MARINE CONSTRUCTION MONITORING AND MANAGEMENT PLAN

Koombana Bay Marine Structures, Bunbury

AU213001693.003
Rev 2
27 October 2023

rpsgroup.com

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
Draft A	Draft for client review	HarHou	GilGla	NA	22/06/2022
Rev 0	Final for issue	GilGla	HarHou	GilGla	06/07/2022
Rev 1	Final for issue	GilGla	GilGla	GilGla	22/03/2023
Rev 2	Updated in response to EPA and public comments	JanEag	JanEag	JanEag	27/10/2023

Approval for issue

J. Eagle		31 October 2023

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SUMMARY – KOOMBANA BAY

Proposal name	Koombana Bay Marine Structures
Proponent name	South West Development Commission
Marine construction monitoring and management plan purpose	Consistent with the Environmental Protection Authority's (EPA) Environmental Scoping Document (EPA 2015) the purpose of this Marine Construction Monitoring and Management Plan (MCMMP) is to identify and detail the measures the future proposal proponents will implement during construction of the future proposals to manage and mitigate potential impacts to marine environmental quality and benthic communities and habitats to demonstrate and ensure that the EPA's objectives and proposed KBMS strategic proposal environmental objectives are capable of being met
Key EPA factors and objectives	• Marine environmental quality: To maintain the quality of water, sediment and biota so that the environmental values are protected • Benthic communities and habitats: To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained
Relevant Koombana Bay Marine Structures environmental objectives	• Marine environmental quality: – Maintain ecosystem integrity within high and moderate levels of ecological protection areas – Maintain seafood safe for human consumption within high and moderate levels of ecological protection areas – Maintain primary and secondary contact recreation values within high and moderate levels of ecological protection areas – Maintain aesthetic values within high and moderate levels of ecological protection areas • Benthic communities and habitats: – Maintain extent of benthic communities and habitats outside of the development envelopes – Maintain blue swimmer crab and fin fish fisheries
Condition clauses (if applicable)	N/A
Key components or legal requirements of the MCMMP	See Section 3.1 Objective-based provisions and Section 3.2 Outcome-based provisions
Proposed construction date	Construction dates and time frames for the future proposals are yet to be determined
MCMMP required pre-construction?	Yes ☒ No ☐

1 INTRODUCTION

The South West Development Commission (SWDC) is the proponent for the Koombana Bay Marine Structures (KBMS) strategic proposal.

The KBMS proposal was referred to the Environment Protection Authority (EPA) on 24 March 2015 under Section 38 of the *Environment Protection Act 1986* (EP Act). The EPA determined the KBMS proposal required assessment at the level of "Strategic Proposal (Public Environmental Review" or SPER) primarily because this proposal identified that the three future proposals may individually, or in combination, have a significant impact on the environment. The EPA approved an Environmental Scoping Document (ESD) for the KBMS strategic proposal on 26 June 2015.

The KBMS strategic proposal is located within the City of Bunbury, about 174 kilometres (km) south of Perth, Western Australia. The marine structures subject to the KBMS strategic proposal are situated within Koombana Bay, which neighbours the Bunbury Central Business District and the Marlston North residential and waterfront developments. Figure 1 illustrates the indicative KBMS strategic proposal.

An overarching summary of the KBMS strategic proposal is provided in Table 1.

Table 1: Summary of the KBMS strategic proposal

Proposal title	Koombana Bay Marine Structures
Proponent name	South West Development Commission
Brief description	The KBMS strategic proposal is for the construction and operation of small craft marine infrastructure in Bunbury, south-west Western Australia. The proposed marine infrastructure includes construction and operation of jetties, boat ramps and boat pens. The identified future proposals under the strategic proposal for the construction and operation of: • Casuarina Boat Harbour • Koombana Bay Sailing Club (KBSC) marina • Dolphin Discovery Centre (DDC) finger jetty. The construction of the future proposals will be undertaken in stages. The marine infrastructure is located adjacent to, or proximate to existing infrastructure in Koombana Bay, Bunbury.

A description and identification of the elements for each future proposal in provided in Table 2.

Table 2: Identified future proposal description and elements

Casuarina Boat Harbour

This future proposal includes a dredging and dredge spoil disposal component, a piling component, land reclamation and construction of a breakwater and revetment walls. The marine infrastructure includes the construction and operation of floating jetties, boat ramps and boat pens.

Proposal element	Location / description	Maximum extent, capacity or range
Physical elements		
Development envelope	Figure 1	Up to 40 hectares (ha)
(Indicative) Casuarina Boat Harbour disturbance footprint		Up to 32 ha within indicative disturbance footprint
Breakwater		Up to 3.5 ha within indicative disturbance footprint
Reclamation		Up to 3.5 ha within indicative disturbance footprint
Marine infrastructure		Floating jetties, boat ramps and boat pens to be located within indicative disturbance footprint

KBSC marina

This future proposal includes a dredging component, a piling component, land reclamation (including onshore dredge spoil disposal) and construction of two breakwaters. The marine infrastructure includes the construction and operation of floating jetties, boat ramps and boat pens.

Proposal element	Location / description	Maximum extent, capacity or range
Physical elements		
Development envelope	Figure 1	Up to 16 ha
(Indicative) KBSC marina disturbance footprint		Up to 10 ha within indicative disturbance footprint
Breakwaters		Up to 2.5 ha within indicative disturbance footprint
Reclamation		Up to 2 ha within indicative disturbance footprint
Marine infrastructure		Floating jetties, boat ramps and boat pens to be located within indicative disturbance footprint

DDC finger jetty

This future proposal includes a finger jetty, a piling component and a temporary onshore construction laydown area.

Proposal element	Location / description	Maximum extent, capacity or range
Physical elements		
Development envelope	Figure 1	Up to 0.5 ha
(Indicative) DDC jetty indicative disturbance footprint		Up to 0.15 ha within indicative disturbance footprint
Marine infrastructure		Jetty up to 110 metres long
Other elements which affect extent of effects on the environment		
Proposal time	Maximum project life	100 years
	Construction phase	Construction time frames yet to be determined
	Operations phase	100 years

Figure 1: KBMS strategic proposal

1.1 Scope and rationale

This Marine Construction Monitoring and Management Plan (MCMMP) identifies and details the measures the future proposal proponents will implement during construction of the future proposals to manage and mitigate potential impacts to marine environmental quality and benthic communities and habitats to demonstrate and ensure that the EPA's objectives and proposed KBMS strategic proposal environmental objectives are capable of being met. To address the risk to local amenity values from the construction of the future derived proposals, this MCMMP also includes social surroundings management actions.

This MCMMP details an objective and outcome-based monitoring and management framework and has been prepared to accord with the EPA's Instructions on how to prepare EP Act Part IV Environmental Management Plans (EPA 2021).

1.2 Environmental scoping document requirements

This MCMMP was specifically prepared to address the requirements of ESD (EPA 2015) for the KBMS strategic proposal (Table 3).

Table 3: KBMS strategic proposal ESD requirements

MCMMP required work	Relevant section
7. a. A MCMMP that includes protocols and procedures for monitoring (e.g. turbidity, light attenuation coefficient, visual records, etc.) and management (e.g. silt curtains, pre-washing of limestone rock for breakwater, etc.) to ensure that the construction of each of the future proposals achieves the Environmental Quality Objectives (EQO) / Levels of Ecological Protection defined in the revised Environmental Quality Plan (EQP)	All document
5. Include in the MCMMP details of the monitoring and management to occur during and after construction for each of the future proposals to demonstrate and ensure that the EPA's objectives for benthic communities and habitats can be met and that the residual impacts are not greater than predicted. The MCMMP is to include the protocols and procedure for mapping and influence defined for each of the future proposals	Sections 3 and 4

1.3 Key construction elements

The key construction elements of the KBMS strategic proposal which have the potential to impact the marine environment are:

- Dredging
- Piling
- Land reclamation
- Breakwater and revetment wall construction
- Dewatering of contaminated sediment.

1.3.1 Dredging programme summary

The proposed dredging program is summarised below.

- The total volume of dredged material is anticipated to be up to 266,000 m^3 and it is expected that dredging will be undertaken outside of the Southern Port Authority's (SPA) biannual autumn and spring maintenance dredging programme:
  - Casuarina Boat Harbour Phase 1 will be undertaken using a Trailing Suction Hopper Dredge (TSHD) and a backhoe Dredge (BHD) operating 24 hours a day over a period of approximately one month (28 days).
  - KBSC marina dredging will be undertaken using a BHD / Cutter Suction Dredge (CSD) for a period of up to nine weeks (64 days).
  - Casuarina Boat Harbour Phase 2, which will commence at least one year after completion of Phase 1, will be undertaken using a BHD over a three-month period (93 days).

- Most of the dredge material from Casuarina Boat Harbour is proposed to be disposed of at the 36 ha offshore disposal ground 10 km north-west of the KBMS strategic proposal (up to 230,000 m^3 from Phase 1 and Phase 2). Dredge material with elevated levels of tributyltin (TBT) from Casuarina Boat Harbour (up to 10,000 m^3) will be disposed of onshore within a contained bund during Phase 2.
- Dredge material from the KBSC marina (up to 26,000 m^3) will be taken onshore for reuse within a reclamation area.

Offshore disposal of Casuarina Boat Harbour dredged material, including monitoring and management at the offshore disposal ground, are addressed in the approved Dredge Spoil Disposal Management Plan (Cardno 2023). Marine Environmental Quality Modelling (GHD 2023a) has demonstrated that a Zone of Moderate Impact (ZoMI) or a Zone of High Impact (ZoHI) are not predicted to occur at the offshore site from the disposal of dredged material. Triggers have been established in Cardno (2023) to monitor the accuracy of the modelling predictions. A management response will be triggered under Cardno (2023) should monitoring infer that a ZoMI may exist in areas where light sensitive benthic habitats (e.g. seagrass, macro algae) have been mapped. Therefore the risk of temporary (and permanent) loss of light sensitive benthic habitats because of increased turbidity / sedimentation associated with the dredge plume from the offshore disposal of dredged material has been addressed by monitoring and management provisions identified in Cardno (2023).

Department of Transport (DoT), proponent for the Casuarina Boat Harbour future proposal, has obtained an *Environment Protection (Sea Dumping) Act 1981* permit (SD2022-4034) for the offshore disposal of dredged material independently of the EPA's assessment of the KBMS strategic proposal.

1.3.1.1 Onshore disposal

Sediment quality testing has indicated the presence of TBT in a discrete area within the Phase 2 dredge boundary (Cardno 2022). Dredged material from this area is not considered suitable for offshore disposal.

The estimated volume of this material is up to 10,000 m^3. A long reach BHD will be employed to remove the TBT contaminated sediment material and transfer onshore. Anticipated duration of dredging and onshore disposal is approximately 20 days.

This material will be temporarily stored, dewatered then transferred to a waste receival facility. This will involve placement into lined, bunded holding ponds or geotextile tubes (geotubes). Material placed in holding ponds will be allowed to dry out before being trucked to an appropriate waste facility for disposal.

Geotubes provide a temporary storage area for the dredged slurry before determination of appropriate disposal methods for liquid and solid phases. Should geotubes be used, these will be situated on a bunded area of hardstand. Environmentally safe polymers may be added to the slurry to bind sediment and help separate solids from the liquid. Once separated, water within the tubing will be tested to determine its suitability for return to the ocean (Section 4.1.4). Remaining sediment is to be disposed of at a receiving waste facility.

1.4 Relationships to other plans

This MCMMP provides a monitoring and management framework to mitigate potential environmental impacts to marine environmental quality and benthic communities and habitats during future proposal construction to address the ESD (EPA 2015) requirements. This MCMMP is complemented by the following plans:

- Marine Fauna Management Plan (MFMP; RPS 2023a) provides the management framework to mitigate potential environmental impacts to marine fauna during future proposal construction and operation. The monitoring and management actions proposed in the MFMP have not been reproduced in this MCMMP. Hence the MCMMP will be implemented in conjunction with MFMP during future proposal construction.
- Avifauna Management Plan (AMP, RPS 2023c) provides the management framework to mitigate the potential environmental impacts to seabirds during the future proposal construction and operation. The monitoring and management actions proposed in the AMP have not been reproduced in this MCMMP. Hence the MCMMP will be implemented in conjunction with AMP during future proposal construction.
- Marine Environmental Quality Management Plan (MEQMP; GHD 2023b) provides the management framework to mitigate potential environmental impacts to marine environmental quality during future proposal operation.

- Coastal Processes Management Plan (GHD 2023c) provides the management framework to mitigate potential environmental impacts to coastal processes during future proposal operation.
- Dredge Spoil Disposal Management Plan (Cardno 2023) provides the monitoring and management framework to mitigate potential environmental impacts from the offshore disposal of dredged material.

1.5 Key environmental factors

Potential impacts to the key environmental factors of marine environmental quality and benthic communities and habitats from the construction activities associated with the future proposals are summarised in Table 4.

Table 4: Environmental factors, objectives and key impacts during construction

Environmental factor	EPA objective	Key impacts during construction
Marine environmental quality	To maintain the quality of water, sediment and biota so that the environmental values are protected	**Direct impacts** • Temporary increase in total suspended solids (TSS) and nutrients/ contaminants from dredging and breakwater construction **Indirect impacts** • Temporary increase in net sedimentation from dredging and breakwater construction • Temporary reduction in water quality from return water from onshore disposal of TBT contaminated sediment material
Benthic communities and habitats	To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained	**Direct impacts** • Removal of benthic communities and habitats from dredging and breakwater construction **Indirect impacts** • Temporary decrease in light availability for benthic communities and habitats from dredging and breakwater construction

1.5.1 KBMS strategic proposal objectives

The proposed overarching KBMS strategic proposal environmental objectives will ensure the EPA's objectives for marine environmental quality and benthic communities and habitats are achieved during construction of the future proposals. The KBMS strategic proposal environmental objectives of relevance to construction of the future proposals are:

- Marine environmental quality:
  - Maintain ecosystem integrity within high and moderate levels of ecological protection areas
  - Maintain seafood safe for human consumption within high and moderate levels of ecological protection areas
  - Maintain primary and secondary contact recreation values within high and moderate levels of ecological protection areas
  - Maintain aesthetic values within high and moderate levels of ecological protection areas
- Benthic communities and habitats:
  - Maintain extent of benthic communities and habitats outside of the development envelopes
  - Maintain blue swimmer crab and fin fish fisheries.

1.5.2 Other environmental factors

Construction of the future proposals also has the potential to reduce local amenity values to proximate sensitive social receptors (e.g. recreation areas, residential development, commercial buildings):

- Noise will be generated by construction works, including piling
- Construction works may result in significant acute or ongoing ground vibration
- Construction works will result in limiting access to the beachfront and marine construction works areas

- High levels of dust are unlikely to be generated during the construction as the anticipated extent of terrestrial ground disturbance and subsequent earthwork requirements will be limited.

To address the risk to local amenity values from the construction of the future derived proposals, this MCMMP also includes high level social surroundings management actions.

2 DETAILED CONSTRUCTION APPROACH

2.1 Casuarina boat harbour

The Casuarina Boat Harbour Phase 1 dredge and construction programme, includes the northern breakwater, associated reclamation area and include internal jetties and boat pens.

The Phase 2 construction activities includes dredging, revetment walling, jetties and boat pens (if not undertaken as part of Phase 1) and internal boat ramps. The Phase 2 construction programme will be undertaken outside of the Casuarina Boat Harbour Phase 1 dredging and breakwater construction and KBSC marina construction.

Phase 1 and 2 dredging programmes will be undertaken outside of the SPA's biannual autumn and spring maintenance dredging program.

The Casuarina Boat Harbour construction methodology and staging are defined in Table 5.

Table 5: Casuarina Boat Harbour proposed construction methodology and staging

Future proposal		Construction staging	Construction methodology	Estimated proposed extent	Indicative construction time frames
Casuarina Boat Harbour	**Two phase construction methodology**				
	Phase 1				
	1.	Dredging	TSHD and BHD	Dredging of up to 130,000 m^3 material	• One month (28 days) • 24-hour operation • During months of April to November only
	2.	Construction of the outer northern breakwater and reclamation area	End tipping of suitable rock material and clean engineering fill	Up to 3.50 ha	Nine months (278 days)
	3.	Installation of internal jetties and associated boat pens (if undertaken as part of Phase 1)	Pile driving during jetty and boat pen construction	To be determined	Construction time frame yet to be determined
	Phase 2 (time gap between the completion of Phase 1 and the commencement of Phase 2)				
	4.	Dredge and onshore dredge material disposal	BHD	• Dredging of up to 110,000 m^3 material • Up to 10,000 m^3 of dredge material with elevated levels of TBT will be disposed of onshore (into lined, bunded holding ponds or geotextile tubes), where it will be dewatered and then removed off site (e.g. landfill) • Onshore dredge material disposal area will be located within the indicative disturbance footprint of Casuarina Boat Harbour	• Three and a half months (93 days) (24-hour operation) • During months of April to November only
	5.	Revetment walling	Construction of rock revetment, including core and armour rock	To be determined	Construction time frame yet to be determined

Future proposal	Construction staging		Construction methodology	Estimated proposed extent	Indicative construction time frames
	6.	Jetties and associated boat pens	Pile driving during jetty and boat pen construction	Up to 27 floating jetties and 460 boat pens	Construction time frame yet to be determined (likely staged)
	7.	Internal boat ramps	Pile driving during boat ramp jetty construction	Approximately five lanes	Construction time frame yet to be determined

2.1.1 Phase 1 construction description

2.1.1.1 Dredge methodology

Dredging activities will be undertaken as the first phase of works required to construct the northern breakwater. Dredging the northern breakwater footprint is required to ensure a stable foundation for the structure. Dredging is also required to ensure the entrance channel provides clear and safe navigation. The Phase 1 dredge operations will involve removing up to 130,000 m^3 of dredge material.

Table 6 summarises the Phase 1 TSHD dredge methodology. The phased dredge programme is illustrated in Figure 2.

Table 6: Casuarina Boat Harbour – Phase 1 dredge methodology summary

Aspect	Description
Phase 1 TSHD programme	
Phase 1 dredge volume	Up to 130,000 m^3 within a 14.25 ha dredge footprint (Phase 1 dredge area)
TSHD	TSHD will be the primary dredging approach used for most of the Phase 1 dredge area (24-hour operation), with a BHD used to dredge small areas of seabed material near existing infrastructure/reclamation areas where the TSHD could not readily dredge
Phase 1 dredge time frames	Approximately 28 consecutive days dredging subject to potential delays due to inclement weather, unfavourable sea state and/or unforeseen equipment malfunction
Dredge sediment	• Sediment sampling and geotechnical testing confirmed unconsolidated muddy, soft silt and loose sand on the seabed beneath the proposed northern breakwater and within the harbour. Soft silt on the seabed is associated with engineering construction issues such as sinking of rock into the seabed, general instability, large settlements, and complex behaviour under seismic loads • Engineering assessment has confirmed the only acceptable construction methodology is to dredge the soft silt and loose sand beneath within the Phase 1 dredge area for the purpose of providing long-term geotechnical stability for the northern breakwater

2.1.1.1.1 Phase 1 – dredge programme

A TSHD will be used to excavate the northern breakwater footprint. The TSHD will be equipped with a Global Positioning System (GPS) to monitor its location. Dredging will occur across a 28-day period with 24-hour operation. A BHD will be used to dredge small areas of seabed material near existing infrastructure / reclamation areas where the TSHD will not readily dredge.

Once in the proposed dredging area, the TSHD will lower a suction pipe to the seabed, start the dredge pump(s) and commence dredging. The dredged material will settle out in the hopper and the excess transport water will be evacuated through the overflow system. The overflow will be fitted with a 'green valve' (or an 'overflow valve'). When the draught of the TSHD vessel reaches the dredging load mark, dredging will be suspended, and the dredged material transported to the offshore disposal ground.

2.1.1.1.2 Breakwater construction

After the Phase 1 dredge operations, the construction of northern breakwater will be commenced. The breakwater and associated reclamation area will be up to 3.50 ha.

The breakwaters will consist of core material and armour stone (the exposed rock) from licensed quarries in the district. The core material and armour stone will be delivered to site by trucks using public roads. The armour stone will likely be granite or basalt (or rock with similar geotechnical properties). The core material will be tipped from the truck into the water and the breakwater will be progressively lengthened. An excavator will place filter and armour rock. The core will be shaped as required using conventional earthmoving equipment such as front-end loaders and hydraulic excavators. An access road and public walkway will be constructed along the entire length of the main breakwater.

2.1.2 Phase 2 construction description

2.1.2.1 Dredge methodology

The Phase 2 dredge operations will involve removing up to 110,000 m^3 dredge material. It should be noted that the northern breakwater will have been constructed before the Phase 2 dredging occurs which means this will be occurring within an enclosed harbour.

Table 7 summarises the Phase 2 BHD dredge methodology. The phased dredge programme is illustrated in Figure 2.

Table 7: Casuarina Boat Harbour – Phase 2 dredge methodology summary

Aspect	Description
Phase 2 BHD programme	
Phase 2 dredge volume	Up to 110,000 m^3 within a 14.25 ha dredge footprint (Phase 2 dredge area)
BHD (offshore disposal)	A BHD mounted on a pontoon will excavate the sediment from the seabed and lift the material to the surface. The sediment material in the bucket will then be loaded into a split-hopper barge.
BHD (onshore disposal)	• TBT contaminated material, estimated to be up to 10,000 m^3 will be dredged by a BHD and transferred onshore into lined, bunded holding ponds (or geotextile tubes), where it will be dewatered before being trucked to an appropriate waste facility for disposal • Onshore dredge material disposal area will be located within the indicative disturbance footprint of Casuarina Boat Harbour
Phase 2 dredge time frames	Approximately 93 consecutive days dredging (24-hour operation); subject to potential delays due to inclement weather, unfavourable sea state and/or unforeseen equipment malfunction

2.1.2.1.1 Phase 2 – BHD dredge programme

A BHD will be used to excavate and deepen the Phase 2 area of Casuarina Boat Harbour. A BHD is a long arm excavator secured to a manoeuvrable barge or boat. The backhoe bucket will excavate seabed material to the surface. The lifting and lowering of the bucket, boom and stick occurs in a very controlled and monitored manner. The material in the bucket is then loaded into a loader barge.

The 110,000 m^3 BHD dredging programme will be undertaken across approximately 93 consecutive days, via a 24-hour dredge operation. The BHD will remove up to 10,000 m^3 of TBT impacted material. This dredge material will be transferred directly onshore into lined, bunded holding ponds (or geotextile tubes), where it will be dewatered before being trucked to an appropriate waste facility for disposal. The anticipated duration of dredging and onshore disposal is approximately 20 days.

Onshore dredge material disposal area will be located within the indicative disturbance footprint of Casuarina Boat Harbour.

2.1.3 Jetties and floating pens and revetment walling construction

The various jetties, and floating pens, will be supported by piles. The depth to the underlying basalt rock varies, hence piling may not be attainable when the basalt is encountered at shallow depths. Alternative construction methodologies to anchor the jetty structures within the basalt rock may be required.

2.1.4 Other infrastructure

Service infrastructure (road, car and trailer parking electricity, water, sewerage, communication) will be installed during the staged construction periods to service boat pens, car parks and other public amenities.

Figure 2: Casuarina Boat Harbour indicative proposal Phase 1 and Phase 2 construction elements (northern breakwater, floating jetties and boat pens) and dredge areas

2.2 KBSC marina

The KBSC marina construction methodology and staging are defined in Table 8.

Table 8: KBSC marina construction methodology

Future proposal	Construction staging		Construction methodology	Estimated proposed extent	Indicative construction time frames
KBSC marina	**Sequential construction**				
	1.	Eastern breakwater constructed first	End tipping of suitable rock material and clean engineering fill	2.50 ha	Five months (152 days) – breakwater construction programme
	2.	Western breakwater constructed second			
	3.	Installation of the revetment walls concurrent with the western breakwater construction	Installation of rock revetment walling along the reclamation area	0.20 ha	The revetment walling will be installed on a staged basis in accordance with the dredge programme and onshore dredge material management
	4.	Dredging internal KBSC marina and disposal within the onshore reclamation area	Floating dredge methodology either: • BHD – long arm excavator • Small CSD	The 2.0 ha reclamation area will be filled in stages, with the initial stage addressing the 26,000 m^3 dredge material	Six to nine weeks (42 days using BHD or 64 days using CSD During months of April to November only)
	5.	Installation of internal jetties and associated boat pens	Pile driving during jetty and boat pen construction	To be determined	Approximately 100 boat pens in the first stage with additional pens installed in accordance with market demand
	6.	Boat ramps	Pile driving during boat ramp jetty construction	Up to 2	Construction time frame yet to be determined

The ultimate reclamation area and the installation of revetment walls, internal jetties and boat pens will be finalised and then constructed on a staged basis.

2.2.1 Breakwater construction

Construction methods for the breakwaters will include the end tipping of suitable rock material from trucks progressively from the shore into the water to form the breakwater core. The core material is likely to be well-graded rubble up to approximately 0.6 m in diameter (with no more than 20% being less than 0.2 m in diameter). An excavator will trim the batter slopes, with granite armour placed onto the breakwater structure.

The eastern and then western breakwaters will be constructed concurrently, along with the internal revetment wall supporting the reclamation area, over an approximate six-month period. Once the eastern and western breakwaters are constructed, silt curtains will be positioned across the marina entrance prior to the commencement of the dredge programme.

2.2.2 Dredge methodology

The dredge methodology presented in Table 9 provides for two dredge scenarios i.e. BHD and / or a CSD. The most suitable dredge and material placement method will be used to achieve the required environmental outcomes. The KBSC marina dredge area is illustrated in Figure 3.

The KBSC marina will be dredged to a depth of -2.9 m Chart Datum creating a dredge material volume of approximately 26,000 m^3. This material is proposed to be dredged in one single event. The seabed within the KBSC marina footprint (breakwaters and dredge area) consists of:

- *Halophila* sp. and *Heterozostera* sp. seagrass meadows

- Sediment with turf algae
- Bare sediment.

Table 9: KBSC marina dredge methodology summary

Aspect	Description
Dredge volume	Up to 26,000 m^3 within a 4.25 ha dredge footprint
Dredging methodology: floating dredge	Dredging will be completed with either: • CSD; or • Excavator mounted on a pontoon (e.g. BHD). Material will be removed from the seabed, either by a cutter head or the excavator, and will be pumped into the reclamation area via a slurry pump
Dredge time frames	Approximately six to nine weeks dredging programme subject to potential delays due to inclement weather, unfavourable sea state and/or unforeseen equipment malfunction. Dredging to occur during months of April to November only
Dredge sediment	Sediment sampling and geotechnical testing confirmed unconsolidated loose sand on the seabed within the KBSC dredge footprint. Sediment was sampled to a depth of 1m below seabed level. At this depth, a medium hardened clay layer was found in all the samples (Cardno 2021)
Onshore disposal	The 2.0 ha reclamation area will be filled in stages, with the initial stage addressing the 26,000 m^3 dredge material
Silt curtains	Silt curtains are the most likely management method for containing the dredging suspended sediment following breakwater construction. Following construction of the eastern and western breakwaters, suspended sediment generated from the dredge programme will most likely be contained within the marina water body using silt curtains. However, alternative methods that achieve the same outcome (with the same level of certainty regarding effectiveness) may also be used

2.2.3 KBSC marina dredge options

2.2.3.1 Cutter suction dredge

A CSD features a suction opening that has been connected to a dredging pump. The cutter cuts away the dredge material / sediment and mixes it with water. This mixture for the KBSC marina would be pumped into the reclamation area disposal ponds via a discharge pipe. The reclamation areas will be lined with a finer core material and a heavy-duty geo-textile before the dredge material is placed. The dredge contractor can manipulate several aspects to minimise dredge turbidity and improve the construction efficiency of the cutter suction dredger, this including:

- Type of cutter head
- Speed of dredge pump
- Discharge pipeline
- Construction layout.

The revolving movement of the cutter will cause intensive dispersion of extracted sediment particles in the area around the cutter. This will result in temporary elevated levels of suspended sediment (or turbidity levels). There will also be some tailwater (or decanting) with suspended sediment from the reclamation area into the marina area.

2.2.3.2 BHD with slurry pump

A backhoe would be placed on a work barge and manoeuvred around the dredge area, dredging sediment from the seabed and placing it into a slurry pump on the barge. The slurry pump would then pump the dredge material through the pipeline to the heavy-duty geo-textile lined dredge reclamation area.

2.2.4 Dredge material reclamation area

The dredged material will be placed in the reclamation area lined settlement ponds with tailwater stored for sufficient time to allow for settling of fine suspended sediments (residence time) prior to discharge of the tailwater back into the marina waterbody.

The primary method of control over tailwater quality discharged from the pond system will be through silt curtains, control of the dredging regime and through the management of dredge and water volumes in the reclamation settlement ponds. The dredge flow rate will be controlled so that sufficient residence time is achieved for suspended sediment concentrations to be within allowable limits by the time the water is discharged back into the marina.

2.2.5 Jetties and floating pens

The jetties and up to 300 floating pens will be supported and/or anchored into the seabed. The depth to the underlying basalt rock varies across the marina footprint. The installation of the jetty foundation through hydraulic piling may not be attainable when the basalt is encountered at shallow depths. Alternative construction methodologies to anchor the jetty structures within the basalt rock may be required.

2.2.6 Other infrastructure

Marina service infrastructure (electricity, water, sewerage, communication) will be constructed or installed during the construction period. Minor dewatering may be required for trenching to install some services.

Figure 3: KBSC marina indicative proposal

2.3 DDC finger jetty

The DDC finger jetty construction methodology is identified in Table 10.

Table 10: DDC finger jetty construction methodology

Future proposal	Construction staging		Construction methodology	Estimated proposed extent	Indicative construction time frames
DDC finger jetty	1.	Construction of a new finger jetty	Pile driving during jetty construction	Up to 110 m in length Up to 150 m^2	Construction time frame yet to be determined

2.3.1 Construction methodology

The new jetty will be up to 110 m long and 5 m wide. The DDC finger jetty is illustrated in Figure 4.

Piling works will be the primary construction methodology to install the finger jetty. It is anticipated that tubular steel piles will be installed using a barge with a piling hammer. No geotechnical assessment of the seabed has been undertaken to date, however a seabed geotechnical assessment s planned to be completed prior to the submission of the future proposal. This geotechnical assessment will determine the final construction methodology.

The jetty decking will be fabricated off-site and transported to site for installation.

As a guide, the construction time frame for a finger jetty structure is typically between ten to 20 weeks. Approximately 0.15 ha of the Koombana Bay foreshore area (immediately adjacent to the DDC facility) will be temporarily closed during the construction period.

Figure 4: DDC finger jetty indicative proposal

3 SURVEY AND STUDY FINDINGS

3.1 Marine environmental quality

Dredging and breakwater construction present as the primary construction related risks to marine environmental quality. Dredging and breakwater construction will result in a temporary impact on marine environmental quality due to increased turbidity (i.e. increased TSS), net sedimentation and the release of nutrients / contaminants in dredged sediments.

The predicted marine environmental quality is expected to meet a 'moderate' level of ecological protection (i.e. 90% species protection within the future proposal development envelopes and Inner Harbour) and a 'high' level of ecological protection (i.e. 99% species protection within Koombana Bay, Leschenault Inlet and surrounding marine waters). No significant residual impact on marine environmental quality is predicted beyond the future proposal development envelopes.

Monitoring and management of benthic communities and habitats in the zones of influence and moderate impact from the dredging and breakwater construction activities generally rely on quantitative trigger value criteria. Baseline water quality monitoring determined a 50th and 80th percentile turbidity value of 2.3 Nephelometric Turbidity Unit (NTU) and 3.3 NTU for summer and 7.1 NTU to 15.6 NTU for winter, respectively. Clearly, higher natural turbidity with greater variability occurs in winter relative to summer, so benthic communities and habitats are likely seasonally adapted to winter turbidity increases in southern Koombana Bay (e.g. seasonal versus perennial species). In contrast, low turbidity with relatively small variations occurs during the summer, so potential construction impacts from turbidity-generating construction activities are likely to affect benthic communities and habitats to a greater degree than winter.

Differences between the 80th percentile and median concentrations of TSS were 3, 4.6 and 6 milligrams per litre (mg/L) in Koombana Bay, Casuarina Boat Harbour and Leschenault Inlet, respectively. These TSS differences can serve as guideline values (or impact thresholds) to define the allowable levels of TSS above background due to construction-related turbidity generation.

A conservative TSS impact threshold of 2 mg/L for the future proposals was established as part of the Benthic Communities and Habitats Study (RPS 2023b; Table 11).

3.2 Benthic communities and habitats

Casuarina Boat Harbour accounts for the greatest proportion of the total disturbance to benthic communities and habitats, followed by the KBSC marina, then the DDC finger jetty.

The 29.65 ha Casuarina Boat Harbour direct disturbance area is primarily comprised of 28.57 ha of bare sediment (temporary loss) and to a lesser degree 0.44 ha of seagrass habitat – *Halophila sp.* and *Heterozostera* sp. and 0.64 ha of sediment with turf algae (permanent loss).

The 11.13 ha KBSC marina direct disturbance area is primarily comprised of 8.17 ha of seagrass habitat – *Halophila sp.* and *Heterozostera sp*. (permanent loss) and to a lesser degree 2.57 ha of sediment with turf algae (permanent loss) and 0.39 ha of bare sediment (temporary loss).

The DDC finger jetty is estimated to directly impact 0.03 ha of seagrass habitat - *Halophila sp*. and *Heterozostera sp*. habitat (permanent loss).

To determine the indirect impacts from dredging and breakwater construction activities, predicted construction-related increases of TSS above background levels and net sedimentation were derived through construction scenario modelling (GHD 2023a) and used spatial represent the Zone of Influence (ZoI), ZoMI and ZoHI. The zones of influence were established using benthic communities and habitat criteria (RPS 2023b), which is summarised below in Table 11.

Table 11: Impact zone thresholds for excess total suspended solids and net sedimentation

Impact Zone	Definition	TSS threshold	Net sedimentation threshold
ZoI	The area within which changes in environmental quality associated with dredge plumes are predicted and anticipated during the dredging operations, but where these changes would not result in a detectible impact on benthic biota	≥2 mg/L above background conditions for at least one time step during a scenario (30 minutes)	≥0.4 cm and <2 cm
ZoMI	The area within which predicted impacts on benthic organisms are recoverable within a period of five years following completion of the dredging activities. This zone abuts, and lies immediately outside of, the zone of high impact	≥2 mg/L above background for 18 to 89 continuous days	≥2 cm and <3 cm
ZoHI	The area where impacts on benthic communities or habitats are predicted to be irreversible. The term irreversible means 'lacking a capacity to return or recover to a state resembling that prior to being impacted within a time frame of five years or less'. Areas within and immediately adjacent to proposed dredge and disposal sites are typically within zones of high impact	Loss of perennial seagrasses: ≥2 mg/L above background for ≥90 continuous days	≥3 cm

(Source: RPS 2023b)

The zones of impact of the 'likely worst' and 'likely best' cases of the 'probable', 'serial' and 'parallel' construction sequences identified by GHD (2023a) were very similar where:

- ZoHI was predicted for one of the 'serial' construction scenarios within the KBSC marina from breakwater construction and dredging for both the 'likely worst' and 'likely best cases
- ZoMI was limited primarily to the western and southern margins of Koombana Bay in proximity to the construction activities. The extent of the ZoMI was primarily driven by the Phase 1 TSHD of the Casuarina Boat Harbour northern breakwater footprint
- ZoI extended into the Leschenault Inlet, the northern and southern coastal waters from Koombana Bay and in the vicinity of the offshore disposal ground. The Phase 1 TSHD period with much higher fines source fluxes than any of the other construction elements established the outer boundaries of this zone.

The aggregate of the 'likely worst' and 'likely best' ZoI, ZoMI and ZoHI for the 'probable', 'serial' and 'parallel' construction sequences are presented in relation to the KBMS strategic proposal and benthic habitats and community mapping in Figure 5.

ZoI was much more limited for the Phase 2 BHD within Koombana Bay and adjacent coastal waters, and ZoMI was limited to within Casuarina Boat Harbour. The aggregate of the 'likely worst' and 'likely best' ZoI and ZoMI for the Phase 2 BHD construction sequence is presented in Figure 6. No additional irreversible indirect losses for Casuarina Boat Harbour or the KBSC marina were predicted by the construction modelling scenarios because the ZoHI is contained entirely within the indicative disturbance / dredging footprint of the Casuarina Boat Harbour or the KBSC marina future proposals (Figure 5).

(Source: RPS 2023b)

Figure 5: Aggregate likely worst and likely best ZoI, ZoMI and ZoHI for the probable, serial and parallel construction sequences and benthic habitats and community mapping

(Source: RPS 2023b)

Figure 6: Aggregate of the likely worst and likely best ZoI, ZoMI and ZoHI for the Phase 2 BHD construction sequence for Casuarina Boat Harbour and benthic habitats and community mapping

4 MANAGEMENT APPROACH

4.1 Marine water quality

The MEQMP (GHD 2023b) adopts the environmental quality management framework (EQMF) presented in the EPA's Technical Guidance: Protecting the Quality of Western Australia's Marine Environment (EPA 2016a). The key elements of the EQMF are:

- Environmental values (EVs), which establish a broad area of ecological or social importance to the stakeholders
- Environmental quality objectives (EQOs), which specify the stakeholder aspirations for specific management objectives for each value.

The EVs and EQOs for the KBMS strategic proposal are presented in Table 12.

Table 12: EVs and EQOs for the KBMS strategic proposal

EVs	EQOs
Ecosystem health	Maintenance of ecosystem integrity
Fishing and aquaculture	Maintenance of seafood safe for human consumption
Recreation and aesthetics	• Maintenance of primary contact recreation values • Maintenance of secondary contact reaction values • Maintenance of aesthetic values
Cultural and spiritual	Cultural and spiritual values of the marine environment are protected
Industrial water supply	Maintenance of water quality for Industrial use

The EQO for ecosystem health requires the spatial classification of two levels of ecological protection for Koombana Bay and proximal waters, namely:

- Moderate level of ecological protection or Moderate Ecological Protection Area (MEPA) during construction have been identified for the Inner Harbour, Casuarina Boat Harbour, KBSC marina and the DDC finger jetty development envelopes. A MEPA classification recognises that marine environmental quality will be reduced on a local scale during construction
- High levels of ecological protection or High Ecological Protection Area (HEPA) delineation will cover Koombana Bay, adjacent coastal waters and Leschenault Inlet, excluding the MEPA areas.

The operational MEPAs and HEPAs presented in the MEQMP (GHD 2023b) have been modified to account for 'halo' effects during construction. The MEPAs and HEPAs for the Koombana Bay and proximate marine waters during construction are presented in Figure 7.

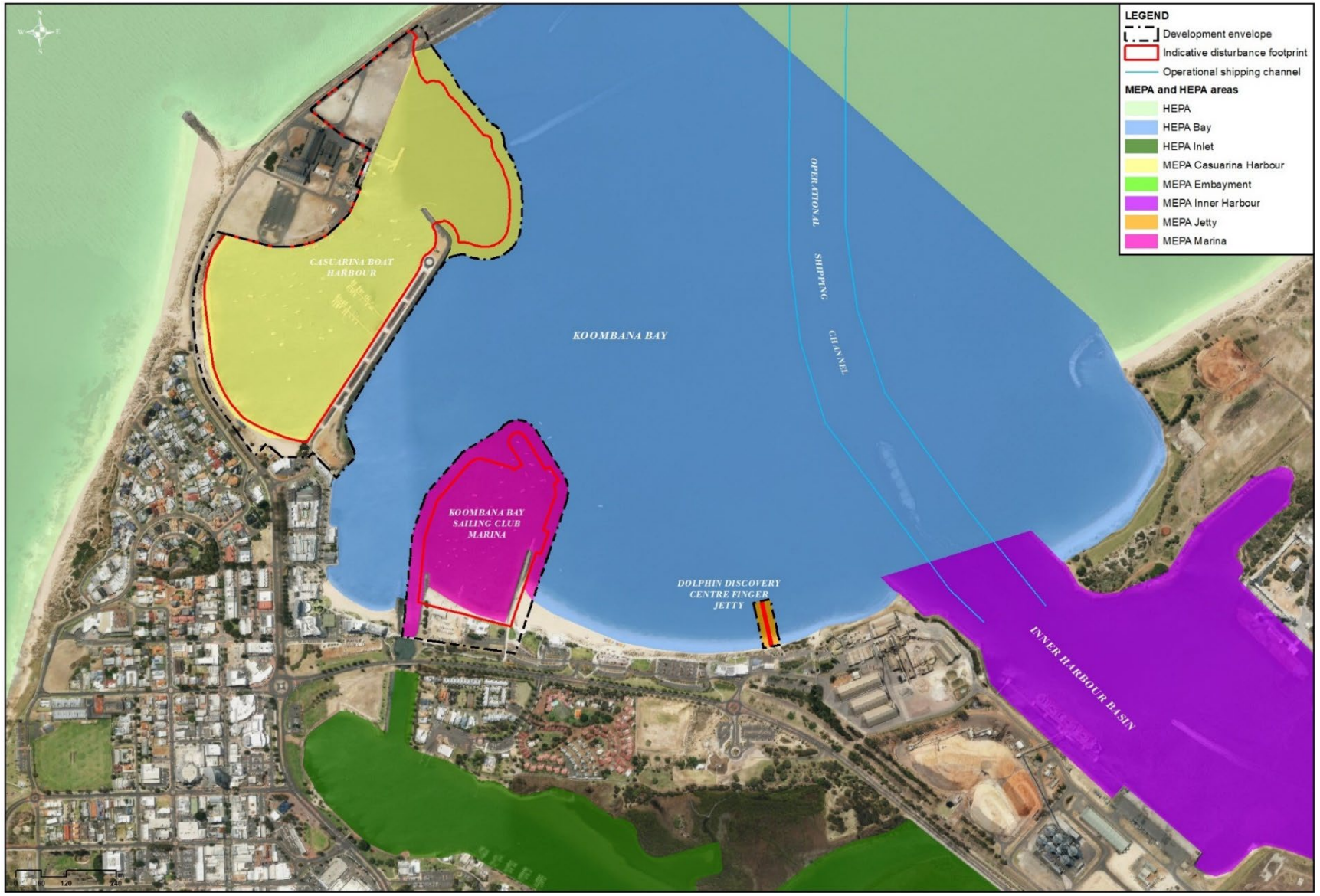

Figure 7: Spatial representation of the EQP showing HEPA and MEPA

Two levels of trigger criteria were considered during development of this MCMMP:

1. Environmental quality guidelines (EQGs), which are threshold numerical values or narrative statements, when satisfied indicate a high degree of certainty that the associated EQO is achieved. If not satisfied, then assessment against an environmental quality standard is triggered because of uncertainty as to whether the associated EQO has been achieved.
    - EQG triggers have been set at conservative levels to ensure trigger level actions are implemented well in advance of the environmental outcome being compromised.
2. Environmental quality standards (EQS), which are threshold numerical values or narrative statements, when not satisfied indicate a significant risk that the associated EQO is not achieved, and with continued EQS exceedance a management response is triggered.
    - EQS trigger criteria and actions are to be implemented if EQG trigger level criteria are exceeded.

During construction, the marine environment outside the future proposal development envelope is designated as a HEPA (Figure 7). The EQGs for this level of protection are:

- Recommended 99% species protection guideline trigger levels for toxicants in water will apply
- Default guideline values for toxicants in sediments (Australian and New Zealand governments and Australian state and territory governments 2018).

Within one month of construction completion, marine environmental quality is to return to a HEPA in the waters between the future proposal indicative disturbance footprint and the development envelope. The EQGs for this level of protection are as specified above.

A MEPA is to be achieved within the enclosed marina water bodies of the Casuarina Boat Harbour and KBSC marina future proposals within one month of construction completion. The EQGs for this level of protection are:

- Application of the default 90% species protection guideline trigger levels for toxicants in water
- Default guideline values for toxicants in sediments (Australian and New Zealand governments and Australian state and territory governments 2018).

The EQG and EQS trigger environmental criteria for marine water quality and benthic communities and habitats, which specifically relate to dredging and breakwater construction are summarised in Table 11.

Exceedance of EQGs and EQS trigger levels signals that additional management actions are required to assist with achieving the environmental outcome.

4.2 Benthic communities and habitats

The management approach for benthic communities and habitats is premised on restricting direct impacts to the future proposal indicative disturbance footprint and significant indirect impacts to marine environment quality (i.e. ZoHI resulting in permanent loss of benthic communities and habitats) to the future proposal development envelopes. This will occur through the management of direct impacts and application of the adopted EQGs during construction monitoring.

The management of potential impacts to the benthic communities and habitats:

- Is in accordance with EPA guidance, specifically
    - Technical Guidance: Environmental Impact Assessment of Marine Dredging Proposals (EPA 2021)
    - Environmental Factor Guideline: Benthic Communities and Habitats (EPA 2016b)
    - Technical Guidance: Protection of Benthic Communities and Habitats (EPA 2016c)
- Has been informed by conservative predictions of the extent, severity and duration of any residual changes to the environment caused by dredging and breakwater construction (RPS 2023b; GHD 2023a).

4.3 Social surroundings

A management-based approach has been proposed to address the risk to local amenity values from the construction of the future derived proposals.

5 MCMMP PROVISIONS

This MCMMP has been prepared to align with Instructions on how to prepare EP Act Part IV Environmental Management Plans (EPA 2021), including the following:

- Objective-based provisions relate to monitoring and management actions, where specific trigger or threshold criteria may not be appropriate for the circumstances. Objective-based provisions have been provided for Casuarina Boat Harbour in Table 13, KBSC marina in Table 14 and DDC finger jetty in Table 15.
- Outcome-based provisions focus on monitoring and evaluating specific measurable outcomes and are typically driven by trigger and threshold criteria. Outcome-based provisions have been provided for Casuarina Boat Harbour in Table 16 and KBSC marina in Table 17.

Should monitoring conducted under this MCMMP determine that EQGs and / or EQOs are not being achieved, the relevant contingency management actions will be implemented until it is demonstrated that the EQOs are being achieved and will continue to be achieved.

5.1 Objective-based provisions

Objective-based provisions have been used where measurements are not practicable, and therefore the implementation of management actions is required.

Table 13: Objective-based provisions for Casuarina Boat Harbour

EPA factors and objectives

- Marine environmental quality: To maintain the quality of water, sediment and biota so that the environmental values are protected
- Benthic communities and habitats: To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained
- Social surroundings: To protect social surroundings from significant harm

Relevant KBMS strategic proposal objectives

- Marine environmental quality:
  - Maintain ecosystem integrity within high and moderate levels of ecological protection areas
  - Maintain seafood safe for human consumption within high and moderate levels of ecological protection areas
  - Maintain primary and secondary contact recreation values within high and moderate levels of ecological protection areas
  - Maintain aesthetic values within high and moderate levels of ecological protection areas
- Benthic communities and habitats:
  - Maintain extent of benthic communities and habitats outside of the development envelopes
  - Maintain blue swimmer crab and fin fish fisheries
- Social surroundings: N/A

Key environmental impacts and risks

- Marine environmental quality:
  - Temporary reduction in water quality from return water from onshore disposal of TBT contaminated sediment material
- Benthic communities and habitats:
  - Removal of benthic communities and habitats from dredging and breakwater construction
  - Temporary decrease in light availability for benthic communities and habitats from dredging and breakwater construction
- Social surroundings:
  - Noise will be generated by construction works, including piling
  - Construction works may result in significant acute or ongoing ground vibration
  - Construction works will result in limiting access to the beachfront and marine construction works areas
  - High levels of dust are unlikely to be generated during the construction as the anticipated extent of terrestrial ground disturbance and subsequent earthwork requirements will be limited

Management target	Construction staging	Construction methodology	Management actions	Monitoring	Timing / frequency of actions	Reporting
Marine environmental quality						
Contaminated material is not released to the marine environment	**Phase 2**					
	Dredge and onshore dredge material disposal	BHD	• TBT contaminated sediment material is to be removed from the marine environment, transferred onshore and confined (e.g. geotubes, holding ponds) • Return water will be tested to determine its suitability for return to the ocean (or evaporated) • Remaining sediment is to be disposed of at a receiving waste facility	• Testing of return water prior to return • Confirm TBT impacted sediment is removed before proceeding with remaining Phase 2 dredging	Testing of return water prior to return	Field data sheets and laboratory analysis reports
Marine environmental quality and Benthic communities and habitats						
No dredging / breakwater construction to occur outside of the future proposal indicative disturbance area and no dredging to occur during summer months (December to March) when seagrass cover is predicted to be highest.	**Phase 1**					
	Dredge and offshore dredge material disposal	TSHD and BHD	Dredge vessel to navigate using onboard GPS with appropriate accuracy	Navigation equipment (on dredge) inspection and testing	Prior to commencement of dredging operations and then daily	Daily dredging log
	Construction of the outer northern breakwater and reclamation area	End tipping of suitable rock material and clean engineering fill	Survey of construction set out and extents during breakwater construction works	Weekly basis during construction		Weekly survey reports
			Review of breakwater layout against available aerial imagery to confirm it is within the future proposal indicative disturbance area	Review of breakwater layout post completion of breakwater construction		Breakwater layout assessment
	Phase 2					
	Dredge and offshore / onshore dredge material disposal	BHD	Dredge vessel to navigate using onboard GPS with appropriate accuracy	Navigation equipment (on dredge) inspection and testing	Prior to commencement of dredging operations and then daily	Daily dredging log

Management target	Construction staging	Construction methodology	Management actions	Monitoring	Timing / frequency of actions	Reporting
Social surroundings						
Reduce and manage the risk to local amenity values from the construction of the future derived proposals	**Phase 1** • Dredge and offshore dredge material disposal • Construction of the outer northern breakwater and reclamation area • Installation of internal jetties and associated boat pens (if undertaken as part of Phase 1) **Phase 2** • Dredge and offshore/onshore dredge material disposal • Revetment walling • Jetties and associated boat pens • Internal boat ramps	• TSHD and BHD • End tipping of suitable rock material and clean engineering fill • Pile driving during jetty and boat pen construction • Construction of rock revetment, including core and armour rock • Pile driving during boat ramp jetty construction	**Noise and vibration management** • Noise and vibration plan to be developed by future proposal proponents prior to commencement of works to the satisfaction of the City of Bunbury, including (but not limited to): – Piling works to be undertaken between 8.00 am and 4.00 pm Monday to Friday to minimise noise impacts to sensitive social receptors – Vehicles, vessels, fixed/mobile plant and equipment on-site during construction to be the quietest reasonably available consistent with operational requirements, and to be routinely maintained to ensure effectiveness of noise suppression systems and equipment – Fixed and semi-permanent equipment (e.g. generators and compressors) to be located as far from sensitive social receptors as practicable – All 'warm-up' of fixed/mobile plant and equipment by site personnel arriving early to the future proposal construction site not to be conducted outside of approved construction hours – Assessment and management actions for noise and artificial light spill from construction activities should work be required outside the standard daylight working hours	• As per the City of Bunbury approved noise and vibration plan. • Any noise or vibration related complaints to be registered as an environmental incident, triggering review of work processes and corrective action	As required	Complaints register
			Access management Installation of temporary fencing, inclusive of sediment controls, along the boundary of the terrestrial construction works area to restrict access for members of the public to the construction area. Temporary shared path diversions will be constructed (as required) to allow for continued public use during construction. Interactions between construction vehicles and members of the public along the shared paths during construction will be actively managed	Any access related complaints to be registered as an environmental incident, triggering review of work processes and corrective action		
			Dust management • Minimise the potential for dust to be generated from construction activities through the minimisation of the total area of exposed ground surfaces • Any temporary stockpiles (e.g. fill materials) to be located as far from sensitive social receptors as practicable • Ensure all plant machinery carrying materials to and from the future proposal construction area are covered and adequately secured to prevent drift during transportation • Undertake street sweeping (as required) to remove excess materials from any directly adjacent roads • In the event of observations or reports of excessive dust levels, mitigation measures will be implemented. Options could include using water truck to dampen soil / temporary stockpiles, application of hydro-mulch, etc.	• Dust levels to be observed during early construction works inspections to ascertain requirement for dust mitigation measures • Any dust related complaints to be registered as an environmental incident, triggering review of work processes and corrective action		

Table 14: Objective-based provisions for KBSC marina

EPA factors and objectives

- Benthic communities and habitats: To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained
- Social surroundings: To protect social surroundings from significant harm

Relevant KBMS strategic proposal objectives

- Benthic communities and habitats:
  - Maintain extent of benthic communities and habitats outside of the development envelopes
  - Maintain blue swimmer crab and fin fish fisheries
- Social surroundings: N/A

Key environmental impacts and risks

- Benthic communities and habitats:
  - Removal of benthic communities and habitats from dredging and breakwater construction
  - Temporary decrease in light availability for benthic communities and habitats from dredging and breakwater construction
- Social surroundings:
  - Noise will be generated by construction works, including piling
  - Construction works may result in significant acute or ongoing ground vibration
  - Construction works will result in limiting access to the beachfront and marine construction works areas
  - High levels of dust are unlikely to be generated during the construction as the anticipated extent of terrestrial ground disturbance and subsequent earthwork requirements will be limited

Management target	Construction staging	Construction methodology	Management actions	Monitoring	Timing / frequency of actions	Reporting
Marine environmental quality and Benthic communities and habitats						
No dredging / breakwater construction to occur outside of the future proposal indicative disturbance area and during summer months (Dec to March) when seagrass cover is at its highest.	**Sequential construction**					
	Eastern breakwater constructed first Western breakwater constructed second	End tipping of suitable rock material and clean engineering fill	• Survey of construction set out and extents during breakwater construction works • Review of breakwater layout against available aerial imagery to confirm it is within the future proposal indicative disturbance area	• Weekly basis during construction • Review of breakwater layout post completion of breakwater construction		• Weekly basis during construction • Review of breakwater layout post completion of breakwater construction
	Dredging internal KBSC marina and disposal within onshore reclamation area	• Floating dredge methodology either: • BHD – long arm excavator • Small CSD	Dredge vessel to navigate using onboard GPS with appropriate accuracy	Navigation equipment (on dredge) inspection and testing	Prior to commencement of dredging operations and then daily	Daily dredging log
Area affected by suspended sediments during dredging and breakwater construction will be limited (wherever possible)			Silt curtains will be used for KBSC marina dredging to manage turbidity and will also provide a physical barrier between marine fauna (e.g. dolphins) and dredging works	• Marine fauna observer (MFO) is to undertake daily inspection of the marina area, including silt curtains, prior to commencement of dredging works • Should any marine fauna become entrapped within the silt curtains, the following procedure will be implemented – All dredging and terrestrial works in the near vicinity will not be able to commence or must cease immediately – The silt curtains will be parted to allow fauna to exit the area, on their own accord (i.e. without human interaction) – MFO to monitor the area for ten minutes prior to recommencement of works to ensure marine fauna has	Daily inspection	Daily inspection reports

Management target	Construction staging	Construction methodology	Management actions	Monitoring	Timing / frequency of actions	Reporting
				safely moved away from the works area		
Social surroundings						
Reduce and manage the risk to local amenity values from the construction of the future derived proposals	**Sequential construction** • Eastern breakwater constructed first • Western breakwater constructed second • Installation of the revetment walls concurrent with the western breakwater construction • Dredging internal KBSC marina and disposal within onshore reclamation area • Installation of internal jetties and associated boat pens • Boat ramps	• End tipping of suitable rock material and clean engineering fill • Installation of rock revetment walling along the reclamation area • Floating dredge methodology either: • BHD – long arm excavator • Small CSD • Pile driving during jetty, boat pen and boat ramp jetty construction	**Noise and vibration management** • Noise and vibration plan to be developed by future proposal proponents prior to commencement of works to the satisfaction of the City of Bunbury, including (but not limited to): – Piling works to be undertaken between 8.00 am and 4.00 pm Monday to Friday to minimise noise impacts to sensitive social receptors – Vehicles, vessels, fixed/mobile plant and equipment on-site during construction to be the quietest reasonably available consistent with operational requirements, and to be routinely maintained to ensure effectiveness of noise suppression systems and equipment – Fixed and semi-permanent equipment (e.g. generators and compressors) to be located as far from sensitive social receptors as practicable – All 'warm-up' of fixed/mobile plant and equipment by site personnel arriving early to the future proposal construction site not to be conducted outside of approved construction hours – Assessment and management actions for noise and artificial light spill from construction activities should work be required outside the standard daylight working hours	• As per the City of Bunbury approved noise and vibration plan. • Any noise or vibration related complaints to be registered as an environmental incident, triggering review of work processes and corrective action	As required	Complaints register
			Access management Installation of temporary fencing, inclusive of sediment controls, along the boundary of the terrestrial construction works area to restrict access for members of the public to the construction area. Temporary shared path diversions will be constructed (as required) to allow for continued public use during construction. Interactions between construction vehicles and members of the public along the shared paths during construction will be actively managed	Any access related complaints to be registered as an environmental incident, triggering review of work processes and corrective action		
			Dust management • Minimise the potential for dust to be generated from construction activities through the minimisation of the total area of exposed ground surfaces • Any temporary stockpiles (e.g. fill materials) to be located as far from sensitive social receptors as practicable • Ensure all plant machinery carrying materials to and from the future proposal construction area are covered and adequately secured to prevent drift during transportation • Undertake street sweeping (as required) to remove excess materials from any directly adjacent roads • In the event of observations or reports of excessive dust levels, mitigation measures will be implemented. Options could include using water truck to dampen soil / temporary stockpiles, application of hydro-mulch etc.	• Dust levels to be observed during early construction works inspections to ascertain requirement for dust mitigation measures • Any dust related complaints to be registered as an environmental incident, triggering review of work processes and corrective action		

Table 15: Objective-based provisions for DDC finger jetty

EPA factors and objectives

- Social surroundings: To protect social surroundings from significant harm

Relevant KBMS strategic proposal objectives

- Social surroundings: N/A

Key environmental impacts and risks

- Social surroundings:
  - Noise will be generated by construction works, including piling
  - Construction works may result in significant acute or ongoing ground vibration
  - Construction works will result in limiting access to the beachfront and marine construction works areas
  - High levels of dust are unlikely to be generated during the construction as the anticipated extent of terrestrial ground disturbance and subsequent earthwork requirements will be limited

Management target	Construction staging	Construction methodology	Management actions	Monitoring	Timing / frequency of actions	Reporting
Social surroundings						
Reduce and manage the risk to local amenity values from the construction of the future derived proposals	Construction of a new finger jetty	Pile driving during jetty construction	**Noise and vibration management** • Noise and vibration plan to be developed by future proposal proponents prior to commencement of works to the satisfaction of the City of Bunbury, including (but not limited to): – Piling works to be undertaken between 8.00 am and 4.00 pm Monday to Friday to minimise noise impacts to sensitive social receptors – Vehicles, vessels, fixed/mobile plant and equipment on-site during construction to be the quietest reasonably available consistent with operational requirements, and to be routinely maintained to ensure effectiveness of noise suppression systems and equipment – Fixed and semi-permanent equipment (e.g. generators and compressors) to be located as far from sensitive social receptors as practicable – All 'warm-up' of fixed/mobile plant and equipment by site personnel arriving early to the future proposal construction site not to be conducted outside of approved construction hours – Assessment and management actions for noise and artificial light spill from construction activities should work be required outside the standard daylight working hours	• As per the City of Bunbury approved noise and vibration plan. • Any noise or vibration related complaints to be registered as an environmental incident, triggering review of work processes and corrective action	As required	Complaints register
			Access management Installation of temporary fencing, inclusive of sediment controls, along the boundary of the terrestrial construction works area to restrict access for members of the public to the construction area. Temporary shared path diversions will be constructed (as required) to allow for continued public use during construction. Interactions between construction vehicles and members of the public along the shared paths during construction will be actively managed	Any access related complaints to be registered as an environmental incident, triggering review of work processes and corrective action		
			Dust management • Minimise the potential for dust to be generated from construction activities through the minimisation of the total area of exposed ground surfaces • Any temporary stockpiles (e.g. fill materials) to be located as far from sensitive social receptors as practicable • Ensure all plant machinery carrying materials to and from the future proposal construction area are covered and adequately secured to prevent drift during transportation • Undertake street sweeping (as required) to remove excess materials from any directly adjacent roads • In the event of observations or reports of excessive dust levels, mitigation measures will be implemented. Options could include using water truck to dampen soil / temporary stockpiles, application of hydro-mulch, etc.	• Dust levels to be observed during early construction works inspections to ascertain requirement for dust mitigation measures • Any dust related complaints to be registered as an environmental incident, triggering review of work processes and corrective action		

5.2 Outcome-based provisions

Outcome-based provisions have trigger and threshold criteria that are measurable and readily interpreted.

Table 16: Outcome-based provisions for Casuarina Boat Harbour

EPA Marine environmental quality factor and objective

- Marine environmental quality: To maintain the quality of water, sediment and biota so that the environmental values are protected
- Benthic communities and habitats: To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained

Relevant KBMS strategic proposal objectives

- Maintain ecosystem integrity within high and moderate levels of ecological protection areas
- Maintain seafood safe for human consumption within high and moderate levels of ecological protection areas
- Maintain primary and secondary contact recreation values within high and moderate levels of ecological protection areas
- Maintain aesthetic values within high and moderate levels of ecological protection areas

Key environmental impacts and risks

- Temporary increase in TSS and nutrients / contaminants from dredging and breakwater construction
- Temporary increase in net sedimentation from dredging and breakwater construction
- Temporary reduction in water quality from return water from onshore disposal of TBT contaminated sediment material

Management target	Construction staging	Construction methodology	Management actions	Monitoring	Timing / frequency of actions	Reporting
Ecosystem health – water quality						
Trigger criteria (EQG): TSS >2 mg/L (above background)	**Phase 1** • Dredge and offshore dredge material disposal • Construction of the outer northern breakwater and reclamation area **Phase 2** • Dredge and onshore / offshore dredge material disposal	**Phase 1** • TSHD and BHD • End tipping of suitable rock material and clean engineering fill **Phase 2** • BHD	**Trigger level actions:** If EQG is exceeded: • Review daily plume observations / sketches and / or aerial imagery / drone image captures / remote imagery units to determine whether the plume is a result of future proposal dredging / construction works • If visible plume is attributable to future proposal, undertake a visual check for ongoing turbidity from dredging / works areas to determine source and extent of plume • Continue to monitor TSS and commence monitoring EQS	• Dredge plume observations / sketches • Aerial imagery / Drone image capture / Remote imagery units	Daily during dredging and breakwater construction	• Daily dredging log • Daily inspection reports (including sketches and images)
Threshold criteria (EQS): TSS >2 mg/L (above background) for 18 consecutive days			**Threshold contingency actions:** If EQS is exceeded immediately investigate whether exceedance was caused by future proposal dredging / construction works: • If the exceedance is attributable to future proposal, visual check for ongoing turbidity outside of development envelope for source and the extent and duration of plume • Review visual plume observations to determine extent of visible plume over the previous fortnight (or exceedance period) • Increase water quality monitoring to daily until levels reduce to EQG thresholds • Review rock quarry processes, this may include: – Regular cleaning of quarry floor to remove fines so that they are not loaded out with the rock products – Requiring quarry operators (through the works specification) to avoid lower quality softer rock material that would otherwise create a higher potential for fines generation – Minimising rehandling of rock products to avoid generation of additional fines • Review management of future proposal dredging / construction works to determine what additional contingency actions are required. This may include: – Modification of dredge / construction methodology – Reduction or cessation of construction during certain weather events	Water quality monitoring at all four monitoring sites (Figure 8 during 'probable', 'serial' and 'parallel' construction scenarios; Figure 9 during Phase 2 for Casuarina Boat Harbour construction sequence) using either (manual) sonde or real time logger. Parameters to include: • Turbidity (NTU) • Photosynthetic active radiation[1] • Conductivity • pH • Temperature • Dissolved oxygen • Depth • Water sampling for TSS analysis also to be undertaken	Frequency of monitoring to be increased (i.e. twice per week / weekly) in instances of exceedance	Field data sheets and laboratory analysis reports
Ecosystem health – seagrass – *Halophila* sp. and *Heterozostera* sp. and macroalgae extent and composition						
Trigger criteria (EQG): TSS>2 mg/L (above background)	**Phase 1** • Dredge and offshore dredge	**Phase 1** • TSHD and BHD • End tipping of suitable	**Trigger level actions:** Triggers have been established to monitor the accuracy of the modelling predictions. A response will be triggered should monitoring infer that ZoMI may exist, in areas where seagrass has been mapped, as follows:	Water quality monitoring at all four monitoring sites (Figure 8 during 'probable', 'serial' and 'parallel' construction scenarios; Figure 9 during Phase 2 for Casuarina Boat Harbour	• Commence water quality monitoring one month prior to commencement of dredging/breakwater	• Field data sheets and laboratory analysis reports • Monitoring results (including trigger exceedances) will be included in monthly

[1] Photosynthetic active radiation is the portion of the light spectrum (400–700 nm) utilised by plants for photosynthesis

Management target	Construction staging	Construction methodology	Management actions	Monitoring	Timing / frequency of actions	Reporting
	material disposal • Construction of the outer northern breakwater and reclamation area **Phase 2** • Dredge and onshore / offshore dredge material disposal	rock material and clean engineering fill **Phase 2** • BHD	• Trigger 1: Depth- and time-averaged (across individual monitoring campaign) TSS concentration at proximate monitoring sites (i.e. KB-Bay 3, KB-SW-1, KB-SW-2)is greater than 2 mg/L above average background levels for a measurement campaign • Trigger 2: Depth- and time-averaged (across individual monitoring campaign) TSS concentration at further afield Koombana Bay sites (i.e. KB-Bay 4, KB-Beach) or Leschenault Inlet sites (LI-West, LI-Mid, LI-Far) is greater than 2 mg/L above average background levels for a measurement campaign – If Trigger 2 has been exceeded at further afield monitoring sites: – investigate whether exceedance was caused by future proposal dredging / construction works – metocean conditions data available from the Bureau of Meteorology and Department of Transport (DoT) will be assessed to determine if the exceedance at the site(s) in question is likely to exist for a continuous period of greater than 18 days (e.g. continuous prevailing winds in one direction) – If reversible (or irreversible) impact to light sensitive benthic habitat is anticipated because of increased turbidity / sedimentation associated with the dredge plume reduce, modify or cease marine construction work	construction sequence) using either (manual) sonde or real time logger. Parameters to include: • Turbidity (NTU) • Photosynthetic active radiation • Conductivity • pH • Temperature • Dissolved oxygen • Depth • Water sampling for TSS analysis also to be undertaken	construction (once per week) • Undertake water quality monitoring during dredging / breakwater construction (once per week / fortnight) • Undertake water quality monitoring data for one month after completion of dredging/breakwater construction (fortnightly if required)	compliance reports to the Transforming Bunbury's Waterfront (TBW) Technical Group representative • TBW Technical Group representative to report to TBW Technical Group during scheduled project control meetings
Threshold criteria (EQS): • No measurable impacts to seagrass or macroalgae communities' extent and composition outside of the development envelopes boundary • TSS >2 mg/L (above background) for 18 consecutive days			**Threshold contingency actions:** If the EQS is exceeded immediately: • Complete towed video transects atKB-SW1, KB-SW2, KB-Beach and KB-Bay 3 . Compare seagrass and macroalgae communities' extent and composition against the current extent and composition identified in RPS (2023b) for KB-SW1, KB-SW2 and KB-Beach and pre-construction towed video transects for KB-Bay 3 • Quantify and assess extent of impact to benthic communities and habitats outside the future proposal development envelope(s) based on comparison with the current extent and composition identified in RPS (2023b)	Seagrass and macroalgae extent and composition assessed using towed video transects during construction where threshold is exceeded and after construction (if required)	Upon TSS exceedance during construction and within one month after construction completion (if required)	• Monitoring results (including trigger exceedances) will be included in monthly compliance reports to the TBW Technical Group representative • TBW Technical Group representative to report to TBW Technical Group during scheduled project control meetings
Ecosystem health – toxicants in water[2]						
Trigger criteria (EQG): • Toxicants in water for HEPA (EPA 2017, Table 2a: Environmental quality criteria for protecting the marine ecosystem from the effects of toxicants in marine waters and sediment pore waters) • Sample concentrations from a single site should not exceed the EQG • EQG at ZoHI boundary: – Metals: – Cadmium: 0.7 µg/L – Copper: 0.3 µg/L – Lead: 2.2 µg/L – Mercury (inorganic): 0.1 µg/L – Nickel: 7 µg/L – Zinc: 7 µg/L – Organics: – Benzene 500 µg/L – Naphthalene 50 µg/L – Organometallics: – TBT (as Sn) 0.0004 µg/L	**Phase 1** • Dredge and offshore dredge material disposal • Construction of the outer northern breakwater and reclamation area **Phase 2** • Dredge and onshore / offshore dredge material disposal	**Phase 1** TSHD and BHD End tipping of suitable rock material and clean engineering fill **Phase 2** • BHD	**Trigger level actions:** If EQG exceeded, immediately: • Investigate source of contamination: – Visual check for source of contamination such as hydrocarbon leaks/spills • If attributable to the future proposal, implement sampling program to define extent of contamination • Monitor EQS and increase frequency of monitoring	Water quality at all four monitoring sites (Figure 8 during 'probable', 'serial' and 'parallel' construction scenarios; Figure 9 during Phase 2 for Casuarina Boat Harbour construction sequence), including: • Metals • Cadmium • Copper • Lead • Mercury • Nickel • Zinc • Organics: • Benzene • Naphthalene • Organometallics • TBT	• Commence water quality monitoring one month prior to commencement of dredging/breakwater construction (once per week) • Undertake water quality monitoring during dredging and breakwater construction (once per week / fortnight) • Undertake water quality monitoring for one month after completion of dredging and breakwater construction (fortnightly if required) or until levels are reduced to EQG thresholds • Frequency of monitoring to be increased (i.e. twice per week / weekly) in instances of exceedance	• Field data sheets and laboratory analysis reports • Monitoring results (including trigger exceedances) will be included in monthly compliance reports to the TBW Technical Group representative • TBW Technical Group representative to report to TBW Technical Group during scheduled project control meetings
Threshold criteria (EQS): • Toxicants in water for HEPA (EPA 2017) – Table 2a – Environmental quality criteria for protecting the marine ecosystem from the effects			**Threshold contingency actions:** If EQS is exceeded, immediately: • Investigate source of contamination: • Visual check for source of contamination such as hydrocarbon leaks/spills	Water quality at all four monitoring sites (Figure 8 during 'probable', 'serial' and 'parallel' construction scenarios; Figure 9 during Phase 2 for Casuarina Boat Harbour construction sequence), including:	Undertake water quality monitoring at increased frequency until levels are reduced to EQG thresholds	• Monitoring results (including trigger exceedances) will be included in monthly compliance reports to the

[2] Water quality criteria were based on the EPA's Environmental Quality Reference Document for Cockburn Sound (EPA 2017)

Management target	Construction staging	Construction methodology	Management actions	Monitoring	Timing / frequency of actions	Reporting
of toxicants in marine waters and sediment pore waters. • EQS high protection: • Bioavailable measures (EPA 2017, Table 2a) • Indirect biological measures (EPA 2017, Table 2a)			• If attributable to the future proposal, manage, reduce, modify or cease construction to achieve EQG	• Metals – Cadmium – Copper – Lead – Mercury – Nickel – Zinc • Organics: – Benzene – Naphthalene • Organometallics – TBT		TBW Technical Group representative • TBW Technical Group representative to report to TBW Technical Group during scheduled project control meetings
Trigger criteria (EQG): • Toxicants in water for MEPA (EPA 2017) – Table 2a – Environmental quality criteria for protecting the marine ecosystem from the effects of toxicants in marine waters and sediment pore waters. • Sample concentrations from a single site should not exceed the EQG. • EQG at ZoMI boundary: – Metals: – Cadmium: 14 µg/L – Copper: 3 µg/L – Lead: 6.6 µg/L – Mercury (inorganic): 0.7 µg/L – Nickel: 200 µg/L – Zinc: 23 µg/L – Organics: – Benzene 900 µg/L – Naphthalene 50 µg/L – Organometallics – TBT (as Sn) 0.02 µg/L			**Trigger level actions[3]:** If EQG is exceeded, immediately: • Investigate source of contamination: – Visual check for source of contamination such as hydrocarbon leaks/spills • If attributable to the future proposal, implement sampling program to define extent of contamination • Monitor EQS and increase frequency of monitoring	Water quality at all four monitoring sites (Figure 8 during 'probable', 'serial' and 'parallel' construction scenarios; Figure 9 during Phase 2 for Casuarina Boat Harbour construction sequence), including: • Metals – Cadmium – Copper – Lead – Mercury – Nickel – Zinc • Organics: – Benzene – Naphthalene • Organometallics – TBT	• Commence water quality monitoring one month prior to commencement of dredging/breakwater construction (once per week) • Undertake water quality monitoring during dredging and breakwater construction (once per week / fortnight) • Undertake water quality monitoring for one month after completion of dredging and breakwater construction (fortnightly if required) or until levels are reduced to EQG thresholds • Frequency of monitoring to be increased (i.e. twice per week / weekly) in instances of exceedance	• Field data sheets and laboratory analysis reports • Monitoring results (including trigger exceedances) will be included in monthly compliance reports to the TBW Technical Group representative • TBW Technical Group representative to report to TBW Technical Group during scheduled project control meetings
Threshold criteria (EQS): • Toxicants in water for MEPA (EPA 2017) – Table 2a – Environmental quality criteria for protecting the marine ecosystem from the effects of toxicants in marine waters and sediment pore waters. • EQS moderate protection: – Bioavailable measures (EPA 2017, Table 2a) – Indirect biological measures (EPA 2017, Table 2a)			**Threshold contingency actions:** If EQS is exceeded, immediately: • Investigate source of contamination: – Visual check for source of contamination such as hydrocarbon leaks/spills • If attributable to the future proposal, manage, reduce, modify or cease construction to achieve EQG	Water quality at all four monitoring sites (Figure 8 during 'probable', 'serial' and 'parallel' construction scenarios; Figure 9 during Phase 2 for Casuarina Boat Harbour construction sequence), including: • Metals – Cadmium – Copper – Lead – Mercury – Nickel – Zinc • Organics – Benzene – Naphthalene • Organometallics – TBT	Undertake water quality monitoring at increased frequency until levels are reduced to EQG thresholds	• Monitoring results (including trigger exceedances) will be included in monthly compliance reports to the TBW Technical Group representative • TBW Technical Group representative to report to TBW Technical Group during scheduled project control meetings

Table 17: Outcome-based provisions for KBSC marina

EPA Marine environmental quality factor and objective

- Marine environmental quality: To maintain the quality of water, sediment and biota so that the environmental values are protected
- Benthic communities and habitats: To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained

Relevant KBMS strategic proposal objectives

[3] Applicable to return water monitoring

- Maintain ecosystem integrity within high and moderate levels of ecological protection areas
- Maintain seafood safe for human consumption within high and moderate levels of ecological protection areas
- Maintain primary and secondary contact recreation values within high and moderate levels of ecological protection areas
- Maintain aesthetic values within high and moderate levels of ecological protection areas

Key environmental impacts and risks

- Temporary increase in TSS and nutrients / contaminants from dredging and breakwater construction
- Temporary increase in net sedimentation from dredging and breakwater construction
- Temporary reduction in water quality from return water from onshore disposal of TBT contaminated sediment material

Management target	Construction staging	Construction methodology	Management actions	Monitoring	Timing / frequency of actions	Reporting
Ecosystem health – water quality						
Trigger criteria (EQG): TSS >2 mg/L (above background)	• Eastern breakwater constructed first • Western breakwater constructed second • Dredging internal KBSC marina and disposal within onshore reclamation area	End tipping of suitable rock material and clean engineering fill • Floating dredge methodology either: • BHD – long arm excavator • Small CSD	**Trigger level actions:** If EQG is exceeded: • Review daily plume observations / sketches and / or aerial imagery / drone image captures / remote imagery units to determine whether the plume is a result of future proposal dredging / construction works • If visible plume is attributable to future proposal, undertake a visual check for ongoing turbidity from dredging / works areas to determine source and extent of plume • Continue to monitor TSS and commence monitoring EQS	• Dredge plume observations / sketches • Aerial imagery / Drone image capture / Remote imagery units	Daily during dredging and breakwater construction	• Daily dredging log • Daily inspection reports (including sketches and images)
Threshold criteria (EQS): TSS >2 mg/L (above background) for 18 consecutive days			**Threshold contingency actions:** If EQS is exceeded immediately investigate whether exceedance was caused by future proposal dredging / construction works: • If the exceedance is attributable to future proposal, visual check for ongoing turbidity outside of development envelope for source and the extent and duration of plume • Review visual plume observations to determine extent of visible plume over the previous fortnight (or exceedance period) • Increase water quality monitoring to daily until levels reduce to EQG thresholds • Review rock quarry processes, this may include: – Regular cleaning of quarry floor to remove fines so that they are not loaded out with the rock products – Requiring quarry operators (through the works specification) to avoid lower quality softer rock material that would otherwise create a higher potential for fines generation – Minimising rehandling of rock products to avoid generation of additional fines • Review management of future proposal dredging / construction works to determine what additional contingency actions are required. This may include: – Modification of dredge / construction methodology – Reduction or cessation of construction during certain weather events	Water quality monitoring at all four monitoring sites (Figure 8 during 'probable', 'serial' and 'parallel' construction scenarios; Figure 9 during Phase 2 for Casuarina Boat Harbour construction sequence) using either (manual) sonde or real time logger. Parameters to include: • Turbidity (NTU) • Photosynthetic active radiation[4] • Conductivity • pH • Temperature • Dissolved oxygen • Depth • Water sampling for TSS analysis also to be undertaken	Frequency of monitoring to be increased (i.e. twice per week / weekly) in instances of exceedance	Field data sheets and laboratory analysis reports
Ecosystem health – seagrass – *Halophila* sp. and *Heterozostera* sp. and macroalgae extent and composition						
Trigger criteria (EQG): TSS>2 mg/L (above background)	• Eastern breakwater constructed first • Western breakwater constructed second	End tipping of suitable rock material and clean engineering fill	**Trigger level actions:** Triggers have been established to monitor the accuracy of the modelling predictions. A response will be triggered should monitoring infer that ZoMI may exist, in areas where seagrass has been mapped, as follows:	Water quality monitoring at all four monitoring sites (Figure 8 during 'probable', 'serial' and 'parallel' construction scenarios; Figure 9 during Phase 2 for Casuarina Boat Harbour construction	• Commence water quality monitoring one month prior to commencement of dredging/breakwater	• Field data sheets and laboratory analysis reports • Monitoring results (including trigger

[4] Photosynthetic active radiation is the portion of the light spectrum (400–700 nm) utilised by plants for photosynthesis

Management target	Construction staging	Construction methodology	Management actions	Monitoring	Timing / frequency of actions	Reporting
	• Dredging internal KBSC marina and disposal within onshore reclamation area	• Floating dredge methodology either: • BHD – long arm excavator • Small CSD	• Trigger 1: Depth- and time-averaged (across individual monitoring campaign) TSS concentration at proximate monitoring sites (i.e. KB-Bay 4, KB-SW 1, KB-SW 2) is greater than 2 mg/L above average background levels for a measurement campaign • Trigger 2: Depth- and time-averaged (across individual monitoring campaign) TSS concentration at further afield Koombana Bay sites (i.e. KB-Bay 3, KB-Beach) or Leschenault Inlet sites (LI-West, LI-Mid, LI-Far) is greater than 2 mg/L above average background levels for a measurement campaign – If Trigger 2 has been exceeded for further afield monitoring sites: • Investigate whether exceedance was caused by future proposal dredging / construction works. I • Metocean conditions data available from the Bureau of Meteorology and Department of Transport (DoT) will be assessed to determine if the exceedance at the site(s) in question is likely to exist for a continuous period of greater than 18 days (e.g. continuous prevailing winds in one direction) – If reversible (or irreversible) impact to light sensitive benthic habitat is anticipated because of increased turbidity / sedimentation associated with the dredge plume reduce, modify or cease marine construction work	sequence) using either (manual) sonde or real time logger. Parameters to include: • Turbidity (NTU) • Photosynthetic active radiation • Conductivity • pH • Temperature • Dissolved oxygen • Depth • Water sampling for TSS analysis also to be undertaken	construction (once per week) • Undertake water quality monitoring during dredging / breakwater construction (once per week / fortnight) • Undertake water quality monitoring data for one month after completion of dredging/breakwater construction (fortnightly if required)	exceedances) will be included in monthly compliance reports to the Transforming Bunbury's Waterfront (TBW) Technical Group representative • TBW Technical Group representative to report to TBW Technical Group during scheduled project control meetings
Threshold criteria (EQS): • No measurable impacts to seagrass or macroalgae communities' extent and composition outside of the development envelopes boundary • TSS >2 mg/L (above background) for 18 consecutive days			**Threshold contingency actions:** If the EQS is exceeded immediately: • Complete towed video transects at KB-SW1, KB-SW2, KB-Beach and KB-Bay 3. Compare seagrass and macroalgae communities' extent and composition against the current extent and composition identified in RPS (2023b) for KB-SW1, KB-SW2 and KB-Beach and pre-construction towed video transects for KB-Bay 3 • Quantify and assess extent of impact to benthic communities and habitats outside the future proposal development envelope(s) based on comparison with the current extent and composition identified in RPS (2023b)	Seagrass and macroalgae extent and composition assessed using towed video transects during construction where threshold is exceeded and after construction (if required)	Upon TSS exceedance during construction and within one month after construction completion (if required)	• Monitoring results (including trigger exceedances) will be included in monthly compliance reports to the TBW Technical Group representative • TBW Technical Group representative to report to TBW Technical Group during scheduled project control meetings

Management target	Construction staging	Construction methodology	Management actions	Monitoring	Timing / frequency of actions	Reporting
Ecosystem health – toxicants in water[5]						
Trigger criteria (EQG): • Toxicants in water for HEPA (EPA 2017, Table 2a: Environmental quality criteria for protecting the marine ecosystem from the effects of toxicants in marine waters and sediment pore waters) • Sample concentrations from a single site should not exceed the EQG • EQG at ZoHI boundary: – Metals: – Cadmium: 0.7 µg/L – Copper: 0.3 µg/L – Lead: 2.2 µg/L – Mercury (inorganic): 0.1 µg/L – Nickel: 7 µg/L – Zinc: 7 µg/L – Organics: – Benzene 500 µg/L – Naphthalene 50 µg/L – Organometallics: – TBT (as Sn) 0.0004 µg/L	• Eastern breakwater constructed first • Western breakwater constructed second • Dredging internal KBSC marina and disposal within onshore reclamation area	End tipping of suitable rock material and clean engineering fill • Floating dredge methodology either: • BHD – long arm excavator • Small CSD	**Trigger level actions:** If EQG exceeded, immediately: • Investigate source of contamination: – Visual check for source of contamination such as hydrocarbon leaks/spills • If attributable to the future proposal, implement sampling program to define extent of contamination • Monitor EQS and increase frequency of monitoring	Water quality at all four monitoring sites (Figure 8 during 'probable', 'serial' and 'parallel' construction scenarios; Figure 9 during Phase 2 for Casuarina Boat Harbour construction sequence), including: • Metals – Cadmium – Copper – Lead – Mercury – Nickel – Zinc • Organics: – Benzene – Naphthalene • Organometallics – TBT	• Commence water quality monitoring one month prior to commencement of dredging/breakwater construction (once per week) • Undertake water quality monitoring during dredging and breakwater construction (once per week / fortnight) • Undertake water quality monitoring for one month after completion of dredging and breakwater construction (fortnightly if required) or until levels are reduced to EQG thresholds • Frequency of monitoring to be increased (i.e. twice per week / weekly) in instances of exceedance	• Field data sheets and laboratory analysis reports • Monitoring results (including trigger exceedances) will be included in monthly compliance reports to the TBW Technical Group representative • TBW Technical Group representative to report to TBW Technical Group during scheduled project control meetings
Threshold criteria (EQS): • Toxicants in water for HEPA (EPA 2017) – Table 2a – Environmental quality criteria for protecting the marine ecosystem from the effects of toxicants in marine waters and sediment pore waters. • EQS high protection: – Bioavailable measures (EPA 2017, Table 2a) – Indirect biological measures (EPA 2017, Table 2a)			**Threshold contingency actions:** If EQS is exceeded, immediately: • Investigate source of contamination: – Visual check for source of contamination such as hydrocarbon leaks/spills • If attributable to the future proposal, manage, reduce, modify or cease construction to achieve EQG	Water quality at all four monitoring sites (Figure 8 during 'probable', 'serial' and 'parallel' construction scenarios; Figure 9 during Phase 2 for Casuarina Boat Harbour construction sequence), including: • Metals – Cadmium – Copper – Lead – Mercury – Nickel – Zinc • Organics: – Benzene – Naphthalene • Organometallics – TBT	Undertake water quality monitoring at increased frequency until levels are reduced to EQG thresholds	• Monitoring results (including trigger exceedances) will be included in monthly compliance reports to the TBW Technical Group representative • TBW Technical Group representative to report to TBW Technical Group during scheduled project control meetings

[5] Water quality criteria were based on the EPA's Environmental Quality Reference Document for Cockburn Sound (EPA 2017)

Management target	Construction staging	Construction methodology	Management actions	Monitoring	Timing / frequency of actions	Reporting
Trigger criteria (EQG): • Toxicants in water for MEPA (EPA 2017) – Table 2a – Environmental quality criteria for protecting the marine ecosystem from the effects of toxicants in marine waters and sediment pore waters. • Sample concentrations from a single site should not exceed the EQG. • EQG at ZoMI boundary: – Metals: – Cadmium: 14 µg/L – Copper: 3 µg/L – Lead: 6.6 µg/L – Mercury (inorganic): 0.7 µg/L – Nickel: 200 µg/L – Zinc: 23 µg/L – Organics: – Benzene 900 µg/L – Naphthalene 50 µg/L – Organometallics – TBT (as Sn) 0.02 µg/L			**Trigger level actions[6]:** If EQG is exceeded, immediately: • Investigate source of contamination: – Visual check for source of contamination such as hydrocarbon leaks/spills • If attributable to the future proposal, implement sampling program to define extent of contamination • Monitor EQS and increase frequency of monitoring	Water quality at all four monitoring sites (Figure 8 during 'probable', 'serial' and 'parallel' construction scenarios; Figure 9 during Phase 2 for Casuarina Boat Harbour construction sequence), including: • Metals – Cadmium – Copper – Lead – Mercury – Nickel – Zinc • Organics: – Benzene – Naphthalene • Organometallics – TBT	• Commence water quality monitoring one month prior to commencement of dredging/breakwater construction (once per week) • Undertake water quality monitoring during dredging and breakwater construction (once per week / fortnight) • Undertake water quality monitoring for one month after completion of dredging and breakwater construction (fortnightly if required) or until levels are reduced to EQG thresholds • Frequency of monitoring to be increased (i.e. twice per week / weekly) in instances of exceedance	• Field data sheets and laboratory analysis reports • Monitoring results (including trigger exceedances) will be included in monthly compliance reports to the TBW Technical Group representative • TBW Technical Group representative to report to TBW Technical Group during scheduled project control meetings
Threshold criteria (EQS): • Toxicants in water for MEPA (EPA 2017) – Table 2a – Environmental quality criteria for protecting the marine ecosystem from the effects of toxicants in marine waters and sediment pore waters. • EQS moderate protection: – Bioavailable measures (EPA 2017, Table 2a) – Indirect biological measures (EPA 2017, Table 2a)			**Threshold contingency actions:** If EQS is exceeded, immediately: • Investigate source of contamination: – Visual check for source of contamination such as hydrocarbon leaks/spills • If attributable to the future proposal, manage, reduce, modify or cease construction to achieve EQG	Water quality at all four monitoring sites (Figure 8 during 'probable', 'serial' and 'parallel' construction scenarios; Figure 9 during Phase 2 for Casuarina Boat Harbour construction sequence), including: • Metals – Cadmium – Copper – Lead – Mercury – Nickel – Zinc • Organics – Benzene – Naphthalene • Organometallics – TBT	Undertake water quality monitoring at increased frequency until levels are reduced to EQG thresholds	• Monitoring results (including trigger exceedances) will be included in monthly compliance reports to the TBW Technical Group representative • TBW Technical Group representative to report to TBW Technical Group during scheduled project control meetings

[6] Applicable to return water monitoring

6 MONITORING

6.1 Marine environmental quality

6.1.1 Locations

Water quality monitoring will be undertaken at the following locations for the Casuarina Boat Harbour and KBSC marina future proposals:

- Proximate bay sites to Casuarina Boat Harbour and KBCS marina to monitor impact on water quality and benthic communities and habitats from dredging and breakwater construction
  - KB-Bay 3 (Casuarina Boat Harbour) / KB-Bay 4 (KBSC marina), KB-SW 1 and KB-SW 2
- Further afield bay, inlet and harbour sites to monitor impact on water quality and benthic communities and habitats from dredging and breakwater construction
  - KB-Bay 3 (KBSC marina) / KB-Bay 4 (Casuarina Boat Harbour), KB-Beach, LI-West, LI-Mid, LI-Far and IH-Mid
- Bay ‘reference’ sites for the purpose of assessing the minor impacts, if assessment criteria are exceeded at the other monitoring sites
  - KB-Bay 1 and KB-Bay 2.

The location of the monitoring sites is presented in Figure 8 for the ‘probable’, ‘serial’ and ‘parallel’ construction sequences and in Figure 9 for the Phase 2 of Casuarina Boat Harbour construction sequence. Water quality monitoring is not proposed to be undertaken for the DDC jetty.

Figure 8: Water quality monitoring locations during for the probable, serial and parallel construction sequences

Figure 9: Water quality monitoring locations during the Phase 2 construction sequence for Casuarina Boat Harbour

Prior to commencement, during and after dredging and / or breakwater construction, water sampling will occur at all the monitoring sites. It is not considered appropriate to directly compare the water quality from the proximate and further afield sites to the reference sites due to the high 'natural' variability of water quality inside Koombana Bay. Results from the proximate sites will initially be assessed against results from the further afield sites to determine whether project activities are having a greater effect than "natural" influences before comparing results with the reference.

At each site, a single integrated depth water sample will be collected on a weekly / fortnightly basis. The sample will be filtered on site and tested for TSS and toxicants. Supplementary water quality monitoring will include conductivity-temperature-depth profiles, metals, organics and organometallics (See Table 16 and Table 17 for proposed standard suite of monitoring parameters).

Additionally, the following parameters where exceedances were identified during the baseline water quality monitoring (GHD 2022) will be tested as part of the standard suite of monitoring parameters:

- Nutrients:
  - Reduced inorganic nitrogen (ammonia plus ammonium; NHx)
  - Oxides of nitrogen (nitrate plus nitrite; NOx)
  - Total nitrogen (TN)
  - Filterable reactive phosphorus (FRP)
  - Total phosphorus (TP)
- Chlorophyll-a.

6.1.2 Pre-construction monitoring

Pre-construction water quality monitoring will be undertaken on a weekly basis for four weeks prior to the commencement of dredging and / or breakwater construction.

6.1.3 Breakwater construction and reclamation

During construction, water quality monitoring will be undertaken weekly during the initial phase of construction activities and scheduled for expedited analysis to ensure prompt response to any confirmed exceedances. If the initial results (first four events) indicate that construction activities are not adversely impacting the surrounding environment, ongoing monitoring will be undertaken fortnightly for the remainder of the construction activities. This applies during breakwater construction and with the reuse of up to 26,000 m^3 of clean dredge material that will be taken onshore for reuse within the KBSC marina reclamation area.

At each site, a single integrated depth water sample will be collected. This sample will be filtered on site for TSS. Supplementary water quality monitoring will include conductivity-temperature-depth profiles, metals, organics and organometallics.

6.1.4 Return water monitoring

Water from the onshore disposal of the 10,000 m^3 of TBT contaminated sediment material may be returned to the marine environment. It is anticipated that this would occur via a designated return point (that would be determined prior to commencement of Phase 2 activities). The water quality of any return water will be managed and monitored to meet either a 'high' or 'moderate' level of ecological protection (depending on the location of the return point). This approach is consistent with the existing level of ecological protection for Koombana Bay. The EQG for toxicants in water will be 99% species protection trigger values in the central parts of Koombana Bay; whereas 90% species protection is applicable to the semi-enclosed water bodies and within 250 metres of shipping berths and turning basins associated with the port.

Representative samples of return water will be collected on a weekly basis and from KB-Bay 3 and KB-SW 2 assuming these are the sites closest to the return point). Samples should be tested for turbidity / TSS, metals, organics and organometallics to ensure the water is of acceptable quality prior to return to the marine environment.

6.1.5 During dredging

During dredging, water quality monitoring will be undertaken weekly during the initial phase of works and scheduled for expedited analysis to ensure prompt response to any confirmed exceedances. If the initial results (first four events after commencement of dredging) indicate that dredging works are not adversely impacting the surrounding environment, ongoing monitoring will be undertaken fortnightly for the remainder of the dredging period.

At each site, a single integrated depth water sample will be collected. This sample will be filtered on site for TSS. Supplementary water quality monitoring will include conductivity-temperature-depth profiles, metals, organics and organometallics.

6.1.6 Post-construction

Post-construction monitoring is only required where elevated levels of turbidity or toxicants are recorded during that are directly attributable to future proposal dredging / construction works. If exceedances are recorded during construction, post-construction monitoring will occur fortnightly for one month or until levels are reduced to EQG thresholds.

6.1.7 Reporting

Water quality monitoring reports are to be delivered within 10[7] working days of data being collected in the field (or sooner).

They should include, as a minimum:

- Plots and statistical summary of vertical profiling data for all physical parameters and profiles
- Calculation of depth averaged TSS at each monitoring site
- Interpretation of field data and laboratory analysis
- Identification and assessment of any trigger exceedances.

6.1.8 Data assessment

Proximate and further afield monitoring sites are used to indicate whether parameters are elevated beyond the future proposal development envelopes.

The data will be assessed against the pre-construction readings and at reference monitoring sites once dredging / construction works commence.

If water quality monitoring criteria is approaching the proposed criteria:

- Dredge / construction contractor will be informed
- Monitoring frequency will be increased.

If water quality criteria are exceeded due to factors attributable to the future proposal:

- Dredge / construction method will be modified to reduce plume
- Increased monitoring frequency to be maintained until levels decline below criteria.

If water quality criteria continue to be exceeded:

- Cease dredging / construction works until work method can be modified to maintain water quality.

[7] Dependent upon laboratory processing times

6.2 Sediment quality

Sediment quality characterisation of all marine sediments that are subject to dredging have been reported as part of the SPER.

No further monitoring of sediments is required, except for sediments that have been placed onshore for dewatering and disposal off-site. Once sediments have been dewatered, samples will be collected and tested to classify the material and confirm the landfill licence requirements.

6.3 Aesthetic appearance

Aesthetic appearance will be assessed qualitatively via a questionnaire supplied to field personnel (Figure 10). The questionnaire will be completed during the water quality monitoring events and will be based on observations made at proximate and further afield monitoring sites.

Site:	Recorder	Comments
Date:		
Environmental quality guideline		
Algae/plant material visible on surface	Y/N	
Dead marine organisms visible	Y/N	
Water clarity	Y/N	
Noticeable colour variation	Y/N	
Oil or other films on surface	Y/N	
Floating debris on surface	Y/N	
Noticeable odour	Y/N	

Figure 10: Example field sheet template for aesthetic observations

6.4 Benthic communities and habitats

Towed video transects of the seagrass and macroalgae communities' extent and composition will be completed within 14 days of the projected exceedance at KB-SW 1, KB-SW 2, KB-Beach and KB-Bay 2 monitoring sites only. The remaining monitoring sites were mapped as bare sediment by RPS (2023b). Three transects will be completed at each site and the video will be analysed for seagrass and macroalgae communities' extent and composition using a point count method within the Transect Measure software.

Pre-construction towed video transects at KB-Bay 2 will be undertaken in advance of construction commencing to provide a reference point for any towed video transects undertaken during construction. Towed video transects were completed by RPS (2023b) for KB-SW 1, KB-SW 2, KB-Beach and are considered acceptable for future reference.

6.4.1 Direct impacts

To determine the direct impacts to benthic communities and habitats, an as-constructed assessment of the marine infrastructure will be undertaken. Aerial imagery of the future proposal indicative disturbance footprints taken prior to construction will be compared against aerial imagery obtained immediately after construction to estimate direct benthic communities and habitats losses from the future proposal.

6.4.2 Indirect impacts

The turbidity plume will be monitored and compared/validated to modelled predictions via visual plume observations through daily observations and TSS monitoring. Aerial imagery / drone image capture / remote imagery unit capture will be collected before construction, during and immediately after construction. This data will be used to assess the spatial extent of benthic communities and habitats within the zones of influence.

After construction, towed video transects may also be completed at KB-SW 1, KB-SW 2, KB-Beach and KB-Bay 2 to confirm the findings of desktop assessment, should aerial imagery / drone image capture / remote imagery unit capture not provide sufficient evidence of benthic communities and habitats extents.

6.5 Visual monitoring

Visual monitoring will be undertaken daily for turbid plumes. Physical monitoring and tracking (turbidity and photosynthetic active radiation) via a vessel will be undertaken during water quality monitoring events. The data will be assessed against the baseline and pre-construction water quality monitoring and a suitable control site outside of Koombana Bay.

A sketch map of the turbid plume at the dredge and breakwater construction areas will be prepared on every day that dredging and rock dumping (for breakwater construction) occurs, to record a visual extent of turbidity. (Images collected by drone / remote imagery unit are also acceptable). The plume sketch map will be completed daily between 1100 and 1300 when sun glint on the water surface is minimal. The plume sketch map will be completed on a pre-designed template. All fields in the plume sketch template are to be completed. Plume sketches will be reviewed and compared against predicted modelled plume outputs in instances of exceedance for the EQG or EQS of TSS. Daily site photographs of the dredge and breakwater construction areas should also be compiled to verify the plume sketches.

7 REVIEW AND REPORTING

7.1 Adaptive management and review

The future proposal proponents are committed to undertaking activities in a manner that considers the sensitivities of the environment, minimises potential impacts in accordance with industry practices and state and Commonwealth guidelines, and thereby promotes environmentally responsible development.

As such, this MCMMP will be reviewed on an annual basis and updated if required (for example in response to new information) to ensure that the stated environmental objectives are being met. Reviews will address matters including:

- Overall effectiveness of the MCMMP in providing the management framework to meet the stated environmental objectives
- Future proposal proponent environmental performance
- Changes to environmental values
- Review environmental objectives / management and mitigation measures as part of adaptive management processes
- Any relevant emerging environmental issues.

An annual review of observation data and incident reports will be undertaken in consultation with future proposal proponent to enable consideration of the need for changes to impact controls and practical management procedures. A review of this MCMMP may also occur after a significant change in the design parameters, or a significant non-conformance or incident relating to the implementation of management / mitigation measures.

Any observed breaches in conformance will be investigated fully and additional corrective measures will be devised with the aim of preventing recurrences.

The adaptive management and review processes will be implemented by the future proposal proponents during construction.

8 IMPLEMENTATION OF THE MCMMP

8.1 Training awareness and competency

The future proposal proponent will ensure that all personnel working on the future proposal have the required training to undertake their work, ensuring that the work is conducted to minimise the impact to the environment, and that personnel are made aware of the site environmental management procedures. This will include but not be limited to site inductions and toolbox meetings.

8.1.1 Inductions

All personnel working on a future proposal will complete a site induction. Regarding environmental management this will include:

- Emergency response procedures and safety requirements
- Environmental incident procedures and reporting requirements
- Environmental roles and responsibilities
- Monitoring, audits and inspections that are conducted
- Environmental management objectives and compliance requirements
- Any site-specific environmental factors, e.g. protected fauna
- Records will be kept ensuring that all personnel have completed the site induction.

8.1.2 Toolbox meetings

Daily toolbox meetings will be held during construction of the future proposals. The following items will be covered during these meetings:

- Concerns and/or queries raised by personnel
- Report any environmental incidents or near misses that occurred
- Discussion of environmental procedures or controls that are required to be implemented
- Raising any new environmental issues that personnel should be made aware of
- Ensuring personnel are all aware of the environmental management procedures that are to be followed during the construction of the future proposal.

8.2 Auditing

Monthly compliance audits will be undertaken during the construction of the future proposal. The audits will ensure the environmental impacts are being managed including, but not limited to, turbidity plumes, surface water quality and local amenity values. Compliance audits to be undertaken immediately prior to, during and after cessation of construction works.

8.2.1 Pre-start inspection

Prior to work commencing, daily inspections will be undertaken. This will include attending the toolbox meeting and completing a site walkover to ensure that the management actions of this MCMMP are being followed and there are no incidents or non-conformances.

8.2.2 Compliance audit and inspection

In accordance with ISO 19011 Guidelines for Quality and/or Environmental Management Systems Auditing, an auditing program will be completed for the duration of the future proposal construction works.

8.2.3 Post-construction inspection

Prior to handover of the future proposal to the proponent, a final inspection will be undertaken to ensure that the works have been completed as per the contract specifications and that there are no ongoing legacy issues.

8.3 Incident management

8.3.1 Management of non-conformances

A non-conformance can include the following:

- When the documented management actions outlined in Section 3 of this MCMMP are not followed
- Set trigger values for the Marine Water Quality Monitoring are exceeded.

The personnel responsible for measuring and/or monitoring each environmental item, i.e. marine water quality will be responsible for recording any non-conformances. The future proposal proponent will keep a record of any non-conformances, which will be updated on a weekly basis.

8.3.2 Environmental incidents reporting

An environmental incident is an unplanned event that causes or has the potential to cause harm to the environment. Incidents can be classified according to their severity:

- Level 1 incidents have no measurable impact on the environment.
- Level 2 incidents impacts are limited to the future proposal development envelopes or there are only short-term reversible impacts to the environment.
- Level 3 incidents result in the potential to cause environmental harm or degradation beyond the future proposal development envelopes.

Depending on the severity of the incident, works should cease immediately, and controls should be put in place to contain the incident and minimise any environmental impacts.

Levels 1 and 2 incidents are considered relatively minor and are to be reported to the future proposal proponent within 24 hours. Levels 1 and 2 incidents will be reported to the TBW Technical Group representative on a weekly basis.

Level 3 incidents will be immediately verbally reported to the TBW Technical Group representative and DoT. An incident report will be provided by close of business of that day.

The records of the incident should include the time, date, nature of the incident and the immediate control actions implemented. The TBW Technical Group representative and DoT will then agree on what further corrective action should be taken and the time frame over which this will occur. The future proposal proponent will monitor the effectiveness of the corrective actions, which will also be reported.

8.4 Compliance reporting

8.4.1 Project compliance

A record will be kept of any non-conformances. The register of non-compliances will include at a minimum the following information:

- A description of the non-conformance
- Monitoring results, where applicable
- Identification of the cause of the non-compliance
- Contingencies implemented or proposed.

The record of non-conformances will be updated on a weekly basis. Non-conformances will be reported to the future proposal proponent and be identified in monthly compliance reports to the TBW Technical Group representative.

Monthly compliance reports will also include the following additional information:

- Environmental monitoring completed
- Monitoring results
- Environmental incidents
- Any contingencies and corrective actions taken
- Any public complaints.

8.4.2 Records management

The following records will be kept:

- Inductions and training undertaken by personnel
- Non-conformances will be recorded in a register which will be updated and reported on a weekly basis. Contingency actions implemented will also be recorded
- Incidents will also be recorded. Levels 1 and 2 incidents will be reported on a weekly basis. Level 3 incidents to be reported as soon as possible to the TBW Technical Group representative by the close of business of that day
- In addition to this, records will also be kept of:
  - All monitoring results
  - Inspection and audit reports.
  - This information will be made available to regulators on request.

8.4.3 MCMMP close-out report

At the completion of construction activities, a close-out report will be prepared by the future proposal proponent which will summarise all the information that is provided in the monthly compliance reports including:

- Environmental monitoring completed
- Monitoring results
- Management actions that were undertaken at the site and the effectiveness of these
- Non-conformances
- Environmental incidents
- Any contingencies and corrective actions taken, how long these actions were undertaken and the effectiveness of these
- Any public complaints
- Stakeholder consultation
- The reporting that was undertaken throughout the project.

The close-out report must also identify if there are any ongoing monitoring or maintenance requirements.

9 COMPLAINTS REGISTER

Complaints can be made via tbw@swdc.wa.gov.au.

TBW Technical Group representative will maintain a formal register of marine based complaints associated with the future proposal construction works. The complaints register will include the following details:

- Time and date of the complaint
- Details of the complainant (name and phone number)
- Nature of complaint and any supporting information
- Investigative and management actions undertaken by TBW Technical Group representative.

Corrective actions shall be communicated to the complainant to close out the issues raised.

10 STAKEHOLDER CONSULTATION

Stakeholder groups have been consulted in the preparation of the KBMS strategic proposal, which has informed the preparation of this MCMMP. Stakeholder groups consulted include:

- Local community
- Department of Transport
- Koombana Bay Sailing Club
- Dolphin Discovery Centre
- Southern Ports Authority
- City of Bunbury
- Department of Primary Industries and Regional Development
- Department of Biodiversity, Conservation and Attractions
- Department of Water and Environmental Regulation (DWER).

11 MCMMP AMENDMENTS

As noted in Section 5, this MCMMP will be reviewed on an annual basis and updated, as required, to ensure that the stated environmental objectives are being met. Amendments to the MCMMP will be provided to DWER for endorsement / acceptance. Figure 11 has been provided as a framework to capture and track any updates or amendments to the MCMMP.

Complexity of changes	Minor revisions ☐	Moderate revisions ☐	Major revisions ☐	
Number of key environmental factors	One ☐	2–3 ☐	>3 ☐	
Date revision submitted to EPA	DD/MM/YYYY			
Proponent's operational requirement time frame for approval of revision	< One month ☐	< Six months ☐	> Six months ☐	None ☐
Reason for time frame				

Item no.	Section no.	Page no.	Summary of change	Reason for change
1.				
2.				
3.				

Figure 11: Example record of MCMMP amendments

12 REFERENCES

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