested for Lease

Hecate formally submits its interest in an area of interest (AOI) as summarized in Table 1 and depicted in Figure 1a. AOI A and AOI B are 521 and 523 square kilometers (kms) respectively and would make up the requested lease area of 1,044 square kms. Table 2 summarizes and Figure 1b depicts the area of interest overlaid on BOEM aliquots.

Table 1. Area Requested for Lease

Area of Interest	Square Miles	Square Kilometers
A	201	521
B	202	523
Total	**403**	**1,044**

The AOI would be located approximately 15 nm from the shoreline and would be capable of producing a minimum of 3.13 GW of power (assuming a yield of 3 MW per square km which could be adjusted upward). While the AOI represents approximately 1,044 square km, the project may occupy a smaller area within a portion of the AOI.

Table 2. Lease Area Blocks

Block Number	Partial Block (Aliquot) Designation	Quantity of Aliquots
AOI A		
6021	K,L,O,P	4
6022	F,G,H,I,J,K,L,M,N,O,P	11

Block Number	Partial Block (Aliquot) Designation	Quantity of Aliquots
6023	B,C,D,E,F,G,H,I,J,K,L,M,N,O,P	15
6024	A,B,C,D,E,F,G,H,I,J,K,M,N,O	14
6025	A,B,E,F	4
6070	P	1
6071	C,D,G,H,J,K,M,N,O,P	11
6072	A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P	16
6073	A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P	16
6074	A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P	16
6075	A,B,E,F,I,J,M,N	8
6120	C,D,H	3
6121	A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P	16
6122	A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P	16
6123	A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P	16
6124	A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P	16
6125	A,B,E,F,I,J,M,N,O	9
6170	L,P	2
6171	A,B,C,D,F,G,H,J,K,M,N,O,P	14
6172	A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P	16
6173	A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P	16
6174	A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P	16
6175	A,B,C,E,F,G,I,J,K,L,M,N,O,P	14
6220	D	1
6221	A,B,C,D,E,F,G,H,J,K,L,N,O,P	14
6222	A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P	16
6223	A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P	16
6224	A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P	16
6225	A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P	16
6226	A,E,F,I,J,M,N,O	8

Block Number	Partial Block (Aliquot) Designation	Quantity of Aliquots
7123	N,O,P	3
7124	M,N	2
	Total AOI A	**362**
AOI B		
6271	C,D,H,L	4
6272	A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P	16
6273	A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P	16
6274	A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P	16
6275	A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P	16
6276	A,B,C,E,F,G,I,J,K,M,N,O	12
6322	A,B,C,D,F,G,H,L	8
6323	A,B,C,D,E,F,G,H,I,J,K,L,N,O,P	15
6324	A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P	16
6325	A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P	16
6326	A,B,C,E,F,G,I,J,K,M,N,O,P	13
6373	C,D,I	3
6374	A,B,C,D,E,F,G,H,I,J,K,L,N,O,P	15
6375	A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P	16
6376	A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P	16
6424	C,D,H	3
6425	A,B,C,D,E,F,G,H,L	9
6426	A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P	16
6476	B,C,D,F,G,H,J,K,L,N,O,P	12
6477	A,E,I,M	4
6526	B,C,D,F,G,H,J,K,L,N,O,P	12
6527	A,E,I,M	4
6576	B,C,D,F,G,H,I,J,K,L,M,N,O,P	14
6577	A,E,I,M	4

Block Number	Partial Block (Aliquot) Designation	Quantity of Aliquots
6625	D,H,K,L,O,P	6
6626	A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P	16
6627	A,E,I,M	4
6675	B,C,D,F,G,H,I,J,K,L,M,N,O,P	14
6676	A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P	16
6677	A,E,I,M	4
6724	D,H,L	3
6725	A,B,C,D,E,F,G,H,I,J,K,L	12
6726	A,B,C,D,E,F,G,H,I,J,K,L	12
	Total AOI B	**363**

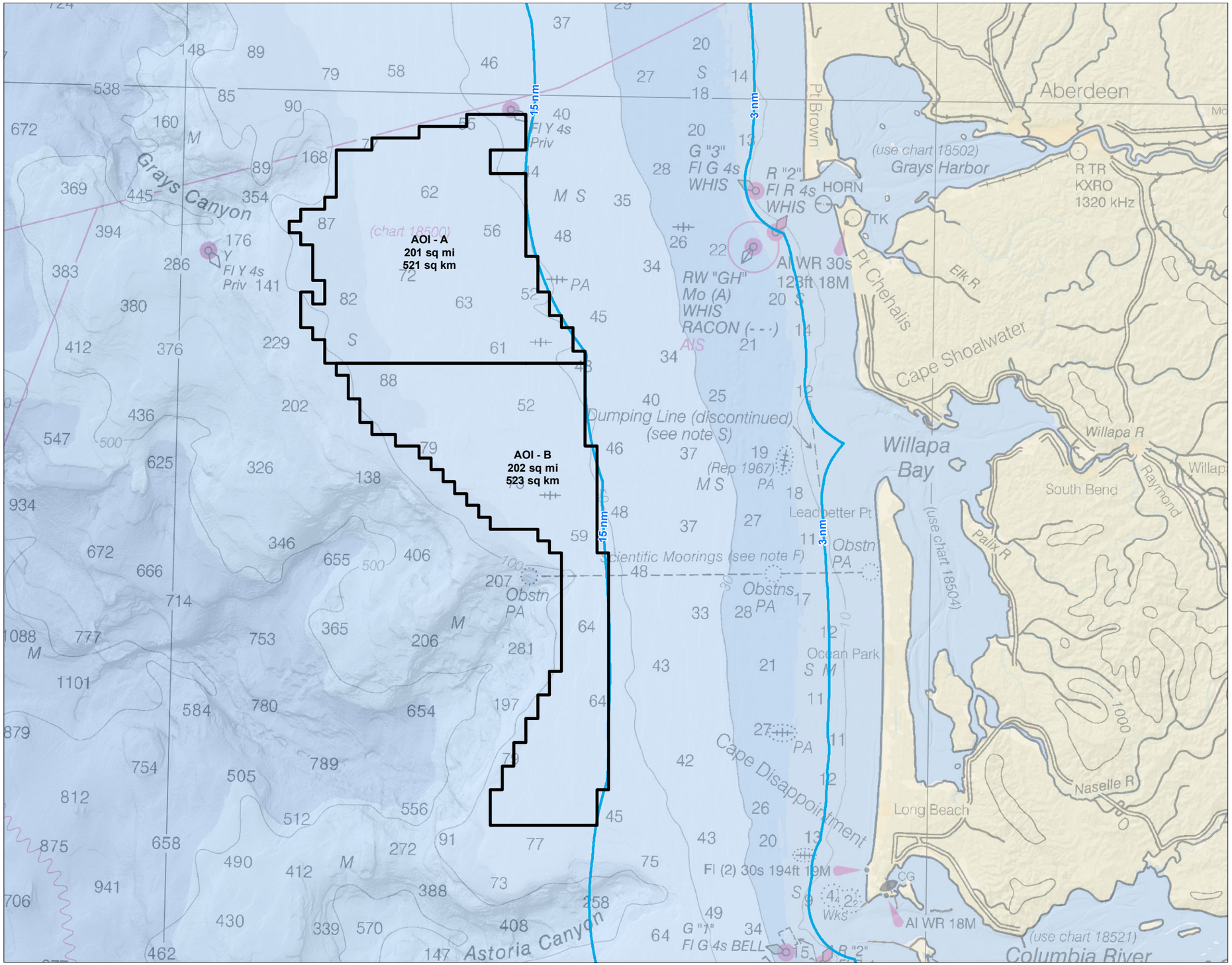

Figure No.
1a

Title
Areas of Interest (AOI)

Client/Project
Hecate Energy Cascadia Offshore Wind Project

Project Location
(124°40'12"W, 46°54'25.2"N)

185705430
Prepared by JC on 2022-03-14
Technical Review by MT on 2022-03-14
Independent Review by CB on 2022-03-14

0 4 8 Miles
1:400,000 (At original document size of 11x17)

Area of Interest (AOI)
Nautical Miles from Shoreline

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Map features Hecate 2022; NOAA 2021; BOEM 2021.
3. Base map: Esri 2021; NOAA 2021.
4. Soundings in fathoms.

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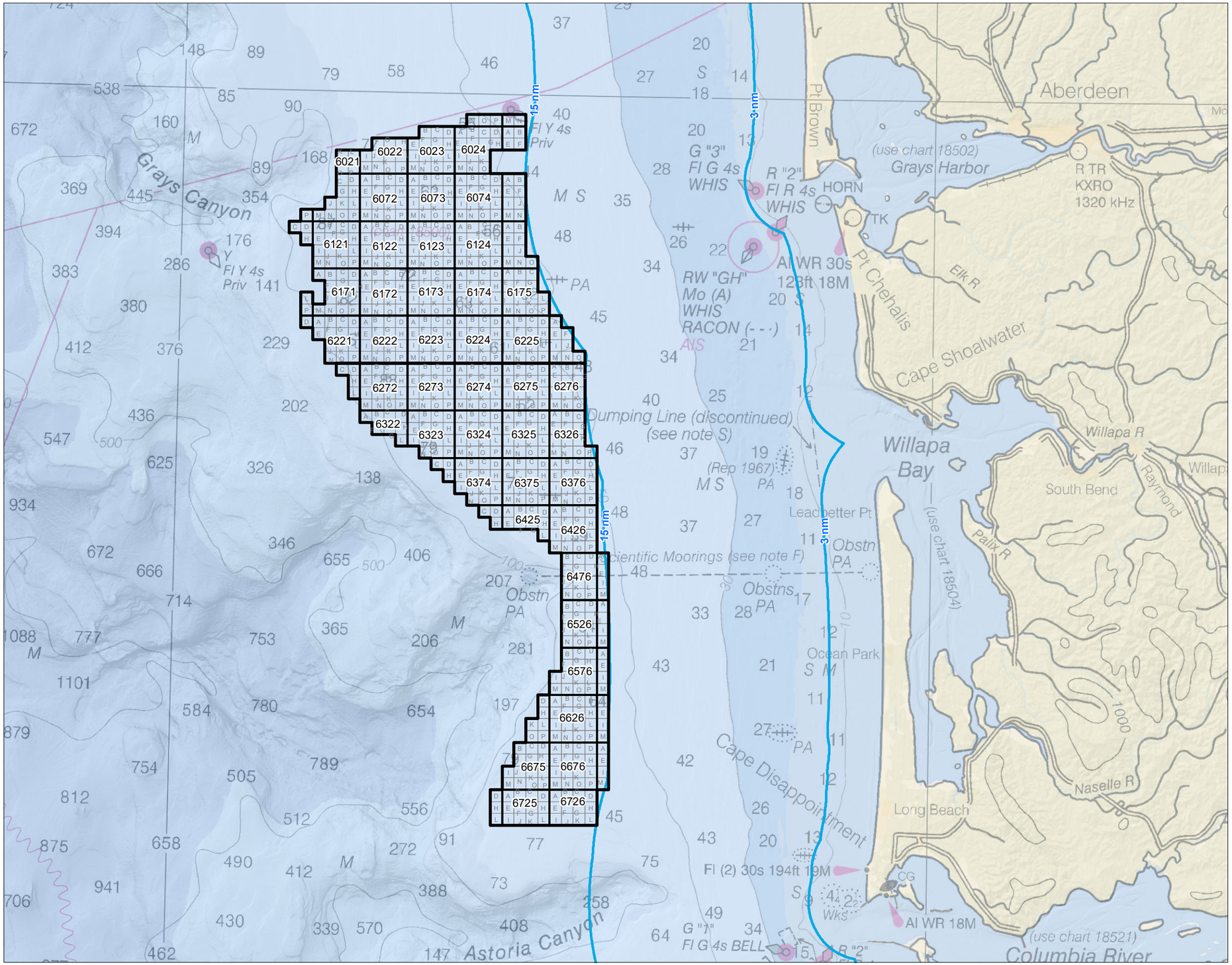

Figure No.
1b

Title
Area of Interest: BOEM Aliquots

Client/Project
Hecate Energy Cascadia Offshore Wind Project

Project Location
(124°40'12"W, 46°54'25.2"N)

185705430
Prepared by JC on 2022-03-14
Technical Review by MT on 2022-03-14
Independent Review by CB on 2022-03-14

0 4 8 Miles
1:400,000 (At original document size of 11x17)

- Area of Interest (AOI)
- BOEM Aliquot Block
- BOEM Aliquot Subblock
- Nautical Miles from Shoreline

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Map features Hecate 2022; NOAA 2021; BOEM 2021.
3. Base map: Esri 2021; NOAA 2021.
4. Soundings in fathoms.

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2.2.1 Screening Process Used to Select Area of Interest

The first step of the siting process was to evaluate potential locations for an AOI. Building from the initial feasibility review of environmental and other constraints, Hecate has preliminarily evaluated potential lease areas off the coast of Washington and has determined the most suitable location for offshore wind energy development based on:

- Wind, ocean, and seafloor resources
- Bathymetry and geologic conditions
- Environmental considerations
- Visual and cultural impacts
- Military and other ocean uses

These factors are summarized below and further described in Section 3.0; however, further study of these topics would occur during site assessment activities.

Wind, Ocean, and Seafloor resources

The wind resource in the requested lease area is consistent throughout the requested lease area with average wind speeds in the range of 8.25 to 8.5 m/s at a 90-meter hub height. The ocean and seafloor resources are also relatively consistent throughout the requested lease area. The majority of the area is fine grained sediments with isolated pockets of hardbottom or rocky reef which are designated as Habitat Areas of Particular Concern (HAPC) which would be avoided during project development.

Bathymetry and Geologic Conditions

The bathymetry in the requested lease area is relatively level with gradual slopes and depths ranging from 75 to 225 meters (246 to 738 feet). Steep slopes and canyons and depths below 225 meters and have been avoided in the requested lease area. Geologic conditions are fairly uniform with shelf deposits of sands and silts as the main feature.

Environmental Considerations

Designated sensitive habitats such as those associated with canyons and marine protected areas have been avoided in the requested lease area. Other environmental considerations such as marine mammal and essential fish habitat have been reviewed for potential impacts. Hecate would use criteria to avoid or minimize impacts on environmental resources such as fish and wildlife migration corridors, sensitive habitats, and threatened or endangered species.

Visual and Cultural Impacts

The requested lease area considered ways to minimize visual impacts by locating the wind project a distance of 15 nm (17 miles) from the shore. Washington's coastal areas are rich with cultural resources and include archaeological sites providing prehistoric records of native people's marine-oriented uses. In addition, the area includes traditional cultural properties

associated with the cultural practices, traditions, beliefs, lifeways, arts, crafts, or social institutions of living communities such as the Quinault Indian Nation (QIN). Cultural resource impacts would be minimized during the design of the project.

Military and Other Ocean Uses

The requested lease area was designed to avoid the Navy Warning and Training areas W-237A to the north and W-507B to the south of the requested lease area. The Department of Defense (DoD) will be consulted for compatibility with the remaining uses such as DoD flight training routes. Other marine uses including commercial fishing and vessel traffic routes were evaluated for impact and will be considered for the design, spacing, and layout of the wind project.

2.2.2 Further Study

Information provided herein represents existing environmental conditions within the proposed lease area based on a review of publicly available literature, databases, and surveys. Site specific data for the AOI, POI, and cable routes would be determined during site assessment and permitting activities. As a result, the project area would be refined at that time.

If this requested lease area is awarded, further study of geotechnical and geophysical environments, navigational hazards, protected areas, marine mammal presence and behavior, birds and bats, cultural resources, and other resources in the requested lease area and areas associated with the potential subsea cable routes would be necessary prior to developing an offshore wind energy project. Coordination with the Washington state government, the U.S. Department of Defense (DoD), the U.S. Department of the Navy (Navy), the U.S. Airforce (USAF), local communities, and other stakeholders will be required to identify potential impacts during the development process. Additional data and analyses would inform the potential impacts of offshore wind development in the requested lease area and guide the avoidance and minimization measures, permits, and approvals that Hecate would need to develop the area in compliance with all applicable laws, regulations, and policies. Hecate would coordinate with applicable agencies and stakeholders and develop measures to minimize or mitigate potential impacts.

2.3 Description of Facilities

The requested lease area would consist of up to 134 floating WTGs, each with a capacity of 15 MW, resulting in an overall capacity of approximately 2,000 MW. The WTGs under consideration include the Vestas V236-15.0 MW prototype or similar turbine. Specifications for these turbine models are summarized in Table 3. Each turbine would be deployed on a floating concrete semi-submersible hull held in position by up to three marine mooring lines in the water column securely anchored to the seabed. Turbines would be connected by interconnection cables, which would be connected to an onshore transition point by an export transmission cable.

Table 3. Wind Turbine Specifications

Specification	Measurement
Height	280 meters
Rotor diameter	236 meters
Blade length	115.5 meters
Swept Area	43,732 square meters
Rated power	15,000 kilowatts
Cut-in speed	3 meters per second
Cut-out speed	30 meters per second

Source: Vestas 2021a, Vestas 2021b

2.3.1 Transmission

Hecate has performed an extensive transmission analysis of over 20 different POI in Washington. These 20 POI were reduced to seven POI, and a more extensive analysis regarding transmission optimization as well as a cable routing analysis from the offshore project site to an onshore landing has also been evaluated. These POI include substations that are near the coast and the "next" substation away, which results in delivery to the region's 500-kilovolt system.

2.4 General Schedule

Hecate envisions a preliminary indicative schedule of proposed activities, assuming BOEM determines that there is no competitive interest, leading up and through the commercial operations of offshore wind energy facilities within the requested lease area (Table 4).

Table 4. Preliminary Schedule of Proposed Offshore Wind Energy Project Development Activities in accordance with Code of Federal Regulations 585.231

Proposed Activities	Preliminary Schedule
Application Submission and Bureau of Ocean Energy Management Determination of No Competitive Interest	6 months – 1 year
Bureau of Ocean Energy Management Federal/State Agency Coordination; Coastal Zone Management Act (CZMA) Consistency Certification (15 Code of Federal Regulations part 930 subpart D)*	6 months - 1 year*
Bureau of Ocean Energy Management Issues Non-Competitive Lease	At completion of consultations
Site Assessment Plan (SAP)	1 year

Proposed Activities	Preliminary Schedule
Construction and Operations Plan (COP)/EIS/ROD	3 years
Execution (Fabrication and Installation)	2-3 years
Operation	33 years
Decommissioning	2-3 years

Note: *In accordance with 15 CFR 930 subpart D, the CZMA review period is six months. However, the preliminary schedule anticipates the process could take longer if additional data or information is requested.

3.0 Renewable Energy Resource and Environmental Conditions

3.1 Wind Resource

The wind resource in the vicinity of the continental shelf west of Grays Harbor and Willapa Bay, Washington, is characterized by variable wind conditions which fluctuate according to seasonal patterns. According to the National Renewable Energy Laboratory (NREL), areas with annual average wind speeds of 7 meters per second (m/s) and greater at 90 m above sea level are generally considered to have a wind resource suitable for offshore development (NREL 2021).

Preliminary data indicate that wind resources in the requested lease area are comparable to other wind farm development sites. Wind measurements within the requested lease area have been identified by the U.S. Department of Energy's (DOE's) NREL as having average annual wind speeds in the range of 8.25 to 8.5 m/s at 90 m above sea level. (NREL 2021). Higher wind speeds are generally observed at an increased distance from the shoreline as shown in Figure 2. Wind and metocean conditions are currently being measured at the requested lease area by Ocean Observatories Initiative (OOI) at Station 46099 (NOAA 2021). The OOI also maintains other buoys in the vicinity of the lease area identified as the Coastal Endurance Array. The Coastal Endurance Array is designed to observe cross-shelf and along-shelf variability in the region. Each line contains three sites spanning the slope (approximately [~] 500-600 m), shelf (~80-90 m), and inner-shelf (~25-30 m). The three sites across the shelf and slope are associated with characteristic physical, geological, and biological processes. All sites contain fixed sensors at the top and bottom of the water column paired with an adjacent water column profiler. (OOI 2022) (Figure 2).

The predominant wind direction is from the southwest with higher wind speeds during the fall, winter, and spring months versus the summer months. In late spring and summer, westerly to northwesterly winds associated with the North Pacific high-pressure system produce a dry season. Beginning in October and throughout the winter, southwesterly and westerly winds associated with the dominant Aleutian low-pressure system provide ample moisture and cloud cover for the wet season (NOAA 1993).

3.2 Metocean

The metocean conditions at the requested lease area are characterized by major ocean currents and seasonal patterns. As previously described, ocean circulation in the North Pacific reflects large-scale air movements in the atmosphere, specifically those relating to two major atmospheric pressure cells, the North Pacific High and Aleutian Low. Storm systems spiral around these pressure gradients and deliver energy to the surface of the ocean. In winter, the Aleutian Low is dominant, causing storms which blow onshore from the southwest. In summer, the North Pacific High moves northward off Oregon, causing winds to blow north to south along the Oregon Coast. El Niño and La Niña years also impact the weather patterns (Oregon Coastal Atlas 2021).

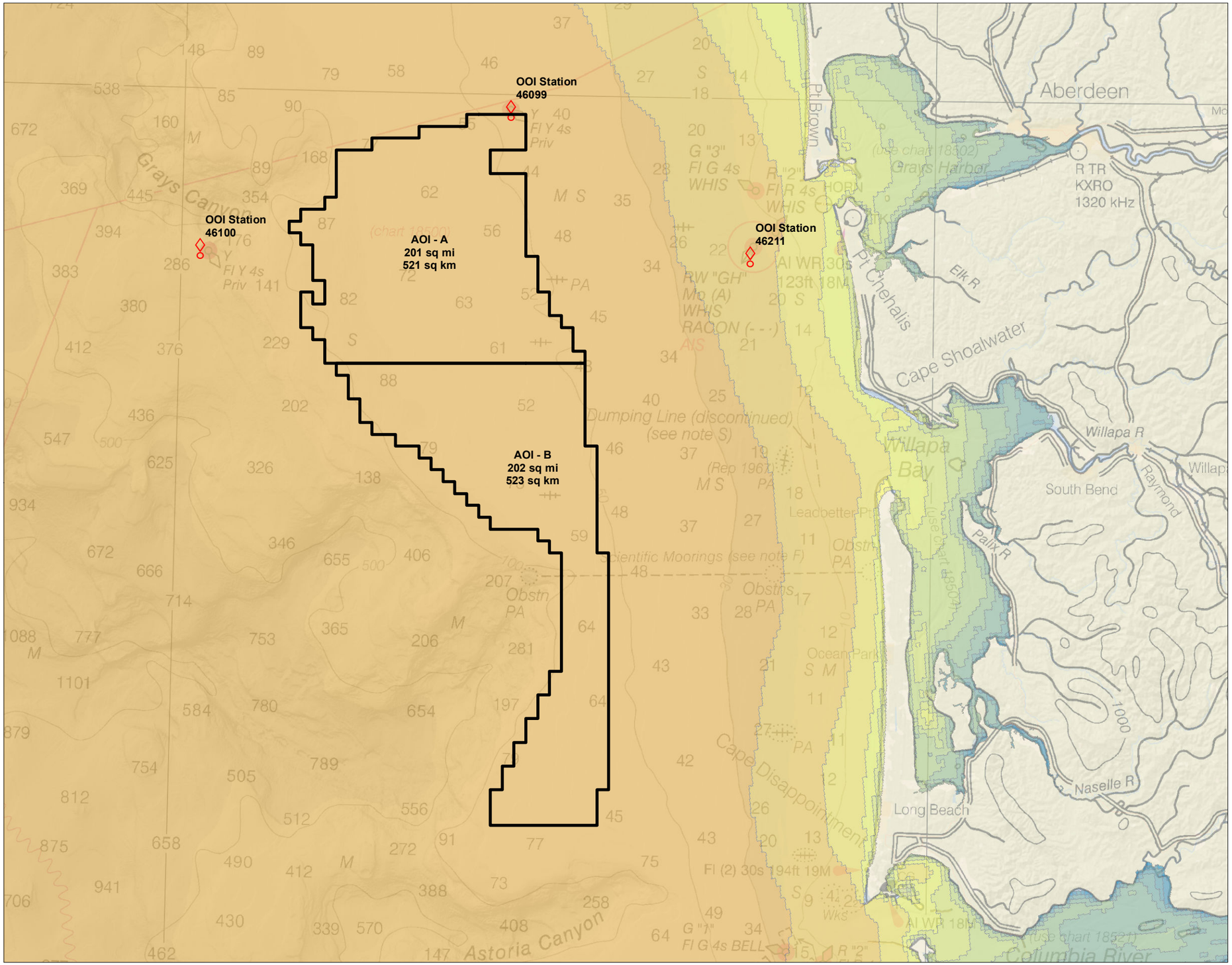

Figure No.
2

Title
Wind Regime

Client/Project
Hecate Energy Cascadia Offshore Wind Project

Project Location
(124°40'12"W, 46°54'25.2"N)

185705430
Prepared by JC on 2022-03-14
Technical Review by MT on 2022-03-14
Independent Review by CB on 2022-03-14

0 4 8 Miles
1:9,312,553 (At original document size of 11x17)

Area of Interest (AOI)
Metaocean Buoy

Annual Average Offshore Wind Speed (m/s at 90m)

- 5 - 5.25
- 5.25 - 5.5
- 5.5 - 5.75
- 5.75 - 6
- 6 - 6.25
- 6.25 - 6.5
- 6.5 - 6.75
- 6.75 - 7
- 7 - 7.25
- 7.25 - 7.5
- 7.5 - 7.75
- 7.75 - 8
- 8 - 8.25
- 8.25 - 8.5

Notes

1. Coordinate System: NAD 1983 UTM Zone 10N
2. Map features Hecate 2022; OOI 2022; NREL 2020; BOEM 2021.
3. Base map: Esri 2021; NOAA 2021.
4. Soundings in fathoms.

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3.3 Waves and Currents

3.3.1 Waves

The wave climate of the Pacific Northwest is recognized for its severity, with winter storms commonly generating deepwater significant wave heights (SWH) greater than 10 m (about one event of this magnitude per year), with the largest storms in the region having generated SWHs in the range of 14–15 m (Komar et al. 2013). Deepwater SWHs and spectral peak periods have annual averages of about 2 m and 10 seconds, respectively. High, long-period waves (averaging about 3 m in height and 12–13 seconds in period), high water levels, and a west-southwest direction of wave approach characterize the winter months (November through February). Small waves (1-m SWHs and 8-second periods), low water levels, and wind and waves from the west-northwest are the typical summer conditions (May through August) (USGS 2012).

Wave heights on the OCS average almost 5 m (16 feet [ft]) during December and January (NOAA 1993). During summer, waves are lower in height, predominantly from the northwest, causing longshore currents and sediment transport to the south. In winter, waves are generally higher and from the southwest, causing northerly longshore currents and sediment transport.

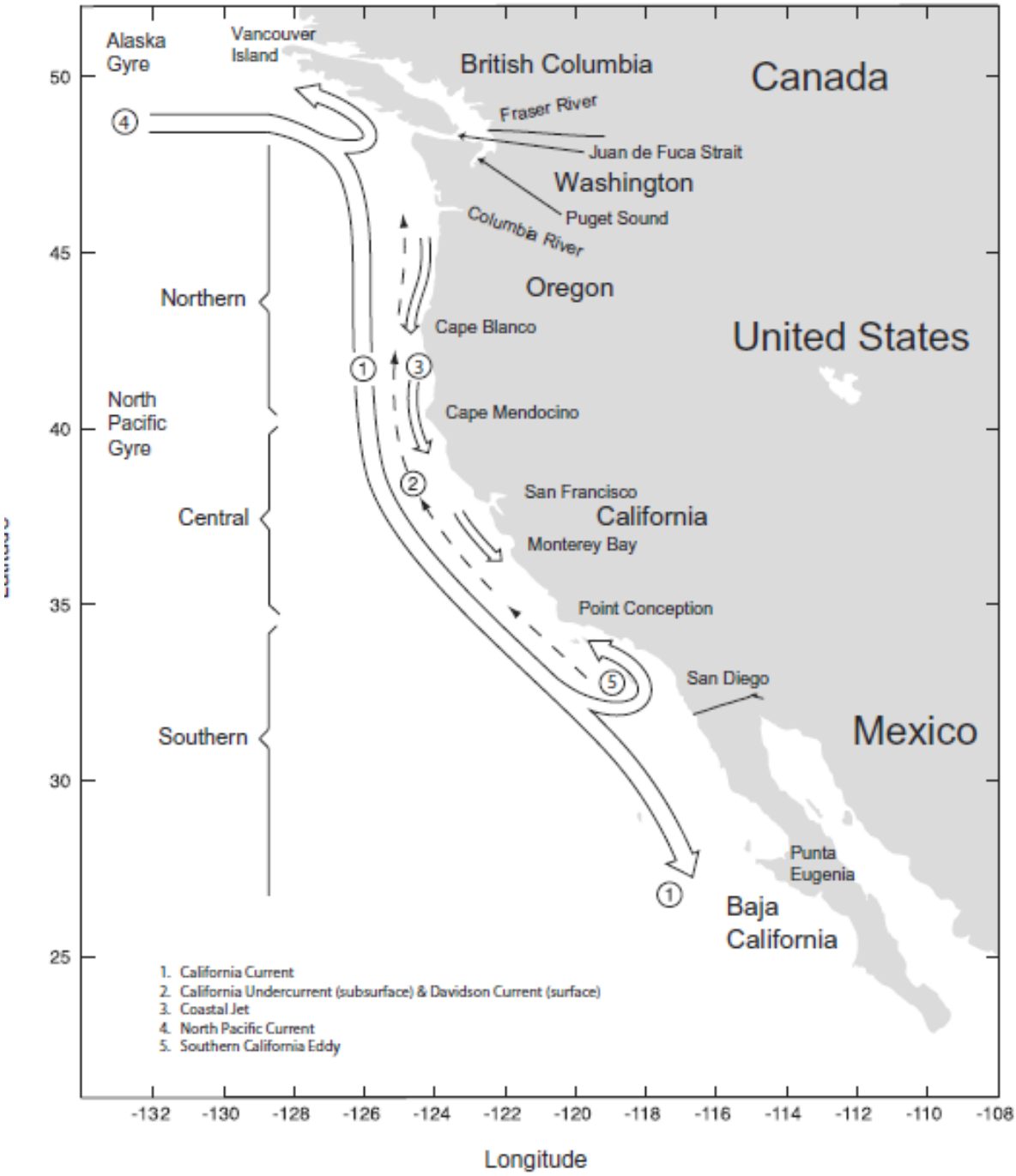
There are several metocean buoys in the vicinity of the requested lease area and part of the OOI funded by the National Science Foundation and part of National Oceanic and Atmospheric Administration's (NOAA's) National Data Buoy Center network of buoy data collection. OOI Buoy Station 46099 is located at 46.986 North latitude and 124.566 West longitude in the eastern section of the requested lease area shown in Figure 2. This buoy has been collecting data since 2016 and includes wind direction and speed; wave height, period, and direction; sea level pressure; air temperature, sea surface temperature; and other parameters.

3.3.2 Currents

The Washington coast is subject to the complex and seasonally variable current patterns of the California Current System (Hickey and Banas 2003). The dynamics of the California Current system circulation are dominated by strong along-shore winds and the narrow continental shelf. West of the continental shelf break, the southward California Current dominates year-round. The California Undercurrent flows northward over the continental slope and supplies most of the nutrient-rich water that reaches the waters over the shelf during the summer upwelling conditions. In fall and winter, the Davidson Current flows northward over the continental shelf and slope, along with a southward undercurrent (Figure 3).

Figure 3. Ocean Currents

D.M. Checkley Jr., J.A. Barth / Progress in Oceanography 83 (2009) 49–64



The summer upwelling season is signaled by a change from northward-dominated winter currents to southward-dominated summer currents. In fair spring and summer weather, winds accelerate surface currents southward and offshore, bringing cold, salty, nutrient-rich water to the surface and spreading fresher water from coastal estuaries away from shore and towards the south. The nutrients brought up into the photic zone (i.e., the upper portion of the water column where sunlight penetrates) nourish the planktonic base of the coastal food web. However, during storms or other periods of northward winds, the currents (especially those closer to shore) are generally reversed: the system switches into downwelling, and the plumes of fresher water tend to be pushed back towards the shore. Consequently, phytoplankton blooms form during upwelling events, but are pushed back towards shore during storms. In summer, local sea levels and currents are also strongly affected by coastal-trapped waves (i.e., water movements resulting from a complex interaction of shelf slope, wind, and the water's angular momentum) generated as far away as central California. (WDFW 2011).

3.4 Bathymetry and Geology

As described in Section 2.2.1, bathymetry on the continental shelf in the requested lease area ranges approximately 75–225 m (246–738 ft) deep. Figure 4 provides a bathymetric map and contours of the requested lease and surrounding area. Figure 5 provides a summary of the geologic setting.

The continental shelf off the Washington coast is smooth and narrow, ranging in width from 8–40 miles. Submarine canyons incise the continental shelf and slope along the entire coast. The continental slope consists of a steep and highly incised upper portion, and a more gently sloping lower portion which grades into the Cascadia Basin. Although glacial deposits compromise the underlying relic sediments of the continental shelf, the Columbia River is the dominant source of modern sediment for the southern Washington shelf. The northern shelf is fed by sediments carried from the Strait of Juan de Fuca. Year-round bottom currents and winter storms transport much of this sediment north-northwest. The sediment accumulates on the shelf as a band of sandy silt with the inner shelf sandy and the outer shelf comprising silt and clay. Much of this sediment is transported to and deposited in the Quinault Canyon where it gradually works downhill into the Cascadia Basin. Overlying the bedrock along many areas of the coast are deposits of sand and gravel laid down by glacial streams during extensive glaciation of the Olympic Mountains during the Pleistocene Epoch 17,000 to 70,000 years ago. Prominent gravel deposits lie off Cape Flattery, Grays Harbor, and the mouth of the Quinault River (NOAA 1993).

As shown in Figure 5, bottom sediments in the requested lease area consist largely of sedimentary shelf deposits, which includes mostly silt with isolated pockets of rocky shelf and gravel deposits.

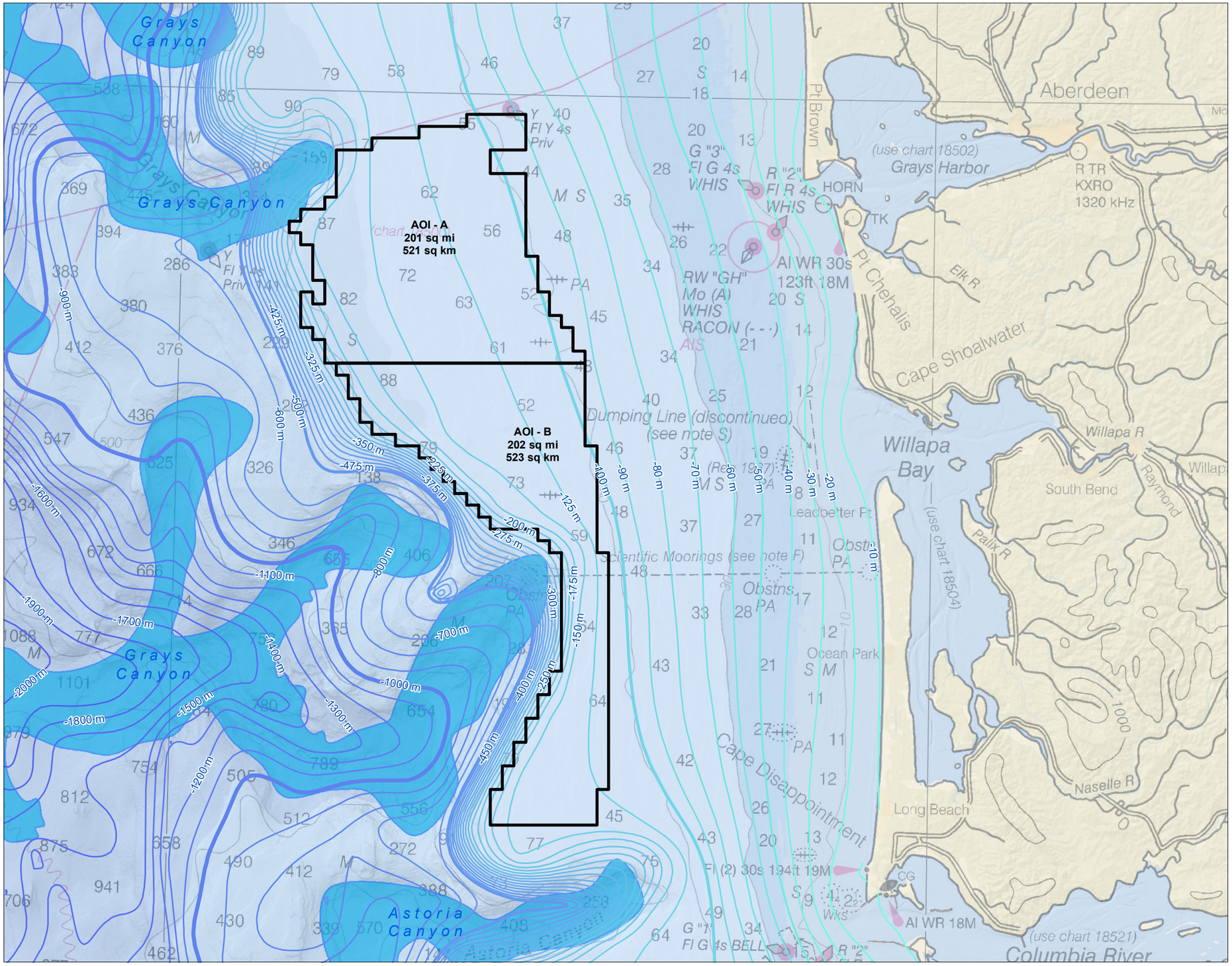


Figure No.
4

Title
Bathymetry

Client/Project
Hecate Energy Cascadia Offshore Wind Project

Project Location
(124°40'12"W, 46°54'25.2"N)

185705430
Prepared by JC on 2022-03-14
Technical Review by MT on 2022-03-14
Independent Review by CB on 2022-03-14

0 4 8 Miles
1:9,312,553 (At original document size of 11x17)

- Area of Interest (AOI)
- Bathymetric Contours (m)
- Submarine Canyons

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Map features: NOAA 2021; BOEM 2021.
3. Base map: Esri 2021; NOAA 2021.
4. Soundings in fathoms.

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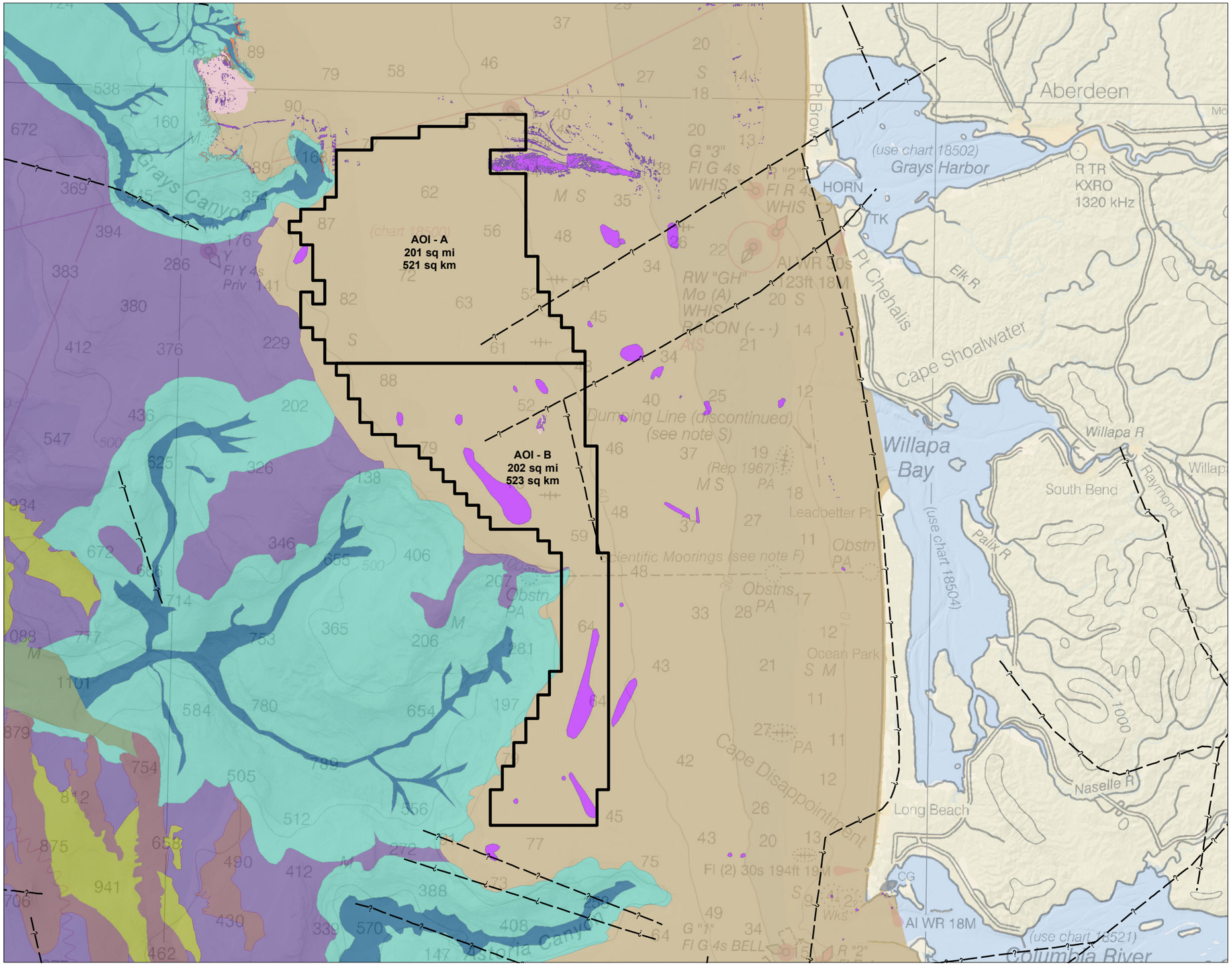

Figure No.
5

Title
Geologic Setting

Client/Project
Hecate Energy Cascadia Offshore Wind Project

Project Location
(124°40'12"W, 46°54'25.2"N)

185705430
Prepared by JC on 2022-03-14
Technical Review by MT on 2022-03-14
Independent Review by CB on 2022-03-14

0 4 8 Miles
1:400,000 (At original document size of 11x17)

Area of Interest (AOI)
Faults

Offshore Geology
- Sedimentary Slope Channel
- Sedimentary Slope Canyon Wall
- Sedimentary Slope Canyon Floor
- Sedimentary Slope
- Sedimentary Shelf
- Sedimentary Ridge
- Sedimentary Basin
- Rocky Slope Canyon Wall
- Rocky Slope Canyon Floor
- Rocky Slope
- Rocky Shelf
- Mixed Slope Canyon Wall
- Mixed Slope Canyon Floor
- Mixed Slope
- Mixed Shelf

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Map features: Hecate 2022; NREL 2021; USGS 2021; NOAA 2021; BOEM 2021.
3. Base map: Esri 2021; NOAA 2021.
4. Soundings in fathoms.

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3.5 Marine Mammals

All marine mammals that may be present in the requested lease area are protected under the Marine Mammal Protection Act (MMPA) (16 United States Code [USC] Sections [§§] 1361 et seq.). The MMPA enacted a national policy to protect populations of marine mammals from declining beyond the point at which they would not be able to function successfully within their environment. The MMPA is implemented by three entities: NOAA Fisheries, U.S. Fish and Wildlife Service (USFWS), and the Marine Mammal Commission.

Some marine mammals potentially occurring in the requested lease area are also protected by the Endangered Species Act (ESA) (16 USC §§1531-1544) and/or the State of Washington (Washington Administrative Code 220-610). Under Section 7 of the ESA, federal agencies (e.g., BOEM) must consult with the USFWS and/or NOAA Fisheries when any action the agency carries out, funds, or authorizes may affect ESA-listed species or critical habitat. In general, the USFWS manages ESA-listed terrestrial and freshwater species and NOAA Fisheries manages marine and anadromous listed species (USFWS 2021a).

At least 29 species of marine mammals occur in waters off Washington, including cetaceans (i.e., whales, dolphins, and porpoises), pinnipeds (i.e., seals and sea lions), and northern sea otters (*Enhydra lutris kenyoni*) (Burke Museum 2021; NOAA Fisheries 2021a) (Table 5). Eight cetacean species are listed under the ESA and by the state of Washington, and one species is a state candidate for listing. The requested lease area overlaps a portion of the designated critical habitat for the southern resident killer whale, which extends from the international border with Canada, south to Point Sur, California, and between the 20 and 656-ft depth contour but excludes the Quinault Range Site north of Grays Harbor (Figure 6) (NOAA Fisheries 2021b). One pinniped species, the Steller sea lion (*Eumetopias jubatus*), is threatened under the ESA and by the state, and northern sea otters are state threatened. The *Marine Spatial Plan for Washington's Pacific Coast* indicates that the northwest portion of the requested lease area near Grays Canyon may contain areas of high ecological importance for marine mammals (Map 8; State Ocean Caucus 2018).

Table 5. Marine Mammals in Washington State

Common Name	Scientific Name	Endangered Species Act Status	Washington Status
Cetaceans			
Baird's beaked whale	*Berardius bairdii*	__	__
Blue whale	*Balaenoptera musculus*	Endangered	Endangered
Cuvier's beaked whale	*Ziphius cavirostris*	__	__
Dall's porpoise	*Phocoenoides dalli*	__	__
Dwarf sperm whale	*Kogia sima*	__	__

Common Name	Scientific Name	Endangered Species Act Status	Washington Status
False killer whale	*Pseudorca crassidens*	__	__
Fin whale	*Balaenoptera physalis*	Endangered	Endangered
Gray whale	*Eschrichtius robustus*	Endangered[1]	Sensitive
Harbor porpoise	*Phocoena*	__	Candidate
Hubbs' beaked whale	*Mesoplodon carlhubbsi*	__	__
Humpback whale	*Megaptera novaeangliae*	Endangered	Endangered
Killer whale	*Orcinus orca*	Endangered[2]	Endangered
Minke whale	*Balaenoptera acutorostrata*	__	__
Northern Pacific Right whale	*Eubalaena japonica*	Endangered	Endangered
Northern right whale dolphin	*Lissodelphis borealis*	__	__
Pacific white-sided dolphin	*Lagenorynchus obliquidens*	__	__
Pygmy sperm whale	*Kogia breviceps*	__	__
Risso's dolphin	*Grampus griseus*	__	__
Sei whale	*Balaenoptera borealis*	Endangered	Endangered
Short-beaked common dolphin	*Delphinus delphis*	__	__
Short-finned pilot whale	*Globicephala macrorhynchus*	__	__
Sperm whale	*Physeter macrocephalus*	Endangered	Endangered
Stejneger's beaked whale	*Mesoplodon stejnegeri*	__	__
Pinnipeds			
California sea lion	*Zalophus californianus*	__	__
Harbor seal	*Phoca vitulina*	__	__
Northern elephant seal	*Mirounga angustirostris*	__	__
Northern fur seal	*Callorhinus ursinus*	__	__
Steller sea lion	*Eumetopias jubatus*	Threatened	Threatened

Common Name	Scientific Name	Endangered Species Act Status	Washington Status
Mustelids			
Northern sea otter[3]	*Enhydra lutris kenyoni*	__	Threatened

Sources: Burke Museum 2021; NOAA Fisheries 2021a
Notes:
1. Two populations of gray whale occur in Washington, the Western and Eastern North Pacific stocks, but only the Western North Pacific stock is protected by the ESA (WDFW 2021a).
2. Three populations of killer whales occur in Washington, transient, offshore, and southern resident, but the Endangered Species Act protects only the southern resident population (WDFW 2021b). The requested lease area includes designated critical habitat for the southern resident killer whale (NOAA Fisheries 2021b).
3. Northern Sea otters do not occur in the requested lease area but do occur in Washington in rocky marine habitats and kelp beds within 1.2 miles of the northern Olympic Coast or Strait of Juan de Fuca (WDFW 2021c).

3.6 Sea Turtles

All sea turtles potentially occurring in the requested lease area are also protected by the ESA (16 USC §§1531-1544) and/or the State of Washington (Washington Administrative Code 220-610). Four species of sea turtles, the green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coriacea*), loggerhead sea turtle (*Caretta caretta*), and olive ridley sea turtle (*Lepidochelys olivacea*) are occasional visitors to marine waters off Washington. Sea turtles do not breed on the beaches of Washington. The olive ridley (largely considered an accidental visitor) is listed as endangered under the ESA; the green sea turtle is listed as threatened under the ESA and by the state; and the leatherback and loggerhead sea turtles are listed as endangered under the ESA and by the state (WDFW 2021d, e, f; NOAA Fisheries 2021a). The requested lease area is entirely overlapped by designated leatherback sea turtle critical habitat, which extends from Cape Flattery, Washington, to Cape Blanco, Oregon, east of the 2,000-m depth contour (NOAA Fisheries 2021c).

3.7 Fish and Fisheries

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended through 2007, 16 United States Code (USC) §1801, is the primary law governing marine fisheries management in federal waters. Managed species under the MSA include marine, estuarine, and anadromous finfish; mollusks; and crustaceans. The MSA fosters long-term biological and economic sustainability of our nation's marine fisheries from 3 nm (3.5 miles or 5.6 km) to 200 nm (230 miles or 370 km) from shore. WDFW manages fisheries in state waters from the shore out to 3 nm (WDFW 2021g).

The MSA established eight Regional Fishery Management Councils to be stewards of fishery resources through the preparation, monitoring, and revision of fishery management plans (FMPs). The Pacific Fishery Management Council conserves and manages fishery resources in federal waters off California, Oregon, and Washington through the implementation of FMPs for

groundfish, salmon, coastal pelagic species (e.g., anchovies, mackerel, sardines), and highly migratory species (e.g., tunas, sharks, swordfish) (PFMC 2021a).

The Pacific Fisheries Management Council also works with NOAA Fisheries to designate essential fish habitat (EFH) for federally managed species. EFH identifies waters and substrates required by fish for spawning, breeding, feeding, and growth to maturity. EFH waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish (NOAA Fisheries 2021d; PFMC 2021b). The requested lease area overlaps EFH for groundfish, coastal pelagic species (including finfish and krill), and highly migratory species (i.e., Pacific common thresher shark [*Alopias vulpinus*]) (NOAA Fisheries 2021e).

Sensitive or important habitats within EFH are designated as HAPC. HAPC types may include eelgrass, rocky reefs, estuaries, seagrass, kelp forests, and areas of interest characterized by unique geological and ecological elements. Each of these provide habitat for numerous species in fisheries managed under the MSA (NOAA Fisheries 2020, 2021d). The HAPC designation does not automatically confer additional protections or restrictions upon an area, but they help to prioritize and focus conservation efforts (NOAA Fisheries 2020). Several rocky reef HAPCs lie within the requested lease area (Figure 7) (NOAA Fisheries 2021e).

Commercial and recreational fishing are important components of Washington's economy and, collectively, they occur at medium to high intensities across the requested lease area (Map 17, State Ocean Caucus 2018). Commercial fisheries active in the requested lease area include but are not limited to sablefish (*Anoplopoma fimbria*), groundfish, Pacific whiting (*Mercluccius productus*), salmon (*Oncorhynchus* sp.), albacore tuna (*Thunnus alalunga*), Pacific sardine (*Sardinops sagax*), Dungeness crab (*Cancer magister*), and pink shrimp (*Pandalus jordani*). These fisheries are generally low to medium intensity across most of the requested lease area; however, areas of high-intensity fishing do occur for some fisheries (Maps 18–25, State Ocean Caucus 2018). Pink shrimp, for example, exhibits most of its highest intensity activity in and near the requested lease area. According to NOAA Fisheries (2021f), commercial fishing in Washington accounted for about $250 million in revenue in 2018, with the three largest fisheries being crab (~$98 million), salmon (~$32 million), and albacore tuna (~$15 million).

Recreational fisheries in the requested lease area include but are not limited to salmon, bottomfish, and lingcod (*Ophiodon elongatus*), Pacific halibut (*Hippoglossus stenolepis*), and albacore tuna. Recreational salmon fishing is generally medium intensity in the requested lease area, and albacore tuna is low to medium intensity. However, high-intensity recreational fishing activity occurs for bottomfish, lingcod, and Pacific halibut in some parts of the requested lease area (Maps 26–29, State Ocean Caucus 2018). In 2018, angler trip expenditures for marine fishing totaled more than $147 million plus an additional $450 million in durable good expenditures (NOAA Fisheries 2021f).

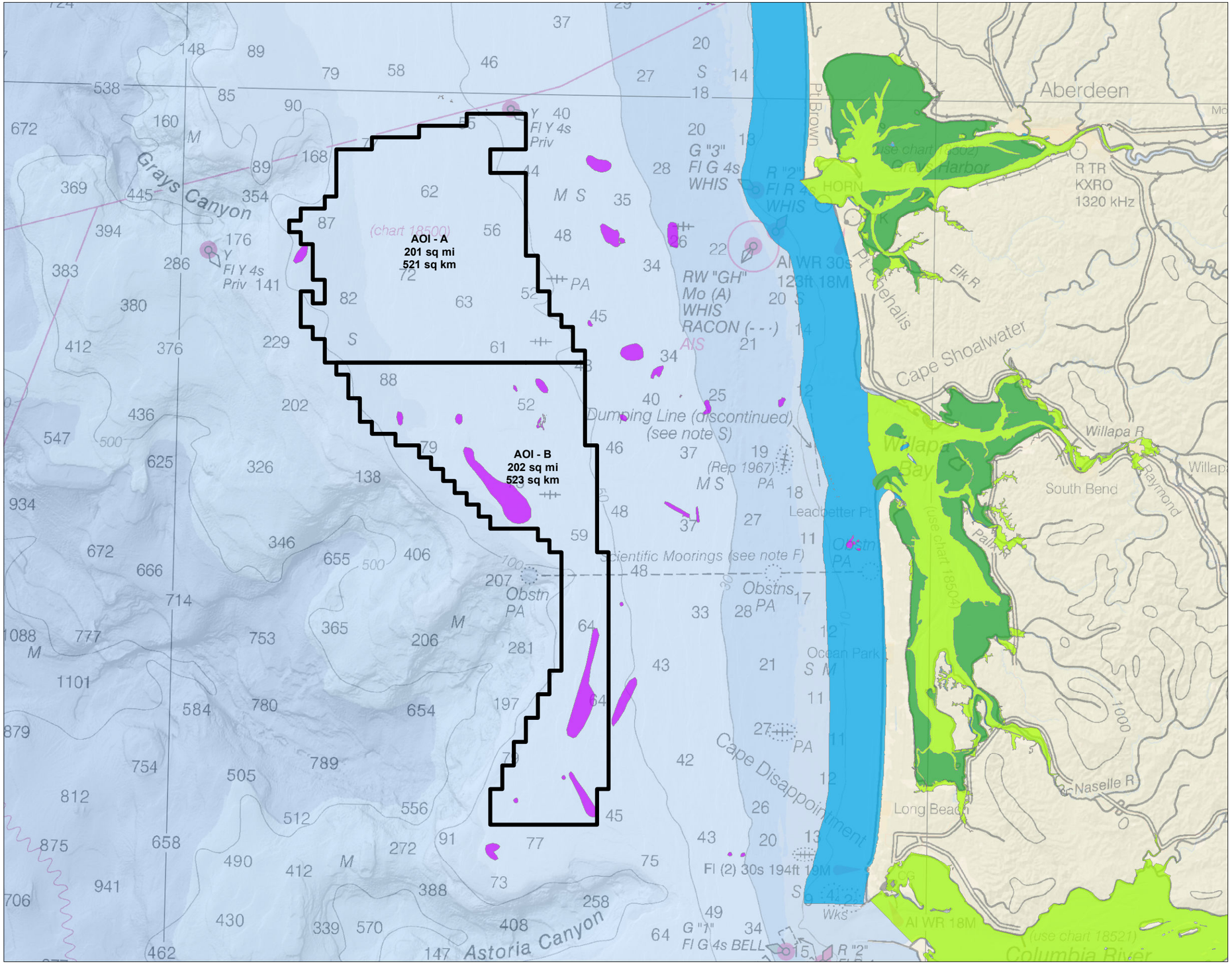

Figure No.
6

Title
Habitat Areas of Particular Concern

Client/Project
Hecate Energy Cascadia Offshore Wind Project

Project Location
(124°40'12"W, 46°54'25.2"N)

185705430
Prepared by JC on 2022-03-14
Technical Review by MT on 2022-03-14
Independent Review by CB on 2022-03-14

0 4 8 Miles
1:9,312,553 (At original document size of 11x17)

Area of Interest (AOI)

Habitat Areas of Particular Concern

- Estuaries
- Rocky Reefs
- Seagrass
- WA St. waters (0-3nm)

Notes

1. Coordinate System: NAD 1983 UTM Zone 10N
2. Map features Hecate 2022; NOAA 2021; BOEM 2021.
3. Base map: Esri 2021; NOAA 2021.
4. Soundings in fathoms.

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Table 6 identifies the ESA-listed fish species that may use the requested lease area. These species are anadromous and spend parts of their lives in both freshwater and marine waters (NOAA Fisheries 2021a). Designated critical habitat for the green sturgeon occurs in marine waters off the coast of Washington out to the 360 ft depth contour, which overlaps the eastern edge of the requested lease area (Figure 7) (NOAA Fisheries 2021g). No state-listed fish are found in offshore waters; however, the state-endangered pinto abalone (*Haliotis kamtschatkana*) is a marine invertebrate associated with rocky reef habitats, typically at depths of 9–60 ft (WDFW 2021h). According to the *Marine Spatial Plan for Washington's Pacific Coast*, several ecologically important areas for fish overlap the requested lease area (Map 5, State Ocean Caucus 2018).

Table 6. Endangered Species Act-listed Fish Potentially Occurring in the Lease Area

Common Name	Scientific Name	Population(s)	Status
Chinook salmon	*Oncorhynchus tshawytscha*	Lower Columbia River ESU, Snake River Falls ESU, Upper Willamette River ESU, Upper Columbia spring-run ESU	Threatened
Chum salmon	*Oncorhynchus keta*	Columbia River ESU	Threatened
Coho salmon	*Oncorhynchus kisutch*	Lower Columbia River ESU	Threatened
Eulachon	*Thaleichthys pacificus*	Southern DPS	Threatened
Green sturgeon	*Acipenser medirostris*	Southern DPS	Threatened[1]
Sockeye salmon	*Oncorhynchus nerka*	Snake River ESU	Endangered
Steelhead	*Oncorhynchus mykiss*	Lower Columbia River DPS, Middle Columbia River DPS, Snake River Basin DPS, Upper Willamette River DPS	Threatened

Source: NOAA Fisheries 2021a
Acronyms: ESU – Evolutionarily Significant Unit; DPS – Distinct Population Segment
Notes: 1. The requested lease area includes designated critical habitat for green sturgeon.

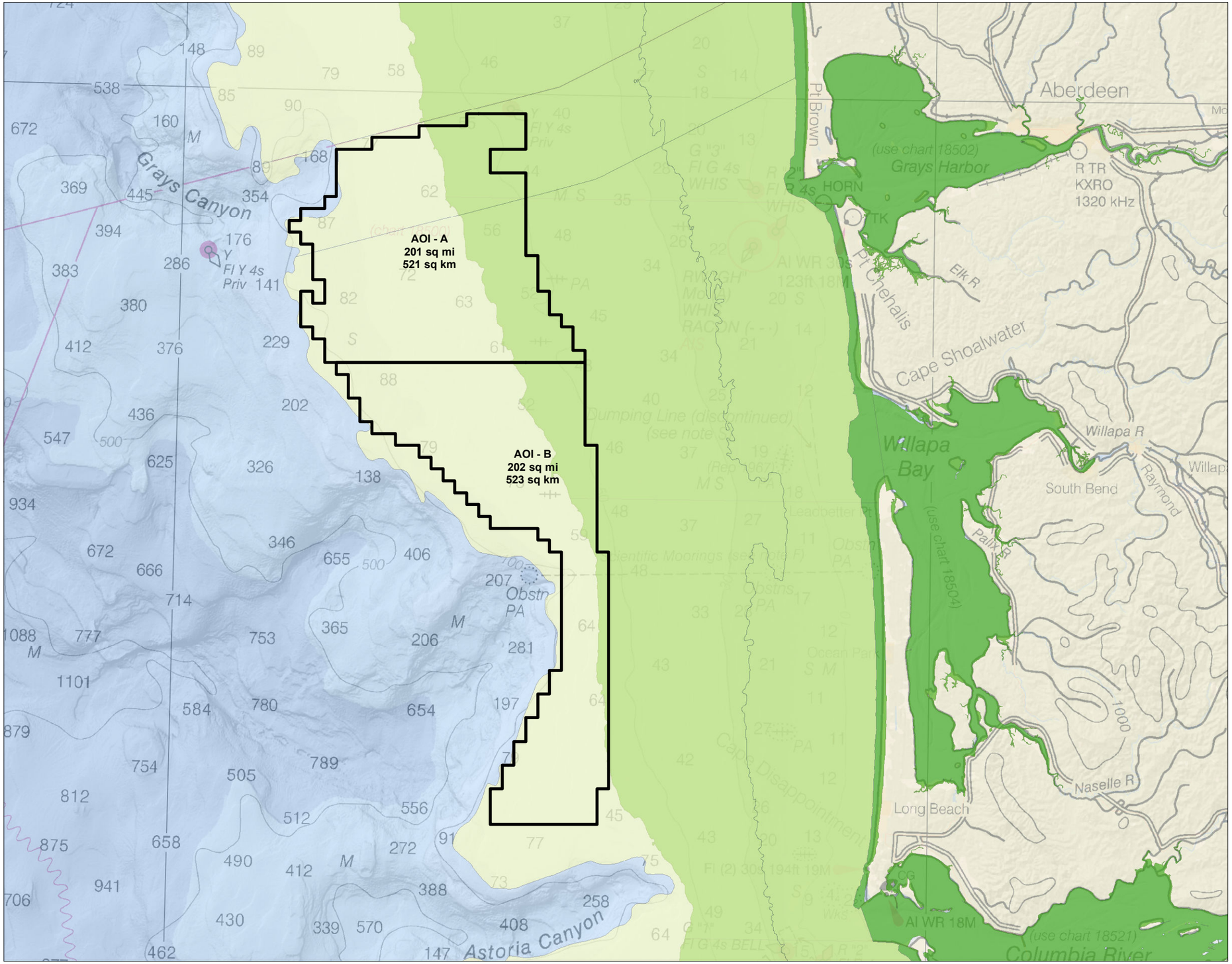

Figure No.
7

Title
Southern Resident Killer Whale and Green Sturgeon Designated Critical Habitat

Client/Project
Hecate Energy Cascadia Offshore Wind Project

Project Location
(124°40'12"W, 46°54'25.2"N)

185705430
Prepared by JC on 2022-03-14
Technical Review by MT on 2022-03-14
Independent Review by CB on 2022-03-14

0 4 8 Miles
1:400,000 (At original document size of 11x17)

- Area of Interest (AOI)
- Southern Resident Killer Whale Critical Habitat
- Green Sturgeon Critical Habitat

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Map features Hecate 2022; NOAA 2021; NMFS 2021.
3. Base map: Esri 2021; NOAA 2021.
4. Soundings in fathoms.

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3.8 Glass Sponges and Sea Pens

The presence of some invertebrates, including glass sponges and sea pens, in and around the requested lease area create important ecosystems for fish and other marine life. In 2007, 30 miles west of Grays Harbor, University of Washington scientists discovered colonies of glass sponges. The species of glass sponges capable of building reefs were thought extinct for 100 million years until they were found in 2005 in the protected waters of British Columbia (Canada)'s Strait of Georgia and Hecatea Strait, the only place in the world they had been observed until 2007 (Hines 2007; Powell et al. 2018). The glass sponge colonies in Washington are proximal to the northwest portion of the requested lease area and Grays Canyon. The sponge reefs could be important to the ecosystems on the Washington coast because they create a thriving oasis, dense with sealife on a seafloor that is otherwise sparely populated for miles (Hines 2007). Sea pens and sponges represent an important ecosystem component in marine soft-bottom environments such as the region between Grays Canyon and Grays Harbor. Sponges and sea pens form a reef-like underlying structure that provides habitat and shelter for fish and marine invertebrates, similar to the role played by corals in rockier substrates (Garcia-Cardenas et al. 2019).

3.9 Birds and Bats

The Migratory Bird Treaty Act (MBTA) makes it unlawful to take migratory birds, which, as defined by the MBTA, include all species native to the United States or its territories that occur because of natural biological or ecological processes (1,093 total species), with exceptions for some species including upland game birds like quail and grouse (USFWS 2017, 2021b). Nearly every bird species potentially occurring in the requested lease area would be protected by the MBTA. Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, directs federal agencies that are taking actions that have or are likely to have a negative effect on migratory birds to develop and implement a Memorandum of Understanding with USFWS to promote conservation of migratory bird populations. This Executive Order further implements the MBTA and requires coordination between the USFWS and federal agencies. BOEM, formerly part of the Minerals Management Service, implemented a Memorandum of Understanding with the USFWS in 2009 in which both agencies have interests and responsibilities to see that energy development and mineral extraction on the OCS are done in a manner protective of the migratory birds and their habitats (MMS and USFWS 2009).

According to eBird (2021) records, 157 bird species have been documented in offshore waters west of Grays Harbor. Species groups commonly represented are waterfowl, grebes, shorebirds, jaegers (*Stercorarius* sp.), alcids, gulls and terns, loons (*Gavia sp*.), albatrosses (*Phoebastria* sp.), storm-petrels, shearwaters, cormorants, and brown pelicans (*Pelecanus occidentalis*). Species associated with terrestrial and nearshore habitats, including raptors and passerines, have also been documented in these offshore areas, but are far less commonly observed. While some species may be present in and near the requested lease area at any time of year, others would be present seasonally. Birds would not be nesting around the requested lease area unless suitable, small offshore islands are present. The *Marine Spatial Plan for Washington's Pacific Coast* reports that pelagic species tended to be associated with the continental shelf or other geological features, such as submarine canyons. This plan also indicates that areas of high ecological importance for seabirds occur in some parts of the requested lease area, particularly in the

northern portion near Grays Canyon and along the eastern edge in shallower waters (Map 12, State Ocean Caucus 2018).

Two ESA-listed bird species use offshore waters west of Grays Harbor: marbled murrelet (*Brachyramphus marmoratus*, threatened) and short-tailed albatross (*Phoebastria albatrus*, endangered) (eBird 2021; USFWS 2021c). Marbled murrelets use offshore waters year-round, though typically closer to shore, and short-tailed albatrosses are observed rarely in Washington offshore waters (eBird 2021). State-listed birds reported using offshore waters west of Grays Harbor include marbled murrelet (endangered), tufted puffin (*Fratercula cirrhata*; endangered), and common loon (*Gavia immer*, sensitive).

Bats are primarily associated with terrestrial environments, but they have been documented in offshore environments in Europe and in North America (i.e., Mid-Atlantic and Gulf of Maine). Bats have been recorded at offshore islands in the Pacific Ocean but have never been detected over offshore waters (Solick and Newman 2021). BOEM is currently conducting acoustic bat detection research in the Pacific that may provide better insight into their use of offshore waters off the west coast (BOEM 2019). Fifteen species of bats occur in Washington, 10 of which occur west of the Cascade Mountains (Burke Museum 2021). No ESA- or state-listed bats occur in Washington.

3.10 Protected Areas

The Olympic Coast National Marine Sanctuary (OCNMS) is located approximately 10 miles north of the requested lease area. It was designated in 1994 to protect ecological and cultural resources of the marine waters on the continental shelf from Copalis Beach north to Cape Flattery, where the Strait of Juan de Fuca meets the Pacific Ocean. The important ecological resources in the sanctuary include but are not limited to seabirds, marine mammals, kelp and intertidal communities, and deep-sea coral and sponges. The area also includes more than 200 documented shipwrecks and is a vital part of the culture of several tribal communities. The National Marine Sanctuaries Act directs NOAA to adopt regulations for the sanctuary, which include prohibiting activities such as moving, removing, or injuring historical resources; altering the seabed; and the taking of marine mammals, seabirds, or sea turtles. A National Marine Sanctuary Permit is required to conduct a prohibited activity within a national marine sanctuary under the National Marine Sanctuaries Act (NOAA 2017).

The proposed lease area is located approximately 10 miles south of the OCNMS at the closest point, and the project will be designed to avoid or mitigate impacts to the OCNMS.

3.11 Military Use Areas and Aviation

Ocean uses off the coast of Washington includes significant DoD, Navy, and USAF operations, training, and testing activities. The requested lease area is in close proximity with Navy, Military Operations Areas (MOA), and Warning Areas (WA). In addition, USAF Military Training Routes (MTRs) are located over the requested lease area as depicted on Figure 8 (FAA 2021).

Navy training and testing in this area is contained within maritime operating areas and warning areas that include both air, water, and underwater space areas. For over 70 years, the Navy has and continues to use the airspace over the Washington Peninsula for training Navy, Air Force, and Coast Guard aircrews. The Navy tests ships, aircraft, weapons, combat systems, and sensors and related equipment, and conducts scientific research activities to achieve and maintain military readiness. The Navy uses the offshore area for training activities such as anti-air warfare, anti-surface warfare, anti-submarine warfare (ASW), electronic warfare, mine warfare, and naval special warfare. Sonar, ordnance, munitions, and targets are used during testing and training activities. Specific examples of Navy activities include flight formation practice, submarine mine exercises, target practice, tracking exercises, and torpedo testing. The Navy trains and tests to meet the requirements of Title 10 of the U.S. Code to maintain, train, and equip combat-ready naval forces capable of winning wars, deterring aggression, and maintaining freedom of the seas (State Ocean Caucus 2018). The Federal Aviation Administration (FAA) designates air space for military activities, including warning areas, restricted airspace, training routes, and operating areas.

The northern portion of the requested lease area is located adjacent to Warning Area W-237 (specifically, W-237A) and adjacent to the Olympic Air Traffic Control Assigned Airspace (ATCAA), MOA, and Quinault Range Site (Figure 8). The W-237 complex includes Warning Areas W-237A through W-237J which are offshore areas used for joint air/surface operations such as missile firings, air-to-surface bombing, air-to-air firing, combat tactics, intercepts, aerial refueling, instrument training, aerobatics, and formation flight training. The W-237 complex is also a designated ASW range for coordinated ASW operations, sonobuoys, practice depth charges and smoke markers (Global Security 2011). W-237 includes sea surface and underwater areas and extends into airspace to varying degrees.

The Quinault Range Site, part of the Naval Undersea Warfare Center Division Keyport Range Complex, is located off the coast of Jefferson and Grays Harbor Counties with the same boundaries as W-237A and includes 1 mile of shoreline at Pacific Beach, Washington. Surf zone activities would be conducted from an area on the shore and seaward (State Ocean Caucus 2018). The Quinault Range Site is an area where the following activities are conducted: unmanned underwater vehicle training, countermeasure testing (using torpedoes), mine detection and classification testing, unmanned aerial system testing, unmanned surface vehicle system testing, unmanned underwater vehicle training, acoustic and oceanographic research, and cold-water support (USDOE 2020). The Olympic MOA is used for in-flight air refueling training, flight familiarization, and aircraft combat maneuvering (Global Security 2011). The southern portion of the requested lease area is located adjacent to Warning Area W570B. Although no part of the Northwest Training Range Complex (NWTRC) W-570 is within the Pacific Northwest Surface Subsurface Operations Area (Department of the Navy 2016).

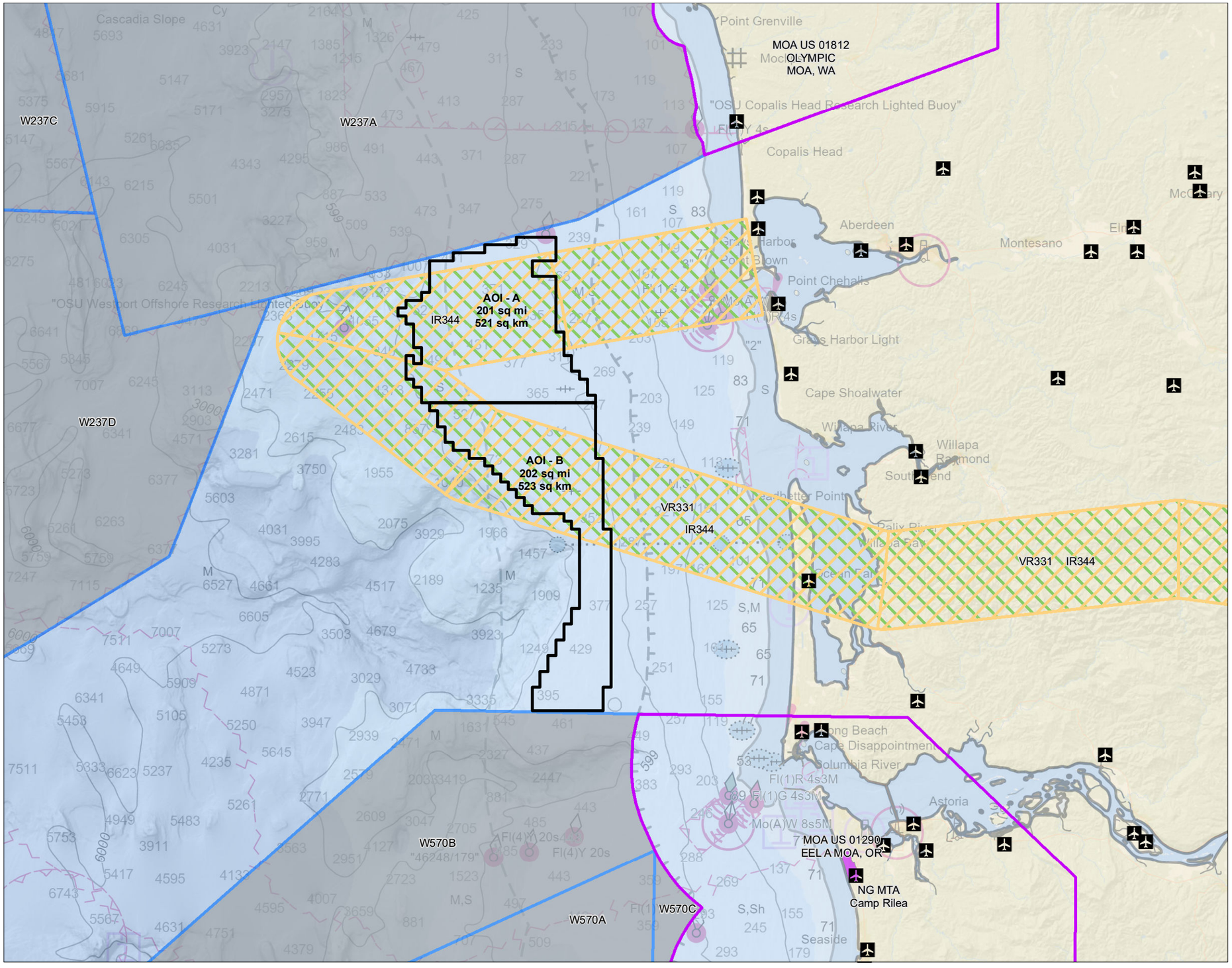

Figure No.
8

Title
Military Use Areas

Client/Project
Hecate Energy Cascadia Offshore Wind Project

Project Location
(124°40'12"W, 46°54'25.2"N)

185705430
Prepared by JC on 2022-03-14
Technical Review by MT on 2022-03-14
Independent Review by CB on 2022-03-14

0 6 12 Miles
1:600,000 (At original document size of 11x17)

- Area of Interest (AOI)
- Airports
- Visual Route Military Training Routes (VR MTR) Corridors
- Instrument Route Military Training Routes (IR MTR) Corridors
- Special Use Airspace (SUA)/Military Warning Area
- Military Operations Areas (MOA)
- Military Installations, Ranges, and Training Areas

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Map features Hecate 2022; DOD 2021; FAA 2022; BOEM 2021; NOAA 2021.
3. Base map: Esri 2021; NOAA 2021.
4. Soundings in fathoms.

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The requested lease area avoids Navy Warning Areas W237 to the north and Warning Area W570 to the south (see Figure 8). The requested lease area overlaps with MTRs for Visual Routes (VRs) and Instrument Routes (IRs) (Figure 8). The northern and southern requested lease area is within VR 331 and IR 344 routes which are primarily flown by the 62d Airlift Wing out of McChord Field and Joint Base Lewis McChord. Generally, MTRs are established below 10,000 ft mean sea level (MSL) for operations at speeds in excess of 250 knots. Multiple aircraft fly these routes and operate either Visual Flight Rules (VFRs) or Instrument Flight Rules (IFRs) at speeds up to 500 knots of indicated airspeed and altitudes from300 ft above ground level (AGL) to several thousand feet (USAF 2017). VR 331 is typically flown by C-17 aircraft (USAF 2021).

The closest commercial airports to the requested lease area are in the vicinity of Grays Harbor, Washington, and are a minimum of 15 nm distance to shore from the eastern side of the requested lease area. These airports typically service only small aircraft (Figure 8):

- Hogan's Corner Airport, 33 Hale Ave, Hoquiam, Washington
- Ocean Shores Municipal Airport, 498 Duck Lake Drive NE, Ocean Shores, Washington
- Westport Airport, 215 I Street Westport, Washington
- Bowerman Airport, Airport Way, Hoquiam, Washington

3.12 Vessel Traffic and Navigation

According to the MSP, potential new ocean uses such as offshore wind energy, offshore aquaculture, or other developments could adversely affect these important ocean resources and uses. Multiple overlapping jurisdictions and authorities create additional challenges for coordinating decision-making and proactive planning. The MSP helps address these challenges by providing a tool to protect resources and uses, to guide potential applicants as they develop proposals for ocean uses, and to assist state agencies and others, including local, tribal, and federal governments, with evaluating and engaging in those proposals more effectively. The sections below are taken from the Washington MSP (State Ocean Caucus 2018)

According to the MSP, vessel traffic along the Washington coast comprises various types of vessels, including tank, cargo, and fishing vessels. Vessels are defined by their carrying capacity or deadweight tonnage (dwt), which describes the number of metric tons of cargo, stores, and bunker fuel that a vessel can transport. Tankers arriving to ports in the Pacific Northwest range from 12,000–190,000 dwt. In Puget Sound, tankers carrying crude oil and petroleum products are limited to 125,000 dwt. There is no regulatory tonnage limit for tankers operating in Grays Harbor or the Columbia River. The depth of navigation channels for the Columbia River and Grays Harbor limits the size of vessels in these areas. Crude oil and petroleum products are also handled by integrated tug-barges and articulated tug-barges.

The U.S. Coast Guard maintains aids to navigation, which include a mixture of lateral and non-lateral buoys, beacons, and automated identification systems.

The OCNMS encompasses much of the northern half of the MSP Study Area and is located approximately 10 miles to the north of the requested lease area. The International Maritime

Organization establishes "Areas to Be Avoided" (ATBAs) in defined areas where navigation is very hazardous or where they can contribute to avoiding casualties, and they have designated an ATBA within the OCNMS.

Most deep-draft vessels and barges carrying liquid bulks (e.g., petroleum, petroleum products, biofuels, and chemicals) travel far from the shore unless they are entering or departing a port. However, barges and vessels that are accessing the Port of Grays Harbor and barges that are carrying dry cargoes (regardless of destination) do transit the coastal area just below the ATBA. This is a consideration for the development of offshore energy systems (BST Associates 2014). The Grays Harbor Navigation Channel is nearly 23 nm long. It begins approximately 4 miles offshore and runs in an easterly direction, allowing access for deep-draft vessels to Port of Grays Harbor facilities (State Ocean Caucus 2018). All deep-draft vessels are limited by the controlling depth (32 ft) of the inner navigation channel in Grays Harbor.

The West Coast Offshore Vessel Traffic Risk Management Project Workgroup recommends that where no other management measures such as ATBAs, Traffic Separation Schemes, or recommended tracks already exist, vessels 300 gross tons or larger transiting coastwise anywhere between Cook Inlet, Alaska, and San Diego, California, should voluntarily stay a minimum distance of 25 nm offshore. They also recommend that with those same management exceptions, tank ships laden with crude oil or persistent petroleum products should voluntarily stay a minimum distance of 50 nm offshore (West Coast Offshore Vessel Traffic Risk Management Project Workgroup 2002). Automated Identification System (AIS) data, as seen in the MSP (Maps 36–39. State Ocean Caucus 2018.) Maps 36, 37, 38, and 39, indicates that most of the vessels transiting the MSP Study Area stay offshore as recommended. Exceptions to this include vessels entering and exiting Grays Harbor and Willapa Bay as well as smaller vessels including tug/tow vessels.

Various maps have been assembled in the MSP and include Cargo, Passenger, Tanker, Tug and Tow, and Fishing areas based on vessel density and use. Wind farm development will consider transit lanes and coexistence with other ocean uses during the planning and public outreach phases of the project. Figure 9 shows navigation data, and Figure 10 shows AIS vessel traffic data off the coast of Washington.

3.13 Telecommunication Cables

The requested lease area is not near any known telecommunication cables as illustrated in Figure 11. Existing telecommunication cables in the Pacific Northwest include the Alaska United-East cable, the Arctic Fibre cable, the Juan de Fuca cable, the Sea Breeze Pacific Juan de Fuca cable, and five other submarine cables. No existing telecommunication infrastructure has been identified within the requested lease area or immediate surrounding area (Figure 11).

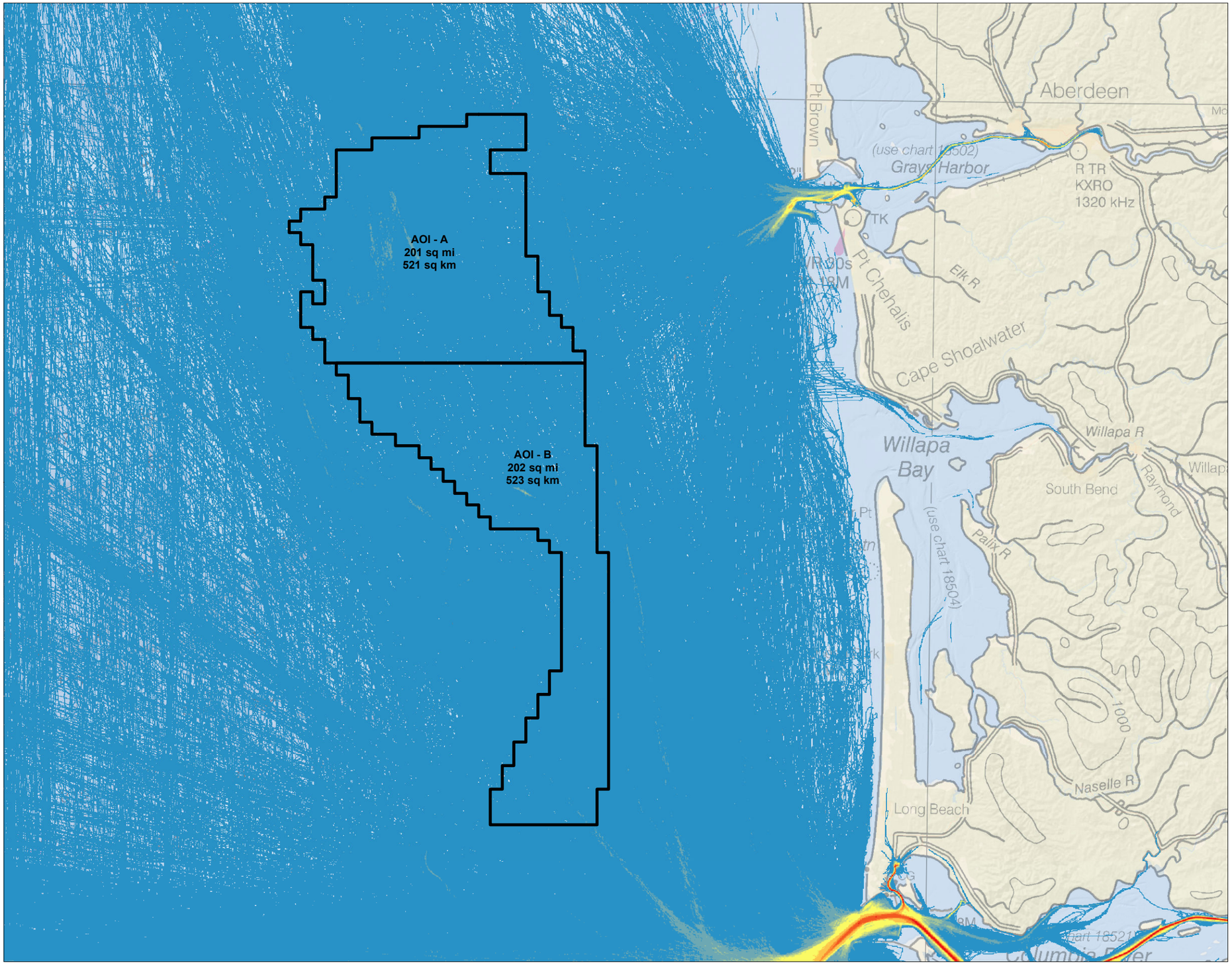

Figure No.
10

Title
Vessel Traffic

Client/Project
Hecate Energy Cascadia Offshore Wind Project

Project Location
(124°40'12"W, 46°54'25.2"N)

185705430
Prepared by JC on 2022-03-14
Technical Review by MT on 2022-03-14
Independent Review by CB on 2022-03-14

0 4 8 Miles
1:400,000 (At original document size of 11x17)

Area of Interest (AOI)

AIS Vessel Transit Counts 2015

- 1 - 25
- 26 - 50
- 51 - 75
- 76 - 100
- 101 - 250
- 251 - 500
- 501 - 750
- 751 - 1,500
- 1,501+

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Map features Hecate 2022; BOEM 2021; Automatic Identification System (AIS) 2015.
3. Base map: Esri 2021; NOAA 2021.
4. Soundings in fathoms.

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V:\185705430\03-data\gis_cad\gis\maps\figures\Hecate2022\OSW_Fig10_Vessel Traffic.mxd Revised: 2022-03-15 By: jcomstock

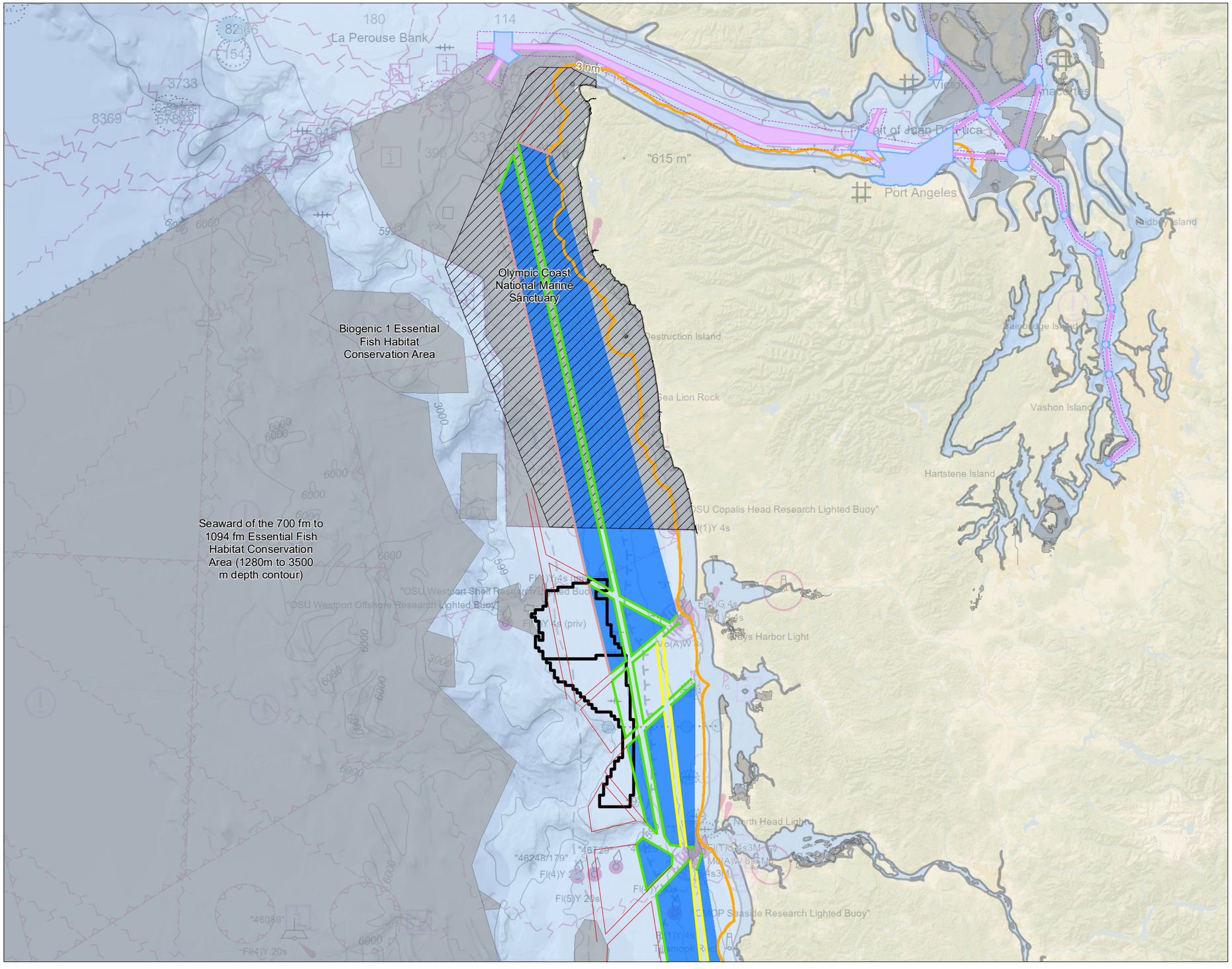


Figure No.
9

Title
Navigation Data

Client/Project
Hecate Energy Cascadia Offshore Wind Project

Project Location
(124°40'12"W, 46°54'25.2"N)

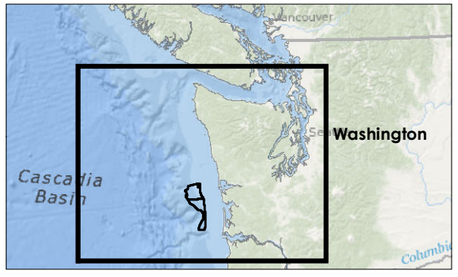
185705430
Prepared by JC on 2022-03-14
Technical Review by MT on 2022-03-14
Independent Review by CB on 2022-03-14

0 10 20 Miles
1:1,250,000 (At original document size of 11x17)

- Area of Interest (AOI)
- WA State Boundary - 3 nm

Towboat Crabber Lane Boundaries
- Year-Round Lane
- Summer Lane (Apr. 15 - Nov. 24)
- Fishing Area
- Advisory Only
- Open Season Fishing Areas (Towlane Deliniation)
- Marine Protection Areas

Marine Transportation/Shipping Lanes and Regulations
- Traffic Separation Schemes/Traffic Lanes
- Olympic Coast National Marine Sanctuary
- Precautionary Areas
- Traffic Separation Schemes



Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Map features Hecate 2022; NOAA 2017 and 2021; Washington Sea Grant 2012; BOEM 2021; Washington Marine Spatial Plan (MSP) 2018.
3. Base map: Esri 2021; NOAA 2021.
4. Soundings in fathoms.
5. MSP data is for generalized use and not formal navigation channels.
6. Traffic separation schemes derived from NOAA navigation charts.

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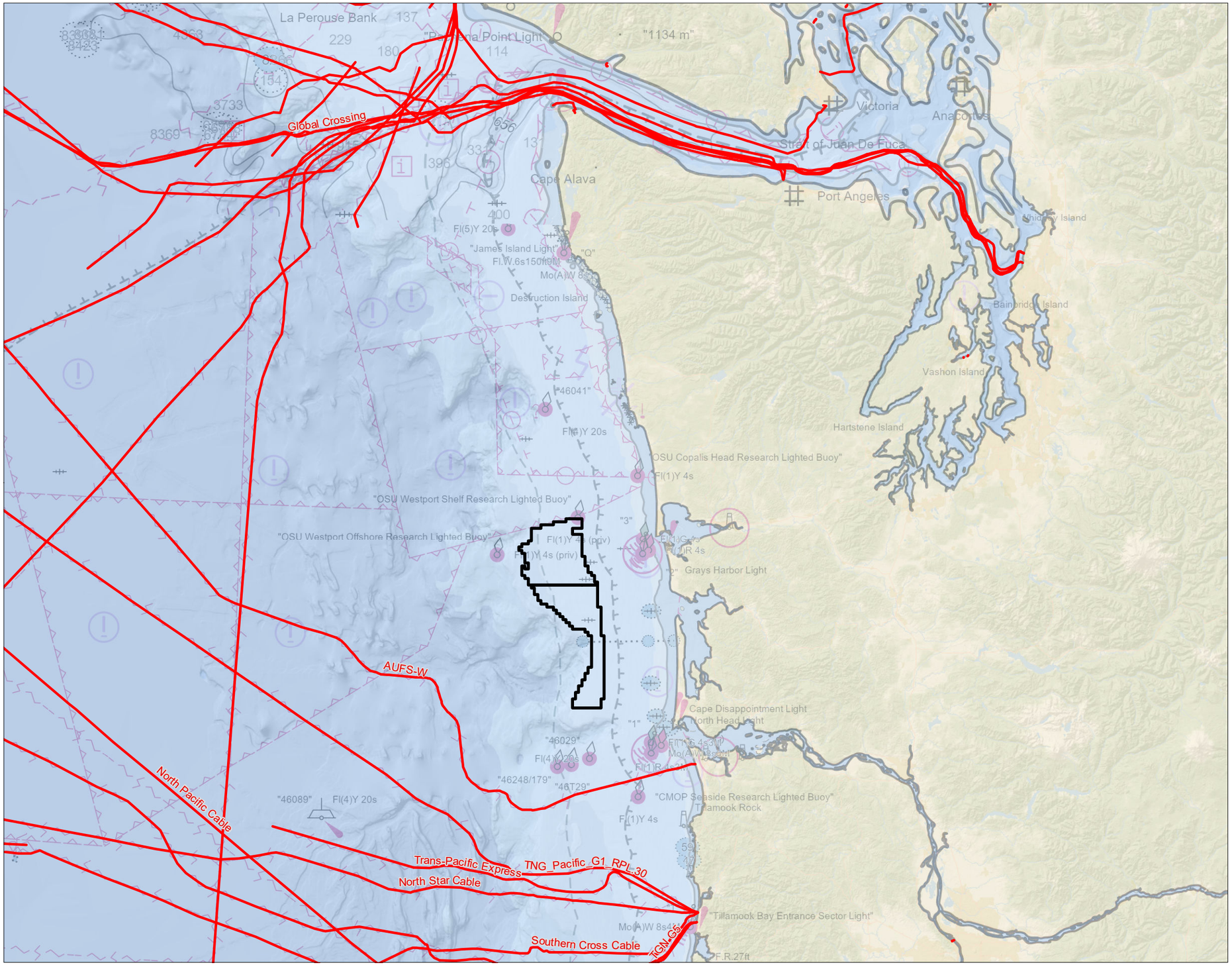

Figure No.
11

Title
Cable Routes

Client/Project
Hecate Energy Cascadia Offshore Wind Project

Project Location
(124°40'12"W, 46°54'25.2"N)

185705430
Prepared by JC on 2022-03-14
Technical Review by MT on 2022-03-14
Independent Review by CB on 2022-03-14

0 10 20 Miles
1:1,500,000 (At original document size of 11x17)

Area of Interest (AOI)
Submarine Cables

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Map features Hecate 2022; NOAA 2021; BOEM 2021.
3. Base map: Esri 2021; NOAA 2021.
4. Soundings in fathoms.

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3.14 Visual Resources and Cultural Resources

3.14.1 Visual Resources

The visual landscape within the requested lease area consists of open ocean with no known permanent physical structures in federal offshore waters, other than the subsea infrastructure previously described. The proposed 15 MW turbines would be up to 280 m/920 ft in height. Structures of this size installed at a distance of 15 nm (~17.26 miles) from shore would be visible as small objects from coastal areas. Empirical studies of onshore and offshore wind energy facilities have documented slight visibility under favorable conditions of wind turbines less than the height of those proposed here (i.e., 428 ft) at a distance of 23.5 nm; clear visibility was documented for turbines of similarly shorter heights at distances exceeding 15.6 nm, with blade motion shown to be visible at distances as great as 23 nm (Sullivan 2021). It is expected that the 15 MW turbines viewed under favorable conditions from a distance of 15 nm would have a comparatively higher degree of potential visibility. However, meaningful visibility of any such project would be a function of a number of factors. Atmospheric conditions, the curvature of the earth, and built or natural shoreline features are all conditions that could limit or even eliminate visibility from coastal areas during certain times. Conversely, absence of any marine layer and low relative humidity could result in clear visibility, particularly during times when the turbines would be backlit (i.e., near sunset) and in direct views. Nighttime visibility of offshore structure lighting is likely to be dependent on the intensity and dimmability of the lights and aircraft detection lighting systems. A visual impact assessment would be produced under the BOEM guidelines for this project.

3.14.2 Cultural Resources

Native people have lived along the Washington coast for at least 6,000 years; and relied heavily on ocean and coastal resources such as ocean plants, fish, shellfish, seabirds, and marine mammals. While specific uses varied for each tribe, native people harvested many different species from the ocean, estuaries, and bodies of fresh water, e.g., salmon, steelhead, halibut, cod, sea bass, sole, rockfish, shellfish, and crabs. They also hunted seals, sea lions, sea otters, and whales. Sites include shell middens, villages, petroglyphs, burial grounds, fish weirs, canoe runs, traditional cultural properties, and others (ICF International et al. 2013). Tribal cultural resources may also include sites, places of importance in traditional oral histories, and ethnographic villages. The QIN, which consists of the Quinault and Queets Tribes with members descended from the Quileute, Hoh, Chehalis, Chinook and Cowlitz peoples, have inhabited the coastal regions of the Olympic Peninsula for thousands of years. The 208,150-acre Quinault Indian Reservation supports diverse ecosystems that have continually provided its inhabitants with ample materials which have sustained their physical and spiritual wellbeing. Archaeological data from the area indicates the cultural traditions of the QIN have persisted much longer than the available physical evidence and suggests a cultural identity that continues to flourish to this day (Sturtevant 1978).

The shoreline has changed over time as well due to climate change; therefore, it is probable that prehistoric Native American archeological sites exist that are now submerged beneath the ocean.

Sea level was at its lowest at about 19,000 BP[1], when the shoreline was located up to about 30 miles offshore from the present-day shoreline. Since then, sea level has risen at varying rates, pushing possible prehistoric occupants farther inland (ICF International et al. 2013).

During the historic period, Euro-American maritime culture and shipwrecks are embedded into the setting. Historical resources from this time include buildings, structures, sites, districts, and objects as well as shipwrecks. Over 180 ships were reported wrecked or lost at sea in or near OCNMS waters between 1808 and 1972 (State Ocean Caucus 2018).

Historical places, archaeological sites, and traditional cultural properties include areas important for maintaining cultural identities, places of spiritual power or healing, places associated with origins or important events, and areas with aesthetic significance for people today. Some historical resources and traditional cultural properties may also be sensitive to various levels of visual disturbance from new ocean uses, such as offshore wind and will be evaluated under BOEM guidelines.

[1] Before Present (BP) years is a time scale used mainly in archaeological disciplines to specify events that occurred before the origin of practical radiocarbon dating in the 1950s. Because the "present" time changes, standard practice is to use 1 January 1950 as the commencement date (epoch) of the age scale.

4.0 Conformance with State Energy Planning

With high sustained offshore wind speeds, the OCS has great potential for generating clean energy and economic opportunity for Washington. Accessing these wind resources is important to meet the State's goal to achieve 100 percent renewable energy by 2045 as part of SB 5116. Wind measurements within the requested lease area have been identified by DOE's NREL as having average annual wind speeds in the range of 8.25 to 8.5 m/s at 90 meters above sea level.

Per 30 CFR 585.230, unsolicited requests should provide a number of items, (a) through (g), of which "(e)" stipulates the following: "If available from the appropriate State or local government authority, a statement that the proposed activity conforms with state and local energy planning requirements, initiatives, or guidance."

As mentioned in Section 1, the 100% Clean Energy For America Plan includes harnessing 1 percent of our nation's technical offshore wind resource. While Hecate does not yet have a statement from state or local authorities regarding conformance with state and local energy planning, we intend to pursue conformance letters should the requested lease area prove to be acceptable to BOEM and other stakeholders going forward.

5.0 Documentation of Lessee Qualifications

Hecate Energy has the legal qualifications to hold a lease in accordance with 30 CFR 585.106 and 585.107(c) and the guidance found in the *Qualifications to Acquire and Hold Renewable Energy Leases and Grants on the OCS*. Specifically, Hecate Energy is a Delaware limited liability company with principal offices at 621 West Randolph Avenue, Chicago, IL 60661. A copy of the organizational formation certificate is provided in **Attachment 1**. Additional information regarding Hecate Energy's technical and financial capability are provided below.

Founded in 2012 by a team of industry veterans who have worked together for over 25 years, Hecate Energy has entered into over 3.6 GW of renewable power purchase agreements (PPAs) across 62 PPAs with 31 counterparties. Further, Hecate has raised financing for over $3.5+ billion of renewables projects, including three projects over $500 million each. Hecate has the technical and financial capability to construct, operate, maintain, and decommission a utility-scale, offshore wind facility of this scope and capacity. Hecate has financed billions of dollars of power plant developments and acquisitions. Successful financings have ranged from 500 MW solar utility projects in the United States, to battery storage projects in Canada, to a wind farm in Jordan. The total amount of financing for these portfolios has been in the billions of dollars and has included debt and equity investments from a wide range of private equity, infrastructure funds, energy investment funds, domestic utilities, foreign utilities, Japanese conglomerates, and commercial banks.

5.1 Technical Capability

Hecate is a leading renewables developer with a pipeline of about 40 GW under development, with 3.6 GW of offtake contracts signed. Over 1.1 GW of projects developed by Hecate are currently under construction, including two 500 MW solar projects in east Texas. Hecate Energy solar projects will represent over 10% of the utility scale solar COD in the US in 2022 and projected for the next five years.

Highlights of Hecate's experience include:

- Raised financing for over $2 billion of renewables projects in the past 12 months, including three projects of over $500 million each and over $1 billion for projects in Texas:
    - Developing and securing financing for a 500 megawatt alternating current (MWac) merchant solar photovoltaic (PV) project, which is currently under construction, in Wharton County, Texas
    - Developed and secured financing for a 500 MWac project in Roseland, Texas
- Secured a $250 million line of credit to support ongoing development and security deposit requirements for Hecate Energy

- Raised over $30 million in financing for our Johanna battery storage project in California, which is under construction

- Developed a 400 MWac solar PV project in Ohio with three different offtake contracts and financed by a United States private equity fund and Algonquin, a Canadian utility (phase 1 is currently under construction)

- Raised financing for, developed and entered into REC contracts with New York State Energy Research and Development Authority (NYSERDA) and Connecticut Department of Energy and Environmental Protection (CT DEEP) for 40 MWac, 50 MWac and 60 MWac solar PV projects in New York

- Awarded the largest solar project that NYSERDA has awarded to-date, a 500 MWac project

- Developed and secured financing for 14.8 MWac/58.8 megawatt hour (MWh) of utility-scale battery storage in Ontario, Canada, which are operational

- Developed and arranged financing for a 45 MWac wind project in Jordan, which is operational

- Welcomed Repsol as a minority investor, improving Hecate's balance sheet and aligning with Repsol as a long-term investor and financier of many of the projects developed by Hecate

No legal or regulatory actions have been taken against Hecate in the past 5 years.

Hecate's minority investor, Repsol, is an integrated oil and gas company with presence in more than 40 countries, employing over 25,000 people. Repsol is present along the entire energy value chain, including exploration, production, refining, transport, chemicals, retail sales, and new types of energy and is the market leader in refining and marketing in Spain. Repsol has mining rights in the United States over blocks located in the Gulf of Mexico (i.e., Green Canyon, Alaminos Canyon, Atwater Valley, Garden Banks, Keathley Canyon, Mississippi Canyon, and Walker Ridge) and Alaska. Additionally, the company is developing unconventional resources in the Mississippian Lime play. With the addition of production during 2014, the United States already represents almost 10% of the company's total hydrocarbon output. Repsol's domestic headquarters is located in Houston, Texas, and employs more than 600 people.

In 2011, Repsol agreed to acquire SeaEnergy Renewables Limited (SERL) from a United Kingdom offshore wind development company, SeaEnergy, and has interest in 3 projects: Moray Firth, Inch Cape, and Beatriz. Repsol also formed a consortium with Portuguese green power company EDP Renovaveis to develop Moray Firth and Inch Cape. Following the acquisition of SERL by Repsol, the Portuguese firm obtained 67% of Moray and 49% of Inch Cape Offshore Wind Limited. In 2016, Repsol sold the offshore wind business in the United Kingdom to State Development and Investment Corporation (SDIC) of China for 238 million euros. The sale

includes the Inch Cape project (100%) and Repsol's share in the Beatrice project (25%), both of which are located on the east coast of Scotland.

Repsol is part of a consortium operating the 25MW WindFloat Atlantic project. The WindFloat Atlantic project features three Mitsubishi Heavy Industries (MHI) Vestas 8.4 MW turbines mounted on Principle Power's semi-submersible floating foundations. The Windplus consortium comprises EDP Renewables, Engie, Repsol, and Principle Power.

Further, Repsol owns numerous offshore energy assets around the globe, including substantial assets in the Americas. In addition to assets in the United States, Repsol owns offshore energy assets in Brazil, Columbia, Guyana, Trinidad and Tobago, Venezuela and Mexico.

5.1.1 Offtake Counterparties

Hecate has strong relationships and has contracted with some of the largest energy buyers in the world to deliver innovative and cost-effective power generation and storage solutions (Figure 12).

Figure 12. Hecate Energy Selected Offtakers

5.1.2 Hecate Capabilities Matrix

As evidenced in Table 7, which highlights the expertise Hecate has provided to the projects that it has developed, Hecate has deep experience in performing the tasks necessary to bring a renewables project from concept to operations.

5.0 Documentation of Lessee Qualifications

Table 7. Hecate Capabilities Matrix

Project Description					Development								EPC			Financing			Asset Management			
Name	Technology	MW	State / Country	COD	Offtake	Site	Permit	Interconnection	Property Tax Abatement	Wetlands / Habitat Mitigation	Mineral Rights	Title	Negotiate EPC Contract	Procure Major Components	Construction Oversight	Development	Construction	Long-Term	Own	Operate	Scheduling / Bidding	Contract Administraction
Forbes I	Solar	3	Rhode Island	2012	✓	✓	✓	✓	✓	✓	N/A	✓	✓	✓	✓	✓	✓	-	-	-	-	-
Old Alabama Road	Solar	1	Georgia	2013	✓	✓	✓	✓	-	✓	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	N/A	✓
Rome Highway	Solar	1	Georgia	2013	✓	✓	✓	✓	-	-	N/A	✓	-	-	-	✓	-	-	-	-	-	-
Monson	Solar	3	Massachusetts	2014	✓	✓	✓	✓	✓	✓	N/A	✓	-	-	-	✓	-	-	-	-	-	-
Turner Bend	Solar	1	Georgia	2015	✓	✓	✓	✓	-	✓	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	N/A	✓
Beacon 1, 3 and 4	Solar	162	California	2016	✓	-	✓	✓	N/A	✓	-	-	-	-	-	✓	✓	-	-	-	-	-
Old Midville	Solar	20	Georgia	2016	✓	✓	✓	✓	✓	✓	N/A	✓	-	-	✓	✓	✓	-	-	-	-	-
JHU - Keswick	Solar	1	Maryland	2016	✓	✓	✓	✓	N/A	N/A	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	N/A	✓
JHU - Davis	Solar	1	Maryland	2016	✓	✓	✓	✓	N/A	N/A	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	N/A	✓
Houston	Solar	50	Texas	2017	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cherrydale	Solar	20	Virginia	2017	✓	✓	✓	✓	✓	✓	N/A	✓	✓	✓	✓	✓	✓	-	-	-	-	-
LA Distribution Center	Solar	11	California	2017	✓	✓	✓	✓	N/A	N/A	N/A	✓	✓	✓	✓	✓	✓	-	-	-	-	-
Clarke County	Solar	10	Virginia	2017	✓	✓	✓	✓	✓	✓	N/A	✓	✓	✓	✓	✓	✓	-	-	-	-	-
Blair Road	Solar	4	Florida	2017	✓	✓	✓	✓	✓	✓	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	N/A	✓
Old Alabama Road 2	Solar	1	Georgia	2017	✓	✓	✓	✓	N/A	N/A	N/A	✓	-	-	-	✓	-	-	-	-	-	-
Morgan	Solar	1	Georgia	2017	✓	✓	✓	✓	N/A	✓	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	N/A	✓
IESO Powin	Storage	8	Ontario	2018	✓	✓	✓	✓	N/A	N/A	N/A	✓	✓	-	-	✓	✓	-	-	-	-	-
IESO Maple Leaf	Storage	4	Ontario	2018	✓	-	-	-	N/A	N/A	N/A	-	-	-	-	-	-	-	-	-	-	-
Forbes II	Solar	3	Rhode Island	2018	✓	✓	✓	✓	✓	✓	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	N/A	✓
Kitchener	Storage	2	Ontario	2018	✓	✓	✓	✓	N/A	✓	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Port of Los Angeles	Solar	10	California	2019	✓	✓	✓	✓	N/A	N/A	N/A	✓	-	-	-	✓	-	-	-	-	-	-
Shobak	Wind	45	Jordan	2020	✓	-	-	-	-	-	-	-	-	-	-	✓	✓	✓	✓	-	-	-
East Texas Electric Coop	Solar	15	Texas	2020	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	N/A	✓
Franklin	Solar	20	Pennsylvania	2020	-	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Johanna 1	Storage	10	California	2020	✓	✓	✓	✓	N/A	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Johanna 2	Storage	10	California	2020	✓	✓	✓	✓	N/A	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Simsboro	Solar	5	Louisiana	2020	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	-	✓	-	-	-	-	-	-
West Newberry	Solar	3	South Carolina	2020	✓	✓	✓	✓	✓	✓	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	N/A	✓
Roseland	Solar	500	Texas	2021	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	✓	-	-	-	-	-	-
Aktina	Solar	500	Texas	2021	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	✓	-	-	✓	-	-	-
Highland	Solar	300	Ohio	2021	✓	✓	✓	✓	✓	✓	N/A	✓	-	-	-	✓	-	-	-	-	-	-
Santa Teresa	Solar	100	New Mexico	2021	✓	✓	✓	✓	✓	✓	✓	✓	-	-	-	✓	-	-	-	-	-	-
Cincinnati, Aggregation	Solar	65	Ohio	2021	✓	✓	✓	✓	✓	✓	N/A	✓	✓	-	-	✓	-	-	-	-	-	-
NYSERDA 50	Solar	50	New York	2021	✓	✓	✓	✓	✓	✓	N/A	✓	✓	✓	✓	✓	-	-	-	-	-	-
Jicarilla Solar 1	Solar	50	New Mexico	2021	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	-	✓	-	-	-	-	-	-
Jicarilla Solar 2	Solar	50	New Mexico	2021	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	-	✓	-	-	-	-	-	-
CT DEEP	Solar	40	New York	2021	✓	✓	✓	✓	✓	✓	N/A	✓	✓	✓	✓	✓	-	-	-	-	-	-
Cincinnati, Municipal	Solar	35	Ohio	2021	✓	✓	✓	✓	✓	✓	N/A	✓	✓	-	-	✓	-	-	-	-	-	-
Palo Alto	Solar	26	California	2021	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Jicarilla Storage 1	Storage	20	New Mexico	2021	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	-	✓	-	-	-	-	-	-
NYSERDA 60	Solar	60	New York	2022	✓	✓	✓	✓	✓	✓	N/A	✓	✓	✓	✓	✓	-	-	-	-	-	-
Puget	Solar	35	Washington	2022	✓	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-

5.1.3 Key Personnel

For one or more projects located in the western planning area, we presently envision that staff from Hecate Energy and Repsol would provide the key personnel to lead the planning and development of the project, supported by contracted consultants. Hecate's personnel are highly qualified to develop, finance, construct, own, and operate the proposed project. Key individuals are highlighted below.

Dr. Paul Turner, Hecate Energy, Senior Vice President, Business Development
Paul brings over 30 years of experience in the utility and energy industry. Before joining Hecate in 2012, Paul was the Chief Executive Officer of Nacel Energy Corporation, which was a publicly traded wind energy company based in Scottsdale, Arizona. While at Nacel, Paul was responsible for putting together the company's corporate strategy and developing a portfolio of wind projects across West Texas. At Hecate, Paul has led the site control, early-stage development, and community engagement on over 20 GW of solar and wind projects across the continental United States. In addition to his stateside work, Paul is leading offshore wind development at Hecate Wind, where the company recently announced a 10 GW offshore wind project in Iceland whose offtake will be sold into the United Kingdom. In addition to the Iceland project (referred to as Kári Energy), Paul is also leading the development efforts on an additional 46 GW of offshore wind projects in the United States, Asia, and Africa.

Paul was a Managing Director at Peoples Energy Resources Corp. While there, Paul led the development of multiple natural gas-fired combined cycle and simple cycle power plants, including the 1,150 MW COB Energy Facility near Klamath Falls, Oregon, and the 280 MW Valencia Energy Facility near Albuquerque, New Mexico. Both fully developed projects were sold, with Valencia going to Public Service Company of New Mexico and COB sold to J Power. Prior to joining Peoples Energy Resources Corp., Paul was a principal at CornerStone Energy Advisors.

Diane Sullivan, Hecate Energy, Senior Vice President, Environmental and Permitting
Diane leads environmental regulatory permitting at Hecate Energy. She has 25 years of land planning, ecological and environmental professional practice experience, with a focus on utilities and energy sectors. Her expertise is developing project strategies to effectively navigate regulatory processes, and environmental and engineering survey requirements. Diane oversees the preparation of environmental reviews pursuant to the National Environmental Policy Act and equivalent state and local regulations. She manages the preparation of associated resource evaluation reports required for impact analysis including land use, visual/aesthetic, cultural, ecological, surface waters, wetlands, erosion and sediment control, transportation, noise/sound, air quality, communication, community resources and socioeconomic impacts. She acts as the primary agency liaison for state and federal agency coordination, and where required, oversees the preparation of state licensing and federal certificate applications for energy generation and associated linear electric transmission projects.

Diane has been the project director or lead regulatory specialist during development and construction phases of energy projects for more than 4 GW of renewables, eight development-phase, United States-based offshore wind projects, and more than 700 miles of domestic gas and

electric transmission and distribution systems. Prior to joining Hecate Energy, Diane was the national renewable energy sector lead at Stantec Consulting Services Inc. In this capacity, she was the project director/principal-in-charge of the development of Construction and Operations Plans for the Orsted Skipjack Offshore Wind Farm in Delaware/Maryland, the Orsted South Fork Wind Farm in New York, and the Orsted Sunrise Wind Farm in New York.

Patricia Shorr, Hecate Energy, Senior Vice President, Project Development
Patti serves as Senior Vice President of Project Development and applies her extensive experience to managing Hecate Energy's large utility-scale projects. Patti manages a network of outside contractors as well as Hecate Energy colleagues to help ensure successful delivery of some of the company's most high-profile and complex projects. Patti led the development of the 45 MW wind project in Jordan and 1.5 GW of solar projects in Virginia, Ohio, and Texas. The Jordan wind project was competitively bid, and it provides energy to the National Electric Power Company in Jordan. She led the development of and participated in the permitting and monetization of the project, which achieved commercial operation in January 2021. The project was permitted under the International Finance Corporation (IFC) guidelines.

Prior to joining Hecate Energy, Patti served as principal for Spectrum Capital Energy LLC, where, over the course of 20 years, she provided development and financial advisory services to private utility-scale developers of wind and solar projects both domestically and internationally. She has provided expertise in all stages of the development, construction, and operation of wind energy projects, and has often brought her skills to new markets where wind projects are new sources of energy starting her career as a financial advisor to a consortium of development, Japanese debt lenders and Mitsubishi Heavy Industries as they sought to enter the United States market. She led the financing of the first wind energy project in the United Kingdom and has worked in various development capacities for wind energy projects in California, Illinois, Iowa, Nebraska, Wisconsin, and Ohio.

João Paulo Costeira, Repsol, Executive Director, Low Carbon Generation
João leads Repsol's low carbon generation division and has more than 25 years of experience in the energy sector. Formerly with EDP Renewables, João was a member of the Board of Directors, a Member of the Executive Committee, the Chief Operations Officer–Offshore, and the Chief Operations Officer for Europe and Brazil for EDP Renewables S.A. João previously served EDP Group as an Executive Board Member of Naturgas in Spain and Portgás in Portugal. He managed investments of more than 3 billion in the United Kingdom and France and prospects in the United States, Netherlands, Taiwan, Australia, Colombia, Sweden, and Japan. He drove the objective of EDP Renewables, becoming a relevant player in offshore wind on both sides of the Atlantic, lead through selective mergers and acquisitions, the expansion of the company (i.e., onshore and solar) in new markets, defined a global procurement strategy adapted to a changing market, and piloted the company's digital transformation. João oversaw corporate operations in the United States, Portugal, France, and the United Kingdom, and reached financial close for a 1 GW offshore project (2.6 billion capital expenditure), raising 2.1 billion debt, which was the second largest structured financed offshore deal ever made. He also led successful bids for 2 GW of offshore projects in the United Kingdom and France in partnerships with Engie and Mitsubishi and 1.6 GW of offshore lease rights in Massachusetts in association with Shell. In his capacity, he also forged successful partnership structures for projects with some of the world's top

companies (e.g., Shell, Eon, Innogy, Marubeni, Repsol, Macquarie), and led successful negotiations with the biggest turbine suppliers (e.g., Vestas, MHIV, Siemens, Gamesa, Nordex, General Electric (GE), Senvion).

Julio Cortezón, Repsol Renewables, Chief Development Officer
Julio has more than 25 years of experience in the energy sector. Relative to offshore wind experience, his entry into offshore wind began in the United Kingdom in 2011 through the acquisition of Sea Energy Renewables Ltd., with a 1.2 GW portfolio comprising three projects under development, and the development of a staff of 40 people based in Edinburgh, Scotland. He served as a member of the Board of Directors of United Kingdom projects in a joint venture with EDP Renewables. His entry into floating offshore wind sector came through the acquisition of 20% of Windplus S.A., a company developing 25 MW of floating offshore wind projects off the coast of Portugal. He oversaw Repsol's divestment of the United Kingdom-based offshore wind business to China's SDIC for 238 million euros in 2016.

Federico Toro, Repsol Renewables, United States Manager
Federico has more than 15 years of experience in the energy sector and leads renewables in the United States for Repsol. As Procurement Director at EDP Renewables and Repsol Renewables, Federico procured wind turbines and balance-of-plant contracts for over 10 GW of onshore wind projects worldwide and 5 GW of projects located in the United States. He served as the Director of Offshore Wind Procurement at EDP Renewables, where he sourced and managed capital expenditure contracts procurement for Moray East Project (950 MW) in the United Kingdom, Le Treport (500 MW) and Normantieur (500 MW) in France, and the Wind Float project (50 MW) in Portugal. He was responsible for developing and executing a bid strategy definition for several offshore wind lease tenders in the Netherlands, France, the United Kingdom, and the United States (i.e., the Mayflower wind project), and the capital expenditure//operating expenses responsible for the winning bid at the Mayflower's Massachusetts project (800 MW).

5.1.4 Consultants

While Hecate Energy and Repsol have in-house capabilities for development, engineering, transmission interconnection, and finance matters, we recognize that a multi-disciplinary team of renewable energy professionals with specific expertise in offshore wind and marine systems will be required to successfully develop an offshore wind project in the Pacific Region. We have developed a consulting team to assist in the preliminary development phase of the Project consisting of qualified professionals to support environmental and regulatory affairs, legal services, stakeholder engagement and communications, and government relations. During the pre-development activities, we have engaged with Stantec Consulting Services (Stantec) to provide environmental due diligence; HDR, Inc. (HDR) to support communication and stakeholder engagement; Thompson Consulting Group (TCG) to lead government affairs and communications, and Stoel Rives LLP as outside legal counsel. At the initiation of site assessment, survey, conceptual design and engineering for the Project and associated facilities, Hecate would expand the consulting team. Specifically, we would contract with Stantec, HDR, and/or additional consultants and subconsultants to address:

- wind measurement and assessment;
- engineering evaluations and cost estimation;
- geotechnical and geophysical surveys;
- avian surveys;
- archaeological and historic resource surveys;
- visual resource assessment;
- finfish, shellfish, EFH and other commercial or tribal fisheries studies;
- benthic habitat surveys;
- sediment transport modeling;
- air quality/emissions studies;
- marine mammal and sea turtle surveys;
- terrestrial and coastal habitat and fauna studies;
- transmission siting and routing;
- navigation and vessel traffic;
- military operations, airspace and communication interference;
- ports and harbors selection and improvements;
- socioeconomic impact analysis; and
- other site specific studies.

5.2 Financial Capability

Hecate Energy has financed billions of dollars of power plant development and acquisitions, including over $3.5+ billions of renewable projects in the United States in the past 12 months. Successful financings include 500 MW solar utility projects in the United States, battery storage projects in Canada, and a wind farm in Jordan. The total amount of financing for these portfolios has been in the billions of dollars and has included debt and equity investments from a wide range of energy investment funds, utilities, and commercial banks.

Hecate has strong relationships and has contracted with some of the most sophisticated project owners in the world to deliver innovative and cost-effective power generation and storage solutions (Figure 13). Representative projects for which Hecate has raised financing are listed in Table 8.

Figure 13. Selected Long-Term Financiers of Hecate Energy Projects

Table 8. Projects Financed by Hecate Energy that have reached COD or are Under Construction

Project	Status	PPA Counterparty	Financial Partner	MWac
Aktina Solar El Campo, Texas	Under Construction	Merchant	Tokyo Gas America	500
Roseland	Under Construction	Google Energy	Enel	500
Highland 300	Under Construction	Major C&I Customer	DE Shaw	300
Beacon Solar Mojave, California	COD	Los Angeles Department of Water & Power	sPower	162
Cincinnati	Under Construction	Dynegy	Algonquin	100
Brewster Alpine, Texas	COD	City of Houston	Solairedirect (Engie)	50
Old Midville Millen, Georgia	COD	Georgia Power	Citizens Energy	20

Project	Status	PPA Counterparty	Financial Partner	MWac
Cherrydale Kendall Grove, Virginia	COD	Old Dominion Electric Cooperative	Dominion Energy	20
Johanna	Under Construction	Southern California Edison	InfraRed Capital Partners/Hecate Grid	20
Federal Shipping Service Los Angeles, California	COD	Los Angeles Department of Water & Power	True Green Capital	11
Port of Los Angeles Los Angeles, California	COD	Los Angeles Department of Water & Power	True Green Capital	10
Clarke White Post, Virginia	COD	Old Dominion Electric Cooperative	Dominion Energy	10
Blair Road Jacksonville, Florida	COD	Jacksonville Electric Authority	Synovus Bank (debt)	4
Forbes Street I East Providence, Rhode Island	COD	National Grid	DE Shaw	3
Monson Monson, Massachusetts	COD	Net Metering and Merchant SRECs	SunEdison	3
Forbes Street II East Providence, Rhode Island	COD	National Grid	Fifth Third Bank (debt)	3
West Newberry	Under Construction	Totality Renewables	Synovus Bank (debt)	3
Johns Hopkins University Baltimore, Maryland	COD	Johns Hopkins University	Synovus Bank (debt)	2
Turner Bend Rome, Georgia	COD	Georgia Power	Synovus Bank (debt)	1
Old Alabama Rd Woodland, GA	COD	Georgia Power	Synovus Bank (debt)	1
Old Alabama Rd 2 Woodland, Georgia	COD	Georgia Power	Boviet USA	1

Project	Status	PPA Counterparty	Financial Partner	MWac
Rome Highway Aragon, Georgia	COD	Georgia Power	Inman Solar	1
Morgan Rome, Georgia	COD	Georgia Power	Synovus Bank (debt)	1

5.2.1 Financing Plan

Hecate Energy maintains ready access to the capital needed to carry energy infrastructure projects through their multi-year development cycles. Hecate funds development form its balance sheet and raises long-term capital from leading global investors. Hecate has ample capital to fund the development of the contemplated projects, as Hecate dedicates tens of millions of dollars annually to development financing. Regarding long-term financing, Hecate Energy has raised over $3.5+ billions of capital for renewable projects in the United States within the past 12 months alone. Further, Repsol, with a $20 billion market cap, is a 40% owner of Hecate, and is actively providing long-term capital for Hecate's renewable projects.

Hecate Energy's audited financial statements are available upon request.

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ATTACHMENT 1

Hecate's Articles of Incorporation

Delaware

The First State

I, JEFFREY W. BULLOCK, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY THE ATTACHED IS A TRUE AND CORRECT COPY OF THE CERTIFICATE OF FORMATION OF "HECATE ENERGY LLC", FILED IN THIS OFFICE ON THE FIRST DAY OF MAY, A.D. 2012, AT 4:38 O'CLOCK P.M.

Jeffrey W. Bullock, Secretary of State

5148034 8100

AUTHENTICATION: 9543111

120496362

DATE: 05-01-12

You may verify this certificate online at corp.delaware.gov/authver.shtml

State of Delaware
Secretary of State
Division of Corporations
Delivered 05:05 PM 05/01/2012
FILED 04:38 PM 05/01/2012
SRV 120496362 - 5148034 FILE

CERTIFICATE OF FORMATION

OF

HECATE ENERGY LLC

The undersigned, an authorized natural person, for the purpose of forming a limited liability company, under the provisions and subject to the requirements of the State of Delaware (particularly Chapter 18, Title 6 of the Delaware Code and the acts amendatory thereof and supplemental thereto, and known, identified, and referred to as the "Delaware Limited Liability Company Act"), hereby certifies that:

FIRST: The name of the limited liability company is Hecate Energy LLC.

SECOND: The address of its registered office and the name of the registered agent at such address, as required to be maintained by Section 18-104 of the Delaware Limited Liability Company Act is 2711 Centerville Road, Suite 400, Wilmington, Delaware 19808, County of New Castle. The name of its registered agent at that address is Corporation Service Company.

IN WITNESS WHEREOF, the undersigned has executed this Certificate of Formation this 1st day of May, 2012.

By: /s/ Michael H. Woolever
Michael H. Woolever, Authorized Person