

LEEUWIN OFFSHORE WINDFARM WESTERN AUSTRALIA

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EPBC REFERRAL SUPPORTING DOCUMENT



LEEUWIN OFFSHORE WIND PTY LTD

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10/02/2022
VERSION 1.5

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EXECUTIVE SUMMARY

This document supports a referral under the Environment Protection and Biodiversity Conservation Act for the development of an offshore wind farm in Western Australia.

Leeuwin Offshore Wind Pty Ltd is proposing the construction, operation and decommissioning of the Leeuwin Offshore Wind Farm (OWF; the proposed action). The Leeuwin OWF comprises all infrastructure necessary for an OWF and supporting electricity transmission assets to transmit energy generated to the existing onshore electricity grid. Once operational the proposed action will have the capacity to generate in excess of 3.0 GW of electricity (up to 11 Terawatt-hour (TWh) of power per year).

The proposed action will span Commonwealth waters, Western Australian coastal waters within Geographe Bay, southwest Western Australia (WA) and land areas in the vicinity of the town of Binningup (Shire of Harvey). The proposed action is being referred under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) for the assessment of potential impacts to Matters of National Environmental Significance (MNES). The proponent intends to refer the proposed action to the WA Environmental Protection Authority (EPA) under the *Environmental Protection Act 1986* (EP Act) in 2022.

This document provides a preliminary assessment of the potential impacts to MNES associated with the proposed action, including both onshore and offshore components. A desktop literature review of publicly available information was conducted, including those published by the Australian Government Department of Agriculture, Water and the Environment (DAWE) and the WA Department of Biodiversity, Conservation and Attractions (DBCA). Whilst the primary focus was on defining and assessing the MNES

using the DAWE Protected Matters Search tool, additional state-specific environmental database searches were undertaken, including but not limited to the Threatened and Priority Flora, Fauna and Ecological Communities Database maintained by WA Department of Biodiversity, Conservation and Attractions (DBCA). This information was synthesised to describe the existing environment within and adjacent to the Development Envelope.

A Likelihood of Occurrence assessment was conducted on each of the MNES potentially occurring in the vicinity of, and potentially impacted by, the proposed action. Potential impacts associated with the construction, operation and decommissioning of the proposed action were assessed. Relevant control measures, to eliminate or mitigate these impacts, were also identified.

The following MNES listed under the EPBC Act were identified as being relevant to the proposed action;

- The Peel-Yalgorup Ramsar site (listed as a Wetland of International Importance).
- Four listed Threatened Ecological Communities
- 71 listed Threatened Species
- 69 listed Migratory Species

Other Matters Protected by the EPBC Act:

- 95 listed Marine Species
- 33 whales and other Cetaceans
- 2 Australian Marine Parks

Potential impacts identified as relevant to the MNES include:

- Bird mortality as a result of collision with turbines, or behavioural change (avoidance).
- Marine fauna disturbance or physical injury as a result of underwater noise and vibration during construction (e.g. pile driving or geotechnical surveys etc).
- Loss of native vegetation including threatened flora species or ecological communities.
- Loss of onshore fauna habitat from land clearing.
- Loss of onshore habitat from the introduction of weeds and pathogens.
- Reduced onshore water quality due to uncontrolled run off during construction activities.
- Loss of marine benthic habitat due to construction activities.
- Species behaviour changes due to construction activities.
- Species behaviour changes due to operation noise and vibrations (turbines) and electromagnetic fields from undersea cables.
- Reduced marine water quality due to dredging and dredge spoil placement.
- Reduced marine water quality due to chemical/hydrocarbon spills from support vessels.
- Introduction of marine pests.
- Marine faunal injury or death due to support vessel strike.

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1. INTRODUCTION

This supporting document provides a preliminary review of the potential impacts to Matters of National Environmental Significance (MNES) associated with the proposed action, including both onshore and offshore components.

A desktop literature review of publicly available information, including the Department of Agriculture, Water, and the Environment (DAWE) protected matter search tool (PMST) and Conservation Values Atlas, was completed to describe the existing environment within and adjacent to the Development Envelope.

This document has been prepared to provide supporting information relevant to the referral of the proposed action under the EPBC Act. This report:

- Provides an overview of the onshore and offshore components of the proposed action.
- Presents a description of the environmental and social conditions in the Development Envelope and surrounds.
- Presents a review of Commonwealth and State Government environmental values mapping, database results, and legislative considerations.
- Provides a preliminary assessment of potential impacts of the proposed action on MNES.
- Identifies proposed management strategies to avoid or minimise potential impacts to MNES.

1.1 PROJECT OVERVIEW

Leeuwin Offshore Wind Pty Ltd is proposing the construction, operation and decommissioning of the Leeuwin Offshore Wind Farm (the proposed action). The proposed action will span Commonwealth waters, Western Australian coastal waters within Geographe Bay, southwest Western Australia and land areas in the vicinity of the town of Binningup (Shire of Harvey).

The proposed action will have the capacity to generate in excess of 3.0 GW of electricity (up to 11 TWh of power per year) and will support Australia's commitment to "reduce greenhouse gas emissions by

26-28% by 2030 (DISER, 2021), as well as the Western Australian Government's target of enhanced climate resilience and net zero greenhouse gas emission by 2050 (DWER, 2021).

The key components of the proposed action are (Figure 1):

- Offshore Wind Turbine Generators (WTGs).
- Offshore Substations (OSS).
- Substructures and seabed foundations (for the WTGs and OSS).
- Subsea cables (inter-array cables) linking the WTGs with each other and the OSS.
- Subsea export cables to connect the wind farm to the coast via a landfall.
- Onshore transmission cables and substations to connect to the South-West Interconnected System (SWIS).

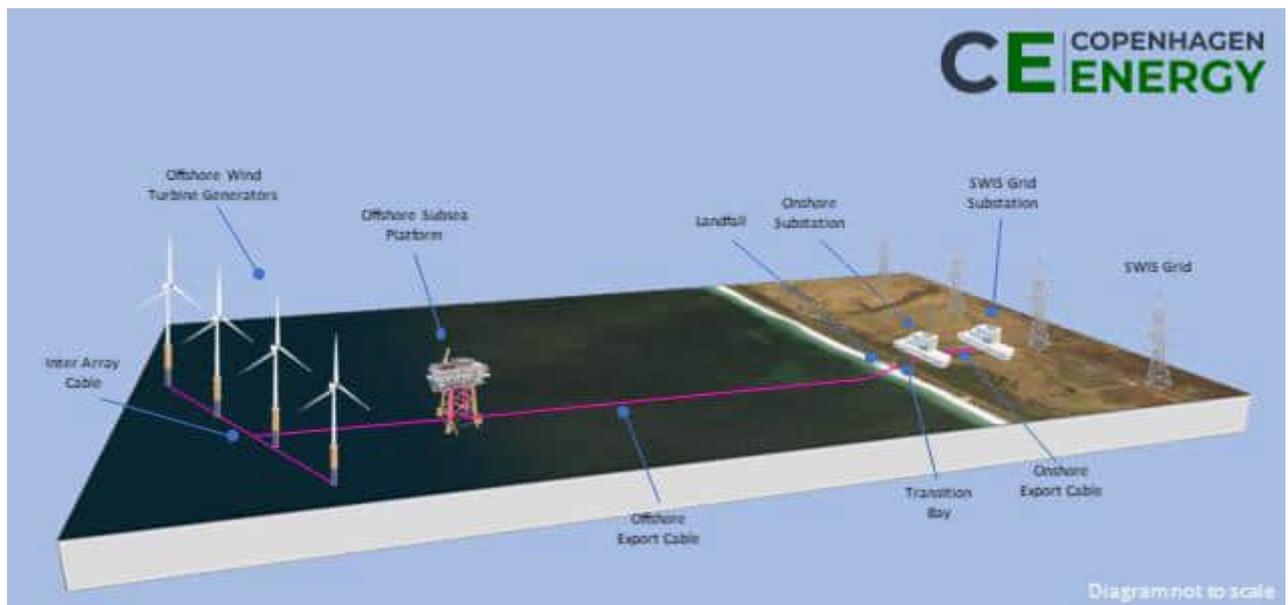


Figure 1 - Conceptual diagram showing the proposed onshore and offshore components

The proposed action is being referred under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) for the assessment of potential impacts to Matters of National Environmental Significance (MNES). The proposed action will be referred to the WA Environmental Protection Authority (EPA) under the *Environmental Protection Act 1986* (EP Act) in 2022.

The proposed action is located approximately 130 km south of Perth between Mandurah and Bunbury (Figure 2). The WTGs, inter-array subsea cables and substation platforms would be located in Commonwealth waters. The export cables would transit through State waters to join to the onshore infrastructure.

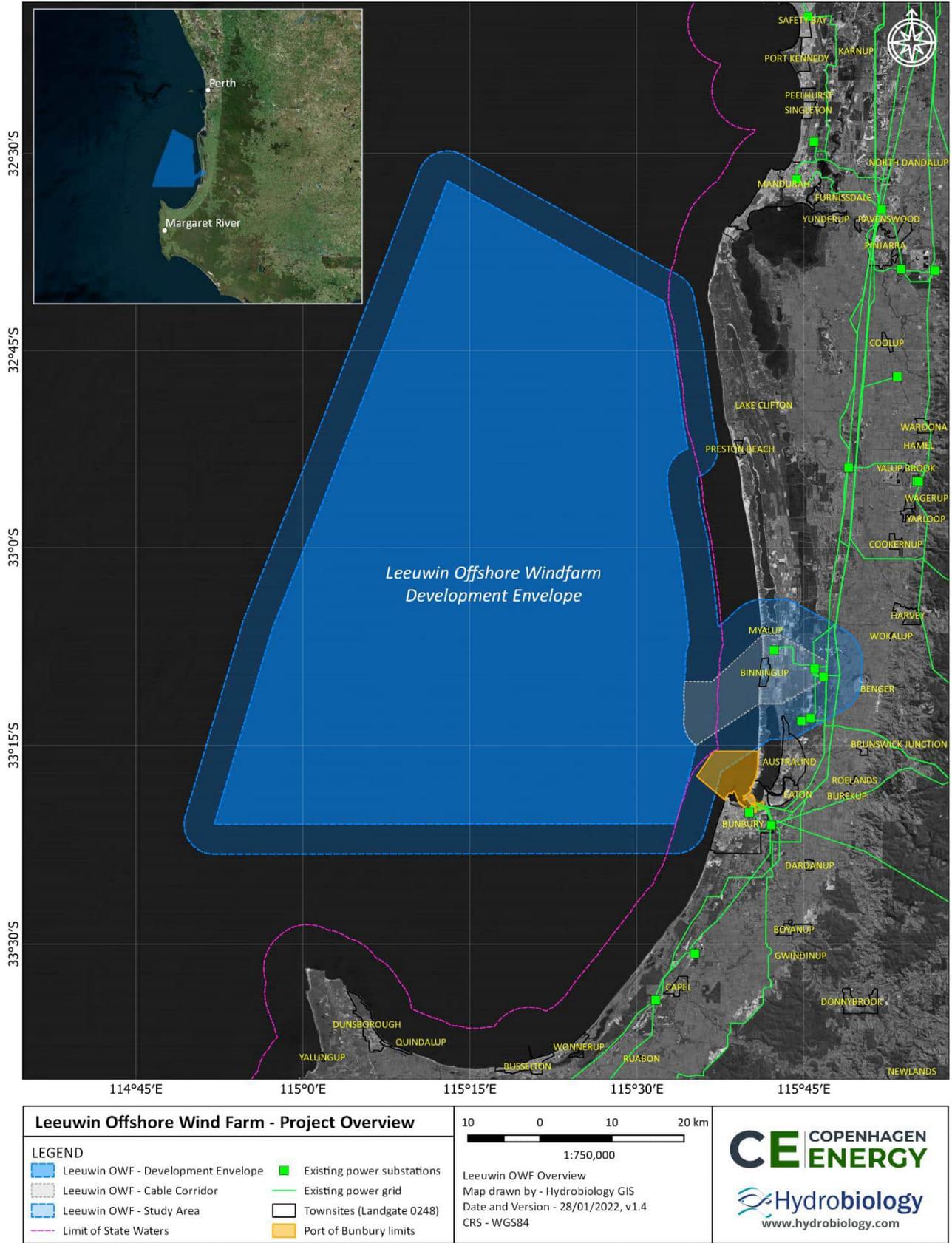


Figure 2 - Overview of proposed Leeuwin Offshore Wind Farm

1.2 PROPONENT

The proposed action is being put forward by Leeuwin Offshore Wind Pty Ltd, which is a wholly owned subsidiary of Copenhagen Energy A/S (CE), a Danish renewable energy developer with over 40 years' cumulative experience in delivering offshore and onshore wind and solar photovoltaic (PV) developments in Denmark and throughout Europe. CE has both development and operational experience in offshore wind projects. The company is currently developing several utility scale offshore wind projects in Ireland totalling more than 5 GW of power. CE is focused on a portfolio of offshore wind projects in Australia, and is proposing to develop, construct and operate four offshore windfarms in WA (of which the proposed action is one).

CE is very focused on Corporate Social Responsibility (CSR) and endeavours to enter local partnerships to maximise the direct benefits of the proposed action to the local community and economy (see Appendix B Copenhagen Energy's Environmental Policy).

The proposed action seeks to deliver the following outcomes.

- Support a seamless energy transition within WA during the retirement of coal power plants.
- Fulfil the growing demand for renewable energy to support the decarbonisation of industry in WA.
- Boost regional economies.
- Create thousands of direct and indirect local jobs during construction and operation of the proposed action.
- Contribute to reducing energy pricing through increased supply and competition.
- Contribute to protecting against power outages during peak periods and meeting baseload power needs.
- Maintain the existing economic benefits and environmental and social values of the region.

1.3 TERMINOLOGY

Throughout this document the following terms are used frequently:

- **Development Envelope:** is the area that contains all the proposed activities (including the disturbance footprint).
- **Study Area:** is the area that contains the Development Envelope plus an additional 5 km buffer. The buffer is in place to assess any potential downstream or edge impacts associate with the proposed action.
- **Project Footprint:** is the area that is proposed to be directly impacted by the proposed action. As the design of the proposed action progress the footprint will be refined and rationalised, but will remain within the Development Envelope and not exceed the nominated total size.

1.4 ACRONYMS AND ABBREVIATIONS

Table 1 - Summary of relevant acronyms and terminology used throughout this document

Acronym or Terminology	Definition
AEIP	Australian Exposure Information Platform
AHA	<i>Aboriginal Heritage Act 1972</i> (superseded by <i>Aboriginal Cultural Heritage Act 2021</i>)
AHIS	Aboriginal Heritage Information System
ACH	<i>Aboriginal Cultural Heritage Act 2021</i>
AMSA	Australian Maritime Safety Authority
ANZECC	Australian and New Zealand Environment and Conservation Council
BIA	Biological Important Area
BC Act	<i>Biodiversity Conservation Act 2016</i> (Western Australia)
BCH	Benthic Communities and Habitats
CALM	Department of Conservation and Land Management (superseded by DBCA)
CAMBA	China-Australia Bird Agreement
CE	Copenhagen Energy
Cetacean	A marine mammal group including whales and dolphins
CPT	Cone Penetrometer Testing
CRC	Cooperative Research Centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSR	Corporate Social Responsibility
DAWE	Australian Department of Agriculture, Water and the Environment
DBCA	Western Australia Department of Biodiversity, Conservation and Attractions
DEE	Australian Department of the Environment and Energy (superseded by DAWE and DISER in 2020)
DEWHA	Australian Department of, Water, Heritage, and the Arts (superseded by DAWE)
DISER	Australian Department of Science, Industry, Energy and Resources
DoE	Australian Department of the Environment (superseded by DEE in 2016, now DAWE)
DPLH	Western Australia Department of Planning Lands and Heritage
EEZ	Economic Exclusive Zone
EIA	Environmental Impact Assessment
EPA	Environmental Protection Authority
EP Act	<i>Environmental Protection Act 1986</i>
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i> (Commonwealth)
GIS	Geographic Information System

Acronym or Terminology	Definition
GW	Giga Watt
Ha	Hectares
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
IMS	Invasive Marine Species
IRENA	International Renewable Energy Agency
IUCN	International Union Conservation of Nature
JAMBA	Japan-Australia Migratory Bird Agreement
KEF	Key Ecological Feature
km	Kilometre
KSIA	Kemerton Strategic Industrial Area
kV	Kilovolt
LAA	<i>Land Administration Act 1997</i>
LAT	Lowest Astronomical Tide
MARPOL	International Convention for the Prevention of Pollution from ships
mg/L	Milligrams per litre
MNES	Matters National Environmental Significance
MHWM	Mean High Water Mark
MSESS	Matters of State Environmental and Social Significance
m/s	Metres per second
MSL	Mean Sea Level
MW	Mega Watt
NATPLAN	National Plan for Maritime Emergencies
NEM	National Electricity Market
NM	Nautical Mile
OSS	Offshore Sub-Station
WTG	Wind Turbine Generator
PMST	Protected Matter Search Tool
RIWI Act	<i>Rights in Water and Irrigation Act 1914</i>
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement
SCADA	Supervisory Control and Data Acquisition
SWIS	Southwest Interconnected System
TEC	Threatened Ecological Communities
TSB	Territorial Sea Baseline

Acronym or Terminology	Definition
TWh	Terawatt-hour
UCH	Underwater Cultural Heritage
USD	United States Dollar
WA	Western Australia
WALA	Western Australian Land Authority
WEM	Wholesale Electricity Market

2. STATUTORY CONTEXT

The Development Envelope spans Commonwealth waters and Western Australian coastal waters and land areas. The Commonwealth, State and local government requirements applicable to the proposed action are outlined below.

2.1 COMMONWEALTH LEGISLATION

2.1.1 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) regulates any activities that may impact on Matters of National Environmental Significance (MNES). This act is administered by the Commonwealth Department of Agriculture, Water, and the Environment (DAWE). An assessment of potential impacts has been conducted and the potential MNES are listed in Table 2. Additional details on flora and fauna protected under the EPBC Act that may occur in, or in proximity to, the Development Envelope are provided in following sections. A map showing marine parks and protected areas in proximity to the Development Envelope is provided in Figure 3. CE expects that the proposed action will be classified as a 'controlled action' requiring formal assessment under the EPBC Act.

Table 2 - Matters of National Environmental Significance (MNES) and Other Matters relevant to the Leeuwin Offshore Wind Farm Project.

MNES	Relevance to project activities
World heritage properties	Not applicable: there are no World Heritage Places within the Development Envelope
National heritage properties	Not applicable: there are no National Heritage Places within the Development Envelope
Wetlands of international importance ('Ramsar wetlands')	Project activities may interact with elements of the Peel-Yalgorup Ramsar site
Threatened ecological communities	Four Threatened Ecological Communities (TECs) occur within, or in proximity to, the onshore part of the Development Envelope: <ul style="list-style-type: none"> • Tuart (<i>Eucalyptus gomphocephala</i>) Woodlands and Forests – Critically Endangered • Banksia Woodlands of the Swan Coastal Plain – Endangered • Subtropical and Temperate Coastal Saltmarsh – Vulnerable • Clay Pans of the Swan Coastal Plain – Critically Endangered
Threatened species	Up to 71 threatened plant or animal species may occur within, or in proximity to, the Development Envelope.
Migratory species	Up to 69 migratory species may occur within, or in proximity to, the Development Envelope.
Commonwealth marine areas	Offshore Wind Turbine Generators (WTGs) and other offshore infrastructure are proposed to be established in Commonwealth marine areas (Exclusive Economic Zone and Territorial Sea).
Other Matters	Relevance to project activities
Critical habitats	No critical habitats will be impacted by the proposed action.
Listed Marine Species	Up to 95 listed marine species may be impacted by the proposed action.
Whales and other Cetaceans	Up to 33 species of whale and other cetaceans have reported distributions within the study area.
Commonwealth reserves (terrestrial)	No Commonwealth terrestrial reserves will be impacted by the proposed action.
Commonwealth Marine Parks	The Development Envelope has been designed to avoid marine parks. The Development Envelope abuts with the northern boundary of the Geographe Marine Park (Special Purpose Zone, IUCN IV). The Protected Matters Search Tool (PMST) also identifies the Perth Canyon Marine Park which is 70 km to the NW of the study area. The proponent also notes the South-west Corner Marine Park, 25 km to the Southwest of the study area, which was not identified by the PMST.

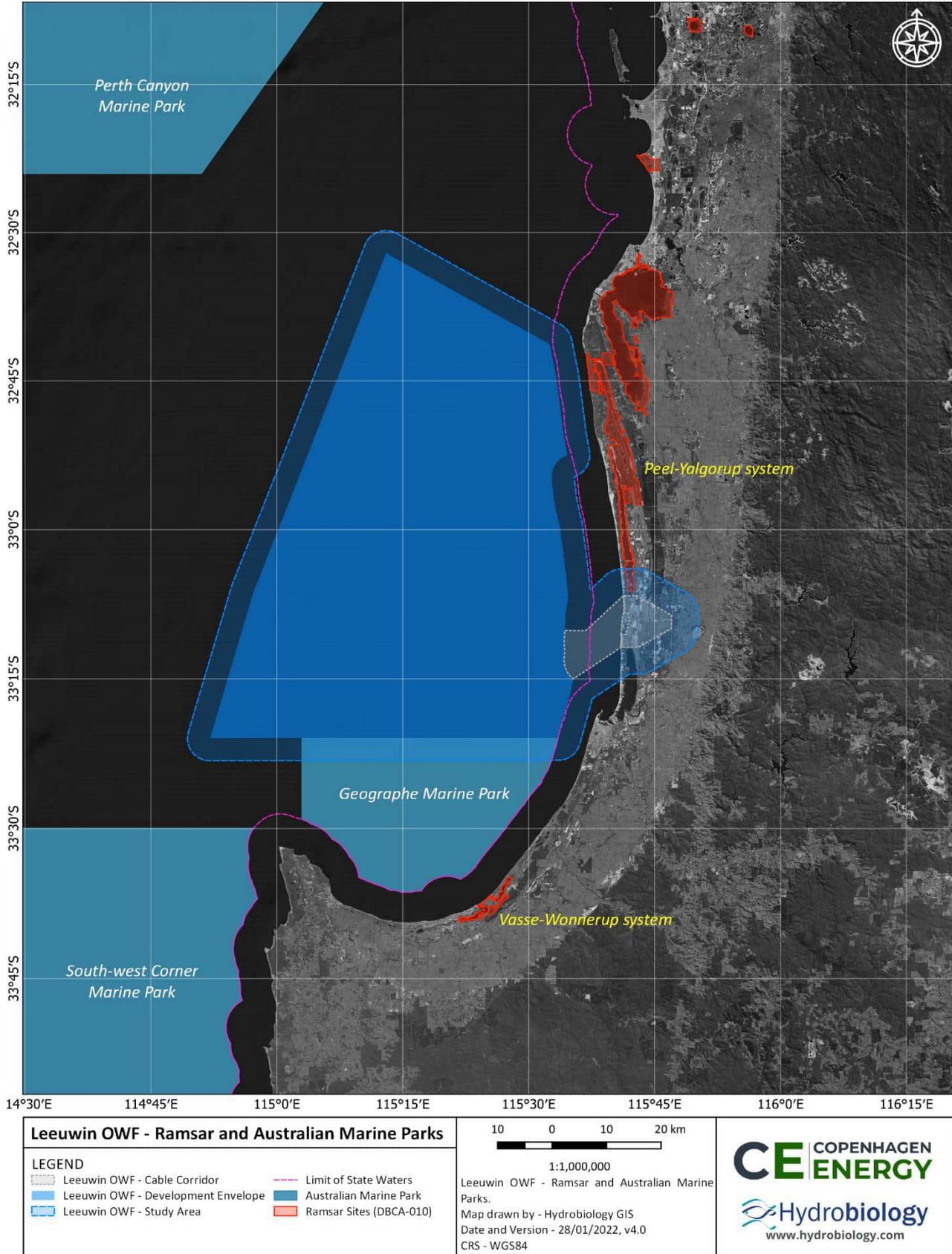


Figure 3 - Commonwealth Marine Parks and Ramsar wetlands in proximity to Development Envelope

2.1.2 OFFSHORE ELECTRICITY INFRASTRUCTURE BILL 2021

Federal legislation to facilitate and regulate the development of electricity infrastructure in Commonwealth offshore waters has recently been passed by both Houses of Parliament. The new legislation will:

- Prohibit offshore renewable energy infrastructure and offshore electricity transmission infrastructure in the Commonwealth offshore area without a licence.
- Provide for the Minister to declare specified areas suitable for offshore infrastructure activities and to grant licences allowing proponents to undertake offshore infrastructure activities in these areas.
- Provide for safety and protection zones to protect offshore electricity infrastructure.
- Establish administrative processes to manage the licence application process; and to regulate environmental, infrastructure integrity, health and safety and compliance aspects of offshore energy infrastructure.

When enacted (most likely in 2022), the Bill will be known as the *Offshore Electricity Infrastructure Act 2021*. The Bill will commence on a day fixed by proclamation or - if the Bill does not commence within 6 months from the day the *Offshore Electricity Infrastructure Act 2021* receives Royal Assent - the whole of the Bill will commence on the day after the end of that 6-month period.

2.1.3 AUSTRALIAN MARITIME SAFETY AUTHORITY ACT 1990

The *Australian Maritime Safety Authority Act 1990* promotes maritime safety and protects the marine environment from pollution from ships and facilitates the response to marine pollution events such as oil spills. This act is administered by the Commonwealth Australian Maritime Safety Authority (AMSA). Marine pollution from vessel associated with the project would be undertaken in accordance with the National Plan for Maritime Emergencies (NATPLAN).

2.1.4 BIOSECURITY ACT 2015

The *Biosecurity Act 2015* regulates vessels entering Commonwealth waters to prevent the introduction of invasive marine species (IMS) via ballast water and hull fouling. This Act is administered by the Commonwealth Department of Agriculture (DAWE). The project will be required to implement control measures for all vessels and infrastructure coming into Commonwealth waters to reduce the likelihood of the introduction of IMS. Ballast water would be managed in accordance with Ballast Water Management Requirements and antifouling in accordance with Anti-fouling and In-water Cleaning Guidelines.

2.1.5 NAVIGATION ACT 2012

The *Navigation Act 2012* regulates all vessel in Commonwealth waters. The act promotes the safety of life at sea, safe navigation, and marine pollution prevention. This act is administered by AMSA. All vessel associated with the project would be subject to the requirement of the Act including safe navigation, pilotage practice and pollution prevention certificates in place

2.1.6 PROTECTION OF THE SEA (PREVENTION OF POLLUTION FROM SHIPS) ACT 1983

The *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* regulates the discharge of oil and other substances such as noxious liquids, sewage, garbage, and air pollution from vessels. The act requires vessel to adhere to the International Convention for the Prevention of Pollution from ships (MARPOL) and is administered by the AMSA.

2.1.7 UNDERWATER CULTURAL HERITAGE ACT (2018)

The *Underwater Cultural Heritage (UCH) Act 2018* protects the heritage values of shipwrecks, sunken aircraft, maritime infrastructure, indigenous sites, and associated relics older than 75 years in Australian waters (from Territorial Sea Baseline (TSB) to the Exclusive Economic Zone). This Act is managed by the Western Australia Museum as the delegated authority in WA for the Commonwealth UCH Act. Indigenous UCH sites differ as in State coastal waters (TSB to 3 NM) they are protected by the WA *Aboriginal Heritage Act 2020* managed by the Department of Planning Lands and Heritage (DPLH). If Indigenous UCH sites are found in Commonwealth waters beyond 3NM they would fall under the Commonwealth *Underwater Cultural Heritage Act 2018*.

Cultural heritage database searches indicated that there is one wreck (the Thermoni II) within the Development Envelope, the exact location of the wreck is not certain and due to its age (<56 years old) it is not protected by the UCH Act. There are two other listings outside of the Development Envelope; the Lass of Geraldton which is protected and the other the Lena which is not protected but is a popular tourist attraction. Consideration will be made when designing the location of offshore infrastructure to avoid the Lena and the Lass of Geraldton wrecks.

2.1.8 NATIVE TITLE ACT 1993

The *Native Title Act 1993* recognises the rights and interests of Aboriginal and Torres Strait Islander people. The onshore part of the Development Envelope intersects lands under the traditional custodianship of the Noongar People. In June 2015, six Indigenous Land Use Agreements (ILUAs), for the resolution of native title across the Southwest of Western Australia (the SWNT Settlement), were executed by the Minister for Environment, Director General of Parks and Wildlife, Chairs of the Conservation Commission and Marine Parks and Reserves Authority and other parties. The SWNT Settlement applies to the Gnaala Karla Booja (WC98/58) Native Title claim area, which extends approximately from Kwinana (in the north) to Capel (in the south) and eastwards as far as Wagin and Kojonup. This area includes the onshore part of the Development Envelope. With the commencement of the SWNT Settlement in 2021, native title rights and interests were surrendered in exchange for a package of benefits contained within the ILUAs, including co-operative and joint management over parts of the conservation estate.

2.2 STATE LEGISLATION

2.2.1 ENVIRONMENTAL PROTECTION ACT 1986

The proposed action will be referred to the WA Environmental Protection Authority (EPA) under the Environmental Protection Act 1986 (EP Act) in early 2022.

Additional information on the environmental and social factors likely to be considered as part of assessment of the proposed action under other legislation is presented in the following sections.

2.3 SECONDARY APPROVALS

If the proposed action is approved by the Minister following assessment under Part IV of the EP Act, a range of secondary approvals will be required under Western Australian legislation. These are summarised in Table 3 .

Table 3 - Secondary approval potentially required for implementation of the Proposed Action

Legislation	Administering agency	Matters regulated	Consents required
<i>Aboriginal Heritage Act 1972 (or Aboriginal Cultural Heritage Act 2021, when enacted)</i>	Department of Planning, Lands and Heritage	Activities that may harm Aboriginal cultural assets (whether tangible or intangible)	Ministerial consent under S18 of the AHA or ACH permit and/or approval of an ACH management plan under the ACH Act.
<i>Biodiversity Conservation Act 2016</i>	Department of Biodiversity, Conservation and Attractions	'Taking' of threatened flora or fauna Activities that may modify the occurrence of a threatened ecological community.	Ministerial authorisation under Section 40 of the BC Act. Ministerial authorisation under Section 45 of the BC Act.
Part V of <i>Environmental Protection Act 1986</i>	Department of Water and Environmental Regulation	'Prescribed activities', listed in Schedules 1 and 2 of the Environmental Protection Regulations 1987 Clearing of native vegetation (including seaweed or other marine vegetation).	Proposed activities are unlikely to require either a works approval or licence under Part V of the EP Act, with the possible exception of concrete batching (Category 77). Proposal will be exempt from the requirement to seek a separate native vegetation clearing permit if impacts on flora and vegetation are assessed as part of the EPA assessment.
<i>Heritage Act 2018</i>	Heritage Council of Western Australia	Activities that may alter registered heritage places so that the cultural heritage significance of the place is detrimentally affected.	Works permit or heritage agreement
<i>Land Administration Act 1997</i>	Department of Planning, Lands and Heritage	Activities (including establishment of infrastructure or other improvements or taking of vegetation) conducted on Crown land, including in reserves (terrestrial or marine)	Ministerial consent under relevant section(s) of the LAA.
<i>Western Australian Marine Act 1982</i>	Department of Transport	Safety of navigation and shipping	Certificates of survey, certificates of competency, mooring permits, towage permits
<i>Planning and Development Act 2005</i>	Shire of Harvey	Develop activities within the Shire of Harvey	Building permits and similar local government consents, considered in the context of State Planning Policy No. 2.6 (State Coastal Planning Policy) and other relevant policies, for example State Planning Policy No. 2 Environment and Natural Resources Policy

Legislation	Administering agency	Matters regulated	Consents required
<i>Rights in Water and Irrigation Act 1914</i>	Department of Water and Environmental Regulation	Construction or alteration of wells Extraction of groundwater Disturbance of the bed or banks of watercourses	If any of the regulated activities is required, permits will be required under relevant sections of the RIWI Act.
<i>Road Traffic (Vehicles) Act 2012</i>	Main Roads Western Australia	Use of state or local roads by heavy vehicles Transport of oversized / over-mass loads on state or local roads.	Approval of Oversize Over mass Transport Management Plan Transport permit(s)
<i>Contaminated Sites Act 2003</i>	The Department of Water and Environmental Regulation	The Act requires that known or suspected land of water contamination is reported to DWER, investigated and, if necessary, remediated.	No consent required. Baseline survey to establish any previous contamination.

3. PROPOSED ACTION

3.1 PROPOSED ACTION LOCATION

The proposed action is located in the south-west of Western Australia approximately 130 km south of Perth between Mandurah and Bunbury. The offshore Wind Turbine Generators (WTGs) and Offshore Sub-Station (OSS) platforms will be localised within Commonwealth marine waters¹, (approximately 15 km to 70 km from the coast). The export cables will cross from Commonwealth marine waters (>3nm) to State waters (< 3nm), where landfall will be made.

Land-based components of the proposal are located within the Shire of Harvey local government area. The local governments to the north and south of the Development Envelope are the Shire of Waroona and the City of Bunbury, respectively.

3.2 PROPONENT

The proposed action is being proposed by Leeuwin Offshore Wind Pty Ltd, which is a wholly owned subsidiary of Copenhagen Energy A/S, a Danish renewable energy developer with over 40 years' cumulative experience in delivering offshore and onshore wind and solar photovoltaic (PV) developments in Denmark and throughout Europe. CE has both development and operational experience in offshore wind projects. The company is currently developing several utility scale offshore wind projects in Ireland totalling more than 5 GW of power. CE is focused on a portfolio of offshore wind projects in Australia, and is proposing to develop, construct and operate four offshore windfarms in WA (of which the proposed action is one).

CE is very focused on Corporate Social Responsibility (CSR) and endeavours to enter local partnerships to maximise the direct benefits of the proposed action to the local community and economy.

The proposed action seeks to deliver the following outcomes.

¹ The Commonwealth marine area is any part of the sea, including the waters, seabed, and airspace, within Australia's exclusive economic zone and/or over the continental shelf of Australia, that is not State or Northern Territory waters. The Commonwealth marine area stretches from 3 to 200 nautical miles from the coast.

- Support a seamless energy transition within WA during the retirement of coal power plants.
- Fulfil the growing demand for renewable energy to support the decarbonisation of industry in WA.
- Boost regional economies.
- Create thousands of direct and indirect local jobs during construction and operation of the proposed action.
- Contribute to reducing energy pricing through increased supply and competition.
- Contribute to protecting against power outages during peak periods and meeting baseload power needs.
- Maintain the existing economic benefits and environmental and social values of the region.

3.3 PROPONENTS ENVIRONMENTAL MANAGEMENT

Copenhagen Energy takes its environmental responsibilities extremely seriously. Sustainable development and environmental stewardship are the driving force behind the company's core values and mission. The company's mission is to accelerate the development of green energy projects all over the world with the goal of zero CO₂ emissions to combat the global climate crisis. While pushing new frontiers for offshore wind power the company is focused on adopting best practice in environmental management for this project.

The senior management team of Copenhagen Energy have more than 40 years' experience developing renewable energy projects onshore and offshore in Denmark, Germany and United Kingdom. These projects have been managed to comply with all environmental and safety laws, rules and regulations relevant to these countries and jurisdictions. This track history is especially relevant as these countries lead the world in their regulation and management of environmental impacts from offshore wind. Copenhagen Energy is conscious that Australia's offshore wind industry is in its infancy and is focused on transferring this best practice to ensure the success of this new industry.

The team's project experience has included Natura 2000 areas, which are conservation and protection areas established by the European Commission to protect core breeding and resting sites for rare and threatened species and natural habitat. This previous experience is highly relevant to this project in light of the Ramsar wetland in the vicinity of the project which also includes rare and threatened species and habitat. Copenhagen Energy has the experience and knowledge to manage the environmental and social impacts associated with this project. They are committed to consult and work with all key stakeholders to fully identify all potential impacts and to design robust management strategies to avoid potential impacts and where impacts cannot be avoided mitigation measures will be developed to minimize impacts.

Copenhagen Energy has not been involved in any cases of environmental misconduct or accidents (presently or in the past). Please see Appendix B - CE Environmental Policy, for more details on the company's environmental management ethos.

3.4 KEY COMPONENTS

The key proposed action components include the following (see Table 4 and supplementary Proposal Description document – Appendix C). The Project is in the early development stage, and therefore many of the detailed design parameters are yet to be determined. The design process is evolving based on technical feasibility and commercial viability studies and will continue to be refined in response to environmental and social impacts identified, as well as the consultation process.

Offshore wind assets

- Approximately 200 offshore WTG supported by suction caissons, piled foundations or gravity bases. The WTGs will be located exclusively in Commonwealth marine waters (approximately 15 km to 70 km from the coast).
- A network of buried and/or protected (in areas where burial is not possible) subsea cables along the seabed connecting strings of the WTGs together and connecting them to the offshore transmission assets. These are known as inter-array cables.

The size of individual WTGs is yet to be determined. At this stage, it is anticipated that individual WTGs delivering between 15 MW and 25 MW will be installed, with the definitive number, final location and ultimate turbine specifications being determined prior to construction. The final choice of turbine will be dependent on supply chain and available technology at the time of construction, as well as further environmental assessment and site investigations.

Offshore transmission assets

- A number of OSS platforms to collect and transform the generated electricity for transmission to shore. The OSS will be located exclusively in Commonwealth marine waters.
- Subsea export cables to connect to the onshore power grid. The export cables will cross from Commonwealth marine waters (>3nm) to State waters (< 3nm), where landfall will be made.
- It is anticipated that the export cables will be buried and/or protected (in areas where burial is not possible).

Coastal and onshore transmission assets

The coastal and onshore components of the proposed action include:

- Cable landfalls (the point(s) at which the subsea cables come ashore, most likely subsurface).
- A transition joint bay (the interface between the offshore and onshore cables).
- A number of onshore substations.
- An onshore transmission system, consisting of a number of circuits (either overhead, underground or a combination of both) which transmit energy generated by the windfarm from the onshore substation(s) to the SWIS.
- A transmission system connection point (the interface into the SWIS).
- Temporary construction areas and access roads.

Connection to the SWIS grid

A feasibility assessment was conducted, in consultation with Western Power, to determine the best substation location(s) to provide efficient connection to the SWIS grid. The assessment highlighted two options (Kemerton and Landwehr), however Landwehr was excluded from this referral as the onshore cable route passed over the Peel-Yalgorup Ramsar wetland. At present the Kemerton terminal and power station is being referred. The cable route avoids the Ramsar wetland and it also offers a shorter cable route to the substation (approximately 8 km from the coast) which reduces the onshore disturbance footprint.

Ancillary onshore infrastructure

Onshore ancillary infrastructure may be required, such as a control room, site offices, storage and personnel facilities and monitoring devices. The type, number, and location of these will be confirmed during development of the proposed action, in consultation with the relevant authorities.

Project Footprint and Development Envelope

The total Project Footprint was calculated to be 2,090 ha. This was calculated based on the dimensions of the project infrastructure (WTGs, OSS, export cables) plus a significant buffer. The Development Envelope is significantly larger than the Project Footprint to allow for flexibility to move the Project Footprint in response to key information obtained from environmental and social baseline studies. As the project progresses, the Project Footprint and development envelope will be further refined in terms of their size and location.

Table 4 - The proposed extent of the project development envelope and footprint in Commonwealth waters and State waters and lands

Project Area	Area (km ²)	Area (ha)
Commonwealth waters		
Offshore Development Envelope	4,233	423,339
Offshore Footprint	19	1,899
State waters		
Offshore Development Envelope	504	5,041
Offshore Footprint	2	170
Onshore Lands		
Development Envelope	604	6,041
Onshore Footprint	0.20	21
Total Project Footprint	21	2,090
Total Development Envelope	5,341	434,421

3.5 CONSTRUCTION ACTIVITIES

Site establishment and construction phase activities will typically include the following onshore and offshore activities:

Onshore:

- Preparation work, including clearing and topsoil storage, for onshore construction sites and access routes.
- Establishment of temporary onshore construction sites.

- Transportation of manufactured components (foundations, towers, nacelles, blades, gearbox, generators etc).
- Onshore assemblage of key turbine tower components, then transport offshore with the nacelle and blades for final assembly.
- Excavation or tunnelling at the landfall site.
- Establishment of onshore transmission infrastructure. In underground sections this will involve excavation of cable trenches. In overhead sections, works will include installation of tower foundations and structures.
- Rehabilitation of temporary disturbance areas.

Offshore:

- Installation of navigation aids to support the construction phase.
- Marine transportation of components to the installation sites within the windfarm area.
- Seabed preparation work.
- Installation of foundations (and associated scour protection if required).
- Substructure installation onto installed foundations.
- Installation of substations and inter-array subsea cables.
- Installation of export cable(s), with trenching/protection as required
- Cable connection and commissioning at substations.
- Erection of turbines.
- Testing and commissioning.

3.6 OPERATIONAL AND MAINTENANCE ACTIVITIES

Once commissioned, the windfarm is intended to operate 24 hours a day, 365 days a year. The windfarm will operate automatically, with each turbine operating independently of the others. The operation and control of the windfarm will be monitored by means of a Supervisory Control and Data Acquisition (SCADA) system, installed at each turbine, and linked to the onshore control base. The SCADA system will enable the remote control of individual turbines or the windfarm in general and will support information transfer, storage, and the shutdown of any wind turbine in emergency circumstances.

The windfarm will be serviced and maintained throughout its life by a local operating 'base'. An ongoing programme of maintenance activities will be implemented to support the efficient operation of the windfarm. It is anticipated that this maintenance programme will result in the creation of a local service base and the creation of a significant number of new permanent jobs.

Inspections of support structures, scour protection and subsea cables will be performed on a regular basis, as will *ad-hoc* visits for surveillance purposes. Maintenance of WTGs is normally separated into three categories:

- Periodic overhauls
- Scheduled maintenance
- Unscheduled maintenance

3.6.1 PERIODIC OVERHAULS

Periodic equipment overhauls will be carried out in accordance with the turbine manufacturer's warranty. They are planned for execution during periods of the year with the best weather conditions (typically summer/autumn). They are carried out according to the supplier's specifications and typically

include function and safety tests, visual inspections, analysis of oil samples, change of filters, lubrication, checking of bolts, replacement of brake pads, oil changes on gear box or hydraulic systems, etc.

3.6.2 SCHEDULED MAINTENANCE

Scheduled inspections and maintenance work is primarily carried out on wear parts susceptible to failure or deterioration in between the periodic overhauls. A scheduled inspection of each turbine is likely to occur every 6-12 months. Tasks will typically include inspection on faults and minor fault rectification.

3.6.3 UNSCHEDULED MAINTENANCE

Unscheduled maintenance may be required to rectify any sudden defects. The scope of such maintenance would range from small defects to complete failure or breakdown of main components. Such maintenance would require the intervention of construction vessels similar to those used for the construction of the windfarm.

3.7 DECOMMISSIONING ACTIVITIES

Requirements for decommissioning will be established through the planning and assessment phases of the proposed action. A detailed decommissioning plan will be prepared prior to the eventual decommissioning process, in consultation with stakeholders and the relevant authorities, to ensure all approval requirements, environmental impacts, and mitigation measures are fully understood and reported.

3.8 PROJECT TIMELINE

The design and operational life of the windfarm is currently estimated at approximately 30 years, or up to 50 years with repowering (replacement of some or all turbines).

It is currently planned that construction of the proposed action would span a nominal 36-month period, commencing in 2026 and ending in 2028, subject to the completion of the required permitting processes. An indicative timeline for proposed action construction is presented in Figure 4.

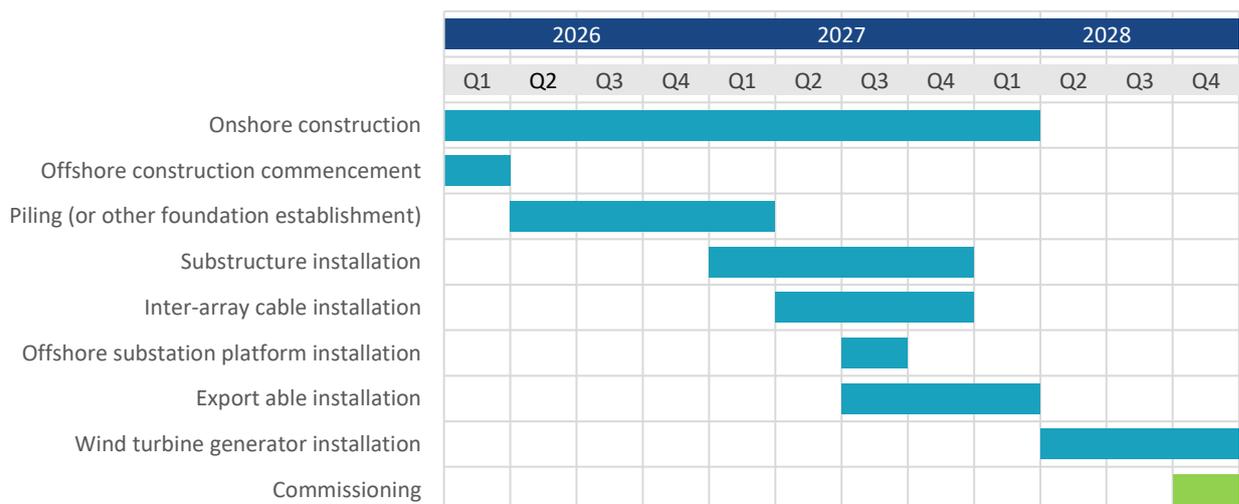


Figure 4 - Construction phase timing (indicative)

3.9 PROPOSED ACTION JUSTIFICATION AND ALTERNATIVES

The impacts of climate change are being seen with increasing frequency and intensity around the world. Renewable energy can contribute significantly to reducing the emission of greenhouse gases, which are a key contributor to global warming and climate change.

Oceans are an abundant source of renewable energy potential, capable of driving a “blue economy” based on sustainable use of energy harnessed from the oceans. Use of offshore renewable energy sources can contribute to the decarbonisation of the power sector and to other end-use applications that are relevant for a blue economy (for example, shipping, cooling, and water desalination). Offshore renewables can also provide significant socio-economic opportunities such as job creation, improved livelihoods, local value chains and synergies amongst blue economy sectors.

3.9.1 OFFSHORE WIND

Wind power has become one of the fastest growing renewable energy technologies. In 2019, global wind power capacity expanded to 586 GW, accounting for 25% of total renewable energy capacity, second only to hydropower (Leong and Ko, 2021). Of this, the cumulative installed capacity of offshore wind energy rose from 67 MW (in 2000) to around 29 GW (in 2019). The International Renewable Energy Agency (IRENA) predicts that offshore wind power will be a leading power generation source by 2030, with 228 GW of installed capacity. Growth is expected to continue to 1000 GW by 2050 (International Renewable Energy Agency, 2019). Cumulative investments in offshore wind are projected to reach USD \$350 billion by 2030 and USD \$1.47 trillion by 2050 (IRENA, 2019).

Offshore wind has emerged as one of the most promising renewable energy technologies. The cost of generating power using offshore wind turbines is falling fast. The falling cost of technology is reflected in the decreasing price of electricity generated by offshore wind.

Australia has a coastline of almost 60,000 km, with very high quality and abundant offshore wind resources. A recent report by the Blue Economy Cooperative Research Centre (CRC) estimated the offshore wind potential over the entire Australian exclusive economic zone (EEZ) to be 27,369 GW, with the ‘technically accessible resource’ estimated to be 2,233 GW (Briggs et al., 2021). This is far in excess of current and projected electricity demand across Australian electricity markets (National Electricity Market (NEM), SWIS and others).

The same report (Briggs et al., 2021) found that the Australian offshore wind resource is strongest south of Tasmania, where the maximum average wind speeds exceed 12 m/s; and that along the whole of the southern, western, and most of the eastern coasts of the continent, the average wind speeds are in the range of 9-10 m/s (considered very good) or 8-9 m/s (considered good) quality offshore wind resource. Offshore wind resources on the west coast of WA have strong capacity factors (a measure of the consistency of wind and the proportion of the time that a generator can generate electricity): theoretical capacity factors exceeding 55% are widespread along the WA coast.

With such an extraordinary offshore wind resource, Australia is in a strong position, particularly in the southern half of the country, to create a significant new industry. There are currently more than ten offshore wind projects proposed for development in Australia. Cumulatively, the power generating capacity of these projects exceeds 16 GW installed capacity, which demonstrates the great potential contribution of offshore wind as part of an Australian energy transition.

The Blue Economy CRC report points out a number of ways in which the development of offshore wind power could benefit Australia, such as:

- Diversifying Australia’s clean energy generation stock with high-capacity factors that complement the generation profile of onshore energy sources.

- Delivering high-capacity factor renewable energy in regions close to existing coal-fired power stations scheduled for closure, ensuring optimal use of existing electricity infrastructure, and avoiding stranded or under-utilised assets.
- Easing land use conflicts that could intensify with the large-scale developments of onshore solar and wind installations.
- Using and redeveloping port infrastructure.
- Providing alternative employment, especially to support a just transition for fossil-fuel workers in the coal, oil, and gas sectors.

3.9.2 THE LEEUWIN OWF PROJECT

CE has been conducting desktop investigations and constraints mapping studies into the potential for offshore wind development off WA since early 2020. Initial feasibility studies found that the offshore environment along the WA coastline offers a powerful and consistent wind resource, with the potential to generate more electricity at a steadier rate than most other renewable energy sources. The consistent, strong wind patterns along the WA coast provide an opportunity to develop high-capacity offshore wind power near key transmission nodes. This, combined with the relatively shallow waters and small tidal range along the southwestern WA coast, makes the proposed site an ideal location to develop an offshore windfarm.

Once operational the Leeuwin Offshore Wind Farm will have the capacity to generate in excess of 3.0 GW of electricity (up to 11 TWh of power per year). This output would be enough electricity to power approximately 3.0 million² Western Australian homes and would offset an expected 6 million tonnes of CO₂ annually.

The key objectives of the proposed action are:

- Generate energy from a renewable source to supply renewable electricity to the Wholesale Electricity Market (WEM) for the SWIS.
- To collaborate with all stakeholders to ensure that the proposed action maintains social and environmental values in the area.
- Create opportunities to provide local and regional social and environmental benefits throughout the life of the proposed action.
- Contribute to the realisation of WA Climate Change Policy's aspirational target of 'enhanced climate resilience and net zero greenhouse gas emissions by 2050'.
- Support the Australian Government commitment to achieve its 2030 climate change target to 'reduce greenhouse gas emissions by 26 to 28% below 2005 levels by 2030'.
- Import significant skills, knowledge, and expertise from global leaders in offshore wind farm technology to establish an offshore wind industry in WA.
- Support the Australian and WA governments' ambition to become a major exporter of renewable hydrogen.

3.9.3 PROJECT ALTERNATIVES

The Leeuwin OWF site was selected as the preferred offshore windfarm location following an initial site selection study of the entire WA coastline. The site selection study evaluated alternative windfarm

² Based on average household consumption of 5,198kWh / year and 60% load factor for the 3.5 GW OWF (AEMC, 2017)

locations based upon a ranking system that included consideration of a range of engineering, environmental, social and design constraints, including the following factors:

- Wind strength.
- Extreme weather and cyclone risk.
- Risk of seismic activity.
- Presence of conservation areas or other protected environmental features.
- Presence of threatened species or ecological communities.
- Potential for interaction with migratory species and marine fauna.
- Benthic communities: presence of seagrass, coral, rocky outcrops, or other important habitat features.
- Environmental quality: biodiversity, degree of ecosystem alteration.
- Coastal landforms: susceptibility to erosion.
- Bathymetry and water depth: implications for establishment and maintenance of infrastructure.
- Onshore and offshore substrate and soil conditions.
- Potential presence of acid sulphate soils.
- Water quality.
- Presence of Aboriginal sites or cultural values.
- Presence of other heritage features (shipwrecks, etc).
- Potential for conflict with other land / water uses:
 - Tourism.
 - Recreation.
 - Fisheries/aquaculture.
 - Shipping.
 - Defence: army/naval restricted zones.
- Potential for cumulative impacts with other coastal developments.
- Potential presence of unexploded ordnance.
- Access to / linkage with other infrastructure and/or industrial users.
 - Proximity to a large port
 - Access roads.
 - Viable connection to the grid.
 - Distance to industry that have a drive to decarbonise.

The Leeuwin OWF site was selected as the preferred site for initial development based upon its:

- Highly wind velocities and consistency with mean wind speeds greater than 8.3 m/s (at 100 m elevation).
- Shallow bathymetry, with water depths ranging from 18 - 45 m.
- Good access to existing port infrastructure at Bunbury and Kwinana.
- Suitable electricity substation located 8km from the landfall at Kemerton that would allow electricity transmission into the SWIS.
- Proximity to a skilled workforce.
- Proximity to existing and future residential and industrial energy users.
- Low risk of extreme weather or cyclones.
- Potential to make use of infrastructure alignments established for other existing projects, thereby avoiding some environmental disturbance.

A range of possible alignments for subsea cables and substations and for transition areas to onshore facilities were assessed. Key considerations in the identification of the preferred (and chosen) layout included:

- Land access considerations.
- Environmental values.
- Proximity to existing and future power infrastructure and industrial activity.
- Potential for cumulative impacts with other coastal developments.

3.9.4 OTHER WIND FARMS IN THE AREA

An EPBC and State referral have been submitted by WA Offshore Windfarm Pty Ltd (EPBC Act Public Notices - Reference number 2021/8961 a subsidiary of UK company Australis Energy). They are proposing 37 turbines in State waters. Figure 5 shows the Leeuwin Offshore Wind Farm location in relation to the proposed WA Offshore Windfarm.

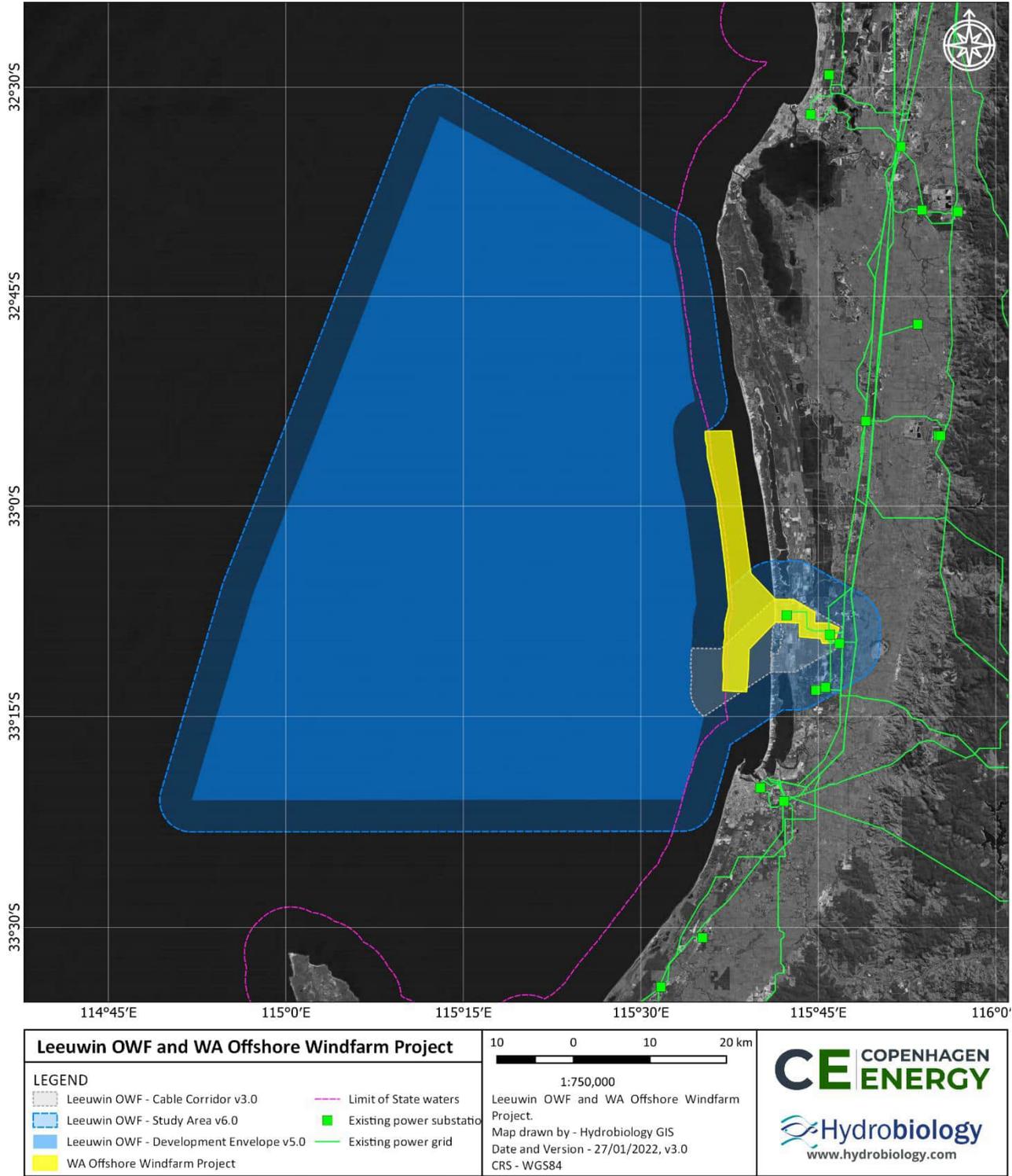


Figure 5 - Leeuwin Offshore Wind Farm in relation to the proposed WA Offshore Windfarm (EPBC Act Public Notices - Reference number 2021/8961)

4. DESCRIPTION OF EXISTING ENVIRONMENT

4.1 OFFSHORE ENVIRONMENT

4.1.1 MARINE BIOREGION

The proposed action is located within the south-west Marine Bioregion, which extends from the eastern end of Kangaroo Island (South Australia) to Shark Bay (Western Australia), spanning 1.3 million square kilometres of temperate and subtropical waters in South Australia and Western Australia.

The area is of global significance as a breeding and feeding ground for several protected marine species such as the southern right whale, blue whale, and the Australian sea lion. The region is also known to be particularly important for six species of seabird – the Australian lesser noddy, common noddy, flesh-footed shearwater, wedge tailed shearwater, bridled tern, and roseate tern.

Key physical features of the south-west bioregion include the Leeuwin Current, which has a significant influence on the biodiversity of the region. A range of conservation values have been identified for the bioregion, including Key Ecological Features (KEFs), Biologically Important Areas (BIAs), EPBC listed species that live in or utilise Commonwealth Marine Areas (see following sections) and protected places including marine reserves, historical places, and historic shipwrecks.

4.1.2 OCEANOGRAPHY AND COASTAL PROCESSES

The south-west marine environment of Western Australia is dominated by the Leeuwin Current, transporting relatively warm, nutrient poor water southward during winter. Inshore, the weaker and cooler Capes Current flows northward close to the coastline from Cape Leeuwin to Cape Naturaliste and beyond (Damara, 2015).

The region is classified as microtidal with a predominantly diurnal tidal regime (i.e., one high tide and one low tide every 12-hours) ranging 0.8 m from lowest to highest astronomical tide (Damara, 2015; Southern Ports, 2017). Beaches along the coast are all west facing, and the prevailing wind and swell direction is south to southwest for much of the year driving sediment transport in a northwest direction. These prevailing patterns are reversed during winter storms driven by large swell and wind from the northwest creating sediment transport to move in a southerly direction along the coast (Damara, 2015).

There are two estuaries in the vicinity of the proposed action; the Peel-Harvey Estuary which is 110 km to the north and the Leschenault Estuary which is 23 km to the south of the proposed action. Due to the distance the proposed action is unlikely to cause any changes to these systems.

The region is located on the western edge of the Swan Coastal Plain in an area with highly mobile sand dunes. These dunes are naturally susceptible to erosion and accretion due to the prevailing winds and swell (Damara, 2009) and dune vegetation communities play an important role to stabilise these seasonal movements.

4.1.3 BENTHIC ENVIRONMENT

Geographe Bay is a wide relatively shallow embayment with average water depth of around 30 m (Figure 6). The majority of the seafloor is covered by unconsolidated sediments that have been deposited over older clay layers. The coastal waters within the Development Envelope (off Binningup Beach) are predominantly sandy seabed with sparsely distributed seagrass (Southern Ports, 2017). There is also a series of discontinuous limestone ridges that run parallel to the coast (Galaiduk, Radford and Harvey, 2018).

Typically, benthic habitat in the region includes fine to medium sand with dense seagrass meadows of *Posidonia sinuosa*, broken up by sandy depressions ranging in size from meters to hectares. These seagrass meadows maintain sediment stability and serve as a nursery for juvenile fish and crustacea (CoastWise, 2001)

Benthic habitat mapping in the Binningup area, in the vicinity of the proposed cable crossing, found sponges, ascidians, Bryozoa, hydroids, hard corals, macroalgae and seagrasses, with macroalgal assemblages comprising *Ecklonia*, *Sargassum*, *Caulerpa*, *Scythothalia*, *Epiphytes* and *Codium*. Sparse seagrass meadows occur approximately 1 km offshore, primarily consisting of *Posidonia angustifolia*, with sporadically distributed *P. coriacea* and *Amphibolis spp* (Water Corporation, 2008). The Western Rock Lobster (*Panulirus cygnus*) occurs within the area, which plays an important functional role in the coastal ecosystem processes (MacArthur, Hyndes and Babcock, 2007).

4.1.4 BIOLOGICALLY IMPORTANT AREAS

Biologically Important Areas (BIAs) are nominated areas within the marine bioregion that have been identified as important to protected species. These are areas where species aggregate and display biologically important behaviours (i.e., foraging, resting, migration, breeding etc.). There are 19 nominated BIAs that intersect with the Development Envelope (DAWE, 2021), these are discussed in detail in the following sections.

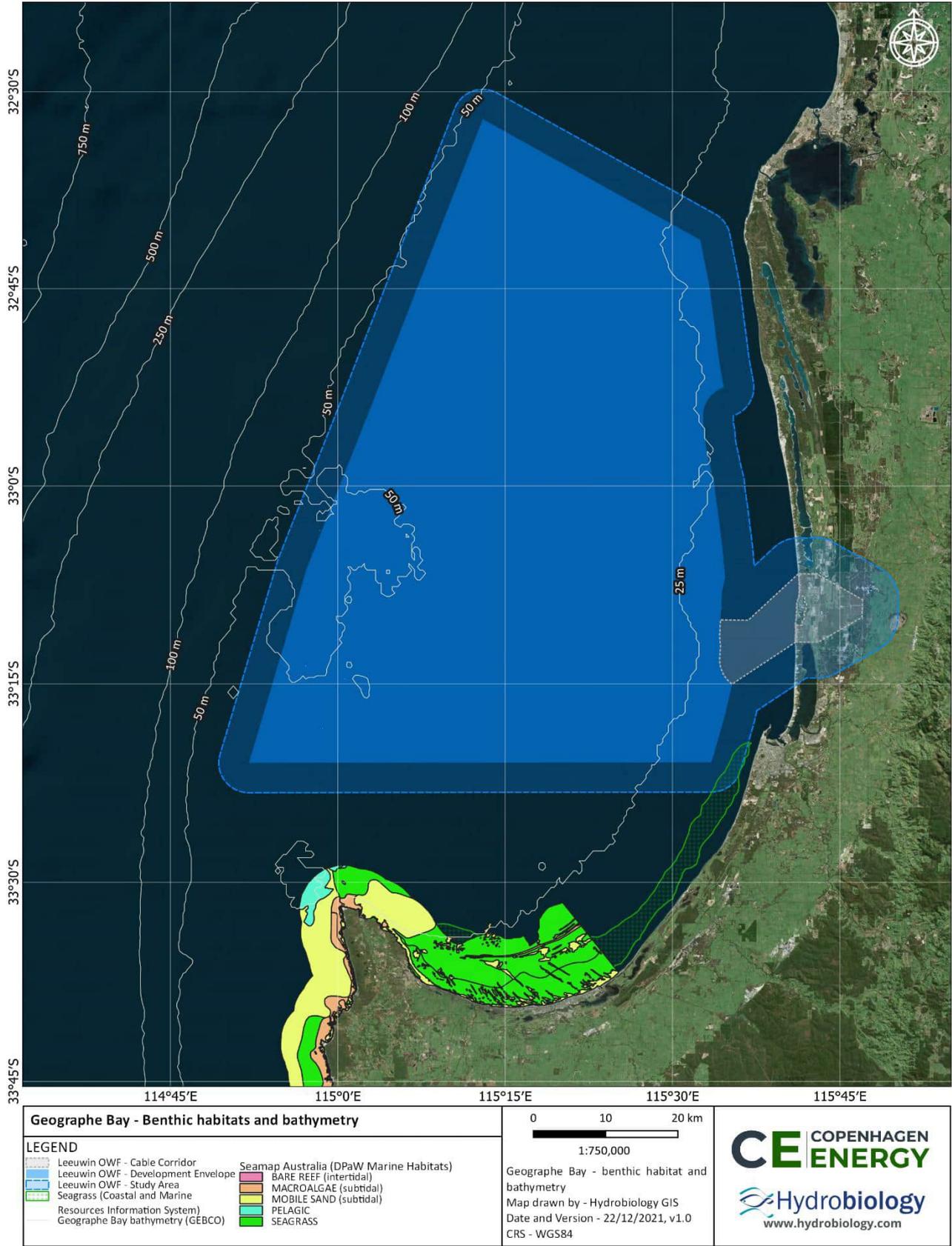


Figure 6 - Geographe Bay – Benthic Habitats and Bathymetry

1.1.1 KEY ECOLOGICAL FEATURES

Key Ecological Features (KEF) are not Matters of National Environmental Significance (MNES) and as such, have no legal status. However, they are often considered as important parts of the Commonwealth marine area. The four KEFs that have been identified in the vicinity of the project are:

4.1.4.1 COMMONWEALTH MARINE ENVIRONMENT WITHIN AND ADJACENT TO THE WEST-COAST INSHORE LAGOONS

The Commonwealth marine environment within and adjacent to the west-coast inshore lagoons is designated as a KEF area based upon the high productivity and aggregations of marine life. This KEF, identified in the South-west Marine Bioregional Plan with the key conservation values of supporting high productivity and aggregation of marine life, encompasses a chain of inshore lagoons extending from Kalbarri to south of Mandurah, with the southern boundary intersecting with the Development Envelope. These lagoons are important for the recruitment of commercially and recreationally important fishery species and are associated with high levels of biodiversity and endemism. Migratory fish including herring, garfish, tailor and Australian salmon also inhabit the area seasonally.

4.1.4.2 COMMONWEALTH MARINE ENVIRONMENT WITHIN AND ADJACENT TO GEOGRAPHE BAY

Geographe Bay is a large, sheltered embayment with extensive seagrass beds, accounting for almost 80% of benthic primary production in the region and noted for high biodiversity and endemism. Geographe Bay and its adjacent waters provide important nursery grounds for a variety of species and also provide valuable habitat for many fish and invertebrates. This KEF is recognised as an important seasonal resting area for migrating humpback whales (McCauley, Fewtrell and Popper, 2003).

4.1.4.3 WESTERN ROCK LOBSTER

The Development Envelope is located within a designated KEF defined by the presence of the western rock lobster (*Panulirus cygnus*), which plays an important functional role in the ecosystem processes of coastal waters (MacArthur, Hyndes and Babcock, 2007).

4.1.4.4 ANCIENT COASTLINE AT 90 – 120 METRE DEPTH

The Ancient Coastline (spatially delineated by bathymetry between 90 and 120 metre depth) is defined as a key ecological feature for its high productivity and aggregations of marine life, biodiversity and endemism. The Development Envelope extends to within 10-15 km of this KEF on its Western boundary. Benthic habitats and associated demersal communities along the span of the Ancient Coastline are recognised for their conservation value.

1.1.2 FISHERIES

There are a number of commercial fisheries located within or adjacent to the Development Envelope, including Australia's most valuable fishery, the Western Rock Lobster fishery. Fishers use baited pots and export the majority of the catch overseas, predominantly to China. The greatest lobster catch is caught in the area between Geraldton and Perth off the coast of Western Australia, with smaller numbers caught both north and south of this region (Bellchambers *et al.*, 2012; Gaughan and Santoro, 2020).

Other significant commercial fisheries in the region include the Southwest Beach Seine, Commercial Crab, Abalone, Octopus, and various demersal and estuarine finfish fisheries. The region also hosts trawl fisheries including the Western Deepwater Trawl Fishery, Offshore Demersal Fishery and Southwest Trawl Managed Fishery. However, most of the region shallower than 200 m is protected and closed to trawling (Gaughan and Santoro, 2020).

The region hosts a large number of recreational fishers, mostly concentrated around the population centres of Bunbury, Mandurah and Perth. Beach launching is commonly practised along the coast with facilities located within the marine waters adjacent to Binningup Beach and Myalup, both popular beach fishing locations due to 4WD access. However, there are no recreational boat ramps within the Development Envelope, with the nearest located at Australind and Bunbury.

4.2 ONSHORE ENVIRONMENT

Onshore components of the proposed action lie within the 1,333,901 hectares Perth subregion (SWA2) of the Swan Coastal Plain bioregion (Interim Biogeographic Regionalisation for Australia, Version 7).

4.2.1 CLIMATE AND HYDROLOGY

The region is characterised by a Mediterranean climate, with a median annual rainfall of approximately 730 mm (Figure 7). Mean maximum daily temperatures range between about 30 °C (in February) and 17.3°C (in July). Mean minimum daily temperatures range between 15.9 °C (in February) to 7.2 °C (in July). Winds in coastal areas are typically offshore (easterly) in the morning and onshore (westerly) in the afternoon. Average wind speeds are typically stronger between November and March and weaker between May and July (Figure 8).

The onshore Development Envelope straddles the catchment divide between the Harvey River catchment (north of Binningup) and the larger Collie River catchment (south of Binningup). The area contains no major natural drainage lines.

4.2.2 GROUNDWATER

The Swan Coastal Plain is underlain by unconfined groundwater that resides in a variety of aquifers, including quartz or calcareous sand, limestone, and a range of mixed sediments (Semeniuk and Semeniuk, 2006). The depth to groundwater in the superficial aquifer is typically shallow, with the water table normally within 5 to 10 m of the ground surface. Seasonally, the depth to groundwater may vary by up to 2 m, but changes in groundwater levels are more usually less than 1 m (DEC, 2009; Rockwater Pty Ltd, 2009). Groundwater flows in a westerly or south-westerly direction, discharging to coastal lake systems, to the Leschenault Inlet or to the ocean. Groundwater is mostly circumneutral in pH and fresh to slightly brackish, with salinities ranging from approximately 500 to 2,000 mg/L total dissolved solids.

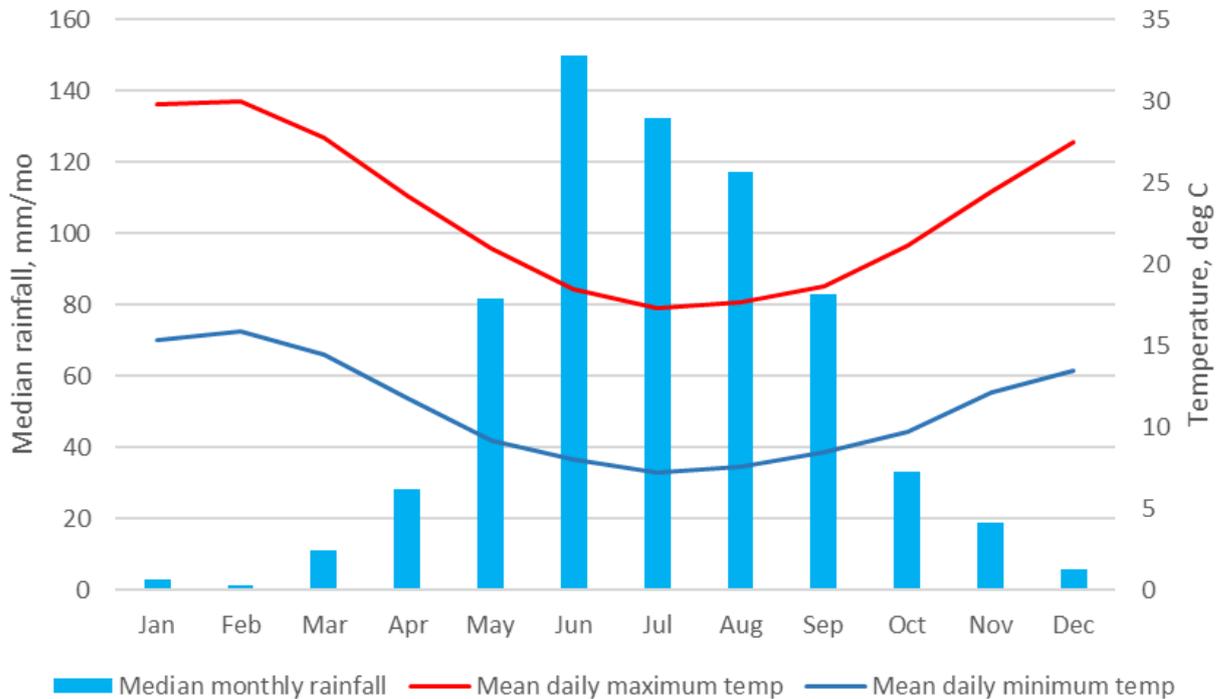


Figure 7 - Average rainfall (mm per month) and temperature (°C) from 1995 – 2021 for Bunbury station, Western Australia (Data from the Bureau of Meteorology)

4.2.3 LANDFORMS AND SOILS

The Swan Coastal Plain is a low lying coastal plain. The onshore Development Envelope mostly overlies the Yalgorup Plain, a Pleistocene to Holocene landform consisting of fossiliferous limestone, aeolian limestone and quartz sand (Semeniuk, 1995) extending inland some 5 to 6 kilometres from the Holocene estuarine lagoons and aeolian barrier ridges along the coast. The Yalgorup Plain has generally low to undulating relief of about 4 to 10 m, with some relict dune ridges up to 15 m high. Superficial soils within the Development Envelope are expected to comprise sands or loamy sands derived from fluvial or aeolian sediments transported from the Darling Scarp or deposited during successive periods of marine incursion. The Acid Sulphate Soil Risk Map for the Swan Coastal Plain was accessed and geospatial data overlaid with the project location (see Figure 9). These data suggest that parts of the onshore cable corridor may be underlain by acid sulphate soils and further soil assessment will need to be undertaken prior to any ground disturbance.

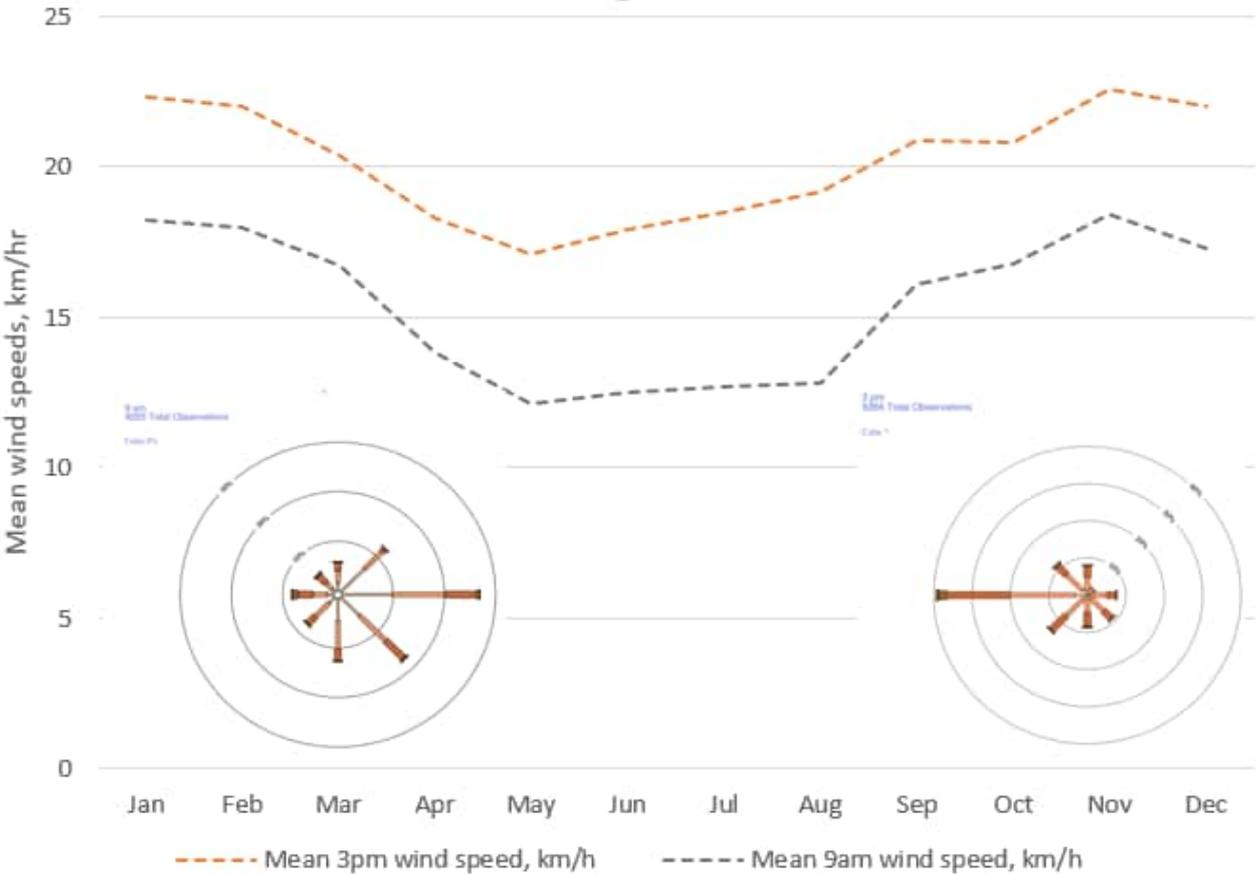


Figure 8 - Average monthly wind speeds (km/h) recorded in Bunbury, Western Australia between 1995 – 2021

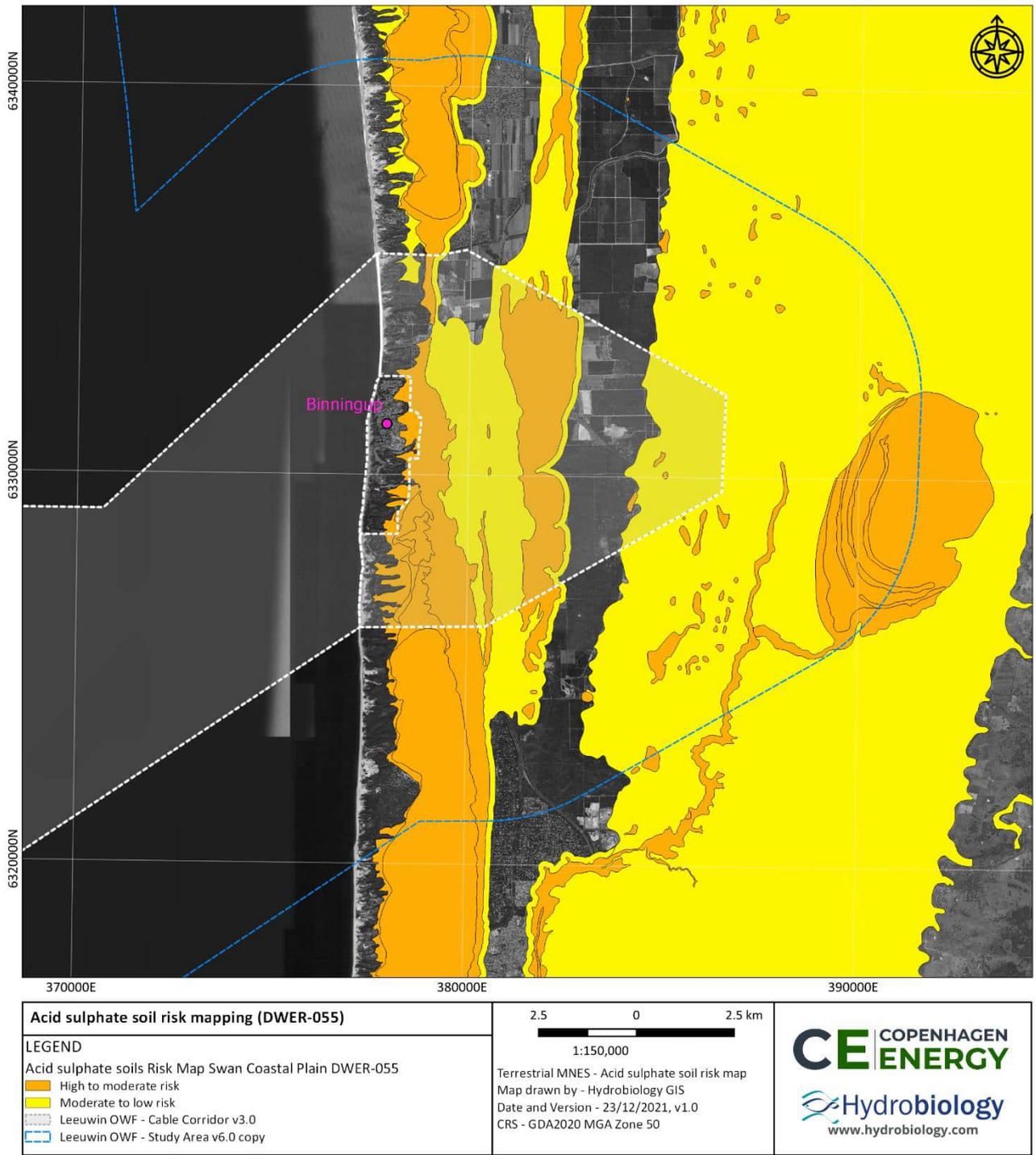


Figure 9 - Potential for acid sulphate soils (CSIRO)

4.2.4 CONSERVATIONS AREAS AND OTHER SIGNIFICANT ENVIRONMENTAL FEATURES

The onshore cable route has been designed to avoid the vast majority of State and National Parks and conservation areas in the vicinity. There is one Regional Park called Kalgalup which intersects the Development Envelope (see the brown polygon in Figure 10). The following conservation areas lie outside of the Development Envelope (but within the study area);

- Myalup State Forest.
- Leschenault Peninsula Conservation Park.
- Yalgorup National Park.
- Bengier Swamp ('Reserve 34811', vested in the Conservation Commission of WA).
- A range of freehold land parcels held by the Department of Biodiversity Conservation and Attractions (DBCA).

While these areas are not classified at MNES (and outside the scope of this EPBC Referral). They have been included in this report and will receive a full assessment during the State assessment process.

4.2.5 WETLANDS

A key feature of the south-west region are the wetlands that parallel much of the coastline. These wetlands are biologically productive and provide habitat for a range of flora and fauna species. There is one Ramsar Wetland of International Importance (The Peel–Yalgorup system Ramsar ID: 482). Ramsar wetlands are considered MNES under the EPBC Act, as such the Peel-Yalgorup System is described in further detail in Section 7.4. Figure 11 shows the location of the Peel-Yalgorup Ramsar Wetland in relation to the Development Envelope.

There are two other nationally important wetlands in proximity to the Development Envelope: the Yalgorup Lakes System (WA095) and the Bengier Swamp (WA072). They are both listed under the Directory of Important Wetlands. The Bengier Swamp is located approximately 30km inland from the proposed action and the Yalgorup Lakes system is approximately 30km north and part of the Peel Yalgorup Ramsar Wetland described above.

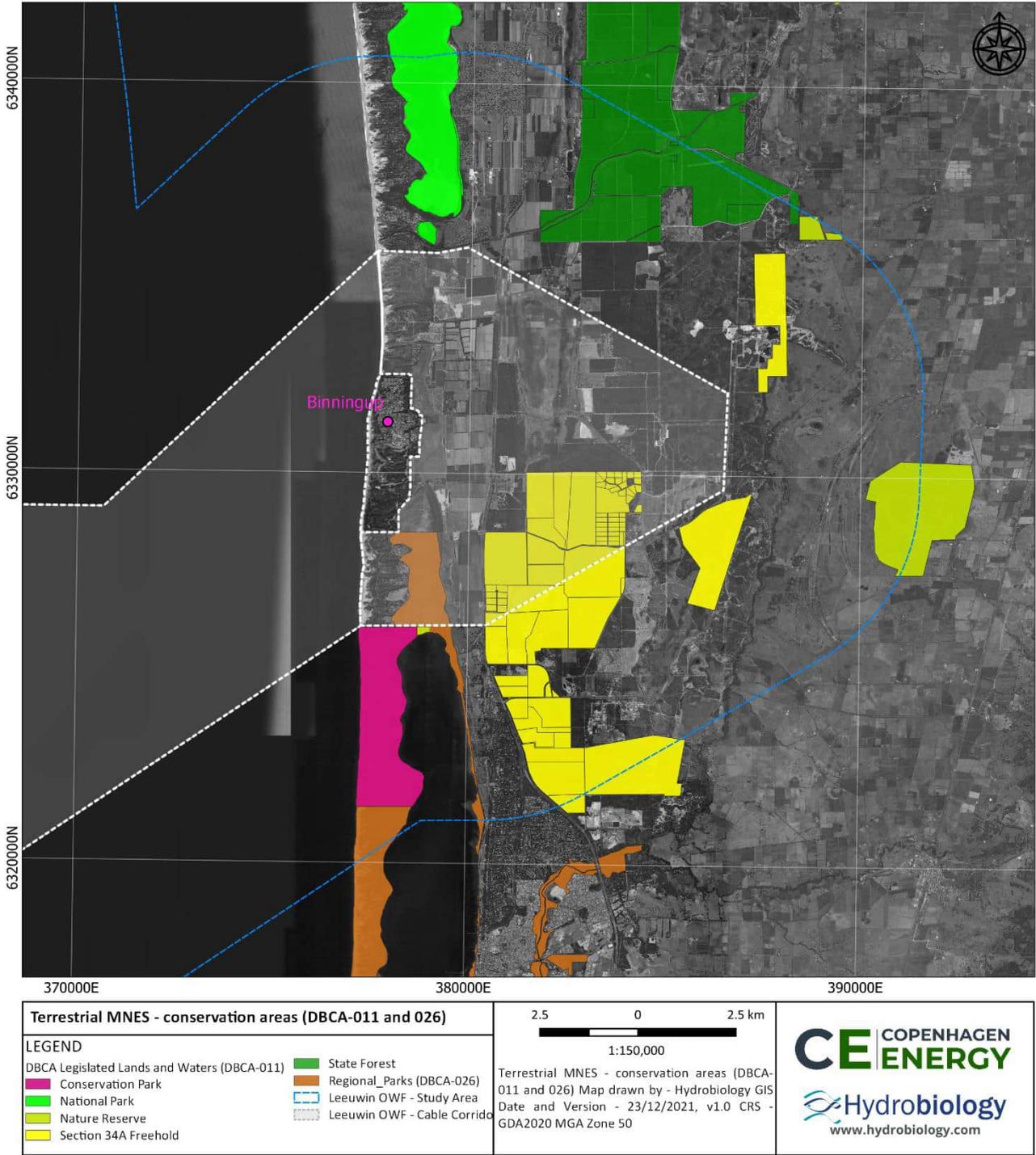


Figure 10 - Conservation areas in proximity to the onshore Development Envelope

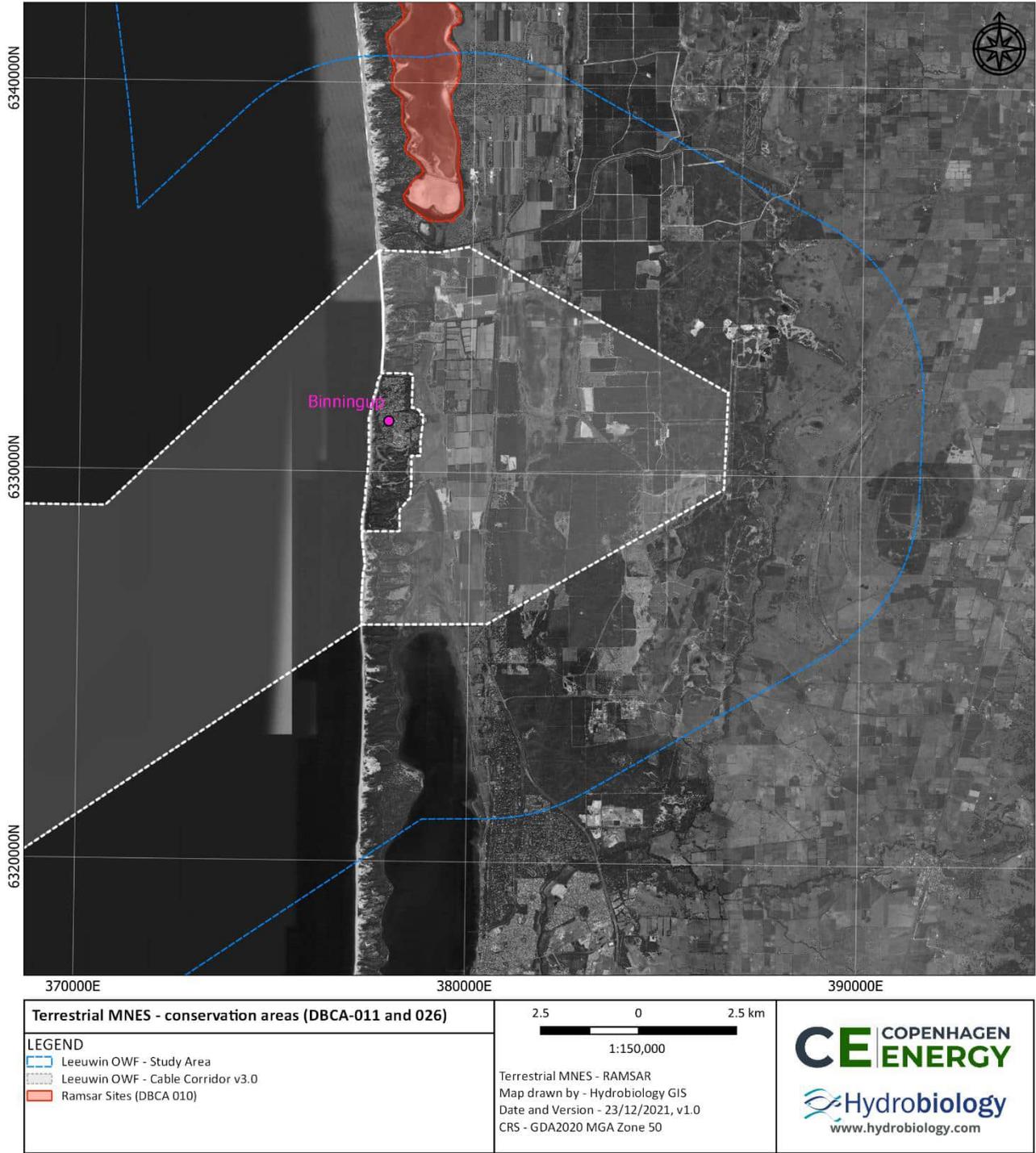


Figure 11 – Peel Yalgorup system, Ramsar site.

4.2.6 FLORA AND VEGETATION

Much of the land within the onshore Development Envelope has been cleared of native vegetation as part of historic land development for agricultural, residential, and related land uses i.e., Binningup Desalination Plant, transmission corridors for the Kemerton sub-station, Forrest Hwy.

There are remnant vegetation communities found in mosaic patches throughout the Development Envelope that include the following vegetation types. Coastal dune vegetation exists along a coastal strip, extending inland for up to approximately 1 km. East of the dunes is vegetation typical of the 'Bassendean vegetation complex', which is likely to include *Eucalyptus marginata*, WA Sheoak (*Allocasuarina fraseriana*), Banksia and Melaleuca species. Sedgelands may occur in moister areas between the Holocene dunes.

The proposed cable corridor intersects with the northern portion of the proposed Kemerton Strategic Industrial Area (KSIA). Flora and vegetation surveys of the KSIA identified a total of 28 vegetation communities including the TEC listed Banksia Woodlands of the Swan Coastal Plain, Tuart woodlands (*Eucalyptus gomphocephala*) and Forests of the Swan Coastal Plain (DEE, 2016; Development WA, 2021).

A desktop assessment indicates that it is highly likely that the Leeuwin Development Envelope does include areas of the following TECs; Banksia Woodlands, Tuart Woodlands TEC's and Subtropical and Temperate Coastal Saltmarsh.

Several threatened species occur in the KSIA including the threatened orchid species *Drakaea elastica* (EPBC Act Endangered) and *Drakaea micrantha* (EPBC Act Vulnerable) (Development WA, 2021). Desktop assessment of the KSIA threatened species map indicate that these orchid species are not found within the Development Envelope (within the KSIA) field surveys will be required to confirm this.

Further details of terrestrial flora and communities categorised at MNES are described in the following sections.

4.2.7 TERRESTRIAL FAUNA HABITATS

Habitat suitable for foraging, roosting and /or breeding for three Nationally Threatened species of black cockatoo (Carnaby's Black Cockatoo, Baudin's Cockatoo, and Forest Red-tailed Black Cockatoo) is likely to occur in parts of the Development Envelope. The 'Critically Endangered' Western Ringtail Possum may also occur within the onshore part of the Development Envelope. Further details of terrestrial fauna and communities are described in the following sections.

4.2.8 SUBTERRANEAN FAUNA

A literature review revealed no information about EPBC-listed subterranean fauna in the vicinity of the Development Envelope. There is the potential of other subterranean fauna to occur due to the presence of coastal limestone karst and cave systems in the area.

4.2.9 ABORIGINAL CULTURAL HERITAGE

A preliminary desktop search of Aboriginal Heritage Information System (AHIS) data base found no registered Aboriginal heritages sites within the onshore Development Envelope, however a number of 'other heritage places' (Site IDs: 4884, 5803, 5804, 5805, 5806 and 5807) are listed in the AHIS database. These sites have been assessed as not meeting criteria set out in Section 5 of the *Aboriginal Heritage Act 1972*³. However, the sites cannot be discounted as not having some local cultural or heritage importance. There are no World Heritage properties or National Heritage Places within the onshore Development Envelope.

³ The *Aboriginal Heritage Act 1972* is likely to be repealed in 2022 and replaced by the *Aboriginal Cultural Heritage Act 2021*.

4.2.10 EUROPEAN CULTURAL HERITAGE

There are 15 places listed on the State Register of Heritage Places within the study area, including the following. These sites are not classified as MNES and will be addressed in great detail during the State assessment.

- First Windmill Site (farming)
- Binningup Park Site (urban park)
- Binningup War Memorial
- Depression Sustenance Worker's Camp Site (historic)
- Pead's Cottage

4.2.11 VISUAL AMENITY

South-western Australia is renowned for its scenic coastal beaches that annually attract domestic and international visitors. The proposed site is located offshore of Whitehill Beach, Preston Beach, Binningup Beach, Myalup Beach, Buffalo Beach, Belvidere Beach, Koombana Beach, Jetty Baths Beach and Mindalong Beach.

4.2.12 PLANNING AND LAND USE

The onshore Development Envelope lies entirely within the Shire of Harvey and much of the land has been cleared and subject to some form of land development. Current land use in the area includes general farming, grazing, desalination plant, mineral processing industries, sand extraction, forestry plantations, infrastructure, municipal services (landfill, wastewater treatment), rural and semi-rural residential, native vegetation and wetland conservation. In addition, there is a Western Power electricity transmission corridor and substation (Kemerton). The project design will seek to utilise these previously developed areas for the disturbance footprint as opposed to disturbing any natural ecosystems.

It is important to note that approximately one third of the proposed cable corridor overlaps with the proposed Kemerton Strategic Industrial Area (KSIA) which is currently being assessed under the EPBC Act (EPBC Reference Number 2021/8883). The KSIA propose to further develop this area to become an industry hub for the southwest.

5. METHODS

5.1 SOURCES OF INFORMATION

Hydrobiology has prepared a description of the existing marine and terrestrial environments for the proposed action based on a desktop review of publicly available information. The information and data sources described below were used to inform the 'Likelihood of Occurrence' assessment for species listed under the EPBC Act. Where available, published sightings, known migration routes, feeding and breeding grounds as well as Biologically Important Areas (BIA) were used to draw conclusions on the likelihood of a species being in the area.

The data and information provided in this report have been collated from the following sources:

- Peer reviewed scientific papers and studies
- Database searches:
 - EPBC Protected Matters Search Tool (PMST) for the marine extent of the Development Envelope and included a 5 km buffer (refer to Figure 12).
 - Atlas of Living Australia (CSIRO)
 - Species Profile and Threats Database (DAWE)
 - Threatened & Priority Flora, Fauna & Ecological Communities Database Search (DBCA)
 - NatureMap (DBCA)
 - Biologically Important Areas (BIA) (DAWE)
 - State Reserves
 - Key Ecological Features (KEF) (DAWE)
 - Australasian Underwater Cultural Heritage (Bunbury region) (DAWE)
 - Australian Wetland Database (DAWE)
 - Species Profile and Threats Database (SPRATS) (DAWE)
 - Australian National Shipwreck Database (ANSDB)
 - Western Australian Museum Maritime shipwreck database (WAM)
 - Conservation Values Atlas (DAWE)
 - Land data (Landgate)
 - ASRIS mapping tool (CSIRO)

- Australian Exposure Information Platform (AEIP)
- South-west Marine Bioregional Plan and supporting documents (i.e. Species group report cards)
- Species Recovery Plans and Conservation Advice for various threatened species prepared by the Commonwealth (Department of the Environment) or some cases State agencies
- Previous environmental studies within or in proximity to the Development Envelope

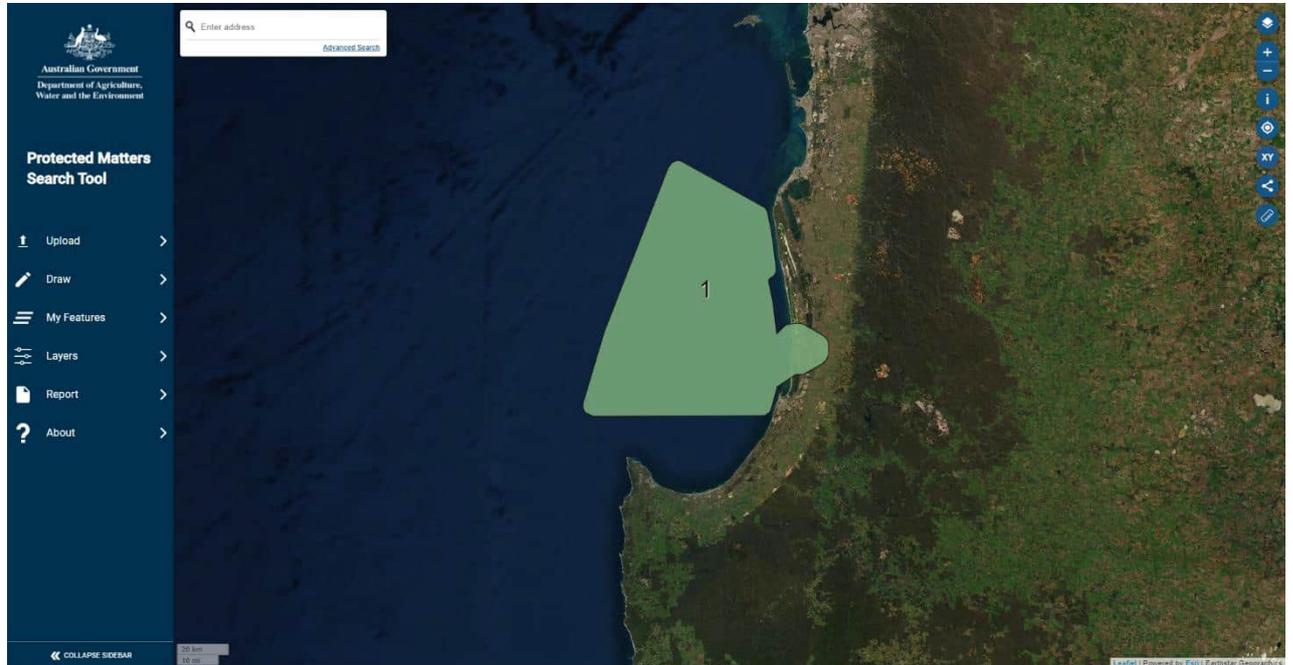


Figure 12 - Map of the study area included in the EPBC protected matters database search. The study area includes a 5 km buffer around the planned Development Envelope and Cable Corridor.

5.2 LIKELIHOOD OF OCCURRENCE

A 'likelihood of occurrence' assessment was conducted for the listed MNES and "Other Matters", assessing the potential for MNES to occur within the proximity of the Development Envelope. A 'Likelihood of Occurrence' category was applied to all species identified through the PMST.

'Likelihood of Occurrence' was based upon the known distribution, habitat utilisation (i.e., breeding, foraging, nesting, migration etc.) and other notable values as reported under the EPBC PMST. From this assessment, species potentially occurring in proximity to the Development Envelope were identified. Criteria for the 'Likelihood of Occurrence' is described in Table 5.

Table 5 - 'Likelihood of Occurrence' criteria description

Likelihood of Occurrence	Criteria
Unlikely	No observations of species within proximity to the Development Envelope.
Possible	Species was identified by the PMST as potentially occurring within the Development Envelope. Past observations of species are rare or restricted to limited individual sightings.
Likely	Species identified by PMST as likely to occur and/or use habitat within the Development Envelope. Development Envelope supports habitat likely to be utilised by the species for foraging, breeding, migration, or roosting.
Known	Species is known to occur within the Development Envelope. Species are regularly sighted within the area or known movements (such as migration) have been recorded as occurring within the Development Envelope.

6. MNES SEARCH RESULTS

The EPBC Act is the primary legislation that protects MNES, including migratory and threatened species. A PMST search was conducted of the Development Envelope and identified a list of MNES. The MNES are discussed below and listed in the following Tables. Species that are not MNES but are listed under the EPBC Act as “other matters” were included. The full PMST search report is provided in Appendix D Protected Matters Search.

- Birds (Table 6)
- Marine Mammals (Table 7)
- Terrestrial Mammals (Table 8)
- Marine Turtles (Table 9)
- Shark, Bony Fish and Freshwater Mussel (Table 10)
- Terrestrial Flora (Table 11)
- Other Matters (Table 12)

The PMST identified:

- 1 Wetland of International Importance (RAMSAR)
- 1 Commonwealth Marine Area
- 4 Listed Threatened Ecological Communities
- 71 Listed Threatened Species and
- 69 Listed Migratory Species

The “Other Matters” identified:

- 95 Listed Marine Species
- 33 Whales and Other Cetaceans

6.1 MNES RESULTS - BIRDS

Table 6 - MNES listed bird species identified from the PMST search for the proposed action

Bird Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Actitis hypoleucos</i>	Common Sandpiper	Listed marine species	The Common Sandpiper is a migratory wetland species that breeds in the northern hemisphere (February – May) and migrates south to Australia during the northern winter. The sand piper is known to occur in the Peel-Yalgorup Wetland System (Higgins & Davies, 1996).	Unlikely	Species has been sighted in the Peel-Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).
<i>Anous stolidus</i>	Common Noddy	Listed marine species	The Common Noddy is migratory marine species that is known to reside on offshore islands across the north-west and central coast of Western Australia. The Common Noddy nests on offshore islands, often forming large colonies of more than 100 000 nests (Higgins & Davies, 1996).	Unlikely	The Development Envelope is not within the species main distribution and does not contain habitat suitable for the species.
<i>Anous tenuirostris melanops</i>	Australian Lesser Noddy	Vulnerable, Listed marine species	The Australian Lesser Noddy is distributed from Seychelles to Houtman Abrolhos Islands. They are known to nest on the Houtman Abrolhos Islands as well as other sub-tropical and tropical islands in the Indian Ocean. This species feeds on small fish found at the water surface (Higgins & Davies, 1996).	Unlikely	The Development Envelope is not within the species main distribution and does not contain habitat suitable for the species.
<i>Apus pacificus</i>	Fork-tailed Swift	Listed marine species	The Fork-tailed swift is a migratory marine species that breeds in the northern hemisphere (February – May) and migrates south to Australia during the northern winter. Species has historically been sighted in the Peel Yalgorup Ramsar Wetland however recent surveys didn't detect the species.	Unlikely	Species has been historically sighted in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).

Bird Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Ardenna carneipes</i>	Flesh-footed Shearwater, Fleshy-footed Shearwater	Listed marine species	The Flesh-footed Shearwater is a trans-equatorial pelagic bird species that spends a significant portion of its life on the open ocean, rarely venturing close to land except to breed. It breeds from late August to mid-May on approximately 60 islands across the southern Indian and south-western Pacific Oceans (including 41 islands off the coast of south-west WA).	Possible	A BIA for the aggregation of this species intersects the Development Envelope. Unlikely to occur in onshore components as does not contain suitable habitat or foraging.
<i>Arenaria interpres</i>	Ruddy Turnstone	Migratory, listed marine species	The Ruddy Turnstone is found widespread across Australia during the non-breeding season, most commonly found in coastal habitats, it has been observed in every Australian state. Ruddy Turnstones visit Australia between September to May, then returning to the breeding ground in Siberia and St Lawrence. Its preferred habitat is rocky shores or beaches with large amounts of seaweed. It is also found in shallow tidal pools, coral or shell beaches and occasionally estuaries or coastal lagoons.	Possible	While the species has not been recorded within the Development Envelope there are numerous records of this species occurring in nearby coastal habitats (Binningup, Preston Beach and Bunbury). This species usually forages along coastlines but there are occasional sightings further offshore
<i>Botaurus poiciloptilus</i>	Australasian Bittern	Endangered	The Australasian Bittern occurs mainly in freshwater wetlands. It has been recorded at the Peel-Yalgorup wetland system and throughout the south-west of Western Australia (DBCA, 2018, Marchant & Higgins, 1990). It favours wetlands with tall dense vegetation, where it forages in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water. This species breeds between October to February.	Unlikely	Species has been sighted in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Listed marine species	The Sandpiper is a migratory wetland species that breeds in the northern hemisphere and migrates south to Australia during the northern winter. It is known to occur in Yalgorup Ramsar Wetland.	Unlikely	Species has been sighted in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).

Bird Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Calidris alba</i>	Sanderling	Listed marine species	The Sanderling is a migratory wetland species that breeds in the northern hemisphere and migrates south to Australia during the northern winter. It is known to occur in Yalgorup Ramsar Wetland.	Unlikely	Species has been sighted in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).
<i>Calidris canutus</i>	Red Knot, Knot	Endangered, Listed marine species	The Red Knot is a migratory waterbird that occurs in coastal habitat. It breeds in the northern hemisphere (North America, Russia and Greenland) and migrates south to escape the harsh winter of the north. They are commonly found in the north-west of Australia in August but there have been historical sightings in the Peel-Yalgorup wetland system.	Unlikely	Species has been sighted in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).
<i>Calidris ferruginea</i>	Curlew Sandpiper	Critically Endangered, Listed marine species	Curlew Sandpipers is a migratory shorebird that inhabit intertidal mudflats in sheltered coastal areas (e.g. estuaries, bays), ponds in saltworks and sewage farms, inland lakes and dams. They occur in both fresh and brackish waters, and occasionally around floodwaters (Higgins and Davies, 1996). They breed in Siberia and migrate to the southern hemisphere during the northern winter. In Australia they occur from Cape Arid (near Esperance) to the south of Broome. Large flocks are seen at Port Hedland Saltworks, 80 Mile Beach, Roebuck Bay and Lake Macleod. The sandpiper has historically been sighted within the Yalgorup National Park (Hale and Butcher, 2007).	Unlikely	Species has been sighted in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).

Bird Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Calidris melanotos</i>	Pectoral Sandpiper	Listed marine species	The Pectoral Sandpiper is a migratory waterbird that occurs in coastal habitat. It breeds in the northern hemisphere and migrates south to Australia during the northern winter. It prefers shallow fresh to saline wetlands and is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	Unlikely	Species has been sighted in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).
<i>Calidris ruficollis</i>	Red-necked Stint	Listed marine species	The Red-necked Stint is a migratory waterbird that occurs in coastal habitat. It breeds in the northern hemisphere (North America, Russia and Greenland) and migrates south to escape the harsh winter of the north. It is known to occur in Yalgorup Ramsar Wetland.	Unlikely	Species has been sighted in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).
<i>Calidris subminuta</i>	Long-toed Stint	Listed marine species	The Long-toed Stint is a migratory waterbird that breeds in the northern hemisphere and migrates south to Australia. It is known to occur in Yalgorup Ramsar Wetland.	Unlikely	Species has been sighted in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).
<i>Calidris tenuirostris</i>	Great Knot	Critically Endangered, Listed marine species	The Great Knot is a migratory wading bird that typically occupies sheltered coastal habitats, with large intertidal mudflats and sandflats. Great Knots have been recorded across the entire Australian coastline however the greatest numbers occur within northern Australia. In Western Australia, they are mostly observed in Roebuck Bay and Eighty Mile Beach. The Great Knot has historically been sighted within the Yalgorup National Park (Hale and Butcher, 2007).	Unlikely	Species has been sighted in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).

Bird Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Calyptorhynchus banksii naso</i>	Forest Red-tailed Black-Cockatoo, Karrak	Vulnerable	The Forest Red-tailed Black Cockatoo is endemic to south-west WA. They nest in the hollows of live and dead eucalypts trees and one of their key habitat is the Banksia woodlands. It is likely that the cockatoo is present in the Development Envelope due to the presence of Banksia Woodland.	Likely	Species likely to be within the Development Envelope due to the presence of Banksia Woodland in the vicinity.
<i>Charadrius leschenaultii</i>	Greater Sand Plover, Large Sand Plover	Vulnerable, Listed marine species	In Australia, the Greater Sand Plover occurs in coastal areas in all states, though the greatest numbers occur in northern Australia, especially the north-west. In Western Australia, Roebuck Bay and Eighty Mile Beach are considered internationally important sites for the Greater Sand Plover, this species is less common in the south-west. This species does not breed in Australia, they breed in the northern hemisphere between March and May.	Unlikely	Species has been sighted in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).
<i>Charadrius mongolus</i>	Lesser Sand Plover, Mongolian Plover	Endangered, Listed marine species	Lesser Sand Plovers have a widespread distribution across Australian coastlines, mainly occurring in eastern and northern Australia. In Western Australia, they are most commonly found in Roebuck Bay and Eighty Mile Beach. Lesser Sand Plovers forage on sandflats and mudflats in intertidal environments. This species does not breed in Australia. They migrate to their breeding grounds in the northern hemisphere between May and June.	Unlikely	Species has been sighted in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).

Bird Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Diomedea amsterdamensis</i>	Amsterdam Albatross	Endangered, Listed marine species	The Amsterdam Albatross is a pelagic bird species that spends a significant portion of its life on the open ocean, rarely venturing close to land except to breed. They breed on Amsterdam Island in the Indian Ocean. The species migratory range is poorly understood, however there have been sightings around Australia and New Zealand. There are no documented sightings of this species in the vicinity of the Development Envelope.	Unlikely	Species unlikely to occur in the offshore component of the Development Envelope as species are highly pelagic typically foraging far offshore and breeding colonies are on Amsterdam Island (over 3,500km away). Unlikely to occur in the onshore component due to a lack of suitable habitat and foraging.
<i>Diomedea dabbenena</i>	Tristan Albatross	Endangered, Listed marine species	The Tristan Albatross is a large pelagic bird species that spends a significant portion of its life on the open ocean, rarely venturing close to land except to breed. They breed on Gough Island and Inaccessible Island (South Atlantic Ocean). The species migratory range is poorly understood. There have been sightings on the southern coast of Western Australia. There are no documented sightings of this species in the vicinity of the Development Envelope.	Unlikely	Species unlikely to occur in the offshore component of the Development Envelope as species are highly pelagic typically foraging far offshore and breeding colonies are in the South Pacific Ocean. Unlikely to occur in the onshore component due to a lack of suitable habitat and foraging.
<i>Diomedea epomophora</i>	Southern Royal Albatross	Vulnerable, Listed marine species	The Southern Royal Albatross is a pelagic bird species that spends a significant portion of its life on the open ocean, rarely venturing close to land except to breed. They are widely distributed along the south coast of Australia, ranging from Western Australia, as far south as Macquarie Island, to New South Wales. There are no documented sightings of this species in the vicinity of the Development Envelope.	Unlikely	Species unlikely to occur in the offshore component of the Development Envelope as species are highly pelagic typically foraging far offshore. Unlikely to occur in the onshore component due to a lack of suitable habitat and foraging.
<i>Diomedea exulans</i>	Wandering Albatross	Vulnerable, Listed marine species	The Wandering Albatross pelagic bird species that spends a significant portion of its life on the open ocean, rarely venturing close to land except to breed. There are no documented sightings of this species in the vicinity of the Development Envelope.	Unlikely	Species unlikely to occur in the offshore component of the Development Envelope as species are highly pelagic typically foraging far offshore. Unlikely to occur in the onshore component due to a lack of suitable habitat and foraging.

Bird Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Diomedea sanfordi</i>	Northern Royal Albatross	Endangered, Listed marine species	The Northern Royal Albatross is a pelagic bird species that spends a significant portion of its life on the open ocean, rarely venturing close to land except to breed. This species breeds solely on islands in New Zealand. The migratory routes range over the Southern Ocean, subantarctic waters, subtropical, and occasionally Antarctic waters (Marchant and Higgins, 1990). There are no documented sightings of this species in the vicinity of the Development Envelope.	Unlikely	Species unlikely to occur in the offshore component of the Development Envelope as species are highly pelagic typically foraging far offshore and breeding colonies are in NZ. Unlikely to occur in the onshore component due to a lack of suitable habitat and foraging.
<i>Falco hypoleucos</i>	Grey Falcon	Vulnerable	The species occurs in arid and semi-arid Australia. They are not common and can be found in the southwest WA. The species frequents timbered lowland plains, particularly acacia shrublands. The species has been observed hunting in treeless areas and frequents tussock grassland and open woodland, especially in winter. There are no published sightings of this species in the area.	Unlikely	Species unlikely to occur within the Development Envelope
<i>Gallinago megala</i>	Swinhoe's Snipe	Migratory	There are infrequent records of Swinhoe's Snipe in Australia. Swinhoe's Snipe are most commonly found in Northern Territory. There have been sightings in the Pilbara and the Kimberley. This species is migratory, visiting Australia between October and April from the breeding grounds in Siberia and Mongolia. The preferred habitat of Swinhoe's Swipes is on the edge of wetlands, swamps and freshwater streams. They feed on small invertebrates. There are no recorded sightings of this species around the Development Envelope	Unlikely	Species has not been recorded within proximity to the Development Envelope. The preferred habitat of this species, is not present within the Development Envelope

Bird Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Gallinago stenura</i>	Pin-tailed Snipe	Migratory, listed marine species	The distribution of Pin-tailed Snipes in Australia is poorly documented. There have been confirmed observation in New South Wales, Northern Territory and Western Australia. Within Western Australia, Pin-tailed Snipes have been recorded in the south-west and Pilbara region. This species visits Australia between September and March, then returning to the breeding grounds in Siberia. When in Australia, Pin-tailed Snipes are most often found on edges of shallow, freshwater swamps, ponds and lakes as well as drier, more open wetlands.	Unlikely	This species has not been recorded within or near the Development Envelope, with one recorded sighting in the south-west region of Western Australia (in Perth). The preferred habitat of this species is not found within the Development Envelope.
<i>Halobaena caerulea</i>	Blue Petrel	Vulnerable, Listed marine species	The Blue Petrels is a small pelagic bird species that spends a significant portion of its life on the open ocean, rarely venturing close to land except to breed. They breed on Macquarie Island (south of NZ) and nest in colonies. They forage in Antarctic and subantarctic water. There are no documented sightings of this species in the vicinity of the Development Envelope.	Unlikely	Species unlikely to occur in the offshore component of the Development Envelope as species are highly pelagic typically foraging far offshore and breeding colonies are south of NZ. Unlikely to occur in the onshore component due to a lack of suitable habitat and foraging.
<i>Hydroprogne caspia</i>	Caspian Tern	Listed marine species	Caspian Tern is a small migratory marine bird species that is widespread in Australia occurring from the Great Australian Bight up to Dampier Peninsula in Western Australia. They inhabit a variety of coastal areas such as harbours, lagoons, beaches and wetlands. Their nests are built on the ground in beaches and among vegetation. There have been sightings of this species in the Yalgorup Ramsar Wetland.	Possible	Species has been sighted in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species is a coastal forager). Possibly occurs in the coastal portion as this area has suitable habitat and foraging. Unlikely to occur in onshore sections (due to the lack of wetland habitat).

Bird Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Leipoa ocellata</i>	Malleefowl	Vulnerable	Malleefowl are found in semi-arid to arid shrublands and low woodlands, especially those dominated by mallee and/or acacias. A sandy substrate and abundance of leaf litter are required for breeding. Densities are generally greatest in areas of higher rainfall and on more fertile soils where habitats tend to be thicker and there is an abundance of food plants.	Unlikely	This species is unlikely to occur within the terrestrial component of this referral as suitable habitat is not present.
<i>Limicola falcinellus</i>	Broad-billed Sandpiper	Listed marine species	A migratory waterbird that breeds in the northern hemisphere and migrates south to Australia to escape the northern winter. It is known to occur in Yalgorup Ramsar Wetland but not every year (numbers are scarce).	Unlikely	Species has been sighted in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).
<i>Limosa lapponica</i>	Bar-tailed Godwit	Migratory	Bar-tailed Godwits are large migratory waders that are predominantly found foraging on the waters' edge of sheltered coastal environments. They prefer soft mud, often with beds of Zostera. The Bar-tailed Godwit is more commonly found in northern Australia than the south-west. During the non-breeding season 88% of the Bar-tailed Godwits reside in Australia and New Zealand	Unlikely	Species has been sighted in the Peel Yalgorup Ramsar Wetland which is 1 km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).
<i>Limosa lapponica menzbieri</i>	Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit	Critically Endangered	Bar-tailed Godwits are large migratory waders that are predominantly found foraging on the waters' edge of sheltered coastal environments. They prefer soft mud, often with beds of Zostera. The Bar-tailed Godwit is more commonly found in northern Australia than the south-west. During the non-breeding season 88% of the Bar-tailed Godwits reside in Australia and New Zealand	Unlikely	Species has been sighted in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).

Bird Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Limosa limosa</i>	Black-tailed Godwit	Listed marine species	A migratory wetland species that breeds in the northern hemisphere and migrates south to Australia to escape the northern winter. It has been sighted in the Yalgorup Ramsar Wetland.	Unlikely	Species has been sighted in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).
<i>Macronectes giganteus</i>	Southern Giant-Petrel, Southern Giant Petrel	Endangered, Listed marine species	The Southern Giant Petrel is a pelagic bird species that spends a significant portion of its life on the open ocean, rarely venturing close to land except to breed. They breed on 6 islands in the southern oceans (Macquarie Island, Heard Island, McDonald Island, Giganteus Island, Hawker Island, and Frazier Island). The range of this bird is large (over 36,000, 000 km ²). They forage in southern waters south of 25 degrees where they spend most of their time (Bird Life International, 2008; Marchant and Higgins, 1990). There are no documented sightings of this species in the vicinity of the Development Envelope.	Unlikely	Unlikely to occur in the offshore component of the Development Envelope, breeding and foraging typically occurs in the southern oceans more than 6,000km away).
<i>Macronectes halli</i>	Northern Giant Petrel	Vulnerable, Listed marine species	The Northern Giant Petrel is a pelagic bird species that spends a significant portion of its life on the open ocean, rarely venturing close to land except to breed. They breed in the sub-arctic and forage in southern waters south of 25 degrees where they spend most of their time (Marchant and Higgins, 1990).	Possible	Possibly occurs in the offshore component of the Development Envelope, as this species forages in the southern India Ocean. The Threatened and Priority Flora Database results revealed several sightings of this species within the project study area (but not within the DE).
<i>Motacilla cinerea</i>	Grey Wagtail	Listed marine species	A migratory terrestrial bird species that breeds in the northern hemisphere and migrates south to Australia to escape the northern winter. Outside of the breeding season they are commonly seen around lakes, coasts and other wetland habitats.	Unlikely	Possible to occur on the coastal sections of the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).

Bird Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Numenius madagascariensis</i>	Eastern Curlew, Far Eastern Curlew	Critically Endangered, Listed marine species	The Eastern Curlew is the largest migratory shorebird in the world. It is widely distributed in Australia. In Western Australia, it is recorded from the Peel Inlet to the southern Stokes Inlet. It breeds in Siberia, Russia, Mongolia and China from May to June, and migrates to Australia for its non-breeding season. It feeds on intertidal sand and mud flats, around mangroves, salt flats, saltmarsh and beaches. The species is known to occur in the Peel Yalgorup Wetland.	Unlikely	Species is known to occur in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).
<i>Numenius minutus</i>	Little Curlew, Little Whimbrel	Migratory, listed marine species	Little Curlews are non-breeding visitors to Australia. They are most commonly found in northern Australia from Port Hedland in Western Australia to the Queensland coast. This species is observed in Australia from September to April, before departing to the breeding grounds in Russia. Little Curlews are omnivores, mainly eating insects, berries and seeds, they forage in sedgeland, dry saltmarshes, coastal swamps, mudflats or sandflats.	Unlikely	Species is known to occur in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).
<i>Numenius phaeopus</i>	Whimbrel	Listed marine species	A migratory wetland species that breeds in the northern hemisphere and migrates south to Australia to escape the northern winter. When migrating the species typically travels along the coast (Bird Life International, 2016). The species is known to occur in the Peel Yalgorup Wetland.	Unlikely	Species is known to occur in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).

Bird Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Onychoprion anaethetus</i>	Bridled Tern	Listed marine species	The Bridled Tern is a migratory seabird that inhabits warm tropical waters worldwide. They spend a significant portion of their lives far offshore, rarely seen near land except when blown off course or to breed. They breed on offshore islands along the WA coast (Penguin Island, Lancelin Island, Houtman Abrolhos, Lowendal Island, and Ashmore Reef). The species has been sighted in the Peel Yalgorup Wetland but is not a common visitor.	Unlikely	Development Envelope intersects a BIA for feeding and foraging for large numbers of this species. However unlikely to occur in the offshore component of the Development Envelope as breeding occurs on island further north (ie Penguin Island is 100 km north) and foraging typically occurs far offshore.
<i>Pachyptila turtur subantarctica</i>	Fairy Prion (southern)	Vulnerable	The Fairy Prion is a small seabird found throughout the southern oceans. They feed in large flocks at sea, sometimes alongside other seabirds. They tend to stay offshore but do come inshore during stormy weather and to breed on islands. Breeding islands include Macquarie Island and Bishop and Clerk Islets. There are no documented sightings of this species at the Peel Yalgorup Wetland.	Unlikely	Unlikely to occur in the offshore component of the Development Envelope as breeding occurs on island at least 4000 km away. Foraging typically occurs far offshore.
<i>Pandion haliaetus</i>	Osprey	Listed marine species	The Osprey is a fish-eating bird of prey (raptor) that occurs worldwide. The Australian population are not migratory. They are typically found around the coastline inhabiting warmer coastal waters, estuaries (Poole, 2019) and rocky islands. There are high population densities on the Houtman Abrolhos, Barrow and Montebello Islands. They breed near freshwater lakes and rivers and rocky offshore island (i.e., Rottnest Island) (September to October). There are no documented sightings of this species at the Peel Yalgorup Wetland.	Possible	Possible to occur on the coastal sections of the Development Envelope. Possible to occur in the offshore component of the Development Envelope (species is a marine forager). Unlikely to occur in onshore sections (due to the lack of foraging habitat/fish).

Bird Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Philomachus pugnax</i>	Ruff (Reeve)	Listed marine species	A migratory wetland species that breeds in the northern hemisphere and migrates south to Australia to escape the northern winter (Bird Life International, 2016). The species is known to occur in the Peel Yalgorup Wetland.	Unlikely	Species is known to occur in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).
<i>Phoebastria fusca</i>	Sooty Albatross	Vulnerable, Listed marine species	The Sooty Albatross is a pelagic bird species that spends a significant portion of its life on the open ocean, rarely venturing close to land except to breed. Breeding takes place on subtropical and subantarctic islands in the Indian and Atlantic Oceans. They have been observed feeding in nearshore waters of southern Australia. There are no documented sightings of this species at the Peel Yalgorup Wetland.	Unlikely	Unlikely to occur in the offshore component of the Development Envelope, breeding and foraging typically occurs on offshore islands.
<i>Pluvialis fulva</i>	Pacific Golden Plover	Listed marine species	A migratory wetland species that breeds in the northern hemisphere and migrates south to Australia to escape the northern winter between September - April (Bird Life International, 2016). The species has been sighted in the Peel Yalgorup Wetland	Unlikely	Species is known to occur in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).
<i>Pterodroma mollis</i>	Soft-plumaged Petrel	Vulnerable, Listed marine species	The Soft-plumaged Petrel is a seabird that occurs globally in temperate and subantarctic waters in the Atlantic, Indian and South Pacific Oceans. This species is highly pelagic and rarely approaches land, except at breeding colonies. They breed on offshore islands between Sept-April, the only breeding location known in Australia is at Maatsuyker Island off the coast of Tasmania. Breeding occurs from September to April. There are no documented sightings of this species at the Peel Yalgorup Wetland.	Unlikely	The Development Envelope intersects a BIA for feeding and foraging for this species. However unlikely to occur in the offshore component of the Development Envelope as breeding occurs on island in Tasmania and they are highly pelagic typically foraging far offshore.

Bird Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Rostratula australis</i>	Australian Painted Snipe	Endangered, Listed marine species	The Australian Painted Snipe is a shorebird endemic to Australia that frequent shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They have been recorded as breeding in all months, but typically Aug-Feb. The majority of records are from the eastern states, with less frequent records in Western Australia. The species has been sighted in the Peel Yalgorup Wetland.	Unlikely	Species is known to occur in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).
<i>Sterna dougallii</i>	Roseate Tern	Migratory, Listed marine species	Roseate Terns are polytypic, and four subspecies are known to occur. Within Australia (and New Caledonia), the subspecies <i>S. dougallii gracilis</i> breeds along coastlines usually in habitats of dense vegetation and has been recorded nesting alongside other tern species including fairy terns (<i>Sternula nereis</i>). Breeding occurs in Western Australia during two distinctive periods, either spring-summer or autumn winter, peak laying period between April and November. Breeding is likely influenced by the abundance of food.	Possible	Species is known to occur in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).
<i>Sternula nereis nereis</i>	Australian Fairy Tern	Vulnerable	The Australian Fairy Tern is a small seabird that occurs along the coast of WA, SA, Tasmania and Victoria in estuaries, freshwater lakes, wetlands (Dunlop and Greenwell, 2021). They nest on sheltered sandy beaches, spits and banks above the high tide line and below vegetation. There is a resident population of the species within the Peel Yalgorup Wetland system (PCC, 2019).	Unlikely	Development Envelope intersects a BIA for feeding and foraging for this species. However, unlikely to occur in the offshore component of the Development Envelope as species occur along the coast. Unlikely to occur in the onshore component due to a lack of suitable foraging habitat in the Development Envelope i.e. Wetland.

Bird Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Thalassarche carteri</i>	Indian Yellow-nosed Albatross	Vulnerable, Listed marine species	The Indian-Yellow-nosed Albatross is a pelagic bird species that is found in subtropical and warmer subantarctic waters. It is found off the coast of Western Australia as it forages in the southern Indian Ocean (Marchant and Higgins, 1990). The species occupies inshore and offshore waters (Latham, 1980), particularly where there are calm seas and light winds (Cox, 1973). The birds fly low or at medium heights over the sea, using air currents rising off swells for lift (Marchant and Higgins, 1990) They breed on Prince Edward Islands (South Africa), Kerguelen Islands, Crozet Island, Amsterdam and St Paul Islands (France). There are no documented sightings of this species at the Peel Yalgorup Wetland.	Possible	Possibly occurs in the offshore component of the Development Envelope, as this species forages in the southern India Ocean. Unlikely to occur in the onshore component due to a lack of suitable foraging habitat.
<i>Thalassarche cauta</i>	Shy Albatross	Endangered, Listed marine species	The Shy Albatross is a pelagic bird species that spends a significant portion of its life on the open ocean, rarely venturing close to land except to breed. There are three known breeding island colonies off the coast of Tasmania, namely Albatross Island, Pedra Branca and Mewstone. The Shy Albatross breeds on rocky islands and builds mounded egg nests of soil, grass, and roots. They lay one egg in late September.	Possible	Possibly occurs in the offshore component of the Development Envelope, as this species forages in the southern India Ocean. The Threatened and Priority Flora Database results revealed two sightings of this species within the project study area (but not within the DE).
<i>Thalassarche impavida</i>	Campbell Albatross Campbell Black-browed Albatross	Vulnerable, Listed marine species	The Campbell Albatross is a is a pelagic bird species that spends a significant portion of its life on the open ocean, rarely venturing close to land except to breed. They breed on Campbell Island, New Zealand. They have been seen foraging over the oceanic continental slopes off Tasmania, Victoria, and New South Wales. There are no documented sightings of this species at the Peel Yalgorup Wetland.	Unlikely	Unlikely to occur in the offshore component of the Development Envelope, breeding occurs in NZ and foraging typically occurs in the southern oceans more.

Bird Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Thalassarche melanophris</i>	Black-browed Albatross	Vulnerable, Listed marine species	The Black-browed Albatross is a pelagic bird species that spends a significant portion of its life on the open ocean, rarely venturing close to land except to breed. It breeds on islands off the south-east coast of Australia (Victoria and Tasmania). Their pelagic range extending down to sub-Antarctic areas. There are no documented sightings of this species at the Peel Yalgorup Wetland.	Unlikely	Unlikely to occur in the offshore component of the Development Envelope, breeding occurs in Victoria and Tasmania and foraging typically occurs in the southern oceans and Antarctic.
<i>Thalassarche steadi</i>	White-capped Albatross	Vulnerable, Listed marine species	The White-capped Albatross is a pelagic bird species that spends a significant portion of its life on the open ocean, rarely venturing close to land except to breed. It breeds on islands off the coast of New Zealand. There are no documented sightings of this species at the Peel Yalgorup Wetland.	Unlikely	Unlikely to occur in the offshore component of the Development Envelope, breeding occurs in NZ and foraging typically occurs in the southern oceans more.
<i>Tringa brevipes</i>	Grey-tailed Tattler	Listed marine species	The Grey-tailed Tattler is a small migratory shorebird that breeds in the northern hemisphere and migrates south to Australia to escape the northern winter (Bird Life International, 2016). The species is known to occur in the Peel Yalgorup Wetland.	Unlikely	Species is known to occur in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).
<i>Tringa glareola</i>	Wood Sandpiper	Listed marine species	The Wood Sandpiper is a small migratory shorebird that breeds in the northern hemisphere and migrates south to Australia to escape the northern winter (Bird Life International, 2016). The species is known to occur in the Peel Yalgorup Wetland.	Unlikely	Species is known to occur in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).

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<i>Tringa nebularia</i>	Common Greenshank Greenshank	Listed marine species	The Common Greenshank is a small migratory shorebird that breeds in the northern hemisphere and migrates south to Australia to escape the northern winter (Bird Life International, 2016). The species is known to occur in the Peel Yalgorup Wetland.	Unlikely	Species is known to occur in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).
<i>Tringa stagnatilis</i>	Marsh Sandpiper Little Greenshank	Listed marine species	The Marsh Sandpiper is a small migratory shorebird that breeds in the northern hemisphere and migrates south to Australia to escape the northern winter (Bird.Life International, 2016). The species is known to occur in the Peel Yalgorup Wetland.	Unlikely	Species is known to occur in the Peel Yalgorup Ramsar Wetland which is 1km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).
<i>Tringa totanus</i>	Common Redshank Redshank	Listed marine species	The Common Redshank is a small migratory shorebird that breeds in the northern hemisphere and migrates south to Australia to escape the northern winter (Bird Life International, 2016). The species is known to occur in the Peel Yalgorup Wetland.	Unlikely	Species is known to occur in the Peel Yalgorup Ramsar Wetland which is 1 km from the Development Envelope. Unlikely to occur in the offshore component of the Development Envelope (species not a marine forager) or onshore sections (due to the lack of wetland habitat).
<i>Zanda baudinii</i>	Baudin's Black-Cockatoo, Long-billed Black-cockatoo	Endangered (listed as <i>Calyptorhynchus baudinii</i>)	Species endemic to south-west WA, Species occurs in temperate forest and woodland dominated by <i>Eucalyptus marginate</i> (jarrah), <i>Corymbia calophylla</i> (marri) and <i>E. diversicolor</i> (karri). The species nests in the hollows of mature eucalypts, particularly marri One of their key habitats is the Banksia woodlands (DEE, 2018c). It is likely that the cockatoo is present in the Development Envelope due to the presence of Banksia Woodland.	Likely	Species likely to be within the Development Envelope due to the presence of Banksia Woodlands.

Bird Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Zanda latirostris</i>	Carnaby's Black Cockatoo, Short-billed Black-cockatoo	Endangered (listed as <i>Calyptorhynchus latirostris</i>)	Species is endemic to south-west WA. Breeding occurs inland but in non-breeding season the majority of species move to higher rainfall coastal regions including Midwest coast, Swan Coastal Plain and south coast (Dept Parks and Wildlife, 2013). One of their key habitats is the Banksia woodlands (DEE, 2018c). It is likely that the cockatoo is present in the Development Envelope due to the presence of Banksia Woodland.	Likely	Species likely to be within the Development Envelope due to the presence of Banksia Woodlands.

6.2 MNES RESULTS – MARINE MAMMALS

Table 7 - MNES listed marine mammal species identified from the PMST search for the proposed action

Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Arctocephalus forsteri</i>	Long-nosed Fur-seal New Zealand Fur-seal	Listed Marine	The species is found in the coastal waters and on the offshore islands of southern Australia, from the south-west Western Australia to east of Kangaroo Island in South Australia.	Possible	Given the location of the Leeuwin OWF in SW Western Australia, it is reasonable to assume this species could be observed within the study area.
<i>Balaenoptera acutorostrata</i>	Minke Whale	Whale and other cetaceans	Minke whales are known to undertake seasonal migration routes to the poles during spring, returning to the tropics during fall and winter.	Possible	Given the wide distribution of this species offshore, it is reasonable to assume it could be observed within the study area.
<i>Balaenoptera borealis</i>	Sei Whale	Vulnerable Migratory Whale and other cetaceans	Sei Whales are distributed worldwide and usually occur in deep, offshore waters along continental margins. Most distribution data is based upon historical whaling records however this data is not reliable as there is potential misidentification with Bryde's Whales. Sightings in Australia waters are sporadic and infrequent. Sei Whales have not been recorded occurring within the vicinity of the Development Envelope or surrounding areas. There has been suggestion of Sei Whales utilising the Perth Canyon for feeding but this has not been confirmed.	Unlikely	There are no documented sightings of Sei Whales within the Development Envelope or surrounding waters.

Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Balaenoptera edeni</i>	Bryde's Whale	Migratory Whale and other cetaceans	Bryde's Whale are globally distributed in tropical and warm temperate waters, have been infrequently observed across all Australian states inshore and offshore (Bannister, Kemper and Warneke, 1996). The ecology of Bryde's Whales in Australian waters is poorly understood, there are no records of this species occurring within the Development Envelope.	Unlikely	There are no documented sightings of Bryde's Whale within the vicinity of the Development Envelope
<i>Balaenoptera musculus</i>	Blue Whale	Endangered Migratory Whale and other cetaceans	There are two subspecies of Blue Whales (Pygmy and Antarctic) that both have been observed in waters around Australia. Sightings occur at various times throughout the year with known areas of significance being feedings grounds along the southern continental shelf and most notably the Perth Canyon in Western Australia. Pygmy Blue Whale's aggregate on the northern side of the Perth Canyon from May to November. Pygmy Blue Whales are regularly sighted around the vicinity of the Development Envelope, with them migrating through the area from the Southern Ocean to feeding grounds in the Perth Canyon.	Known	Pygmy Blue Whales are known to migrate through waters within the Development Envelope. Antarctic Blue Whales have also been detected seasonally (between May and November) from acoustic tracking around Cape Leeuwin and the Perth Canyon, as such it is likely they too will travel through the Development Envelope.
<i>Balaenoptera physalus</i>	Fin Whale	Vulnerable Migratory Whale and other cetaceans	Fin Whales are large (up to 27 m), cosmopolitan baleen whale species. They are common in temperate waters, particularly in areas of complex bathymetry. They are rarely observed in inshore waters. Migration patterns of Fin Whales in Australia are unknown, and distribution of this species is largely based on stranding events. In Western Australia, two Fin Whales have been stranded, one in Cottesloe (1996) and the other in Mandurah (1951). While there have been no confirmed sightings of Fin Whales within the Development Envelope, acoustic tracking of whales in Geographe Bay (south of the Development Envelope) have identified that Fin Whales possibly occur within that area (Recalde-Salas et al., 2014).	Possible	There have not been recorded sightings of Fin Whales within the Development Envelope. Rarely observed inshore however they have been detected using acoustic tracking in Geographe Bay (directly south of the Development Envelope).

Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Caperea marginata</i>	Pygmy Right Whale	Migratory Whale and other cetaceans	The Pygmy Right Whale are distributed between 32° S and 47° S in Australian waters, with few occurrences recorded in Western Australia. Sightings around the Development Envelope are rare. They have been known to occur within Geographe Bay (located directly south of the Development Envelope). Pygmy Right Whales are poorly studied, therefore their distribution, abundance and movement patterns in the area are not known.	Possible	The distribution and abundance of this species are poorly understood, however there are infrequent sightings of Pygmy Right Whales in Geographe Bay (directly south of the Development Envelope).
<i>Eubalaena australis</i>	Southern Right Whale	Endangered, Migratory Whale and other cetaceans	The Southern Right Whale are seasonally present along the Australian coast between late April and early November. It has been recorded in the coastal waters of all Australian states except for the Northern Territory. The feeding habitat of this species is very poorly known as there have been no dedicated studies on feeding areas. Based off sighting information, it is likely that feeding occurs in deep, offshore waters. Breeding grounds for the Southern Right Whale are usually shallow, high energy, nearshore waters. Female whales display strong site fidelity to their calving grounds, known to return to their calving grounds every three years. Calving takes place between June and November. Southern Right Whales are seasonally observed within the Development Envelope and in Geographe Bay (directly south of the Development Envelope).	Known	Southern Right Whales are seasonally present along the Australian coast between late April and early November. Breeding for the Southern Right Whale is known to occur within the Development Envelope. A BIA occurs in proximity to the Development Envelope.

Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Lagenorhynchus obscurus</i>	Dusky Dolphin	Migratory Whale and other cetaceans	Dusky Dolphins are small cetaceans that reside in temperate and sub-Antarctic waters, they occur throughout waters across the Southern hemisphere, mostly in temperate and sub-Antarctic zones. In Australia, they occasionally occur along the southern coast from Western Australia to Tasmania. There are no known records of Dusky Dolphins occurring within the Development Envelope or in surrounding marine areas (Geographe Bay, Bunbury etc.).	Unlikely	Species or species may occur within the Development Envelope
<i>Megaptera novaeangliae</i>	Humpback Whale	Vulnerable Migratory Whale and other cetaceans	Humpback whales make their annual migrations between breeding areas in tropical waters along their respective coast and feeding areas in the Antarctic. Their migration usually takes place within 20 km of the coast at ~ 200 m depth. They also travel widely through the waters to the south of Australia during migrations to and from Antarctic feeding areas. Humpback Whales are regularly observed within the vicinity of the Development Envelope between July and December.	Known	Congregations and aggregations of this species are known to occur within the Development Envelope. The Development Envelope intersects one of four known resting areas for Humpback Whales and is a nominated BIA for their migration.
<i>Neophoca cinerea</i>	Australian Sea-lion Australian Sea Lion	Endangered Listed Marine	The Australian Sea Lion is endemic to Australia, with a breeding range that extends from Houtman Abrolhos, Western Australia to The Pages Island, east of Kangaroo Island, South Australia. Australian Sea Lions are distributed along the Western Australian coast in shallow on-shelf waters (less 200 m deep). This species prefers the sheltered side of islands and avoids exposed rocky headlands. They breed on low-lying, limestone islands, protected by perimeter reefs.	Likely	The Australian Sea Lion has been sighted occasionally foraging within and around the Development Envelope. The BIA for this species is approximately 20km to the north of the Development Envelope.

Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Orcinus orca</i>	Killer Whale Orca	Migratory Whale and other cetaceans	Killer Whales have been recorded in waters across all states of Australia with greatest concentrations in Tasmania and southern waters. They are currently considered to occur in one location in Australian waters as there is no known unsurpassable, pelagic boundary for this species. Killer Whales preferred habitat includes oceanic, pelagic and neritic waters in both warm and cold waters. Killer Whales have been observed in Geographe Bay (south of the Development Envelope) but no recorded observations within the Development Envelope.	Possible	This species has a vast, oceanic distribution with no known pelagic boundaries in Australia. There are no recorded sightings of Killer Whales in the Development Envelope, and they are typically pelagic species.
<i>Physeter macrocephalus</i>	Sperm Whale	Migratory Whale and other cetaceans	There have been confirmed records of Sperm Whales in all Australian states. Females and juvenile males are typically restricted to warmer waters (north of 45°S) but adult males travel to and from colder waters up to the edge of the Antarctic pack-ice. Within Western Australia, sperm whales are most commonly observed congregating in offshore waters in Albany. Sperm whales generally inhabit waters of 300 – 600 m depth, with females inhabiting depths > 1000 m. Observations of sperm whales in waters < 300 m deep is uncommon. There have been no recorded observations of sperm whales within the Development Envelope or surrounding waters.	Unlikely	This species typically inhabits waters much deeper (> 300 m) than those within the Development Envelope. There have been no recorded observations of this species within proximity to the Development Envelope.

6.3 MNES RESULTS – TERRESTRIAL MAMMALS

Table 8 - MNES terrestrial mammal species identified from the PMST search for the proposed action

Terrestrial Mammal Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Dasyurus geoffroii</i>	Western Quoll Chuditch	Vulnerable	The Western Quoll is a marsupial mammal endemic to south-west corner of WA. It inhabits wet and dry sclerophyll forests including Jarrah and Mallee (Menkhorst and Knight, 2001). The quoll is known to occur in the Yalgorup National Park (DEC, 2012), which is 25 km from the Development Envelope. One of their key habitats is the Tuart Woodlands and Forrest. It is possible that the quoll is present in the Development Envelope due to the presence of Tuart Woodlands and Forrest, however the population is very patchy.	Likely	Species likely to occur due to the presence of Tuart Woodlands and Forrest. However, the population is very patchy.
<i>Pseudocheirus occidentalis</i>	Western Ringtail Possum	Critically Endangered	The Western Ringtail Possum is a medium-sized arboreal marsupial, endemic to south-western Western Australia. The species is exclusively folivorous, feeding on leaves of myrtaceous species, predominantly Peppermint, but also Marri and Jarrah (DPAW, 2017). One of their key habitats is the Tuart Woodlands and Forrest. It is possible that the quoll is present in the Development Envelope due to the presence of Tuart Woodlands and Forrest.	Likely	Species likely to occur due to the presence of Tuart Woodlands and Forrest. Species has several sightings within the Development Envelope (DBCA database).
<i>Setonix brachyurus</i>	Quokka	Vulnerable	While Quokkas are most often found on smaller islands off the coast of Western Australia (e.g. Rottnest Island), discrete populations also exist in forest and coastal heath between Perth and Albany. There have been no recorded observations within the Development Envelope.	Possible	Species possible to occur given the presence of forest and coastal heath in the region. There have been no recorded observations within the Development Envelope.

6.4 MNES RESULTS – MARINE TURTLES

Table 9 - MNES marine turtle species identified from the PMST search for the proposed action

Marine Turtle Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Caretta caretta</i>	Loggerhead Turtle	Endangered Marine Migratory	Loggerhead Turtles are a cosmopolitan species of turtle that occurs in shallow waters with seagrass bed or coral and rocky reefs along the western, northern, and eastern coastlines of Australia. Nesting occurs on beaches from Shark Bay to Northwest Cape, Western Australia, and in southern Queensland. Loggerhead turtles have been observed occurring in waters in the south-west of Western Australia. Severe weather events have caused juvenile Loggerhead turtles to become stranded along the coastlines in Bunbury and Busselton (south of the Development Envelope). Waters in the south-west of Western Australia are considered to be the southern limit of their foraging range.	Possible	Waters in the south-west of Western Australia are considered to be the southern limit of their foraging range. Species have been known to occur occasionally in the waters within the Development Envelope and surrounding areas but only occasionally. DBCA database indicated sightings within the project study area,
<i>Chelonia mydas</i>	Green Turtle	Vulnerable Marine Migratory	Green Turtles nest, forage, and migrate across tropical northern Australia, although individuals can stray into temperate waters. Key nesting sites in Western Australia in the north include the Dampier Archipelago, Lacepede Islands, Ningaloo, and Jurabi Coasts. Typically, they forage across dense seagrass beds or mangrove forests. While they are more commonly observed in tropical waters, Green Turtles have been observed infrequently within waters around the Development Envelope and surrounding marine areas.	Possible	Waters in the south-west of Western Australia are considered to be the southern limit of their foraging range. Green turtles have been recorded, although rare, within the Development Envelope and in the surrounding marine areas. DBCA database indicated sightings within the project study area,

Marine Turtle Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Dermochelys coriacea</i>	Leatherback Turtle	Endangered Marine Migratory	Leatherback Turtles are the largest (up to 2 m) sea turtles that are found in tropical, subtropical, and temperate waters throughout the world. They are a highly pelagic species and cover vast oceanic distances when foraging. This species has an unusually wide latitudinal range, occurring from tropical waters to observations in waters ~10 °C (Hamann et al., 2006). No major nesting has been recorded in Australia, although scattered isolated nesting has been observed in the Northern Territory and Queensland. There have been no confirmed nesting sites in Western Australia. Leatherback turtles have not been observed within the Development Envelope however there has been sightings in Busselton and Eagle Bay (~ 30 km from the Development Envelope). Leatherback turtles are frequently observed foraging in the Southern Ocean.	Unlikely	Species has not been observed within the vicinity of the Development Envelope, but sightings of Leatherback turtles have been observed in Eagle Bay and Busselton (~30 km south of the Development Envelope).
<i>Natator depressus</i>	Flatback Turtle	Vulnerable Marine Migratory	Flatback Turtles nest solely in northern Australia, on sandy tropical beaches in Western Australia, the Northern Territory and Queensland. They migrate to different areas, with some individuals recorded up to 1,500 km away from their nesting site. While Flatbacks are known to traverse large oceanic distances, observations of Flatback Turtles are concentrated around the tropical waters of northern Australia. There is one confirmed record of a Flatback Turtle occurring within the Bunbury region. However, this is a preserved specimen collected in 1995, there are no other records in the area (ALA, 2021).	Possible	Flatback Turtle distribution is largely concentrated to waters in northern Australia. DBCAs database indicated 1 sighting within the project study area, but this area is considered the southern limit of their foraging range, so unlikely to occur.

6.5 MNES RESULTS – SHARKS, BONY FISH AND MUSSEL

Table 10 - MNES sharks and bony fish species identified from the PMST search for the proposed action

Sharks and Bony Fish Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Carcharhinus longimanus</i>	Oceanic whitetip shark	Marine Migratory	Oceanic whitetip sharks attain up to 4 metres in length and has a wide distribution, occurring offshore in tropical and subtropical waters. In Australia, this open-ocean species is found in warmer waters from northern Sydney to central Western Australia.	Unlikely	This species has a broad range, and the Development Envelope does not form part of the key habitat for this species.
<i>Carcharias taurus</i>	Grey nurse shark	Vulnerable	The western population of the grey nurse shark in Western Australia has a broad inshore distribution, primarily in sub-tropical and temperate waters. Grey nurse sharks are often observed hovering motionless just above the seabed, in or near deep sandy-bottomed gutters or rocky caves in the vicinity of inshore rocky reefs and islands. The species has been recorded at varying depths but is commonly observed from 15 to 40 metres.	Possible	Grey nurse sharks could potentially occur in the area
<i>Carcharodon carcharias</i>	Great white shark	Vulnerable Marine Migratory	Great white sharks are a migratory shark species, reaching up to 6 metres in length. They are solitary animals frequently observed near fur seal and sea lion colonies and feed on fish, pinnipeds, and cetaceans. In Australia, great white sharks are widely distributed and have been recorded from central Queensland around the south coast to north-west Western Australia but may also occur further north on both coasts. There are documented sightings of this species within the Development Envelope.	Possible	Great white sharks could potentially occur within the Development Envelope, with recorded sightings in the area, however this species has a broad range.

Sharks and Bony Fish Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Galeorhinus galeus</i>	School shark	Conservation Dependent	The School shark is a key commercial species caught within Australian Commonwealth fisheries. School sharks have a global distribution in temperate waters, and although mainly found inshore to 550 metres deep, this species also occurs in the open ocean. These highly migratory sharks occur in small schools and feed on crustaceans, cephalopods, echinoderms, fishes and worms. In Australian waters, school sharks grow to 1.75 metres in length and are found in offshore temperate waters from southern Queensland to Perth in Western Australia, moving extensively throughout southern Australia waters.	Possible	School sharks could potentially occur within the Development Envelope; however this species has a broad range.
<i>Isurus oxyrinchus</i>	Shortfin mako shark	Marine Migratory	Shortfin mako sharks can reach 4.45 metres in length and although an oceanic shark, this species is sometimes found close to shore. Frequenting surface waters of tropical and temperate seas, shortfin makos can be found in depths of up to 750 metres. They have a varied diet and feed on cephalopods, cetaceans, fish, other sharks and turtles. This species is targeted in commercial fisheries and taken as bycatch in longline and driftnet fisheries on the high-seas. Shortfin mako sharks are widespread in Australian waters, with the exception of the Northern Territory.	Possible	Shortfin mako sharks could potentially occur within the Development Envelope, however this species has a broad range.
<i>Lamna nasus</i>	Porbeagle shark	Marine Migratory	Porbeagle sharks grow up to 3.5 metres in length and inhabit cold, temperate waters and areas around the edge of continental shelves, however they can temporarily move into coastal water. They utilise a broad vertical range of the water column and although commonly found at around 300 metre depth, dives can exceed 1300 metres. In Australia, they occur from southern Queensland to south-west Australia singly, in schools and feeding aggregations. Porbeagles are a migratory species, with these movements poorly understood.	Unlikely	Porbeagle sharks are unlikely to occur within the Development Envelope, as this species has a broad range and are more commonly found in deeper waters.

Sharks and Bony Fish Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Mobula alfredi</i>	Reef manta ray	Marine Migratory	Reef manta rays occur close to land along productive coastlines with consistent upwelling and around coral and rocky reefs. Although they mainly feed on plankton, reef mantas also eat small fish. In Australia, the species has been recorded from south-western Western Australia, around the tropical north to the southern coast of New South Wales.	Unlikely	Manta rays may visit waters within the Development Envelope but are predominantly found further north.
<i>Mobula birostris</i>	Giant manta ray	Marine Migratory	Giant or oceanic manta rays are commonly found in near-shore waters, in coral and rocky reefs, but also in deeper waters singly or in loose aggregations. Although they mainly feed on plankton, mantas also eat small and moderate-sized fishes. Manta rays occur in marine tropical seas worldwide, and occasionally in temperate waters. In Australia, the species has been recorded from south-western Western Australia, around the tropical north to the southern coast of New South Wales.	Unlikely	Manta rays may visit waters within the Development Envelope but are predominantly found in waters further north.
<i>Rhincodon typus</i>	Whale shark	Vulnerable Marine Migratory	Whale sharks occur offshore in tropical and warm temperate seas but are also found inshore and in lagoons of coral atolls. These sharks reach 20 meters in length and are highly migratory, annually returning to the same location. Found singly, or in aggregations numbering more than 100 individuals, whale sharks eat planktonic and nektonic prey, such as small fishes, crustaceans, and squid. In Australia, whale sharks can be found off most states but are most commonly seen in waters off northern Australia.	Unlikely	Whale sharks may visit waters within the Development Envelope but are predominantly found further north.

Sharks and Bony Fish Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Sphyrna lewini</i>	Scalloped hammerhead shark	Conservation Dependent	Scalloped hammerhead sharks are usually found in the top 25 meters of the water column and occur in waters up to 1000 metres deep. This widespread species occurs in coastal tropical and warm temperate waters, often approaching close inshore and entering enclosed bays and estuaries. While permanent resident populations exist, scalloped hammerheads also form large schools of small migrating individuals. In Australia, this species occurs from Geographe Bay, in Western Australia around the tropical north to Sydney in New South Wales, but the species is rarely seen south of the Houtman Abrolhos Islands.	Unlikely	Scalloped hammerhead sharks may visit waters within the Development Envelope but are predominantly found further north.
<i>Thunnus maccoyii</i>	Southern bluefin tuna	Conservation Dependent	Southern bluefin tuna are a highly migratory species found in temperate and cold seas worldwide, with spawning grounds located off the northern coast of Western Australia. This species grows up to 2.45 metres in length and feed on a wide variety of crustaceans, cephalopods, fishes, and other marine animals. Southern bluefin tuna school by size with mature individuals offshore while juveniles are associated with coastal and continental shelf waters. In Australian waters, this species is mainly found in the Great Australian Bight, with the young moving down the Western Australian coast away from the spawning grounds.	Possible	Southern bluefin tuna may travel through the waters within the Development Envelope but are predominantly found further offshore.

Sharks and Bony Fish Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Galaxiella nigrostriata</i>	Blackstriped dwarf galaxias	Endangered	<p>The Blackstriped dwarf galaxias is a small freshwater fish endemic to coastal wetlands in south-west Western Australia. These fish grow to 4.8 cm in length and can survive in the damp bottom sediments of temporary waterways over summer.</p> <p>This species feed on small insects, aquatic insect larvae and micro-crustaceans and breeding is associated with winter rains.</p> <p>Blackstriped dwarf galaxias are found in permanent or ephemeral spring-fed streams, small creeks, ponds and roadside ditches in sandy wetland areas with thick vegetation from Augusta to Albany, and in three remnant populations located near Bunbury, Melaleuca Park (north of Perth) and Lake Chandala (north of Muchea).</p>	Possible	<p>Unlikely to occur as there are no drainage areas, rivers or creeks in the Development Envelope that could support the species.</p> <p>DBCA Database search confirmed the presence of this species 1km outside of the Development Envelope.</p>
<i>Westralunio carteri</i>	Carter's freshwater mussel	Vulnerable	<p>Carter's freshwater mussel is endemic to south-western Australia with a patchy distribution in sandy/muddy sediments. This species is found in greatest densities in woody debris, tree roots and overhanging vegetation in freshwater bodies, although their precise habitat requirements are unknown.</p> <p>This species is restricted to freshwater lakes, reservoirs, rivers and streams within 50-100 km of the coast in south-western Australia from Gingin Brook southward to the Kent, Goodga and Waychinicup Rivers.</p>	Unlikely	<p>Unlikely to occur as there are no drainage areas, rivers or creeks in the Development Envelope that could support the species.</p>

6.6 MNES RESULTS – FLORA

Table 11 - MNES flora species identified from the PMST search for the proposed action

Flora Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Andersonia gracilis</i>	Slender andersonia	Endangered	The slender andersonia is currently found in the Badgingarra, Dandaragan and Kenwick areas on seasonally damp or black sandy clay flats or near swamps. They are often found near heath vegetation with species such as <i>Calothamnus hirsutus</i> , <i>Verticordia densiflora</i> and <i>Kunzea recurve</i> (DEC, 2006). There have been no sightings of this species in the Development Envelope.	Unlikely	The Development Envelope is not within the species main distribution and does not contain habitat suitable for the species.
<i>Austrostipa bronwenae</i>	No Common Name	Endangered	<i>Austrostipa bronwenae</i> is currently known from four populations over a linear distance of 175 km on the Swan Coastal Plain, growing in grey-brown sandy loam or dark brown loam over clay in low-lying winter wet areas. Known to occur in the areas of Kenwick, Bunbury and Kemerton, the species flowers annually between October and November (DPAW, 2017)	Likely	Species identified as being within the Study Area (but not inside the Development Envelope (DBCA Threatened and Priority Flora Database, 2022).
<i>Caladenia huegelii</i>	King spider orchid Grand spider orchid	Endangered	This species is found on the Swan Coastal Plain within 20 km of the coast, from just north of Perth to the Busselton area over 250 km. The spider orchid occurs in small patches of remanent natural vegetation and flower between September – October.	Likely	Species identified as being approximately 1 km outside of the Study Area (but not inside the Development Envelope; DBCA Threatened and Priority Flora Database, 2022).
<i>Caladenia procera</i>	Carbunup King Spider Orchid	Critically Endangered	<i>Caladenia procera</i> is endemic to a small area in the south-west of Busselton, Western Australia (linear distance < 15 km) with all subpopulations occurring within the Sotuh West Natural Resource Management Region. There has been a disjunct occurrence identified near Kemerton. <i>Caladenia procera</i> grows in Jarrah, Marri and Peppermint Woodlands on alluvial sandy-clay loam flats (Hopper and Brown, 2001).	Likely	Species identified as being within the Study Area (but not inside the Development Envelope (DBCA Threatened and Priority Flora Database, 2022).

Flora Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Diuris drummondii</i>	Tall Donkey Orchid	Vulnerable	There are 12 known populations of <i>Diuris drummondii</i> occurring between Perth and Walpole, Western Australia. They are found on low-lying depressions in peaty and sandy clay swamps. These orchids are frequently observed standing in several centimetres of water, even during summer flowering periods, Tall Donkey Orchids flower from October to mid-January (Marchant, Brown and Thomson-Dans, 1998).	Known	Species identified as being within the Development Envelope (DBCA Threatened and Priority Flora Database, 2022).
<i>Diuris micrantha</i>	Dwarf Bee Orchid	Vulnerable	<i>Diuris micrantha</i> has seven known populations, the range extends from east of Kwinana to south of Frankland, Western Australia. It is found on dark, grey to blackish sandy clay-loam substrates in winter-wet depressions or swamps. The bases are often covered in shallow water (Marchant, Brown and Thomson-Dans, 1998)	Unlikely	The Development Envelope is not within the species main distribution and does not contain habitat suitable for the species.
<i>Diuris purdiei</i>	Purdies' Donley Orchid	Endangered	<i>Diuris purdiei</i> has a known range from south of Perth to the Whicher Range, within the Swan (Western Australia) Natural Resource Management Region. It is found of sand to sandy clay soils, in areas subject to winter inundation amongst native sedges (Marchant, Brown and Thomson-Dans, 1998).	Unlikely	The Development Envelope is not within the species main distribution and does not contain habitat suitable for the species.
<i>Drakaea elastica</i>	Glossy Leafed Hammer Orchid Warty Hammer Orchid	Endangered	<i>Drakaea elastica</i> is a species of orchid endemic to the WA with a range between Cataby to Busselton. They grow on bare patches of sand alongside winter-wet swamps, typically in Banksia woodlands or spearwood thicket vegetation. They flower September to November (Florabase, 2022)	Known	Threatened Flora Database identified then as being within the Development Envelope.

Flora Species Name	Common Name	EPBC Act Listing Status	Habitat Description and Distribution	Likelihood of Occurrence	Likelihood Justification
<i>Drakaea micrantha</i>	Dwarf Hammer Orchid	Vulnerable	There are 32 known small, scattered populations of <i>Drakaea micrantha</i> in a range from Perth to Albany, Western Australia. The Dwarf Hammer Orchid is usually found on cleared firebreaks or in open sandy patches, typically on infertile grey sands and in Jarrah and Commons Sheok woodlands. Dwarf Hammer Orchids flower from September to October (Marchant et al., 1998).	Known	Threatened Flora Database identified then as being within the Development Envelope.
<i>Synaphea sp. Fairbridge Farm</i>	Selena's Synaphea	Critically Endangered	<i>Synaphea sp. Fairbridge Farm</i> occurs within the Swan Coastal Plain (North Dandalup, Serpentine and Pinjarra). They prefer sandy or sandy clay soils and winter-wet flats. They flower in October (Florabase, 2022). There have been no sightings of this species in the Development Envelope.	Unlikely	The Development Envelope is not within the species main distribution and does not contain habitat suitable for the species.
<i>Synaphea sp. Serpentine</i>	Serpentine Synaphea	Critically Endangered	<i>Synaphea sp. Serpentine</i> occurs over a narrow geographic range from west of Byford to south of Serpentine, growing predominantly in grey-brown sandy-loam or clay in seasonally wet areas (DPAW, 2017). There have been no sightings of this species in the Development Envelope.	Unlikely	The Development Envelope is not within the species main distribution and does not contain habitat suitable for the species.
<i>Synaphea stenoloba</i>	Dwellingup Synaphea	Endangered	<i>Synaphea stenoloba</i> occurs within the Swan Coastal Plain (North Dandalup, Serpentine and Pinjarra). They prefer sandy or sandy clay soils and winter-wet flats. They flower August to October (Florabase, 2022). There have been no sightings of this species in the Development Envelope.	Unlikely	The Development Envelope is not within the species main distribution and does not contain habitat suitable for the species.

6.7 “OTHER MATTERS” RESULTS

Table 12 - “Other Matters” identified from the PMST search for the proposed action

Species Name	Common Name	EPBC Act Listing Status	Likelihood of Occurrence	Likelihood Justification
Birds				
<i>Bulbulcus ibis</i>	Cattle Egret	Marine – other	Unlikely	This species is predominantly found in the north-east of Western Australia and Northern Territory. This species inhabits grasslands and wetlands. There have been no recorded observations of this species occurring within the Development Envelope, with infrequent sightings in Bunbury, Western Australia
<i>Charadrius ruficapillus</i>	Red-capped plover	Marine – other	Possible	Species has a widespread distribution across Australian coastlines/inland. Unlikely to interact with the coastal component of the Development Envelope but may occur within the vicinity of the Onshore Envelope.
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Marine - other	Possible	Species occurs across most coastal and near-coastal areas in Australia. Therefore, may occur within the vicinity of the Development Envelope.
<i>Himantopus himantopus</i>	Pied Stilt	Marine – other	Unlikely	Species has a widespread distribution across Australian coastlines/inland. Unlikely to interact with the marine component of the Development Envelope but may occur within the vicinity of the Onshore Envelope.
<i>Larus pacificus</i>	Pacific Gull	Marine – other	Unlikely	Species is found widely distributed across Australian coastlines, predominantly along the southern coast. There are no recorded observations of this species within proximity of the Development Envelope.
<i>Merops ornatus</i>	Rainbow Bee-eater	Marine – other	Possible	Species has a widespread distribution across Australian coastlines/inland. Unlikely to interact with the marine component of the Development Envelope but may occur within the vicinity of the Onshore Envelope.

Species Name	Common Name	EPBC Act Listing Status	Likelihood of Occurrence	Likelihood Justification
<i>Onychoprion fuscatus</i>	Sooty Tern	Marine - other	Possible	There is a nominated BIA for Sooty Terns occurring within the Development Envelope.
<i>Pachyptila turtur</i>	Fairy Prion	Marine – other	Unlikely	Recorded observations of this species in Western Australia are rare, with the majority of sightings occurring in the eastern states. There are no recorded observations of this species within proximity to the Development Envelope
<i>Pterodroma macroptera</i>	Great-winged Petrel	Marine – other	Possible	Species occurrences are broadly distributed across the southern end of Australia. This species is predominantly pelagic, but some records occur across Australian coastlines, may interact with the offshore component of the Development Envelope.
<i>Puffinus assimilis</i>	Little Shearwater	Marine – other	Possibly	There is a nominated BIA for this species within the boundary of the Development Envelope.
<i>Recurvirostra novaehollandiae</i>	Red-necked Avocet	Marine – other	Possible	Species has a widespread distribution across Australian coastlines/inland. Unlikely to interact with the marine component of the Development Envelope but may occur within the vicinity of the Onshore Envelope.
<i>Stercorarius skua</i>	Great Skua	Marine – other	Unlikely	Records in Australia are rare and are predominantly concentrated to the eastern coast of Australia.
<i>Thinornis cucullatus</i>	Hooded Dotterel	Marine – other	Possible	Species observations are distributed across sandy, coastal habitats across Australia but are rare. Species may interact with the Development Envelope.
Mammals				
<i>Arctocephalus forsteri</i>	Long-nosed Fur-seal	Marine – other	Likely	Infrequent observations of this species have been recorded as occurring within the vicinity of Geographe Bay (south of the Development Envelope)

Species Name	Common Name	EPBC Act Listing Status	Likelihood of Occurrence	Likelihood Justification
<i>Balaenoptera acutorostrata</i>	Minke Whale	Cetacean	Possible	This species is more commonly observed in waters in the eastern states of Australia but there are infrequent sightings in the south-west of Western Australia. This species may interact with the offshore component of the Development Envelope.
<i>Delphinus delphis</i>	Common Dolphin	Cetacean	Possible	Species is more commonly observed in waters in the eastern states of Australia but there are some infrequent records occurring in south-west, Western Australia.
<i>Feresa attenuata</i>	Pygmy killer whale	Cetacean	Unlikely	Distribution of this species in Australia is poorly documented and almost exclusively based upon stranding events, there has been one stranding event of this species recorded in Western Australia. The known preferred habitat of this species does not occur within proximity to the Development Envelope, as they typically inhabit warmer, tropical waters.
<i>Globicephala macrorhynchus</i>	Short-finned Whale Pilot	Cetacean	Unlikely	Distribution of this species is poorly understood and predominantly based upon historical stranding events, there have been several stranding events in Western Australia. (most recently Hamelin Bay in 2018), Both Pilot Whale species are nearly impossible to distinguish at sea, therefore species are tentatively assigned based upon location. Studies conducted outside of Australia have observed short-finned pilot whales inhabiting waters between 600 - 1000m deep. There have been no recorded sightings of this species within proximity to the Development Envelope.
<i>Globicephala melas</i>	Long-finned Pilot Whale	Cetacean	Possible	This species has infrequent sightings, with the majority of observations occurring off the southern coast of Australia. In Western Australia, there have been 6 recorded stranding events for this species (the largest mass stranding event of any whale species in Western Australia was 320 long-finned whales in Dunsborough 1996, ~70 km from Development Envelope). There have been no recorded sightings of this species within the Development Envelope but stranding events have occurred in relative proximity.
<i>Grampus griseus</i>	Risso's Dolphin	Cetacean	Possible	Species has been observed in waters in all states of Australia but are more common in the eastern states of Australia.

Species Name	Common Name	EPBC Act Listing Status	Likelihood of Occurrence	Likelihood Justification
<i>Kogia breviceps</i>	Pygmy Sperm Whale	Cetacean	Unlikely	Distribution of this species in Australia is poorly understood and based upon predominantly stranding events or sightings of deceased individuals. A stranding event has occurred in every Australian state except the Northern Territory. In Western Australia, sightings are limited to rare individuals. Studies done outside Australia have found this species typically inhabits waters between 400 – 600 m in depth. There have been no recorded sightings of this species within proximity to the Development Envelope.
<i>Kogia sima</i>	Dwarf Sperm Whale	Cetacean	Unlikely	Distribution of this species in Australia is poorly understood, most records based on stranding events and sightings of deceased individuals. This species is predominantly oceanic species but known to approach coasts more frequently than Pygmy Sperm Whales. Mostly inhabit waters > 200 m in depth. There have been no recorded sightings of this species in proximity to the Development Envelope.
<i>Lissodelphis peronii</i>	Southern Right Whale Dolphin	Cetacean	Unlikely	Distribution of this species is poorly understood. Previous studies have shown that they typically inhabit waters >200 m in depth. There have been no recorded sightings of this species in Western Australia.
<i>Mesoplodon bowdoini</i>	Andrew's Beaked Whale	Cetacean	Unlikely	Records of this species in Australia are limited to stranding events and sightings of deceased individuals. One deceased individual washed ashore in Swanbourne, Western Australia (~120 km from the Development Envelope). The depth range for this species is not known but likely inhabit in deep, oceanic waters.
<i>Mesoplodon densirostris</i>	Blainville's Beaked Whale Dense-beaked Whale	Cetacean	Unlikely	Records of this species in Australia are based upon stranding events, there has been one recorded stranding event in Western Australia. This species likely inhabits waters >500 m deep.
<i>Mesoplodon grayi</i>	Gray's Beaked Whale Scamperdown Whale	Cetacean	Possible	Distribution of this species in Australia is poorly understood, however this species is the second most commonly stranded whale in Australia. There have been several stranding events of this species in relatively nearby areas (Busselton and Dunsborough, ~60 and ~70 km from the Development Envelope, respectively).

Species Name	Common Name	EPBC Act Listing Status	Likelihood of Occurrence	Likelihood Justification
<i>Mesoplodon layardii</i>	Strap-toothed Beaked Whale Strap-toothed Whale Layard's Beaked Whale	Cetacean	Unlikely	Distribution of this species is not well known, they are most frequently observed in the southern ocean. The depth range for this species is not known, likely inhabit deep, oceanic waters. Infrequent sightings have occurred in relative proximity to the Development Envelope but these have been rare occurrences
<i>Mesoplodon mirus</i>	True's Beaked Whale	Cetacean	Unlikely	Records of this species in Australia are based upon minimal stranding events, there has been two recorded stranding event in Western Australia. This species likely inhabits waters >500 m deep.
<i>Peponocephala electra</i>	Melon-headed Whale	Cetacean	Unlikely	This species has had infrequent sightings in Western Australia. They typically inhabit warm, equatorial waters. They mostly forage in waters between 200 – 400 m in depth but have been observed in much shallower waters around oceanic islands. There have been no recorded sightings in proximity to the Development Envelope.
<i>Pseudorca crassidens</i>	False Killer Whale	Cetacean	Likely	Species has been observed in waters in all states of Australia. False Killer Whales are likely to occur within the vicinity of the Development Envelope.
<i>Stenella attenuata</i>	Spotted Dolphin	Cetacean	Unlikely	Species is most observed in northern Australia with some sightings in waters in the eastern states of Australia. Only record of Spotted Dolphins in the south-west of Western Australia was from a stranding event in 2002.
<i>Stenella coeruleoalba</i>	Striped Dolphin Euphrosyne Dolphin	Cetacean	Unlikely	There have been infrequent sightings of this species in Western Australia, with one individual observed in Augusta. Most are observed in warm waters, and often travel at depths > 1000 m
<i>Stenella longirostris</i>	Long-snouted Spinner Dolphin	Cetacean	Possible	There are several observations of this species in Western Australia recorded as far south as Bunbury. Most often they swim at depths ~100 m but are known to have a large depth range, and have been observed in much shallower waters.
<i>Steno bredanensis</i>	Rough-toothed Dolphin	Cetacean	Unlikely	Recorded observations of this species in Australia occur from Barrow Island, Western Australia to southern New South Wales. There have

Species Name	Common Name	EPBC Act Listing Status	Likelihood of Occurrence	Likelihood Justification
				been no recorded sightings within proximity to the Development Envelope.
<i>Tursiops aduncus</i>	Indian Ocean Bottlenose Dolphin	Cetacean	Likely	Species has been observed in waters in all states of Australia. Indian Ocean Bottlenose Dolphin are likely to occur within the vicinity of the Development Envelope.
<i>Tursiops truncatus s. str.</i>	Bottlenose Dolphin	Cetacean	Likely	Species has been observed in waters in all states of Australia. Bottlenose Dolphin are likely to occur within the vicinity of the Development Envelope.
<i>Ziphius cavirostris</i>	Cuvier's Beaked Whale Goose-beaked Whale	Cetacean	Unlikely	Distribution of this species is poorly understood and mostly based upon stranding events. There have been several stranding events of this species in Western Australia. They are widely distributed from sub-polar waters to tropical, typically swimming at 1000 m depth. There are no recorded sightings in proximity to the Development Envelope.
Marine Reptiles				
<i>Disteira kingii</i>	Spectacled Seasnake	Marine – other	Unlikely	Species records are concentrated to the northern coasts of Australia.
Fish (Seahorse)				
<i>Acentronura austral</i>	Shortpouch Pygmy Pipehorse	Marine – other	Possible	Given the broad spatial coverage of the Development Envelope, variety of benthic habitats and depth profiles, it is reasonable to assume this species could occur within the Development Envelope.
<i>Campichthys galei</i>	Gale's Pipefish	Marine – other	Possible	Given the broad spatial coverage of the Development Envelope, variety of benthic habitats and depth profiles, it is reasonable to assume this species could occur within the Development Envelope.
<i>Heraldia nocturna</i>	Upside-down Pipefish	Marine – other	Possible	Given the broad spatial coverage of the Development Envelope, variety of benthic habitats and depth profiles, it is reasonable to assume this species could occur within the Development Envelope.

Species Name	Common Name	EPBC Act Listing Status	Likelihood of Occurrence	Likelihood Justification
<i>Hippocampus angustus</i>	Western Spiny Seahorse	Marine – other	Possible	Given the broad spatial coverage of the Development Envelope, variety of benthic habitats and depth profiles, it is reasonable to assume this species could occur within the Development Envelope.
<i>Hippocampus breviceps</i>	Shorthead Seahorse	Marine – other	Possible	Given the broad spatial coverage of the Development Envelope, variety of benthic habitats and depth profiles, it is reasonable to assume this species could occur within the Development Envelope.
<i>Hippocampus subelongatus</i>	West Australian Seahorse	Marine – other	Possible	Given the broad spatial coverage of the Development Envelope, variety of benthic habitats and depth profiles, it is reasonable to assume this species could occur within the Development Envelope.
<i>Histiogamphelus cristatus</i>	Rhino Pipefish	Marine – other	Possible	Given the broad spatial coverage of the Development Envelope, variety of benthic habitats and depth profiles, it is reasonable to assume this species could occur within the Development Envelope.
<i>Lissocampus caudalis</i>	Smooth Pipefish	Marine – other	Possible	Given the broad spatial coverage of the Development Envelope, variety of benthic habitats and depth profiles, it is reasonable to assume this species could occur within the Development Envelope.
<i>Lissocampus fatiloquus</i>	Prophets Pipefish	Marine – other	Possible	Given the broad spatial coverage of the Development Envelope, variety of benthic habitats and depth profiles, it is reasonable to assume this species could occur within the Development Envelope.
<i>Lissocampus runa</i>	Javelin Pipefish	Marine – other	Possible	Given the broad spatial coverage of the Development Envelope, variety of benthic habitats and depth profiles, it is reasonable to assume this species could occur within the Development Envelope.
<i>Maroubra perserrata</i>	Sawtooth Pipefish	Marine – other	Possible	Given the broad spatial coverage of the Development Envelope, variety of benthic habitats and depth profiles, it is reasonable to assume this species could occur within the Development Envelope.
<i>Mitotichthys meraculus</i>	Western Crested Pipefish	Marine – other	Possible	Given the broad spatial coverage of the Development Envelope, variety of benthic habitats and depth profiles, it is reasonable to assume this species could occur within the Development Envelope.

Species Name	Common Name	EPBC Act Listing Status	Likelihood of Occurrence	Likelihood Justification
<i>Nannocampus subosseus</i>	Bonyhead Pipefish	Marine – other	Possible	Given the broad spatial coverage of the Development Envelope, variety of benthic habitats and depth profiles, it is reasonable to assume this species could occur within the Development Envelope.
<i>Phycodurus eques</i>	Leafy Seadragon	Marine – other	Possible	Given the broad spatial coverage of the Development Envelope, variety of benthic habitats and depth profiles, it is reasonable to assume this species could occur within the Development Envelope.
<i>Phyllopteryx taeniolatus</i>	Common Seadragon	Marine – other	Possible	Given the broad spatial coverage of the Development Envelope, variety of benthic habitats and depth profiles, it is reasonable to assume this species could occur within the Development Envelope.
<i>Pugnaso curtirostris</i>	Pugnose Pipefish	Marine – other	Possible	Given the broad spatial coverage of the Development Envelope, variety of benthic habitats and depth profiles, it is reasonable to assume this species could occur within the Development Envelope.
<i>Solegnathus lettiensis</i>	Gunther's Pipefish	Marine – other	Possible	Given the broad spatial coverage of the Development Envelope, variety of benthic habitats and depth profiles, it is reasonable to assume this species could occur within the Development Envelope.
<i>Stigmatopora argus</i>	Spotted Pipefish	Marine – other	Possible	Given the broad spatial coverage of the Development Envelope, variety of benthic habitats and depth profiles, it is reasonable to assume this species could occur within the Development Envelope.
<i>Stigmatopora nigra</i>	Widebody Pipefish	Marine – other	Possible	Given the broad spatial coverage of the Development Envelope, variety of benthic habitats and depth profiles, it is reasonable to assume this species could occur within the Development Envelope.
<i>Urocampus carinirostris</i>	Hairy Pipefish	Marine – other	Possible	Given the broad spatial coverage of the Development Envelope, variety of benthic habitats and depth profiles, it is reasonable to assume this species could occur within the Development Envelope.
<i>Vanacampus margaritifer</i>	Mother-of-pearl Pipefish	Marine – other	Possible	Given the broad spatial coverage of the Development Envelope, variety of benthic habitats and depth profiles, it is reasonable to assume this species could occur within the Development Envelope.

Species Name	Common Name	EPBC Act Listing Status	Likelihood of Occurrence	Likelihood Justification
<i>Vanacampus phillipi</i>	Port Phillip Pipefish	Marine – other	Possible	Given the broad spatial coverage of the Development Envelope, variety of benthic habitats and depth profiles, it is reasonable to assume this species could occur within the Development Envelope.

7. MNES DISCUSSION

This section provides further details on the MNES that are considered possible, likely or known to occur at the proposed site.

7.1 COMMONWEALTH MARINE AREAS AND AUSTRALIAN MARINE PARKS

The offshore Development Envelope, in which the WTGs and OSS will be installed lies exclusively within Commonwealth marine waters (i.e. >3nm from the coast). The 5 km buffer, which has been used as an environmental study area for the project, intersects the Geographe Marine Park.

7.1.1 THE GEOGRAPHE MARINE PARK

The Geographe Marine Park abuts the southern boundary of the proposed Development Envelope (see Figure 3). The park protects extensive seagrass meadows, which are important nursery habitat for many species including juvenile rock lobsters (CoastWise, 2001).

The Park covers 977 km² and is divided into multiple zones including.

- Habitat Protection Zone (IUCN IV)
- Multiple Use Zone (IUCN VI)
- National Park Zone (IUCN II) and
- Special Purpose Zone (Mining Exclusion) (IUCN VI).

The southern boundary of the Development Envelope borders the Special Purpose Zone (Mining Exclusion; IUCN VI). The type of zone dictates what activities can (and cannot) occur in these areas. Within this zone mining activity and exploration is prohibited, however commercial shipping, recreational fishing and anchoring is allowed.

The proposed action will not involve any activities within the Commonwealth Marine Park.

7.1.2 SOUTH-WEST CORNER MARINE PARK

The South-west Corner Marine Park is situated approximately 25km south-west of the study area. The park protects localised upwellings of nutrient rich waters, that provides feeding opportunities for

western rock lobsters, seabirds, white sharks, Australian sea lions and whale species. The vast majority of this park is zoned Special Purpose Zone (Mining Exclusion) (IUCN VI). A small portion of this park is also zoned National Park Zone (IUCN II). The proposed action will not involve any activities within the Commonwealth Marine Park and given the spatial separation, it is highly unlikely that the proposed action will impact the marine park.

7.1.3 PERTH CANYON MARINE PARK

The Perth Canyon Marine Park is 70km north-west of the study area. The park protects unique feeding sites for blue whales and is biodiversity hotspots. The portion of the park closest to the development envelope is zoned Multiple Use Zone (IUCN VI). The proposed action will not involve any activities within the Commonwealth Marine Park and given the spatial separation, it is highly unlikely that the proposed action will impact the marine park.

7.2 THREATENED ECOLOGICAL COMMUNITIES

Threatened ecological communities (TECs) are groups of naturally occurring native plants and other organisms that interact with the unique habitat that are protected under the *Environmental Protection and Biodiversity Conservation Act 1999*. Ecological communities include woodlands, grasslands, shrublands, forests, wetlands, marine, ground springs and cave communities.

A search of the PMST and the Threatened and Priority Ecological Community search (DBCA) identified four TECs that are likely to occur within the Development Envelope (DBCA, 2022).

- Tuart Woodlands (*Eucalyptus gomphocephala*) and Forests of the Swan Coastal Plain ecological community (Critically Endangered).
- Banksia Woodlands of the Swan Coastal Plain ecological community (Endangered).
- Subtropical and Temperate Coastal Saltmarsh (Vulnerable).
- Clay Pans of the Swan Coastal Plain (Critically Endangered).

Based on the desktop assessment it is highly likely that three of the above TEC occur within the Development Envelope (Tuart Woodlands, Banksia Woodlands and Coastal Saltmarsh). Field surveys will be conducted to identify the location of these TEC and to assess their structure and condition using the key diagnostic criteria and condition threshold relevant to each TEC. These surveys will inform the design of the project, particularly the placement of the onshore infrastructure to ensure that these sensitive areas are avoided (where possible).

The proposed action has the potential to directly impact the TECs through the clearing of vegetation. The scale of the land clearing is proposed to be less than 50 hectares. Where possible the disturbance footprint will be designed to utilise previously disturbed or cleared land and avoid areas of native vegetation. In addition, areas of land that are cleared for the transmission corridor will be revegetated with native vegetation. A desktop land use assessment indicates that a large portion of the Disturbance Envelope is already disturbed/cleared (e.g. KSIA, Binningup Desalination Plant, export cables connecting to Kemerton sub-station, Forrest Hwy), so revegetation works will help to rehabilitate areas of the Development Envelope that have previously been disturbed resulting in positive effect on the local ecosystem. It is envisioned that the risk of clearing to TEC can be successfully mitigated.

Onshore construction activities have the potential to impact the TECs through the introduction of weeds and pathogens. Introduced flora and pathogen can outcompete native vegetation leading to a loss of suitable habitat. Weed control and pathogen control measures will be adopted throughout the life of the project and will be detailed in the project's environmental management plans.

Potential indirect impacts may be experienced due to a reduction in water quality from uncontrolled runoff during construction activities. An assessment of surface and groundwater hydrology will be conducted and will inform the design of the project to mitigate any potential impacts to water quality.

7.2.1 TUART WOODLANDS AND FORESTS

Tuart Woodlands (*Eucalyptus gomphocephala*) and Forests of the Swan Coastal Plain ecological community (Tuart Woodlands and Forrest) is a TEC that is characterised by woodlands, forests where the primary defining feature is the presence of Tuart Trees in the uppermost canopy. The ecological community is generally found along the coast associated with calcareous soil and varies in terms of its structure, height and canopy closure. It can occur in a variety of forms, most commonly open forest, woodland, and open woodland. The Tuart TEC was classified as 'Critically Endangered' under the EPBC Act on 4 July 2019 due to the identification of a significant decline in geographic distribution, a loss of functionally important species and a reduction in community integrity. The Tuart Woodlands and Forrest provide critical habitats to the Western Ringtail Possum and may support the Western Quoll (DAWE, 2017). A Threatened and Priority Ecological Community search (DBCA) showed that this community is present within the Development Envelope (see Figure 13). In addition, a vegetation survey conducted for another project (KSIA) confirmed that Tuart Woodlands and Forrest are found within the Development Envelope (Development WA, 2021).

7.2.2 BANKSIA WOODLANDS

Banksia Woodlands of the Swan Coastal Plain ecological community (Banksia Woodlands) is a TEC that is characterised by a collection of unique plants and animals that are only found together in the Swan Coastal Plain of Western Australia. The Banksia Woodlands were listed as 'Endangered' under the EPBC Act on 16 September 2016, due to a significant decline in the extent of the ecological community. The ecological community typically has a prominent tree layer of Banksia sometimes with scattered eucalyptus and other tree species. The understorey is species rich with many wildflowers, including sclerophyllous shrubs, sedges and herbs. The woodlands provide critical habitats to 20 nationally threatened species (including the Carnaby's and Forest Red-tailed Black Cockatoos, the Western Quoll and the Western Ringtail Possum) as well as many unique wildflower species (DEE, 2016).

A Threatened and Priority Ecological Community search (DBCA) showed that this community is present within the Development Envelope (see Figure 14). In addition, a vegetation survey conducted for another project (KSIA) confirmed that Banksia Woodlands are found within the Development Envelope (Development WA, 2021).

7.2.3 THE COASTAL SALTMARSH

The Subtropical and Temperate Coastal Saltmarsh ecological community is a TEC that occurs within a relatively narrow margin of coastline within the subtropical and temperate climatic zones. The Coastal Saltmarsh TEC was listed as Vulnerable under the EPBC Act on 10 August 2013 as the community has been identified as having a '*small geographic distribution with coupled demonstratable threat*' and has been observed having a '*Rate of continuing detrimental change*' (SEWPAC, 2013). The Coastal Saltmarsh occur on the coast in low energy embayments and has connection with tidal regimes. The Coastal Saltmarsh consists mainly of salt-tolerant vegetation (halophytes) including: grasses, herbs, sedges, rushes and shrubs. The ecological community is inhabited by a wide range of infaunal and epifaunal invertebrates, and low-tide and high-tide visitors such as prawns, fish and birds. It often constitutes important nursery habitat for fish and prawn species (Adam, 2002; Saintilan, 2009). A Threatened and Priority Ecological Community search (DBCA) showed that this community is present within the southern portion of the Development Envelope (see Figure 15).

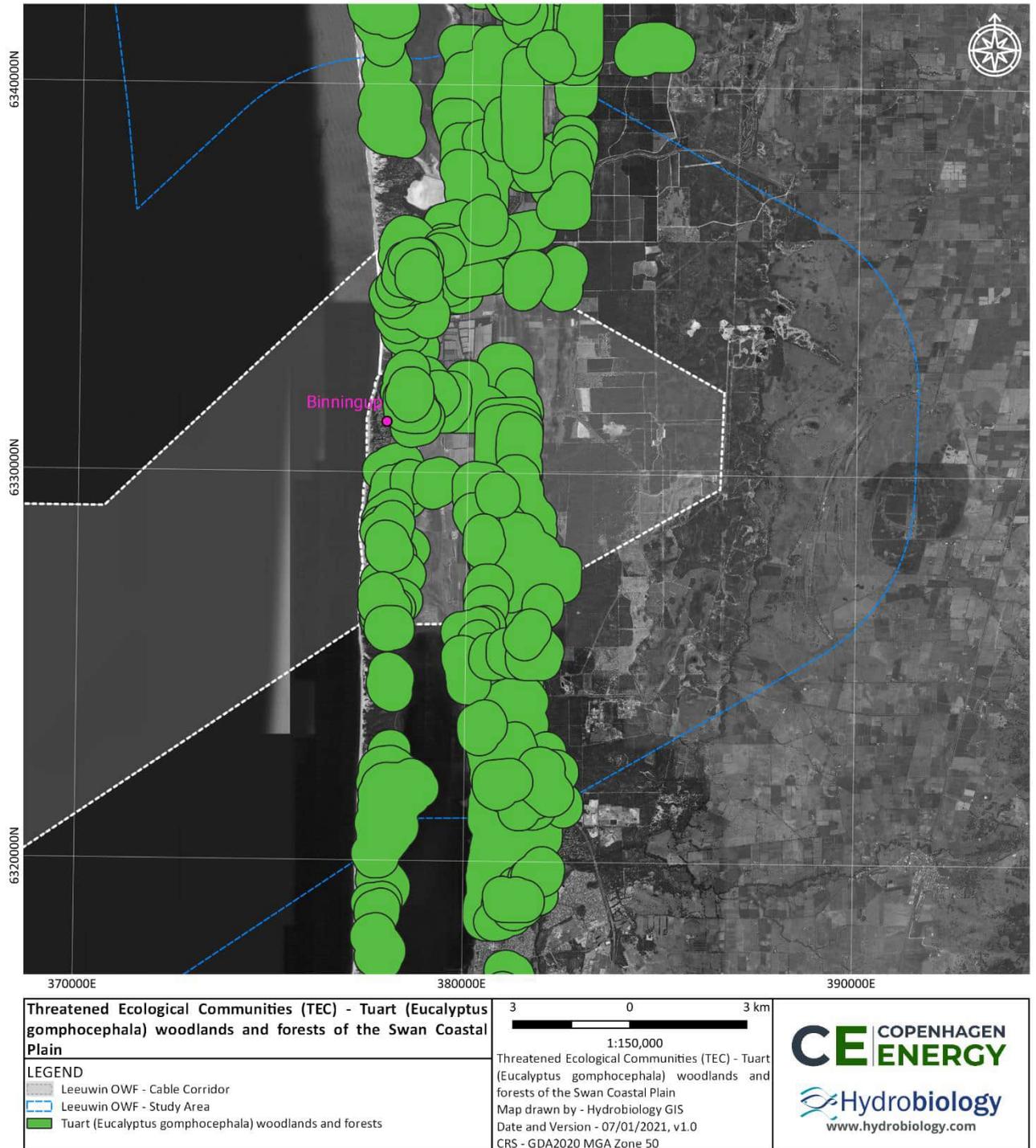


Figure 13 - Tuart Woodlands and Forests of the Swan Coastal Plan ecological community likely to occur within the Development Envelope

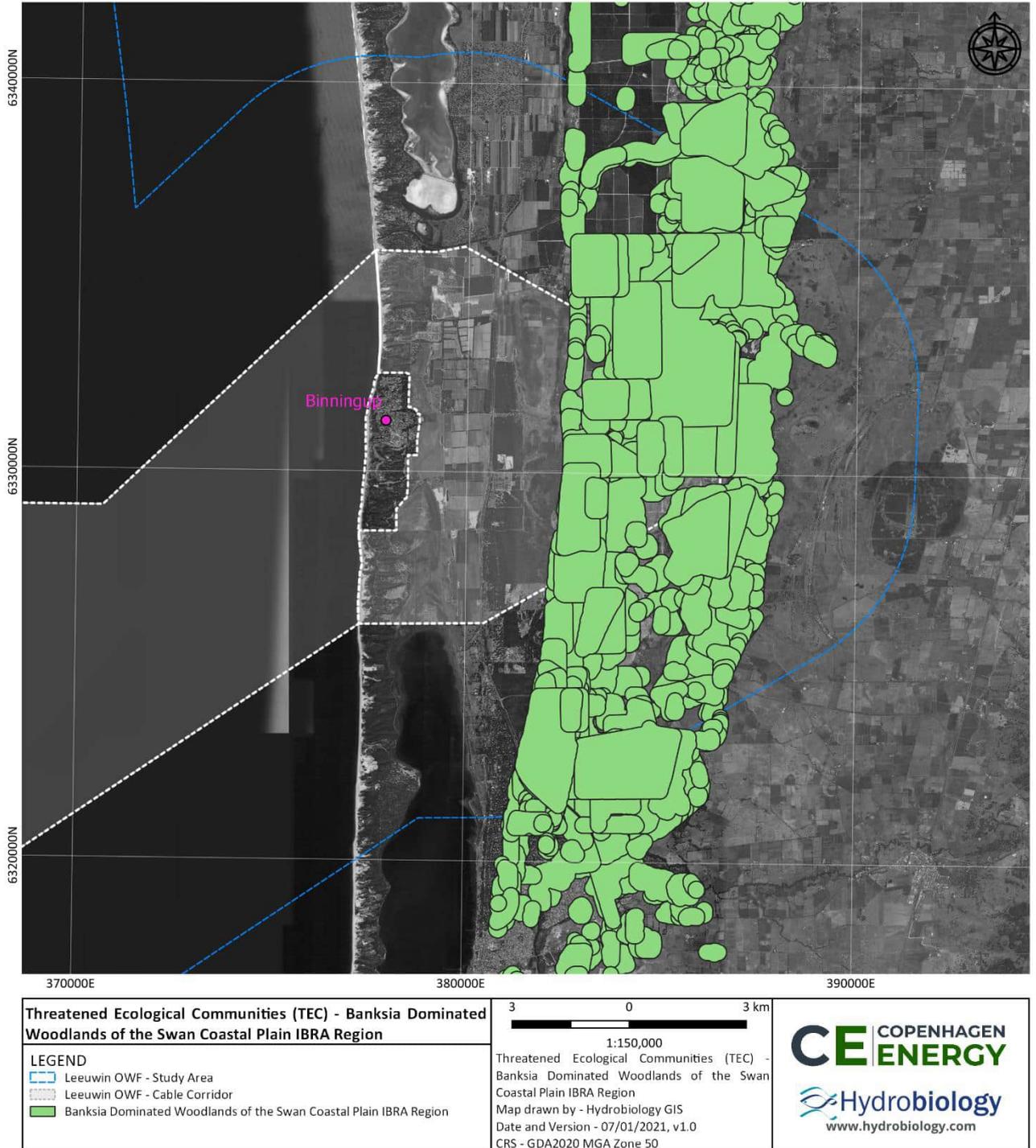


Figure 14 - Banksia Woodlands of the Swan Coastal Plain ecological community likely to occur within the Development Envelope

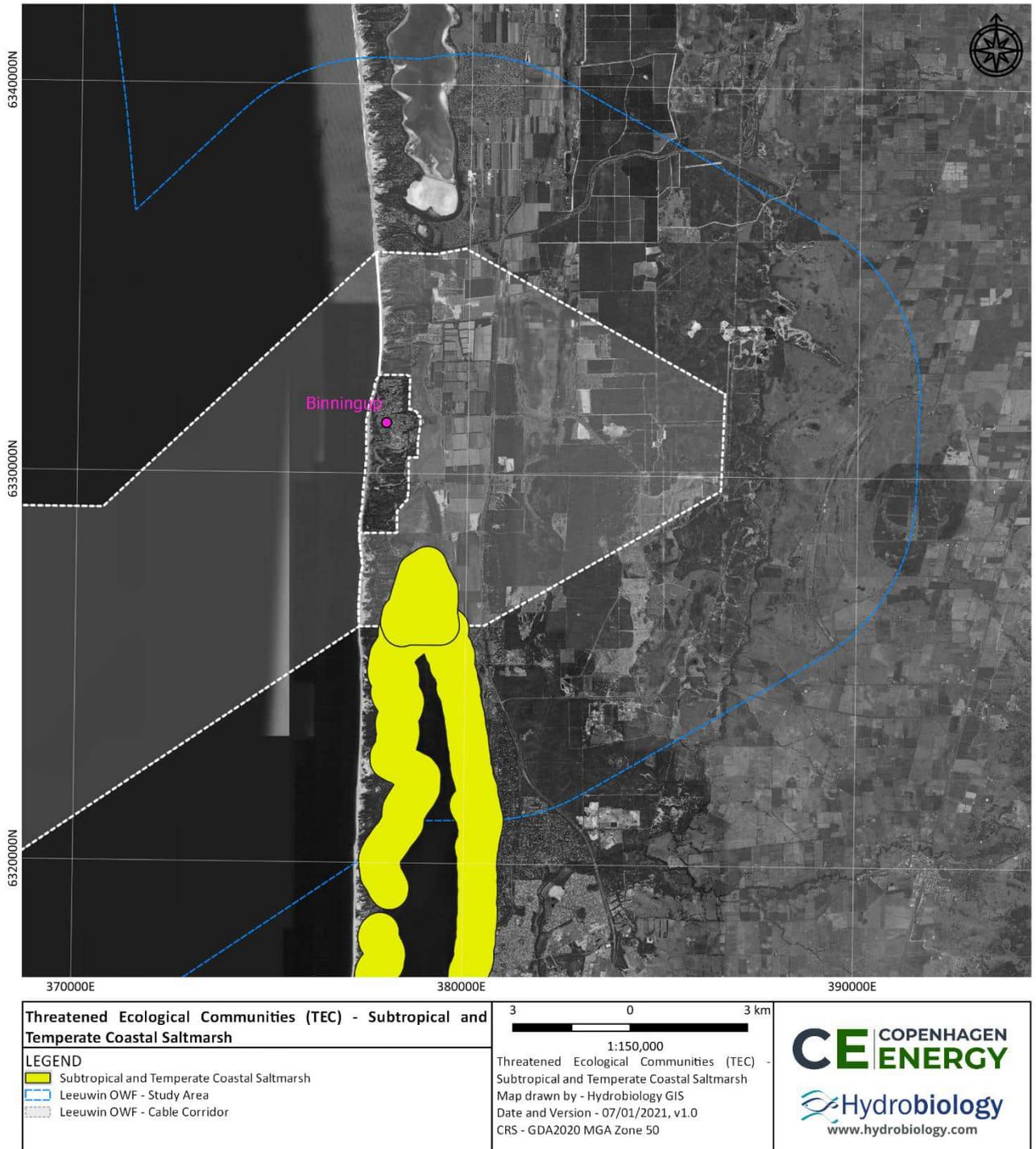


Figure 15 - Subtropical and Temperate Coastal Saltmarsh ecological community likely to occur within the Development Envelope.

7.2.4 CLAY PANS OF THE SWAN COASTAL PLAIN

The Clay Pans of the Swan Coastal Plain TEC occur where clay substrate is low in the landscape and forms an impermeable layer close to the surface (Department of Environment and Energy, 2017). According to the National Recovery Plan for this TEC, the clay pans are comprised of four Western Australian Threatened Ecological Communities, of which two have been identified within the Study Area; Dense shrublands on clay flats and Herb rich shrublands in clay pans). This TEC is listed as Critically

Endangered. The clay pans provide critical habitats to several listed species including the Carnaby's black-cockatoo (endangered) (Department of the Environment, 2022). A Threatened and Priority Ecological Community search (DBCA) showed that this community is present within the project study area, but not within the Development Envelopes (Figure 16), so direct impacts to this TEC are expected to be negligible.

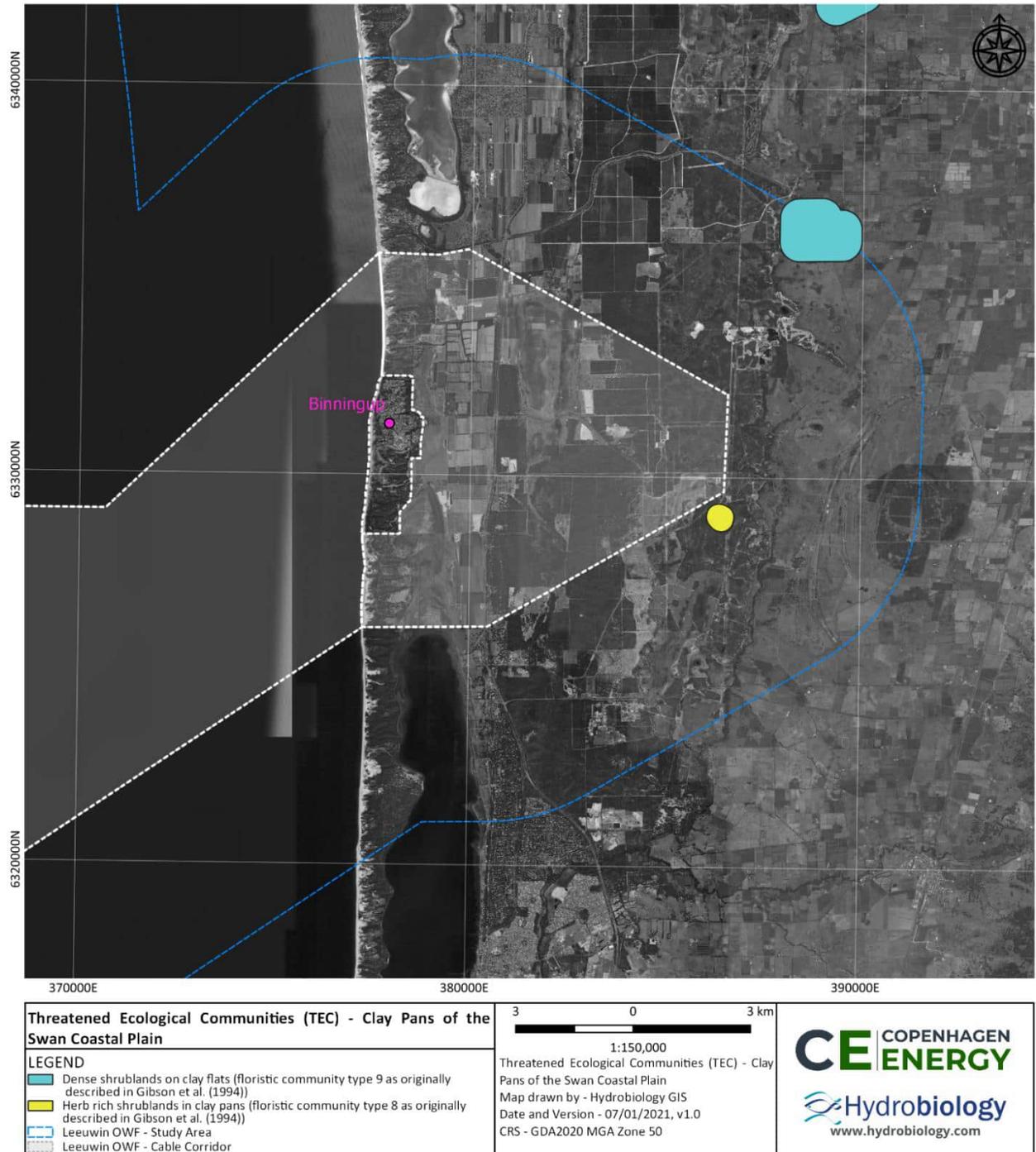


Figure 16 - Clay pans of the Swan Coastal Plain.

7.3 THREATENED FLORA SPECIES

The PMST listed fifteen species of threatened flora as possibly occurring within the Study Area. A more detailed search using the Threatened and Priority Flora Database search (DBCAs) identified that of these twelve species only three species have recorded observations within the Development Envelope. A further four species were found just outside of the Development Envelope but have been included in this assessment to ensure a conservative approach. Figure 17 is a map of the Development Envelope and the likely sightings of these species based on the DBCA database.

Found inside the Development Envelope:

- Tall Donkey Orchid (*Diuris drummondii*) - Vulnerable
- Glossy Leafed/Warty Hammer Orchid (*Drakaea elastica*) - Endangered
- Dwarf Hammer Orchid (*Drakaea micrantha*) - Vulnerable

Found just outside the Development Envelope:

- King Spider/Grand Spider Orchid (*Caladenia huegelii*) - Endangered
- Caribunup King Spider Orchid (*Caladenia procera*) - Critically Endangered
- Dwarf Bee Orchid (*Diuris micrantha*) - Vulnerable
- *Austrostipa bronwenae* - Endangered

Six of the seven species are orchids that are endemic to the south-west of Western Australia. These orchids have been listed as threatened due to the fragmentation of populations and the continuing decline in the extent of occurrence, area of occupancy and the quality of habitat (DEC, 2009). Habitat critical to the survival of these orchids include Banksia Woodlands which provide the necessary habitat to support viable populations of the mycorrhizal fungus and the pollinating wasp species both of which are crucial to the life cycle of the orchid's (DEC, 2009).

Austrostipa bronwenae is a perennial rhizomatous grass that is endemic to the south-west of WA and only found at three sites within the Swan Coastal Plain, one of which is Kemerton (in the close vicinity of the proposed action). This species is ranked as Endangered as it has been reduced to a small area (<500 km²), the population has been severely fragmented due to urban development and there is a continuing decline in the numbers and extent (DPW, 2017). The main threats to these species are land clearing, urban development, road and firebreak maintenance, degraded habitat, weed invasion, roadworks, firebreak maintenance, drought and rising soil salinity.

The proposed action has the potential to directly impact these threatened species through the clearing of vegetation. As discussed in the TEC section, these impacts will be mitigated by designing the footprint to utilise previously cleared lands and to avoid native vegetation. Vegetation surveys will be conducted to map all threatened flora within the Development Envelope and to ascertain their structure and condition. Cleared areas will be revegetated with native vegetation to reduce the risk of habitat fragmentation. It is envisioned that the risk of land clearing to threatened flora can be successfully mitigated.

Onshore construction activities have the potential to impact the threatened flora through the introduction of weeds and pathogens. Introduced flora and pathogen can outcompete native vegetation leading to a loss of suitable habitat. Weed control and pathogen control measures will be adopted throughout the life of the project and will be detailed in the project's environmental management plans.

Potential indirect impacts may be experienced due to a reduction in water quality from uncontrolled runoff during construction activities. An assessment of surface water hydrology will be conducted and will inform the design of the proposed action to mitigate any potential impacts to water quality.

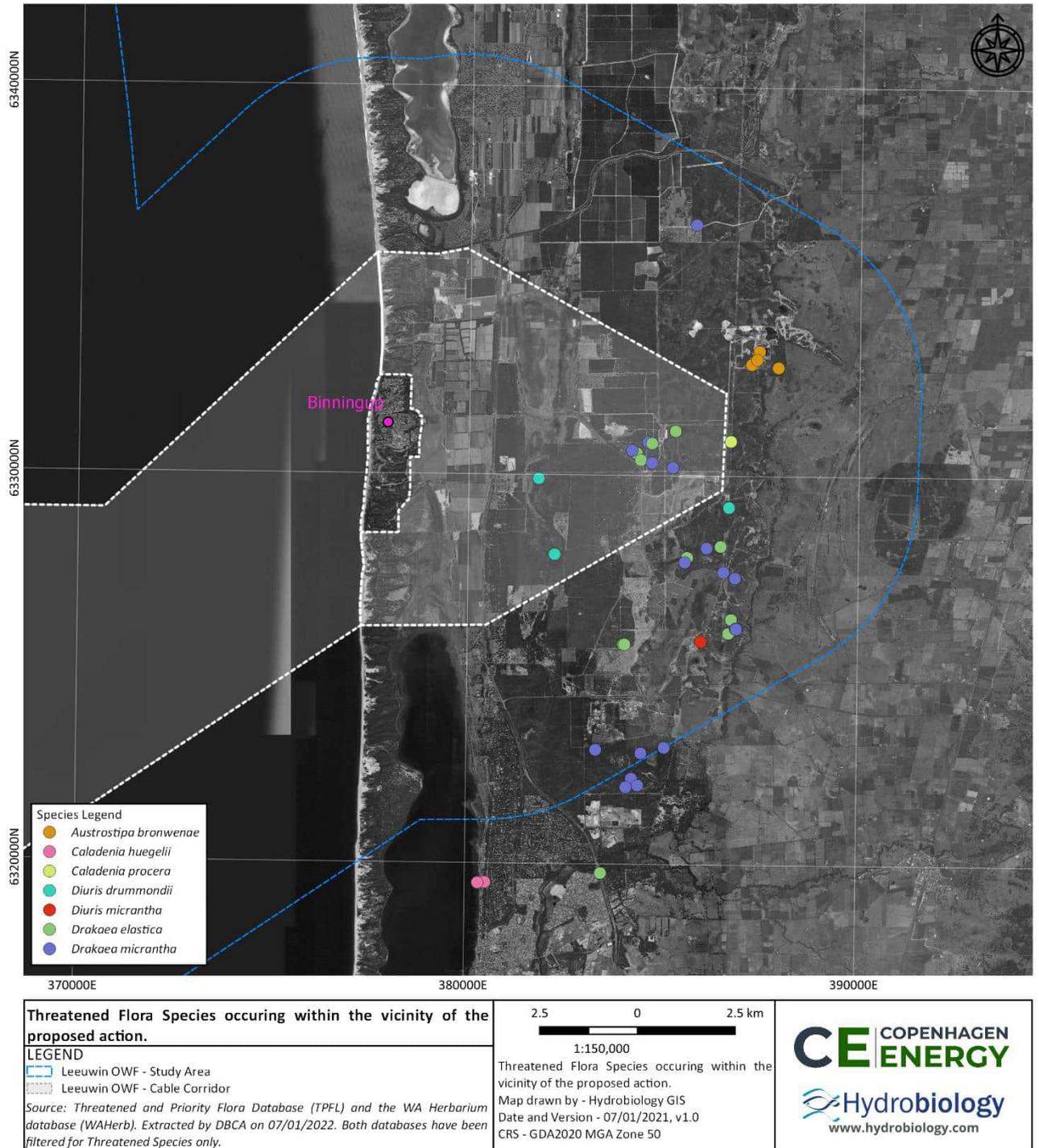


Figure 17 - Threatened flora likely to occur within the Development Envelope

7.4 WETLANDS OF INTERNATIONAL IMPORTANCE

The Development Envelope lies adjacent to the Peel-Yalgorup System Ramsar site (Site ID: 36) which is listed as a Wetland of International Importance under the Ramsar Convention. The system is characterised by shallow estuaries, coastal saline lakes and freshwater marshes with the Peel and Harvey estuaries connecting to the Indian Ocean through various channels. The wetland is large and

includes the Peel Inlet, Harvey Estuary, Lake McLarty, Lake Mealup and ten Yalgorup National Park wetlands.

The wetland is one of the most important areas for birds in the south-west Australia, it supports a diverse range of waterbirds, invertebrates, marine and estuarine fish. Its importance is also due to its large geographical area, high productivity and it is one of the few locations in the world that supports living thrombolites. Thrombolites are clotted-microbial communities that have are approximately 2000 years old and are found in hyposaline waters at Lake Clifton. The Thrombolites of Lake Clifton are classified as a Nationally Threatened Ecological Community and listed as 'Critically Endangered' under the EPBC Act; however, the extent of this ecological community does not intersect with the Development Envelope. The wetland is part of the East-Asian-Australasian Flyway a migratory route used by tens of thousands of birds that fly south from the northern hemisphere to avoid the northern winter. These migratory birds typically arrive in September and inhabit wetlands throughout Australia, including the Peel-Yalgorup Wetland System (PCC, 2019).

The proposed onshore transmission corridor site is over 3 km from the southern edge of the wetland and the offshore infrastructure component will be at least 16 km from the adjacent wetland both of which provide sizeable buffers for any potential impacts from the proposed action.

The onshore construction works may indirectly impact water quality at nearby wetlands and waterways. For example, uncontrolled surface water flows from the project into the wetland could introduce nutrients, acid sulphate soils (ASS) or alter the salinity of the receiving waters. An assessment of the surface and groundwater hydrology will be required to confirm any potential impacts. Additional management measures will include soil testing for ASS and the use of sediment ponds and bunds to control any surface water flows and quality.

The operation of the offshore wind farm has the potential to impact on bird species associated with the Ramsar wetland through collision with turbines or the alteration of flight movements or migration patterns. An alteration in the population of these species could potentially change the ecological character of the wetland. The potential impacts to bird species is covered in more detail in the following section.

7.5 THREATENED BIRD SPECIES

The PMST listed a total of 65 MNES bird species that may occur in the study area. Almost a third of these are migratory wetland species (n = 19), and the remaining are marine/coastal species. Five of the MNES are terrestrial species. A more detailed search using the Threatened and Priority Flora Database search (DBCAs) identified that of these 65 species 16 species have been found within the study area (Figure 18). This figure shows that the vast majority of the birds species congregate in the Peel Yalgorup Wetland System as opposed to the Development Envelope. The following section provide more detail on the species that are found within the project study area along with an assessment of potential impacts.

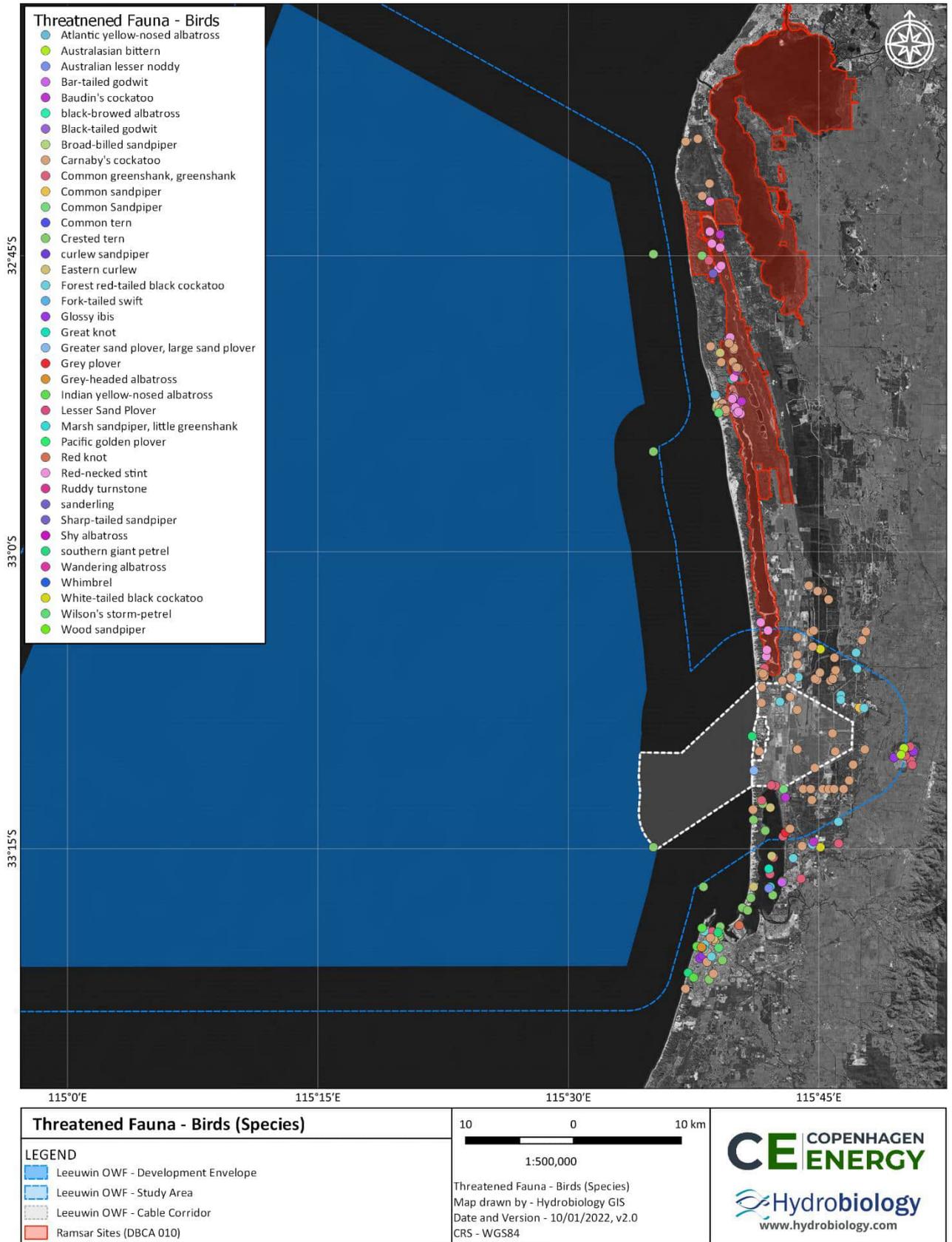


Figure 18 - Threatened bird species in the vicinity of the Development Envelope

The Development Envelope intersects nine BIAs for birds, these are listed below, and maps are provided to show the extent of the BIAs in relation to the Development Envelope. It is important to note that the Threatened and Priority Flora Database search revealed that there have been no recorded sightings of the birds associated with the BIAs in the Development Envelope.

The Development Envelope intersects 12 BIAs for birds:

- Flesh-footed Shearwater (Figure 19)
- Wedge-tailed Shearwater (Figure 20)
- Little Penguin (Figure 21)
- Bridled Tern (Figure 22)
- Sooty Tern (Figure 23)
- White-faced Storm Petrel (Figure 24)
- Soft-plumaged Petrel (Figure 25)
- Little Shearwater (Figure 26)
- Fairy Tern (Figure 27)
- Caspian Tern (Figure 28)
- Pacific Gull (Figure 29)
- Roseate Tern (Figure 30)

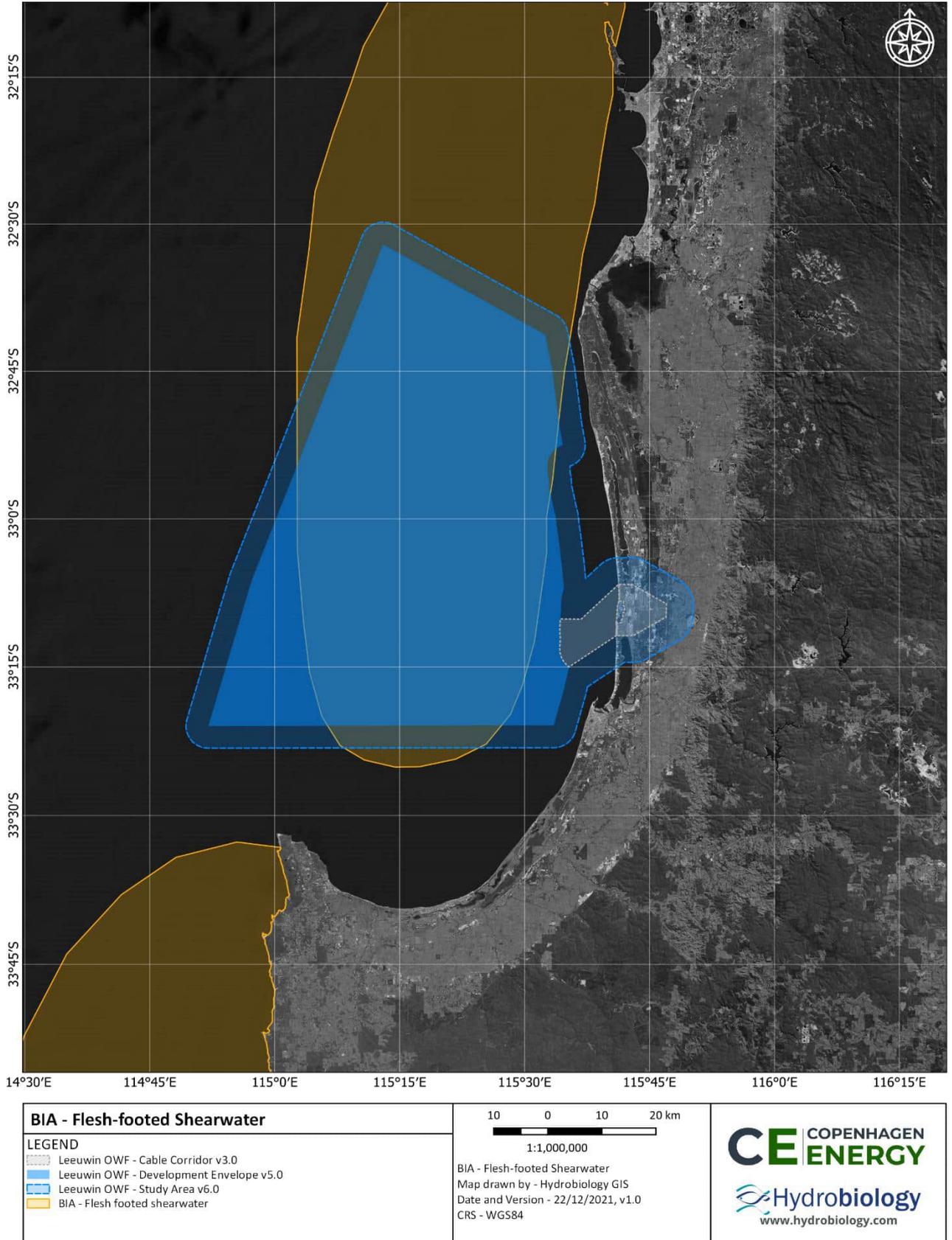


Figure 19 - BIA for the Flesh-footed Shearwater

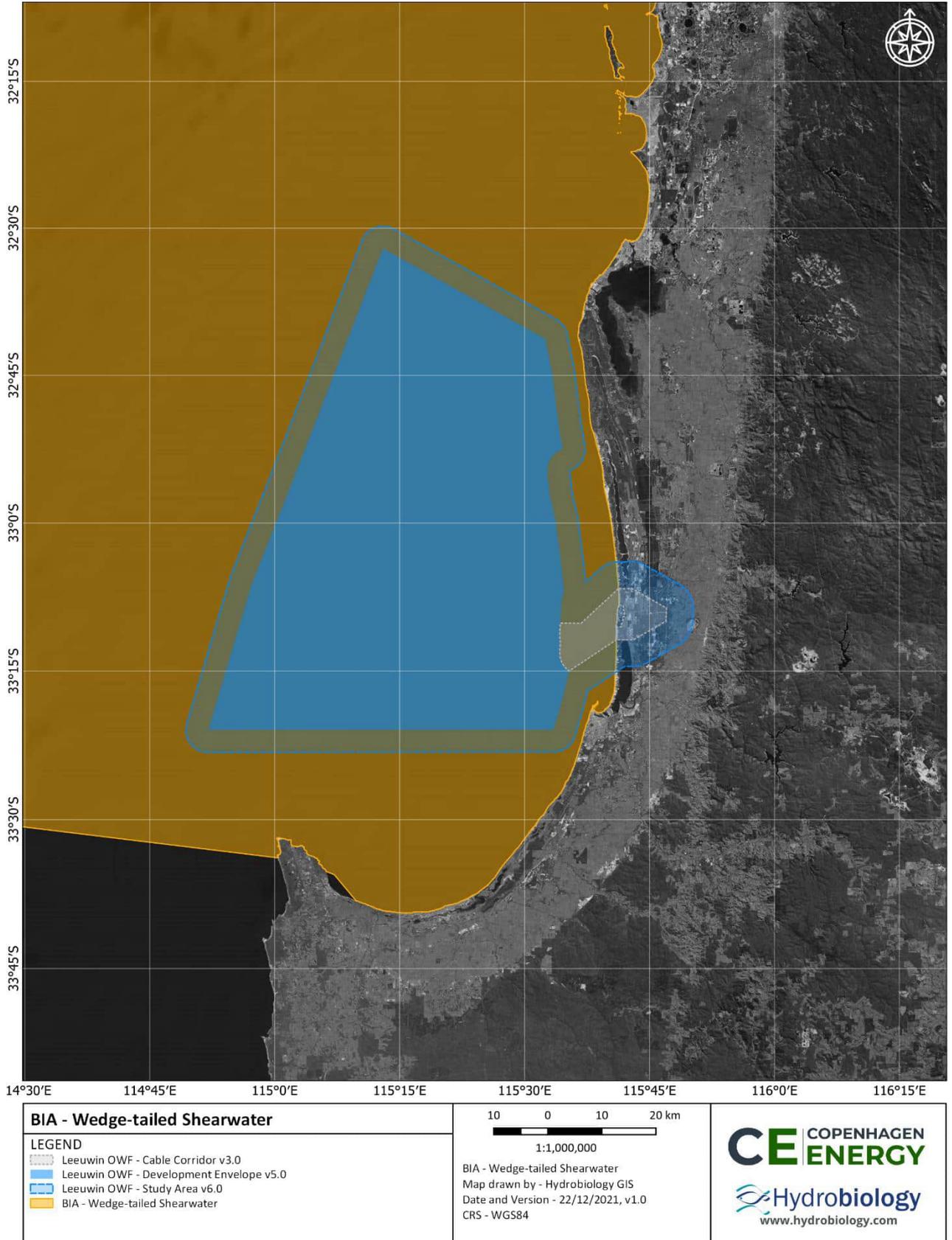


Figure 20 - BIA for the Wedge-tailed Shearwater

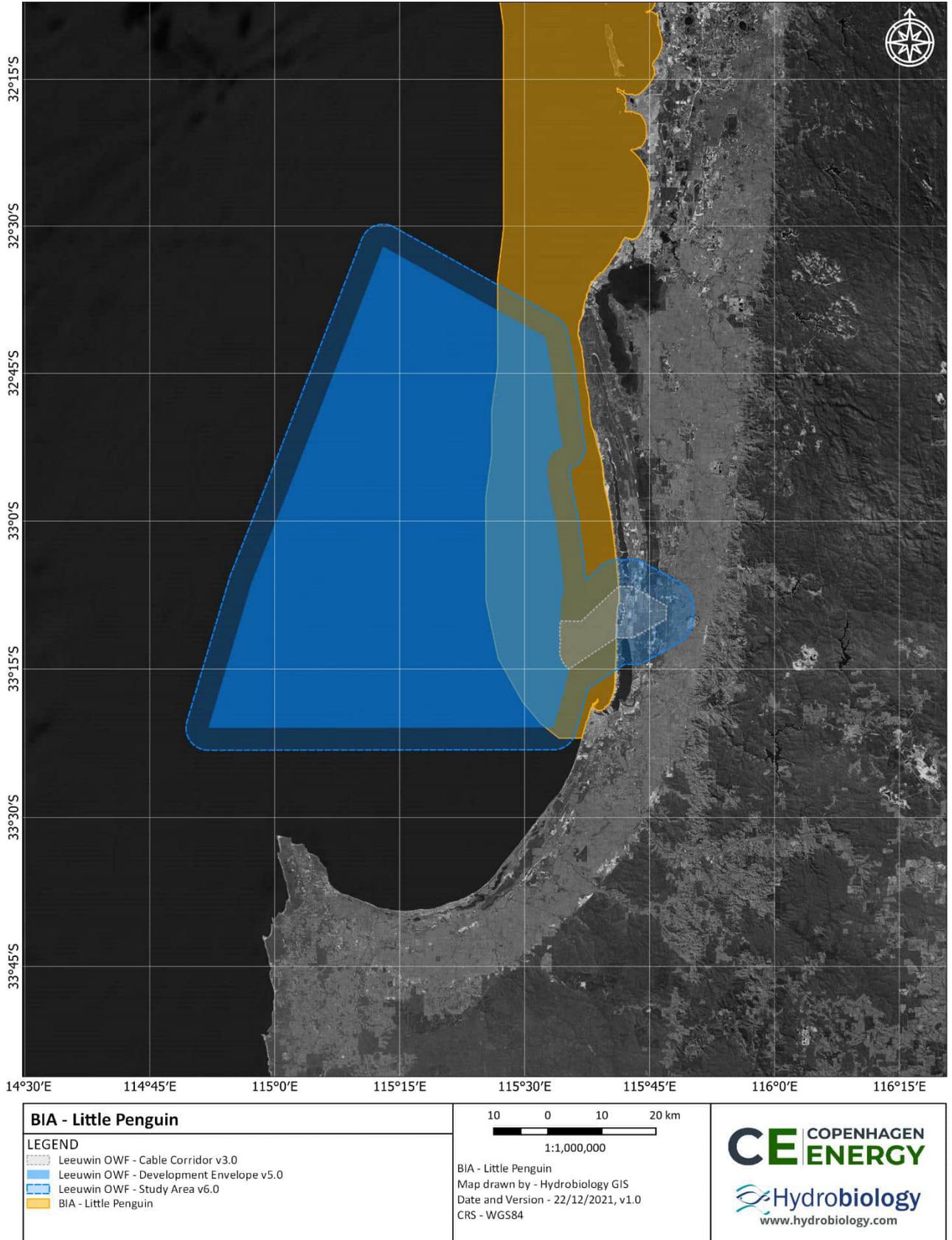


Figure 21 - BIA for the Little Penguin

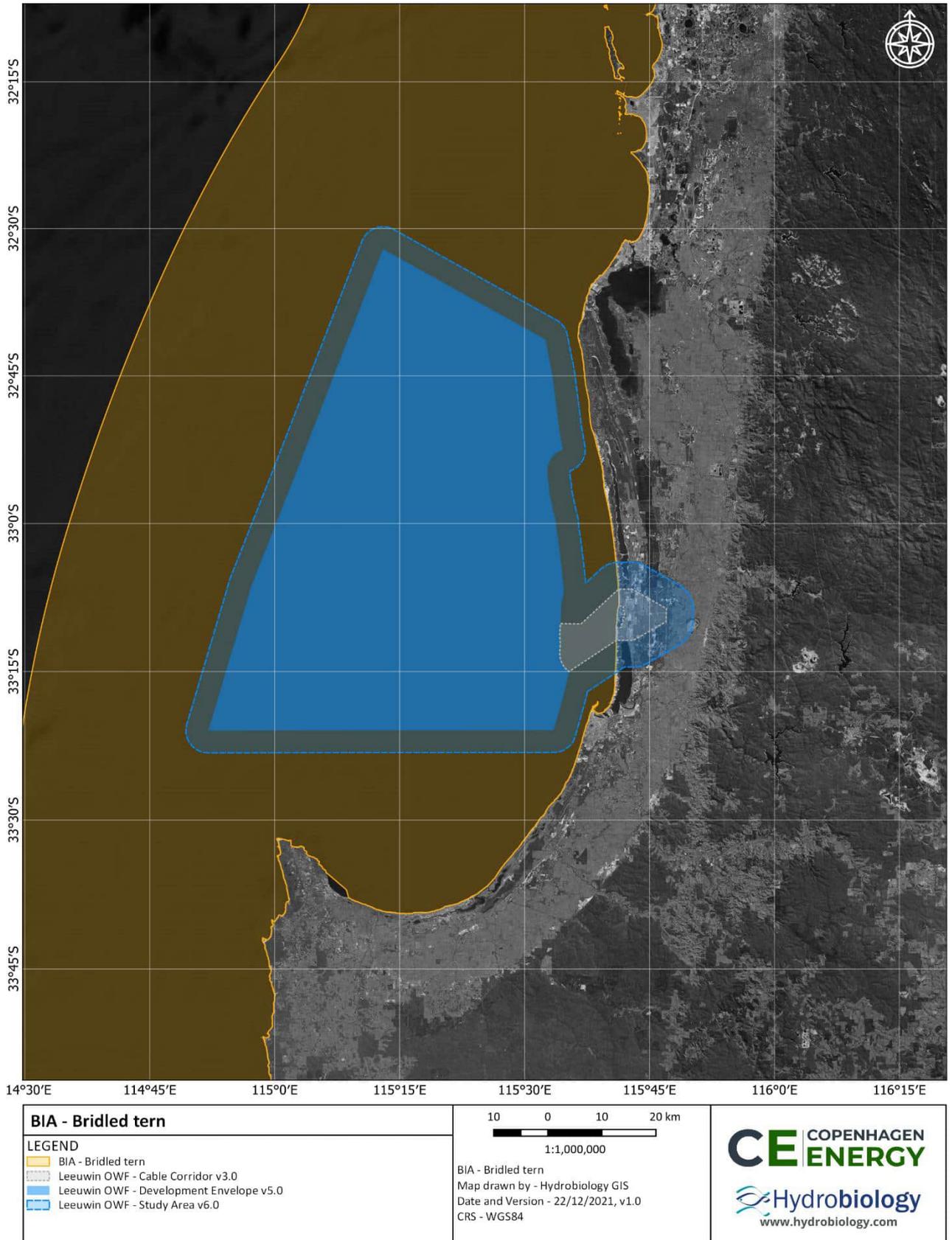


Figure 22 - BIA for the Bridled Tern

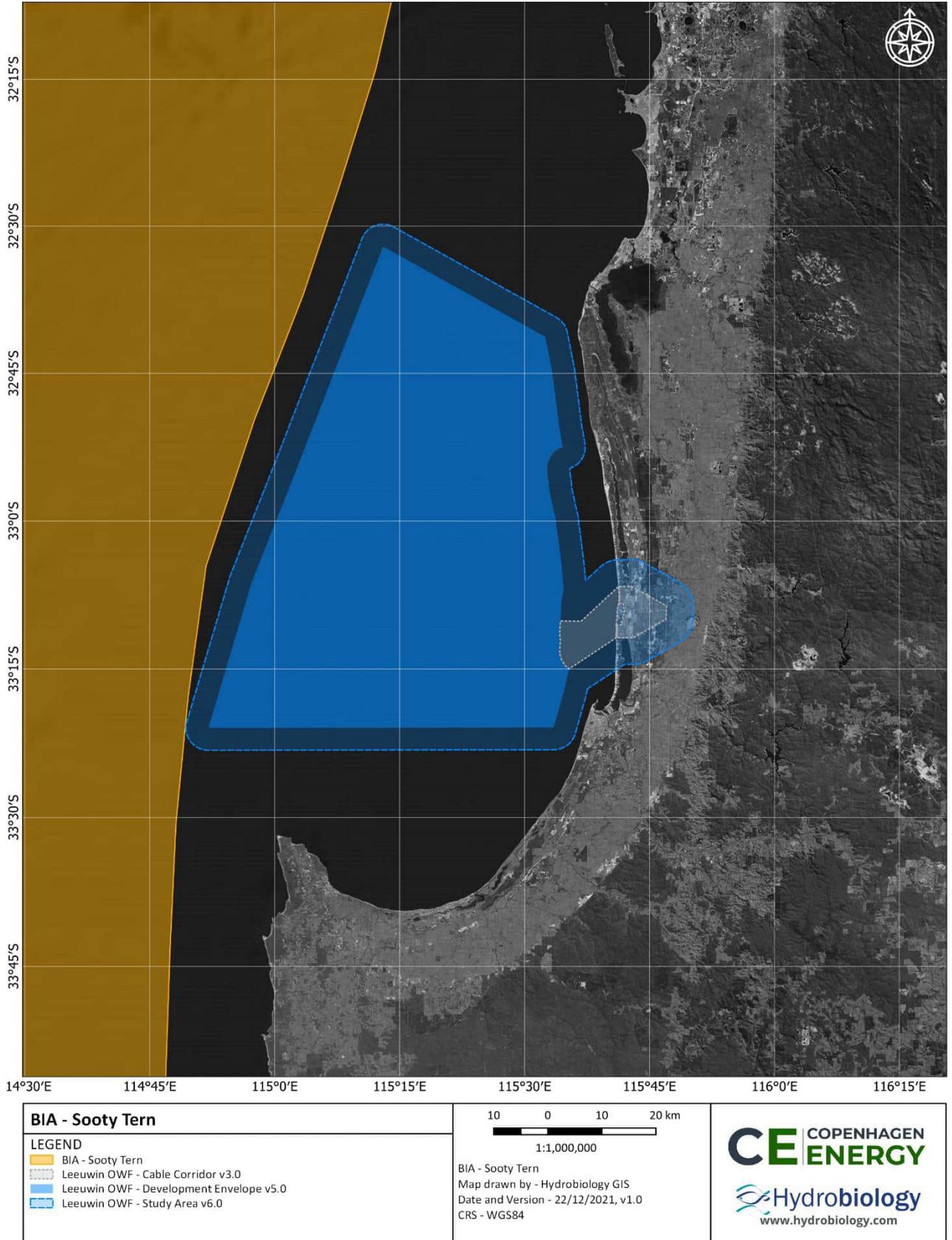


Figure 23 - BIA for the Sooty Tern

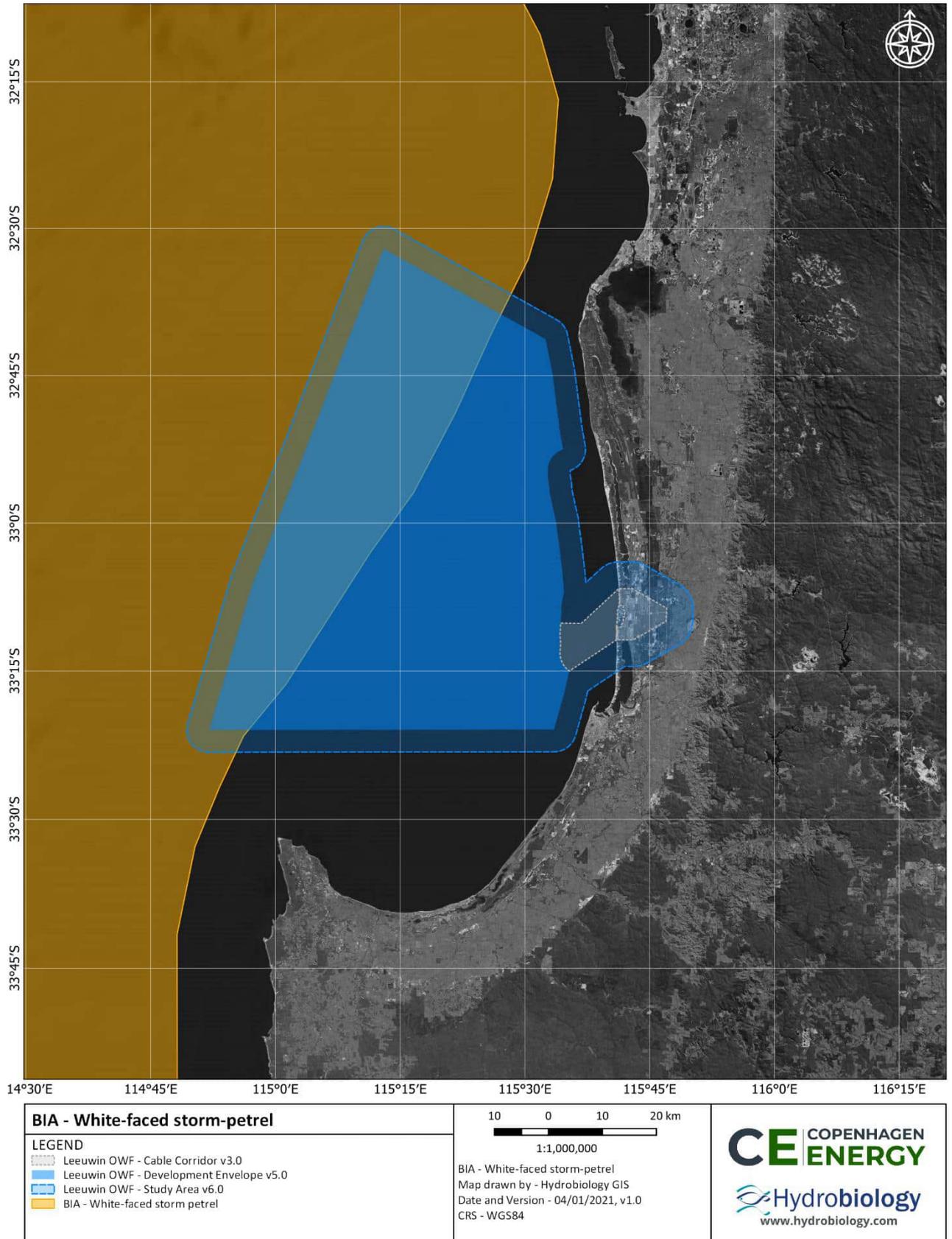


Figure 24 - BIA for the White-face Storm Petrel

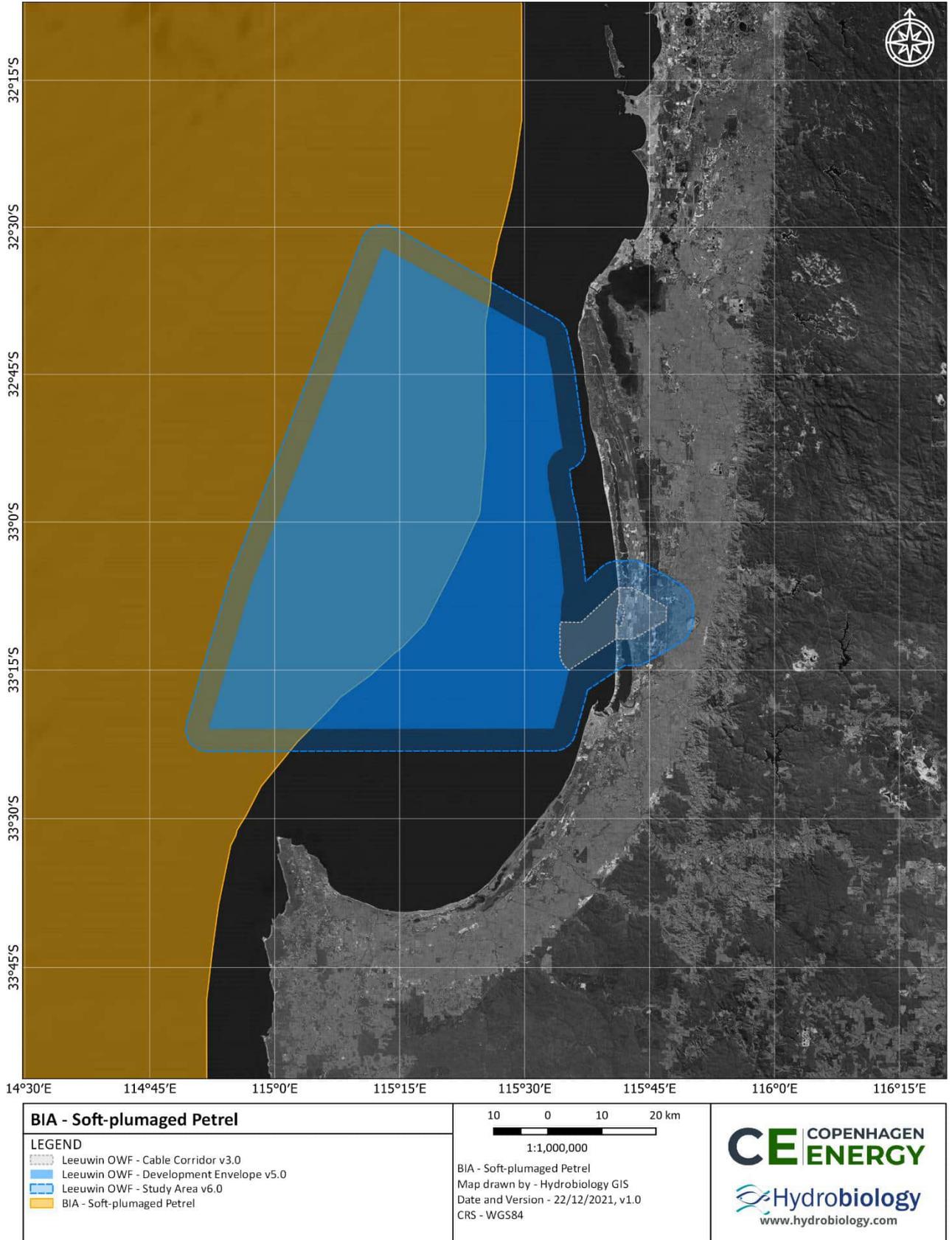


Figure 25 - BIA for the Soft-plumaged Petrel

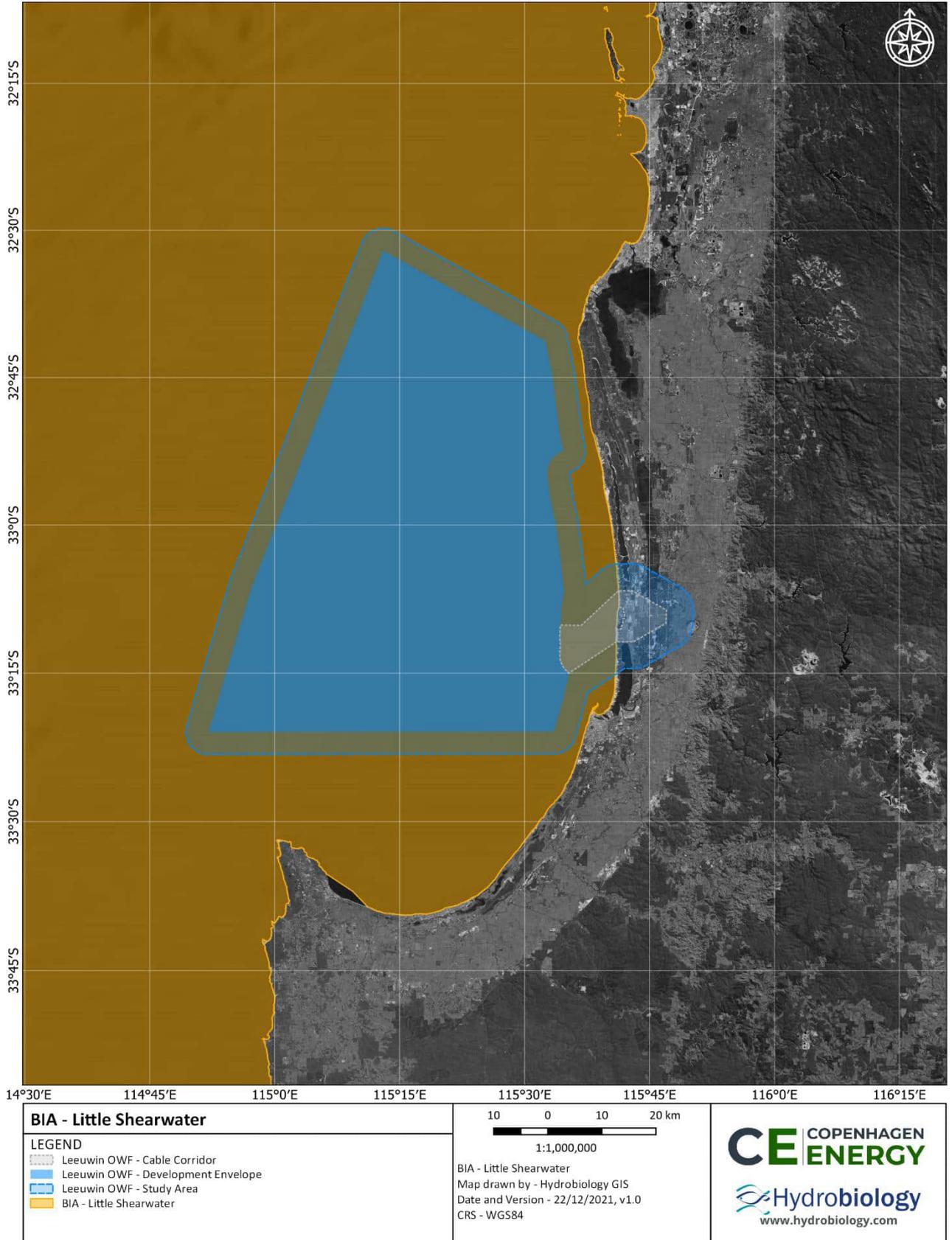


Figure 26 - BIA for the Little Shearwater

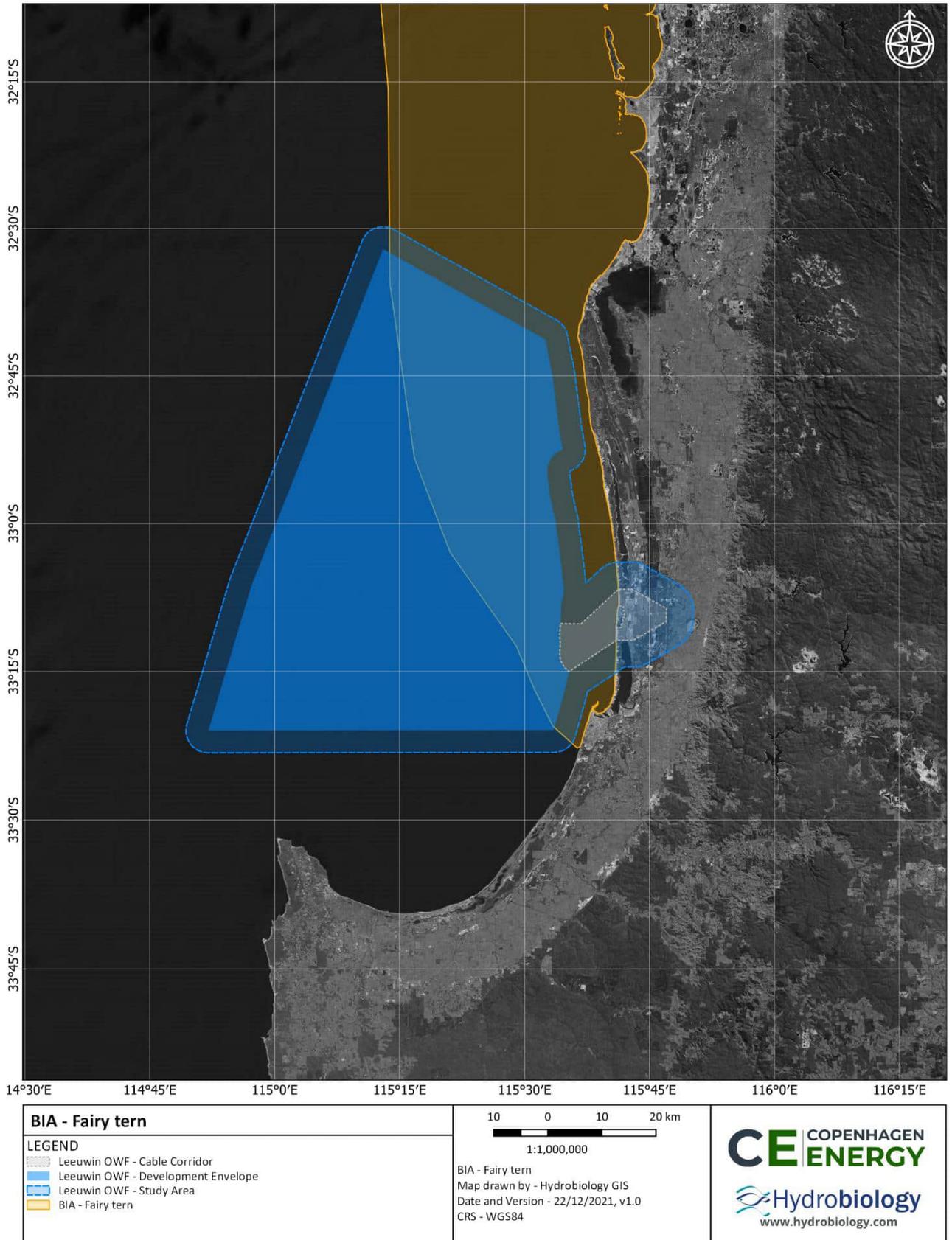


Figure 27 - BIA for the Fairy Tern

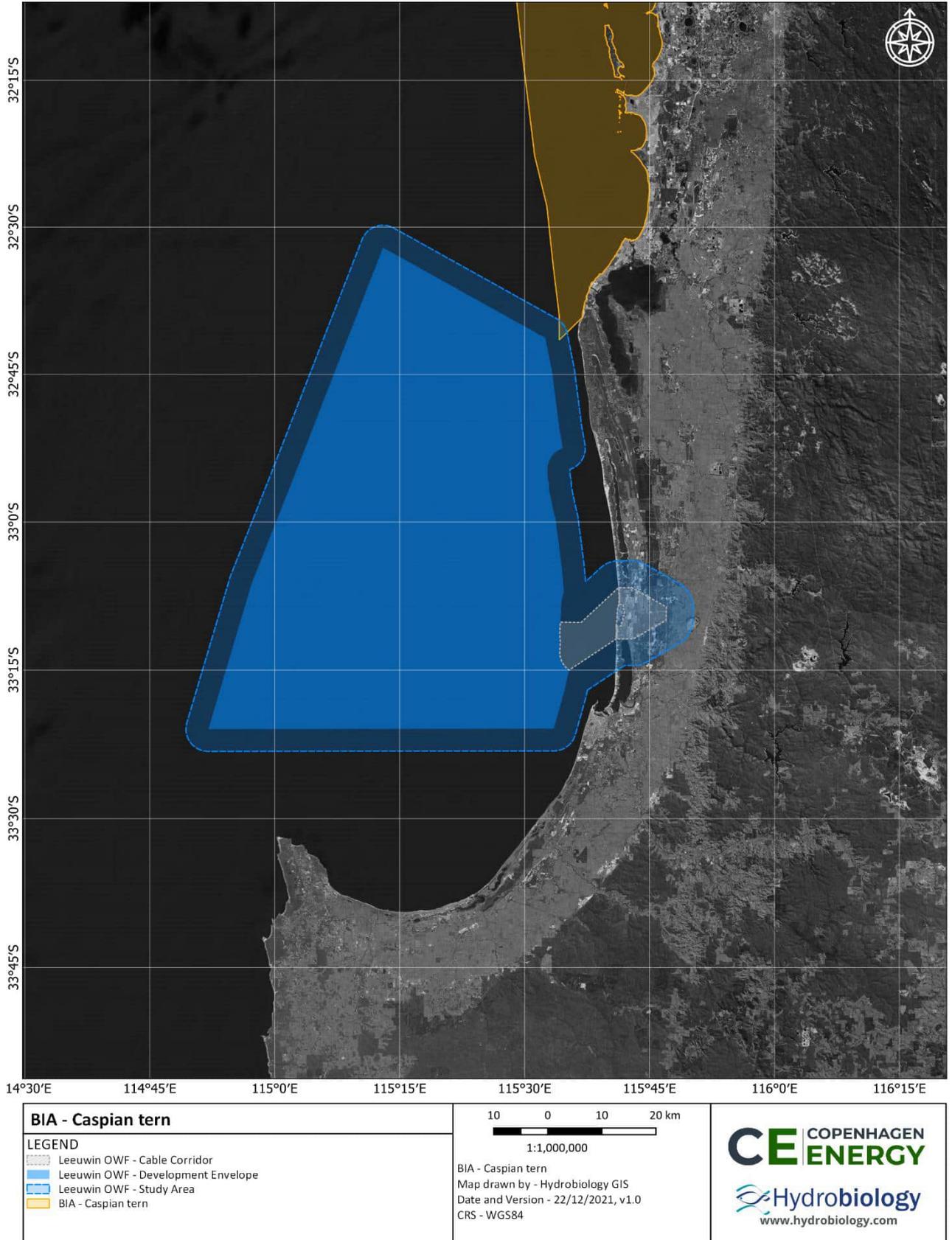


Figure 28 - BIA for Caspian Tern

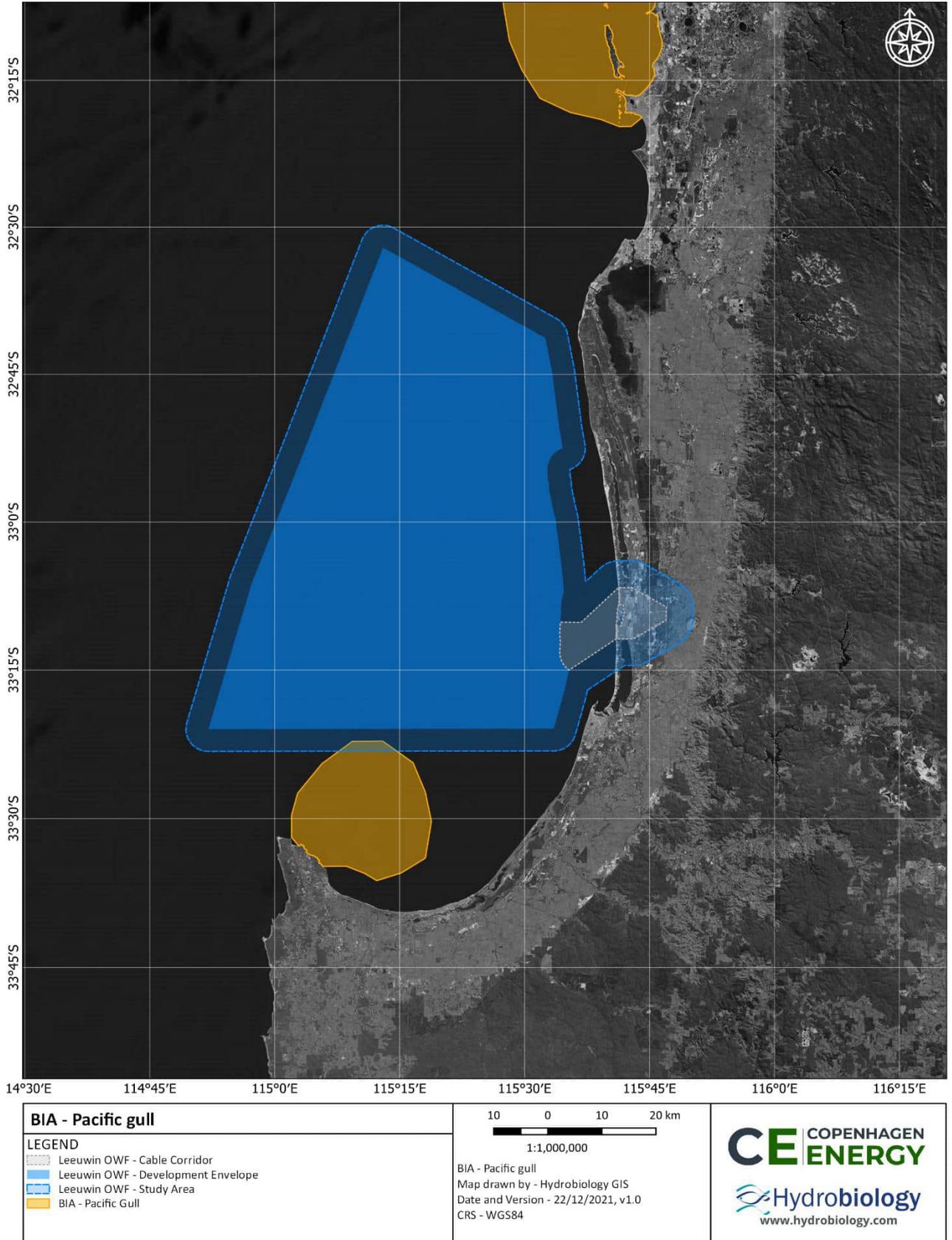


Figure 29 - BIA for Pacific Gull

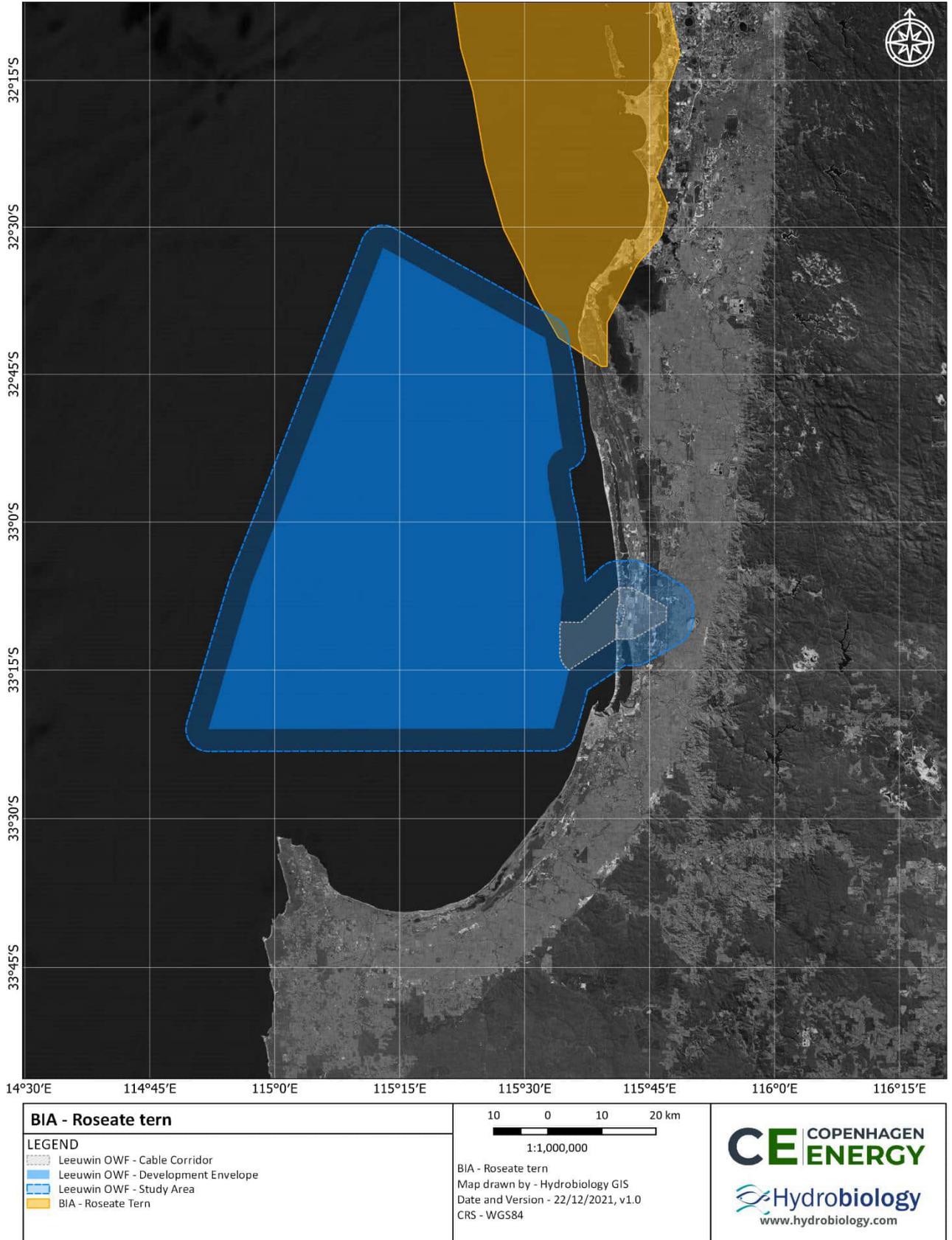


Figure 30 - BIA for Roseate Tern

7.5.1 MIGRATORY WETLAND SPECIES

The proposed action is approximately 1 km from the southern section of the Peel-Yalgorup Wetland System. This wetland supports a large number of migratory shorebirds and wetland bird species (many of whom are classified as MNES). Of the 19 MNES species identified as being within the project study area (Threatened and Priority Flora Database search, DBCA) 11 are migratory wetland species (see Figure 18).

- Curlew Sandpiper (*Calidris ferruginea*) – Critically Endangered
- Eastern Curlew (*Numenius madagascariensis*) – Critically Endangered
- Australasian Bittern (*Botaurus poiciloptilus*) – Endangered
- Greater San Plover (*Charadrius leschenaultia*) - Vulnerable
- Common Sandpiper (*Actitis hypoleucos*)
- Glossy Ibis (*Plegadis falcinellus*)
- Pacific Golden Plover (*Pluvialis fulva*)
- Red-necked Stint (*Calidris ruficollis*)
- Sharp-tailed Sandpiper (*Calidris acuminata*)
- Wood Sandpiper (*Tringa glareola*)
- Common Greenshank (*Tringa nebularia*)

These birds migrate from their breeding grounds in the northern hemisphere in September to avoid the harsh northern winter. They travel via the East Asian-Australasian Flyway over several weeks, stopping at staging sites along the way to rest and refuel. They arrive at Peel-Yalgorup in late spring and spend the summer feeding and depart for the northern hemisphere in February to March. Juveniles of all species who arrive in the Ramsar site spend their first one or two winters before heading to the northern hemisphere to breed (Higgins and Davies, 1996).

The operation of the offshore wind farm has the potential to impact on these species through collision with turbines or the alteration of flight movements or migration patterns. The majority of studies investigating bird mortality resulting from turbine collision have recorded relatively low levels of mortality (e.g. Winkelman 1992a, 1992b, Painter et al. 1999, Erickson et al. 2001). However, in the context of threatened species (with low population numbers) even low levels of mortality could impact a population. These studies acknowledge that the collision risk depends on a range of factors including weather, time of year, bird species, proximity to bird congregations, size and number of turbines, rotor speed, presence of lights associated with the turbine and alignment of turbines (Hüppop et al., 2006a, Winkelman 1992c, Thelander et al. 2003). Several studies have suggested that future planning of offshore wind farms should avoid bird aggregation areas as they pose a higher risk of bird mortality (Fox and Petersen, 2019).

When migrating north and south these wetland species typically fly along the coast or inland (as opposed to flying out to sea) as they can access stop over sites to rest and feed (Alerstam, 1978). Some species follow preferred pathways that related to important stopover locations that provide food. Some migratory birds do fly offshore but fly at high altitudes (above turbine height), however they do fly at lower altitudes during take-off and landing and during poor weather (Drewitt & Langston, 2008; Newton, 2007).

Whilst in Australia these wetland species are typically not known to feed offshore, they prefer to forage in coastal areas, where they inhabit sheltered embayments, estuaries and lagoons. They also occur around terrestrial wetlands near coastal lakes and swamps, or further inland at salt-lakes (Marchant & Higgins 1993). The turbines are proposed to be located at least 15-20km offshore, it is unlikely that these wetland species will be at risk as they are less likely to fly offshore, however further investigation is required to ensure that the potential risks are fully understood.

7.5.2 MARINE BIRD SPECIES

The Threatened and Priority Flora Database search revealed two marine bird species that have been recorded as being within the project study area (see Figure 18).

- Southern Giant Petrel (pelagic) (*Macronectes giganteus*) - Endangered
- Shy Albatross (pelagic bird) (*Thalassarche cauta*) - Vulnerable

The albatross and petrel are pelagic birds and spend a significant portion of their lives on the open ocean, rarely venturing close to land except to breed. They are commonly found hundreds to thousands of kilometres offshore foraging in southern waters south of 25 degrees (ACAP, 2015; Bird Life International, 2008; Marchant and Higgins, 1990). Both the Shy Albatross and the Southern Giant Petrel are known to breed on remote island in the southern oceans (over 4,000 km from the proposed action). The Threatened and Priority Flora Database results revealed only two sightings of these species, this suggests that they are not a common visitor to the area. Figure 18 shows sightings of the Crested Tern (*Thalasseus bergii*) and the Grey Plover (*Pluvialis squatarola*) within the Development Envelope, these species are listed as Migratory and Least Concern (LC) meaning that they are assessed to be thriving, with a distribution or population status that is not threatened (hence they did not come up on the PMST results). Consequently they are not being considered as part of this MNES assessment.

The physical presence of the windfarm, and associated noise, vibrations, and artificial lighting, may cause displacement or avoidance behaviours of Albatrosses and Petrels from foraging habitats. However, based upon the vast distances that Albatrosses and Petrels are known to traverse to forage, the proposed action is unlikely to lead to a significant loss of foraging area or a decline in Albatross population.

There is a risk of collision with the WTGs, with the likelihood of collision likely to be species-specific based upon different foraging behaviours and soaring heights. Several studies have showed that some bird species will actively change their flight pattern to avoid flying in close proximity to the turbines (Exo et al., 2003; Lindeboom et al., 2011; Percival, 2001; Plonczkier & Simms, 2012), which is advantageous and may explain the low bird strike rates. Some researcher suggested that this adjustment of flight may impact migratory birds (Masden et al., 2009) while others suggested that this avoidance did not have an impact on bird feeding or distribution (Percival, 2001). Large pelagic seabirds (albatross, gulls, terns) are most at risk as they feed in offshore waters, and less likely to be able to evade rotors as they are slow fliers. The turbines proposed will be larger and slower than the turbines currently in use. There is building evidence to suggest that these large slower turbines result in a significant reduction of bird deaths.

The research suggests that the likelihood of impact is relatively low, however the consequence to threatened species (especially endangered and critically endangered) is high. Further research is required to identify the bird species likely to fly in the vicinity of the offshore Development Envelope, migratory pattern and altitude and to assess their potential risk of bird strike particularly those that are classified as MNES.

7.5.3 TERRESTRIAL BIRDS

The Threatened and Priority Flora Database search revealed three species of Cockatoo that have been recorded as being within the project study area (Department of Sustainability Environment Water Population and Communities, 2012);

- Baundin's Cockatoo (*Calyptorhynchus baudinii*) - Endangered
- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) - Endangered
- Forest red-tailed Black Cockatoo (*Calyptorhynchus banksia*) - Vulnerable

These species are endemic to the south-west of WA and are typically found in temperate forest and woodland dominated by *Eucalyptus marginate* (jarrah), *Corymbia calophylla* (marri) and *E. diversicolor* (karri). The species nests in the hollows of mature eucalypts trees, particularly marri (DEE, 2018c). The Threatened and Priority Flora Database search revealed 79 sightings of the Carnaby's Cockatoo, but only a handful of sightings for the other two species. This suggests that it is highly likely that the Carnaby's Cockatoo is found within the Development Envelope and is likely to be foraging and roosting within the Banksia Woodlands TEC that have been identified in the area. The presence of these species will depend on the type of vegetation communities present in the Study area, foraging resources, roosting habitat and the type/distribution of suitable breeding hollows. Further investigation is required to understand the presence of species in the area and potential impacts from proposed works.

The proposed action has the potential to directly impact these threatened species through the clearing of onshore vegetation. As discussed in the TEC section, these impacts will be mitigated by designing the footprint to utilise previously cleared lands and to avoid native vegetation, particularly the Banksia Woodlands as they are critical habitat for these threatened cockatoos. Cleared areas will be revegetated with native vegetation to reduce the risk of habitat fragmentation to these species. It is envisioned that the risk of land clearing to the threatened cockatoos can be successfully mitigated.

Potential indirect impacts may be experienced due to a reduction in water quality from uncontrolled runoff during construction activities. An assessment of surface and groundwater hydrology will be conducted and will inform the design of the project to mitigate any potential impacts to water quality. Impacts associated with the offshore wind turbines are expected to be negligible as Cockatoos are land-based birds, so the risk of turbine collision and bird mortality is highly unlikely.

7.6 THREATENED TERRESTRIAL MAMMALS

The PMST listed three species of threatened terrestrial mammals as possibly occurring within the Study Area. A more detailed search using the Threatened and Priority Flora Database search (DBCA) identified that only two of these have been found within the Development Envelope (see Figure 31);

- Western Ringtail Possum (*Pseudocheirus occidentalis*) -Critically endangered
- Western Quoll or Chuditch (*Dasyurus geoffroii*) -Critically endangered

The Western Ringtail Possum is a medium-sized arboreal marsupial, endemic to south-western WA. The species is exclusively folivorous, feeding on leaves of myrtaceous species, predominantly Peppermint, but also Marri and Jarrah (DPaW 2017). One of their key habitats is the Tuart Woodlands and Forrest, which is present in the southern section of the Development Envelope. The Threatened and Priority Flora Database search map show that the vast majority of the possum sighting are clustered around the township of Binningup. In suburban areas, western ringtail possums are known to rest or live in roof spaces and other dark cavities in houses. They have a relatively small home range of less than 5ha. The species has experienced declines in abundance and habitat across its range since colonial settlement. The major threat to this species is habitat loss and fragmentation from urban development (DEC, 2017). Further investigations will be required to determine if critical habitat is present within the Study area.

The Western Quoll is a marsupial mammal also endemic to south-western WA. It inhabits wet and dry sclerophyll forests including Jarrah and Mallee (Menkhorst, 2001). The quoll is known to occur in the Yalgorup National Park (DEC, 2012) which is 25 km from the Development Envelope. One of their key habitats is the Tuart Woodlands and Forrest. The Threatened and Priority Flora Database search map show only two sighting of the quoll just outside of the Development Envelope possibly in remanent native vegetation.

The proposed action has the potential to directly impact these threatened species through the clearing of onshore vegetation. As discussed in the TEC section, these impacts will be mitigated by designing the footprint to utilise previously cleared lands and to avoid native vegetation, particularly the Banksia Woodlands and Tuart Woodlands as they are critical habitat for these threatened terrestrial mammals. Cleared areas will be revegetated with native vegetation to reduce the risk of habitat fragmentation to these species. It is envisioned that the risk of land clearing to the threatened mammals can be successfully mitigated.

Potential indirect impacts may be experienced due to a reduction in water quality from uncontrolled runoff during construction activities. An assessment of surface water hydrology will be conducted and will inform the design of the project to mitigate any potential impacts to water quality.

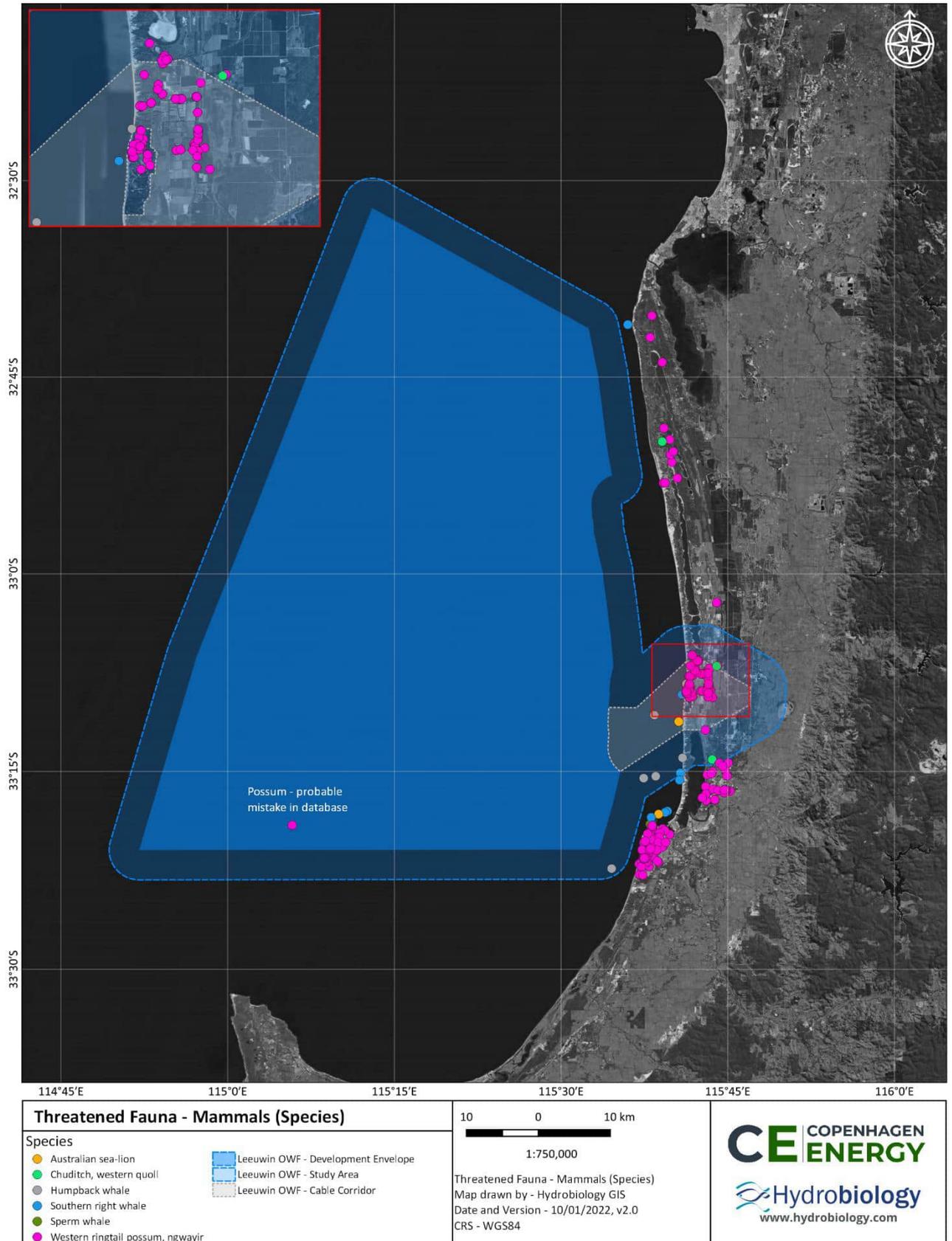


Figure 31 - Threatened mammals likely to occur within the Development Envelope

7.7 THREATENED MARINE MAMMALS

The PMST listed 13 species of marine mammals as possibly occurring within the Study Area. A more detailed search using the Threatened and Priority Flora Database search (DBCA) identified that only three of these have been found within the Development Envelope (see Figure 31). One sperm whale sighting was discounted as it was a museum specimen and didn't register in the PMST search.

- Humpback Whale (*Megaptera novaeangliae*) - Vulnerable
- Southern Right Whale (*Eubalaena australis*) - Endangered
- Australia Sea-Lion (*Neophoca cinerea*) – Endangered
- Sperm Whale (*Physeter macrocephalus*)

The Development Envelope intersects four BIAs for whales, these are listed below, and maps are provided to show the extent of the BIAs in relation to the Development Envelope;

- Blue and Pygmy Blue Whale (see Figure 32)
- Humpback Whale (see Figure 33)
- Australian Sea Lion (see Figure 34)
- Southern Right Whale (Figure 35)

7.7.1 HUMPBACK WHALE

Humpback Whales are listed under the EPBC Act as Vulnerable and the PMST identified that they are known to aggregate within the Development Envelope. Humpback Whales make seasonal migrations from their summer feeding grounds in Antarctic waters to their tropical breeding ground in winter. Migration times vary year-to-year due to water temperature, sea ice, prey abundance and predation risk. The major breeding region for Humpback Whales in Western Australia is in the Kimberley Region (Jenner et al., 2001).

There is a nominated migration (north and south) BIA for Humpback Whales that intersects with the spatial extent of the Leeuwin Offshore Windfarm. Humpback Whales are known to travel through the site area both heading north to breeding grounds and returning to feeding ground in the south. The study area is within one of only four resting places along the WA coastline for the Humpback.

Underwater noise and vibration from construction, especially impact pile driving, may cause physical/auditory injury and avoidance behaviours. Avoidance of the area may affect the migration of the whales when heading either to breeding or feeding grounds. Further investigations are required into the timings of aggregations and their habitat utilisation in the area to assess potential impacts.

Disturbance of the seabed during construction and decommissioning may cause displacement of prey species, however seabed disturbances are considered to be localised and temporary, and as the area is not considered an important feeding ground for the species, this impact is unlikely to cause long-term impacts to the populations.

There is a risk of vessel collision with Humpbacks during construction and decommissioning phases, however vessel collision with marine mammals can largely be mitigated by vessel speed and vessel type and considered low risk to the Humpback Whale population. Potential impacts and management measures are outlined in Section 8.

7.7.2 SOUTHERN RIGHT WHALES

Southern Right Whales occur in the coastal waters of Australia's southern coastline off Western Australia and South Australia, from Sydney to Perth (including Tasmania (Bannister 1990)). The Southern Right Whale are seasonally present along the Australian coast between late April and early November. The feeding habitat of this species is very poorly known, however it is likely that feeding occurs in deep,

offshore waters. Breeding grounds for the Southern Right Whale are in the vicinity of the Development Envelope in shallow, high energy, nearshore waters. These breeding grounds are classified under the BIA for this species. During the breeding season female whales display strong site fidelity and return to the same calving grounds every three years. Calving takes place between June and November. Potential impacts to this species may occur as a result of offshore activities, in particular pile driving, but with the proposed management measures outlined in Section 8 any impacts to this species are unlikely.

7.7.3 AUSTRALIAN SEA LION

Australian Sea Lions are the only pinniped endemic to Australia. They utilise a variety of onshore habitats including exposed islands, rocky terrain, sandy beaches, and vegetated dunes. All foraging is restricted to marine environments on the continental shelf, they primarily forage on the seafloor most commonly at depths between 20 – 100 m. Breeding female Sea Lions exhibit extreme site fidelity, always returning to the same breeding grounds. Sea lions typically travel from 60 to 190 km from their colony to forage. The Australian Sea Lion is likely to occur occasionally within the Development Envelope. The closest known breeding colony is Seal Island (located ~50 km north of the Development Envelope) (Osterrieder et al., 2017). Hence there is a BIA for this species approximately 20km to the north of the Development Envelope. The Australian Sea Lion has been sighted occasionally foraging within and around the Development Envelope.

Underwater noise and vibration from construction, especially impact pile driving may cause avoidance behaviours. Australian Sea Lions are perceptive to noise and known to respond quickly to vessels therefore it is expected that they will largely avoid the area during construction activities (Osterrieder et al., 2017). Seabed disturbance may affect the foraging of Australian Sea Lions within the Development Envelope, however, the Development Envelope is located on the outer limits of their known foraging range and is not a known key foraging area. Potential impacts to this species may occur as a result of offshore activities, but with the proposed management measures outlined in Section 8 any significant impacts to this species are unlikely.

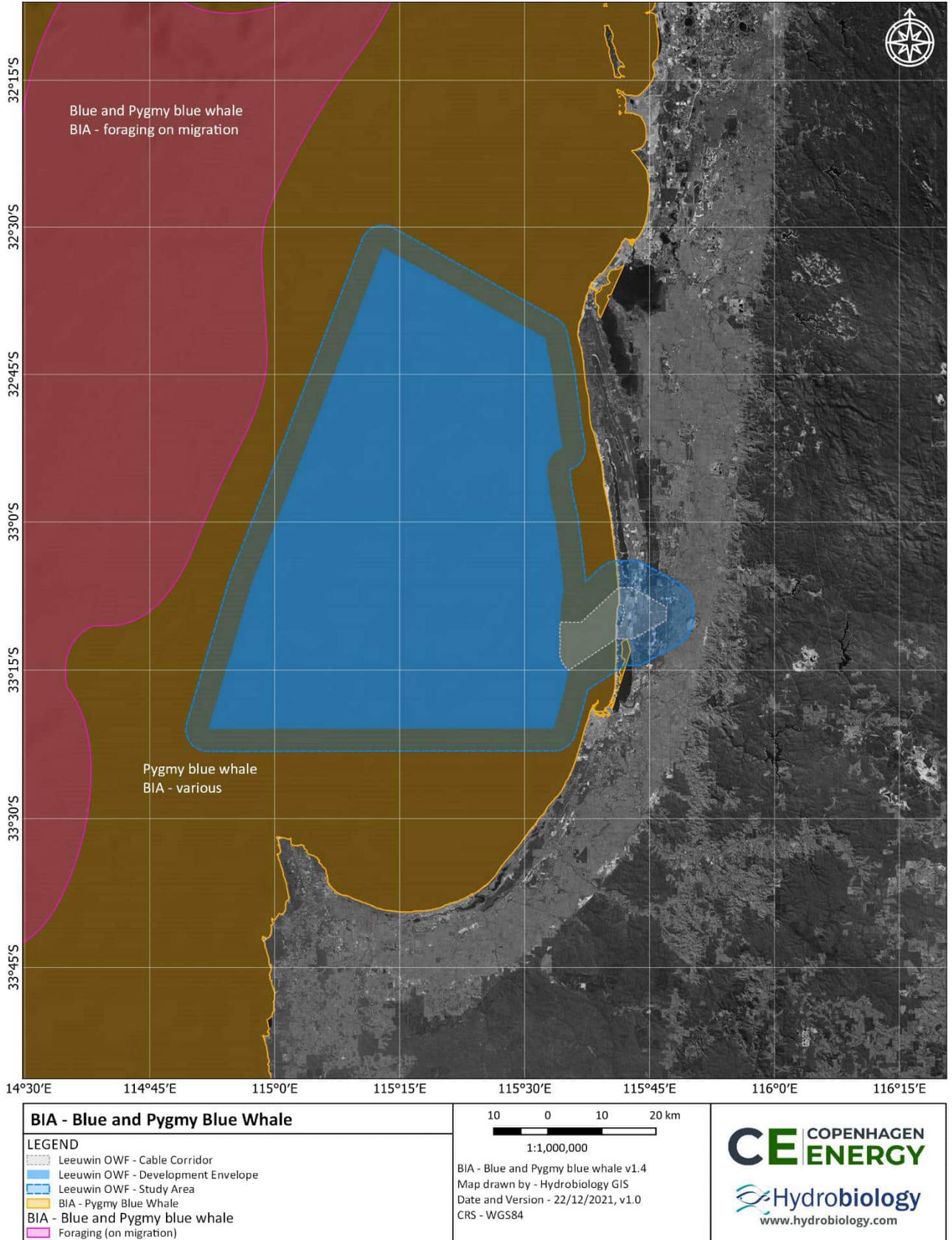


Figure 32 - BIA for the blue and Pygmy Blue Whale

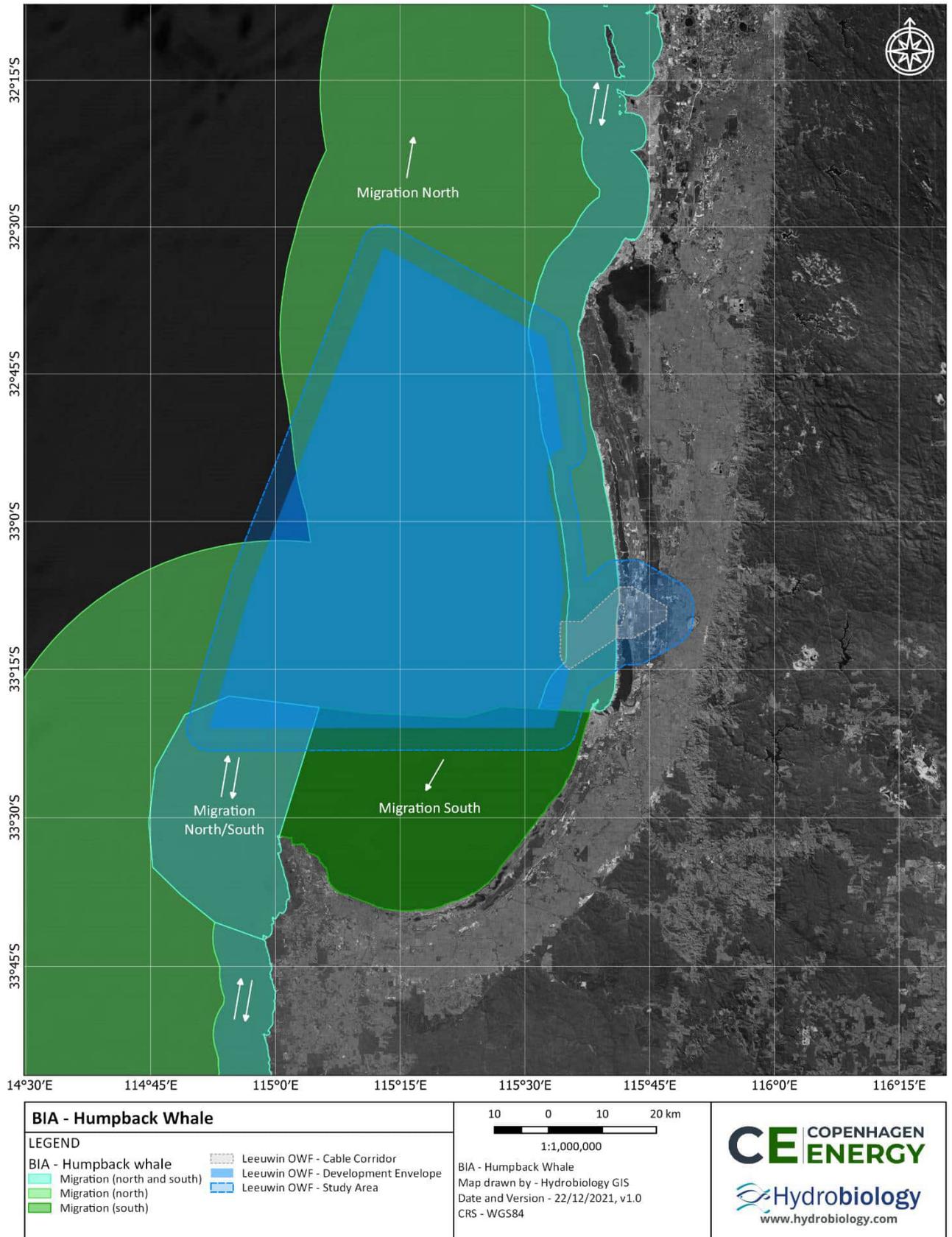


Figure 33 - BIA for the Humpback Whale

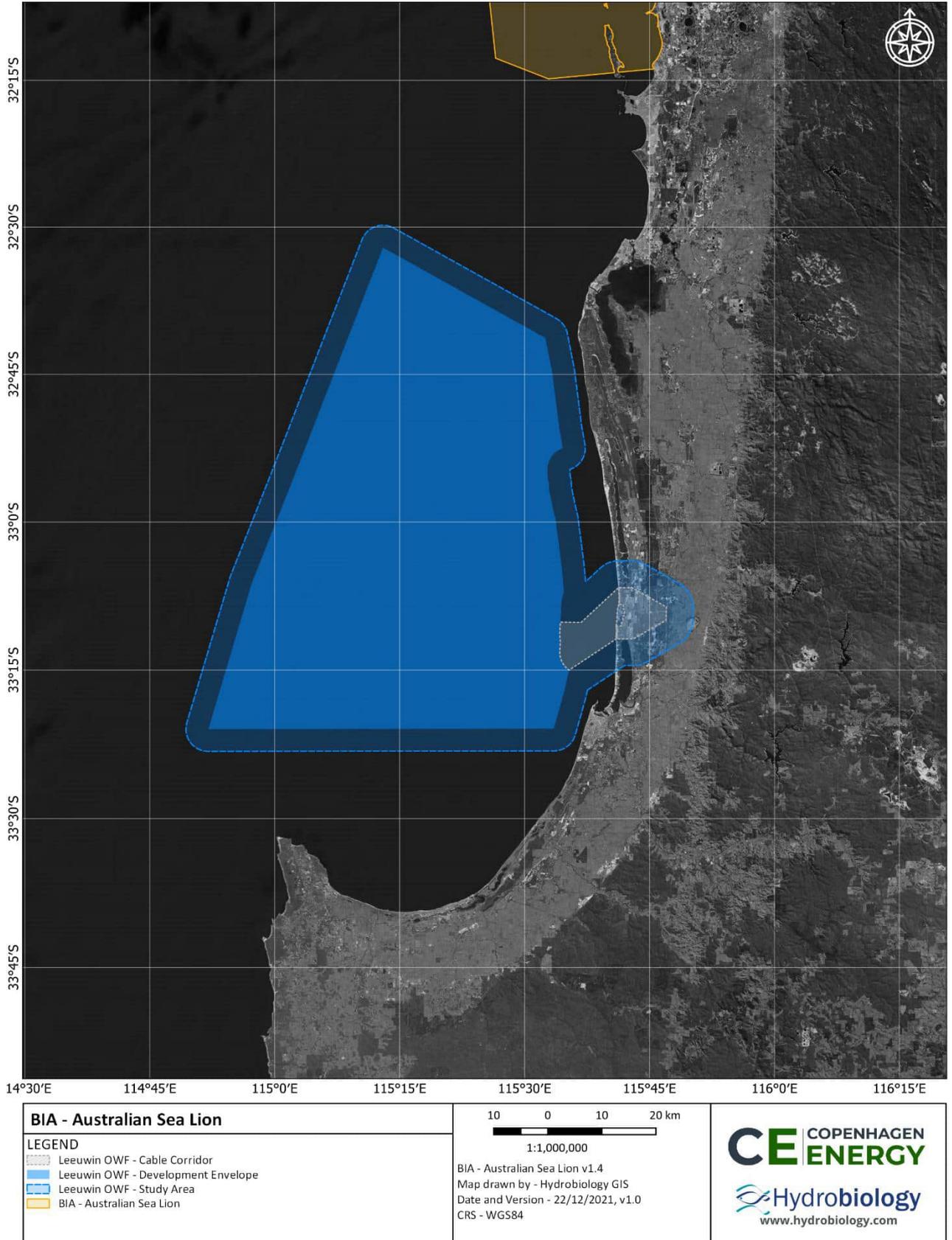


Figure 34 - BIA Australian Sea Lion

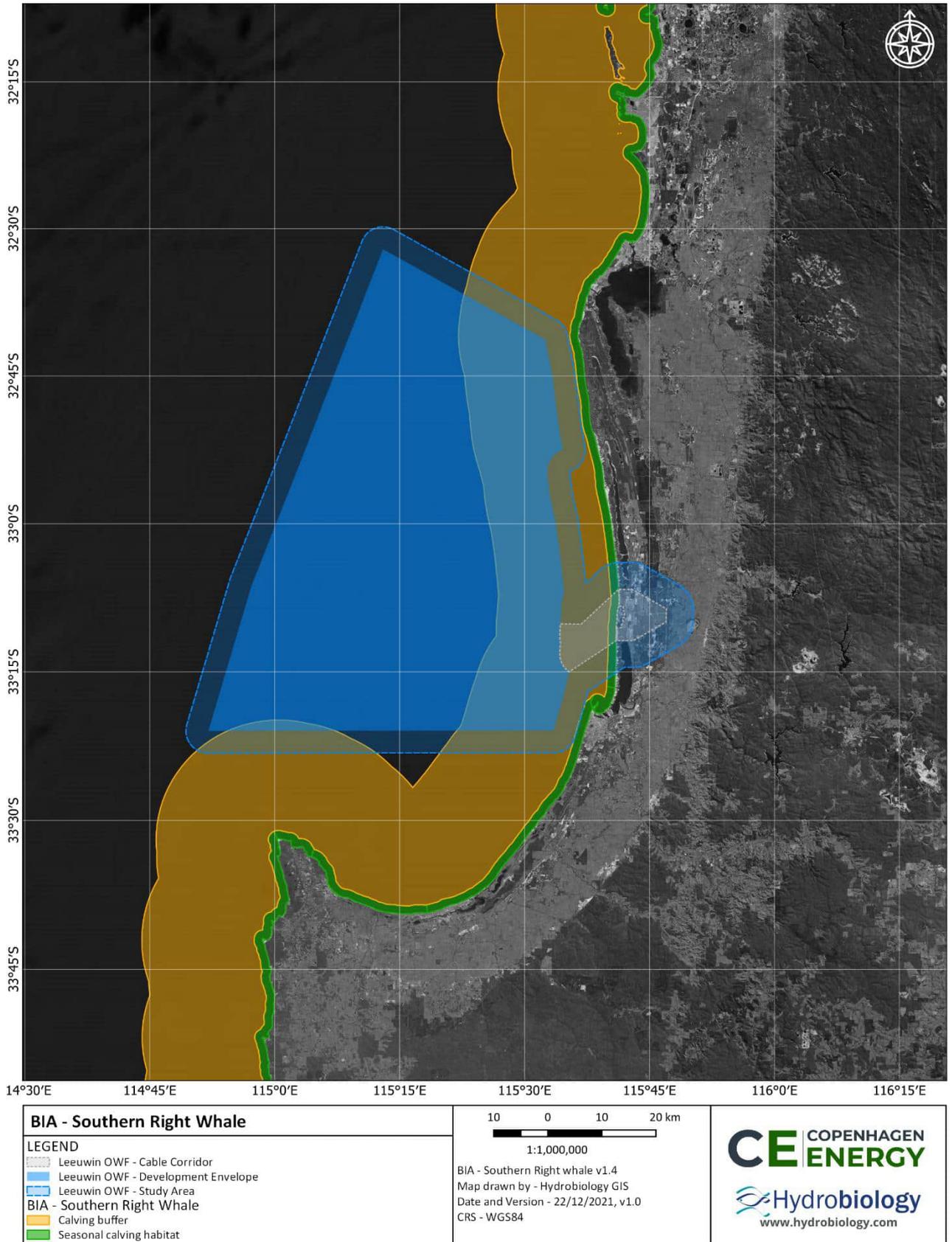


Figure 35 - BIA Southern Right Whale

7.8 THREATENED MARINE SHARKS AND BONY FISH

The PMST listed a total of 13 species of sharks, bony fish and mussels that may occur within the Study Area. A more detailed search using the Threatened and Priority Flora Database search from DBCA indicated that of these, only two species have been sighted within the project Study area;

- Great White Shark (*Carcharodon carcharias*) - Vulnerable
- Blackstriped Dwarf Galaxias (*Galaxiella igrostriatal*) - Endangered

The Great White Shark is a migratory shark species that is widely, but not evenly distributed in Australian waters. They are solitary animals frequently observed near fur seal and sea lion colonies and feed on fish, pinnipeds, and cetaceans. Great White Sharks were considered to have a largely coastal distribution but recent research suggests that individuals may also spend significant time in the open ocean (DotE, 2015). There was one documented sightings of this species within the Development Envelope, just off the township of Binningup. Potential impacts to this species may occur as a result of offshore activities, in particular pile driving, but with the proposed management measures outlined in Section 8 any impacts to this species are unlikely.

The Blackstriped Dwarf Galaxias is a small freshwater minnow (fish) that is endemic to WA. They typically occur in coastal freshwater rivers, lakes and wetlands, but have also been found in small creeks, ponds and roadside ditches in sandy wetland areas with thick vegetation from Augusta to Albany, and in three remnant populations located near Bunbury, Melaleuca Park (north of Perth) and Lake Chandala (north of Mueha). These fish grow to 4.8 cm in length and can survive in the damp bottom sediments of temporary waterways over summer. This species feeds on small insects, aquatic insect larvae and micro-crustaceans and breeding occurs in winter during the rainy season. The DBCA database had several sightings approximately 1km outside of the Development Envelope within permanent pools at the Kemerton Silica Sands operation. A desktop assessment of the area indicated that there are no drainage areas, rivers or creeks inside of the Development Envelope hence, so the species is unlikely to be found there. Further investigation is required to understand the presence of this species and potential impacts from proposed works.

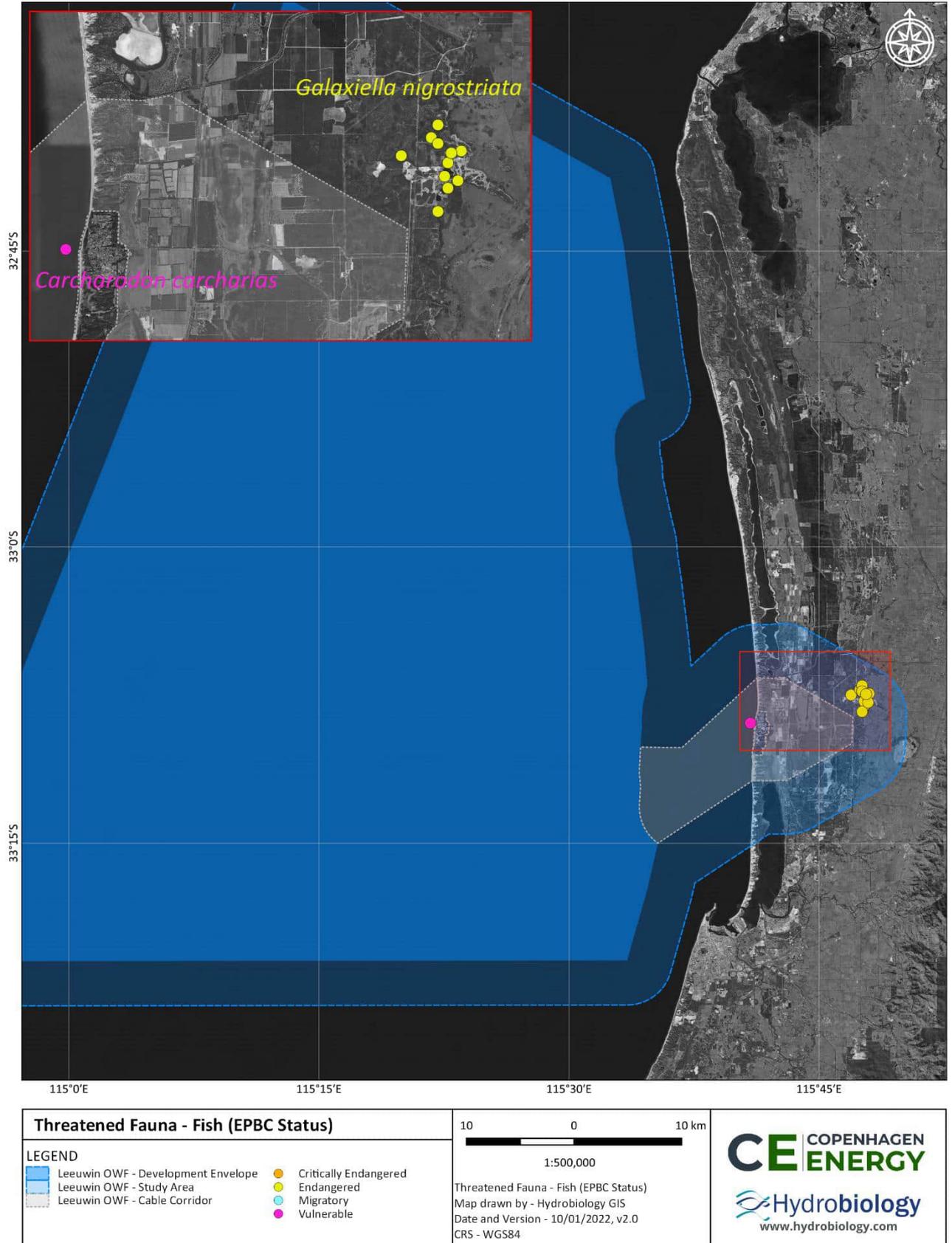


Figure 36 - Threatened fish (as identified in DBCA database) likely to occur within the Development Envelope

7.9 THREATENED MARINE TURTLES

The PMST listed a total of four turtle species that may occur within the Study Area. A more detailed search using the Threatened and Priority Flora Database indicated that there have been sightings of two of these species within the project study area (Figure 37).

- Loggerhead Turtle (*Caretta caretta*) - Endangered
- Green Turtle (*Chelonia mydas*) - Vulnerable

According to DBCA database searches Loggerhead and Green Turtles have been observed within and adjacent to the Development Envelope. There has been some observation of flatback turtles nearby in Bunbury, but not within the Study Area. Although these waters are considered the southern limit of their foraging range, juveniles loggerheads have been washed ashore after severe weather events further south of the Study Area. They may also be in the area to feed in the nutrient rich waters. Turtles traverse vast oceanic distances for foraging, so the construction, operations and decommissioning phases are unlikely to result in reduction of the population of these species. There are no breeding or nesting grounds in the vicinity so the area is not considered to be a habitat crucial to their survival.

Noise, vibrations and artificial light may cause disturbances to sea turtles in the area, these impacts are unlikely to have any long-term effect on sea turtles, and avoidance of the area would likely be temporary.

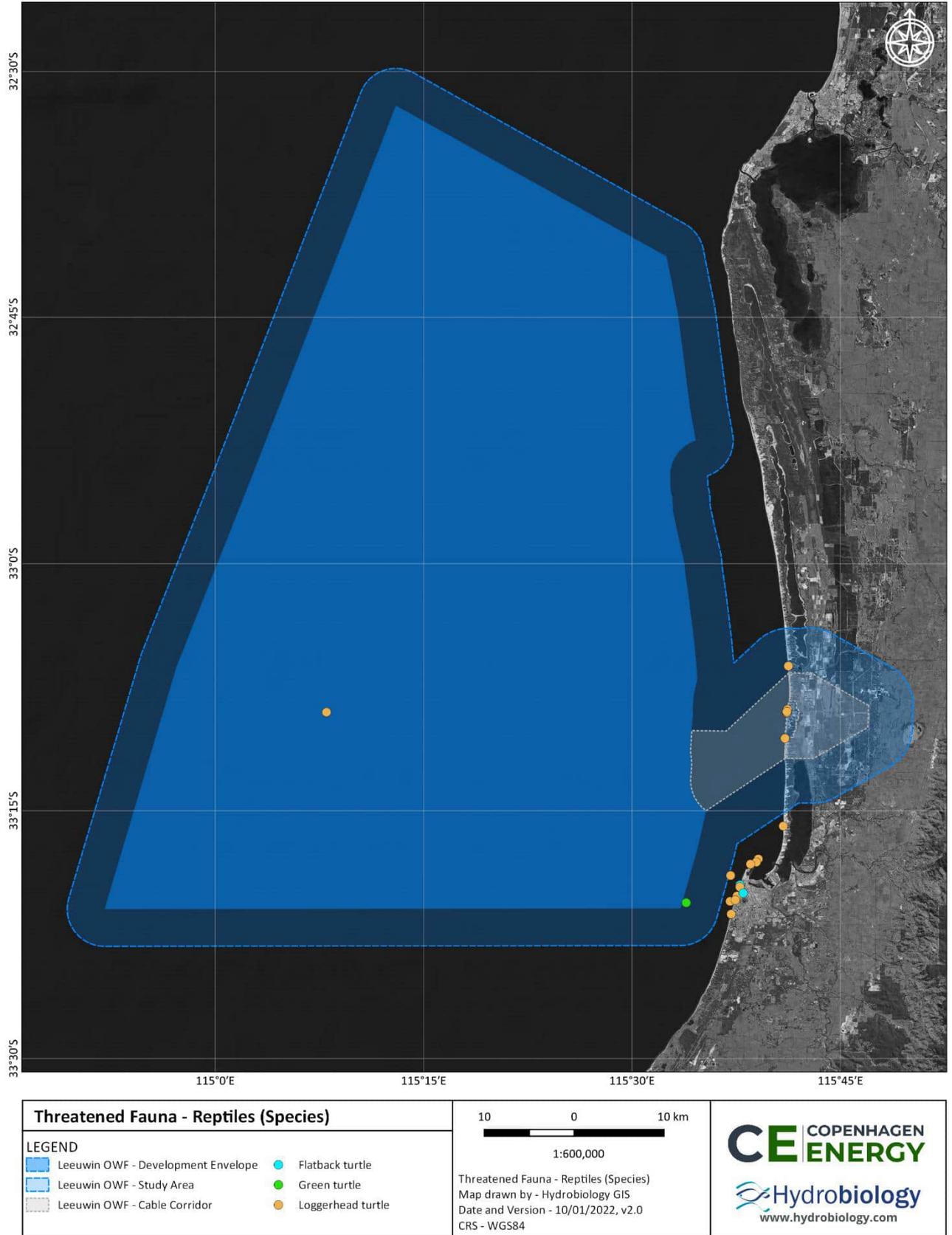


Figure 37 - Threatened reptiles likely to occur within the Development Envelope

8. POTENTIAL IMPACTS AND PROPOSED MANAGEMENT

This section presents the MNES potentially present in proximity to the proposed action, the potential impacts to these species and the proposed management measures to mitigate these impacts (Table 13).

Table 13 - Potential impacts to MNES and proposed management

Turbine operation		
MATTER POTENTIALLY IMPACTED	POTENTIAL IMPACTS	PROPOSED MANAGEMENT
MNES Migratory and marine birds (13 species)	<ul style="list-style-type: none"> • The operation of the offshore wind turbines has the potential to impact on migratory and marine bird species through collision with turbines or the alteration of flight movements or migration patterns. • Studies indicate that bird mortality from turbines is relatively low, however threatened species with smaller populations are at risk as low levels of mortality could impact population. • Pelagic and migratory birds at greater risk as they fly offshore. 	<ul style="list-style-type: none"> • Turbines located at least 15 – 20 km offshore so risk to shore birds and terrestrial birds negligible. • The proposed turbines are large and slow which are known to reduce bird mortality. • Design measures to reduce risk of bird mortality (number of turbines, turbine height, location, distance between turbine) • Bird surveys to identify bird species at risk, migratory routes and altitude.

Onshore clearing, earthworks, and trenching

MATTER POTENTIALLY IMPACTED	POTENTIAL IMPACTS	PROPOSED MANAGEMENT
<p>MNES:</p> <p>TEC (3 communities)</p> <p>Threatened flora (6 species)</p> <p>Peel-Yalgorup Wetland System</p> <p>Migratory and marine birds (13 species)</p> <p>Terrestrial birds (3 species)</p> <p>Terrestrial mammals (2 species)</p>	<ul style="list-style-type: none"> • The onshore construction works will include the removal of vegetation, clearing and levelling. This may result in habitat loss for TEC and threatened terrestrial species that occur within the Development Envelope. • The onshore construction works will increase the potential to spread introduced flora species and pathogens. Introduced species can outcompete native flora species and result in a loss of suitable habitat for fauna. • The onshore construction works may indirectly impact water quality at nearby wetlands and waterways and the MNES that occur there. • The onshore construction works may indirectly impact water quality at nearby wetlands and waterways. For example, uncontrolled surface water flows from the project into the wetland could introduce nutrients, ASS or alter the salinity of the receiving waters. Any impacts to the wetland will indirectly impact the MNES species that utilise the wetland. 	<ul style="list-style-type: none"> • Vegetation surveys will be conducted to characterise existing conditions, species and TEC present in the vicinity of the proposed action. • The scale of the land clearing is proposed to be 21 hectares. • A large portion of the Development Envelope has been cleared/disturbed (e.g. Binningup Desalination Plant, export cables connecting to Kemerton sub-station, Forrest Hwy). Where possible the placement of the onshore corridor and infrastructure will utilise these areas and avoid areas of native vegetation and habitat crucial to support threatened and priority flora and fauna species. • Specific weed and pathogen controls protocols will be included in the Construction Environmental Management Plan. • Rehabilitation and landscaping works will utilise locally occurring native vegetation. • Pre-construction and construction activities will be managed to prevent any significant impact on nearby wetlands and waterways. • An assessment of the surface and groundwater hydrology will be required to confirm any potential impacts to the Ramsar wetland. • Management measures will include soil testing for ASS and the use of sediment ponds and bunds to control any surface water flows and quality.

Installation and operation of WTGs, cables, and other sub-sea infrastructure		
MATTER POTENTIALLY IMPACTED	POTENTIAL IMPACTS	PROPOSED MANAGEMENT
<p>MNES:</p> <p>Marine mammals (3 species)</p> <p>Marine sharks (1 species)</p> <p>Marine turtles (2 species)</p> <p>Migratory and marine birds (13 species)</p>	<p>Benthic habitat loss is expected during construction activities (installation of WTGs, cables, substations), and from the physical presence of the OWF infrastructure.</p> <p>Installation of WTGs may require pile driving which can impact marine species in the following ways.</p> <ul style="list-style-type: none"> • Instant death/injury (physical and or auditory) from sound pulses generated from the pile driving impact with the seafloor. • Auditory injury from cumulative noise exposure over the construction period. • Behavioural disturbance leading to secondary impacts (Thompson <i>et al.</i>, 2020). <p>Cables and other subsurface structures may require dredging, burying or similar activities. Potential impacts, as defined in the EPA Technical Guidance include:</p> <ul style="list-style-type: none"> • Direct loss of benthic habitat by removal or burial. • Indirect impacts on benthic habitats from the effects of sediments introduced to the water column by the dredging and dredge spoil disposal. • Effects of suspended sediment and increased turbidity on fish behaviour, visual acuity, gill function and survival. <p>Electromagnetic fields (EMFs) are created by high voltage undersea cables. They have the potential for behavioural changes in some highly electro-receptive species such as sharks and rays but may also impact bony fish and invertebrates (Bureau of Ocean Energy Management, 2020).</p> <p>Interaction of construction and survey vessels with marine fauna could lead to behavioural changes (noise, lights, general disturbance), injury or death (vessel strike etc).</p>	<ul style="list-style-type: none"> • High resolution benthic habitat mapping to identify critical habitats. • The depth required to install the OWF foundations ensures minimal overlap with seagrass meadows. • Refine development footprint to avoid Key Ecological Features. • Pile driving is only one of the options to install WTGs. Suction caissons and gravity bases are presented as options and do not require pile driving. • Ensure construction timing avoid peak seasons/periods during which the species will cross or inhabit the study area (as defined by their BIAs and baseline survey data). • Investigate and implement relevant underwater noise mitigation strategies such as bubble curtains • Apply controls during pile driving operations consisting of, but not limited to marine mammal observers, pre-start watch, soft-start and shut-down procedures if a listed animal is detected inside the defined mitigation zone. • Investigate use of Passive Acoustic Monitoring during night-time construction operations. • Identify suitable location for dredge spoil. • Limit vessel speeds within BIAs. • Subsea cable design and appropriate depth of burial should be considered to reduce the effect EMFs. The voltage on the copper conductors within the cable is blocked by a grounded metallic covering on the cable.

Vessel Activity		
MATTER POTENTIALLY IMPACTED	POTENTIAL IMPACTS	PROPOSED MANAGEMENT
<p>MNES:</p> <p>Marine mammals (3 species)</p> <p>Marine sharks (1 species)</p> <p>Marine turtles (2 species)</p>	<p>Vessel strike on marine fauna:</p> <ul style="list-style-type: none"> • Vessel strikes can lead to injury or death, and intense vessel activity in general can disturb or alter normal behaviours (e.g. migration routes, foraging etc) over extended periods of time. • Behavioural traits of some species can make them vulnerable to vessel strike such as slow swimming speed and general lack of awareness of vessel noise and danger posed by vessels. • Vessel activity within the development envelope will vary over the lifetime of the proposed action; from large construction and survey vessels to smaller inshore work-boats. <p>Chemical/Hydrocarbon spills and dropped objects:</p> <ul style="list-style-type: none"> • Fish, shellfish, and corals can come into contact with oil if it is mixed into the water column. When exposed to oil, adult fish may experience reduced growth, enlarged livers, changes in heart and respiration rates, fin erosion, and reproduction impairment. Fish eggs and larvae can be especially sensitive to lethal and sublethal impacts. • Oil impacts the insulating ability of fur-bearing mammals (such as seals, sealions etc) and reduces the water repellence of a bird-feathers. • Dolphins and whales may inhale/ingest oil or other spilled chemicals, which can affect organs, immune function and reproduction. Many birds and animals also ingest these chemicals when they try to clean themselves, which can poison them. • Seagrass photosynthetic function can be inhibited by the deployment of dispersal agents, a chemical typically used in the clean-up of oil spills. 	<p>Vessel Strike on marine fauna:</p> <p>Reduce vessel speeds within the study area and during key season/periods for marine fauna such as humpback whale migration etc.</p> <p>The National Strategy for Reducing Vessel Strike on Cetaceans and other Marine Megafauna 2017 provides guidance on understanding and reducing the risk of vessel collisions and the impacts they may have on marine megafauna (Commonwealth of Australia, 2017).</p> <p>The Australian Maritime Safety Authority recommend the following measures to reduce the risk of vessel strike:</p> <ul style="list-style-type: none"> • Maintain a look out for cetaceans, especially during peak migration/foraging seasons. • Warn other vessels in the vicinity using appropriate means of communication if cetaceans have been sighted. • Reducing vessel speed in areas where cetaceans have been sighted; and • Consider course alterations away from sightings. <p>Chemical/Hydrocarbon spills and dropped objects.</p> <ul style="list-style-type: none"> • All vessels employed during the proposed action will be required to meet rigorous Australian and international maritime laws to minimise the risk of chemical or hydrocarbon spills to the environment. • Any hazardous spill must be reported to the Joint Rescue Coordination Centre (JRCC) Australia (Harmful Substances Report [POLREP]), such that an immediate assessment and response can be arranged.

Vessel Activity

Introduction of marine pests:

Marine pests can be introduced through vectors such as ballast water or biofouling (attached to hulls and equipment imported from other jurisdictions). Marine pests carry the potential to have a population-level effect over a long period.

- An oil spill response plan will be developed for the proposed action.
- All vessels will have a response plan and equipment.

Introduction of marine pests:

- All vessels will adhere to the Australian Ballast Water Management Requirements (Department of Agriculture Water and the Environment, 2020) and the International Convention for the Control and Management of Ships' Ballast Water and Sediments (Ballast Water Convention).
- All vessels will utilise the Quick Ballast Water (DBW) Risk Assessment Tool (DAWR, 2018).
- All vessels will utilise the Vessel Check Risk Assessment Tool (DPIRD).

9. CONCLUSIONS

The MNES species and “other matters” potentially occurring at the proposed Leeuwin Offshore Windfarm were identified through the examination of PMST reports, with the likelihood of occurrence further refined through a more detailed examination of the identified species.

The following MNES listed under the EPBC Act were identified as being relevant to the proposed action;

- The Peel-Yalgorup Ramsar site (listed as a wetland of international importance).
- Four Threatened Ecological Communities
 - Tuart Woodlands (*Eucalyptus gomphocephala*) and Forests of the Swan Coastal Plain ecological community – Critically Endangered.
 - Banksia Woodlands of the Swan Coastal Plain ecological community – Endangered.
 - Subtropical and Temperate Coastal Saltmarsh – Vulnerable.
 - The Clay Pans of the Swan Coastal Plain – Critically Endangered.
- Seven threatened flora species
 - Tall Donkey Orchid (*Diuris drummondii*) - Vulnerable
 - Glossy Leafed/Warty Hammer Orchid (*Drakaea elastica*) - Endangered
 - Dwarf Hammer Orchid (*Drakaea micrantha*) - Vulnerable
 - King Spider/Grand Spider Orchid (*Caladenia huegelii*) - Endangered
 - Caribunup King Spider Orchid (*Caladenia procera*) - Critically Endangered
 - Dwarf Bee Orchid (*Diuris micrantha*) – Vulnerable
 - *Austrostipa bronwenae* - Endangered
- Eleven threatened migratory wetland bird species.
 - Curlew Sandpiper (*Calidris ferruginea*) – Critically Endangered.
 - Eastern Curlew (*Numenius madagascariensis*) – Critically Endangered.
 - Australasian Bittern (*Botaurus poiciloptilus*) – Endangered.
 - Greater San Plover (*Charadrius leschenaultia*) – Vulnerable.
 - Common Sandpiper (*Actitis hypoleucos*)
 - Glossy Ibis (*Plegadis falcinellus*)
 - Pacific Golden Plover (*Pluvialis fulva*)
 - Red-necked Stint (*Calidris ruficollis*)

- Sharp-tailed Sandpiper (*Calidris acuminata*)
- Wood Sandpiper (*Tringa glareola*)
- Common Greenshank (*Tringa nebularia*)
- Two threatened marine bird species.
 - Southern Giant Petrel (pelagic) (*Macronectes giganteus*) - Endangered
 - Shy Albatross (pelagic bird) (*Thalassarche cauta*) - Endangered
- Three threatened terrestrial bird species.
 - Baundin's Cockatoo (*Calyptorhynchus baudinii*) - Endangered
 - Carnaby's Cockatoo (*Calyptorhynchus latirostris*) - Endangered
 - Forest red-tailed Black Cockatoo (*Calyptorhynchus banksia*) - Vulnerable
- Two threatened terrestrial mammal species.
 - Western Ringtail Possum (*Pseudocheirus occidentalis*) – Critically Endangered
 - Western Quoll or Chuditch (*Dasyurus geoffroii*) - Vulnerable
- Three threatened marine mammal species.
 - Humpback Whale (*Megaptera novaeangliae*) - Vulnerable
 - Southern Right Whale (*Eubalaena australis*) - Endangered
 - Australia Sea-Lion (*Neophoca cinerea*) – Endangered
- One listed threatened shark species.
 - Great White Shark (*Carcharodon carcharias*) - Vulnerable
- Two threatened turtle species.
 - Loggerhead Turtle (*Caretta caretta*) - Endangered
 - Green Turtle (*Chelonia mydas*) – Vulnerable

Potential impacts identified as relevant to the MNES include:

- Bird mortality and avoidance as a result of collision with turbines.
- Hearing loss or injury as a result of construction pile driving.
- Loss of onshore habitat from land clearing
- Loss of onshore habitat from the introduction of weeds and pathogens
- Reduced onshore water quality due to uncontrolled run off during construction activities.
- Loss of benthic habitat due to construction activities.
- Species behaviour changes due to construction activities.
- Species behaviour changes due to operation noise and vibrations (turbines) and electromagnetic fields from undersea cables.
- Reduced marine water quality due to dredging and dredge spoil removal.
- Reduced marine water quality due to chemical/hydrocarbon spills from support vessels.
- Introduction of marine pests.
- Faunal injury or death due to vessel strike.

9.1 LIMITATIONS

This document should be considered as a preliminary assessment of environmental matters, in support of an EPBC referral. Therefore, it is expected that not all facets of the activity or the environmental matters have been comprehensively described. This more detailed level of assessment will be conducted as part of a full Environmental Impact Assessment.

Spatial data captured in maps is only current to the date of map publication. Where possible, we have accessed government data through web feature services hosted on data.wa.gov.au. This ensures the currency of the available data up to the date each map was drawn. In addition, the information contained in the Protected Species Matters Report is current to 27/01/2022.

10. REFERENCES

ACAP (2015) Agreement on the Conservation of Albatrosses and Petrels-[www](http://www.acap.aq). Available at: www.acap.aq (Accessed: January 3, 2022).

Adam, P. (2002) "Saltmarshes in a time of change," *Environmental conservation*, 29(1), pp. 39–61. doi:10.1017/S0376892902000048.

ALA (2021) Preserved specimen of *Natator depressus* (Garman, 1880) | Flatback Turtle, Atlas of Living Australia .

Bannister, J.L., Kemper, C.M. and Warneke, R.M. (1996) The Action Plan for Australian Cetaceans. Canberra: Australian Nature Conservation Agency. Available at: <http://www.environment.gov.au/resource/action-plan-australian-cetaceans>. (Accessed: January 10, 2022).

Bellchambers, L.M. et al. (2012) "Western Rock Lobster Ecology-The State of Knowledge Marine Stewardship Council Principle 2: Maintenance of Ecosystem," (236). Available at: www.fish.wa.gov.au (Accessed: December 20, 2021).

BirdLife International (2016) "*Numenius phaeopus*". IUCN Red List of Threatened Species.

Bohne, T., Griebmann, T. and Rolfes, R. (2019) 'Modeling the noise mitigation of a bubble curtain', *The Journal of the Acoustical Society of America*. Acoustical Society of America, 146(4), pp. 2212–2223. doi: 10.1121/1.5126698.

Bureau of Ocean Energy Management (2020) Electromagnetic Fields (EMF) from Offshore Wind Facilities. Environmental Studies. Available at: <https://www.boem.gov/sites/default/files/documents/renewable-energy/mapping-and-data/Electromagnetic-Fields-Offshore-Wind-Facilities.pdf> (Accessed: January 8, 2022).

Chamberlain, D. et al. (2006) "The effect of avoidance rates on bird mortality predictions made by wind turbine collision risk models," *Ibis* (London, England), 148(s1), pp. 198–202. doi:10.1111/j.1474-919X.2006.00507.x.

- CoastWise (2001) Geographe Bay Foreshore Management Plan Proposals. Prepared for the Shire of Busselton and the Geographe Catchment Council by CoastWise. . Busselton, Western Australia.
- Commonwealth of Australia (2017) National Strategy for Reducing Vessel Strike on Cetaceans and other Marine Megafauna.
- Cox, J. (1973) "The identification of the smaller *Diomedea*, and the status of the *Diomedea*," South Australian Ornithologist , 26, pp. 67–75.
- Damara (2009) The Yalgorup Coast: Binningup to Cape Bouvard, Western Australia.
- Damara (2015) Harvey Coastal Hazard Risk Management and Adaptation Plan: Coastal Hazards Assessment – Part Two, Prepared by Damara Pty Ltd for Shire of Harvey. Available at: <http://www.peronnaturaliste.org.au/wp-content/uploads/2017/06/PNP-Harvey-CHRMAP-Coastal-Hazards-Part-Two.pdf> (Accessed: December 23, 2021).
- DAWE (2017) Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the swan coastal plain. Western Australia.
- DAWE (2021) Protected Matters Search Tool, Department of Agriculture, Water and the Environment. Available at: <https://www.awe.gov.au/environment/epbc/protected-matters-search-tool> (Accessed: December 23, 2021).
- DEC (2006) Slender Andersonia (*Andersonia gracilis*) Interim Recovery Plan 2006-2011. Interim Recovery Plan No. 228. Western Australia.
- DEC (2009) Technical Surveys of the Dawesville to Binningup Region. Perth.
- DEC (2012) Chuditch (*Dasyurus geoffroii*) Recovery Plan. Wildlife Management Program No. 54. Perth, Western Australia.
- DEE (2016) Banksia Woodlands of the Swan Coastal Plain: a nationally protected ecological community. Available at: www.environment.gov.au/cgi-bin/sprat/public/ (Accessed: January 3, 2022).
- Department of Agriculture Water and the Environment (2020) Australian Ballast Water Management Requirements. Version 8.
- Department of Biodiversity, Conservation and Attractions. (2017). Fauna Profile - Western Ringtail Possum *Pseudocheirus occidentalis*. Retrieved from <http://www.dbca.wa.gov.au/>
- Dept of the Environment Water Heritage and the Arts (2008) EPBC Act Policy Statement 2.1 - Interaction between offshore seismic exploration and whales.
- Department of the Environment (2015). Species Profile and Threats Database (SPRAT), <https://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>. Accessed on 5/1/22.
- Department of Environment and Energy (2017) 'Recovery Plan for Clay pans of the Swan Coastal Plain ecological community', pp. 1–81.
- Department of Sustainability Environment Water Population and Communities (2012) EPBC Act referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo (endangered) *Calyptorhynchus latirostris* Baudin's cockatoo (vulnerable) *Calyptorhynchus baudinii* Forest red-tailed black cockatoo (vulnerable) *Calyptorhynchus bank*. Available at: <https://www.awe.gov.au/sites/default/files/documents/referral-guidelines-wa-black-cockatoo.pdf>.
- Department of the Environment (2022) Clay Pans of the Swan Coastal Plain in Community and Species Profile and Threats Database, Department of the Environment, Canberra. Available at: <http://www.environment.gov.au/sprat> (Accessed: 28 January 2022).

- Development WA (2021) Kemerton Strategic Industrial Area: Referral under Section 38 of the Environmental Protection Act 1986.
- DISER (2021) Australia's emissions projections 2021.
- DPAW (2017) *Serpentine Synaphea* (Synaphea sp. Serpentine (G.R. Brand 103). Interim Recovery Plan 2017-2022.
- Drewitt, A.L. and Langston, R.H.W. (2008) "Collision Effects of Wind-power Generators and Other Obstacles on Birds," *Annals of the New York Academy of Sciences*, 1134(1), pp. 233–266. doi:10.1196/annals.1439.015.
- Dunlop, J.N. and Greenwell, C.N. (2021) "Seasonal movements and metapopulation structure of the Australian fairy tern in Western Australia," *Pacific conservation biology*, 27(1), p. 47. doi:10.1071/PC20030.
- DWER (2021) Greenhouse Gas Emissions Policy for Major Projects.
- Erickson, W.P. et al. (2001) Avian Collisions with Wind Turbines: A Summary of Existing Studies and Comparisons to Other Sources of Avian Collision Mortality in the United States. United States. doi:10.2172/822418.
- Exo, K.-M., Hüppop, O. and Garthe, S. (2003a) "Birds and offshore wind farms: A hot topic in marine ecology," *Wader Study Group Bulletin*, 100, pp. 50–53.
- Exo, K.-M., Hüppop, O. and Garthe, S. (2003b) "Birds and offshore wind farms: a hot topic in marine ecology," *Assessment*, (April), pp. 50–53.
- Florabase (2022) "Florabase—the Western Australian Flora," Western Australian Herbarium (1998–) [Preprint]. Western Australia : Department of Biodiversity, Conservation and Attractions .
- Galaiduk, R., Radford, B.T. and Harvey, E.S. (2018) "Utilizing individual fish biomass and relative abundance models to map environmental niche associations of adult and juvenile targeted fishes," *Scientific reports*, 8(1), pp. 9412–9457. doi:10.1038/s41598-018-27774-7.
- Gaughan, D.J. and Santoro, K. (2020) Status Reports of the Fisheries and Aquatic Resources of Western Australia 2018/19: The State of the Fisheries. . Perth.
- Hale, J. and Butcher, R. (2007) Ecological Character Description for the Peel-Yalgorup Ramsar Wetland Site. Perth, Western Australia .
- Hamann, M. et al. (2006) "Assessment of the conservation status of the leatherback turtle in the Indian Ocean and South East Asia," IOSEA Marine Turtle MoU Secretariat: Bangkok, 1–174.
- Higgins, P.J. and Davies, S.J.J.F. (eds) (1996) Handbook of Australian, New Zealand and Antarctic Birds. Volume Three - Snipe to Pigeons. Melbourne, Victoria : Oxford University Press.
- Hopper, S. and Brown, A. (2001) "Contributions to Western Australian Orchidology Part 2: New taxa and circumscriptions in Caladenia Spider, Fairy and Dragon Orchids of Western Australia," *Nuytsia*, 14.
- International Renewable Energy Agency (2019) Future of Wind: Deployment, investment, technology, grid integration and socio-economic aspects, A Global Energy Transformation Paper .
- Johnstone, R.E. 1949-(Ronald E. et al. (1998) Handbook of Western Australian birds. Perth, W.A: Western Australian Museum. Available at: <https://go.exlibris.link/XfQrg8Zq>.
- Latham, P.C.M. (1980) "Yellow-nosed mollymawks in the Bay of Plenty," *Notornis*, 27, pp. 393–394.
- MacArthur, L., Hyndes, G. and Babcock, R. (2007) "Western rock lobster in ecosystem processes of south-western Australia." Available at: <http://www.ag.gov.au/cca>. (Accessed: December 20, 2021).

- Marchant, N.G., Brown, A. and Thomson-Dans, C. (1998) Western Australia's threatened flora. Como, W.A: Dept. of Conservation and Land Management.
- Marchant, N.G. (Neville G. et al. (1998) Western Australia's threatened flora. Como, W.A: Dept. of Conservation and Land Management.
- Marchant, S. and Higgins, P.J. (eds) (1990) Handbook of Australian, New Zealand and Antarctic Birds. Volume One - Ratites to Ducks. Melbourne, Victoria : Oxford University Press.
- Marchant, S. and Higgins, P.J. (eds) (1993) Handbook of Australian, New Zealand and Antarctic Birds. Volume 2 - Raptors to Lapwings.
- Masden, E.A. et al. (2009) "Barriers to movement: Impacts of wind farms on migrating birds," ICES Journal of Marine Science, 66(4), pp. 746–753. doi:10.1093/icesjms/fsp031.
- McCauley, R.D., Fewtrell, J. and Popper, A.N. (2003) "High intensity anthropogenic sound damages fish ears," The Journal of the Acoustical Society of America, 113(1), p. 638.
- Menkhorst, P. and Knight, F. (2001) A field guide to the mammals of Australia. Melbourne: Oxford University Press. Available at: <https://go.exlibris.link/Yr2Mdsxq>.
- Percival, S.M. (2001) Assessment of the Effects of Offshore Wind Farms on Birds. Consultancy Report to UK Department of Technology and Industry. Ecology Consulting.
- Plonczkier, P. and Simms, I.C. (2012) "Radar monitoring of migrating pink-footed geese: Behavioural responses to offshore wind farm development," Journal of Applied Ecology, 49(5), pp. 1187–1194. doi:10.1111/j.1365-2664.2012.02181.x.
- Recalde-Salas, A. et al. (2014) "Non-song vocalizations of pygmy blue whales in Geographe Bay, Western Australia," Citation: The Journal of the Acoustical Society of America, 135, p. 213. doi:10.1121/1.4871581.
- Rockwater Pty Ltd (2009) Dawseville to Binningup Technical Environmental Studies – Hydrogeological Study. Jolimont.
- Saintilan, N. (2009) Australian saltmarsh ecology. Collingwood, Vic: CSIRO Pub. Available at: <https://go.exlibris.link/rMdG0VSz>.
- Semeniuk, V. (1995) "New Pleistocene and Holocene stratigraphic units in the Yalgorup Plain area, southern Swan Coastal Plain," Journal of the Royal Society of Western Australia, 78, p. 67. Available at: <https://go.exlibris.link/WXZ5zpnj>.
- Semeniuk, V. and Semeniuk, C.A. (2006) "Sedimentary fill of basin wetlands, central Swan Coastal Plain, southwestern Australia. Part 2: distribution of sediment types and their stratigraphy," Journal of the Royal Society of Western Australia, 89(4), pp. 185–220. Available at: <https://www.biodiversitylibrary.org/part/298779>.
- SEWPAC (2013) Conservation Advice for Subtropical and Temperate Coastal Saltmarsh.
- Southern Ports (2017) Bunbury Port Development Long Term Monitoring and Management Plan.
- Thelander, C.G. et al. (2003) Bird Risk Behaviors and Fatalities at the Altamont Pass Wind Resource Area: Period of Performance, March 1998--December 2000. United States. doi:10.2172/15006013.
- Thompson, P.M. et al. (2020) "Balancing risks of injury and disturbance to marine mammals when pile driving at offshore windfarms," Ecological Solutions and Evidence, 1(2), pp. 1–12. doi:10.1002/2688-8319.12034.
- Tsouvalas, A. (2020) 'Underwater noise emission due to offshore pile installation: A review', Energies, 13(12). doi: 10.3390/en13123037.

Water Corporation (2008) Southern Seawater Desalination Project - Environment Impact Assessment Public Environmental Review. Perth, Western Australia.

Würsig, B., Greene, C. R. and Jefferson, T. A. (2000) 'Development of an air bubble curtain to reduce underwater noise of percussive piling', *Marine Environmental Research*, 49(1), pp. 79–93. doi: 10.1016/S0141-1136(99)00050-1.

APPENDIX B. COPENHAGEN ENERGY ENVIRONMENTAL POLICY

Offshore Wind Environmental Policy

In Copenhagen Energy we comply with all pertinent environmental and safety laws, rules and regulations, not just because it is legally required, but also because we believe it is the only way to conduct sustainable business.

We seek to develop projects in harmony with local heritage and environment and strive to preserve them in the future. We embrace local cultures and traditions, ensuring that the local communities get direct benefit from our projects.

While pushing new frontiers for offshore wind power we take as many local constraints as possible into account when selecting new sites for development. This includes but is not limited to flora and fauna, commercial and recreational human activities over and under water as well as cultural heritage in the area. We are confident that offshore wind farms can coexist with the current users and neighbors of the sites if appropriate measures are put in place.

We adhere to the mitigation hierarchy principles of avoiding, reducing and restoring potential environmental impacts. This is done by initiating the dialogue early in the development process to take into account stakeholder views, new sensitivities and local information. Based on this input, we explore how we can mitigate potential environmental impacts in the best possible way.

Through detailed planning and in collaboration with authorities, we determine the specific location of wind

turbines and cables to avoid unacceptable or significant impacts on the marine and coastal environment, including considering rare species or habitats.

We are an environmentally responsible neighbor in the communities where we operate and act promptly and responsibly to correct incidents or conditions that endanger health, safety, or environment. Report them to authorities promptly and inform affected parties as appropriate.

We will strive to continuously improve our environmental performance and measure this by setting targets consistent with the aims of this policy and monitor the fulfillment.

Environmental performance will be reported regularly to the Board of Directors, who will ensure that the necessary resources are provided to support this Policy fully.

APPENDIX C. PROPOSAL DESCRIPTION DOCUMENT

Leeuwin Offshore Wind Farm

Proposal Description Document

PROPOSAL DESCRIPTION

Leeuwin Offshore Wind Pty Ltd is proposing the construction, operation and decommissioning of the Leeuwin Offshore Wind Farm within Geographe Bay, off the southwest region of Western Australia. Leeuwin Offshore Wind Pty Ltd is a wholly owned subsidiary of Copenhagen Energy A/S (CE), a Danish renewable energy developer with over 40 years' cumulative experience in delivering offshore and onshore wind and solar photovoltaic (PV) developments in Denmark and throughout Europe.

The Proposal is located approximately 130 km south of Perth between Mandurah and Bunbury, with all wind turbines to be located within Commonwealth Waters. Land-based components of the Proposal are located within the Shire of Harvey local government area. The Proposal will span Commonwealth waters, Western Australian coastal waters and land areas.

Once operational the Leeuwin Offshore Wind Farm will have the capacity to generate in excess of 3.0 GW of electricity (up to 11 Terawatt-hour (TWh) of power per year). This output would be enough electricity to power approximately 3.0 million¹ Western Australian homes and would offset an expected 6 million tonnes of CO₂ annually. This will support Australia's commitment to reduce greenhouse gas emissions by 26-28% by 2030, as well as the Western Australian Government's target of enhanced climate resilience and net zero greenhouse gas emission by 2050.

The Proposal includes the installation of up to 200 wind turbines, each up to 25 MW, and associated substation platforms, within Commonwealth Waters. The generated electricity will be brought onshore via export cables which will traverse State Waters to landfall onshore. Once onshore, electricity generated by the Proposal will be transmitted, via underground and/or overhead cables, to a substation. The electricity can then be connected into the local grid system or other power infrastructure.

The size of individual wind turbines is yet to be determined. At this stage, it is anticipated that individual turbines delivering between 15 MW and 25 MW will be installed, with the definitive number, final location and ultimate turbine specifications being determined prior to construction.

The Project is in the early development stage, and therefore many of the detailed design parameters are yet to be determined. The design process is evolving based on technical feasibility and commercial viability studies and will continue to be refined in response to environmental and social impacts identified, as well as the consultation process.

¹ Based on average household consumption of 5,198kWh / year and 60% load factor for the 3.5 GW OWF (AEMC, 2017)

PROPOSAL KEY CHARACTERISTICS

Summary of Proposal		
Proposal Title	Leeuwin Offshore Wind Farm	
Proponent Name	Leeuwin Offshore Wind Pty Ltd	
Short Description	<p>The Proposal is for the construction and operation of a wind farm in Commonwealth Waters, within Geographe Bay, approximately 15 km to 70 km from the coast off the southwest region of Western Australia.</p> <p>The Proposal comprises the installation of up to 200 turbines, each up to 25 MW, associated substation platforms and export cable (within export cable corridors) for the transmission of electricity onshore to feed into the local grid or other power infrastructure. Once operational the proposed action will have the capacity to generate in excess of 3.0 GW of electricity (up to 11 Terawatt-hour (TWh) of power per year.</p>	
Physical Elements		
Element	Location	Proposed Extent
Offshore wind farm elements: <ul style="list-style-type: none"> • Up to 200 turbines. • Up to 6 Offshore Substation Platforms. • Substructures and associated seabed foundations for turbines and platforms. • Inter-array cables linking individual turbines and platforms. • Offshore Export Cable. 	Commonwealth Waters	Footprint = 1899.6 ha Development Envelope = 423,339 ha
Offshore wind farm elements: <ul style="list-style-type: none"> • Offshore export cable. 	State Waters	Footprint = 170.4 ha Development Envelope = 5,041 ha
Onshore infrastructure including: <ul style="list-style-type: none"> • Landfall site • Transmission joint bay • Onshore export cables. • Onshore substation(s). • Connection into grid or other power infrastructure. 	State Lands	Footprint = 20.9 ha Development Envelope = 6,041 ha
Construction Elements		
Various construction phases may be required and a typical programme for installation of the Proposal would involve the key stages below, with overlaps where possible		
Offshore Infrastructure		
<ul style="list-style-type: none"> • Installation of navigation aids to support the construction phase. • Marine transportation of components to the installation sites within the windfarm area. • Seabed preparation work. • Installation of foundations (and associated scour protection if required). • Substructure installation onto installed foundations. • Installation of substations and inter-array subsea cables. • Installation of export cable(s), with trenching/protection as required. • Cable connection and commissioning at substations. • Erection of turbines. • Testing and commissioning. 		

Coastal and Onshore Infrastructure

- Preparation work, including clearing and topsoil storage, for onshore construction sites and access routes.
- Establishment of temporary onshore construction sites.
- Transportation of manufactured components (foundations, towers, nacelles, blades, gearbox, generators etc).
- Onshore assemblage of key turbine tower components, then transport offshore with the nacelle and blades for final assembly.
- Excavation or tunnelling at the landfall site.

Rehabilitation

At the completion of each construction phase, any temporary construction/laydown areas will be rehabilitated.

Operational and Maintenance Elements

Offshore Wind Farm

Proposed Extent

Electricity Generation and Transmission

Up to 11 TWh per annum

Once commissioned, the Proposal is intended to operate 24 hours a day, 365 days a year. The windfarm will operate automatically with each turbine operating independently of the others. The operation and control of the windfarm will be assessed by a Supervisory Control and Data Acquisition (SCADA) system, installed at each turbine and at the onshore control base. The SCADA system will enable the remote control of individual turbines or the windfarm in general, as well as information transfer, storage and the shutdown of any wind turbine in emergency circumstances.

The windfarm will be serviced and maintained throughout its life from a local operation and maintenance base, and an ongoing programme of operation and maintenance activities would be developed and rolled out to support the efficient operation of the windfarm.

Decommissioning Elements

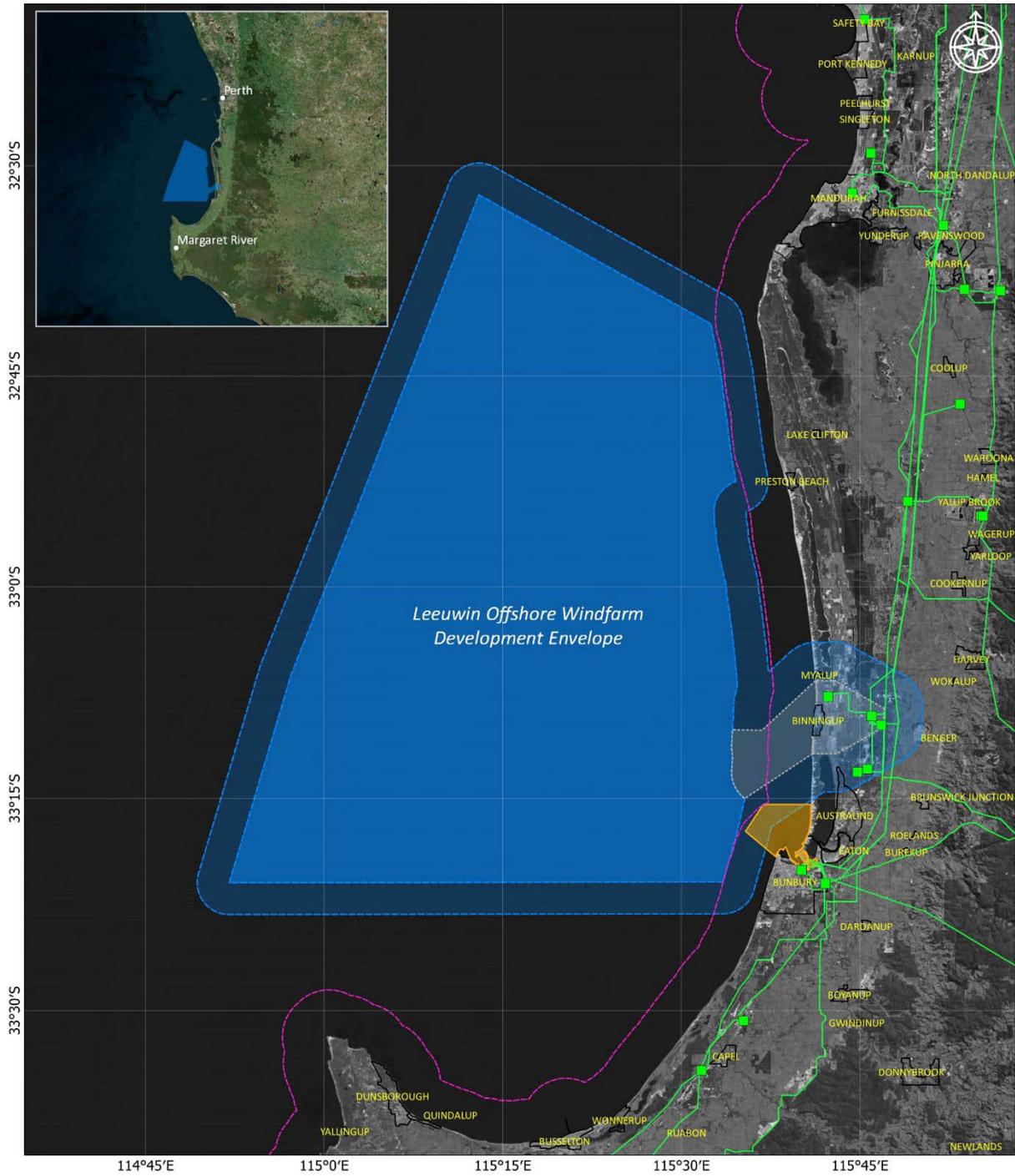
Offshore Wind Farm

Requirements for decommissioning will be established through the planning and assessment phases of the Proposal. A detailed decommissioning plan will be prepared prior to the decommissioning process, in consultation with stakeholders and the relevant authorities, to ensure all approval requirements, environmental impacts, and mitigation measures are fully understood and reported.

At this stage, it is anticipated that at the end of the operational life of the Proposal, offshore structures above the seabed would be removed. Offshore cabling would likely be left *in situ* to avoid impacts to the environment. Onshore underground cables would potentially be left in the ground with the cable ends cut, sealed and securely buried as a precautionary measure. Above ground transmission infrastructure would likely be dismantled. Port and harbour facilities are likely to be repurposed for other offshore activities.

Other elements which affect extent of effects on the environment

Proposal time	Maximum project life	Up to 50 years (with repowering)
	Construction phase	The proposed action will likely be developed in phases. It is currently planned that construction would span a nominal 36-month period, commencing in 2026 and ending in 2028, subject to the completion of the required permitting processes.
	Operation phase	Up to 50 years (with repowering)
	Decommissioning phase	Included in maximum project life



Leeuwin Offshore Wind Farm - Project Overview		10 0 10 20 km 1:750,000		 www.hydrobiology.com
LEGEND Leeuwin OWF - Development Envelope Leeuwin OWF - Cable Corridor Leeuwin OWF - Study Area Limit of State Waters	Existing power substations Existing power grid Townsites (Landgate 0248) Port of Bunbury limits	Leeuwin OWF Overview Map drawn by - Hydrobiology GIS Date and Version - 28/01/2022, v1.4 CRS - WGS84		

APPENDIX D. PROTECTED SPECIES MATTERS REPORT



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 27-Jan-2022

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar)	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	71
Listed Migratory Species:	69

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	95
Whales and Other Cetaceans:	33
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	2
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	7
Regional Forest Agreements:	None
Nationally Important Wetlands:	2
EPBC Act Referrals:	40
Key Ecological Features (Marine):	4
Biologically Important Areas:	22
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands) [\[Resource Information \]](#)

Ramsar Site Name	Proximity
Peel-yalgorup system	Within Ramsar site

Commonwealth Marine Area [\[Resource Information \]](#)

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name
EEZ and Territorial Sea

Listed Threatened Ecological Communities [\[Resource Information \]](#)

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area
Clay Pans of the Swan Coastal Plain	Critically Endangered	Community likely to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area
Tuart (<i>Eucalyptus gomphocephala</i>) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered	Community likely to occur within area

Listed Threatened Species [\[Resource Information \]](#)

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.

Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Anous tenuirostris melanops	Vulnerable	Species or species habitat may occur within area
Australian Lesser Noddy [26000]		

Scientific Name	Threatened Category	Presence Text
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Foraging, feeding or related behaviour known to occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Foraging, feeding or related behaviour known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat likely to occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Critically Endangered	Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Phoebastria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Zanda baudinii listed as Calyptorhynchus baudinii Baudin's Black-Cockatoo, Long-billed Black-cockatoo [87736]	Endangered	Breeding likely to occur within area
Zanda latirostris listed as Calyptorhynchus latirostris Carnaby's Black Cockatoo, Short-billed Black-cockatoo [87737]	Endangered	Species or species habitat known to occur within area

FISH

Scientific Name	Threatened Category	Presence Text
Galaxiella nigrostriata Blackstriped Dwarf Galaxias, Black-stripe Minnow [88677]	Endangered	Species or species habitat known to occur within area
Hoplostethus atlanticus Orange Roughy, Deep-sea Perch, Red Roughy [68455]	Conservation Dependent	Species or species habitat may occur within area
Nannatherina balstoni Balston's Pygmy Perch [66698]	Vulnerable	Species or species habitat may occur within area
Thunnus maccoyii Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat likely to occur within area
MAMMAL		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat known to occur within area
Setonix brachyurus Quokka [229]	Vulnerable	Species or species habitat may occur within area
OTHER		
Westralunio carteri Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat known to occur within area
PLANT		
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area
Austrostipa bronwenae [87808]	Endangered	Species or species habitat known to occur within area
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat likely to occur within area
Caladenia procera Carbunup King Spider Orchid [68679]	Critically Endangered	Species or species habitat known to occur within area
Diuris drummondii Tall Donkey Orchid [4365]	Vulnerable	Species or species habitat known to occur within area
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat known to occur within area
Diuris purdiei Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat likely to occur within area
Drakaea elastica Glossy-leafed Hammer Orchid, Glossy-leafed Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat known to occur within area
Eleocharis keigheryi Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat may occur within area
Lambertia echinata subsp. occidentalis Western Prickly Honeysuckle [64528]	Endangered	Species or species habitat may occur within area
Synaphea sp. Fairbridge Farm (D. Papenfus 696) Selena's Synaphea [82881]	Critically Endangered	Species or species habitat likely to occur within area
Synaphea sp. Pinjarra Plain (A.S. George 17182) [86878]	Endangered	Species or species habitat may occur within area
Synaphea sp. Serpentine (G.R. Brand 103) [86879]	Critically Endangered	Species or species habitat may occur within area
Synaphea stenoloba Dwellingup Synaphea [66311]	Endangered	Species or species habitat likely to occur within area
REPTILE		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

SHARK

[Carcharias taurus \(west coast population\)](#)

Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur within area
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[Carcharodon carcharias](#)

White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
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[Centrophorus zeehaani](#)

Southern Dogfish, Endeavour Dogfish, Little Gulper Shark [82679]	Conservation Dependent	Species or species habitat likely to occur within area
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[Galeorhinus galeus](#)

School Shark, Eastern School Shark, Snapper Shark, Tope, Soupfin Shark [68453]	Conservation Dependent	Species or species habitat may occur within area
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[Rhincodon typus](#)

Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
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[Sphyrna lewini](#)

Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area
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Listed Migratory Species

[[Resource Information](#)]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat likely to occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Hydroprogne caspia Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Onychoprion anaethetus Bridled Tern [82845]		Breeding known to occur within area
Phoebastria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area

Scientific Name	Threatened Category	Presence Text
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat likely to occur within area
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Foraging, feeding or related behaviour known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Foraging, feeding or related behaviour known to occur within area

Scientific Name	Threatened Category	Presence Text
Calidris alba Sanderling [875]		Foraging, feeding or related behaviour known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calidris ruficollis Red-necked Stint [860]		Foraging, feeding or related behaviour known to occur within area
Calidris subminuta Long-toed Stint [861]		Foraging, feeding or related behaviour known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Foraging, feeding or related behaviour known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Foraging, feeding or related behaviour known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Gallinago stenura Pin-tailed Snipe [841]		Foraging, feeding or related behaviour likely to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Foraging, feeding or related behaviour known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Foraging, feeding or related behaviour known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area
Numenius phaeopus Whimbrel [849]		Foraging, feeding or related behaviour known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Foraging, feeding or related behaviour known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Foraging, feeding or related behaviour known to occur within area

Scientific Name	Threatened Category	Presence Text
Tringa brevipes Grey-tailed Tattler [851]		Foraging, feeding or related behaviour known to occur within area
Tringa glareola Wood Sandpiper [829]		Foraging, feeding or related behaviour known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Foraging, feeding or related behaviour known to occur within area
Tringa totanus Common Redshank, Redshank [835]		Foraging, feeding or related behaviour known to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Ardena carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Arenaria interpres Ruddy Turnstone [872]		Foraging, feeding or related behaviour known to occur within area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area
Calidris acuminata Sharp-tailed Sandpiper [874]		Foraging, feeding or related behaviour known to occur within area
Calidris alba Sanderling [875]		Foraging, feeding or related behaviour known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area overfly marine area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Calidris ruficollis Red-necked Stint [860]		Foraging, feeding or related behaviour known to occur within area overfly marine area
Calidris subminuta Long-toed Stint [861]		Foraging, feeding or related behaviour known to occur within area overfly marine area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Foraging, feeding or related behaviour known to occur within area overfly marine area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Foraging, feeding or related behaviour known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Foraging, feeding or related behaviour known to occur within area overfly marine area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat likely to occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Gallinago megala Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur within area overfly marine area
Gallinago stenura Pin-tailed Snipe [841]		Foraging, feeding or related behaviour likely to occur within area overfly marine area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Foraging, feeding or related behaviour known to occur within area overfly marine area
Hydroprogne caspia as Sterna caspia Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area
Larus pacificus Pacific Gull [811]		Foraging, feeding or related behaviour may occur within area

Scientific Name	Threatened Category	Presence Text
Limicola falcinellus Broad-billed Sandpiper [842]		Foraging, feeding or related behaviour known to occur within area overfly marine area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Foraging, feeding or related behaviour known to occur within area overfly marine area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Numenius phaeopus Whimbrel [849]		Foraging, feeding or related behaviour known to occur within area
Onychoprion anaethetus as Sterna anaethetus Bridled Tern [82845]		Breeding known to occur within area
Onychoprion fuscatus as Sterna fuscata Sooty Tern [90682]		Foraging, feeding or related behaviour likely to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Foraging, feeding or related behaviour known to occur within area overfly marine area
Phoebastria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Foraging, feeding or related behaviour known to occur within area
Pterodroma macroptera Great-winged Petrel [1035]		Foraging, feeding or related behaviour known to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Scientific Name	Threatened Category	Presence Text
Puffinus assimilis Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Foraging, feeding or related behaviour known to occur within area overfly marine area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area
Stercorarius skua as Catharacta skua Great Skua [823]		Species or species habitat may occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Thinornis cucullatus as Thinornis rubricollis Hooded Dotterel, Hooded Plover [87735]		Species or species habitat known to occur within area overfly marine area
Tringa brevipes as Heteroscelus brevipes Grey-tailed Tattler [851]		Foraging, feeding or related behaviour known to occur within area
Tringa glareola Wood Sandpiper [829]		Foraging, feeding or related behaviour known to occur within area overfly marine area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area overfly marine area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Foraging, feeding or related behaviour known to occur within area overfly marine area
Tringa totanus Common Redshank, Redshank [835]		Foraging, feeding or related behaviour known to occur within area overfly marine area
Fish		
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Hippocampus subelongatus West Australian Seahorse [66722]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus fatiloquus Prophet's Pipefish [66250]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys meraculus Western Crested Pipefish [66259]		Species or species habitat may occur within area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Longsnout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammal		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat likely to occur within area
Reptile		

Scientific Name	Threatened Category	Presence Text
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Whales and Other Cetaceans [[Resource Information](#)]

Current Scientific Name	Status	Type of Presence
Mammal		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area

Current Scientific Name	Status	Type of Presence
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Globicephala melas Long-finned Pilot Whale [59282]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia sima as Kogia simus Dwarf Sperm Whale [85043]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
Lissodelphis peronii Southern Right Whale Dolphin [44]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
Mesoplodon bowdoini Andrew's Beaked Whale [73]		Species or species habitat may occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Mesoplodon grayi Gray's Beaked Whale, Scamperdown Whale [75]		Species or species habitat may occur within area
Mesoplodon layardii Strap-toothed Beaked Whale, Strap-toothed Whale, Layard's Beaked Whale [25556]		Species or species habitat may occur within area
Mesoplodon mirus True's Beaked Whale [54]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area

Current Scientific Name	Status	Type of Presence
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Stenella coeruleoalba Striped Dolphin, Euphrosyne Dolphin [52]		Species or species habitat may occur within area
Stenella longirostris Long-snouted Spinner Dolphin [29]		Species or species habitat may occur within area
Steno bredanensis Rough-toothed Dolphin [30]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Australian Marine Parks		[Resource Information]
Park Name	Zone & IUCN Categories	
Perth Canyon	Multiple Use Zone (IUCN VI)	
Geographe	Special Purpose Zone (Mining Exclusion) (IUCN VI)	

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	
Benger Swamp	Nature Reserve	WA	
Byrd Swamp	Nature Reserve	WA	
Leschenault Peninsula	Conservation Park	WA	
NTWA Bushland covenant (0004)	Conservation Covenant	WA	

Protected Area Name	Reserve Type	State
NTWA Bushland covenant (0095)	Conservation Covenant	WA
Unnamed WA40564	Nature Reserve	WA
Yalgorup	National Park	WA

Nationally Important Wetlands [\[Resource Information \]](#)

Wetland Name	State
Benger Swamp	WA
Yalgorup Lakes System	WA

EPBC Act Referrals [\[Resource Information \]](#)

Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
Airborne sonar trials	2001/540	Controlled Action	Completed
Albemarle Lithium hydroxide manufacturing plant, Kemerton, WA	2017/8099	Controlled Action	Post-Approval
Binningup Beach Residential Development, Lots 195, 304, 9003 Lakes Parade, Binningup WA	2009/5046	Controlled Action	Post-Approval
Bluewaters Power Station Expansion Phases 3 & 4	2008/4113	Controlled Action	Proposed Decision
Clear 2.86 ha of native vegetation for the purpose of horticulture	2010/5655	Controlled Action	Post-Approval
Kemerton SIA Road and Drainage project, near Australind, WA	2018/8237	Controlled Action	Post-Approval
Lot 20 and 42 Marriot Road Commercial Development	2021/8883	Controlled Action	Proposed Decision
Lot 4 Runnymede Road, Wellesley - Proposed Sand Extraction	2020/8862	Controlled Action	Assessment Approach
Production horticulture in Lot 6 and Lot 8 Old Coast Road, Myalup	2020/8827	Controlled Action	Assessment Approach
Proposed Sand Extraction at Lot 601 Stanley Road, Wellesley, WA	2020/8635	Controlled Action	Further Information Request
Sand Extraction Project Lot 5 Wellesley Road, Wellesley Shire of Harvey	2021/9034	Controlled Action	Assessment Approach
Sand Mine, Lot 122 Old Coast Road, Parkfield, Binningup, WA	2014/7164	Controlled Action	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
Sand Mining on Lot 7 Runnymede Road	2011/5996	Controlled Action	Post-Approval
Silica Sand Mine Expansion	2002/910	Controlled Action	Post-Approval
Southern Seawater Desalination Project	2008/4173	Controlled Action	Post-Approval
WA Offshore Windfarm	2021/8961	Controlled Action	Assessment Approach
Yarragadee Water Supply Development	2005/2073	Controlled Action	Completed
Not controlled action			
Albemarle Lateral Gas Pipeline, Kemerton, WA	2019/8387	Not Controlled Action	Completed
Benger Solar Farm Connection Project - WA	2020/8763	Not Controlled Action	Completed
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed
Kemerton Lateral Gas Pipeline Project	2005/2388	Not Controlled Action	Completed
Kemerton Renewable Energy Node Switchyard KEREN Switchyard	2021/9072	Not Controlled Action	Completed
Limestone quarry expansion	2005/2268	Not Controlled Action	Completed
Limestone Quarry Expansion, Lots 3618 and 1794, Finn Road	2005/2332	Not Controlled Action	Completed
Limestone quarry mining	2006/2942	Not Controlled Action	Completed
Seismic Survey, Bremer Basin, Mentelle Basin and Zeewyck Sub-basin	2004/1700	Not Controlled Action	Completed
Stanley Road waste management facility, Wellesley, WA	2014/7131	Not Controlled Action	Completed
Vegetation Clearance for Horticulture Operation Expansion, Lot 2, Springfield Rd, Parkfield, WA	2014/7196	Not Controlled Action	Completed
Not controlled action (particular manner)			

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
2D seismic survey	2008/4493	Not Controlled Action (Particular Manner)	Post-Approval
3D Marine Seismic Survey Within WA-382-P	2007/3799	Not Controlled Action (Particular Manner)	Post-Approval
Australind Piggery expansion	2014/7117	Not Controlled Action (Particular Manner)	Post-Approval
Construct and operate a 132kV transmission line and upgrade Kemerton Terminal Si	2008/4484	Not Controlled Action (Particular Manner)	Post-Approval
Construction of urea production plant and supporting infrastructure	2009/5067	Not Controlled Action (Particular Manner)	Post-Approval
Grand Southern Margin 2D Marine Seismic Survey	2008/4599	Not Controlled Action (Particular Manner)	Post-Approval
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval
Limestone Extraction on Lot 5 Old Coast Road, Myalup, WA	2012/6468	Not Controlled Action (Particular Manner)	Post-Approval
Referral decision			
3D Marine Seismic survey	2007/3725	Referral Decision	Completed
Grand Southern Margin 2D Marine Seismic Survey	2008/4573	Referral Decision	Completed
Sonar Trials and Acoustic Trials	2001/538	Referral Decision	Completed

Key Ecological Features

[[Resource Information](#)]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
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Name	Region
Ancient coastline at 90-120m depth	South-west
Commonwealth marine environment within and adjacent to Geographe Bay	South-west
Commonwealth marine environment within and adjacent to the west coast inshore lagoons	South-west
Western rock lobster	South-west

Biologically Important Areas

Scientific Name	Behaviour	Presence
Seabirds		
Ardena carneipes Flesh-footed Shearwater [82404]	Aggregation	Known to occur
Ardena pacifica Wedge-tailed Shearwater [84292]	Foraging (in high numbers)	Known to occur
Eudyptula minor Little Penguin [1085]	Foraging (provisioning young)	Known to occur
Hydroprogne caspia Caspian Tern [808]	Foraging (provisioning young)	Known to occur
Larus pacificus Pacific Gull [811]	Foraging (in high numbers)	Former Range
Onychoprion anaethetus Bridled Tern [82845]	Foraging (in high numbers)	Known to occur
Onychoprion fuscata Sooty Tern [82847]	Foraging	Known to occur
Pelagodroma marina White-faced Storm petrel [1016]	Foraging (in high numbers)	Known to occur
Pterodroma mollis Soft-plumaged Petrel [1036]	Foraging (in high numbers)	Known to occur

Scientific Name	Behaviour	Presence
Puffinus assimilis tunneyi Little Shearwater [59363]	Foraging (in high numbers)	Known to occur
Sterna dougallii Roseate Tern [817]	Foraging	Known to occur
Sternula nereis Fairy Tern [82949]	Foraging (in high numbers)	Known to occur
Whales		
Balaenoptera musculus Blue and Pygmy Blue Whale [36]	Foraging (on migration)	Known to occur
Balaenoptera musculus brevipoda Pygmy Blue Whale [81317]	Distribution	Known to occur
Balaenoptera musculus brevipoda Pygmy Blue Whale [81317]	Foraging Area (annual high use area)	Known to occur
Balaenoptera musculus brevipoda Pygmy Blue Whale [81317]	Known Foraging Area	Known to occur
Balaenoptera musculus brevipoda Pygmy Blue Whale [81317]	Migration	Known to occur
Eubalaena australis Southern Right Whale [40]	Calving buffer	Known to occur
Eubalaena australis Southern Right Whale [40]	Seasonal calving habitat	Known to occur
Megaptera novaeangliae Humpback Whale [38]	Migration (north)	Known to occur
Megaptera novaeangliae Humpback Whale [38]	Migration (north and south)	Known to occur
Megaptera novaeangliae Humpback Whale [38]	Migration (south)	Known to occur

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [-Museum Victoria](#)
- [-Australian Museum](#)
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- [-Online Zoological Collections of Australian Museums](#)
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- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
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- [-Western Australian Herbarium](#)
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- [-University of New England](#)
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- [-Australian Government, Department of Defence](#)
- [Forestry Corporation, NSW](#)
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- [-CSIRO](#)
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- [-eBird Australia](#)
- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

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EPBC Act referral



Australian Government
Department of Agriculture, Water and the Environment

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Title of proposal	2022/9160 - Leeuwin Offshore Wind Farm
Section 1	
Summary of your proposed action	
1.1 Project industry type	Energy Generation and Supply (renewable)
1.2 Provide a detailed description of the proposed action, including all proposed activities	
<p>Leeuwin Offshore Wind Pty Ltd is proposing the construction, operation and decommissioning of the Leeuwin Offshore Wind Farm within Geopraphe Bay, off the southwest region of Western Australia. The proposed action is located approximately 130 km south of Perth between Mandurah and Bunbury, with all wind turbines to be located within Commonwealth Waters. Land-based components of the proposed action are located within the Shire of Harvey local government area. The proposed action will span Commonwealth waters, Western Australian coastal waters and land areas. Once operational the Leeuwin Offshore Wind Farm will have the capacity to generate in excess of 3.0 GW of electricity (up to 11 Terawatt-hour (TWh) of power per year). This output would be enough electricity to power approximately 3.0 million Western Australian homes and would offset an expected 6 million tonnes of CO₂ annually. This will support Australia's commitment to reduce greenhouse gas emissions by 26-28% by 2030, as well as the Western Australian Government's target of enhanced climate resilience and net zero greenhouse gas emission by 2050.</p> <p>The proposed action includes the installation of offshore Wind Turbine Generators (WTGs) and associated Offshore Substations (OSS) platforms, within Commonwealth Waters. The generated electricity will be brought onshore via export cables which will traverse State Waters to landfall onshore. Once onshore, electricity generated by the proposed action will be transmitted, via underground and/or overhead cables, to a substation. The electricity can then be connected into the local grid system or other power infrastructure. The proposed action is in the early development stage, and therefore many of the detailed design parameters are yet to be determined. The design process is evolving based on technical feasibility and commercial viability studies and will continue to be refined through stakeholder consultation and in response to environmental and social impacts assessments.</p> <p>A description of the key components of the proposed action are provided below. For more detail on the key features of the proposed action see Appendix A, Section 3 Proposed Action.</p> <p>Offshore wind assets</p> <ul style="list-style-type: none">• Approximately 200 offshore WTGs supported by suction caissons, piled foundations or gravity bases. The WTGs will be located exclusively in Commonwealth marine waters (approximately 15 km to 70 km from the coast).• A network of buried and/or protected (in areas where burial is not possible) subsea cables along the seabed connecting strings of the WTGs together and connecting them to the offshore transmission assets. These are known as inter-array cables. <p>Offshore transmission assets</p> <ul style="list-style-type: none">• A number of OSS platforms to collect and transform the generated electricity for transmission to shore. The OSS will be located exclusively in Commonwealth marine waters.• Subsea export cables to connect to the onshore power grid. The export cables will cross from Commonwealth marine waters (>3nm) to State waters (< 3nm), where landfall will be made.• It is anticipated that the export cables will be buried and/or protected (in areas where burial is not possible). <p>Coastal and onshore transmission assets</p> <ul style="list-style-type: none">• Cable landfalls (the point(s) at which the subsea cables come ashore, most likely subsurface).• A transition joint bay (the interface between the offshore and onshore cables).• A number of onshore substations.• An onshore transmission system, consisting of a number of circuits (either overhead, underground or a combination of both) which transmit energy generated by the windfarm from the onshore substation(s) to the South-West Interconnected System (SWIS).• A transmission system connection point (the interface into the SWIS).• Temporary construction areas and access roads. <p>The key activities associated with the proposed action are described below.</p> <p>Key Construction Activities</p> <p>Onshore:</p> <ul style="list-style-type: none">• Preparation work, including clearing and topsoil storage, for onshore construction sites and access routes.	



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- Establishment of temporary onshore construction sites.
- Transportation of manufactured components (foundations, towers, nacelles, blades, gearbox, generators etc).
- Onshore assemblage of key turbine tower components, then transport offshore with the nacelle and blades for final assembly.
- Excavation or tunnelling at the landfall site.
- Establishment of onshore transmission infrastructure. In underground sections this will involve excavation of cable trenches. In overhead sections, works will include installation of tower foundations and structures.
- Rehabilitation of temporary disturbance areas.

Offshore:

- Installation of navigation aids to support the construction phase.
- Marine transportation of components to the installation sites within the windfarm area.
- Seabed preparation work.
- Installation of foundations (and associated scour protection if required).
- Substructure installation onto installed foundations.
- Installation of substations and inter-array subsea cables.
- Installation of export cable(s), with trenching/protection as required
- Cable connection and commissioning at substations.
- Erection of turbines.
- Testing and commissioning.

Key Operational and Maintenance Activities

Once commissioned, the windfarm is intended to operate 24 hours a day, 365 days a year. The windfarm will operate automatically, with each turbine operating independently of the others. The operation and control of the windfarm will be monitored by means of a Supervisory Control and Data Acquisition (SCADA) system, installed at each turbine, and linked to the onshore control base. The SCADA system will enable the remote control of individual turbines or the windfarm in general and will support information transfer, storage, and the shutdown of any wind turbine in emergency circumstances.

The windfarm will be serviced and maintained throughout its life by a local operating 'base'. An ongoing programme of maintenance activities will be implemented to support the efficient operation of the windfarm. It is anticipated that this maintenance programme will result in the creation of a local service base and the creation of a significant number of new permanent jobs.

Inspections of support structures, scour protection and subsea cables will be performed on a regular basis, as will ad-hoc visits for surveillance purposes. Maintenance of WTGs is normally separated into three categories:

- Periodic overhauls
- Scheduled maintenance
- Unscheduled maintenance

Key Decommissioning Activities

Requirements for decommissioning will be established through the planning and assessment phases of the proposed action. A detailed decommissioning plan will be prepared prior to the eventual decommissioning process, in consultation with stakeholders and the relevant authorities, to ensure all approval requirements, environmental impacts, and mitigation measures are fully understood and reported.

1.3 What is the extent and location of your proposed action?

See Appendix B

1.5 Provide a brief physical description of the property on which the proposed action will take place and the location of the proposed action (e.g. proximity to major towns, or for off-shore actions, shortest distance to mainland)

The proposed action is located in the south-west of Western Australia approximately 130 km south of Perth between Mandurah and Bunbury. The offshore WTGs and OSS platforms will be localised within Commonwealth marine waters (approximately 15 km to 70 km from the coast). The export cables will cross from Commonwealth marine waters (>3nm) to State waters (< 3nm), where landfall will be made.

Land-based components of the proposal are located within the Shire of Harvey local government area, directly north of the town of Binningup. The local governments to the north and south of the Development Envelope are the Shire of Waroona and the City of Bunbury, respectively. The project area will be refined during future stages of the project.

See Appendix A - Figure 2 (Map of Proposed Action Area)

1.6 What is the size of the proposed action area development footprint (or work area) including disturbance footprint and avoidance footprint (if relevant)?



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The Project Footprint was calculated to be 21km² (2,090 ha). This was calculated based on the dimensions of the project infrastructure (WTGs, OSS, export cables) plus a significant contingency. The Development Envelope was calculated to be 5,341km² (434,421 ha). The Development Envelope is significantly larger than the Project Footprint to allow for flexibility to move the Project Footprint in response to key information obtained from environmental and social baseline studies. As the project progresses, the Project Footprint will be further refined in terms of its size and location. The key features of the proposed action are discussed in detail in Appendix A, Section 3 Proposed Action and a table provided that summaries the proposed Project Footprint and Development Envelope in Commonwealth and State Waters and onshore.

1.7 Proposed action location

Other - The proposed action is located approximately 15 km to 70 km from the coast.

1.8 Primary jurisdiction

Western Australia

1.9 Has the person proposing to take the action received any Australian Government grant funding to undertake this project?

Yes No

1.10 Is the proposed action subject to local government planning approval?

Yes No

1.10.1 Is there a local government area and council contact for the proposal?

Yes No

1.11 Provide an estimated start and estimated end date for the proposed action	Start Date	01/01/2026
	End Date	01/01/2076

1.12 Provide details of the context, planning framework and state and/or local Government requirements

The proposed action spans Commonwealth Waters and Western Australian State Waters and lands so will be subject to both Commonwealth and State approvals. In line with this, the proposed action is being referred under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) for the assessment of potential impacts to Matters of National Environmental Significance (MNES) (this document).

In addition, the proponent intends to refer the proposed action to the WA Environmental Protection Authority (EPA) under the Environmental Protection Act 1986 (EP Act) in 2022. A range of secondary approvals will be required under Western Australian legislation, and these are covered in detail in Appendix A - Section 2 Statutory Context.

1.13 Describe any public consultation that has been, is being or will be undertaken, including with Indigenous stakeholders

Leeuwin Offshore Wind Pty Ltd seek to develop projects in harmony with local heritage and environment, and they strive to preserve them for the future. They believe that involving communities and stakeholders early in the development process is key to achieving this goal and is critical to developing a successful project.

Forty years of collective experience in renewable energy throughout Europe has taught them that developer that commence the stakeholder engagement process early, with a strategic long-term view, are more likely to achieve overall positive outcomes for their proposal.

Leeuwin Offshore Wind Pty Ltd is committed to genuine consultation with local communities and stakeholders at all stages of the project and in response to this have developed a Stakeholder and Community Engagement Plan. At the heart of this plan is to identify the stakeholder groups, build relationships, gain mutual respect and make better decisions. The is the intention to involve communities and stakeholders early, to seek their input, understand their views, utilise local knowledge and expertise and build opportunities for people to get involved in the project.

To date, Leeuwin Offshore Wind Pty Ltd has started consultation and conversations with the following:

- Commonwealth Department of Agriculture, Water and Environment (DAWE)



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- Commonwealth Department of Industry, Science Energy and Resources (DISER)
- Department of Defense
- National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA)
- National Offshore Petroleum Titles Administrator (NOPTA)
- Department of Jobs, Tourism, Science and Innovation (JTSI)
- Danish Trade Council
- WA Energy Minister
- Western Power
- Western Australian Museum (Marine Archaeology)
- Southern Ports Authority
- Minister for Energy
- Australian Energy Market Operator (AEMO)
- Water Corporation
- Development Western Australia
- Alcoa Corporation
- Fortescue Future Industries

Future Consultation that is planned for the immediate future includes key indigenous groups, local community groups, local councils, fisheries and State Government departments relevant to the proposed action. Consultation tools that will be used, include the following. In response to COVID restrictions remote communication options will be included to ensure that stakeholders have the opportunity to engage and be involved, for example online meetings, presentation, webinars, written submission and hard copy information packs.

- Letters
- Meetings
- Workshops
- Information sessions
- Community Reference Group
- Frequently Asked Questions
- Project webpage

1.14 Describe any environmental impact assessments that have been or will be carried out under Commonwealth, State or Territory legislation including relevant impacts of the project

A desktop environmental impact assessment of potential impacts to matters of national significance (MNES) was undertaken (Appendix A - Section 6 and Section 7). This assessment provides a preliminary evaluation of potential impact of the proposed action to marine and terrestrial MNES.

Pending the outcomes of this referral (and the planned EPA referral), environmental impact assessments will be carried out as required to satisfy all relevant Commonwealth and Western Australian legislation.

1.15 Is this action part of a staged development (or a component of a larger project)?

- Yes No

1.16 Is the proposed action related to other actions or proposals in the region?

- Yes No



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Section 2

Matters of national environmental significance

2.1 Is the proposed action likely to have any direct or indirect impact on the values of any World Heritage properties?

Yes No

2.2 Is the proposed action likely to have any direct or indirect impact on the values of any National Heritage places?

Yes No

2.3 Is the proposed action likely to have any direct or indirect impact on the ecological character of a Ramsar wetland?

Yes No

Wetland

The Development Envelope lies adjacent to the Peel-Yalgorup System Ramsar site (Site ID: 36) which is listed as a Wetland of International Importance under the Ramsar Convention. The proposed onshore transmission corridor site is over 3 km from the southern edge of the wetland and the offshore infrastructure component will be at least 16 km from the adjacent wetland both of which provide sizeable buffers for any potential impacts from the proposed action. The system is characterised by shallow estuaries, coastal saline lakes and freshwater marshes with the Peel and Harvey estuaries connecting to the Indian Ocean through various channels. The wetland is large and includes the Peel Inlet, Harvey Estuary, Lake McLarty, Lake Mealup and ten Yalgorup National Park wetlands. The wetland is one of the most important areas for birds in the south-west Australia, it supports a diverse range of waterbirds, invertebrates, marine and estuarine fish. For further details see Appendix A, Section 4.2.5

Impact

The onshore construction works may indirectly impact water quality at nearby wetlands and waterways. For example, uncontrolled surface water flows from the proposed action into the wetland could introduce nutrients, acid sulphate soils (ASS) or alter the salinity of the receiving waters. An assessment of the surface and groundwater hydrology will be required to confirm any potential impacts. Additional management measures will include soil testing for ASS and the use of sediment ponds and bunds to control any surface water flows and quality. Offshore activities have the potential to impact on bird species associated with the Ramsar wetland, this is covered in the following section.

The proposed onshore transmission corridor site is over 3 km from the southern edge of the wetland and the offshore infrastructure component will be at least 16 km from the adjacent wetland both of which provide sizeable buffers for any potential impacts from the proposed action.

The operation of the offshore wind farm has the potential to impact on bird species associated with the Ramsar wetland through collision with turbines or the alteration of flight movements or migration patterns. An alteration in the population of these species could potentially change the ecological character of the wetland. The potential impacts to bird species is covered in more detail in the following section (Section 2.4 - Species or threatened ecological community – Birds) and in Appendix A, Section 8 Potential Impacts and Proposed Management.

2.3.2 Do you consider this impact to be significant?

Yes No

2.4 Is the proposed action likely to have any direct or indirect impact on the members of any listed species or any threatened ecological community, or their habitat?

Yes No

Species or threatened ecological community

Threatened Ecological Communities

A search of the PMST and the Threatened and Priority Ecological Community search (DBCA) identified four TECs that are likely to occur within the Development Envelope (DBCA, 2022).

- Tuart Woodlands (*Eucalyptus gomphocephala*) and Forests of the Swan Coastal Plain ecological community



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(Critically Endangered).

- Banksia Woodlands of the Swan Coastal Plain ecological community (Endangered).
- Subtropical and Temperate Coastal Saltmarsh (Vulnerable).
- Clay Pans of the Swan Coastal Plain (Critically Endangered).

For further details see Appendix A, Section 4.2.6 and 7.2 – Threatened Ecological Communities.

Impact

Based on the desktop assessment it is highly likely that three of the above TEC occur within the Development Envelope (Tuart Woodlands, Banksia Woodlands and Coastal Saltmarsh). Field surveys will be conducted to identify the location of these TEC and to assess their structure and condition using the key diagnostic criteria and condition threshold relevant to each TEC. These surveys will inform the design of the project, particularly the placement of the onshore infrastructure to ensure that these sensitive areas are avoided (where possible).

The proposed action has the potential to directly impact the TECs through the clearing of vegetation. The scale of the land clearing is proposed to be less than 21 hectares. Where possible the disturbance footprint will be designed to utilise previously disturbed or cleared land and avoid areas of native vegetation. In addition, areas of land that are cleared for the transmission corridor will be revegetated with native vegetation. A desktop land use assessment indicates that a large portion of the Disturbance Envelope is already disturbed/cleared (e.g. KSIA, Binningup Desalination Plant, export cables connecting to Kemerton sub-station, Forrest Hwy), so revegetation works will help to rehabilitate areas of the Development Envelope that have previously been disturbed resulting in positive effect on the local ecosystem. It is envisioned that the risk of clearing to TEC can be successfully mitigated.

Onshore construction activities have the potential to impact the TECs through the introduction of weeds and pathogens. Introduced flora and pathogen can outcompete native vegetation leading to a loss of suitable habitat. Weed control and pathogen control measures will be adopted throughout the life of the project and will be detailed in the project's environmental management plans.

Potential indirect impacts may be experienced due to a reduction in water quality from uncontrolled runoff during construction activities. An assessment of surface and groundwater hydrology will be conducted and will inform the design of the project to mitigate any potential impacts to water quality.

Potential impacts and management measures are outlined in Appendix A, Section 8 Potential Impacts and Proposed Management.

Species or threatened ecological community

Marine Birds

The Threatened and Priority Flora Database search revealed two marine bird species that have been recorded as being within the project study area (see Figure 18).

- Southern Giant Petrel (pelagic) (*Macronectes giganteus*) - Endangered
- Shy Albatross (pelagic bird) (*Thalassarche cauta*) – Vulnerable

More information is provided in Appendix A - Section 7.5.2 Marine Bird Species.

Impact

The albatross and petrel are pelagic birds and spend a significant portion of their lives on the open ocean, rarely venturing close to land except to breed. They are commonly found hundreds to thousands of kilometres offshore foraging in southern waters south of 25 degrees (ACAP, 2015; Bird Life International, 2008; Marchant and Higgins, 1990). Both the Shy Albatross and the Southern Giant Petrel are known to breed on remote island in the southern oceans (over 4,000 km from the proposed action). The Threatened and Priority Flora Database results revealed only two sightings of these species, this suggests that they are not a common visitor to the area. Appendix A (Figure 18) shows sightings of the Crested Tern and the Grey Plover within the Development Envelope, however these species are not listed as MNES (listed as Least Concern – LC).

The physical presence of the windfarm, and associated noise, vibrations, and artificial lighting, may cause displacement or avoidance behaviours of Albatrosses and Petrels from foraging habitats. However, based upon the vast distances that Albatrosses and Petrels are known to traverse to forage, the proposed action is unlikely to lead to a significant loss of foraging area or a decline in Albatross population.

There is a risk of collision with the WTGs, with the likelihood of collision likely to be species-specific based upon different foraging behaviours and soaring heights. Several studies have showed that some bird species will actively change their flight pattern to avoid flying in close proximity to the turbines (Exo et al., 2003; Lindeboom et al., 2011; Percival, 2001; Plonczkier & Simms, 2012), which is advantageous and may explain the low bird strike rates. Some researcher suggested that this adjustment of flight may impact migratory birds (Masden et al., 2009) while others suggested that this avoidance did not have



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an impact on bird feeding or distribution (Percival, 2001). Large pelagic seabirds (albatross, gulls, terns) are most at risk as they feed in offshore waters, and less likely to be able to evade rotors as they are slow fliers. The turbines proposed will be larger and slower than the turbines currently in use. There is building evidence to suggest that these large slower turbines result in a significant reduction of bird deaths.

The research suggests that the likelihood of impact is relatively low, however the consequence to threatened species (especially endangered and critically endangered) is high. Further research is required to identify the bird species likely to fly in the vicinity of the offshore Development Envelope, migratory pattern and altitude and to assess their potential risk of bird strike particularly those that are classified as MNES.

Species or threatened ecological community

Terrestrial Birds

The Threatened and Priority Flora Database search revealed three species of Cockatoo that have been recorded as being within the project study area (Department of Sustainability Environment Water Population and Communities, 2012);

- Baundin's Cockatoo (*Calyptorhynchus baudinii*) - Endangered
- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) - Endangered
- Forest red-tailed Black Cockatoo (*Calyptorhynchus banksia*) - Vulnerable

More information is provided in Appendix A - Section 7.5.3 Terrestrial Birds.

Impact

The proposed action has the potential to directly impact these threatened species through the clearing of onshore vegetation. As discussed in the TEC section, these impacts will be mitigated by designing the footprint to utilise previously cleared lands and to avoid native vegetation, particularly the Banksia Woodlands as they are critical habitat for these threatened cockatoos. Cleared areas will be revegetated with native vegetation to reduce the risk of habitat fragmentation to these species. It is envisioned that the risk of land clearing to the threatened cockatoos can be successfully mitigated.

Potential indirect impacts may be experienced due to a reduction in water quality from uncontrolled runoff during construction activities. An assessment of surface and groundwater hydrology will be conducted and will inform the design of the project to mitigate any potential impacts to water quality. Impacts associated with the offshore wind turbines are expected to be negligible as Cockatoos are land-based birds, so the risk of turbine collision and bird mortality is highly unlikely.

A more detailed desktop assessment can be found in Appendix A (Section 6 and 7). These sections provide information about the likelihood of these species occurring within the Development Envelope.

Potential impacts and management measures are outlined in Appendix A, Section 8 Potential Impacts and Proposed Management.

Species or threatened ecological community

Marine Mammals

The PMST listed 13 species of marine mammals as possibly occurring within the Study Area. A more detailed search using the Threatened and Priority Flora Database search (DBCAs) identified that only three of these have been found within the Development Envelope (see Appendix A Figure 31). One sperm whale sighting was discounted as it was a museum specimen and didn't register in the PMST search.

- Humpback Whale (*Megaptera novaeangliae*) - Vulnerable
- Southern Right Whale (*Eubalaena australis*) - Endangered
- Australia Sea-Lion (*Neophoca cinerea*) – Endangered
- Sperm Whale (*Physeter macrocephalus*)

A more detailed desktop assessment can be found in Appendix A (Section 6 and 7). These sections provide information about the likelihood of these species occurring within the Development Envelope.

Impact

Cetaceans

There is a risk of vessel collision with Humpbacks during construction and decommissioning phases, however vessel collision with marine mammals can largely be mitigated by vessel speed and vessel type and considered low risk to the Humpback Whale population. Potential impacts and management measures are outlined in Appendix A, Section 8 Potential Impacts and Proposed Management.

Underwater noise and vibration from construction, especially impact pile driving, may cause physical/auditory injury and avoidance behaviours in whales. Avoidance of the area may affect the migration of the whales when heading either to breeding or feeding grounds. Further investigations are required into the timings of aggregations and their habitat utilisation in



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the area to assess potential impacts. Proposed management measures are outlined in Appendix A Section 8.

Disturbance of the seabed during construction and decommissioning may cause displacement of prey species, however seabed disturbances are considered to be localised and temporary, and as the area is not considered an important feeding ground for the species, this impact is unlikely to cause long-term impacts to the populations.

Sea Lions

Underwater noise and vibration from construction, especially impact pile driving may cause avoidance behaviours. Australian Sea Lions are perceptive to noise and known to respond quickly to vessels therefore it is expected that they will largely avoid the area during construction activities (Osterrieder et al., 2017). Seabed disturbance may affect the foraging of Australian Sea Lions within the Development Envelope, however, the Development Envelope is located on the outer limits of their known foraging range and is not a known key foraging area. Potential impacts to this species may occur as a result of offshore activities, but with the proposed management measures outlined in Section 8 any significant impacts to this species are unlikely.

Species or threatened ecological community

Marine Turtles

The PMST listed a total of four turtle species that may occur within the Study Area. A more detailed search using the Threatened and Priority Flora Database indicated that there have been sightings of two of these species within the project study area (see Appendix A, Figure 37).

- Loggerhead Turtle (*Caretta caretta*) - Endangered
- Green Turtle (*Chelonia mydas*) – Vulnerable

More information is provided in Appendix A - Section 7.9 Marine Turtles.

Impact

Noise, vibrations and artificial light may cause disturbances to sea turtles in the area, these impacts are unlikely to have any long-term effect on sea turtles, and avoidance of the area would likely be temporary.

Potential impacts and management measures are outlined in Appendix A, Section 8 Potential Impacts and Proposed Management.

Species or threatened ecological community

Sharks and Bony Fish

The PMST listed a total of 13 species of sharks, bony fish and mussels that may occur within the Study Area. A more detailed search using the Threatened and Priority Flora Database search from DBCA indicated that of these, only two species have been sighted within the project Study

- Great White Shark (*Carcharodon carcharias*) - Vulnerable
- Blackstriped Dwarf Galaxias (*Galaxiella igrostriatal*) - Endangered

A more detailed desktop assessment was included in Appendix A, Section 6 and Section 7 to determine the likelihood of these species occurring within the Development Envelope.

Impact

Potential impacts to the Great White Shark species may occur as a result of offshore activities, in particular pile driving, but with the proposed management measures outlined in Appendix A, Section 8 any impacts to this species are unlikely.

Species or threatened ecological community

Terrestrial Mammals

The PMST listed three species of threatened terrestrial mammals as possibly occurring within the Study Area. A more detailed search using the Threatened and Priority Flora Database search (DBCA) identified that only two of these have been found within the Development Envelope (see Appendix A, Figure 31);

- Western Ringtail Possum (*Pseudocheirus occidentalis*) -Critically endangered
- Western Quoll or Chuditch (*Dasyurus geoffroii*) -Critically endangered

A more detailed desktop assessment was included in Appendix A, Section 6 and Section 7 to determine the likelihood of these species occurring within the Development Envelope.

Impact

The proposed action has the potential to directly impact these threatened species through the clearing of onshore vegetation. As discussed in the TEC section, these impacts will be mitigated by designing the footprint to utilise previously cleared lands and to avoid native vegetation, particularly the Banksia Woodlands and Tuart Woodlands as they are critical habitat for these threatened terrestrial mammals.



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Cleared areas will be revegetated with native vegetation to reduce the risk of habitat fragmentation to these species. It is envisioned that the risk of land clearing to the threatened mammals can be successfully mitigated.

Potential indirect impacts may be experienced due to a reduction in water quality from uncontrolled runoff during construction activities. An assessment of surface water hydrology will be conducted and will inform the design of the project to mitigate any potential impacts to water quality.

Potential impacts and management measures are outlined in Appendix A, Section 8 Potential Impacts and Proposed Management.

Species or threatened ecological community

Terrestrial Flora

The PMST listed fifteen species of threatened flora as possibly occurring within the Study Area. A more detailed search using the Threatened and Priority Flora Database search (DBCAs) identified that of these twelve species only three species have recorded observations within the Development Envelope. A further four species were found just outside of the Development Envelope but have been included to ensure a conservative approach.

- Tall Donkey Orchid (*Diuris drummondii*) - Vulnerable
- Glossy Leafed/Warty Hammer Orchid (*Drakaea elastica*) - Endangered
- Dwarf Hammer Orchid (*Drakaea micrantha*) - Vulnerable
- King Spider/Grand Spider Orchid (*Caladenia huegelii*) - Endangered
- Carburnup King Spider Orchid (*Caladenia procera*) - Critically Endangered
- Dwarf Bee Orchid (*Diuris micrantha*) – Vulnerable
- *Austrostipa bronwenae* - Endangered

A more detailed desktop assessment was included in Appendix A, Section 6 and Section 7.

Impact

The proposed action has the potential to directly impact these threatened species through the clearing of vegetation. As discussed in the TEC section, these impacts will be mitigated by designing the footprint to utilise previously cleared lands and to avoid native vegetation. Vegetation surveys will be conducted to map all threatened flora within the Development Envelope and to ascertain their structure and condition. Cleared areas will be revegetated with native vegetation to reduce the risk of habitat fragmentation. It is envisioned that the risk of land clearing to threatened flora can be successfully mitigated.

Onshore construction activities have the potential to impact the threatened flora through the introduction of weeds and pathogens. Introduced flora and pathogen can outcompete native vegetation leading to a loss of suitable habitat. Weed control and pathogen control measures will be adopted throughout the life of the project and will be detailed in the project's environmental management plans.

Potential indirect impacts may be experienced due to a reduction in water quality from uncontrolled runoff during construction activities. An assessment of surface water hydrology will be conducted and will inform the design of the proposed action to mitigate any potential impacts to water quality.

Potential impacts and management measures are outlined in Appendix A, Section 8 Potential Impacts and Proposed Management.

2.4.2 Do you consider this impact to be significant?

Yes No

2.5 Is the proposed action likely to have any direct or indirect impact on the members of any listed migratory species or their habitat?

Yes No

Migratory species

Migratory Birds

The proposed action is approximately 1 km from the southern section of the Peel-Yalgorup Wetland System. This wetland supports a large number of migratory bird species. Of the 19 MNES species identified as being within the project study area

(Threatened and Priority Flora Database search, DBCAs) 11 are migratory wetland species.

- Curlew Sandpiper (*Calidris ferruginea*) – Critically Endangered
- Eastern Curlew (*Numenius madagascariensis*) – Critically Endangered
- Australasian Bittern (*Botaurus poiciloptilus*) – Endangered
- Greater San Plover (*Charadrius leschenaultia*) - Vulnerable
- Common Sandpiper (*Actitis hypoleucos*)



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- Glossy Ibis (*Plegadis falcinellus*)
More information is provided in Appendix A - Section 7.5.1 Migratory Wetland Species

Impact

The operation of the offshore wind farm has the potential to impact on these species through collision with turbines or the alteration of flight movements or migration patterns. The majority of studies investigating bird mortality resulting from turbine collision have recorded relatively low levels of mortality (e.g. Winkelman 1992a, 1992b, Painter et al. 1999, Erickson et al. 2001). However, in the context of threatened species (with low population numbers) even low levels of mortality could impact a population. These studies acknowledge that the collision risk depends on a range of factors including weather, time of year, bird species, proximity to bird congregations, size and number of turbines, rotor speed, presence of lights associated with the turbine and alignment of turbines (Hüppop et al., 2006a, Winkelman 1992c, Thelander et al. 2003). Several studies have suggested that future planning of offshore wind farms should avoid bird aggregation areas as they pose a higher risk of bird mortality (Fox and Petersen, 2019).

When migrating north and south these wetland species typically fly along the coast or inland (as opposed to flying out to sea) as they can access stop over sites to rest and feed (Alerstam, 1978). Some species follow preferred pathways that related to important stopover locations that provide food. Some migratory birds do fly offshore but fly at high altitudes (above turbine height), however they do fly at lower altitudes during take-off and landing and during poor weather (Drewitt & Langston, 2008; Newton, 2007).

Whilst in Australia these wetland species are typically not known to feed offshore, they prefer to forage in coastal areas, where they inhabit sheltered embayments, estuaries and lagoons. They also occur around terrestrial wetlands near coastal lakes and swamps, or further inland at salt-lakes (Marchant & Higgins 1993). The turbines are proposed to be located at least 15-20km offshore, it is unlikely that these wetland species will be at risk as they are less likely to fly offshore, however further investigation is required to ensure that the potential risks are fully understood.

2.5.2 Do you consider this impact to be significant?

Yes No

2.6 Is the proposed action to be undertaken in a marine environment (outside Commonwealth marine areas)?

Yes No

2.6.1 Is the proposed action likely to have any direct or indirect impact on the Commonwealth marine environment?

Yes No

2.6.2 Describe the nature and extent of the likely impact on the whole of the environment

The offshore Development Envelope, in which the WTGs and OSS will be installed lies exclusively within Commonwealth marine waters (i.e. >3nm from the coast). There may be impacts to Commonwealth Waters for example a loss of benthic habitat due to construction activities. Reduced marine water quality due to dredging and dredge spoil removal. Reduced marine water quality due to chemical/hydrocarbon spills from support vessels. Introduction of marine pests.

Potential impacts and management measures are outlined in Appendix A, Section 8 Potential Impacts and Proposed Management.

2.6.3 Do you consider this impact to be significant?

Yes No

2.7 Is the proposed action likely to be taken on or near Commonwealth land?

Yes No

2.8 Is the proposed action taking place in the Great Barrier Reef Marine Park?

Yes No

2.9 Is the proposed action likely to have any direct or indirect impact on a water resource from coal seam gas or large coal mining development?

Yes No



Note: PDF may contain fields not relevant to your application. These fields will appear blank or unticked. Please disregard these fields.

2.10 Is the proposed action a nuclear action? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
2.11 Is the proposed action to be taken by a Commonwealth agency? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
2.12 Is the proposed action to be undertaken in a Commonwealth Heritage place overseas? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
2.13 Is the proposed action likely to have any direct or indirect impact on any part of the environment in the Commonwealth marine area? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
2.13.1 Describe the nature and extent of the likely impact on the whole of the environment <p>The offshore Development Envelope abuts the Geographe Marine Park (see Appendix A, Figure 3). The park protects extensive seagrass meadows, which are important nursery habitat for many species including juvenile rock lobsters (CoastWise, 2001). The proposed action will not involve any activities within the Commonwealth Marine Park.</p> <p>There may be indirect impacts to Commonwealth Marine for example a reduction in marine water quality due to dredging and dredge spoil removal in adjacent areas. Reduced marine water quality due to chemical/hydrocarbon spills from support vessels. Introduction of marine pests.</p> <p>Potential impacts and management measures are outlined in Appendix A, Section 8 Potential Impacts and Proposed Management.</p>
2.13.2 Do you consider this impact to be significant? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No



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Section 3

Description of the project area

3.1 Describe the flora and fauna relevant to the project area

Flora and Vegetation

Much of the land within the onshore Development Envelope has been cleared of native vegetation as part of historic land development for agricultural, residential, and related land uses i.e., Binningup Desalination Plant, transmission corridors for the Kemerton sub-station, Forrest Hwy. There are remnant vegetation communities found in mosaic patches throughout the Development Envelope that include the following vegetation types. Coastal dune vegetation exists along a coastal strip, extending inland for up to approximately 1 km. East of the dunes is vegetation typical of the 'Bassendean vegetation complex', which is likely to include *Eucalyptus marginata*, WA Sheoak (*Allocasuarina fraseriana*), *Banksia* and *Melaleuca* species. Sedgeland may occur in moister areas between the Holocene dunes.

The proposed cable corridor intersects with the northern portion of the proposed Kemerton Strategic Industrial Area (KSIA). Flora and vegetation surveys of the KSIA identified a total of 28 vegetation communities including the TEC listed *Banksia* Woodlands of the Swan Coastal Plain, Tuart woodlands (*Eucalyptus gomphocephala*) and Forests of the Swan Coastal Plain (DEE, 2016; Development WA, 2021).

A desktop assessment indicates that it is highly likely that the Leeuwin Development Envelope does include areas of the following TECs; *Banksia* Woodlands, Tuart Woodlands TEC's and Subtropical and Temperate Coastal Saltmarsh. Several threatened species occur in the KSIA including the threatened orchid species *Drakaea elastica* (EPBC Act Endangered) and *Drakaea micrantha* (EPBC Act Vulnerable) (Development WA, 2021). Desktop assessment of the KSIA threatened species map indicate that these orchid species are not found within the Development Envelope (within the KSIA) field surveys will be required to confirm this. Further details of terrestrial flora and communities are provided in Appendix A, Section 7 (Threatened Flora and TEC).

Fauna

The literature review identified a number of faunal species that may potentially occur in the area including the Western Ringtail Possum, Western Quoll or Chuditch, Baundin's Cockatoo Carnaby's Cockatoo, Forest red-tailed Black and a vast array of wetland birds associated with the nearby Peel Yalgorup wetland. Appendix A, Section 7 provides details of the species likely to occur in the area. A literature review revealed no information about EPBC-listed subterranean fauna in the vicinity of the Development Envelope. There is the potential of other subterranean fauna to occur due to the presence of coastal limestone karst and cave systems in the area. Further field studies will be conducted to capture a base line of actual species and communities found within the development envelope.

3.2 Describe the hydrology relevant to the project area (including water flows)

Ground Water

The onshore components of the proposed action lies within the Swan Coastal Plain which is underlain by unconfined groundwater that resides in a variety of aquifers, including quartz or calcareous sand, limestone, and a range of mixed sediments (Semeniuk and Semeniuk, 2006). The depth to groundwater in the superficial aquifer is typically shallow, with the water table normally within 5 to 10 m of the ground surface. Seasonally, the depth to groundwater may vary by up to 2 m, but changes in groundwater levels are more usually less than 1 m (DEC, 2009; Rockwater Pty Ltd, 2009). Groundwater flows in a westerly or south-westerly direction, discharging to coastal lake systems, to the Leschenault Inlet or to the ocean. Groundwater is mostly circumneutral in pH and fresh to slightly brackish, with salinities ranging from approximately 500 to 2,000 mg/L total dissolved solids.

Surface Water

The onshore Development Envelope straddles the catchment divide between the Harvey River catchment (north of Binningup) and the larger Collie River catchment (south of Binningup). The area contains no major natural drainage lines. However directly north and south of the project are wetlands that parallel much of the coastline. These wetlands are biologically productive and provide habitat for a range of flora and fauna species.

Further investigation will be conducted to understand surface and groundwater hydrology in the area. This information will be used to inform the design of the project and establish appropriate management measures to prevent impacts to these water sources.

3.3 Describe the soil and vegetation characteristics relevant to the project area

Offshore

Geographe Bay is a wide relatively shallow embayment with average water depth of around 30 m (Appendix A, Figure 6). The majority of the seafloor is covered by unconsolidated sediments that have been deposited over older clay layers. The coastal waters within the Development Envelope (off Binningup Beach) are predominantly sandy seabed with sparsely



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distributed seagrass (Southern Ports, 2017). There is also a series of discontinuous limestone ridges that run parallel to the coast (Galaiduk, Radford and Harvey, 2018). Typically, benthic habitat in the region includes fine to medium sand with dense seagrass meadows of *Posidonia sinuosa*, broken up by sandy depressions ranging in size from meters to hectares. These seagrass meadows maintain sediment stability and serve as a nursery for juvenile fish and crustacea (CoastWise, 2001).

Benthic habitat mapping in the Binningup area, in the vicinity of the proposed cable crossing, found sponges, ascidians, Bryozoa, hydroids, hard corals, macroalgae and seagrasses, with macroalgal assemblages comprising *Ecklonia*, *Sargassum*, *Caulerpa*, *Scythothalia*, Epiphytes and *Codium*. Sparse seagrass meadows occur approximately 1 km offshore, primarily consisting of *Posidonia angustifolia*, with sporadically distributed *P. coriacea* and *Amphibolis* spp (Water Corporation, 2008). The Western Rock Lobster (*Panulirus cygnus*) occurs within the area, which plays an important functional role in the coastal ecosystem processes (MacArthur, Hyndes and Babcock, 2007).

Onshore

The Swan Coastal Plain is a low lying coastal plain. The onshore Development Envelope mostly overlies the Yalgorup Plain, a Pleistocene to Holocene landform consisting of fossiliferous limestone, aeolian limestone and quartz sand (Semenuk, 1995) extending inland some 5 to 6 km from the Holocene estuarine lagoons and aeolian barrier ridges along the coast. The Yalgorup Plain has generally low to undulating relief of about 4 to 10 m, with some relict dune ridges up to 15 m high. Superficial soils within the Development Envelope are expected to comprise sands or loamy sands derived from fluvial or aeolian sediments transported from the Darling Scarp or deposited during successive periods of marine incursion. The Acid Sulphate Soil Risk Map for the Swan Coastal Plain was accessed and geospatial data overlaid with the project location (see Appendix A, Section 4). These data suggest that parts of the onshore cable corridor may be underlain by acid sulphate soils and further soil assessment will need to be undertaken prior to any ground disturbance.

3.4 Describe any outstanding natural features and/or any other important or unique values relevant to the project area

There are no outstanding natural features relevant to the proposed action.

3.5 Describe the status of native vegetation relevant to the project area

Much of the land within the onshore Development Envelope has been cleared of native vegetation as part of historic land development for agricultural, residential, and related land uses i.e., Binningup Desalination Plant, transmission corridors for the Kemerton sub-station, Forrest Hwy.

There are remnant vegetation communities found in mosaic patches throughout the Development Envelope that include the following vegetation types. Coastal dune vegetation exists along a coastal strip, extending inland for up to approximately 1 km. East of the dunes is vegetation typical of the 'Bassendean vegetation complex', which is likely to include *Eucalyptus marginata*, WA Sheoak (*Allocasuarina fraseriana*), *Banksia* and *Melaleuca* species. Sedgeland may occur in moister areas between the Holocene dunes. A desktop assessment indicates that it is highly likely that the Leeuwin Development Envelope does include areas of the following TECs; *Banksia* Woodlands, Tuart Woodlands TEC's and Subtropical and Temperate Coastal Saltmarsh.

Several threatened species occur in the KSIA including the threatened orchid species *Drakaea elastica* (EPBC Act Endangered) and *Drakaea micrantha* (EPBC Act Vulnerable) (Development WA, 2021). Desktop assessment of the KSIA threatened species map indicate that these orchid species are not found within the Development Envelope (within the KSIA) field surveys will be required to confirm this.

A Threatened and Priority Flora Database search (DBCAs) identified that seven species of threatened flora species occur within, or just outside of the Development Envelope. Six of the seven species are orchids that are endemic to the south-west of Western Australia. These orchids have been listed as threatened due to the fragmentation of populations and the continuing decline in the extent of occurrence, area of occupancy and the quality of habitat (DEC, 2009).

A more detailed desktop assessment is provided in Appendix A, Section 6 and Section 7.

3.6 Describe the gradient (or depth range if action is to be taken in a marine area) relevant to the project area

Offshore

The proposed action will span Commonwealth waters and Western Australian coastal waters within Geographe Bay. Geographe Bay is a wide relatively shallow embayment with average water depth of around 30 m. Appendix A, Figure 6 provides a map of the proposed action in Geographe Bay overlaid with the bathymetry. The majority of the seafloor is covered by unconsolidated sediments that have been deposited over older clay layers. The coastal waters within the Development Envelope (off Binningup Beach) are predominantly sandy seabed with sparsely distributed seagrass (Southern Ports, 2017). There is also a series of discontinuous limestone ridges that run parallel to the coast (Galaiduk, Radford and Harvey, 2018).



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Onshore

The onshore area in the vicinity of the proposed landfall north of Binningup is relatively low-lying coastal plain with undulating relief of between 4-10 m. Superficial soils within the Development Envelope are expected to comprise sands or loamy sands derived from fluvial or aeolian sediments transported from the Darling Scarp or deposited during successive periods of marine incursion.

3.7 Describe the current condition of the environment relevant to the project area

Offshore

The coastal waters within the Development Envelope (off Binningup Beach) are predominantly sandy seabed with sparsely distributed seagrass (Southern Ports, 2017). There is also a series of discontinuous limestone ridges that run parallel to the coast (Galaiduk, Radford and Harvey, 2018). The available literature suggests that the benthic communities in this area are relatively low in species abundance and diversity. This pattern may be explained by the prevailing strong winds and highly mobile seabed. The offshore area receives a large volume of shipping traffic from the nearby port of Bunbury (10 km south). Impacts of these activities on the offshore environment are not known. Further field investigations are required to capture a baseline of environmental conditions within the proposed area.

Onshore

Much of the land within the onshore Development Envelope has been cleared of native vegetation as part of historic land development for agricultural, residential, and related land uses i.e., Binningup Desalination Plant, transmission corridors for the Kemerton sub-station, Forrest Hwy. There are remnant vegetation communities found in mosaic patches throughout the Development Envelope. Coastal dune vegetation exists along a coastal strip, extending inland for up to approximately 1 km, however these areas have been highly disturbed due to recreational four-wheel driving and camping (evident by extensive 4wd tracks throughout this area). The Acid Sulphate Soil Risk Mapping suggest that parts of the onshore cable corridor may be underlain by acid sulphate soils and further soil assessment will need to be undertaken prior to any ground disturbance (see Appendix A, Figure 9). Further field investigations are required to capture a baseline of environmental condition within the proposed area.

3.8 Describe any Commonwealth Heritage places or other places recognised as having heritage values relevant to the project

Underwater Cultural Heritage

Cultural heritage database searches indicated that there is one wreck (the Thermoni II) within the Development Envelope, the exact location of the wreck is not certain and due to its age (<56 years old) it is not protected by the UCH Act. There are two other listings outside of the Development Envelope; the Lass of Geraldton which is protected and the other the Lena which is not protected but is a popular tourist attraction. Consideration will be made when designing the location of offshore infrastructure to avoid the Lena and the Lass of Geraldton wrecks. Initial consultation has begun with the Western Australian Museum (Maritime Archaeology) to identify wrecks. This process will be continued and refined as the project progresses.

State Register of Heritage Places

There are 15 places listed on the State Register of Heritage Places within the study area, including the following. These sites are not classified as MNES and will be addressed in great detail during the State assessment.

- First Windmill Site (farming)
- Binningup Park Site (urban park)
- Binningup War Memorial
- Depression Sustenance Worker's Camp Site (historic)
- Pead's Cottage

3.9 Describe any Indigenous heritage values relevant to the project area

A preliminary desktop search of Aboriginal Heritage Information System (AHIS) data base found no registered Aboriginal heritages sites within the onshore Development Envelope, however a number of 'other heritage places' (Site IDs: 4884, 5803, 5804, 5805, 5806 and 5807) are listed in the AHIS database. These sites have been assessed as not meeting criteria set out in Section 5 of the Aboriginal Heritage Act 1972. However, the sites cannot be discounted as not having some local cultural or heritage importance. There are no World Heritage properties or National Heritage Places within the onshore Development Envelope. An indigenous heritage assessment and consultation with Aboriginal representative is required to identify areas and specific sites that hold cultural value.

3.10 Describe the tenure of the action area (e.g. freehold, leasehold) relevant to the project area

Offshore

The seabed of the referral area is Crown Land.

Onshore



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The majority of the proposed onshore development envelope is classified as freehold land. There are areas of reserve land, however it is envisioned that as the onshore development envelope is refined it will avoid these areas.

3.11 Describe any existing or any proposed uses relevant to the project area

Onshore

The onshore Development Envelope lies entirely within the Shire of Harvey and much of the land has been cleared and subject to some form of land development. Current land use in the area includes general farming, grazing, desalination plant, mineral processing industries, sand extraction, forestry plantations, infrastructure, municipal services (landfill, wastewater treatment), rural and semi-rural residential, native vegetation and wetland conservation. In addition, there is a Western Power electricity transmission corridor and substation (Kemerton). The project design will seek to utilise these previously developed areas for the disturbance footprint as opposed to disturbing any natural ecosystems. The sheltered beaches near Binningup and Myalup are used by local residents and tourists for recreational activities such as camping, four-wheel driving, swimming, surfing, boating and fishing. Beach launching is commonly practiced along the coast with launching ramps located at Binningup Beach and Myalup, both popular beach fishing location due to 4WD access. There are no boat launching ramps in the Development Envelope.

Approximately one third of the proposed onshore cable corridor overlaps with the proposed Kemerton Strategic Industrial Area (KSIA) which is currently being assessed under the EPBC Act (EPBC Reference Number 2021/8883). The KSIA propose to further develop this area to become an industry hub for the southwest.

Offshore

There are a number of commercial fisheries located within or adjacent to the Development Envelope, notably Australia's most valuable fishery, the Western Rock Lobster. Other significant commercial fisheries in the region include the Southwest Beach Seine, Commercial Crab, Abalone, Octopus, and various marine and estuarine finfish fisheries. The region also hosts trawl fisheries including the Western Deepwater Trawl Fishery, Offshore Demersal Fishery and Southwest Trawl Managed Fishery. The offshore area receives a large volume of shipping traffic from the nearby port of Bunbury (10 km south). In addition, local residents use the offshore area for fishing, diving and boating.



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Section 4

Measures to avoid or reduce impacts

4.1 Describe the measures you will undertake to avoid or reduce impact from your proposed action

Below is a list of proposed management measures to mitigate potential impacts. Appendix A, Section 8 Potential Impacts and Proposed Management provide further detail on these measures;

- Turbines located at least 15 – 20 km offshore so risk to shore birds and terrestrial birds negligible.
- The proposed turbines are designed to be large and slow which are known to reduce bird mortality.
- Design measures to reduce risk of bird mortality (number of turbines, turbine height, location, distance between turbine)
- Bird surveys to identify bird species at risk, migratory routes and altitude.
- Vegetation surveys will be conducted to characterise existing conditions, species and TEC present in the vicinity of the proposed action.
- The scale of the land clearing is proposed to be 21 hectares.
- A large portion of the Development Envelope has been cleared/disturbed (e.g. Binningup Desalination Plant, export cables connecting to Kemerton sub-station, Forrest Hwy). Where possible the placement of the onshore corridor and infrastructure will utilise these areas and avoid areas of native vegetation and habitat crucial to support threatened and priority flora and fauna species.
- Specific weed and pathogen controls protocols will be included in the Construction Environmental Management Plan.
- Rehabilitation and landscaping works will utilise locally occurring native vegetation.
- Pre-construction and construction activities will be managed to prevent any significant impact on nearby wetlands and waterways.
- An assessment of the surface and groundwater hydrology will be required to confirm any potential impacts to the Ramsar wetland.
- Management measures will include soil testing for ASS and the use of sediment ponds and bunds to control any surface water flows and quality.
- High resolution benthic habitat mapping to identify critical habitats.
- The location of OWF foundations designed to ensure minimal overlap with seagrass meadows.
- Refine development footprint to avoid Key Ecological Features.
- Pile driving is only one of the options to install WTGs. Suction caissons and gravity bases are presented as options and do not require pile driving.
- Ensure construction timing avoid peak seasons/periods during which the species will cross or inhabit the study area (as defined by their BIAs and baseline survey data).
- Investigate and implement relevant underwater noise mitigation strategies such as bubble curtains.
- Apply controls during pile driving operations consisting of, but not limited to marine mammal observers, pre-start watch, soft-start and shut-down procedures if a listed animal is detected inside the defined mitigation zone.
- Investigate use of Passive Acoustic Monitoring during night-time construction operations.
- Identify suitable location for dredge spoil.
- Limit vessel speeds within BIAs.
- Subsea cable design and appropriate depth of burial should be considered to reduce the effect EMFs. The voltage on the copper conductors within the cable is blocked by a grounded metallic covering on the cable.
- Reduce vessel speeds within the study area and during key season/periods for marine fauna such as humpback whale migration etc.
- To avoid vessel strike maintain a look out for cetaceans, especially during peak migration/foraging seasons, warn other vessels in the vicinity using all appropriate means of communication if cetaceans have been sighted, reducing vessel speed in areas where cetaceans have been sighted; and consider course alterations away from sightings.
- All vessels employed during the proposed action will be required to meet rigorous Australian and international maritime laws to minimise the risk of chemical or hydrocarbon spills to the environment.
- Any hazardous spill must be reported to the Joint Rescue Coordination Centre (JRCC) Australia (Harmful Substances Report [POLREP]), such that an immediate assessment and response can be arranged.
- An oil spill response plan will be developed for the proposed action.
- All vessels will adhere to the Australian Ballast Water Management Requirements (Department of Agriculture Water and the Environment, 2020) and the International Convention for the Control and Management of Ships' Ballast Water and Sediments (Ballast Water Convention) to reduce the risk of introduce marine pests.
- All vessels will utilise the Quick Ballast Water (DBW) Risk Assessment Tool (DAWR, 2018).
- All vessels will utilise the Vessel Check Risk Assessment Tool (DPIRD).

4.2 For matters protected by the EPBC Act that may be affected by the proposed action, describe the proposed environmental outcomes to be achieved

Leeuwin Offshore Wind Pty Ltd takes its environmental responsibilities extremely seriously and is committed to adopting best



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practice in environmental management for this project. They will comply with all environmental laws, rules and regulations relevant to the project. They are committed to consult and work with all key stakeholders to fully identify all potential impacts and to design robust management strategies to avoid potential impacts and where impacts cannot be avoided mitigation measures will be developed to minimize impacts. The proposed action will be managed in alignment with Recovery Plans, Conservation Management Plans, Conservation Advices, Threat Abatement Programs and Commonwealth Marine Bioregional Plans that are relevant to MNES that occur in the referral area.

Specific outcomes that are proposed to be achieved by the project include;

- No significant impacts to Peel Yalgorup Ramsar site, EPBC Act listed threatened species, TECs or migratory species, or the Commonwealth marine area.
- No destruction, modification or fragmentation of habitats considered critical or important to the survival of an EPBC Act listed threatened or migratory species.
- No substantial adverse impacts to underwater heritage features within the referral area.
- No invasive marine species are introduced as a result of the proposed action.
- No substantial changes to the marine hydrological regime or water quality as a result of the proposed action.



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Section 5

Conclusion on the likelihood of significant impacts

5.1 You indicated the below ticked items to be of significant impact and therefore you consider the action to be a controlled action

- World Heritage properties
- National Heritage places
- Wetlands of international importance (declared Ramsar wetlands)
- Listed threatened species or any threatened ecological community
- Listed migratory species
- Marine environment outside Commonwealth marine areas
- Protection of the environment from actions involving Commonwealth land
- Great Barrier Reef Marine Park
- A water resource, in relation to coal seam gas development and large coal mining development
- Protection of the environment from nuclear actions
- Protection of the environment from Commonwealth actions
- Commonwealth Heritage places overseas
- Commonwealth marine areas

5.2 If no significant matters are identified, provide the key reasons why you think the proposed action is not likely to have a significant impact on a matter protected under the EPBC Act and therefore not a controlled action

Significant matters identified above.



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Section 6

Environmental record of the person proposing to take the action

6.1 Does the person taking the action have a satisfactory record of responsible environmental management? Explain in further detail

The proposed action is being developed by Leeuwin Offshore Wind Pty Ltd, which is a wholly owned subsidiary of Copenhagen Energy. The senior management team of Copenhagen Energy have more than 40 years' experience developing renewable energy projects onshore and offshore in Denmark, Germany and United Kingdom. These projects have been managed to comply with all environmental and safety laws, rules and regulations relevant to these countries. See Appendix A - Section 3, and Appendix B - Copenhagen Energy's Offshore Wind Environmental Policy

6.2 Provide details of any past or present proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against either (a) the person proposing to take the action or, (b) if a permit has been applied for in relation to the action – the person making the application

There are no such proceedings

6.3 If it is a corporation undertaking the action will the action be taken in accordance with the corporation's environmental policy and framework?

Yes No

6.3.1 If the person taking the action is a corporation, provide details of the corporation's environmental policy and planning framework

The proposed action is being developed by Leeuwin Offshore Wind Pty Ltd, which is a wholly owned subsidiary of Copenhagen Energy.

Leeuwin Offshore Wind Pty Ltd takes its environmental responsibilities extremely seriously. Sustainable development and environmental stewardship are the driving force behind the company's core values and mission. The company's mission is to accelerate the development of green energy projects all over the world with the goal of zero CO2 emissions to combat the global climate crisis. While pushing new frontiers for offshore wind power the company is focused on adopting best practice in environmental management for this project.

The senior management team of Copenhagen Energy have more than 40 years' experience developing renewable energy projects onshore and offshore in Denmark, Germany and United Kingdom. These projects have been managed to comply with all environmental and safety laws, rules and regulations relevant to these countries and jurisdictions. This track history is especially relevant as these countries lead the world in their regulation and management of environmental impacts from offshore wind. Copenhagen Energy is conscious that Australia's offshore wind industry is in its infancy and is focused on transferring this best practice to the ensure the success of this new industry.

The team's project experience has included Natura 2000 areas, which are conservation and protection areas established by the European Commission to protect core breeding and resting sites for rare and threatened species and natural habitat. This previous experience is highly relevant to this project in light of the Ramsar wetland in the vicinity of the proposed action which also includes rare and threatened species and habitat. Copenhagen Energy have the experience and knowledge to manage the environmental and social impacts associated with this project. They are committed to consult and work with all key stakeholders to fully identify all potential impacts and to design robust management strategies to avoid potential impacts, and where impacts cannot be avoided mitigation measures will be developed to minimize impacts.

Neither Leeuwin Offshore Wind Pty Ltd or Copenhagen Energy have not been involved in any cases of environmental misconduct or accidents (presently or in the past).

Please see Appendix B - Copenhagen Energy's Offshore Wind Environmental Policy, for more details on the company's environmental management ethos.

6.4 Has the person taking the action previously referred an action under the EPBC Act, or been responsible for undertaking an action referred under the EPBC Act?

Yes No



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Section 7

Information sources

Reference source

The following sources were used; Peer reviewed scientific papers, EPBC Protected Matters Search Tool (PMST), Atlas of Living Australia (CSIRO), Species Profile & Threats Database (DAWE), Threatened & Priority Flora, Fauna & Ecological Communities Database Search (DBCAs), NatureMap (DBCAs), Biologically Important Areas (BIA) (DAWE), State Reserves, Key Ecological Features (KEF) (DAWE), Australasian Underwater Cultural Heritage (Bunbury region) (DAWE), Australian Wetland Database (DAWE), Species Profile & Threats Database (SPRATS) (DAWE), Australian National Shipwreck Database (ANSDB), Western Australian Museum Maritime shipwreck database (WAM), Conservation Values Atlas (DAWE), Land data (Landgate), ASRIS mapping tool (CSIRO), Australian Exposure Information Platform (AEIP), South-west Marine Bioregional Plan, Species group report cards, Species Recovery Plans & Conservation Advice (Department of the Environment), Previous environmental studies within the Development Envelope.

Reliability

All sources are accredited government sources or peer reviewed studies

Uncertainties

None



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Section 8

Proposed alternatives

Do you have any feasible alternatives to taking the proposed action?

Yes No

8.0 Provide a description of the feasible alternative

The Leeuwin OWF site was selected as the preferred offshore windfarm location following an initial site selection study of the entire WA coastline. The site selection study evaluated alternative windfarm locations based upon a ranking system that included consideration of a range of engineering, environmental, social and design constraints, including the following factors:

- Wind strength.
- Extreme weather and cyclone risk.
- Risk of seismic activity.
- Presence of conservation areas or other protected environmental features.
- Presence of threatened species or ecological communities.
- Potential for interaction with migratory species and marine fauna.
- Benthic communities: presence of seagrass, coral, rocky outcrops, or other important habitat features.
- Environmental quality: biodiversity, degree of ecosystem alteration.
- Coastal landforms: susceptibility to erosion.
- Bathymetry and water depth: implications for establishment and maintenance of infrastructure.
- Onshore and offshore substrate and soil conditions.
- Potential presence of acid sulphate soils.
- Water quality.
- Presence of Aboriginal sites or cultural values.
- Presence of other heritage features (shipwrecks, etc).
- Potential for conflict with other land / water uses:
 - Tourism.
 - Recreation.
 - Fisheries/aquaculture.
 - Shipping.
 - Defense: army/naval restricted zones.
- Potential for cumulative impacts with other coastal developments.
- Potential presence of unexploded ordnance.
- Access to / linkage with other infrastructure and/or industrial users.
- Proximity to a large port
- Access roads.
- Viable connection to the grid.
- Distance to industry that have a drive to decarbonise.

The Leeuwin OWF site was selected as the preferred site for initial development based upon its:

- Highly wind velocities and consistency with mean wind speeds greater than 8.3 m/s (at 100 m elevation).
- Shallow bathymetry, with water depths ranging from 18 - 45 m.
- Good access to existing port infrastructure at Bunbury and Kwinana.
- Suitable electricity substation located 8km from the landfall at Kemerton that would allow electricity transmission into the SWIS.
 - Proximity to a skilled workforce.
 - Proximity to existing and future residential and industrial energy users.
 - Low risk of extreme weather or cyclones.
 - Potential to make use of infrastructure alignments established for other existing projects, thereby avoiding some environmental disturbance.

A range of possible alignments for subsea cables and substations and for transition areas to onshore facilities were assessed. Key considerations in the identification of the preferred (and chosen) layout included:

- Land access considerations.
- Environmental values.
- Proximity to existing and future power infrastructure and industrial activity.
- Potential for cumulative impacts with other coastal developments.

A feasibility assessment was conducted, in consultation with Western Power, to determine the best substation location(s) to provide efficient connection to the SWIS grid. The assessment highlighted two options (Kemerton and Lanwehr); however, Lanwehr was excluded from this referral as the onshore cable route passed over the Peel-Yalgorup Ramsar wetland. At present the Kemerton terminal and power station is being referred. The cable route avoids the Ramsar wetland, and it also



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offers a shorter cable route to the substation (approximately 8 km from the coast) which reduces the onshore disturbance footprint.

8.1 Select the relevant alternatives related to your proposed action

- Timeframes
- Locations
- Activities

8.25 Do you have another alternative?

- Yes
- No



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Section 9

Person proposing the action

9.1.1 Is the person proposing the action an organisation or business?
 Yes No

Organisation

Organisation name (as registered for ABN/ACN)
 Business name
 ABN
 ACN 656719907
 Business address Unit 2, 95 Hay St, Subiaco, 6008, WA, Australia
 Postal address
 Main Phone number +61 8 6218 0900
 Fax
 Primary email address nah@copenhagen-energy.com
 Secondary email address

9.1.2 I qualify for exemption from fees under Regulation 5.23(1)(ii) of the EPBC Regulations because I am:
 Small business
 Not applicable

9.1.2.1 You must provide the date/income year that you became a small business entity:
 01/11/2021

9.1.2.2 I would like to apply for a waiver of full or partial fees under Regulation 5.21A of the EPBC Regulations
 Yes No

9.1.3 Contact (for an organisation - the contact details of the person authorised to sign on behalf of the organisation)

First name Jasmin
 Last name Bejdic
 Job title CEO
 Phone
 Mobile +45 3111 1759
 Fax
 Email jb@copehagen-energy.com
 Primary address Thorvaldsensvej 2, 5.th, 1871 Frederiksberg, Denmark,
 1871, Frederiksberg, Denmark
 Address

Declaration: Person proposing the action (To be signed by the person at 9.1.3)

I, _____, declare that to the best of my knowledge the information I have given on, or attached to the EPBC Act Referral is complete, current and correct. I understand that giving false or misleading information is a serious offence. I declare that I am not taking the action on behalf or for the benefit of any other person or entity.

Signature: Date:

I, _____, the person proposing the action, consent to the designation of _____ as the proponent for the purposes of the action described in this EPBC Act Referral.

Signature:.....Date:

I have read the Department of the Environment and Energy's guidance in the online form concerning the definition of a small business entity and confirm that I qualify for a small business exemption.

Signature:.....Date:



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Proposed designated proponent

9.2.1 Is the proposed designated proponent an organisation or business?
 Yes No

Organisation

Organisation name (as registered for ABN/ACN)
Business name
ABN
ACN 656719907
Business address Unit 2, 95 Hay St, Subiaco, 6008, WA, Australia
Postal address
Main Phone number +61 8 6218 0900
Fax
Primary email address nah@copenhagen-energy.com
Secondary email address

9.2.2 Contact (for an organisation - the contact details of the person authorised to sign on behalf of the organisation)

First name Jasmin
Last name Bejdic
Job title CEO
Phone +45 3111 1759
Mobile +45 3111 1759
Fax
Email jb@copenhagen-energy.com
Primary address Thorvaldsensvej 2, 5.th, 1871 Frederiksberg, 1871,
 Frederiksberg, Denmark
Address

Declaration: Proposed Designated Proponent

I, _____, the
 proposed designated proponent, consent to the designation of
 myself as the proponent for the purposes of the action described in this EPBC Act Referral.

Signature: **Date:**



Note: PDF may contain fields not relevant to your application. These fields will appear blank or unticked. Please disregard these fields.

Referring party (person preparing the information)

9.3.1 Is the referring party an organisation or a business?
 Yes No

Organisation

Organisation name (as registered for ABN/ACN)
 Business name
 ABN
 ACN 656719907
 Business address 95 Hay St, Subiaco, 6008, WA, Australia
 Postal address
 Main Phone number +45 3111 1759
 Fax
 Primary email address jb@copehagen-energy.com
 Secondary email address

9.3.2 Contact (for an organisation - the contact details of the person authorised to sign on behalf of the organisation)

First name Jasmin
 Last name Bejdic
 Job title CEO
 Phone +45 3111 1759
 Mobile
 Fax
 Email jb@copehagen-energy.com
 Primary address Thorvaldsensvej 2, 5. th., 1871 Frederiksberg, 1871, Frederiksberg, Denmark
 Address

Declaration: Referring party (person preparing the information)

I, _____, declare that to the best of my knowledge the information I have given on, or attached to this EPBC Act Referral is complete, current and correct. I understand that giving false or misleading information is a serious offence.

Signature: Date:



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Appendix A	
Attachment	
Document Type	File Name
action_area_images	App C Leeuwin Offshore Windfarm PDD.pdf
supporting_tech_reports	App A MNES Supporting Document.pdf
corp_env_policy_docs	App B CE Environmental Policy.pdf

Appendix B
Coordinates
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