

Capel to Leschenault CHRMAP

Chapter Report: Implementation

Peron Naturaliste Partnership

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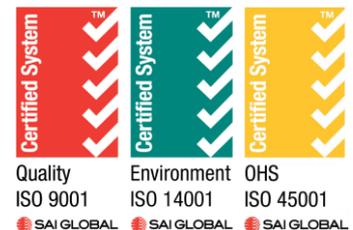


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CONTENTS

1	INTRODUCTION	4
2	LAND USE PLANNING INSTRUMENTS	8
2.1	General Land Use Planning Instruments	8
2.1.1	Reservation of Land	8
2.1.2	Local Planning Scheme Amendments	8
2.1.3	Notifications on Titles	10
2.1.4	Compulsory Acquisition	10
2.1.5	Other Instruments	10
2.1.6	Structure Planning	11
2.2	LGA Specific Land Use Planning Instruments	11
2.2.1	Shire of Capel	11
2.2.2	City of Bunbury	15
2.2.3	Shire of Harvey	18
2.2.4	Shire of Dardanup	22
3	FUNDING OPTIONS	27
3.1	Beneficiary (user) pays Operating Budget, General Rates and Coastal Management Fund	27
3.2	Specified Area Rate	27
3.3	Levies	27
3.4	Lease Land Management	27
3.5	State Grants - CoastWA	28
3.6	Federal Grants	29
3.7	Beneficiary (user) Pays	29
4	STAKEHOLDER AND COMMUNITY ENGAGEMENT	30
5	SHORT-TERM IMPLEMENTATION	31
5.1	Key assumptions	31
5.2	Further Investigations	31
6	MONITORING	34
6.1	Review of Existing Coastal Monitoring	34
6.2	Recommended Coastal Monitoring Activities	34
6.3	Trigger Points	35
6.4	CHRMAP Review	35
7	MEDIUM AND LONG-TERM IMPLEMENTATION	37
8	RECOMMENDATIONS SUMMARY	38
9	SUMMARY AND NEXT STEPS	66

APPENDICES

Appendix A Engagement Summary Report



LIST OF FIGURES

Figure 1-1	Risk management and adaptation hierarchy, as depicted in the WAPC Coastal hazard risk management and adaptation planning guidelines (2019)	5
Figure 1-3	Methodology	6
Figure 1-4	Study Area and Management Unit	7

LIST OF TABLES

Table 2-1	Land use planning recommendations for the Shire of Capel	11
Table 2-2	Content for Shire of Capel local planning scheme amendment appendix in accordance with LU1.	13
Table 2-3	Land use planning recommendations for the City of Bunbury	15
Table 2-4	Content for City of Bunbury local planning scheme amendment appendix in accordance with LU1.	16
Table 2-5	Land use planning recommendations for the Shire of Harvey	18
Table 2-6	Content for Shire of Harvey local planning scheme amendment appendix in accordance with LU1.	20
Table 2-7	Land use planning recommendations for the Shire of Dardanup	22
Table 2-8	Content for Shire of Dardanup local planning scheme amendment appendix in accordance with LU1.	24
Table 7-1	MU1 Recommendations	39
Table 7-2	MU2 Recommendations	42
Table 7-3	MU3 Recommendations	45
Table 7-4	MU4 Recommendations	47
Table 7-5	MU5 Recommendations	49
Table 7-6	MU6 Recommendations	52
Table 7-7	MU7 Recommendations	55
Table 7-8	MU8 Recommendations	57
Table 7-9	MU9 Recommendations	59
Table 7-10	MU10 Recommendations	62
Table 7-11	MU11 Recommendations	64



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)

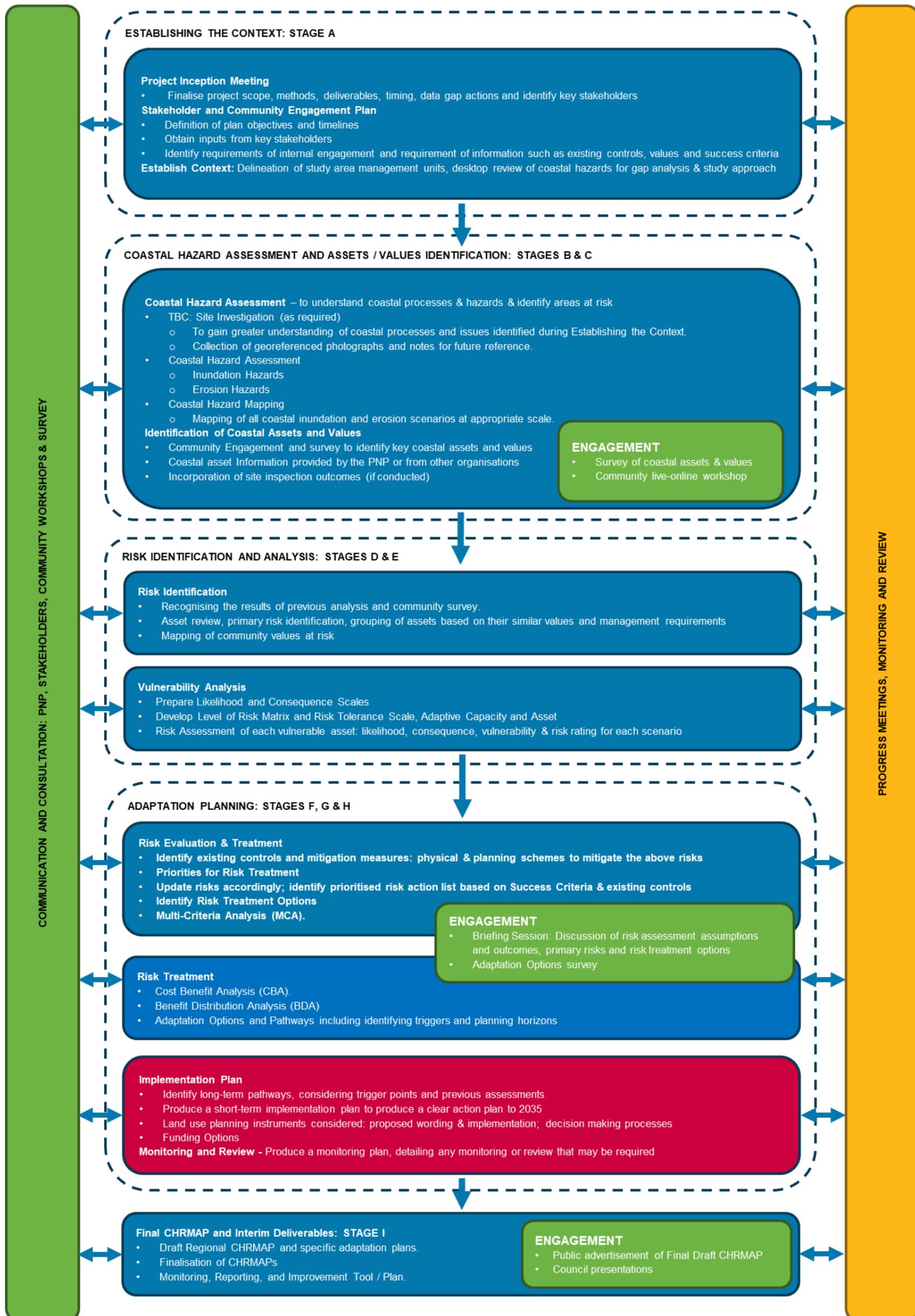


Figure 1-2 Methodology

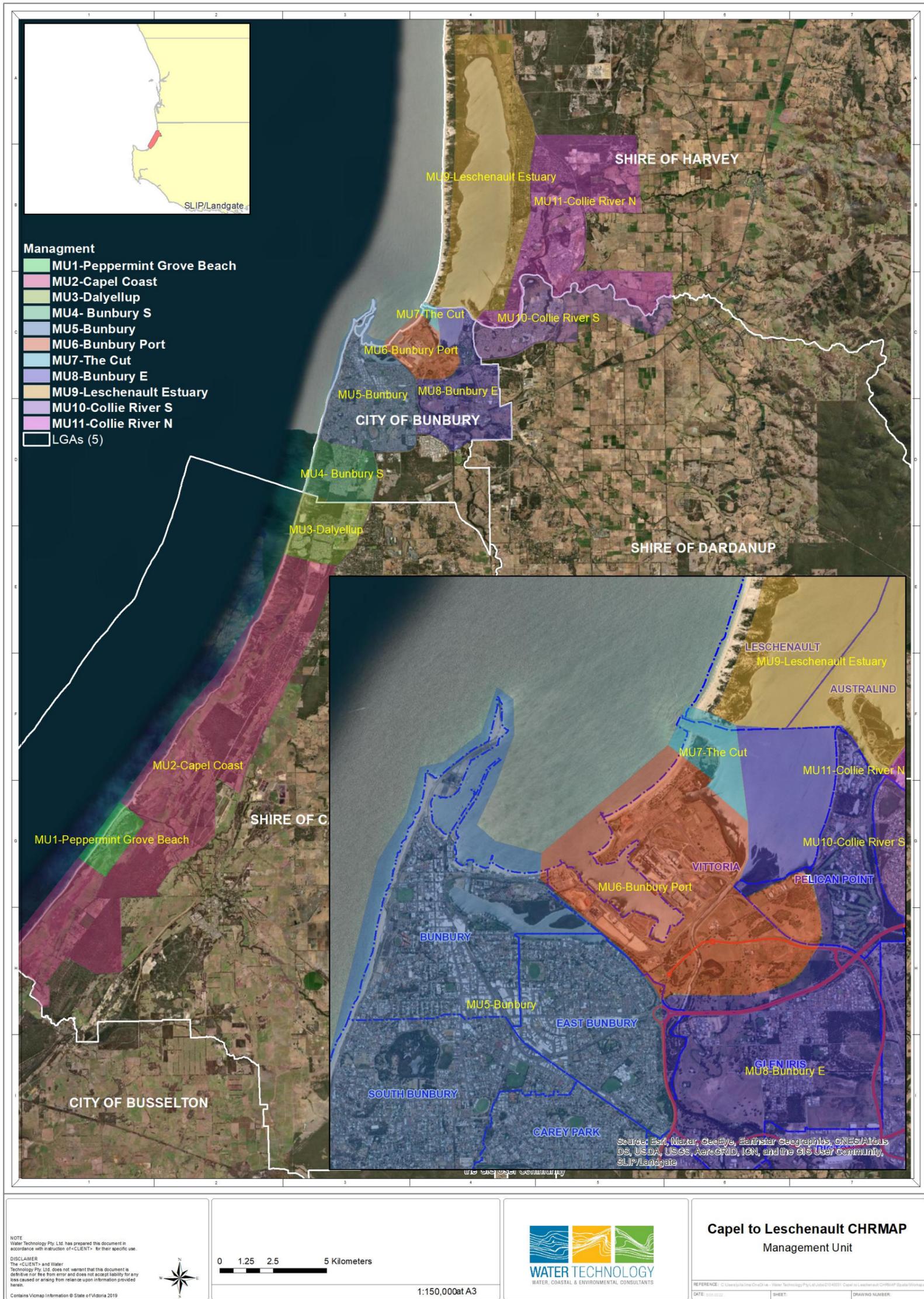


Figure 1-3 Study Area and Management Unit



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, it's District Planning Scheme No. 1 and it's 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>▪ 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



**CAPEL TO LESCHENAULT COASTAL
HAZARD RISK MANAGEMENT
ADAPTATION PLAN (CHRMAP)
ENGAGEMENT SUMMARY REPORT**



SHAPE URBAN

EXECUTIVE SUMMARY

The Capel to Leschenault coastline is highly valued by the people who call it home, however the coastal areas are subject to erosion and inundation risks, which will have a significant impact on its communities over time.

The Peron Naturaliste Partnership (PNP), the City of Bunbury and the Shires of Capel, Dardanup and Harvey have partnered with the Department of Biodiversity, Conservation and Attractions, Department of Water and Environmental Regulation and Southern Ports Authority to develop a Coastal Hazard Risk Management and Adaptation Plan (CHRMAP) to understand how these changes can be best managed into the future.

In 2019 a CHRMAP was prepared for the Koombana Bay area that examined erosion risks and adaptation options, but this is the only location. The Koombana Bay CHRMAP will be considered in the context of the broader CHRMAP area in this study.

A critical part of this project is the engagement with the local community and relevant stakeholders. Given the coastline's susceptibility to coastal erosion, extreme weather events and climate change risks, the stakeholder engagement for the project has been shaped to facilitate an understanding of coastal challenges, hazards and risks, understand how the community values assets along the coastline and the value they place on protection for those assets.

These values will help inform the management actions and adaptation strategies for use and protection of the management units that make up the project area's coastal zone. The coastal zone for this project includes the coastline and low-lying areas around the Leschenault Inlet and Estuary and associated rivers including the Preston/ Collie River.

This engagement summary report presents outcomes of the engagement undertaken to collect community coastal values for the coastal townsites in the City of Bunbury, Shire of Capel, Shire of Dardanup and Shire of Harvey.

A workshop was undertaken in a nominated location in each of the local government areas and linked online on 2 September 2021.

Key values from online and in-person engagement are the use of coastal and estuarine areas for activities like walking, swimming, boating, family time; inform the need for retention of coastal vegetation and landforms; protection of the environment; observation of coastal erosion occurring and a desire to see this be addressed.

Outcomes were then presented to a Coastal Community Advisory Group in September and November 2022

We thank all those who were involved in generating these values via the online engagement platform (Social Pinpoint), social media or email, and through the workshop processes.



ACKNOWLEDGEMENT

Shape Urban acknowledge the Pindjardup and Wardandi people of the Noongar Nation as traditional custodians of the land on which we have worked for this project. We recognise their cultural heritage, beliefs and relationship to the land, which continue to be important to the Noongar people today.

We pay our respects to Elders past and present, and to the land which they have cared for.

DISCLAIMER

This document has been prepared by Shape Urban for the Peron Naturaliste Partnership, the City of Bunbury and the Shires of Capel, Dardanup and Harvey, the Department of Biodiversity, Conservation and Attractions, the Department of Water and Environmental / Regulation and the Southern Ports Authority on behalf of

Water Technology Pty Ltd

DOCUMENT TITLE

Capel to Leschenault Coastal Hazard Risk Management and Adaptation Plan - Engagement Summary Report

NO.	AUTHOR	REVIEWED BY	DATE	PURPOSE
1	Anika Chhabra	A Kelderman	25/10/21	Values Gathering Engagement Summary for review
2	Anika Chhabra	A Kelderman	27/09/22	Treatment Options Engagement Summary for review
3	A Kelderman	A Kelderman	21/02/23	Final Options Engagement Summary



CONTENTS

EXECUTIVE SUMMARY

1.0 INTRODUCTION	6
1.1 BACKGROUND	6
1.2 ENGAGEMENT ACTIVITIES	8
1.3 PURPOSE OF THE REPORT	8
1.4 ENGAGEMENT SUMMARY	8
2.0 ONLINE FEEDBACK	11
2.1 ONLINE ENGAGEMENT	11
2.2 SOCIAL MEDIA	11
2.3 CHRMAP VALUES SURVEY	12
2.4 MAP AND COMMENTS	30
3.0 WORKSHOP	32
3.1 WORKSHOP FORMAT	32
3.2 WORKSHOP ATTENDEES	33
3.3 WORKSHOP OUTCOMES	33
4.0 COASTAL COMMUNITY ADVISORY GROUP	43
4.1 CCAG MEMBERS	43
4.2 MEETING ONE	44
4.3 MEETING TWO	49
CONCLUSION	52
5.1 NEXT STEPS	52

APPENDICES

1.0 INTRODUCTION

1.1 BACKGROUND

The Capel to Leschenault coastline is highly valued by the people who call it home, however the coastal areas are subject to erosion and inundation risks, which will result in coastline changes over different time periods and have a significant impact on its communities over time. There will also be further changes as a result of climate change, such as sea level rise and more severe storm events.

Balancing the community's desire to live near the coast and managing the impacts of coastal processes is therefore becoming more important.

The Peron Naturaliste Partnership (PNP), the City of Bunbury and the Shires of Capel, Dardanup and Harvey have partnered with the Department of Biodiversity, Conservation and Attractions (DBCA), Department of Water and Environmental Regulation (DWER) and Southern Ports Authority (SPA) to develop a Coastal Hazard Risk Management and Adaptation Plan (CHRMAP) for the area to understand how these changes can be best managed into the future.

The study area sits across four local government areas (LGAs), namely the Shire of Harvey, City of Bunbury, Shire of Dardanup, and Shire of Capel (Figure 1 refers).

The study areas consists of sand and mixed coasts, estuaries and inlets (e.g. Leschenault Inlet), rivers (Collie River and Preston River), and numerous areas of important coastal infrastructure under the management of different government organisations (including the Port of Bunbury, Koombana Bay Sailing Club, Casuarina Harbour, jetties, groynes, seawalls, bridges).

The region has been identified in Western Australia as an erosion hotspot and is considered a priority for coastal hazard assessment and management planning.

A critical part of this project is the engagement with the local community and relevant stakeholders. Stakeholder engagement aims to raise awareness of the project, gather knowledge of how the community values assets along the coastline and ensure that concerns and aspirations are properly understood.

These values and concerns help inform the selection of appropriate adaptation strategies to respond to the coastal risks throughout the project, and in particular when undertaking an assessment of the suitability of various adaptation options compared to the criteria which is used to selected preferred adaptation pathways.

This report details the engagement and workshops through preparation of the CHRMAP.

This report will continue to be updated as more engagement work is undertaken.

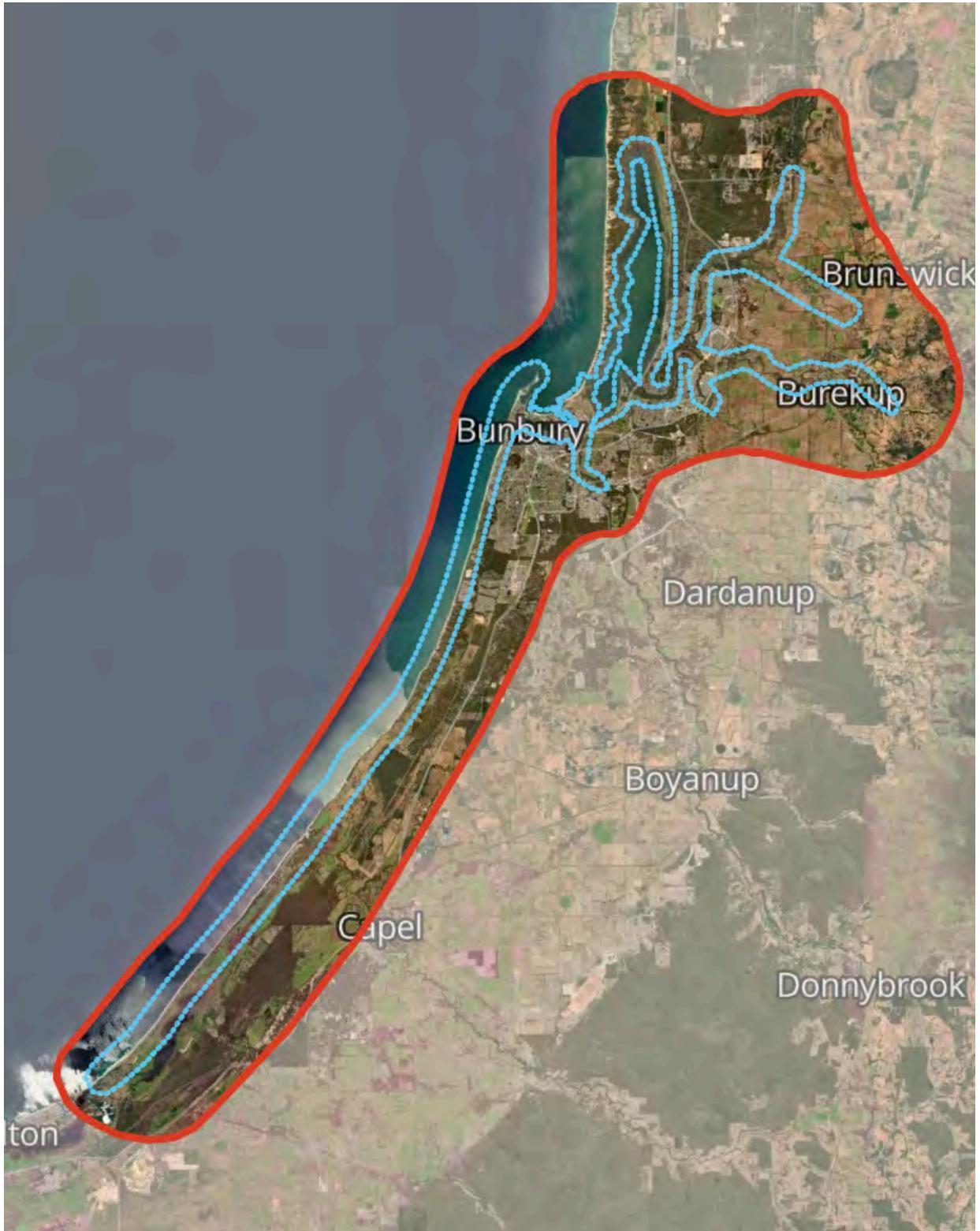


Figure 1 - Capel to Leschenault CHRMAP Study Area

1.2 ENGAGEMENT ACTIVITIES

The engagement activities for the project included:

- use of an interactive project tool (Social Pinpoint) to answer CHRMAP value survey questions and pin values and comments spatially on a project map;
- hard copy surveys mirroring the online component;
- a community workshop held in a location in each of the four LGAs and linked online to discuss coastal processes, map community values and understand issues and concerns of the community for the study area;
- A Coastal Community Advisory Group and associated meetings; and
- stakeholder meetings.

1.3 PURPOSE OF THE REPORT

The purpose of this report is to summarise the stakeholder engagement process undertaken through development of the CHRMAP. It includes activities undertaken, the information presented and modes of engagement. The report details feedback received. All individual comments from online and hard copy surveys and workshops can be found unedited in the Appendices section of this report.

1.4 ENGAGEMENT SUMMARY

In the values gathering phase, stakeholders were able to use an online project page with a mapping tool and survey to drop pins and comment on spatially located activities of value.

Participants were also able to respond to a survey and provide any other feedback about use of the coastline. The survey was available online and in hard copy at the LGA administration centres.

The survey and mapping tool was open from 26 July 2021 to 10 September 2021. In addition, people could provide survey responses in hard copy.

The project team received 84 CHRMAP values survey responses online, 97 hard copy survey responses (a total of 181 survey responses) and 56 'pins' were placed on the map.

Stakeholders were further engaged through the following:

- Social media posts
- Key briefings with the Project Steering Group (PSG) including administrative and elected members from PNP, the four LGAs, the Department of Planning, Lands and Heritage and the Department of Transport
- Briefings to key staff members and Executive Management at the LGAs.

28 people attended the workshop.

In total more than 150 participants contributed to this stage of engagement, with an approximate reach of more than 445 local community members and organisations.

The community's values and other stakeholder feedback received was subsequently used to inform the development of adaptation options for the study area which were tested through a Coastal Community Advisory Group (CCAG).

This group was made up of participants from the earlier workshops that expressed interest and other stakeholders identified by the project team.

This report will be updated with these outcomes and the outcomes of additional engagement as the project progresses.





2.0 ONLINE FEEDBACK

2.1 ONLINE ENGAGEMENT

The PNP's website was used to provide a summary of the project and direct the community to a dedicated project page (<https://getinvolved.mysocialpinpoint.com.au/capel-to-leschenault-chrmap>).

The community could view project information, frequently asked questions, access the survey, register for project updates, register for the workshop or do a combination of these things.

Online engagement is measured by splitting the level of interaction into three groups; aware, informed and engaged.

Aware

The total number of participants aware of the project through the online engagement tools can be measured by the number of people that viewed at least one page of the website relating to the project. 1,443 participants visited at least one page of the project online.

Informed

Of those who were aware, a smaller group were informed further about the project. This can be measured by the number of interactions with the pages. These people numbered 445.

Engaged

The total who contributed or engaged by using one of the tools was 114. From these, 114 engaged contributors submitted a total of 84 survey responses and 56 pins were placed.

Other

The LGAs also offered the community the opportunity to fill in the CHRMAP Values survey that was on the Social Pinpoint project page in hard copy. 97 hard copy surveys were received, resulting in a total of 181 surveys being completed.

2.2 SOCIAL MEDIA

The four LGAs used social media, specifically Facebook, to promote the project and any engagement activities. The following statistics show the amount of engagement generated by social media activity:

- Shire of Capel - 6 August 2021 - 3 likes
- City of Bunbury - 11 August 2021 - 227 reactions, 47 comments and 43 shares. Reactions include 201 likes, 21 love, 3 laugh, 1 surprised and 1 care
- Shire of Harvey - 23 August 2021 - 7 likes, 1 comment and 2 shares
- Shire of Capel - 27 August 2021 - 4 likes and 2 shares
- Shire of Dardanup - 30 August 2021 - no feedback (noting the workshop was hosted on 2 September 2021).

Comments on City of Bunbury post related to erosion and the loss of beaches and views to date, a desire to declare a climate emergency, how vegetation contributed to values (both the coastal processes benefit and impacting viewsd), and observations of the negative impacts of physical controls like groynes and sand fill that had been seen elsewhere.

One respondent requested an accessible carpark with views to the ocean.

2.3 CHRMAP VALUES SURVEY

The community told the project team that the coastal zone is important to them for many recreation, social and cultural reasons.

The coastal zone for this project includes the coastline and low-lying areas around the Leschenault Inlet and Estuary and associated rivers including the Preston/ Collie River.

A survey was set up to understand the importance of the study area to the community for a range of activities, and the importance to the community of being able to undertake these activities.

The CHRMAP survey asked the community 15 individual questions about how they use and value the coastal areas, how they value different adaptation responses, and their relationship to the coastal townsites.

Two additional questions asked respondents about their age and gender. A total of 181 survey responses were received. The following section summarises the responses to the survey questions.

Q1 - Within the project area which area do you visit the most?

Peppermint Grove Beach was the most popular response to this question (76 mentions). The next most popular location was Dalyellup Beach (58 mentions), followed by Koombana Bay (15 mentions).

Leschenault Inlet, Lighthouse Beach and Forrest Beach all received (10 mentions) .

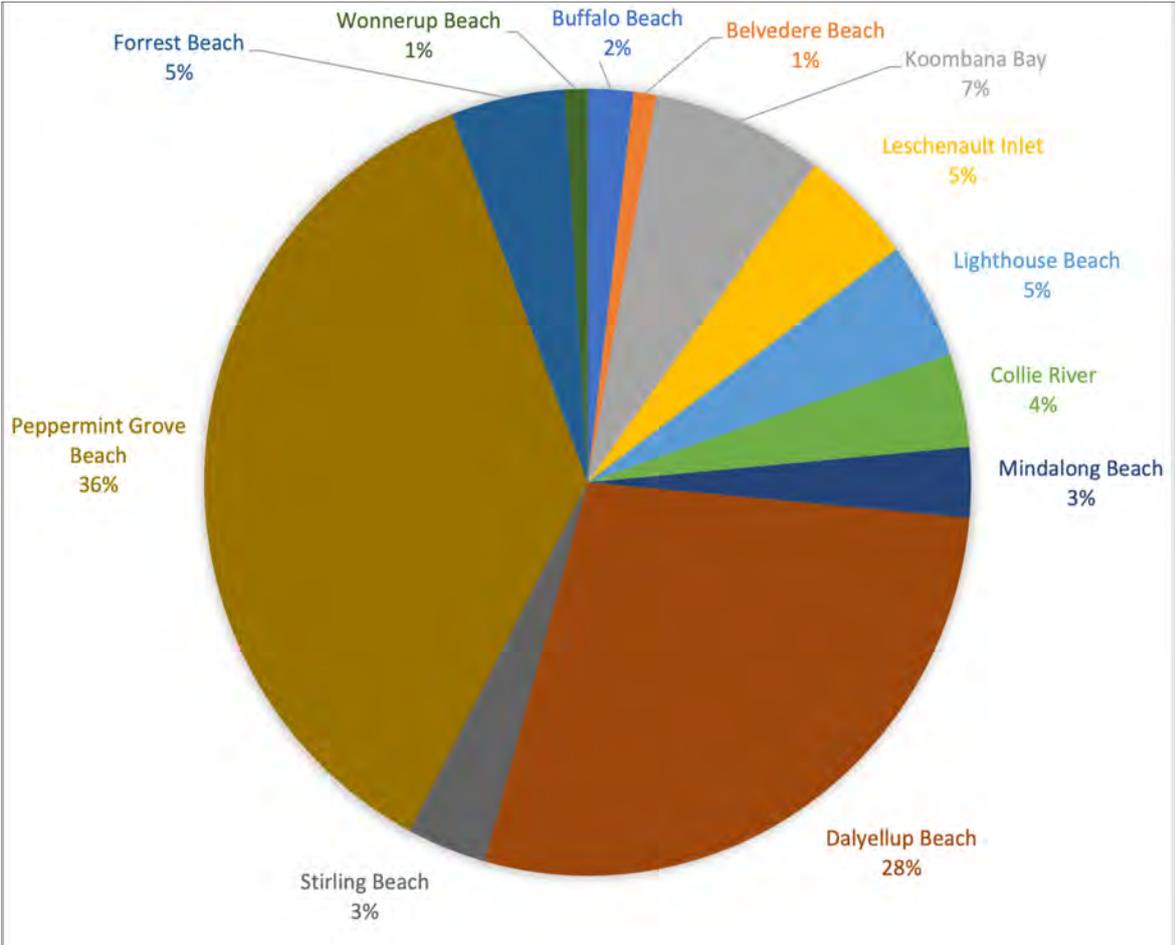


Figure 2 - Question 1

Q2 - How often do you visit the beach, foreshore area and/or Leschenault Inlet and Estuary?

The frequency of visitation to areas varied.

68 respondents visited weekly (37%), 61 respondents visited daily (33%), 29 visited monthly (16%) and 23 visited occasionally (12%).

Three respondents visited these areas rarely (2%).

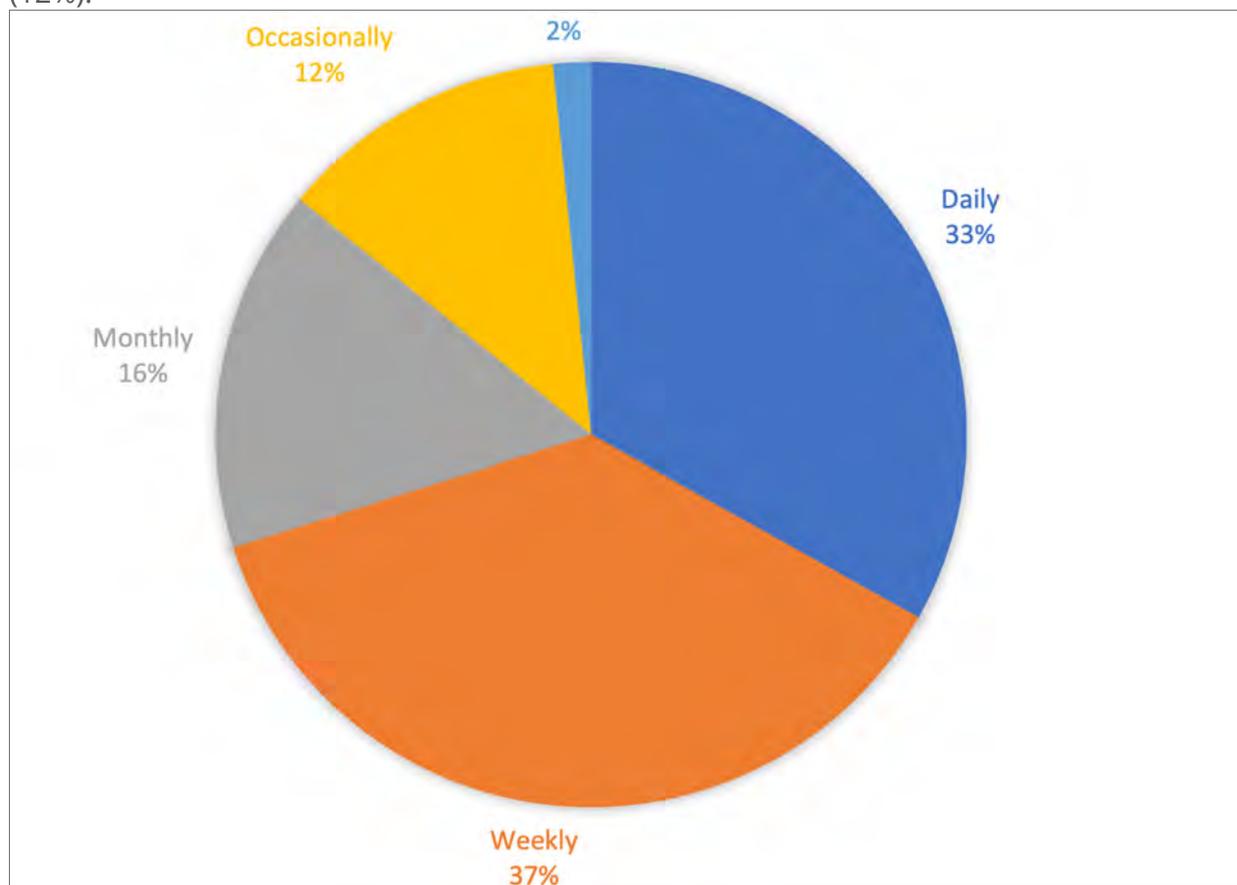


Figure 3 - Question 2

Q3 - What do you use the beach, foreshore area and/or Leschenault Inlet and Estuary for?

People were able to select multiple options regarding what they use the beach or foreshore areas for.

Beach based activities was the most popular use with 136 mentions, followed closely by water based activities (128 mentions). Foreshore based and nature based activities were also well represented, with 111 and 100 mentions respectively.

The beach, water, foreshore and nature based activities comprise a variety of reasons, as depicted in Figure 4.

9 respondents selected the 'Other' option and provided responses about what they used these areas for. Responses included being a landowner adjacent to the coast, for exercise (noting this was a beach based activity option), dog walking, photography, for views, rowing and to use the sailing club.

Two respondents did not want to see any more development on the coast and suggested no four-wheel driving be permitted.

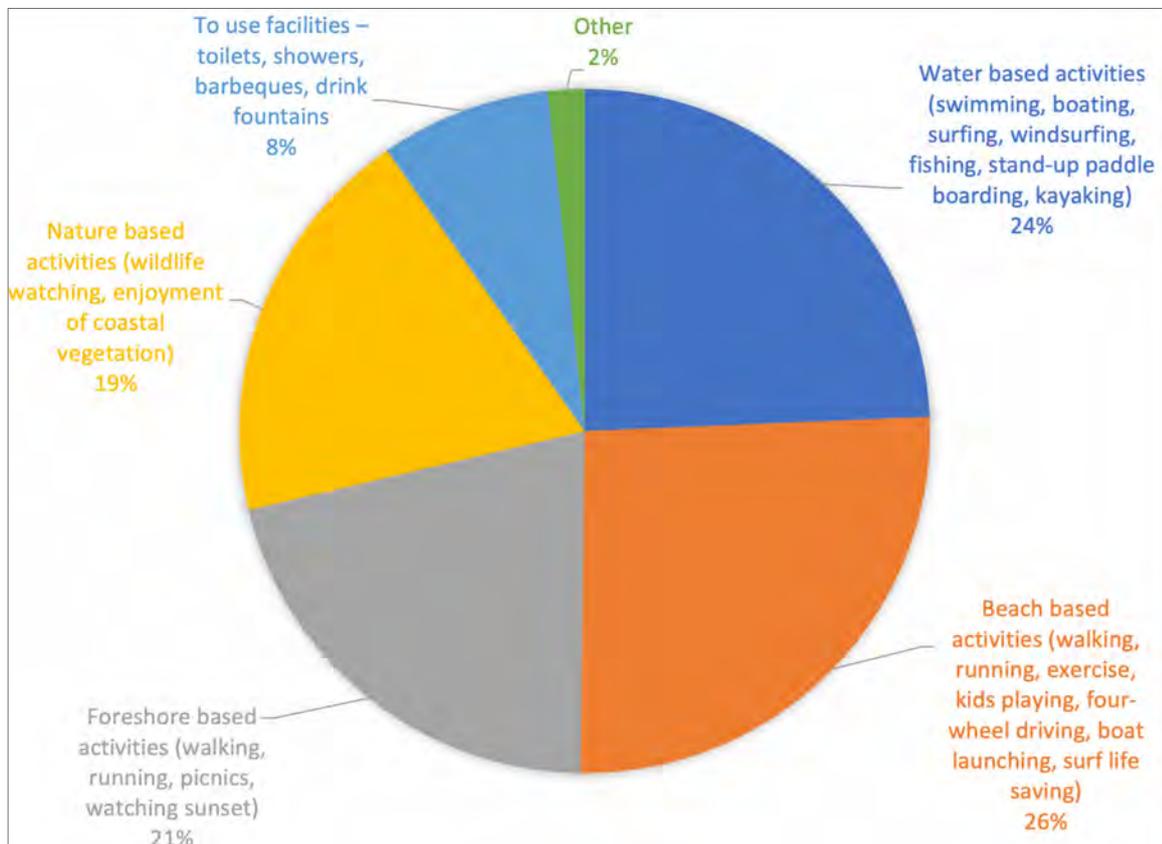


Figure 4 - Question 3

Q4 - How would you describe your understanding of coastal erosion and coastal flooding?

85 respondents (46%) had a general awareness of coastal erosion and flooding, 62 (34%) had a good understanding, and 26 (14%) had a very good understanding.

Nine respondents (5%) were uncertain about coastal erosion and flooding and one (1%) was not at all aware.

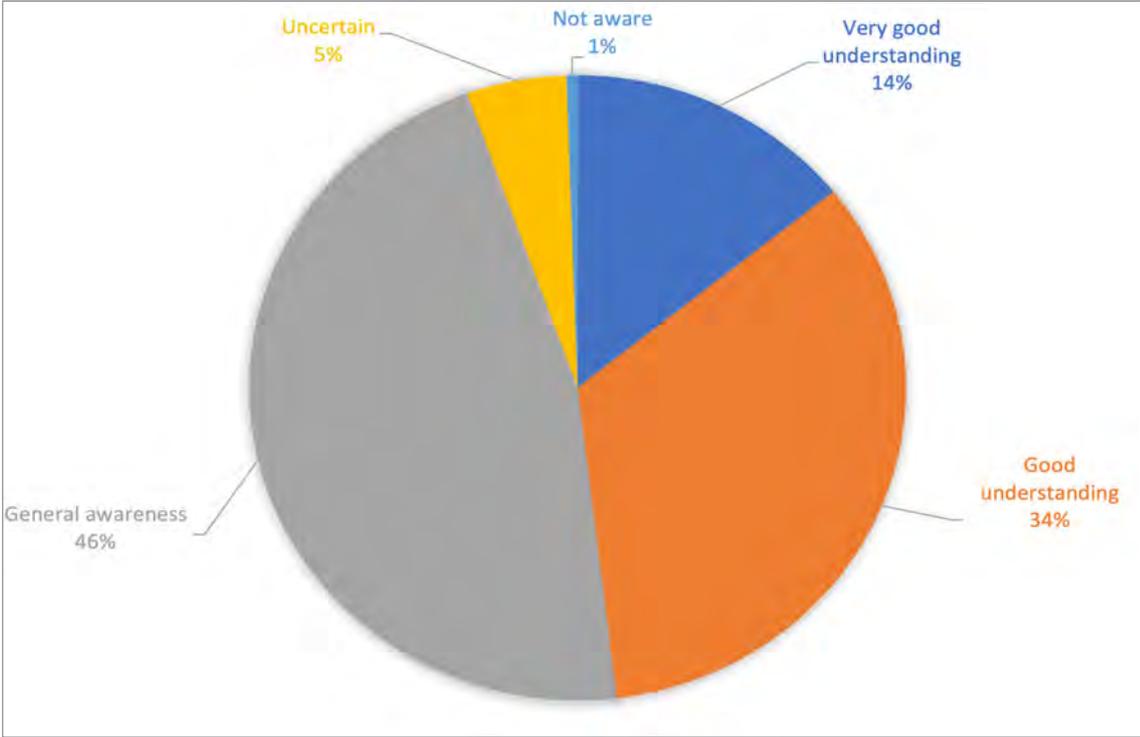


Figure 5 - Question 4

Q5 - What do you consider to be the most important values of the Capel to Leschenault project area?

Respondents were asked to rank a selection of 10 values in order of importance to them from one (1) to 10.

When averaged across all responses, the most important values to respondents were:

1. Preserving the natural environment and ecological ecosystems ;
2. Retention of natural landscapes not interrupted by human-made structures; and
3. Opportunities to use beaches for passive recreation activities (e.g. swimming and walking).

The ranking for all ten options are shown at Figure 6.

1. Preserving the natural environment and ecological systems
2. Retention of natural landscapes, not interrupted by human-made structures
3. Opportunities to use beaches for passive recreation activities (e.g. swimming and walking)
4. Ongoing provision of beaches and foreshore reserves for current and future generations
5. Ensuring that all residents and visitors are able to access the beach and foreshore
6. Conservation of heritage sites
7. Opportunities to enjoy the coastal landscape (e.g. viewing platforms and interpretive signage)
8. Opportunities to use public foreshore facilities (e.g. toilets, showers, picnic and BBQ facilities)
9. Opportunities to use facilities that support active recreation (e.g. boat ramps and jetties)
10. Opportunities to use for commercial operations that support the local economy (e.g. cafes, jetties and tourism activities)

Figure 6 - Question 5

Q6 - On a scale of 1 to 5 (where 1 is strongly disagree and 5 is strongly agree), how do you feel about the following options for coastal management?

Respondents were asked to rate nine coastal management approaches from 1 (strongly disagree) to 5 (strongly agree).

These responses follow.

Preserve dunes, revegetate foreshore reserves and do not remove beach wrack (seaweed) to lower the risk of coastal erosion

A majority of respondents (100 strongly agree votes and 50 agree votes) were in favour of preserving dunes, revegetating foreshore reserves and not removing beach wrack (see Figure 7).

Six respondents strongly disagreed and two disagreed with this management approach.

Three respondents didn't have a positive or negative view on this management approach.

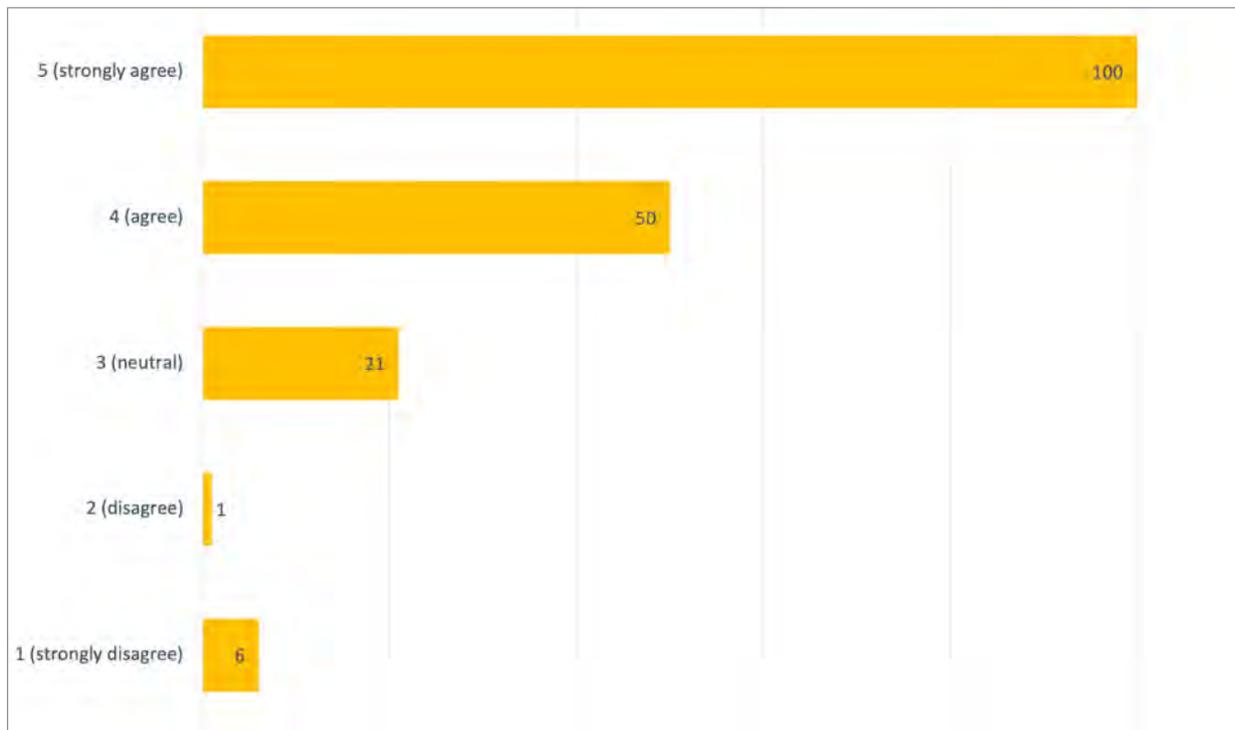


Figure 7 - Preservation to lower risk of coastal erosion

Landowners should be allowed to protect their property where they have demonstrated there will be no impact on the adjoining coast

76 respondents agreed that landowners should be allowed to protect their property where they have demonstrated there will be no impact on the adjoining coast (see Figure 8).

This was the most favoured response, followed by 55 respondents who strongly agreed with this management approach.

Two respondents disagreed with this management approach, one strongly disagreed and three respondents were neutral about this management approach.

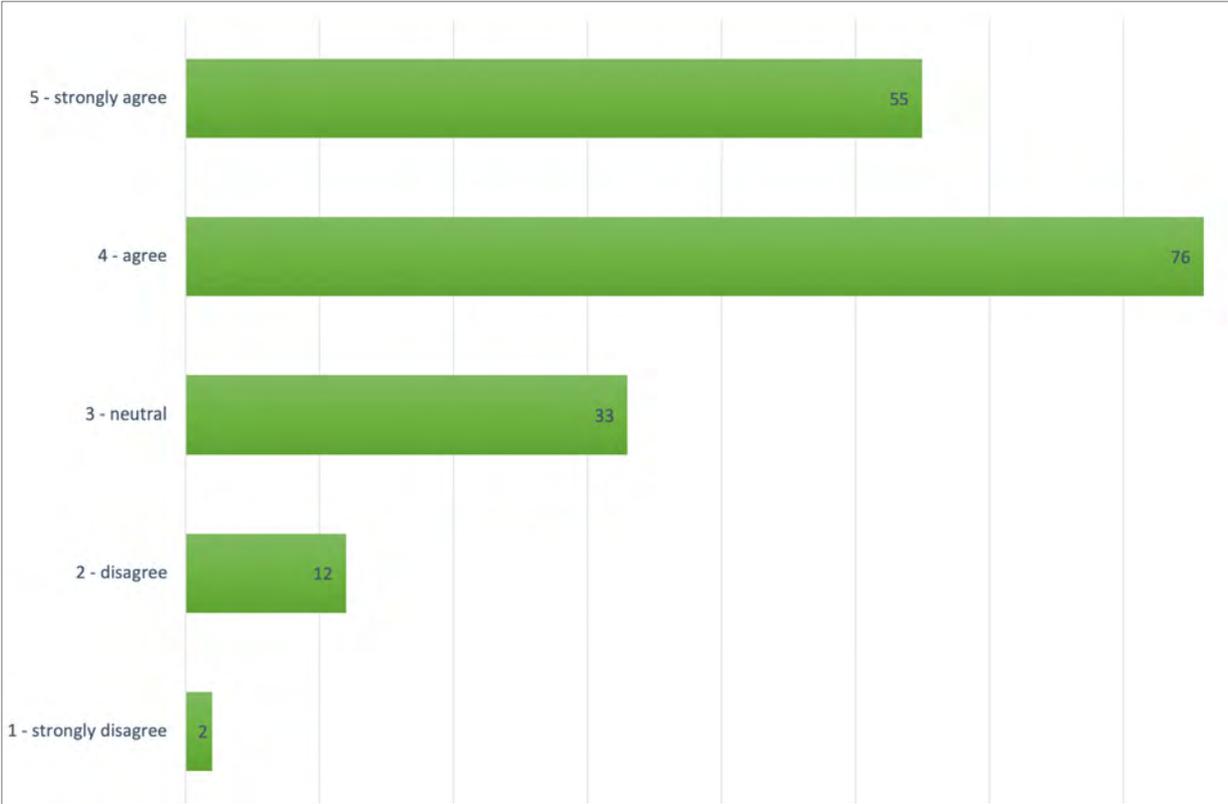


Figure 8 - Protect private property with demonstration of no coastal impact

Beneficiaries of protection works should bear the capital and maintenance costs of those works

Responses to this question were distributed broadly from strongly disagree to strongly agree. Percentages have thus been used to differentiate how respondents felt about this management approach.

33% of respondents were neutral about beneficiaries of protection works bearing the costs of these works. 28% of respondents agreed with the management approach and 15.8%

strongly agreed.

9.7% of respondents strongly disagreed and 15.8% strongly agreed with the premise of this management approach. The distribution of these responses suggest that this may require further discussion during the next engagement stage.

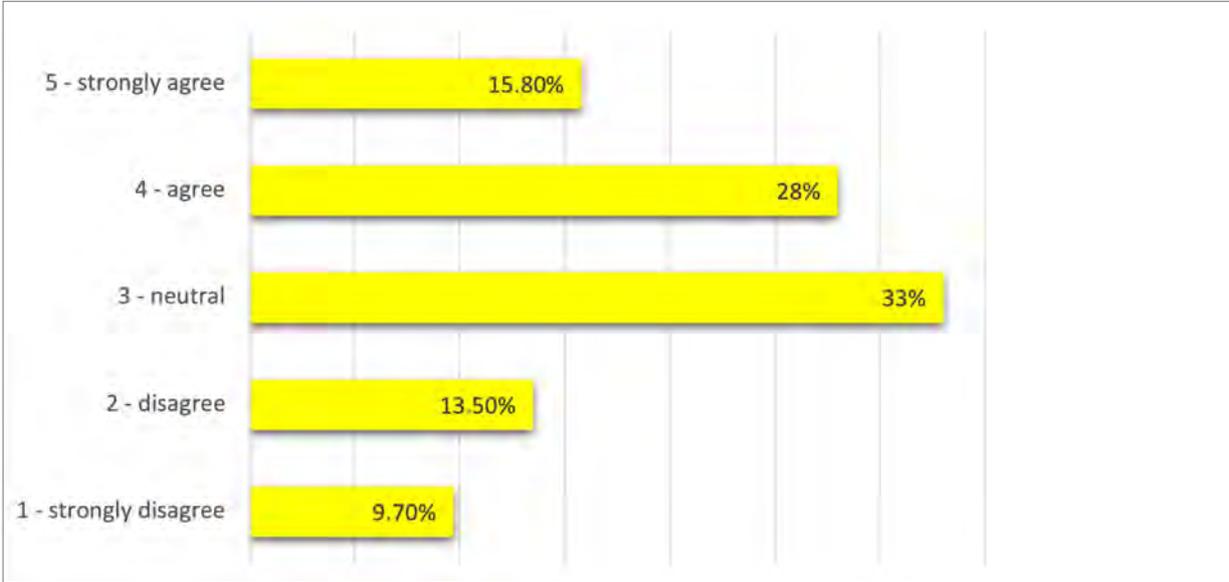


Figure 9 - Beneficiaries of protection works should bear cost

Protect private property from erosion, even if this results in the loss of public foreshore reserve and beach access

Responses to this question were also distributed broadly. Percentages have thus been used to differentiate how respondents felt about this management approach.

28.7% of respondents disagreed that private property should be protected from erosion even if it results in the loss of public foreshore reserve and beach access. 18.6% strongly disagreed with this management approach.

14.9% agreed and 12.8% strongly agreed with this management approach. 5% were neutral.

This response suggests that this approach should also be discussed further during the next engagement stage.

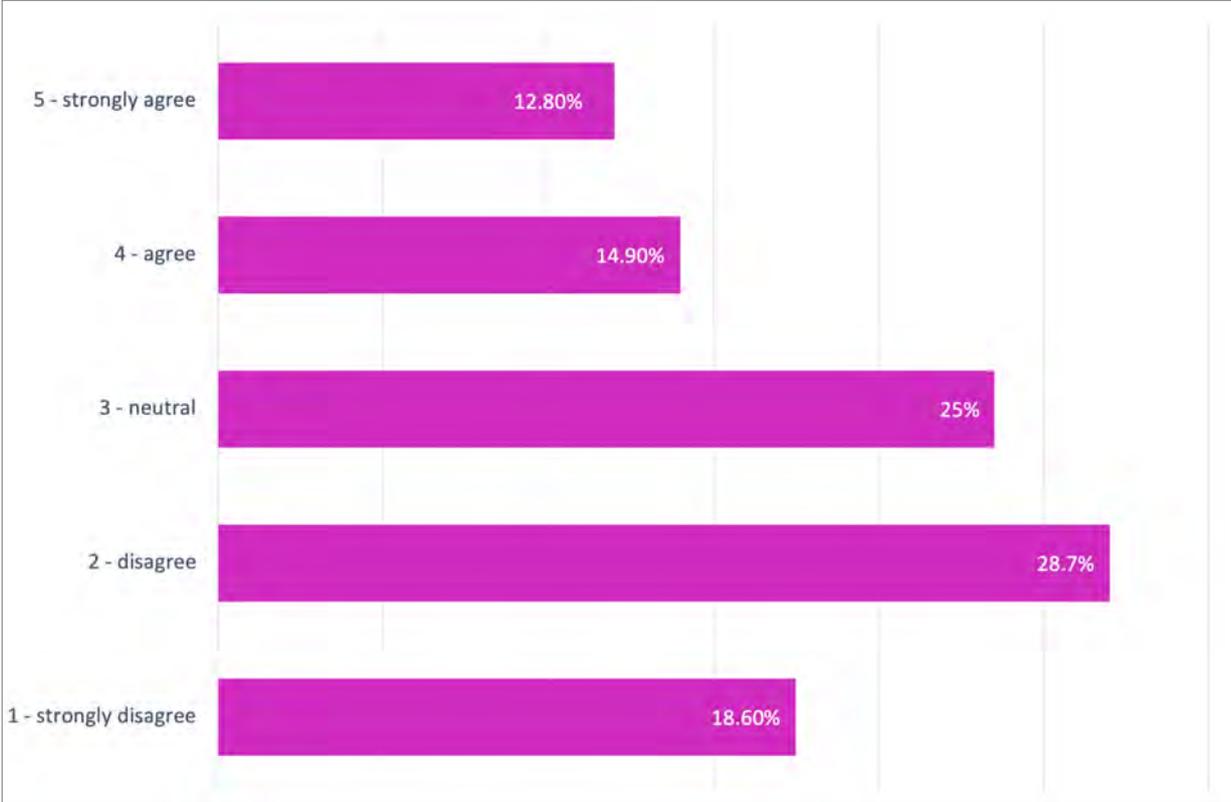


Figure 10 - Protect private property from erosion at all costs

Allow approved land uses in developed areas until erosion becomes intolerable

Respondents generally disagreed that approved land uses should be allowed in developed areas until erosion becomes intolerable.

65 respondents strongly disagreed with this management approach, and another 57 disagreed with it.

18 respondents agreed with this approach and 12 strongly agreed with this approach.

30 respondents were neutral.

This management approach will need further consideration, and potentially discussion around how this might be progressed.

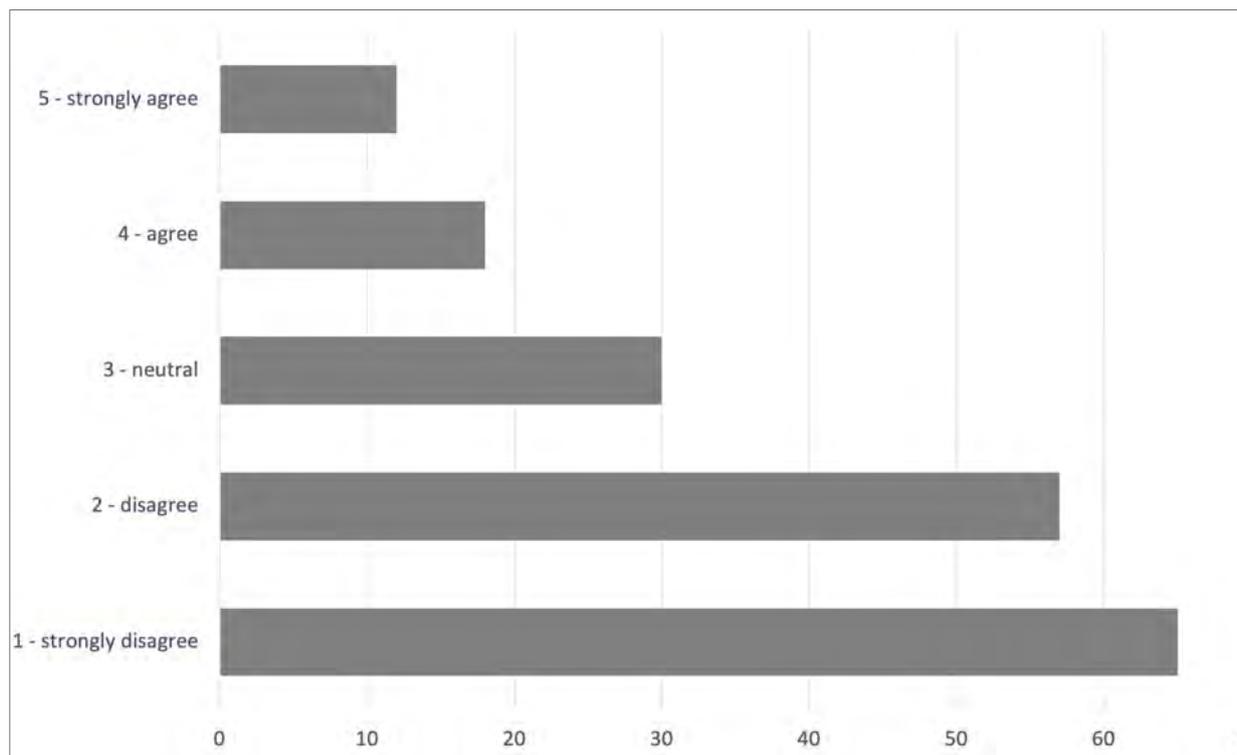


Figure 11 - Allow approved uses until erosion is intolerable

Retain public access to beaches and foreshore reserves and preserve coastal dunes and vegetation for future generations

There was strong agreement (115 polled for strongly agree and 49 polled for agree) from respondents about retaining public access to beaches and foreshore reserves and preserving coastal dunes and vegetation for future generations.

Only four respondents strongly disagreed with and six disagreed with this management approach. Four respondents were neutral about this management approach.

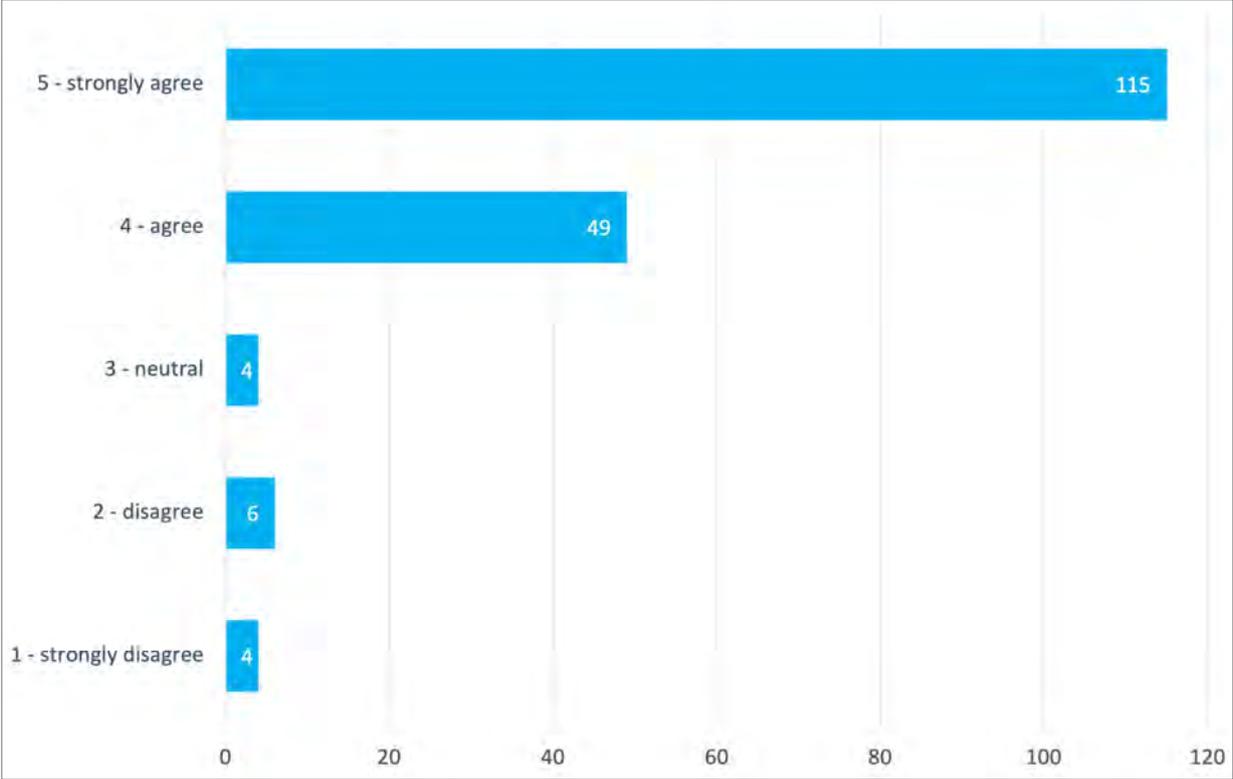


Figure 12 - Retain public access and protect dunes and vegetation for future generations

Relocate assets away from the coast and let natural processes take their course

This management approach also received a range of responses from stakeholders. Of the 181 responses, 11% (20 votes) strongly agreed with the management approach and 26.52% (48 votes) agreed. 12.71% of respondents (23 votes) strongly disagreed with the management approach and 26% (47 votes) disagreed with it.

23.76% of responses (43 votes) were neutral about this management approach.

Relocation (retreat) is a complicated management approach and needs to be considered carefully against other community outcomes.

The project team will discuss this and other management approaches and the trade-offs involved with the community after vulnerability and risk profiles have been undertaken for the various coastal and estuarine assets in the study area.



Figure 13 - Relocate assets away from coast

Do not allow more intensive development (such as units where there is a single house) in hazard areas

There was largely support for not allowing more intense development in hazard areas - 97 respondents strongly agreed and 56 agreed.

Six respondents strongly disagreed and seven disagreed with this management approach.

13 respondents were neutral about the approach.

This management approach will be discussed further when the project team consults with the community and stakeholders about adaptation options for the study area.

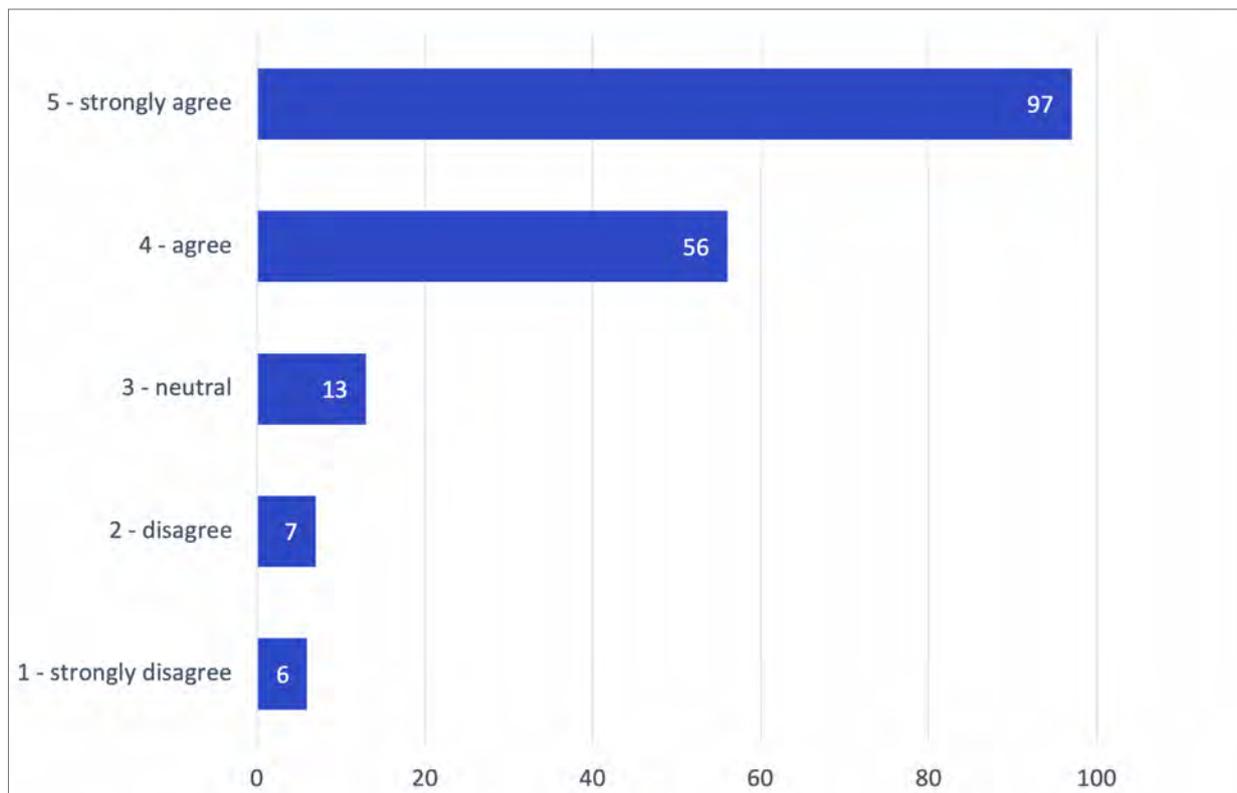


Figure 14 - Do not allow more intensive development in hazard areas

Private landowners should be informed about the risk of erosion when purchasing or developing in hazard areas

119 responses strongly agreed that private landowners should be informed about the risk of erosion when purchasing or developing in hazard areas. 53 responses agreed with this approach. This was the vast majority of responses, with only three (3) polled strongly disagreeing with the approach, two (2) polled disagreeing and three (3) neutral polls.

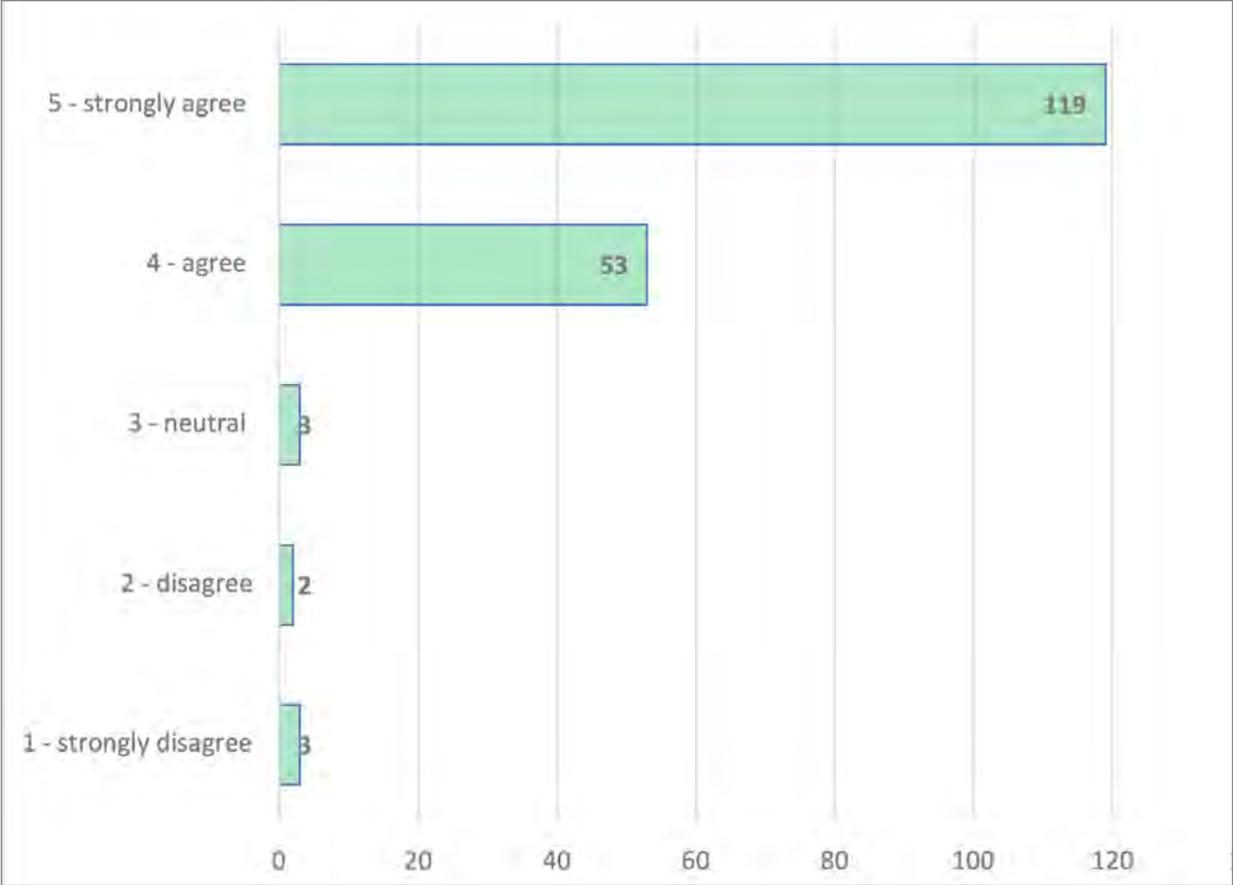


Figure 15 - Inform purchasers or developers of erosion risks in hazard areas

Q7 - How would you describe your connection to the Capel to Leschenault coast?

151 respondents to this question are landowners.

Nine respondents rent in the area, 16 are rate payers (own property but are not residents) and six work in the area.

six respondents are holidaying in the area.

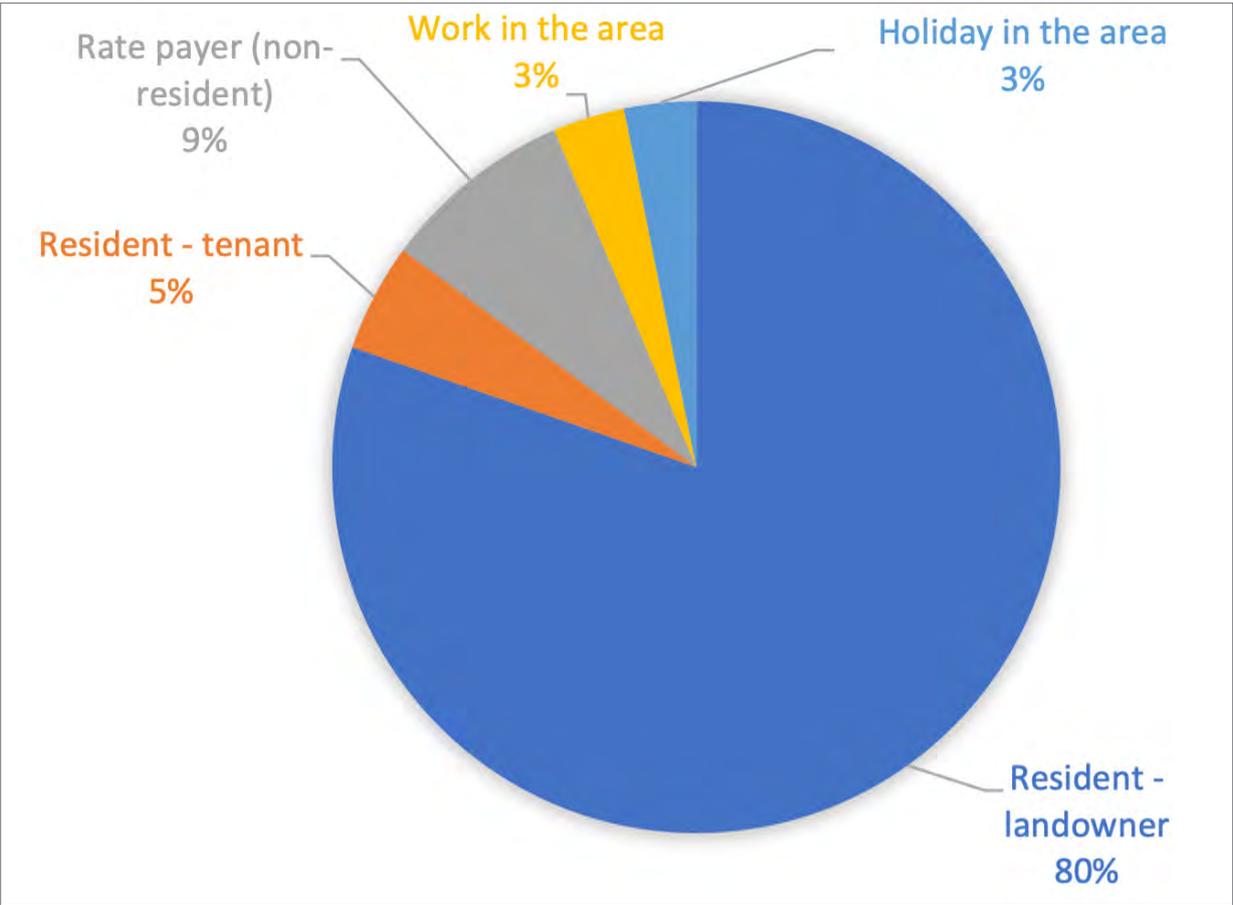


Figure 16 - Question 7

Q8 - How would you describe yourself?

81 survey respondents were female, 96 were male, one identified as non-binary and three said they would prefer not to say.

Q9 - What age bracket applies to you?

24% of respondents were 66+ years old. 32% were in the 56-65 age bracket, 20% were in the 46-55 age bracket and 12% were in the 36-45 age bracket.

7% of respondents were in the 26-35 age bracket, 1% (one person) was in the 18-25 age bracket and 1% (one) was in the 0-10 age bracket.

2% of respondents (six people) preferred not to say.

The overall sample of respondents is representative of the demographic population of the LGAs.

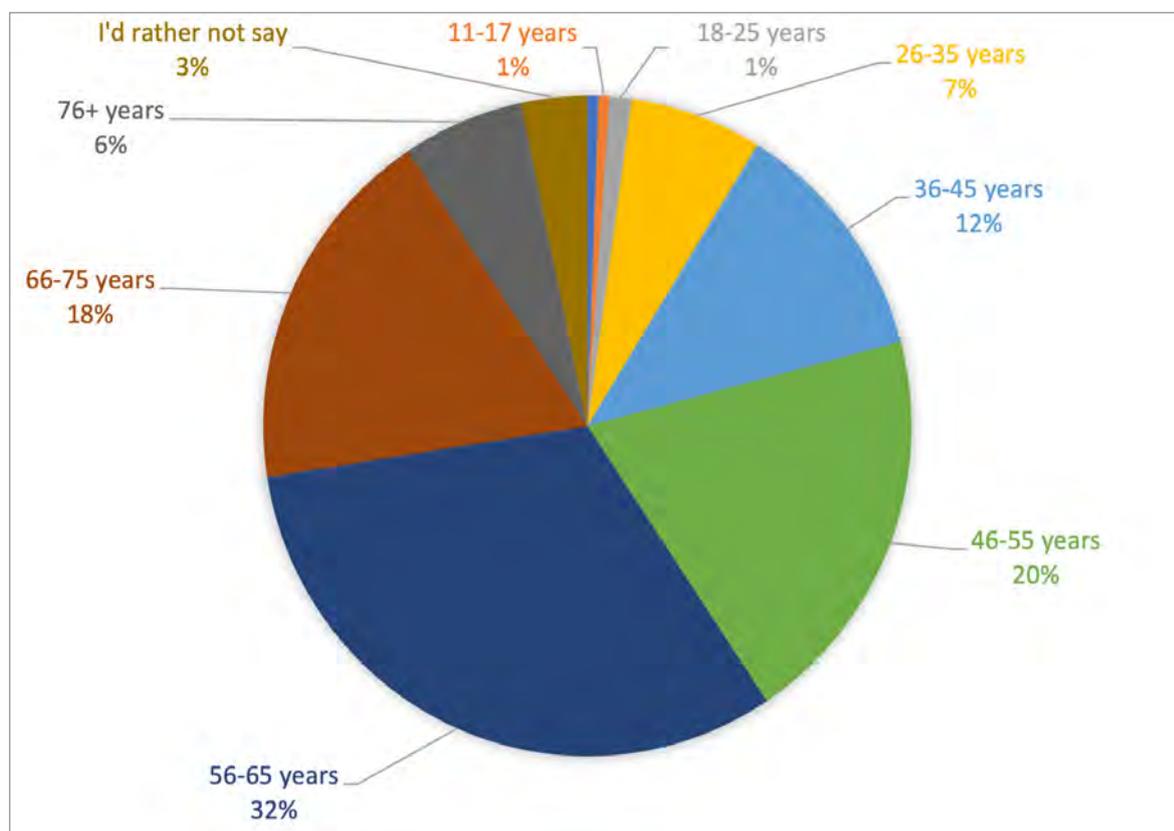


Figure 17 - Question 9



2.4 MAP AND COMMENTS

Respondents had the choice to place a 'pin' on a map provided on the project page and make a comment regarding that location.

Figure 18 illustrates the web portal mapping tool comments received. It shows where feedback was provided across a number of themes represented by the pin options.

A total of 56 comments were received on the interactive map. These were generally broadly distributed, with a larger clustering of comments around the Bunbury coastline and Peppermint Grove Beach in Capel.

The pins related to the following five category options:

- Water based activities (e.g. swimming, boating, surfing, windsurfing, fishing)
- Beach based activities (e.g. four-wheel driving)
- Foreshore based activities (e.g. walking, running, picnics, bbqs, watching sunset)
- Nature based activities (e.g. wildlife watching, enjoyment of coastal vegetation)
- Something else/other (please describe)

Of the 56 comments received, these are broken down as follows:

- 15 water based comments - mainly discussing swimming, kayaking, and boating values

- Six beach based comments - with a few people discussing 4WDing, dog walking and exploring areas with the family
- 11 foreshore based comments - speaking to similar activities by respondents (walk/swim/cycle/walk dogs/watch sunset/watch wildlife)
- 14 nature based comments - largely around retention/ protection of vegetation and coastal landforms
- Nine something else/ other comments - these comments had a focus on the need for recognition of coastal erosion or protection of vegetation and the environment.

The breakdown of comments received in the different LGAs is outlined below:

- Harvey - 11 comments
- Bunbury - 27 comments
- Dardanup - three comments
- Capel - 15 comments

Key themes from the comments received are consistent with survey responses; these were around valuing the coastal and estuarine areas for activities like walking, swimming, boating, exploring with the family, and wanting to see/the need for retention of coastal vegetation and landforms and the protection of the environment.

Another strong theme was around coastal erosion and climate changes being observed by respondents.

The full list of unedited comments 'pinned' on the map can be found at Appendix A. These are broken down into the different LGAs.



Figure 18 - Interactive online mapping tool

3.0 WORKSHOP

A community workshop was held on Thursday 2 September 2021 from 5.30pm to 8pm. The workshop was a hybrid online-in person event, with the online and in person locations all linked to be run as a single session.

The in person locations were:

- Shire of Harvey Australind Council Chambers
- Shire of Dardanup Eaton Council Chambers
- City of Bunbury Council Chambers
- Shire of Capel Council Chambers

Participants nominated the location they would like to attend, with locations being hosted by staff from the respective Local Government.

Members from the consultant project team hosted the workshop online, supported by the project manager at PNP.

The workshop provided community members with the opportunity to establish and record their coastal values for their local areas and to let the project team know their issues and concerns.

3.1 WORKSHOP FORMAT

Facilitation was undertaken by Shape Urban and Water Technology presented coastal information.

At the start of the session, the project team provided attendees with basic information on CHRMAPs and coastal processes, the key coastal issues for each of the LGAs and what hierarchy of adaptation options, as provided for by the Western Australian Planning Commission's CHRMAP Guidelines (WAPC, 2019).

The project team also shared the draft key findings from the online engagement with workshop attendees.

The project team reminded participants about the coastal planning that has already been undertaken (context).

Following the presentation, the workshops comprised two interactive activities:

- 1. Establishing coastal values** - workshop participants were asked to identify values important to them on a map at their table. Each location got a map that was focused on their LGA. Participants had to place blue dots on the map and link these back to numbers on a sheet. At the end of this exercise participants presented their established values back to the larger workshop group.

2. Issues/ concerns - the project team asked participants to mark on the same map (using orange dots) any issues or concerns they had along the coast or river frontages, or to identify things that have changed that affect them. Participants were asked to work together to create a comprehensive list. At the end of the activity, participants shared their feedback with the larger workshop group.

Section 3.3 discusses the outcomes of each of the activities.

The workshop presentation is at Appendix B.

3.2 WORKSHOP ATTENDEES

There was a total of 27 community member attendees at the workshop. In addition, members from the project team, PNP and LGAs also attended.

3.3 WORKSHOP OUTCOMES

3.3.1 Establishing coastal values

Participants were asked to think about a place that they loved to go to (in the coastal zone) and to write that on their sheet. They were asked to consider why those places are important to them, what they do there, and what physical aspects of the place are important to them.

The project team advised participants that these places and spaces can be any type of activity, e.g. an area for community use, an important cultural place, an environment that matters to them.

Participants at each location were given task sheets as templates to list these places and match numbered dots they placed on the maps.

The coastal values are broken down into the four LGAs. However, the comments and values cut across LGAs and should be read more generally to make up the study area.

Harvey

No significant values were provided for the Shire of Harvey coastal zone.

Bunbury and Dardanup

Important coastal values have been combined for Bunbury and Dardanup given responses on the night were marked beyond LGA boundaries. Additionally, there were only three attendees at the Dardanup location and one had to leave halfway through, so this combination of values gives a comprehensive understanding of coastal values for both LGA locations.

Valued places and activities, and why these are important to attendees are:

- Nyadup Rocks (Rocky Point) for surfing through autumn/ winter/ spring (#10)
- Northern end of Back Beach (#12)
- The Outer Harbour (inside the Port area) for surfing through winter and fishing; Dalyellup Beach for the surf club, swimming and fishing; Big Swamp for walking and running; Koombana Beach for swimming and dining (#9)

- Bunbury Cut for surfing, fishing, jet ski use, feeding point for dolphins (#4)
- The beach In the northern section of the Seabird coastline - very important to families and kids and is a regionally accessed beach (#11)
- BP Groyne for surfing and swimming (#14 and #15)
- The Bay for surfing, swimming and fishing (#16)
- Leschenault Inlet for running, walking, cafes, bird watching (#18)
- Pelican Point - important for migratory shorebirds (#52)
- Leschenault Estuary as one of the main coastal wetlands in the area with high environmental value (#21)
- Beaches and dune systems in Back Beach, Belvedere Peninsula, Dalyellup Beach, Peppermint Beach - habitat for diverse species of coastal animals and protection from impacts of sea level risk due to climate change (#23 and #24)
- Hungry Hollow for recreation (#48)
- The mouth of the Collie and Preston rivers - prime feeding areas for migratory shorebirds (#41)
- Bunbury Port (#30)
- Quindalup dune system and its ecology (#34)
- Manea Park for walking, flora and fauna, photography, orchids (#30)
- Tuart forest - a peaceful place to run and walk, unique vegetation and fauna (#112)

Other comments related to locations that people wanted to see protected in response to sea level rise and that people valued for environmental reasons.

The mapped values for Bunbury and Dardanup are at Figure 19.

The full set of unedited responses are at Appendix C.

Capel

Comments made at the Capel workshop also cover some of the Bunbury LGA.

Valued places and activities, and why these are important to attendees are:

- Peppermint Grove Beach for running, walking, swimming, fishing (#B2)
- Stratham Beach for water sports, fishing and walking (#3)
- Back Beach for watersports, walking, surf life saving(#2)
- Ocean Drive for driving to work and cycling for exercise Good swimming near the lookout at the northern end of Lancelin (#2)
- Dalyellup Dunes - access to beach, however has been reducing over years - insufficient action to protect the dunes (#4)
- Tuart Forest - environment, walking, wildlife, trees (#B1)
- Capel Coast - concerns about contamination on the coast (#J2 and #J3)
- Capel Coast - sensitive Aboriginal history (#J2)
- Dalyellup Beach and Parks - 4WDing (#D5)

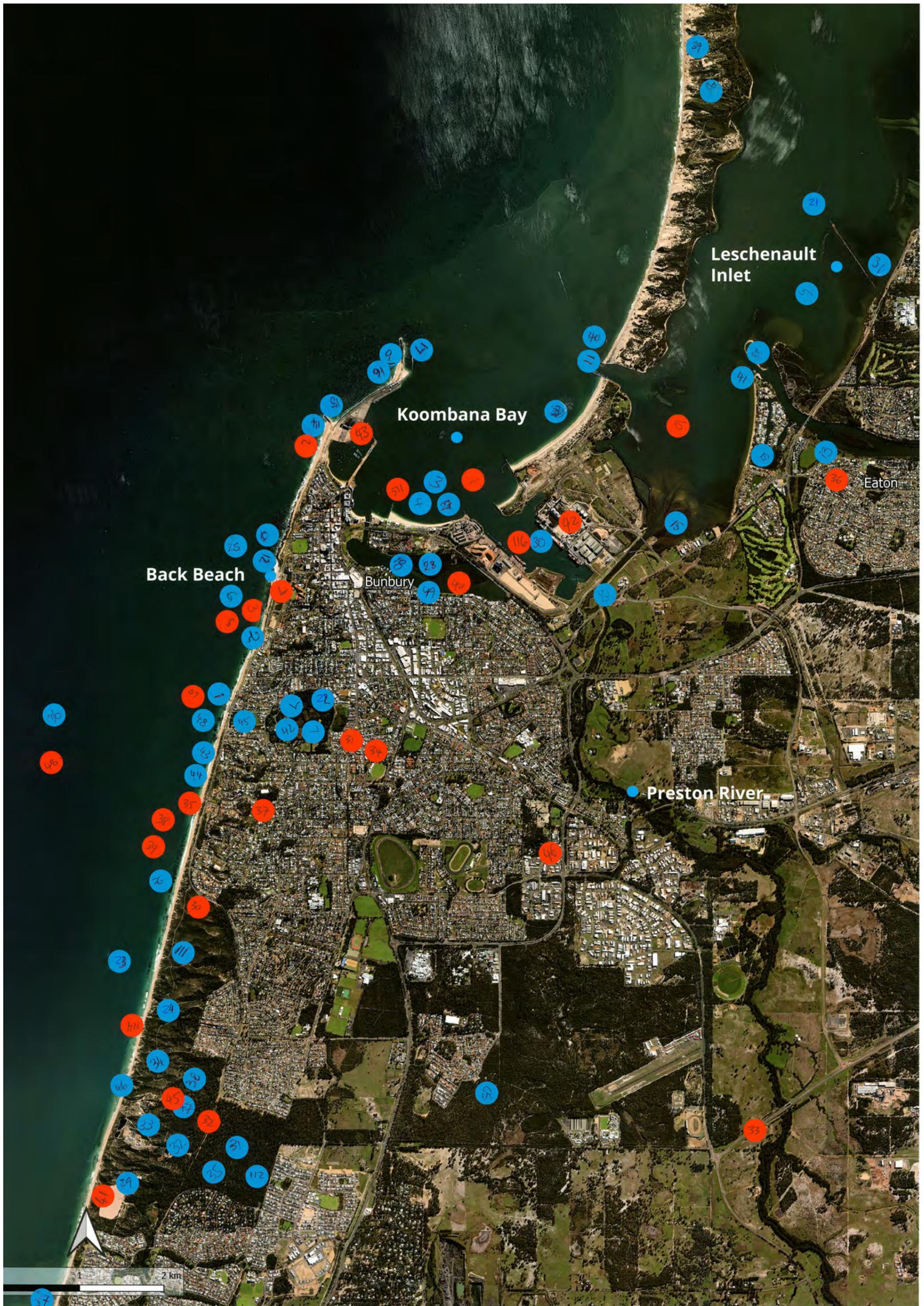


Figure 19 - Coastal values exercise for Bunbury and Dardanup

- Between the ocean and the drain if there is a blow out there is loss of land) (#81)
- Capel River Wetlands (Mallokup Wetlands) - important home for water birds and other communities, high aesthetic value, rich organic adjacent agricultural land (#CRW)
- Beach north of Capel River mouth - last 'wild' coast with reef and near shore snorkelling, bird watching, cray fishing - narrow beach needs protection from 4WDs (#P1)
- Capel River mouth and beach for walking, swimming, taking visitors to see it (value the scenery and bird life) (#B1)
- Minningup Beach for walking, swimming, value scenery and bird life (#B2)
- Stirling Wetlands - importance of historical swan nesting, vegetation for swan nesting - need for fox control (#B3)

Other comments related to revegetation by community members at Peppermint Grove Beach and observations that for the first time a primary dune has been 'blown out' (#77) .

The mapped values for Capel are at Figure 20.

The full set of unedited responses are at Appendix D.

Summary

The workshop identified some key coastal values for the LGAs - namely:

- Beaches and estuarine areas for activities like walking, swimming, exercise, views, fishing, surfing, 4WDing
- Wetlands and environmental areas for their flora and fauna diversity which participants could view. These places were also used for views, walks and to enjoy the scenery.
- Vegetation retention and revegetation and the need to do more to protect coastal areas from erosion came up multiple times in the different LGAs.
- Environmental protection was generally very highly valued.
- Sea level rise and climate change was also a key discussion point at the workshop, with participants wanting to see more done in this space.
- Appreciation of wildlife at various locations and the need to protect habitat for these community and species to continue to frequent these locations.

These reasons *why* workshop participants value various features provide better understanding and insight to assess what assets have the greatest need or priority for adaptation and management.

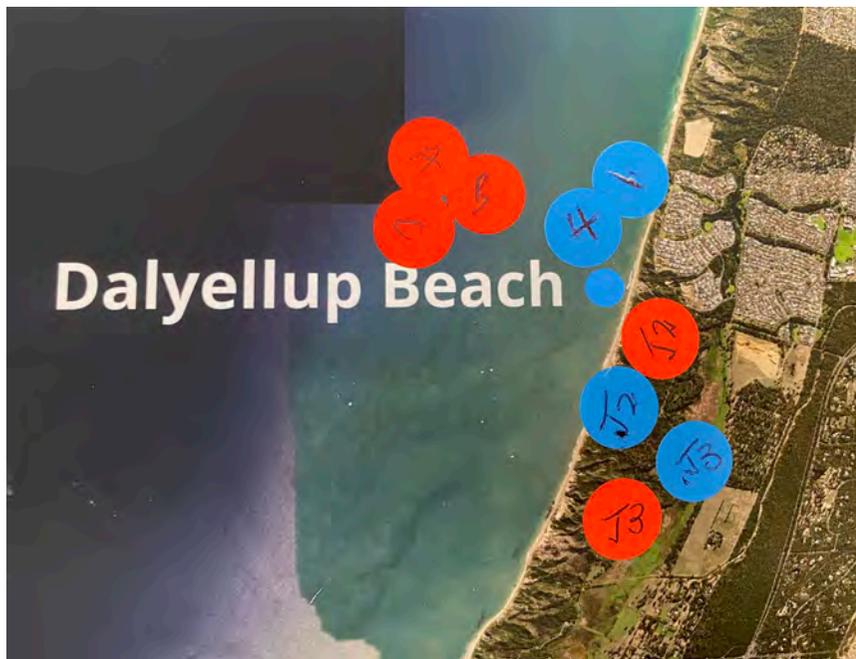
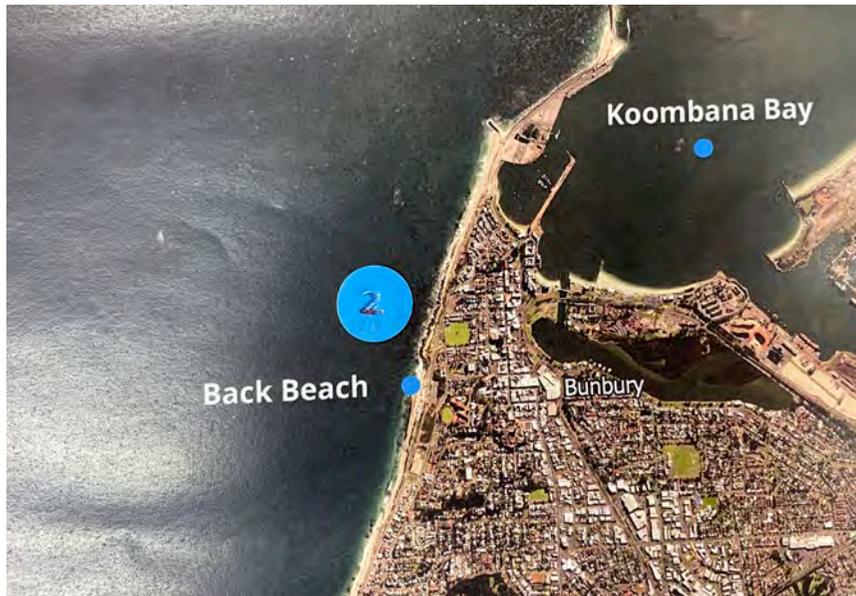


Figure 20 - Coastal values exercise for Capel

3.3.2 Issues/ Concerns

After the initial task to establish coastal values, feedback was shared by each workshop location key values were discussed. The discussion included participants' issues and concerns about some of the values and the risks participants saw to those values remaining.

The project team then asked participants to comment on issues or concerns about the coast or river frontages, or to identify things that have changed in those areas that affected participants.

Similar to Task 1, participants were asked to list issues, number those issues and then place an orange 'dot' with the same number on the same maps they had used for Task 1. Figures 19, 20 and 21 refer.

Harvey

No significant issues or concerns were provided for the Shire of Harvey coastal zone.

Bunbury and Dardanup

Issues/ concerns or things that have changed that affect participants are:

- Beach erosion - eroding of sand dunes, loss of sand. Also loss of infrastructure that supports enjoying the beach and natural environment e.g. beach stairs closed off (#114)
- Beach erosion 2 - drop in value of properties - massive impact to the natural assets of Bunbury (#114)
- Seagrass - the amount of seagrass that is ripped up and deposited on the beach during storms - the loss of seagrass beds (#3)
- The Port - the effects of the port activities, like tankers coming in and out, pollution are of concern - possible risk of inundation at the port and what this would mean for Koombana Bay and the dolphin population (#116)
- Groundwater and soil contamination from the Port (#42 and #43)
- Sand movement changing ocean conditions (#5)
- Sand through carparks and gardens (#7)
- Climate change causing stronger storms causing more damage (#3)
- Pollution in the Estuary (#6)
- Estuary is critical for migratory shorebirds especially
- Hungry Hollow - very little beach to walk on or swim at - worried about increasing visitors and the human and storm impact on beaches, paths and vegetation (#47)
- Impact of 4WDing on beaches
- Destruction of natural coastal wetlands that protect from extreme events (#48)
- Contaminated lands and highly contaminant industries close to the coast (#48)
- Contaminated sites - Dalryellup Waste Residue Disposal Facility and its close proximity to the high tide line and housing development and the drinking water extraction site (#41)

- Biodiversity loss (#32)
- Habitat loss (#30)
- Urban sprawl inland (#33)
- Loss of access to beach for recreation (#35)
- Loss of cultural sites (#36)
- Human impacts e.g. litter, human movement through planted areas, development close to beach, pollution (#39)
- Impact of marine based developments on health of waterways and marine fauna (e.g. flushing of inlet) (#40)

The mapped values for Bunbury and Dardanup are at Figure 20.

The full set of unedited responses are at Appendix E.

At the Dardanup location, two of the three workshop participants spoke to the local government project staff about their concerns about possible pollution and contamination along the coastline that may impact on the groundwater quality.

Capel

Issues/ concerns or things that have changed that affect participants are:

- Human impact e.g. Driving on the beach and making new tracks through dunes. This combined with more adverse weather events is causing major erosion of dunes that protect inland vegetation and homes etc (#14)
- Dalyellup - lack of education about coastal erosion or signage/ fencing to limit erosion by informing (#A)

- Dalyellup - due to erosion from residents and storms there is a need to help re-establish vegetation to help stabilise dune systems (#B)
- Dalyellup - loss of access to beach during winter and erosion of dunes (#C)
- Shire has drainage on to beach which backfills and causes erosion (#B1)
- Wetlands and farmlands becoming saline due to drains left open at Capel River (#B2)
- Peppermint Grove Beach - primary dune attacked for the first time in 50 years (#77)
- Recognition of multiple ownership (private, government, unallocated Crown land, public open space) and how we can get them to work together
- Salt water ingress through the cuts (#PA1)
- Salting land - salinity (#PA2)
- Elimination of beach/ habitat in relatively wild coastline (#PA3)
- Capel/ Stirling Wetland inundation north and south of Capel River - need to protect bird life especially swans (#B2)
- Tuart Forest National Park still capable of natural regeneration if kangaroos kept out - also, underground water level has dropped due to sand mining projects and quotas for farming, which affects forest vegetation (#B3)

Summary

The workshop identified some key issues/concerns across the LGAs - these are:

- Beach erosion and its environmental, social and financial impacts
- Contamination and pollution impacts from the port at Bunbury and other industrial activities along the coastline on fauna and flora and the health of waterways
- Destruction to coastal wetlands that protect from extreme events and that are home to birds and wildlife
- Biodiversity and habitat loss
- Human impact on the coastal and estuarine natural assets and values to the community

3.3.3 Other - Workshop Questions

Workshop participants across the four LGAs asked the following questions at the workshop. Project team responses are provided in italics below each question.

Are erosion and inundation the only two major risks?

The coast is shaped by many forces - the ocean, the wind, the structure of the rock and earth along different parts of the coast, and the impact of people and their activities. Coastal landscapes and risks to these therefore are a result of a combination of erosion, inundation, transportation (of coastal materials) and the impacts of humans on those coastal areas.

Climate change and sea level rise are also a risk to coastal areas.

Explain the rationale of combining areas for the CHRMAP in the face of different characteristics.

The PNP is working with four of its LGAs (Harvey, Bunbury, Dardanup and Capel) to prepare this CHRMAP in accordance with the requirements of SPP 2.6 and the State Coastal Hazard Risk Management and Adaptation Planning Guidelines (2019).

The study area is being broken up into management units (MU) that will represent a similar coastal landforms and locations so that each MU can be assessed according to associated risks and vulnerabilities, and according proposed treatments/solutions can address specific contextual requirements.

Sites are at risk from erosion and inundation. The list of the state's contaminated sites is on the Contaminated sites Register held by DWER. The interaction of ingress of sea water into contaminated groundwater at these sites could have significant impacts on contamination migration, potentially impacting Priority protection zones for drinking water areas that currently exist in the project area. As there are a number of registered contaminated sites within the project area, will the CHRMAP be considering specific impacts to these sites as a matter of importance due to the increased public and environmental health risk of impacts to these sites?

Yes, the project team will factor this into the CHRMAP process and, working with the community, propose responses that are appropriate to the study area.

Why the problem, climate change, is not included in the website introduction of the project and also it's mention like 15 minutes into to explanation of the project in the workshop? Climate Change is the problem. We are trying to adapt to the impacts, but the problem is climate change. It is important to be transparent with the community.

This has now been updated on the website. Climate change is explicit in the CHRMAP guidelines and used as one metric for determining the vulnerability and risk analysis.

How do you factor changes with time, flexibility in options for climate change?

State Planning Policy 2.6 - State Coastal Planning Policy (SPP 2.6) factors in a mean sea level rise of 0.9 metres over 100 years. The technical personnel from the project team will establish the sea level rise for the study area as well as vulnerabilities, levels of risk and triggers, all of which will assist with putting in place planning measures to address these risks.

Aware of any planning responses for shires that have already have CHRMAPS completed e.g. Wanneroo?

Yes, the project team has worked with other LGAs that have prepared CHRMAPs with differing planning responses to suit locations, level of risk and triggers. They will use this information as well as work with the community to develop planning responses that are appropriate for the study area requirements.

Why traditional owners are not present in the workshops? Are the aboriginal heritage areas being considered and protected?

The project team are speaking to Traditional Owners separately, to establish their values and concerns in the study area.

To evaluate the risk, will storm surges and extreme sea events be considered together with SLR? Having in account that extreme events occurrence rate is increasing due to climate change.

Yes, the project team will consider these events as part of its coastal assessment.

Interest has been shown generally by the community in this stage of the planning - how will you get an idea of what is valued by those not yet paying attention?

The project team, the four LGAs and the PNP ran a range of engagement and communication activities to understand community value, including direct emails to hundreds of known contacts, social media posts, the PNP project website, the Social Pinpoint project page, community survey, and workshops to reach as broad a range of community members as possible about their values.

Hard copy surveys were also distributed at a few locations in the LGAs.

There will also be additional opportunities to be involved and provide feedback as part of this project - feedback on this engagement report, direct feedback to the LGAs, by email and on social media.

We encourage you to provide us with feedback on any values in the study area you don't believe have been covered in the engagement report. These values will help inform Stage F - Risk Evaluation and Stage G - Risk Treatment.

Updating FAQs

These questions and responses will be shared in the form of Frequently Asked Questions (FAQs) on the project website. The PNP and four LGAs will direct stakeholders and community members to these FAQs.

4.0 COASTAL COMMUNITY ADVISORY GROUP

A Coastal Community Advisory Group (CCAG) was convened to support the steering committee in sensitivity testing of options and community review of technical inputs.

All attendees from initial workshops were invited to nominate to be involved and environment and community groups linked to the coast were also invited to express interest.

The first meeting of the CCAG was on Thursday 21 July 2022, and the second meeting was held on November 30, 2022. Both meetings were hosted at the City of Bunbury Administration Building .

4.1 CCAG MEMBERS

A total of 10 persons were selected as members of the CCAG, as follows:

- Greg Campbell, Australind representative
- Greg Norton, Capel representative
- Kerry Collard, Aboriginal Community
- Bronwyn Mutton, North Stirling Wetlands/Capel LCDC
- Les Mutton, Capel representative
- Ross Anderson, Harvey representative
- Sora Marin Estrella, Bunbury representative
- Anna Underwood, Harvey representative
- Judy Hearne, Peppermint Grove Beach Community Association
- Jan Tierney, Dolphin Discovery Centre

The following material was provided to the CCAG to support their role:

- Coastal Assets and Community Values Report (which describes the outcomes of the previous community values survey)
- The Preliminary Community Engagement Outcomes Report (which forms Section 2 and Section 3 of this report)
- A map showing the 'Management Units' (the way different sections of the coast are grouped), including draft hazard mapping: <https://watech.maps.arcgis.com/apps/webappviewer/index.html?id=d43c39fda97d426ea6192d1a7a8543cf>
- State Planning Policy 2.6 Coastal Planning Policy 2.6 https://www.wa.gov.au/system/files/2021-07/SPP-CST-SPP2-6_Policy.pdf
- Coastal hazard risk management and adaptation planning guidelines: https://www.wa.gov.au/system/files/2021-07/GD_CST_coastal_hazard_risk_management-guidelines-July2019.pdf
- Planned or managed retreat - existing planning framework and instruments: https://www.wa.gov.au/system/files/2021-07/CST-GD-CHRMAP-Guidelines-Published-Version-July-2019_Appendix-4.pdf

Meeting One

There was a total of 8 member attendees at meeting one, and 4 member attendees at meeting two.

In addition, members from the project team, PNP and LGAs also attended.

4.2 MEETING ONE

The first meeting was convened to discuss adaptation options, criteria and the options assessment process. Participants were asked to sensitivity test the assumptions the project team have made on the social and environmental values identified.

Facilitation was undertaken by Shape Urban and Water Technology presented coastal information.

The workshop comprised a significant amount of information, presented in a way to provide a solid understanding of the complex assessment process. The majority of the information shared can be found in the *Capel to Leschenault CHRMAP - Chapter Report: Risk Evaluation and Treatment*.

The project team shared the draft multi-criteria analysis of adaptation options with the participants and asked for comments and feedback on the scores presented.

The workshop presentation is at Appendix G.

Participants' were invited to test the accuracy of the project team's assessment of a number of options.

These options are typical adaptation treatments described in the technical reporting, and included:

- Locating assets in areas that will not be vulnerable to coastal hazards (AV)
- Leaving assets unprotected (PMR1)
- Demolition / removal / relocation of asset from inside hazard area (PMR2)
- Prevention of further development / prohibit expansion of existing use rights (PMR3)
- Voluntary acquisition (PMR4)
- Design assets to withstand impacts (AC1)
- Beach nourishment or replenishment (PR1)
- Groynes (PR2)
- Seawalls (PR3)
- Artificial reef (PR4)
- Offshore breakwater (PR5)
- Levy / Weir / Storm Surge Barrier (PR6)
- Monitoring (NR1)
- Protection Structure Audit (NR2)
- Notification on title (NR3)
- Emergency evacuation plans (NR4)
- Do nothing (DN1)

Each treatment was measured against the following criteria:

- Effectiveness
- Environment Impact
- Social Impact
- Aesthetic Impact
- Cost
- Future Adaptability

In the project team assessment, an adaptation option that responds positively against a criteria, would have a +2, whilst an option that performs negatively against a criteria would have a -2. Moderate is '0' and so on.

The full list of options and project team scores can be found in Appendix H.

In general, the meeting found that the project team had been relatively accurate in their scoring of adaptation options (noting that only social and environmental criteria were being considered).

For each Management Unit, Table 1 indicates those score that will change as a result of the CCAG inputs (note - only options where scores changed are included).

The highlighted cell indicates the subject management unit.

Where no change to scores was made a (-) symbol is used. Where the CCAG agreed on a revised value, both the project team value and the CCAG value are shown, with the number in brackets being the agreed CCAG revised value.

Table 1 - CCAG Multi-Criteria Assessment Revised Values

Management Unit 1 – Peppermint Grove Beach					
	Enviro. Impact	Social Impact	Aesth. Impact	Score	Comment
Design assets to withstand impacts (AC1)	-	1 (+2)	-	+10 (+11)	It was suggested this option score slightly higher on 'social impact'.
Groynes (PR2)	0 (down)	-	-	+1 (0)	No specific new value was suggested, final score is assumed.
Artificial reef (PR4)	0 (up)	-	-	-4 (-3)	No specific new value was suggested, final score is assumed.
Levy / Weir / Storm Surge Barrier (PR6)	0 (+2)	0 (+1)	0 (+1)	+1 (+5)	It was suggested this option score slightly higher on all measures.
Do nothing (DN1)	-1 (-2)	-1 (-2)	-	-8 (-10)	It was suggested this option score slightly lower on 'environmental impact' and 'social impact'.
Comments General - Some items could be controlled to have much more impact +10 or -10 than just +2 or -2					

Table 1 (cont'd) - CCAG Multi-Criteria Assessment Revised Values

Management Unit 2 – Capel Coast					
	Enviro. Impact	Social Impact	Aesth. Impact	Score	Comment
Groynes (PR2)	0 (-2)	-	-	-4 (-6)	It was suggested this option score lower on 'environmental impact'
Offshore breakwater (PR5)	0 (-1)	-	-	-7 (-8)	It was suggested this option score slightly lower on 'environmental impact'
Levy / Weir / Storm Surge Barrier (PR6)	0 (+2)	1 (+1)	2 (+2)	+1 (+6)	It was suggested this option score slightly better on all measures.
Management Unit 3 - Dalyellup					
	Enviro. Impact	Social Impact	Aesth. Impact	Score	Comment
Groynes (PR2)	0 [/ -1]	-	-	1 (0)	It was suggested this option score slightly lower on 'environmental impact'.
Offshore breakwater (PR5)	0 [/ -1]	-	-	-5 (-6)	It was suggested this option score slightly lower on 'environmental impact'.
Management Unit 4 – Bunbury South					
Comment - the CCAG suggested no changes to the project team scores for this management unit.					
Management Unit 5 – Bunbury					
Comment - the CCAG suggested no changes to the project team scores for this management unit.					
Management Unit 6 – Bunbury Port					
Comment - the CCAG suggested no changes to the project team scores for this management unit.					

Table 1 (cont'd) - CCAG Multi-Criteria Assessment Revised Values

Management Unit 7 - The Cut					
Comment - the CCAG suggested no changes to the project team scores for this management unit.					
Management Unit 8 - Bunbury East					
	Enviro. Impact	Social Impact	Aesth. Impact	Score	Comment
Beach nourishment or replenishment (PR1)	0 (-1)	-	-	+3 (+2)	It was suggested this option score slightly lower on 'environmental impact'.
Seawalls (PR3)	0 (+2)	0 (-2)	-	0	It was suggested this option score slightly lower on 'environmental impact' and 'social impact'.
Offshore breakwater (PR5)	-	-	0 (-1)	0 (-1)	It was suggested this option score slightly lower on 'aesthetic impact'.
Levy / Weir / Storm Surge Barrier (PR6)	-	-	0 (-1)	+3 (+2)	It was suggested this option score slightly lower on 'aesthetic impact'.
Notification on title (NR3)	+2	+1 (+2)	-	+8 (+9)	It was suggested this option score slightly higher on 'environmental impact' and 'social impact'.
Management Unit 9 - Leschenault Estuary					
	Enviro. Impact	Social Impact	Aesth. Impact	Score	Comment
Levy / Weir / Storm Surge Barrier (PR6)	-	-	0 (-1)	+3 (+2)	It was suggested this option score slightly lower on 'aesthetic impact'.
Notification on title (NR3)	-	1 [/ +2]	-	+8 (+10)	It was suggested this option score slightly higher on 'social impact'.
Do nothing (DN1)	-1 (-2)	-1 (-2)	-1 (-2)	-8 (-11)	It was suggested this option score slightly lower on all criteria.

Table 1 (cont'd) - CCAG Multi-Criteria Assessment Revised Values

Management Unit 10 – Collie River South					
	Enviro. Impact	Social Impact	Aesth. Impact	Score	Comment
Prevention of further development / prohibit expansion of existing use rights (PMR3)	1 (+2)	0 (+1)	0 (+1)	+6 (+10)	It was suggested this option score slightly higher on all criteria.
Voluntary acquisition (PMR4)	2 (+2)	1 (+1)	-	+5 (+8)	It was suggested this option score slightly higher on 'environmental impact' and 'social impact'.
Levy / Weir / Storm Surge Barrier (PR6)	-	-	0 [/ -1]	+3 (+2)	It was suggested this option score slightly lower on 'aesthetic impact'.
Notification on title (NR3)	-	1 (+2)	-	+8	It was suggested this option score slightly higher on 'social impact'.
Management Unit 10 – Collie River North					
	Enviro. Impact	Social Impact	Aesth. Impact	Score	Comment
Notification on title (NR3)	2	1 (+2)	0	8	It was suggested this option score slightly higher on 'social impact'.

In addition to the revised values suggested by the CCAG for the environmental, social and aesthetic values, some members of the CCAG made comment about other project team assessments as follows:

Management Unit 8 – Bunbury E

- CCAG queried if cost should be higher (i.e. +2) for the option ‘Locating assets in areas that will not be vulnerable to coastal hazards (AV)’.
- CCAG queried if cost should be higher (i.e. +2) for the option ‘Leaving assets unprotected (PMR1)’.
- CCAG queried if cost should be lower (i.e. -1) for the option ‘Levy / Weir / Storm Surge Barrier (PR6)’.

Management Unit 9 – Leschenault Estuary

- CCAG queried if cost should be lower (i.e. -1) for the option ‘Levy / Weir / Storm Surge Barrier (PR6)’. Meeting One

Meeting One Summary

As noted earlier in this report, the CCAG indicated general support for the project team scores with some exceptions.

Notwithstanding the responses, it remains that many of the recommended options will be complex and challenging to share with the broader community, many of whom will not have had the process and method of selecting options presented to them in such a detailed manner.

Regardless of how suitable the options are, communication will need to be clear and simple.

4.3 MEETING TWO

The intent of Meeting Two was to seek feedback on the project team final recommendations. The meeting was held both in-person and online, with some COVID-19 impacts.

Of the four member attendees, two had not attended the previous meeting and background material was presented in detail.

Reflecting that the documents are about to be ‘public’ there was substantial discussion about how the process is communicated both in terms of actual sharing of the CHRMAP’s and in terms of both the language and images used to present management options. Members support pathways for the community to partner with the coastal managers in implementing ongoing management actions.

The workshop presentation is at Appendix I.

Key Themes of Meeting 2

Environment

The most dominant discussion of the workshop reflects the broader feedback from the engagement process: that the environment is of primary concern and of the greatest value. Members reiterated a desire for 'environment' to be weighted more highly.

Members noted that reporting needs to strongly reinforce the fact that the natural environment is also an "asset".

Members reflected on some of the adaptation hierarchy diagrams, and how they are focused on the hierarchy response to built assets. On reflection, the project team noted that the absence of diagrams showing natural assets presented an implied meaning; members suggested that diagrams be updated; for example, that trees should be added to, or replace buildings in images.

It was suggested that Traditional Owner communities value environmental considerations over social and economic considerations. One quote reflects this most accurately: *"we are designing a plan that looks at the health of our Country, planning for our collective survival"*.

There was acknowledgement that some environmental assets cannot practically be relocated/recreated, as coastal processes would naturally result in long term loss. However, members noted this is more of a challenge where the foreshore abuts built development, and the coast/riverine environment is not given 'room' to change naturally over time.

Heritage

Some heritage sites which could not be formally identified for cultural reasons were noted as being present. Members indicated the relocation of many of these types of assets is not possible/feasible.

Ongoing monitoring for sites of Aboriginal significance was requested, as areas adjacent to water bodies are all sensitive to development.

Education

Aligned with the discussion regarding diagrams and images, members suggested the use of more (and better) imagery and fit for purpose infographics when communicating with community members.

Members also suggested greater levels of community education around values, monitoring, the need for regular updates to the CHRMAP and related documents.

Members suggested an ongoing engagement program be developed to regularly update the community of CHRMAP actions, changes to planning to support the CHRMAP, and opportunities to be involved in real-time support.

Aesthetic impact is less important than effectiveness.

Cost Focus

Members expressed a concern with Multi-criteria Analysis and Cost Benefit Analysis being the primary tools to remove options and select preferred options, as these do not necessarily place great enough value on environment and social factors.

They noted that at the scale of the CHRMAP, it was difficult to accurately identify local scale community values that may become more apparent during detailed planning.

This was linked to a discussion around the lack of weighting of those environment and social criteria.

The Project Team noted that a sensitivity/calibration process had been applied through the CCAG, whilst acknowledging that this was a small group and the scale of the project area makes it difficult for community members to give considered input on so many areas.

Comments about recommendations

Members queried the need for emergency evacuation plans for erosion given the current storm erosion distances.

Members also noted the need for feasibility investigations and seeking of approvals, including possible environmental impact for any substantial protect options. A desire to maintain natural assets and provide buffer areas around key assets was expressed.

Future Reviews

Members expressed appreciation for the need to undertake reviews of the CHRMAP and to be kept up-to-date on monitoring activities.

Meeting Two Summary

Meeting Two 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.

Ongoing education and engagement (as noted in this section), will build capacity in the community over time to respond in more detail, more rapidly to future reviews. This may result in stronger weighting of those values that were expressed as being of priority importance to the community in future reviews (noting that the engagement in developing this CHRMAP has also enabled that outcome to an extent).

CONCLUSION

The engagement undertaken to date provides a strong understanding of what the community values in each of the four LGAs in the study area, and how they might view the adaptation options that respond to the various coastal challenges.

The multi-engagement approach has allowed for a thorough investigation of community values at different sections of the coastline.

There was strong alignment from stakeholders on coastal values and issues/ concerns, across the four LGAs.

This is centred around:

- Beaches and estuarine area values for activities like walking, swimming, exercise, views, fishing, surfing, 4WDing
- Wetlands and environmental area values for their flora and fauna diversity, walks and to enjoy the scenery.
- Vegetation retention and revegetation and the need to do more to protect coastal areas from erosion
- Environmental protection values
- Sea level rise and climate change concerns, and how this is being addressed by the LGAs
- Concerns around the impact of erosion and its environmental, social and financial impacts
- Concern about contamination and pollution impacts from industrial activities along the coastline on fauna and flora and the health of waterways

- Destruction to coastal wetlands that protect from extreme events and that are home to birds and wildlife
- Biodiversity and habitat loss concerns
- Concerns about human impact on the coastal and estuarine natural assets and values to the community

All of the discussions regarding values and issues/ concerns, and suggestions by stakeholders to address the priority issues subsequently supported the project team in drafting a suitable multi-criteria analysis (MCA) process, tested with the CCAG, and then finalised with their input.

In the following stages, the feedback provided will enable the development of clear and simple communications materials so that the broader community can understand the proposed treatment options and trade off's for each.

NEXT STEPS

This report summarises the engagement undertaken with the community as part of developing the CHRMAP, including broad community engagement on values in the study area and more detailed discussions with the CCAG. It included online engagement, workshops in-person and online.

Recommendations noted in this report have been translated into the final CHRMAP document through the MCA and through the implementation plan of the CHRMAP.



2P
8 AM - 5 PM
MON - SAT
NO TICKET
REQUIRED
←

APPENDICES

Appendix A: Map Comments

Appendix B: Workshop Presentation

Appendix C: Bunbury and Dardanup Workshop Task 1 Comments

Appendix D: Capel Workshop Task 1 Comments

Appendix E: Bunbury and Dardanup Workshop Task 2 Comments

Appendix F: Capel Workshop Task 2 Comments

Appendix G: Coastal Community Advisory Group Meeting One Presentation

Appendix H: MCA Options and Scores

Appendix I: Coastal Community Advisory Group Meeting Two Presentation

APPENDIX A

MAP COMMENTS - HARVEY



Comment Type	Comment
Water based	Crabbing, watch amazing sunsets
Nature based	Cycling from Australind next to the Cathedral Avenue is very enjoyable. This 'cycling' path could be extended to the Leschenault Peninsula and ultimately to the Cut.
Foreshore based	Swimming cycling walking dolphin watching
Beach based	4wd driving, take family up beach with dog for picnic, swim, relax, interact with wildlife
Foreshore based	My family and I are regular campers and visitors to this spot, at least twice a week for the last 20+ years, we travel via boat and camp via boat as well as it was originally a boat only camping, lately more 4wd area driving through the fence, which I often repair, it is these types of campers that are tearing up the camps and lighting fires, such as the one that got away last year & always leave rubbish, can the fence be repaired?? I'm willing to help anyway?
Nature based	This area has been underutilised for a long time and I think it sound be improved so that it can be used and appreciated by the complete community. This doesn't include a residential canal development that can be accessed by a select few.
Nature based	Important area to preserve as part of the Kalgulup Regional Park, for flora and fauna, but there are also opportunities for recreational development (e.g. walk paths and bird watching hut)
Nature based	Migratory shorebird feeding grounds
Foreshore based	I have great concern about all the blue metal rocks that have been dumped along the river bank in this area as I believe there are much better alternatives to blue metal rocks that are totally foreign to the area and greatly diminish the beauty as well as reducing the wildlife not only on the bank but most specifically the river! Was any impact studies done before doing this??? Is the shire planning to continue to do this???
Nature based	Nice area to walk. The bushland provides an opportunity to enjoy nature close to home. It would be great if a cycle path could be developed here connecting Collie River Park with the Paris Road bridge over the Brunswick River.
Nature based	Open space often grazed by kangaroos. The scenery and wildlife can be enjoyed from Eaton Drive. More area here should be spared from urban development and included in the Kalgulup Regional Park. Great opportunity to develop a cycle/walk path from Leicester Reserve to the bridge to Treendale through a wide open area.

MAP COMMENTS - BUNBURY



Note:

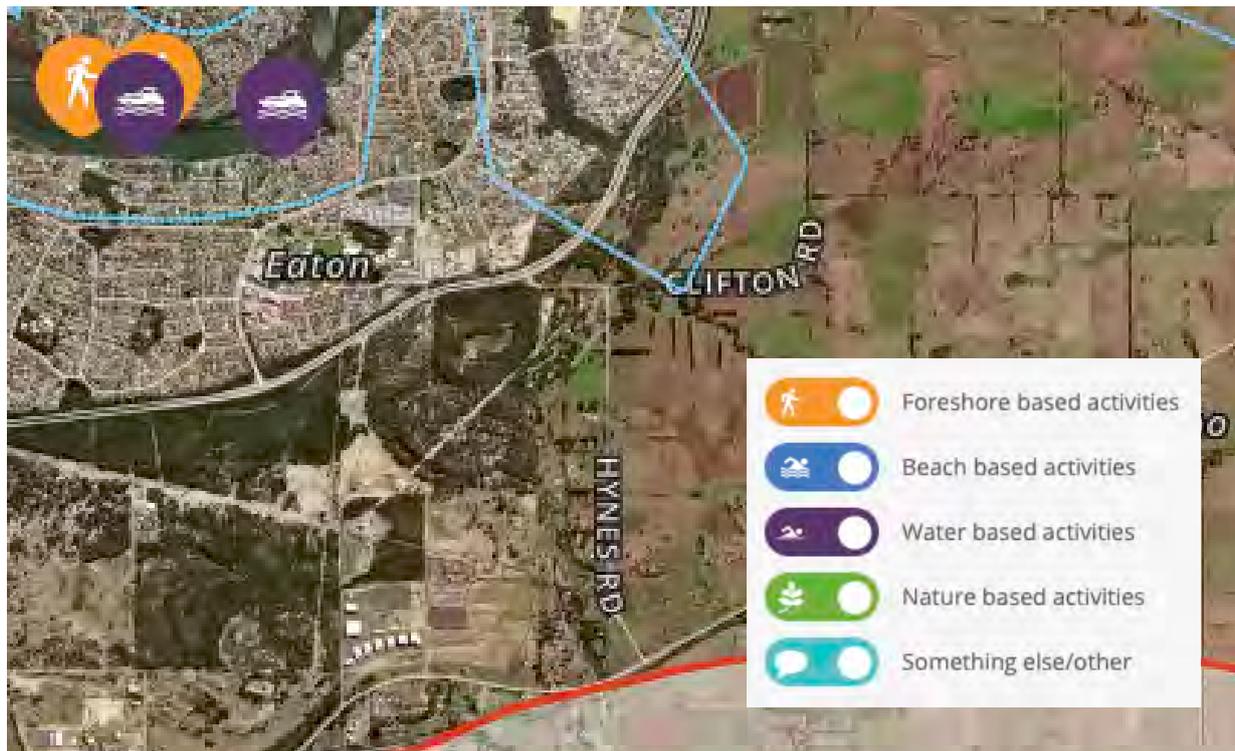
Bunbury comments in black

Outside the study area comments in blue

Comment Type	Comment
Nature based	Bird Watching
Water based	Swimming, running the dog on the beach, scurfig, cooling off in summer
Water based	Fishing with kids, running
Water based	Swimming cycling walking running dolphin watching
Water based	Fantastic for families! Would be great to have jumping platforms or more youth activities and options in the summer
Water based	Sailing at the yacht club - Launching boats off the sandy beach area.
Water based	Surfing/swimming
Foreshore based	Walking , Bicycle , Leisure relaxation and enjoyment of outdoors , nature observations , photography and studies inclusive of citizen science habitat ecology observations recorded on iNaturalist database for reference
Nature based	Ongoing nature photography , acquiring images , identification of genus and species , seasonal processes , habitat and ecology characteristics , also with observations recorded on iNaturalist database (CSIRO) for reference purposes , particularly terrestrial Flora and Avian , avian , insects , arachnids , and currently inclusive of Mosquito identification relating to Blood Borne Disease Vector research , as well as Mangrove (Avicennia marina) Seasonal observations throughout recent 2020 , 2021
Something else/Other	Citizen Science , ongoing observations and recording of seasonal cycles and growth of Avicennia Marina (Grey Mangrove) , recording of observations on iNaturalist database (CSIRO). The Mangroves are of international interest and currently of interest for research for Climate Change / Tidal Zones and Natural Carbon Management. A.marina is recognised as Estuarine/Tidal Zone growth and is supported interdependently in conjunction with the Tidal Wetlands , also under current ongoing observations
Beach based	Love this area and exploring the rock pools with the kids. There's grass and vegetation on the sand/beach and it feels secluded and away from the road
Water based	Surf Life Saving Competitions, Swimming, Old Boys swim races, fitness training, surfing, paddling, body surfing, interacting with dolphins
Foreshore based	Walking , Beach , outdoor leisure, activity and relaxation , also intending to make inclusive of some nature observations in future.

Comment Type	Comment
Something else/Other	Fragile and narrow dune vegetation area, infrastructure in close proximity to ocean
Foreshore based	cycling running watching the sunset
Water based	Love this area for the family & Dog
Water based	Put an artificial reef here to help with dune erosion! It will provide ecosystem restoration on land and sea, and it will create surf and diving opportunities for commercial and public use. Why would you not?
Nature based	Kids love exploring here
Nature based	daily connection with nature
Water based	Swimming/surfing
Water based	Paddle ski
Foreshore based	Walking along the beach with my kids and dog is a daily activity for my family
Nature based	Great place to walk and for other kinds of outdoor recreation. This is an ideal location for orienteering, which hopefully will be allowed again.
Something else/Other	Walking , outdoor activity leisure , enjoy nature and with ongoing local wetlands habitat ecological observations
Nature based	Local Nature Study and Research on coastal Wetlands Habitat Ecology , Observations inclusive of ongoing acquisition of Images , Identification of genus and species for Flora , Avian , Pollinators , Water Birds , including insects eg wasps bees. Observations recorded and listed on iNaturalist database for reference.
Something else/Other	Citizen Science , ongoing local Wetlands habitat ecology study and research , Observations inclusive of Images and Genus / species listings recorded on iNaturalist database for reference , Seasonal processes etc
Foreshore based	Walking , outdoor activity leisure relaxation and appreciation of natural habitat

MAP COMMENTS - DARDANUP



Comment Type	Comment
Foreshore based	With regard to the proposal for car park and road realignment, is it really necessary? I believe a better option would be to have no car parking there and all parking at the club and that area regenerated back to original bush to encourage more wildlife. As putting more cars there with parking leaning towards the river will encourage oil and fuel from cars to run directly to river and contaminate, there is ample space around the club for parking.
Water based	Paddling, admiring wildlife
Water based	I'd really like to see the health of the Collie River improved to a point whereby it could be used for purposes other than boating. Having lived in Eaton for the past 45 plus years I find it disappointing to have witnessed the gradual degradation of this waterway to its current level.

MAP COMMENTS - CAPEL

-  Foreshore based activities
-  Beach based activities
-  Water based activities
-  Nature based activities
-  Something else/other

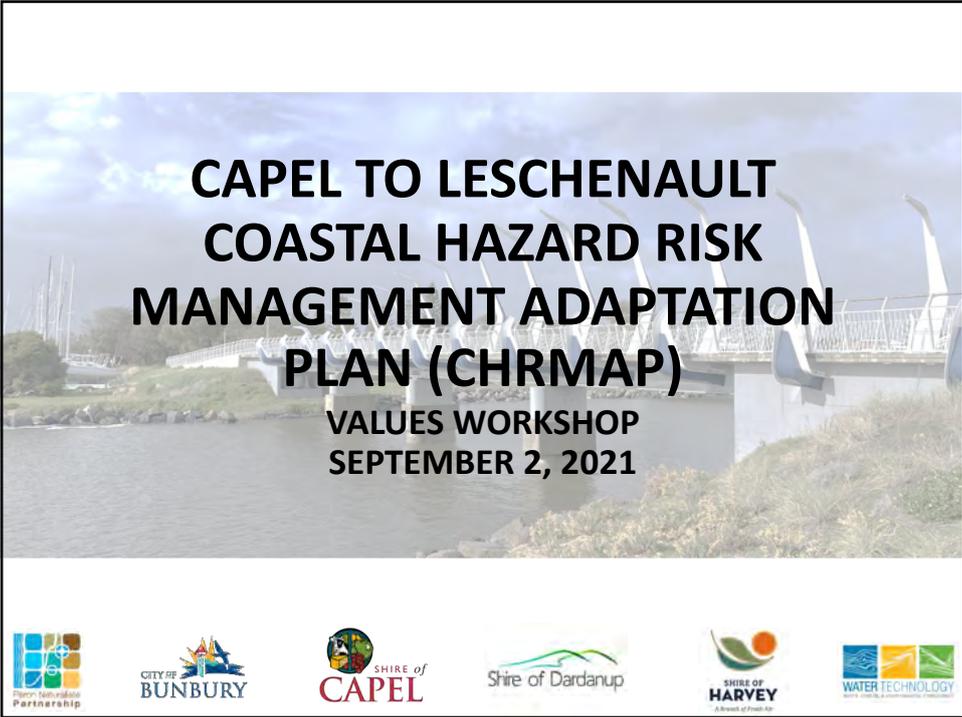


Comment Type	Comment
Foreshore based	Walking , MTB , outdoor leisure relaxation among nature
Nature based	walking running mountain biking watching wildlife and native flora
Something else/Other	Seriously worried that most of the residents in this area may not have taken note of the impact coastal erosion and inundation will have on the whole area , that they think it's just about the shoreline. People need to recognise that its crucial we encourage and support the shire to plan and make provision now, make sure we are building the resources, financial and otherwise, to take action so the lifestyle we enjoy can be protected by taking constructive and less invasive steps
Foreshore based	swimming walking/running on beach watching sunset and wildlife
Beach based	Vehicle access to (driving on) the Dalyellup beach is one of the most important things in my life and in many of my friends. It is the main reason why I live in Dalyellup. It is a myth that everyone can walk long distances on sand while carry things. To enjoy the beach and engage in activities like fishing paddle boarding etc. you have a few thing to transport like chairs and SHADE. Please leave the 4x4 access at Dalyellup as is. We are happy with the way it is now.
Something else/Other	Read a lot of scaremongering lately that only the particular patch of basalt in Gelorup (despite there being a big belt of basalt right through the SW) can possibly save us from inundation. This convenient position of people wanting the BORR out of Gelorup is damaging and misleading , ignores the range of constructive steps we should all be taking, infers all we can do is duck for cover behind a high hard wall.
Beach based	Such a special place to bring my dogs and unwind. An unspoilt, looked after beach area with a wealth of wills life to enjoy
Beach based	Read a big announcement in local press in May by Cr. Southwell that council had a plan to open up the "secret" beach coast between Dalyellup and Forrest Beach for cars to drive along etc etc. He said the plan would come to council in JUne. So far, thank heavens, it hasn't. No-one else in the shire seems to know anything about it either, except the May press splurge. Hopefully such a plan will be subject to the planning you are doing. It seemed to have quite opposite intentions.
Nature based	Reef snorkelling
Beach based	swimming snorkelling wildlife watching

Comment Type	Comment
Something else/Other	Parts of these wetlands at Mallokup are at sea level in height with very salty water located at shallow depths below. They will likely further increase in salinity. New management options and development restrictions in low lying areas needs to be considered.
Water based	kayaking
Nature based	From Mt Stirling lookout you can see bird filled wetlands, the world's best Tuart forest and the famous coastline from the tip of the Geographe bay, along the Busselton coastline to the dunes of Bunbury.
Something else/Other	We are all so used to the road and drainage infrastructure through the low wetland areas behind the sandhills that we take it for granted, we think it's all about the shoreline. If there is not planning to maintain and meet challenges to infrastructure through rising water levels, then the issue wont be about recreation, we just plain won't be able to live there.
Something else/Other	This is the site of the Higgins Cut, an attempt some 120 years ago to divert water from the Capel River into the ocean. The mouth of the cut silted up very quickly but it now poses a risk to the farmland inland as a rising sea could cause erosion of the mouth of the cut and allow large volumes of seawater to flow inland

APPENDIX B

WORKSHOP PRESENTATION



**CAPEL TO LESCHENAULT
COASTAL HAZARD RISK
MANAGEMENT ADAPTATION
PLAN (CHRMAP)**
VALUES WORKSHOP
SEPTEMBER 2, 2021



1

Welcome!



2

This meeting is a bit different!

Your local team will look after you and make sure the feedback is shared – your ‘Host’ will have welcomed you

The consultant team is online:

Shape Urban - Anna Kelderman

Water Technology – Joanna Garcia-Webb



3

Welcome

A spot of housekeeping....

- Mobile Phones
- Bathrooms
- Emergency procedures
- We will be recording this session so that others can review – please advise your ‘host’ if you would like us to obscure you when we complete the recording
- Try and be COVID safe - keep 1.5m away from others if possible, use the hand sanitiser, and please make sure you practice good hygiene if sneezing!
- Write down as much as you can!



4

Introductions

Who are you?

Where do you live?

What is your main interest?



5



6

What are we doing?



7

Our Remit

Our coast is highly valued. It provides places and spaces to live, do business, be active and enjoy.

However, the coast is vulnerable to natural coastal processes such as waves, storms and sea level rise, and to the changes that people make to the coastline (buildings, hard coastal structures and dune/beach changes).

As the coastline begins to change, it can impact the infrastructure in the 'coastal zone' and how the coast can be used.



8

Some coastal planning has already been done...

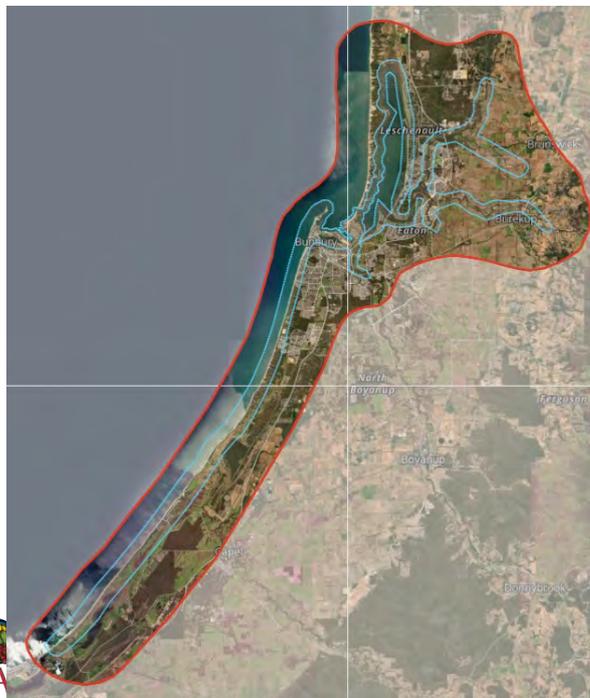
- Koombana Bay CHRMAP (2019) - will be considered in the context of the broader CHRMAP
- *Shire of Harvey Ocean coastline (north of the Cut, Bevedere Beach and Binningup etc)*
 - *Not part of this project study area*
- PNP Coastal Monitoring & Other Studies in Project Area
 - Considered and included in analysis in this project



9

Our Remit

The CHRMAP will establish adaptation options that balance the values and needs of the community along the ocean and river front coastline and consider economic, social and environmental considerations



10

Why are we doing the project?

This project will help us to understand 'coastal hazards' and 'risks' that may impact the coastal zone in the future and what the options are for managing those

The coastal zone for this project includes the coastline and low-lying areas around the Leschenault Inlet and Estuary and associated rivers including the Preston/Collie River.



11

CHRMAP...

What on earth is a CHRMAP??

- Coastal Hazard Risk Management Adaptation Plan
- Hard to say...
- Char-map, Cher-map, croomp, adaptation plan



12

CHRMAP...

A strategic plan to meet *coastal hazard challenges...*

- Identifies vulnerable public and private assets
- Aims to preserve community values for current & future generations
- Informs community and decision makers
- Required under *State Planning Policy 2.6 – Coastal Planning*

A plan for the next 100 years



13

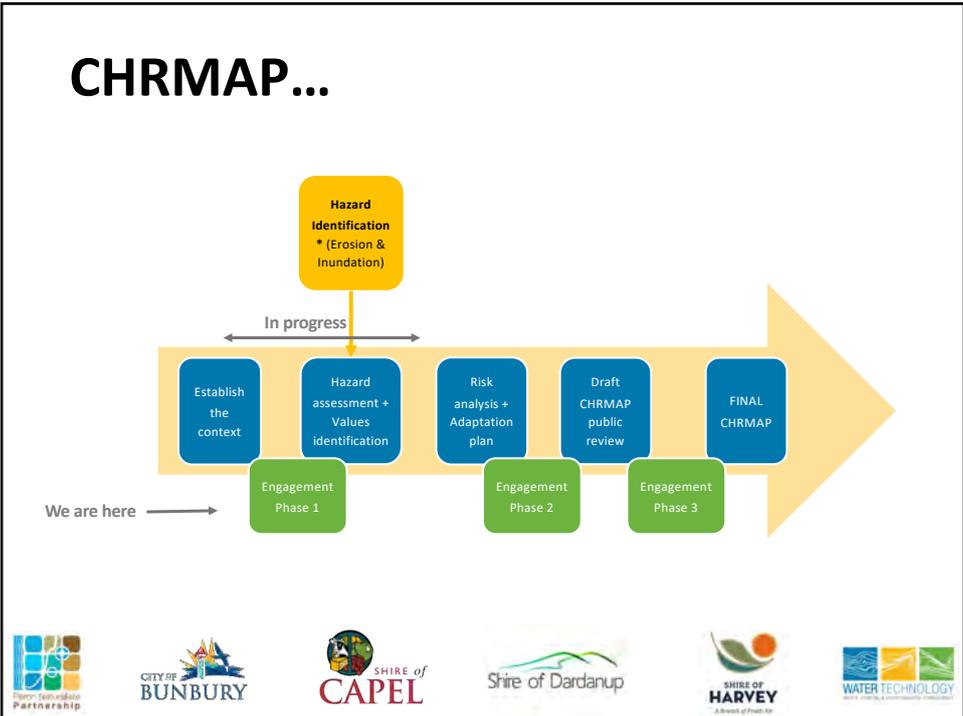
CHRMAP...

The key components of a CHRMAP are:

- **Understanding** the local environment and community **values**
- Assessing how much things can **cope with the impact of climate change**
- **Identifying** the **risks** (likelihood of an event occurring and the consequences of that event occurring)
- Analysing the findings and **evaluating** the **management options**
- **Identifying** the **adaptation options**
- **Identifying** funding options, monitoring and review of frameworks



14



15

Coastal hazard challenges

The key challenges on the coast are **erosion** and **inundation**

Predicted Sea Level Rise will increase both!

City of Bunbury, Shire of Capel, Shire of Dardanup, Shire of Harvey, Water Technology

16

Sea Level Rise

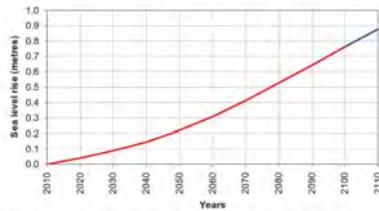
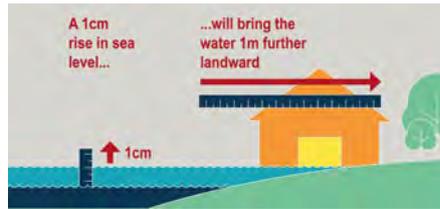


Figure 16 - Recommended allowance for sea level rise in coastal planning for WA (red line SRES scenario A1FI 95th percentile after Hunter (2009), normalised to 2010, blue line continuation of scenario to 2010)

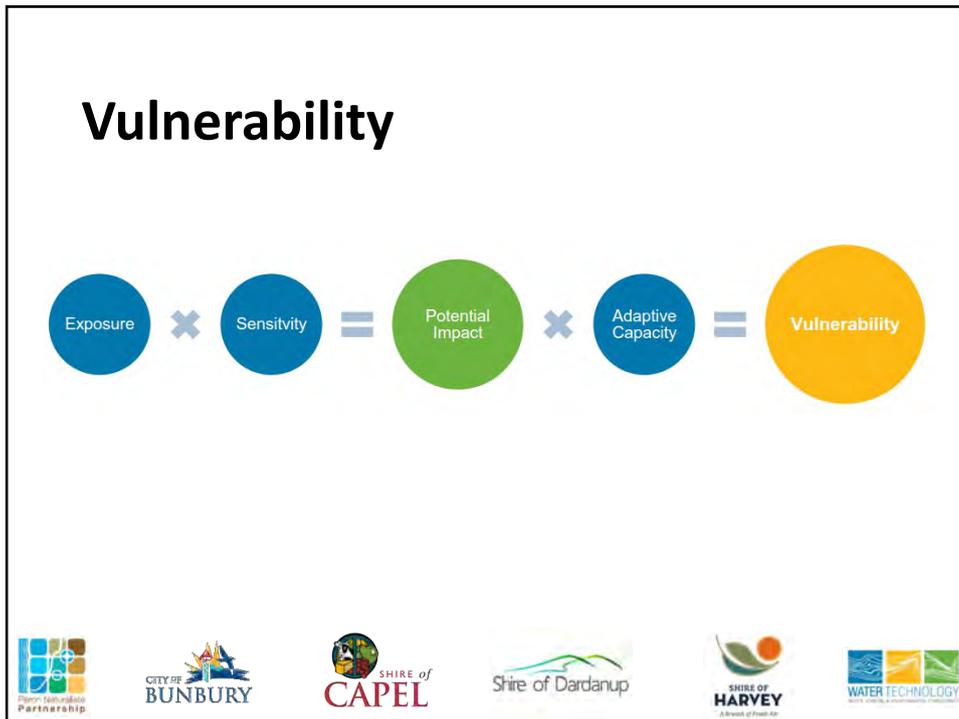


17

Risk



18



19

Hazard Identification

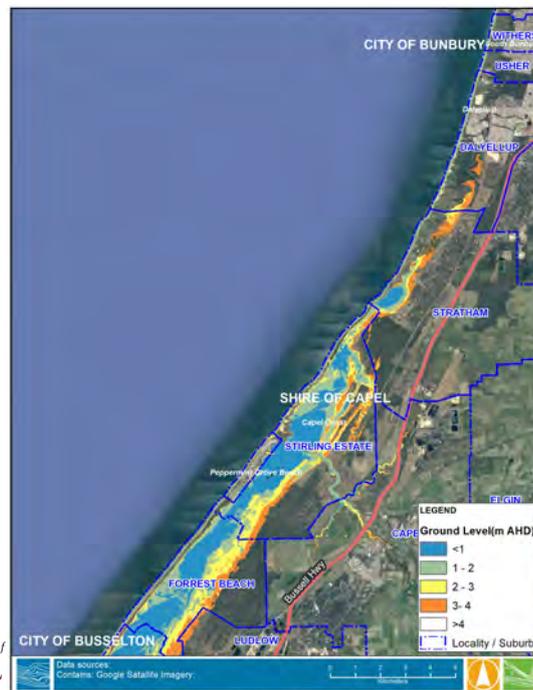
Predicting the *risk* of **erosion + inundation** with sea level rise

- *In progress*
- Large study area split into Management Units for adaptation planning, primarily split by jurisdiction
 - Different coastal hazards in each unit
- Hazard mapping will indicate the **zone of risk** – not the predicted future shoreline!

20

Key Issues – Shire of Capel

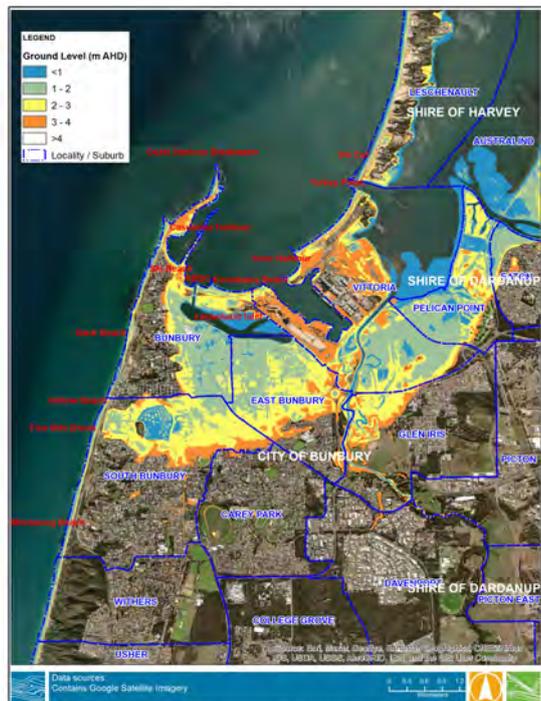
- Low lying land behind coastal dune system
- Dunes act as a natural levee at present
 - Pressure on the dunes will increase (SLR), while their ability to withstand will decrease (erosion)



21

Key Issues – City of Bunbury

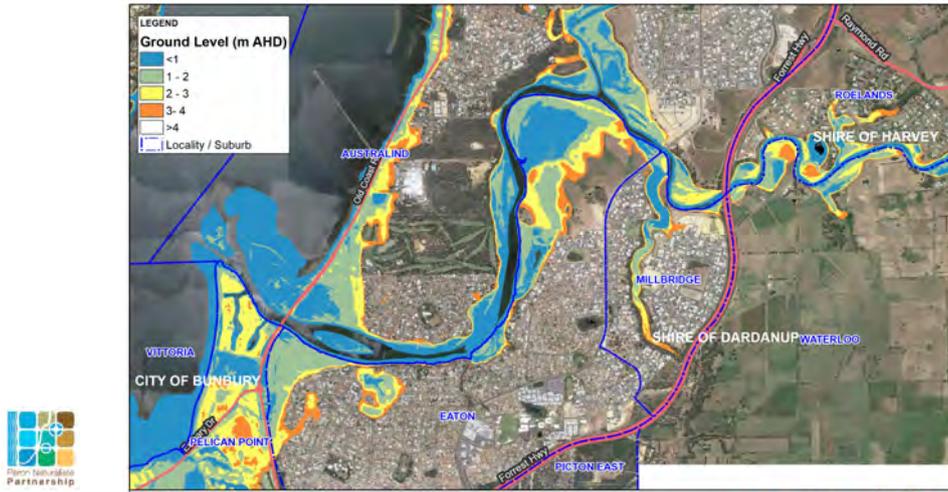
- Low lying land across much of City
- Highly developed coastline
 - Proximity of infrastructure and assets on open coast along west of LGA



22

Key Issues – Shire of Dardanup

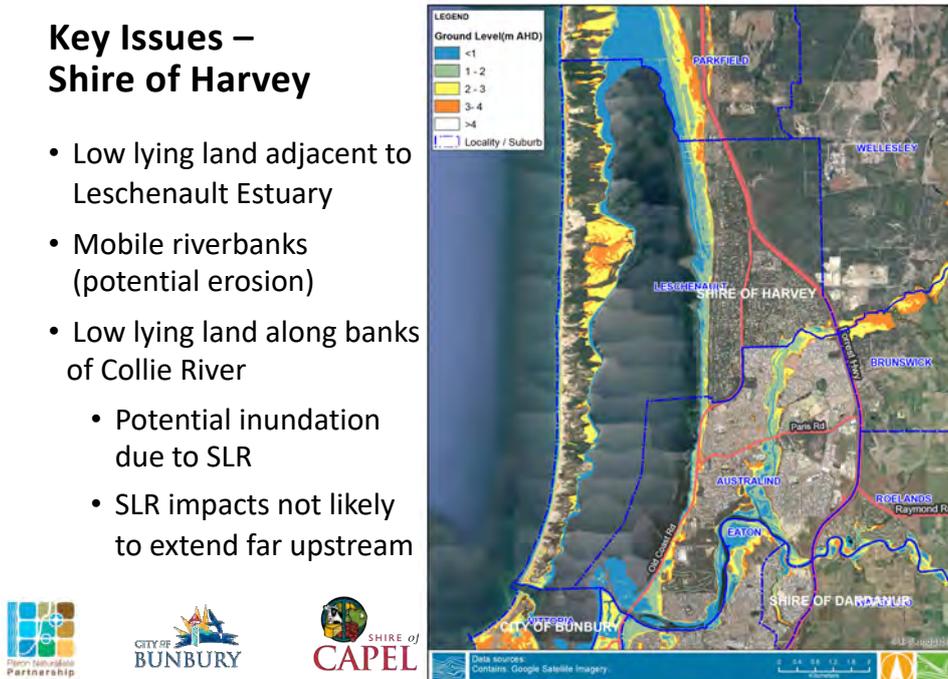
- Mobile riverbanks (potential erosion)
- Low lying land along banks of Collie River
 - Potential inundation due to SLR
 - SLR impacts not likely to extend far upstream



23

Key Issues – Shire of Harvey

- Low lying land adjacent to Leschenault Estuary
- Mobile riverbanks (potential erosion)
- Low lying land along banks of Collie River
 - Potential inundation due to SLR
 - SLR impacts not likely to extend far upstream



24

Adaptation Options



25

Adaptation Options

Hierarchy of Controls:

- **Avoid** – Options which aim to eliminate the risk of coastal hazards by avoiding development
- **Managed Retreat** – Options which progressive retreat/relocate development
- **Accommodation** – Options which seek to enhance assets to cope with the temporary impacts
- **Protection** – Options which seek to artificially protect the coast



26

Adaptation Options



27

Q&A

Take a moment to think of any questions for Joanna or Anna

Anna will call on each room (alphabetically) to ask questions – write down any questions you might have and give them to your host – they will type it in the Q&A box and we will answer them



28



29

So...What will you influence?

Through this process you will help us to refine:

- The preferred option for each at-risk asset
- Better understanding of community values (more measurable)
- Future information sharing, better tools for describing and explaining hazard management



30

What are we doing today?

- Discussing the places you value and why
- Getting a better idea of key issues and concerns
- Considering areas that you would prioritise for hazard management and adaptation



31

Task 1 - Values

Think about a place that you love to go – write on your sheet –

- why it is important
- what do you do there
- what physical aspects of the place are important

Can be an area for community use, an important cultural place, and environment that matters to you etc

(number the item on your sheet and then place a blue 'dot' with the same number on the large map on the wall – check with others to avoid doubles!)



32

Share feedback

Tell us what's important -

Anna will call on each room (alphabetically) to share feedback



33

Task 2 – Issues/Concerns

Tell us about an issue or concern that you have along our coast or river frontages or identify things that have changed that affect you

(number the item on your sheet and then place a **orange** 'dot' with the same number on the large map on the wall – check with others to avoid doubles!)



34

Share feedback

Tell us what's important -

Anna will call on each room (alphabetically) to share feedback



35

Next Steps...

- Finalising the engagement phase (open to September 10)

383	46	123
Unique Users	Comments	Survey Responses

- <https://getinvolved.mysocialpinpoint.com.au/capel-to-leschenault-chrmap/map#/sidebar/tab/about>
- Reviewing and reporting on feedback
- Providing a project update



36

Next Steps...

- Completing hazard mapping
- Identifying valued assets
- Identifying risks
- Assessing management options
- **Another opportunity for the community to be involved in the process, considering adaptation options and the implications of various solutions**



37

Thank you!!



38

APPENDIX C

BUNBURY AND DARDANUP WORKSHOP TASK 1 COMMENTS

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK ONE

Think about a place that you love to go – tell us - why it is important, what do you do there, what physical aspects of the place are important

(number the item on your sheet and then place a blue 'dot' with the same number on the large map on the wall – check with others to make there are no doubles!)

2) OCEAN DRIVE - Very close to the Beach
Beach. BONBORN MAJOR SERVICES
ARE UNDER THIS ROAD - WATER
POWER, ETC. ETC.
THIS IS A MAJOR CARRIAGE WAY

8. SAND DUNES, OCEAN SIDE OF
LESCH. ESTUARY - MASSIVE AMOUNTS
TOXIC MUD BURIED IN DUNES.
PIPED - FROM ORIGINALLY -
LA PORT. MANUFACTURER OF TITANIUM -
OXIDE.

7. BIG SWAMP. HAS DRIED OUT
IN RECENT SUMMERS. ~~EAST OF~~
WETLAND EAST OF BIG SWAMP.
HAS MORE WATER IN IT THAN
SEEN BY LONG TERM LOCALS EVER.

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK ONE

Think about a place that you love to go – tell us - why it is important, what do you do there, what physical aspects of the place are important

(number the item on your sheet and then place a blue 'dot' with the same number on the large map on the wall – check with others to make there are no doubles!)

- | | | |
|---|--------------------------------------------------------------------------------------------------------------------------------|---|
| ⑩ | • Nyadup Rocks (Rocky Point)
- Swim through summer | ○ |
| ⑫ | • Northern End of Back Beach (Sidewash)
- Surf through Autumn./Winter/Spring | ○ |
| ⑨ | • Outer Harbour. (Port Inside Port Area)
- Surf through winter
- Fishing
• Dalyellup Beach - surf club /Swim. | |
| | • Maidens Reserve - Walking /Running
• the Dalyellup Beach (off coast)
Fishing / Free diving.
• Big Swamp. | |
| | - Walking / Running
• Koombana Beach.
- Swimming / On Lake Eat Dining | |
| ⑪ | • Bunbury Cut.
- Surfing / Fishing / Jet Ski Use. | |

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK ONE

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14 14

• BP Beach / Groyne. (Southern Side)
- Surf / Swim / Walk.

15

• BP Groyne. - Northern Side.
- Surf / Swim

16

- The Bay. - Surf. / Swim / Fish.

17

- Inside Port. Northern End.
- Surf / Fish / Crabbing.

18 18

Leschenault Inlet.
- Run around / Walk / Cafe's
✓

•

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK ONE

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- 4 KOOMBAD A BAY
- 5 LESCHENAULT ESTUARY
- 6 BACK BEACH.
- 7 BIG SWAMP.
- 50 PRESTON RIVER

LEARNED TO SWIM AS A CHILD IN THE BAY, AND THE DOLPHINS.
CRABBED IN THE ESTUARY

SWAM & SURFED AT THE BACK BEACH.
THE WILDLIFE AT BIG SWAMP ARE PRECIOUS AND NEED TO BE PROTECTED
ALL THESE PLACES ARE IMPORTANT TO

BUNBURY AND ITS RESIDENTS
~~THEY~~ MAKE BUNBURY WHAT IT IS.
THEY ARE ALL PART OF THE NATURAL HISTORY AND ENVIRONMENT OF BUNBURY.
WITHOUT THEM BUNBURY WOULD NOT BE BUNBURY.

THE LOCAL FLORA IS ALSO OF GREAT IMPORTANCE.

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK ONE

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Leschenault Luliet
Birdwatching. Shorebirds - losing shoreline with full tides this winter. Critical for feeding, roosting + NESTING for at least 3 species
The Mangroves as a fish nursery - inundation this winter
* See *

Lesch Estuary
as above
Loss of fringing vegetation, casuarinas etc +
samplings due to chronic erosion of sand + wind
severity in winter
* See *

Bunbury Back Beach
Loss of beach
Erosion of dunes + dune vegetation - long established
Not much coastal replanting + revegetation projects
for 20 years, ~~more~~ not encouragement to community
to respect fringing vegetation

(OR 51)
Venezia Lagoon (52) Pelican Pt
* * Important for our migratory shorebirds for feeding, roosting, sanctuary -



PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK ONE

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LESCHENAULT ESTUARY (21)

One of the main coastal wetlands in the area, with high environmental value. Waterbirds, dolphins, long migratory shorebirds

BIG SWAMP PARK (22)

A great example of recovered degraded wetland, with ~~large~~^{high} numbers and diversity of waterbirds. Some of the few paperbark wetland left.

BEACHES & DUNE SYSTEMS IN BACK (23)

BEACH & BELVEDERE PENINSULA (BUFFALO BEACH) → DARYELUP BEACH, PEPPERMINT BEACH

~~They are~~ some are nearly pristine systems, offer habitat for diverse species of coastal animals and protect us (for now) from the impacts of sea level rise due to climate change.

MAIDENS DUNE SYSTEM (24)

The only fully developed dune system left within the city boundaries

END OF BACK BEACH → FOF surf. (25)

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK ONE

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(number the item on your sheet and then place a blue 'dot' with the same number on the large map on the wall – check with others to make there are no doubles!)

48

Area of Interest:

Hungry Hollow - I have lived within 300m of this area for many years of my life. over the time it has been a

key recreational area. ^{socially.} _{emotionally}

Physical aspects - VERY CONCERNED ^{physically} re soil erosion and the proximity of urban areas / roads etc. The erosion of the area has forced people to swim elsewhere ie Koombana

49

low lying areas of East Bunbury - lack of drainage. flooding roads - danger with traffic

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK ONE

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- 39 Belvedere bar (dunes between the Leschenault Estuary and the ocean) This is important as sea level rise and erosion may lead to new "cuts" being formed giving inflow of seawater into the Estuary and potentially significant influence on Estuary biota.
- 40 The cut. feeding zone for dolphins, prime influence point between Estuary and Ocean.
- 41 Mouth of Preston and Collic Rivers. Prime feeding areas for migratory shorebirds. Seawater incursion and erosion will impact significantly.
- 42 Big Swamp Bunbury. Fresh water ecosystem. Saltwater incursion will impact freshwater environment
- 43 Back beach Bunbury (the whole Beach) worried that engineering control options (eg. groynes) will impact natural coastal processes eg longitudinal coastal drift and seaweed wrack deposition
- 44 Bunbury dunes and infrastructure close to ocean - future of this infrastructure eg. Roads and houses and the cost and impact of protection options
- 45 Saltwater incursion on groundwater reserves and freshwater ecosystems
- 46 Impact of dune erosion in general on nesting sites for coastal bird life
- 47 Impacts on coastal veg communities eg thuart forest and fauna eg western ringtail possum

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK ONE

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- | | | |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------|------------------------------------------|
| 34 - | Quindalup dune system & its ecology. | } Unique to southern Swan Coastal plain. |
| 38 - | Tuart forest within project area | |
| 37 - | coastal wetlands south of Bunbury
unique flora & fauna. | |
| 35 - | Banksia woodland within project area! | |
| * CONTAMINATED SITES * | | |
| 29 - | Dalgellup Waste Residue Disposal facility
contaminated site, contaminated groundwater beneath, UNLINED SITE. | |
| 30 - | BUNBURY PORT. | |
| 31 - | TRONOX PROCESSING PLANT. | " |
| 32 - | DRINKING WATER EXTRACTION SITES. | " clean water." |
| 33 - | BUNBURY WASTE WATER TREATMENT PLANT.
- important infrastructure. | |
| 36 - | Allocated development areas within local shire town planning schemes need review after CH2MAP completion. | " |

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK ONE

Think about a place that you love to go – tell us - why it is important, what do you do there, what physical aspects of the place are important

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26 ○ Mindalong Beach
~ Important to ~~be~~ me as it's a local beach (close to ~~my~~ home) where I walk my dog, ride my bike & do bush walking in adjacent Maidens Reserve)

27 ○ Kambana Bay
~ Important for recreation (on water), dolphin spotting, walks and access to cafes

28 ○ Mangrove Cove (Leschenault Inlet)
~ Important as it contains southernmost mangrove population; bird habitat; etc.
~ I walk there, do rowing and frequent restaurants, pubs & cafes there

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK ONE

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(number the item on your sheet and then place a blue 'dot' with the same number on the large map on the wall – check with others to make there are no doubles!)

111) Maidens Reserve - walk along trails, photography
Solitude. I most value the natural environment
flora & fauna.

7) Big Swamp - walking, bird watching, photography
I most value the natural environment.

4) Koombana Bay - walking, dolphin Centre,
Dolphin watching, visiting cafes, BBQ's,
social events, triathalon.

13) Collie River walking path. Walking, photography
Bird watching.

1) Back Beach - walking, sunsets

30) Manea Park - Walking, flora & fauna,
photography, orchids.

31) Tuart Forest Walk - Walking, cycling,
natural environment, bird watching, photography.

The majority of things I value are the natural
environment for walking, solitude, flora & fauna,
photography.

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK ONE

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111
3 • Koombanay bay : Swimming & walking along the beach .
• Maidens reserve : I walk along the trails, enjoy the patches of bush. Sometimes I walk or run along the beach.

112 • The Coast forest : A very peaceful place to run and/or walk. The vegetation and fauna is unique.

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK ONE

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①

The Bunbury Ocean Beach - Just south of the "Hollow". I walk my dog there, take sunset photos, and enjoy the beach during the warmer months. (At Hayward Street)

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK ONE

Think about a place that you love to go – tell us - why it is important, what do you do there, what physical aspects of the place are important

(number the item on your sheet and then place a blue 'dot' with the same number on the large map on the wall – check with others to make there are no doubles!)

<p>88 SUP & crabbing around the island. Dolphins, birds & sunsets → magic!</p>

APPENDIX D

CAPEL WORKSHOP TASK 1 COMMENTS

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK ONE

Think about a place that you love to go – tell us - why it is important, what do you do there, what physical aspects of the place are important

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I LIVE AT PEPPY BEACH, SOME 20 METRES FROM THE BEACH. I GET UP EARLY AND GO TO THE BEACH MOST MORNINGS. I RUN THE LENGTH OF THE BEACH. IN THE SUMMER MY PARTNER & I SWIM ALONG THE BEACH, SOME DAYS UP TO 4 KILOMETRES.

THE WIND AND THE WAVES CHANGE THE BEACH AND THE DUNES BUT PEOPLE CLIMBING THE FRAGILE DUNES, FOUR WHEEL

DRIVES, WEEDS AND RABBITS ARE CAUSING MUCH EROSION,

CLIMATE CHANGE IS ACCELERATING EROSION.

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK ONE

Think about a place that you love to go – tell us - why it is important, what do you do there, what physical aspects of the place are important

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<p>① AL</p> <p><u>My Home</u> 47 Hott Drive</p> <p>on Dalgetty Dunes. (and other residential homes)</p>	<ul style="list-style-type: none"> - Accomodation - Beach access → stairs, walk dog etc. - Dunes erode erode erode (would like to know how to assist in protecting dunes helping people in Dalgetty know + act on limiting erosion). <p>I think a lot of people don't see the level of risk to the dunes + the behaviours required to limit erosion.</p>
<p>② AL</p> <p>Back Beach /</p> <p>Ocean Drive</p>	<ul style="list-style-type: none"> - water sports / walking. - Surf life saving - Drive to work - Cycle along road for exercise and with cycle club.
<p>③ AL</p> <p>Stratham Beach.</p>	<ul style="list-style-type: none"> - water sports - fishing - walking <div style="border: 1px solid black; padding: 5px; width: fit-content;"> <ul style="list-style-type: none"> - forests - farms - residential - beach access. </div>
<p>Dalgetty Dunes</p> <p>④ AL</p> <p>the dunes</p>	<ul style="list-style-type: none"> - Access to beach has been reduced over last 2 years. - eroding - concern dunes have been eroded by 8m over last 2 winters - walking - beach use and have not recovered during summer. - insufficient action to protect dunes or to inform public on how to protect the dunes such as signs to inform or fencing to protect dunes or vegetation to protect dunes. <p>the dunes</p>

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK ONE

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<p>TUART FOREST B1</p> <p>ENVIRONMENT</p> <p>WALK WILDLIFE TREES.</p> <p style="text-align: right;">PEPP!</p>
<p>BEACH B2</p> <p>SWIMMING, FISHING, WALKING</p> <p style="text-align: right;">PEPP!</p>

TASK 1

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan - Workshop - TASK ONE

Think about a place that you love to go - tell us - why it is important, what do you do there, what physical aspects of the place are important

Number the item on your sheet and then place a blue dot with the same number on the large map on the wall - check with others to make there are no doubles!

My Place

TASK 2 on LHS

Peppermint Grove Beach for swimming-walking-being

Concerns

- natural
 - accessible
 - undeveloped
 - beautiful
- +++ Protect / Preserve Dunal Ecology +++

Cars + Vehicles chewing it up
Car Park Inundation

Capel Coast

Dalyellup People Not Paying Attention
+ it will impact them

J2

J2

J2

Small Shire what ~~the~~ priorities will be given to ~~the~~ Capel's needs

J3

Development Continues in Dalyellup ~~the~~ proper management of ~~the~~ planning is part of ~~the~~ AVOID

J3

How is the study collecting Info Required from LGAs

the people who would VALUE it being done properly aren't there yet!!!

eg Re Contaminated Sites

~~Data~~ Planning Regulations
- What part will this map have in Decision Making or is it up to the councils

Sensitive Aboriginal History
Cooperation + Collaboration
+ Reconciliation Action Planning

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK ONE

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<p>71 FARM + BEACH</p> <p>DUNE EROSION CAUSED BY VEHICLES IN DUNES - SINGLE DUNE SYSTEM POTENTIAL TO OPEN FARMLAND TO OCEAN</p>
<p>B1</p>

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK ONE

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05 81	DAILY/EVERY BENCH & PARKS ROAD INFILL NEW HOOSING SITES WE HAVE LAND AT DOUNGUP BETWEEN OCEAN & GOVT DRAIN IF BLOW OUT WE LOSE LAND. (4 WHEEL DRIVE)

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK ONE

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<p>Capel River Wetlands.</p> <p>Important home and refuge for thousands of water birds and other natural communities.</p> <p>High aesthetic value. Some walking, some canoeing, some horse riding, some photography.</p> <p>The adjacent agricultural land is rich organic sediments which are very productive for pasture, crops, grazing.</p>

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK ONE

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Beach N of Capel river mouth: last "wild" coast with best ~~near~~ reef & shore reef snorkelling. Very narrow beach needs protection from vehicles. ^{should be} (no vehicles)
We snorkel, watch birds, crayfish along this coastline.
PI CRW 

6

U

Mallokup wetland (wetlands near Capel Bridge).
Great Birdwatching & Major swan nesting area.
CRW 

U

7

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK ONE

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B1

Capel river mouth and beach
Visit, walk on beach, swim
Take visitors there

Value the natural scenery there and bird life
Swim on the reef. Sadly over last 40 yrs big decline
in fish and decline in ocean species on reef

B2

Minnup beach at end of Rich Rd
Same points as above

B3

Stirling wetlands 1km north and south of
Capel River

Importance of historical swan nesting area.
About 100 swans nests. Swans need to be
considered - vegetation for nesting.

Need for fox control

Ten years ago there were 550 swans on Lake Moore
1km Nth of Capel River. Since then swan numbers
declining. They need nesting sites

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK ONE

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We have lived on the waters edge (within 100mts) for fifty 50 years and love every aspect of it. Each year we plant six coastal trees, and place cottage on blow outs caused by Rabbits.

Between 1971 and 1973 as Exploration Manager for Nalson's Titanium N.L. we undertook a coastal drilling programme in the Sand dunes between locations 17@ Skatway and Warrupool dead water at 50ft x 50ft hole centres (excluding location 42)

" I love every aspect of Peppermint Beach"
Swimming fishing beach fishing. walking.
barbecue.



This week ending 31st Aug is the first time in 50 years that a primary dune has been attacked near the Northern Totet Block

Rex Barber Niron King / Noston King

APPENDIX E

BUNBURY AND DARDANUP WORKSHOP TASK 2 COMMENTS

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK TWO

Tell us about an issue or concern that you have along our coast or river frontages or identify things that have changed that affect you.

(number the item on your sheet and then place a orange 'dot' with the same number on the large map on the wall – check with others to make there are no doubles!)

114 Beach Erosion – eroding of sand dunes, losing sand. But also loss of infrastructure that supports enjoying the beach & natural environment – beach stairs that are still closed off. Back beach.

③ Sea grass – amount of sea grass that is ripped up & deposited on beach during storms. My concern is loss of sea grass beds NOT the grass being on the beach.

116 Port – the effects of the Port concern me. The effect of tankers coming in & out, pollution. Possible effects of inundation at the Port & what this would mean for Koombana Bay & the Dolphin population.

Lastly, as a group, is there one issue you would say is the most important to manage in your area?

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK TWO

Tell us about an issue or concern that you have along our coast or river frontages or identify things that have changed that affect you.

(number the item on your sheet and then place a orange 'dot' with the same number on the large map on the wall – check with others to make there are no doubles!)

114 • Beach erosion : Drop on value of properties & of course, a massive impact to the natural assets of Bonbruy.

115 • Damage to seagrass habitats in Koombana bay.

Lastly, as a group, is there one issue you would say is the most important to manage in your area?

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK TWO

Tell us about an issue or concern that you have along our coast or river frontages or identify things that have changed that affect you.

(number the item on your sheet and then place a orange 'dot' with the same number on the large map on the wall – check with others to make there are no doubles!)

- ② ~~1~~ • Erosion to sand dunes / beaches
- ⑤ ~~11~~ ~~2~~ • Sand movement changing ocean conditions
- ⑦ ~~3~~ • Sand through car parks / gardens.
- ~~4~~ • Beach access, is more difficult due to erosion
- Limited Beach access.

• Erosion damaging vegetation / fauna.
in general along all coastline

Lastly, as a group, is there one issue you would say is the most important to manage in your area?

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK TWO

Tell us about an issue or concern that you have along our coast or river frontages or identify things that have changed that affect you.

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③ CLIMATE CHANGE CAUSING STRONGER STORMS
CAUSING MORE DAMAGE

① POLLUTION IN KOOMBANA BAY

SEA LEVEL RISE

6. POLLUTION IN THE ESTUARY

Lastly, as a group, is there one issue you would say is the most important to manage in your area?

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK TWO

Tell us about an issue or concern that you have along our coast or river frontages or identify things that have changed that affect you.

(number the item on your sheet and then place a orange 'dot' with the same number on the large map on the wall – check with others to make there are no doubles!)

See previous list of comments - Task 1,

Can't get to the beach!

Beach too short -

Too many ~~rock~~ rocks exposed - uncomfortable

Wind too wild + ongoing winds 2020 + 2021.
winters. More severe than previous

Estuary -

Pt Mornington } River deltas

Pt Doro

crucial for our migratory shorebirds
especially - 21+ species to Arctic Circle to nest!

* Fairy Terns - nesting shorebirds - bait fish eaters

* Red-capped Plovers

" forage at low tide

* Pied Oystercatchers

4 WD's smashing beaches, dunes
NOT ALL

But there are mavericks, very damaging

During storm beach nesting activity

Destroyed Fairy Tern nesting colony at the Cut
in late 2020.

* Beach nesting birds as an
indicator of coastal health. *

Lastly, as a group, is there one issue you would say is the most important to manage in your area?

water drains on beach front

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK TWO

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(number the item on your sheet and then place a orange 'dot' with the same number on the large map on the wall – check with others to make there are no doubles!)

(47)

Hungry Hollow - major concern personally
- soon there will be very little beach to walk / swim at.

Having seen the damage of cyclone Alby to road / beaches / buildings previously - worried that we're not prepared for

Concerned that as the increasing traffic along beach front will also possibly bring more people - tramping out paths through established vegetation - particularly as many paths have been closed this winter due to storms.

for future events

Lastly, as a group, is there one issue you would say is the most important to manage in your area?



PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK TWO

Tell us about an issue or concern that you have along our coast or river frontages or identify things that have changed that affect you.

(number the item on your sheet and then place a orange 'dot' with the same number on the large map on the wall – check with others to make there are no doubles!)

DESTRUCTION OF NATURAL COASTAL WETLANDS THAT PROTECT US FROM EXTREM EVENTS AND SLR.

ALL CONTAMINATED LANDS AND HIGHLY CONTAMINANT INDUSTRIES CLOSE TO THE COAST. (TRONOX, INNER HARBOUR LAND ETC)

HARD STRUCTURES DO NOT ALLOW FOR NATURAL COASTAL WETLANDS TO RECYCLE?

Lastly, as a group, is there one issue you would say is the most important to manage in your area?

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK TWO

Tell us about an issue or concern that you have along our coast or river frontages or identify things that have changed that affect you.

(number the item on your sheet and then place a orange 'dot' with the same number on the large map on the wall – check with others to make there are no doubles!)

Contaminated sites.

- 41 * Daljellyp Waste Residue Disposal facility
- unlined industrial waste disposal
 - contains material that contains heavy metals and radioactive material.
 - site is in very close proximity to the high tide line and housing development

and the Daljellyp Drinking water extraction site. The ingress of seawater may impact the bio availability of contaminants increasing mobility within groundwater. The coastal aquifer is not protected in this area increasing risk.

42 * Port, Burbury groundwater & soil contamination

43 * outer port soil contamination

44 * TRONOX site soil & groundwater contamination

45 * impacts on drinking water

46 * Proposed development within the project zone should be deferred until CHRMAT completion

Lastly, as a group, is there one issue you would say is the most important to manage in your area?

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK TWO

Tell us about an issue or concern that you have along our coast or river frontages or identify things that have changed that affect you.

(number the item on your sheet and then place a orange 'dot' with the same number on the large map on the wall – check with others to make there are no doubles!)

- 30 loss of habitat. This will impact flora and fauna population;
- 31 Groundwater contamination from salt water. will impact freshwater ecosystems and drinking water
- 32 Biodiversity loss. General detriment to environment.
- 33 Urban sprawl inland
- 34 Groundwater contamination from contaminated sites
- 35 loss of access to the beach for recreation
- 36 loss of cultural sites
- 37 Threats to coastal living

Lastly, as a group, is there one issue you would say is the most important to manage in your area?

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK TWO

Tell us about an issue or concern that you have along our coast or river frontages or identify things that have changed that affect you.

(number the item on your sheet and then place a orange 'dot' with the same number on the large map on the wall – check with others to make there are no doubles!)

38) Erosion (through ^{eg} storm events) –
limiting access & enjoyment

39) Human impacts → evidence of (eg litter,
human movement through planted
areas, development close to beach, pollution)

40) Impact of marine-developments on health
_{based}
of waterways (eg flushing of Inlet) &
marine fauna

Lastly, as a group, is there one issue you would say is the most important to manage in your area?

APPENDIX F

CAPEL WORKSHOP TASK 2 COMMENTS

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK TWO

Tell us about an issue or concern that you have along our coast or river frontages or identify things that have changed that affect you.

(number the item on your sheet and then place a orange 'dot' with the same number on the large map on the wall – check with others to make there are no doubles!)

POPULATION PRESSURE MEANS THE SMALL PERCENTAGE OF PEOPLE WHO DO THE WRONG THING IS BECOMING A LOT OF PEOPLE. THESE ARE THE ONES DRIVING ON THE BEACH AND MAKING NEW TRACKS THROUGH THE DUNES AND THIS COMBINED WITH MORE ADVERSE WEATHER EVENTS ARE CAUSING MAJOR EROSION OF DUNES THAT PROTECT INLAND ENVIRONMENT AND HOMES ETC.

14

Lastly, as a group, is there one issue you would say is the most important to manage in your area?

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK TWO

Tell us about an issue or concern that you have along our coast or river frontages or identify things that have changed that affect you.

(number the item on your sheet and then place a orange 'dot' with the same number on the large map on the wall – check with others to make there are no doubles!)

Dalgellup.
① lack of education about coastal erosion and signage / fencing to limit erosion to inform

Dalgellup
② Re-Vegetation - due to erosion from residents and from storm erosion there is a need to help re-establish vegetation to help stabilize the dune systems.

Dalgellup
③ loss of access to beach during winter and erosion of dunes (about 5m to 10m ~~deep~~ ^{e.g. (stairs)} along the beach in Dalgellup last 2 years

Lastly, as a group, is there one issue you would say is the most important to manage in your area?

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK TWO

Tell us about an issue or concern that you have along our coast or river frontages or identify things that have changed that affect you.

(number the item on your sheet and then place an orange 'dot' with the same number on the large map on the wall – check with others to make there are no doubles!)

SHIRE HAS DRAINAGE ONTO BEACH -
IT BACK FILLS & CAUSES EROSION

B1

DUNE PLANTING & REVEGETATION
DOES NOT HALT

EROSION GETS WORSE

B2

HAVE YOU DONE A SEISMIC SURVEY
OF COAST ??

DETERMINE ROCK TYPE

Lastly, as a group, is there one issue you would say is the most important to manage in your area?

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK TWO

Tell us about an issue or concern that you have along our coast or river frontages or identify things that have changed that affect you.

(number the item on your sheet and then place a orange 'dot' with the same number on the large map on the wall – check with others to make there are no doubles!)

81

SINGLE DUNE SYSTEM
SERIOUS DUNE BLOW OUT CAUSED BY
VEHICLES ~~BE~~ COMING OFF BEACH

82

+ FAYAMLAND
WETLANDS BECAME SALINE BECAUSE
OF DRAINS LEFT OPEN AT CAPEL
RIVER - IT IS IMPROVING

Lastly, as a group, is there one issue you would say is the most important to manage in your area?

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK TWO

Tell us about an issue or concern that you have along our coast or river frontages or identify things that have changed that affect you.

(number the item on your sheet and then place a orange 'dot' with the same number on the large map on the wall – check with others to make there are no doubles!)

<p>81</p> <p>BEACH BLOW OUT</p>
<p>Lastly, as a group, is there one issue you would say is the most important to manage in your area?</p>

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK TWO

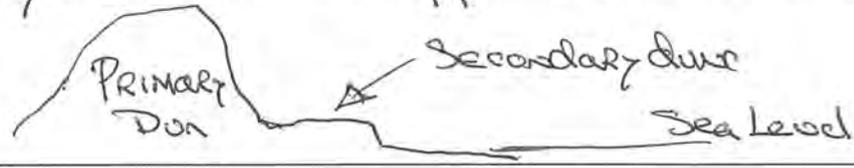
Tell us about an issue or concern that you have along our coast or river frontages or identify things that have changed that affect you.

(number the item on your sheet and then place a orange 'dot' with the same number on the large map on the wall – check with others to make there are no doubles!)

77

77

Right now! the sea has attacked a primary dune the first we have seen in 50 years at Reppesant Grove Beach



My biggest concern is what this study intends to do about rising sea levels "Concrete Trenchbacks" ? "Gripins" Groynes.

Lastly, as a group, is there one issue you would say is the most important to manage in your area?

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK TWO

Tell us about an issue or concern that you have along our coast or river frontages or identify things that have changed that affect you.

(number the item on your sheet and then place a orange 'dot' with the same number on the large map on the wall – check with others to make there are no doubles!)

Recognition of multiple ownership of beach land & how can we get them all working together

- private land owners
- government property
- unallocated crown land
- public open space

Lastly, as a group, is there one issue you would say is the most important to manage in your area?

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK TWO

Tell us about an issue or concern that you have along our coast or river frontages or identify things that have changed that affect you.

(number the item on your sheet and then place a orange 'dot' with the same number on the large map on the wall – check with others to make there are no doubles!)

Water Salt water ingress through the cuts,
(eg. Capel)

PA1

Salt water ~~is~~ rising from ground behind dunes
eg. salting land.

PA2

Elimination of Beach/habitat in. relatively
wild coastline.

PA3

Lastly, as a group, is there one issue you would say is the most important to manage in your area?

PNP Leschenault to Capel Coastal Hazard Risk Management Adaptation Plan – Workshop - TASK TWO

Tell us about an issue or concern that you have along our coast or river frontages or identify things that have changed that affect you.

(number the item on your sheet and then place a orange 'dot' with the same number on the large map on the wall – check with others to make there are no doubles!)

B1

Capel River mouth and ^{saltwater} surge up stream

B2

Capel/Stirling wetland inundation south and north of Capel River
Need for protection of bird life especially swans which return for decades of where they were hatched.

B3

Tuart Forest National Park
Mininnup Forest is still capable of natural regeneration if kangaroos are kept out in last 30 years
Underground water level has dropped due to 3 sand mining projects + huge quotas for farming
Lower water table affects forest vegetation

Lastly, as a group, is there one issue you would say is the most important to manage in your area?

APPENDIX G

COASTAL COMMUNITY ADVISORY GROUP MEETING ONE PRESENTATION

CAPEL TO LESCHENAULT COASTAL HAZARD RISK MANAGEMENT ADAPTATION PLAN (CHRMAP)

COASTAL COMMUNITY ADVISORY GROUP
WORKSHOP

JULY 21, 2022



1

Acknowledging Country



2

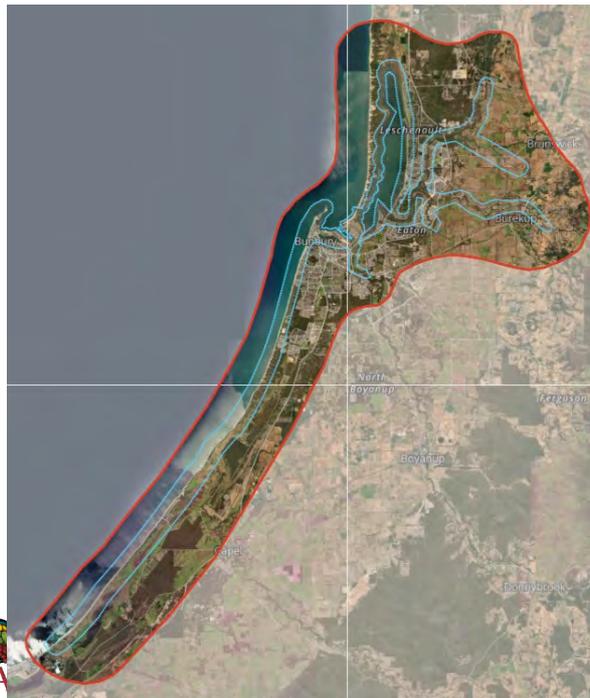
What are we doing?



3

Our Remit

The CHRMAP will establish adaptation options that balance values and needs of the community along the ocean and river front coastline considering economic, social and environmental considerations



4

Why are we doing the project?

This project is helping us to understand 'coastal hazards' and 'risks' that may impact the coastal zone in the future and what the options are for managing those

The coastal zone for this project includes the coastline and low-lying areas around the Leschenault Inlet and Estuary and associated lower reaches of rivers including the Preston/Collie River.



5

CHRMAP...

What is a CHRMAP??

- Coastal Hazard Risk Management Adaptation Plan
- Hard to say...
- Char-map, Cher-map, croomp, adaptation plan



6

CHRMAP...

A strategic plan to meet *coastal hazard challenges...*

- Identifies vulnerable public and private assets
- Aims to preserve community values for current & future generations
- Informs community and decision makers
- **Required under *State Planning Policy 2.6 – Coastal Planning***

A plan for the next 100 years



7

CHRMAP...

The key components of a CHRMAP are:

- Understanding context & values
- Assessing how things can cope with (climate) change
- Identifying the risks (likelihood & consequences)
- Analysing findings & evaluating options
- **Identifying the adaptation options**
- **Identifying funding options, monitoring and review of frameworks**



8

Coastal hazard challenges

The key challenges on the coast are **erosion** and **inundation**



Predicted Sea Level Rise will increase both!



9

Sea Level Rise

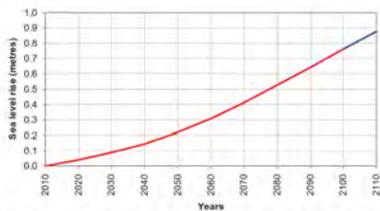


Figure 18 - Recommended allowance for sea level rise in coastal planning for WA (red line SRES scenario A1FI 95th percentile after 2000), normalised to 2010, blue line continuation of scenario to 2010)

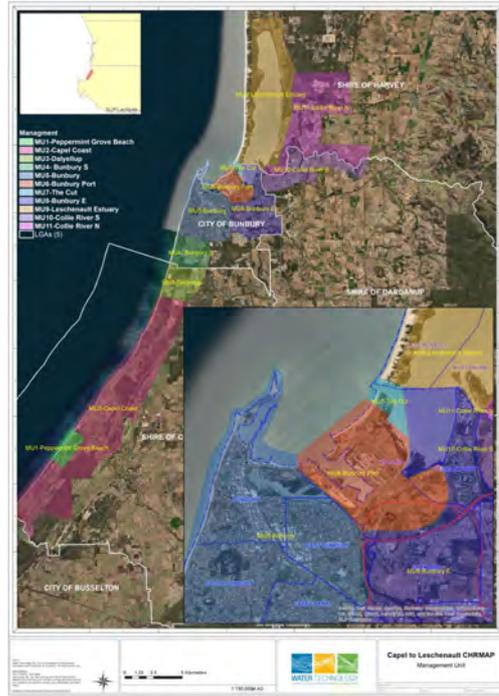


10

Hazard Identification

Predicting the *risk* of **erosion + inundation** with sea level rise

- Large study area split into Management Units for adaptation planning, primarily split by jurisdiction
 - Different coastal hazards in each unit
- Hazard mapping indicate the **zone of risk** – not the predicted future shoreline!
 - [Online maps](#)



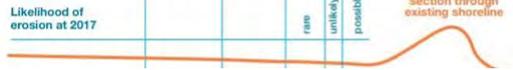
11

Vulnerability



12

Exposure / Likelihood



13

Exposure / Likelihood



14

Exposure / Likelihood



Likelihood of erosion at 2017				rare	unlikely	possible
Likelihood of erosion at 2030		rare		unlikely	possible	likely
Likelihood of erosion at 2050	rare	unlikely	possible	likely	very likely	



Exposure / Likelihood



Likelihood of erosion at 2017				rare	unlikely	possible
Likelihood of erosion at 2030		rare		unlikely	possible	likely
Likelihood of erosion at 2050	rare	unlikely	possible	likely	very likely	
Likelihood of erosion at 2070	unlikely	possible	likely	very likely	almost certain	



So how does it look?



17

Vulnerability Analysis Results

Erosion vulnerability ratings by management unit & planning horizon

Management Unit	2020	2035	2050	2120
MU1 – Peppermint Grove Beach	High	Extreme	Extreme	Extreme
MU2 – Capel Coast	High	Extreme	Extreme	Extreme
MU3 – Dalyellup	High	Extreme	Extreme	Extreme
MU4 – Bunbury S	High	High	High	Extreme
MU5 – Bunbury	High	Extreme	Extreme	Extreme
MU6 – Bunbury Port	Extreme	Extreme	Extreme	Extreme
MU7 – The Cut	Extreme	Extreme	Extreme	Extreme
MU8 – Bunbury E	Extreme	Extreme	Extreme	Extreme
MU9 – Leschenault Estuary	High	Extreme	Extreme	Extreme
MU10 – Colлие River S	Extreme	Extreme	Extreme	Extreme
MU11 – Colлие River N	High	Extreme	Extreme	Extreme



18

Vulnerability Analysis Results

Inundation vulnerability ratings by management unit & planning horizon

Management Unit	2020	2035	2050	2120
MU1 – Peppermint Grove Beach	High	High	High	High
MU2 – Capel Coast	Medium	Medium	Medium	High
MU3 – Dalyellup	Medium	Medium	Medium	Medium
MU4 – Bunbury S	Medium	Medium	Medium	Medium
MU5 – Bunbury	High	High	High	High
MU6 – Bunbury Port	Medium	Medium	Medium	High
MU7 – The Cut	Medium	Medium	Medium	Medium
MU8 – Bunbury E	High	High	High	High
MU9 – Leschenault Estuary	High	High	High	High
MU10 – Collie River S	Medium	High	High	High
MU11 – Collie River N	Medium	Medium	Medium	High



What are the options to choose from?



Adaptation Options – 17 of them!



21

Adaptation Options

Hierarchy of Controls:

Avoid – Options which aim to eliminate the risk of coastal hazards by avoiding development

Managed Retreat – Options which progressive retreat/relocate development

Accommodation – Options which seek to enhance assets to cope with the temporary impacts

Protection – Options which seek to artificially protect the coast

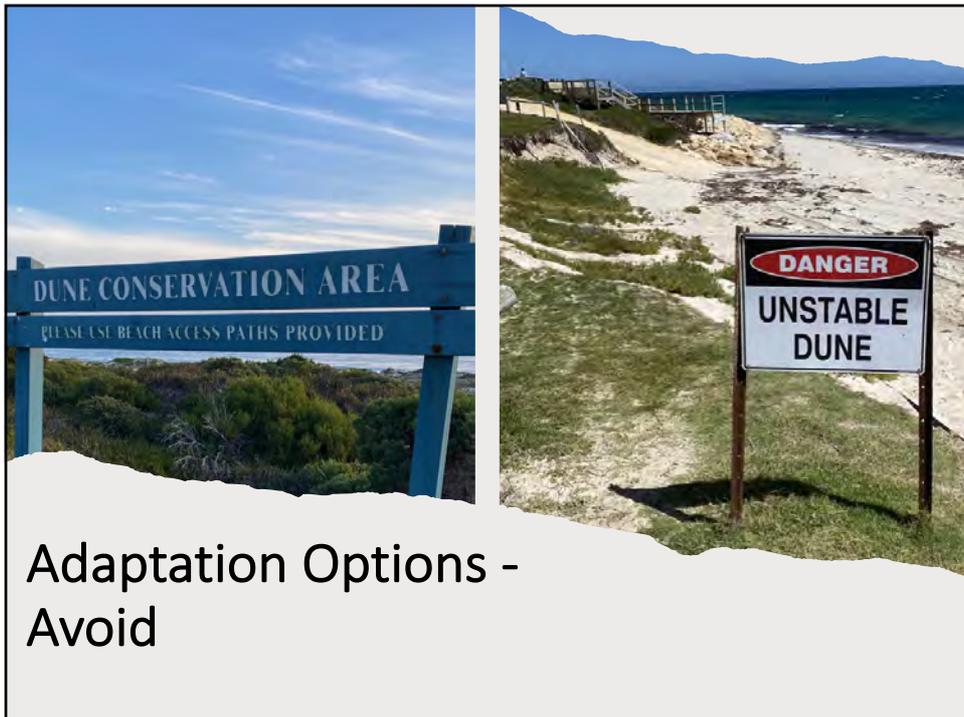


22

Adaptation Options

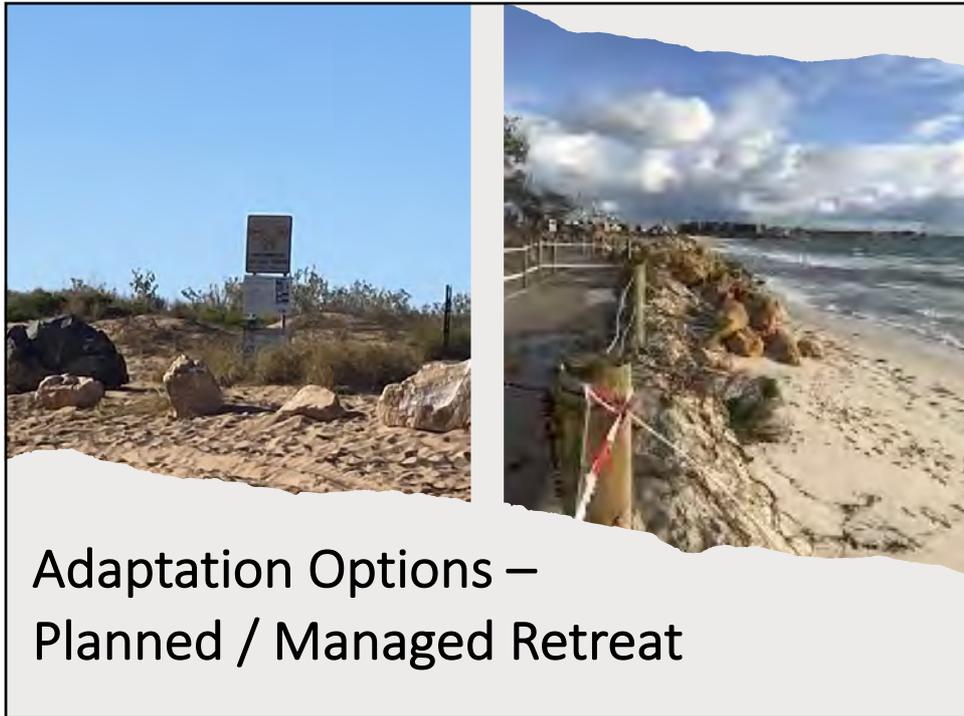


23



Adaptation Options -
Avoid

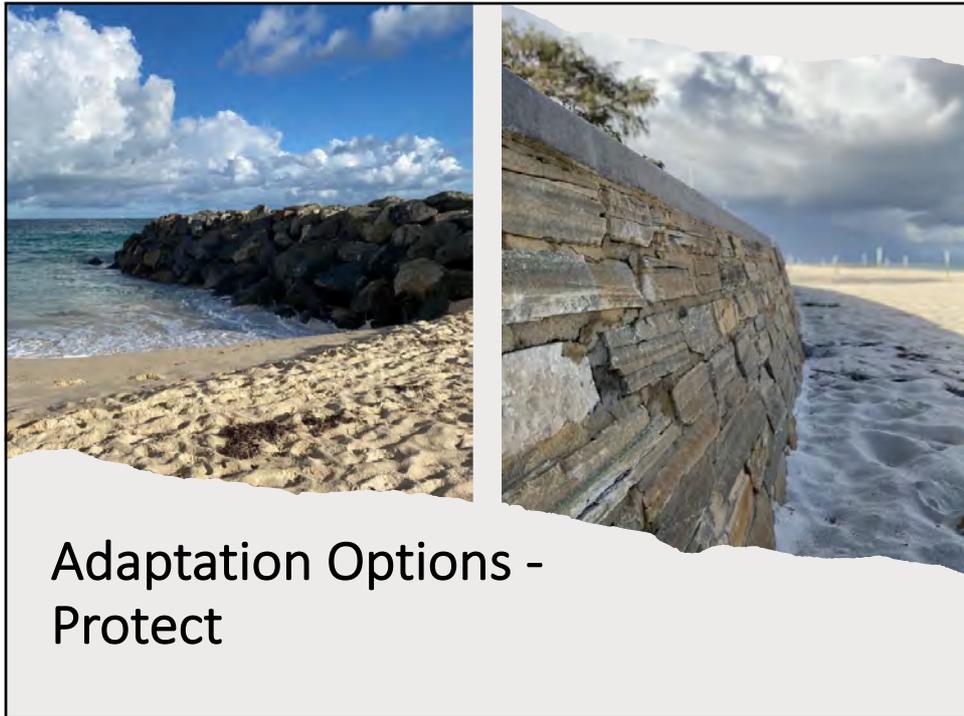
24



25



26



27



28

How do we make decisions about what is best?



29

Multi-Criteria Assessment

Rating: Score	Effectiveness	Environmental Impact	Social Impact	Aesthetic Impact	Cost (Capital & Ongoing)	Future Adaptability	Final Recommendation
Positive: +2	Expected to be very effective	Significant positive impact, return to more natural coastline	Significant positive social impact, encourages community development	Positive aesthetics, improves existing coastline and place recognition	Low costs. Higher capital costs accepted if other criteria met. Very low economic loss.	Very adaptable, not likely to leave legacy issues	Further Investigation Recommended, Score > 0
Positive: +1	Expected to be effective	Positive impact, return to more natural coastline	Positive social impact, encourages community development	Positive aesthetics, retains the existing coastline and place recognition	Reasonable costs. Higher capital costs accepted if other criteria met. Low economic loss.	Adaptable, not likely to leave legacy issues	Further Investigation Recommended, Score > 0
Neutral: 0	May or may not be effective, possibly unable to predict	No (or unclear) environmental impact	No discernible social impact, indeterminate net impact	Neutral aesthetic	Moderate costs	May leave legacy issues	Suitability unclear, Score = 0
Negative: -1	Likely to be ineffective in the short or long term	Potential significant negative impacts, including marine beachfront obliteration	Negative social impact. May discourage new or existing people from the area	Coastline / landscape appearance negatively altered	High initial or ongoing costs, especially if low likelihood of success. High economic loss.	Likely to create legacy issues	Not recommended, Score < 0
Negative: -2	Very likely to be ineffective in the short or long term	Significant negative impacts, including marine beachfront obliteration	Significant negative social impact. May discourage new or existing people from the area	Coastline / landscape appearance degraded	Very high initial or ongoing costs, especially if low likelihood of success. Very high economic loss.	Will create legacy issues	Not recommended, Score < 0



30

MCA Example Results: MU5

Option (Option Code)	Effectiveness	Environment Impact	Social Impact	Aesthetic Impact	Cost	Future Adaptability	Score	Comment
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	2	2	1	2	2	2	11	This option applies to undeveloped land. In this MU most undeveloped land is already zoned as foreshore reserve. Any developable land in MU should be subject to this option. Community will benefit by appropriate foreshore reserve width and access throughout the planning timeframe.



31

MCA Example Results: MU5

Option (Option Code)	Effectiveness	Environment Impact	Social Impact	Aesthetic Impact	Cost	Future Adaptability	Score	Comment
Prevention of further development / prohibit expansion of existing use rights (PMR3)	1	1	0	0	2	2	6	Allows for continued use of the land whilst viable, without creating legacy issues. May be unpopular with landholders.



32

MCA Example Results: MU5

Option (Option Code)	Effectiveness	Environment Impact	Social Impact	Aesthetic Impact	Cost	Future Adaptability	Score	Comment
Offshore breakwater (PR5)	2	0	1	-1	-1	-1	0	Costly to build and maintain but can be designed to work effectively and provide usable sandy beach. Social concerns about ocean views likely. Concerns could be offset by designing shore-attached structures.



33

MCA Example Results: MU5

Option (Option Code)	Effectiveness	Environment Impact	Social Impact	Aesthetic Impact	Cost	Future Adaptability	Score	Comment
Do nothing (DN1)	-2	-1	-1	-1	-1	-2	-8	Not an effective adaptation option and may not be popular with the community.



34

Task 1 – Discuss our Preliminary Scoring

Using the sheets on your tables – consider if we got the ‘Environmental’ ‘Social’ and ‘Aesthetic’ Impact Criteria *right*

Mark your sheets individually and then discuss

Note: ‘Right’ is not a technical term – much of this is qualitative for different areas and different communities – we are sensitivity testing!



35

Task 2 – Continue Discussion

Using the sheets on your tables – consider if we got the ‘Environmental’ ‘Social’ and ‘Aesthetic’ Impact Criteria *right*

Agree on the master sheet

Note: ‘Right’ is not a technical term – much of this is qualitative for different areas and different communities – we are sensitivity testing!



36

MCA DRAFT Results

Option	MU1	MU2	MU3	MU4	MU5	MU6	MU7	MU8	MU9	MU10	MU11
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	11	11	11	11	11	11	11	11	11	11	11
Leaving assets unprotected (PMR1)	2	2	2	2	2	2	2	2	2	2	2
Demolition / removal / relocation of asset from inside hazard area (PMR2)	7	7	7	7	7	7	7	7	7	7	7
Prevention of further development / prohibit expansion of existing use rights (PMR3)	6	6	6	10	6	6	N/A	6	6	6	6
Voluntary acquisition (PMR4)	5	4	5	N/A	5	5	N/A	5	5	5	5
Design assets to withstand impacts (AC1)	10	10	N/A	12	10	10	12	10	10	10	10
Beach nourishment or replenishment (PR1)	3	-4	3	-7	3	4	4	3	3	3	3
Groynes (PR2)	1	-4	1	-11	1	3	3	0	0	-1	-1
Seawalls (PR3)	-6	-10	-6	-12	-2	0	0	0	0	-1	-1
Artificial reef (PR4)	-4	-6	-4	-10	-3	-4	-4	-5	-4	N/A	N/A
Offshore breakwater (PR5)	-5	-7	-5	-12	0	-3	-4	0	0	N/A	N/A
Levy / Weir / Storm Surge Barrier (PR6)	1	1	N/A	N/A	4	3	N/A	3	3	3	3
Monitoring (NR1)	7	7	7	7	7	7	7	7	7	7	7
Protection Structure Audit (NR2)	N/A	N/A	N/A	N/A	6	6	6	6	6	N/A	N/A
Notification on title (NR3)	7	7	7	7	7	7	7	7	7	7	7
Emergency evacuation plans (NR4)	6	6	N/A	N/A	6	6	N/A	7	6	7	7
Do nothing (DN1)	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8

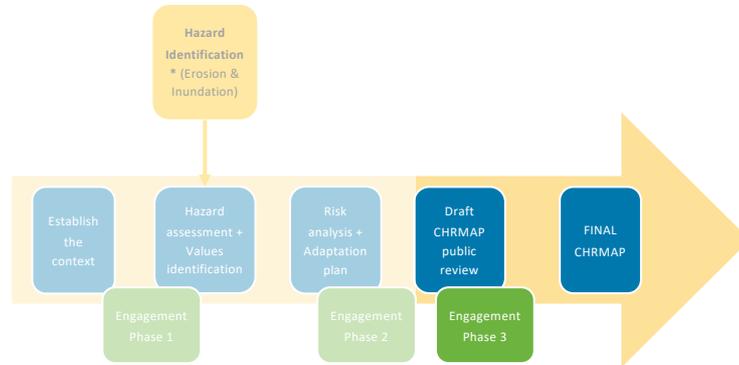


Next Steps...

- Cross check all hazard mapping
- Finalising multi-criteria assessment
- Establishing recommendations
- Preparing the Draft CHRMAP for public review



CHRMAP...



APPENDIX H

MCA OPTIONS AND SCORES



DRAFT Multi-Criteria Analysis – MU1 – Peppermint Grove Beach

Option (Option Code)	Effectiveness	Environment Impact	Social Impact	Aesthetic Impact	Cost	Future Adaptability	Score	Comment
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	2	2	1	2	2	2	11	This option applies to undeveloped land. In this MU most undeveloped land is already zoned as foreshore reserve. Any developable land in MU should be subject to this option. Community will benefit by appropriate foreshore reserve width and access throughout the planning timeframe.
Leaving assets unprotected (PMR1)	0	-1	1	0	1	1	2	Suitable for low-value public assets such as foreshore amenities.
Demolition / removal / relocation of asset from inside hazard area (PMR2)	1	2	2	1	-1	2	7	Suitable for low to medium value public assets such as car park and ablutions block. Potentially costly if triggers met before asset due for replacement.
Prevention of further development / prohibit expansion of existing use rights (PMR3)	1	1	0	0	2	2	6	Allows for continued use of the land whilst viable, without creating legacy issues. May be unpopular with landholders.
Voluntary acquisition (PMR4)	2	1	0	2	-2	2	5	For private property. Effective but costly option. Ensures foreshore reserve retained. May be unpopular with landholders, depending on implementation strategy.
Design assets to withstand impacts (AC1)	2	2	1	1	2	2	10	For inundation hazard. Early design considerations mean implementation can occur as assets are routinely upgraded / renewed.
Beach nourishment or replenishment (PR1)	0	0	1	1	-1	2	3	Potentially very expensive if no nearby suitable and sustainable sand source available. Could create legacy issues for future.
Groynes (PR2)	1	0	1	0	-1	0	1	A groyne field may assist to stabilise the shoreline. Groynes can lead to downdrift erosion issues if not designed and constructed appropriately. Would require sand nourishment as part of works, which can help provide a sandy beach.
Seawalls (PR3)	1	-2	-1	-1	-2	-1	-6	Expensive option. Likely to lead to reduction or loss of usable sandy beach.
Artificial reef (PR4)	0	0	0	0	-2	-2	-4	Difficult to design submerged structures to work effectively, and costly to build and maintain.
Offshore breakwater (PR5)	1	0	-1	-1	-2	-2	-5	Costly to build and maintain but can be designed to work effectively and provide usable sandy beach. Social concerns about ocean views likely.
Levy / Weir / Storm Surge Barrier (PR6)	1	0	0	0	-1	1	1	Some form of inundation protection on the banks / mouth of the Capel River to minimise inundation on the low lying land behind the town. This would be costly but potentially effective. Impacts would need to be investigated thoroughly.
Monitoring (NR1)	2	2	1	0	0	2	7	Low-cost action which causes no problems. Resulting data is required for most management approaches.
Protection Structure Audit (NR2)							N/A	No existing protections structures in this MU.
Notification on title (NR3)	1	2	1	0	2	2	8	For private property. Effective low-cost option. May be unpopular with affected landholders, but appreciated by potential purchasers, depending on implementation strategy.
Emergency evacuation plans (NR4)	1	0	1	0	2	2	6	For inundation hazard. Doesn't directly address vulnerabilities of assets but low cost to plan for keeping people safe. Important for single-road access to town.
Do nothing (DN1)	-2	-1	-1	-1	-1	-2	-8	Not an effective adaptation option and may not be popular with the community.



DRAFT Multi-Criteria Analysis – MU2 – Capel Coast

Option (Option Code)	Effectiveness	Environment Impact	Social Impact	Aesthetic Impact	Cost	Future Adaptability	Score	Comment
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	2	2	1	2	2	2	11	This option applies to undeveloped land, which there are large areas of in this MU. Community will benefit by appropriate foreshore reserve width and access throughout the planning timeframe.
Leaving assets unprotected (PMR1)	0	-1	1	0	1	1	2	Suitable for low-value public assets such as foreshore recreational amenities.
Demolition / removal / relocation of asset from inside hazard area (PMR2)	1	2	2	1	-1	2	7	Suitable for low-value public assets such as foreshore recreational amenities. Potentially costly if triggers met before asset due for replacement.
Prevention of further development / prohibit expansion of existing use rights (PMR3)	1	1	0	0	2	2	6	Allows for continued use of the land whilst viable, without creating legacy issues. May be unpopular with landholders.
Voluntary acquisition (PMR4)	2	1	0	1	-2	2	4	For private property. Effective but costly option. Ensures foreshore reserve retained. May be unpopular with landholders, depending on implementation strategy. Will cost much less than protection given the sparse development in this MU.
Design assets to withstand impacts (AC1)	2	2	1	1	2	2	10	For inundation hazard. Early design considerations mean implementation can occur as assets are routinely upgraded / renewed.
Beach nourishment or replenishment (PR1)	-2	0	0	0	-2	0	-4	Potentially very expensive if no nearby suitable and sustainable sand source available. Could create legacy issues for future. Not feasible over large section of coastline.
Groynes (PR2)	-1	0	1	-1	-2	-1	-4	Not feasible over large section of coastline. Groynes can be effective at stabilising shorelines but can also lead to downdrift erosion issues if not designed and constructed appropriately.
Seawalls (PR3)	-1	-2	-1	-2	-2	-2	-10	Expensive option, not realistic due to the length of MU, and number of impacted assets (and hence low funding potential).
Artificial reef (PR4)	-2	0	0	0	-2	-2	-6	Difficult to design submerged structures to work effectively, and costly to build and maintain.
Offshore breakwater (PR5)	-1	0	-1	-1	-2	-2	-7	Expensive option, not realistic due to the length of MU, and number of impacted assets (and hence low funding potential). Costly to build and maintain. Social concerns about ocean views likely.
Levy / Weir / Storm Surge Barrier (PR6)	1	0	0	0	-1	1	1	Some form of inundation protection on the banks / mouth of the Capel River to minimise inundation on the low lying land. This would be costly but potentially effective. Impacts would need to be investigated thoroughly.
Monitoring (NR1)	2	2	1	0	0	2	7	Low-cost action which causes no problems. Resulting data is required for most management approaches.
Protection Structure Audit (NR2)							N/A	No existing protection structures in this MU.
Notification on title (NR3)	1	2	1	0	2	2	8	For private property. Effective low-cost option. May be unpopular with affected landholders, but appreciated by potential purchasers, depending on implementation strategy.
Emergency evacuation plans (NR4)	1	0	1	0	2	2	6	For inundation hazard. Doesn't directly address vulnerabilities of assets but low cost to plan for keeping people safe.
Do nothing (DN1)	-2	-1	-1	-1	-1	-2	-8	Not an effective adaptation option and may not be popular with the community.



DRAFT Multi-Criteria Analysis – MU3 - Dalyellup

Option (Option Code)	Effectiveness	Environment Impact	Social Impact	Aesthetic Impact	Cost	Future Adaptability	Score	Comment
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	2	2	1	2	2	2	11	This option applies to undeveloped land. In this MU most undeveloped land is already zoned as foreshore reserve. Any developable land in MU should be subject to this option. Community will benefit by appropriate foreshore reserve width and access throughout the planning timeframe.
Leaving assets unprotected (PMR1)	0	-1	1	0	1	1	2	Suitable for low-value public assets such as foreshore recreational amenities.
Demolition / removal / relocation of asset from inside hazard area (PMR2)	1	2	2	1	-1	2	7	Suitable for low-value public assets such as foreshore recreational amenities. Potentially costly if triggers met before asset due for replacement.
Prevention of further development / prohibit expansion of existing use rights (PMR3)	1	1	0	0	2	2	6	Allows for continued use of the land whilst viable, without creating legacy issues. May be unpopular with landholders.
Voluntary acquisition (PMR4)	2	1	0	2	-2	2	5	For private property. Effective but costly option. Ensures foreshore reserve retained. May be unpopular with landholders, depending on implementation strategy and timeframes.
Design assets to withstand impacts (AC1)							N/A	Only suitable for inundation hazard. In this MU only environmental assets are projected to be affected, so not applicable.
Beach nourishment or replenishment (PR1)	0	0	1	1	-1	2	3	Potentially very expensive if no nearby suitable and sustainable sand source available. Could create legacy issues for future.
Groynes (PR2)	1	0	1	0	-1	0	1	A groyne field may assist to stabilise the shoreline. Groynes can lead to downdrift erosion issues if not designed and constructed appropriately. Would require sand nourishment as part of works, which can help provide a sandy beach.
Seawalls (PR3)	1	-2	-1	-1	-2	-1	-6	Expensive option. Likely to lead to reduction or loss of usable sandy beach.
Artificial reef (PR4)	0	0	0	0	-2	-2	-4	Difficult to design submerged structures to work effectively, and costly to build and maintain.
Offshore breakwater (PR5)	1	0	-1	-1	-2	-2	-5	Costly to build and maintain but can be designed to work effectively and provide usable sandy beach. Social concerns about ocean views likely.
Levy / Weir / Storm Surge Barrier (PR6)							N/A	Inundation is not a high risk in this management unit
Monitoring (NR1)	2	2	1	0	0	2	7	Low-cost action which causes no problems. Resulting data is required for most management approaches.
Protection Structure Audit (NR2)							N/A	No existing protection structures in this MU.
Notification on title (NR3)	1	2	1	0	2	2	8	For private property. Effective low-cost option. May be unpopular with affected landholders, but appreciated by potential purchasers, depending on implementation strategy.
Emergency evacuation plans (NR4)							N/A	Suitable for inundation hazard that may affect people but given the few affected assets in this MU and their environmental nature this is not applicable.
Do nothing (DN1)	-2	-1	-1	-1	-1	-2	-8	Not an effective adaptation option and may not be popular with the community.



DRAFT Multi-Criteria Analysis – MU4 – Bunbury S

Option (Option Code)	Effectiveness	Environment Impact	Social Impact	Aesthetic Impact	Cost	Future Adaptability	Score	Comment
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	2	2	1	2	2	2	11	This option applies to undeveloped land, which there are large areas of in this MU. Community will benefit by appropriate foreshore reserve width and access throughout the planning timeframe.
Leaving assets unprotected (PMR1)	0	-1	1	0	1	1	2	Suitable for low-value public assets such as foreshore recreational amenities.
Demolition / removal / relocation of asset from inside hazard area (PMR2)	1	2	2	1	-1	2	7	Suitable for low-value public assets such as foreshore recreational amenities. Potentially costly if triggers met before asset due for replacement.
Prevention of further development / prohibit expansion of existing use rights (PMR3)	2	2	1	1	2	2	10	Allows for continued use of the land whilst viable, without creating legacy issues. May be unpopular with landholders. Nature of environmental reserve can be maintained effectively with this approach.
Voluntary acquisition (PMR4)							N/A	For private property – none in hazard zone in this MU.
Design assets to withstand impacts (AC1)	2	2	2	2	2	2	12	For inundation hazard which is projected to affect very few assets in this MU. Early design considerations mean implementation can occur as assets are routinely upgraded / renewed.
Beach nourishment or replenishment (PR1)	-2	-1	-1	-1	-2	0	-7	Potentially very expensive if no nearby suitable and sustainable sand source available. Could create legacy issues for future. Not feasible over large section of coastline. Does not complement environmental focus of this MU.
Groynes (PR2)	-2	-2	-2	-2	-2	-1	-11	Not feasible over large section of coastline. Groynes can be effective at stabilising shorelines but can also lead to downdrift erosion issues if not designed and constructed appropriately. Does not complement environmental focus of this MU.
Seawalls (PR3)	-2	-2	-2	-2	-2	-2	-12	Expensive option, not realistic due to the length of MU, and nature of impacted assets. Does not complement environmental focus of this MU.
Artificial reef (PR4)	-2	-2	-2	0	-2	-2	-10	Difficult to design submerged structures to work effectively, and costly to build and maintain. Expensive option, not realistic due to the length of MU, and nature of impacted assets. Does not complement environmental focus of this MU.
Offshore breakwater (PR5)	-2	-2	-2	-2	-2	-2	-12	Expensive option, not realistic due to the length of MU, and number of impacted assets (and hence low funding potential). Costly to build and maintain. Social concerns about ocean views likely. Does not complement environmental focus of this MU.
Levy / Weir / Storm Surge Barrier (PR6)							N/A	Inundation is not a high risk in this management unit
Monitoring (NR1)	2	2	1	0	0	2	7	Low-cost action which causes no problems. Resulting data is required for most management approaches.
Protection Structure Audit (NR2)							N/A	No existing protection structures in this MU.
Notification on title (NR3)	1	2	1	0	2	2	8	For private property. Effective low-cost option. May be unpopular with affected landholders, but appreciated by potential purchasers, depending on implementation strategy.
Emergency evacuation plans (NR4)							N/A	Suitable for inundation hazard that may affect people but given the few affected assets in this MU and their nature this is not applicable.
Do nothing (DN1)	-2	-1	-1	-1	-1	-2	-8	Not an effective adaptation option and may not be popular with the community.



DRAFT Multi-Criteria Analysis – MU5 - Bunbury

Option (Option Code)	Effectiveness	Environment Impact	Social Impact	Aesthetic Impact	Cost	Future Adaptability	Score	Comment
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	2	2	1	2	2	2	11	This option applies to undeveloped land. In this MU most undeveloped land is already zoned as foreshore reserve. Any developable land in MU should be subject to this option. Community will benefit by appropriate foreshore reserve width and access throughout the planning timeframe.
Leaving assets unprotected (PMR1)	0	-1	1	0	1	1	2	Suitable for low-value public assets such as foreshore recreational amenities.
Demolition / removal / relocation of asset from inside hazard area (PMR2)	1	2	2	1	-1	2	7	Suitable for low-value public assets such as foreshore recreational amenities. Potentially costly if triggers met before asset due for replacement.
Prevention of further development / prohibit expansion of existing use rights (PMR3)	1	1	0	0	2	2	6	Allows for continued use of the land whilst viable, without creating legacy issues. May be unpopular with landholders.
Voluntary acquisition (PMR4)	2	1	0	2	-2	2	5	For private property. Effective but costly option. Ensures foreshore reserve retained. May be unpopular with landholders, depending on implementation strategy and timeframes. Likely to cost less than protection.
Design assets to withstand impacts (AC1)	2	2	1	1	1	2	9	For inundation hazard. Early design considerations mean implementation can occur as assets are routinely upgraded / renewed / redeveloped.
Beach nourishment or replenishment (PR1)	0	0	1	1	-1	2	3	Potentially very expensive if no nearby suitable and sustainable sand source available. Could create legacy issues for future.
Groynes (PR2)	1	0	1	0	-1	0	1	A groyne field may assist to stabilise the shoreline. Groynes can lead to downdrift erosion issues if not designed and constructed appropriately. Would require sand nourishment as part of works, which can help provide a sandy beach. Already in use in this MU.
Seawalls (PR3)	2	-1	-1	-1	-1	-1	-3	Expensive option. Likely to lead to reduction or loss of usable sandy beach. Already in use in this MU. Likely more acceptable because familiar and this MU more developed than others.
Artificial reef (PR4)	0	0	1	0	-2	-2	-3	Difficult to design submerged structures to work effectively, and costly to build and maintain.
Offshore breakwater (PR5)	2	0	1	-1	-1	-1	0	Costly to build and maintain but can be designed to work effectively and provide usable sandy beach. Social concerns about ocean views likely. Concerns could be offset by designing shore-attached structures.
Levy / Weir / Storm Surge Barrier (PR6)	2	0	2	0	-1	1	4	The storm surge barrier is effective at reducing inundation but the present design is predicted to be breached by the present day 500-year ARI event, and more frequent future events. Upgrades would be effective at reducing the inundation impact.
Monitoring (NR1)	2	2	1	0	0	2	7	Low-cost action which causes no problems. Resulting data is required for most management approaches. Also a source of data for identifying triggers for other management options.
Protection Structure Audit (NR2)	2	0	0	0	2	2	6	An audit should be undertaken of all existing coastal protection structures.
Notification on title (NR3)	1	2	1	0	2	2	8	For private property. Effective low-cost option. May be unpopular with affected landholders, but appreciated by potential purchasers, depending on implementation strategy.
Emergency evacuation plans (NR4)	1	0	1	0	2	2	6	For inundation hazard. Doesn't directly address vulnerabilities of assets but low cost to plan for keeping people safe. Important for considering inundation of access roads to parts of MU.
Do nothing (DN1)	-2	-1	-1	-1	-1	-2	-8	Not an effective adaptation option and may not be popular with the community.



DRAFT Multi-Criteria Analysis – MU6 – Bunbury Port

Option (Option Code)	Effectiveness	Environment Impact	Social Impact	Aesthetic Impact	Cost	Future Adaptability	Score	Comment
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	2	2	1	2	2	2	11	This option applies to undeveloped land. In this MU most undeveloped land is already zoned as reserve. Any developable land in MU should be subject to this option. Community will benefit by appropriate foreshore reserve width and access throughout the planning timeframe.
Leaving assets unprotected (PMR1)	0	-1	1	0	1	1	2	Suitable for low-value public assets such as foreshore recreational amenities.
Demolition / removal / relocation of asset from inside hazard area (PMR2)	1	2	2	1	-1	2	7	Suitable for low-value public assets such as foreshore recreational amenities. Potentially costly if triggers met before asset due for replacement.
Prevention of further development / prohibit expansion of existing use rights (PMR3)	1	1	0	0	2	2	6	Allows for continued use of the land whilst viable, without creating legacy issues. May be unpopular with landholders.
Voluntary acquisition (PMR4)	2	1	0	2	-2	2	5	For private property. Effective but costly option. Ensures foreshore reserve retained. May be unpopular with landholders, depending on implementation strategy and timeframes. Likely to cost less than protection.
Design assets to withstand impacts (AC1)	2	2	1	1	2	2	10	For inundation hazard. Early design considerations mean implementation can occur as assets are routinely upgraded / renewed / redeveloped.
Beach nourishment or replenishment (PR1)	1	0	1	1	-1	2	4	Potentially very expensive if no nearby suitable and sustainable sand source available. Could create legacy issues for future. Small ocean frontage and structure-controlled pocket beaches make it a potentially effective option.
Groynes (PR2)	1	1	1	1	-1	0	3	A groyne field may assist to stabilise the shoreline. Groynes can lead to downdrift erosion issues if not designed and constructed appropriately. Could require sand nourishment as part of works, which can help provide a sandy beach. Existing structures increase acceptability.
Seawalls (PR3)	1	0	0	0	-2	0	0	Expensive option. Likely to lead to reduction or loss of usable sandy beach. May be acceptable at this industrialised MU, especially because there are existing seawalls.
Artificial reef (PR4)	0	0	0	0	-2	-2	-4	Difficult to design submerged structures to work effectively, and costly to build and maintain.
Offshore breakwater (PR5)	1	0	0	0	-2	-2	-3	Costly to build and maintain but can be designed to work effectively and provide usable sandy beach.
Levy / Weir / Storm Surge Barrier (PR6)	2	0	2	0	-2	1	3	A storm surge barrier at the Cut may be effective at reducing inundation, combined with additional protection along Preston River. This would be costly; impacts would need to be investigated.
Monitoring (NR1)	2	2	1	0	0	2	7	Low-cost action which causes no problems. Resulting data is required for most management approaches.
Protection Structure Audit (NR2)	2	0	0	0	2	2	6	An audit should be undertaken of all existing coastal protection structures.
Notification on title (NR3)	1	2	1	0	2	2	8	For private property. Effective low-cost option. May be unpopular with affected landholders, but appreciated by potential purchasers, depending on implementation strategy.
Emergency evacuation plans (NR4)	1	0	1	0	2	2	6	For inundation hazard. Doesn't directly address vulnerabilities of assets but low cost to plan for keeping people safe. Important for considering inundation of main access roads.
Do nothing (DN1)	-2	-1	-1	-1	-1	-2	-8	Not an effective adaptation option and may not be popular with the community.



DRAFT Multi-Criteria Analysis – MU7 – The Cut

Option (Option Code)	Effectiveness	Environment Impact	Social Impact	Aesthetic Impact	Cost	Future Adaptability	Score	Comment
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	2	2	1	2	2	2	11	This option applies to undeveloped land. In this MU most undeveloped land is already zoned as reserve. Any developable land in MU should be subject to this option. Community will benefit by appropriate foreshore reserve width and access throughout the planning timeframe.
Leaving assets unprotected (PMR1)	0	-1	1	0	1	1	2	Suitable for low-value public assets such as foreshore recreational amenities.
Demolition / removal / relocation of asset from inside hazard area (PMR2)	1	2	2	1	-1	2	7	Suitable for low-value public assets such as foreshore recreational amenities. Potentially costly if triggers met before asset due for replacement.
Prevention of further development / prohibit expansion of existing use rights (PMR3)							N/A	No developed land parcels.
Voluntary acquisition (PMR4)							N/A	No developed land parcels.
Design assets to withstand impacts (AC1)	2	2	2	2	2	2	12	For inundation hazard which is projected to affect very few assets in this MU. Early design considerations mean implementation can occur as assets are routinely upgraded / renewed.
Beach nourishment or replenishment (PR1)	1	0	1	1	-1	2	4	Potentially very expensive if no nearby suitable and sustainable sand source available. Could create legacy issues for future. Small ocean frontage and structure-controlled pocket beaches make it a potentially effective option.
Groynes (PR2)	1	1	1	1	-1	0	3	A groyne field may assist to stabilise the shoreline. Groynes can lead to downdrift erosion issues if not designed and constructed appropriately. Could require sand nourishment as part of works, which can help provide a sandy beach. Existing structures increase acceptability.
Seawalls (PR3)	2	0	0	0	-1	-1	0	Expensive option. Likely to lead to reduction or loss of usable sandy beach. MU already has seawall for much of coastline.
Artificial reef (PR4)	0	0	0	0	-2	-2	-4	Difficult to design submerged structures to work effectively, and costly to build and maintain.
Offshore breakwater (PR5)	0	0	0	0	-2	-2	-4	Costly to build and maintain. Location means unlikely to very effective.
Levy / Weir / Storm Surge Barrier (PR6)							N/A	A storm surge barrier at the Cut may be effective at reducing inundation elsewhere, however not necessarily required in this MU.
Monitoring (NR1)	2	2	1	0	0	2	7	Low-cost action which causes no problems. Resulting data is required for most management approaches.
Protection Structure Audit (NR2)	2	0	0	0	2	2	6	An audit should be undertaken of all existing coastal protection structures.
Notification on title (NR3)	1	2	1	0	2	2	8	For private property. Effective low-cost option. May be unpopular with affected landholders, but appreciated by potential purchasers, depending on implementation strategy.
Emergency evacuation plans (NR4)							N/A	Suitable for inundation hazard that may affect people but given the few affected assets in this MU and their environmental nature this is not applicable.
Do nothing (DN1)	-2	-1	-1	-1	-1	-2	-8	Not an effective adaptation option and may not be popular with the community.



DRAFT Multi-Criteria Analysis – MU8 – Bunbury E

Option (Option Code)	Effectiveness	Environment Impact	Social Impact	Aesthetic Impact	Cost	Future Adaptability	Score	Comment
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	2	2	1	2	2	2	11	This option applies to undeveloped land. In this MU most undeveloped land is already zoned as foreshore reserve. Any developable land in MU should be subject to this option. Community will benefit by appropriate foreshore reserve width and access throughout the planning timeframe.
Leaving assets unprotected (PMR1)	0	-1	1	0	1	1	2	Suitable for low-value public assets such as foreshore recreational amenities.
Demolition / removal / relocation of asset from inside hazard area (PMR2)	1	2	2	1	-1	2	7	Suitable for low-value public assets such as foreshore recreational amenities. Potentially costly if triggers met before asset due for replacement.
Prevention of further development / prohibit expansion of existing use rights (PMR3)	1	1	0	0	2	2	6	Allows for continued use of the land whilst viable, without creating legacy issues. May be unpopular with landholders.
Voluntary acquisition (PMR4)	2	1	0	2	-2	2	5	For private property. Effective but costly option. Ensures foreshore reserve retained. May be unpopular with landholders, depending on implementation strategy and timeframes. Likely to cost less than protection.
Design assets to withstand impacts (AC1)	2	2	1	1	2	2	10	For inundation hazard. Early design considerations mean implementation can occur as assets are routinely upgraded / renewed / redeveloped.
Beach nourishment or replenishment (PR1)	0	0	1	1	-1	2	3	Potentially very expensive if no nearby suitable and sustainable sand source available. Could create legacy issues for future.
Groynes (PR2)	0	0	1	0	-1	0	0	A groyne field may assist to stabilise the shoreline. Groynes can lead to downdrift erosion issues if not designed and constructed appropriately. Would require sand nourishment as part of works, which can help provide a sandy beach..
Seawalls (PR3)	2	0	0	0	-1	-1	0	Expensive option. Likely to lead to reduction or loss of usable sandy beach. Likely more acceptable because nature of MU means they can be smaller structures.
Artificial reef (PR4)	-2	0	1	0	-2	-2	-5	Difficult to design submerged structures to work effectively, and costly to build and maintain.
Offshore breakwater (PR5)	1	0	1	0	-1	-1	0	Costly to build and maintain but could potentially be designed to work effectively and provide usable sandy beach. Social concerns about ocean views likely. Concerns could be offset by designing shore-attached structures.
Levy / Weir / Storm Surge Barrier (PR6)	2	0	2	0	-2	1	3	A storm surge barrier at the Cut may be effective at reducing inundation, potentially combined with additional protection along Preston River. This would be costly; impacts would need to be investigated.
Monitoring (NR1)	2	2	1	0	0	2	7	Low-cost action which causes no problems. Resulting data is required for most management approaches.
Protection Structure Audit (NR2)	2	0	0	0	2	2	6	An audit should be undertaken of all existing coastal protection structures.
Notification on title (NR3)	1	2	1	0	2	2	8	For private property. Effective low-cost option. May be unpopular with affected landholders, but appreciated by potential purchasers, depending on implementation strategy.
Emergency evacuation plans (NR4)	1	0	2	0	2	2	7	For inundation hazard. Doesn't directly address vulnerabilities of assets but low cost to plan for keeping people safe. Important for considering inundation of access roads to parts of MU.
Do nothing (DN1)	-2	-1	-1	-1	-1	-2	-8	Not an effective adaptation option and may not be popular with the community.



DRAFT Multi-Criteria Analysis – MU9 – Leschenault Estuary

Option (Option Code)	Effectiveness	Environment Impact	Social Impact	Aesthetic Impact	Cost	Future Adaptability	Score	Comment
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	2	2	1	2	2	2	11	Community will benefit by appropriate foreshore reserve width and access throughout the planning timeframe. This option applies to undeveloped land, which there are large areas of in this MU. Community will benefit by appropriate foreshore reserve width and access throughout the planning timeframe.
Leaving assets unprotected (PMR1)	0	-1	1	0	1	1	2	Suitable for low-value public assets such as foreshore recreational amenities.
Demolition / removal / relocation of asset from inside hazard area (PMR2)	1	2	2	1	-1	2	7	Suitable for low-value public assets such as foreshore recreational amenities. Potentially costly if triggers met before asset due for replacement.
Prevention of further development / prohibit expansion of existing use rights (PMR3)	1	1	0	0	2	2	6	Allows for continued use of the land whilst viable, without creating legacy issues. May be unpopular with landholders.
Voluntary acquisition (PMR4)	2	1	0	2	-2	2	5	For private property. Effective but costly option. Ensures foreshore reserve retained. May be unpopular with landholders, depending on implementation strategy and timeframes. Likely to cost less than protection.
Design assets to withstand impacts (AC1)	2	2	1	1	2	2	10	For inundation hazard. Early design considerations mean implementation can occur as assets are routinely upgraded / renewed / redeveloped.
Beach nourishment or replenishment (PR1)	0	0	1	1	-1	2	3	Potentially expensive if no nearby suitable and sustainable sand source available. Could create legacy issues for future.
Groynes (PR2)	0	0	1	0	-1	0	0	A groyne field may assist to stabilise the shoreline. Groynes can lead to downdrift erosion issues if not designed and constructed appropriately. Would require sand nourishment as part of works, which can help provide a sandy beach..
Seawalls (PR3)	2	0	0	0	-1	-1	0	Expensive option. Likely to lead to reduction or loss of usable sandy beach / socially amenable shoreline. Likely more acceptable because nature of MU means they can be smaller structures.
Artificial reef (PR4)	-1	0	1	0	-2	-2	-4	Difficult to design submerged structures to work effectively, and costly to build and maintain.
Offshore breakwater (PR5)	1	0	1	0	-1	-1	0	Costly to build and maintain but could potentially be designed to work effectively and provide usable sandy beach. Could be social concerns about estuary views. Concerns could be offset by designing shore-attached structures.
Levy / Weir / Storm Surge Barrier (PR6)	2	0	2	0	-2	1	3	A storm surge barrier at the Cut may be effective at reducing inundation. This would be costly; impacts would need to be investigated.
Monitoring (NR1)	2	2	1	0	0	2	7	Low-cost action which causes no problems. Resulting data is required for most management approaches.
Protection Structure Audit (NR2)	2	0	0	0	2	2	6	An audit should be undertaken of any existing coastal protection structures. Water Technology are not aware of any in this MU.
Notification on title (NR3)	1	2	1	0	2	2	8	For private property. Effective low-cost option. May be unpopular with affected landholders, but appreciated by potential purchasers, depending on implementation strategy.
Emergency evacuation plans (NR4)	1	0	1	0	2	2	6	For inundation hazard. Doesn't directly address vulnerabilities of assets but low cost to plan for keeping people safe. Important for considering inundation of main access roads.
Do nothing (DN1)	-2	-1	-1	-1	-1	-2	-8	Not an effective adaptation option and may not be popular with the community.



DRAFT Multi-Criteria Analysis – MU10 – Collie River S

Option (Option Code)	Effectiveness	Environment Impact	Social Impact	Aesthetic Impact	Cost	Future Adaptability	Score	Comment
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	2	2	1	2	2	2	11	This option applies to undeveloped land. In this MU most undeveloped land is already zoned as foreshore reserve. Any developable land in MU should be subject to this option. Community will benefit by appropriate foreshore reserve width and access throughout the planning timeframe.
Leaving assets unprotected (PMR1)	0	-1	1	0	1	1	2	Suitable for low-value public assets such as foreshore recreational amenities.
Demolition / removal / relocation of asset from inside hazard area (PMR2)	1	2	2	1	-1	2	7	Suitable for low-value public assets such as foreshore recreational amenities. Potentially costly if triggers met before asset due for replacement.
Prevention of further development / prohibit expansion of existing use rights (PMR3)	1	1	0	0	2	2	6	Allows for continued use of the land whilst viable, without creating legacy issues. May be unpopular with landholders.
Voluntary acquisition (PMR4)	2	1	0	2	-2	2	5	For private property. Effective but costly option. Ensures foreshore reserve retained. May be unpopular with landholders, depending on implementation strategy and timeframes. Likely to cost less than protection.
Design assets to withstand impacts (AC1)	2	2	1	1	2	2	10	For inundation hazard. Early design considerations mean implementation can occur as assets are routinely upgraded / renewed / redeveloped.
Beach nourishment or replenishment (PR1)	0	0	1	1	-1	2	3	Potentially very expensive if no nearby suitable and sustainable sand source available. Could create legacy issues for future.
Groynes (PR2)	-1	0	1	0	-1	0	-1	A groyne field is not an effective erosion mitigation option for this MU...
Seawalls (PR3)	1	0	0	0	-1	-1	-1	Expensive option. Likely more acceptable because nature of MU means they can be smaller structures, however erosion risk based on application of policy so not necessarily required / appropriate.
Artificial reef (PR4)							N/A	Not appropriate in this riverine environment
Offshore breakwater (PR5)							N/A	Not appropriate in this riverine environment
Levy / Weir / Storm Surge Barrier (PR6)	2	0	2	0	-2	1	3	A storm surge barrier at the Cut may be effective at reducing inundation. This would be costly; impacts would need to be investigated.
Monitoring (NR1)	2	2	1	0	0	2	7	Low-cost action which causes no problems. Resulting data is required for most management approaches.
Protection Structure Audit (NR2)							N/A	No existing protection structures in this MU.
Notification on title (NR3)	1	2	1	0	2	2	8	For private property. Effective low-cost option. May be unpopular with affected landholders, but appreciated by potential purchasers, depending on implementation strategy.
Emergency evacuation plans (NR4)	1	0	2	0	2	2	7	For inundation hazard. Doesn't directly address vulnerabilities of assets but low cost to plan for keeping people safe. Important for considering inundation of access roads to parts of MU.
Do nothing (DN1)	-2	-1	-1	-1	-1	-2	-8	Not an effective adaptation option and may not be popular with the community.



DRAFT Multi-Criteria Analysis – MU11 – Collie River N

Option (Option Code)	Effectiveness	Environment Impact	Social Impact	Aesthetic Impact	Cost	Future Adaptability	Score	Comment
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	2	2	1	2	2	2	11	This option applies to undeveloped land. In this MU most undeveloped land is already zoned as foreshore reserve. Any developable land in MU should be subject to this option. Community will benefit by appropriate foreshore reserve width and access throughout the planning timeframe.
Leaving assets unprotected (PMR1)	0	-1	1	0	1	1	2	Suitable for low-value public assets such as foreshore recreational amenities.
Demolition / removal / relocation of asset from inside hazard area (PMR2)	1	2	2	1	-1	2	7	Suitable for low-value public assets such as foreshore recreational amenities. Potentially costly if triggers met before asset due for replacement.
Prevention of further development / prohibit expansion of existing use rights (PMR3)	1	1	0	0	2	2	6	Allows for continued use of the land whilst viable, without creating legacy issues. May be unpopular with landholders.
Voluntary acquisition (PMR4)	2	1	0	2	-2	2	5	For private property. Effective but costly option. Ensures foreshore reserve retained. May be unpopular with landholders, depending on implementation strategy and timeframes. Likely to cost less than protection.
Design assets to withstand impacts (AC1)	2	2	1	1	2	2	10	For inundation hazard. Early design considerations mean implementation can occur as assets are routinely upgraded / renewed / redeveloped.
Beach nourishment or replenishment (PR1)	0	0	1	1	-1	2	3	Potentially very expensive if no nearby suitable and sustainable sand source available. Could create legacy issues for future.
Groynes (PR2)	-1	0	1	0	-1	0	-1	A groyne field is not an effective erosion mitigation option for this MU. .
Seawalls (PR3)	1	0	0	0	-1	-1	-1	Expensive option. Likely more acceptable because nature of MU means they can be smaller structures, however erosion risk based on application of policy so not necessarily required / appropriate.
Artificial reef (PR4)							N/A	Not appropriate in this riverine environment
Offshore breakwater (PR5)							N/A	Not appropriate in this riverine environment
Levy / Weir / Storm Surge Barrier (PR6)	2	0	2	0	-2	1	3	A storm surge barrier at the Cut may be effective at reducing inundation. This would be costly; impacts would need to be investigated.
Monitoring (NR1)	2	2	1	0	0	2	7	Low-cost action which causes no problems. Resulting data is required for most management approaches.
Protection Structure Audit (NR2)							N/A	No existing protection structures in this MU.
Notification on title (NR3)	1	2	1	0	2	2	8	For private property. Effective low-cost option. May be unpopular with affected landholders, but appreciated by potential purchasers, depending on implementation strategy.
Emergency evacuation plans (NR4)	1	0	2	0	2	2	7	For inundation hazard. Doesn't directly address vulnerabilities of assets but low cost to plan for keeping people safe. Important for considering inundation of access roads to parts of MU.
Do nothing (DN1)	-2	-1	-1	-1	-1	-2	-8	Not an effective adaptation option and may not be popular with the community.

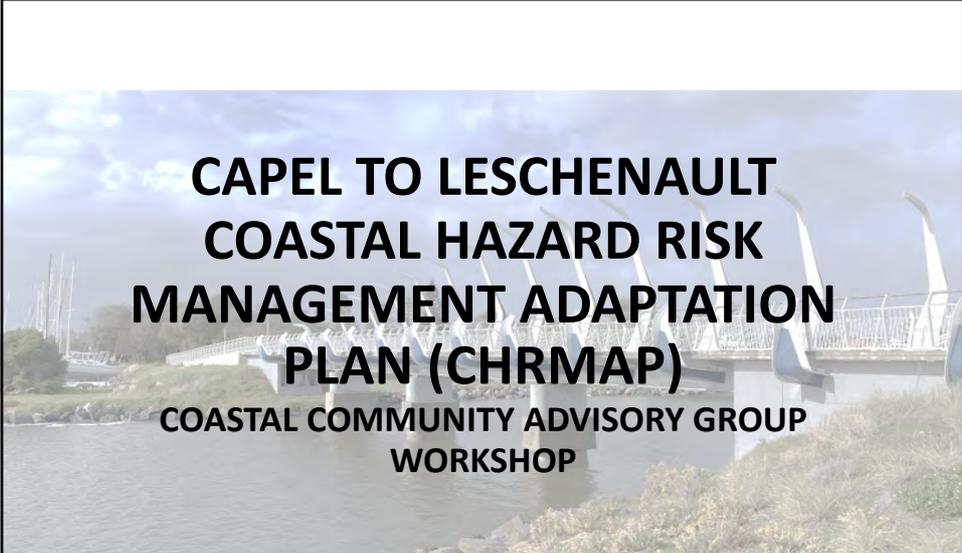


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APPENDIX I

COASTAL COMMUNITY ADVISORY GROUP MEETING TWO PRESENTATION



CAPEL TO LESCHENAULT COASTAL HAZARD RISK MANAGEMENT ADAPTATION PLAN (CHRMAP) COASTAL COMMUNITY ADVISORY GROUP WORKSHOP

November 30, 2022



1

What are we doing today?

- A quick reminder / background
- How did we use your feedback on the MCA
- General recommendations
- Management unit discussion – preliminary options



2



3

Our Remit

The CHRMAP will establish adaptation options that balance values and needs of the community along the ocean and river front coastline considering economic, social and environmental considerations



The map shows the Bunbury coastline and river system. A red outline highlights the area covered by the CHRMAP, which includes the ocean front and the river front. Labels on the map include: Leschenault, Brimbank, Bunbury, North Bunbury, Carrington, and Bonnybrook. The map also shows the coastline and the river system.



Logos for the City of Bunbury and the Coastal Resilience Partnership (CRP) are located at the bottom left of the slide.

4

CHRMAP...

A strategic plan to meet *coastal hazard challenges*...

- Identifies vulnerable public and private assets
- Aims to preserve community values for current & future generations
- Informs community and decision makers
- **Required under *State Planning Policy 2.6 – Coastal Planning***

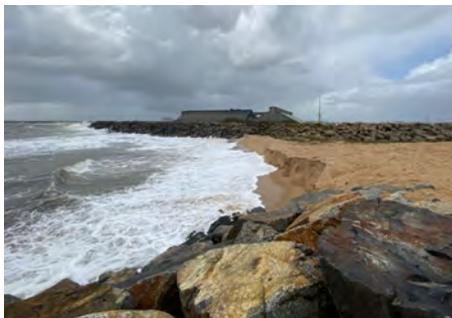
A plan for the next 100 years



5

Coastal hazard challenges

The key challenges on the coast are **erosion** and **inundation**



Predicted Sea Level Rise will increase both!



6

What are the options to choose from?



7

Adaptation Options – 17 of them!



8

Adaptation Options



9



10

Multi-Criteria Assessment

Rating: Score	Effectiveness	Environmental Impact	Social Impact	Aesthetic Impact	Cost (Capital & Ongoing)	Future Adaptability	Final Recommendation
Positive: +2	Expected to be very effective	Significant positive impact, return to more natural coastline	Significant positive social impact, encourages community development	Positive aesthetics, improves existing coastline and place recognition	Low costs, Higher capital costs accepted if other criteria met, Very low economic loss	Very adaptable, not likely to leave legacy issues	Further Investigation Recommended, Score > 0
Positive: +1	Expected to be effective	Positive impact, return to more natural coastline	Positive social impact, encourages community development	Positive aesthetics, retains the existing coastline and place recognition	Reasonable costs, Higher capital costs accepted if other criteria met, Low economic loss	Adaptable, not likely to leave legacy issues	Further Investigation Recommended, Score > 0
Neutral: 0	May or may not be effective, possibly unable to predict	No (or unclear) environmental impact	No discernible social impact, indeterminate net impact	Neutral aesthetic	Moderate costs	May leave legacy issues	Suitability unclear, Score = 0
Negative: -1	Likely to be ineffective in the short or long term	Potential significant negative impacts, incentives needed to resolve altogether	Negative social impact, May discourage new or existing people from the area	Coastline / landscape appearance negatively affected	High initial or ongoing costs, especially if key features to be replaced, High economic loss	Little to no future legacy issues	Not recommended, Score < 0
Negative: -2	Very likely to be ineffective in the short or long term	Significant negative impacts, incentives needed to resolve altogether	Significant negative social impact, May discourage new or existing people from the area	Coastline / landscape appearance degraded	Very high initial or ongoing costs, especially if key features to be replaced, Very high economic loss	Will create legacy issues	Not recommended, Score < 0








11

MCA Example Results: MU5

Option (Option Code)	Effectiveness	Environment Impact	Social Impact	Aesthetic Impact	Cost	Future Adaptability	Score	Comment
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	2	2	1	2	2	2	11	This option applies to undeveloped land. In this MU most undeveloped land is already zoned as foreshore reserve. Any developable land in MU should be subject to this option. Community will benefit by appropriate foreshore reserve width and access throughout the planning timeframe.



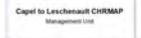
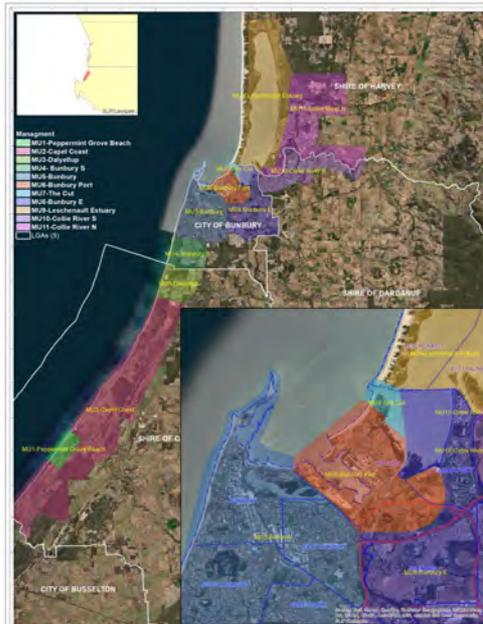
12

MCA DRAFT Results July 2022

Option	MU1	MU2	MU3	MU4	MU5	MU6	MU7	MU8	MU9	MU10	MU11
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	11	11	11	11	11	11	11	11	11	11	11
Leaving assets unprotected (PMR1)	2	2	2	2	2	2	2	2	2	2	2
Demolition / removal / relocation of asset from inside hazard area (PMR2)	7	7	7	7	7	7	7	7	7	7	7
Prevention of further development / prohibit expansion of existing use rights (PMR3)	6	6	6	10	6	6	N/A	6	6	6	6
Voluntary acquisition (PMR4)	5	4	5	N/A	5	5	N/A	5	5	5	5
Design assets to withstand impacts (AC1)	10	10	N/A	12	10	10	12	10	10	10	10
Beach nourishment or replenishment (PR1)	3	-4	3	-7	3	4	4	3	3	3	3
Groynes (PR2)	1	-4	1	-11	1	3	3	0	0	-1	-1
Seawalls (PR3)	-6	-10	-6	-12	-2	0	0	0	0	-1	-1
Artificial reef (PR4)	-4	-6	-4	-10	-3	-4	-4	-5	-4	N/A	N/A
Offshore breakwater (PR5)	-5	-7	-5	-12	0	-3	-4	0	0	N/A	N/A
Levy / Weir / Storm Surge Barrier (PR6)	1	1	N/A	N/A	4	3	N/A	3	3	3	3
Monitoring (NR1)	7	7	7	7	7	7	7	7	7	7	7
Protection Structure Audit (NR2)	N/A	N/A	N/A	N/A	6	6	6	6	6	N/A	N/A
Notification on title (NR3)	7	7	7	7	7	7	7	7	7	7	7
Emergency evacuation plans (NR4)	6	6	N/A	N/A	6	6	N/A	7	6	7	7
Do nothing (DN1)	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8



Management Units



MCA FINAL Results August 2022

Option	MU1	MU2	MU3	MU4	MU5	MU6	MU7	MU8	MU9	MU10	MU11
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	11	11	11	11	11	11	11	11	11	11	11
Leaving assets unprotected (PMR1)	2	2	2	2	2	2	2	2	2	2	2
Demolition / removal / relocation of asset from inside hazard area (PMR2)	7	7	7	7	7	7	7	7	7	7	7
Prevention of further development / prohibit expansion of existing use rights (PMR3)	5	6	6	10	6	6	N/A	6	6	9	6
Voluntary acquisition (PMR4)	4	4	5	N/A	5	5	N/A	5	5	7	5
Design assets to withstand impacts (AC1)	9	10	N/A	10	9	10	12	9	9	9	9
Beach nourishment or replenishment (PR1)	0	-4	0	-7	3	4	4	2	3	3	3
Groynes (PR2)	0	-6	0	-11	1	3	3	0	0	-1	-1
Seawalls (PR3)	-1	-10	-4	-12	-2	0	0	0	0	-1	-1
Artificial reef (PR4)	-3	-6	-4	-10	-3	-4	-4	-1	-4	N/A	N/A
Offshore breakwater (PR5)	-5	-7	-6	-12	0	-3	-4	-1	0	N/A	N/A
Levy / Weir / Storm Surge Barrier (PR6)	4	6	N/A	N/A	4	3	N/A	1	1	1	1
Monitoring (NR1)	7	7	7	7	7	7	7	7	7	7	7
Protection Structure Audit (NR2)	N/A	N/A	N/A	N/A	6	6	6	6	6	N/A	N/A
Notification on title (NR3)	7	7	7	7	7	7	7	6	6	6	6
Emergency evacuation plans (NR4)	6	6	N/A	N/A	6	6	N/A	7	6	7	7
Do nothing (DN1)	-10	-8	-8	-8	-8	-8	-8	-8	-11	-8	-8



From there...



The team considered the 'green' options

- Non-structural options are typically suitable everywhere (emergency evacuation plans, preventing further development where there is none etc)
 - Avoid
 - Accommodate
- Protect and managed retreat options require additional analysis – costs and beneficiaries need to be better considered
 - Cost Benefit Analysis & *Benefit Distribution Analysis*



17



18

General Recommendations



19

Feedback

- Through this section, note any concerns you have or raise questions
- We will take these away to consider in final preparations



20

'Anywhere' recommendations

- Monitoring (NR1)
- Protection Structure Audit (NR2)
- Emergency evacuation plans (NR4)
- Sand Source Feasibility Study
- Rock Source Feasibility Study
- Update / prepare Foreshore Management Plans (FMPs)



21

'Anywhere' recommendations

- Locating assets in areas that will not be vulnerable to coastal hazards (AV)
- Leaving assets unprotected (PMR1) & Demolition / removal / relocation of asset from inside hazard area (PMR2)
- Prevention of further development / prohibit expansion of existing use rights (PMR3)
- Design (new) assets to withstand impacts (AC1)



22

'Anywhere' recommendations

- Notification on title (NR3) (*example*)
 - **"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:**
 - *most landward part of the Horizontal Shoreline Datum being within [x**] metres of the most seaward part of the lot boundary;*
 - *a public road no longer available / legal access;*
 - *Services no longer available*



23

'Anywhere' recommendations

- Land Use Planning responses – Public Land
 - Amendment to Local Planning Scheme to include 'Foreshore Reserve' (public land)
 - Local Planning Policy (LPP) linked to the SCA – guidelines for development, standards and approval pathways
 - Review leases – suitable lease conditions



24

'Anywhere' recommendations

- Land Use Planning responses – Private Land
 - Amendment to Local Planning Scheme to include provisions re CHRMAP > Special Control Area (private land)
 - Local Planning Policy (LPP) linked to the SCA – guidelines for development, standards and approval pathways
 - Structure plans assessed in line with CHRMAP
 - Direct notification (of notification)



25



26

Management Unit Recommendations



27

Management Unit	Recommended Primary Option for Erosion
MU1 – Peppermint Grove Beach	PMR4 Planned / Managed Retreat by Voluntary Acquisition
MU2 – Capel Coast	PMR4 Planned / Managed Retreat by Voluntary Acquisition
MU3 – Dalyellup	PMR4 Planned / Managed Retreat by Voluntary Acquisition
MU4 – Bunbury South	PMR 1, 2, 3 Planned / Managed Retreat Leaving Assets Unprotected; Removal Of Assets From Inside Hazard Area; Prevention Of Further Development
MU5 - Bunbury	PR2 - Protection with Groyne
MU6 – Bunbury Port	PR2 - Protection with Groyne
MU7 – The Cut	PR2 - Protection with Groyne
MU8 – Bunbury East	PR2 - Protection with Groyne
MU9 – Leschenault Estuary	PR2 - Protection with Groyne
MU10 – Collie River South	PR1 - Protection with sand renourishment
MU11 – Collie River North	PR1 - Protection with sand renourishment



28

Management Unit	Recommended Primary Option for Inundation
MU1 – Peppermint Grove Beach	PR6 – Levy and drainage with MU2
MU2 – Capel Coast	PR6 – Levy and drainage with MU1
MU3 – Dalyellup	Inundation not applicable
MU4 – Bunbury South	Inundation not applicable
MU5 - Bunbury	PR6 – Replace Storm Surge Barrier
MU6 – Bunbury Port	PR6 - Levy
MU7 – The Cut	AC1 – Design assets to withstand impacts
MU8 – Bunbury East	To be determined
MU9 – Leschenault Estuary	To be determined
MU10 – Collie River South	To be determined
MU11 – Collie River North	To be determined



MU3 – Dalyellup

Inundation is not a concern for MU3



MU4 – Bunbury South

No options included under CBA

The recommendation is for managed retreat in accordance with sustainable planning principles.

PMR 1, 2, 3

Planned / Managed Retreat

Leaving Assets Unprotected; Removal Of Assets From Inside Hazard Area; Prevention Of Further Development



31

MU7 – The Cut

No CBA options for Inundation for The Cut

Small area affected which can be address by sustainable planning principles.

AC1 – Design assets to withstand impacts



32



33

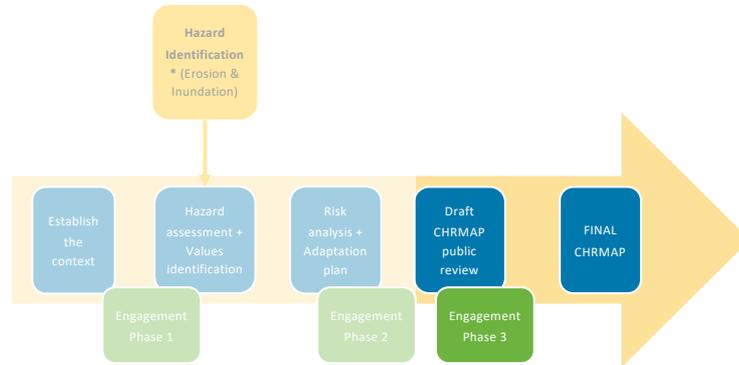
Next Steps...

- Cross check all costs / cost benefit analysis and consider Benefit Distribution
- Finalise recommendations
- Draft CHRMAP for public review



34

CHRMAP...



35

Thank you!!



36



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