



Wattle Range
COUNCIL

Adaptation Strategy

Beachport Coast Adaptation Strategy

Wattle Range Council

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1 INTRODUCTION

1.1 The Project

Wattle Range Council, Robe District Council, and the District Council of Grant are undertaking a process to develop coastal adaptation strategies for 11 townships located in the Limestone Coast region. The Limestone Coast Local Government Association (LCLGA), Coast Protection Board, and Kingston District Council are also key stakeholders in this project. The overall objective of this project is to develop a consistent coastal adaptation strategy for the region. The coastline in this region of South Australia has experienced coastal erosion and inundation and it is expected that these hazards are likely to intensify over future decades.

The aim of this project is to identify the coastal hazards and risk associated up to the year 2100 and evaluate potential adaptation options and pathways for implementation for the 11 coastal settlements. This project specifically focused on the township of Beachport and the hazards of coastal erosion and inundation (permanent and temporary).

1.2 Extent and Scale

Beachport occupies approximately 28 km of the South Australian coastline. The Beachport Conservation Park and Lake George occupy a substantial area within the township boundaries. Lake George is connected to Rivoli Bay by a managed drain, which has a gate at the bay interface. Much of the shoreline of the township has been modified by various coastal structures including groynes, revetments and seawalls. These structures seek to control the foreshore shape and retain sand. The town is clustered on the southern and eastern sides of Lake George. Key public assets include a golf course, school, recreational centre and a surf life saving club.



2 THE ADAPTATION PLANNING PROCESS

2.1 Level of Assessment and General Approach

The approach used in this assessment is based on the Local Government Association of South Australia's Coastal Adaptation Guidelines (LGASA, 2020). Three levels of assessment for adaptation studies are defined in the LGASA (2020) as First, Second and Third Pass assessments, essentially building up from a rapid to detailed level of risk assessment. Based upon the data available at this location as well as the aims of this assessment, this assessment can be classified as a "Second Pass" assessment.

Purpose of Coastal Process Assessment	Spatial Scale	Complexity of Assessment	Applicable Sediment Compartment	LGASA Guidelines (2020) Pass Equivalence
- National trends (or State comparison) - Sensitivity or broad scale assessments to indicate general areas of higher exposure using limited processes	10 - 100 km	Low	Primary	First Pass
- Regional or state-wide scoping studies - Indicative estimates of broad-scale change to identify trends and future focus areas - Regional coastal hazard assessments	1 - 10 km	Low - Medium	Primary / Secondary	First Pass
- Local coastal hazard assessments - Hotspot studies - Adaptation planning - Informing planning scheme updates	10 - 1000 m	Medium – High (Medium Adopted)	Tertiary	Second Pass
- Site-specific hazard assessment - On-ground design and construct of works - Informing development consent	<10 m	High – Very High	Tertiary	Third Pass
Low: Captures the processes in a way that allows for long timescale duration of analysis (forecasting) and/or large spatial scales. Typically, reduced physics or parameterised approaches with lower data requirements. Medium: Balances the need for specific process detail with spatial resolution (and thus computational and data needs). Typical empirical methods or transect based analysis. High: Includes key physical processes with higher data requirement usually for validation and seeks to describe these at spatial and temporal scales that are efficient but informative such as by employing scaling approaches. Very High: Includes the greatest number of physical processes and seeks to describe as much of the physical process as possible in high spatial and temporal resolution. These approaches typically have the highest data requirements for both process resolution and validation.				

This document is a summary document that outlines the coastal adaptation strategy and therefore presents an overview of the outcome of the overall assessment. Details on the data used, analysis approach, risk assessment and adaptation options considered are documented in a separate report:

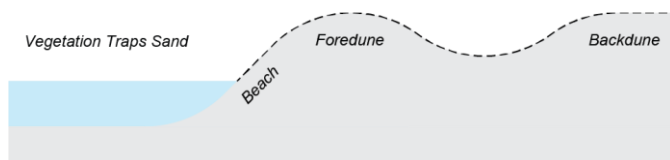
FSC Range (2025). *Limestone Coast Adaptation Strategies - Technical Report for Wattle Range Council*.

2.2 How our coasts change

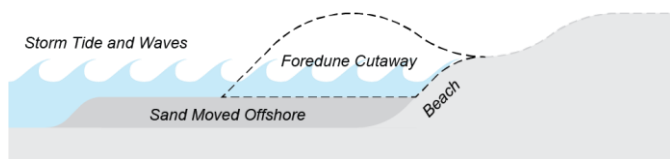
Across the region, the coastal landscape continually changes. This can occur over long timescale or at times of rapid change, such as during storms. Actions we take may have substantial implications for environmental, cultural and economic values within our coastal areas and in some cases can also extend inland. Understanding the key drivers of landscape change is the first step to developing a plan to balance values and land use in our region, both now and into the future. This component of the assessment is referred to as a coastal processes (or hazards) assessment, which seeks to understand the processes affecting our coasts.

Sandy coast erosion and accretion

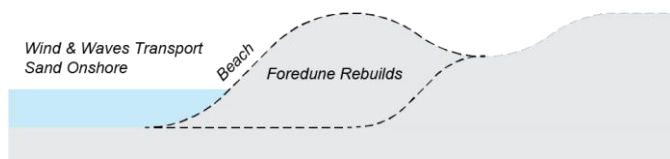
Natural sandy dune systems go through periods of erosion and accretion. Dune vegetation has a key role in assisting dune growth by helping to trap sand.



Erosion can occur when winds, waves and coastal currents shift sediment away or along the shoreline, sometimes just offshore. Short term erosion (storm bite) is often associated with big storms.

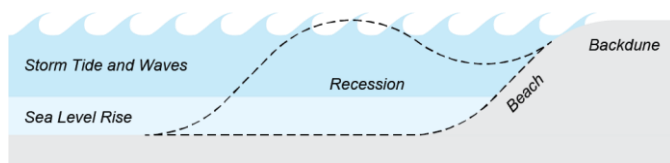


During calm conditions, wind and waves transport sand onshore, building up the dune. For a stable beach, a lot of the sand moved offshore in a storm will eventually move back onto the beach.



In some cases, changes in sediment supply or climate conditions (such as bigger or more frequent storms), means the beach may not rebuild fully between storm events.

With less sand retained on the beach over time, long-term erosion (recession) may occur. The shoreline position then tends to move landward.

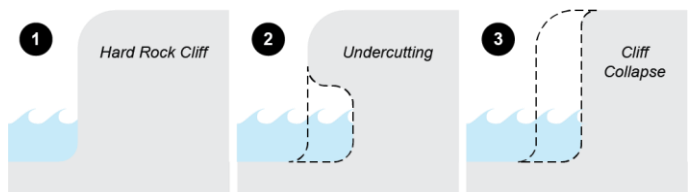


Rocky coast erosion

Over geological timescales (thousands of years), softer sediments are eroded away, exposing hard rocky coasts. These coasts are common throughout the region.

Hard rock

Hard rock cliff slopes are susceptible movements such as cliff falls that may be initiated by a combination of surface processes (rain, surface runoff) and/or due to marine influences at the base of the cliff (e.g. toe undercutting). Hard rock erosion can occur with little or no warning.



Where a sandy beach is 'perched' on a rock platform at the base of a cliff, increasing sea levels and wave energy often result in sand loss, due to limited sand volumes and little to no sand supply, as well as increased wave reflection off the rocky coast.

Soft rock

Some rocky coastal areas have softer, more erodible rock. These coasts can be more vulnerable to erosion from both surface processes and cliff toe undercutting.

Erosion of soft, rocky coasts can occur as both cliff falls and slumping (material movement down its slope).

Unlike sandy coast, rocky coasts do not 'recover' after erosion. However, they also tend to erode at a slower rate.

Temporary inundation

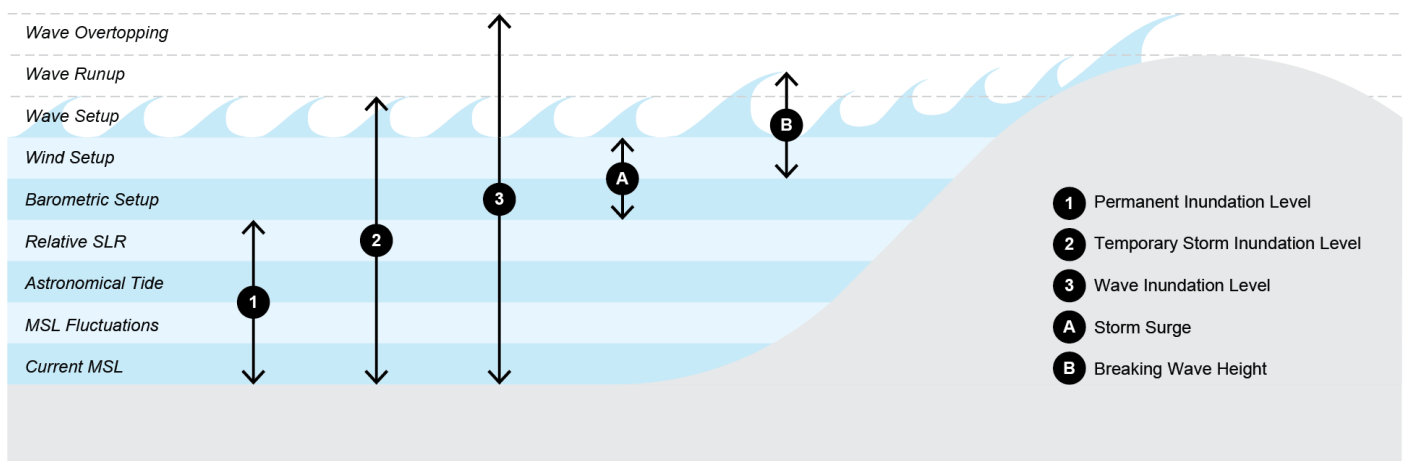
Temporary inundation is the flooding of low-lying coastal land due to a locally elevated sea level (storm tide) combined with waves impacting the coast. This temporary storm inundation level can impact low-lying land for periods of time that range from hours to days. It is caused by the combined influence of:

- Current and future mean sea level
- The predicted tide
- Low pressure air systems causing increases in sea level (barometric setup)
- Wind setup caused by high winds
- Wave setup caused by waves approaching the shoreline

In addition to these storm effects, waves can travel over the top of this elevated water (runup, overtopping) and impact the shoreline. These wave components tend to be shorter in duration and are often greatest during the peak of the storm.

Permanent inundation

Permanent inundation occurs when low-lying areas become regularly inundated as part of the regular tidal cycle, up to and including the Highest Astronomical Tide (HAT). Increases in mean sea level (MSL) over time due to sea level rise (SLR) will influence the extent of permanently inundated areas.



2.3 Mapping hazards

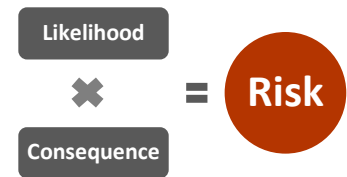
Parts of our coastline may be more vulnerable to coastal hazards than others. The potential impact of coastal hazards, including erosion (sand loss) and inundation (flooding) – both temporary and permanent have been assessed. These impacts were determined using numerical models as well as existing data and considered by both present day conditions and predicted future changes.

The estimated “coastal hazard extent” has been mapped to identify areas that are exposed to inundation, erosion or sea level rise.

2.4 Assessing risk

Coastal hazard risk is the potential for coastal hazards to impact things we value, where the outcome is uncertain. To assess risk, we undertake a Risk Assessment.

A Risk Assessment is a systematic process of evaluating the potential risks (likelihood and consequence) of coastal hazards, helping to inform a risk management response and adaptation actions.



Likelihood

The likelihood of exposure to coastal hazards is determined by quantifying the probability (chance) of an event occurring. An 'event' is a storm or weather event that may cause inundation (flooding) or erosion along the coast. An event might include high winds, high tides and/or large waves. For this assessment, various scenarios from more frequent to rarer events, and multiple sea level rise scenarios have been considered. To quantify likelihood of these hazard events, statistical methods have been used to combine each of the different components of a hazard to produce a statistical probability of spatial extent of impact.

Consequence

The consequence (impact/outcome) of a value or use being exposed to a coastal hazard is tailored based on local stakeholder and community feedback. Consequence ratings can also vary for hazard types (erosion and inundation) and consider short and long term impacts. A consequence matrix is used to assign individual ratings to each value and use. This may range from *low* where little to no impact is felt, to *high* where there are severe, widespread impacts, damage or loss of life.

Evaluating risk

Risk can be assessed at various scales – from a regional level to individual sites and assets. Once consequence and likelihood ratings have been determined, a risk matrix can be used to assess the overall level of risk under different scenarios. Quantifying risk provides a standardised basis to strategically prioritise and manage risk. It may be the case that we can accept or 'live with' a certain level of risk. However, after some time, we may reach a 'trigger' point where the risk reaches unacceptable levels. An example may be a sea level that becomes too high and causes regular flooding during storms.

Adaptation planning considers a range of options to effectively manage coastal hazard risk, from present day to longer-term (2100). Effective risk management may also require several actions. How these actions are sequenced is usually based on how the risk profile changes over time, and for different locations. When the risk profile reached a 'trigger point', the action is usually implemented.

It may be several decades before a trigger for an action occurs, and over that time we may have new information (e.g., better climate data) or changes that need to be considered (e.g., changes in policy) that may affect how we manage risk. Therefore, these adaptation plans are expected to be reviewed and updated. However, what is most important is that we have an achievable and realistic plan that spans many decades and provides us with a vision of how our communities will evolve over time.

The risk matrix used in this assessment as well as the full spatial results are described in more detail in the technical report for each community (see section 2.1).

		Consequence				
Likelihood		Negligible	Minor	Moderate	Major	Extreme
	Likely	Medium	Medium	Significant	High	High
	Possible	Low	Medium	Significant	Significant	High
	Unlikely	Low	Medium	Medium	Significant	Significant
	Rare	Low	Low	Medium	Medium	Significant

Risk	Risk tolerance	Action required
High	High risk: a risk that, following an understanding of likelihood and consequence, is so high that it requires actions to avoid or reduce the risk.	Immediate and/or ongoing action is needed to treat, eliminate, or reduce risk to acceptable levels
Significant	Medium to significant risk: a risk that, following an understanding of likelihood and consequence, is low enough to allow the exposure to continue, and at the same time high enough to require new treatments or actions to reduce the risk. Society can live with this risk but believe that as much as is reasonably practical should be done to reduce the risks further.	Short term action is needed to treat, eliminate, or reduce risk to acceptable levels
Medium		Short to longer term action is needed to treat, eliminate or reduce risk to acceptable levels
Low	Low risk: a risk that, following an understanding of likelihood and consequence, is sufficiently low to require no new treatments or actions to reduce the risk further. Individuals and society can live with this risk without feeling the necessity to reduce the risks any further.	Manage and monitor the risk as part of current operations, provide for periodic maintenance/review.

2.5 What is adaptation?

Across the Limestone Coast, as well as Australia more generally, coastal land managers are taking a strategic approach to managing the risk of coastal hazards. By understanding coastal zone values, vulnerabilities and risk, we can develop a strategic plan that is effective and practical. Most importantly, it provides a clear direction for the future for our coastal communities. Adaptation seeks to proactively manage or avoid harm or make use of beneficial opportunities. This process recognises that careful planning combined with a forward looking approach can reduce economic losses and response costs, preserve biodiversity, and provide a strategy to maintain the long-term viability of coastal communities.

There are many different options that are considered during the adaptation planning phase and not all are appropriate for each location or context.

2.6 Developing an adaptation strategy

To develop our adaptation approach, we bring together what we know from technical, strategic and engagement work, and use it to define adaptation options to manage coastal hazards, and identify the pathway required to implement the adaptation options over the assessment horizon.

The strategy that has been developed for Beachport has been informed by:

- consultation with land managers, local communities, and other interested stakeholders
- the values and objectives for different locations
- an understanding of the risk of coastal hazards at different localities
- a regional-scale perspective of the range of values, uses and pressures in the coastal zone
- State guidance and legislation

Once “at risk” coastal areas were identified, different adaptation options were considered. Each option has a different strategic approach to manage coastal hazard risk and form a hierarchical framework. This framework focuses on first avoiding the risk, then explores opportunities for nature-based methods and working with natural coastal processes to reduce coastal hazard risk and increase biodiversity. Where these options are not expected to be effective, accommodating the risk or in some cases retreating from

the risk is considered. Finally, protection options were considered but these are often expensive and come with ongoing management requirements. Adaptation actions are not mutually exclusive, and often a suite of measures is required to effectively manage coastal hazard risk.

Adaptation options	Approach
1. Non-Intervention	Allow marine and coastal processes, and the hazards they may pose, to occur.
2. Avoid	Locate new uses, development and redevelopment away from areas that are or will be negatively impacted by coastal hazards.
3. Nature-Based Strategies	Enhancing or restoring natural features to mitigate coastal hazard risk.
4. Accommodate	Structures are designed to reduce the exposure to, or decrease the impact of, coastal hazard risk.
5. Retreat	Existing structures, assets or uses may be decommissioned or relocated away from areas that are, or will be, negatively impacted by coastal hazards.
6. Protect	Existing physical barriers are enhanced, or new ones constructed. Protect is an option of last resort as it is often expensive, its benefits tend to be very localised, and it frequently transfers problems to nearby areas.

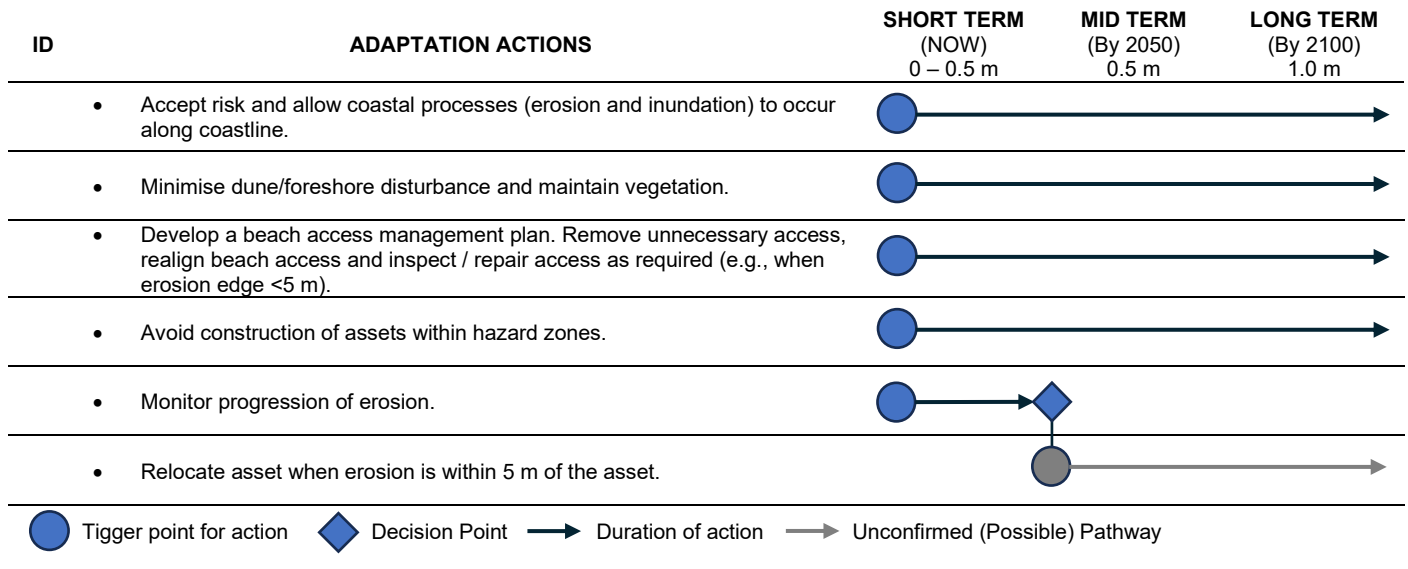
All adaptation actions can be broadly classified under three key types

- land management and planning
- nature-based strategies
- engineering solutions.

Adaptation Actions	
Land management and planning Use policy, planning instruments, guidance materials, communication, capacity building and strategic processes to enact change.	Land use Access, planning overlays and schemes, land acquisition
	Resilient development Design standards, setbacks
Nature-based Strategies Use the creation or restoration of coastal habitats as a strategy or as part of a combined strategy for hazard risk reduction.	Coastal ecosystems Mangroves, seagrass, saltmarsh
	Dune ecosystems Dune protection / vegetation, beach nourishment / scraping
	Hybrid actions Sand fencing, buried revetments
Engineering Solutions Use engineering and design to develop coastal structures, engineered changes to landform, or modify existing infrastructure.	Beach nourishment
	Seawalls, Revetments
	Groynes
	Breakwaters
	Changes to drainage network
	Changes to road network

2.7 Adaptation pathways

A “pathways approach” is used to help determine what combinations of adaptation actions might be feasible where and when. This allows us to plan our adaptation approach over time. This approach often incorporates multiple actions in response to the risks and these actions change over time as different triggers occur. This approach enables a range of different pathways to be identified, along with their relative sequencing, dependencies (actions that rely on each other) and triggers for implementation. These adaptation pathways are usually summarised as a map such as that shown below.

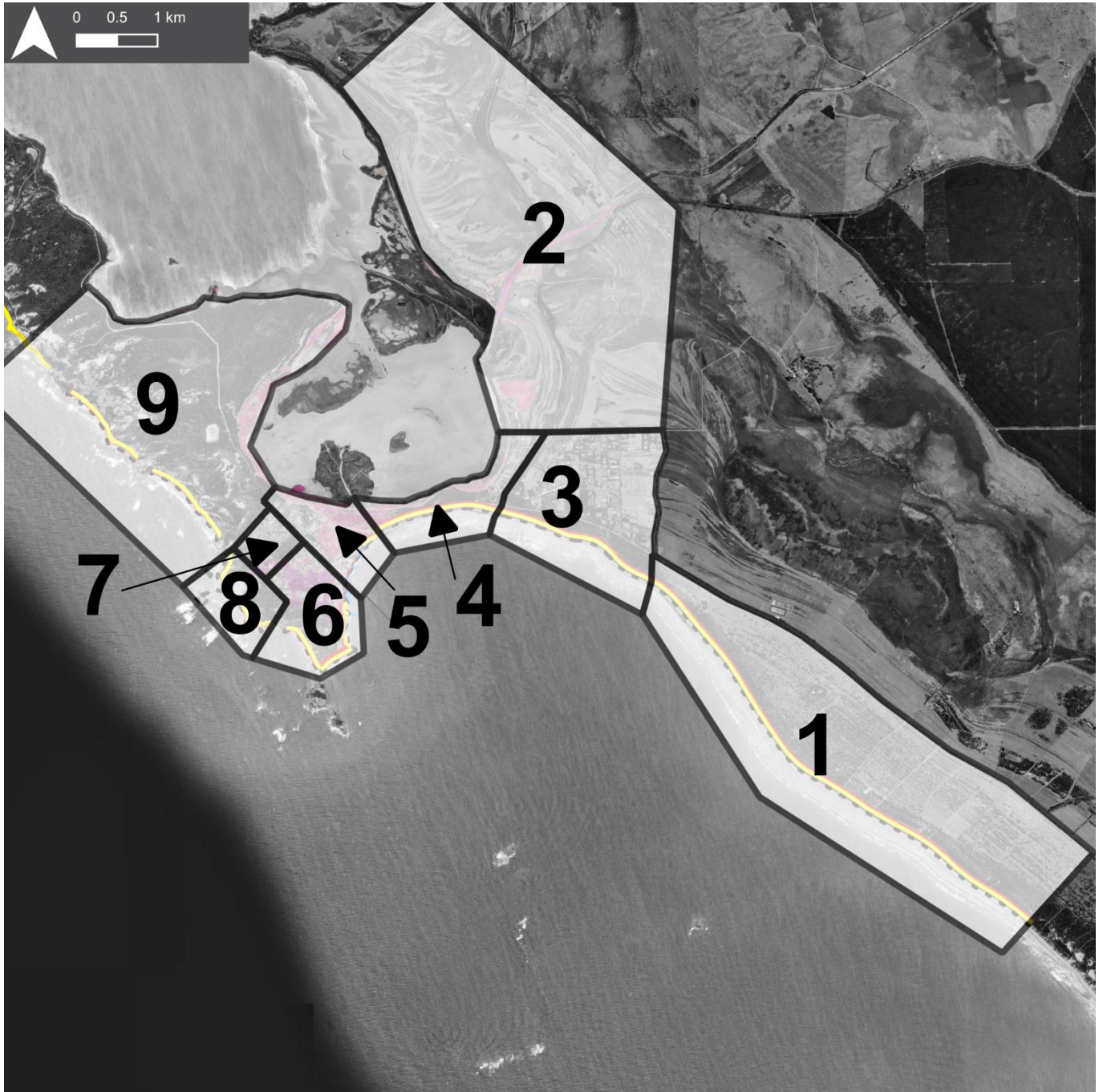


It is important to recognise that a pathways approach:

- Is a decision making process
- Is made up of a sequence of steps or decision points over time
- Uses thresholds and triggers for when new decisions need to be made
- Is forward looking
- Recognises the changing nature of climate change impacts
- Aims to ensure the most effective tools are being used at the most effective time.
- Can change over time

3 MAP OF BEACHPORT’S ADAPTATION AREAS

In this adaptation strategy, Beachport has been separated into 9 adaptation areas. These areas should not be considered to be isolated regions, they are simply areas for the purposes of communication, planning and implementation; the boundaries are artificial and for convenience.



4 SOUTH EAST BEACHPORT (AREA 1)



Erosion Hazard

- • Baseline
- By 2050
- By 2100

Inundation Hazard Shoreline Features

- <0.25 m
- 0.25 - 0.35 m
- 0.35 - 0.65 m
- 0.65 - 1.25 m
- >1.25 m
- Groyne
- Revetment
- Rocky Coast
- Seawall

Hazard extents are prior to any adaptation actions and for a 100-year Annual Recurrence Interval (ARI) storm event.

The erosion hazard lines correspond to the 95% likelihood of areas seaward of this line being impacted by erosion.

The likely inundation area includes storm tide, 2100 sea level rise, and wave effects (setup and runup) where applicable.

Assets at risk

No assets were identified as being at risk in this area except for the local coastline of Rivoli Bay.

ASSET	ASSET TYPE	2050		2100		RELATED ACTIONS
		EROSION	INUNDATION	EROSION	INUNDATION	
Rivoli Bay Foreshore	Public Amenity	Medium	Low	Medium	Low	1.1, 1.2, 1.3, 1.4

* Some assets within this category have a lower risk rating

Adaptation Actions

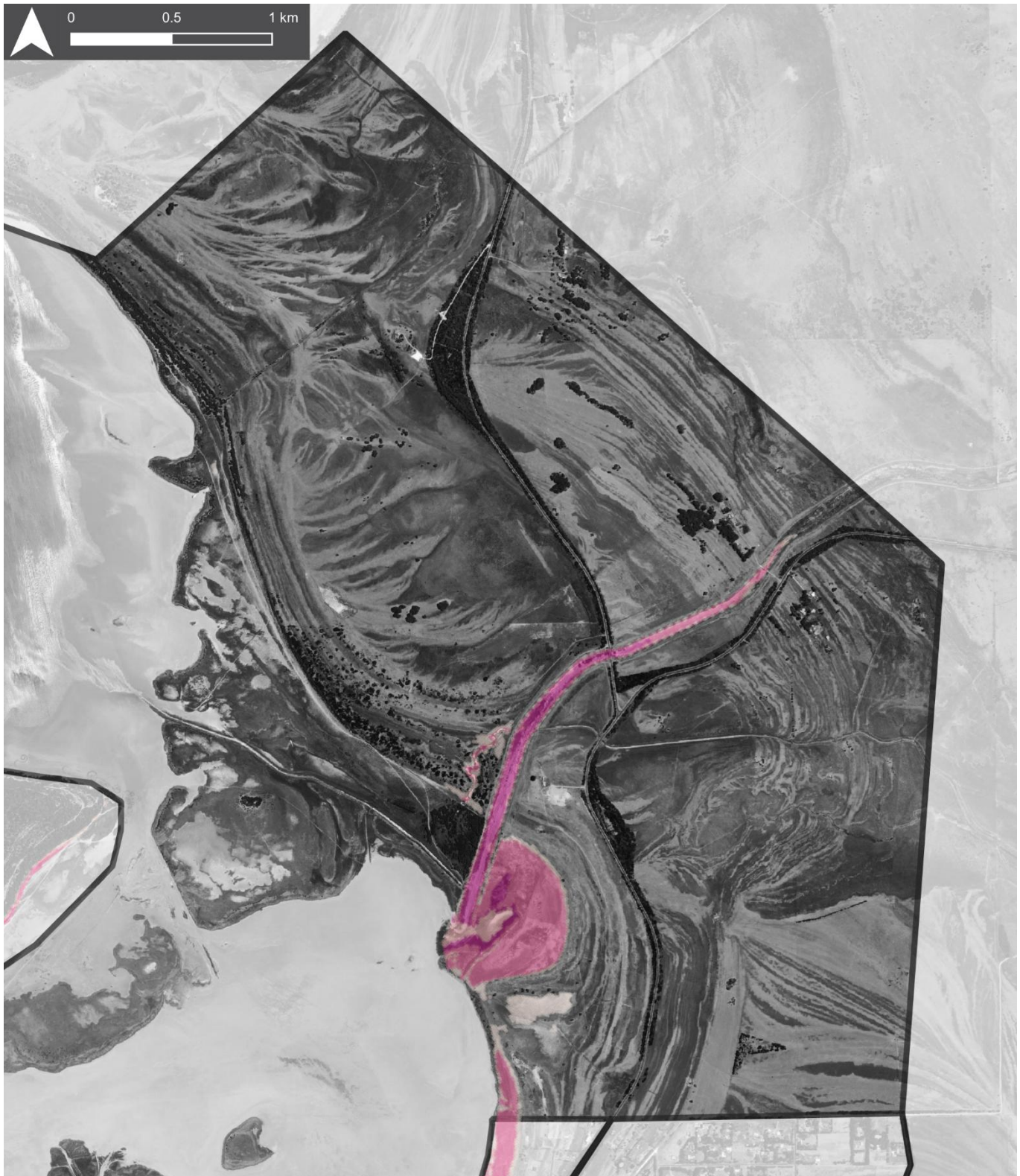
The principal adaptation approach is non-intervention with some isolated accommodate actions.

ID	ADAPTATION ACTIONS	SHORT TERM (NOW) 0 – 0.5 m	MID TERM (By 2050) 0.5 m	LONG TERM (By 2100) 1.0 m
1.1	Accept risk and allow coastal processes to occur.			
1.2	Minimise dune/foreshore disturbance and maintain vegetation.			
1.3	Develop a beach access management plan. Remove unnecessary access, realign beach access and inspect / repair access as required (e.g., when erosion edge <5 m).			
1.4	Avoid construction of assets within hazard zones.			
 Trigger point for action  Decision Point  Duration of action  Unconfirmed (Possible) Pathway				

Why adopt these actions?

- This area is relatively remote and a natural landscape. The absence of assets of substantial value warrants, over the adaptation planning horizon, allowing coastal processes to occur with only minor interventions for public safety.

5 NORTH EAST BEACHPORT (AREA 2)



Erosion Hazard	Inundation Hazard	Shoreline Features
• • Baseline	<0.25 m	— Groyne
— By 2050	0.25 - 0.35 m	~ Revetment
— By 2100	0.35 - 0.65 m	— Rocky Coast
	0.65 - 1.25 m	— Seawall
	>1.25 m	

Hazard extents are prior to any adaptation actions and for a 100-year Annual Recurrence Interval (ARI) storm event.

The erosion hazard lines correspond to the 95% likelihood of areas seaward of this line being impacted by erosion.

The likely inundation area includes storm tide, 2100 sea level rise, and wave effects (setup and runup) where applicable.

Assets at risk

The assets at risk in this area are the two main roads that pass through the area, along with agricultural lands.

ASSET	ASSET TYPE	2050		2100		RELATED ACTIONS
		EROSION	INUNDATION	EROSION	INUNDATION	
Agricultural Land	Agriculture		Low		Significant*	2.1, 2.2, 4.5
Southern Ports Highway	Transport		Low		Low	2.1
Beachport Penola Road	Transport				Low	2.1

* Some assets within this category have a lower risk rating

Adaptation Actions

The principal adaptation approach is non-intervention, although it should be noted that actions to control inundation through the Lake George Outlet will also reduce the risk in this area (see Area 4).

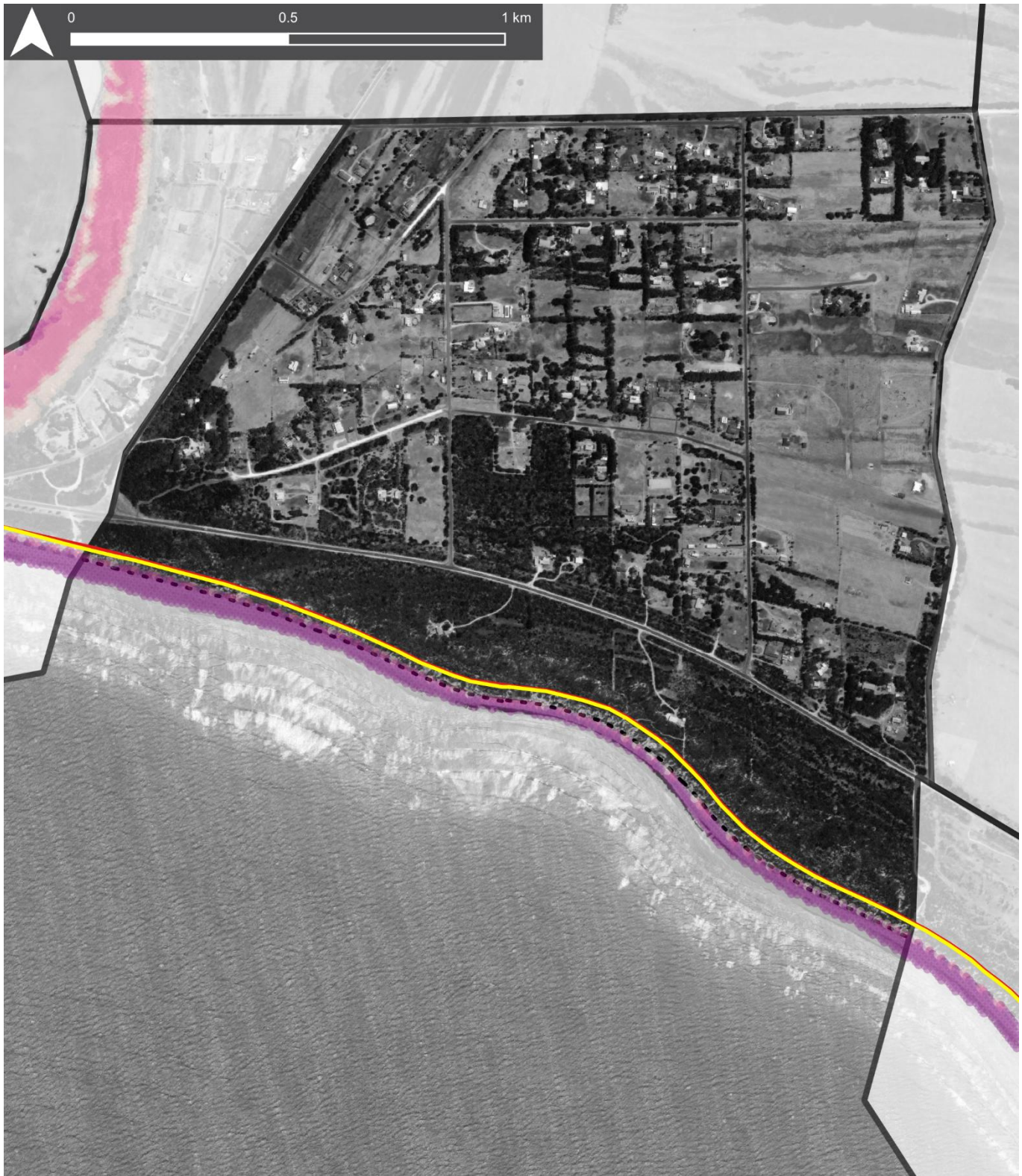
ID	ADAPTATION ACTIONS	SHORT TERM (NOW) 0 – 0.5 m	MID TERM (By 2050) 0.5 m	LONG TERM (By 2100) 1.0 m
2.1	Accept risk and allow coastal processes to occur.			
2.2	Avoid construction of assets within hazard zones.			

 Tigger point for action
  Decision Point
  Duration of action
  Unconfirmed (Possible) Pathway

Why adopt these actions?

- This area is a natural / agricultural landscape. The absence of assets of substantial value at elevated risk warrants, over the adaptation planning horizon, allowing natural processes to occur. Avoiding construction of high value assets in elevated risk areas (some agricultural land) is to be avoided.
- Inundation actions in other areas are expected to reduce the inundation exposure at this location. These are discussed in Area 4.

6 EAST BEACHPORT (AREA 3)



Erosion Hazard	Inundation Hazard	Shoreline Features
• • Baseline	<0.25 m	— Groyne
— By 2050	0.25 - 0.35 m	— Revetment
— By 2100	0.35 - 0.65 m	— Rocky Coast
	0.65 - 1.25 m	— Seawall
	>1.25 m	

Hazard extents are prior to any adaptation actions and for a 100-year Annual Recurrence Interval (ARI) storm event.

The erosion hazard lines correspond to the 95% likelihood of areas seaward of this line being impacted by erosion.

The likely inundation area includes storm tide, 2100 sea level rise, and wave effects (setup and runup) where applicable.

Assets at risk

The assets at risk within this area principally consist of Southern Ports Highway, local roads and some rural residential properties. These assets are exposed to some inundation in isolated areas over the assessment horizon. The Rivoli Bay foreshore is also exposed to erosion over the assessment horizon.

ASSET	ASSET TYPE	2050		2100		RELATED ACTIONS
		EROSION	INUNDATION	EROSION	INUNDATION	
Beachport Cemetery	Council Asset					
Commercial Properties	Private Asset					
Rural Residential Properties	Private Asset		Low		Low	3.5, 4.5
Rivoli Bay Foreshore	Public Amenity	Medium	Low	Medium	Low	3.1, 3.2, 3.3, 3.4
Sunderland Drive	Transport		Low		Low	3.5, 4.5
McLachlan Drive	Transport		Low		Low	3.5, 4.5
Southern Ports Highway	Transport			Low		3.5, 4.5

* Some assets within this category have a lower risk rating

Adaptation Actions

The principal adaptation approach is non-intervention and some monitoring in areas where risk is present. The inundation risk is low over the assessment horizon and actions to control inundation through the Lake George Outlet would further reduce the risk in this area (see Area 4).

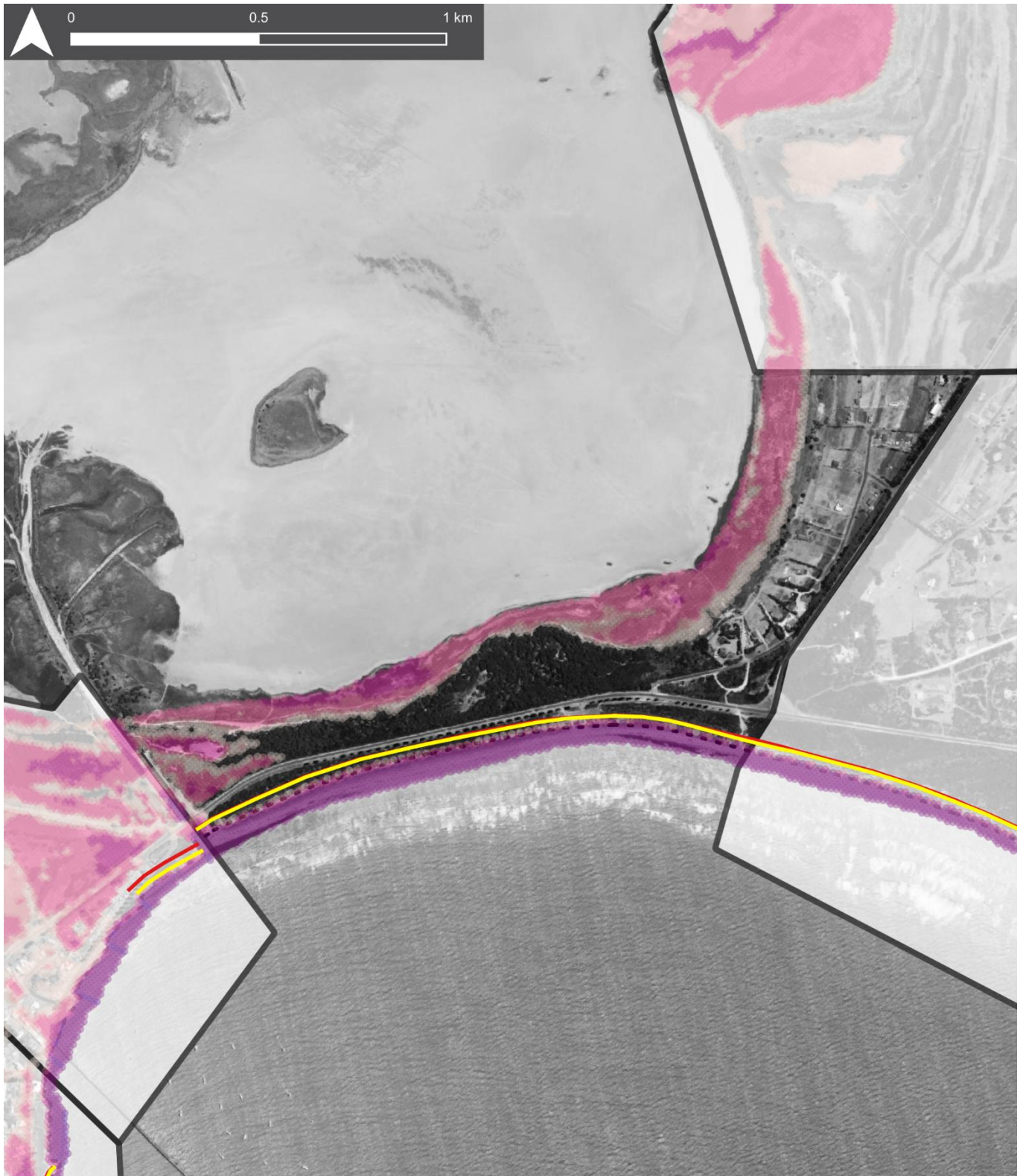
ID	ADAPTATION ACTIONS	SHORT TERM (NOW) 0 – 0.5 m	MID TERM (By 2050) 0.5 m	LONG TERM (By 2100) 1.0 m
3.1	Accept risk and allow coastal processes to occur.			
3.2	Minimise dune/foreshore disturbance and maintain vegetation.			
3.3	Monitor erosion and review adaptation pathway if risk changes.			
3.4	Avoid construction of assets within hazard zones.			
3.5	Monitor inundation and review adaptation pathway if risk changes.			

Tigger point for action
 Decision Point
 Duration of action
 Unconfirmed (Possible) Alternative

Why adopt these actions?

- The inundation risk is low throughout the area and inundation actions in other areas are expected to further reduce the inundation exposure at this location. These are discussed in Area 4.
- The erosion risk is confined to a natural landscape (Rivoli Bay foreshore) and no assets of substantial value are within the hazard zones over the adaptation planning horizon.

7 EAST OF LAKE GEORGE OUTLET (AREA 4)



Erosion Hazard		Inundation Hazard		Shoreline Features	
--- Baseline		<0.25 m		— Groyne	
— By 2050		0.25 - 0.35 m		~ Revetment	
— By 2100		0.35 - 0.65 m		— Rocky Coast	
		0.65 - 1.25 m		— Seawall	
		>1.25 m			

Hazard extents are prior to any adaptation actions and for a 100-year Annual Recurrence Interval (ARI) storm event.

The erosion hazard lines correspond to the 95% likelihood of areas seaward of this line being impacted by erosion.

The likely inundation area includes storm tide, 2100 sea level rise, and wave effects (setup and runup) where applicable.

Assets at risk

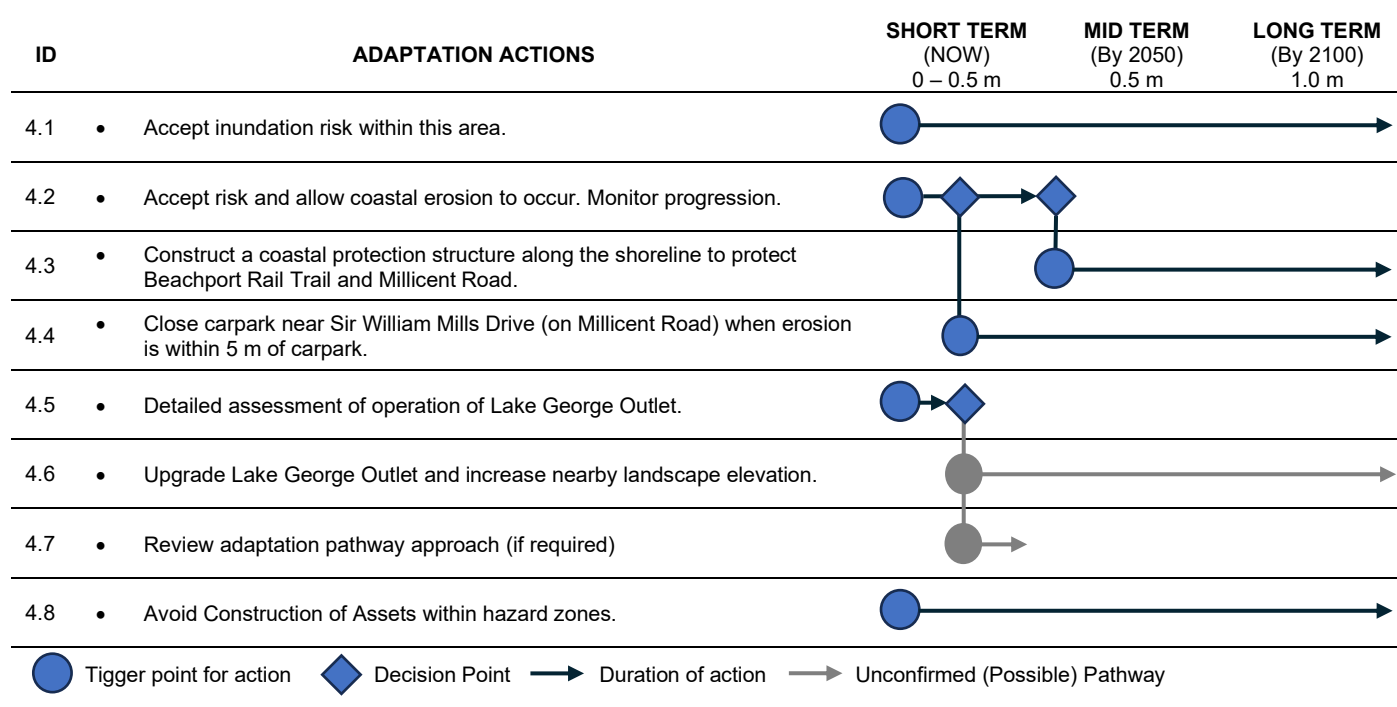
The inundation that occurs in this area is due to the propagation of water from Rivoli Bay through the Lake George Outlet during large storm events. As the storm events persist in duration, inundation is expected to impact this area as well as other areas within Beachport. Some minor inundation also originates across the Rivoli Bay Foreshore. Erosion along the shoreline is also expected, which will principally impact transport infrastructure.

ASSET	ASSET TYPE	2050		2100		RELATED ACTIONS
		EROSION	INUNDATION	EROSION	INUNDATION	
Carpark near Sir William Mills Drive (on Millicent Road)	Council Asset	High*	Low	High*	Low	4.4
Rural Residential Properties	Private Asset		Low		Low	4.1
Beachport Rail Trail	Public Amenity	Significant*	Low	Significant*	Low	4.1, 4.2, 4.3
Reserve fringing Lake George	Reserve		Low		Significant*	4.1, 4.5
Rivoli Bay foreshore	Reserve	High	Low	High	Medium	4.1, 4.2
Lakeside Drive	Transport		Low		Low	4.1
Millicent Road	Transport	Medium	Low	High	Low	4.1, 4.2, 4.3
Samuel Way Drive	Transport		Low		Low	4.1
Sir William Mills Drive	Transport		Low		Low	4.1

* Some assets within this category have a lower risk rating

Adaptation Actions

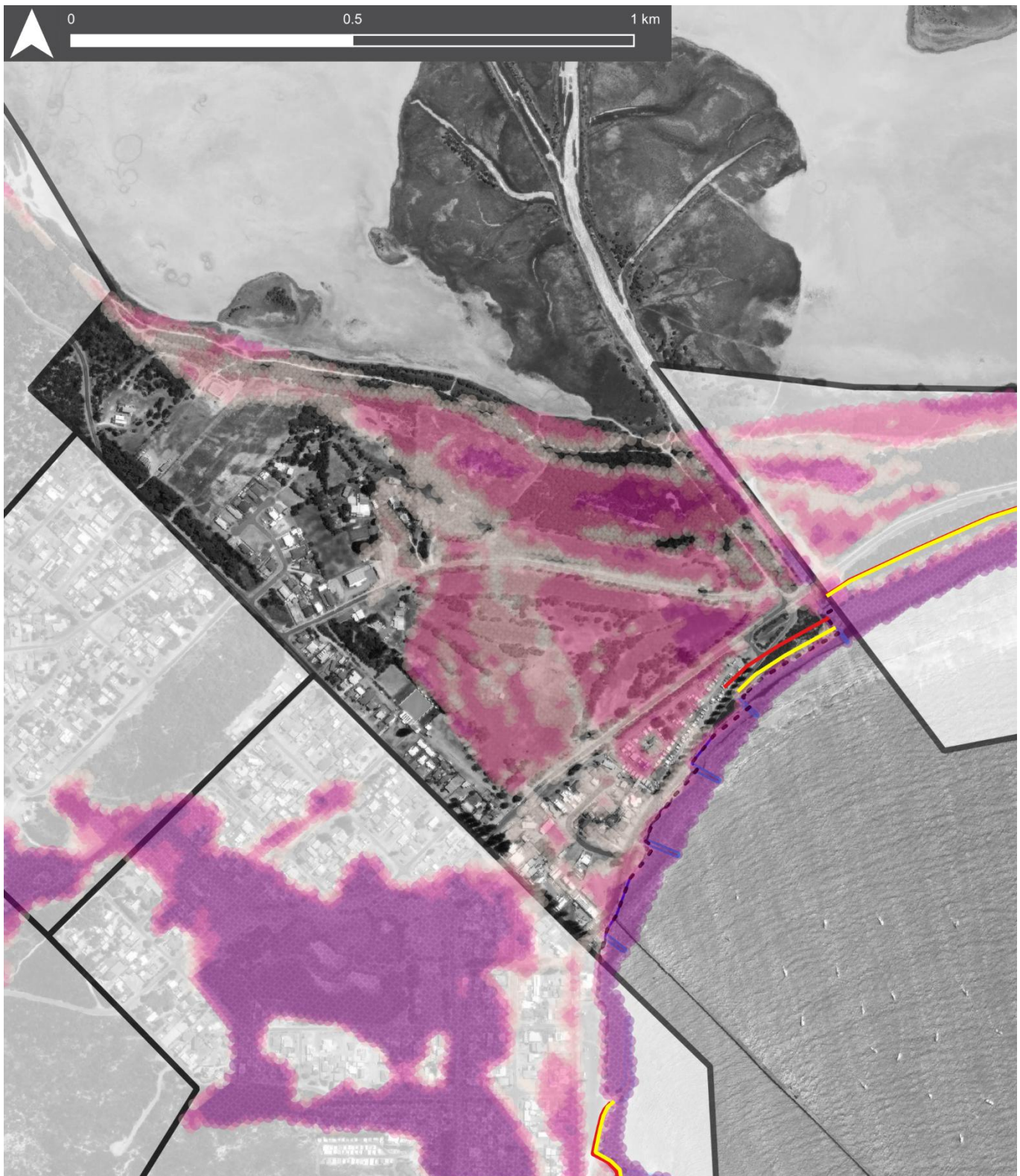
Inundation is substantially reduced when the outlet is closed. How the outlet operates in this context, the suitability of its design and if it can be relied upon to manage inundation at Beachport requires a detailed assessment. To address erosion hazards, localised retreat is proposed until the erosion extent is close to the Beachport Rail Trail, after which the construction of coastal protection structures is proposed to protect the trail and Millicent Road.



Why adopt these actions?

- Erosion hazards are principally within a natural foreshore area. However, ongoing erosion is expected to impact the carpark near Sir William Mills Drive. Relocation of the carpark to the lake side of Millicent Road was considered but based on the options assessment undertaken this option was not progressed. Closure of the carpark was the preferred option.
- When erosion is close to impacting the shared path outlet to surf beach and (by extension) Millicent Road, a coastal protection strategy is to be implemented. Millicent Road is a key transport route into Beachport and relocation of the road to another location was not deemed viable in the options assessment.
- The inundation extent is predominantly confined to the edges of Lake George and was assessed to be of low risk to assets in the area. However, the Lake George Outlet was identified as a key pathway for inundation into this area as well as other areas of Beachport. Given this is a key inundation pathway, a detailed assessment is proposed to assess how the outlet operates in a coastal hazards context, the suitability of its design and if it can be relied upon to manage inundation. Critical to this assessment will be to assess the impacts of compound flooding (storms + rain). Based on this assessment, change to the outlet may be required, another strategy required, or both.

8 WEST OF LAKE GEORGE OUTLET (AREA 5) INC. GOLF COURSE AND BEACHPORT CARAVAN PARK



Erosion Hazard	Inundation Hazard	Shoreline Features
• • Baseline	<0.25 m	— Groyne
— By 2050	0.25 - 0.35 m	~ Revetment
— By 2100	0.35 - 0.65 m	— Rocky Coast
	0.65 - 1.25 m	— Seawall
	>1.25 m	

Hazard extents are prior to any adaptation actions and for a 100-year Annual Recurrence Interval (ARI) storm event.

The erosion hazard lines correspond to the 95% likelihood of areas seaward of this line being impacted by erosion.

The likely inundation area includes storm tide, 2100 sea level rise, and wave effects (setup and runup) where applicable.

Assets at risk

The inundation that occurs in this area is predominantly due to the propagation of water from Rivoli Bay through the Lake George Outlet during large storm events. As the storm events persist in duration, inundation is expected to impact the area as well as other areas within Beachport. Some inundation also originates across the Rivoli Bay Foreshore near the end of the existing seawall. Erosion is expected to occur adjacent to The Outlet where the existing shoreline is currently unprotected. This will impact the shoreline and foreshore reserve, as well as Beach Road.

ASSET	ASSET TYPE	2050		2100		RELATED ACTIONS
		EROSION	INUNDATION	EROSION	INUNDATION	
Beachport Rail Trail	Council Asset		Medium*		Significant*	4.5
Beachport Visitor Information Centre	Council Asset		Low		Medium	4.5, 5.5
Millicent Road Parking	Council Asset		Low		Medium	4.5, 5.5
Old Custom House	Council Asset		Low		Low	4.5, 5.5
Parking along Beach Road	Council Asset		Low		Medium	5.3, 5.4
Beachport Recreation Centre	Council Asset		Low		Low	4.5
Beachport Foreshore Reserve (Near Lake George Outlet)	Public Amenity	Significant	High*	High	High*	5.1, 5.2, 5.3, 5.4
Beachport Foreshore Reserve (Other locations)	Public Amenity		High*		High*	5.1, 5.2
Susan Wilson Memorial Playground	Public Amenity		Low		Low	5.5
Beachport Primary School	Public Services		Low*		Medium*	4.5
Beachport CFS Station	Public Services					-
Commercial properties (Between Millicent Road and Beach Road)	Private Assets		Low*		Medium*	4.5, 5.5
Residential Properties along Golf Course	Private Assets				Low	4.5
Beachport Bowling Club	Recreation					-
Beachport Golf Course	Recreation		Significant*		Significant*	4.5
Alfred Court	Transport		Low		Medium*	4.5, 5.5
Beach Road	Transport		Low		Medium*	4.5, 5.5
Golf Course Road	Transport		Medium*		Medium*	4.5
Lakeside informal tracks	Transport		Medium*		Significant*	4.5
Lake George Road	Transport		Low		Low	4.5
Linnell Drive	Transport		Low*		Low*	4.5, 5.5
Millicent Road	Transport		Low		Medium	4.5, 5.5
Railway Terrace	Transport		Low*		Medium*	4.5, 5.5
Beachport Caravan Park	Tourism		Medium*		Significant*	4.5, 5.5

* Some assets within this category have a lower risk rating

Adaptation Actions

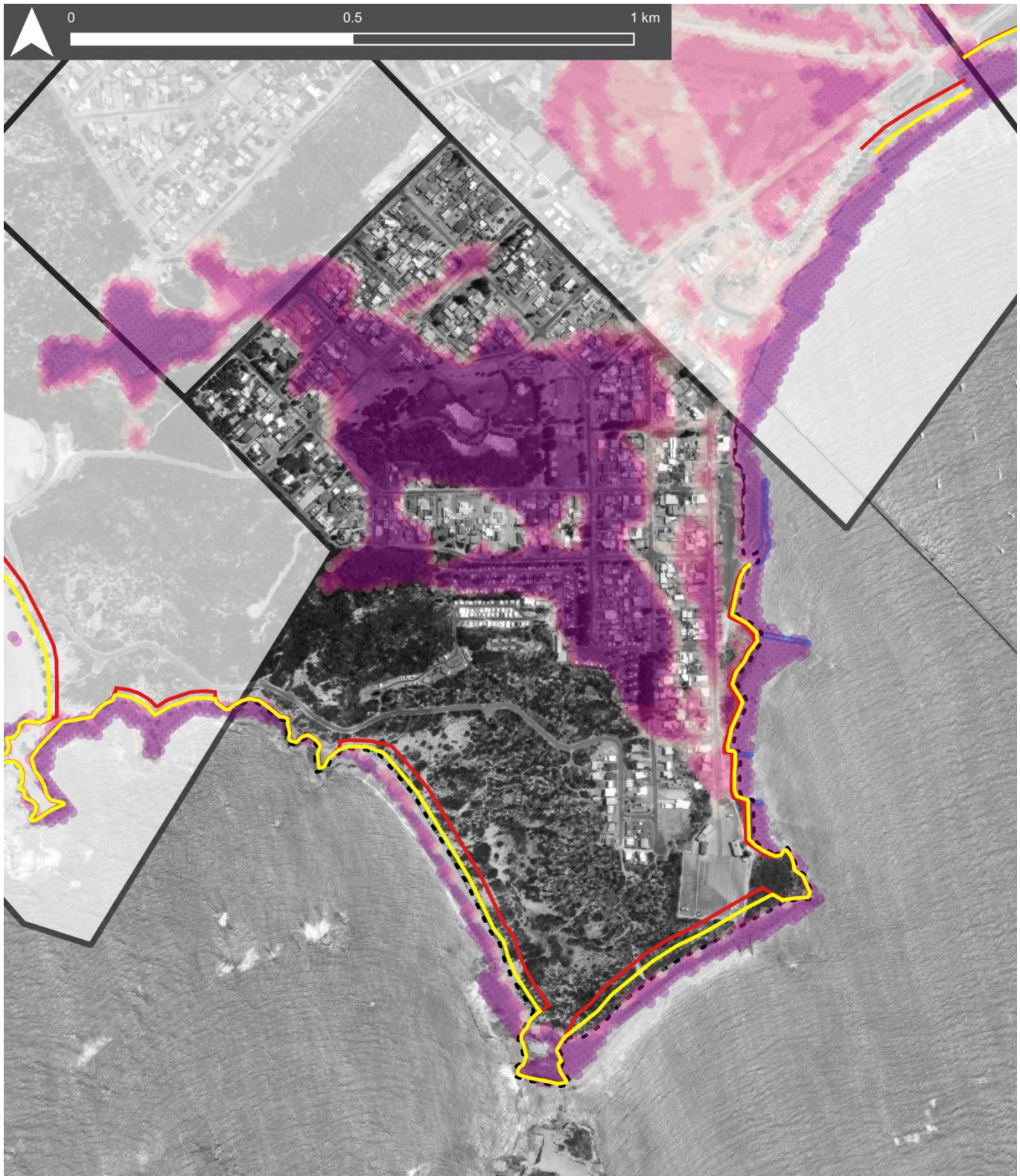
Inundation is substantially reduced when the outlet is closed. How the outlet operates in this context, the suitability of its design and if it can be relied upon to manage inundation at Beachport requires a detailed assessment. These actions are considered in Area 4. To address sources on inundation over Beach Road, it is proposed to elevate Beach Road and / or the foreshore to reduce inundation into the remaining areas of Beachport. To address erosion hazards, a combination of nourishment (and possibly groyne reconfiguration if required), dune and foreshore stabilisation works as well as localised retreat are proposed. When erosion is within 5 m of Beach Road, a coastal protection structure is proposed between The Outlet and adjacent coastal protection structures.

ID	ADAPTATION ACTIONS	SHORT TERM (NOW) 0 – 0.5 m	MID TERM (By 2050) 0.5 m	LONG TERM (By 2100) 1.0 m
5.1	• Beach nourishment and groyne reconfiguration (as required) for beach amenity. Consider elevating beach to increase resilience.			
5.2	• Undertake dune / foreshore stabilisation works.			
5.3	• Monitor progression of erosion.			
5.4	• When erosion is within 5 m of Beach Road, implement coastal protection structure			
5.5	• Increase elevation of Beach Road and/or Foreshore (approximately from Railway Terrace to Caravan Park) to mitigate inundation risk.			
 Trigger point for action  Decision Point  Duration of action  Unconfirmed (Possible) Alternative				

Why adopt these actions?

- Lake George Outlet was identified as a key pathway for inundation into this area as well as other areas of Beachport. Given this is a key inundation pathway, a detailed assessment is proposed to assess how the outlet operates in a coastal hazards context, the suitability of its design and if it can be relied upon to manage inundation. Critical to this assessment will be to assess the impacts of compound flooding (storms + rain). Based on this assessment, changes to the outlet may be required, another strategy required, or both.
- Inundation over Beach Road was identified as a future inundation pathway. This inundation is most likely between Railway Terrace and the Caravan Park access road. Locally increasing the elevation of Beach Road and/or the foreshore reserve to close this inundation pathway was identified as an effective strategy at this location.
- Beach erosion was identified an ongoing risk to the shoreline. Much of the shoreline is principally a public amenity asset and is popular with the local community. The land behind is mostly protected by a network of seawalls and revetment. Ongoing nourishment and possible optimisation of the groyne configuration is proposed to maintain public amenity as efficiently as possible, noting that some renourishment may be required after large storm events.
- When erosion is close to impacting Beach Road, a coastal protection strategy is to be implemented. Much of the existing coastline in this area is already armoured and thus an extension to of this armour to The Outlet would complete this network of protection.

9 CENTRAL BEACHPORT (AREA 6)



Erosion Hazard	Inundation Hazard	Shoreline Features
• • Baseline	<0.25 m	— Groyne
— By 2050	0.25 - 0.35 m	~ Revetment
— By 2100	0.35 - 0.65 m	— Rocky Coast
	0.65 - 1.25 m	— Seawall
	>1.25 m	

Hazard extents are prior to any adaptation actions and for a 100-year Annual Recurrence Interval (ARI) storm event.

The erosion hazard lines correspond to the 95% likelihood of areas seaward of this line being impacted by erosion.

The likely inundation area includes storm tide, 2100 sea level rise, and wave effects (setup and runup) where applicable.

Assets at risk

The majority of assets at risk in this area are exposed to inundation that passes over Beach Road and propagates through the landscape to areas with lower elevation. Erosion along the eastern shoreline occurs south of the Beachport Harbour where the shoreline is principally protected by low dunes and sand that accumulates between groynes. This area is an area of public amenity, relatively narrow, and low in elevation. Within Cape Martin much of the erosion is observed with reserve areas where few assets are located.

ASSET	ASSET TYPE	2050		2100		RELATED ACTIONS
		EROSION	INUNDATION	EROSION	INUNDATION	
Beachport Harbour Carpark	Council Asset		Low		Low	6.1
Beachport Harbour Masters Complex	Private Asset		Low		Low	6.1
Beachport Harbour Public Toilets	Council Asset		Low		Low	6.1
Beachport Foreshore Reserve / Shoreline	Public Amenity	High*		High*		6.2, 6.5, 6.6, 6.7
Beachport Lagoon and nearby public space	Public Amenity		Medium*		Significant	6.8, 6.9, 6.10
Cape Martin – South East Shoreline	Public Amenity	High		High		6.1, 6.2, 6.3, 6.4
Cape Martin – South West Shoreline	Public Amenity	High		High		6.1, 6.2, 6.3, 6.4
Centennial Park	Public Amenity		Medium*		Significant	6.8, 6.9, 6.10
Commercial properties along Railway Terrace	Private Asset		Low		Medium	4.5, 5.5, 6.8, 6.9, 6.10
Industrial properties within this area	Private Asset	High	Low	High	Low	6.6, 6.7, 6.8, 6.9
Properties within this area (particularly near Beachport Lagoon)	Private Asset		Medium*		Significant*	6.8, 6.9, 6.10
Beachport Southern Ocean Tourist Park	Tourism		Low*		Significant*	6.8, 6.9, 6.10
Beachport Whaling Monument	Tourism		Low		Medium	6.8, 6.9
Beach Road	Transport	High	Low	High	Significant*	4.5, 5.5, 6.6, 6.7, 6.8, 6.9
Several Local Roads within area	Transport		Low		Significant*	4.5, 5.5, 6.8, 6.9, 6.10

* Some assets within this category have a lower risk rating

Adaptation Actions

Adaptation actions in this area include actions from areas 4 and 5, which also impact this area. There is a focus on shoreline restoration, dune stabilisation and when required the implementation of coastal protection structures either in isolation or in combination with increasing the elevation of Beach Road. Closure of the inundation pathway across Beach Road is necessary to address inundation in this area as well as in adjacent areas.

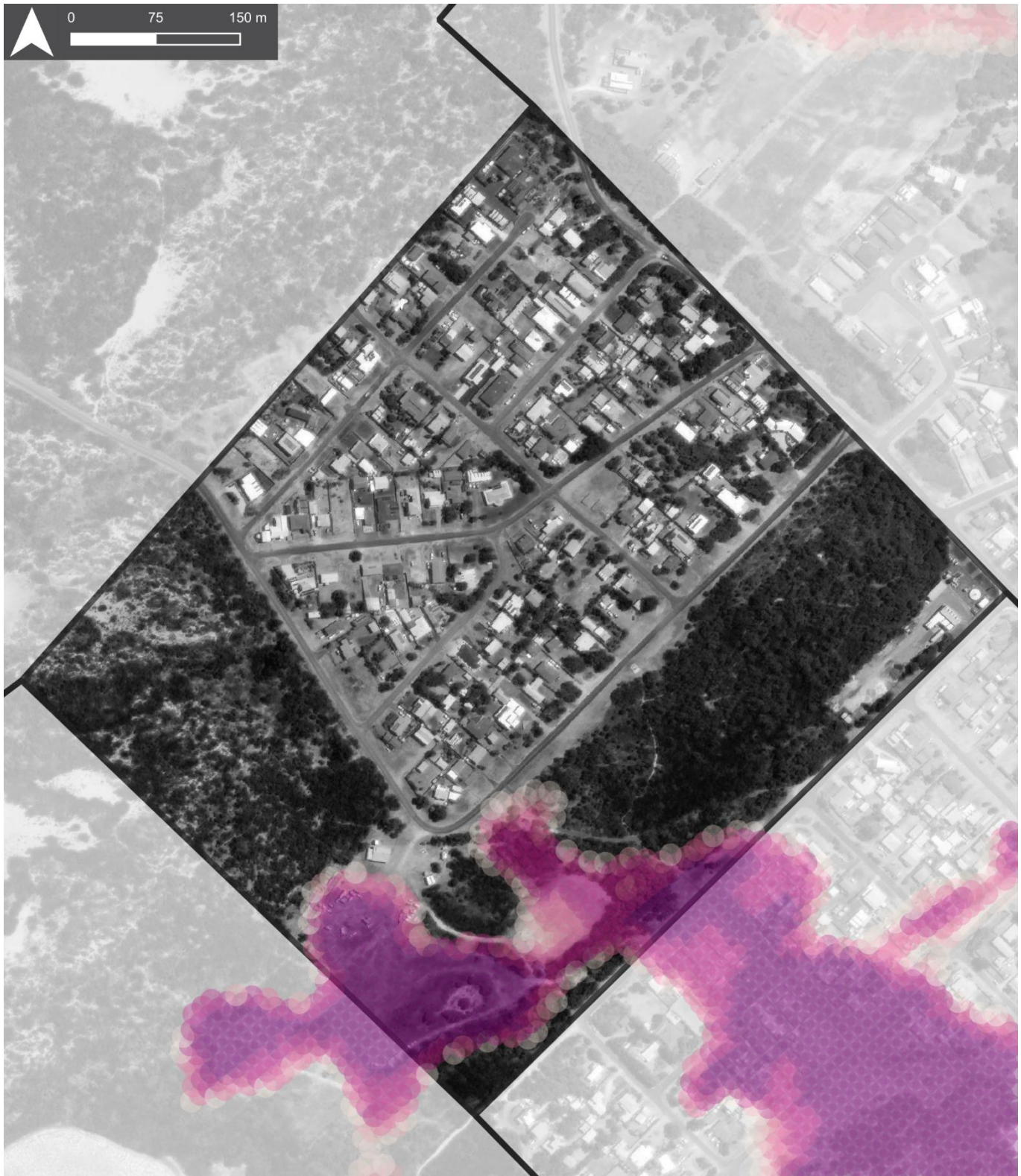
ID	ADAPTATION ACTIONS	SHORT TERM (NOW) 0 – 0.5 m	MID TERM (By 2050) 0.5 m	LONG TERM (By 2100) 1.0 m
6.1	• Accept risk and allow coastal processes to occur.			
6.2	• Minimise dune/foreshore disturbance and maintain vegetation.			
6.3	• Develop a beach access management plan. Remove unnecessary access, realign beach access and inspect / repair access as required (e.g., when erosion edge <5 m).			
6.4	• Avoid construction of assets within hazard zones.			
6.5	• Nourish beaches to maintain public amenity and to increase dune/foreshore resilience.			
6.6	• Dune / foreshore restoration including increasing elevation where possible.			
6.7	• Monitor progression of erosion. Consider alternative adaptation pathways when erosion is within 5 m of Beach Road or other high value assets.			
6.8	• Implement coastal protection structure to protect Beach Road and / or adjacent assets from erosion and inundation.			
6.9	• Elevate Beach Road and/or foreshore landscape to close inundation pathways.			
6.10	• Undertake an assessment of pumping capacity and network associated with Beachport Lagoon.			

 Trigger point for action
  Decision Point
  Duration of action effectiveness
  Unconfirmed Pathway

Why adopt these actions?

- Much of the inundation in this area is caused by elevated water levels that pass over Beach Road and along the local road network to areas of lower elevation. By increasing the elevation and resilience of the foreshore dunes and beaches in this area, inundation can be reduced while also maintaining and enhancing public amenity.
- Inundation from nearby areas will also impact this area. Actions undertaken in those areas will also reduce the inundation risk to this area.
- Erosion is expected to impact Beach Road and other nearby assets south of Beachport Harbour. The initial adaptation pathway is to nourish local beaches as well as to maintain and enhance existing foreshore dunes to increase shoreline resilience. If erosion continues to progress, a coastal protection structure may need to be implemented to protect Beach Road and adjacent assets. In addition, Beach Road or other landscape elements in the area may need to be elevated to reduce inundation in the long term to this area of Beachport as well as to surrounding areas.
- Within Cape Martin, erosion is confined to relatively remote natural landscape areas. Thus the most appropriate response is to allow these coastal processes to occur.

10 CENTRAL WEST (AREA 7) BOUNDED BY PARKLAND AND RAILWAY TERRACE



Erosion Hazard	Inundation Hazard	Shoreline Features
• • Baseline	<0.25 m	— Groyne
— By 2050	0.25 - 0.35 m	~ Revetment
— By 2100	0.35 - 0.65 m	— Rocky Coast
	0.65 - 1.25 m	— Seawall
	>1.25 m	

Hazard extents are prior to any adaptation actions and for a 100-year Annual Recurrence Interval (ARI) storm event.

The erosion hazard lines correspond to the 95% likelihood of areas seaward of this line being impacted by erosion.

The likely inundation area includes storm tide, 2100 sea level rise, and wave effects (setup and runup) where applicable.

Assets at risk

Assets in this area at exposed inundation hazards that originate from Area 6. These assets are predominantly public assets and areas of reserve, except for Beachport Pony Club. We note that risk associated with a dune breach at Lake Siloam are considered in section 11.

ASSET	ASSET TYPE	2050		2100		RELATED ACTIONS
		EROSION	INUNDATION	EROSION	INUNDATION	
Parklands Terrace	Transport		Low*		Medium*	6.8-6.10, 7.1-7.3
Beachport Pony Club	Private Asset		Medium*		Significant*	6.8-6.10, 7.1-7.3
Reserve between Parklands and NW Terrace	Reserve		Medium*		Significant*	6.8-6.10, 7.1-7.3

* Some assets within this category have a lower risk rating

Adaptation Actions

Adaptation action principally focus on acceptance of the risk (particularly where this occurs in reserves) and limiting construction of assets within the hazard zones.

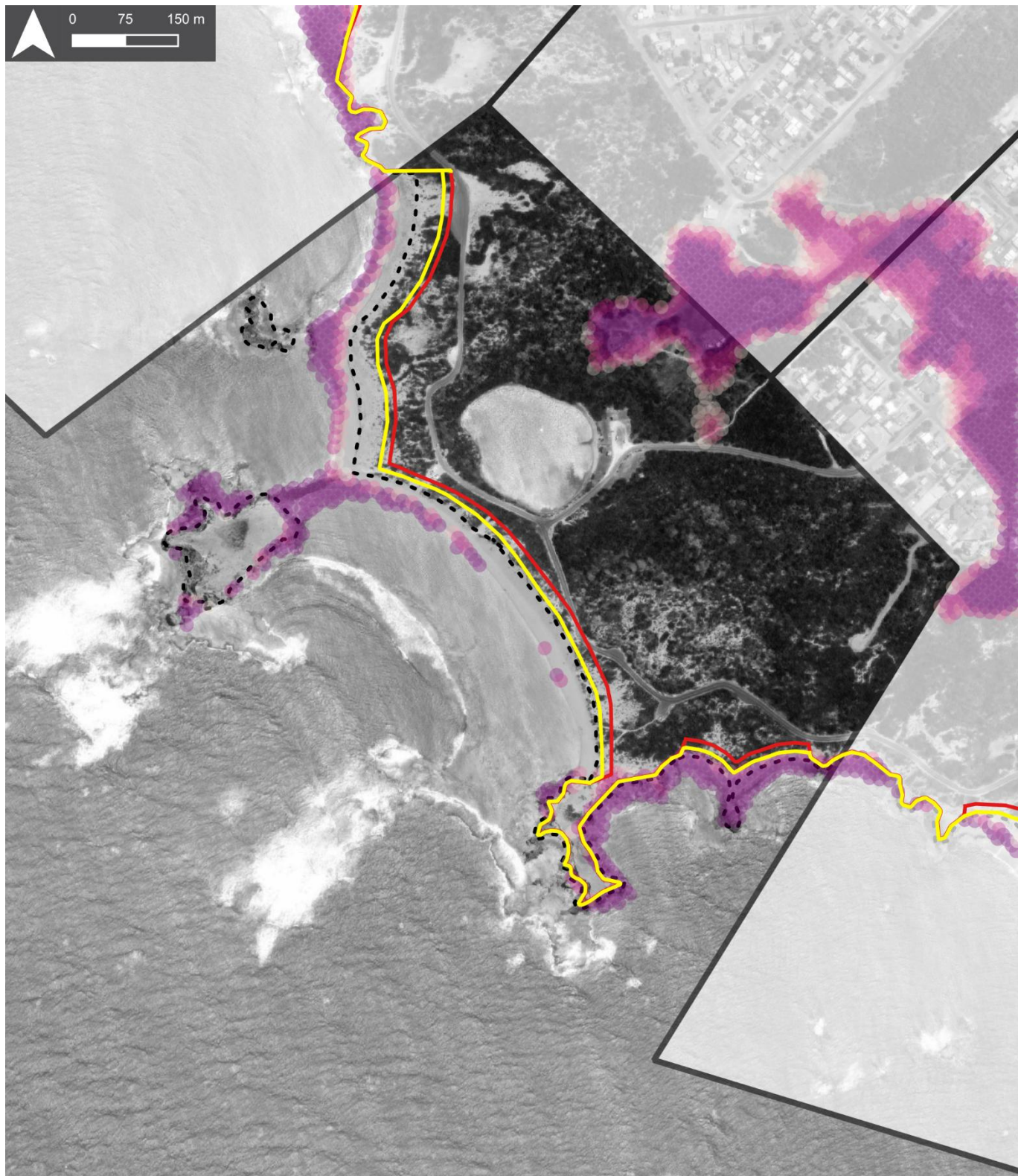
ID	ADAPTATION ACTIONS	SHORT TERM (NOW) 0 – 0.5 m	MID TERM (By 2050) 0.5 m	LONG TERM (By 2100) 1.0 m
7.1	Accept risk and allow coastal processes to occur.			
7.2	Avoid construction of high value assets within hazard zone.			
7.3	Reassess risk in this area after actions are undertaken in adjacent areas.			

Trigger point for action
 Decision Point
 Duration of action
 Unconfirmed (Possible) Alternative

Why adopt these actions?

- Actions undertaken in other areas are expected to reduce the inundation risk in this area. After these actions are undertaken, the risk should be reassessed in this area to determine if any additional actions are required to further reduce the risk.

11 WESTERN BEACHPORT (AREA 8) INCLUDING POOL OF SILOAM AND SCENIC DRIVE



Erosion Hazard	Inundation Hazard	Shoreline Features
- Baseline - By 2050 - By 2100	<0.25 m 0.25 - 0.35 m 0.35 - 0.65 m 0.65 - 1.25 m >1.25 m	- Groyne - Revetment - Rocky Coast - Seawall

Hazard extents are prior to any adaptation actions and for a 100-year Annual Recurrence Interval (ARI) storm event.

The erosion hazard lines correspond to the 95% likelihood of areas seaward of this line being impacted by erosion.

The likely inundation area includes storm tide, 2100 sea level rise, and wave effects (setup and runup) where applicable.

Assets at risk

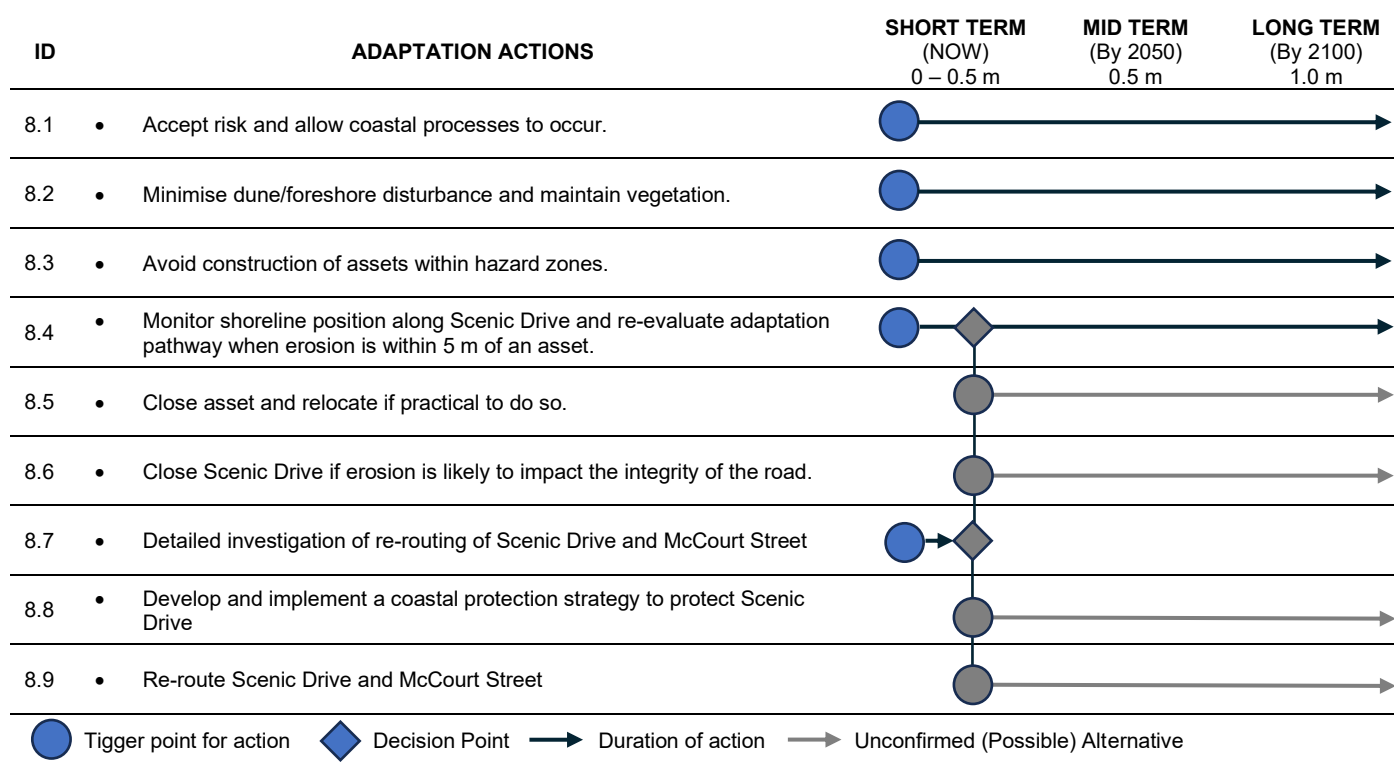
Assets in this area are principally exposed to erosion hazards. These assets are associated with Scenic Drive where shoreline erosion is expected to impact the road as well as parking areas.

ASSET	ASSET TYPE	2050		2100		RELATED ACTIONS
		EROSION	INUNDATION	EROSION	INUNDATION	
Coastal reserve within this area	Reserve	High	Low	High	Low	6.8, 6.9, 6.10, 8.1, 8.2, 8.3
Durant's Lookout Parking Area	Council Asset	High		High		8.3, 11.4
Scenic Drive	Transport	Significant*	Low	High*	Low	8.3, 8.4, 8.7
Parking area off Scenic Drive opposite Pool of Siloam.	Council Asset	High		High		8.3, 8.4
Pool of Siloam Parking area and Toilet Block	Council Asset		Low		Low	6.8, 6.9, 6.10
McCourt Street	Transport	Low	Medium*	Low	Medium*	6.8, 6.9, 6.10

* Some assets within this category have a lower risk rating

Adaptation Actions

Adaptation action principally focus on acceptance that coastal erosion is likely to impact Scenic Drive and its associated infrastructure. A key action is to investigate the circumstances that might require the re-routing of Scenic Drive, and what this action might require. Until this action is realised, coastal erosion monitoring and dune stabilization are key adaptation actions.



Why adopt these actions?

- Erosion has been ongoing along this section of coastal for many years and substantial volumes of sand have now been eroded from this section of coastline. Defending the road is not deemed to be practical given the elevation of the road and the length of protection that is likely to be required. Rerouting Scenic Drive is also expected to provide an opportunity to protect Beachport from inundation that may occur due to breaches in the dunes along this section of coastline.
- Some assets such as Durant's Lookout Parking Area are expected to be impacted by erosion. The proposed adaptation pathway is to monitor coastal erosion progression and to undertake dune restoration, rehabilitation and stabilisation actions. When erosion is within 5 m of the asset, this strategy proposes to close and relocate these assets where it is practical to do so. Protection of these assets was not deemed viable due to the elevation of the landscape on which they have been constructed.

12 NORTH WEST BEACHPORT (AREA 9)



Erosion Hazard	Inundation Hazard	Shoreline Features
- Baseline - By 2050 - By 2100	<0.25 m 0.25 - 0.35 m 0.35 - 0.65 m 0.65 - 1.25 m >1.25 m	- Groyne - Revetment - Rocky Coast - Seawall

Hazard extents are prior to any adaptation actions and for a 100-year Annual Recurrence Interval (ARI) storm event.

The erosion hazard lines correspond to the 95% likelihood of areas seaward of this line being impacted by erosion.

The likely inundation area includes storm tide, 2100 sea level rise, and wave effects (setup and runup) where applicable.

Assets at risk

The key asset at risk in this area is Scenic Drive, along with some informal coastal and lakeside tracks.

ASSET	ASSET TYPE	2050		2100		RELATED ACTIONS
		EROSION	INUNDATION	EROSION	INUNDATION	
Lake George Track / Lake George Road	Transport		Low		Low	9.1, 9.2
Beachport Conservation Park	Reserve		Significant*		Significant*	9.1, 9.2
Scenic Drive	Transport	Low*		Medium*		9.5, 9.6
Parking area on Scenic Drive (near Blowhole)	Council Asset					-
Informal parking areas at end of Scenic Drive	Council Asset					-
Parklands Terrace	Transport					-
Informal lakeside tracks	Transport		Medium*		Significant*	9.1, 9.2
Informal coastal tracks	Transport	Significant		High		9.5, 9.7

* Some assets within this category have a lower risk rating

Adaptation Actions

Adaptation action principally focus on acceptance of some risk (particularly where this occurs in reserves) and local retreat of key assets such as Scenic Drive.

ID	ADAPTATION ACTIONS	SHORT TERM (NOW) 0 – 0.5 m	MID TERM (By 2050) 0.5 m	LONG TERM (By 2100) 1.0 m
9.1	Accept risk and allow coastal processes to occur.			
9.2	Minimise dune/foreshore disturbance and maintain vegetation.			
9.3	Develop a beach access management plan. Remove unnecessary access, realign beach access and inspect / repair access as required (e.g., when erosion edge <5 m).			
9.4	Avoid construction of assets within hazard zones.			
9.5	Monitor shoreline erosion and reevaluate risk when erosion is within 5 m of transport infrastructure (Scenic Drive, informal coastal tracks)			
9.6	Locally retreat Scenic Drive.			
9.7	Close or retreat informal tracks.			



Trigger point for action



Decision Point



Duration of action



Unconfirmed (Possible) Alternative

Why adopt these actions?

- Erosion and inundation in this area is confined to relatively remote natural landscape areas. Thus the most appropriate response is to allow these coastal processes to occur. The exception to this is Scenic Drive, which is at risk of erosion in some locations. The adaptation pathway in these locations is to locally retreat and realign Scenic Drive. Implementation of coastal protection structures in these areas is expected to be difficult to realise.



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