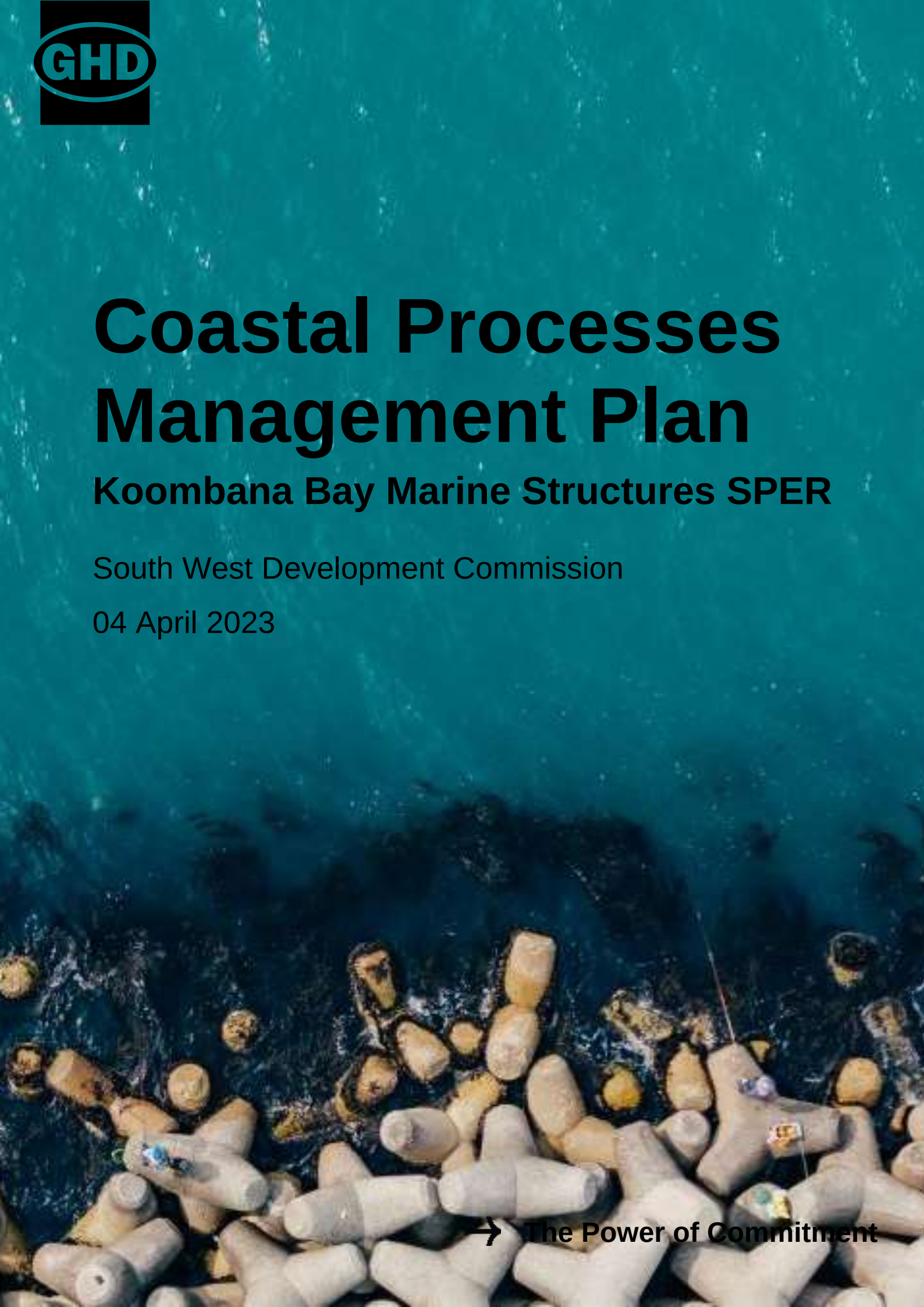
Coastal Processes Management Plan

Koombana Bay Marine Structures SPER

South West Development Commission

04 April 2023



The Power of Commitment

Document status

Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S2	1	Dr J. Romero	S. Hosseini		F. Hannon		29/6/22
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Executive summary

This Coastal Processes Management Plan (CPMP) has been prepared in accordance with the Environmental Protection Authority's (EPA) instructions on the preparation of environmental management plans (EPA 2020) for the Koombana Bay Marine Structures (KBMS) Strategic proposal at the Public Environment Review level (Assessment Number 2049). The purpose of this CPMP is to address relevant Environmental Scoping Document (ESD) requirements (items) in regards to the monitoring and management of coastal processes and seagrass wrack following approval of the KBMS proposal. This CPMP is not a detailed Implementation Action Plan (IAP). A detailed IAP provides the list of actions and an Implementation Schedule for each of the management actions including prioritisations, costs and detailed responsibilities. While these actions are defined in this document, a review and definition of prioritisations and responsibilities is necessary. This review and compilation of the detailed CPMP including an IAP shall be undertaken by the primary stakeholders that include the South West Development Commission (SWDC), City of Bunbury (CoB), Department of Transport (DoT), Koombana Bay Sailing Club (KBSC) and Southern Ports Authority (SPA).

A summary of the CPMP as per EPA (2020) guidance is provided in the following table.

Item	Description
Proposal name	Koombana Bay Marine Structures
Proponent name	South West Development Commission
Ministerial Statement number	Not applicable
Purpose of the CPMP	Provide management and monitoring actions for coastal processes and seagrass wrack in accordance with ESD items 4, 5 and 6 (coastal processes).
CPMP objectives	This CPMP's objectives for coastal processes management (CPM) and seagrass wrack management (SWM) are: – **Management Target CPM1**: Maintain Koombana Beach via renourishment as per Seashore Engineering (2013) guidance on the order of ~4,000 m^3 every 5 years. Maintain Ski, Jetty Baths and KBSC Marina beaches via renourishment to meet aesthetic and recreational values, and asset management needs. – **Management Target CPM2**: Maintain seabed levels and navigability of southern Koombana Bay and its waterways from sediment movement as per design depth specifications of up-to-date nautical charts. – **Management Target CPM3**: During coastal process management measures (e.g. dredging) meet MEQMP (GHD 2023b) bottom DO Environmental Quality Guideline Values of >80% and >90% for Moderate and High Ecological Protection Areas, respectively. – **Management Target SWM1**: Remove seagrass wrack on southern Koombana Bay beaches when greater than ten (10) public complaints received so as to not impact aesthetics, odour, recreational activities and/ beach sand quality. – **Management Target SWM2**: Maintain seabed levels and navigability from potential seagrass wrack accumulation in Casuarina Boat Harbour and KBSC marina as per design depth specifications of up-to-date nautical charts. – **Management Target SWM3**: Maintain seagrass wrack accumulation in KBSC marina and Casuarina Boat Harbour to meet MEQMP (GHD 2023b) bottom DO Environmental Quality Guideline Value of >80% for a Moderate Ecological Protection Area.
Proposed construction date	To be determined at the future proposal stage
CPMP require pre-construction?	No

This report is subject to, and must be read in conjunction with, the limitations, assumptions and qualifications contained throughout this plan.

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Acronyms and abbreviations

Acronym / Definition	Description
Baseline condition	The environmental conditions prior to being subject to pressures from a development or operation of concern. This may include natural environmental conditions that are largely un-impacted by human influences or the state of the environment just prior to influences and effects of development
CBD	Central Business District
CBH	Casuarina Boat Harbour
CHRMAP	Coastal Hazard Risk Management and Adaptation Plan(ning)
CoB	City of Bunbury
CPM	Coastal Processes Management
CPMP	Coastal Processes Management Plan
CPMP	Coastal Processes Management Plan
DDC	Dolphin Discovery Centre
DoT	Department of Transport
EPA	Environmental Protection Authority
ESD	Environmental Scoping Document
Indicator	A measurable or quantifiable characteristic selected for specific purposes to indicate health or condition of that part of the environment
IAP	Implementation Action Plan
IS	Implementation Schedule
KBMS	Koombana Bay Marine Structures (the strategic proposal)
KBSC	Koombana Bay Sailing Club
KEF	Key Environmental Factors
Management actions	The identified actions implemented to meet the environmental objective
Management target	A type of indicator that is defined to demonstrate that the objective is being met.
MEQ	Marine Environmental Quality
MEQMP	Marine Environmental Quality Management Plan
SPA	Southern Ports Authority
SPER	Strategic Public Environmental Review
SWDC	South West Development Commission
SWM	Seagrass Wrack Management
TBD	To be determined
TG	Technical Group

1. Context, scope and rationale

1.1 Proposal

The South West Development Commission (SWDC) is the proponent for the Koombana Bay Marine Structures (KBMS) proposal. In March 2015 the SWDC referred the KBMS proposal to the Western Australia Environmental Protection Authority (EPA), which determined the KBMS proposal to be assessed at the level of "Strategic Proposal" (Public Environment Review or SPER). The EPA approved an Environmental Scoping Document (ESD) for the KBMS SPER (Assessment Number 2049) on 26 June 2015.

The KBMS proposal (or the 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 proposal.

The KBMS strategic proposal aims to construct and operate the following marine structures within Koombana Bay:

1. Casuarina Boat Harbour expansion.
2. Koombana Bay Sailing Club (KBSC) marina.
3. Dolphin Discovery Centre (DDC) finger jetty.

Collectively, these three (3) separate marine structures are referred to as the KBMS strategic proposal. Individually, and because they will be constructed over different timescales, the three (3) individual marine structures are referred to as "future proposals". This is consistent with the EPA's assessment process and terminology under the *Environmental Protection Ac, 1986.*

1.1.1 General description of KBMS strategic proposal

A general description of the KBMS strategic proposal is provided in Table 1.

Table 1 General strategic proposal description

Strategic proposal title	Koombana Bay Marine Structures
Strategic proponent name	South West Development Commission
Short description	The strategic proposal is to develop areas in Koombana Bay for small craft marine infrastructure (Figure 1). The proposed marine infrastructure includes jetties, boat ramps and boat pens. The identified future proposals under the strategic proposal are for the construction and operation of: – **Casuarina Boat Harbour** – **Koombana Bay Sailing Club Marina** – **Dolphin Discovery Centre Finger Jetty** The construction of future proposals will be undertaken in stages. The marine infrastructure is located adjacent to, or in close proximity to existing infrastructure in Koombana Bay, Bunbury.

1.1.2 Identified future proposal description and elements

A description and elements of the KBMS future proposals are 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, piling activities, 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 ha
(Indicative) Casuarina Boat Harbour (CBH) disturbance footprint	Figure 1	Up to 32 ha within CBH disturbance footprint
Breakwater	Figure 1	Up to 3.5 ha within CBH disturbance footprint
Reclamation	Figure 1	Up to 3.5 ha within CBH disturbance footprint
Marine infrastructure	Within CBH	Floating jetties, boat ramps and boat pens within CBH disturbance footprint.
Koombana Bay Sailing Club marina This future proposal includes a dredging component, a piling component, land reclamation (including onshore dredge spoil disposal) and construction of 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) Koombana Bay Sailing Club (KBSC) marina disturbance footprint	Figure 1	Up to 10 ha within KBSC disturbance footprint
Breakwaters	Figure 1	Up to 2.5 ha within KBSC disturbance footprint
Reclamation	Figure 1	Up to 2 ha within KBSC disturbance footprint
Marine infrastructure	Within KBSC	Floating jetties, boat ramps and boat pens within KBSC disturbance footprint
Dolphin Discovery Centre 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) Dolphin Discovery Centre (DDC) jetty disturbance footprint	Figure 1	Up to 0.15 ha within DDC disturbance footprint
Marine infrastructure	Figure 1	Jetty up to 110 metres long

Figure 1 ***Development envelope, indicative disturbance footprint and marine elements***

1.2 Coastal processes

The KBMS strategic proposal is predicted to have modest impacts on the coastal processes of southern Koombana Bay (GHD 2023a) except for decreased sediment movement:

– Along the Marlston Waterfront – Ski Beach area due to alteration of circulation patterns (in particular the nearshore boundary current) in this region from the proposed KBSC marina breakwaters (Figure 2).
– Within the proposed KBSC marina due to sheltering (decreased currents and wave climate) (Figure 2).

In short, southern Koombana Bay is a low energy setting (waves and currents), which yields a degree of uncertainty in predicted potential impacts to coastal processes. Therefore, an appropriate monitoring and management regime (this plan) has been developed to confirm these predictions and to maintain the coastal processes of southern Koombana Bay.

1.3 Seagrass wrack

The KBMS strategic proposal is not predicted to materially impact the seagrass wrack transport of southern Koombana Bay (Figure 2, GHD 2023a). However, as southern Koombana Bay is a low energy (waves and currents), there is a degree of uncertainty in the predicted potential impacts thereby necessitating an appropriate monitoring and management regime (this plan) to confirm (or otherwise) these predictions. It is also necessary to continue any current monitoring and management regime to minimise adverse impacts of seagrass wrack accumulations on the beaches and within the waterways of southern Koombana Bay.

1.4 Key environmental factors

1.4.1 Coastal processes

EPA's objective for the key environmental factor (KEF) coastal processes is 'to maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected'. The ESD also required assessment of any seagrass wrack impacts, which can be inferred as the following objective "to maintain the existing seagrass wrack dynamics'.

1.4.2 Marine environmental quality

EPA's objective for the KEF marine environmental quality (MEQ) is 'to maintain the quality of water, sediment and biota so that the environmental values (both ecological and social) are protected'.

Any MEQ monitoring and management in relation to maintenance activities after implementation of the KBMS proposal due to coastal processes (e.g. dredging) will be through the Marine Environmental Quality Management Plan (MEQMP) (GHD 2023b). Similarly, the monitoring and management actions in relation to the effect of seagrass wrack on MEQ after implementation of the KBMS proposal will be implemented through the MEQMP.

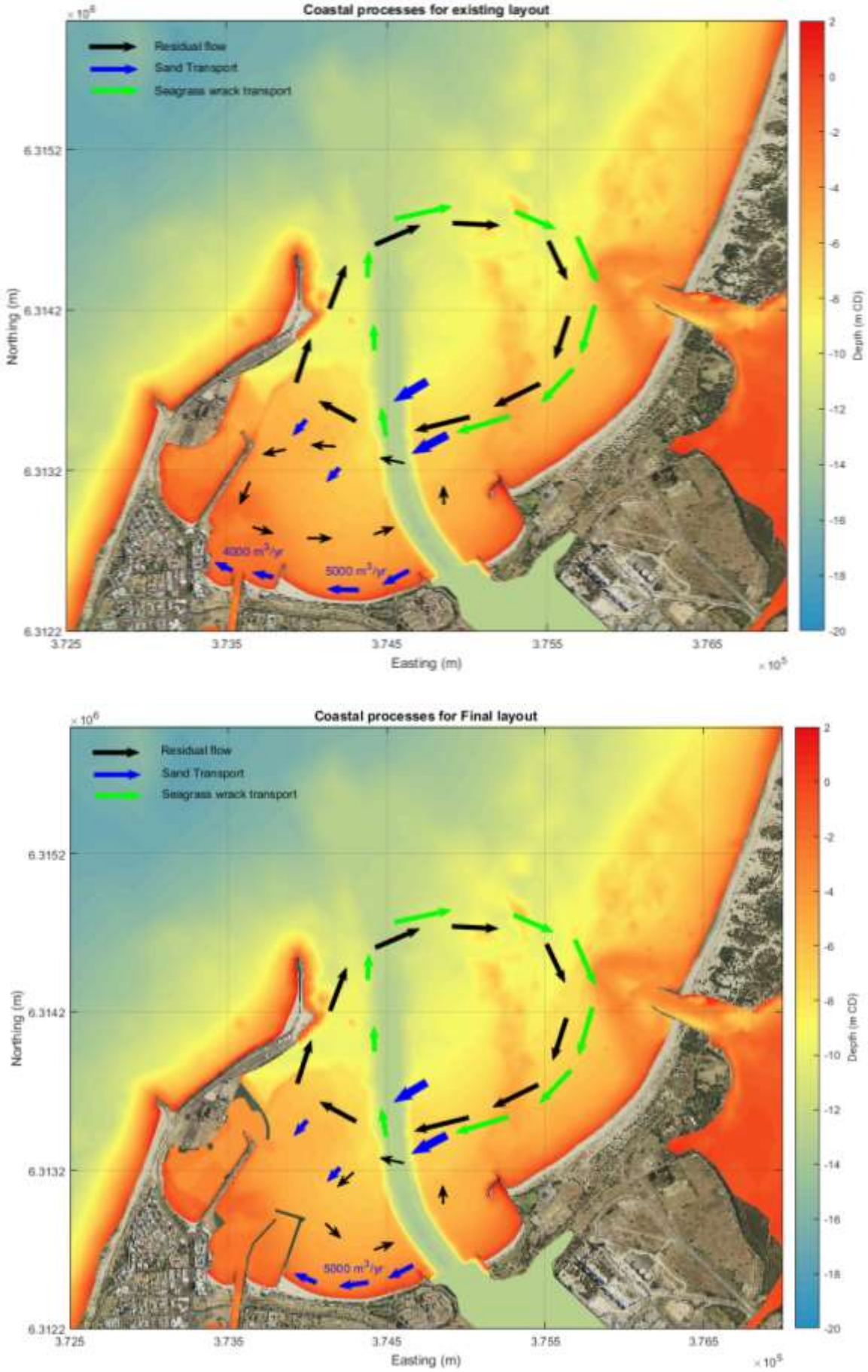

Figure 2 ***Predicted patterns of circulation, sand transport potential and seagrass wrack transport for the baseline condition (top) and KBMS proposal (bottom) (GHD 2023a)***

1.5 CPMP requirements

This CPMP has been prepared in accordance with the EPA instructions on the preparation of environmental management plans (EPA 2020).

1.5.1 ESD requirements

This CPMP has been prepared to address three ESD items for the coastal processes KEF (Table 3) in regards to the monitoring and management of coastal processes and seagrass wrack.

Table 3 ESD 2049 requirements for management and monitoring of seagrass wrack for KEF 4 (coastal processes)

ESD Item No	ESD 2049 KEF CP Item Description	Supporting Technical Report and/or Plan
4	Identify management and mitigation measures for each of the future proposals to demonstrate that the EPA's objectives for coastal processes can be met and to ensure residual impacts are not greater than predicted. This is to include the identification of areas of land and sea within the harbour/marina boundary to allow for management works and buffer areas to manage sand and/or wrack accumulations. Management and mitigation measures are to have regard for existing coastal management plans, including the Bunbury Coastal Protection, Part A – Koombana Bay Coastal Erosion and Design Report (Seashore Engineering 2013).	– This CPMP – Coastal Processes Impact Assessment technical study (GHD 2023a)
5	Outline the agency responsible for the management of coastal processes including the roles and responsibilities for wrack management and maintenance dredging.	– This CPMP
6	Include a Coastal Processes Management Plan, which details the monitoring and management that will apply during and after construction to demonstrate and ensure that residual impacts to coastal processes are not greater than predicted.	– This CMP (after construction) – Construction Environmental Management Plan (RPS 2023) (during construction)

1.6 Limitations

This report: has been prepared by GHD for South West Development Commission and may only be used and relied on by South West Development Commission for the purpose agreed between GHD and South West Development Commission as set out in this plan.

GHD otherwise disclaims responsibility to any person other than South West Development Commission arising in connection with this plan. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this plan were limited to those specifically detailed in the plan and are subject to the scope limitations set out in the plan.

The opinions, conclusions and any recommendations in this plan are based on conditions encountered and information reviewed at the date of preparation of the plan. GHD has no responsibility or obligation to update this plan to account for events or changes occurring subsequent to the date that the plan was prepared.

The opinions, conclusions and any recommendations in this plan are based on assumptions made by GHD described in this plan. GHD disclaims liability arising from any of the assumptions being incorrect.

1.7 Rationale and approach

The following sub-sections provide background information on:

– The KBMS strategic proposal that informed and developed the management approach for this CPMP.
– Results of modelling investigations and reviews of historic/recent information.
– The assumptions and uncertainties associated with the development and the proposed management approach.

– The management targets, monitoring and management actions in the subsequent sections of this CPMP are aligned with the overall management approach.

The Transforming Bunbury Waterfront Coastal Hazard Risk Management and Adaptation Plan (CHRMAP) (GHD 2019) was prepared in 2018 on the basis of the full implementation of the KBMS proposal. The CHRMAP identifies:

– Coastal erosion/inundation hazards/risks.
– Recommendations for an adaptation pathway with monitoring/management actions to assist adapting to immediate/short-term coastal erosion/inundation risks.
– Appropriate planning to address increasing risk over four timeframes (immediate, to 2030, 2030-2070, 2070-2120).

This CPMP is aligned with the CHRMAP (GHD 2019) immediate and short-term monitoring and management actions in regards to monitoring and management[1] as both are based on the evaluation of potential impacts to coastal processes from implementation of the KBMS strategic proposal as reported in the Coastal Process Impact Assessment technical study (GHD 2023a).

1.7.1 Technical studies and key past investigations

Potential impacts from the KBMS strategic proposal relative to the existing conditions have been predicted for:

– Coastal processes (GHD 2023a)
– Hydrodynamics (GHD 2023c)
– Flushing (GHD 2023c).

Past and recent investigations have informed the understanding of the coastal processes and seagrass wrack dynamics of southern Koombana Bay. These are summarised in Table 4 and are briefly described in the following sub-sections.

Table 4 Technical studies completed for the KBMS proposal and key past investigations of coastal processes

Study	Reference	Timeframe	Key outcomes
Characterisation of seagrass wrack dynamics in Geographe Bay	Oldham et al (2010) Pattiaratchi et al (2011)	2010-2011	– Understanding of fundamental processes of seagrass wrack dynamics in south-western Western Australia
Koombana Beach management options	Seashore Engineering (2013)	1991-2012	– Most recent investigation of Koombana Beach morphology – Longshore sediment transport estimates
Coastal processes modelling	GHD (2023a)	2016-2021	– Predicted large decrease in sand transport along the Marlston Waterfront and Ski Beach due to reduced circulation in embayment between KBSC marina and Jetty Road Causeway – Predicted large decrease in sand transport along KBSC beach due to proposed KBSC marina breakwaters – Comparative modelling assessment between existing condition and KBMS proposal indicates modest impacts to coastal processes and seagrass wrack dynamics
Marine environmental quality modelling	GHD (2023c)	2016-2021	– Altered circulation patterns in southwestern Koombana Bay predicted due to the proposed KBSC marina breakwaters – Increased flushing times of Leschenault Inlet and Casuarina Boat Harbour due to altered circulation patterns and the proposed Casuarina Boat Harbour Northern Breakwater, respectively – Predicted flushing of proposed KBSC marina similar to Casuarina Boat Harbour

[1] Exclusive of coastal infrastructure asset management in the CHRMAP (GHD 2019).

1.7.1.1 Seagrass wrack dynamics in Geographe Bay

The most comprehensive study of seagrass wrack dynamics was undertaken for Geographe Bay to inform Port Geographe management (Oldham et al 2010), which characterised the seasonal dynamics as follows:

– Seagrass wrack is generated in offshore seagrass meadows from shedding (leaves and stems) that accumulate in the meadows and unvegetated zones until autumn as the material is denser than seawater.
– The first winter storms distribute seagrass wrack through the water column and transport it towards shore where:
  - Some of the wrack becomes buoyant and accumulates at the surface of the water column.
  - Some of the wrack remains dense and remains near the seabed.
  - Generally, seagrass wrack is deposited on beaches during storm events with high water levels.
– The wrack may be repeatedly washed (and moved) onto and from the beaches depending on local metocean conditions. Seagrass wrack deposits high on the beach may become incorporated into the beach sand, compacted and difficult to be remobilised into the water during subsequent storm events. As seagrass wrack dries on beaches, it becomes more buoyant.
– The next storm event can remobilise the seagrass wrack from the beach to the nearshore waters where it may be transported from the beach.

These processes are likely to be similar for the Bunbury coastal waters given its proximity to Geographe Bay and the presence of seagrass meadows with the same seagrass species (*Posidonia sinuosa* and *Amphilbolis Antarctica*).

1.7.1.2 Past Koombana Beach management options

Seashore Engineering (2013) undertook an assessment of eight (8) coastal management options for Koombana Beach that included:

– A description of the evolution of beach formation over two monitoring periods (i.e. 1991-2009, 2009-2012) and the mechanisms contributing to sediment accretion and erosion along the western and eastern limits, respectively.
– An evaluation of beach profiles over time and estimates of the volume changes that represent the balance of longshore sediment transport (i.e. volume-based estimates of longshore transport).
– The selection of two preferred options for detailed evaluation.

One of the Seashore Engineering (2013) options has been partially implemented with the construction of the Point Busaco revetment in 2015. Further, the additional recommendation of renourishment of eastern Koombana Beach with sand from the Outer Harbour traps (i.e. south of BP Beach Groyne and/or west of Outer Harbour Breakwater) has been implemented by the Southern Ports Authority on at least several occasions (pers. comm. Department of Transport). It is recommended that establishment of monitoring and any renourishment of Koombana Beach rely on the Seashore Engineering (2013) specifications in the first instance.

1.7.1.3 Coastal processes modelling

The baseline condition and original design[2] of the KBMS proposal (Figure 2) was modelled to comparatively evaluate potential impacts to coastal processes and seagrass wrack dynamics (GHD 2023a). Generally, relatively small changes to coastal processes and seagrass wrack dynamics were predicted from implementation of the KBMS proposal except for:

– Circulation patterns along western Koombana Beach are predicted to shift offshore to the north by the Koombana Bay Eastern Breakwater, but this is not predicted to cause material changes to longshore sand transport along Koombana Beach.
– Relatedly, the KBSC marina is predicted to disrupt the baseline condition circulation pattern between these structures and the Jetty Road Causeway with a concomitant decrease in the longshore sediment transport along the Marlston Waterfront-Ski Beach and the KBSC beach.

[2] Refer to Section 1.7.2 regarding coastal processes modelling undertaken for the larger original KBSC marina design than the smaller footprint of the revised design.

– The KBSC marina will reduce sand supply to the beach therein with likely sand quality deterioration that will potentially require renourishment.
– Reduced flushing of Casuarina Boat Harbour, KBSC marina and Leschenault Inlet may lead to water quality degradation (GHD 2023c), which will be monitored and managed as per the MEQMP (GHD 2023b).
– The proposed Casuarina Harbour Northern Breakwater is predicted to reduce currents along the southern extent of the Outer Harbour, though material increases to sedimentation are not predicted.

Predicted changes to coastal process due to the KBMS proposal that may require active management include:

– Potential beach realignment of Ski Beach.
– Sedimentation in Casuarina Boat Harbour and KBSC marina, and the embayment between these marine structres.
– Potential scour and/or deposition in proximity to proposed structures.

In short, impacts to coastal process are predicted to be constrained to southwestern Koombana Bay in the immediate locale of KBMS proposal with no/minor impacts predicted for eastern Koombana Bay (e.g. Koombana Beach).

1.7.1.4 MEQ modelling

The baseline condition and revised design of the KBMS proposal (Figure 2) were modelled to comparatively evaluate potential impacts to hydrodynamics including flushing (GHD 2023c). Generally, relatively small changes to hydrodynamics were predicted from implementation of the KBMS proposal except for:

– Altered circulation patterns in southwestern Koombana Bay as described in Section 1.7.1.3.
– Increased median flushing time of Leschenault Inlet from ~8 days to ~9.5 days.
– Increased median flushing time of Casuarina Boat Harbour from ~2 days to ~5-6 days.
– A median flushing time for KBSC marina of ~5 days.

1.7.2 Key assumptions and uncertainties

Assumptions and uncertainties associated with the implementation of the KBMS proposal in regards to potential impacts on coastal processes and seagrass wrack dynamics are provided in (GHD 2023a), which include:

– The original design of the KBSC marina derived proposal was revised (decreased in size) to improve the predicted future flushing of Leschenault Inlet (and thereby reduce potential MEQ impacts). The GHD (2023a) coastal processes assessment was completed prior to this design revision. However, as illustrated in Figure 3 the offshore extent of the revised design is similar to the original design. The smaller revised design will yield similar potential impacts to coastal processes as the original design. Hence, the GHD (2023a) coastal processes impact assessment on the basis of the original design is deemed ‘representative’ of the revised design.
– The re-arrangement of the breakwater (in future design optimisations) may result in altered wave reflection patterns. This is unlikely to impact coastal processes, however any potential impact on navigation and other structures are to be reviewed by the designer.
– The DDC finger jetty will be a piled structure that is not anticipated to have any material impact on coastal processes, and was not evaluated in the GHD (2023a) coastal processes impact assessment. Rather, any potential impacts to coastal processes from the proposed piled DDC finger jetty (none anticipated) will be monitored and managed via this CPMP.
– The GHD (2023a) coastal processes impact assessment was primarily through a comparative analysis of simulated changes in coastal processes between the KBMS proposal and the baseline condition. A comparative analysis approach was adopted because:
    - Generally, there was insufficient information/data to verify all of the models and quantitative approaches used to address coastal processes. However, industry-standard models and approaches, and their application, were utilised to identify if the KBMS proposal causes changes (impacts) relative to the baseline condition.

- Whether or not relative impacts occur in terms of a specific coastal process at a particular location from implementation of the KBMS proposal were forecast. For example, predicted impacts were primarily limited to southwestern Koombana Bay in proximity (or within) the proposed structures, whereas no/minimal impacts were predicted in southeastern Koombana Bay (e.g. Koombana Beach).

– Uncertainty in terms of the magnitude of impacts is partly ameliorated due to the low energy coastal processes setting of southwestern Koombana Bay with relatively modest sediment movement and seagrass wrack accumulation relative to higher energy open ocean coastal settings. This relatively low energy setting of the KBMS proposal extends the timescales to monitor and to identify changes, to implement management actions and to continually improve this CPMP relative to open ocean coastal settings.

In short, though predicted impacts to coastal processes and seagrass wrack are relatively minor and are predicted to occur in southwestern Koombana Bay within proximity of the KBMS proposal, this CPMP provides an adaptive and flexible monitoring and management framework to manage uncertainties in the predicted impacts.

1.7.3 Objective-based management approach

The management of the KBMS proposal via this CPMP is focused on monitoring and management of two components:

– Sediment movement

– Seagrass wrack accumulations.

It is challenging to quantify numeric criteria and/or thresholds for coastal processes and seagrass wrack management that may be impacted by the KBMS proposal given the predicted low impacts relative to the existing condition and the degree of predictive uncertainty. Therefore, an objective-based management approach has been adopted for this CPMP.

1.7.4 Rationale for choice of management actions

The management targets and management actions identified in this CPMP have been developed on the basis of previous investigations, the KBMS SPER technical studies (Section 1.7.1), the Transforming Bunbury Waterfront CHRMAP (GHD 2019) and the MEQMP (GHD 2023b). The objective-based management approach (Section 1.7.3) and the management actions outlined in this CPMP are consistent with past management of southern Koombana Bay coastal processes, and other Western Australia marinas and harbours.

Figure 3 ***Existing and proposed coastal infrastructure and KBMS proposal***

2. Implementation of the CPMP

2.1 KBMS management policy

The KBMS Management Policy (Final Version March 2022) underpins the coordination and management of this CPMP. The management framework of the policy is illustrated in Figure 4.

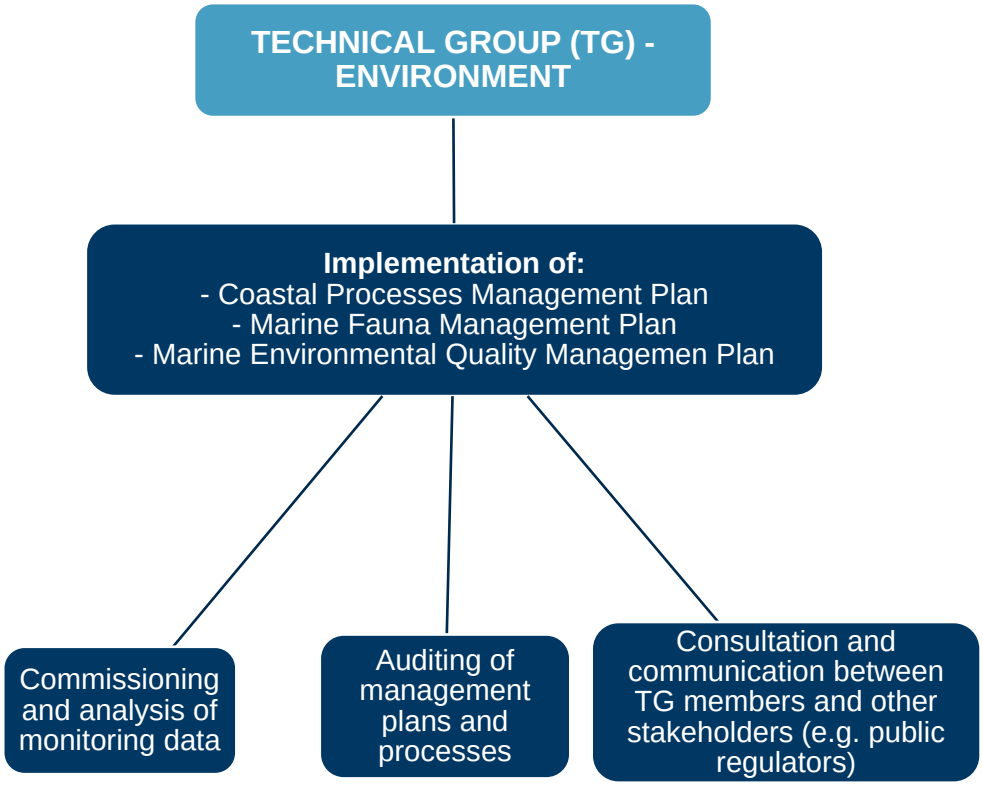

Figure 4 Management framework of the KBMS management policy

The key elements of the policy as they pertain to this CPMP include:

- Monitoring and management:
  - Environmental impacts are principally managed through implementing the requirements of this CPMP. It is the responsibility of each proponent to manage their derived proposal within the coastal processes criteria outlined in this CPMP.
  - Proponents of each derived proposal must comply with the conditions of any notice issued under the EP Act as they pertain to coastal processes and the monitoring requirements specified in this CPMP.
  - SWDC (supported by the Technical Group [TG]) will manage compliance aspects of this CPMP.
- Compliance and reporting:
  - Derived proposal proponents must comply with arrangements outlined in this CPMP and any other management controls imposed by any relevant statutory or government authority in relation to their activities in Koombana Bay. Importantly, it is the derived proposal proponent and not the SWDC that is liable for any breaches.
  - The SWDC's role is one of administrator and coordinator of the Framework, and by extension this CPMP.
- Audits and reviews:
  - The SWDC and TG will periodically review the policy to ensure it meets regulatory requirements and community expectations. The initial review period will be three (3) years following commencement of

implementation of the SPER. Note the frequency of CPMP reviews may be at a greater frequency (see Section 3).

2.2 CPMP coordination and management

The responsible parties for coordination and management of the CPMP are summarised in Table 5, which is underpinned by the KBMS management policy (Section 2.1).

Table 5 Coordination and monitoring/management responsibilities

Shorelines and Structures	Monitoring and Management Responsibility Entity	CPMP Coordination Entity
Koombana Beach	CoB	SWDC
KBSC Beach and KBSC breakwaters	KBSC	
Jetty Baths Beach, Casuarina Boat Harbour breakwaters, the Plug	DoT	
Outer Harbour	SPA	

CPMP coordination responsibilities by SWDC (or delegate entity) include:

- Coordination of routine and trigger-based monitoring among entities responsible for monitoring and management.
- Responsibility for information management of all routine and trigger-based monitoring (e.g. data, reports, exceedance events), and implemented management actions (e.g. documentation, emails, phone logs).
- Preparation of annual reports and submissions to regulators.
- Reviews and updates to this CPMP.

CPMP monitoring and management responsibilities of entities responsible for shorelines/structures (see Table 5) include:

- Arrangements with service providers to carry out routine and trigger-based monitoring to industry-level standards.
- Carrying out management actions (mitigation measures) arising from non-compliance of management targets.
- Carrying out preventative controls arising from prior non-compliance of management targets.
- Reporting any non-compliance events of management targets that are not captured with this CPMP's monitoring regime.
- Provision of community and other stakeholder information regarding coastal process within respective areas of responsibility.

2.3 Coastal processes

2.3.1 Environmental objective

Minimise the impact on the environment, coastal processes and navigability due to interruption and/or alteration of sediment movement by the KBMS proposal.

2.3.2 Management targets

- **Management Target CPM1**: Maintain Koombana Beach via renourishment as per Seashore Engineering (2013) guidance on the order of ~4,000 m^3 every 5 years. Maintain Ski, Jetty Baths and KBSC Marina beaches via renourishment to meet aesthetic and recreational values, and asset management needs.
- **Management Target CPM2**: Maintain seabed levels and navigability of southern Koombana Bay and its waterways from sediment movement as per design depth specifications of up-to-date nautical charts.

– **Management Target CPM3**: During coastal process management measures (e.g. dredging) meet MEQMP (GHD 2023b) bottom DO Environmental Quality Guideline Values of >80% and >90% for Moderate and High Ecological Protection Areas, respectively.

2.3.3 Monitoring

This section describes routine monitoring to identify potential impacts from the KBMS proposal on coastal processes, and if needed trigger-based monitoring to determine if management actions are required.

2.3.3.1 Routine monitoring

The routine coastal processes monitoring program will involve the collection, analysis and interpretation of observations and data over a range of timeframes to confirm that management targets are being met (Table 6).

Table 6 Routine monitoring to measure performance of coastal processes management targets

Indicator	Method	Locations	Frequency	Responsible Party	Already in Place?
Metocean	AWAC (waves), anemometer (wind)	Beacon 3 and Beacon 10	Continuous	SPA	Yes
	Tide gauge	Inner Harbour, the Plug		DoT	Yes
General beach condition	Site inspections by coastal technical advisor and photo monitoring	Southern Koombana Bay beaches (Jetty Baths, KBSC marina, Koombana, Ski)	At least once per year	CoB (Koombana and Ski beaches) DoT (Jetty Baths Beach) KBSC (KBSC Marina Beach)	Yes (by CoB)
	Aerial photography		At least once per year from winter to spring		Yes (by CoB)
Beach profiles and nearshore seabed elevations	Hydrographic and/or topographic surveys		Annually (November or December)		No, implement soon to establish current baseline condition
Beach sand volume	Compare volume to baseline		Annual survey Analysis every 5 years		No, implement soon to establish current baseline condition
Cross-sectional areas of waterways entrances and Outer Harbour	Hydrographic surveys	Entrances to Casuarina Boat Harbour and KBSC marina, and the Plug	Every 2 years in autumn	DoT (Casuarina Boat Harbour, the Plug) KBSC (KBSC marina)	Yes
		Outer Harbour		SPA	Yes
Water quality (Bottom DO)	As per MEQMP (GHD 2023b)	In region of in-water implementation of management action	Before, during and after in-water implementation of management action	As per MEQMP (GHD 2023b)	No

2.3.3.2 Trigger-based monitoring

The trigger-based coastal processes monitoring program involves the collection, analysis and interpretation of additional information in response to routine monitoring data/observations to confirm if management actions are required (Table 7).

Table 7 Trigger-based monitoring to determine extent of non-performance of coastal processes management targets

Indicator	Method	Location	Trigger	Responsible Party
General beach condition	Site inspections by coastal technical advisor and photo monitoring	Southern Koombana Bay beaches (Casuarina Boat Harbour, KBSC Marina, Koombana, Ski)	To confirm non-compliance of management target CPM1 (if required prior to management action)	CoB (Koombana and Ski beaches) DoT (Jetty Baths Beach) KBSC (KBSC Marina Beach)
Cross-sectional areas of waterways entrances and Outer Harbour	Hydrographic surveys	Entrances to Casuarina Boat Harbour and KBSC marina, and the Plug	To confirm non-compliance of management target CPM2 (if required prior to management action)	DoT (Casuarina Boat Harbour, the Plug) KBSC (KBSC marina)
		Outer Harbour		SPA (Outer Harbour)
Water quality (Bottom DO)	As per MEQMP (GHD 2023b)	In region of in-water implementation of management action	To confirm non-compliance of management target CPM3 (if required prior to management action)	As per MEQMP (GHD 2023b)

2.3.4 Management actions

Management actions for non-performance of a management targets are summarised in Table 8.

Table 8 Management actions in event of non-performance of coastal processes management targets

Action	Method	Location	Management Trigger	Responsible Party	Management already in place?
Import and placement of sand to maintain beach amenity and values	Sand nourishment, sand back passing	KBSC Beach	Non-compliance of management target CPM1	KBSC	Identified in previous coastal management plans, prior implementation events (pers. comm. DoT)[3]
		Jetty Baths Beach		DoT	
		Ski Beach		CoB	
		Koombana Beach (see Seashore Engineering 2013)			
Removal of sediment to maintain navigability	Dredging	KBSC marina	Non-compliance of management target CPM2[4]	KBSC	Yes – SPA undertake maintenance dredging of the Outer Harbour
		Casuarina Boat Harbour		DoT	
		The Plug			
		Outer Harbour		SPA	
Water quality monitoring (Bottom DO)	As per MEQMP (GHD 2023b)	In region of in-water implementation of management action	Non-compliance of management target CPM3	As per MEQMP (GHD 2023b)	Yes, however increased frequency is required to respond to targets

2.3.5 Reporting

2.3.5.1 Annual report

An annual compliance report will state whether the environmental objective for coastal processes management has been met. In the event the environmental objective was not achieved, the annual compliance report will include a description of the effectiveness of revised and/or additional management actions implemented and an analysis of the trends from the monitoring results. The annual compliance report will be prepared by SWDC (or delegated entity) and submitted to the DWER (EPA) by 1 March each year.

[3] Refer to Seashore (2013) for a list of coastal management options identified for Koombana Beach.
[4] Annual surveys are to be used as the basis to examine compliance in consultation with the Harbour Master and with reference to the declared depth of the navigational waterways.

2.3.5.2 Reporting non-compliance of management targets

If a management target for coastal processes is not met, then DWER (EPA) will be notified by SWDC (or delegated entity) within ten (10) days of identification of the exceedance. An investigation report will be prepared by SWDC (or delegated entity) that describes the investigation into the exceedance and corrective actions.

2.4 Seagrass wrack

2.4.1 Environmental objective

Minimise the impact on the environment due to trapped seagrass wrack.

2.4.2 Management targets

Management Target SWM1: Remove seagrass wrack on southern Koombana Bay beaches when greater than ten (10) public complaints received[5] so as to not impact aesthetics, odour, recreational activities and/or beach sand quality.

Management Target SWM2: Maintain seabed levels and navigability from potential seagrass wrack accumulation in Casuarina Boat Harbour and KBSC marina as per design depth specifications of up-to-date nautical charts.

Management Target SWM3: Maintain seagrass wrack in Casuarina Boat Harbour and KBSC marina to meet MEQMP (GHD 2023b) bottom DO Environmental Quality Guideline Value of >80% for a Moderate Ecological Protection Area.

2.4.3 Monitoring

This section describes routine monitoring to identify potential impacts from the KBMS proposal on natural seagrass wrack dynamics, and if needed trigger-based monitoring to determine if management actions required.

2.4.3.1 Routine monitoring

The routine seagrass wrack monitoring program will involve the collection, analysis and interpretation of observations and data over a range of timeframes to confirm that management targets are being met (Table 9).

Table 9 Routine monitoring to measure performance of seagrass wrack management targets

Indicator	Method	Location	Frequency	Responsible Party	Already in place?
Seagrass wrack accumulation	Visual inspection by facility management	KBSC marina	Weekly between autumn and spring	KBSC	Yes
		Casuarina Boat Harbour		DoT	
	Site inspections by coastal technical advisor and photo monitoring	Southern Koombana Bay beaches (Jetty Baths, KBSC Marina, Koombana, Ski)	Three occasions during autumn, winter and spring	CoB (Koombana and Ski beaches) KBSC (KBSC Marina beach) DoT (Jetty Baths Beach)	No
	Aerial photography		At least once per year between winter and spring		No
	Multi-beam surveys[6]	Entrances to Casuarina Boat Harbour, KBSC marina, and the Plug	Every 2 years in autumn	DoT (Casurina Boat Harbour, the Plug) KBSC (KBSC marina)	No
Water quality (Bottom DO)	As per MEQMP (GHD 2023b)	KBSC marina Casuarina Boat Harbour	As per MEQMP (GHD 2023b)	DoT (Casuarina Boat Harbour) KBSC (KBSC marina)	No

[5] In consultation with the City of Bunbury, seagrass wrack removal is carried out on the basis of public complaints.
[6] To ensure safe navigation for recreational and commercial vessels into the entrances to Casuarina Boat Harbour and KBSC marina through maintenance of seabed depths, periodic surveys of the navigable depth will be used to assess areas (if any) of seagrass wrack accumulation. Note DoT has found multibeam surveys effective to resolve the surface of the seagrass wrack layer at Jurien Bay and Port Geographe.

2.4.3.2 Trigger-based monitoring

The trigger-based seagrass wrack monitoring program involves the collection, analysis and interpretation of additional information in response to routine monitoring data/observations to confirm if management actions are required (Table 10).

Table 10 Trigger-based monitoring to determine extent of non-performance of seagrass wrack management targets

Parameter	Method	Location	Trigger	Responsible Party
Seagrass wrack accumulation on shoreline	Site inspections by coastal technical advisor and photo monitoring	KBSC Beach, Jetty Baths Beach, Koombana Beach, Ski Beach Adjacent structures	To confirm non-compliance of management target SWM1 (if required prior to management action)	CoB (Koombana and Ski beaches and adjacent structures) DoT (Jetty Baths Beach and adjacent structures) KBSC (KBSC Marina Beach and adjacent structures)
Seagrass wrack accumulation in Casuarina Boat Harbour and/or KBSC marina	Cross-sectional areas/transects	Casuarina Boat Harbour KBSC Marina	To confirm source of non-compliance of management target SWM2 (if required prior to management action)	DoT (Casuarina Boat Harbour) KBSC (KBSC marina)
Water quality (Bottom DO)	As per MEQMP (GHD 2023b)	Casuarina Boat Harbour KBSC Marina	To confirm source of non-compliance of management target SWM3 (if required prior to management action)	DoT (Casuarina Boat Harbour) KBSC (KBSC marina)

2.4.4 Management actions

Management actions for non-performance of seagrass wrack management targets are summarised in Table 11.

Table 11 Management actions in event of non-performance of seagrass wrack management targets

Action	Method	Location	Management Trigger	Responsible Party
Removal of small volumes of seagrass wrack on structures and/or beaches	Manually and disposal onshore rubbish[7]	KBSC beach and breakwaters	At discretion of facility/asset operational personnel	CoB (Koombana and Ski beaches and adjacent structures) DoT (Jetty Baths Beach and adjacent structures) KBSC (KBSC Marina Beach and adjacent structures)
		Jetty Baths beach and breakwaters		
		Koombana Beach, Ski Beach		
Removal and disposal of large volumes of seagrass wrack from beaches	Appropriate plant to remove and dispose of seagrass wrack (e.g. bobcat, small excavator) from beaches	Southern Koombana Bay beaches (Jetty Baths, KBSC marina, Koombana, Ski)	Non-compliance of management targets SWM1	
Removal and disposal of large volumes of in-water seagrass wrack	Appropriate plant to remove seagrass wrack (e.g. fishing trawler, barge, dredge) from water and dispose offshore or onshore	KBSC marina Casuarina Boat Harbour	Non-compliance of management target SWM2 and/or SWM3	KBSC (KBSC marina) DoT (Casuarina Boat Harbour)
Increased frequency of water quality (bottom DO) monitoring	As per MEQMP (GHD 2023b)	KBSC marina Casuarina Boat Harbour	Non-compliance of management target SWM3	As per MEQMP (GHD 2023b)

[7] Small volumes of seagrass wrack that accumulate (e.g. among breakwaters, on the beaches) and pose an issue (i.e. aesthetics, odour, recreational impact, navigation, water quality) will be removed and relocated as part of the general rubbish removal and cleaning operations by CoB (Koombana Beach, Ski Beach), KBSC (KBSC marina) and DoT (Casuarina Boat Harbour).

2.4.5 Reporting

2.4.5.1 Annual report

An annual compliance report will state whether the environmental objective for seagrass wrack management has been met. In the event the environmental objective was not achieved, the annual compliance report will include a description of the effectiveness of revised and/or additional management actions implemented and an analysis of the trends from the monitoring results. The annual compliance report will be prepared by SWDC (or delegate entity) and submitted to the DWER (EPA) by 1 March each year.

2.4.5.2 Reporting non-compliance of management targets

If a management target for seagrass wrack management is not met, then DWER (EPA) will be notified by SWDC (or delegate entity) within ten days of identification of the exceedance. An investigation report will be prepared by SWDC (or delegate entity) that describes the investigation into the exceedance and corrective actions.

3. Adaptive management and review

CoB, DoT, KBSC and SPA will implement adaptive management to learn from the monitoring information, evaluation against management targets, and implementation of management measures for coastal processes and seagrass wrack management. The extent to which coastal processes and seagrass wrack dynamics will replicate the GHD (2023a) modelling predictions of low impacts from the KBMS proposal relative to the baseline condition will be confirmed through implementation of this CPMP. Interannual variations in the coastal processes and seagrass wrack dynamics of Koombana Bay may require flexible and adaptive management approaches. The recommended adaptive approach is to:

– Undertake a systematic evaluation of the routine (and trigger-based) monitoring data to assess whether impacts from the KBMS proposal are similar to the modelled predictions.
– Increase understanding of coastal processes and seagrass wrack dynamics in southern Koombana Bay from the routine monitoring and management actions.
– Review any environmental issues and recommendations that have any material bearing on coastal processes and seagrass wrack dynamics from close-out reports for any maintenance works in Koombana Bay, inclusive of the Shipping Channel and Inner Harbour (e.g. SPA dredging, beach renourishment).
– Undertake an annual review of the CPMP to assess the effectiveness of the management targets, management actions, and routine and trigger-based monitoring, and to identify continual improvement opportunities to incorporate into the CPMP.
– Review the frequency and methods of monitoring and management outlined in this CPMP to ascertain if the predicted low impacts of the KBMS proposal are supported.

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