

Capel to Leschenault CHRMAP

Chapter Report: Implementation

Peron Naturaliste Partnership

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1 INTRODUCTION

The global mean sea level is rising since the nineteenth century and is projected to rise faster in the future (IPCC 2021). Rising sea levels and intensifying storm activity increase the risk of coastal inundation (such as permanent and temporary coastal flooding) and coastal erosion (such as storm beach erosion, long-term shoreline recession, etc.).

To manage these hazards, State governments across Australia have introduced obligations that require local governments to consider and plan for these hazards. Specifically, in Western Australia (WA), the governing policy is the Western Australian Planning Commission's (WAPC) "State Planning Policy No. 2.6: State Coastal Planning Policy" (WAPC, 2013, abbreviated to "SPP2.6"). SPP2.6 recommends that management authorities develop a Coastal Hazard Risk Management and Adaptation Plan (CHRMAP) for land use or development potentially vulnerable to coastal hazards. Technical Guidelines have been developed to assist in the CHRMAP process (WAPC, 2019).

The SPP2.6 requires risk management planning for existing or proposed development located in an area at risk of coastal hazards over a 100-year planning timeframe. SPP2.6 and the CHRMAP Guidelines provide a risk assessment framework to identify risks that are intolerable to the community and other stakeholders, including local governments, indigenous and cultural interests, and private enterprises. Risk management measures are then proposed and compared, following the SPP2.6 adaptation hierarchy. The CHRMAP aims to increase knowledge and understanding of coastal hazard risks and to identify risk management and adaptation measures for implementation. The outcomes of the CHRMAP can inform local and state government policies, strategies and plans, including (but not limited to), planning strategies, community strategic plans, drainage strategies, asset management plans, emergency management plans, and foreshore management plans. Risk management measures are then developed according to the adaptation hierarchy outlined in SPP2.6.

This project is guided by the CHRMAP Guidelines (WAPC, 2019) with the study scope and deliverables consistent with the objectives identified by these guidelines and the SPP2.6. In addition, the project aims to recommend strategic directions for coastal adaptation scenarios up to 2120 and to propose an implementation plan to achieve coastal adaptation. This CHRMAP project aims to increase knowledge and understanding of coastal hazard risks and identify risk management and adaptation measures for implementation. The commonly adopted coastal risk management hierarchy includes the principles of *Avoid*, *Retreat*, *Accommodate*, and *Protect*, as shown in **Error! Reference source not found.**

“Avoiding the placement of sensitive development within areas that are at risk from coastal hazards provides the most resilience to future coastal hazards. Conversely, using protection structures to allow sensitive development within areas that would otherwise be at risk from coastal hazards provides the least resilience to future coastal hazards.”

WAPC 2019, Coastal hazard risk management and adaptation guidelines – Section 5.1, page 29.

Avoiding risk exposure and retreating from areas exposed to risk are the preferred course of action in the hierarchy, but either response will be challenging to communicate and complex to implement. This is because there is an historical notion that all land currently developed is suitable for development *ad infinitum*; purchase and improvement of land follows by both the private sector and public agencies (including the development of essential services infrastructure). The fact that this may not hold true over long time periods is unlikely to be factored in to ownership and development of land, and the financial and social constraints of acting can be significant.



Retreat can be further complicated by the absence of suitable land to retreat to, or the cost of developing such land. As such, policy amendments in local planning provisions to enable this is required. To implement this in Capel, Leschenault and Greater Bunbury, a review of state and local planning provisions and recommendations for how these can be updated to further consider and respond to coastal risk is provided.

The outcomes will be used to inform local and state government policies, strategies and plans, including (but not limited to), planning strategies, community strategic plans, drainage strategies, asset management plans, emergency management plans, and foreshore management plans, in accordance with WAPC guidelines.

The project will adhere to the WAPC (2019) guidelines with scope and deliverables to be consistent with the objectives identified by these guidelines and SPP2.6. In addition, the project will identify the strategic direction for coastal adaptation scenarios from the present-day to 2120 (100 years management timeframe) and this implementation plan is the blueprint to achieve this direction. Overall, this CHRMAP will develop a flexible adaptation pathway for the region and serve as a key reference for management, planning and policy-making for the short-term (0-15 years), medium-term (15-30 years), and long-term (100 years).

Delivery of this project will occur over 9 stages (as summarised in Figure 1-2), each of which represents a key hold point. The staged approach is developed according to the PNP's scope and is in line with the CHRMAP Guidelines (WAPC, 2019).

This report presents the Stage H Implementation Chapter Report, which outlines planning and the coastal management actions (i.e. Options) recommended to address erosion and inundation vulnerabilities. The red bubble displayed in Figure 1-2 outlines Stage H in the context of the full CHRMAP methodology.

The specific localities, study area extent and management units used in the study underpinning this implementation report is shown in Figure 1-3.



Avoid

Identify future 'no-build areas', use planning tools to prevent new development, and enhance the natural environment in areas at risk now or in the future.



Retreat

Withdraw, relocate or abandon built assets that are at risk; enhance the natural environment and allow natural ecosystems to retreat landward as sea levels rise.



Accommodate

Continue to use the land but implement changes such as building on piles, converting agriculture to fish farming or growing food or salt-tolerant crops.



Protect

Use hard structures (e.g., seawalls, levees) or soft solutions (e.g. vegetation) to protect built assets. May result in loss of natural environment and be prohibitively expensive, especially in the long term.

Figure 1-1 Risk management and adaptation hierarchy, as depicted in the WAPC Coastal hazard risk management and adaptation planning guidelines (2019)

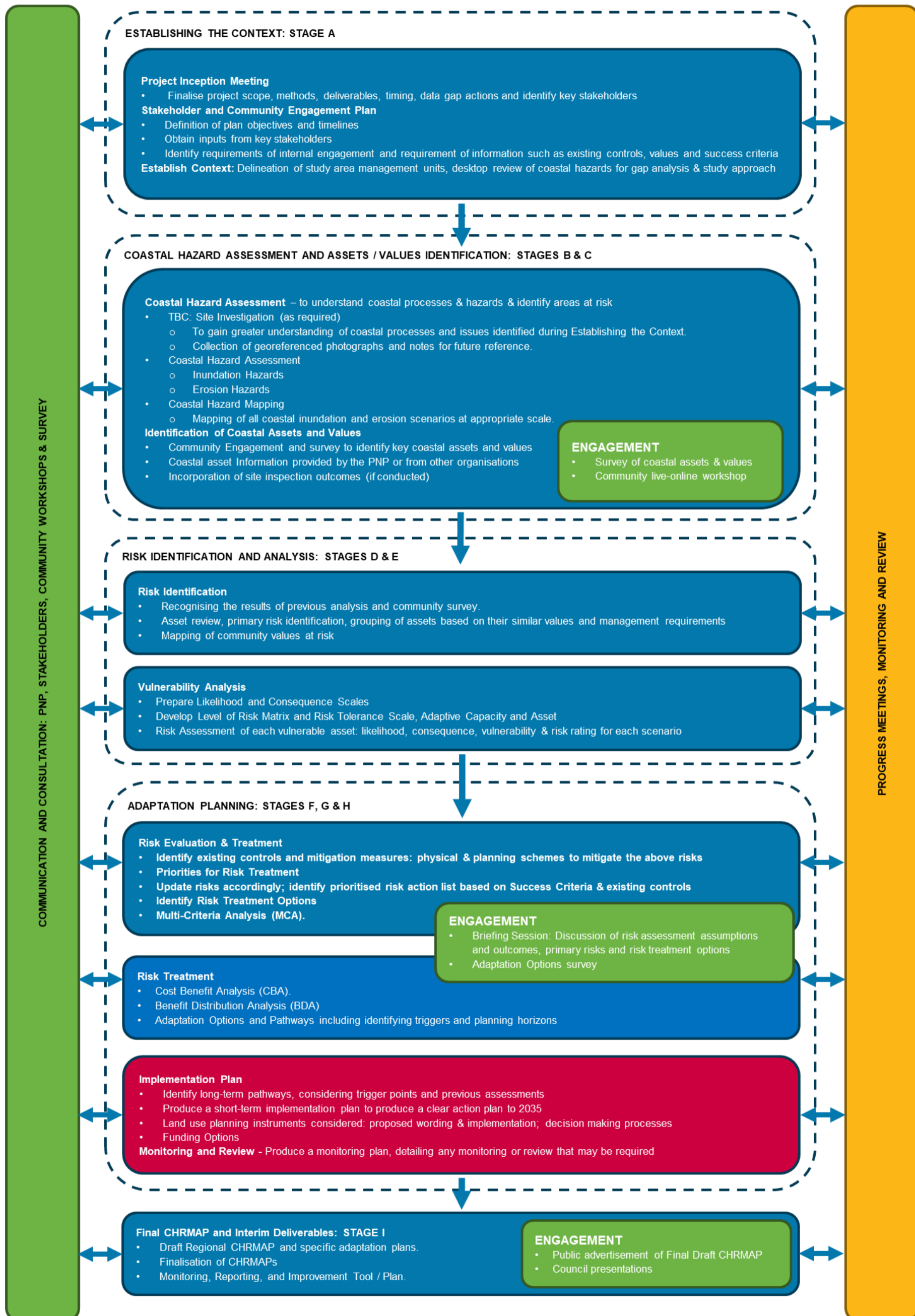


Figure 1-2 Methodology

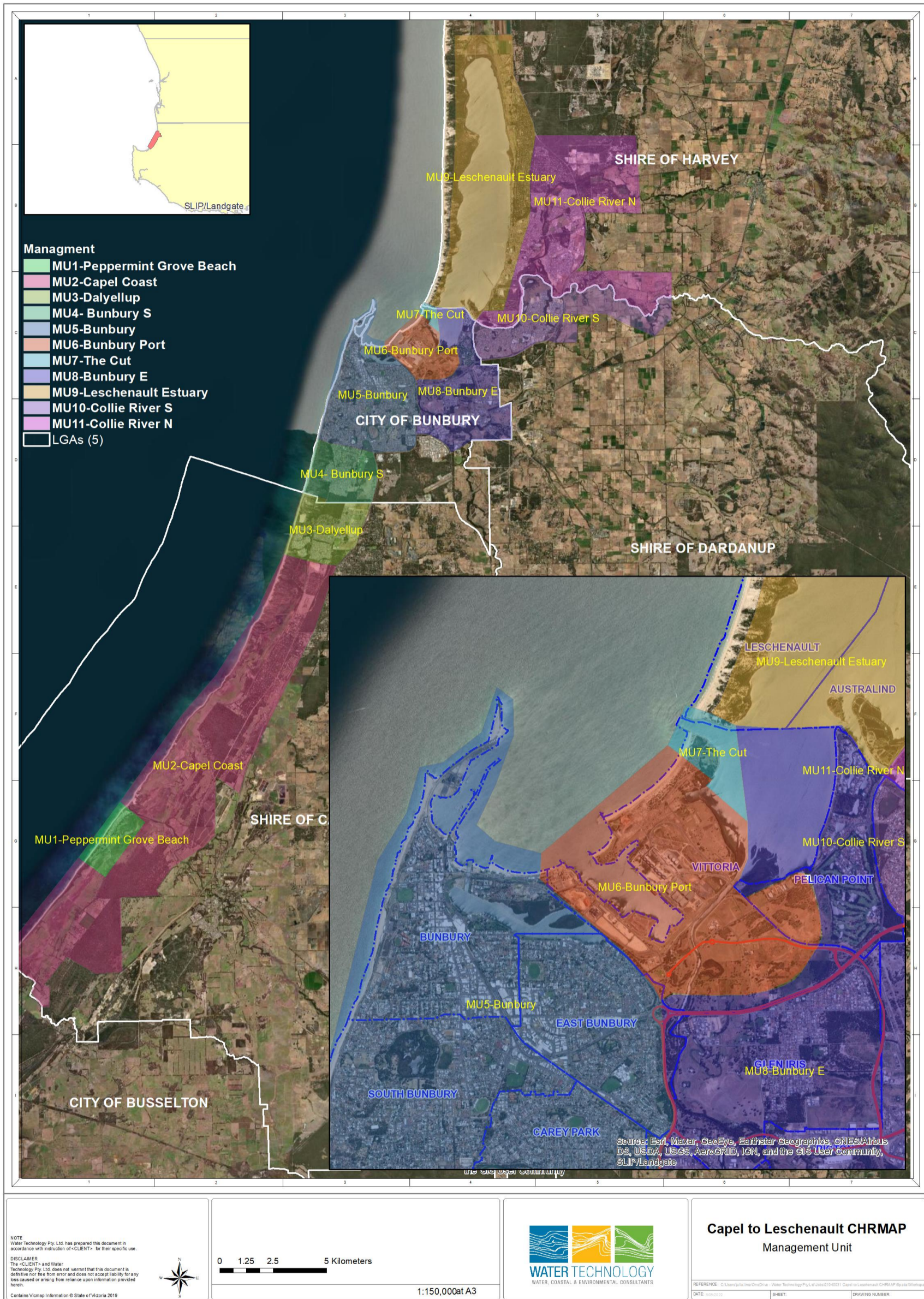


Figure 1-3 Study Area and Management Unit



2 LAND USE PLANNING INSTRUMENTS

There is a direct relationship between coastal hazard exposure and development. How buildings and assets are designed and located determines their exposure, ultimately impacting risk to people and property.

Therefore, the policy instruments that govern development is an important tool to use in reducing risk exposure. The following sections detail the relevant state and local measures that can be used to increase coastal resilience. In this section, the following land use planning instruments are described:

- Inclusion of coastal hazard exposure to be considered in **structure planning**
- Establishment of **Special Control Area/s** as an overlay to further regulate development in high exposure areas
- Inclusion of coastal hazard information for buyers through **Notifications on Titles** to increase awareness of hazard exposure and risk
- Establishment of a program for **Compulsory Acquisition** of land where coastal hazard risk is deemed intolerable for habitation
- **Reservation of Land** to prevent intensification or inappropriate land use in areas exposed to coastal hazard
- **Other instruments** such as leaseback arrangements and land swaps, which are presently conceptual however may become feasible as further investigation is completed over time.

Land use planning has an important role to play in increasing the resilience of coastal areas to sea level rise, storm-tide inundation, and erosion, as they govern how coastal areas are developed and managed.

2.1 General Land Use Planning Instruments

Western Australia has a well-established approach to coastal hazard planning via SPP 2.6 and CHRMAP Guideline, which refer to several planning instruments that can manage coastal hazards, as follows:

2.1.1 Reservation of Land

Land can be reserved for 'Foreshore'. This is particularly the case for public assets, where such a reservation would give rise to improved asset management and planning of the foreshore, including information about when and how to relocate public assets such as public amenities, seating, shelter, playground etc when they reach end of life.

Reservation of land is suitable across the CHRMAP area.

NB: It is noted that a Foreshore Reservation is not currently included in the Planning and Development (Local Planning Schemes) Regulations 2015 (Model Scheme Text), however, is currently being contemplated as part of the State's Planning Reform agenda to support this specific circumstance. The current process for gazetting a scheme has given rise to many varied reserves since the 2015 gazettal of that document, including several similar foreshore reserves.

2.1.2 Local Planning Scheme Amendments

2.1.2.1 Special Control Area

What is a SCA?



A Local Government Authority (LGA) may declare a Special Control Area (SCA) over areas that are regarded as significant and where special provisions may need to apply.

To enable targeted planning measures to be applied to locations with the highest coastal hazard exposure, a local planning scheme (LPS) amendment can be progressed. This should be informed by SPP 2.6, to classify vulnerable areas as a Special Control Area (SCA).

An SCA overlay typically includes a mapped area that special development conditions apply to. The requirements of a SCA apply in addition to the underlying planning controls dictated by the planning scheme and state framework, such as zoning, building requirements and matters of significance.

Why implement a SCA?

A coastal hazard SCA could be designed to address erosion or inundation separately or relate to combined coastal hazard risk. The effect of the SCA includes further development regulation to manage hazard exposure, which should be assessed on a case-by-case basis to control over the intensification of land where coastal risks are prominent. For example, a development that might otherwise be exempt from development approval would require a planning approval in addition to a building approval.

This may also include referencing a local planning policy to describe assessment procedures and development standards on land prone to coastal hazard, to provide government specific mechanisms for managing coastal risk in areas where it is most relevant.

Where would a coastal hazard SCA apply?

An SCA can facilitate land use changes and development control within that area. The SCA can be determined by the position of either the 2120 coastal processes setback line, or the inundation extent of the 500-year ARI event in the year 2120, whichever is the more landward.

An SCA should be applied to relate specifically to land subject to coastal processes (as recommended in WAPC, 2019). The SCA is allocated a number and depicted on the Scheme Map (as an overlay map).

A Special Control Area is suitable across the CHRMAP area. There may be some merit in consolidating the existing CSA for Flood Prone Areas in to the SCA for Coastal Hazard Planning. This will need to be investigated as the Flood Prone Areas SCA also sits within the Greater Bunbury Region Scheme.

2.1.2.2 Local Planning Policy (LPP)

LPPs are prepared and adopted according to the provisions in Part 2 Division 2 of the Deemed Provisions of the relevant local planning scheme. An LPP can be prepared in respect of any matter related to the planning and development of the Scheme area. The LPP may apply to a particular class or classes of matter specified in the policy and may apply to the whole of the Scheme area or to parts specified in the policy.

An LPP can provide more detail and guidance on what sort of development would be acceptable and will also assist the LGA in making planning decisions on coastal development requiring the exercise of discretion (e.g., it might specify appropriate design responses for individual development proposals; relocatable dwellings; prescribed setbacks; finished floor levels). The policy would further identify the Council's intention to require notifications on title as a condition of development approval.

A Local Planning Policy responsive to coastal hazard management is suitable across the CHRMAP area.



2.1.3 Notifications on Titles

Supported by a suitable SCA, there is an opportunity to require the provision of a Section 70A Notification on the Title of land as a condition of any planning approval to alert prospective purchasers of the potential coastal hazard impacts on the lot, as required by SPP2.6. These Notifications can only be applied where triggered by a Subdivision or Development Application. These can either be general alerts or more specific time-limited approvals (e.g., where the temporary use of land in hazard areas is allowed, where appropriate, until hazards materialise, while ensuring that the LGA maintains discretion over development in these areas).

The proponent may apply for an extension to the approval if the approval expires before hazards occur, whilst the LGA would be in a position to require demolition or removal of compromised structures if hazards occur ahead of the Notification timeframe. This option potentially supports landowners with larger risk appetites but may also be a source of future opportunities for conflicts, which will need ongoing management (funding, monitoring, reporting, etc.).

A Notice of Title planning instrument is suitable across the CHRMAP area and there may need to be some alignment with existing Notifications linked to the flood prone nature of some areas.

2.1.4 Compulsory Acquisition

Compulsory acquisition is an option where no other planning instrument has been able to suitably set aside land for coastal hazard processes, when hazards have advanced to a stage where land exceeds tolerable risk thresholds. This would require the reservation of land for public purposes via a scheme amendment. Options include:

- Purchase of the land by the LGA if the owner is willing to sell it by ordinary sale under Section 190 of the Planning and Development Act (2005) (PD Act)
- Compulsory taking by the LGA without agreement under Section 191 of the PD Act coupled with the Land Administration Act (1997).

If the land remains zoned (within an SCA overlay) then the above options are not available. This instrument should be carefully considered in relation to any protective structures being proposed.

2.1.5 Other Instruments

Innovative planning instruments, such as 'leaseback of land' and 'land swaps' may be considered. While there is growing interest in these and much work interstate on these matters, these instruments have not been tested in the WA planning context and are not explicitly provided for or anticipated under the State's current planning framework. However, some research into these treatments may be suitable and palatable for the community for locations where "coastal retreat" is possible to adjacent location (for the purpose of settlement relocation). In such a scenario, the nature of compensation may be limited to depreciating assets rather than the combination of land and structures.

Considerations of other instruments should be informed by research, implementation case studies from other locations, suitability to the local context, and receptiveness of decision-makers and the community.



2.1.6 Structure Planning

Structure Plans are prepared and approved prior to the subdivision or development of land in development areas identified within the Local Council Planning Scheme, or where required by WAPC.

In areas where further development or redevelopment of land is possible or anticipated, structure plans should incorporate the requirements of the CHRMAP, ensuring an appropriate coastal foreshore reserve is included, siting development outside of the hazard zone, particularly residential development, and avoiding or suitably filling low-lying areas to circumvent inundation impacts. This is important so as not to increase the number of buildings and assets that are exposed to coastal hazards, so resources can be focused on managing the residual risk existing development is exposed to.

2.2 LGA Specific Land Use Planning Instruments

2.2.1 Shire of Capel

The Shire of Capel has previously contemplated coastal planning and foreshore management principles in the Coastal Strategy 2005, Local Planning Strategy 2021, Local Planning Scheme No. 7 and the Peppermint Grove Land Use Strategy 2013. Many of the general recommendations remain relevant and are typical management actions (as opposed to planning recommendations). Some require minor amendment or review to improve clarity and strength, and these are noted in this implementation report. In addition, there is an urgent need to establish a response to coastal hazards within the Shire's town planning legislative framework.

There is urgent need to establish a response to coastal hazards within the Shire's planning legislative framework.

Structure Planning may be effective in the coastal zone where some property development is considered adjacent Peppermint Grove Beach (MU1), Dalyellup (MU3), or in future development opportunities along the Capel River, and in the low-lying area east of Peppermint Grove Beach (MU1 and MU2).

Recommended land use planning instruments are detailed in Table 2-1.

Table 2-1 Land use planning recommendations for the Shire of Capel

Action	Description	Timing	Cost
LU1	The Shire shall prepare an amendment to the Local Planning Scheme No. 8 to include provisions relating to the coastal erosion and inundation hazard zones to 2120 as identified in this study. The amendment shall be inserted at Schedule 6 – Special Control Areas, and a new line shall be added to the table to insert SCA9 – Coastal Hazard Risk Area. SCA9 shall read as per Table 2-2.	Immediate	N/A
LU2	The Shire shall prepare an amendment to the Local Planning Scheme No. 8 to include a Foreshore Reserve encompassing all public land under the control of the Shire (excluding public roads) within the coastal erosion and inundation hazard zones to 2120 as identified in this study.	Aligned with LU1	N/A



Action	Description	Timing	Cost
	<p>The amendment shall be inserted at Part 2 – Reserves Land, Clause 14 – Local Reserves (in Table 1). A new Reserve name shall be included and shall read: ‘Foreshore’</p> <p>The Foreshore Reserve should include the following objectives:</p> <ul style="list-style-type: none"> ▪ set aside areas for foreshore reserved abutting a body of water or water course ▪ provide for the protection of natural values and processes, including a coastal retreat ▪ to accommodate a range of active and passive recreational uses that would be capable of relocation or rehabilitation 		
LU3	<p>The Shire should prepare a Local Planning Policy (LPP) to be linked to the SCA under Local Planning Scheme No. 8 and provide guidance for applicants and decision-makers in relation to assessment procedures and development standards on land prone to coastal hazards, which may include recommended finished floor levels where impacted by inundation or siting of development to the least vulnerable portion of a lot for both erosion and inundation where possible. The LPP may also specify appropriate design responses for individual development proposals e.g., relocatable dwellings, prescribed setbacks and revegetation responses.</p>	Aligned with LU1	\$15,000
LU4	<p>In areas where further development or redevelopment of land is possible or anticipated, structure plans should incorporate the requirements of the CHRMAP, ensuring an appropriate coastal foreshore reserve is included and that any low-lying areas are adequately avoided or suitably filled to avoid inundation impacts. Existing and proposed structure plans should be reviewed to adhere to SPP2.6 and account for the risks identified in the CHRMAP</p>	At application	N/A
LU5	<p>The Shire shall notify all landholders that may be affected by coastal hazards by 2120 directly.</p> <p>Supported by a suitable SCA, there is an opportunity to require the provision of a Section 70A notification on the Title of land as a condition of any planning approval to alert prospective purchasers of the potential coastal hazard impacts on the lot, as required by SPP2.6. These notifications can only be applied where triggered by a Subdivision or Development Application. These can either be general alerts or more specific time limited approvals (e.g., where the temporary use of land in hazard areas is allowed, where appropriate, until hazards materialise, while ensuring that the Shire maintains discretion over development in these areas).</p> <p>The proponent may apply for an extension to the approval if the approval expires before hazards occur, whilst the Shire would be in a position to require demolition or removal of compromised structures if hazards occur ahead of predicted timeframe. This option potentially supports</p>	Immediate	<p>No cost to the Shire.</p> <p>The cost is borne by Landowners / land managers</p>



Action	Description	Timing	Cost
	landowners with larger risk appetites. The LPP should include details of this potential framework.		
LU6	The Shire should review existing leasehold facilities located within the hazard zone and notify the lessee of the CHRMAP. Leases should be reviewed at renewal timeframes to determine the suitability and/or length of future leases. The Foreshore Reservation in LU7 below establishes the zone of interest.	Immediate	N/A

Table 2-2 Content for Shire of Capel local planning scheme amendment appendix in accordance with LU1.

Item	Recommended Text
Name of Area	SCA 9 – Coastal Hazard Risk Area
Purpose	To identify areas subject to coastal erosion and inundation on the Scheme Map as a Special Control area and provide measures to ensure that land use and development within its boundaries are regulated and managed
Objectives	<ul style="list-style-type: none"> ▪ To ensure land in the coastal zone is continuously provided for coastal foreshore management, public access, recreation and conservation. ▪ To ensure public safety and reduce risk associated with coastal erosion and inundation. ▪ To avoid inappropriate land use and development of land at risk from coastal erosion and inundation. ▪ To ensure land use and development does not accelerate coastal erosion or inundation risks; or have a detrimental impact on the functions of public reserves. ▪ To ensure that development addresses the Capel to Leschenault Coastal Hazard Risk Management and Adaptation Plan 2023 prepared in accordance with State Planning Policy No. 2.6 State Coastal Planning Policy (as amended) and any relevant local planning policy.
Additional Provisions	<ol style="list-style-type: none"> 1. All proposed development within the SCA requires approval 2. In considering proposed structure plans, subdivision or development applications due regard shall be given to – <ol style="list-style-type: none"> a) the Capel to Leschenault Coastal Hazard Risk Management and Adaptation Plan 2023. b) State Planning Policy 2.6 -State Coastal Planning Policy; and c) Relevant local planning policies. 3. Where subdivision or development applications are received within SCA 9, the local government shall require a notification pursuant to section 70A of the Transfer of Land Act 1983 to be placed on the Certificate(s) of Title of the subject land, at the cost of the landowner and to the satisfaction of the local government. The notification is to read as follows for land within the coastal hazard area at 2050: <i>“Vulnerable Coastal Area – This lot is located in an area likely to be subject to coastal erosion and/or inundation over the next 100 years and is subject to conditions of development approval which require removal and/or rehabilitation of development to pre-development conditions if any one of the following events occurs:</i> <ol style="list-style-type: none"> a) <i>the most landward part of the Horizontal Shoreline Datum being within [insert here the distance equivalent of the S1 Erosion Allowance (allowance for the current risk of erosion) for the subject lot as per the Shire of Capel Coastal Hazard Risk Management Adaptation Plan as amended from time to time] metres of the most seaward part of the lot boundary.</i>



Item	Recommended Text
	<p>b) <i>a public road no longer being available or able to provide legal access to the property.</i></p> <p>c) <i>when water, sewerage or electricity to the lot is no longer available as they have been removed/decommissioned by the relevant authority due to coastal hazards.</i></p> <p>The notification is to read as follows for land within the coastal hazard area from 2051 - 2120:</p> <p><i>“Vulnerable Coastal Area – This lot is located in an area likely to be subject to coastal erosion and/or inundation over the next 100 years”</i></p> <p>4. Notwithstanding the provisions of above (1), (2) and (3) development approval is not required within SCA 9 for the following development if such development is otherwise exempt from requiring development approval under the Scheme:</p> <p>a) buildings or structures not used for human habitation.</p> <p>b) extensions to an existing single, grouped or multiple dwelling where the net floor area of the proposed extensions is no more than 50m²; and</p> <p>c) a change of use where no works are proposed.</p>
Advice Notes	<p>On the occasion of any development approval pursuant to the Additional Provisions of SCA 9, the following “Advice Notes” indicate suitable and tested advice to be provided to applicants:</p> <ul style="list-style-type: none"> ▪ The development subject of this approval may be impacted by coastal hazards in the short to medium term (likely by 2050). Should the development be affected by coastal hazards in the future as predicted, the development and any associated works are likely to require partial or complete relocation. The local government is under no obligation to assist or protect structures from coastal erosion/inundation threats and accepts no liability and will pay no costs associated with relocation or any protection from or damages caused by coastal processes. ▪ The applicant is advised that the Horizontal Shoreline Datum means the active limit of the shoreline under storm activity, as defined in State Planning Policy 2.6 – State Coastal Planning Policy. ▪ The applicant is advised that the [insert here <i>the distance equivalent of the S1 Erosion Allowance (allowance for the current risk of erosion) for the subject lot as per the Shire of Capel Coastal Hazard Risk Management Adaptation Plan as amended from time to time</i>] metre distance between the Horizontal Shoreline Datum and the most seaward part of the lot boundary is the S1 value for this location which is obtained from the Capel to Leschenault Coastal Hazard Risk Management Adaptation Plan 2023. S1 is the allowance for absorbing the current risk of storm erosion, as defined in State Planning Policy 2.6 – State Coastal Planning Policy (2013). ▪ Should the development be affected by Coastal Hazards in the future the landowner will be responsible for relocating/removing the development and all costs associated. The local government is under no obligation to assist or protect structures from coastal erosion/inundation threats and accepts no liability and will pay no costs associated with any protection from or damages caused by coastal processes. ▪ In relation to condition [x insert here], upon removal of the development the site is to be rehabilitated to pre-development condition which comprises of a bare earth lot, free of any buildings, demolition rubble or remnants of the approved development.



2.2.2 City of Bunbury

The City and its partners have acknowledged coastal based hazard for many decades since the flooding experienced from Cyclone Alby in 1978. Planning conditions have been used to support an ‘accommodate’ option in the suburb of East Bunbury since that time, with flood-prone land noted via planning instruments in the Greater Bunbury Region Scheme and the City’s Local Planning Scheme No. 8. A recent CHRMAP has also been prepared for Koombana Bay. The Koombana Bay, Casuarina Drive and Leschenault Inlet Master Plans refer to flooding and coastal vulnerability, as well as the importance of the waterfront environment.

■ ■ ■
There is urgent need to establish a response to coastal hazards within the City’s planning legislative framework.
■ ■ ■

However, few provisions exist within the City’s planning instruments to directly respond to the broader coastal hazard challenge and there is an urgent need to establish a response within the town planning legislative framework to best manage the challenge and make the associated risks more apparent / visible.

Structure Planning may be effective in the coastal zone where some property development or redevelopment may be considered in low lying areas along the Leschenault Inlet and Koombana Bay (MU5), however, the whole of the City is generally built out and unlikely to experience this pathway.

Recommended land use planning instruments are detailed in Table 2-3.

Table 2-3 Land use planning recommendations for the City of Bunbury

Action	Description	Timing	Cost
LU1	The City shall prepare an amendment to the Local Planning Scheme No. 8 to include provisions relating to the coastal erosion and inundation hazard zones to 2120 as identified in this study. The amendment shall be inserted Schedule 7 and shall read: <i>Coastal Hazard Risk Area Special Control Area</i> and include the information provided in Table 2-4.	Immediate	\$5,000
LU2	The City shall prepare an amendment to the Local Planning Scheme No. 8 to include a Foreshore Reserve encompassing all public land within the coastal erosion and inundation hazard zones to 2120 as identified in this study. The amendment shall be inserted at Part II – Reserves, Clause 14 (3). A new Reserve name shall be included and shall read: ‘Foreshore’ The Objectives of the reserve shall read: <ul style="list-style-type: none"> ▪ set aside areas for foreshore reserved abutting a body of water or water course ▪ provide for the protection of natural values and processes, including a coastal retreat ▪ to accommodate a range of active and passive recreational uses that would be capable of relocation or rehabilitation 	Aligned with LU1	\$5,000
LU3	The City should prepare a Local Planning Policy (LPP) to be linked to the SCA under Local Planning Scheme No. 8 and provide guidance for applicants and decision-makers in relation to assessment procedures and development standards on land prone to coastal hazards, which may include recommended finished floor levels where impacted by inundation or siting of development to the least vulnerable portion of a lot for both erosion and inundation where possible. The LPP may also	Aligned with LU1	\$25,000



Action	Description	Timing	Cost
	<p>specify appropriate design responses for individual development proposals e.g., relocatable dwellings, prescribed setbacks and revegetation responses.</p> <p>The preparation of the LPP should also comprise a review of design guidelines which are located within the same zone, such as the Grand Canals Design Guidelines, to ensure there is no misinterpretation of the role and power of each document. Consolidation is recommended where it can be achieved.</p>		
LU4	<p>In areas where further development or redevelopment of land is possible or anticipated, structure plans should incorporate the requirements of the CHRMAP, ensuring an appropriate coastal foreshore reserve is included and that any low-lying areas are adequately avoided or suitably filled to avoid inundation impacts. Existing and proposed structure plans should be reviewed to ensure they adhere to SPP2.6 and account for the risks identified in the CHRMAP.</p>	At application	N/A
LU5	<p>The City shall notify all landholders that may be affected by coastal hazards by 2120 directly.</p> <p>Supported by a suitable SCA, there is an opportunity to require the provision of a Section 70A notification on the Title of land as a condition of any planning approval to alert prospective purchasers of the potential coastal hazard impacts on the lot, as required by SPP2.6. These notifications can only be applied where triggered by a Subdivision or Development Application. These can either be general alerts or more specific time limited approvals (e.g., where the temporary use of land in hazard areas is allowed, where appropriate, until hazards materialise, while ensuring that the City maintains discretion over development in these areas).</p> <p>The proponent may apply for an extension to the approval if the approval expires before hazards occur, whilst the Shire would be in a position to require demolition or removal of compromised structures if hazards occur ahead of predicted timeframe. This option potentially supports landowners with larger risk appetites. The LPP should include details of this potential framework.</p>	Immediate	N/A
LU6	<p>The City should review existing leasehold facilities located within the hazard zone and notify the lessee of the CHRMAP. Leases should be reviewed at renewal timeframes to determine the suitability and/or length of future leases. The Foreshore Reservation in LU2 establishes the zone of interest.</p>	Immediate	N/A

Table 2-4 Content for City of Bunbury local planning scheme amendment appendix in accordance with LU1.

Item	Recommended Text
Name of Area	Coastal Hazard Risk Area Special Control Area
Purpose	To provide guidance for land use and development within areas subject to coastal erosion and inundation
Objectives	<ul style="list-style-type: none"> ▪ To ensure land in the coastal zone is continuously provided for coastal foreshore management, public access, recreation and conservation. ▪ To ensure public safety and reduce risk associated with coastal erosion and inundation.



Item	Recommended Text
	<ul style="list-style-type: none"> ▪ To avoid inappropriate land use and development of land at risk from coastal erosion and inundation. ▪ To ensure land use and development does not accelerate coastal erosion or inundation risks; or have a detrimental impact on the functions of public reserves. ▪ To ensure that development addresses the Capel to Leschenault Coastal Hazard Risk Management and Adaptation Plan 2023 prepared in accordance with State Planning Policy No. 2.6 State Coastal Planning Policy (as amended) and any relevant local planning policy.
Additional Provisions	<ol style="list-style-type: none"> 1. All proposed development within the SCA requires approval 2. In considering proposed structure plans, subdivision or development applications due regard shall be given to – <ol style="list-style-type: none"> a) the Capel to Leschenault Coastal Hazard Risk Management and Adaptation Plan 2023. b) State Planning Policy 2.6 - State Coastal Planning Policy; and c) Relevant local planning policies. 3. Where subdivision or development applications are received within SCA1, the local government shall require a notification pursuant to section 70A of the Transfer of Land Act 1983 to be placed on the Certificate(s) of Title of the subject land, at the cost of the landowner and to the satisfaction of the local government. The notification is to read as follows: <i>“Vulnerable Coastal Area – This lot is located in an area likely to be subject to coastal erosion and/or inundation over the next 100 years”</i> 4. Notwithstanding the provisions of above (1), (2) and (3) development approval is not required within SCA1 for the following development if such development is otherwise exempt from requiring development approval under the Scheme: <ol style="list-style-type: none"> a) temporary or non-permanent structures not used for human habitation. b) extensions to an existing single, grouped or multiple dwelling where the net floor area of the proposed extensions is no more than 50m²; and c) a change of use where no new structures are proposed.
Advice Notes	<p>On the occasion of any development approval pursuant to the Additional Provisions of SCA 1, the following “Advice Notes” indicate suitable and tested advice to be provided to applicants:</p> <ul style="list-style-type: none"> ▪ The development subject of this approval may be impacted by coastal hazards in the short to medium term (likely by 2050). Should the development be affected by coastal hazards in the future as predicted, the development and any associated works are likely to require partial or complete relocation. The local government is under no obligation to assist or protect structures from coastal erosion/inundation threats and accepts no liability and will pay no costs associated with relocation or any protection from or damages caused by coastal processes. ▪ The applicant is advised that the Horizontal Shoreline Datum means the active limit of the shoreline under storm activity, as defined in State Planning Policy 2.6 – State Coastal Planning Policy (2013). ▪ The applicant is advised that the [x insert here] metre distance between the Horizontal Shoreline Datum and the most seaward part of the lot boundary is the S1 value for this location which is obtained from the Capel to Leschenault Coastal Hazard Risk Management Adaptation Plan 2023. S1 is the allowance for absorbing the current risk



Item	Recommended Text
	<p>of storm erosion, as defined in State Planning Policy 2.6 – State Coastal Planning Policy (2013).</p> <ul style="list-style-type: none"> Should the development be affected by Coastal Hazards in the future the applicant will be responsible for relocating/removing the development and all costs associated. The local government is under no obligation to assist or protect structures from coastal erosion/inundation threats and accepts no liability and will pay no costs associated with any protection from or damages caused by coastal processes. In relation to condition [x insert here], upon removal of the development the site is to be rehabilitated to pre-development condition which comprises of a bare earth lot, free of any buildings, demolition rubble or remnants of the approved development.

2.2.3 Shire of Harvey

The Shire has previously contemplated coastal planning and foreshore management principles in its Local Planning Strategy, its District Planning Scheme No. 1 and its Shire of Harvey Coastal CHRMAP which deals with the open coastline area of the Shire (excluded from this study). In addition, a number of conditions limit development close to waterbodies for reasons of visual landscape amenity and to respond to known flooding issues which are also recognised in the Greater Bunbury Region Scheme.

There remains a need to establish a response to coastal hazards within the Shire's town planning legislative framework.

There remains a need to establish a response to coastal hazards within the Shire's town planning legislative framework, which is clear and reflects the outcomes of this CHRMAP and also comprises the recommendations of the Shire of Harvey Coastal CHRMAP.

Structure Planning may be effective in the coastal zone where some property development or redevelopment may be considered adjacent the Leschenault Estuary foreshore (Cathedral Avenue) and adjacent the Collie River (MU9 and MU11).

Recommended land use planning instruments are detailed in Table 2-5.

Table 2-5 Land use planning recommendations for the Shire of Harvey

Action	Description	Timing	Cost
LU1	<p>The Shire shall prepare an amendment to the District Planning Scheme No. 1 to include provisions relating to the coastal erosion and inundation hazard zones to 2120 as identified in this study and in the Shire of Harvey Coastal CHRMAP.</p> <p>The amendment shall insert a new Clause at <i>Part VIII – General Development Requirements, Clause 8.14</i> and shall read:</p> <p><i>8.14 Coastal Hazard Risk Area Special Control Area</i></p> <p><i>a) Coastal Hazard Risk Area (Special Control Area) shown on the Scheme Map as SCA with a [insert colour here] border and a number and included in Appendix 16 – Special Control Areas.</i></p> <p>The amendment shall also include insertion of Appendix 16 – Special Control Areas and include the information provided in Table 2-6.</p>	Immediate	\$15,000
LU2	<p>The Shire shall prepare an amendment to the District Planning Scheme No. 1 to include a Foreshore Reserve encompassing all public land within the coastal erosion and inundation hazard zones to 2120 as identified in this study, which is not included in the</p>	Aligned with LU1	\$5,000



Action	Description	Timing	Cost
	<p>Regional Open Space Regional Reserve within the Greater Bunbury Region Scheme.</p> <p>No amendment to the existing planning scheme text is required as the document does not reference these specifically, however, a new legend and mapping will be required for the relevant scheme maps.</p>		
LU3	<p>The Shire should prepare a Local Planning Policy (LPP) to be linked to the SCA under District Planning Scheme No. 1 and provide guidance for applicants and decision-makers in relation to assessment procedures and development standards on land prone to coastal hazards, which may include recommended finished floor levels where impacted by inundation or siting of development to the least vulnerable portion of a lot for both erosion and inundation where possible. The LPP may also specify appropriate design responses for individual development proposals e.g., relocatable dwellings, prescribed setbacks and revegetation responses.</p>	Aligned with LU1	\$15,000
LU4	<p>In areas where further development or redevelopment of land is possible or anticipated, structure plans should incorporate the requirements of the CHRMAP, ensuring an appropriate coastal foreshore reserve is included and that any low-lying areas are adequately avoided or suitably filled to avoid inundation impacts. Existing and proposed structure plans should be reviewed to ensure they adhere to SPP2.6 and account for the risks identified in the CHRMAP.</p>	At application	N/A
LU5	<p>The Shire shall notify all landholders that may be affected by coastal hazards by 2120 directly.</p> <p>Supported by a suitable SCA, there is an opportunity to require the provision of a Section 70A notification on the Title of land as a condition of any planning approval to alert prospective purchasers of the potential coastal hazard impacts on the lot, as required by SPP2.6. These notifications can only be applied where triggered by a Subdivision or Development Application. These can either be general alerts or more specific time limited approvals (e.g., where the temporary use of land in hazard areas is allowed, where appropriate, until hazards materialise, while ensuring that the City maintains discretion over development in these areas).</p> <p>The proponent may apply for an extension to the approval if the approval expires before hazards occur, whilst the Shire would be in a position to require demolition or removal of compromised structures if hazards occur ahead of predicted timeframe. This option potentially supports landowners with larger risk appetites. The LPP should include details of this potential framework.</p>	Immediate	N/A
LU6	<p>The Shire should review existing leasehold facilities located within the hazard zone and notify the lessee of the CHRMAP. Leases should be reviewed at renewal timeframes to determine the suitability and/or length of future leases. The Foreshore Reservation in LU7 below establishes the zone of interest.</p>	Immediate	N/A
LU7	<p>The Shire should undertake a review of its Local Planning Scheme generally, to provide for the updated Model Provisions</p>	In line with suitable timeframes	TBC (a broader review is



Action	Description	Timing	Cost
	<p>from the Planning and Development (Local Planning Schemes) Regulations 2015.</p> <p>During this review, the Foreshore Reserve noted in LU2 can be introduced in the model format, and should include the following objectives:</p> <ul style="list-style-type: none"> ▪ set aside areas for foreshore reserved abutting a body of water or water course ▪ provide for the protection of natural values and processes, including a coastal retreat ▪ to accommodate a range of active and passive recreational uses that would be capable of relocation or rehabilitation <p>In this review, a detailed consolidation of Clauses and provisions modelled on the current planning framework can be inserted.</p>	as required by the WAPC and orderly and proper planning	required based on the age of the existing scheme)
LU8	<p>Notwithstanding LU7, if the preparation of scheme amendments noted in LU1 and LU2 precede the scheme review recommended in LU7, the amendment should also comprise a review of other clauses within the existing scheme, to ensure there is no overlay between a number of clauses which would cause confusion or create onerous red tape. This includes consideration of Clause 7.2, 7.3, 8.8, Schedule 3 (3.7 Area 6). Schedule 4 (4.4), Schedule 6 (6.3) and Schedule 15 (Area 1 and Area 6). Consolidation is recommended where it can be achieved</p>	Aligned with LU1	\$5,000

Table 2-6 Content for Shire of Harvey local planning scheme amendment appendix in accordance with LU1.

Item	Recommended Text
Name of Area	SCA 1 – Coastal Hazard Risk Area
Purpose	To provide guidance for land use and development within areas subject to coastal erosion and inundation
Objectives	<ul style="list-style-type: none"> ▪ To ensure land in the coastal zone is continuously provided for coastal foreshore management, public access, recreation and conservation. ▪ To ensure public safety and reduce risk associated with coastal erosion and inundation. ▪ To avoid inappropriate land use and development of land at risk from coastal erosion and inundation. ▪ To ensure land use and development does not accelerate coastal erosion or inundation risks; or have a detrimental impact on the functions of public reserves. ▪ To ensure that development addresses the Capel to Leschenault Coastal Hazard Risk Management and Adaptation Plan 2023 prepared in accordance with State Planning Policy No. 2.6 State Coastal Planning Policy (as amended) and any relevant local planning policy.
Additional Provisions	<ol style="list-style-type: none"> 1. All proposed development within the SCA requires approval 2. In considering proposed structure plans, subdivision or development applications due regard shall be given to – <ol style="list-style-type: none"> a) the Capel to Leschenault Coastal Hazard Risk Management and Adaptation Plan 2023. b) State Planning Policy 2.6 -State Coastal Planning Policy; and



Item	Recommended Text
	<p>b) Relevant local planning policies.</p> <p>3. Where subdivision or development applications are received within SCA1, the local government shall require a notification pursuant to section 70A of the Transfer of Land Act 1983 to be placed on the Certificate(s) of Title of the subject land, at the cost of the landowner and to the satisfaction of the local government.</p> <p>The notification is to read as follows for land within the coastal hazard area at 2050: <i>“Vulnerable Coastal Area – This lot is located in an area likely to be subject to coastal erosion and/or inundation over the next 100 years and is subject to conditions of development approval which require removal and/or rehabilitation of development to pre-development conditions if any one of the following events occurs:</i></p> <p>a) <i>the most landward part of the Horizontal Shoreline Datum being within [x insert here] metres of the most seaward part of the lot boundary.</i></p> <p>b) <i>a public road no longer being available or able to provide legal access to the property.</i></p> <p>c) <i>when water, sewerage or electricity to the lot is no longer available as they have been removed/decommissioned by the relevant authority due to coastal hazards.”</i></p> <p>The notification is to read as follows for land within the coastal hazard area from 2051 - 2120: <i>“Vulnerable Coastal Area – This lot is located in an area likely to be subject to coastal erosion and/or inundation over the next 100 years”</i></p> <p>4. Notwithstanding the provisions of above (1), (2) and (3) development approval is not required within SCA1 for the following development if such development is otherwise exempt from requiring development approval under the Scheme:</p> <p>a) temporary or non-permanent structures not used for human habitation.</p> <p>b) extensions to an existing single, grouped or multiple dwelling where the net floor area of the proposed extensions is no more than 50m²; and</p> <p>c) a change of use where no new structures are proposed.</p>
Advice Notes	<p>On the occasion of any development approval pursuant to the Additional Provisions of SCA 1, the following “Advice Notes” indicate suitable and tested advice to be provided to applicants:</p> <ul style="list-style-type: none"> ▪ The development subject of this approval may be impacted by coastal hazards in the short to medium term (likely by 2050). Should the development be affected by coastal hazards in the future as predicted, the development and any associated works are likely to require partial or complete relocation. The local government is under no obligation to assist or protect structures from coastal erosion/inundation threats and accepts no liability and will pay no costs associated with relocation or any protection from or damages caused by coastal processes. ▪ The applicant is advised that the Horizontal Shoreline Datum means the active limit of the shoreline under storm activity, as defined in State Planning Policy 2.6 – State Coastal Planning Policy (2013). ▪ The applicant is advised that the [x insert here] metre distance between the Horizontal Shoreline Datum and the most seaward part of the lot boundary is the S1 value for this location which is obtained from the Capel to Leschenault Coastal Hazard Risk Management Adaptation Plan 2023. S1 is the allowance for absorbing the current risk of storm erosion, as defined in State Planning Policy 2.6 – State Coastal Planning Policy (2013).



Item	Recommended Text
	<ul style="list-style-type: none"> Should the development be affected by Coastal Hazards in the future the applicant will be responsible for relocating/removing the development and all costs associated. The local government is under no obligation to assist or protect structures from coastal erosion/inundation threats and accepts no liability and will pay no costs associated with any protection from or damages caused by coastal processes. In relation to condition [x insert here], upon removal of the development the site is to be rehabilitated to pre-development condition which comprises of a bare earth lot, free of any buildings, demolition rubble or remnants of the approved development.

NB: It is noted that the Shire of Harvey Coastal CHRMAP includes a recommendation to increase the regional open space reservation in the Greater Bunbury Region Scheme. This may not be necessary if the Foreshore reservation is included in the scheme amendment or scheme review for areas outside of the Regional Reservation. The Foreshore Reserve will ensure visibility of the foreshore management role of the reserve and not imply a 'recreational' component. Both actions should be considered together.

2.2.4 Shire of Dardanup

The Shire has previously contemplated management principles, with a particular focus on flooding impacts and reliance on the Greater Bunbury Region Scheme Floodplain Management Policy 2017. However, few provisions exist within the Shire's planning instruments to directly respond to the broader coastal hazard challenge and there is a need to establish a response within the town planning legislative framework to best manage the challenge and make the associated risks more apparent / visible.

Structure Planning may be effective in the riverine zone where some property development may be considered adjacent Collie River in Eaton North and along the Eaton foreshore where some large lots remain at Leake Street and closer to the Collie River mouth (MU10).

■ ■ ■
Coastal hazard management needs to be established in the planning legislative framework and improve the visibility coastal risk exposure.
■ ■ ■

Recommended land use planning instruments are detailed in Table 2-7.

Table 2-7 Land use planning recommendations for the Shire of Dardanup

Action	Description	Timing	Cost
LU1	<p>The Shire shall prepare an amendment to the Local Planning Scheme No. 3 to include provisions relating to the coastal erosion and inundation hazard zones to 2120 as identified in this study.</p> <p>The amendment shall be inserted at Clause 9.1 <i>Operation of Special Control Areas</i> of the current scheme. A new Clause 9.1.1 c) shall be inserted and shall read:</p> <p><i>c) Coastal Hazard Risk Area (Special Control Area) shown on the Scheme Map as SCA with a [insert colour here] border and a number and included in Appendix XV – Special Control Areas.</i></p> <p>The amendment shall also include insertion of Appendix XV – Special Control Areas and include the information provided in Table 2-8.</p>	Immediate	\$10,000
LU2	<p>The Shire shall prepare an amendment to the Local Planning Scheme No. 3 to include a Foreshore Reserve encompassing all public land within the coastal erosion and inundation hazard zones</p>	Aligned with LU1	\$5,000



Action	Description	Timing	Cost
	<p>to 2120 as identified in this study, which is not included in the Regional Open Space Regional Reserve within the Greater Bunbury Region Scheme.</p> <p>No amendment to the existing planning scheme text is required as the document does not reference these specifically, however, a new legend and mapping will be required for the relevant scheme maps.</p>		
LU3	<p>The Shire should prepare a Local Planning Policy (LPP) to be linked to the SCA under Local Planning Scheme No. 3 and provide guidance for applicants and decision-makers in relation to assessment procedures and development standards on land prone to coastal hazards, which may include recommended finished floor levels where impacted by inundation or siting of development to the least vulnerable portion of a lot for both erosion and inundation where possible. The LPP may also specify appropriate design responses for individual development proposals e.g., relocatable dwellings, prescribed setbacks and revegetation responses.</p>	Aligned with LU1	\$15,000
LU4	<p>In areas where further development or redevelopment of land is possible or anticipated, structure plans should incorporate the requirements of the CHRMAP, ensuring an appropriate coastal foreshore reserve is included and that any low-lying areas are adequately avoided or suitably filled to avoid inundation impacts. Existing and proposed structure plans should be reviewed to ensure they adhere to SPP2.6 and account for the risks identified in the CHRMAP.</p>	At application	N/A
LU5	<p>The Shire shall notify all landholders that may be affected by coastal hazards by 2120 directly.</p> <p>Supported by a suitable SCA, there is an opportunity to require the provision of a Section 70A notification on the Title of land as a condition of any planning approval to alert prospective purchasers of the potential coastal hazard impacts on the lot, as required by SPP2.6. These notifications can only be applied where triggered by a Subdivision or Development Application. These can either be general alerts or more specific time limited approvals (e.g., where the temporary use of land in hazard areas is allowed, where appropriate, until hazards materialise, while ensuring that the Shire maintains discretion over development in these areas).</p> <p>The proponent may apply for an extension to the approval if the approval expires before hazards occur, whilst the Shire would be in a position to require demolition or removal of compromised structures if hazards occur ahead of predicted timeframe. This option potentially supports landowners with larger risk appetites. The LPP should include details of this potential framework.</p>	Immediate	N/A
LU6	<p>The Shire should review existing leasehold facilities located within the hazard zone and notify the lessee of the CHRMAP. Leases should be reviewed at renewal timeframes to determine the suitability and/or length of future leases. The Foreshore Reservation in LU7 below establishes the zone of interest.</p>	Immediate	N/A
LU7	<p>The Shire should undertake a review of its Local Planning Scheme generally, to provide for the updated Model Provisions from the Planning and Development (Local Planning Schemes) Regulations 2015.</p>	In line with suitable timeframes as required	TBC (a broader review is required)



Action	Description	Timing	Cost
	<p>During this review, the Foreshore Reserve noted in LU2 can be introduced in the model format, and should include the following objectives:</p> <ul style="list-style-type: none"> ▪ set aside areas for foreshore reserved abutting a body of water or water course ▪ provide for the protection of natural values and processes, including a coastal retreat ▪ to accommodate a range of active and passive recreational uses that would be capable of relocation or rehabilitation <p>In this review, a detailed consolidation of Clauses and provisions modelled on the current planning framework can be inserted.</p>	by the WAPC and orderly and proper planning	based on the age of the existing scheme)
LU8	<p>Notwithstanding LU7, if the preparation of scheme amendments noted in LU1 and LU2 precede the scheme review recommended in LU7, the amendment should also comprise a review of other clauses within the existing scheme, to ensure there is no overlap between a number of clauses which may cause confusion or create onerous red tape. This includes consideration of Part 4 – Miscellaneous; Clause 4.6 Protection of Shores, Colie River Relief Floodway, Clause 4.9, and Floodway considerations in Appendix VIII – Additional Requirements – Small Holdings Zones (Area 9, 10 & 15). Consolidation is recommended where it can be achieved.</p>	Aligned with LU1	\$5,000

Table 2-8 Content for Shire of Dardanup local planning scheme amendment appendix in accordance with LU1.

Item	Recommended Text
Name of Area	SCA 1 – Coastal Hazard Risk Area
Purpose	To provide guidance for land use and development within areas subject to coastal erosion and inundation
Objectives	<ul style="list-style-type: none"> ▪ To ensure land in the coastal zone is continuously provided for coastal foreshore management, public access, recreation and conservation. ▪ To ensure public safety and reduce risk associated with coastal erosion and inundation. ▪ To avoid inappropriate land use and development of land at risk from coastal erosion and inundation. ▪ To ensure land use and development does not accelerate coastal erosion or inundation risks; or have a detrimental impact on the functions of public reserves. ▪ To ensure that development addresses the Capel to Leschenault Coastal Hazard Risk Management and Adaptation Plan 2023 prepared in accordance with State Planning Policy No. 2.6 State Coastal Planning Policy (as amended) and any relevant local planning policy.
Additional Provisions	<ol style="list-style-type: none"> 1. All proposed development within the SCA requires approval 2. In considering proposed structure plans, subdivision or development applications due regard shall be given to – <ol style="list-style-type: none"> a) the Capel to Leschenault Coastal Hazard Risk Management and Adaptation Plan 2023. b) State Planning Policy 2.6 -State Coastal Planning Policy; and c) Relevant local planning policies.



Item	Recommended Text
	<p>3. Where subdivision or development applications are received within SCA1, the local government shall require a notification pursuant to section 70A of the Transfer of Land Act 1983 to be placed on the Certificate(s) of Title of the subject land, at the cost of the landowner and to the satisfaction of the local government.</p> <p>The notification is to read as follows for land within the coastal hazard area at 2050: <i>“Vulnerable Coastal Area – This lot is located in an area likely to be subject to coastal erosion and/or inundation over the next 100 years and is subject to conditions of development approval which require removal and/or rehabilitation of development to pre-development conditions if any one of the following events occurs:</i></p> <ol style="list-style-type: none"> a) <i>the most landward part of the Horizontal Shoreline Datum being within [x insert here] metres of the most seaward part of the lot boundary.</i> b) <i>a public road no longer being available or able to provide legal access to the property.</i> c) <i>when water, sewerage or electricity to the lot is no longer available as they have been removed/decommissioned by the relevant authority due to coastal hazards.”</i> <p>The notification is to read as follows for land within the coastal hazard area from 2051 - 2120: <i>“Vulnerable Coastal Area – This lot is located in an area likely to be subject to coastal erosion and/or inundation over the next 100 years”</i></p> <p>4. Notwithstanding the provisions of above (1), (2) and (3) development approval is not required within SCA1 for the following development if such development is otherwise exempt from requiring development approval under the Scheme:</p> <ol style="list-style-type: none"> a) temporary or non-permanent structures not used for human habitation. b) extensions to an existing single, grouped or multiple dwelling where the net floor area of the proposed extensions is no more than 50m²; and c) a change of use where no new structures are proposed.
Advice Notes	<p>On the occasion of any development approval pursuant to the Additional Provisions of SCA 1, the following “Advice Notes” indicate suitable and tested advice to be provided to applicants:</p> <ul style="list-style-type: none"> ▪ The development subject of this approval may be impacted by coastal hazards in the short to medium term (likely by 2050). Should the development be affected by coastal hazards in the future as predicted, the development and any associated works are likely to require partial or complete relocation. The local government is under no obligation to assist or protect structures from coastal erosion/inundation threats and accepts no liability and will pay no costs associated with relocation or any protection from or damages caused by coastal processes. ▪ The applicant is advised that the Horizontal Shoreline Datum means the active limit of the shoreline under storm activity, as defined in State Planning Policy 2.6 – State Coastal Planning Policy (2013). ▪ The applicant is advised that the [x insert here] metre distance between the Horizontal Shoreline Datum and the most seaward part of the lot boundary is the S1 value for this location which is obtained from the Capel to Leschenault Coastal Hazard Risk Management Adaptation Plan 2023. S1 is the allowance for absorbing the current risk of storm erosion, as defined in State Planning Policy 2.6 – State Coastal Planning Policy (2013). ▪ Should the development be affected by Coastal Hazards in the future the applicant will be responsible for relocating/removing the development and all costs associated. The local government is under no obligation to assist or protect structures from coastal erosion/inundation threats and accepts no liability and will pay no costs associated with any protection from or damages caused by coastal processes.



Item	Recommended Text
	<ul style="list-style-type: none"><li data-bbox="320 315 1425 405">▪ In relation to condition [x insert here], upon removal of the development the site is to be rehabilitated to pre-development condition which comprises of a bare earth lot, free of any buildings, demolition rubble or remnants of the approved development.

NB: There will be some foreshore areas included in the regional open space reservation in the Greater Bunbury Region Scheme, where this CHRMAP recommends including the Foreshore reservation in the scheme amendment or scheme review for areas outside of the Regional Reservation. The Foreshore Reserve will ensure visibility of the foreshore management role of the reserve and not imply a 'recreational' component. Both actions should be considered together.



3 FUNDING OPTIONS

The Stage G Risk Treatment Report presents a summary of financial and economic implications to inform the local governments of the potential cost of coastal hazards over the planning timeframe and the cost to implement the recommended treatment Options. A summary of the costs of recommended Options is also provided for each MU in Section 8 of this report.

This section identifies all revenue-raising mechanisms available for obtaining funds to assist implementation. Funding mechanisms considered include:

- Operating budget, general rates and coastal management fund
- Special area rates / differential rating
- Yearly budgeting
- Levies
- Lease land management
- State grants
- Federal grants

3.1 Beneficiary (user) pays Operating Budget, General Rates and Coastal Management Fund

The individual land managers within the study area should consider establishing a coastal management fund that includes specific allowance for managing and adapting to the risk posed by coastal erosion and inundation. The purpose of this fund includes:

- To allocate a percentage of the organisation's operating budget for coastal management. The percentage and amounts will vary for each organisation but between 0.5% and 3.0% is proposed.
- To save funds routinely so that when triggers are met the established management actions can be implemented efficiently.
- Acknowledge coastal management costs are forecast to increase in line with sea level rise and the realisation of coastal hazard projections.

3.2 Specified Area Rate

Where adaptation Options are designed to protect specific sections of coastal land and assets, such as private property, it is recommended that the LGAs progress the establishment of a specified area rate. The rate can be applied to those beneficiaries within the 100-year hazard zone, and the amount raised should consider the estimated 100-year cost for each Option and the Benefit Distribution Analysis (BDA) report.

3.3 Levies

It is recommended the LGAs investigate the feasibility of establishing a particular levee for coastal management that would be a transparent source of the coastal management fund discussed above.

3.4 Lease Land Management

Coastal land vested with coastal managers in the study area and leased to third parties represents a unique scenario whereby implementation of some Options may require specific lease clauses, but there is also potential to raise funds for coastal management. During considerations of lease renewal, coastal managers should consider the land use, vulnerability of the land, projected timeframe of unacceptable vulnerability, length



of lease, recommended implementation Options and need for any specific clause around triggers or required management actions by the lessee. Increases in lease amounts may be able to raise funds to help offset the cost of management.

3.5 State Grants - CoastWA

CoastWA aims to implement a strategic response to the growing impacts of coastal hazards to ensure sustainable land use and development on the coast for the long-term. CoastWA has committed \$33.5 million of funding over five years from 2021-26. For further information visit <https://www.wa.gov.au/government/document-collections/coastwa-grants> It comprises the following grant programs:

- Coastal Adaptation and Protection grants
- Hotspot Coastal Adaptation and Protection Major Project Fund
- Coastwest grants
- Coastal Management Plan Assistance Program

There are also two other grant programs relevant to coastal hazard risk management in WA:

- Royalties for Regions
- Local Government Financial Assistance Grants

The Department of Transport administers the Coastal Adaptation and Protection (CAP) grants and the Hotspot Coastal Adaptation and Protection (H-CAP) Major Project Fund. CAP grants provide financial assistance for local projects that identify and manage coastal hazards. The program aims to build partnerships with local coastal managers, such as local governments and help them understand and adapt to coastal hazards. CAP Grants fund up to 50% of project costs. H-CAP supports projects which design and implement adaptation Options at coastal erosion hotspots identified by the DoT in recent years. Invitations to apply for H-CAP are sent directly to eligible coastal managers (those with a completed CHRMAP and an identified erosion hotspot) There are two identified erosion hotspots – The Cut in MU7 and Koombana Beach in MU5.

Coastwest grants support eligible coastal land managers and community organisations to undertake projects that manage and enhance WA's coastal environments through rehabilitation, restoration and preventative actions. Coastwest grants are administered by the Department of Planning, Lands and Heritage.

Coastal Management Plan Assistance Program (CMPAP) grants support eligible coastal land managers to develop adaptation and management plans and strategies for coastal areas that are, or are predicted to become, under pressure from a variety of challenges. CMPAP grants are administered by the Department of Planning, Lands and Heritage.

Other WA grant programs which may provide funding for coastal projects include Royalties for Regions and Local Government Financial Assistance Grants.

Royalties for Regions is facilitated by Department of Primary Industries and Regional Development and promotes and facilitates economic, business and social development in regional Western Australia for the benefit of all Western Australians. For further information visit: <http://www.drd.wa.gov.au/rfr/whatisrfr/Pages/default.aspx>

Local Government Financial Assistance Grants are administered by the Department of Local Government, Sport and Cultural Industries. They are grants funded by the Commonwealth Government and are distributed among 137 local governments in WA each year. The grants allow councils to spend the funds according to local priorities. For further information visit: <https://www.dlgsc.wa.gov.au/local-government/local-governments/financial-assistance-grants>



It should be noted that State funding mechanisms require matching cash contributions from the land manager, and as such, funding will still need to be sourced through one or more of the other available measures. State funding grants may also restrict access to funding where public monies would partially or predominantly benefit private landowners or users.

Because coastal hazards and coastal land management will continue to evolve and are unlikely to be resolved by 2026 (beyond the term of the CoastWA Grants), long-term sustainable funding is likely to be required from the State.

3.6 Federal Grants

Federal grants are variable and often unpredictable, but it is important for coastal managers to stay aware of any funding and grant programs available. Early planning and preparation will mean more-competitive applications can be prepared quickly when grants are announced.

On 13 February 2022 the Australian Government announced the \$50 million Coastal and Estuarine Risk Mitigation Program which is funded by the Emergency Response Fund. This program supports projects that reduce the impact of disasters on coastal communities. Successful applicants were announced on 4 November 2022. The Coastal and Estuarine Risk Mitigation Program will help drive long term resilience and sustainability by delivering priority projects that mitigate the impact of disasters on communities and economies.

Areas of focus for the Program include:

- Adaptation and resilience actions, including investment in grey infrastructure and green-blue infrastructure (which includes nature-based solutions)
- Planning, including local and regional risk assessments and mapping, business case development, preparation of community focused regional coastal management programs; and
- Investment in monitoring infrastructure and activities to understand the coastal and estuarine zone over time.

For more information visit <https://nema.gov.au/programs/emergency-response-fund/coastal-estuarine-risk-mitigation-program#Overview>

It should be noted that Federal funding mechanisms may require matching cash contributions from the land manager, and as such, funding may still need to be sourced through one or more of the other available measures. Federal funding grants may also restrict access to funding where public monies would partially or predominantly benefit private landowners or users.

3.7 Beneficiary (user) Pays

'User Pays' principles essentially dictate that the beneficiaries of adaptation Options should pay for them. Mechanisms for fund raising may include:

- Specified Area Rates – as described above and considering the findings of the BDA.
- Mechanisms for visitors to the town, as user of the coastline, to contribute. This could be in the form of a levee applied to their accommodation, or paid parking at key tourist sites.
- Developer contributions where specific developments benefit from their coastal location



4 STAKEHOLDER AND COMMUNITY ENGAGEMENT

Following development of draft recommended options for implementation a second meeting of the Coastal Community Advisory Group (CCAG) was held in November 2022. The intent of Meeting Two was to seek feedback on the project team final recommendations. The meeting confirmed many of the values of the broader community engagement and Meeting One outcomes. The meeting was also able to highlight a number of practical improvements to the CHRMAP documents, notably surrounding communication and engagement, which have been incorporated into updated versions. Ongoing education and engagement as noted in this report will build capacity in the community. Further detail on the second meeting of the CCAG is provided in 9Appendix A as part of the updated Engagement Summary Report.



5 SHORT-TERM IMPLEMENTATION

The coastal adaptation pathway includes short-term, medium-term and long-term actions. Short-term actions are anticipated to be implemented by 2035, corresponding to a 10-15 year planning horizon; medium-term actions implementation would occur before 2050 (15-30); while long-term actions would be implemented beyond 2050, towards 2120.

The proposed short-term coastal management actions (i.e. “Options”), for each Management Unit, are summarised in Section 8 and include the following information:

- Recommended risk treatment Options
- Responsibility – the entity will be the risk management owner
- Planning timeframe
- Approvals required
- Inclusion of trigger points and their monitoring requirements into planning schemes
- Costs
- Short-term actions were designed to be compatible with medium and long-term adaptation actions.

5.1 Key assumptions

The timeframes envisaged in the coastal adaptation pathways are not absolute. These timeframes are related to the current state of local land planning, coastal processes knowledge and climate projections, as outlined in the CHRMAP. Therefore, the timeframes are typically not aligned on “worst-case” scenarios but instead consider risk-adjusted and/or consensus-based adjustments and quantifications. Other Options may be envisaged, particularly if land planning practices, coastal processes knowledge or climate projections are changed. Therefore, the implementation pathway will evolve overtime.

The Options have been selected based on information gathered through all the previous CHRMAP project stages. Although the Multi-Criteria Analysis and Cost Benefit Analysis have been key gateway decision points for selecting many Options. The preparation of the MCA and CBA required interpretation and approximations, particularly regarding the criteria and cost quantifications, and have limitations. Also, the proposed Options have been developed only at a conceptual level to draw comparisons between several Options.

The CHRMAP proposed Options should be the subject of further investigations, surveys, policy review, environmental impact investigation, development approval and authorities endorsement, local stakeholder and community engagement, preliminary design, detailed design, costing and any other applicable preparation work required prior to be implemented. The Options should be optimised and modified following such additional investigations.

An example of this could be changes to Management Unit boundaries, to optimise Option effectiveness and to reduce costs. It may also be practical to develop a staged implementation approach to some of these management actions to test their effectiveness and to refine design of subsequent stages (e.g. staged installation of beach groynes). Some interim management Options may also be progressed, such as the development of emergency evacuation procedures and systems, until inundation protection measures can be fully implemented.

5.2 Further Investigations

Information gaps identified in the CHRMAP should be gathered early. Some of these gaps can be closed by the collection of data, as discussed further in Section 6. Other information gaps can be closed during the preliminary and/or detailed design phase when specific or detailed analysis of available data, information,



modelling, and projections are carried out. The "governance/support" role currently undertaken by the PNP should continue with funding support for coordination of coastal management, planning, engineering and research in the study area.

A number of the recommended investigations may already exist in LGA technical or planning documents. The CHRMAP recommended investigations have been scoped specifically to meet coastal hazard planning elements introduced in the State Coastal Planning Policy 2.6.

The following investigations are recommended:

1. Preparation of Asset Management Plans by each LGA, which identify existing infrastructure and recreational facilities in the coastal erosion and inundation hazard zone and provides direction to:
 - a. Progressively relocate non-critical assets (PMR2) away from the coastal hazard zone once they reach the end of asset life or replace assets with suitably durable and/or sacrificial infrastructure. This may include vulnerable recreational car parks; recreational amenities such as public ablutions; barbeque/picnic/shade areas; playground and other recreational equipment; and access structures such as ramps, stairs and paths and fences, etc.
 - b. Plan for the relocation of critical service infrastructure outside of the coastal hazard zone once they reach the end of asset life, or at a minimum, modify the service infrastructure asset so that it does not run parallel to the coastline where possible and can be progressively removed when exposed to intolerable risk levels. This may include public safety infrastructure.
2. Investigate opportunities for leaseback of land and land swaps in the context of planned and managed retreat. Seek legal advice regarding the basis of agreements with landholders and whether opt-ins can be time constrained.
3. Sand source feasibility study – Several MU's have recommended Options which require sand nourishment, both for erosion management (such as beach groynes including sand nourishment) and inundation management (such as raising beach levels to improve coastal drainage). The availability of suitable sand for beach nourishment works is unfortunately not well understood in the study area. It is recommended that a sand source feasibility is undertaken for the PNP to determine the capacity and cost of local sand supplies. This study should consider both land-based and marine sand sources as well as evaluate potential environmental impacts and approvals required. Cost estimates in this CHRMAP have assumed that a reliable source of sand in reasonable proximity to the study area may be available. If this assumption is incorrect, costs may increase and affect the CHRMAP recommendations.
4. Rock source feasibility study – Similar to the above but for armour rock suitable for building coastal management structures. Several MU's have recommended Options requiring armour rock which needs to be fit for purpose. An analysis of the availability of such rock suitable for marine works, with suitable density, quarry yields, close location and tolerable costs should be undertaken. Potential environmental impacts should be considered in the rock source feasibility study, as well as any approvals required. Cost estimates in this CHRMAP have assumed that a reliable source of rock can be found in the study area. If this assumption is incorrect, costs may increase and affect the CHRMAP recommendations.
5. Emergency evacuation planning – A review of emergency evacuation plans in the study area should be undertaken to assess if the evacuation plans are suitable for managing the projected coastal hazards. Existing documents may need to be updated or revised as required. Plans should detail emergency response to coastal erosion and flooding impacts, as well as storm damage causing infrastructure to collapse into the public foreshore or coastal environment. Evacuation planning for inundation should clearly identify appropriate evacuation routes, assess their suitability, and plan for upgrades required to meet future LGA developments. Scenario planning could also be undertaken to test the plans.



6. Foreshore Management Plans (FMPs) - Updated foreshore management plans for the study areas may increase the protective capacity of the natural dune system. Foreshore management plans should address:
 - a. The requirements of SPP2.6 and its supporting documentation
 - b. The findings of this CHRMAP
 - c. Potential environmental issues such as biodiversity and environmental impacts, and detail a weed management strategy for the coastline
 - d. Incorporate findings of Asset Management Plans as appropriate
 - e. Include recommendations for closing excess beach access points, ensuring appropriately fenced and signed paths, signage for dune repair and clear signage for 4-wheel drive access and permissibility
 - f. Develop an education strategy for coastal and environmental management. The strategy should work to inform the community about the CHRMAP and FMP and their findings and use suitable engagement methods such as infographics, FAQ's. The education strategy should also include appropriate on-ground signage and information for beach access, camping and 4-wheel driving, where applicable.
 - g. Monitor impacts of 4WD vehicles (where applicable) and general beach access on nesting habitats and migratory bird species in dune areas
 - h. Determine the need for a bush fire management plan for the dune and coastal areas
7. Coastal Hazard Mapping Study – the study partners should consider an advocacy program with the support of organisations such as the Western Australian Local Government Association (WALGA) and Local Government Planners Association (LGPA) to achieve a state-wide coastal mapping database similar to the Fire and Emergency Services (FESA) mapping of bushfire prone areas recognised as a result of applying *State Planning Policy 3.7: Planning in Bushfire Prone Areas*. Such mapping could become a vital knowledge-building tool for communities across the state coming to terms with increasing coastal hazards. NB: it is recognised that only areas where a CHRMAP has been completed and endorsed could be mapped accurately, however, other identified coastal hazard hotspots could be included in this mapping with future studies determining the extent of the coastal hazard risk area. This undertaking would complement the local-scale education strategies.



6 MONITORING

Monitoring is essential to managing coastal hazards, tracking when coastal hazards reach trigger points, understanding the coastline evolution, capturing changes to vulnerabilities and measuring the success of coastal management actions.

Coastal monitoring will inform the short-term implementation phase and increase the knowledge base for subsequent CHRMAP revisions and targeted investigations. The CHRMAP implementation report outlines:

- Review of existing coastal monitoring programs
- Review of coastal hazard projects outlined in erosion hazard assessment
- Recommend coastal monitoring activities to identify trigger points, to record dilapidation, to record when trigger points occur and to include indicative costs of monitoring works
- Recommend Trigger points
- Recommend CHRMAP review

6.1 Review of Existing Coastal Monitoring

The following coastal monitoring activities are currently undertaken in the study area and should be continued:

1. Beach width and photo monitoring led by the PNP
2. Oblique aerial photography twice per year – by PNP
3. Inundation extent monitoring – actively being prepared for by PNP
4. Shoreline vegetation movement analysis from aerial photos undertaken by DoT
5. Water level monitoring at the Bunbury Storm Surge Barrier undertaken by DoT
6. Wave monitoring by the Southern Ports, Bunbury
7. Bathymetric survey of entire study area to minimum 10m depth by DoT
8. Wind recording in Bunbury by the BOM

6.2 Recommended Coastal Monitoring Activities

The monitoring activities described below are designed to identify the impacts of the recommended Options and to record the evolution of the coastal trigger points. Indicative costs for budgeting purposes are provided.

Should any Option be modified, or other coastal projects be undertaken (such as maritime, or recreation/tourism projects) where coastal hazard risk management is not the primary focus, they should be subject to the same CHRMAP principles and require their own monitoring program appropriate to their location, size and objectives. The following coastal monitoring activities are recommended:

1. Routine beach and dune surveys, in the form of beach profiles, are recommended every six months, following the summer and winter seasons, every 400m along the coast. Beach profiles may be spaced more closely where Options include trigger points monitoring and/or to support specific project requirements. The beach survey may also be continuous along the coast using LiDAR or other appropriate technique with a view to capture more accurately coastal processing, while allowing the processing of beach profile data. At the minimum, beach profiles should be carried out every two years following winter. Additionally, surveys can be undertaken immediately following severe storms producing significant beach erosion. These are useful for recording historical events, confirming the presence of bedrock, and calibrating models. Beach profile datasets should include the location of the Horizontal Shoreline Datum (HSD). The beach profiles must extend from the edge of the coastal cadastral boundary down to the



Lowest Astronomical Tide (LAT). The survey datasets should be centralised into a database, which includes previous historical beach profiles and quality control information such as survey date, datum, survey mark, beach material encountered (rock vs sand) and method used.

2. Corresponding monitoring photos should be taken at the same time as beach surveys – particularly for inundation events as it is often impractical to organise detailed survey at short notice.
3. Regular monitoring of the coastal management structures (Protection Structure Audit – NR2) – e.g., seawalls, groynes, breakwaters and storm surge barrier. These should be undertaken with consistent methodology to allow comparison between inspections. These can be commenced immediately, and the initial assessment would identify an appropriate review schedule for each structure, or if there is an issue with an asset. Such assessment would occur yearly to blend into the existing LGA asset management reporting systems.
4. Geotechnical investigations are proposed to determine the presence of bedrock below the beach. When bedrock is located relatively near the surface, it can provide some natural protection to erosion and reduce the scope of works. However, in low-lying areas, the presence of bedrock may not significantly mitigate the coastal hazards. Such investigation may be carried out by ground penetration radar, test pits or survey observations following beach erosion events.

6.3 Trigger Points

The CHRMAP consider four types of trigger points, as follows:

- **Proximity trigger:** Where the most landward part of the Horizontal Shoreline Datum (HSD) is within the Storm Erosion Allowance of the most seaward point of a public asset of interest or private property lot boundary. Due to the high value of the foreshore reserve, the foreshore reserve may be considered to be “the most seaward point”. If individual assets have a specific distance-based trigger relating to the HSD then the beach and dune survey activities described above should be used to collect topographic data that can be used to map the updated HSD position.
- **Access trigger:** Where a public road is considered no longer available or able to provide legal access to the property
- **Utilities trigger:** When water, sewage, communications or electricity to the lot is no longer available as they have been removed/decommissioned by the relevant authority due to coastal hazards.
- **Damage trigger:** Any property within the hazard zone and within a dedicated Special Control Area, that is damaged by a coastal hazard from an extreme weather event shall require LGA approval before being repaired. The review process should involve re-fit of minor or moderately damaged assets to accommodate coastal hazards in the future; or removal and redevelopment outside the hazard zone for damaged assets.

This list follows a sequential / prioritisation order. That is, a “proximity trigger” is recommended over a “damage trigger”.

6.4 CHRMAP Review

This CHRMAP should be updated at least every 10 years to maintain currency and should be a “living document”. An earlier review should be considered when the following event occurs:

- Substantial storm events generating severe coastal hazards approaching or exceeding the CHRMAP projections
- Significant changes to land-use planning – such as complex amendments to a Local Planning Scheme or the Greater Bunbury Region Scheme, or the full review of either of these documents.



- New information becomes available which substantially affects the summary of local community values and assets (natural or built). This may typically occur when consulting the community regarding other documents such as the Local Planning Scheme or Foreshore Management Plan, or the occurrence of a significant storm event.
- Hazard modelling for the study area should be updated given any of the following:
 - recent data collection
 - planning changes
 - updates in climate change science, specifically local sea level rise projections
 - coastal engineering methodology
 - changes to the CHRMAP success criteria by coastal land managers
 - triggers are reached

Ongoing coastal management operations within the study area should consider the status of both short and long-term adaptation strategy progress, including assessment of the performance and review of any identified strategies.

Monitoring of CHRMAP outcomes, actions and future updates should always include consultation with stakeholders and the community to make sure any changes are communicated, and that the stakeholders positions are reflected in the coastal management outcomes.



7 MEDIUM AND LONG-TERM IMPLEMENTATION

Medium (15 – 30 years) and long-term (30 – 100 years) implementation provides a strategic consideration of how the PNP and its member organisations will adapt to long-term climate change impacts. Therefore, medium- and long-term implementation are not described in detail in the CHRMAP. Longer-term responses include:

- Actioning the revised planning instruments
- Managing coastal retreat
- Exhausting the SPP2.6 hierarchy of actions, high value assets may be protected where sustainable impacts and funding are identified/prioritised
- Providing temporary/interim hazard protection may also become more costly and a change in adaptation pathway could be required. For example, as sea level rise progresses, it is likely that Options using sand or rock resources to protect assets near the coast may become unsustainable.

Recommended medium and long-term actions are summarised in Section 8. In addition, long-term adaptation strategies/pathways have been recommended for each MU for both erosion and inundation that will allow for the continuous function of local communities whilst accommodating the increasing burden of coastal hazards. The long-term strategy informs future planning instruments, supports monitoring, recommends planning reviews and underpins collaboration between coastal land managers, stakeholders and the community.

The two primary coastal management actions mitigating erosion hazards are:

- Planned / Managed retreat (PMR4 – Voluntary Acquisition): Use the planning instruments and long-term plan to systematically move assets with low adaptive capacity out of the hazard zone
- Protect (several possible Options): Undertake works as necessary to prevent erosion to assets

The three coastal management actions mitigating inundation hazards are:

- Planned / Managed retreat (PMR4 – Voluntary Acquisition): Use the planning instruments and long-term plan to systematically move assets with low adaptive capacity out of the hazard zone
- Accommodate (Design Assets to Withstand Impacts – AC1): limit damage from inundation events through finished floor level requirements
- Protect (Levee / Barrier – PR6): Undertake works as necessary to prevent or limit inundation of assets exposed along the coast



8 RECOMMENDATIONS SUMMARY

All recommendations are provided in Table 8-1 to Table 8-11 for each individual MU. Note that inundation is not a concern for MU3 or MU4.



Table 8-1 MU1 Recommendations

Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
Recommended Short-Term Option to address Erosion is Planned / Managed Retreat – Voluntary Acquisition (PMR4)	<ul style="list-style-type: none"> Acquisition assumed in the same year as hazard line identifies parcels as vulnerable Coastal hazards impact few properties in the short term, so the focus is to manage foreshore reserves and coastal amenities, undertake coastal monitoring, and prepare for implementation in medium to long-term 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$13.1M at NPV 4% for whole 100-year timeframe 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 	x	x	x		
Recommended Short-Term Option to address Inundation is a Levee (PR6) in combination with MU2	<p>For MU1: To address the inundation of Stirling Wetland</p> <ul style="list-style-type: none"> Consider / masterplan for two levees on either side of the Capel River, each 2km long. Complete implementation by 2035 Included higher contingency (+50%) to cover additional environmental treatment, revegetation, local drainage challenges <p>For MU2: To address the inundation of Stirling Wetland:</p> <ul style="list-style-type: none"> Consider / masterplan for new culverts with one-way valves installed at Higgins Cut with some associated earthworks Higher contingency than usual (+50%) to cover additional environmental treatment, revegetation, local drainage challenges Complete installation by 2035 <p>To address coastal inundation at the Minnipup Drain Outlet, from flowing to connect with Stirling Wetlands:</p> <ul style="list-style-type: none"> Consider / masterplan for levee at 300m long Complete installation by 2035 This may be slower to implement than beach nourishment. Higher contingency than usual (+50%) to cover additional environmental treatment, revegetation, and local drainage challenges 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Confirmation of SLR in accordance with projections to 2035 Confirmation of approach through preliminary and detailed design 	<ul style="list-style-type: none"> \$4.7M at NPV 4% BDA analysis estimates a fair and reasonable breakdown of % costs to different benefiting parties is: <ul style="list-style-type: none"> Private Landholders at ~9% Shire at ~3% WA State Government at ~88% 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 			x	x	
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	<ul style="list-style-type: none"> Item cost for investigations and management plans 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$100,000 	<ul style="list-style-type: none"> Operational 	x	x			
Leaving assets unprotected (PMR1)	<ul style="list-style-type: none"> To 2035 for low-value public assets Assumes a clean-up rate following damage/loss No private land acquisition included Maintenance assumes ongoing allowance for foreshore reserve 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Storm damage 	<ul style="list-style-type: none"> \$415,000 (Plus 3% annual maintenance of \$12,450 pa) 	<ul style="list-style-type: none"> Operational 	x	x	x		



Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
Demolition / removal / relocation of asset from inside hazard area (PMR2)	<ul style="list-style-type: none"> Preparation of Asset Management Plan To 2035 for public-built assets Allows for removal of toilet block at Wave Walk Maintenance assumes ongoing allowance for foreshore reserve Removal / Relocation of assets as required 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Audit of assets within 2035 erosion and inundation hazard zone and identification of assets where damage would be unacceptable 	<ul style="list-style-type: none"> \$993,000 (Plus 1% annual maintenance of \$9,930 pa) 	<ul style="list-style-type: none"> Operational Grants 	x	x	x		
Prevention of further development / prohibit expansion of existing use rights (PMR3)	<ul style="list-style-type: none"> Item cost for investigations and management plans Investigate opportunities for leaseback of land and land swaps in the context of planned and managed retreat. Seek legal advice regarding the basis of agreements with landholders and whether opt-ins can be time constrained 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$100,000 (Plus 1% annual maintenance of \$1,000 pa) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
Design assets to withstand impacts (AC1)	<ul style="list-style-type: none"> Item cost for investigations and management plans – primarily any case-by-case work needed for public assets 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$200,000 (Plus 1% annual maintenance of \$2,000 pa) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
Monitoring (NR1)	<ul style="list-style-type: none"> Beach survey for storm behaviour and to track HSD and inundation levels Routine 6-monthly beach profiles following the summer and winter periods. Minimum every two years in Spring 	<ul style="list-style-type: none"> LGA Can seek support and assistance from DoT 	<ul style="list-style-type: none"> Completed CHRMAP Severe storm event(s) 	<ul style="list-style-type: none"> \$20,000 (Plus 10% annual maintenance of \$2,000 pa) 	<ul style="list-style-type: none"> Operational Grants 	x	x	x		
Notification on Title (NR3)	<ul style="list-style-type: none"> Item cost for investigations and implementation plans 	<ul style="list-style-type: none"> LGA Can seek support and assistance from DPLH, WALGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$250,000 (Plus 1% annual maintenance of \$2,500 pa) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
Emergency evacuation plans (NR4)	<ul style="list-style-type: none"> Item cost for investigations and evacuation plans 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$250,000 (Plus 1% annual maintenance of \$2,500 pa) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
INVESTIGATION 1 Sand Source Feasibility Study	<ul style="list-style-type: none"> Determine the capacity and cost of local sand supplies, including both land-based and marine sources Likely require repetition over Medium-term as market changes Focus for this MU is appropriate fill for inundation levee, but requirements of ad hoc sand nourishment and earthworks to raise land heights should be included 	<ul style="list-style-type: none"> LGA Can seek support from neighbouring LGA's, PNP, and state departments 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$30,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated to allow a larger budget which will reduce risk and increase confidence in the study outcomes 	<ul style="list-style-type: none"> Operational Grants 	x	x		x	
INVESTIGATION 2 Rock Source Feasibility Study	<ul style="list-style-type: none"> Analyse the availability of rock in terms of density, quarry yields, location and costs Likely require repetition over Medium-term as market changes Focus for this MU is smaller armour rocks that may be needed for embankments 	<ul style="list-style-type: none"> LGA Can seek support from neighbouring LGA's, PNP, and state departments 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$20,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x		x	



Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
INVESTIGATION 3 Update Foreshore Management Plans (FMPs)	<ul style="list-style-type: none"> An updated FMP could emphasise on the protective capacity of the natural dune system. FMP updates should address the requirements of SPP2.6 and incorporate the findings of this CHRMAP Prepare an updated Foreshore Management Plan and include recommendations for closing excess beach access points, appropriately fenced and signed paths, signed and patrolled vehicle and boat launching exclusion area and signage for dune repair 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$30,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x	x	x	x
Recommended Medium and Long-term pathway to address erosion is Planned / Managed Retreat – Voluntary Acquisition (PMR4)	<ul style="list-style-type: none"> Implement when triggers are met See explanation in Land Use Planning Section of this report 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> HSD within 14m of property boundary 	<ul style="list-style-type: none"> \$13.1M at NPV 4% over 100-year timeframe 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 				x	x
Recommended Medium and Long-term pathway to address Inundation is a Levee (PR6) in combination with MU2	<ul style="list-style-type: none"> Target 2035 installation Monitor and maintain infrastructure and carry out reviews in accordance with new information and CHRMAP updates. 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Updated CHRMAP 	<ul style="list-style-type: none"> Annual maintenance estimate of approximately \$0.1M pa 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 				x	x



Table 8-2 MU2 Recommendations

Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
Recommended Short-Term Option to address Erosion is Planned / Managed Retreat – Voluntary Acquisition (PMR4)	<ul style="list-style-type: none"> Acquisition assumed in same year as hazard line identifies parcels as vulnerable Coastal hazards impact few properties in the short term, so the focus is to manage foreshore reserves and coastal amenities, undertake coastal monitoring, and prepare for implementation in medium to long-term Properties affected in the Short-term are Agricultural/Rural. Case-by-case consideration is needed to consider infrastructure at risk. 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP HSD within 10-28m of property boundary – varies across MU. 	<ul style="list-style-type: none"> \$36.6M at NPV 4% over 100-year timeframe 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 	x	x	x		
Recommended Short-Term Option to address Inundation is a Levee (PR6) in combination with MU1	<p>For MU1: To address the inundation of Stirling Wetland</p> <ul style="list-style-type: none"> Consider / masterplan two levees either side of the Capel River, each 2km long 2035 implementation Higher contingency (+50%) to cover additional environmental treatment, revegetation, local drainage challenges <p>For MU2: To address the inundation of Stirling Wetland:</p> <ul style="list-style-type: none"> Assumes new culverts with one-way valves installed at Higgins Cut with some associated earthworks Higher contingency than usual (+50%) to cover any treatment, revegetation, local drainage challenges Assume 2035 installation <p>To address coastal inundation at the Minninup Drain Outlet, from flowing to connect with Stirling Wetlands:</p> <ul style="list-style-type: none"> Assumes levee at 300m long Assume 2035 implementation Higher contingency than usual (+50%) to cover additional environmental treatment, revegetation, and local drainage challenges 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Confirmation of Sea Level Rise (SLR) in accordance with projections to 2035 Confirmation of approach through preliminary and detailed design 	<ul style="list-style-type: none"> \$4.7M at NPV 4% BDA analysis estimates a breakdown of % costs to different benefiting parties should be: <ul style="list-style-type: none"> Private Landholders at ~9% Shire at ~3% WA State Government at ~88% 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 			x	x	
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	<ul style="list-style-type: none"> Item cost for investigations and management plans 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$150,000 	<ul style="list-style-type: none"> Operational 	x	x			
Leaving assets unprotected (PMR1)	<ul style="list-style-type: none"> To 2035 for low-value public assets Assumes a clean-up rate following damage/loss No private land acquisition included Maintenance assumes ongoing allowance for foreshore reserve 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Storm damage 	<ul style="list-style-type: none"> \$244,000 (Plus 3% annual maintenance of \$7,320 pa) 	<ul style="list-style-type: none"> Operational 	x	x	x		



Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
Demolition / removal / relocation of asset from inside hazard area (PMR2)	<ul style="list-style-type: none"> Preparation of Asset Management Plan To 2035 for public built assets Allows for removal of building at Wave Walk Maintenance assumes ongoing allowance for foreshore reserve Removal / Relocation of assets as required 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Audit of assets within 2035 erosion and inundation hazard zone and identification of assets where damage would be unacceptable 	<ul style="list-style-type: none"> \$537,000 (Plus 1% annual maintenance of \$5,370) 	<ul style="list-style-type: none"> Operational Grants 	x	x	x		
Prevention of further development / prohibit expansion of existing use rights (PMR3)	<ul style="list-style-type: none"> Item cost for investigations and management plans Investigate opportunities for leaseback of land and land swaps in the context of planned and managed retreat. Seek legal advice regarding the basis of agreements with land holders and whether opt-ins can be time constrained 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$100,000 (Plus 1% annual maintenance of \$1,000) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
Design assets to withstand impacts (AC1)	<ul style="list-style-type: none"> Item cost for investigations and management plans – primarily any case-by-case work needed for public assets 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$200,000 (Plus 1% annual maintenance of \$2,000) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
Monitoring (NR1)	<ul style="list-style-type: none"> Beach survey for storm behaviour and to track HSD and inundation levels Routine 6-monthly beach profile following the summer and winter periods. Minimum every two years in Spring 	<ul style="list-style-type: none"> LGA Can seek support and assistance from DoT 	<ul style="list-style-type: none"> Completed CHRMAP Severe storm event(s) 	<ul style="list-style-type: none"> \$20,000 (Plus 10% annual maintenance of \$2,000) 	<ul style="list-style-type: none"> Operational Grants 	x	x	x		
Notification on title (NR3)	<ul style="list-style-type: none"> Item cost for investigations and implementation plans 	<ul style="list-style-type: none"> LGA Can seek support and assistance from DPLH, WALGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$250,000 (Plus 1% annual maintenance of \$2,500) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
Emergency evacuation plans (NR4)	<ul style="list-style-type: none"> Item cost for investigations and evacuation plans 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$250,000 (Plus 1% annual maintenance of \$2,500) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
INVESTIGATION 1 Sand Source Feasibility Study	<ul style="list-style-type: none"> Determine the capacity and cost of local sand supplies, including both land-based and marine sources Likely require repetition over Medium-term Focus for this MU is appropriate fill for inundation levee, but requirements of ad hoc sand nourishment and earthworks to raise land heights should be included 	<ul style="list-style-type: none"> LGA Can seek support from neighbouring LGA's, PNP, and state departments 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$30,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x		x	
INVESTIGATION 2 Rock Source Feasibility Study	<ul style="list-style-type: none"> Analyse the availability of rock in terms of density, quarry yields, location and costs Likely require repetition over Medium-term Focus for this MU is smaller armour rock that may be needed for river and levee 	<ul style="list-style-type: none"> LGA Can seek support from neighbouring LGA's, PNP, and state departments 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$20,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x		x	



Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
INVESTIGATION 3 Update Foreshore Management Plans (FMPs)	<ul style="list-style-type: none"> Prepare an updated Foreshore Management Plan An updated FMP could help increase the protective capacity of the natural dune system. Updates should address the requirements of SPP2.6 and incorporate the findings of this CHRMAP 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$30,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x	x	x	x
Recommended Medium and Long-term pathway to address erosion is Planned / Managed Retreat – Voluntary Acquisition (PMR4)	<ul style="list-style-type: none"> Implement when triggers are met See explanation in Land Use Planning Section of this report 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> HSD within 10-28m of property boundary – varies across MU. 	<ul style="list-style-type: none"> \$36.6M at NPV 4% 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 				x	x
Recommended Medium and Long-term pathway to address Inundation is a Levee (PR6) in combination with MU2	<ul style="list-style-type: none"> Assumes 2035 installation as described in second row of this table Monitoring and maintenance of infrastructure and design reviews in accordance with new information and CHRMAP updates. 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Updated CHRMAP 	<ul style="list-style-type: none"> Annual maintenance estimate of approximately \$0.1M 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 				x	x



Table 8-3 MU3 Recommendations

Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
Recommended Short-Term Option to address Erosion is Planned / Managed Retreat – Voluntary Acquisition (PMR4)	<ul style="list-style-type: none"> Acquisition assumed in same year as hazard line identifies parcels as vulnerable Coastal hazards impact few properties in the short term, so the focus is to manage foreshore reserves and coastal amenities, undertake coastal monitoring, and prepare for implementation in medium to long-term 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP HSD within 24-29m of property boundary – varies across MU. 	<ul style="list-style-type: none"> \$10.6M at NPV 4% for whole 100-year timeframe 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 	x	x	x		
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	<ul style="list-style-type: none"> Item cost for investigations and management plans 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$150,000 	<ul style="list-style-type: none"> Operational 	x	x			
Leaving assets unprotected (PMR1)	<ul style="list-style-type: none"> To 2035 for low-value public assets Assumes a clean-up rate following damage/loss No private land acquisition included Maintenance assumes ongoing allowance for foreshore reserve 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Storm damage 	<ul style="list-style-type: none"> \$501,000 (Plus 3% annual maintenance of \$15,030) 	<ul style="list-style-type: none"> Operational 	x	x	x		
Demolition / removal / relocation of asset from inside hazard area (PMR2)	<ul style="list-style-type: none"> Preparation of Asset Management Plan To 2035 for public built assets Allows for removal of building at Wave Walk Maintenance assumes ongoing allowance for foreshore reserve Removal / Relocation of assets as required 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Audit of assets within 2035 erosion hazard zone and identification of assets where damage would be unacceptable 	<ul style="list-style-type: none"> \$1,102,000 (Plus 1% annual maintenance of \$11,020) 	<ul style="list-style-type: none"> Operational Grants 	x	x	x		
Prevention of further development / prohibit expansion of existing use rights (PMR3)	<ul style="list-style-type: none"> Item cost for investigations and management plans Investigate opportunities for leaseback of land and land swaps in the context of planned and managed retreat. Seek legal advice regarding the basis of agreements with land holders and whether opt-ins can be time constrained 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$100,000 (Plus 1% annual maintenance of \$1,000) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
Monitoring (NR1)	<ul style="list-style-type: none"> Beach survey for storm behaviour and to track HSD and inundation levels Routine 6-monthly beach profile following the summer and winter periods. Minimum every two years in Spring 	<ul style="list-style-type: none"> LGA Can seek support and assistance from DoT 	<ul style="list-style-type: none"> Completed CHRMAP Severe storm event(s) 	<ul style="list-style-type: none"> \$20,000 (Plus 10% annual maintenance of \$2,000) 	<ul style="list-style-type: none"> Operational Grants 	x	x	x		
Notification on title (NR3)	<ul style="list-style-type: none"> Item cost for investigations and implementation plans 	<ul style="list-style-type: none"> LGA Can seek support and assistance from DPLH, WALGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$250,000 (Plus 1% annual maintenance of \$2,500) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
INVESTIGATION 1 Sand Source Feasibility Study	<ul style="list-style-type: none"> Determine the capacity and cost of local sand supplies, including both land-based and marine sources Likely require repetition over Medium-term Focus for this MU is appropriate sand for ad hoc sand nourishment 	<ul style="list-style-type: none"> LGA Can seek support from neighbouring LGA's, PNP, and state departments 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$30,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 			x		



Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
INVESTIGATION 2 Update Foreshore Management Plans (FMPs)	<ul style="list-style-type: none"> Prepare an updated Foreshore Management Plan An updated FMP could help increase the protective capacity of the natural dune system. Updates should address the requirements of SPP2.6 and incorporate the findings of this CHRMAP 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$30,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x	x	x	x
Recommended Medium and Long-term pathway to address erosion is Planned / Managed Retreat – Voluntary Acquisition (PMR4)	<ul style="list-style-type: none"> Implement when triggers are met See explanation in Land Use Planning Section of this report 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> HSD within 24-29m of property boundary – varies across MU. 	<ul style="list-style-type: none"> \$10.6M at NPV 4% 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 				x	x



Table 8-4 MU4 Recommendations

Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
Recommended Short-Term Option to address Erosion is Planned / managed Retreat combining Leaving Assets Unprotected (PMR1); Removal of Assets from Inside Hazard Area (PMR2), and Prevention of Further Development (PMR3)	<ul style="list-style-type: none"> Audit of assets within 2035 erosion hazard zone and identification of assets where damage would be unacceptable to determine between PMR1 and PMR2 Investigation to determine acceptable foreshore amenity facilities within hazard zone 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> Included under component items below 	<ul style="list-style-type: none"> Operational Grants 	x	x	x		
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	<ul style="list-style-type: none"> Item cost for investigations and management plans 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$150,000 	<ul style="list-style-type: none"> Operational 	x	x			
Leaving assets unprotected (PMR1)	<ul style="list-style-type: none"> To 2035 for low-value public assets Assumes a clean-up rate following damage/loss No private land acquisition included Maintenance assumes ongoing allowance for foreshore reserve 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Storm damage 	<ul style="list-style-type: none"> \$59,000 (Plus 3% annual maintenance of \$1,770) 	<ul style="list-style-type: none"> Operational 	x	x	x		
Demolition / removal / relocation of asset from inside hazard area (PMR2)	<ul style="list-style-type: none"> Preparation of Asset Management Plan To 2035 for public built assets Allows for removal of building at Wave Walk Maintenance assumes ongoing allowance for foreshore reserve Removal / Relocation of assets as required 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Audit of assets within 2035 erosion hazard zone and identification of assets where damage would be unacceptable 	<ul style="list-style-type: none"> \$129,000 (Plus 1% annual maintenance of \$1,290) 	<ul style="list-style-type: none"> Operational Grants 	x	x	x		
Prevention of further development / prohibit expansion of existing use rights (PMR3)	<ul style="list-style-type: none"> Item cost for investigations and management plans Investigate opportunities for leaseback of land and land swaps in the context of planned and managed retreat. Seek legal advice regarding the basis of agreements with land holders and whether opt-ins can be time constrained 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$50,000 (Plus 1% annual maintenance of \$500) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
Monitoring (NR1)	<ul style="list-style-type: none"> Beach survey for storm behaviour and to track HSD and inundation levels Routine 6-monthly beach profiles following the summer and winter periods. Minimum every two years in Spring 	<ul style="list-style-type: none"> LGA Can seek support and assistance from DoT 	<ul style="list-style-type: none"> Completed CHRMAP Severe storm event(s) 	<ul style="list-style-type: none"> \$20,000 (Plus 10% annual maintenance of \$2,000) 	<ul style="list-style-type: none"> Operational Grants 	x	x	x		
Notification on title (NR3)	<ul style="list-style-type: none"> Item cost for investigations and implementation plans 	<ul style="list-style-type: none"> LGA Can seek support and assistance from DPLH, WALGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$50,000 (Plus 1% annual maintenance of \$500) 	<ul style="list-style-type: none"> Operational Grants 	x	x			



Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
INVESTIGATION 1 Sand Source Feasibility Study	<ul style="list-style-type: none"> Determine the capacity and cost of local sand supplies, including both land-based and marine sources Likely require repetition over Medium-term Focus for this MU is appropriate sand for ad hoc sand nourishment 	<ul style="list-style-type: none"> LGA Can seek support from neighbouring LGA's, PNP, and state departments 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$30,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x		x	
INVESTIGATION 2 Update Foreshore Management Plans (FMPs)	<ul style="list-style-type: none"> Prepare an updated Foreshore Management Plan An updated FMP could help increase the protective capacity of the natural dune system. Updates should address the requirements of SPP2.6 and incorporate the findings of this CHRMAP 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$30,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x	x	x	x
Recommended Medium and Long-term pathway to address Erosion is Planned / managed Retreat combining Leaving Assets Unprotected (PMR1); Removal of Assets from Inside Hazard Area (PMR2), and Prevention of Further Development (PMR3)	<ul style="list-style-type: none"> Implement when triggers are met See explanation in Land Use Planning Section of this report 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> HSD within 11m of low-value public assets, equivalent of approximately half of storm erosion allowance for this MU (21m) 	<ul style="list-style-type: none"> Included under component items 	<ul style="list-style-type: none"> Operational Grants 				x	x



Table 8-5 MU5 Recommendations

Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
Recommended Short-Term Option to address Erosion is Protection with Groynes (PR2)	<ul style="list-style-type: none"> Assumes 15 rock groynes 100m long, 400m apart 13 on ocean coast and 2 in Koombana Bay 2020 Implementation Interim management may use Beach Renourishment as temporary protection while implementation of primary option is organised 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP Monitoring Confirmation of design, costs and funding Construction likely to be staged 	<ul style="list-style-type: none"> \$83.5M at NPV 4% for whole 100-year timeframe Detailed design and costings estimated at \$250,000 BDA analysis estimates a fair and reasonable breakdown of % costs to different benefiting parties is: <ul style="list-style-type: none"> Private Landholders at ~3% City at ~64% WA State Government at ~34% 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 	x	x	x		
Recommended Short-Term Option to address Inundation is to replace storm surge barrier (PR6)	<ul style="list-style-type: none"> Replacement of storm surge barrier at the Leschenault Inlet 2035 Implementation 	<ul style="list-style-type: none"> State Government with DoT likely to be the lead agency with support by LGA 	<ul style="list-style-type: none"> Completed CHRMAP Monitoring Confirmation of design, costs and funding Confirmation of SLR in accordance with projections to 2035 	<ul style="list-style-type: none"> \$17.9M at NPV 4% Detailed design and costings estimated at \$250,000 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 	x	x	x		
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	<ul style="list-style-type: none"> Item cost for investigations and management plans 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$150,000 	<ul style="list-style-type: none"> Operational 	x	x			
Leaving assets unprotected (PMR1)	<ul style="list-style-type: none"> To 2035 for low-value public assets Assumes a clean-up rate following damage/loss No private land acquisition included Maintenance assumes ongoing allowance for foreshore reserve 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Storm damage Audit of assets within 2035 erosion and inundation hazard zone and identification of assets where damage would be unacceptable 	<ul style="list-style-type: none"> \$2,011,000 (Plus 3% annual maintenance of \$60,330) 	<ul style="list-style-type: none"> Operational 	x	x	x		
Demolition / removal / relocation of asset from inside hazard area (PMR2)	<ul style="list-style-type: none"> Preparation of Asset Management Plan To 2035 for public built assets Allows for removal of building at Wave Walk Maintenance assumes ongoing allowance for foreshore reserve Removal / Relocation of assets as required 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Audit of assets within 2035 erosion and inundation hazard zone and identification of assets where damage would be unacceptable 	<ul style="list-style-type: none"> \$4,506,000 (Plus 1% annual maintenance of \$45,060) 	<ul style="list-style-type: none"> Operational Grants 	x	x	x		



Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
Prevention of further development / prohibit expansion of existing use rights (PMR3)	<ul style="list-style-type: none"> Item cost for investigations and management plans Investigate opportunities for leaseback of land and land swaps in the context of planned and managed retreat. Seek legal advice regarding the basis of agreements with land holders and whether opt-ins can be time constrained 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$100,000 (Plus 1% annual maintenance of \$1,000) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
Design assets to withstand impacts (AC1)	<ul style="list-style-type: none"> Item cost for investigations and management plans – primarily any case-by-case work needed for public assets 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$500,000 (Plus 1% annual maintenance of \$5,000) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
Monitoring (NR1)	<ul style="list-style-type: none"> Beach survey for storm behaviour and to track HSD and inundation levels routine 6-monthly beach profile following the summer and winter periods. Minimum every two years in Spring 	<ul style="list-style-type: none"> LGA Can seek support and assistance from DoT 	<ul style="list-style-type: none"> Completed CHRMAP Severe storm event(s) 	<ul style="list-style-type: none"> \$30,000 (Plus 10% annual maintenance of \$3,000) 	<ul style="list-style-type: none"> Operational Grants 	x	x	x		
Protection Structure Audit (NR2)	<ul style="list-style-type: none"> Item cost to inspect condition, influence on sediment transport and inundation and remaining design life on all coastal management structures Includes ocean coast seawalls Outer Harbour breakwater and spur groynes, Casuarina Harbour breakwaters and causeway, Koombana Bay groynes and Dolphin Discovery Centre buried seawall 	<ul style="list-style-type: none"> LGA DoT Koombana Sailing Club Southern Ports, Bunbury 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$75,000 (Plus 2% annual maintenance of \$1,500) 	<ul style="list-style-type: none"> Operational Grants 		x	x		
Notification on title (NR3)	<ul style="list-style-type: none"> Item cost for investigations and implementation plans 	<ul style="list-style-type: none"> LGA Can seek support and assistance from DPLH, WALGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$250,000 (Plus 1% annual maintenance of \$2,500) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
Emergency evacuation plans (NR4)	<ul style="list-style-type: none"> Item cost for investigations and evacuation plans 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$250,000 (Plus 1% annual maintenance of \$2,500) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
INVESTIGATION 1 Sand Source Feasibility Study	<ul style="list-style-type: none"> Determine the capacity and cost of local sand supplies, including both land-based and marine sources Likely require repetition over Medium-term Focus for this MU is bulk sand nourishment for ocean coast, but should also consider the need for appropriate fill to raise height of land in inundation hazard zone 	<ul style="list-style-type: none"> LGA Can seek support from neighbouring LGA's, PNP, Southern Ports and state departments 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$60,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x		x	
INVESTIGATION 2 Rock Source Feasibility Study	<ul style="list-style-type: none"> Analyse the availability of rock in terms of density, quarry yields, location and costs Likely require repetition over Medium-term Focus for this MU is armour and core rock of all sizes 	<ul style="list-style-type: none"> LGA Can seek support from neighbouring LGA's, PNP, Southern Ports and state departments 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$60,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x		x	



Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
INVESTIGATION 3 Update Foreshore Management Plans (FMPs)	<ul style="list-style-type: none"> Prepare an updated Foreshore Management Plan An updated FMP could help increase the protective capacity of the natural dune system. Updates should address the requirements of SPP2.6 and incorporate the findings of this CHRMAP 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$30,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x	x	x	x
Recommended Medium and Long-term pathway to address Erosion is Protection with Groynes (PR2)	<ul style="list-style-type: none"> Monitoring will determine need for additional stages of groynes in future and the eventual need for major refurbishment or replacement of the structures and associated beach renourishment 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Monitoring Updated CHRMAP 	<ul style="list-style-type: none"> \$83.5M at NPV 4% for whole 100-year timeframe Annual maintenance estimate of approximately \$1.0M 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 				x	x
Recommended Medium and Long-term pathway to address Inundation is to replace storm surge barrier (PR6)	<ul style="list-style-type: none"> Monitoring and maintenance of infrastructure and design and performance reviews in accordance with new information and CHRMAP updates. Secondary components may include the need for additional levees and drainage improvements as sea level rise progresses 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Monitoring Updated CHRMAP 	<ul style="list-style-type: none"> Annual maintenance estimate of approximately \$0.25M 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 				x	x



Table 8-6 MU6 Recommendations

Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
Recommended Short-Term Option to address Erosion is Protection with Groynes (PR2)	<ul style="list-style-type: none"> Assumes 5 rock groynes 75m long, 300m apart along ocean coast: 800m revetment seawall along estuary coast 2035 Implementation 	<ul style="list-style-type: none"> Southern Ports, Bunbury LGA 	<ul style="list-style-type: none"> Completed CHRMAP Monitoring Confirmation of design, costs and funding Construction likely to be staged 	<ul style="list-style-type: none"> \$8.8M at NPV 4% for whole 100-year timeframe Detailed design and costings estimated at \$200,000 	<ul style="list-style-type: none"> Operational Grants 	x	x	x		
Recommended Short-Term Option to address Inundation is a Levee (PR6)	<ul style="list-style-type: none"> Assumes 700m levee to cover ocean frontage (400m east of port and 300m on west) Assume 2020 implementation Does not address inundation risk from estuary frontage. Further investigation is required as the broader PR6 Option comprising a new storm surge barrier at The Cut did not perform better than the base case for any discount rate 	<ul style="list-style-type: none"> Southern Ports, Bunbury 	<ul style="list-style-type: none"> Completed CHRMAP Monitoring Confirmation of design, costs and funding Confirmation of SLR in accordance with projections to 2035 	<ul style="list-style-type: none"> \$1.2M at NPV 4% Detailed design and costings estimated at \$150,000 Further Investigation of Options for inundation that come from estuary frontage - \$150,000 	<ul style="list-style-type: none"> Operational Grants 	x	x	x		
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	<ul style="list-style-type: none"> Item cost for investigations and management plans 	<ul style="list-style-type: none"> LGA Southern Ports, Bunbury 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$50,000 	<ul style="list-style-type: none"> Operational 	x	x			
Leaving assets unprotected (PMR1)	<ul style="list-style-type: none"> To 2035 for low-value public assets Assumes a clean-up rate following damage/loss No private land acquisition included Maintenance assumes ongoing allowance for foreshore reserve 	<ul style="list-style-type: none"> Southern Ports, Bunbury 	<ul style="list-style-type: none"> Storm damage Audit of assets within 2035 erosion and inundation hazard zone and identification of assets where damage would be unacceptable 	<ul style="list-style-type: none"> \$360,000 (Plus 3% annual maintenance of \$10,800) 	<ul style="list-style-type: none"> Operational 	x	x	x		
Demolition / removal / relocation of asset from inside hazard area (PMR2)	<ul style="list-style-type: none"> Preparation of Asset Management Plan To 2035 for public built assets Allows for removal of building at Wave Walk Maintenance assumes ongoing allowance for foreshore reserve Removal / Relocation of assets as required 	<ul style="list-style-type: none"> Southern Ports, Bunbury 	<ul style="list-style-type: none"> Audit of assets within 2035 erosion and inundation hazard zone and identification of assets where damage would be unacceptable 	<ul style="list-style-type: none"> \$791,000 (Plus 1% annual maintenance of \$7,910) 	<ul style="list-style-type: none"> Operational Grants 	x	x	x		
Prevention of further development / prohibit expansion of existing use rights (PMR3)	<ul style="list-style-type: none"> Item cost for investigations and management plans Investigate opportunities for leaseback of land and land swaps in the context of planned and managed retreat. Seek legal advice regarding the basis of agreements with land holders and whether opt-ins can be time constrained For this MU controlled by Southern Ports, Bunbury it is envisaged the work may incorporate appropriate clauses into operational and strategic planning and lease conditions. 	<ul style="list-style-type: none"> Southern Ports, Bunbury 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$30,000 (Plus 1% annual maintenance of \$3,000) 	<ul style="list-style-type: none"> Operational Grants 	x	x			



Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
Design assets to withstand impacts (AC1)	<ul style="list-style-type: none"> Item cost for investigations and management plans – primarily any case-by-case work needed for public assets 	<ul style="list-style-type: none"> Southern Ports, Bunbury 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$100,000 (Plus 1% annual maintenance of \$1,000) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
Monitoring (NR1)	<ul style="list-style-type: none"> Beach survey for storm behaviour and to track HSD and inundation levels Routine 6-monthly beach profiles following the summer and winter periods. Minimum every two years in Spring 	<ul style="list-style-type: none"> Southern Ports, Bunbury Can seek support and assistance from LGA, DoT 	<ul style="list-style-type: none"> Completed CHRMAP Severe storm event(s) 	<ul style="list-style-type: none"> \$10,000 (Plus 10% annual maintenance of \$1,000) 	<ul style="list-style-type: none"> Operational Grants 	x	x	x		
Protection Structure Audit (NR2)	<ul style="list-style-type: none"> Item cost to inspect condition, influence on sediment transport and inundation and remaining design life on all coastal management structures Includes Port seawall and Port Breakwaters for Inner Harbour 	<ul style="list-style-type: none"> Southern Ports, Bunbury 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$50,000 (Plus 2% annual maintenance of \$1,500) 	<ul style="list-style-type: none"> Operational Grants 		x	x		
Notification on title (NR3)	<ul style="list-style-type: none"> Item cost for investigations and implementation plans For this MU controlled by Southern Ports, Bunbury it is envisaged the work may incorporate appropriate clauses into operational and strategic planning and lease conditions. 	<ul style="list-style-type: none"> Southern Ports, Bunbury Can seek support and assistance from LGA, DPLH, WALGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$50,000 (Plus 1% annual maintenance of \$500) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
Emergency evacuation plans (NR4)	<ul style="list-style-type: none"> Item cost for investigations and evacuation plans 	<ul style="list-style-type: none"> Southern Ports, Bunbury 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$100,000 (Plus 1% annual maintenance of \$1,000) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
INVESTIGATION 1 Sand Source Feasibility Study	<ul style="list-style-type: none"> Determine the capacity and cost of local sand supplies, including both land-based and marine sources Likely require repetition over Medium-term Focus for this MU is sand nourishment for Southern Ports ocean and estuary frontage, but should also consider the need for appropriate fill to raise height of land in inundation hazard zone 	<ul style="list-style-type: none"> Southern Ports, Bunbury Can seek support from neighbouring LGA's, PNP, Southern Ports and state departments 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$40,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x		x	
INVESTIGATION 2 Rock Source Feasibility Study	<ul style="list-style-type: none"> Analyse the availability of rock in terms of density, quarry yields, location and costs Likely require repetition over Medium-term Focus for this MU is armour and core rock of all sizes 	<ul style="list-style-type: none"> LGA Can seek support from neighbouring LGA's, PNP, and state departments 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$40,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x		x	



Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
INVESTIGATION 3 Update Foreshore Management Plans (FMPs)	<ul style="list-style-type: none"> Prepare an updated Foreshore Management Plan An updated FMP could help increase the protective capacity of the natural dune system. Updates should address the requirements of SPP2.6 and incorporate the findings of this CHRMAP For this MU controlled by Southern Ports Bunbury it is envisaged the work may incorporate appropriate clauses into operational and strategic planning and lease conditions as well as a joint approach with neighbouring LGA's. 	<ul style="list-style-type: none"> Southern Ports, Bunbury LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$30,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x	x	x	x
Recommended Medium and Long-term pathway to address Erosion is Protection with Groynes (PR2)	<ul style="list-style-type: none"> Monitoring will determine need for additional stages of groynes in future and the eventual need for major refurbishment or replacement of the structures and associated beach renourishment 	<ul style="list-style-type: none"> Southern Ports, Bunbury LGA 	<ul style="list-style-type: none"> Monitoring Updated CHRMAP 	<ul style="list-style-type: none"> \$8.8M at NPV 4% for whole 100-year timeframe Annual maintenance estimate of approximately \$0.2M 	<ul style="list-style-type: none"> Operational Grants 				x	x
Recommended Medium and Long-term pathway to address Inundation is a Levee (PR6)	<ul style="list-style-type: none"> Monitoring and maintenance of infrastructure and design and performance reviews in accordance with new information and CHRMAP updates. Secondary components may include the need for additional levees and drainage improvements as sea level rise progresses 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Monitoring Updated CHRMAP 	<ul style="list-style-type: none"> Annual maintenance estimate of approximately \$20,000 	<ul style="list-style-type: none"> Operational Grants 				x	x



Table 8-7 MU7 Recommendations

Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
Recommended Short-Term Option to address Erosion is Protection with Groynes (PR2)	<ul style="list-style-type: none"> Assumes 2 rock groynes 75m long on ocean-side beach: 320m revetment seawall along estuary coast 2050 Implementation Only monitoring and confirmation of concept design required in short-term 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP Monitoring Confirmation of design, costs and funding Construction likely to be staged 	<ul style="list-style-type: none"> \$2.0M at NPV 4% for whole 100-year timeframe Detailed design and costings estimated at \$200,000 	<ul style="list-style-type: none"> Operational Grants Levies 	x	x	x		
Recommended Short-Term Option to address Inundation is Design assets to withstand impacts (AC1)	<ul style="list-style-type: none"> See AC1 	<ul style="list-style-type: none"> See AC1 	<ul style="list-style-type: none"> See AC1 	<ul style="list-style-type: none"> See AC1 	<ul style="list-style-type: none"> Operational Grants Levies 	x	x	x		
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	<ul style="list-style-type: none"> Item cost for investigations and management plans 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$50,000 	<ul style="list-style-type: none"> Operational 	x	x			
Leaving assets unprotected (PMR1)	<ul style="list-style-type: none"> To 2035 for low-value public assets Assumes a clean-up rate following damage/loss No private land acquisition included Maintenance assumes ongoing allowance for foreshore reserve 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Storm damage Audit of assets within 2035 erosion and inundation hazard zone and identification of assets where damage would be unacceptable 	<ul style="list-style-type: none"> \$88,000 (Plus 3% annual maintenance of \$2,640) 	<ul style="list-style-type: none"> Operational 	x	x	x		
Demolition / removal / relocation of asset from inside hazard area (PMR2)	<ul style="list-style-type: none"> Preparation of Asset Management Plan To 2035 for public built assets Allows for removal of building at Wave Walk Maintenance assumes ongoing allowance for foreshore reserve Removal / Relocation of assets as required 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Audit of assets within 2035 erosion and inundation hazard zone and identification of assets where damage would be unacceptable 	<ul style="list-style-type: none"> \$194,000 (Plus 1% annual maintenance of \$1,940) 	<ul style="list-style-type: none"> Operational Grants 	x	x	x		
Design assets to withstand impacts (AC1)	<ul style="list-style-type: none"> Item cost for investigations and management plans – primarily any case-by-case work needed for public assets 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$50,000 (Plus 1% annual maintenance of \$5,00) 	<ul style="list-style-type: none"> Operational Grants Levies 	x	x	x		
Monitoring (NR1)	<ul style="list-style-type: none"> Beach survey for storm behaviour and to track HSD and inundation levels Routine 6-monthly beach profiles following the summer and winter periods. Minimum every two years in Spring 	<ul style="list-style-type: none"> LGA Can seek support and assistance from Southern Ports, Bunbury and DoT 	<ul style="list-style-type: none"> Completed CHRMAP Severe storm event(s) 	<ul style="list-style-type: none"> \$20,000 (Plus 10% annual maintenance of \$2,000) 	<ul style="list-style-type: none"> Operational Grants 	x	x	x		
Protection Structure Audit (NR2)	<ul style="list-style-type: none"> Item cost to inspect condition, influence on sediment transport and inundation and remaining design life on all coastal management structures Includes structures at The Cut 	<ul style="list-style-type: none"> To be confirmed between: <ul style="list-style-type: none"> LGA's DoT DBCA Southern Ports, Bunbury 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$50,000 (Plus 2% annual maintenance of \$1,500) 	<ul style="list-style-type: none"> Operational Grants 		x	x		



Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
Notification on title (NR3)	<ul style="list-style-type: none"> Item cost for investigations and implementation plans 	<ul style="list-style-type: none"> LGA Can seek support and assistance from DPLH, WALGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$50,000 (Plus 1% annual maintenance of \$500) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
INVESTIGATION 1 Sand Source Feasibility Study	<ul style="list-style-type: none"> Determine the capacity and cost of local sand supplies, including both land-based and marine sources Likely require repetition over Medium-term Focus for this MU is sand nourishment for ocean and estuary frontage, but should also consider the need for appropriate fill to raise height of land in inundation hazard zone 	To be confirmed between: <ul style="list-style-type: none"> LGA's DoT DBCA Southern Ports, Bunbury 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$30,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x		x	
INVESTIGATION 2 Rock Source Feasibility Study	<ul style="list-style-type: none"> Analyse the availability of rock in terms of density, quarry yields, location and costs Likely require repetition over Medium-term Focus for this MU is armour and core rock of all sizes 	To be confirmed between: <ul style="list-style-type: none"> LGA's DoT DBCA Southern Ports, Bunbury 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$60,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x		x	
INVESTIGATION 3 Update Foreshore Management Plans (FMPs)	<ul style="list-style-type: none"> Prepare an updated Foreshore Management Plan An updated FMP could help increase the protective capacity of the natural dune system. Updates should address the requirements of SPP2.6 and incorporate the findings of this CHRMAP For this MU a joint approach with Southern Ports Bunbury is recommended. 	<ul style="list-style-type: none"> LGA Southern Ports, Bunbury 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$30,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x	x	x	x
Recommended Medium and Long-term pathway to address Erosion is Protection with Groynes (PR2)	<ul style="list-style-type: none"> Monitoring will determine need for additional stages of groynes in future and the eventual need for major refurbishment or replacement of the structures and associated beach renourishment 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Monitoring Updated CHRMAP 	<ul style="list-style-type: none"> \$2.0M at NPV 4% for whole 100-year timeframe Annual maintenance estimate of approximately \$90,000 	<ul style="list-style-type: none"> Operational Grants Levies 				x	x
Recommended Medium and Long-term pathway to address Inundation is Design assets to withstand impacts (AC1)	<ul style="list-style-type: none"> Monitoring Secondary components may include the need for additional levees and drainage improvements as sea level rise progresses 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Monitoring Updated CHRMAP 	<ul style="list-style-type: none"> Included as part of Monitoring (NR1) 	<ul style="list-style-type: none"> Operational Grants Levies 				x	x



Table 8-8 MU8 Recommendations

Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
Recommended Short-Term Option to address Erosion is Protection with Groynes (PR2)	<ul style="list-style-type: none"> Assumes 8 rock groynes, 30m long, 100m apart to cover estuary coast from Venezia Blvd north Assumes 6 groynes to cover section of river foreshore 2035 Implementation 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP Monitoring Confirmation of design, costs and funding Construction likely to be staged 	<ul style="list-style-type: none"> \$2.0M at NPV 4% for whole 100-year timeframe Detailed design and costings estimated at \$250,000 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 	x	x	x		
Recommended Short-Term Option to address Inundation requires further investigation	<ul style="list-style-type: none"> Further investigation is required as the broader PR6 Option comprising a new storm surge barrier at The Cut did not perform better than the base case for any discount rate. It is recommended a feasibility analysis is undertaken to assess its effectiveness with consideration of freshwater flooding events and further civil and maritime design considerations as to what scale of facility would be required. 	<ul style="list-style-type: none"> Jointly between State Government and LGA's 	<ul style="list-style-type: none"> Completed CHRMAP Monitoring Investigation of Options, design, costs and funding Confirmation of SLR in accordance with projections to 2035 	<ul style="list-style-type: none"> Further feasibility investigations estimated at \$200,000 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 	x	x	x		
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	<ul style="list-style-type: none"> Item cost for investigations and management plans 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$100,000 	<ul style="list-style-type: none"> Operational 	x	x			
Leaving assets unprotected (PMR1)	<ul style="list-style-type: none"> To 2035 for low-value public assets Assumes a clean-up rate following damage/loss No private land acquisition included Maintenance assumes ongoing allowance for foreshore reserve 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Storm damage Audit of assets within 2035 erosion and inundation hazard zone and identification of assets where damage would be unacceptable 	<ul style="list-style-type: none"> \$111,000 (Plus 3% annual maintenance of \$3,330) 	<ul style="list-style-type: none"> Operational 	x	x	x		
Demolition / removal / relocation of asset from inside hazard area (PMR2)	<ul style="list-style-type: none"> Preparation of Asset Management Plan To 2035 for public built assets Allows for removal of building at Wave Walk Maintenance assumes ongoing allowance for foreshore reserve Removal / Relocation of assets as required 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Audit of assets within 2035 erosion and inundation hazard zone and identification of assets where damage would be unacceptable 	<ul style="list-style-type: none"> \$244,000 (Plus 1% annual maintenance of \$2,440) 	<ul style="list-style-type: none"> Operational Grants 	x	x	x		
Prevention of further development / prohibit expansion of existing use rights (PMR3)	<ul style="list-style-type: none"> Item cost for investigations and management plans Investigate opportunities for leaseback of land and land swaps in the context of planned and managed retreat. Seek legal advice regarding the basis of agreements with land holders and whether opt-ins can be time constrained 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$100,000 (Plus 1% annual maintenance of \$1,000) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
Design assets to withstand impacts (AC1)	<ul style="list-style-type: none"> Item cost for investigations and management plans – primarily any case-by-case work needed for public assets 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$500,000 (Plus 1% annual maintenance of \$5,000) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
Monitoring (NR1)	<ul style="list-style-type: none"> Beach survey for storm behaviour and to track HSD and inundation levels Routine 6-monthly beach profiles following the summer and winter periods. Minimum every two years in Spring 	<ul style="list-style-type: none"> LGA Can seek support and assistance from DoT 	<ul style="list-style-type: none"> Completed CHRMAP Severe storm event(s) 	<ul style="list-style-type: none"> \$30,000 (Plus 10% annual maintenance of \$3,000) 	<ul style="list-style-type: none"> Operational Grants 	x	x	x		



Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
Protection Structure Audit (NR2)	<ul style="list-style-type: none"> Item cost to inspect condition, influence on sediment transport and inundation and remaining design life on all coastal management structures Includes walls along Collie R. 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$50,000 (Plus 2% annual maintenance of \$1,000) 	<ul style="list-style-type: none"> Operational Grants 		x	x		
Notification on title (NR3)	<ul style="list-style-type: none"> Item cost for investigations and implementation plans 	<ul style="list-style-type: none"> LGA Can seek support and assistance from DPLH, WALGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$250,000 (Plus 1% annual maintenance of \$2,500) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
Emergency evacuation plans (NR4)	<ul style="list-style-type: none"> Item cost for investigations and evacuation plans 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$250,000 (Plus 1% annual maintenance of \$2,500) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
INVESTIGATION 1 Sand Source Feasibility Study	<ul style="list-style-type: none"> Determine the capacity and cost of local sand supplies, including both land-based and marine sources Likely require repetition over Medium-term Focus for this MU is sand nourishment for estuary coast, but should also consider the need for appropriate fill to raise height of land in inundation hazard zone 	<ul style="list-style-type: none"> LGA Can seek support from neighbouring LGA's, PNP, Southern Ports and state departments 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$30,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x		x	
INVESTIGATION 2 Rock Source Feasibility Study	<ul style="list-style-type: none"> Analyse the availability of rock in terms of density, quarry yields, location and costs Likely require repetition over Medium-term Focus for this MU is small to medium armour rock 	<ul style="list-style-type: none"> LGA Can seek support from neighbouring LGA's, PNP, Southern Ports and state departments 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$30,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x		x	
INVESTIGATION 3 Update Foreshore Management Plans (FMPs)	<ul style="list-style-type: none"> Prepare an updated Foreshore Management Plan An updated FMP could help increase the protective capacity of the natural dune system. Updates should address the requirements of SPP2.6 and incorporate the findings of this CHRMAP 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$30,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x	x	x	x
Recommended Medium and Long-term pathway to address Erosion is Protection with Groynes (PR2)	<ul style="list-style-type: none"> Monitoring will determine need for additional stages of groynes in future and the eventual need for major refurbishment or replacement of the structures and associated beach renourishment 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Monitoring Updated CHRMAP 	<ul style="list-style-type: none"> \$2.0M at NPV 4% for whole 100-year timeframe Annual maintenance estimate of approximately \$50,000 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 				x	x
Recommended Medium and Long-term pathway to address inundation requires further investigation	<ul style="list-style-type: none"> Further investigation is required as the broader PR6 Option comprising a new storm surge barrier at The Cut did not perform better than the base case for any discount rate. It is recommended a feasibility analysis is undertaken to assess its effectiveness with consideration of freshwater flooding events and further civil and maritime design considerations as to what scale of facility would be required. 	<ul style="list-style-type: none"> Jointly between State Government and LGA's 	<ul style="list-style-type: none"> Monitoring Updated CHRMAP 	<ul style="list-style-type: none"> To be determined following further investigations 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 				x	x



Table 8-9 MU9 Recommendations

Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
Recommended Short-Term Option to address Erosion is Protection with Groynes (PR2)	<ul style="list-style-type: none"> Assumes 63 rock groynes, 30m long, approximately 100m apart or as required to treat 25% of shoreline in MU Locations to be determined 2020 Implementation 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP Monitoring Confirmation of design, costs and funding Construction likely to be staged 	<ul style="list-style-type: none"> \$15.5M at NPV 4% for whole 100-year timeframe Detailed design and costings estimated at \$250,000 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 	x	x	x		
Recommended Short-Term Option to address Inundation requires further investigation	<ul style="list-style-type: none"> Further investigation is required as the broader PR6 Option comprising a new storm surge barrier at The Cut did not perform better than the base case for any discount rate. It is recommended a feasibility analysis is undertaken to assess its effectiveness with consideration of freshwater flooding events and further civil and maritime design considerations as to what scale of facility would be required. 	<ul style="list-style-type: none"> Jointly between State Government and LGA's 	<ul style="list-style-type: none"> Completed CHRMAP Monitoring Investigation of Options, design, costs and funding Confirmation of SLR in accordance with projections to 2035 	<ul style="list-style-type: none"> Further feasibility investigations estimated at \$200,000 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 	x	x	x		
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	<ul style="list-style-type: none"> Item cost for investigations and management plans 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$150,000 	<ul style="list-style-type: none"> Operational 	x	x			
Leaving assets unprotected (PMR1)	<ul style="list-style-type: none"> To 2035 for low-value public assets Assumes a clean-up rate following damage/loss No private land acquisition included Maintenance assumes ongoing allowance for foreshore reserve 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Storm damage Audit of assets within 2035 erosion and inundation hazard zone and identification of assets where damage would be unacceptable 	<ul style="list-style-type: none"> \$351,000 (Plus 3% annual maintenance of \$10,530) 	<ul style="list-style-type: none"> Operational 	x	x	x		
Demolition / removal / relocation of asset from inside hazard area (PMR2)	<ul style="list-style-type: none"> Preparation of Asset Management Plan To 2035 for public built assets Allows for removal of building at Wave Walk Maintenance assumes ongoing allowance for foreshore reserve Removal / Relocation of assets as required Allows for removal of building – Leschenault Discovery Centre 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Audit of assets within 2035 erosion and inundation hazard zone and identification of assets where damage would be unacceptable 	<ul style="list-style-type: none"> \$853,000 (Plus 1% annual maintenance of \$8,530) 	<ul style="list-style-type: none"> Operational Grants 	x	x	x		
Prevention of further development / prohibit expansion of existing use rights (PMR3)	<ul style="list-style-type: none"> Item cost for investigations and management plans Investigate opportunities for leaseback of land and land swaps in the context of planned and managed retreat. Seek legal advice regarding the basis of agreements with land holders and whether opt-ins can be time constrained 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$150,000 (Plus 1% annual maintenance of \$1,500) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
Design assets to withstand impacts (AC1)	<ul style="list-style-type: none"> Item cost for investigations and management plans – primarily any case-by-case work needed for public assets 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$500,000 (Plus 1% annual maintenance of \$5,000) 	<ul style="list-style-type: none"> Operational Grants 	x	x			



Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
Monitoring (NR1)	<ul style="list-style-type: none"> Beach survey for storm behaviour and to track HSD and inundation levels Routine 6-monthly beach profiles following the summer and winter periods. Minimum every two years in Spring 	<ul style="list-style-type: none"> LGA Can seek support and assistance from DoT 	<ul style="list-style-type: none"> Completed CHRMAP Severe storm event(s) 	<ul style="list-style-type: none"> \$30,000 (Plus 10% annual maintenance of \$3,000) 	<ul style="list-style-type: none"> Operational Grants 	x	x	x		
Protection Structure Audit (NR2)	<ul style="list-style-type: none"> Item cost to inspect condition, influence on sediment transport and inundation and remaining design life on all coastal management structures Includes walls along Collie R. 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$50,000 (Plus 2% annual maintenance of \$1,000) 	<ul style="list-style-type: none"> Operational Grants 		x	x		
Notification on title (NR3)	<ul style="list-style-type: none"> Item cost for investigations and implementation plans 	<ul style="list-style-type: none"> LGA Can seek support and assistance from DPLH, WALGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$250,000 (Plus 1% annual maintenance of \$2,500) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
Emergency evacuation plans (NR4)	<ul style="list-style-type: none"> Item cost for investigations and evacuation plans 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$250,000 (Plus 1% annual maintenance of \$2,500) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
INVESTIGATION 1 Sand Source Feasibility Study	<ul style="list-style-type: none"> Determine the capacity and cost of local sand supplies, including both land-based and marine sources Likely require repetition over Medium-term Focus for this MU is sand nourishment for estuary coast, but should also consider the need for appropriate fill to raise height of land in inundation hazard zone 	<ul style="list-style-type: none"> LGA Can seek support from neighbouring LGA's, PNP, Southern Ports and state departments 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$30,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x		x	
INVESTIGATION 2 Rock Source Feasibility Study	<ul style="list-style-type: none"> Analyse the availability of rock in terms of density, quarry yields, location and costs Likely require repetition over Medium-term Focus for this MU is small to medium armour rock 	<ul style="list-style-type: none"> LGA Can seek support from neighbouring LGA's, PNP, Southern Ports and state departments 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$30,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x		x	
INVESTIGATION 3 Update Foreshore Management Plans (FMPs)	<ul style="list-style-type: none"> Prepare an updated Foreshore Management Plan An updated FMP could help increase the protective capacity of the natural dune system. Updates should address the requirements of SPP2.6 and incorporate the findings of this CHRMAP 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$30,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x	x	x	x
Recommended Medium and Long-term pathway to address Erosion is Protection with Groynes (PR2)	<ul style="list-style-type: none"> Monitoring will determine need for additional stages of groynes in future and the eventual need for major refurbishment or replacement of the structures and associated beach renourishment 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Monitoring Updated CHRMAP 	<ul style="list-style-type: none"> \$15.5M at NPV 4% for whole 100-year timeframe Annual maintenance estimate of approximately \$0.2M 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 				x	x



Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
Recommended Medium and Long-term pathway to address inundation requires further investigation	<ul style="list-style-type: none"> Further investigation is required as the broader PR6 Option comprising a new storm surge barrier at The Cut did not perform better than the base case for any discount rate. It is recommended a feasibility analysis is undertaken to assess its effectiveness with consideration of freshwater flooding events and further civil and maritime design considerations as to what scale of facility would be required. 	<ul style="list-style-type: none"> Jointly between State Government and LGA's 	<ul style="list-style-type: none"> Monitoring Updated CHRMAP 	<ul style="list-style-type: none"> To be determined following further investigations 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 				x	x



Table 8-10 MU10 Recommendations

Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
Recommended Short-Term Option to address Erosion is Protection with Beach Renourishment (PR1)	<ul style="list-style-type: none"> Sand nourishment along bank of river for 2,400m Assumes suitable sand source available (grain size, volume, cleanliness, proximity) 2035 implementation 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP Monitoring Confirmation of design, costs and funding Construction likely to be staged 	<ul style="list-style-type: none"> \$1.0M at NPV 4% for whole 100-year timeframe Annual cost estimate of approximately \$50,000 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 	x	x	x		
Recommended Short-Term Option to address Inundation requires further investigation	<ul style="list-style-type: none"> Further investigation is required as the broader PR6 Option comprising a new storm surge barrier at The Cut did not perform better than the base case for any discount rate. It is recommended a feasibility analysis is undertaken to assess its effectiveness with consideration of freshwater flooding events and further civil and maritime design considerations as to what scale of facility would be required. 	<ul style="list-style-type: none"> Jointly between State Government and LGA's 	<ul style="list-style-type: none"> Completed CHRMAP Monitoring Investigation of Options, design, costs and funding Confirmation of SLR in accordance with projections to 2035 	<ul style="list-style-type: none"> Further feasibility investigations estimated at \$200,000 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 	x	x	x		
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	<ul style="list-style-type: none"> Item cost for investigations and management plans 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$150,000 	<ul style="list-style-type: none"> Operational 	x	x			
Leaving assets unprotected (PMR1)	<ul style="list-style-type: none"> To 2035 for low-value public assets Assumes a clean-up rate following damage/loss No private land acquisition included Maintenance assumes ongoing allowance for foreshore reserve 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Storm damage Audit of assets within 2035 erosion and inundation hazard zone and identification of assets where damage would be unacceptable 	<ul style="list-style-type: none"> \$44,000 (Plus 3% annual maintenance of \$1,320) 	<ul style="list-style-type: none"> Operational 	x	x	x		
Demolition / removal / relocation of asset from inside hazard area (PMR2)	<ul style="list-style-type: none"> Preparation of Asset Management Plan To 2035 for public built assets Allows for removal of building at Wave Walk Maintenance assumes ongoing allowance for foreshore reserve Removal / Relocation of assets as required 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Audit of assets within 2035 erosion and inundation hazard zone and identification of assets where damage would be unacceptable 	<ul style="list-style-type: none"> \$97,000 (Plus 1% annual maintenance of \$970) 	<ul style="list-style-type: none"> Operational Grants 	x	x	x		
Prevention of further development / prohibit expansion of existing use rights (PMR3)	<ul style="list-style-type: none"> Item cost for investigations and management plans Investigate opportunities for leaseback of land and land swaps in the context of planned and managed retreat. Seek legal advice regarding the basis of agreements with land holders and whether opt-ins can be time constrained 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$250,000 (Plus 1% annual maintenance of \$2,500) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
Design assets to withstand impacts (AC1)	<ul style="list-style-type: none"> Item cost for investigations and management plans – primarily any case-by-case work needed for public assets 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$150,000 (Plus 1% annual maintenance of \$1,500) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
Monitoring (NR1)	<ul style="list-style-type: none"> Beach survey for storm behaviour and to track HSD and inundation levels Routine 6 monthly beach profiles following the summer and winter periods. Minimum every two years in Spring 	<ul style="list-style-type: none"> LGA Can seek support and assistance from DoT 	<ul style="list-style-type: none"> Completed CHRMAP Severe storm event(s) 	<ul style="list-style-type: none"> \$20,000 (Plus 10% annual maintenance of \$2,000) 	<ul style="list-style-type: none"> Operational Grants 	x	x	x		



Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
Notification on title (NR3)	<ul style="list-style-type: none"> Item cost for investigations and implementation plans 	<ul style="list-style-type: none"> LGA Can seek support and assistance from DPLH, WALGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$250,000 (Plus 1% annual maintenance of \$2,500) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
Emergency evacuation plans (NR4)	<ul style="list-style-type: none"> Item cost for investigations and evacuation plans 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$250,000 (Plus 1% annual maintenance of \$2,500) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
INVESTIGATION 1 Sand Source Feasibility Study	<ul style="list-style-type: none"> Determine the capacity and cost of local sand supplies, including both land-based and marine sources Likely require repetition over Medium-term Focus for this MU is sand nourishment for river shoreline, but should also consider the need for appropriate fill to raise height of land in inundation hazard zone 	<ul style="list-style-type: none"> LGA Can seek support from neighbouring LGA's, PNP, Southern Ports and state departments 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$30,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x		x	
INVESTIGATION 2 Update Foreshore Management Plans (FMPs)	<ul style="list-style-type: none"> Prepare an updated Foreshore Management Plan An updated FMP could help increase the protective capacity of the natural dune system. Updates should address the requirements of SPP2.6 and incorporate the findings of this CHRMAP 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$30,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x	x	x	x
Recommended Medium and Long-term pathway to address Erosion is Protection with Beach Renourishment (PR1)	<ul style="list-style-type: none"> Monitoring will determine frequency and ongoing volume requirements beach renourishment 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Monitoring Updated CHRMAP 	<ul style="list-style-type: none"> \$1.0M at NPV 4% for whole 100-year timeframe Annual cost estimate of approximately \$50,000 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 				x	x
Recommended Medium and Long-term pathway to address inundation requires further investigation	<ul style="list-style-type: none"> Further investigation is required as the broader PR6 Option comprising a new storm surge barrier at The Cut did not perform better than the base case for any discount rate. It is recommended a feasibility analysis is undertaken to assess its effectiveness with consideration of freshwater flooding events and further civil and maritime design considerations as to what scale of facility would be required. 	<ul style="list-style-type: none"> Jointly between State Government and LGA's 	<ul style="list-style-type: none"> Monitoring Updated CHRMAP 	<ul style="list-style-type: none"> To be determined following further investigations 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 				x	x



Table 8-11 MU11 Recommendations

Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
Recommended Short-Term Option to address Erosion is Protection with Beach Renourishment (PR1)	<ul style="list-style-type: none"> Nourishment along bank of river for 2,400m Assumes suitable sand source available (grain size, volume, cleanliness, proximity) 2035 implementation 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP Monitoring Confirmation of design, costs and funding Construction likely to be staged 	<ul style="list-style-type: none"> \$1.0M at NPV 4% for whole 100-year timeframe Annual cost estimate of approximately \$50,000 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 	x	x	x		
Recommended Short-Term Option to address Inundation requires further investigation	<ul style="list-style-type: none"> Further investigation is required as the broader PR6 Option comprising a new storm surge barrier at The Cut did not perform better than the base case for any discount rate. It is recommended a feasibility analysis is undertaken to assess its effectiveness with consideration of freshwater flooding events and further civil and maritime design considerations as to what scale of facility would be required. 	<ul style="list-style-type: none"> Jointly between State Government and LGA's 	<ul style="list-style-type: none"> Completed CHRMAP Monitoring Investigation of Options, design, costs and funding Confirmation of SLR in accordance with projections to 2035 	<ul style="list-style-type: none"> Further feasibility investigations estimated at \$200,000 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 	x	x	x		
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	<ul style="list-style-type: none"> Item cost for investigations and management plans 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$150,000 	<ul style="list-style-type: none"> Operational 	x	x			
Leaving assets unprotected (PMR1)	<ul style="list-style-type: none"> To 2035 for low-value public assets Assumes a clean-up rate following damage/loss No private land acquisition included Maintenance assumes ongoing allowance for foreshore reserve 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Storm damage Audit of assets within 2035 erosion and inundation hazard zone and identification of assets where damage would be unacceptable 	<ul style="list-style-type: none"> \$44,000 (Plus 3% annual maintenance of \$1,320) 	<ul style="list-style-type: none"> Operational 	x	x	x		
Demolition / removal / relocation of asset from inside hazard area (PMR2)	<ul style="list-style-type: none"> Preparation of Asset Management Plan To 2035 for public built assets Allows for removal of building at Wave Walk Maintenance assumes ongoing allowance for foreshore reserve Removal / Relocation of assets as required 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Audit of assets within 2035 erosion and inundation hazard zone and identification of assets where damage would be unacceptable 	<ul style="list-style-type: none"> \$97,000 (Plus 1% annual maintenance of \$970) 	<ul style="list-style-type: none"> Operational Grants 	x	x	x		
Prevention of further development / prohibit expansion of existing use rights (PMR3)	<ul style="list-style-type: none"> Item cost for investigations and management plans Investigate opportunities for leaseback of land and land swaps in the context of planned and managed retreat. Seek legal advice regarding the basis of agreements with land holders and whether opt-ins can be time constrained 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$100,000 (Plus 1% annual maintenance of \$1,000) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
Design assets to withstand impacts (AC1)	<ul style="list-style-type: none"> Item cost for investigations and management plans – primarily any case-by-case work needed for public assets 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$150,000 (Plus 1% annual maintenance of \$1,500) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
Monitoring (NR1)	<ul style="list-style-type: none"> Beach survey for storm behaviour and to track HSD and inundation levels Routine 6-monthly beach profiles following the summer and winter periods. Minimum every two years in Spring 	<ul style="list-style-type: none"> LGA Can seek support and assistance from DoT 	<ul style="list-style-type: none"> Completed CHRMAP Severe storm event(s) 	<ul style="list-style-type: none"> \$10,000 (Plus 10% annual maintenance of \$1,000) 	<ul style="list-style-type: none"> Operational Grants 	x	x	x		



Recommendation	Notes	Responsibility	Trigger	Cost	Funding	2023-2025	2025-2030	2030-2035	2035-2050	2050-2120
Notification on title (NR3)	<ul style="list-style-type: none"> Item cost for investigations and implementation plans 	<ul style="list-style-type: none"> LGA Can seek support and assistance from DPLH, WALGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$100,000 (Plus 1% annual maintenance of \$1,000) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
Emergency evacuation plans (NR4)	<ul style="list-style-type: none"> Item cost for investigations and evacuation plans 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$100,000 (Plus 1% annual maintenance of \$1,000) 	<ul style="list-style-type: none"> Operational Grants 	x	x			
INVESTIGATION 1 Sand Source Feasibility Study	<ul style="list-style-type: none"> Determine the capacity and cost of local sand supplies, including both land-based and marine sources Likely require repetition over Medium-term Focus for this MU is sand nourishment for river shoreline, but should also consider the need for appropriate fill to raise height of land in inundation hazard zone 	<ul style="list-style-type: none"> LGA Can seek support from neighbouring LGA's, PNP, Southern Ports and state departments 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$30,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x		x	
INVESTIGATION 2 Update Foreshore Management Plans (FMPs)	<ul style="list-style-type: none"> Prepare an updated Foreshore Management Plan An updated FMP could help increase the protective capacity of the natural dune system. Updates should address the requirements of SPP2.6 and incorporate the findings of this CHRMAP 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Completed CHRMAP 	<ul style="list-style-type: none"> \$30,000 Assumes only undertaken for this MU in isolation, but synergies should be investigated. 	<ul style="list-style-type: none"> Operational Grants 	x	x	x	x	x
Recommended Medium and Long-term pathway to address Erosion is Protection with Beach Renourishment (PR1)	<ul style="list-style-type: none"> Monitoring will determine frequency and ongoing volume requirements beach renourishment 	<ul style="list-style-type: none"> LGA 	<ul style="list-style-type: none"> Monitoring Updated CHRMAP 	<ul style="list-style-type: none"> \$1.0M at NPV 4% for whole 100-year timeframe Annual cost estimate of approximately \$50,000 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 				x	x
Recommended Medium and Long-term pathway to address inundation requires further investigation	<ul style="list-style-type: none"> Further investigation is required as the broader PR6 Option comprising a new storm surge barrier at The Cut did not perform better than the base case for any discount rate. It is recommended a feasibility analysis is undertaken to assess its effectiveness with consideration of freshwater flooding events and further civil and maritime design considerations as to what scale of facility would be required. 	<ul style="list-style-type: none"> Jointly between State Government and LGA's 	<ul style="list-style-type: none"> Monitoring Updated CHRMAP 	<ul style="list-style-type: none"> To be determined following further investigations 	<ul style="list-style-type: none"> Operational Grants Specified Area Rate Levies User Pays 				x	x



9 SUMMARY AND NEXT STEPS

In this report, one or more Options have been recommended to proceed for further investigation and/or implementation for each MU for both erosion and inundation. The recommendations have considered the CBA results holistically as well as being cognisant of the findings of previous stages of the CHRMAP.

The next stage for the project is to complete four Final CHRMAP summary reports – one for each local government - which will incorporate the findings of all the previous chapter reports including this one.



APPENDIX A ENGAGEMENT SUMMARY REPORT





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