Eastern Breakwater Tourism Jetty

Environmental Impact Assessment

CLIENT: Midwest Ports Authority

STATUS: Rev 0

REPORT NUMBER: 21WAU-0074 / R210388

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Rev B	Draft	Sean Webb-Martin	K Reynolds D Spencer	Internal peer review incorporated into Rev B Draft	R Stevens 30/11/2022
Rev 0	Final	Sean Webb-Martin	Chris Lane	Client comments addressed	C Lane 14/02/2023

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Executive Summary

This Environmental Impact Assessment (EIA) is for a project to construct and operate a Tourism Jetty adjacent to the Eastern Breakwater (EBW) in the Port of Geraldton WA (the Project). The purpose of this document is to present an EIA for the Project in accordance with Part IV of the *Environmental Protection Act 1986* (EP Act).

The scope of the document includes:

- A description of the proposed Project, including justification and design evolution (Section 2)
- Summary of stakeholder engagement undertaken in support of the Project (Section 3)
- Identification of key environmental factors and potential environmental impacts of the Project in accordance with the EPA's Environmental Principles, Factors and associated Objectives (Section 4)
- An assessment of the potential environmental impacts of the Project on other environmental factors (Section 5)
- A holistic assessment of the impacts of the Project on the environment (Section 6).

The Tourism Jetty is proposed to be located on the eastern edge of the EBW providing pedestrian access to vessels from the existing facility. Design of the jetty will include a north-south aligned jetty situated on piles, with a permanent gangway for access to the vessel. Mooring piles will be extended north and south of the hard structure for securely mooring vessels alongside. Increased vessel operations and ongoing requirement for seabed levelling within the proposed access channel are the primary project elements considered for this EIA and Benthic Communities and Habitat (BCH) and Marine Environmental Quality (MEQ) were identified as preliminary key environmental factors to be assessed for the Project. Other factors considered include Marine Fauna, Coastal Processes and Social Surroundings which were included within the assessment at a reduced level due to low likelihood for any impacts on these factors.

It was concluded that the combined impact of the Project activities and the consequent outcomes are not considered to pose significant residual risks to the protection of BCH and therefore biological diversity and ecological integrity can be maintained. In addition, Project activities are not expected to pose any significant residual risks to maintaining the quality of water, sediment and biota and thus the environmental values can be protected. Therefore, in respect of the proposed design and management of the Project, the Proponent considers that the EPA's objective for BCH and MEQ can be met.

Recommendations

1. A project Environmental Management Plan is developed and approved by MWPA for seabed levelling activities;
2. Commercial agreements with Tourist Jetty operators include environmental requirements for usage, particularly with respect to vessel speeds, operating within the defined inner channel and pollution management.
3. The Marine Environmental Monitoring and Management Plan (currently under development) considers potential impacts from ongoing operations into the final surveillance program.

MARINE

Acronyms and Abbreviations

Acronyms/Abbreviation	Description
AH Act	*Aboriginal Heritage Act* 1972
BC Act	*Biodiversity Conservation Act* 2016 (BC Act);
BCH	Benthic Communities and Habitats
BCM	Batavia Coast Marina
CGG	City of Greater Geraldton
CLA	Cumulative Loss Assessment
CMP	Commonwealth Marine Park
DBCA	Department of Biodiversity and Attractions
DE	Development Envelope
DMPA	Dredge Material Placement Area
DoT	Department of Transport
EBW	Eastern Breakwater
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Authority
EPBC Act	*Environmental Protection and Biodiversity Conservation Act* 1999
EP Act	*Environmental Protection Act* 1986
FBH	Fishing Boat Harbour
HEPA	High Ecological Protection Area
HWA Act	*Heritage of Western Australian Act* 1990
LAU	Local Assessment Unit
LEPA	Low Ecological Protection Area
MA Act	*Maritime Archaeology Act* 1973
MEPA	Moderate Ecological Protection Area
MEQ	Marine Environmental Quality
MNES	Matters of National Environmental Significance
MWDC	Mid-West Development Commission
MWPA	Mid-West Ports Authority
PA Act	*Port Authorities Act* 1999

PLA Act	*Ports Legislation Amendment Act* 2014
PAH	Polycyclic Aromatic Hydrocarbons
SLF	Seabed Levelling Footprint
SSC	Suspended Sediment Concentration
TBT	Tributyltin
TEC	Threatened Ecological Community
UCH Act	*Underwater Cultural Heritage Act* 2018 (UCH Act);
WA	Western Australia

O2 MARINE

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1. Introduction

1.1. Document Purpose and Scope

This Environmental Impact Assessment (EIA) presents an assessment of a project to construct and operate a Tourism Jetty (the Project) adjacent to the Eastern Breakwater (EBW) in the Port of Geraldton, WA. The purpose of this document is to present an EIA for the Project in accordance with Part IV of the *Environmental Protection Act 1986* (EP Act).

The scope of the document includes:

- A description of the proposed Project, including justification and design evolution (Section 2)
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- A holistic assessment of the impacts of the Project on the environment (Section 6).

1.2. Proponent

The Proponent for this Project is the Mid-West Ports Authority (MWPA). The Proponent details are provided in Table 1.

Table 1: Proponent Details

Entity Name:	Midwest Ports Authority
Australian Business Number (ABN):	73 384 989 178
Address:	298 Marine Terrace, Geraldton Western Australia 6530
Key Contact (Role):	Damian Tully (CEO)
Key Contact Email:	communications@midwestports.com.au

1.3. Environmental Impact Assessment Process

1.3.1. *Environmental Protection Act 1986* (EP Act) (Part IV)

Part IV of the EP Act is the primary legislation that governs EIA and environmental protection in WA. EIA in WA is conducted by the Environmental Protection Authority (EPA) which has prepared administrative procedures for the purposes of establishing the practices of EIA.

Whilst this EIA has been documented, the action is not predicted to have any significant environmental impacts and as such, will not be referred under the EP Act. However, this document ensures due process has been conducted in accordance with the EP Act and that a formal process of internal assessment has been conducted.

1.3.2. *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act)

The EPBC Act defines a similar process for assessment and referral of actions with the potential to cause significant environmental impacts, however, is typically focused on Matters of National Environmental Significance (MNES). There are no MNES identified that will be placed at risk of serious environmental harm from this proposed action, therefore no referral under the EPBC Act will be required.

1.4. Other Approvals and Regulation

The Project is located within the area of water, land and seabed depicted as the 'Port Area' on Deposit Plan 410027 Sheet 1 as described in *Government Gazette No.34: Port Authorities (Description of Port of Geraldton) Order 2017.* The Port of Geraldton is vested in MWPA under the Port Authorities Act 1999 and is recognised within the City of Greater Geraldton Local Planning Scheme No. 1.

The under Part 4, Section 30 of the Port Authorities Act the functions of a port authority include:

'(a) to facilitate trade within and through the port and plan for future growth and development of the port;

(d) to be responsible for the safe and efficient operation of the port;

(e) to be responsible for maintaining port property; and

(f) to protect the environment of the port and minimise the impact of port operations on that environment.'

The key legislation that applies to this EIA includes, but is not limited to:

- *Aboriginal Heritage Act* 1972 (AH Act);
- *Biodiversity Conservation Act* 2016 (BC Act);
- *Environmental Protection Act* 1986 (EP Act);
- *Heritage of Western Australian Act* 1990 (HWA Act);
- *Underwater Cultural Heritage Act* 2018 (UCH Act);
- *Maritime Archaeology Act* 1973 (MA Act);
- *Port Authorities Act* 1999 (PA Act); and
- *Ports Legislation Amendment Act* 2014 (PLA Act).

1.5. Key Environmental Factors and Assessment Guidelines

Whilst this Project is not considered to represent any significant impacts under the EP and EPBC Acts, and therefore will not be referred for formal assessment, this document details and investigates the potential environmental impacts in accordance with the documents that apply to formally assessed actions. The following key EPA Technical Guidance have been considered in the development of this EIA:

- Statement of environmental principles, factors, objectives and aims of the EIA (EPA 2021a)
- Technical Guidance: Environmental impact assessment of marine dredging proposals (EPA 2021b)
- Technical Guidance: Protection of benthic communities and habitats (EPA 2016a)
- Technical Guidance: Protecting the quality of Western Australia's marine environment (EPA 2016b).

In accordance with the technical guidance, potential project risks were identified for the following key environmental factors:

- Benthic Communities and Habitat (BCH)
- Marine Environmental Quality (MEQ).

Three other environmental factors relevant to the Project were identified, however, due to the low risk of environmental impacts, and in consideration of the mitigation measures proposed to manage potential impacts, these factors are deemed not necessary of further assessment.

- Marine Fauna
- Coastal Processes
- Social Surroundings

The following environmental factors determined not to be relevant to the Project (and not discussed further) include:

- Flora and Vegetation;
- Landforms
- Terrestrial Environmental Quality
- Terrestrial Fauna
- Subterranean Fauna
- Inland Waters
- Air Quality
- Greenhouse Gas Emissions
- Hydrological Processes.

2. The Project

Geraldton and the EBW Project site are located approximately 430 km north of the Western Australian capital city of Perth on the Mid West coastline. Locally the EBW is situated on the eastern side of the Geraldton Port commercial harbour, outside of the Maritime Security exclusion zone, in the south east corner of Champion Bay.

The MWPA are the lead agency responsible for the final design, construction and ongoing operational management, navigational access requirements and environmental performance related to the Project, including within the access channel and surrounding waters.

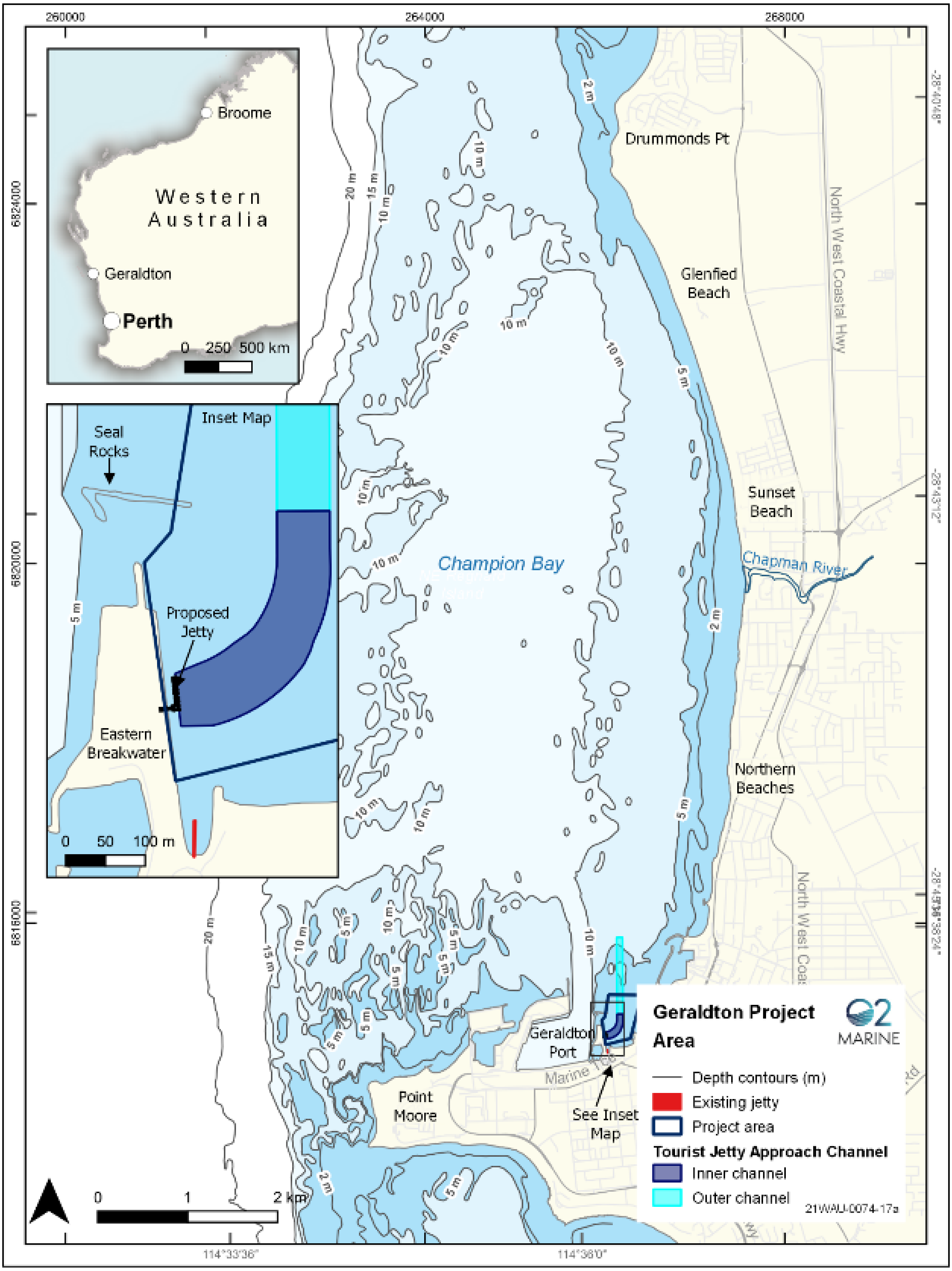

Figure 1: Location of Proposed Tourist Jetty, including infrastructure and approach channel

2.1. Project Description

2.1.1. Key Project Characteristics

The Project involves the operation and maintenance of a fixed facility suitable for local charter vessel operators to moor against to facilitate embarkation and disembarkation of customers. The Project Area includes the approach channel (inner and outer), with the inner channel referred to herein as the Seabed Levelling Footprint (SLF) (Figure 1). The Project will include the following operational elements:

- Vessel berthing and disembarkation
- Embarkation and disembarkation of tourists
- Seabed levelling to maintain the navigable access channel
- Ongoing maintenance of the jetty infrastructure including navigational channel markers.

A summary of the Project is provided in Table 2 and the key characteristics, including operational elements are summarised in Table 3 and presented in Figure 1.

The Project Area is situated near to the town of Geraldton, in Champion Bay between Point Moore in the south and Drummonds Point in the north, in the Mid-West Region of Western Australia (Figure 1). The Project and all activities will occur entirely within the designated Port Waters of Geraldton Port.

Table 2: Project Summary

Project Title	Geraldton Eastern Breakwater Tourism Jetty Project
Proponent Name	Midwest Ports Authority
Short Description	The Project involves the operation and maintenance of a Tourism Jetty and associated navigation requirements located adjacent to the EBW. The Tourism Jetty is proposed to be located on the eastern edge providing pedestrian access to vessels from the existing EBW facility. The jetty will include a north-south aligned jetty situated on pile, with a permanent gangway for access to the vessel. Mooring piles will be extended north and south of the hard structure for securely mooring vessels alongside. The approach channel(SLF) to the Jetty is typically deep enough, though removal of some high spots and ongoing maintenance via seabed levelling will be required.

Table 3: Location and proposed extent of operational elements

Operational Elements		
Channel optimisation	Figure 1	Seabed levelling within a navigable area 2.39 ha to remove high points identified by bathymetric survey with a minimum design depth of 3m LAT.
Channel maintenance	Figure 1	Seabed levelling to maintain navigable water depth of 3m LAT within the defined approach channel.
Vessel operations	Figure 1	Vessel operations within the approach channel and alongside the jetty to embark and disembark tourists from commercially chartered vessel operations.

2.1.2. Project Justification

The requirement for a Tourism Jetty was first identified in the Mid-West Tourism Strategy prepared in July 2014 by the City of Greater Geraldton (CGG) and the Mid-West Development Commission (MWDC) (Evolve Solutions 2014). Tourism in the Mid-West has been identified as a key opportunity to enable continued sustainable economic growth in the region. The strategy recognised key opportunities for the region with the first being 'the Abrolhos Islands maritime history and nature-based experiences' currently being serviced by charter flights and supported by a limited number of vessels.

Current infrastructure on the Abrolhos Islands is minimal and there are no overnight accommodations available to the general public. The strategy identified a growing demand for vessel-based tourism departing from Geraldton. The CGG and MWDC recognised an opportunity to construct infrastructure to help stimulate further tourism spend in Geraldton and the region and sought funding to develop a concept design.

In August 2020 the McGowan Government announced funding as part of the Government's $5.5 billion WA Covid-19 Recovery Plan. This investment commitment allowed the Project to go into the detail design and construction phase. Funding aims were outlined as follows:

- $3 million allocated towards construction of two new jetties to boost tourism along the Batavia Coast
- A jetty for vessels up to 25 metres will be built at the Batavia Coast Marina and a second, to accommodate larger vessels, will be located at Geraldton Port's eastern breakwater.
- Targeted infrastructure to increase visits to the pristine Houtman Abrolhos Islands
- The new jetties, expected to generate an additional $1.9 million in annual visitor expenditure by 2031, and support other local marine-based tourism opportunities including fishing and diving charters, glass bottom boat tours, whale watching, aquaculture farm and maritime history tours.

The Business Case supporting this funding application stated the delivery and management of the facilities would be undertaken by Department of Transport (DoT), MWPA and CGG, as follows:

- DoT would be responsible for delivery of the Batavia Coast Marina (BCM) jetty and other marine components.
- MWPA would be responsible for delivery of the EBW jetty and other marine components.
- CGG will deliver landside components (seating, signage etc) for both the BCM and EBW.

The asset ownership and ongoing maintenance was allocated as follows:

- The BCM jetty will be owned by the DoT with management and maintenance also falling to the Department.
- The EBW jetty will be owned and managed by the MWPA.
- CGG will own and maintain the landside associated infrastructure such as toilets, paving, landscaping, signage and seating.

2.1.3. Project Design Evolution

A site selection study was commissioned by the City of Greater Geraldton in 2020. Three sites were examined to accommodate and install a marine jetty and associated land side infrastructure to facilitate small to medium size tourism vessels. The sites reviewed included:

4. Batavia Coast Marina
5. The Eastern Breakwater
6. Fishing Boat Harbour

The initial study identified that the Batavia Coast Marina (BCM) was the preferred location for the Tourism Jetty Infrastructure however, during the draft review and additional engagement with Department of Transport it was noted that vessels exceeding 25 m could not enter the BCM. This was considered a fatal design flaw and no further investigation of the BCM was undertaken.

The EBW was then identified as being suitable for larger vessels but not ideal for smaller vessels. MWPA did not support the development of a tourism jetty within the existing Fishing Boat Harbour as it was not consistent with the Minister approved Port Master Plan, there were potential conflicts with future industrial developments and the harbour had limited parking facilities and is not well connected to the Geraldton City (ULDA 2020).

The site selection study proposed the construction of a smaller floating jetty at BCM and a fixed jetty at the EBW. The Project team lead by the Mid-West Development Commission (MWDC) proceeded to develop concept designs for Tourism Jetties at both locations. This scope of this document is for the EBW Tourist Jetty. No further consideration of the BCM floating jetty is considered herein.

In November 2021, the then current design concept was reviewed by MWPA and CGG. MWPA proposed three possible locations along the Esplanade:

1. Adjacent to the Esplanade Lookout
2. 30m South of the lookout
3. 100m south of the lookout adjacent to a paved open staging area.

CGG supported option 3, however advised they did not support the additional toilets proposed within the concept design. MWPA then progressed to detailed design. In scoping the detailed design it was identified that a dedicated approach channel will be required to facilitate safe navigation to and from the jetty facility. At the 50% detailed design phase a need for deepening the inner portion of the approach channel was recognised. This deepening would result in the permanent removal of benthic communities and habitat, including some seagrass loss within the inner channel. The initial inner channel approach was designed at 91 m wide, ~400m long and -3.3 m deep.

However, following hydrographic survey in June 2022 the approach channel has been rationalised to 40 m wide to reduce the footprint and reduce associated environmental impacts.

Following the 85% detailed design phase in August 2022, the Project required a deepening of the outer channel to -3.5 m LAT, the Inner Channel at -3 m LAT, incorporated turning circle of 66.5 m in diameter and one-way channel of 66.5 m wide. These depths allow all expected vessels unrestricted safe access to the proposed jetty (WGA 2022). The final inner channel (Figure 1) was further modified to include a small 5 m buffer through which seabed levelling activities will be maintained within and no impacts are allowed to occur outside this footprint.

The consideration of alternative sites for the jetty played a key role in conforming to the EPAs mitigation hierarchy (Avoid, Mitigate, Rehabilitate) to minimise damage and protect critical BCH. A summary of the design evolutions is presented within Table 10 and Table 13, and Appendix A.

2.1.4. Project Operational Elements

2.1.4.1. Channel optimisation

The approach channel is located within an area of natural undisturbed seabed. There have not been any dredging operations, although hydrographic and BCH survey information (O2 Marine 2022b PHS 2017; AECOM 2020; BMT 2021a) has been utilised to inform the proposed channel optimisation methodology for the Project. Seabed levelling has been identified as an appropriate strategy to facilitate the operational elements of the Project.

Seabed levelling is a hydrodynamic dredging technique that mobilises material underwater and then uses the seabed slopes and natural water currents to move the material to another location. It has been used very successfully to level high spots within the FBH entrance by relocating accreted deposits into nearby deeper areas (i.e. approximately 100-200m to the north-east). A plough or sweep bar is mounted on a large steel A-frame then suspended below a seagoing tug or barge that can raise or lower the plough to the required depth (Figure 2). Ploughing and bed levelling is carried out with a high degree of accuracy using on-board GPS enabled system. The operations are supported by a hydrographic survey vessel to ensure required depths are achieved and new high points are not created during the operations.

Figure 2: Quest Marine during June 2020 FBH works (Photo MWPA).

2.1.4.2. Channel Maintenance

It is anticipated that ongoing maintenance seabed leveling operations will be required to maintain the approach channel to a minimum depth of 3.0m LAT. Channel maintenance will be undertaken using the same seabed levelling approach as described in Section 2.1.4.1. Any seabed levelling will be considered within the original footprint of the channel. It is not anticipated that any additional seabed levelling activities would be required (i.e. to further deepen or widen the existing channel).

As there has previously been no dredging or other seabed levelling activities with the SLF, MWPA are uncertain how regular seabed levelling activities would be, although it is not anticipated to be more frequent than every five years.

2.1.4.3. Vessel Operations

The tourism jetty will facilitate embarkation and disembarkation of tourists from the EBW via the gangway and jetty infrastructure onto vessels greater than 25 m in length. Vessels up to 2.8 m draft will be able to access the jetty under all tidal conditions, however larger vessels greater than 2.8 m draft will be restricted to specific tidal heights based on the navigational channel depth. At any one time only one vessel will be able to utilise the facility, although future design may facilitate a maximum of two vessels if implemented.

Existing vessel use of this area is currently limited to small trailer vessels transiting to/from the nearby vessel ramp, recreational water sport vessels accessing the water-ski area and recreational pleasure vessels which utilise the calm embayment to anchor up whilst on a layover and to access supplies form the nearby city centre.

MWPA will be responsible for maintaining navigation, including the access channel, vessel speeds, establishing tidal restrictions and maintenance of navigation markers. Vessel operators accessing this facility will be required to comply with MWPA navigational requirements at all times when accessing the facility, details of which will be included within commercial agreements for use of the facility and to be continually revised based on updated marine navigational charts.

2.1.5. Environmental Assets

Other than conservation significant species which may occur in the Project area, the following key features of conservation significance (Figure 3) have previously been identified within or adjacent to the Project area:

Commonwealth Features of Conservation Significance

Abrolhos Commonwealth Marine Park (CMP) – Special Use Zone – The nearest CMP to the Project area is the Abrolhos CMR, which is located approximately 27 km south-west of the Project area. Given the distance from the Project area, impacts to this CMR are not predicted; and

Threatened Ecological Community: Subtropical and Temperate Coastal Saltmarsh – Subtropical and temperate coastal saltmarsh Threatened Ecological Community (TEC) is known to occur adjacent to the Project area with an established community occurring within the Chapman River. The community occurs within the river mouth area, typically an enclosed river system which intermittently flushes heavy localized rainfall. There are no impacts predicted on this TEC from implementing the Project.

Underwater Cultural Heritage – Eighty-three (83) shipwrecks were identified through a search of the Australasian Underwater Cultural Heritage Database within the Midwest Region – Geraldton, with 32 occurring along the coastline between Dongara and Port Gregory. Eight of these occur within the wider Champion Bay area. However, there are no recorded wrecks within the Nearshore DMPA, nor is there any predicted impacts from this Project to identified existing wrecks. There are 18 Shipwrecks identified on the WA Museum Shipwrecks database that are located off the coast of Geraldton with eight occurring within Champion Bay. Shipwrecks in State Waters are protected under the MA Act.

State Features of Conservation Significance

Abrolhos Islands National Park and Fish Habitat Protection Areas – The dredging area of influence lies entirely within MWPA Port Limits. Around 60 km offshore from the Port of Geraldton is the Abrolhos Islands National Park and Fish Habitat Protection Areas, jointly managed between the Departments of Biodiversity, Conservation and Attractions and Primary Industry and Regional Development.

Aboriginal Heritage – Two registered Aboriginal Heritage Sites are recorded in the Aboriginal Heritage Inquiry System (AHIS) as being in the vicinity of the Project area. These include site ID 5561 Chapman River Mouth and 5874 Bluff Point Midden. As part of the 2021 Maintenance Dredging Project, to better understand and mitigate impacts to Aboriginal heritage, MWPA engaged with the Yamatji Southern Regional Corporation to ensure that key cultural and environmental sensitivities are not impacted by the Project. There is no requirement to seek approvals for the Project, however MPWA are committed to ongoing stakeholder consultation up to, during and post dredging as required. Further details are provided in Section 3.

Other Heritage – A search of the Heritage Council database indicates no maritime or coastal heritage structures within the Project Area. The Point Moore Lighthouse cottage is listed; however, these are not considered within the Project area as such no impacts are predicted.

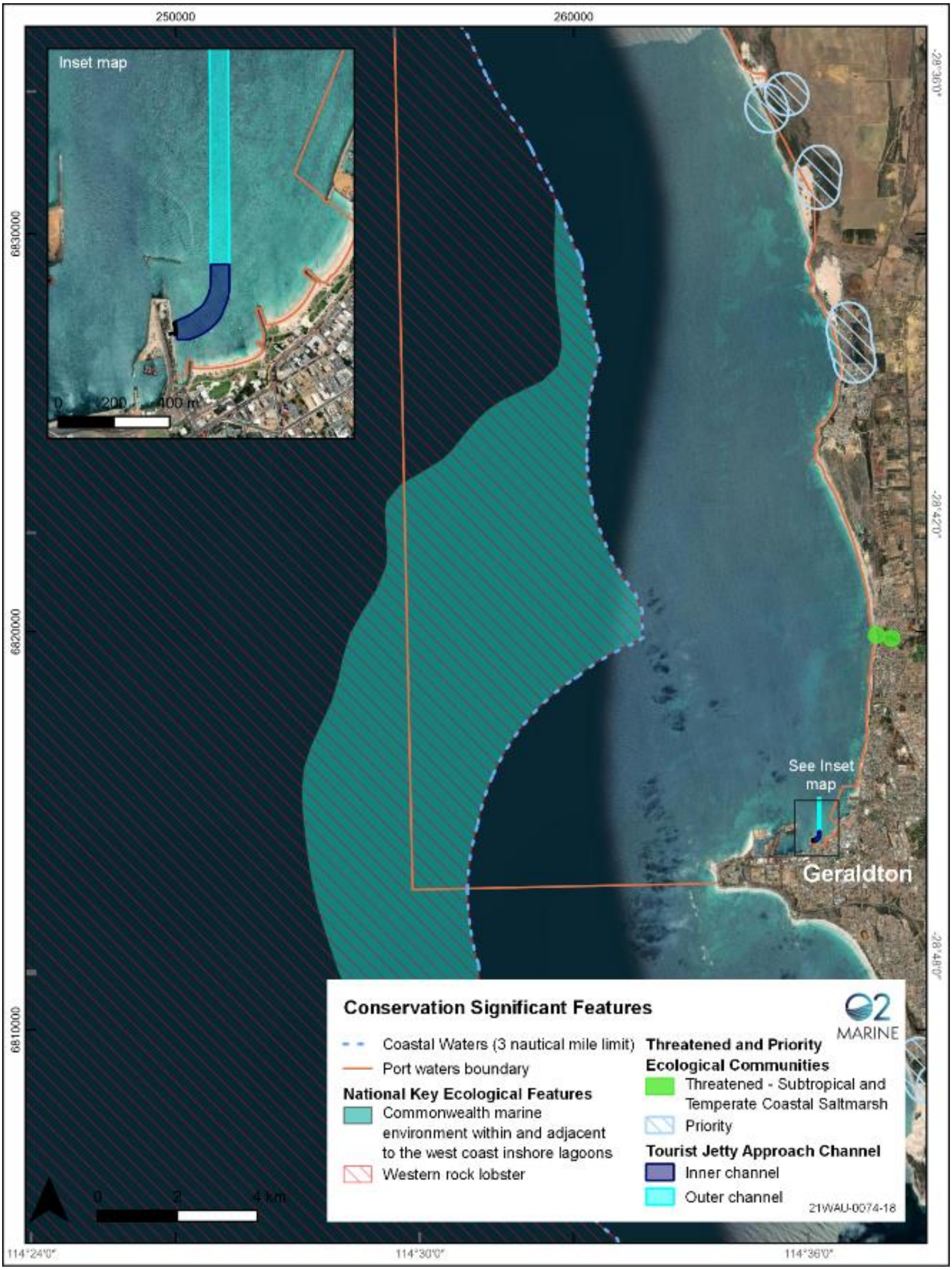

Figure 3: Proposed Tourism Jetty Project – Conservation Significant Features

3. Stakeholder Engagement

3.1. Stakeholder Consultation

A summary of stakeholder consultation regarding Project planning and consulting milestones, outcomes and responses is presented below in Table 4.

Table 4: Stakeholder consultation outcomes

Stakeholder	Date	Method	Purpose	Outcome	Response
City of Greater Geraldton	02/11/2021	CGG Concept Forum Presentation by MWPA CEO	Inform CGG of: Design concept, Three possible locations along the Esplanade, and Proposed supporting facilities (e.g. toilets)	CGG nominated preferred location (Site 3) CGG questioned the need for additional toilets	Design incorporates CGG preferred location. Proposed new amenities were removed from scope.
Department of Transport	27/05/2022	Concept Forum Presentation to DoT Marine Safety	DoT to confirm acceptance of navigation channel – Safety review and operational overview	Amend / review / consult with stake holders in regards to adjoining land / waterway uses ski area and yacht club restrictions around channel use.	Inform local stakeholder and user groups of amendments impacted by navigation channel to service jetty. Additional public notices and warning signs instigated at DoT controlled boat ramps
Vessel Operators	02/11/2022	Forum, engagement from MWPA Trade Office	Concept layout, operability, functional form, vessel channel depth	Agreement on concept as fit for purpose	Incorporate design requests to the extent possible to provide a multi user commercial facility
Geraldton Yacht Club & Ultimate Water sports	01/08/2022	Emailed letter	Advised of project and advise will keep informed.	Nil.	Ultimate Water sports – positive. GYC – Nil.

Department of Transport	16/08/2022	Emailed letter	Request to Modify Operation of the Existing Town Beach Navigation Area		DoT advised they will review and come back to MWPA.
City of Greater Geraldton	3/10/2022	Briefing Paper CGG Concept Forum Presentation by MWPA CEO	Project update and sharing final design.	CGG queried the need for the facility to be secured for private use	MWPA advised the design incorporated security and safety aspects required for tourism industry.
Department of Transport	3/10/2022	Briefing Paper	Project update. Sharing of final design. Notification of proposed seabed leveling and native vegetation clearing requirements.	DoT advised the designated water ski area boundary would remain the same until the facility was nearing completion	MWPA to provide updates on construction progress.
Department of Biodiversity, Conservation and Attractions	3/10/2022			Nil	
Department of Primary Industries and Resources – Fisheries	3/10/2022			Nil	
Public	Nov 2022	Website and social media	Inform community of current port development projects.	Public access to the Environmental Impact Assessment, and this Cumulative Loss Assessment and Clearing Permit once granted	

Other stakeholders consulted with for the site selection study, business case development and detailed design are as follows:

Site Selection Study – 19 and 20th June 2020

- Department of Transport
- Mid-West Development Commission
- Regional Development Australia Midwest Gascoyne
- Mid-West Chamber of Commerce and Industry
- Pollinators
- Geraldton Universities Centre
- Midwest Horticulture Growers Group
- City of Greater Geraldton
- Mid-West Port Authority
- Geraldton Yacht Club
- Tourism Geraldton
- Eco Abrolhos
- Department of Fisheries
- Abrolhos Adventures
- Department of Biodiversity Conservation and Attractions
- Geraldton WA Museum

Business Case Development – June 2020

- Department of Transport
- Department of Water and Environmental Regulation
- Mid-West Development Commission
- City of Greater Geraldton
- Mid-West Port Authority

Detailed Design-Throughout

- Department of Transport
- Geraldton Yacht Club
- City of Greater Geraldton – Concept Forum

3.2. Ongoing Stakeholder Consultation

MWPA has committed to further ongoing consultation with key stakeholders as the Project progresses. One of the primary mechanisms for undertaking this consultation is through the MWPA's dedicated project webpage, targeted emails and social media posts will also provide project updates. MWPA meets regularly with several consultative committees such as:

MWPA Stakeholder Consultation Committee with representatives:

- City of Greater Geraldton.
- Geraldton Fishermen's Cooperative.
- Geraldton community members; and
- Local community groups and tourism organisations.

Port customers and work force:

- Berth Users and Customer meetings.
- Geraldton Fishing Boat Harbour Stakeholder Consultation Group; and
- MWPA Staff Consultative Committees.

Marine works are coordinated via the Harbour Master who disseminates marine notices to inform mariners of the program of works, exclusion zones and communication protocols.

4. Environmental Impact Assessment

4.1. Principles

A summary of how the EP Act principles (EPA 2021a) have been considered in relation to the Project is presented in Table 5.

Table 5: EP Act Principles

Principle	Consideration
1. The precautionary principle *Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.* *In application of this precautionary principle, decisions should be guided by:* a) *Careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and* b) *An assessment of the risk-weighted consequences of various options.*	A project specific risk assessment has been compiled by the Project Team to identify key risks, information gaps, monitoring and management requirements and to consider any appropriate alternatives to those aspects of the Project that posed the most significant environmental risks. The risk assessment was guided by current knowledge, previous lessons learned, and an understanding of environmental impacts gained from previous maritime construction and seabed levelling activities, typically using environmental data where available to reduce scientific uncertainty. Key changes made to the Project design to preserve the environment include: • Identification of suitable location with existing landside facilities (access, parking, toilet facilities etc.) to ensure minimal project and development footprint; • Design has been optimised to reduce the jetty footprint, such as use of mooring piles to reduce jetty size requirements and use of piles for jetty footings to reduce footprint impact on the seabed; • Channel optimisation based on best information through bathymetric surveys to identify and reduce the channel footprint. • Channel optimisation to avoid high spots where possible to reduce impacts sociated with sea-bed levelling. • Channel optimisation to reduce the requirement for dredging through use of sea-bed levelling and tidal access restrictions for large draft vessels. • Construction of best practice lighting design for minimised impacts on Marine Fauna.
2. The principle of intergenerational equity *The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations.*	The Project will enable existing industry to continue whilst minimising potential environmental impacts for the required sediment removal. The Proponent considers that the Project is unlikely to result in any significant environmental impacts that would pose a threat to the health, diversity and productivity of the environment.

Principle	Consideration
3. The principle of the conservation of biological diversity and ecological integrity *Conservation of biological diversity and ecological integrity should be a fundamental consideration.*	The potential impacts of the Project activities on the conservation of biological diversity and ecological integrity have been considered and discussed in relation to the following environmental factors: • Benthic Communities and Habitat (Section 4.3); • Marine Environmental Quality (Section 4.4); and • Other key factors (Section 4.4.6).
4. Principles relating to improved valuation, pricing and incentive mechanisms i. *Environmental factors should be included in the valuation of assets and services.* ii. *The polluter pays principles – those who generate pollution and waste should bear the cost of containment, avoidance and abatement.* iii. *The users of goods and services should pay prices based on the full life-cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste.* iv. *Environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structure, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solution and responses to environmental problems.*	Environmental factors were considered in the Project design. The Project is not expected to generate any significant pollution or waste. Where possible, MWPA will: • Employ appropriately trained local personnel and source local goods and services; • Ensure leading best practice standards during construction to minimise emissions and discharges as far as reasonably possible; Where possible, source goods and services that have the least environmental impact.
5. The principle of waste minimisation *All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.*	Waste generated from the Project will be minimised based on the jetty design and through the implementation of the hierarchy of waste controls: reduce, re-use, recycle, recover and dispose.

4.2. Preliminary Key Environmental Factors

The following preliminary key environmental factors have been identified for the Project:

- Benthic Communities and Habitat
- Marine Environmental Quality.

These factors are addressed individually in Section 4.3 and Section 4.4. Other relevant environmental factors are addressed in Section 5.

4.3. Benthic Communities and Habitat

4.3.1. EPA Objective

The EPA's objective for the factor 'Benthic Communities and Habitats' (BCH) is:

> *'To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained.'*

4.3.2. Policy and Guidance

The following EPA policies and guidance have been considered in evaluating potential impacts on this factor:

- EPA (2016c). Environmental Factor Guideline: Benthic Communities and Habitats, EPA, Western Australia
- EPA (2016a). Technical Guidance – Protection of Benthic Communities and Habitats, EPA, Western Australia
- EPA (2021b). Technical Guidance – Environmental Impact Assessment of Marine Dredging Proposals, EPA, Western Australia.
- DEE (2018) Guide – 'Posidonia australis: Seagrass Meadows of Manning-Hawkesbury Ecoregion: A Nationally Significant Community, Commonwealth of Australia 2018
- DBCA (2022). Priority Ecological Communities for Western Australia Version 33. 1 June 2022
- DER (2014). A guide to the assessment of applicants to clear native vegetation, DER, Western Australia;

4.3.3. Receiving Environment

Studies of BCH that are relevant to the Project are identified in Table 6.

Table 6: Receiving Environment Studies – Benthic Communities and Habitat

Author (Date)	Study
Coupland (1997)	Rhizome and shoot structure, growth and response to sediment burial in *Amphibolis griffithii* (Black) den Hartog.
URS (2001a)	Marine Habitats of Champion Bay, Port Grey and Geelvink Channel
Mackey (2004)	Effects of Temporary PAR reduction on the seagrass *Amphibolis griffithii* (Black) den Hartog
Lavery *et. Al* (2009)	Interactive effects of timing, intensity and duration of experimental shading on *Amphibolis griffithii.*
Lavery *et. Al* (2019)	Defining thresholds and indicators of primary producer response to dredging-related pressures – Synthesis Report
AECOM (2020)	Benthic Habitat Mapping Report – Champion Bay and Surrounds
BMT (2021a)	Assessment of Potential Dredge Material Placement Areas within Champion Bay
BMT (2021b)	Seagrass Communities in Champion Bay and Surroundings
BMT (2022)	Long term resilience of seagrass communities in Champion Bay
O2 Marine (2022a)	Post Dredge Benthic Communities and Habitat Assessment
O2 Marine (2022b)	MWPA Tourist Jetty Targeted BCH mapping of Project area

O2 Marine (2022f)	MWPA Tourist Jetty CLA assessment

4.3.3.1. Characteristics, Distribution and Condition of Benthic Habitat and Communities

Broad Scale Habitat Mapping – Champion Bay

Habitat mapping undertaken by AECOM (2020) identified that the benthic habitats of Champion Bay and the surrounding area can be broken down into a range of habitats, with the key feature of the Bay the limestone substrate which underlies most of the bay and surrounds. Limestone reef presence, relief or reef profile, and the depth of sand overlaying reef, are key factors which influence the epibenthic communities in the bay and surrounding areas. Exposure from prevailing south westerly swell and seas is also a key factor as they play a pivotal role in the movement and dispersal of sand within the bay. Deposition, erosion or frequent resuspension of sand due to wave and tidal water movement greatly influences what type of epibenthic communities colonise certain areas in the bay. Key distinctions can be seen in habitats with similar depths, topography and substrate slope but with varying levels of protection from swell and waves. AECOM described the following natural habitat types, and associated communities:

1. Deep water sand, No epibenthic macrobiota;
2. Deep water pavement with sand, Macroalgae dominant;
3. Deep water reef slope, Macroalgae;
4. High profile deep reef 1-4 m, Macroalgae dominant;
5. Sloping pavement with sand, Low density macroalgae and seagrass;
6. Pavement with sand, No macrobiota;
7. Pavement with sand, Low density seagrass;
8. Pavement with sand, High density seagrass;
9. Pavement with shallow sand, Seagrass dominant;
10. Pavement with sand, Macroalgae
11. Low profile reef with sand, Macroalgae and seagrass codominant;
12. Low profile reef with deep sand, Low density seagrass and macroalgae;
13. Low profile reef with sand, seagrass and macroalgae; and
14. High profile shallow reef 1-4 m, Macroalgae dominant.

A summary of the habitat mapping is described below. Please refer to AECOM (20210) for further details.

Deep Water Communities and Habitat (1-4)

The deep-water habitats typically occur west of a series of north south orientated limestone reef systems which run from Point Moore to the north of Champion Bay and continue on past Drummonds Point. These habitats occur where the low-profile reef with sand become the high-profile reef line which forms the western edge of Champion Bay and the deep-water offshore habitats of Geelvink Channel. The habitat is highly variable as it transitions from high profile macroalgae dominated reef in relatively shallow waters (8–12 m) to the deeper (>20 m) sand and sand covered pavement offshore habitats. The area is characterised by very high profile (> 4 m) reef walls and overhangs which give way to sloping pavement into deeper water. Epibenthic biota were also highly variable.

Benthic communities associated with low and high relief reef are macroalgal with common species such as red and brown algae (*Sargassum* and *Ecklonia*) with a conspicuous understory of *Amphibolis* and *Thalassodendron* seagrass. Interspersed amongst these floral assemblages are substantial patches of completely bare, heavily rippled deep sand. The deep-water reef slope benthic communities are highly variable with small red and brown algae, brown lobed algae, crustose coralline algae, and sporadic sponges and solitary hard corals including *Turbinaria*, *Faviids* and small *Acropora* species. Deep water pavement and sand habitats typically comprised no benthic communities or were dominated by *Sargassum* and *Ecklonia* some patches of low cover *Amphibolis* and *Thalassodendron*.

Limestone Pavement and Sand Communities and Habitats (5-10)

Limestone pavement, with overlying sand of varying depth which receives regular resuspension from swell waves and currents, comprise most of the habitat type in the eastern side of Champion Bay. It's characterised by gradually sloping sand veneered pavement and supports a mosaic of mixed assemblages of macroalgae and seagrass interspersed with equal areas of bare sand. The south-eastern corner of Champion Bay and directly north of the fishing boat harbour entrance is characterised by areas of stable sand generally overlaying pavement. The area receives some protection from swell waves and consequently supports large high-density seagrass meadows, typically dominated by *Halophila, Syringodium* and *Posidonia* with up to 90% coverage mapped.

The seabed in the central part of Champion Bay is the deepest continuous area in the bay forming a natural basin between the eastern nearshore area and the high-profile western reefs. The topography is relatively flat with no sloping in either direction. The area is predominantly sand covered substrate with seagrass meadows of mostly moderate to dense (up to 70% cover) *Amphibolis* with *Halophila* and *Syringodium*. Low densities of small red and brown algae, *Ecklonia* and *Sargassum* also occur.

Several areas in shallow water fringing the fishing boat harbour, and north of the Northern Reclamation DMPA, consisted of deeper sand on pavement which supported little to no benthic communities. The area is often characterised by loose seagrass and macroalgal wrack. Two areas further seaward also featured sand across large areas with very little benthic communities.

Low density seagrass meadows on sand veneered pavement account for a large area directly north of the fishing boat harbour up to the start of the entrance channel. The 10 m isobath appeared to be the depth limit for seagrass dominance in this habitat. West of the fishing boat harbour a band of low-density meadows stretching from the 4 m isobath seaward to the start of the low-profile reef areas gradually curving south towards Point Moore. Substrate in the area was characterised by moderately deeper sand veneers on pavement with seagrass density ranging from 5% to 50% and dominated by *Halophila*. Smaller patches of low cover *Posidonia* and *Syringodium* were also observed.

Shallow Reef Communities and Habitats

Running along the south-eastern shoreline of the Bay from Sunset Beach southwards to just north of the marina, and extending out ~400 m from shore, is an area of dissected limestone shoreline platform with high relief at the offshore end. The habitat contains numerous holes and depressions and supports predominantly large *Ecklonia* and *Sargassum*, with occasional patches of high density *Amphibolis* and *Thalassodendron* seagrass.

North of the entrance channel, low profile reef with sand encompasses the transition between the central basin and the high-profile western reefs. Topographically, the area is predominantly moderate profile (0-1 m) with a gradual rise of approximately 2-4 m from the border of the central basin to the base of the high-profile western reefs. Macroalgae dominate the higher relief areas, while seagrass dominate the lower relief areas which also feature sand. Both biota groups were recorded at up to 50% cover with *Amphibolis* dominating the seagrass taxa and *Sargassum* with *Ecklonia* dominating the macroalgae.

The south-eastern corner of the Bay is characterised by a shallow nearshore area of low-profile reef consisting of rocks, cobbles and low-profile limestone outcrops, surrounded by areas of mostly bare sand. As the seabed becomes shallower towards the shoreline, progressively less limestone is exposed, and deep sand becomes more prominent. Reef areas support low density small algae, with areas of sand supporting low density *Posidonia* and *Halophila* seagrasses. The area also comprised areas of dense seagrass wrack on bare sand.

South of the entrance channel areas of undulating substrate comprising a mix of low-profile limestone rises interpreted with sandy patches and higher relief reef occur. Low-profile limestone predominantly comprises macroalgae, whilst sand inundated pockets support seagrass such as *Halophila* and *Posidonia*. Sections of higher relief support dense communities of small red and brown algae, *Ecklonia* and *Sargassum.* Notably, *Posidonia* is distinct to the southern areas as the northern low profile reef areas are dominated by *Amphibolis*.

Fine Scale Habitat Mapping – Project Area

Detailed mapping was conducted within the Project area to identify key BCH types within the proposed channel access footprint (O2 Marine 2022b). The Project area is approximately 17.8 Ha and was identified to contain the following BCH types (Figure 4):

- Bare Sand (14.07 Ha)
- High Density Seagrass (2.21 Ha)
- Moderate Density Seagrass (0.81 Ha)
- Low Density Seagrass (0.09 Ha)
- Sparse Density Seagrass (0.18 Ha)
- Rockwall (0.41 Ha)

Of the total 17.8 Ha mapped for the BCH Survey, close to 80% comprised of bare substrate with no visible macrophytes, benthic communities or faunal species. These dynamic sediment environments play an important role in providing habitat for numerous benthic organisms. These organisms contained within the sediments help to regulate carbon, nitrogen and sulfur cycling, water column processes and the transport and redistribution of sediments (Snelgrove et al. 1997).

The dominant visible macrophytic community comprised of dense stands of *P. sinuosa* dominated seagrass meadows, comprising 12.4% of habitat area which was present in moderate to high density meadows, generally in the south and adjacent to Seal Rocks in the central west of the Project area. It should also be noted that this species of seagrass is typically a slow coloniser (Bennett et al. 2021). The seagrass species plays an important role in the ecological functioning of the area helping to stabilise the soft sediments, providing food and habitat for fauna and helping to maintain water quality of the nearshore area.

Other larger benthic communities are rare. No large areas of macroalgae were observed. Dead and decaying algal and seagrass wrack accumulations were observed, mainly confined to the middle of the survey area. These may have been transported some distance by oceanographic conditions and will contribute to the eutrophic nutrient budget of the area (AECOM 2020; Bennett et al. 2021).

Attaching or sessile benthic organisms such as sponges and ascidians are also rare in the mapped area, due to the lack of suitable hard substrate for them to attach to (Schoenberg 2016). In this environment, the dominant hard substrate is debris, rock walls and other features (such as some moorings and navigation markers) which are all anthropogenic. AECOM (2020) noted the presence of some coral species along rock walls (i.e., Sea Rocks), however the communities are small and not considered ecologically significant.

Finer sediments which were relatively compact were commonly located throughout the survey area. Very little bioturbation was evident within the sediments however there is a high likelihood that there is quite a presence of buried fauna species in these areas.

Seagrass Condition

To determine the current baseline, or pre-dredging, seagrass health and condition, BMT (2021b) undertook a health investigation at key locations previously incorporated into Geraldton Port dredging programs (2002/2003 and 2012). BMT (2021b) collected data on six key seagrass health indicators across 14 sites within Champion Bay, along with sites at Greenough, Dongara and Jurien Bay to provide regional context. As many of these sites have historical data a comparison with previous data to provide statistical assessment on the current health was completed.

Overall BMT (2021b) summarised that seagrass indicators, such as shoot density, shoot height, leaves per shoot/cluster and aboveground biomass measured at *A. antarctica* and *P. sinuosa* sites showed a relative increase compared to the historical dataset. BMT (2021b) also identified fluctuations within community composition and health over the years. It was identified that this had also occurred within the wider monitoring program and also worldwide. BMT (2021b) surmised that the dynamic nature of Champion Bay (strong waves and currents) are continuously responsible for redistributing sand within the Bay, which is responsible for both creating new, and destroying old habitats. It is also possible that global water temperature rise, and the marine heatwave from 2011 may also have contributed to community shifts observed during 2021. It is therefore reasonable to assume that a high level of natural variability occurs within Champion Bay BCH habitats, particularly for seagrasses.

In addition, BMT (2022) collected data on five key seagrass indicators across 12 sites within the greater Champion Bay area to assess the health of seagrass following the completion of dredging maintenance dredging operations which occurred in the channel and inner harbour of the Port during the last quarter of 2021. BMT (2022) summarised that despite the overall decreasing trends in seagrass shoot density and shoot height between pre- and post-dredging operations, there is no certain evidence of declining overall productivity (appear as reduced shoot length / canopy height) at any sites and therefore the variation in the long term is within the confines of natural variability for the region. BMT (2022) also summarised that shoot density and height responses in seagrasses in Champion Bay are not directly linked to dredging operations as declining trends were observed across both impact and reference sites. Aligning with BMT (2021b), these trends are thought rather to be influenced by other external environmental factors such as wind-induced wave actions that cause the natural resuspension of sediments, river discharges, heatwave events and other local perturbations that resuspend sediments in the water column that are commonly experienced along the Geraldton coastline (BoM 2022). Despite these influences, persistent seagrasses remain in good condition and continue to be a dominant benthic habitat type in Champion Bay.

O2 Marine (2022f) found the condition of *P. sinuosa* was observed to be somewhat impacted with epiphytic growth and sedimentation of the foliage observed, however this is most likely explained by the timing of the survey. During winter, cooler water temperatures, more aggressive swell driven currents and increased turbidity restrict the ability for BCH growth (Masini & Manning 1997, Lavery et al 2009). During the summer months, warmer waters, less aggressive currents and lower turbidity provide more suitable conditions for BCH to thrive, thus resulting in higher densities, as well as the ability for seasonal coloniser species (e.g., H. ovalis) to establish, a species that was observed, however only over a small spatial area.

MARINE

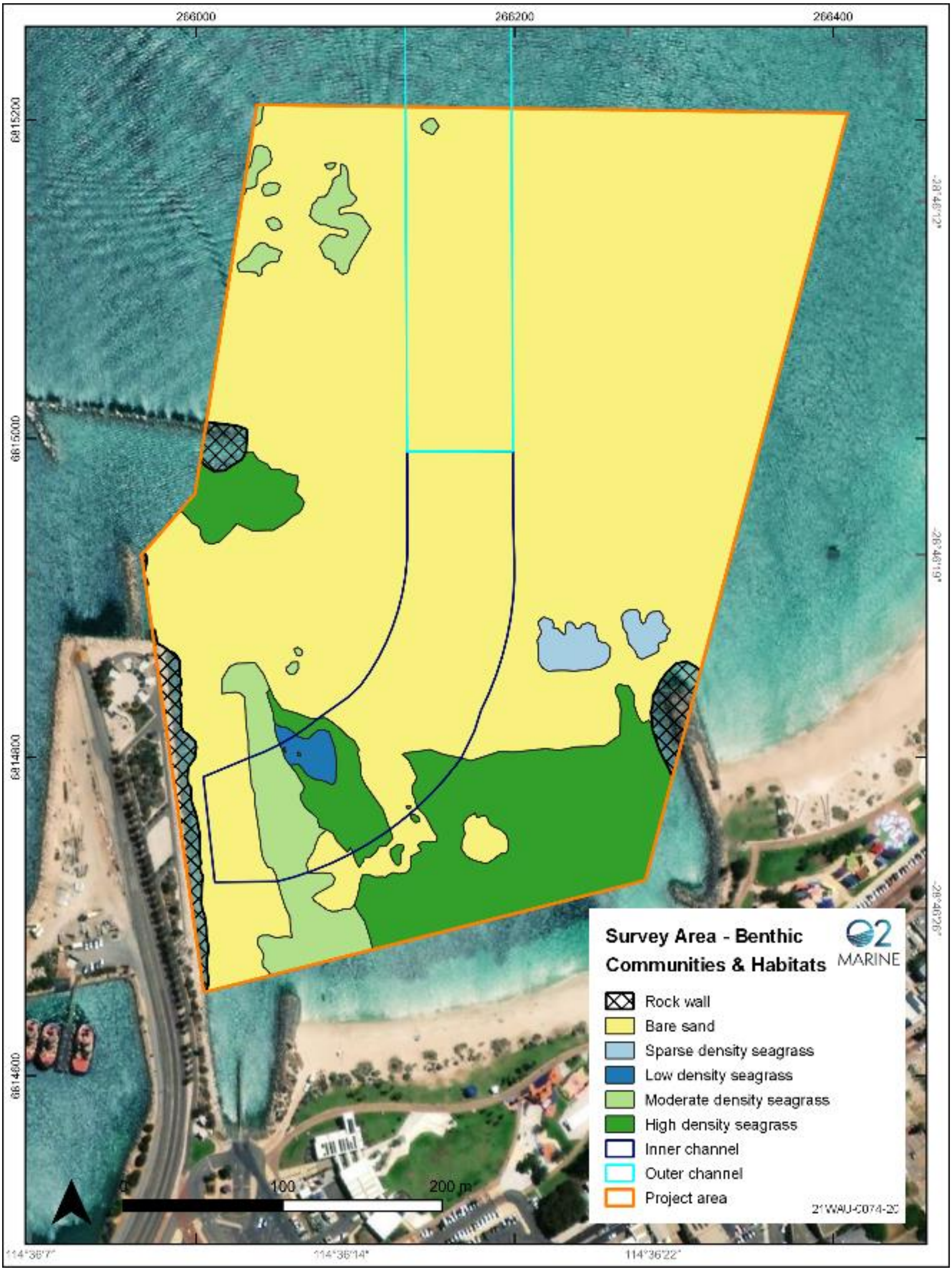

Figure 4: BCH types within Project Area

4.3.3.2. Local Assessment Unit (LAU)

Section 4.2 of EPA (2016b) outlines the requirement to clearly define spatially based LAUs within which BCH presence and loss can be quantified, assessed and presented. LAUs are required to be location specific, assessed on a case-by-case basis and consider local aspects of bathymetry, substrate type, exposure, currents, biological attributes such as habitat types. EPA (2016b) suggests that LAUs should typically be established in units approximately 50 km^2. Applying this guidance to the Project, the DoT defined secondary sediment cell, for Point Moore to Glenfield (Stul *et. Al.* 2014), is considered to represent a suitable boundary for the LAU. Sediment cells define natural units with each cell encompassing adjoining marine and terrestrial environments, thereby providing a base for integrated coastal management in which the component of each cell is considered holistically as an interactive system.

Relevant aspects for application of the Point Moore to Glenfield Beach secondary sediment cell as an LAU considered are as follows:

- The spatial area of the sediment cell/LAU is 47.6 km^2;
- The spatial boundary extends for a similar distribution as the modelling domain and the habitat assessment work completed for this Project;
- The sediment cell is defined by the offshore 15 m bathymetric depth which incorporates the high relief reef system extending north to south between Point Moore and Drummonds Point marking the western extent of Champion Bay;
- The sediment cell classification considered reef systems, substrate types, water circulation, wave exposure and currents occurring when defining the boundary;
- The boundary extends from Point Moore in the south to Drummonds Point in the north, defined at the western extent by the 15 m bathymetric contour and incorporates all of the shoreline, including Chapman River mouth.

The LAU is presented in Figure 5.

Figure 5: Spatial Local Assessment Unit boundary for the Project

4.3.3.3. Benthic Habitat Mapping - LAU

Based on data from AECOM (2020) and BMT (2021a), O2 Marine (2022b) created a consolidated habit map for the LAU. The consolidated habitat map is presented in **Figure 6.** The areas of BCH which occur within the LAU are described in **Table 8**.

For the purposes of the habitat classification, the AECOM BCH descriptions have been assigned to categories in accordance with **Table 7**.

Table 7: Assessment categories as mapped as they relate to mapped BCH descriptors from AECOM (2020)

O2 Marine (2022b) BCH Description	Density	AECOM (2020) BCH Description
Bare Sand	NA	Deep water sand, No epibenthic macrobiota.
		Pavement with sand, No macrobiota.
Macroalgae	NA	Deep water pavement with sand, Macroalgae dominant.
		Deep water reef slope, Macroalgae.
		High profile deep reef 1-4 m, Macroalgae dominant.
		Pavement with sand, Macroalgae.
		High profile shallow reef 1-4 m, Macroalgae dominant.
Seagrass	High	Pavement with sand, High density seagrass.
	Medium	Pavement with shallow sand, Seagrass dominant.
	Low	Pavement with sand, Low density seagrass.
Mixed Assemblage – Seagrass and Macroalgae	NA	Sloping pavement with sand, Low density macroalgae and seagrass;
		Low profile reef with sand, Macroalgae and seagrass codominant
		Low profile reef with deep sand, Low density seagrass and macroalgae.
		Low profile reef with sand, seagrass and macroalgae.
Coral	NA	Seal Rocks Breakwater, Coral Habitat

Table 8: Spatial area of BCH within the LAU

BCH Description	Area (Ha)	Area (% LAU)
Deep Pavement with Sand, Macroalgae	48.81	1.01
Deep Sand, No Epibenthic Macrobiota	37.56	0.78
Deep Water Reef Slope, Macroalgae	107.81	2.23
High Profile Deep Reef 1-4 m, Macroalgae Dominant	737.54	15.26
High Profile Shallow Reef 1-4 m, Macroalgae Dominant	451.45	9.34
Low Profile Reef with Sand, Seagrass and Macroalgae	806.99	16.70
Pavement with Sand, High Density Seagrass	328.45	6.80
Pavement with Sand, Low Density Seagrass	158.70	3.28
Pavement with Sand, Macroalgae	209.94	4.35
Pavement with Sand, No Epibenthic Macrobiota	76.69	1.59
Pavement with Shallow Sand, Seagrass Dominant	830.57	17.18
Sloping Pavement with Sand, Low Density Seagrass and Macroalgae	709.80	14.69
Sloping Pavement with Sand, No Epibenthic Macrobiota	60.95	1.26
Coral	0.31	0.00
Non-BCH (infrastructure, beach, groynes etc.)	266.95	5.52

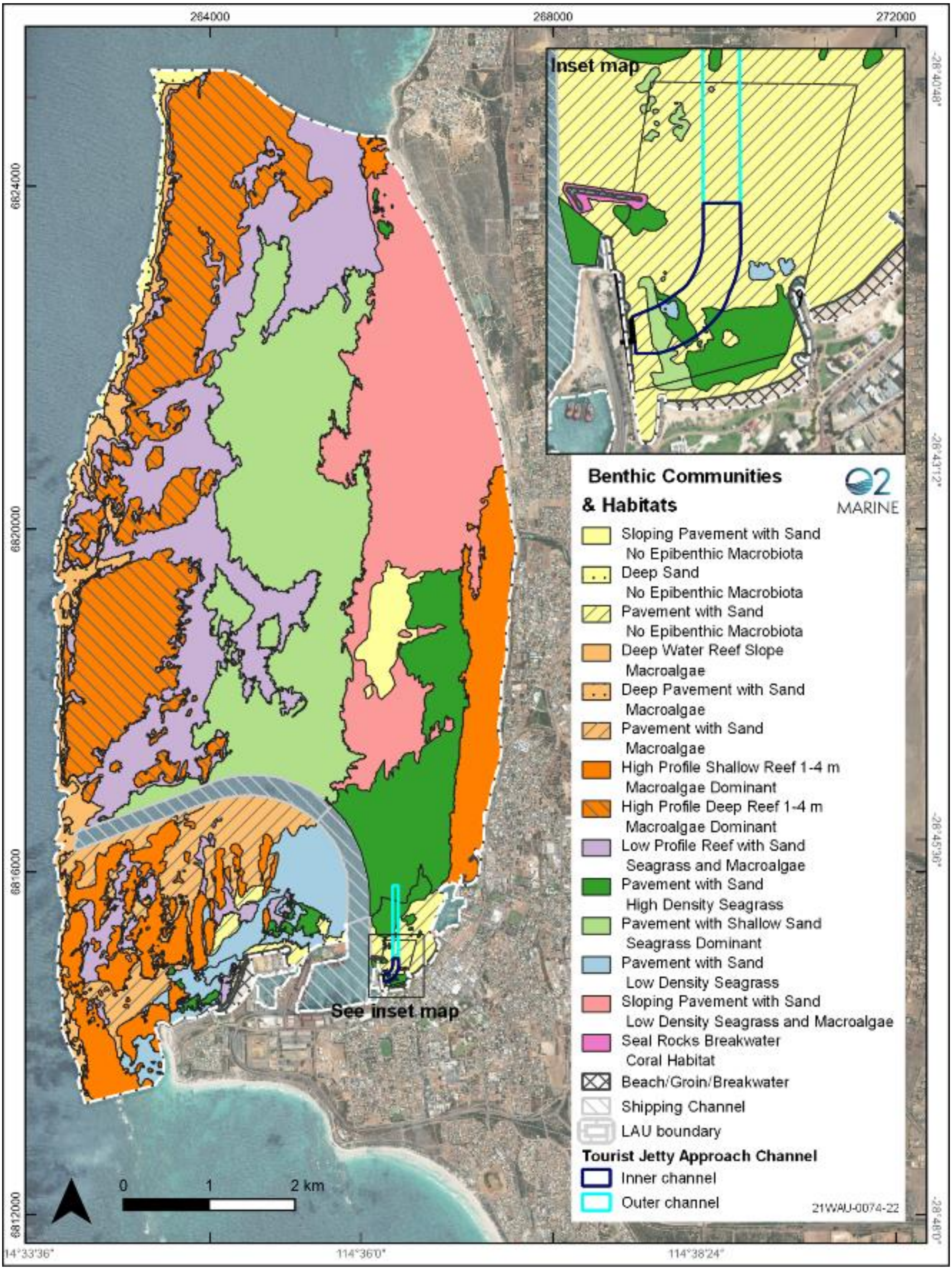

Figure 6: Champion Bay Habitat Map – source: AECOM (2020), BMT (2021b), O2 Marine (2022a) and O2 Marine (2022b)

4.3.3.4. Regional Significance and Conservation Status

The marine habitats mapped during 2020 are largely comparable to previous BCH mapping undertaken during technical studies during 2001 in preparation for the capital dredging project referred to the EPA. URS (2001a) identified no habitats or species that are confined in their distribution to the Champion Bay – Port Grey area, identifying their distributions occurring widely throughout the Central West Coast Region.

Whilst this is still the case, seagrasses, and to a lower extent macroalgae, are still widely considered as important habitats as they provide a variety of ecological functions. The Department of Biodiversity, Conservation and Attractions (DBCA) Species and Communities Program has listed *Posidonia australis* meadows as possible threatened ecological communities and assigned a Priority 3(i) for further survey, definition, and evaluation. The community consists of the assemblage of plants, animals and micro-organisms associated with seagrass meadows dominated by species from the *Posidonia australis* complex. It occurs as continuous to patchy monospecific and multispecies seagrass meadows dominated by species from the *Posidonia australis* complex - *P. angustifolia, P. australis and P. sinuosa*. This community overlaps the Project Area and is distributed in temperate Australian waters between Shark Bay (25°S) on the west coast, across southern Australia to Wallis Lake (32°S) on the east coast, around Bass Strait islands and along the north coast of Tasmania (DCBA, 2022). Lavery *et. Al.* (2019) identifies seagrasses including those within *Posidonia australis* meadows as offering the following ecological services:

- Contribute to the base of the marine food web;
- Provide habitats important for nursery areas for a variety of species;
- Provide foraging and shelter for a variety of species, including western rock lobster;
- Play an important role in recycling nutrients, filtering water and sequestering carbon;
- Protect the coastline form erosion; and
- Provide habitat for a variety of sand forming organisms, contributing vast amounts of sediments into the natural system.

Therefore, seagrasses warrant special protection during marine activities which may impact their ability to deliver these functions. The seagrass species identified have been widely mapped in their distribution, not only within Champion Bay, but also further north and south. There are no particular areas, or species, of conservation significance occurring within the Project area.

4.3.3.5. Predicting Zones of Impact

In response to observed post dredging impacts on seagrasses from the 2002/2003 capital dredging project at Geraldton Port, a shading study was conducted on *A. griffithii* seagrasses in Jurien Bay, some 200 km south of Geraldton (Lavery *et. Al* 2009). This study looked at the cumulative impacts from shading intensity (moderate shading [13-19% of ambient] and high shading [5-11% of ambient]), duration (three-, six- and nine-month periods) and timing (post-summer and post-winter). After each plot of seagrass was subjected to the associated experimental treatment, health assessments were conducted through measuring and collecting a variety of seagrass health metrics to determine where sublethal and lethal impacts where observed.

Results identified timing as the key factor for seagrass impacts, with greatest impacts recorded from moderate shading after three-months during post-summer (57% loss leaf biomass and 67% reduction in rhizome carbohydrates) compared to the same light reduction and duration during post-winter (no loss leaf biomass and 25% decline in rhizome carbohydrates).

In a separate study, Mackey (2004), looked at post shading recovery of *A. griffithii* at a similar study site in response to the 2002/2003 Geraldton Port dredge project. This study shaded plots of *A. griffithii* around 10% of ambient light over 106 days (~three months) during post-summer and then measured the physiological responses of recovery. As with the Lavery *et. Al* (2009) post summer shading experiment, physiological and morphological changes were recorded. However, whilst this was the case after ~three months of high shading, post impact recovery for most variables measured occurred within 42 days.

Pre- and post- dredging BCH surveys conducted adjacent to dredging and material placement areas to support predicted zones of impact during the 2021 maintenance dredging project provide quantitative and qualitative evidence to support these predictions (BMT 2022 and O2 Marine 2022a). Dredging for this project occurred over two short periods (10 September to 23 September and 27 October to 12 November). Based on the timing of the dredging (late winter/early spring) and short duration (~4.5 weeks in total), and localised, short duration dredge plumes predicted from hydrodynamic modelling (GEMS 2021), the EIA prepared for the project predicted no irrecoverable impacts would occur outside the dredge and material placement footprints (O2 Marine 2021a). Results from the post dredge BCH supported these predictions with seagrass increasing in density at 19 of 34 sites investigated across the study site (O2 Marine 2022a).

The wider seagrass health assessment conducted within Champion Bay by BMT (2022) revealed no strong evidence of declining seagrass productivity at any sites from possible light reduction as a result of the 2021 maintenance dredging project. Based on the proposed seabed levelling scenario for this Project, along with experimental and actual qualitative and quantitative data collected during recent dredging projects at the Port it is not predicted that this Project will result in light reduction of sufficient magnitude of duration associated with sub-lethal or lethal impacts. Therefore, for this project there are no predicted Zone of Moderate Impact (ZoMI) and the SLF will be considered a Zone of High Impact (ZoHI).

4.3.4. Potential Impacts

During the operational phase of the proposed Project, the following activities have the potential to impact BCH areas within and adjacent to the SLF:

1. Seabed levelling within the defined SLF may have the potential to cause:
    a. Direct removal (irreversible loss) of subtidal BCH within the SLF;
    b. Indirect potential impacts (irreversible and recoverable impacts) on subtidal BCH from increased turbidity, reduced light and sedimentation; and
    c. Indirect potential impacts (irreversible and recoverable impacts) on subtidal BCH from current scouring of root zones of seagrasses adjacent to the SLF.

During the operational phase of the proposed Project the following factors have the potential to indirectly affect BCH areas within and adjacent to the SLF:

2. Increased frequency and larger vessel operating within the approach channel to access facility may have the potential to cause:
    a. Indirect potential impacts (recoverable impacts) on subtidal BCH from increased turbidity, reduced light and sedimentation.

b. Indirect potential impacts (irreversible and recoverable impacts) on subtidal BCH from propeller scouring of root zones of seagrasses adjacent to the SLF.

4.3.4.1. Assessment of Impacts

Direct removal (irreversible loss) of subtidal BCH within the SLF (1a)

Seabed levelling within the SLF will result in the direct *irreversible loss* of 0.62 ha of seagrasses (**Table 9**), comprising:

- 0.08 Ha (0.002 % of LAU) of low to sparse seagrass habitat;
- 0.24 Ha (0.005 % of LAU) of medium density seagrass habitat; and
- 0.30 Ha (0.006 % of LAU) of high-density seagrass habitat.

A further 1.77 ha (0.037 % of LAU) of bare 'unvegetated' substrate will also be directly impacted as a result of seabed levelling, however, this area will continue to be classified as bare substrate after the completion of dredging and so has not been considered further in the context of this assessment.

Table 9: Direct BCH impacts predicted from Seabed levelling activities

CLA Category	Area (Ha)	Area loss (% LAU)
Pavement with Sand, High Density Seagrass	0.30	0.006
Pavement with Sand, Low Density Seagrass	0.08	0.002
Pavement with Sand, No Epibenthic Macrobiota	1.77	0.037
Pavement with Shallow Sand, Seagrass Dominant	0.24	0.005

Indirect potential impacts (irreversible and recoverable impacts) on subtidal BCH through increased turbidity, reduced light, sedimentation during seabed levelling (1b)

Increased turbidity and TSS can impact BCH through smothering and reducing available benthic photosynthetic light required for photosynthesis. BCH within the project has been mapped in accordance with **Figure 4** which includes seagrasses at low, moderate and high density adjacent to the SLF. Within the LAU seagrass habitat types represents 58.6% or 2834.5 ha.

No indirect irreversible or recoverable impacts are predicted for the Project due to the methods proposed for seabed levelling rather than conventional dredging. Increased turbidity and Suspended Sediment Concentration (SSC) can impact BCH through smothering and reducing available benthic photosynthetic light required for photosynthesis. As aforementioned, there are not predicted to be any indirect impacts through light reduction from this seabed levelling activity based on previous Geraldton dredging and seabed leveling investigations (, O2 Marine 2022a and BMT 2022). Light reduction investigations conducted during the 2020 and 2021 seabed levelling campaigns conducted at the FBH entrance identified no significant reduction in light availability as a result of seabed levelling at nearby sensitive receptors (O2M 2020b and O2M 2021a). Furthermore, as described above quantitative and qualitive data collected pre- and post-dredging to validate predicted impacts outside the ZoHI for the 2021 maintenance dredging project identified no impacts outside that predicted at nearby, adjacent sensitive receptors from plumes associated with the trailer suction hopper dredge or sediments relocation and placement within Champion Bay (O2 Marine 2022a and BMT 2022). Furthermore, investigative research identifies sub lethal seagrass impacts from light reduction require a high level of light reduction over a three-month period. Seabed levelling activities are not predicted to require more than 7 days.

The proposed Project is also a situated within a disturbed environment being modified by land reclamation, adjacent to a recreational vessel ramp and impacted by mooring yachts. This was supported by observations during investigation for this project which identified seagrasses in this local area impacted by epiphytic growth, sedimentation and generally not in pristine condition.

When assessed against the naturally high levels of disturbance which occur from severe weather events within Champion Bay, the predicted impacts from plumes associated with this Project are not anticipated to be markedly different from these natural winter storm events that these species are resilient to.

Therefore, given only 0.62 ha of direct *irreversible* loss and no predicted indirect *irreversible or recoverable impacts* to seagrass the proponent considers that the EPA Objective for BCH is met.

Indirect potential impacts (irreversible and recoverable impacts) on subtidal BCH from scouring of root zones of seagrasses adjacent to the SLF (1c)

Seabed levelling has the potential to expose seagrass root zones adjacent to the SLF through potentially creating sloped banks along the edges. These seagrass root zones would then be subject to natural tidal, wind and wave driven currents which may potentially remove additional sediments. This mechanism has the potential to results in indirect irrecoverable or recoverable impacts on adjacent seagrass meadows. Although the extent of these potential impacts are unknown, there are possible management strategies which will effectively avoid and mitigate the severity and extent. Management generally involves applying a passive drag plough angle along the SLF edges adjacent to seagrasses to ensure there are no steep slopes, thus ensuring the protection of the seagrass root zones. This management strategy needs to be incorporated into the vessel EMP. This can also be evaluated through the post seabed levelling hydrodynamic survey.

If mitigated appropriately, no indirect irreversible or recoverable impact is predicted for the Project due to the methods proposed of seabed levelling. Therefore, there is no predicted loss to existing BCH from this Project outside the SLF.

Indirect potential impacts (irreversible and recoverable impacts) on subtidal BCH through increased turbidity, reduced light, sedimentation through increased vessel activity (2a)

Increased turbidity and TSS can impact BCH through smothering and reducing available benthic photosynthetic light required for photosynthesis. BCH within the project has been mapped in accordance with Figure 4 which includes seagrasses at low, moderate and high density adjacent to the SLF. Within the LAU seagrass habitat types represents 58.6% or 2834.5 ha.

Increased vessel traffic within the areas is likely to result in slightly elevated turbidity during, and for a short duration after vessels have moved through the area. It is also anticipated that only one vessel will access the area at any one time and that use of the jetty for Abrolhos Island tours will be highly seasonal, therefore plumes will quickly disperse between vessel movements and not be constant for any extended duration of time. It is predicted that plumes caused by vessel movement will be highly localised and very short in duration. Therefore, as for the assessment of seabed levelling plumes, this is not predicted to result in any long-term BCH impacts. Furthermore, introduction of speed restrictions and confinement to the demarcated access channel as required by compliance with navigational charts and commercial licenses will further assist with reducing the size and duration of associated plumes, thus further avoiding and mitigating associated impacts.

Indirect potential impacts (irreversible and recoverable impacts) on subtidal BCH from propeller scouring of root zones of seagrasses adjacent to the SLF (2b)

Increased frequency of larger vessels operating within the project area has the potential to result in scouring of sediments from the seagrass root zones adjacent to the inner channel. Risks are highest for vessels engaged in docking and manoeuvring for departure within the approach channel. These impacts would also be increased if seabed levelling activities are not managed in accordance with assessment 1(c) and management proposed in Table 10. Assuming impacts from 1(c) are adequately managed, standalone impacts from vessel activity only can adequately be managed through applying maximum vessel speeds and ensuring all manoeuvring occurs within the demarcated channel. If this management is in place, it is unlikely that indirect impacts would occur on adjacent seagrass meadows.

4.3.5. Mitigation

Mitigation measures proposed to minimise potential impacts on the environmental factor 'Benthic Communities and Habitats' are described in Table 10 and presented in accordance with the EPA's mitigation hierarchy (Avoid, Minimise, Rehabilitate[1]).

[1] Rehabilitation measures are excluded from Table 11 as these are not expected to be required to mitigate impacts to marine environmental quality.

Table 10: Mitigation measures to minimise impacts on Benthic Communities and Habitats

Potential Impact	Avoidance	Minimisation	Residual Impact
Direct removal during seabed levelling (1a)	• Conduct seabed levelling in existing footprint only – no new extent. • Optimising seabed levelling footprint to avoid areas of critical BCH and minimising to meet minimum safe navigable requirements.	• Management of seabed leveling operations under the EMP. • MWPA ongoing seagrass monitoring program.	No residual impacts predicted.
Reduced water clarity due to seabed levelling plumes (1b)	• Light intensity investigations revealed no significant light reduction from previous seabed levelling. • Sediment physical characteristics.	• Marine habitat mapping. • Consider assessment via MWPA ongoing seagrass monitoring program. • EMP: • 12-hour levelling operation to allow plume dispersion.	No residual impacts predicted.
Scouring of root zones of seagrasses adjacent to the SLF (1c)	• Conduct seabed levelling using passive drag plough setting to ensure SLF edges are smooth with no steep slopes or vertical edges adjacent to seagrasses. • Utilisation of hydrographic survey to identify areas vulnerable to scouring.	• Levelling design and implementation resulting in a 'soft edge' by allowing minimal gradient difference between levelled and non-levelled areas as practicable. • Ensuring levelling managed to design depths only. • Further seabed levelling used to homogenise the seafloor depth and edges within the SLF if required.	No residual impacts predicted.
Reduced water clarity due to increase vessel frequency(2a)	• Previous light intensity investigations revealed no significant light reduction from previous seabed levelling or dredging projects and therefore not expected as a result of restricted vessel movements.	• Marine habitat mapping. • Consider assessment via MWPA ongoing seagrass monitoring program. • Education within commercial vessel agreements regarding manoeuvring protocols to reduce plume impacts on seagrass. • Speed restricted to 5 kn within inner channel area to reduce propellor force on seagrass.	No residual impacts predicted.

Scouring of root zones of seagrasses adjacent to the SLF from propeller wash (2b)	• Adherence to channel markers within the approach channel for embarking and disembarking vessels.	• Education within commercial vessel agreements regarding manoeuvring protocols to reduce propellor force on seagrass. • Speed restricted to 5 kn within inner channel area to reduce propellor force on seagrass.	No residual impacts predicted.

4.3.6. Predicted Environmental Protection Outcomes

The predicted EPOs of the Project include:

- No more than 0.62 ha of irreversible loss of BCH within the seabed levelling footprint
- No change to BCH from baseline conditions outside the seabed levelling footprint.

The combined impact of the Project activities and the consequent outcomes are not considered to pose significant residual risks to the protection of BCH and therefore biological diversity and ecological integrity can be maintained. In respect of the proposed design and management of The Project, the Proponent considers that the EPA's objective for BCH has been met.

4.4. Marine Environmental Quality

4.4.1. EPA Objective

The EPA's objective for the factor 'Marine Environmental Quality' is:

'*To maintain the quality of water, sediment and biota so that environmental values are protected*.'

4.4.2. Policy and Guidance

- EPA (2016c). Environmental Factor Guideline: Marine Environmental Quality, EPA, Western Australia; and
- EPA (2016d). Technical Guidance: Protecting the Quality of Western Australia's Marine Environment, EPA, Western Australia. EPA, Western Australia.

4.4.3. Receiving Environment

Studies of marine environmental quality that are relevant to the Project are identified in Table 11.

Table 11: Receiving Environment Studies – Marine Environmental Quality

Author (Date)	Study
MWPA Database	Marine Water Quality Sampling Results Database
URS (2001a)	Port Enhancement Project and Preparatory Works for Town Beach Foreshore Redevelopment – Public Environment Review
Oceanica (2010a)	Geraldton Port—Channel Maintenance Dredging – Dredging Environmental Impact Assessment
GPA (2013a)	2012 Maintenance Dredge Project – Environmental Water Quality Monitoring Report
GPA (2013b)	2012 Maintenance Dredge Project – Environmental Monitoring Report
Coffey (2015)	Geraldton Port Detailed Site Investigation
Coffey (2017)	Geraldton Port Risk Assessment
O2 Marine (2020)	Light Monitoring – Fishing Boat Harbour 2020
O2 Marine (2022a)	Geraldton Port Maintenance Dredging 2022 – Post Dredge Benthic Communities and Habitat Assessment
O2 Marine (2022b)	MWPA Tourist Jetty Targeted BCH mapping of Project area (O2 Marine 2022b)
O2 Marine (2022c)	Geraldton Fishing Boat Harbour Preliminary Site Assessment – Sediment Quality
O2 Marine (2022d)	Geraldton Fishing Boat Harbour Maintenance dredge 2022 EIA
O2 Marine (2022e)	MWPA Tourist Jetty Sediment Quality Sampling Summary Report

4.4.3.1. Environmental Quality Plan

An Environmental Quality Management Framework (EQMF) has not yet been formerly established for the Port of Geraldton or the wider Champion Bay marine waters. However, MWPA has been implementing a comprehensive Marine Water Quality Monitoring Program and as a prescribed premise is required to conduct annual Compliance Sediment Sampling in accordance with the Environmental Licence at the Port of Geraldton. These programs allow MWPA to monitor and manage potential impacts to marine environmental quality which may arise as a result of Port and FBH operations.

In addition, MWPA are currently developing an Marine Environmental Monitoring and Management Plan consistent with the EPA's Technical Guidance for Protecting the Quality of Western Australia's Marine Environment (EPA 2016d), which defines the Environmental Values (EVs), Environmental Quality Objectives (EQOs) and spatial Levels of Ecological Protection (LEPs) that are appropriate to the Port of Geraldton and adjacent Champion Bay. These are defined in Table 12 and presented in Figure 7.

Table 12: Proposed Environmental Values and Environmental Quality Objectives applicable to the Port of Geraldton and surrounding waters

Environmental Values	Environmental Quality Objectives
Ecosystem Health	EQO1: Maintenance of ecosystem integrity.: EQO 1 can be split into four sub objectives, being Maximum, High, Moderate and Low Levels of Ecological Protection (LEPs). However the following sub-objectives are applicable to the Project area: • High LEP: Assigned to all marine waters outside of the moderate LEP, including Champion Bay; and • Moderate LEP: Assigned to a 250m buffer of the operational berths and the inner harbour of Geraldton Port, the Fishing Boat Harbour and Batavia Coastal Marina.
Fishing & Aquaculture	EQO2: Seafood (caught) is of a quality safe for human consumption. EQO3: Water quality is suitable for aquaculture purposes.
Recreation & Aesthetics	EQO4: Water quality is safe for primary contact recreation (e.g. swimming and diving). EQO5: Water quality is safe for secondary contact recreation (e.g. fishing and boating). EQO6: Aesthetic values of the marine environment are protected.
Cultural & Spiritual	EQO7: Cultural and spiritual values of the marine environment are protected.
Industrial Water Supply	EQO8: Water quality is suitable for industrial supply purposes.

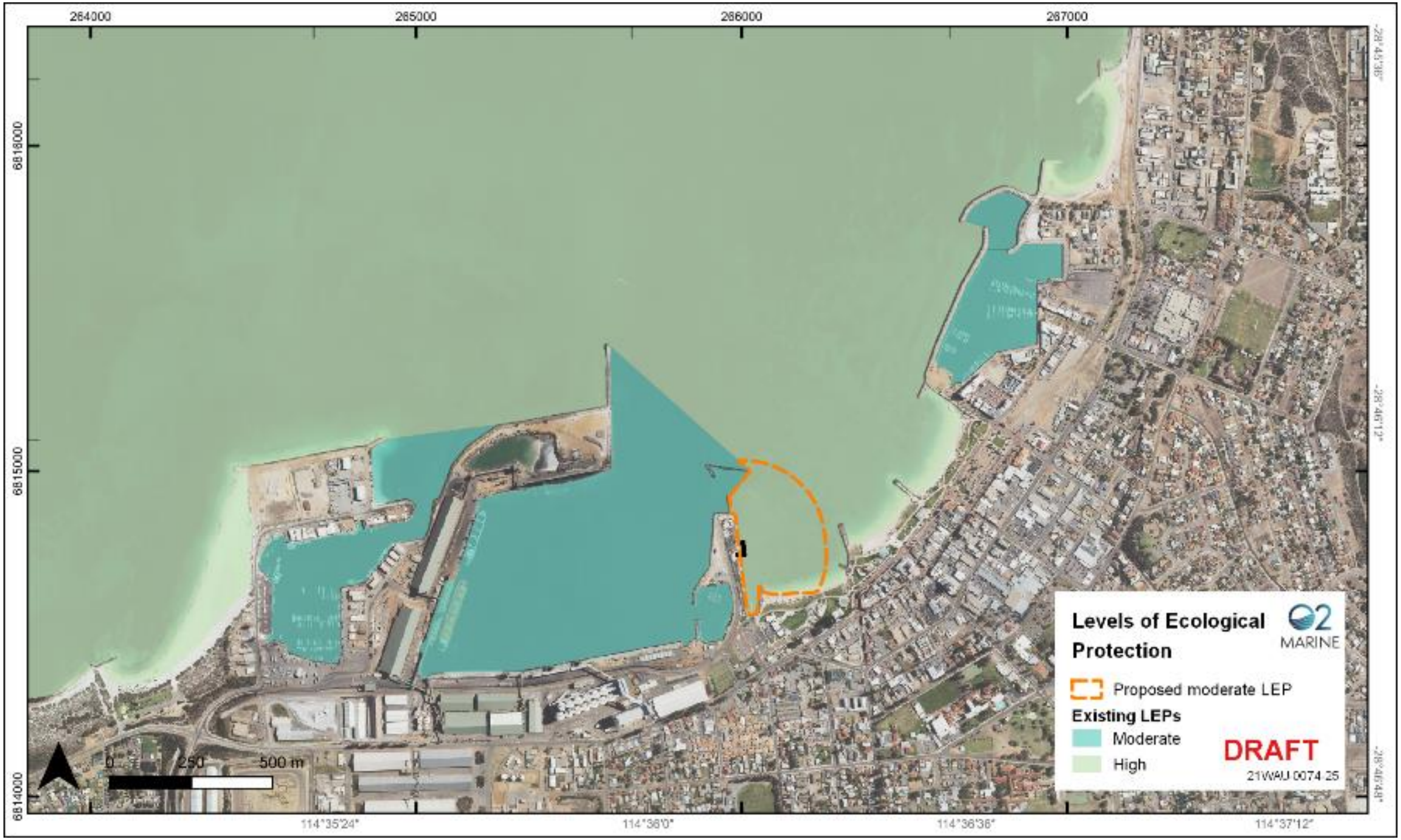

Figure 7: Proposed levels of ecological protection for the Port of Geraldton and surrounding waters including the Fishing Boat Harbour

4.4.3.2. Water Quality

Physical Water Quality

Water clarity in Champion Bay is variable during the year as a result of wind driven current strengths and wave energy, as well as intermittent rainfall runoff in the catchments of the rivers, such as the Greenough and Chapman Rivers that drain the hinterland. Typically, the season of lowest water clarity is winter as a higher energy swell mobilising bottom sediments and due to this being the main time during which the intermittent discharge to the Bay of alluvial sediments from river discharge. In wet years, the Bay remains turbid for many months and salinity of nearshore waters slightly decreases as a result of river inflow. Strong winds in summer create waves that also cause an increase in suspended particulate matter which can also reduce water clarity. The period of greatest water clarity is usually in late summer to autumn (February to May) and occurs in response to reduced wind strengths and wave energy and absence of riverine sediment input.

Turbidity within Champion Bay typically increases closer to shore, mostly as a consequence of wave action that lifts sands and silt-sized particles into the water column (URS 2001a). During spring and summer there is often a marked diurnal effect, with the increased wave action generated by the strong mid-morning to evening sea breezes increasing coastal turbidity compared to the early morning and dawn calms. During autumn and winter, turbidity and cloudiness (discolouration) is also often elevated in the inner half of Champion Bay, a period when fine organic material from the nearshore and shoreline wracks of decaying seaweed and seagrass is suspended and dispersed through the nearshore water column. Apart from the natural sources and cycles of turbidity, propeller wash from ship and tug movements along the inner sector of the entrance channel also contributes to turbidity. Marked variations in turbidity therefore occur within hourly, daily, weather-system and seasonal time cycles, as well as with depth.

Limited data is available for the wider Champion Bay marine environment, though there are limited activities which are likely to result in any marine environmental impacts. Identified activities and their potential, temporary impacts may include:

- Aquaculture fish farming within Champion Bay may have a localised impact over short duration on water quality, such as minor nutrient loading[2].
- Shipping and tug movement within the entrance channel result in localised, short duration turbidity plumes on a regular basis.
- Commercial and recreation vessel activities may have minor, highly localised impacts on water quality from hydrocarbon spillages, anchorages, rubbish or vessel anode deterioration.

During periods of warmer water, when swell and wind conditions result in very calm sea surface condition, temporary blooms of *Trichodesmium*, a filamentous cyanobacteria, may occur within Champion Bay. These blooms typically dissipate quickly when wind or sea state become more unsettled and are considered natural events, however they may have short duration impacts upon water quality during periods of extended blooms.

[2] It is noted that currently no aquaculture activities are presently occurring within designated Champion Bay Indian Ocean Fresh Aquaculture Leases

Light Climate

Two seabed levelling campaigns have been conducted within the adjacent FBH; one during June 2020 (O2 Marine 2020b) and the second during October/November 2021 (O2 Marine 2021a). both campaigns involved removal of sediments accumulated in the entrance channel and Lives Beach with sediments being relocated approximately 250-300 m north/northeast. During these campaigns daily light integral (DLI) (measured as hourly Photosynthetically Active Radiation) was calculated at two sites including a nearby impact location at the nearest BCH receptor and another reference site located north of Point Moore. Both sampling campaigns identified no significant alteration to the light climate during dredging when statistically compared to pre and/or post seabed levelling periods. During the 2020 program DLI was calculated over a 48-day period with a maximum of 5.41 mol/m^2, a minimum of 0.50 mol/m^2 and an average of 3.41 mol/m^2 from the impact location adjacent to the FBH. During the 2022 program DLI was calculated over a 78-day period with a maximum of 5.72 mol/m^2, a minimum of 0.54 mol/m^2 and an average of 3.40 mol/m^2 at the impact site. The reference site reported a DLI maximum of 21.33 mol/m^2, a minimum of 1.79 mol/m^2 and an average of 13.61 mol/m^2.

BMT (2021c) also conducted light monitoring at 3 locations within Champion Bay over a four-month period (January to May) during 2021. Two marine water quality light loggers (sites LL1 and LL2) were utilised to understand the natural seabed climate in Champion Bay and the third terrestrial logger within the MWPA Port area was used to provide surface light readings for calculation of light attenuation coefficients (LAC). This study has shown natural fluctuations in light availability near the seabed at sites LL1 and LL2 and that these variations and therefore temporary reductions in light availability in this study were likely caused by natural strong weather conditions (winds and sea state) that resuspended sediment into the water column, which caused with an increase in turbidity at that same time. The passing of Tropical Cyclone Seroja in early-May 2021 was evident in the light logger data however water conditions returned to natural background levels within a few days following a storm event (BMT 2021c). Therefore, the seabed levelling campaign is expected to have no impact on adjacent seagrass habitat.

Toxicant Concentrations

A water quality monitoring program was implemented (O2 Marine 2022b) as part of the dredge environmental management plan (O2 Marine 2021) developed for the 2021 maintenance dredging program. The program was typically identified to determine the water quality within the low ecological protection area (LEPA) (north-western corner of inner harbour), MEPA (i.e. the inner harbour) and the HEPA (i.e. Champion Bay) as presented within Figure 8. Only data from the HEPA is assessed herein. Only the water quality data collected at ambient reference sites is considered applicable for assessment of ambient conditions relevant to Champion Bay and therefore this Project. These are described further below.

The sampling program incorporated collection and laboratory analysis of dissolved metals, TBTs, hydrocarbons nutrients and total suspended solids (TSS). Sampling events included two rounds pre-dredging, five rounds during dredging and two events post dredging.

A summary of the key sampling results is provided below.

- Pre-dredging:
  - Copper exceeded the 99% SPL at the MEPA/HEPA boundary on both sample events;
  - Zinc exceeded the 99% SPL at all three sites on both sample events;
  - Hydrocarbons and TBT concentrations were all below the LoRs

- Nutrients levels were typically low at all three sites;
- TSS results were all reported below the LoR of 5 mg/L.
- During Dredging:
  - Copper exceeded the 99% SPL at all three sites on one sample event and at one site during two sample events;
  - Zinc exceeded the 99% SPL at all three sites during two sample events;
  - Hydrocarbons and TBT concentrations were all below the LoRs;
  - Nutrients levels were typically low at all three sites;
  - TSS ranged from below1 mg/L up to 4 mg/L.
- Post Dredging
  - Copper exceeded the 99% SPL at two sites during the first sample event and at all three sites during the second sample event;
  - Zinc exceeded the 99% SPL at two sites on the first sample events and at no sites during the second sample event;
  - Hydrocarbons and TBT concentrations were all below the LoRs;
  - Nutrients levels were typically low at all three sites;

4.4.3.3. Sediment Quality

As part of the Project a sediment quality investigation was implemented to assess sediment quality within the Project area (O2 Marine 2022e). Sediment samples were collected within the study area at three sites, two using a surface grab sampler and one using diver push corer. Sediment samples were analysed by the laboratory for physical properties and toxicants.

Samples were typical of a nearshore coastal environment comprising fine grey sands with the presence of shells/biota, slight odour, and low levels of foreign material. Sediments were dominated by sand-sized particles with most sediments having a slightly higher proportion of fine-grained sand. All contaminants in sediments were below ANZG (2018) guideline levels where they exist or detected at very low levels considered natural. Chemical parameters within sediments were also reported at low levels, typically representative of natural levels. Sediments analysed in this report appear to be of natural origins and contaminant free, as expected for the natural environment setting of the proposed Project.

In addition, O2 Marine (2022a) identified the sediments within the adjacent Geraldton port harbour entrance channel to be medium to fine grained, yellow to grey sands of natural origin. No contaminants of potential concern were identified within the entrance channel sediments and are therefore considered to be clean (O2 Marine 202a). Based on these results it can be concluded that Marine Environmental Quality will not be impacted from contaminated sediments during seabed levelling.

4.4.4. Potential Impacts

During the operational phase, the following activities and resulting impacts have the potential to adversely affect marine environmental quality within the Port and surrounding waters:

1. Sea bed levelling activities and localised vessel traffic in the seabed levelling footprint and channel entrance has the potential to:
   a. Increase localised turbidity and suspended sediment concentrations.

b. Reduce water clarity and light over adjacent BCH areas.

2. There is potential for a hydrocarbon release into the marine environment from a vessel spill during refuelling for both vessels engaged in seabed levelling activities and from tourist vessels utilising the TJ.

Assessment of Impacts

Seabed levelling: Increased Localised Turbidity and Suspended Sediment Concentration (1a)

Seabed levelling operations are expected to result in localised increases to turbidity and SSC associated with the dredge plume. The potential impact on EQO1 for the EV '*Ecosystem Health*', is discussed and assessed in the context of the extent, duration and severity of the potential impact on BCH as discussed Section 4.3.

Localised increases in turbidity may also have the potential to temporarily compromise EQO3 for the protection of the EV '*Fishing and Aquaculture*' at the Indian Ocean Fresh aquaculture sea-cages which are located approximately 3,800 m from the Seabed Levelling Footprint. Early stakeholder engagement with facility management identified:

- Indian Ocean Fresh are not anticipating to have any aquaculture stock in the Champion Bay Sea Cages during first half of 2023 during the seabed levelling window (Bruce Starling pers.comms.)

The sampled TSS concentrations during the 2021 maintenance dredging program also confirmed the dredge plume concentration were low to moderate, were highly localised and dissipated within approximately one hour post dredging (O2 Marine 2022b). Dredge plumes associated with this program are anticipated to be significantly larger based on the methodology, as opposed to seabed levelling which is not likely to have any significant plume generation. There were also no reported impacts from the Live Cray Factory during the 2012 or 2022 dredging programs.

A localised increase in turbidity and SSC within the dredge footprint are likely to result in a temporary reduction in marine environmental quality, though it is not anticipated that the resulting potential impacts will be significant. Therefore, in consideration of potential impacts associated with turbidity and SCC, EQO1 for the EV '*Ecosystem Health*' and EQO8 for the protection of the EV '*Industrial Water Supply'* is unlikely to be impacted by the Project.

Seabed levelling- Temporary Reduced Water Clarity and Light (1b)

Reduction in water clarity and light as a result of increased turbidity and SSC, poses a risk to BCH and to a lesser degree, marine fauna. This potential impact on EQO1 for the EV '*Ecosystem Health*', is discussed and assessed in the context of the extent, duration and severity of the potential impact on BCH in Section 4.3.

Vessel and Plant Operations: Potential Hydrocarbon Spill (2)

There is potential for a hydrocarbon release into the marine environment from a vessel spill and or bunkering operations during dredging. However, this risk is inherent in all dredging and port-based vessel operations and can be effectively managed through application of standard operating procedures. Nevertheless, The Project specific EMP includes proposed monitoring and management strategies to mitigate this risk, whilst consideration of the increased risk will be incorporated into the Port wide Marine Environmental Monitoring and Management Program, currently under development.

4.4.5. Mitigation

Mitigation measures proposed to minimise potential impacts on the environmental factor 'Marine Environmental Quality' are described in Table 13 and presented in accordance with the EPA's mitigation hierarchy (Avoid, Minimise, Rehabilitate[3]).

[3] Rehabilitation measures are excluded as these are not expected to be required to mitigate impacts to marine environmental quality.

Table 13: Mitigation measures to minimise impacts on Marine Environmental Quality

Potential Impact	Avoidance	Minimisation	Residual Impact
Localised Turbidity increases from dredging (1a)	Impacts upon BCH assessed in **Section 4.3**		
	> Stakeholder consultation to identify risks and management requirements (**Section 3.1**). > Interpretation of light investigations identifying no significant reduction in benthic light availability during 2020 and 2021 seabed levelling activities.	> Dredge plumes predicted to be highly localised and of short duration. > Turbidity and SSC identified as low risk to Live Cray processing facility (**Section 3.1**). > Daily visual observations and dredge management included within EMP.	No residual impacts predicted.
Reduced water clarity due to dredge plumes (1b)	Impacts upon BCH assessed in **Section 4.3**		
Hydrocarbon Spills (Vessel and Plant Operations) (2)	> Follow all reasonable directions given by the Harbour Master to ensure vessel collisions are avoided. > Store all fuels, oils and lubricants on site to ensure that they do not pose a threat to the environment or the safety of staff and the public. > Maintain vessel speeds below 5 knots whilst within the seabed levelling footprint, to limit the potential for vessel collisions. > Maintain an exclusion zone around the seabed levelling activity to minimise the risk of non-project related vessels entering the area.	> Supply and maintain adequate hydrocarbon spill kits on site and within immediate access during refuelling. > Implement procedures to maintain clean and tidy work areas, including the safe storage of all hydrocarbons and chemicals. > Implement water quality monitoring in accordance with the final Marine Environmental Quality Monitoring and Management Plan.	No residual impacts predicted

4.4.6. Predicted Environmental Protection Outcomes

The Project will result in the following predicted EPOs with respect to marine environmental quality:

- No residual impact on marine environmental quality as a result of the Project activities;

Based on these EPOs, and in consideration of the proposed monitoring and management strategies, the Project activities are not expected to pose any significant residual risks to maintaining the quality of water, sediment and biota and therefore the environmental values can be protected. In relation to the Project, the Proponent considers that the EPA's objective for marine environmental quality has been met.

5. Other Environmental Factors

In addition, to those key environmental factors identified in Section 4, three other relevant environmental factors were also identified.

1. Marine Fauna
2. Coastal Processes
3. Social Surroundings

However, due to their being a very low risk of environmental impact on these other factors, and in consideration of the mitigation measures that the Proponent proposes to implement to manage any impacts, these factors are not required for assessment. These other environmental factors and consideration of impacts are presented in Table 14.

5.1. Nature-based Tourism and Conservation

The project will assist commercial tour operators access the Houtman Abrolhos Islands which have been declared a National Park and Marine Reserve. The islands have significant natural and cultural heritage values including migratory shorebird habitat, seabird breeding and nesting sites, threatened vegetation communities, protected species of reptiles and mammals, sea lion pupping areas, as well as maritime cultural heritage and shipwreck sites. The Department of Biodiversity, Conservation and Attractions (DBCA) have released a management plan for the National Park in 2022 which identifies management measure to minimise visitor impacts. The plan details specific strategies for managing visitors, commercial operations, and nature-based tourism. Key to this management is the requirement for commercial tourism operators to hold an appropriate licence.

The management of vessel-borne biosecurity risks is important both within Champion Bay and at the Abrolhos islands. MWPA in collaboration with the Department of Primary Industries and Development (DPIRD) have implemented a marine pest monitor program that monitors the Fishing Boat Harbour, the Geraldton Commercial Harbour, and the Batavia Coast Marina. This program will be reviewed in consultation with DPIRD and DBCA and expanded if required. MWPA is in consultation with DBCA exploring opportunities to install education information adjacent to and on the jetty infrastructure to promote the environmental and cultural values of the Abrolhos islands and how visitors can help to protect them.

5.2. Policy and Guidance

Australian Government *Issues Paper for the Australian Sea Lion (Neophoca cinerea)* 2013

Australian Government *Recovery Plan for the Australian Sea Lion (Neophoca cinerea)* 2013

Government of South Australia: Underwater Piling Noise Guidelines (DPTI 2012)

Government of WA Houtman Abrolhos's Islands National Park Management Plan 97. DBCA 2022Australian Fisheries Management Authority (AFMA) Australian Sea Lion Management Strategy V2 July 2015

Table 14: Other Environmental Factors and Potential Impacts of the Proposed Dredge Project

Environmental Factor	Receiving Environment	Project Activities	Management, Monitoring & Mitigation	Impacts
Marine Fauna	O2 Marine (2021b) conducted a desktop assessment search of the online EPBC Act Protected Matters Search Tool. The desktop assessment revealed that a number of threatened or migratory marine species may occur within the vicinity of the Geraldton Port channel. The main species identified include: > Australian sea lion (*Neophoca cinerea*); > Humpback whale (*Megaptera novaeangliae*); > Indo-Pacific bottlenose dolphin (*Tursiops aduncus*); and > Western rock lobster (*Panulirus cygnus*). Geraldton is home to a small, non-breeding (male) colony of Australian sea lions (*Neophoca cinerea*). Approximately 17 to 20 mainly sub-adult males and the occasional female are known to use the breakwaters of the Port as haul-out sites. The Australian sea lion was listed as vulnerable under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) in 2005. The sea lion is native to Western Australia and is also listed in Schedule 4 of the WA Wildlife Conservation (Specially Protected Fauna) Notice 1998. The small breakwater north of the project area is known locally as *'Seal Rocks'*. This breakwater is frequently used by male sea lions to rest and sunbathe. It is also a tourist attraction with a dedicated viewing platform at the end of the Esplanade to allow visitors to observe the sea lions from a safe distance. Humpback whales (*Megaptera novaeangliae*) are found in the Geraldton area between late-May to early-December with the peak of the southern migration occurring in September to November. The humpback whale is a listed threatened migratory species (Vulnerable) under the Environmental Protection and	> Seabed Levelling in the access channel. > Piling works during jetty construction > Jetty maintenance; sand blasting, pressure cleaning and painting > Increased vessel movement / traffic	• Channel designed with a 100m offset from "Seal Rocks" known Australian seal lion haul-out area. • Construction EMP, including: • Marine fauna observation zones. • MFO recording and reporting of marine fauna observations, injury or death. • Noise and vibration management and mitigation (piling)Pollution and oil spill response • Waste management procedures • Slow vessel speeds during seabed levelling operations <3 kn. • Speed restricted to <5 kn within inner channel area for operating commercial vessels.	Meets EPA Objective Although there are identified marine fauna within the Project area the activities posed to these are typically low risk. Previous dredge projects in the area (2002/2003, 2012 and 2021) did not report any impacts, and with adequate management proposed there are no anticipated impacts to Marine Fauna from this Project.

	Biodiversity Conservation (EPBC) Act 1999 and is listed as rare or likely to become extinct under the Wildlife Conservation Act 1950. Western rock lobsters occur widely along the mid-west coastline. Juveniles are observed closer along the shoreline and within the protection of bays, such as Champion Bay and use seagrass area and shallow rocky reef areas for foraging and protection. The Geraldton region supports one of the largest commercial and recreation rock lobster fisheries in Australia, although the range is wide and extends far greater than Champion Bay. The Indo-Pacific bottlenose dolphin (*Tursiops aduncus*) is likely to occur in the area though is considered a key species. It has a low conservation status level and is not listed under the EPBC or BC Act. However, it is listed as near threatened according to the IUCN Red List. They occur over a very wide region and are regularly seen within Champion Bay and surrounding waters.		• Marine fauna desktop assessment completed. • Feb-May identified as low environmental risk as it avoids key periods such as: Whale migration and rock lobster migration from nearshore reefs to deeper waters (walk of the whites). • Maintenance Procedures • Jetty access licenses and commercial tour operator licences. • Educational materials for tour operators and tourist	
Coastal Processes	Champion Bay is a semi-sheltered embayment protected from raw ocean swell conditions by a series of shallow subtidal reef systems extending off Point Moore and a deeper parallel limestone ridge which runs north towards Drummond Cove. East of the limestone ridge, water depths up to approximately 11 m occur within two kilometres of the coast. To the west of the limestone ridge, water depths rapidly increase to 20-30 m, and then gradually deepen to 50 m before shallowing again at the Houtman Abrolhos Islands located some 50 km offshore. To the north and south of Point Moore, the coast is comprised primarily of sandy beaches generally overlying beach rock. Occasional areas of shallow beach rock and limestone platform are exposed at locations such as at Drummond Cove, Bluff Point, Point Moore and adjacent to the mouth of the Greenough River.	Leveling of sediments and BCH communities within the SLF.	> Ensure seabed levelling does not occur outside of the SLF. > Extremely minor alterations of the seafloor bathymetry only (i.e. <0.5 m) – not considered sufficient to alter coastal processes. > Minor BCH loss only. Unlikley this minor loss will results in measurable sand production within the secondary sediment cell of Champion Bay.	**Meets EPA Objective** Levelling of 2.25 ha of sediment and BCH is not predicted to have any impacts on the coastal process which occur within the LAU.

MARINE

	Two main rivers, the Greenough River (~10 km south of Point Moore), and Chapman River (~5 km north of Point Moore), periodically discharge into coastal waters in the Geraldton area. These rivers are typically closed at the river mouth discharging only after significant rain falls within the two catchments.		> Native Vegetation Clearing Permit	
Social Surroundings	<u>Cultural Heritage</u> European: There are no significant European sites located within The Project area. Aboriginal: Two registered Aboriginal Heritage Sites are recorded in the Aboriginal Heritage Inquiry System (AHIS) as being in the vicinity of the Project area. These include site ID 5561 Chapman River Mouth and 5874 Bluff Point Midden. Based on their distance from the Project they are not considered at risk from operations. <u>Shipwrecks</u> There are 18 Shipwrecks identified on the WA Museum Shipwrecks database that are located off the coast of Geraldton with eight occurring within Champion Bay. Shipwrecks in State Waters are protected under the MA Act. The exact location of many of these shipwreck sites is unknown. None are identified within the DE for the Project. <u>Vessel Traffic</u> Port waters are utilised already by both commercial & recreational vessels. <u>Recreational Activities</u> Town Beach supports recreational use of Champion Bay with the local Yacht club, fishing, water sports and tourism operators all accessing the waters in and around the project area. <u>Aquaculture and Commercial Fishing</u>	> Disturbance of a shipwreck. > Disturbance of an aboriginal heritage site. > Disturbance of public amenity (i.e. mixed-use wharf zone). > Increased vessel traffic & maritime safety.	> Construction EMP > Consultation undertaken with Fishing Boat Harbour Consultation Committee and MWPA > Targeted consultation with tourism operators. > BCH surveys of the Project Area . > Consultation with the Department of Transport to amend gazetted water-skiing areas. > Maritime Navigational Chart WA939 will be amended, and Maritime Notices issued during construction	**Meets EPA Objective** No known shipwrecks of significance in The Project footprint. Multibeam survey completed within dredge footprint identified no possible shipwrecks in area. Aboriginal heritage not considered at risk due to distance and location away from project site. Vessel traffic limited to only one additional vessel in Project area which is speed restricted The project area supports little in the way of habitat or feeding grounds therefore this development is unlikely to have impacts fishing and catches such as crayfish, fin fish or octopus.

	Commercial and recreational fishing and aquaculture industries operate within Champion Bay.			

6. Conclusion

Overall actual and potential impacts of the Project on the environment are not considered to represent a significant environmental risk on the basis that:

- The EP Act principles and relevant Environmental Protection Authority (EPA) guidance documents have been considered in investigating and evaluating potential impacts of the Project on the EPA's environmental factors;
- A comprehensive set of monitoring and management measures have been developed to further mitigate potential impacts of the Project on the EPA's environmental factors;
- The proponent has committed to open and transparent reporting of environmental performance throughout the Project;
- Evaluation of impacts against all relevant environmental factors, including other environmental factors determined that the EPA's objectives were considered to be met. Specifically, for the key environmental factors the following outcomes were predicted:
  - Benthic Communities and Habitat:
    - No irreversible loss, or serious damage outside the SLF.
    - No detectible reduction from the baseline state of benthic communities outside the SLF.
  - Marine Environmental Quality :
    - Moderate Ecological Protection Area (MEPA) maintained throughout project .
    - A temporary, localised reduction in Marine Environmental Quality during seabed levelling in the immediate vicinity of the SLF.
    - Manage vessel bunkering, chemical storage and spill response to ensure no adverse impacts to the marine environment.
- Evaluation of impacts against Matter of National Environmental Significance determined that there are no predicted impacts.

Based on the outcomes of this EIA, it is recommended that MWPA implement an Environmental Management Plan (EMP) to ensure all potential seabed levelling impacts are managed in accordance with this EIA to ensure predicted impacts achieved. Additionally, commercial agreements with Tourist Jetty users should include conditions of usage, particularly with regards to vessel speeds and operating with the defined inner channel area. The port wide Marine Environmental Monitoring and Management Plan that is being developed should incorporate potential operational impacts to water and sediment quality into the final program. Through the implementation of these recommended instruments, this assessment identifies that the associated risks from the Project are considered adequately minimised and avoided where possible. The implementation of the Project in accordance with the recommended instruments is therefore not predicted to result in 'Significant Environmental Impact' and does not trigger the requirement for referral under Part IV of the EP Act 1986.

It is therefore recommended that MWPA continue to consult with and engage relevant stakeholders and implement the recommended management and monitoring programs accordingly.

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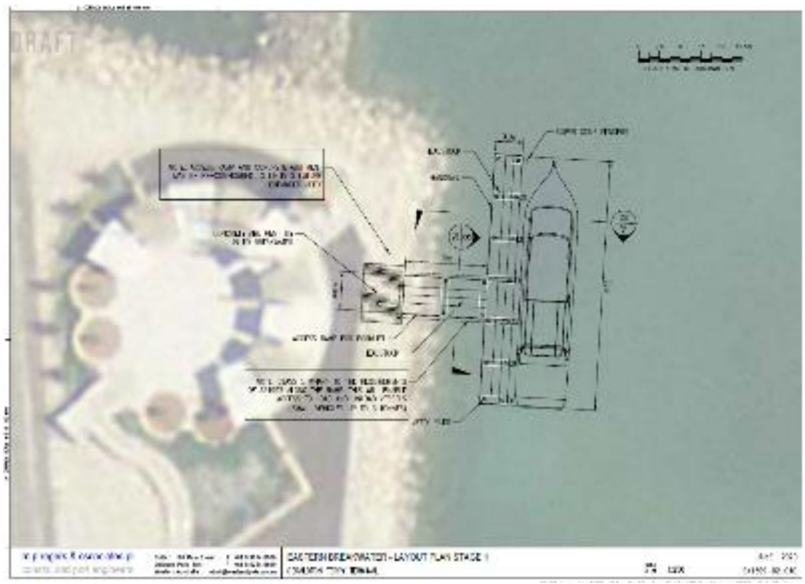
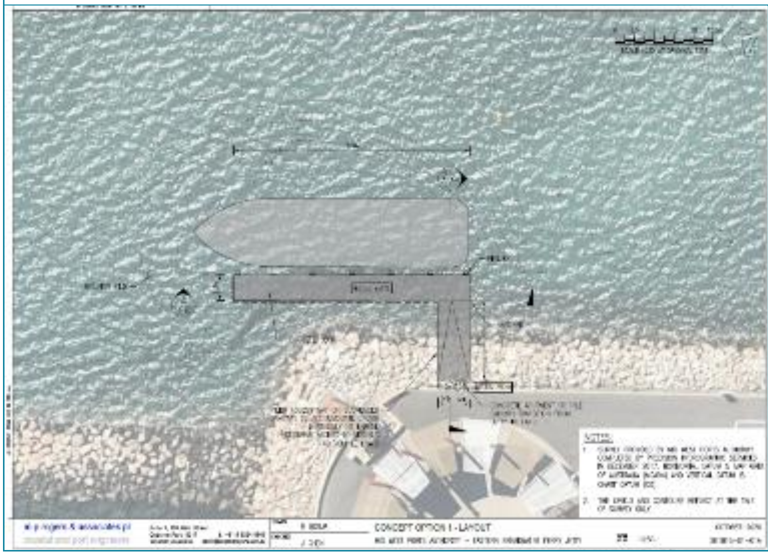
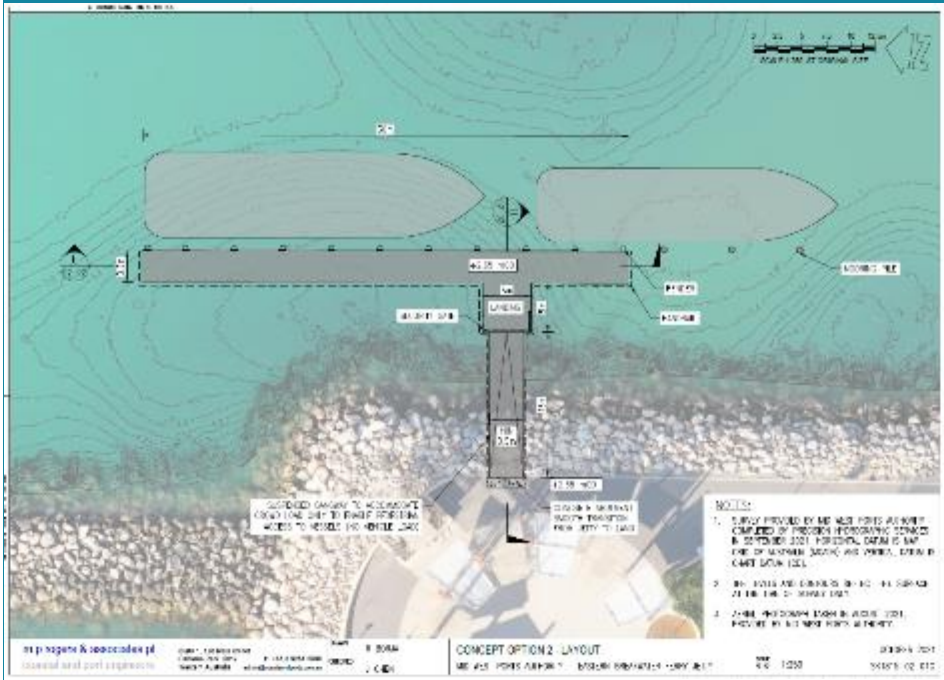
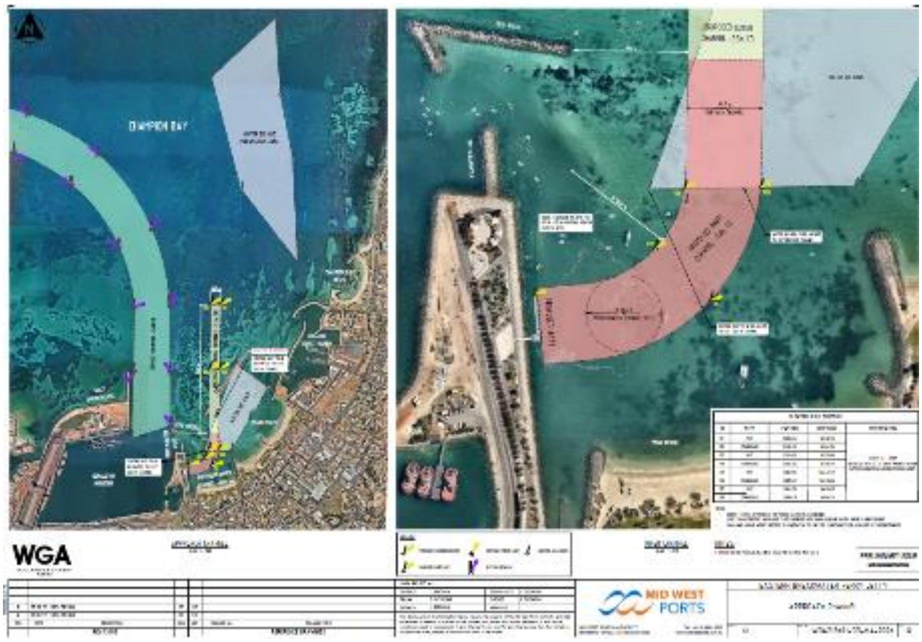
Appendix A. Tourist Jetty Design Evolution

Table 15: TJ design evolution

<table>
<tr><th>Concept Design</th><th>Key Design Elements & Alterations</th></tr>
<tr><td>
</td><td>FEBRUARY 2020
Early concept for EBW
50m long jetty
78.8m wide access channel</td></tr>
<tr><td>
Jetty Location
<table>
<tr><th>Location</th><th>Description</th><th>Pros</th><th>Cons</th></tr>
<tr><td>1</td><td>Adjacent to Esplanade Lookout</td><td>Encourages use of Esplanade
Shade available
Least impact on other waterside users</td><td>Impact on other Esplanade users
View back to town may be blocked</td></tr>
<tr><td>2</td><td>30m South of Esplanade Lookout</td><td>Less impact on other Esplanade users
Shade available nearby
Less impact on other waterside users</td><td>No open area for staging
Eastern footpath congestion</td></tr>
<tr><td>3</td><td>100m South of Esplanade Lookout</td><td>Large open area for staging
Shortest walk for passengers
Least impact on other Esplanade users</td><td>No shade
Closest to Francis St Boat Ramp
Vessels generally berthed closer to general public</td></tr>
</table>
</td><td>FEBRUARY 2020
3 proposed jetty locations along eastern breakwater
Impact consideration, 'Pros' and 'Cons'.
Site 1: Adjacent to the Esplanade Lookout;
Site 2: 30m South of the lookout; and
Site 3: 100m south of the lookout adjacent to a paved open staging area.</td></tr>
</table>

Concept Design	Key Design Elements & Alterations
	JUNE 2020 Northern EBW site example (Site 1) Jetty: 30m long, 3.3m wide 18x piles 10m access ramp
	OCTOBER 2020 Single berth jetty concept, site 1 example Jetty: 30m long, 3.3m wide 10m access ramp

Concept Design	Key Design Elements & Alterations
	OCTOBER 2021 Double berth jetty concept, site 1 example Jetty: 50m, 3.3.m wide 15m access ramp
	FEBRUARY 2022 Maintaining double berth jetty concept Site 3 location selected

Concept Design	Key Design Elements & Alterations
	AUGUST 2022(85% Design) Site 3 selection maintained Double berth jetty concept maintained Jetty: 40m long, 3m wide 20x Jetty Piles 9x Fender Piles 8x CFA abutments