Emu Point to Middleton Beach Coastal Hazard Risk Management Adaptation Plan - Appendices

December 2019

City of Albany

Western Australian Planning Commission

APPENDIX A

Coastal Processes and Investigations

The following information about investigations and management option reports has been summarised from the Emu Point to Middleton Beach Coastal Adaptation and Protection Strategy – Coastal Vulnerability Study and Hazard Mapping (Royal Haskoning DHV, 2017). This summary provides the background information that Royal Haskoning DHV used to inform their erosion and inundation hazard mapping.

There have been several key coastal process and erosion related studies over the last few decades which are relevant to this CHRMAP. Several of these studies have focused on Emu Point and attempted to understand and address the erosion problems that have occurred in this area. Some of the studies resulted in the construction of the various coastal protection structures that presently occupy the shoreline at Emu Point. While there are some points of general agreement in the literature regarding the causal mechanisms for the erosion observed at Emu Point, some key mechanisms have not been identified in fine detail (e.g. have sediment transport dynamics reached a new equilibrium? and what will be the ongoing risk of beach and nearshore erosion from storm events?).

The Coastal Vulnerability Study and Hazard Mapping (Part1; RHDHV 2017) summarised the available knowledge, including practical information about the study area's historical timeline, dredging and nourishment works. The report then built on the knowledge regarding coastal processes through a review of the extensive coastal monitoring data available for the area and application of numerical modelling tools.

Coastal Monitoring Data

Since late 2013, the City of Albany in collaboration with the Western Australia Department of Transport (DoT) and other state government agencies have been actively monitoring the coastal environment within the study area. The recent intensive coastal monitoring has been informed by a series of peer reviews.

Community consultation and involvement has also been an integral part of both the scoping and undertaking of the monitoring program. The recent observational data is supplemented by additional historical and longer-term datasets, many of which exist due to the Port of Albany operations in Princess Royal Harbour. When combined, the observational dataset is extensive and underpins this coastal processes study. It includes: morphological data (e.g. aerial photography, repeat nearshore bathymetric surveys, beach transects), metocean data (e.g. wind, wave, current and water level measurements) and data on seagrasses and sediments.

Numerical Modelling

Numerical modelling undertaken for this study included the following main tasks:

- Spectral Wave (SW) modelling – a 38-year wave hindcast was undertaken to better understand the nearshore wave climate along Middleton Beach and Emu Point. This resulted in defining the long-term average conditions as well as providing valuable information in important historical storms such as the August 1984 event;
- Hydrodynamic (HD) modelling – modelling of tidal and wave driven flows including use of the hydrodynamic model to assist in understanding the historical changes that have occurred over the important Lockyer Shoal area;
- Longshore sediment transport – this modelling looks at identifying the rate and direction of longshore transport and puts this process into context with other coastal processes.

The numerical modelling completed for this study focused on the present day (or existing) conditions within the study area. However, a number of simulations were also completed to look at future climate change conditions and historical conditions (i.e. pre-structure bathymetries). The results of

the numerical modelling were used to inform the understanding of coastal processes and hazards within the study area.

Conceptual Coastal Processes Model

Based on review of available data and literature, site observations, numerical modelling and understanding of coastal processes, a conceptual model of sediment transport processes in the study area has been developed. The conceptual model identifies sediment sources, sinks, pathways and vulnerable areas for focus in subsequent stages of the study. To summarise the key points:

- Given the overall accretion observed along the study area's shoreline, this coastal barrier/beach system is believed to benefit from a long-term supply of sediment. The source of this sediment is believed to be the deeper areas of King George Sound. Given the mechanism of supply, this process is likely to continue in the future.
- Although longshore sediment transport differs in both magnitude and direction along the study area, they were seen to be quite small. Gross rate of longshore sediment transport were determined to be as high as approximately 20,000m3/year with maximum net rates found to be only 10,000m3/year to the west.
- Shape and morphology, both nearshore bathymetry and coastal morphology, are important to consider in determining the dominant coastal processes operating in each sector of the study area. In general, the shape is explained by the similar alignment of the beach to the incoming wave crests. This means that longshore transport is generally low.
- Historically, Emu Point was susceptible to coastal erosion from storms. Results from the 38-year hindcast show that the period between the mid-1980's and mid-1990s was particularly stormy and erosion concerns lead to the introduction of the coastal protection structures along Emu Point.
- While these structures have protected the residential areas from storm erosion, they have resulted in significant changes to the coastal processes in the local area.
- The changes observed between the pre-structure and post-structures conditions are most evident at Lockyer Shoal and along the Emu Point shoreline – see Figure A below. These changes are summarised as:
    - Lockyer Shoal is now significantly smaller than it was prior to the introduction of the coastal structures. That is, the area of shallow water is less expansive.
    - The shoreline, including the salient at Firth Street, has eroded and rotated to be more in line with the altered wave direction over the now smaller Lockyer Shoal.

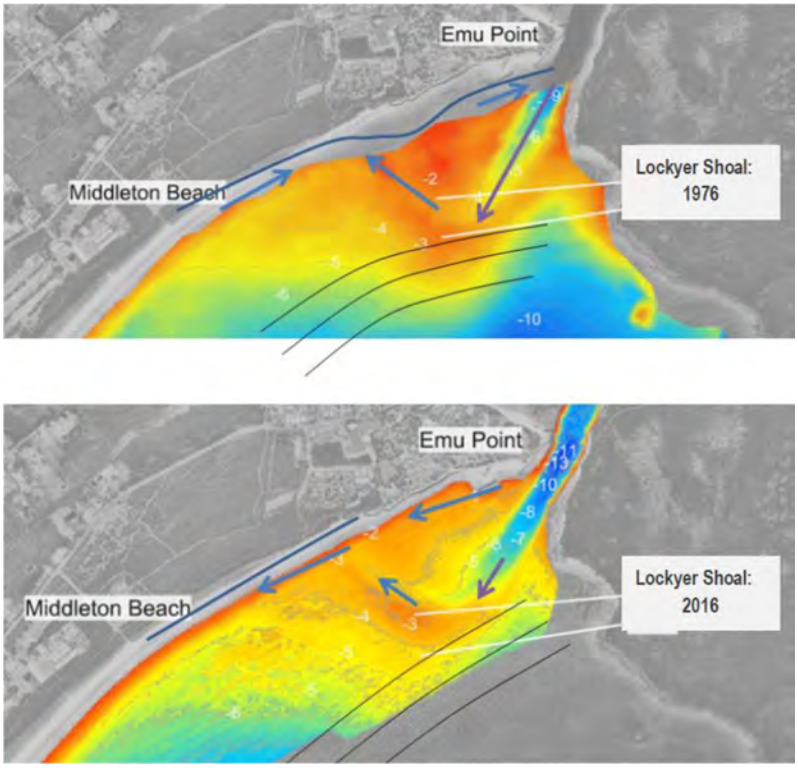


Figure A - Conceptual sediment pathways around Emu Point/Lockyer Shoal for pre-developed (top) and developed (bottom) that described different coastal processes in each scenario

- Based on a review of the repeat bathymetric surveys, it is believed that the main cause for the changes has been the changes to the tidal and wave driven sediment transport caused by the structures themselves. Other contributing factors include the long-term loss of seagrasses and general storminess over that period including the 1984 storm.
- While it has taken almost 30-years for the area to adjust to the introduction of the coastal structures, evidence from the bathymetric surveys and seagrass re-colonisation indicates that the Emu Point/Lockyer Shoal area is beginning to stabilise again. This 'new normal' includes a smaller shoal and a shoreline that is no longer as sandy but afforded protection by the rock coastal protection structures. The beach around the detached breakwater still provides beach amenity to the area.

A timeline of events is summarised in Table A. More detail on the history of the investigations and management options for the study area can be found in Royal Haskoning DHV (2017).

TABLE A: STUDY AREA TIMELINE

YEAR	EVENT
1921	**Storm** - A south-easterly gale lasting several days eroded Emu Point back to the present day Emu Beach Café. *"The big south easterly gale of 1921 lasted for many days…. Emu Point disappeared. The end of Johnson's Guest House [now Emu Beach Café site] stood precariously over the channel which dropped sheer int o deep water. Several rooms had to be dismantled." (Maritime Albany Remembered, Douglas et al, 2001 in PRDW, 2013a).*
1960s	**Structure** – Emu Point Boat Pens were constructed.
1972	**Structure** – Emu Point Baths constructed (fixed jetty)
August 1984	**Storm** – Severe south-easterly storm (approximately 100-year ARI event) at Emu Beach caused considerable erosion, including the loss of beach and foreshore. Several houses were also threatened. Loss of a significant area of seagrass meadow.
1985	**Structure** – The "Brick wall" (i.e. the rock wall at Oyster Harbour Beach) was built (URS, 2012b).
Mid-1980s	**Structure** – Training wall was built along western bank of the Emu Point Channel, groyne extension was added soon after.
May 1987	**Storm** – Significant erosion at Emu Point. South/south-westerly storm persisted with winds at 15-25m/s (30 – 50 knots) for over 4 days. The eroded beach was then re-nourished with sand after this event. See **Appendix A** for historical photos.
1987-1988	**Investigations** - Following severe erosion during a storm in May 1987, the Department of Marine and Harbours, WA (DMH) carried out investigations int o the problem and subsequently nourished the beach and built two groynes.
1989	**Structure** – Construction of an 80m southern groyne as an extension to the training wall at Emu Point was completed in October 1989. These works also included 10,000m^3 of nourishment. The purpose of the groyne was to arrest the erosion of the beach to the south and west of Emu Point and stabilise the point (URS, 2012b).
1991	**Structure** - A second northern groyne was built in August 1991 to stop the erosion of the recreational beach to the north of Emu Point in Oyster Harbour (SKM, 1993).
August 1992	**Storm** - 1992 the southern beach to the west of Emu Point (known as Emu Beach) again suffered erosion. As property was again threatened, there was considerable local concern about the effectiveness of the DMH works. High tide and heavy seas generated by southerly winds caused severe erosion, taking about 4m of the southern beach sand bank.
1992	**Investigation** – Following the construction of the two groynes DHM produced a report that reviewed the effectiveness of these coastal protection structures (DHM, 1992). The considered options were: (i) retain the groyne and monitor (ii) removal of the groyne or (iii) further works such as nourishment, realignment or extension. This report concluded that the groynes should be retained as the southern groyne is serving its purpose by stabilising the western beach with downdrift (northern side) "diminishing as time progresses".
1993	**Investigation** - Following winter storms in 1992 the shoreline to the southwest of Emu Point was eroded, presenting a risk to residential property. Sinclair Knight was engaged by the Town of Albany to complete a coastal protection study that formulated a conceptual model of the dominant coastal processes contributing to the physical changes of Emu Beach. An estimation of the net longshore transport is provided as of the order 10,000m^3/year from west to east. The cross-shore transport is also estimated as a loss of approximately 2,000m^3/year from the area protected by seagrass and as much 4,000m^3/year where there is no protection offered by the seagrass.
1995	**Structure** - Detached breakwater was constructed with 36,000m^3 of sand used to nourish the area in the vicinity of the detached breakwater (URS, 2012b).

1999	**Erosion -** Severe erosion event occurred without storm catalyst. Emu Beach experienced high mean sea levels during the La Nina Event occurring between mid-1998 to early-2001. Erosion of 600m long beach from Boongarrie St to south-west.
1999	**Structure** - Emergency rock revetment constructed in response to erosion event in 1999 (DoT, 2000).
2000	**Investigation** – DoT (2000) conducted a study that examined aerial photography from 1957 to 2000 and reviewed hydrographic survey data taken in 1994 and 1999. The cause of erosion in 1999 was attributed to unusually high mean sea levels. Six management options were investigated: managed recession, sand re- nourishment, headlands, groynes, a seawall and sand-filled geofabric tubes for protection. The study recommended that unless severe recession of the foreshore was seen to continue, the long term management of the beach should be delayed and re-evaluated in 2003.
2001	**Structure** – Rock revetment was extended further to the west.
2003	**Erosion -** Extreme storm event and unusually high sea levels were experienced at Emu Beach during La Nina Event occurring between early-m id 2003 (URS, 2012b).
2003	**Investigation** – MP Rogers undertook a study that analysed: 1. Changes in the coast based on survey/aerial photos of Emu point taken between 1957-2001; 2. Correlations between seagrass loss and coastal erosion; 3. The metocean conditions driving the coastal processes at Emu Point. Report includes statistics including hindcast wave data, wave modelling data, water levels in Albany from 1994-2002, tides, current and wind regime etc.
2005	**Structure** – Final extension of the rock revetment, extended further to the west.
2007	**Structure** – Emu Point Baths converted from fixed jetty to floating pontoon
2011	**Structure** – To avoid the relocation of a dual use path at the end of the Emu Pont rock revetment a geotextile sand container seawall was constructed in August 2011. This caused downdrift erosion. The dual use path was fenced off in January 2012 due to public safety risks from erosion occurring at end of geotextile seawall.
2012	**Investigation** – URS completed studies to det ermine a long-term preferred coastal management option/strategy for the coastline between Middleton Beach and Emu Point. The findings were documented in a series of reports (URS 2012a, 2012b, 2012c and 2012d), including reports on structural condition assessment, coastal processes, data and option development and scheme development. In regard to protection strategies, URS recommended the immediate implementation of: (i) construction of new block wall and beach nourishment at Oyster Harbour Beach, and (ii) remedial work to the training wall at Emu Point. Further investigations were recommended into the feasibility of a preferred coastal protection scheme along Emu Point Beach. The preferred schemes included: detached breakwaters, artificial reefs and beach nourishment options. Further studies were also recommended for the enhancement of Oyster Harbour Beach, with concepts including the extension of the norther groyne and significant beach nourishment.
2012	**Investigation** - DoT produced drawings showing the variation in the vegetation line along Middleton Beach and around Emu Point (DoT, 2012).
2013	**Investigation** - On behalf of the City of Albany, PRDW completed a series of reports in 2013 including the main report titled *"Emu Point to Middleton Beach Coastal Adaptation and Protection Strategy".* The PDRW reports reviewed the 2012 URS studies including: a review of coastal processes, coastal structures, coastal monitoring data and management scheme (or options). PRDW also reviewed a number of schemes suggested by the local community. Recommendations from PRDW (2013b) included: (i) the on-going collection of key coastal monitoring data, (ii) implem ent ation of beach nourishm ent at Oyst er

	Harbour Beach, remediation of the training wall at Emu Point and sand nourishment in front of the Emu Point seawall (or rock revetment), (iii) a trial groyne be constructed west of the Emu Point seawall to trial a community suggested scheme, and (iv) further investigations (detailed modelling and design) of two permanent coastal protection schemes at Emu Point.
2012 – 2013	**Structure** - The dual use path at Emu Point was also relocated landwards.
2014	**Structure** – A new block wall was constructed at Oyster Harbour Beach to replace the old "Brick wall".
2014	**Structure** – In April 2014, CoA installed temporary geotextile groynes to the west of the rock seawall at Emu Point. When the groynes were constructed, approximately 10,000m^3 of sand nourishment was placed in the area. The nourishment was sourced from Ellen Cove (PRDW, 2015). The groynes were installed as a trial to assess what the effect would be of a shore perpendicular structure on the beach.
2013	**Monitoring** – CoA Coastal Monitoring Program commenced.
2013 – 2014	**Monitoring** - WAPC Geoff Bastyan Seagrass Monitoring **Investigation** - UWA Currents and suspended Sediment Study.
2016 – 2017	**Investigation** - WAPC funded Geoff Bastyan Seagrass Productivity Study
2017	**Structure** – Maintenance of GSC trial groynes undertaken.
2017	**Investigation** - RHDHV Coastal Hazard Mapping undertaken; EvoCoast Vulnerability Assessment and structure condition inspections undertaken.

APPENDIX B

Key Stakeholders

KEY STAKEHOLDERS

Although every stakeholder may have an interest in the outcome of a project or a decision, not everyone has the same needs, investment or expectations of engagement. Stakeholders have been identified and categorised as either primary, secondary or tertiary stakeholder as follows (full list in Appendix 1).

Primary Stakeholders

Primary Stakeholders are those who have a direct interest in the outcome of a project, including those who live or operate within the hazard mapping area or who will be directly affected by a project or decision. The needs and expectations of primary stakeholders hold the most importance in terms of engagement and input into the project. For this project, primary stakeholders are:

- COA Councillors;
- Ratepayers;
- Community members or groups who use or rely on the area;
- Agencies and organisations who make decisions about the project area and associated activities;
- Residents in the mapped hazard zone (i.e. up to 100 year risk area);
- Businesses in the mapped hazard zone (i.e. up to 100 year risk area).

Primary stakeholders are listed in Table A.

TABLE A: PRIMARY STAKEHOLDERS

CATEGORY
Accommodation and tourist operations
Businesses
Community Groups
Funding Bodies
State Government Agencies
Local Government
Residents within hazard zones
Sport and Recreation Groups
Utility Providers

Secondary Stakeholders

Secondary Stakeholders are those who are located within the overall study area, have a specific interest in a project or issue or may be indirectly impacted by a project or decisions associated with it, such as:

- People who live and work in the project area;
- Business owners from the project area; and
- Community groups in the City of Albany area.

Secondary stakeholders are listed in Table B.

TABLE B: SECONDARY STAKEHOLDERS

CATEGORY
Aboriginal interests
Accommodation providers
Tourist information providers
Commercial/ businesses
Community groups
Disability services
Elected representatives
Event coordinators
State government agencies
Funding bodies
Education providers
Not for profit organisations
Sport and recreation groups/ providers
User groups
Youth and school groups

Tertiary Stakeholders

Tertiary stakeholders are outside of the hazard mapping and study area but may be indirectly affected by the project, but still have an interest in the project area and activities associated with it. These stakeholders include:

- Some State and Federal Government agencies and organisations;
- Surrounding local government authorities;
- Educational institutions;
- Non-government agencies and organisations; and
- Media.

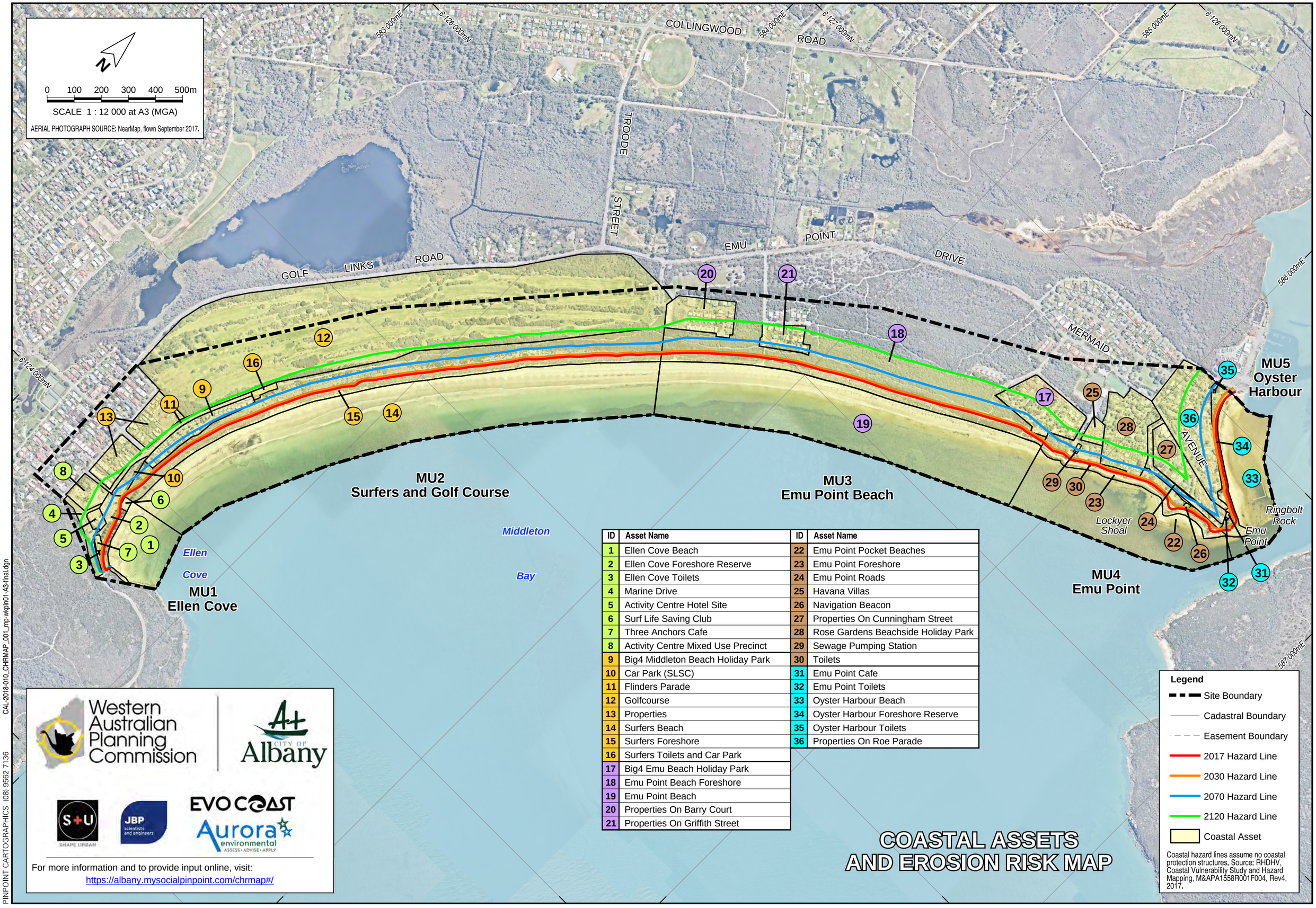
Tertiary stakeholders are listed in Table C.

TABLE C: TERTIARY STAKEHOLDERS

CATEGORY
Accommodation providers
Aged Care Accommodation
Commercial/ businesses
Community Group
Event organisers
Funding Bodies
Libraries
Local Government
Media
Schools
Sport and Recreation
State Government agencies
Tertiary education institutions

APPENDIX C

Simplified Hazard and Inundation Mapping



ID	Asset Name	ID	Asset Name
1	Ellen Cove Beach	22	Emu Point Pocket Beaches
2	Ellen Cove Foreshore Reserve	23	Emu Point Foreshore
3	Ellen Cove Toilets	24	Emu Point Roads
4	Marine Drive	25	Havana Villas
5	Activity Centre Hotel Site	26	Navigation Beacon
6	Surf Life Saving Club	27	Properties On Cunningham Street
7	Three Anchors Cafe	28	Rose Gardens Beachside Holiday Park
8	Activity Centre Mixed Use Precinct	29	Sewage Pumping Station
9	Big4 Middleton Beach Holiday Park	30	Toilets
10	Car Park (SLSC)	31	Emu Point Cafe
11	Flinders Parade	32	Emu Point Toilets
12	Golfcourse	33	Oyster Harbour Beach
13	Properties	34	Oyster Harbour Foreshore Reserve
14	Surfers Beach	35	Oyster Harbour Toilets
15	Surfers Foreshore	36	Properties On Roe Parade
16	Surfers Toilets and Car Park		
17	Big4 Emu Beach Holiday Park		
18	Emu Point Beach Foreshore		
19	Emu Point Beach		
20	Properties On Barry Court		
21	Properties On Griffith Street		

Western Australian Planning Commission

City of Albany

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EVOCOAST

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For more information and to provide input online, visit:
https://albany.mysocialpinpoint.com/chrmap#/

Legend

- Site Boundary
- Cadastral Boundary
- Easement Boundary
- 2017 Hazard Line
- 2030 Hazard Line
- 2070 Hazard Line
- 2120 Hazard Line
- Coastal Asset

Coastal hazard lines assume no coastal protection structures. Source: RHDHV, Coastal Vulnerability Study and Hazard Mapping, M&APA1558R001F004, Rev4, 2017.

COASTAL ASSETS AND EROSION RISK MAP

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PINPOINT CARTOGRAPHICS (08) 9562 7136

APPENDIX D

Stakeholder Engagement Outcomes

EMU POINT TO MIDDLETON BEACH - COASTAL HAZARD RISK MANAGEMENT AND ADAPTATION PLAN (CHRMAP)

ANALYSIS OF SURVEY 1: COASTAL ASSETS AND VALUES

Responses: 201

Dates available: 20 March 2018 to 15 June 2018 (12 weeks)

Survey hosted on Social Pinpoint website with map and information. Distributed to stakeholders via email, events (Vancouver Street Festival) and paper copies (accommodation and cafes).

Questions 1 and 2: Age and gender

Gender	Female	Male	Grand Total
up to 18	9	8	17
19 - 30	16	2	18
31 - 50	65	23	88
51 - 70	38	30	68
71 +	4	6	10
Grand Total	**132**	**69**	**201**

Question 3: What suburb/ locality do you live in?

Albany suburbs:

Albany	**176**
Albany	14
Bayonet Head	12
Bornholm	1
Breaksea Estate	1
Centennial Park	2
Collingwood Heights	4
Collingwood Park	1
Collinwood Heights	2
Cuthbert	1
Elleker	2
Emu Point	10
Gledhow	5
Goode Beach	1
Kalgan	7
Kronkup	1
Lange	1
Little Grove	7
Lockyer	5
Lower King	7
Lowlands	2
Marbelup	3
McKail	8
Middleton	1
Middleton Beach	10
Millbrook	4
Milpara	2
Mira Mar	15
Mount Clarence	4
Mount Elphinstone	1
Mount Melville	8
Mt Melville	1
Muttonbird	1
Orana	2
Robinson	2
Spencer Park	7
Torbay	2
Warrenup	3
Willyung	3
Yakamia	11
(blank)	2
Other	**25**
Bremer Bay	3
Calliope Queensland	1
Claremont	1
Denmark	2

Forrestfield	1
Katanning	2
Manjimup	1
Margaret River	1
Melville	1
Mosman Park	1
Mount Barker	1
Narrikup	1
Orange Grove	1
Perth	3
South Yunderup	2
Wattle Grove	1
Woogenellup	1
Yokine	1
Grand Total	**201**

Question 4: Postcodes

Albany	**176**
6330	174
Other	**25**
4000	1
6000	2
6010	1
6012	1
6056	1
6060	1
6070	1
6109	1
6156	1
6163	1
6208	2
6258	1
6285	1
6317	2
6324	2
6326	1
6333	2
6338	3
Grand Total	**201**

Question 5: Do you associate as a user or non-user of Emu Point or Middleton Beach?

User of Middleton Beach	157 of 201
User of Emu Point	170 of 201
I do not use these areas	9 of 201

Question 6: Would you like to expand by commenting? If you use the area, is it for recreation, business, resident or other?

ASLSC	4
Business and recreation	2
Café	1
Café and Recreation	8
Dog walking	1
Education	1
Family history	1
Fishing	1
holidays	1
Leisure	1
Recreation	114
Recreation and business	1
Recreation and family	3
Recreation and sightseeing	1
Recreation and socialising	2
Resident	1
Resident and recreation	10
Socialising	1
Solitude	1
Work and Recreation	1

(blank)	44
Grand Total	**201**

Question 6: Respondents were asked to choose their top 5 valued assets from the following list:

Coastal scenery and vistas
Attractive areas for locals and visitors
Coastal vegetation and habitat
Wide sandy beach
Access to beach for swimming, walking
Use of beach for surfing
Cultural heritage
Toilet blocks
Ellen Cove Boardwalk
Tourist Accommodation (e.g. Caravan Parks and other accommodation)
Access for horse exercising
Viewing of wildlife (land and/or ocean)
Ellen Cove marine exclosure/ netting
Ellen Cove: Picnic and playground area
Emu Point: Picnic and playground areas
Disability access points
Dual use path
Residential areas
Cafes
Local businesses
Carparks and access points
Surf Life Saving Club (Ellen Cove)

Valued Assets by Albany vs Non-Albany responses

There were no significant differences between Albany and non-Albany responses with respect to valued assets (One-way ANOSIM p=0.956).

Valued Assets by Age

Results indicate that the most valued assets by age groups and gender are:

1. Access to beach for swimming, walking
2. Coastal scenery and vistas
3. Coastal vegetation and habitat
4. Ellen Cove Boardwalk and
5. Cafes.

There were significant age differences in how people responded to valued assets with under 18 year olds valuing assets differently from 31 to 50 year olds (ANOSIM, p= 0.0004) and 51 to 70 year olds (p=0.0056).

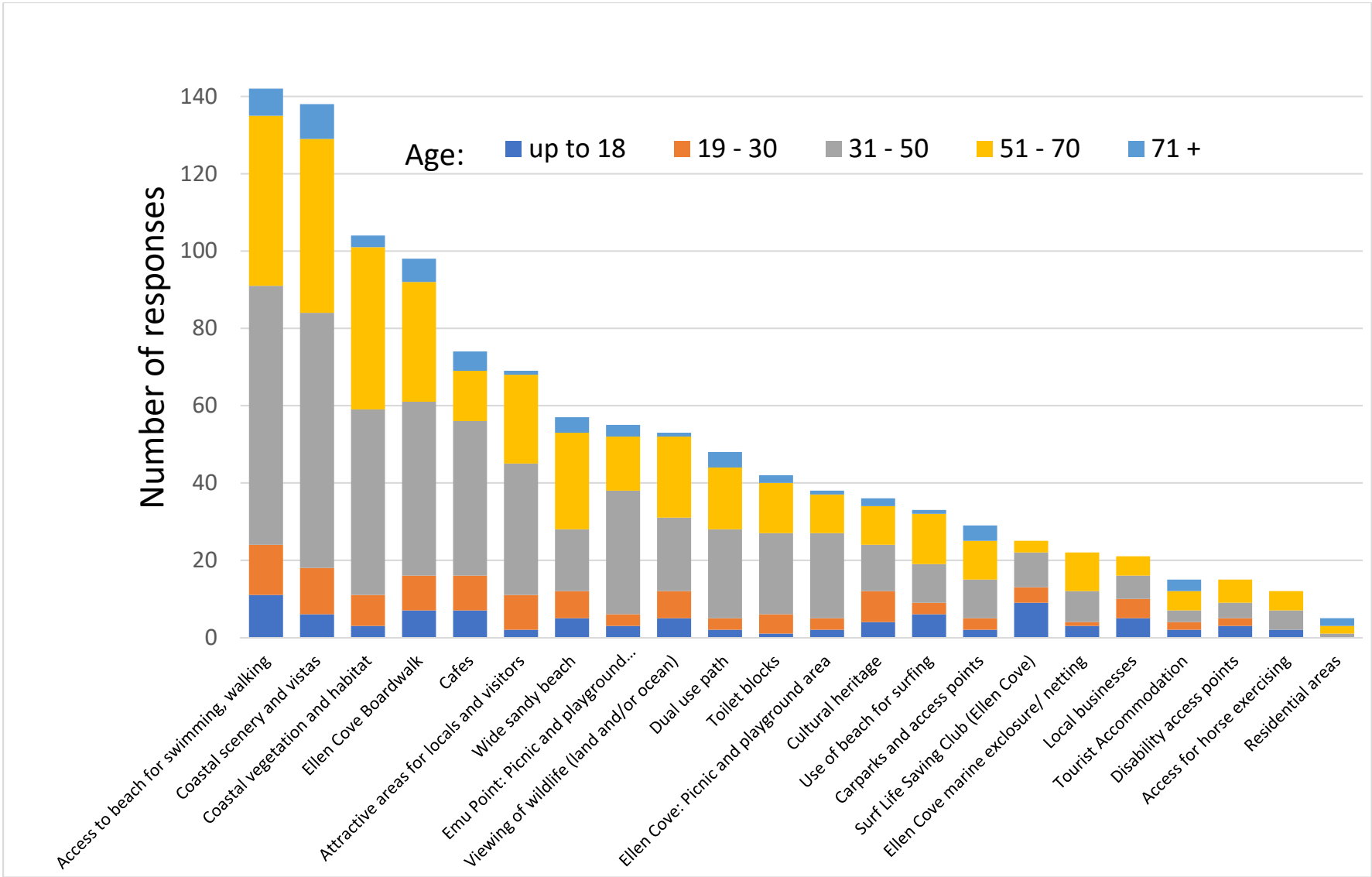
Under 18 year olds were more likely to value the Albany Surf Life Saving Club (SIMPER, 8.1% of the difference between age groups) while 31 – 50 year old respondents were more likely to value coastal scenery and vistas (8.07% of the difference between these two age groups) and coastal vegetation and habitat (7.28%).

Under 18 year olds were more likely to value the Albany Surf Life Saving Club (SIMPER,7.0 % of the difference between age groups) while 51 – 70 year old respondents were more likely to value coastal vegetation (7.9%) and coastal scenery (7.7%).

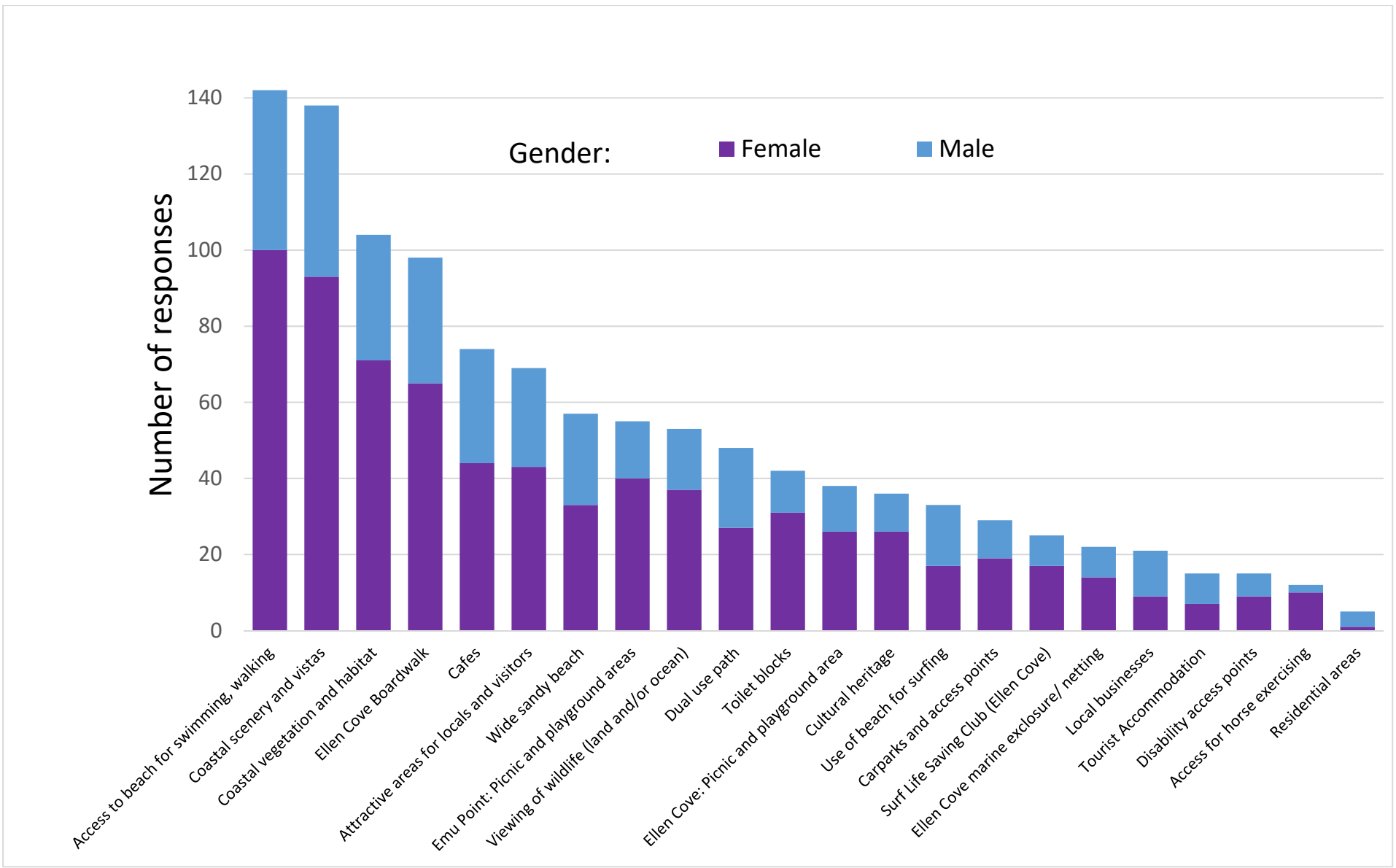
31 – 50 year olds value different assets to 51 to 70 year olds (ANOSIM, p=0.011). 31 – 50 year olds valued Ellen Cove Boardwalk (SIMPER, 7.8% of the difference between age groups), Cafes (7.2%) and access to the beach, while 51 to 70 year olds ascribe value to coastal vegetation (7.6%).

There were significant differences between gender for valued assets (One-way ANOSIM, p=0.0494) with women valuing coastal vegetation (SIMPER, 7.6% of the difference between females and males), access to beach (6.9%) and coastal scenery (6.8%) while men value cafes (7.0%) and wide sandy beaches (6.1%).

Valued Assets by Age



Valued Assets by Gender



Other assets identified by respondents include:

Natural areas
Dog exercise area
Social interaction
Places for socialising
Exercise assets
Shark net and pontoon
Fishing areas
Dog exercise area
Fishing areas
Visual amenity
Soft beach sand
Cafes and businesses
Clean water
Local seaside feel
Fishing areas
Orchids
Healthy dune system
Golf course
Beach in its natural state
Shady tree areas with picnic facilities
Golf course
Diving areas

Question 7: Of your top 5 assets, why are they important to you?

Top 5 answers:

1. Recreation
2. Environment
3. Intrinsic value
4. Sense of place
5. Socialising

Question 8: Would loss or modification of your favourite asset(s) impact on your life?

Would loss or modification impact on your life?	Number of respondents	% of respondents
I can easily access elsewhere	15	7.4%
No	25	12.4%
Yes	161	80.2%
Grand Total	**201**	**100%**

Response/ comment: Would loss or modification of your valued asset impact on your life?
I can easily access elsewhere
Problems of erosion are very big around the ends of Mids near Emu Point. Need improvement
So many beautiful beaches around Albany
The close proximity to the beach is attractive
No
It is a gentle space. To lose that would make it just like every other beach.
They wouldn't impact my life but They very are important for other users e.g. horse exercise area and surf club
Yes
A surf reef at Surfers would protect coast from erosion and enhance enjoyment of this part of the coast. Don't overthink it...some well-placed rocks on the sea floor will do the job of catching sand, creating sea habitat and taking energy out of the swell by having it break further out from the shore
Absolutely. Six generations of family have/ have had a love of this place and have spent part of their life here. It is in our soul. We grieve for the loss of the old hotel at Ellen's Point and are saddened by the current drive to commercialise the area.
All the above are unique to Emu Point and Middleton Beach and cannot be duplicated elsewhere. There is no need to change anything, just improve and maintain the existing facilities and areas.
As I am a young person, it would devastate me if this wasn't hear in the future.
As I hope to soon retire to Albany myself removal of the foreshore recreation opportunities (swimming, walking, use of dual use path and boardwalk etc.) will greatly impact on my life. I believe it is also a state, if not national asset. Land use planning and carful site planning should be able to retain/relocate the key assets and engineering solutions (stone walls etc.) which never work anyway, should not be used to try to retain things exactly as they are now.
Being time poor the ability to be able to walk somewhere attractive and peaceful very close to highly populated areas is convenient and promotes a healthy lifestyle.
Both places are one of the key reasons I chose to move to and stay in Albany.
Can cope losing all except the right to access the beach and the boardwalk
Coastal vegetation and habitat should be conserved where possible with specific trails/paths to ensure minimal human impact
Decrease recreational facilities
Do not remove seaweed from beach. Seaweed keeps sand soft. The heavy vehicles running on Ellen Cove and Middleton Beach (including life savers vehicles) compact the sand to concrete hardness, making it unpleasant for beachgoers. No other beaches in WA get this treatment.
Emu Point is world class and incredibly rare, I often fear the compromise of the area.

Enormously
Especially my morning swims - I love the marine enclosure
Get rid of the groins at Emu Point as they are destroying the coastline, and will increase the erosion along Middleton Beach
I could access the coastline elsewhere closer to home, but this stretch of coast should be protected
I think the basic facilities and services, change isn't that impacting. Environmental and cultural change of surrounding nature would be devastating.
I use the beach just about every day and any change to the beaches integrity would be a huge impact.
I use these every day!
I would feel sad, depressed and hopeless
I'm a bird watcher, to lose more habitat would be detrimental to Red capped Plover and Rock Parrot.
It already has by the obscene and destructive eyesore of the rock walls at Emu Point
It is arrogance and ignorant to think we can modify the shoreline in any lasting way.
It would change our life completely
Leave it alone.
Loss of these assets is out of the question now we have them
Make it a real social hub
Maybe
Mids and Emu Point are iconic to Albany, however climate change will impact coastlines everywhere. Rising sea level will have impacts for everyone
My children love surf club and we also enjoy the parks, local businesses & scenery very much
On an emotional level, it would, yes.
Our home is beachfront on Emu Point Beach, so any modification affects us directly.
The dual use path is perfect to ride with our young children. The safety of being away from roads and the convenience of a cafe at either end for a treat before we ride back is perfect and we have done this regularly for several years.
The Middleton to Emu Point area provides a major role in allowing residents to exercise and maintain a healthy lifestyle.
The surf club is a huge part of my life
The surfers beach would be greatly enhanced by an artificial reef to provide consistent surf. What is happening in regard to this project?
The work at emu point has dramatically altered the area, and I generally avoid the sandbags and groynes because of their ugliness and impact on the vegetation.
These are both wonderful areas that would be a great loss to Albany if they were no longer accessible
This beach is the main reason I live in Albany if it would be compromised I would consider moving back to Perth
Unsure. Would be sad to see more change. Been plenty already since I was a kid in the 70s.
Viewing wildlife from these areas are one of the nicest/easiest to access
Walking Middleton beach with the dogs is a relaxing place to unwind. Once you get up to the deterioration at Emu Beach it is time to turn around. It is unsightly and getting worse.
Want to keep using area as live 5mins away
Want to protect the assets that are most easily accessible and highest volume of visitors
We access all areas
We must ensure the city look after and protect its greatest assets
Would have to find other places to go.
Yes and no. If it is the environmental modification or loss, I don't think it will impact on me but it might impact on future generations.
(blank)

Question 9: If your valued asset(s) are at risk in the next 10 – 50 years, would you be willing to pay for its protection (e.g. through City of Albany rates, differential rating or other mechanisms)?

Would you be willing to pay for protection?	Number of Respondents	Response %
I can easily access similar asset elsewhere	14	6.9%
No	44	21.9%
Yes	143	71.2%
Grand Total	**201**	**100%**

There was no significant difference in willingness to pay between people from Albany and non-local respondents (χ^2_1=1.03, p=0.30). There was no effect of age (χ^2_8=8.28, p=0.407), gender (χ^2_2=4.40, p=0.111), or postcode (χ^2_2=4.10, p=0.129) on willingness to pay responses.

No significant age effect on who respondents believe should pay (ANOSIM, p=0.943).

Gender had a significant effect on respondent's response to 'who pays' (ANOSIM, p=0.0017) with females saying that everyone should pay (users, business, residents, local, State and Australian governments) (SIMPER, 22.9% of the difference in responses between genders) and males saying that State Government (21.3%), Australian Government (18.3%) and local government (18.1%) should pay for management of coastal erosion.

No difference between Albany and other locations in relation to 'who pays' (ANOSIM, p=0.488).

Would you like to expand on your response regarding 'willingness to pay'
A portion of the cost
As long as it is incorporated into rates and not a separate fee
As my top assets are based on naturalness and activities such as walking or swimming I would not be prepared to pay for engineered protection of these assets. This is a land use planning issue and the hard landscape elements (car parks, dual use path, toilets etc) should be relocated further back from the water's edge (maybe access through the golf course or develop some of the undeveloped private property areas). Private property should be protected by the private landholders and not the council, coastal areas are known to be dynamic, so owners should accept that risk.
Being a coastal community, the council should already be budgeting for preservation of its Coastline.
But I would like to see investment only in the preservation of the environment through cultural and environmental management. Infrastructure management should be done on a commercial level

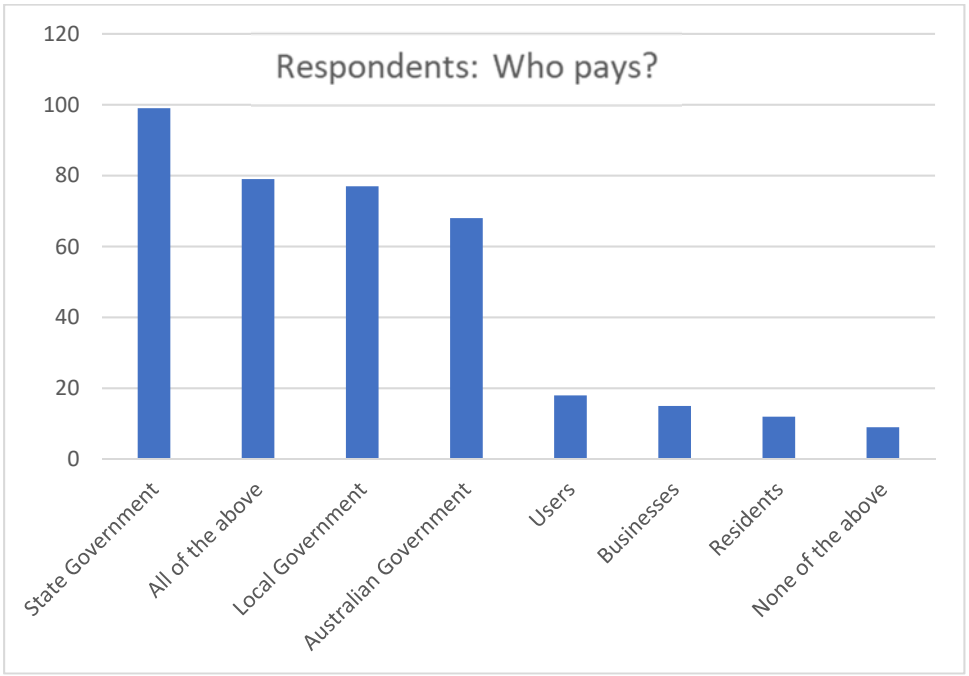
But whole City and all tourists also enjoy this coastal asset, so payment for protection should be State responsibility.
Can't pass on every cost to ratepayers
City of Albany can learn to budget and start saving now from our rates if they predict a loss of these places
Concerns with coastal erosion. Also, riparian areas need to be protected - are areas on the lower Kalgan and King rivers where landholders have cleared parts of the river reserves. Strong action needs to be taken to protect the health of the rivers and harbour.
Council should be protecting the areas through appropriate planning measures and reducing the impact of developments on these areas. If the sea rises so be it but the area shouldn't be reduced from development of residential or commercial properties or land use
Depending on how the City of Albany was spending funds. I see the natural environment as a priority
Don't pay rates - only rent
Fundraisers
Happy to pay to protect our
However, there is a broader issue here which is at the city of Albany has relatively high rates and provides relatively fewer resident services and comfortable councils
I am not sure how much effort should be put into maintaining natural assets. However, I would not like to see the City of Albany or any other agency supporting landowner's infrastructure impacted by rising sea levels. It will be a difficult balancing act.
I am surviving on a state pension and am unable to afford extra payments
I believe that if I want to enjoy living in Albany then I'm partly responsible for contributing towards its upkeep.
I believe that we pay for these in our rates now as these areas are for everyone - but I would not object to paying more to keep it out of the developer's hands.
I do through tax already.
I don't trust the council to utilize the money correctly.
I don't see this as a purely 'rate-payer' expense, it is a state and federal responsibility also - planning and environmental departments.
I guess rate money could go towards maintenance however I'd believe it is the responsibility of state and federal governments.
I only say yes because I use these areas, BUT, Visitors and Albany locals far outweigh residents in their use of these areas, so really it should be EVERYONE contribute via the local shire or State government.
I think that any developers in this area should pay for their own protection of their site. There is some responsibility from local, state, federal government to protect existing development, but if further beach side development occurs, developers must pay and pay for any damage to other parts of the environment
I would like to see what was planned before I committed to this idea.
I would pay a visitor pass to use EP and MB
I would prefer to see money spent on land resumption to allow sufficient space for natural coastal processes to occur as the sea level rises, rather than hard infrastructure to protect what is there now as it will require ongoing and increasing costs to maintain and may result in reduced public foreshore anyway.
I've always been happy to have my rates raised if it means the security of the shark barrier. I also want safe and beautiful park space.
if I live in the area that is my choice and I understand the risks and I should pay to for protection of my assets not others, ignorance is not an excuse
If I was able to afford it I would help pay
If the money goes into protection of this area!
It would depend on how the cost was implemented
It would depend on what that protection might be.
Just as many other beach locations are important
Local residents have some moral responsibility to support (financially or otherwise) The preservation of assets.
Needs proper research for any tech fix. Don't want wasted money.
Newly built facilities should have taken into account sea level rise and not expect others to pay for it
No one will agree to paying for the ongoing infrastructure associated with the uncertain level of coastal erosion.
No surf reef or development !!! Sick of all the development...need to prioritise the environment!!!!
No, I already pay rates which are high enough, what about the people who rent how are they paying for its protection?
Not a large amount but something affordable
Not a resident of Albany
Not in the position to do so
Pay does not have to be only financial. Volunteerism through forming a Coastcare group to ensure a healthy dune system is another form of payment. I would not be willing to pay for hard engineering structures or the protection of commercial/private assets.
Pensioner, not sufficient funds
Protecting certain assets i.e. the sea surf club or Three Anchors by way of sea wall implicates and impacts negatively on other assets i.e. the beach/coastal form and is costly to maintain. Efforts should be given to adapting to sea level rises by relocating assets inland creating incentive for private land owners land to be resumed, reserved and revegetated.
Protection plans designed and implemented over the next 5-10 years for a 100 year outcome would be investable.
Should form part of your annual council rates.
Should we pay for open spaces like parks to be maintained, or is this core business of local government?
Someone with no local knowledge or common sense made the decision to modify the shoreline with devastating results. Had the original storm damage been left it would have repaired as it had over many 20-25 yr cycles. The ongoing damage and failed attempts to correct those decisions should not be repeated nor paid for by local residence
The ability to walk and swim in such pristine conditions and in beautiful scenery is a valuable asset to all residents and tourists.
The City should better manage finances so as not to keep needing to put up rates.
The local council should make sure they don't put it at risk! Look after the environment first, before you look after tourists.
The only assets top 5 for me that are impacted in the 50 years are cafes. These buildings have a finite life and there are opportunities to retreat and build more appropriate cafes with views.
The suburb benefits from strong capital growth and proximity to the attractions of Middleton beach. I don't support paying for the already wealthy
The wasted opportunity to create a remedy has already been paid for by installing works that are contributing to the problem and preventing the depositing of sand onto the shoreline.
There is no coastal barrier that will protect against sea level rise...the costs will be prohibitive and this is best dealt with at national/transnational level. With no action on CO2 levels you can say goodbye to all of these low lying coastal assets and prepare for a vastly altered version of Albany in 2070.

There are only normal natural processes in action. Global warming is a farce and the sea levels are not rising.
This should be non-negotiable, and the City should NOT be making money out of people's local environment
This site is a key aspect of the city's sense of place and identity. It is the 'town beach' and a social hub as well as being the heart of the wider region in its wider context of the framing Mounts and Islands.
We can cycle to this area and that's really important
We pay enough rates, National Park fees and various licenses already, the council need to spend this money more wisely
Why should taxpayers pay for non-delivery of services by corrupt, incompetent government.
Would definitely pay to preserve the area. But emphasise BEACHES NOT BITUMEN.
Yes, in the future when I have money (I am only 12)

Question 10: Who do you think should pay for coastal erosion adaptation?

The following categories were provided to choose from:

Users
Residents
Businesses
Local Government
State Government
Australian Government
All of the above
None of the above

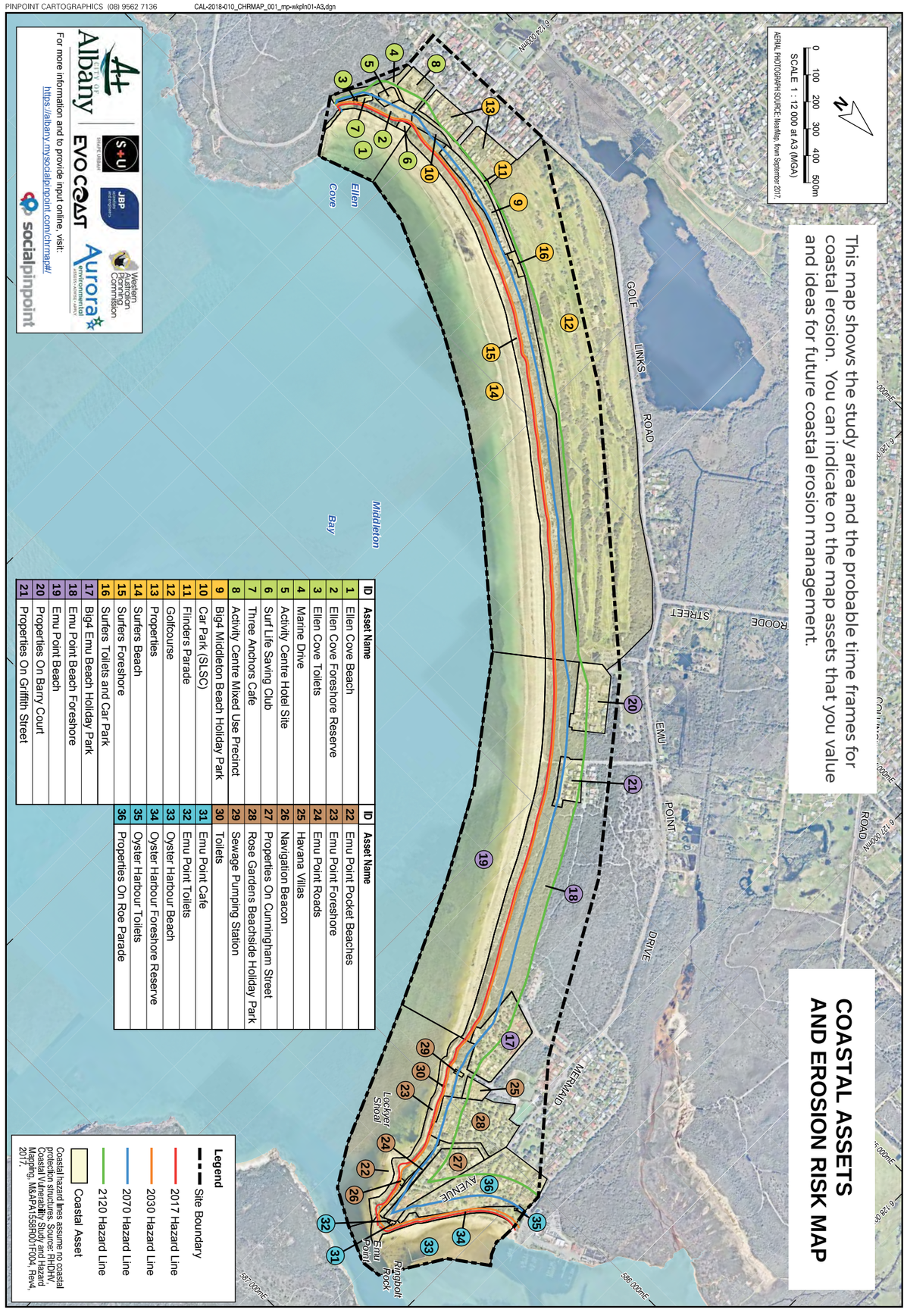


Response to Question: Do you have any comments regarding 'who pays'?
Response: I can easily access similar asset elsewhere
I believe any projects within the 50 year zone should require community consultation on a project by project basis. With funding opportunities and any user pays options included in the community consultation. In an older demographic with fixed incomes in the city and slow economic growth any potential user pays scenarios need long term planning and options for low income ratepayers.
I don't think an entry fee would be appropriate
Reversal of revetments and allow erosion points to re-establish
Response: Not willing to pay
All stages of government should prioritise these improvements
As stated, without global meaningful action on CO2 pollution there are no actions that can be implemented locally that will alter the course of events...do not waste rate/taxpayer's money on ugly infrastructure that will not even last 2 generations.
Ban on any development where erosion likely with de elopes paying for their own protection against erosion and large fines for any damage to environment
Federal Government as its a national/global problem.
I disagree with coastal erosion adaption.
It should just be looked after by residents and no changes need to be made to the area
It's a natural process. Adapt the planning to cater for it.
It's important that everyone is held responsible for what happens
Make it fair
Sue the polluters. And those who facilitated them.
The councillors and local government dept heads of the time who man those very poor decisions with very expensive and far reaching effects. If a private company made poor or negligent decisions in the same way with the same far reach effects on local property owners and the environment, the senior management would be liable.
We have already had to pay for the wrong solution because the various government staff did not take notice of those that had historical local knowledge. I grew up at Emu Point and I believe I have a good understanding of the environmental dynamics that maintained what used to be. You can refer to the minutes of the Emu Point Progress Association to confirm that local knowledge was ignored. I am not and have never been a member but I concur with that organisations remedy following the 1985 storms that led to the inappropriate solutions installed by contractors who profited handsomely from building the rock groins and walls that have continued to exacerbate the problem.

We have some of the world's highest taxes but get no services from corrupt incompetent government!
We pay enough in rates now
Response: Yes, willing to pay
A shared responsibility for preservation of the natural heritage / estate
Also, companies that profit from environmental change or that impact on those areas
As above, I believe primary responsibility for the environment should be state and federal government
As mentioned above, with rising sea levels, a lot of privately owned infrastructure/houses will be impacted and I don't think local government should be responsible.
As this is an environment issue I think it is the responsibility of the State and MAYBE the Fed Gov
Asset is public ownership available for anyone to use so cost should be borne by all
Coastal Environments effect locals and visitors, they should be maintained and managed by local/state government as it is a huge asset to all
Coastal Erosion is a world-wide problem - therefore everybody will be affected.
Cultural erosion impact on many Australians in one form or another. It's part of the bigger picture of climate change which needs to be dealt with by not just individuals but also government
Depends on the land tenure of the land impacted by coastal erosion. Local government need to be responsible for local governments area, State governments for crown reserves. For areas where there is a mixture of tenure, collaboration between state and local government and other relevant organisations will help develop and implement effective strategies.
Developers must also pay for proper studies and adaptation strategies to be properly implemented, including the ceding of land to ensure that enough future public foreshore remains, and government does not get pressured to protect private assets that should not have been built.
I do not think public funds should be used to protect assets such as the Middleton Beach Caravan Park.
I don't think it is right for residents or users to pay for somethings that is to protect the natural environment.
I think responsibility lays with all parties but should be managed by local and state government.
I would expect state and federal assistance
If people choose to live by the coast knowing coastal processes may erode their land then they need to contribute to the cost. Government funding should be used to protect areas for the community and for community use, not private land and use. It all comes down to why the work is being undertaken.
Interesting question. If the wealthy are buying property that will clearly, when not if, need management, that should be their burden- a Spencer Park resident should not pay for private land maintenance on the coast. If the land is parkland, then all local residence and government should help because we all have access.
It is an asset for the whole nation therefore all will pay through taxes.
It is everyone's responsibility to ensure the environment is protected and managed efficiently for all users for all generations
It is such a beautiful place, available to everyone. I do not think the local ratepayers should be responsible.
It should be a shared responsibility
It's a climate change issue that is wider than the local government area
Local - Minor, State/Federal – Major. We can all contribute to sustainable lifestyles. However State and Federal Governments must be leaders in providing manmade climate change solutions.
Local government are surely responsible for looking after the local assets.
Maybe apply a small levy for holiday accommodation and cafes to start to build up funds for erosion works. Particularly with the additional proposed developments in the Ellen Cove area.
Need infill to get more residents and ratepayers in
Our tax money, should be spent more wisely, and not wasted.
People that benefit and use the area this could be said to be almost all the population of Albany who in directly benefit from tourism that is attracted to Albany by its greatest asset
Should be state and federal Govt we already pay massive amounts of tax. They should stop spending our money on sports stadiums and Elizabeth quay!!!
Should be state government for amenity and federal government for tourism
Signs should also be put up to remind people not to walk on sand dunes vegetation e.g. with a fine in place
The rock groynes were put in by the local government which has only added to the erosion in the area therefore they should pay for the continued up keep and projection of the area.
These areas are used by many people not from the local area. The State benefits from these assets through recreation and local business. Most local governments do not have the financial capability to implement the required strategies and infrastructure programs to support protection
This is a community based issue and should be funded by the Government as the governing body of the community
Those that messed it up. The coast will change, it cannot be harnessed, work with the change
Users of the area are not exclusive to the local government area. State government tax would thus be more appropriate for protecting this coastal area as well as many others in WA.
We all enjoy the area for varied reasons it should be protected and managed by the whole of the City and beyond, for the benefit of all who visit it.
We are all responsible!
Who pays depends on what they are paying for, see comments above. There needs to be a focus on long term planning and progressive adaption, working with market forces as its a complex situation.
Who will take responsibility for the planning, decision making and investment?
Yes, as I said before, this is not just a resident's issue, - there are many more users of these areas than residents and I believe the majority of Albany would want to see Emu Point and Middleton Beach protected and maintained. These areas are unique, historical and iconic, not just to Albany, but to Western Australia as a whole, and to our Tourist Industry which is vital to Albany's economy.
You already receive rates and taxes. Use it better.

Question 11: Do you have any questions or comments about the CHRMAP process?

Like to retain our pristine environment as much as possible
I am concerned that sand has accumulated around the Midds jetty and it is increasingly shallow. Also appreciate seaweed clean ups several times a year but worry about why the seagrass is dying and getting beached.
Good advice from professional environmental people should be seriously considered.
Cultural rangers and park managers. Commercial development investing in the environmental sustainability of the coastal area that their customers come to see.
What are the options under consideration to attempt to arrest the erosion issues? Who is been considered to make further decisions relating to future plans for the area and why.
Do not repeat the damage that was done to Emu Point.
This process is a farce. If truly inclusive survey would be binding.
Please remember that we are not the Gold Coast and that we want to keep the area as pristine as possible. This area is one of the areas greatest assets.
Please incorporate protection and enhancement of the foreshore between Ellen Cove and the Surf Club and allow for the expansion of the Surf Club facility. Prefer no further development in the reserve between the beach and Emu Point Drive - retain natural dune system. Incorporate expansion / improvement of facilities at Surfers Beach, particularly if the Surf Reef is developed. Identify Three Anchors as a potential future redevelopment site - possible relocation of the surf club combined with mixed use commercial redevelopment inc bar, cafe
Well I don't know what your proposing yet.
Sea level rise and impact on beaches. Use of groins, sea walls are inevitable. Opportunities to start modelling them now.
I hope a number of land use / development options will be prepared for the community to comment on as this survey format (although commended) does not share the options and opportunities that may be identified, that will help the community decide what is appropriate. I would be happy to be on a voluntary working group or similar.
Would like to see this process make planning recommendations to assist with land use planning decisions, including LandCorp€™s latest development proposals at Middleton Beach.
Community consultation
The solution to Emu Point erosion is removal of all the rock walls
I would like to see the horse exercise area moved away from the beach ... too much manure left on the access path and the horses are doing huge damage to nesting area
All of my above comments please: In particular we all know there is going to be a large complex built at Middleton Beach soon, therefore it is in the interest of that investment to keep the 2 areas well maintained so that the Hotel etc are used to their fullest and not allowed to deteriorate due to lack of appeal.
Involve young people
I think coastal erosion is an important issue for all of Australia as the coastline here is the focal point for most Australians and tourists.
I suggest that artificial constructions like rock walls, sand bags and the removal of sand and trucking to the other end of the beach have all damaged the environment. All man-made structures should be removed to allow the natural flows of tides, waves and sand to do their work. Early photographic evidence shows the natural environment/conditions managed just fine. The ocean will always win because it is relentless.
Where else globally has there been similar mitigation planning?
This is a farce.
I think the hazard lines are not big enough. The effects of a rising sea level in Oyster Harbour where Yakamia Creek empties should be considered. There is very low-lying land from here all the way back to Lake Seppings which would be seriously compromised causing erosion back towards the beach. Lake Seppings used to empty into the ocean at Ellen Cove. This old water way could also be a further conduit for erosion. The Erosion at Emu Point was caused by the initial creation of a coffee rock wall through the channel. If council had listened to the older generation who had witnessed previous erosion and left it alone it would have regenerated as all the other beaches affected by the storm did. These walls have jeopardized the integrity of all of Middleton Beach.
The works at emu point and at Middleton Beach are well advanced in planning or implementation so I question what benefit this process will really have. By putting a hotel so close to the foreshore that is so expensive it forces a protectionist stance and negates other opportunities for coastal management. I hope your process takes a longer-term view.
Build light and out of wood in the area MU1 to MU5 because a) you will be contributing positively to global mitigation efforts and b) if we fail then the clean-up will be easier and recyclable
There has been many of these surveys. Surely an approach to fix the beach area has been established.
To date I am unimpressed with the work of the council. Rock walls, Bitumen, plastic fantastic playgrounds and rubbish art works. It needs better care.
The protection of the area through smart planning.
When are we going to have an artificial surf reef?
Enough money has been wasted on these rock walls, they haven't worked, engage in someone that knows what they are talking about or Middleton Beach will be one long ugly wall
Please keep businesses and residents that may be affected in the loop.
Effective solutions must work with coastal processes rather than trying to fight them. The more we try to engineer solutions the more it will cost and the higher risk of failure is. People always want to discount the future but sea level rise and change to the coast is inevitable - work with it rather than just trying to be politically popular and make the tough decisions sooner rather than later.
community engagement is key to achieving ownership of the plan and future outcomes, I welcome this opportunity to be involved and look forward to the process. I am concerned that there needs to be a balance between planning for worst case scenarios and what is economically feasible in the meantime, i.e. construction of a sea wall at Ellen Cove would fundamentally degrade the intrinsic values of this unique site and economically cripple the proposed development - there needs to be some common sense added to the risk-averse planning environment.
Yes, I want to be included



ID	Asset Name
1	Ellen Cove Beach
2	Ellen Cove Foreshore Reserve
3	Ellen Cove Toilets
4	Marine Drive
5	Activity Centre Hotel Site
6	Surf Life Saving Club
7	Three Anchors Cafe
8	Activity Centre Mixed Use Precinct
9	Big4 Middleton Beach Holiday Park
10	Car Park (SLSC)
11	Flinders Parade
12	Golfcourse
13	Properties
14	Surfers Beach
15	Surfers Foreshore
16	Surfers Toilets and Car Park
17	Big4 Emu Beach Holiday Park
18	Emu Point Beach Foreshore
19	Emu Point Beach
20	Properties On Barry Court
21	Properties On Griffith Street
22	Emu Point Pocket Beaches
23	Emu Point Foreshore
24	Emu Point Roads
25	Havana Villas
26	Navigation Beacon
27	Properties On Cunningham Street
28	Rose Gardens Beachside Holiday Park
29	Sewage Pumping Station
30	Toilets
31	Emu Point Cafe
32	Emu Point Toilets
33	Oyster Harbour Beach
34	Oyster Harbour Foreshore Reserve
35	Oyster Harbour Toilets
36	Properties On Roe Parade

EMU POINT TO MIDDLETON BEACH

COASTAL HAZARD RISK MANAGEMENT AND ADAPTATION PLAN (CHRMAP)

SURVEY

SURVEY OPEN: APRIL - JULY 2018

Andrew Halsall Photography

PLANNING FOR FUTURE COASTAL EROSION

The City of Albany invites you to help plan for management of future coastal erosion at Emu Point and Middleton Beach.

HOW YOU CAN BE INVOLVED

We want you to let us know about assets you value and what you think about long term management of coastal erosion. Assets include infrastructure, businesses, natural features, habitat, scenery, vistas, wide open spaces.

You can do this by:

1. Completing the survey overleaf
2. The attached map shows the study area and the probable time frames for coastal erosion. You can indicate on the map assets that you value and ideas for future coastal erosion management.

Later in the CHRMAP process, you'll have an opportunity to see ideas for possible future treatments, associated costs, trade offs and time frames for these coastal areas. You will be able to let us know how they fit in with your values.

If you would like to be added to our mailing list, please provide your email address:

Email: .....

If you would like to complete this survey electronically or for further information go to:

https://albany.mysocialpinpoint.com/chrmap

Or contact Emma Evans on:

emmae@albany.wa.gov.au

Phone: 6820 3015

Thank you for your time and input.

You can return this survey form to:

City of Albany Office - 102 North Road, Albany

or

PO Box 484, Albany WA 6331

This project is funded by the Western Australian Planning Commission through the Coastal Management Plan Assistance Scheme.

Western Australian Planning Commission

SURVEY - VALUED ASSETS

We are collecting the following information to ensure that we survey a broad cross section of stakeholders.

1. Can you please tell us your age group:

- ☐ up to 18
- ☐ 19 - 30
- ☐ 31 - 50
- ☐ 51 - 70
- ☐ 71+

2. Are you:

- ☐ Female
- ☐ Male
- ☐ Prefer not to say

3. What suburb locality do you live in?

4. What is your post code?

5. Do you associate as a user or non-user of Emu Point or Middleton Beach?

- ☐ User of Emu Point
- ☐ User of Middleton Beach
- ☐ I do not use these areas

Would you like to expand by commenting? If you use the area, is it for recreation, business, resident or other?

If you don't use the area... Why not?

6. Which of the following assets are most important to you?

(Limit to top 5). Assets can be tangible (e.g. infrastructure, businesses, natural features, habitat) or intangible (e.g. scenery, vistas, wide open spaces).

- ☐ Coastal scenery and vistas
- ☐ Attractive areas for locals and visitors
- ☐ Coastal vegetation and habitat
- ☐ Wide sandy beach
- ☐ Access to beach for swimming, walking
- ☐ Use of beach for surfing
- ☐ Cultural heritage
- ☐ Toilet blocks
- ☐ Ellen Cove Boardwalk
- ☐ Tourist Accommodation (e.g. Caravan Parks etc.)
- ☐ Access for horse exercising
- ☐ Viewing of wildlife (land and/or ocean)
- ☐ Ellen Cove Swimming Enclosure
- ☐ Ellen Cove: Picnic and playground area
- ☐ Emu Point: Picnic and playground areas
- ☐ Disability access points
- ☐ Dual use path
- ☐ Residential areas
- ☐ Cafes
- ☐ Local businesses
- ☐ Carparks and access points
- ☐ Surf Life Saving Club (Ellen Cove)

Other assets?

7. Based on your choices in Q6, what is important to you about the asset(s) identified? (e.g. recreation, business, intrinsic value, environment).

8. Would loss or modification of your favourite asset(s) impact on your life?

- ☐ Yes
- ☐ No
- ☐ I can easily access elsewhere

Other response?

9. If your valued asset(s) are at risk in the next 10 – 50 years, would you be willing to pay for its protection (e.g. through City of Albany rates, differential rating or other mechanisms)?

(Differential rates are different local government rates based on potential special requirements of a certain area)

- ☐ Yes
- ☐ No
- ☐ I can easily access similar asset elsewhere

Would you like to expand on your response?

10. Who do you think should pay for coastal erosion adaptation and management?

- ☐ Users
- ☐ Businesses
- ☐ Residents
- ☐ Local Government (through rates)
- ☐ State Government (through taxes or levies)
- ☐ Australian Government (through taxes or levies)
- ☐ All of the above
- ☐ None of the above

11. Do you have any questions or comments about the CHRMAP process that you would like to be considered?

APPENDIX E

Risk and Vulnerability Assessment Tables

#	Management Unit	Asset	Local Planning Scheme Zoning	Description	Potential Extent of Erosion						Likelihood of Erosion						Consequence of Erosion Partial Impact (<50% of asset impacted)				Consequence of Erosion Full Impact (>50% of asset impacted)					
					2017	2030	2050	2070	2090	2120	2017	2030	2050	2070	2090	2120	People Health & Safety	Social & Cultural	Property & Financial	Natural Environment	People Health & Safety	Social & Cultural	Property & Financial	Natural Environment	2017	2030
1	Ellen Cove	Beach	Parks & recreation	Sand area - includes volleyball courts, jetty, shark barrier, swimming pontoon.	Partial loss	Partial loss	Partial loss	Partial loss	Partial loss	Partial loss	Possible	Likely	Almost certain	Almost certain	Almost certain	Almost certain	Insignificant	Major	Insignificant	Insignificant	N/A	N/A	N/A	N/A	Major	Major
1	Ellen Cove	Foreshore Reserve	Parks & Recreation SU25 Special use area (Public Open Space)	Park area south from SLSC to jetty. Incorporates area of public open space identified in TPS SU25. Includes – grassed areas, retic, playground, amphitheatre, lighting, utilities water, showers, bbqs, mature trees, shared pathway, stormwater drainage, portion of Flinders Pd.	Partial loss	Partial loss	Partial loss	Partial loss	Full loss	Full loss	***	***	***	Almost certain	Almost certain	Almost certain	Insignificant	Major	Major	Moderate	Insignificant	Severe	Major	Moderate	Major	Major
1	Ellen Cove	Toilets	Parks & recreation	Toilet block		Partial loss - impacts on building	Partial loss ~50%	Full loss	Full loss	Full loss	***	***	***	Almost certain	Almost certain	Almost certain	N/A	N/A	N/A	N/A	Insignificant	Moderate	Moderate	Insignificant	Moderate	Moderate
1	Ellen Cove	Three Anchors	Parks & recreation	Café/restaurant			Partial loss ~50m	Partial loss ~135m	Partial loss ~180m	Partial loss ~250m	***	***	***	Likely	Almost certain	Almost certain	N/A	N/A	N/A	N/A	Insignificant	Severe	Major	Insignificant	Severe	Severe
1	Ellen Cove	Marine Dr/Adelaide Cr	Priority road	Road - includes street lighting, adjacent car park				Partial loss	Partial loss	Full loss	-	***	***	Possible	Likely	Almost certain	Insignificant	Major	Major	Insignificant	Insignificant	Severe	Severe	Insignificant	Major	Major
1	Ellen Cove	MBAC Hotel/Mixed Use	SU25 Special use area (Hotel / Mixed Use Precinct)	Proposed hotel site					Partial loss	Partial loss	-	-	***	Unlikely	Possible	Likely	N/A	N/A	N/A	N/A	Insignificant	Severe	Severe	Insignificant	Severe	Severe
1	Ellen Cove	MBAC Mixed Use	SU25 Special use area (Mixed Use Precinct)	Proposed development site						Partial loss	-	-	-	Rare	Unlikely	Possible	N/A	N/A	N/A	N/A	Insignificant	Severe	Severe	Insignificant	Severe	Severe
1	Ellen Cove	Albany Surf Life Saving Club	Parks & recreation	Surf life saving club							***	***	***	Almost certain	Almost certain	Almost certain	N/A	N/A	N/A	N/A	Insignificant	Severe	Major	Insignificant	Severe	Severe
2	Surfers & Golf Course	Beach	Parks & recreation	Sand area	Full loss	Full loss	Partial loss	Partial loss	Partial loss	Partial loss	Possible	Likely	Almost certain	Almost certain	Almost certain	Almost certain	Insignificant	Moderate	Insignificant	Insignificant	N/A	N/A	N/A	N/A	Moderate	Moderate
2	Surfers & Golf Course	Foreshore reserve	Parks & recreation	Park area north of SLSC and established dunes. Includes: grassed area, established tress, lighting, water, bbq, park furniture, dual use path, established dunes, access paths, viewing decks.	Partial loss	Partial loss	Partial loss	Partial loss	Full loss	Full loss	Possible	Likely	Almost certain	Almost certain	Almost certain	Almost certain	Insignificant	Moderate	Insignificant	Moderate	Insignificant	Major	Insignificant	Major	Moderate	Moderate
2	Surfers & Golf Course	Car park (SLSC)	Parks & recreation	Large car park adjacent to SLSC		Partial loss ~ 9 bays	Partial loss ~52 bays	Partial loss ~103 bays	Full loss ~162 bays	Full loss	Unlikely	Possible	Likely	Almost certain	Almost certain	Almost certain	Insignificant	Moderate	Moderate	Insignificant	Insignificant	Major	Major	Insignificant	Moderate	Moderate
2	Surfers & Golf Course	Properties between Barrett St to Middleton Rd	R60/R80 Tourist residential	Mixture of residential and tourist properties						Full - loss of road access, water & power connection, and partial loss of lots	-	-	-	Rare	Unlikely	Possible	N/A	N/A	N/A	N/A	Insignificant	Severe	Severe	Insignificant	Severe	Severe
2	Surfers & Golf Course	Properties between north of Middleton Road	R60/R80 Tourist residential	Mixture of residential and tourist properties						Full - loss of road access, water & power connection, and partial loss of lots	-	-	-	Rare	Unlikely	Possible	N/A	N/A	N/A	N/A	Insignificant	Severe	Severe	Insignificant	Severe	Severe
2	Surfers & Golf Course	BIG4 Middleton Beach Holiday Park	Caravan and camping	Caravan park with chalets			Partial loss - buildings impacted	Partial loss - buildings impacted	Full loss	Full loss	Rare	Unlikely	Possible	Likely	Almost Certain	Almost certain	Insignificant	Minor	Moderate	Insignificant	Insignificant	Moderate	Major	Insignificant	Moderate	Moderate
2	Surfers & Golf Course	Flinders Parade (north)	Local road, parks & recreation	Barnett St northwards. Includes street lighting power and water utilities.					Partial loss ~60m	Full loss	-	-	-	Rare	Unlikely	Possible	N/A	N/A	N/A	N/A	Insignificant	Severe	Major	Insignificant	Severe	Severe
2	Surfers & Golf Course	Car park (Surfers)	Parks & recreation	Car park at Surfers						Full loss	-	-	-	Rare	Unlikely	Possible	N/A	N/A	N/A	N/A	Insignificant	Moderate	Minor	Insignificant	Moderate	Moderate
2	Surfers & Golf Course	Toilets (Surfers)	Parks & recreation	Toilets at Surfers					Full loss	Full loss	-	-	Rare	Unlikely	Possible	Likely	N/A	N/A	N/A	N/A	Insignificant	Minor	Minor	Insignificant	Minor	Minor
2	Surfers & Golf Course	Golf Course	Parks & recreation	Heritage listed golf course						Partial loss - does not impact on club building	-	-	-	Rare	Unlikely	Possible	N/A	Minor	Minor	N/A	N/A	N/A	N/A	N/A	Minor	Minor
3	Emu Point Beach	Beach	Parks & recreation	Sand area							Possible	Likely	Almost certain	Almost certain	Almost certain	Almost certain	Insignificant	Moderate	Insignificant	Insignificant	N/A	N/A	N/A	N/A	Moderate	Moderate
3	Emu Point Beach	Foreshore reserve	Parks & recreation	Established dunes and bush, Western Ringtail Possum habitat. Includes dual use path.							Possible	Likely	Almost certain	Almost certain	Almost certain	Almost certain	Insignificant	Moderate	Insignificant	Moderate	Insignificant	Major	Insignificant	Major	Moderate	Moderate
3	Emu Point Beach	Properties on Barry Court	R30/R50 Tourist residential, Hotel/motel	Mixture of residential and tourist developed land and undeveloped lots. Includes local roads and utilities within the road reserve.					Partial loss ~16 lots	Partial loss ~29 lots	-	-	Rare	Unlikely	Possible	Likely	Insignificant	Severe	Major	Insignificant	Insignificant	Severe	Severe	Insignificant	Severe	Severe
3	Emu Point Beach	Properties on Griffith Street	R17.5 Residential	Residential buildings. Includes local roads and utilities within the road reserve.				Partial - loss of road access, power & water	Partial loss ~5 lots	Partial loss ~11 lots	-	Rare	Unlikely	Possible	Likely	Almost Certain	Insignificant	Severe	Major	Insignificant	Insignificant	Severe	Severe	Insignificant	Severe	Severe
3	Emu Point Beach	Developable land	Rural small lot holdings	Site of proposed Landcorp subdivision			Partial loss	Partial loss	Partial loss	Partial loss	Rare	Unlikely	Possible	Likely	Almost certain	Almost certain	Insignificant	Minor	Minor	Insignificant	N/A	N/A	N/A	N/A	Minor	Minor
3	Emu Point Beach	Emu Beach Holiday Park	Tourist residential	Caravan park with chalets			Partial - small corner of lot	Partial loss	Full - buildings impacted	Full - buildings impacted	Rare	Unlikely	Possible	Likely	Almost certain	Almost certain	Insignificant	Minor	Moderate	Insignificant	Insignificant	Moderate	Major	Insignificant	Moderate	Moderate
4	Emu Point	Beach	Parks & recreation	Artificial beach formed by the detached breakwater	Full loss	Full loss	Full loss	Full loss	Full loss	Full loss	***	***	Almost certain	Almost certain	Almost certain	Almost certain	Insignificant	Moderate	Insignificant	Insignificant	Insignificant	Moderate	Insignificant	Insignificant	Moderate	Moderate
4	Emu Point	Foreshore reserve (northeast)	Parks & recreation	Includes grassed area, shared path playground, parking, portion of Boongarrie St, local utilities (power and water).	Partial loss	Partial loss	Full loss	Full loss	Full loss	Full loss	***	***	Almost certain	Almost certain	Almost certain	Almost certain	Insignificant	Moderate	Insignificant	Insignificant	Insignificant	Moderate	Insignificant	Insignificant	Moderate	Moderate
4	Emu Point	Foreshore reserve (southwest)	Parks & recreation	Includes grassed area, shared path playground, parking, portion of Boongarrie St, local utilities (power and water).	Partial loss	Partial loss	Full loss	Full loss	Full loss	Full loss	***	Likely	Almost certain	Almost certain	Almost certain	Almost certain	Insignificant	Moderate	Insignificant	Insignificant	Insignificant	Moderate	Insignificant	Insignificant	Moderate	Moderate
4	Emu Point	Toilets	Parks & recreation	Toilets behind revetment seawall	Full loss	Full loss	Full loss	Full loss	Full loss	Full loss	***	Likely	Almost Certain	Almost Certain	Almost Certain	Almost Certain	Insignificant	Moderate	Insignificant	Insignificant	Insignificant	Moderate	Insignificant	Insignificant	Moderate	Moderate
4	Emu Point	Firth St Pumping Station	Parks & recreation	Sewage pumping station					Full loss	Full loss	-	-	Rare	Unlikely	Possible	Likely	N/A	N/A	N/A	N/A	Insignificant	Insignificant	Major	Insignificant	Major	Major
4	Emu Point	Rose Gardens Beachside Holiday Park	Tourist residential	Caravan park with chalets		Partial loss <50%	Partial loss <50%	Partial loss <50%	Partial loss <50%	Partial loss <50%	***	Possible	Likely	Almost Certain	Almost Certain	Almost Certain	Insignificant	Minor	Moderate	Insignificant	N/A	N/A	N/A	N/A	Moderate	Moderate
4	Emu Point	Properties on Cunningham St	R20 Residential, Local road	Residential buildings and portion of Cunningham St, Boongarrie St Burgess Street, Includes local roads and utilities within the road reserve.			Loss of access and utilities, ~110m of road	Partial loss of 5 lots, loss of buildings, access and utilities, ~230m of road	Partial loss of 13 lots, loss of buildings, access and utilities, ~420m of road	Full ~16 lots, loss of buildings, access and utilities, ~470m of road	***	***	Possible	Likely	Almost Certain	Almost certain	Insignificant	Major	Moderate	Insignificant	Insignificant	Severe	Severe	Insignificant	Major	Major
4	Emu Point	Navigation Beacon	Port industry	Navigation mark, major light	Partial loss of lot	Full loss of beacon	Full loss of lot	Full loss of lot	Full loss of lot	Full loss of lot	***	***	Almost certain	Almost certain	Almost certain	Almost certain	N/A	N/A	Minor	N/A	N/A	N/A	Moderate	N/A	Minor	Moderate
5	Oyster Harbour Beach	Oyster Harbour	Registered Aboriginal Site	Mythological site							Possible	Likely	Almost certain	Almost certain	Almost certain	Almost certain	Insignificant	Moderate	Insignificant	Insignificant	N/A	N/A	N/A	N/A	Moderate	Moderate
5	Oyster Harbour Beach	Beach (northwest)	Parks & recreation	Northwest portion of the beach, includes vehicle access area.	Full loss	Full loss	Full loss	Full loss	Full loss	Full loss	Possible	Likely	Almost certain	Almost certain	Almost certain	Almost certain	Insignificant	Moderate	Insignificant	Insignificant	N/A	N/A	N/A	N/A	Moderate	Moderate

#	Management Unit	Asset	Local Planning Scheme Zoning	Description	Potential Extent of Erosion						Likelihood of Erosion						Consequence of Erosion Partial Impact (<50% of asset impacted)				Consequence of Erosion Full Impact (>50% of asset impacted)					
					2017	2030	2050	2070	2090	2120	2017	2030	2050	2070	2090	2120	People Health & Safety	Social & Cultural	Property & Financial	Natural Environment	People Health & Safety	Social & Cultural	Property & Financial	Natural Environment	2017	2030
5	**Oyster Harbour Beach**	**Beach (southeast)**	Parks & recreation	Southwest portion of the beach, defined as the area where vehicle access is not permitted. Includes swimming jetties.	Full loss	Full loss	Full loss	Full loss	Full loss	Full loss	Possible	Likely	Almost certain	Almost certain	Almost certain	Almost certain	Insignificant	Major	Insignificant	Insignificant	N/A	N/A	N/A	N/A	Major	Major
5	**Oyster Harbour Beach**	**Foreshore reserve (nortwest)**	Parks & recreation	Northern portion of foreshore reserve seaward of the existing grouted vertical rock wall. Includes grassed area, bbqs, lighting, water, navigation aids.	Partial loss	Partial loss	Partial loss	Full loss	Full loss	Full loss	***	***	Almost certain	Almost certain	Almost certain	Almost certain	Insignificant	Minor	Minor	Insignificant	Insignificant	Minor	Minor	Insignificant	Minor	Minor
5	**Oyster Harbour Beach**	**Foreshore reserve (southeast)**	Parks & recreation	Southern portion of foreshore reserve landward of the existing grouted vertical rock wall. Includes grassed area, playground, lighting, water, turn around and parking at the end of the Cunningham St.	Partial loss	Partial loss	Partial loss	Full loss	Full loss	Full loss	***	***	Almost certain	Almost certain	Almost certain	Almost certain	Insignificant	Major	Major	Insignificant	Insignificant	Major	Major	Insignificant	Major	Major
5	**Oyster Harbour Beach**	**Emu Point Café**	SU14 Restaurant, convenience Store, Parks & recreation	Café including toilets			Partial loss - building impacted	Full loss	Full loss	Full loss	***	***	Possible	Likely	Almost Certain	Almost certain	N/A	N/A	N/A	N/A	Insignificant	Major	Moderate	Insignificant	Major	Major
5	**Oyster Harbour Beach**	**Properties on Roe Parade**	R20 Residential, Local road	Residential buildings and portion of Roe Parade, Mermaid Ave, Hunter St, Bedwell St. Includes utilities within the road reserve (power, water, sewage).			Full loss, multiple lots, road ~340m	Full loss, multiple lots, road ~490m	Full loss, multiple lots, road ~600m	Full loss, multiple lots, road ~740m	***	***	Possible	Likely	Almost Certain	Almost certain	N/A	N/A	N/A	N/A	Insignificant	Severe	Severe	Insignificant	Severe	Severe
5	**Oyster Harbour Beach**	**Toilets (near boat pens)**	Parks & recreation	Toilets at the end of Bendwell St				Full loss	Full loss	Full loss	-	***	Unlikely	Possible	Likely	Almost Certain	N/A	N/A	N/A	N/A	Insignificant	Minor	Minor	Insignificant	Minor	Minor

#	Management Unit	Asset	Local Planning Scheme Zoning	Description	Consequence of Erosion				Erosion Risk						Adaptive Capacity to Erosion	Erosion Vulnerability					
					2050	2070	2090	2120	2017	2030	2050	2070	2090	2120		2017	2030	2050	2070	2090	2120
1	Ellen Cove	Beach	Parks & recreation	Sand area - includes volleyball courts, jetty, shark barrier, swimming pontoon.	Major	Major	Major	Major	High	High	Extreme	Extreme	Extreme	Extreme	Very Low	Extreme	Extreme	Extreme	Extreme	Extreme	Extreme
1	Ellen Cove	Foreshore Reserve	Parks & Recreation SU25 Special use area (Public Open Space)	Park area south from SLSC to jetty. Incorporates area of public open space identified in TPS SU25. Includes – grassed areas, retic, playground, amphitheatre, lighting, utilities water, showers, bbqs, mature trees, shared pathway, stormwater drainage, portion of Flinders Pd.	Major	Major	Severe	Severe	-	-	-	Extreme	Extreme	Extreme	Moderate	-	-	-	Extreme	Extreme	Extreme
1	Ellen Cove	Toilets	Parks & recreation	Toilet block	Moderate	Moderate	Moderate	Moderate	-	-	-	High	High	High	Very Low	-	-	-	Extreme	Extreme	Extreme
1	Ellen Cove	Three Anchors	Parks & recreation	Café/restaurant	Severe	Severe	Severe	Severe	-	-	-	Extreme	Extreme	Extreme	Very Low	-	-	-	Extreme	Extreme	Extreme
1	Ellen Cove	Marine Dr/Adelaide Cr	Priority road	Road - includes street lighting, adjacent car park	Major	Major	Major	Severe	-	-	-	High	High	Extreme	High	-	-	-	Medium	Medium	High
1	Ellen Cove	MBAC Hotel/Mixed Use	SU25 Special use area (Hotel / Mixed Use Precinct)	Proposed hotel site	Severe	Severe	Severe	Severe	-	-	-	High	High	Extreme	Very Low	-	-	-	Extreme	Extreme	Extreme
1	Ellen Cove	MBAC Mixed Use	SU25 Special use area (Mixed Use Precinct)	Proposed development site	Severe	Severe	Severe	Severe	-	-	-	Medium	Medium	High	Very Low	-	-	-	Extreme	Extreme	Extreme
1	Ellen Cove	Albany Surf Life Saving Club	Parks & recreation	Surf life saving club	Severe	Severe	Severe	Severe	-	-	-	Extreme	Extreme	Extreme	Very Low	-	-	-	Extreme	Extreme	Extreme
2	Surfers & Golf Course	Beach	Parks & recreation	Sand area	Moderate	Moderate	Moderate	Moderate	Medium	High	High	High	High	High	High	Low	Medium	Medium	Medium	Medium	Medium
2	Surfers & Golf Course	Foreshore reserve	Parks & recreation	Park area north of SLSC and established dunes. Includes: grassed area, established tress, lighting, water, bbq, park furniture, dual use path, established dunes, access paths, viewing decks.	Moderate	Moderate	Major	Major	Medium	High	High	High	Extreme	Extreme	Moderate	Medium	High	High	High	Extreme	Extreme
2	Surfers & Golf Course	Car park (SLSC)	Parks & recreation	Large car park adjacent to SLSC	Moderate	Moderate	Major	Major	Medium	Medium	High	High	Extreme	Extreme	High	Low	Low	Medium	Medium	High	High
2	Surfers & Golf Course	Properties between Barrett St to Middleton Rd	R60/R80 Tourist residential	Mixture of residential and tourist properties	Severe	Severe	Severe	Severe	-	-	-	Medium	High	High	Very Low	-	-	-	Extreme	Extreme	Extreme
2	Surfers & Golf Course	Properties between north of Middleton Road	R60/R80 Tourist residential	Mixture of residential and tourist properties	Severe	Severe	Severe	Severe	-	-	-	Medium	High	High	Very Low	-	-	-	Extreme	Extreme	Extreme
2	Surfers & Golf Course	BIG4 Middleton Beach Holiday Park	Caravan and camping	Caravan park with chalets	Moderate	Moderate	Major	Major	Low	Medium	Medium	High	Extreme	Extreme	Low	Medium	High	High	Extreme	Extreme	Extreme
2	Surfers & Golf Course	Flinders Parade (north)	Local road, parks & recreation	Barnett St northwards. Includes street lighting power and water utilities.	Severe	Severe	Severe	Severe	-	-	-	Medium	High	High	Low	-	-	-	High	Extreme	Extreme
2	Surfers & Golf Course	Car park (Surfers)	Parks & recreation	Car park at Surfers	Moderate	Moderate	Moderate	Moderate	-	-	-	Low	Medium	Medium	High	-	-	-	Low	Low	Low
2	Surfers & Golf Course	Toilets (Surfers)	Parks & recreation	Toilets at Surfers	Minor	Minor	Minor	Minor	-	-	Low	Low	Medium	Medium	Very Low	-	-	High	Extreme	Extreme	Extreme
2	Surfers & Golf Course	Golf Course	Parks & recreation	Heritage listed golf course	Minor	Minor	Minor	Minor	-	-	-	Low	Low	Low	Very High	-	-	-	Low	Low	Low
3	Emu Point Beach	Beach	Parks & recreation	Sand area	Moderate	Moderate	Moderate	Moderate	Medium	High	High	High	High	High	High	Low	Medium	Medium	Medium	Medium	Medium
3	Emu Point Beach	Foreshore reserve	Parks & recreation	Established dunes and bush, Western Ringtail Possum habitat. Includes dual use path.	Moderate	Moderate	Major	Major	Medium	High	High	High	Extreme	Extreme	Moderate	Medium	High	High	High	Extreme	Extreme
3	Emu Point Beach	Properties on Barry Court	R30/R50 Tourist residential, Hotel/motel	Mixture of residential and tourist developed land and undeveloped lots. Includes local roads and utilities within the road reserve.	Severe	Severe	Severe	Severe	-	-	Medium	High	High	Extreme	Very Low	-	-	Extreme	Extreme	Extreme	Extreme
3	Emu Point Beach	Properties on Griffith Street	R17.5 Residential	Residential buildings. Includes local roads and utilities within the road reserve.	Severe	Severe	Severe	Severe	-	Medium	High	High	Extreme	Extreme	Very Low	-	Extreme	Extreme	Extreme	Extreme	Extreme
3	Emu Point Beach	Developable land	Rural small lot holdings	Site of proposed Landcorp subdivision	Minor	Minor	Minor	Minor	Low	Low	Low	Low	Medium	Medium	Very High	Low	Low	Low	Low	Low	Low
3	Emu Point Beach	Emu Beach Holiday Park	Tourist residential	Caravan park with chalets	Moderate	Moderate	Major	Major	Low	Medium	Medium	High	Extreme	Extreme	High	Low	Low	Low	Medium	High	High
4	Emu Point	Beach	Parks & recreation	Artificial beach formed by the detached breakwater	Moderate	Moderate	Moderate	Moderate	-	-	High	High	High	High	Moderate	-	-	High	High	High	High
4	Emu Point	Foreshore reserve (northeast)	Parks & recreation	Includes grassed area, shared path playground, parking, portion of Boongarrie St, local utilities (power and water).	Moderate	Moderate	Moderate	Moderate	-	-	High	High	High	High	Low	-	-	Extreme	Extreme	Extreme	Extreme
4	Emu Point	Foreshore reserve (southwest)	Parks & recreation	Includes grassed area, shared path playground, parking, portion of Boongarrie St, local utilities (power and water).	Moderate	Moderate	Moderate	Moderate	-	High	High	High	High	High	Low	-	Extreme	Extreme	Extreme	Extreme	Extreme
4	Emu Point	Toilets	Parks & recreation	Toilets behind revetment seawall	Moderate	Moderate	Moderate	Moderate	-	High	High	High	High	High	Very Low	-	Extreme	Extreme	Extreme	Extreme	Extreme
4	Emu Point	Firth St Pumping Station	Parks & recreation	Sewage pumping station	Major	Major	Major	Major	-	-	Low	Medium	High	High	Very Low	-	-	High	Extreme	Extreme	Extreme
4	Emu Point	Rose Gardens Beachside Holiday Park	Tourist residential	Caravan park with chalets	Moderate	Moderate	Moderate	Moderate	-	Medium	High	High	High	High	High	-	Low	Medium	Medium	Medium	Medium
4	Emu Point	Properties on Cunningham St	R20 Residential, Local road	Residential buildings and portion of Cunningham St, Boongarrie St Burgess Street, Includes local roads and utilities within the road reserve.	Major	Severe	Severe	Severe	-	-	High	Extreme	Extreme	Extreme	Very Low	-	-	Extreme	Extreme	Extreme	Extreme
4	Emu Point	Navigation Beacon	Port industry	Navigation mark, major light	Moderate	Moderate	Moderate	Moderate	-	-	High	High	High	High	Moderate	-	-	High	High	High	High
5	Oyster Harbour Beach	Oyster Harbour	Registered Aboriginal Site	Mythological site	Moderate	Moderate	Moderate	Moderate	Medium	Medium	High	High	High	High	Moderate	Medium	Medium	High	High	High	High
5	Oyster Harbour Beach	Beach (northwest)	Parks & recreation	Northwest portion of the beach, includes vehicle access area.	Moderate	Moderate	Moderate	Moderate	Medium	Medium	High	High	High	High	Very Low	Extreme	Extreme	Extreme	Extreme	Extreme	Extreme

#	Management Unit	Asset	Local Planning Scheme Zoning	Description	Consequence of Erosion				Erosion Risk						Adaptive Capacity to Erosion	Erosion Vulnerability					
					2050	2070	2090	2120	2017	2030	2050	2070	2090	2120		2017	2030	2050	2070	2090	2120
5	**Oyster Harbour Beach**	**Beach (southeast)**	Parks & recreation	Southwest portion of the beach, defined as the area where vehicle access is not permitted. Includes swimming jetties.	Major	Major	Major	Major	High	High	Extreme	Extreme	Extreme	Extreme	Very Low	Extreme	Extreme	Extreme	Extreme	Extreme	Extreme
5	**Oyster Harbour Beach**	**Foreshore reserve (nortwest)**	Parks & recreation	Northern portion of foreshore reserve seaward of the existing grouted vertical rock wall. Includes grassed area, bbqs, lighting, water, navigation aids.	Minor	Minor	Minor	Minor	Medium	Medium	High	High	High	High	Low	-	-	Extreme	Extreme	Extreme	Extreme
5	**Oyster Harbour Beach**	**Foreshore reserve (southeast)**	Parks & recreation	Southern portion of foreshore reserve landward of the existing grouted vertical rock wall. Includes grassed area, playground, lighting, water, turn around and parking at the end of the Cunningham St.	Major	Major	Major	Major	High	High	Extreme	Extreme	Extreme	Extreme	Very Low	-	-	Extreme	Extreme	Extreme	Extreme
5	**Oyster Harbour Beach**	**Emu Point Café**	SU14 Restaurant, convenience Store, Parks & recreation	Café including toilets	Major	Major	Major	Major	Low	Medium	High	Extreme	Extreme	Extreme	Very Low	-	-	Extreme	Extreme	Extreme	Extreme
5	**Oyster Harbour Beach**	**Properties on Roe Parade**	R20 Residential, Local road	Residential buildings and portion of Roe Parade, Mermaid Ave, Hunter St, Bedwell St. Includes utilities within the road reserve (power, water, sewage).	Severe	Severe	Severe	Severe	Medium	High	High	Extreme	Extreme	Extreme	Very Low	-	-	Extreme	Extreme	Extreme	Extreme
5	**Oyster Harbour Beach**	**Toilets (near boat pens)**	Parks & recreation	Toilets at the end of Bendwell St	Minor	Minor	Minor	Minor	-	Low	Low	Medium	Medium	High	Very Low	-	-	Extreme	Extreme	Extreme	Extreme

#	Management Unit	Asset	Local Planning Scheme Zoning	Description	Likelihood of Inundation						Consequence of Inundation (Temporary)				Consequence of Inundation	Risk of Inundation						Adaptive Capacity to Inundation	Inundation Vulnerability					
					2017	2030	2050	2070	2090	2120	People Health & Safety	Social & Cultural	Property & Financial	Natural Environment	2120	2017	2030	2050	2070	2090	2120		2017	2030	2050	2070	2090	2120
1	Ellen Cove	Beach	Parks & recreation	Sand area - includes volleyball courts, jetty, shark barrier, swimming pontoon.	Possible	Likely	Almost Certain	Almost certain	Almost certain	Almost certain	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	Low	Low	Medium	Medium	Medium	Medium	Very High	Low	Low	Low	Low	Low	Low
1	Ellen Cove	Foreshore Reserve	Parks & Recreation SU25 Special use area (Public Open Space)	Park area south from SLSC to jetty. Incorporates area of public open space identified in TPS SU25. Includes – grassed areas, retic, playground,		Rare	Unlikely	Possible	Likely	Almost Certain	Moderate	Minor	Insignificant	Insignificant	Moderate	-	Low	Medium	Medium	High	High	Very High	-	Low	Low	Low	Low	Low
1	Ellen Cove	Toilets	Parks & recreation	Toilet block			Rare	Unlikely	Possible	Likely	Insignificant	Insignificant	Minor	Minor	Minor	-	-	Low	Low	Medium	Medium	Low	-	-	Medium	Medium	High	High
1	Ellen Cove	Three Anchors	Parks & recreation	Café/restaurant			Rare	Unlikely	Possible	Likely	Minor	Minor	Moderate	Insignificant	Moderate	-	-	Low	Medium	Medium	High	Low	-	-	Medium	High	High	Extreme
1	Ellen Cove	Marine Dr/Adelaide Cr	Priority road	Road - includes street lighting, adjacent car park																								
1	Ellen Cove	MBAC Hotel/Mixed Use	SU25 Special use area (Hotel / Mixed Use Precinct)	Proposed hotel site																								
1	Ellen Cove	MBAC Mixed Use	SU25 Special use area (Mixed Use Precinct)	Proposed development site																								
1	Ellen Cove	Albany Surf Life Saving Club	Parks & recreation	Surf life saving club				Rare	Unlikely	Possible	Insignificant	Minor	Moderate	Insignificant	Moderate	-	-	-	Low	Medium	Medium	Low	-	-	-	Medium	High	High
2	Surfers & Golf Course	Beach	Parks & recreation	Sand area	Possible	Likely	Almost Certain	Almost certain	Almost certain	Almost certain	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	Medium	Medium	Medium	Medium	Medium	Medium	Very High	Low	Low	Low	Low	Low	Low
2	Surfers & Golf Course	Foreshore reserve	Parks & recreation	Park area north of SLSC and established dunes. Includes: grassed area, established tress, lighting, water, bbq, park furniture, dual use path, established dunes, access paths, viewing decks.				Rare	Unlikely	Possible	Moderate	Minor	Insignificant	Insignificant	Moderate	-	-	-	Low	Medium	Medium	Very High	-	-	-	Low	Low	Low
2	Surfers & Golf Course	Car park (SLSC)	Parks & recreation	Large car park adjacent to SLSC				Rare	Unlikely	Possible	Insignificant	Minor	Moderate	Insignificant	Moderate	-	-	-	Low	Medium	Medium	High	-	-	-	Low	Low	Low
2	Surfers & Golf Course	Properties between Barrett St to Middleton Rd	R60/R80 Tourist residential	Mixture of residential and tourist properties				Rare	Unlikely	Possible	Major	Moderate	Minor	Insignificant	Major	-	-	-	Low	Medium	High	High	-	-	-	Low	Low	Medium
2	Surfers & Golf Course	Properties between north of Middleton Road	R60/R80 Tourist residential	Mixture of residential and tourist properties							N/A	N/A	N/A	N/A														
2	Surfers & Golf Course	BIG4 Middleton Beach Holiday Park	Caravan and camping	Caravan park with chalets							N/A	N/A	N/A	N/A														
2	Surfers & Golf Course	Flinders Parade (north)	Local road, parks & recreation	Barnett St northwards. Includes street lighting power and water utilities.							N/A	N/A	N/A	N/A														
2	Surfers & Golf Course	Car park (Surfers)	Parks & recreation	Car park at Surfers							N/A	N/A	N/A	N/A														
2	Surfers & Golf Course	Toilets (Surfers)	Parks & recreation	Toilets at Surfers							N/A	N/A	N/A	N/A														
2	Surfers & Golf Course	Golf Course	Parks & recreation	Heritage listed golf course							N/A	N/A	N/A	N/A														
3	Emu Point Beach	Beach	Parks & recreation	Sand area	Possible	Likely	Almost Certain	Almost certain	Almost certain	Almost certain	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	Medium	Medium	Medium	Medium	Medium	Medium	Very High	Low	Low	Low	Low	Low	Low
3	Emu Point Beach	Foreshore reserve	Parks & recreation	Established dunes and bush, Western Ringtail Possum habitat. Includes dual use path.				Rare	Unlikely	Possible	Insignificant	Minor	Insignificant	Insignificant	Minor	-	-	-	Low	Low	Medium	Very High	-	-	-	Low	Low	Low
3	Emu Point Beach	Properties on Barry Court	R30/R50 Tourist residential, Hotel/motel	Mixture of residential and tourist developed land and undeveloped lots. Includes local roads and utilities within the road reserve.							N/A	N/A	N/A	N/A														
3	Emu Point Beach	Properties on Griffith Street	R17.5 Residential	Residential buildings. Includes local roads and utilities within the road reserve.							N/A	N/A	N/A	N/A														
3	Emu Point Beach	Developable land	Rural small lot holdings	Site of proposed Landcorp subdivision							N/A	N/A	N/A	N/A														
3	Emu Point Beach	Emu Beach Holiday Park	Tourist residential	Caravan park with chalets							N/A	N/A	N/A	N/A														
4	Emu Point	Beach	Parks & recreation	Artificial beach formed by the detached breakwater	Possible	Likely	Almost Certain	Almost certain	Almost certain	Almost certain	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	Medium	Medium	Medium	Medium	Medium	Medium	Very High	Low	Low	Low	Low	Low	Low
4	Emu Point	Foreshore reserve (northeast)	Parks & recreation	Includes grassed area, shared path playground, parking, portion of Boongarrie St, local utilities (power and water).			Rare	Unlikely	Possible	Likely	Insignificant	Minor	Insignificant	Insignificant	Minor	-	-	Low	Low	Medium	Medium	Very High	-	-	Low	Low	Low	Low
4	Emu Point	Foreshore reserve (southwest)	Parks & recreation	Includes grassed area, shared path playground, parking, portion of Boongarrie St, local utilities (power and water).																								
4	Emu Point	Toilets	Parks & recreation	Toilets behind revetment seawall							N/A	N/A	N/A	N/A														
4	Emu Point	Firth St Pumping Station	Parks & recreation	Sewage pumping station							N/A	N/A	N/A	N/A														
4	Emu Point	Rose Gardens Beachside Holiday Park	Tourist residential	Caravan park with chalets							N/A	N/A	N/A	N/A														
4	Emu Point	Properties on Cunningham St	R20 Residential, Local road	Residential buildings and portion of Cunningham St, Boongarrie St Burgess Street, Includes local roads and utilities within the road reserve.							N/A	N/A	N/A	N/A														
4	Emu Point	Navigation Beacon	Port industry	Navigation mark, major light				Rare	Unlikely	Possible					Minor	-	-	-	Low	Low	Medium	High	-	-	-	Low	Low	Low
5	Oyster Harbour Beach	Oyster Harbour	Registered Aboriginal Site	Mythological site																								
5	Oyster Harbour Beach	Beach (northwest)	Parks & recreation	Northwest portion of the beach, defined as the area where vehicle access is permitted.	Possible	Likely	Almost Certain	Almost certain	Almost certain	Almost certain	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	Medium	Medium	Medium	Medium	Medium	Medium	Very High	Low	Low	Low	Low	Low	Low
5	Oyster Harbour Beach	Beach (southeast)	Parks & recreation	Southwest portion of the beach, defined as the area where vehicle access is not permitted. Includes swimming jetties.	Possible	Likely	Almost Certain	Almost certain	Almost certain	Almost certain	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	Medium	Medium	Medium	Medium	Medium	Medium	Very High	Low	Low	Low	Low	Low	Low
5	Oyster Harbour Beach	Foreshore reserve (seaward of existing seawall)	Parks & recreation	Portion of foreshore reserve seaward of the existing grouted vertical rock wall. Includes grassed area, bbqs, lighting, water, navigation aids, vehicle access area.		Rare	Unlikely	Possible	Likely	Almost Certain	Moderate	Minor	Insignificant	Insignificant	Moderate	-	Low	Medium	Medium	High	High	Very High	-	Low	Low	Low	Low	Low
5	Oyster Harbour Beach	Foreshore reserve (landward of existing seawall)	Parks & recreation	Portion of foreshore reserve landward of the existing grouted vertical rock wall. Includes grassed area, playground, lighting, water, turn around and parking at the end of the Cunningham St.		Rare	Unlikely	Possible	Likely	Almost Certain	Moderate	Minor	Insignificant	Insignificant	Moderate	-	Low	Medium	Medium	High	High	Very High	-	Low	Low	Low	Low	Low
5	Oyster Harbour Beach	Emu Point Café	SU14 Restaurant, convenience Store, Parks & recreation	Café including toilets																								
5	Oyster Harbour Beach	Properties on Roe Parade	R20 Residential, Local road	Residential buildings and portion of Roe Parade, Mermaid Ave, Hunter St, Bedwell St. Includes utilities within the road reserve (power, water, sewage).																								
5	Oyster Harbour Beach	Toilets (near boat pens)	Parks & recreation	Toilets at the end of Bendwell St		Rare	Unlikely	Possible	Likely	Almost Certain					Minor	-	Low	Low	Medium	Medium	High	Low	-	Medium	Medium	High	High	Extreme

APPENDIX F

Community Advisory Panel - Summary of Proceedings

City of Albany

Community Advisory Panel

Summary of Proceedings

January 2019

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Form	Report File Name	Report Status	Date	Prepared for	Initials
	Community Advisory Panel Summary of Proceedings	Draft	22/01/19	Review	MP/AK
		Final	30/08/19	Publication	AK

ACKNOWLEDGEMENT

The CHRMAP process acknowledges the traditional custodians of the study area, the Minang people of the Noongar Nation. We recognise their cultural heritage, beliefs and relationship to the land, which continues to be important to Noongar people today. The ancestors of the Noongar people saw the shorelines of Albany rise and fall and they were able to adapt to an ever-changing landscape. We acknowledge the input of Aboriginal community members into this plan and pay our respects to Elders past, present and future.

This project has been funded by the Department of Planning, Lands and Heritage - Coastal Management Plan Assistance Program 16/17 and the City of Albany.

Table of Contents

Contents

1. Summary

The City of Albany (The City) is undertaking development of a Coastal Hazard Risk Management and Adaptation Plan (CHRMAP) for Emu Point to Middleton Beach, which are identified as highly valued areas for economic, social and environmental reasons.

The study considers historic storm erosion and risk of future erosion and inundation due to storm events and predicted sea level rise. The CHRMAP is the final stage in a detailed assessment of the study areas. The assessment has considered the existing structures and landscapes within the area before considering the impact that inundation, erosion and a rise in sea levels would have on the location.

A critical element in understanding the impact that coastal hazards will have on the coastline, is to understand the way the community *values* the coastline. Community values are often intrinsic and experience based, and whilst the technical costs and suitability of certain measures from an engineering or scientific perspective can be quantified by technical consultants, the intrinsic values of the community cannot be so easily measured.

As a response, the City of Albany embarked upon a testing of community values with stakeholders of the study area. This report provides a summary of one element of the engagement undertaken to test community values; the establishment of a Community Advisory Panel (CAP) to provide a community led analysis of the multiple criteria that are considered in developing a suitable CHRMAP that meets the needs of the majority of stakeholders.

The CAP participants first developed a scoring matrix for each of the criteria (Capital Cost, Maintenance Cost, Environmental Impact, Social Impact (Property), Social Impact (Community), Effectiveness and Reversibility), and then scored each of the adaptation options suitable for each at-risk asset.

This report illustrates how complex it is to make decisions about coastal hazard adaptation and management, and how local values shape the way we respond to the coast. The CAP participants have broadly identified the current use of structures at Emu Point as undesirable in the landscape, but have conversely described the need to ensure coastal management is effective and 'does the job'. These two elements are generally in conflict, and show how difficult it is to strike a balance.

The outcomes of the CAP are therefore challenging. Equally describing a situation where the City should absolutely act to protect the values of the coastline, whilst also preferencing adaptation options that are considered technically ineffective (typically sand nourishment), and in isolation are unlikely to lead to protection of the coast.

One overarching observation is that the community preference options that do not include hard structures. This was illustrated by the large numbers of participants that used their scoring to heavily weight scores against hard structures in the Effectiveness category, often going against the criteria scoring which they themselves developed.

However, this is also underpinned by the dominant themes from the community that hard structures should not be developed in an ad-hoc way, should not be constructed without detailed design and engagement with local community members who understand the coastline, and should not impact on the natural environment and adjacent coastline.

Observations are provided throughout this document, to highlight key conflict areas and ongoing engagement opportunities in the ongoing adaptation and management of this coastline.

2. Introduction

2.1 Background

The City of Albany (The City) is undertaking development of a Coastal Hazard Risk Management and Adaptation Plan (CHRMAP) to provide strategic guidance on coordinated, integrated and sustainable planning and management for key coastal assets. Emu Point and Middleton Beach have been identified as highly valued areas for economic, social and environmental reasons.

The study area has experienced historic storm erosion and is at risk of future erosion and inundation due to storm events and predicted sea level rise. The CHRMAP is being developed for the City based on the Western Australian Planning Commission (WAPC) CHRMAP guideline document (WAPC, 2014), which provides a risk management approach to dealing with forecast impacts from coastal hazard in future planning periods and will allow the Albany community to pro-actively plan and manage for future change.

The CHRMAP is the final stage in a detailed assessment of the study area. The assessment has considered the existing structures and landscapes within the area before considering the impact that inundation, erosion and a rise in sea levels would have on this highly-valued location.

The project team had undertaken two workshops which presented the suite of options available for each of the vulnerable assets identified (short term); one to an invited stakeholder group which was a subset of the Project Steering Committee and identified community groups, and the second which was a Councillor Workshop.

At both workshops, it was clear that the time provided to communicate the options was too short and did not result in the outcomes desirable (validated assessment). It was thus considered appropriate to undertake further engagement in a less time constrained format.

The new approach is a representative community panel process, where the outputs are developed by the community, using the background technical information to enable the community to provide us with considered and balanced feedback.

2.2 Desired Outcomes

The desired outcome of the CAP is to better understand the way the community would approach decision making for coastal hazard adaptation. The CAP process sought to provide a more quantitative way to understand the intrinsic values the community places on the coastline, including the hard to measure criteria of 'Social Impact'.

The final scoring will be used by the project team to complete options selection for vulnerable assets.

Two workshops were convened comprising the selected panellists and facilitators. Observers included members of the project team and Elected Members.

The following was the remit for the workshops:

The coastline identified between Middleton Beach and Emu Point is vulnerable to natural coastal processes such as waves, storms and sea level rise. The City of Albany needs to be responsible and adapt to this challenge; what adaptation options will balance the values and needs of the community for this coastline?

2.3 Key Terminology

CHRMAP documents are highly technical and full of plenty of jargon. To help interpretation of this summary, we have included nine key terms which are used regularly and defined as follows:

'assets' means a resource with economic value that an individual, corporation or government owns or controls with the expectation that it will provide a future benefit, and can include natural assets such as beaches and vegetation.

'development' means the development or use of any land, including —

a. any demolition, erection, construction, alteration of or addition to any building or structure on the land;

b. the carrying out on the land of any excavation or other works;

'erosion' refers to shoreline movement where the shoreline shifts landward reducing the width of a coastal foreshore reserve and/or the distance to a fixed feature on the adjoining land.

'event' means any occurrence of a particular set of circumstances that can have an adverse impact(s) on the environment. The event can be certain or uncertain, and be a one-off occurrence or a series of occurrences of a particular set of circumstances.

'flood' an overflow of a large amount of water beyond its normal limits, especially over what is normally dry land.

'inundation' means the flow of water onto previously dry land. It may either be permanent (for example due to sea level rise) or a temporary occurrence during a storm event.

'risk' is specified in terms of an hazardous event or circumstances and the consequence that may flow from it. Risk is measured in terms of a combination of the likelihood of an event occurring and the consequence of that event occurring.

'risk assessment' means the overall process or method for evaluating risks associated with a specific coastal hazard and includes risk identification, risk analysis and risk evaluation.

'vulnerability' means the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its capacity to adapt (adaptive capacity). Systems that are highly exposed, sensitive and less able to adapt are vulnerable.

2.4 Study Area

The CHRMAP is concentrated on the Middleton Beach to Emu Point area between Wooding Point in the south and Oyster Harbour Beach in the north (see Figure 1). This area comprises a variety of well recognised areas or assets used by local, regional and tourist populations.

2.5 Purpose of this report

The purpose of this Report is provide a summary of the CAP workshop process.

Figure 1 Study Area

3. Preparation

3.1 Time and Date

The CAP workshops were held over two days at the following locations:

- Tuesday 4th December 2018 8am – 12pm, Upstairs, Albany Library, York St.
- Saturday 8th December 2018 1pm – 5pm, Albany Surf Life Saving Club, Middleton Beach.

3.2 Participants

Participants comprised a demographically relevant (to Albany) mix of age, gender, land ownership and residential or business interests. Key stakeholder groups were also sought. Expressions of interest were invited directly from previously engaged participants and recognised community organisations, and more broadly via the City's communications database and via social media posts. In total, 25 participants attended Day 1 and 21 participants attended Day 2.

Participants were provided with a link to the project website which included substantial background reporting as pre-reading/information.

3.3 Format

In advance of the CAP, participants were provided with background material to support understanding of the issues. The City has also established a website which includes some background materials, Frequently Asked Questions and maps of the study area. The website can be accessed here.

Day 1 of the CAP comprised a short briefing of the project background, study area and key project drivers, followed by the scoring of each of the criteria:

- Capital Cost;
- Maintenance Cost;
- Environmental Impact;
- Social Impact (Property);
- Social Impact (Community);
- Effectiveness; and
- Reversibility.

Day 2 of the CAP comprised a short update and presentation of Day 1 outputs, and then the opportunity for each participant to score each individual adaptation option in accordance with the Day 1 criteria outputs.

A total of 23 adaptation options were considered for six (6) separate assets.

It is noted that only assets at risk in the immediate term (10 years) are included in the specific adaptation options analysis in the CHRMAP, and there are many more than six (6) assets at risk over the longer term. It is also the case that some assets analysed comprised a grouping of assets located in similar areas and with similar values.

The six assets considered were:

1. Ellen Cove Beach (Management Unit 1)
2. Middleton Beach Foreshore (Management Unit 2)
3. Big 4 Middleton Beach Caravan Park (Management Unit 2)
4. Properties on Griffiths Street (Management Unit 3)
5. Emu Point Foreshore Reserve (Management Unit 3 & 4 combined)
6. Oyster Harbour Beach (Management Unit 5).

Following individual scoring, scores were tallied collectively and a preliminary output was presented to participants.

NB: A 'Management Unit' is a section of coastline which shares similar characteristics and responds similarly to the coastal environment, as shown in Figure 2.

Figure 2 Management Units

4. Community Advisory Panel Day 1

4.1 Agenda and Presentation

Table 1 shows the general agenda for Day 1 proceedings. Appendix A includes the full presentation given on Day 1.

Table 1 Day 1 Agenda

Activity
Arrive and Welcome
Purpose, expectations and remit
Building understanding
Criteria scoring using mix of group discussion, polling and written feedback.
Describing study area/key assets etc.
Next steps, what to expect in the next few days, presentation of site walk plan etc

4.2 Description

CHRMAP is a complicated and technical process which comprises a number of engineering and coastal studies. It is done in accordance with State Planning Policy 2.6 - State Coastal Planning and is a form of risk management planning. Local Government already undertakes a considerable amount of risk management in its day-to-day business and coastal adaptation planning is no different; with the exception that coastal adaptation planning is based on a *likelihood* of something occurring at a future date with the date subject to significant variation (natural occurrences), whilst most other risk management is based on the likelihood of something occurring at a future date subject to much more reliable timeframes.

CHRMAP considers a hierarchy of four adaptation levels as follows:

- **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

Within this hierarchy there are a number of different options at each level, as shown in the presentation at Appendix A.

Participants were advised that the technical consultants had culled unsuitable options in the local Albany/specific coastline context, and had then undertaken an analysis of technical feasibility, applicability, effectiveness and the cost of various options.

Following this presentation of background, participants were asked to provide measurement values for each of the stated criteria:

- Capital Cost - how much it costs to build a specific adaptation option (in today's' dollars);
- Maintenance Cost - how much it costs to keep maintaining a specific adaptation option (in today's' dollars);
- Environmental Impact - possible damage or loss of the beach, impact to vegetation, seagrass, fauna habitat, and potential erosion in adjacent areas;
- Social Impact (Property) - possible impact, loss or damage to private property or privately operated leasehold land;
- Social Impact (Community) - possible loss of ability to walk on the beach, enjoy vistas, access to car parks, park land, footpaths, and assets such as cafés, Surf Life Saving club etc that have intrinsic community value;
- Effectiveness - how effective the option is at managing vulnerability and risk, how well tested the option is, how long the option may be effective; and
- Reversibility - how easy it is to implement other options at a later date, how much the option ties the Local Government to ongoing maintenance and protection, how easy it is to change the approach later.

4.3 Multi Criteria Analysis

Multi criteria analysis (MCA) is a decision making tool used across the world to consider complex decision making where a number of criteria are important, and the best case scenario requires making a number of trade-offs.

MCA is the method being used to help to identify and rank the important factors associated with choosing a particular option for at-risk assets in the Emu Point to Middleton Beach area.

The measures that were determined by the participants on Day 1 across the seven criteria are used to score each option and define the option that has the best overall score.

The one with the lowest score (that best achieves the majority of the community's values) is the preferred option.

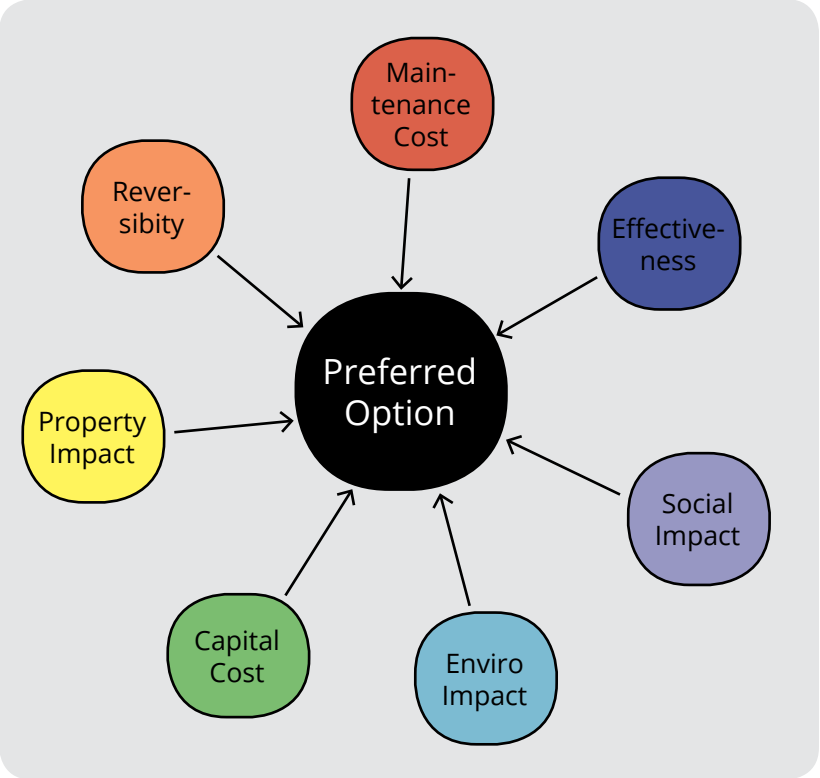
This is illustrated in Figure 3 and 4.

In the example shown in Figure 3, Option 1 has low scores (low negative impact) on the Property Impact, Capital Cost, Social Impact and Effectiveness criteria, but has greater negative scores against Reversibility and Environmental Impact.

Option 2 has low scores against Capital Cost, and Effectiveness, but greater scores against Maintenance Costs, Reversibility, Property Impact, Environmental Impact and Social Impact.

When adding all the criteria score together, Option 1 is the preferred option.

The output for Day 1 is the measurement values for each of the stated criteria.



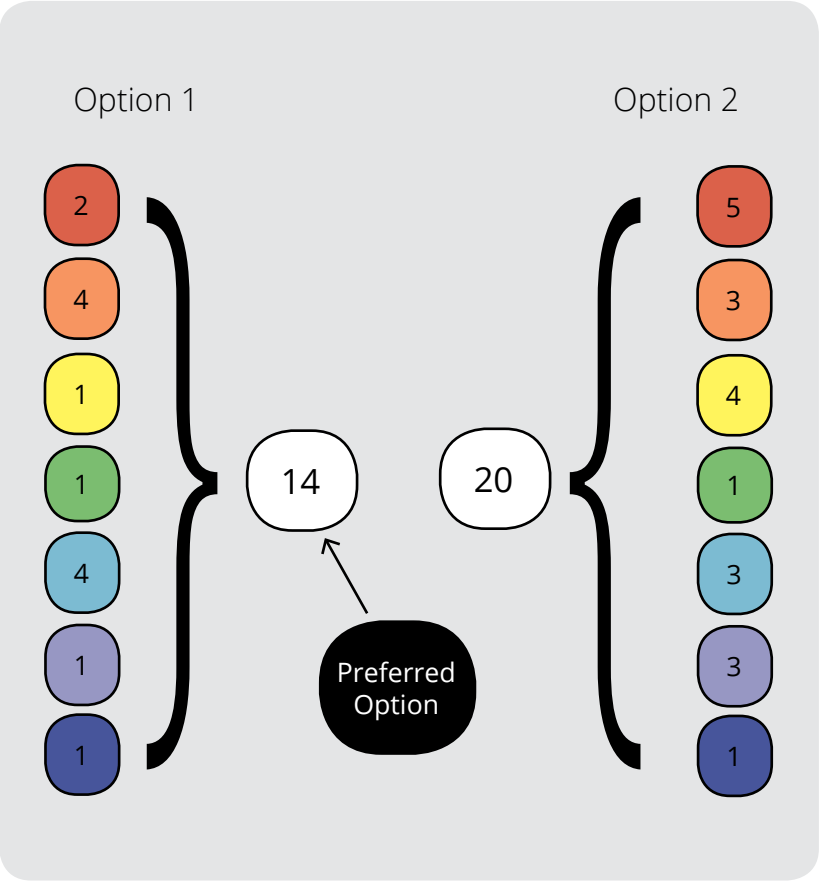


Figure 3 MCA Conceptual Framework (above)

Figure 4 MCA Example Scoring (below)

4.3 Outputs

Participants were provided an opportunity to first discuss the measurement values in small groups, and the summary feedback was collated and an agreed measurement value was set for each criteria.

The process did not always lead to full agreement, with one of the criteria (Social Impact - Property), being further discussed by a small group of participants separately

In some cases the group did not fully achieve consensus, however, the final scoring criteria provides both a greater insight into community values and a logical/measurable basis for assessing each adaptation option.

The final output of the day was a measurement matrix for each of the criteria. The matrix defines a numerical value between 1 and 5 for different outcomes associated with each option. A score of '1' would be an option which scored a low negative impact against that criteria, whilst a score of '5' would be an option which scored a high negative impact against that criteria.

The combined score, as in Figure 4, would be the multi-criteria measurement of each option, and comparatively provides the multi-criteria analysis.

The final measurement matrix is provided in Table 2, with observations against each criteria in Section 4.4.

4.4 Observations

4.4.1 Capital Cost

The final decision for this criteria was that cost should not be a determinant. If all other criteria scores are equal, cost would be the determining factor and a cheaper option would be preferred.

This analysis indicated a strong directive that highly effective options should not be discounted due to costs.

4.4.2 Maintenance Cost

A less expensive maintenance option would be preferenced assuming that the option itself was suitable to achieve the outcomes. Participants noted that any options which is preferred would need to be supported by an adequate maintenance regime.

4.4.3 Environmental Impact

Participants clearly identified a preference for options which had limited impact on the environment. Participants noted that even options which maintained the status quo would not receive the best (lowest) score.

4.4.4 Social Impact (Property)

This category was divided into three sub-categories as each was considered to have differentiated value. Participants identified that private property with existing protective structures would have a greater expectation of having protection maintained, whilst conversely noting that other waterfront property without existing protections should be classified as 'at owners risk'.

Participants considered business properties as a third sub-category, noting that there are multiple beneficiaries of business activity in Albany, including economic benefits that should be protected if possible.

It was noted that during scoring at Day 2 more than one property class is included in a single area, the total will be combined and a single score agreed to ensure this criterion does not over-influence the final preference (e.g. if against residential property the score would be 4, and against business impact the score would be 3, only a single score of 4 would be applied rather than a combined score of 7).

4.4.5 Social Impact (Community)

Participants confirmed previous analysis of community values, noting that only an option which has no clear detrimental impact on community values would receive the best (lowest) score.

4.4.6 Reversibility

Participants discussed the current status quo of the study area in discussing this criterion. Many participants observed that local information would have provided significant information prior to the construction of existing seawalls. The majority of participants noted that these structures have had an irreversible impact on the coastline.

4.4.7 Effectiveness

It was noted by all participants that an effective option is highly desirable.

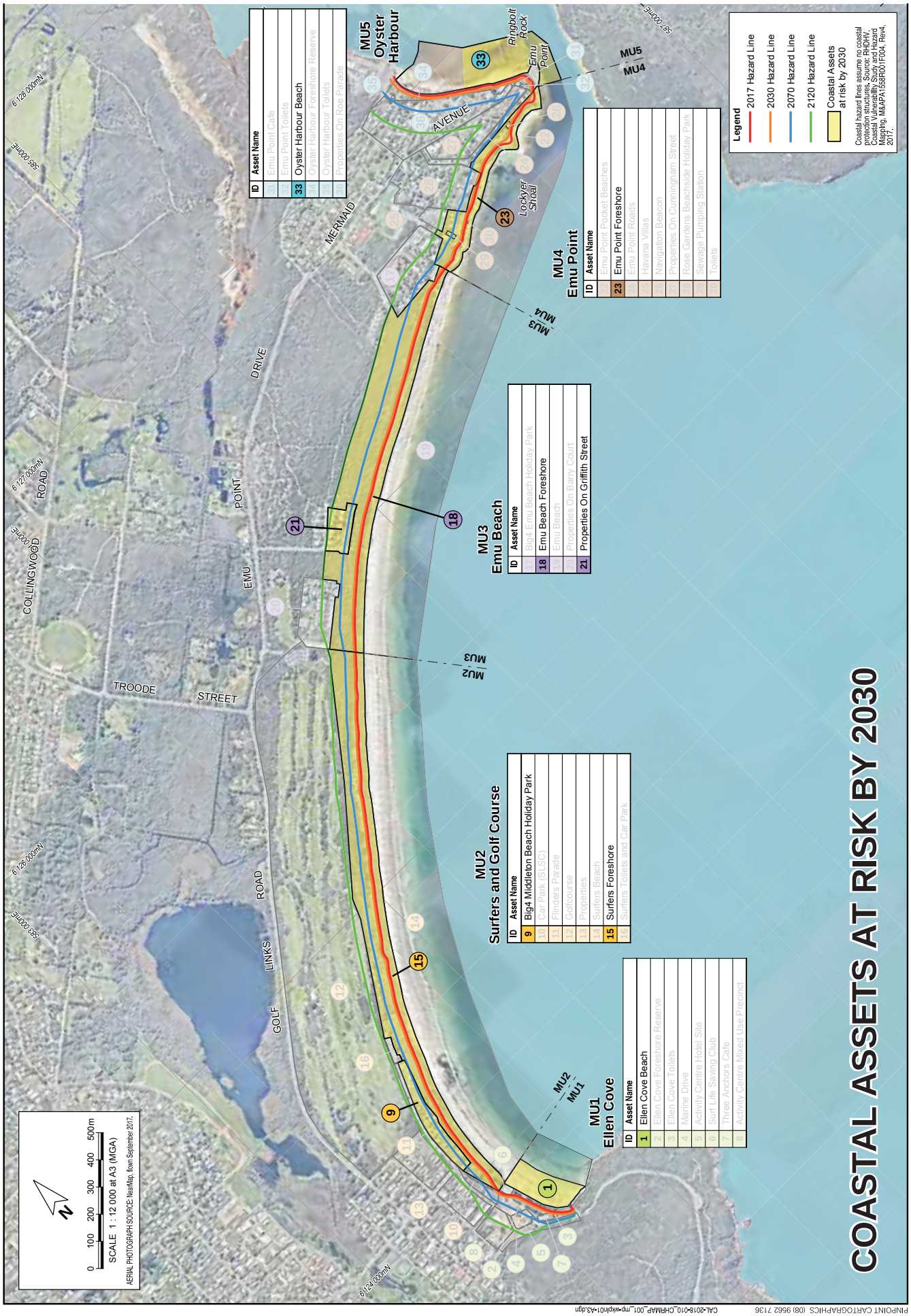
Table 2 Day One Criteria Measurement Outputs

Criteria	1	2	3	4	5
Capital Cost	A less expensive option is preferred if all other criteria are equal.				
Maintenance Cost	<5 million	$5 - $15 million	$15m - $30 million	$30 - $50 million	>$50 million
Environmental Impact	Preserves and repairs	Maintains Status Quo	May result in impact & damage	Likely to result in impact & damage	Will result in impact & damage
Social Impact - Residential property not currently protected	No loss is preferable but this asset class is at owners risk.		Protection for current assets only		
Social Impact - Residential property already protected	0 houses lost	1-10 houses lost	11-19 houses lost	20-40 houses lost	> 40 houses lost
Social Impact - Business property	No loss of existing businesses		Protects or maintains for as long as possible		Loss of existing businesses
Social Impact (community)	Does not affect any community values and/or improves access	Minor impact to community values and/or access	Loss of access to some community assets that doesn't effect overall intrinsic community value	Loss of access to certain assets Improve man made facilities	Will definitely affect key values of area
Reversibility	Easily reversible	Reversible	Reversible but with some cost	Difficult to reverse	Irreversible
Effectiveness	Effective, long-term mitigation	Effective, mid-term mitigation	Effective, short-term mitigation	Limited effectiveness	Ineffective and/or suitable only for minor events

4.5 Day 1 Conclusion

At the conclusion of Day 1, a map was described and provided to all participants showing the coastal assets at risk by 2030, as per Figure 5. The summary shown in Table 1 was provided via email following the workshop, as was the full 'Suite of Options' for each at-risk asset, as attached to this report at Appendix B.

Figure 5 Assets at Risk by 2030 Handout



5. Community Advisory Panel Day 2

5.1 Agenda and Presentation

Table 3 shows the general agenda for Day 2 proceedings. Appendix C includes the full presentation given on Day 2.

Table 3 Day 2 Agenda

Activity
Arrive and Welcome
Purpose, expectations and remit
Building understanding of CHRMAP
Assessment of Options using mix of group discussion, individual scoring and shared polling
Discussion on who pays/preferences
Summary score
Next steps and Thank You

5.2 Description

The Suite of Options provided to participants in advance of Day 2 illustrates the possible management options for each identified at-risk asset in the next 10 years. These assets are considered vulnerable at the current day.

As noted in Section 4.2, a number of options were considered for each asset and unsuitable or infeasible options were culled based on technical analysis. The remaining options included in the Suite of Options can be utilised individually or in combination to respond to, or 'manage' the vulnerable asset.

Day 2 utilised the measurement criteria determined in Day 1 to assess each of the options.

5.3 Outputs

Participants were provided with an individual scoring spreadsheet (Appendix D). The spreadsheet included the Capital Cost and Maintenance Cost as pre-determined values. Participants were not asked to score these criteria as they are quantitative only.

Participants were provided the opportunity to discuss and score the options individually, in small workshop tables, and then collectively via a polling exercise. To support the participants to measure the 'Effectiveness' and 'Reversibility' criteria, participants were provided with a guide from the technical consultants (Appendix E).

The final output of the day was a completed multi-critera analysis from the community perspective for each of the at-risk assets. The combined analysis for each asset is described in Section 5.4, and the summary spreadsheet is provided in Appendix F.

The summary spreadsheet shown in Appendix F displays individual scoring (names withheld for anonymity) and illustrates the variation of individual scoring. The individual scoring highlights how personal values contribute to making decisions in a CHRMAP process; and how complicated decision making in CHRMAP is.

It is noted that Capital Cost has not been scored as per community preference.

NB: Individual response SH12 was not recorded, as this participant did not score any option completely, therefore rendering their scores as invalid.

5.4 Adaptation Option Scores and Observations

5.4.1 Resilience Planning

A number of the at-risk assets identified possible management options that are ongoing City of Albany management tools. These options were 'Maintain and Enhance Beach System'; a beach scraping and minimal sand nourishment option, and 'Maintain and Enhance Dune System'; a dune rehabilitation and protection option.

The City of Albany has committed to ongoing resilience management of the coastal system which would include both of these options at appropriate times. The ongoing dune rehabilitation is subject to a number of grants, which the City will continue to apply for, support and manage.

However, the two options *were* scored comparatively. Maintain and Enhance Dune System was preferred with lower scores across all criteria. This aligns with the anecdotal discussions of the workshops which preferenced more natural, rehabilitation style options over costly options which may negatively impact the coastal area.

5.4.2 Ellen Cove Beach (Management Unit 1)

As part of the LandCorp development at Middleton Beach, a seawall has been proposed and is now funded. As an effective management option, the additional option available at the Ellen Cove Beach area is sand nourishment.

Whilst the overall combined score was 13.1 (out of a maximum of 30), it is noted that several scores reached the late teens and early twenties, indicating that at least some participants did not entirely support sand nourishment in the area. This variance is largely attributed to individual scores on the 'Environmental Impact' and 'Effectiveness' criteria, where some participants suggested greater negative impacts on those criteria.

It was noted by participants that at the end of the construction life of the seawall, an alternative option may need to be considered. Assets such as the foreshore, the cafe and the Surf Club were identified as very high value and important to the community of Albany as well as tourism activity.

5.4.3 Middleton Beach Foreshore (Management Unit 2)

The Middleton Beach foreshore (Surfers and Golf Course area) is a long stretch of coastline which is generally uninterrupted. The asset comprises almost entirely of natural foreshore area, with some coastal access points and Flinders Parade set back outside of the immediate risk area.

This asset is primarily a public asset and has limited opportunity for any form of development. The overall score preferenced 'Avoid Further Development'. Table 4 shows the combined scores across criteria.

All criteria scored better for the preferred option by at least 1-1.5 points.

'Avoid Further Development' in this location also implies a longer term management option of avoiding further development for the assets at-risk in the longer term, such as Flinders Parade, toilets and car parks, and parts of the Golf Course. As these assets are primarily owned by the City of Albany, it is possible that over time when these assets are replaced in line with normal asset replacement timeframes, assets could be relocated outside of the vulnerable area, allowing for extended use of the coastline over time with limited (or less) impact to community access.

Table 4 - Middleton Beach Foreshore MCA

Criteria	Avoid Further Development	Leave Assets Unprotected
Maintenance Cost	1	1
Environmental Impact	1.7	3
Social Impact - Residential not protected	1.9	3.2
Social Impact - Residential protected already		
Social Impact - Business property		
Social Impact (community)	2	3.5
Reversibility	1.8	3.3
Effectiveness	2.4	3.5
TOTAL COMBINED	**10.8**	**17.6**

5.4.4 Big 4 Middleton Beach Caravan Park (Management Unit 2)

The Big 4 Middleton Beach Caravan Park is a well used tourism destination in Albany. The site is leased from the City of Albany to a private organisation.

Participants noted how significant tourism is to the City of Albany economy, local employment as well as general local amenity. The asset is also adjacent to an established park area to the north of the Surf Club and car park.

The overall score preferenced 'Avoid Further Development' with the second highest score being a rock seawall. Table 5 shows the combined scores across criteria. Individual scoring varied significantly which indicates that personal values and preferences played a large role in the scoring of this asset.

It is noted that in the case of this asset, the 'Avoid Further Development' option may be suitable in the short term, however, this does have implications in the future if the asset is significantly damaged by coastal events. This option may not maintain longer term community values without an additional management option.

It is also observed that scores against the 'Effectiveness' criteria differ from the technical guidance provided to participants.

Table 5 - Big 4 Middleton Beach Caravan Park MCA

Criteria	Avoid Further Development	Leave Assets Unprotected	Relocate Assets	Seawall (rock)	Seawall (sandbags)
Maintenance Cost	1	3	3	1	2
Environmental Impact	2.3	3.6	2.3	3.4	3.5
Social Impact - Residential not protected	2.9	3.7	3.1	2.1	2.3
Social Impact - Residential protected already					
Social Impact - Business property					
Social Impact (community)	2.4	3.7	3.1	2.9	3.1
Reversibility	2.7	3.4	3.4	4.1	3.3
Effectiveness	2.9	3.5	2.2	2.8	2.8
TOTAL COMBINED	**14.2**	**20.8**	**17.3**	**16.3**	**17.1**

5.4.6 Properties on Griffiths Street (Management Unit 3)

A number of privately owned properties exist within Management Unit 3, however, it is the first row of houses on Griffiths Street that are the most immediately vulnerable. This is due to the access road itself being at risk; when the road and services are damaged, legal access to the lots will be affected and the properties will be impacted.

This series of homes attracted much discussion. Participants had noted on Day 1 that properties without existing protective structures should not be protected, whilst in the MCA of Day 2 it became more clear how directly this might impact local community members.

Participants enquired about alternatives such as land swap and buy-back schemes to understand what alternatives may be available.

The Griffiths Street properties (front row), are only marginally more impacted than adjacent properties on Barry Court and Dillon Close. However, these properties have longer term access and short term alternatives available.

Notwithstanding, the option preferred for the Griffiths Street asset, implies that same option would also be preferred for the adjacent private properties.

The overall score preferenced 'Sand Nourishment'. Table 6 shows the combined scores across criteria. Individual scoring varied significantly which indicates that personal values and preferences played a large role in the scoring of this asset.

It is noted that in the case of this asset, the 'Sand nourishment' option may be suitable in the short term, but is also recognised as ineffective for longer term protection. This option may not maintain longer term community values without an additional management option being considered.

It is also observed that scores against the 'Reversibility' and 'Effectiveness' criteria differ from the technical guidance provided to participants.

Table 6 - Griffiths Street Properties MCA

Criteria	Relocate Assets	Sand Nourishment	Offshore breakwaters	Nearshore breakwaters	Seawall (rock)
Maintenance Cost	3	2	2	2	1
Environmental Impact	2.7	2.6	3.1	3.3	3.6
Social Impact - Residential not protected	3.5	2.4	2.2	2.6	2.7
Social Impact - Residential protected already					
Social Impact - Business property					
Social Impact (community)	3.4	2.3	2.5	2.7	3.3
Reversibility	3.8	1.6	4.6	4.2	4.1
Effectiveness	2.6	3.5	2.8	2.9	2.9
TOTAL COMBINED	**19.2**	**14.7**	**17.2**	**17.8**	**17.4**

5.4.7 Emu Point Foreshore Reserve (Management Unit 3 & 4 combined)

The Emu Point Foreshore Reserve comprises a number of man made and natural assets. Past adaptation actions have resulted in structures that are widely acknowledged as having a negative impact, whilst the foreshore parkland that is protected by those structures is highly valued in the community.

A large number of adaptation options are available for this asset. Due to the significant number of assets included and behind the immediate vulnerability line, there is an ongoing implication that protection in this location will lock the City of Albany in to ongoing protection in the area. Participants noted this, and also noted how much past decisions had impacted the current coastline, identifying a preference not to revisit 'old mistakes'.

The overall score preferenced 'Maintain and Enhance the Nearshore System' (seagrass rehabilitation). Table 7 shows the combined scores across criteria. Individual scoring varied significantly which indicates that personal values and preferences played a large role in the scoring of this asset.

It is noted that in the case of this asset, the 'Maintain and Enhance the Nearshore System' option may be suitable in the short term, however, the effectiveness of the option is largely untested and may not prove to achieve its goals.

This does have implications in the future if the adaptation option is repeatedly damaged - rendering the coastline behind it vulnerable and without back-up protection. This option may not maintain longer term community values without an additional management option.

It is also observed that scores against the 'Reversibility' and 'Effectiveness' criteria differ from the technical guidance provided to participants.

Table 7 - Emu Point Foreshore MCA

Criteria	Relocate Assets	Maintain/ Enhance seagrass	Sand Nourish-ment	Offshore break-waters	Nearshore break-waters	Groynes	Seawall and parkland	Seawall upgrade (basic)
Maintenance Cost	4	4	5	3	3	2	2	2
Environmental Impact	2.6	1.5	2.6	2.9	3.2	3.6	3.6	3.1
Social Impact - Residential not protected	3.3	2	2.5	2.2	2.4	2.4	2.5	2.4
Social Impact - Residential protected already								
Social Impact - Business property								
Social Impact (community)	2.9	2.1	2.2	2.4	2.4	3	3	3
Reversibility	3.2	2.2	2.3	4.2	3.9	4	4.2	3.6
Effectiveness	2.8	2.7	3.8	2.6	2.6	3.3	2.9	3.3
TOTAL COMBINED	**18.9**	**14.5**	**18.7**	**17.2**	**17.6**	**18.5**	**18.5**	**17.1**

5.4.8 Oyster Harbour Beach (Management Unit 5).

The Oyster Harbour Beach Management Unit is markedly different from the balance of the study area as it is an estuarine environment with shallower water depths and different coastal processes. The shoreline is already managed by seawall structures and a swimming structure behaves somewhat like an offshore breakwater without the requisite reliable effectiveness.

The overall score preferenced 'Sand Nourishment'. Table 8 shows the combined scores across criteria. It is noted that in the case of this asset, the 'Sand Nourishment' option may be suitable in the short term, but is also recognised as ineffective for longer term protection. This option may not maintain longer term community values without an additional management option being considered.

It is also observed that scores against the 'Reversibility' and 'Effectiveness' criteria differ from the technical guidance provided to participants.

Table 8 - Oyster Harbour Beach MCA

Criteria	Sand Nourishment	Nearshore breakwaters	Nearshore breakwaters submerged
Maintenance Cost	1	1	1
Environmental Impact	2.6	2.7	2.7
Social Impact - Residential not protected	1.8	2.3	1.8
Social Impact - Residential protected already			
Social Impact - Business property			
Social Impact (community)	1.9	2.3	1.9
Reversibility	2.2	3.3	3.9
Effectiveness	3.2	2.5	2.8
TOTAL COMBINED	**12.5**	**14.4**	**14.2**

5.5 General Observations

It is apparent that a number of participants had strong views (in both directions) on various constructed versus less permanent options, and that the measurement criteria developed on Day 1 were not strictly followed. This was significantly the case when it came to scoring Reversibility and Effectiveness against the technical guidance provided and where often scores were 2-3 points different to the separate scoring of the project team *using the community's measurement criteria*.

The project team have observed a strong preference away from structures on the coastline in the study area. This appears to be largely as a reaction to the existing structures. This is a valid concern of the community and needs to be respected and acknowledged going forward. The participants noted on more than one occasion that they object to any form of adaptation that is ad-hoc and not considered in the larger study area context.

An additional observation of the project team is the level to which the participants were aware of the technical background to the study area. This greatly enabled the workshop process, whilst also providing some inherent cynicism in the process. It is important that the inputs of the community continue to be sought and valued.

5.6 Other Feedback

All participants were invited to provide ongoing feedback throughout the workshop process. This section provides a summary of that feedback. The feedback and suggestions received will continue to be critical inputs to the final CHRMAP process.

This feedback is reported verbatim from post-it notes written by participants. It has been ordered to relate to the content of the discussion where possible.

5.6.1 Comments specific to the CHRMAP

- History has shown that current science is not necessarily solid (reversibility wise).
- Listening to local knowledge too (although local context is not always equivalent to world-wide. Eg. QLD).
- Lake Seppings has connection to Oyster Harbour and Eyre Park. This waterbody will also rise as intertidal rate and may have greater impact on coastline (as an island). Emu Point Road will be under water as well as lots of property.
- Ensure the options left out aren't suitable - e.g. storm surge barriers, Beach de-watering
- Where does the proposed surf reef fit in (breaking wave energy further out)? Ensure this is considered.
- How can we consider short term (10 years) but make sure it fits into longer term (up to 80 years).
- Capital cost must provide best long term outcomes, even if more expensive.

5.6.2 Comments relevant to the area

- Walking track behind dunes need maintenance. Benches have no views due to growth of vegetation, the stairs to beach are dangerous and the wild flower trails are totally overgrown.
- Return/maintain natural beauty.
- Allow development but not to detriment/compromise natural assets.
- No community access loss.
- No loss of recreation.
- No impact to key values.
- Please organise Geoff Bastyan to talk about sea-grasses to community in future.

5.6.3 Comments about the options overall

- Some options have potential environmental/ social benefits in creating new beaches, for example. I found this difficult to integrate within scoring system given.
- Can breakwaters be designed to avoid accelerated erosion in adjacent coastal areas?
- Needs rolling program to ensure foreshore reserve/ corridor is retained. Otherwise environmental impact will be large as well as impact on housing.
- Sand nourishment depends on ease of sourcing material. In short term may be okay to take from parts of beach but in longer term may have to be transported in and not be economic or desirable.
- Offshore/nearshore structures: prime issue is 'edge' effect on adjacent beach to south. Can breakwaters be designed

to not impact on beach to south? Critical in assessment of these options.

- Plantation of salt bush and coastal vegetation.
- Understanding the positioning of the artificial reef as to recognise where the power of the waves will fall-> soften erosion. Able to predict erosion patterns with reef.
- Sand bags replaced with rock cages e.g. looks better and less micro-plastic/ fibre pollution
- Not putting at risk the natural ecology of the coastal area.
- No data on sand nourishment. The sand disappears – where to in the sound and what effect to environment. What about the 1 billion tonne sand lost out to sea? So sand nourishment is not worth it. Concerned that removal of sand to fix another problem – creates a separate problem – goes against nature (fix its own problems)
- AC3 – continue when possible.
- Need integrated solution, not ad-hoc ongoing fix-ups. Hopefully without too much environmental impact.

5.6.4 Comments about specific options

- Big 4 Middleton Beach - MR2 - heavily influenced by possible alternative location. Can we relocate close? Eg. Next to Wollaston Rd/ Golf course is option for relocation.
- Big 4 Middleton Beach - PR7 Seawall could protect private housing + roads as well as the asset. This longer term would influence some scores.
- Big 4 Middleton Beach - AV2 – should be treated as non-reversible.
- Middleton beach - is the town beach, needs facilities and man-made structure. We are lucky to have so many completely "natural" beaches close by. Erosion
- Surf Club - Not jeopardising the functional services of the surf club.
- Emu Point Foreshore Reserve - AC4 maintain and enhance harbour system is a long term plan that will be the most unpopular in the short term.

5.6.5 Resilience Options

- AC2 Keeping beach flat by removing sand will only maintain a nice clear beach. Does not meet all needs.
- Maintain and enhance beach system. Possibility for funding support as a "Good Practice" for managing.
- AC2- sand nourishment - save your $495,000 very limited value at Ellen Cove.

5.7 Who Pays

A brief discussion was held regarding the complicated topic of who pays. The participants provided responses, again reported verbatim, to provide guidance to Council.

- Let's pay for things that have multiple benefits.
- Wave energy, shark protection, artificial surf reefs. Eg. Could be integrated with coastal protection. Rather than single purpose barriers would provide more support for solid barriers and all community benefit. Innovate and integrate.
- Protection barriers = artificial reefs = wind protection for families/ beach users in summer = create habitat reef for fauna.
- FEDS – increase GST to 12% so gov't has the funding to look after our communities.
- As a ratepayer I would be willing to contribute extra rates IF:
  - There was community involvement
  - Listen to local knowledge i.e.
  - Don't be so quick to react – to storms. Give nature time to repair.
  - Protect what we have without moveable structures.
- Big Leases and Rates - on foreshore already; put the money back into foreshore not bike tracks etc.
- No silo planning - Whole coast not council versus council.
- Special fund set up for whole state to combat climate change challenges. Admin done local after whole plan finished: needs to have state wide experts and local who know more.

- If council listened to local knowledge and adhered to that advice then the people wouldn't mind if council paid.
- Before agreeing to pay locally would want all organisations locally to pay into a fund for it. No exemptions for charities or non-profits who do not pay rates to be exempt from this. Then all people locally would contribute plus visitors so = a local coastal risk GST.
- Inhabitants should contribute, all use it, through rates
- Holiday fee for tourists like overseas
- Federal government makes decisions about topics contributing to climate change so should contribute to costs to counteract effects.
- Businesses and/or inhabitants that run business and/ or live environmentally friendly and have less emission should pay less to fix climate change effects (incentives to be environmentally friendly)
- Donation boxes at cafés and other businesses
- Yearly community fundraisers. Beach concert (the waves haha)
- Leasehold properties and ratepayers in the hazard zone contribute. A lot of income for the city it should be put back into the control measures (or at least a percentage)
- Seek novel funding:
    - ARC
    - Research
    - Centre of Excellence
    - Best Practice
- User/ council pays:
    - ensure clear justification for decisions.
    - adequate sit consultation at all stages of project.
    - communicate effectively.

6. Evaluation

An evaluation survey was provided to all participants to assess the effectiveness of the process, with a view to understanding if the process could be suitable for future similar studies along Albany's coastline. The response rate to the survey was very low, supplemented by some direct feedback via email.

The workshops were held in early December 2018, therefore resulting in the evaluation survey being provided to participants over the Christmas period. This may explain the very low response rate.

Notwithstanding, a summary of the evaluation is provided.

Q1 Did the workshop process help provide better understanding about the CHRMAP process?

66% of responses identified the workshop as helpful. Some participants noted that more pre-reading might be beneficial, whilst others noted (anecdotally) that the topic is very technical and it may not be possible for all participants to fully understand the technical knowledge.

Some participants noted that they had learned quite a lot, and were surprised at the complexity of CHRMAP options analysis.

Q2 Did the workshop process allow you to provide your advice and recommendations to the City of Albany about the CHRMAP process?

Responses were mixed to this question with an equal spread from 'yes, definitely', 'neutral' to 'no, not at all'. Feedback received after Day 1 indicated that a large amount of cynicism remains in the community regarding the authenticity of the engagement process. This may explain the varied feedback to this question.

It is recommended that future workshops of this type be undertaken with the workshop days spread further apart and more time allowed for the criteria measurement workshop, to enable better explanation of the various criteria and the interdependency of each criteria. Case studies and examples should be used, and could form part of pre-reading materials.

Q3 Did the workshop process allow for a variety of perspectives to be presented and shared?

A majority of responses identified that the workshop allowed for 'quite a lot' of perspectives to be shared, with the alternative response being 'neutral'. Based on the broader feedback, additional time allowed for participant selection, pre-reading and participant investigation and questions between the two workshop days would result in an improved experience.

Q4 Did the workshop process allow adequate time to present and discuss the content?

Responses to this question were either 'neutral' or 'no, a bit too limited'. Respondents suggested presentations from technical experts, an introductory session for participants who had no background knowledge of the study (to help with the range of experience), or allowing much greater time to consider the complex topic.

The project team observed that participants felt rushed, and the process would benefit from additional time allowed for participant selection, pre-reading and participant investigation and questions between the two workshop days, as well as following the specific suggestions of respondents regarding technical presentations.

Q5 How did the timing of the workshops suit you?

A variety of responses were received to this question. Some felt that one single all-day workshop would have been better, whilst another suggested only 3 hour sessions over three sessions rather than two sessions of 4 hours.

It is clear from the responses that individual experiences varied greatly. Per earlier observations, it is recommended that additional time be allowed for participant selection, pre-reading and participant investigation and questions between the workshop days would result in an improved experience.

A single day event is not recommended as it does not allow for adequate participant investigation and queries, or site visits to 'reality test' options.

Q6 Would you recommend other community members get involved in this sort of process in the future?

Participants responded either 'neutral' or 'yes, definitely' to this question.

Q7 Finally, these processes can always be improved. What would you suggest that we do next time to make this process better?

This question was an open text field. Suggestions ranged from more information prior to the workshops, to more representation from the decision makers (staff and Elected Members).

Overall comments

In general, it is recommended as a result of the evaluation feedback that additional time be allowed for participant selection and pre-reading before workshops.

In addition, it is recommended that future workshops of this type be undertaken with the workshop days spread further apart and more time allowed for the criteria measurement workshop, to enable better explanation of the various criteria and the interdependency of each criteria. Case studies and examples should be used, and could form part of pre-reading materials.

A site walk could be incorporated as a mandatory component of the process to support participant investigation, 'reality-testing' and questions between the workshop days would also result in an improved experience

Attendance of Elected Members is highly desirable.

6.1 Other Feedback

Feedback received after Workshop Day 1 from a participant indicated an ongoing lack of trust in authentic engagement. Whilst this is noted, the City of Albany should continue to engage on matters of interest to the broader community.

The use of engagement feedback is highly subjective, with not all participants experiencing their feedback being implemented; this is natural as not all participants will have consensus with the broader group.

Processes that aim to place the community as key participants and collaborators in the process will improve the community's expectation and support of similar processes.

Further feedback received via email directly after Workshop Day 2 provided further suggestions, including improvements to the scoring process (not to tally total scores until after all scores were undertaken), and the need to find a way to remove individual bias (for or against certain options).

The feedback noted that the outcomes of the MCA process were not surprising, given that all past surveys have shown the highest values being given to the beach, natural landscape and public use.

Some concern was noted regarding the implementability of some options based on funding and approval processes. The participant suggested greater discussion on the costs and trade-offs of the various options would be beneficial.

A specific note was made of the need to have more staff and Elected Members involved or observing the process.

Finally, one participant noted that the attempt to seek a cross section of the community and have the community involved and in trying to get a rational and objective appraisal of options is commendable.

7. Summary

The main observation of the project team was that the workshop process illustrated a keen interest by the community on impacts of coastal hazards. The workshops enabled greater understanding and awareness of complicated issues and inter-dependant criteria.

However, it is also observed that when final scoring was undertaken, individual preferences often overrode the agreed scoring criteria. This provides an insight into strongly held values associated with the natural coastline experience, skewing most adaptation preferences away from any man-made structures.

These outcomes come with significant trade-offs to some community members and the City of Albany more generally; the City will need to consider the implications associated with options which are effectively 'do nothing' or short term solutions (e.g. sand nourishment). These trade-offs will be analysed in the final CHRMAP document and compared with technical recommendations.

In general, the workshop process provided community members with an opportunity to undertake a deeper and more thorough investigation of this complicated process. The community's values have been clearly displayed, and further opportunities for engaging with the workshop participants should be encouraged.

Appendix A - Day 1 Presentation

Emu Point to Middleton Beach
Coastal Hazard Risk Management & Adaptation Plan

Welcome

Matthew Thomson

Executive Director Infrastructure and Environment

City of Albany

Welcome

A spot of housekeeping….

- Mobile Phones
- Bathrooms
- Emergency procedures

Welcome

- Emma, Anthony, Matt, Melanie, Anna
- Phone charging/calls
- Photos and privacy
- Social media
- Relax – today is the easy bit….!

Introductions

Who are you?

Where do you live?

Why are you here?

The Elephant in the Room…

Or – what on earth is a CHRMAP??

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

Our Remit

The coastline between Middleton Beach and Emu Point is vulnerable to natural coastal processes such as waves, storms and sea level rise.

Our Remit

The City of Albany needs to be responsible and adapt to this challenge; what adaptation options will balance the values and needs of the community for this coastline?

What you will influence

- The preferred option for each at-risk asset
- Better understanding of community values (more measureable)
- Future Engagement activities

What are we doing today

- Considering the criteria being used to assess options
- Considering how important each of these criteria are compared to the others

➡ Saturday we will look at the options

Tips

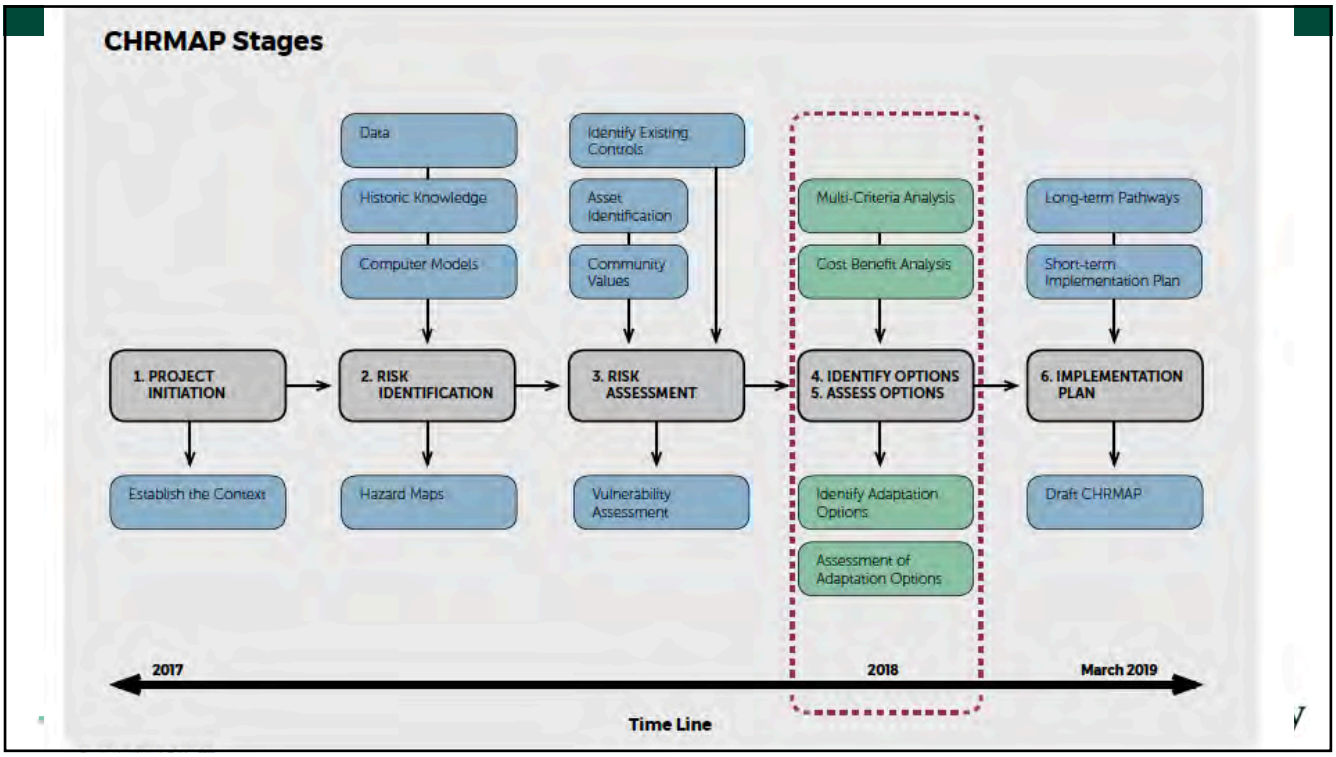
- Be curious. Learn as much as you can.
- Keep an open mind.
- Focus on the remit – avoid going down rabbit holes.
- Question your own pre-existing point of view and beware of confirmation bias.
- Remember that you are here as a citizen, to take into account what is best for the whole community; not necessarily what is best for you.
- Listen to each other. Work together. Make sure you everyone is included.
- If something isn't working for you let us know – it is important you are not distracted from your task.
- Trust the process.

Q&A

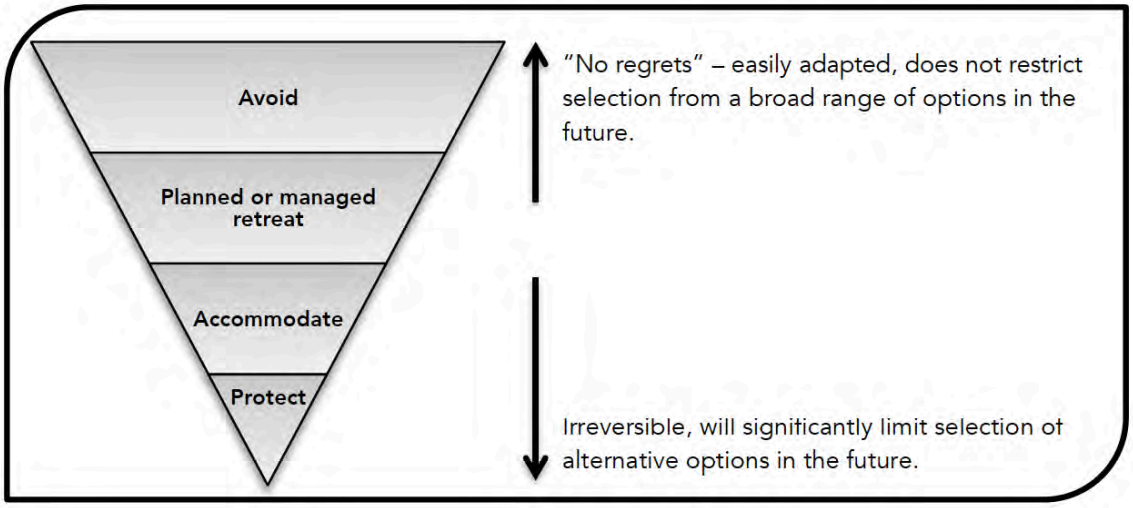
What's this all about?

- Looking into the future and *planning*
- State Planning Policy 2.6 – State Coastal Planning
- Understanding the trade-offs – not everyone wins

City of Albany



The 'hierarchy' of SPP 2.6



Identify 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

Identify adaptation options

HIERARCHY	OPTION
AVOID	**AV1.** Avoid new development in un-developed areas impacted by coastal hazards
	AV2. Avoid further development in existing developed areas impacted by coastal hazards
MANAGED RETREAT	**MR1.** Leave assets unprotected
	MR2. Relocate assets
	MR3. Removal of protection structures
ACCOMMODATE	**AC1.** Design assets to withstand impacts
	AC2. Maintain and enhance beach system
	AC3. Maintain and enhance dune system
	AC4. Maintain and enhance nearshore system – Seagrass regeneration
	AC5. Beach dewatering
PROTECT	**PR1.** Sand nourishment
	PR2. Offshore structures – artificial reefs/shoals
	PR3. Offshore structures – detached breakwaters/ headlands
	PR4. Nearshore structures – breakwaters/ headlands
	PR5. Nearshore structures – groynes
	PR6. Levees/ dykes
	PR7. Seawalls/ revetments
	PR8. Storm surge barriers
	PR9. Upgrade of existing protection structures

Assessing Adaptation Options

Step 1 - short-listing process for each asset with high or extreme vulnerability rating:

- Culled unsuitable options (for Albany/specific coastline)
- Analyse technical feasibility / applicability / cost of options

Assessing Adaptation Options

Step 2 – multi criteria analysis:

- Stakeholders
- You!

What this means to the City

- What will happen after the CHRMAP is done
- Who is involved at the City
- Why plan now for 50 years from now
- How significant is the challenge
- What about other coastlines

Asset Management at the City

- Risk management approach - standard
- Asset management framework – smarter use of your rates
- Best location for assets to avoid sacrificial assets

Q&A

Engagement Outcomes

What the community said when we asked what they valued….

Survey: Valued Assets

☑ Survey respondents: 201

☑ Key messages

- Users:
  157 people - Middleton Beach,
  170 - Emu Point
  9 – non users.

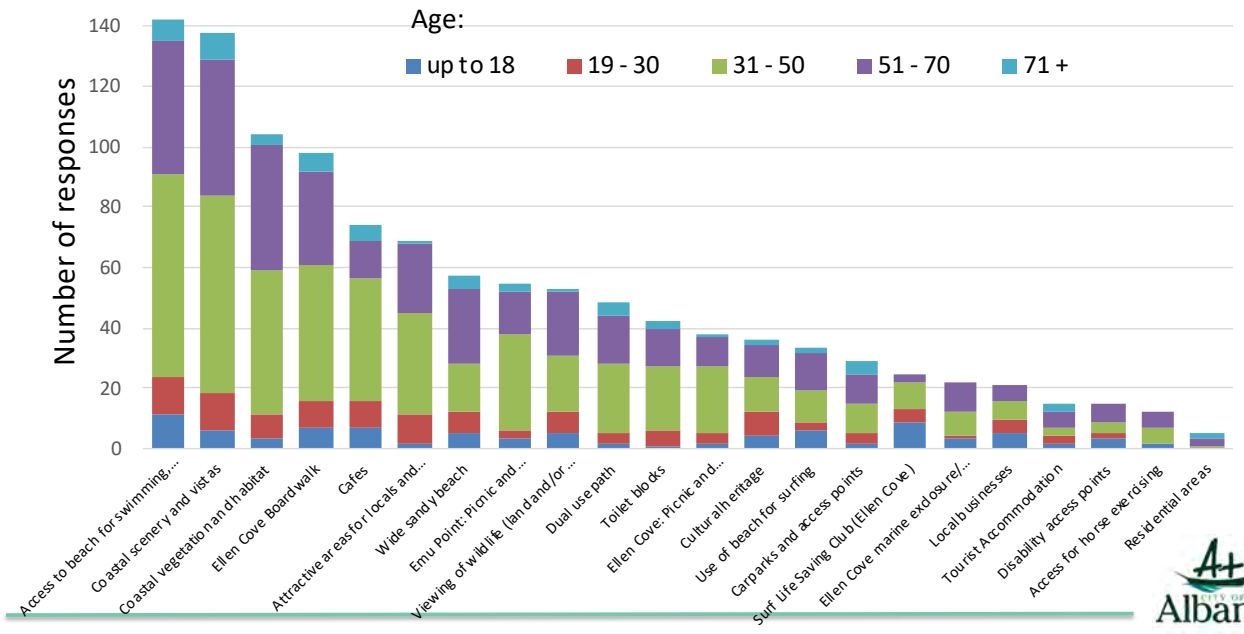
- Area most valued for:
  Recreation
  Residents
  Cafes
  Albany Surf Life Saving Club
  Business
  Family, holidays, socialising

Survey: Valued Assets

☑ Key messages:

- Most valued assets:
  1. Beach access
  2. Coastal scenery and vistas
  3. Coastal vegetation and habitat
  4. Ellen Cove Boardwalk
  5. Cafes
- New assets identified:
  1. Ellen Cove Boardwalk
  2. Fishing spots
  3. Quality of sand
- Newly identified assets included in risk assessment

Community Values Analysis



Scoring

Scoring

We have studied and researched possible impacts on the coast and have identified criteria for how we might assess adaptation options.

How would you score these criteria?

(Lets check if our technical view matches the community's expectation)

Capital Costs

- How much it costs us to build something up front (in todays' $)
- Hint – no value is higher than $20 million

REMEMBER - A LOW SCORE IS A GOOD SCORE!!

Maintenance Costs

- How much it costs us to keep maintaining something over 100 years (in todays' $)
- Hint – allow for up to $50 million

REMEMBER - A LOW SCORE IS A GOOD SCORE!!

Environmental Impact

- Damage/loss of beach, vegetation, seagrass, fauna habitat
- Erosion in adjacent areas

REMEMBER - A LOW SCORE IS A GOOD SCORE!!

Social Impact - Property

- Private property is affected and may be lost or damaged
- May have restriction placed on use
- Think in terms of number of private properties impacted

REMEMBER - A LOW SCORE IS A GOOD SCORE!!

Social Impact - Communal

- Loss of ability to walk on beach, enjoy vistas, access to car parks
- Loss of park land, footpaths
- Loss of assets such as cafes, Surf Life Saving club etc

REMEMBER - A LOW SCORE IS A GOOD SCORE!!

Reversibility

- Once chosen, other options are off the table or very difficult to implement
- Sets expectation/ties future community to the decision/costs
- No regrets, can change mind later with little impact

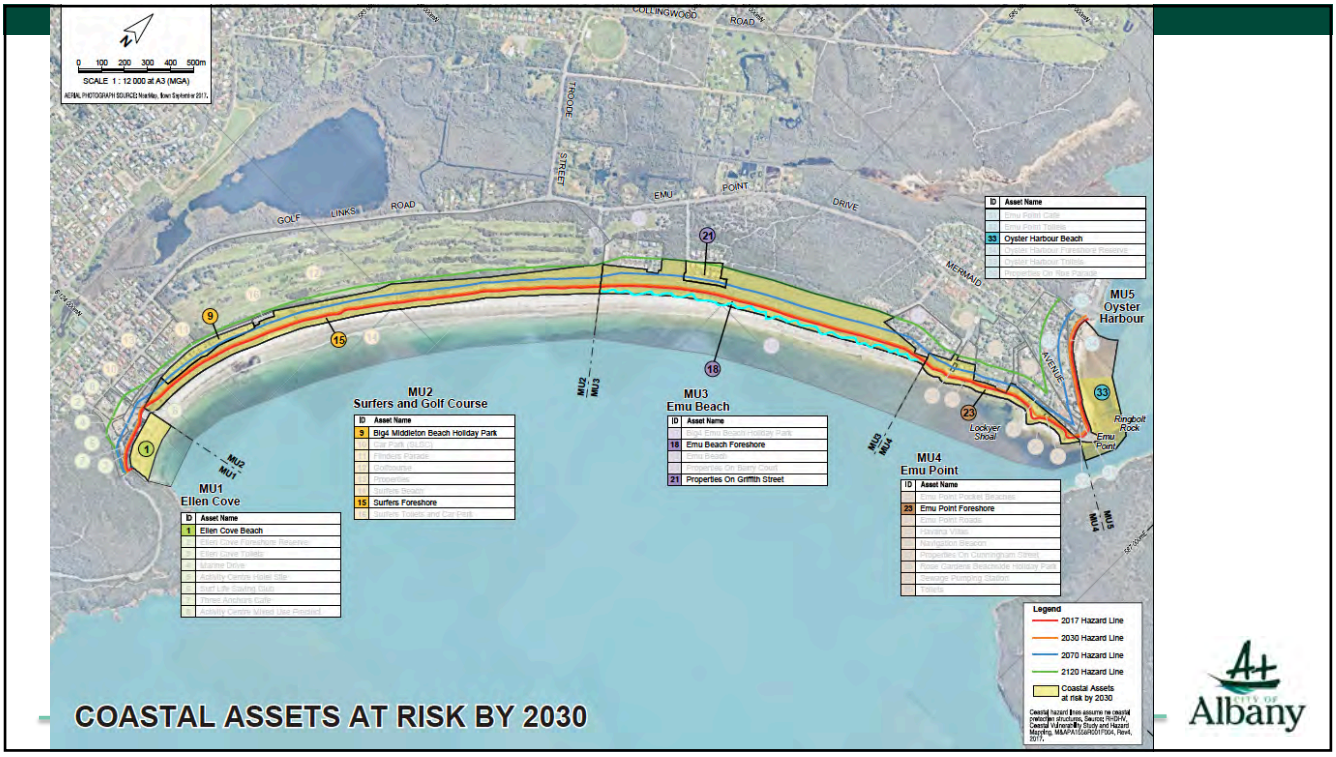
REMEMBER - A LOW SCORE IS A GOOD SCORE!!

Effectiveness

- Short term options suitable for minor protection
- Untested/unclear how effective
- Well tested and understood – works to reduce risk

REMEMBER - A LOW SCORE IS A GOOD SCORE!!

Next Steps


COLLINGWOOD ROAD
FRODE STREET
EMU POINT DRIVE
GOLF LINKS ROAD
MERMAID AVENUE
MU1
Ellen Cove
MU2
Surfers and Golf Course
MU3
Emu Beach
MU4
Emu Point
MU5
Oyster Harbour
Lockyer Shoal
Ringbolt Rock
Emu Point
Legend
2017 Hazard Line
2030 Hazard Line
2070 Hazard Line
2120 Hazard Line
Coastal Assets at risk by 2030
COASTAL ASSETS AT RISK BY 2030
City of Albany


LEGEND
Current Horizontal Setback Datum (HSD)
Present Day (2017)
2030
2050
2070
2090
2120
City of Albany

Optional Site Walk

- 5:30pm Thursday evening
- Meet outside Emu Point Café
- Geoff Bastyan will talk through key elements

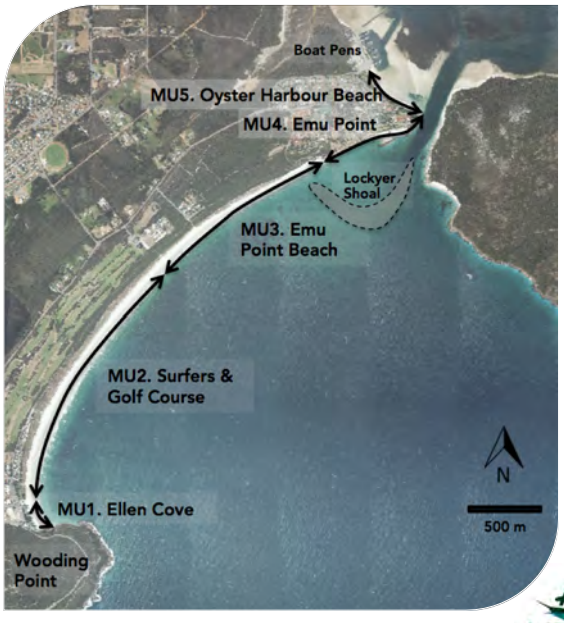
What to expect from us this week

- A brief summary of today's outcomes
- Saturday will be fun/interesting/challenging
- Please allow a few minutes after 5pm for a small thank you celebration

What to do before Saturday

- Have a more detailed look at the background information
- Ask/email me/Emma for anything else you need
- Think about the study area and talk to people you know about those assets

Any questions ?



Appendix B - Suite of Options

ALL ASSETS | MANAGEMENT UNITS
(Where Applicable)

Accommodate
AC2. Maintain and enhance beach system

COMMENTS :

Artificial maintenance of existing sandy beach. May include beach scraping or sand nourishment from within study area.

\+ Maintains existing sandy beach and natural vista.

\- May become less effective as sea level rises and relies on sustainable source of sand.

Ellen Cove existing conditions

ALL ASSETS | MANAGEMENT UNITS
(Where Applicable)

Accommodate
AC3. Maintain and enhance dune system

COMMENTS :

Manage beach access to prevent erosion and revegetate to protect dune system as much as possible.

\+ Maintains foreshore, beach access and natural vista.

\- Limited effectiveness as only reduces the erosion impact.

Dune brushing and
re-vegetation (Rottnest Island)

ASSET : BEACH
Management Unit 1 - Ellen Cove

Protect
PR1. Sand nourishment

COMMENTS :

Manual placement of large volumes of sand on the beach to maintain the existing profile.

\+ Maintains existing sandy beach and natural vista.

\- May become less effective as sea level rises and relies on sustainable source of sand.

Sand nourishment at Ellen Cove

Document Last Updated : November 2018

ASSET : FORESHORE

Management Unit 2 - Surfers & Golf Course

Avoid

AV2. Avoid further development in existing developed areas impacted by coastal hazards

Capital Cost $C

Maintenance Cost $M

Environmental Impact

Social | Amenity Impact

Reversibility

Effectiveness

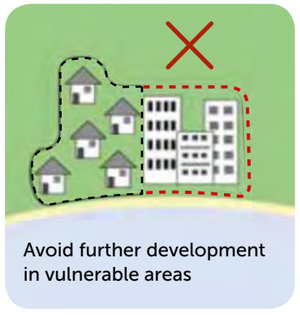
COMMENTS :

New foreshore assets located outside the erosion risk zone. Requires planning framework and Management Plans to support this.

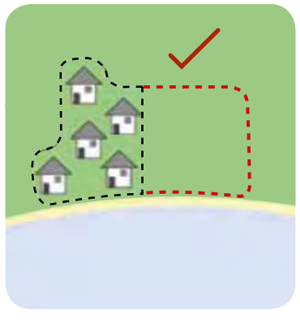
\+ Allows low value assets to be used until impacted

\- Requires monitoring and may require urgent action during or after a storm event.

\- Requires strong commitment to retaining existing natural areas and deter incremental redevelopment.



Avoid further development in vulnerable areas



Document Last Updated : November 2018

ASSET : FORESHORE

Management Unit 2 - Surfers & Golf Course

Managed Retreat

MR1. Leave assets unprotected

Capital Cost $C

Maintenance Cost $M

Environmental Impact

Social | Amenity Impact

Reversibility

Effectiveness

COMMENTS :

Allows the Foreshore to naturally recede and change.

Costs required to prepare Management Plans and remove some built infrastructure within the Reserve.

\+ Allows low value assets to be used until impacted.

\- Requires monitoring and may require urgent action during or after a storm event.

Storm damage on Port Beach Fremantle

Document Last Updated : November 2018

ASSET : BIG 4 HOLIDAY PARK

Management Unit 2 - Surfers & Golf Course

Avoid

AV2. Avoid further development in existing developed areas impacted by coastal hazards

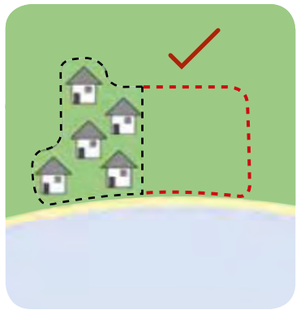
COMMENTS :

Continue existing use of land but restrict further development to least vulnerable portion of lease area. Requires appropriate framework in place and strong commitment to collaborating with lease holder.

\+ Allows existing assets to be used until hazard is imminent.

\- Requires monitoring and may require urgent action during or after a storm event.

Avoid further development in vulnerable areas



Document Last Updated : November 2018

ASSET : BIG 4 HOLIDAY PARK

Management Unit 2 - Surfers & Golf Course

Managed Retreat

MR1. Leave asset unprotected

COMMENTS :

Do nothing and accept potential losses during/following a storm event. Remove assets when they are no longer safe to use.

Requires a strong relationship between City of Albany and lease holder

\+ Allows existing assets to be used until hazard is imminent and requires a private entity to accept risk/loss.

\- Requires monitoring and may require urgent action during or after a storm event.

Storm damage on Port Beach Fremantle

Document Last Updated : November 2018

ASSET : BIG 4 HOLIDAY PARK

Management Unit 2 - Surfers & Golf Course

Managed Retreat
MR2. Relocate asset

Capital Cost
Maintenance Cost
Environmental Impact
Social | Amenity Impact
Reversibility
Effectiveness

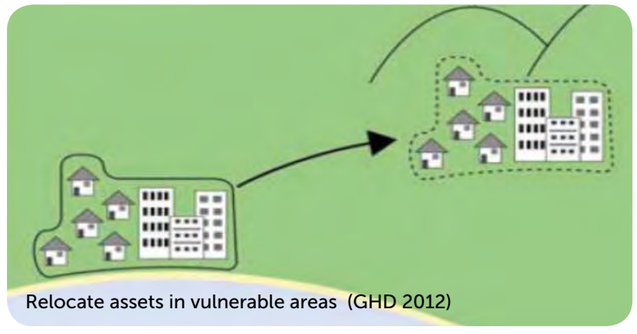
COMMENTS :

Progressively remove assets when the asset is less than 35 metres from the back of beach (vegetation line).

Requires appropriate planning response and close working relationship with the leaseholder.

\+ Allows existing assets to be used until hazard is unacceptable.
Staged removal allows more time and reduces risk.

\- Cost of relocation may be unviable and result in loss of Caravan Park for the City.



Relocate assets in vulnerable areas (GHD 2012)

Document Last Updated : November 2018

ASSET : BIG 4 HOLIDAY PARK

Management Unit 2 - Surfers & Golf Course

Protect

PR7. Seawalls/revetments - Rock or GSC Sandbags

COMMENTS :

Rock construction of a buried seawall to act as a last line of defence.

\+ Provides for ongoing use of existing assets.

\- May affect the beach to the South and eventually result in loss of beach in front of seawall.

\- Limits public access.

\- Negative impact on environment and natural vista.

Construction of buried seawall

Document Last Updated : November 2018

ASSET : GRIFFITHS ST. PROPERTIES

Management Unit 3 - Emu Beach

Managed Retreat
MR2. Relocate assets

Capital Cost: $C
Maintenance Cost: $M
Environmental Impact
Social | Amenity Impact
Reversibility
Effectiveness

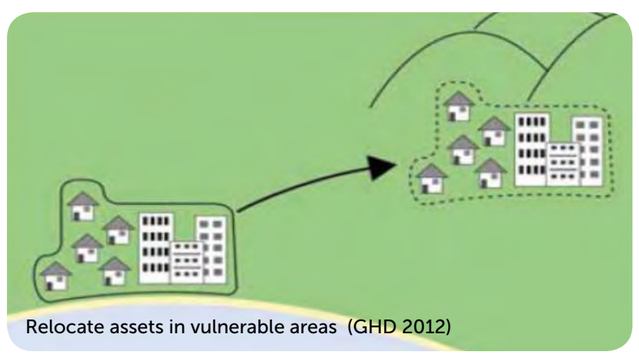
COMMENTS :

Progressively remove assets as they become at risk from coastal hazards. Requires appropriate planning framework to support this option.

\+ Allows existing assets to be used until hazard is unacceptable.

\+ Staged removal allows more time and reduces risk.

\- Ongoing costs to ensure care, control and maintenance.



Relocate assets in vulnerable areas (GHD 2012)

Document Last Updated : November 2018

ASSET : GRIFFITHS ST. PROPERTIES

Management Unit 3 - Emu Beach

Protect

PR1. Sand nourishment

Capital Cost $C

Maintenance Cost $M

Environmental Impact

Social | Amenity Impact

Reversibility

Effectiveness

COMMENTS :

Placement of large volumes of sand on the beach to maintain the existing profile.

\+ Maintains existing sandy beach and natural vista.

\- May become less effective as sea level rises and relies on sustainable source of sand.

\- Is temporary and requires regular re-nourishment.

Sand nourishment

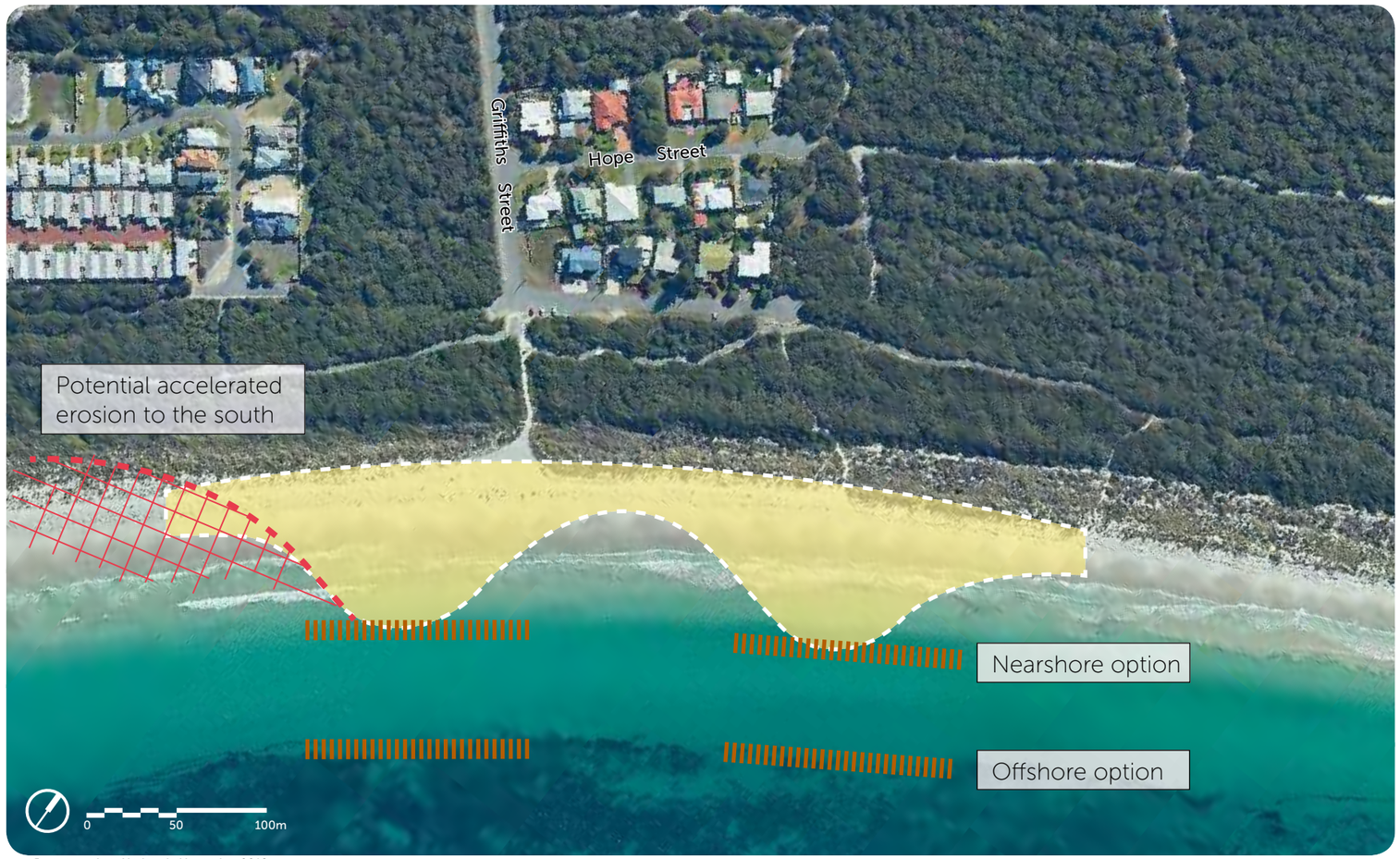
Document Last Updated : November 2018

ASSET : GRIFFITHS ST. PROPERTIES

Management Unit 3 - Emu Beach

Protect

PR2 + PR3. Offshore structures (breakwaters) or
PR4 + PR5. Nearshore structures (breakwaters)



COMMENTS :

Construction of offshore structure (s) to limit wave energy and protect the assets behind it.

\+ Provides for ongoing use of existing assets.

\+ Stabilises coast, maintains sandy beach and access.

\- Negative impact on natural vista and environment.

\- Potential increased erosion of beach to south.

Offshore breakwaters (Siloso Beach)

Document Last Updated : November 2018

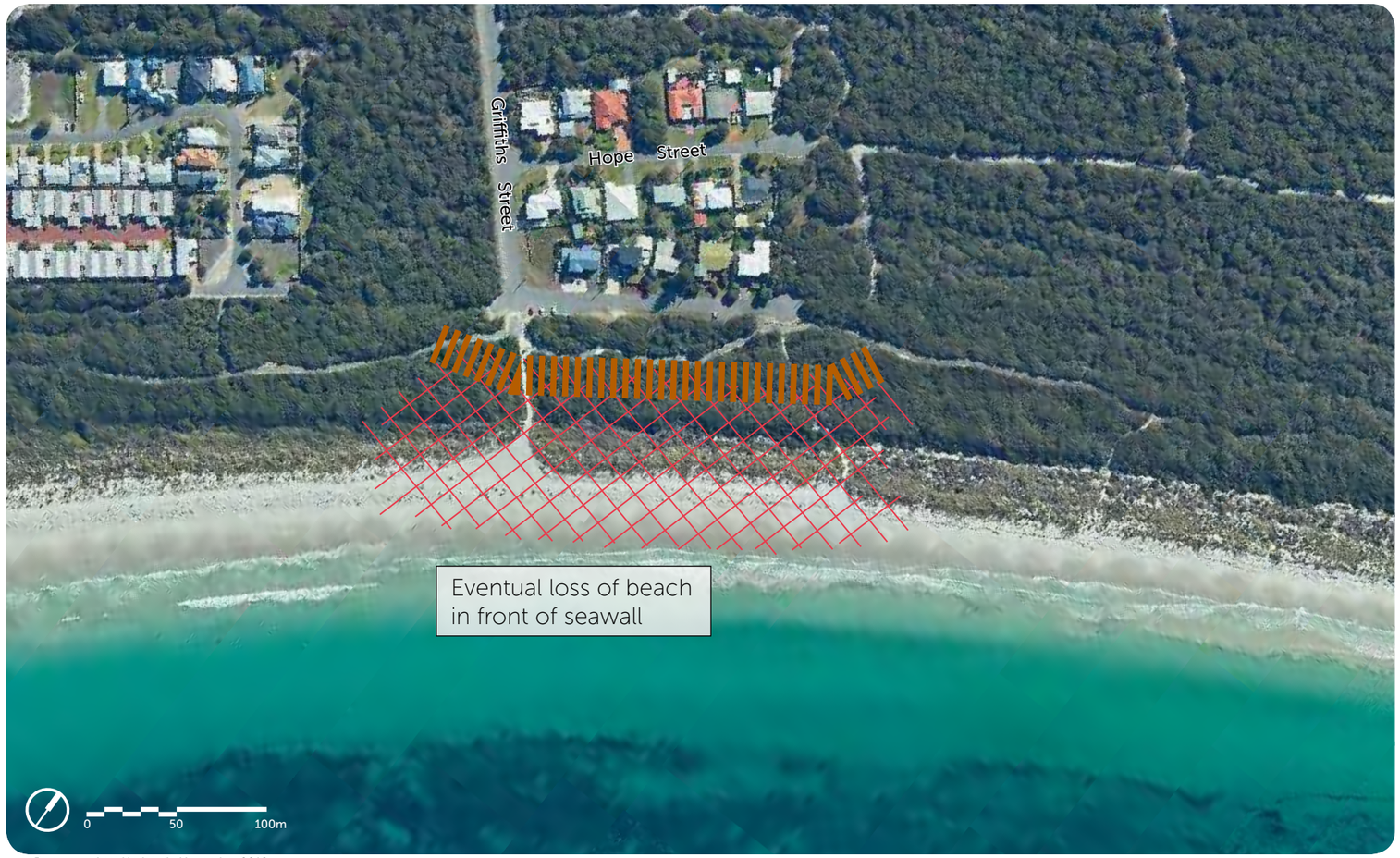
ASSET : GRIFFITHS ST. PROPERTIES

Management Unit 3 - Emu Beach

Protect

PR7. Seawalls / revetments

Capital Cost | Maintenance Cost | Environmental Impact | Social | Amenity Impact | Reversibility | Effectiveness



COMMENTS :

Rock construction of a buried seawall to act as a last line of defence.

\+ Provides for ongoing use of existing assets.

\- Likely to result in accelerated erosion when exposed.

\- Impacts natural vista and amenity.

Construction of buried seawall.

Document Last Updated : November 2018

ASSET : FORESHORE RESERVE

Management Unit 3 + 4 - Emu Beach and Emu Point

Managed Retreat
MR2. Relocate assets

Capital Cost $C
Maintenance Cost $M
Environmental Impact
Social | Amenity Impact
Reversibility
Effectiveness

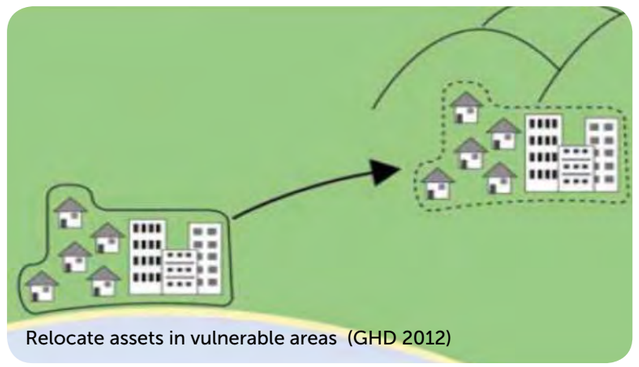
COMMENTS :

Progressively remove assets as they become at risk from coastal hazards. Requires appropriate planning framework to support this option.

\+ Allows shoreline to naturally retreat.

\+ Staged removal allows more time and reduces risk.

\- Ongoing costs to ensure care, control and maintenance.



Relocate assets in vulnerable areas (GHD 2012)

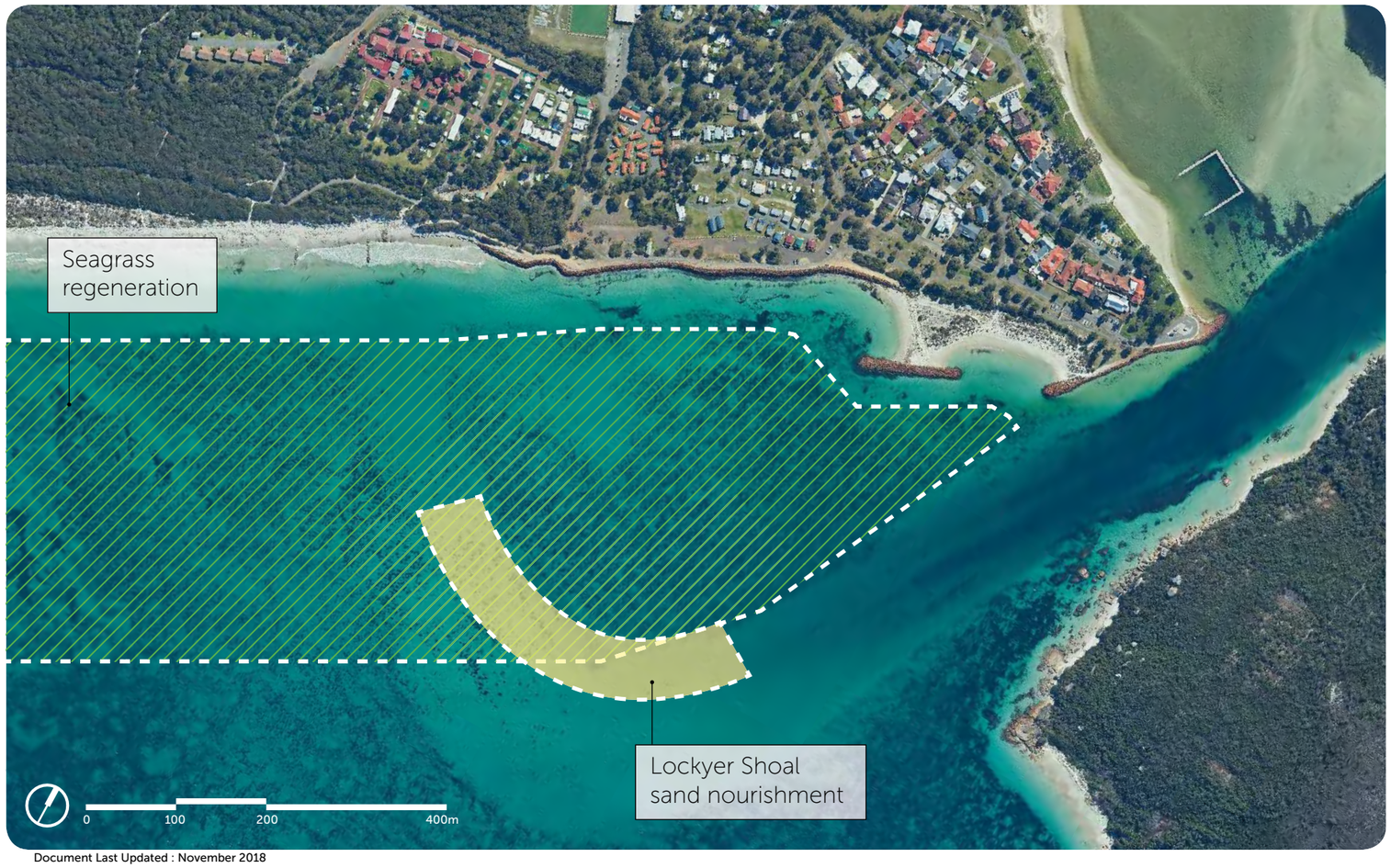
Document Last Updated : November 2018

ASSET : FORESHORE RESERVE

Management Unit 3 + 4 - Emu Beach and Emu Point

Accommodate

AC4. Maintain and enhance nearshore system - seagrass regeneration



COMMENTS :

Preserve and enhance the natural off-shore system to assist in absorbing the impact of storm events and post storm recovery. May include seagrass regeneration and offshore placement of sand.

\+ Reinforces natural coastal processes.

\+ Maintains foreshore, beach and natural vista.

\- Limited confidence in effectiveness as only reduces the erosion impact.

\- Unclear if this option will mitigate risk in severe storm events.


Seagrass harvesting (BMT Oceanica 2013)

Document Last Updated : November 2018

ASSET : FORESHORE RESERVE

Management Unit 3 + 4 - Emu Beach and Emu Point

Protect

PR1. Sand nourishment

COMMENTS :

Placement of large volumes of sand on the beach to maintain the existing profile.

\+ Maintains existing sandy beach and natural vista.

\- May become less effective as sea level rises and relies on sustainable source of sand.

\- Is temporary and requires regular re-nourishment.

Sand nourishment at Oyster Harbour

Document Last Updated : November 2018

ASSET : FORESHORE RESERVE

Management Unit 3 + 4 - Emu Beach and Emu Point

Protect

PR3. Offshore structures or
PR4. Nearshore structures
→ detached breakwaters / headlands

Capital Cost: $C
Maintenance Cost: $M
Environmental Impact
Social | Amenity Impact
Reversibility
Effectiveness

COMMENTS :

Construction of offshore structure (s) to limit wave energy and protect the assets behind it.

\+ Provides for ongoing use of existing assets.

\+ Stabilises coast, maintains sandy beach and access.

\- Negative impact on natural vista and environment.

\- Potential accelerated erosion to the south.

Offshore breakwaters

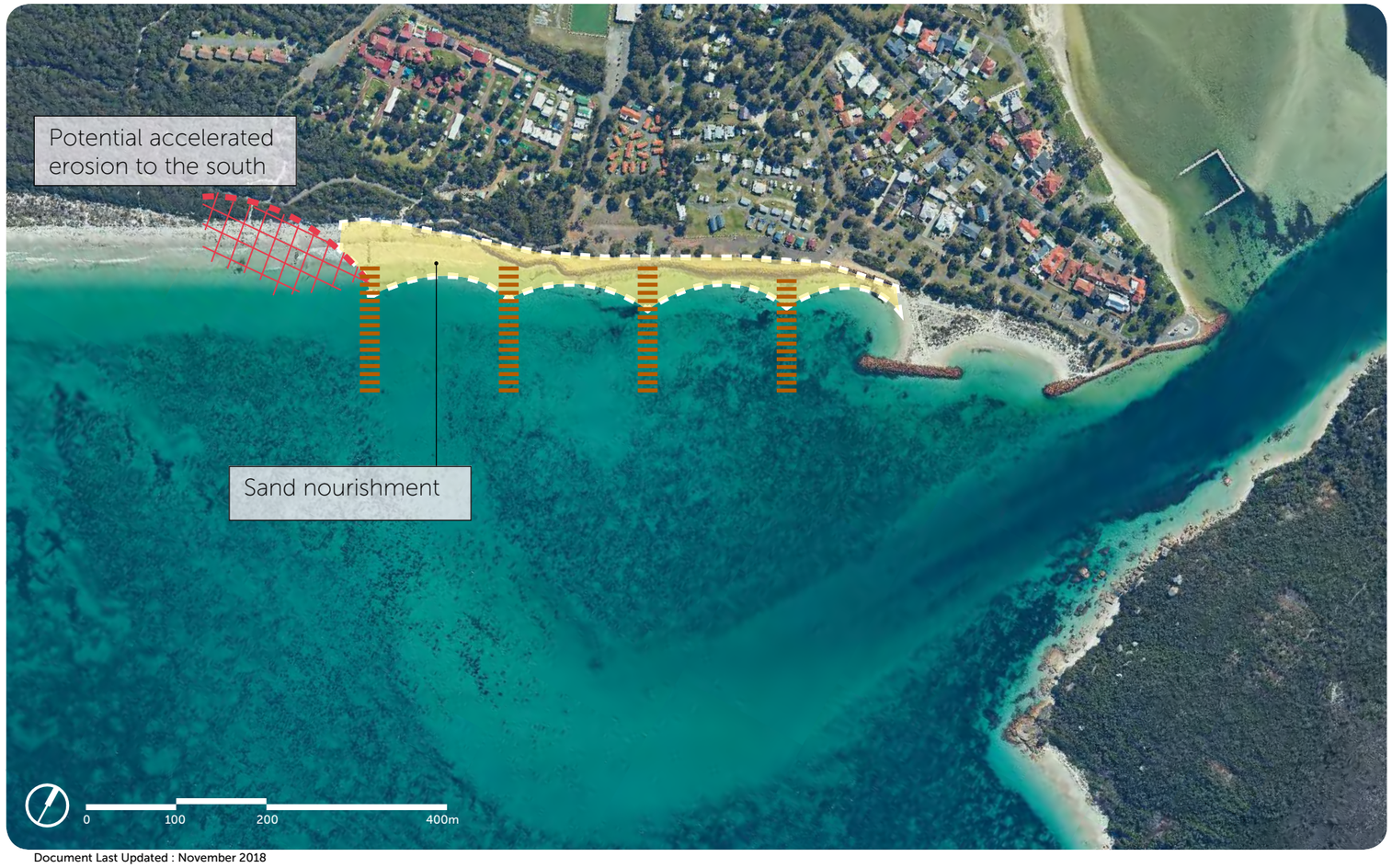
Document Last Updated : November 2018

ASSET : FORESHORE RESERVE

Management Unit 3 + 4 - Emu Beach and Emu Point

Protect

PR5. Nearshore structures - groynes



COMMENTS :

Replace existing seawall with construction of groyne field. Would also require relocation of assets or bulk sand nourishment to obtain buffer.

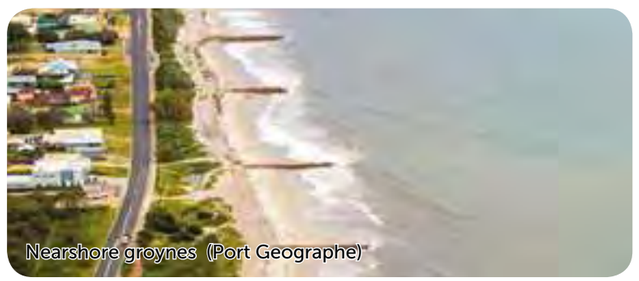
\+ Provides for ongoing use of existing assets.

\+ Stabilises coast, maintains sandy beach and access.

\- Negative impact on natural vista and environment.

\- May limit beach amenity.

\- Likely to result in loss of the beach to the south.


Nearshore groynes (Port Geographe)

Document Last Updated : November 2018

ASSET : FORESHORE RESERVE

Management Unit 3 + 4 - Emu Beach and Emu Point

Protect

PR7. Seawall / revetments and parkland development, or
PR9. Upgrade of existing structures

COMMENTS :

Replace exiting seawall with a specially designed structure that integrates with foreshore redevelopment, could be multi-level.

\+ Provides for ongoing use of existing assets.

\- Continue to have no beach in front of wall and affect beach to South.

\- Negative visual and environmental impact.

\- Likely to result in loss of the beach to the south.


Integrated seawall and foreshore landscape (Esperance)

Document Last Updated : November 2018

ASSET : SOUTH-EAST BEACH

Management Unit 5 - Oyster Harbour Beach

Protect

PR1. Sand nourishment

COMMENTS :

Placement of large volumes of sand on the beach to maintain the existing profile. May also require extension of Northern Groyne.

\+ Maintains existing sandy beach and natural vista.

\- May become less effective as sea level rises and relies on sustainable source of sand.

\- Is short lasting and requires regular re-nourishment.

Sand nourishment at Oyster Harbour

Document Last Updated : November 2018

ASSET : SOUTH-EAST BEACH

Management Unit 5 - Oyster Harbour Beach

Protect
PR3a. Offshore structures
PR3b. Submerged offshore structures

detached breakwaters / headlands

COMMENTS :

Construction of offshore structures to limit wave energy and protect the assets behind it. May include 'smoothing' of beach profile.

\+ Provides for ongoing use of existing assets.

\+ Stabilises coast, maintains sandy beach and access.

\- Negative impact on natural vista and environment / potential impact on recreational water use.


Offshore breakwaters (Siloso Beach)

Document Last Updated : November 2018

Appendix C - Day 2 Presentation

Emu Point to Middleton Beach
Coastal Hazard Risk Management & Adaptation Plan

Welcome

Matthew Thomson

Executive Director Infrastructure and Environment

City of Albany

Welcome

A spot of housekeeping….

- Mobile Phones
- Bathrooms
- Emergency procedures

Welcome

- Emma, Anthony, Matt, Melanie, Anna, Geoff
- Phone charging/calls
- Photos and privacy
- Social media

Our Remit

The coastline between Middleton Beach and Emu Point is vulnerable to natural coastal processes such as waves, storms and sea level rise.

Our Remit

The City of Albany needs to be responsible and adapt to this challenge; what adaptation options will balance the values and needs of the community for this coastline?

What you will influence

- The preferred option for each at-risk asset
- Better understanding of community values (more measureable)
- Future Engagement activities

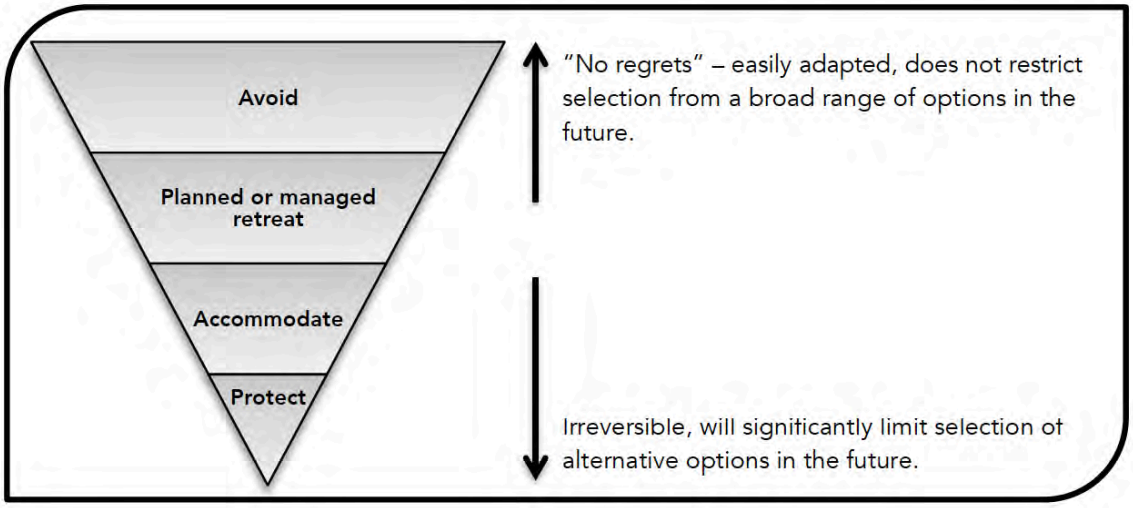
What are we doing today

- Looking at the options available for the most vulnerable assets
- Scoring each of the criteria to determine preferred options

What's this all about?

- Looking into the future and *planning*
- State Planning Policy 2.6 – State Coastal Planning
- Understanding the trade-offs – not everyone wins

The 'hierarchy' of SPP 2.6



Identify adapta

Hierarchy of Controls

- **Avoid** – Options which a by avoiding developmen
- **Managed Retreat** – Opti development
- **Accommodation** – Optic with the temporary impa
- **Protection** – Options wh

AVOID	**AV1.** Avoid new development in un-developed areas impacted by coastal hazards
	AV2. Avoid further development in existing developed areas impacted by coastal hazards
MANAGED RETREAT	**MR1.** Leave assets unprotected
	MR2. Relocate assets
	MR3. Removal of protection structures
ACCOMMODATE	**AC1.** Design assets to withstand impacts
	AC2. Maintain and enhance beach system
	AC3. Maintain and enhance dune system
	AC4. Maintain and enhance nearshore system – Seagrass regeneration
	AC5. Beach dewatering
PROTECT	**PR1.** Sand nourishment
	PR2. Offshore structures – artificial reefs/shoals
	PR3. Offshore structures – detached breakwaters/ headlands
	PR4. Nearshore structures – breakwaters/ headlands
	PR5. Nearshore structures – groynes
	PR6. Levees/ dykes
	PR7. Seawalls/ revetments
	PR8. Storm surge barriers
	PR9. Upgrade of existing protection structures

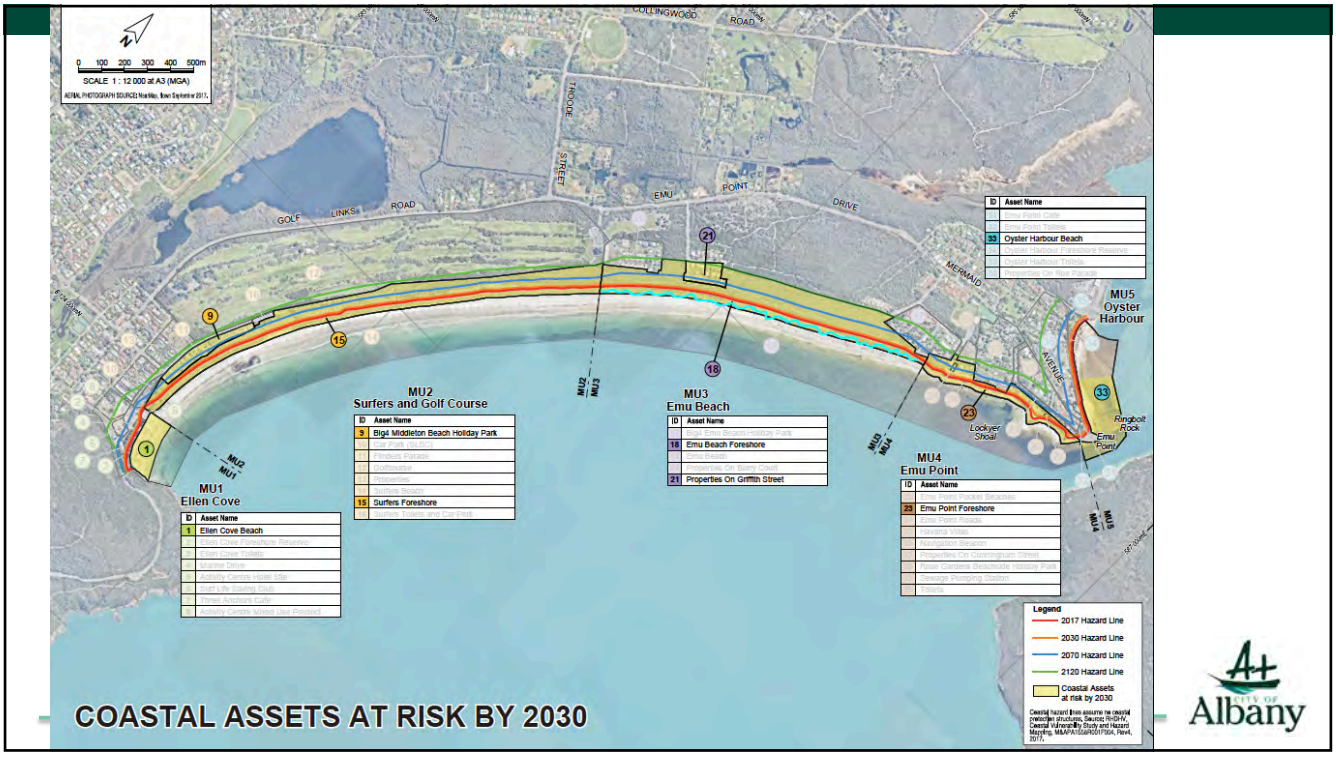
Q&A

Assessing Adaptation Options

Step 1 - short-listing process for each asset with high or extreme vulnerability rating:

- Culled unsuitable options (for Albany/specific coastline)
- Analyse technical feasibility / applicability / cost of options

Assessing the options/using your measures


COLLINGWOOD ROAD
FRODE STREET
EMU POINT DRIVE
GOLF LINKS ROAD
MERMAID AVENUE
MU1
Ellen Cove
MU2
Surfers and Golf Course
MU3
Emu Beach
MU4
Emu Point
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Lockyer Shoal
Ringbolt Rock
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2017 Hazard Line
2030 Hazard Line
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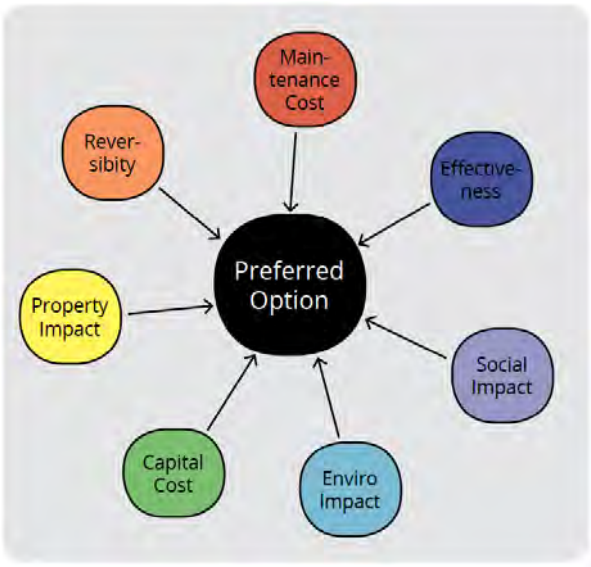
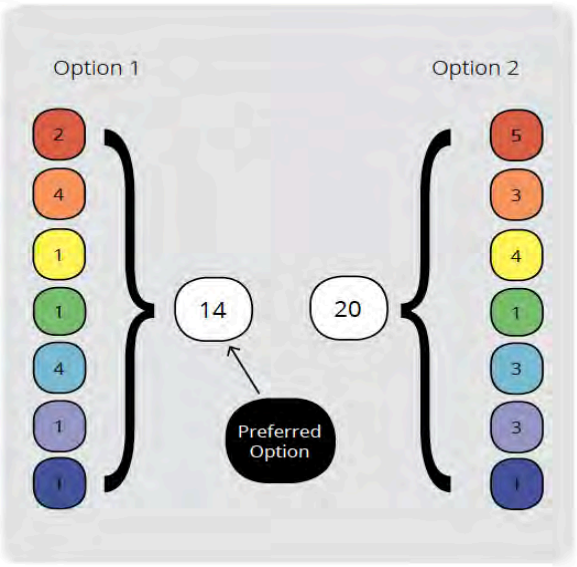
2120 Hazard Line
Coastal Assets at risk by 2030
COASTAL ASSETS AT RISK BY 2030
City of Albany


Main-tenance Cost
Rever-sibity
Effective-ness
Preferred Option
Property Impact
Social Impact
Capital Cost
Enviro Impact


Option 1
Option 2
2
4
1
1
4
1
1
14
20
5
3
4
1
3
3
1
Preferred Option

MU/Asset	Option	Capital Cost	Maintenance Cost	Environmental Impact	Social Impact - Property	Social Impact - Communal	Reversibility	Effectiveness
Several	AC2 – maintain and enhance beach system							
Several	AC3 – maintain and enhance dune system							
MU1 – Beach	PR1 – sand nourishment							
MU2 - Foreshore	AV2 – avoid further development							
	MR1 – leave assets unprotected							

1. Step through the assets and each options in groups
2. You will apply you <u>own</u> personal score
3. We will poll the overall preference and identify majority

MU/Asset	Option	Capital Cost	Maintenance Cost	Environmental Impact	Social Impact - Property	Social Impact - Communal	Reversibility	Effectiveness
Several	AC2 – maintain and enhance beach system							
Several	AC3 – maintain and enhance dune system							
MU1 – Beach	PR1 – sand nourishment							
MU2 - Foreshore	AV2 – avoid further development							
	MR1 – leave assets unprotected							

1. We will measure preferred overall option per asset
2. You get to provide comments
3. The outcome will be a preferred option, or at least a much shorter list

Measurement

One last thing…

Costs - Capital Cost

- At present we have no differentiation
- If two options score equally well on all other criteria, will price be a differentiator?

One last thing…

Costs - Capital Cost

- If YES – identify the range you would like to choose
- If NO – provide key dot points so Council knows what decision to make

Last, last thing…

Costs - Maintenance Cost

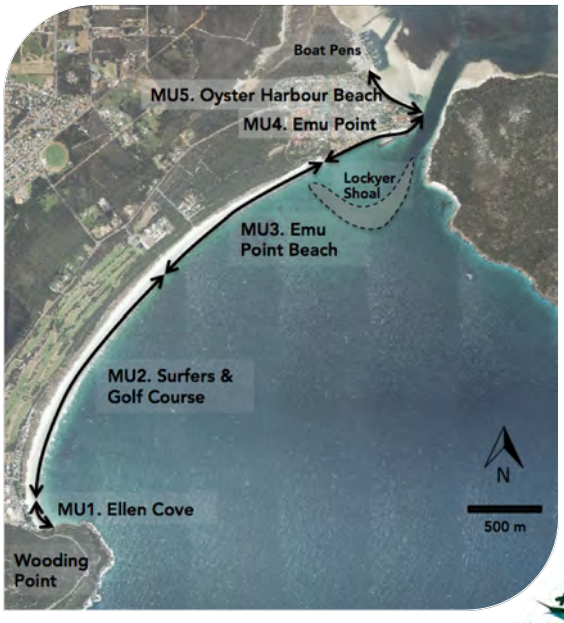
- At present we imply that a good option would be an expensive outcome compared to a cheaper one
- If two options score equally well on all other criteria, would you still preference the more expensive option?

One last thing…

Costs - Maintenance Cost

- If YES – provide key dot points so Council knows what decision to make
- If NO – identify the range you would like to choose or say – 'flip'

Any questions before we start ?



Suite of Options

Who pays…

The cost of protection and management is very high. Who do you think should pay for it?

Survey: Valued Assets

☑ Willingness to pay for coastal erosion treatments:

- 71.2% willing to pay
- 21.9% not willing to pay
- 6.9% said they could find similar assets elsewhere

☑ Who respondents think should pay…

- 5% - Users
- 4% - Businesses
- 3% - Residents
- 20% - Local Government
- 26% - State Government
- 18% - Australian Government
- 21% - All of the above
- 2% - None of the above

Would you change your support for different options?

Thinking of the preferred options, would you change any recommendations if only Council was paying?

Summary of Scores

Next Steps

Thank You!

Paul Camins

Executive Director Development Services

City of Albany

Appendix D - Scoring Spreadsheet (including Costs)

MU/Asset	Option	Capital Cost	Maintenance Cost	Environmental Impact	Social Impact - Property	Social Impact - Communal	Reversibility	Effectiveness				
Several	AC2 – maintain and enhance beach system	$5,000	$495,000						0.00		0.00	$500,000
Several	AC3 – maintain and enhance dune system	$4,000	$396,000						0.00		0.00	$400,000
MU1 – Beach	PR1 – sand nourishment	$213,000 - $568,000	$4,260,000 - $5,680,000						0.00		0.00	$4,473,000 - $6,248,000
MU2 - Foreshore	AV2 – avoid further development	$0	$0						0.00		0.00	$0
	MR1 – leave assets unprotected	$0	$0						0.00		0.00	$0
MU2 – Big 4	AV2 – avoid further development	$0	$0						0.00		0.00	$0
	MR1 – leave assets unprotected	$7,882,000	$15,764,000						0.00		0.00	$23,646,000
	MR2 – relocate assets	$5,818,000	$11,636,000						0.00		0.00	$17,454,000
	PR7 – seawall (rock)	$1,731,000	$2,462,000						0.00		0.00	$4,193,000
	PR7 – seawall (GSC)	$2,535,000	$12,675,000						0.00		0.00	$15,210,000
MU3 – Griffiths St Properties	MR2 – relocate assets	$12,188,000	$24,376,000						0.00		0.00	$36,564,000
	PR1 – sand nourishment	$844,000	$10,550,000						0.00		0.00	$11,394,000
	PR2 + PR3 - off shore structures (breakwaters)	$4,433,000	$8,866,000						0.00		0.00	$13,299,000
	PR4 + PR5 - near shore structures (breakwaters)	$3,110,000	$6,220,000						0.00		0.00	$9,330,000
	PR7 - seawall	$1,669,000	$3,338,000						0.00		0.00	$5,007,000

MU/Asset	Option	Capital Cost		Maintenance Cost		Environmental Impact	Social Impact - Property	Social Impact - Communal	Reversibility	Effectiveness				
MU 3/4 – Foreshore Reserve	MR2 – relocate assets	$21,613,000		$43,226,000								0.00		0.00	$64,839,000
	AC4 – maintain and enhance nearshore system	$5,850,000		$39,000,000								0.00		0.00	$44,850,000
	PR1 – sand nourishment	$4,400,000		$55,000,000								0.00		0.00	$59,400,000
	PR3 - off shore structures (detached breakwaters/headlands) + sand nourishment once off	$22,018,000		$29,702,000								0.00		0.00	$51,720,000
	PR4 - near shore structures (detached breakwaters/headlands) + sand nourishment once off	$12,611,000		$17,276,000								0.00		0.00	$29,887,000
	PR5 - nearshore structures - groynes	$2,825,000		$5,650,000								0.00		0.00	$8,475,000
	PR7 - seawall / revetments and parkland development	$6,484,000		$12,968,000								0.00		0.00	$19,452,000
	PR9 - upgrade of existing structures	$4,672,000		$9,344,000								0.00		0.00	$14,016,000
MU5 – South-east beach	PR1 – sand nourishment	$160,000		$2,000,000								0.00		0.00	$2,160,000
	PR3a – offshore structures (detached breakwaters/headlands) + sand nourishment once off	$715,000		$1,148,000								0.00		0.00	$1,863,000
	PR3b – submerged offshore structures (detached breakwaters/headlands) + sand nourishment once off	$701,000		$1,120,000								0.00		0.00	$1,821,000

Appendix E - Effectiveness and Reversibility Guide

NOTES FOR REVERSIBILITY AND EFFECTIVENESS FOR EACH OPTION

MU/Asset	Option	Reversibility	Effectiveness
Several	AC2 – maintain and enhance beach system	Maintains broad range of options in future. Can complement several other options. Can be limited if accompanied by a seawall.	Reasonable for minor to moderate storm erosion events. Unlikely to mitigate risk during severe storm erosion events or in medium to long term with increased erosion due to sea level rise.
Several	AC3 – maintain and enhance dune system	Maintains broad range of options in future. Can complement several other options.	Reasonable for minor to moderate storm erosion events. Unlikely to mitigate risk during severe storm erosion events or in medium to long term with increased erosion due to sea level rise.
MU1 – Beach	PR1 – sand nourishment	As the asset being protected is a beach, the only other complementary option is AC2 - maintain and enhance beach system (with sand scraping etc.) This is largely controlled by decision to implement seawall to protect foreshore assets.	Reasonable for minor to moderate storm erosion events. Unlikely to mitigate risk during severe storm erosion events or in medium to long term with increased erosion due to sea level rise. Beach could still be maintained by sourcing sand from outside study area, likely to have an increasing cost.
MU2 - Foreshore	AV2 – avoid further development	Maintains broad range of options in future. Can complement several other options. Is a no-regret option which would see future assets located outside risk zone, but also allows for different options to be considered over time to complement this option.	Reasonable for short to medium-term, but once erosion scarp reaches existing assets, this option is only effective when combined with other options.
MU2 - Foreshore	MR1 – leave assets unprotected	Maintains broadest range of options in future. This option could be continued on, or other Accommodate or Protect options could be utilised.	This option assumes assets are retained for as long as possible, and accepts a higher degree of risk and vulnerability compared to MR2 – relocate assets. Reasonable for minor to moderate storm erosion events. Unlikely to mitigate risk during severe storm erosion events or in medium to long-term with increased erosion due to sea level rise.
MU2 – Big 4	AV2 – avoid further development	Maintains broad range of options in future and allows for different options to be considered to complement this option.	Reasonable for short to medium-term, but once erosion scarp reaches existing assets, this option is only effective when combined with other options. This issue is compounded by the asset having a limited footprint, which is narrow and shore-parallel.

MU/Asset	Option	Reversibility	Effectiveness
MU2 – Big 4	MR1 – leave assets unprotected	Maintains broadest range of options in future. This option could be continued on, or other Accommodate or Protect options could be utilised. Has limitations due to shore-parallel footprint of asset – once utility infrastructure is removed it would result in the holiday park being unusable unless it could be replaced.	This option assumes assets are retained for as long as possible, and accepts a higher degree of risk and vulnerability compared to MR2 – relocate assets. Reasonable for minor to moderate storm erosion events. Unlikely to mitigate risk during severe storm erosion events or in medium to long-term with increased erosion due to sea level rise.
MU2 – Big 4	MR2 – relocate assets	Maintains broadest range of options in future. This option could be continued on, or other Accommodate or Protect options could be utilised.	This option assumes assets are removed sooner than for MR1 – leave assets unprotected, and accepts a lower degree of risk and vulnerability. As a result, it ensures assets are not affected by erosion – but also reduces the time they can continue to be used. May be able to be applied to built infrastructure, to leave land available for different uses – e.g. unpowered campground, or foreshore reserve.
MU2 – Big 4	PR7 – seawall (rock or GSC)	Irreversible, will significantly limit selection of alternative options in the future. If made of rock, likely to stay in place over 100-yr timeframe.	Likely to protect holiday park from erosion over 100-yr timeframe if appropriately designed, monitored and maintained/refurbished.
MU3 – Griffiths St Properties	MR2 – relocate assets	Maintains broadest range of options in future. This option could be continued on, or other Accommodate or Protect options could be utilised. This would be a rolling process for rows of properties based on trigger distances (progressive setbacks from moving coastline).	Ensures assets are not affected by erosion – but also reduces the time they can continue to be used. May be able to be applied with a “lease-back” option or to leave land available for different uses – e.g. foreshore reserve.
MU3 – Griffiths St Properties	PR1 – sand nourishment	Maintains broad range of options in future. Can complement several other options.	Reasonable for minor to moderate storm erosion events. Unlikely to mitigate risk during severe storm erosion events or in medium to long term with increased erosion due to sea level rise. Beach could still be maintained by sourcing sand from outside study area, likely to have an increasing cost.
MU3 – Griffiths St Properties	PR3/PR4 - breakwaters/headlands (offshore or nearshore)	Irreversible, will significantly limit selection of alternative options in the future. If made of rock, likely to stay in place over 100-yr timeframe. The further offshore the structures, the more difficult and expensive they would be to remove.	Likely to protect properties from erosion over 100-yr timeframe if appropriately designed, monitored and maintained/refurbished.
MU3 – Griffiths St Properties	PR7 - seawall	Irreversible, will significantly limit selection of alternative options in the future. Likely to stay in place over 100-yr timeframe.	Likely to protect properties from erosion over 100-yr timeframe if appropriately designed, monitored and maintained/refurbished. Protection of foreshore reserve depends on location of wall and time of construction.

MU/Asset	Option	Reversibility	Effectiveness
MU 3/4 – Foreshore Reserve	MR2 – relocate assets	Maintains broadest range of options in future. This option could be continued on, or other Accommodate or Protect options could be utilised. This would be a rolling process for assets and rows of properties based on trigger (the shoreline movement or a specific event) distances.	Ensures assets are not affected by erosion – but also reduces the time they can continue to be used. May be able to be applied with a "lease-back" option or to leave land available for different uses – e.g. foreshore reserve.
MU 3/4 – Foreshore Reserve	AC4 – maintain and enhance nearshore system	Maintains broad range of land-based options in future. This option could be continued on, or other Accommodate or Protect options could be utilised in combination, depending on the results achieved.	Reasonable for minor to moderate storm erosion events. Unclear if this option can mitigate risk during severe storm erosion events or in medium to long term with increased erosion due to sea level rise. Largely dependant on if seagrass regeneration can be adequately encouraged.
MU 3/4 – Foreshore Reserve	PR1 – sand nourishment	Maintains broad range of options in future. Can complement several other options.	Reasonable for minor to moderate storm erosion events. Unlikely to mitigate risk during severe storm erosion events or in medium to long term with increased erosion due to sea level rise. Beach could still be maintained by sourcing sand from outside study area, likely to have an increasing cost.
MU 3/4 – Foreshore Reserve	PR3/PR4 breakwaters/headlands (offshore or nearshore)	Irreversible, will significantly limit selection of alternative options in the future. Likely to stay in place over 100-yr timeframe. The further offshore the structures, the more difficult and expensive they would be to remove.	Likely to protect foreshore reserves and assets from erosion over 100-yr timeframe if appropriately designed, monitored and maintained/refurbished.
MU 3/4 – Foreshore Reserve	PR5 Nearshore structures - groynes	Difficult to remove. Will limit selection of alternative options in the future.	Reasonable for minor to moderate storm erosion events. May also mitigate risk during severe storm erosion events and in medium to long term if appropriately designed, monitored and maintained/refurbished. Uncertainty is due to complicated local sediment transport patterns.
MU 3/4 – Foreshore Reserve	PR7/PR9 – Seawall	Irreversible, will significantly limit selection of alternative options in the future. Likely to stay in place over 100-yr timeframe.	Likely to protect foreshore reserves and assets from erosion over 100-yr timeframe if appropriately designed, monitored and maintained/refurbished.
MU5 – South-east beach	PR1 – sand nourishment	As the asset being protected is a beach, the only other complementary option is AC2 - maintain and enhance beach system (with sand scraping etc.) This is largely controlled by decision to implement seawall to protect foreshore assets.	Reasonable for minor to moderate storm erosion events. Unlikely to mitigate risk during severe storm erosion events or in medium to long term with increased erosion due to sea level rise. Beach could still be maintained by sourcing sand from outside study area, likely to have an increasing cost.

MU/Asset	Option	Reversibility	Effectiveness
MU5 – South-east beach	PR3 – Offshore breakwaters/exposed headlands	Difficult to remove. Will limit selection of alternative options in the future. Not as difficult as for open ocean coastline, because of smaller wave climate and shallow water. Likely to stay in place for many decades, maybe the 100-yr timeframe. The further offshore the structures, the more difficult and expensive they would be to remove.	Likely to protect foreshore reserves and assets from erosion over 100-yr timeframe if appropriately designed, monitored and maintained/refurbished.
MU5 – South-east beach	PR3 – Submerged offshore breakwaters/ exposed headlands	Difficult to remove. Will limit selection of alternative options in the future. Not as difficult as for open ocean coastline, because of smaller wave climate and shallow water. Likely to stay in place for many decades, maybe the 100-yr timeframe. The further offshore the structures, the more difficult and expensive they would be to remove.	Likely to protect foreshore reserves and assets from erosion over 100-yr timeframe if appropriately designed, monitored and maintained/refurbished. Submerged breakwater makes maintenance more challenging.

Appendix F - Multi Criteria Analysis

MU/Asset	Option	SH1	SH2	SH3	SH4	SH5	SH6	SH7	SH8	SH9	SH10	SH11	SH13	SH14	SH15	SH16	SH17	SH18	SH19	SH20	SH21	Average
Several	AC2 - maintain and enhance beach system (MC $495,000)	1		5	1			2	5	5	1	3	3	2	3	4	5	3	3	3	4	3.1
	AC3 - maintain and enhance dune system (MC $396,000)	1		2	5				3	3	5	2	2	2	2	3	4	2	3	3	3	2.8
MU1 - Beach	PR1 - sand nourishment	2	3	5	5	3	4	2	5	5	5	2	3	1	3	4	4	3	3	4	3	3.5
MU2 - Foreshore	AV2 - avoid further development	1	3	1	1	1	1	2	3	1	1	5	1	3	5	3	1	2	5	3	5	2.4
	MR1 - leave assets unprotected	2	4	1	5	4	1	2	4	1	5	5	1	3	5	3	5	5	5	4	5	3.5
MU2 - Big 4	AV2 - avoid further development	2	5	1	1	5	1	2	4	1	1	5	1	3	3	4	1		5	5	5	2.9
	MR1 - leave assets unprotected	3	1	1	5	3	4	2	4	1	5	5	1	3	4	4	5		5	5	5	3.5
	MR2 - relocate assets	3	2	1	1	2	1	2	4	1	1	1	1	2	1	3	1		5	5	5	2.2
	PR7 - seawall (rock)	2	1	5	1	3	4	5	4	5	5	1	2	5	3	1	3		1	1	1	2.8
	PR7 - seawall (GSC)	2	1	5	3	2	4	4	4	5	3	1	2	5	3	3	3		2	1	1	2.8
MU3 - Griffiths St Properties	MR2 - relocate assets	3	1	1	3	4	1	2	4	1	5	1	1	3	2	2	1		5	4	5	2.6
	PR1 - sand nourishment	2	2	5	2	3	4	3	5	5	2	5	3	2	3	4	5		4	5	3	3.5
	PR2 + PR3 - off shore structures (breakwaters)	3	2	5	4	2	4	2	5	5	5	1	2	2	4	2	2		1	2	1	2.8
	PR4 + PR5 - near shore structures (breakwaters)	3	2	5	5	2	4	2	5	5	5	1	2	2	4	3	2		1	1	1	2.9
	PR7 - seawall	2	1	5	2	2	4	5	5	5	5	5	3	1	5	1	2		1	1	1	2.9
MU 3/4 - Foreshore Reserve	MR2 - relocate assets	3	5	1	1	1	2	1	4	2	1	1	1	3	2	2	5	5	5	5	5	2.8
	AC4 - maintain and enhance nearshore system	2	3	1	5	1	2	3	3	1	3	5	4	3	1	2	2	3	3	3	3	2.7
	PR1 - sand nourishment	2	4	5	5	2	4	3	5	5	1	5	3	2	3	4	5	3	5	4	5	3.8
	PR3 - off shore structures (detached breakwaters/headlands) + sand nourishment once off	2	4	5	3	1	4	4	5	4	5	1	1	2	3	1	1	2	1	2	1	2.6
	PR4 - near shore structures (detached breakwaters/headlands) + sand nourishment once off	2	3	5	3	1	4	4	5	4	5	2	1	2	3	1	2	2	1	1	1	2.6
	PR5 - near shore structures - groynes	2	3	5	4	1	3	4	5	5	5	5	3	2	5	3	4	2	2	1	1	3.3
	PR7 - seawall/revetments and parkland development	2	4	5	5	1	2	4	4	5	4	1	3	1	5	1	4	2	1	2	1	2.9
	PR9 - upgrade of existing strucutres	2	4	5	5	1	2	3	4	5	5	4	3	5	5	3	3	2	1	2	1	3.3
MU5 South-East Beach	PR1 - sand nourishment	3	3	5	5	1	4	3	4	4	1	5	3	2	3	4	4	2	3	3	2	3.2
	PR3a - off shore structures (detached breakwaters/headlands) + sand nourishment once off	2	4	5	5	1	4	3	4	4	1	1	3	2	1	2	3		1	1	1	2.5
	PR3b - submerged offshore structures (detached breakwaters/headlands) + sand nourishment once off	2	4	5	5	1	4	3	4	5	4	2	3	3	1	2	2		1	1	1	2.8

APPENDIX G

Cost Benefit Analysis

JBP
scientists
and engineers

Emu Point to Middleton Beach CHRMAP

Economic analysis of coastal adaptation options

Final Report

November 2018

City of Albany

EVO COAST

Aurora environmental
ASSESS • ADVISE • APPLY

S+U
SHAPE URBAN

JBP Project Manager

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Revision History

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Final 1.0 / 26 Oct 2018		KI, CB, MP
Final 1.1 / 20 Nov 2018		KI, CB, MP

Contract

This report describes work commissioned by Melanie Price, on behalf of Aurora Environmental, by an email dated 22 February 2018. Aurora Environmental's representative for the contract was Karl Ilich of EvoCoast. Pamela Wong and Daniel Rodger of JBP carried out this work.

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Director

Purpose

This document has been prepared as a Draft Report for Aurora Environmental and EvoCoast. JBP accepts no responsibility or liability for any use that is made of this document other than by the Client for the purposes for which it was originally commissioned and prepared.

JBP has no liability regarding the use of this report except to Aurora Environmental and EvoCoast Pty Ltd.

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Trading as Jeremy Benn Pacific and JBP Scientists and Engineers

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Executive Summary

This assessment was undertaken by Jeremy Benn Pacific (JBP), on behalf of Aurora and EvoCoast Pty Ltd. It describes a coastal erosion damages assessment and Cost-Benefit Appraisal (CBA) of several coastal adaptation options for the Emu Point to Middleton Beach Coastal Hazard Risk Management and Adaptation Plan (CHRMAP), prepared for the City of Albany. It should be read in the context of the wider project reports.

The cost-benefit methodology has been designed to provide a quantitative, economic assessment of a range of adaptation options to address erosion vulnerability. It provides information on the whole life costs of each management strategy devised to mitigate erosion, the damages avoided due to the scheme's implementation, and the economic benefits received within the Local Government Area. It has not included intangible, environmental or social value, which are the subject of a Multi-Criteria Analysis (MCA), which is to be completed separately to this assessment.

The CBA uses available erosion mapping throughout Middleton and Emu Point beaches, as a set of deterministic erosion zones for 2017, 2030, 2070 and 2120 (Royal Haskoning DHV 2017). This economic assessment has considered adaptation options for the following assets/asset-groups:

- Big 4 Middleton Beach Caravan Park in Management Unit 2
- Griffiths Street properties in Management Unit 3
- Emu Beach and Emu Point foreshore reserves including toilet block on Boongarrie Street in Management Units 3 and 4

Erosion modelling was used to estimate the economic damages likely to be experienced until 2120. The results indicate Big 4 Middleton Beach Caravan Park (MU2-Big4) and Griffiths St. Properties (MU3-Griffiths Street) will incur relatively minor damages until 2070. After this planning horizon the damages at MU3-Griffiths Street will increase steadily as residential properties are affected. Conversely the foreshore reserves in MU3 and MU4 (MU3/4 foreshores) experience higher initial damages, as land and assets located close to the foreshore are affected in the short term.

Several adaptation options, including Avoid, Managed Retreat, Accommodate and Protect, have been proposed in order to minimise the effects of future erosion. Their construction year is typically proposed between 2030-2040, with whole life costs estimated throughout their lifespan to 2120. Costs have included construction, intervention, training, maintenance, repairs, and upgrade fees. Purchase and demolition costs are also included where required.

A Cost-Benefit Analysis (CBA) was completed to consider some of the economic merits of the proposed adaptation options. As currently proposed, no option has a positive economic return. The following options had the highest Benefit-Cost Ratio (BCR) for each asset group, where a value of over 1 is considered economically viable:

- MU2-Big4: PR7, Rock Seawall. BCR: 0.5
- MU3-Griffiths Street. PR7, Rock Seawall. BCR: 0.5
- MU3/4 foreshores: PR5 Nearshore structures - groynes. BCR: 0.5

The options proposed are expensive while the present erosion risk is economically low in comparison. This translated to relatively low BCRs.

For these options to be economically viable consideration could be given to a staged response with further optimisation of engineered options. Testing of a delayed implementation date at MU2-Big4 and MU3-Griffiths Street indicated a delayed construction of the rock seawalls can be economically viable. Simply delaying the implementation date of the nearshore groynes at MU3/4 foreshore did not produce a positive BCR, and further design optimisation could be considered.

This economic analysis supports a multi-stage development of options for each management unit to initially focus on mitigating current risks. For instance, minor erosion to the foreshore could be managed by small nourishment works. Delaying investment in permanent "hard" engineered options while preparing cash reserves would be a more suitable approach, to be implemented when erosion risks become high (e.g. circa 2060-2070).

This analysis shows that committing to hard engineered structures too early will be expensive in the long-run. However, economical aspects are not the single most important governing factor in decision-making. Value-based assessments are of considerable importance in managing the coastline, and have been considered in an MCA which is summarised in the main project reports

Contents

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List of Tables

Abbreviations

BCR ..... Benefit Cost Ratio
CBA ..... Cost-Benefit Appraisal
CHRMAP ..... Coastal Hazard Risk Management and Adaptation Plan
JBP ..... Jeremy Benn Pacific
MCA ..... Multi-Criteria Analysis
MU ..... Management Unit
NCCARF ..... National Climate Change Adaptation Research Facility
NPV ..... Net Present Value

1 Introduction

This assessment was undertaken by Jeremy Benn Pacific (JBP), on behalf of Aurora Environmental and EvoCoast Pty Ltd. It describes a coastal erosion damages assessment and Cost-Benefit Appraisal (CBA) of several coastal adaptation options for the Emu Point to Middleton Beach Coastal Hazard Risk Management and Adaptation Plan (CHRMAP), prepared for the City of Albany. It should be read in the context of the wider project reports.

The cost-benefit methodology has been designed to provide a quantitative, economic assessment of a range of adaptation options to address erosion vulnerability. It provides information on the whole life costs of each option, the magnitude of economic erosion damages avoided, and the tangible economic benefits received within the Local Government Area.

The CBA is only one element proposed to aid the decision-making process. The results of this analysis are complimented by a multi-criteria analysis (MCA) which considers Capital Cost, Maintenance Costs, Environmental Impact, Social Impact, technical Effectiveness and Reversibility. The method and results of the MCA are summarised in the main project reports.

1.1 Report Structure

In addition to this introductory chapter, this report is laid out in the following sections:

- Chapter 2 (Background to coastal economic appraisals) presents an overview of the economic analysis.
- Chapter 3 (Damages assessment) summarised the available erosion modelling, and assets, infrastructure and land at risk throughout the project life.
- Chapter 4 (Options assessment) presents a descriptions of design options considered in this study, and the estimated whole life costs for their implementation.
- Chapter 5 (Cost-benefit assessment) presents an assessment of the benefits of implementing each option, including the benefit-cost ratio.
- Chapter 6 (Summary) presents a summary of the appraisal and recommendations.

2 Background to coastal economic appraisals

2.1 Coastal erosion context

Existing assets, infrastructure, recreational space and ecosystems located along the coast may come under threat of short-term erosion or long-term coastal recession. Estimating this erosion risk is challenging due to the number of interrelated processes. This can include changing environmental parameters such as storm events to sea level rise, changing land-use, progressive densification along the coast, and deterioration of any existing coastal protection infrastructure.

This analysis uses available erosion hazards maps Emu Point to Middleton Beach study area (Royal Haskoning DHV 2017). 1 The maps depict projected erosion extents for 2017, 2030, 2070 and 2120 planning horizons, with the 2017 shoreline position used to represent the present time.

The coastline is split into several coastal units spanning from Management Unit (MU) 1 at Ellen Cove to MU5 at Oyster Harbour - see main reports. This economic assessment focusses on the following assets/asset-groups within:

- Big 4 Middleton Beach Caravan Park in MU 2
- Griffiths Street. Properties in MU 3
- Emu Beach and Emu Point foreshore reserves including toilet block on Boongarrie Street in MU 3 and MU 4

No new erosion modelling was undertaken by JBP for this project, and as such this analysis is considered high level only. The analysis considers principally the relative merits of a range of adaptation options to address erosion vulnerability. The expected erosion following construction of a coastal protection scheme has not been modelled, and instead is based on an indicative performance rate outlined in Section 4.1. No interaction is considered between coastal units, e.g. the influence of protection at MU3 is not assumed to worsen erosion to the surrounding units. A larger section of coast was investigated for MU3 - Griffiths Street compared to the other assets/asset-groups. This allows for the inclusion of Barry Court and ensures there isn't a gap in the infrastructure/assets considered between MU3-Griffiths Street and MU3/4 foreshores. Without updated erosion modelling of the options being considered it is difficult to estimate the extent of influence. To effectively compare options the performance rates have been amended to represent this. It is expected that further design investigations would be undertaken to refine the preferred adaptation options once identified.

1 Royal Haskoning DHV (2017) Emu Point to Middleton Beach – Coastal Adaptation and Protection Strategy. Coastal Vulnerability Study and Hazard Mapping. Part 1: Coastal Processes and Hazard Mapping

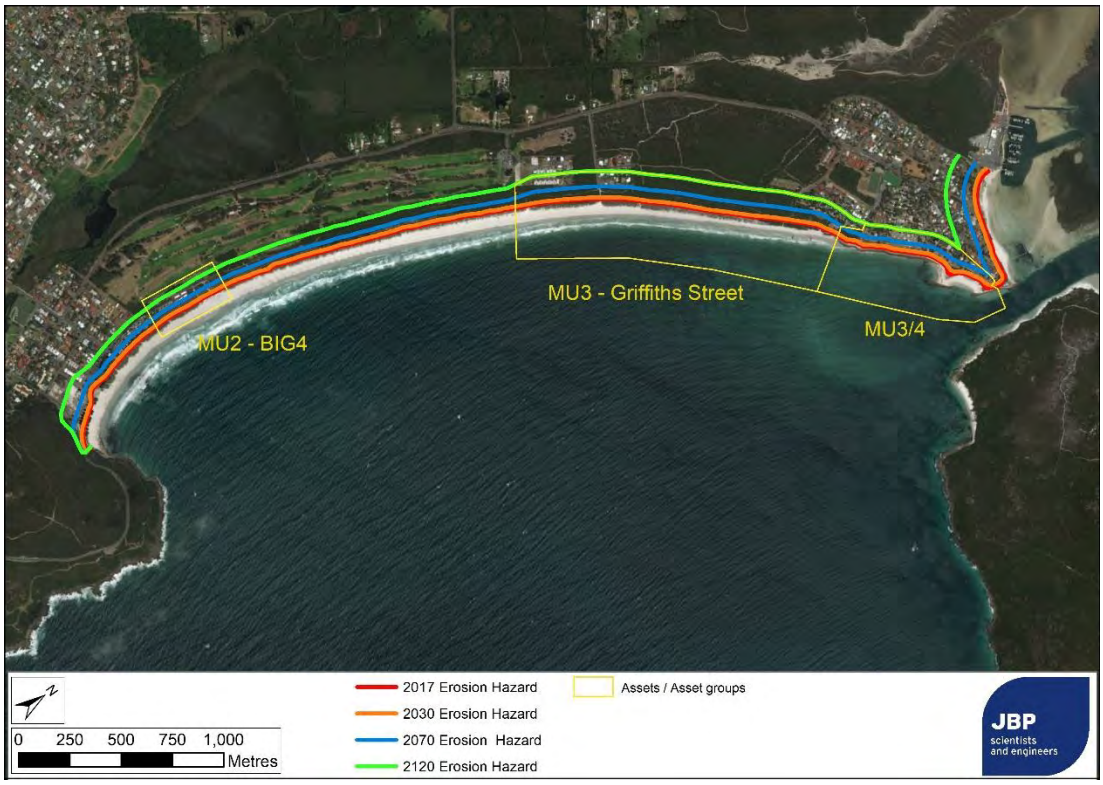

Figure 2-1: Assets, asset-groups and coastal hazard lines used within this economic analysis

2.2 Background to coastal zone economics

Quantitative, economic assessments are used increasingly to evaluate coastal management options. Economic assessments assist managers to understand the economic benefits of different management options to users, the local community, and the wider Local Government Area. Economic assessment seeks to quantify whole life costs such as planning, design, construction, maintenance and decommissioning.

Two main approaches are used:

- A cost-benefit assessment (CBA), is used to compare whole life costs of a coastal management option with its whole life benefits, expressed in monetary terms. It is intended to provide a quantitative, economic assessment of each option.
- A multi-criteria analysis (MCA) is typically used as all project aspects cannot be monetised or compared using simple dollar units. In a coastal management context, an MCA may evaluate a project against various criteria such as those considered in the wider project reports.

This report summarises the CBA components only.

2.3 Quantifying benefits and costs

By quantifying benefits, an economic analysis intends to understand the value gained from the investment. For the Emu Point to Middleton beach area, this has included tangible values only, which includes those with a clear monetary value, such as infrastructure, assets, and property. They have been valued through either a 'replacement cost' based on local data, or a 'benefit transfer' where values have been inferred from other locations and transferred to the study site. Intangible values have been considered within a separate MCA.

Within this CBA the following economic indicators have been reported:

- Benefit-Cost Ratio (BCR), which is the present value of benefits divided by the present value of operating costs (benefit / costs). An option is considered beneficial for BCR values over 1 (i.e. benefits outweigh costs). The higher the BCR the greater the economic return

- Net Present Value (NPV). The Net Present Value (NPV) is defined as the present value of the benefits minus the present value of operating costs (benefits - costs). An option is considered beneficial for positive values.

2.4 Decision rules

The following economic rules apply when interpreting and using the economic indicators to form the following decision criteria:

- If the BCR is greater than 1, a project is economically viable
- If the BCR is less than 1, a project is not economically viable
- If the NPV is greater than 0, a project is economically viable
- If the NPV is less than 0, a project is not economically viable

It is not uncommon for a project to not achieve the above stated decision criteria, but may still go ahead when there are additional overwhelming intangible benefits that cannot be valued within the context of the BCR. Similarly, it is not uncommon for projects which are economically viable to not proceed.

3 Damages assessment

3.1 Introduction

The impacts due to future erosion have been quantified to understand the degree of damage that can be expected to the frontage, and when this may occur. This has included the identification and valuation of expected losses to land, infrastructure and significant assets (e.g. CoA or state owned) due to erosion, based on available erosion hazard lines. The economic loss due to the erosion has been valued through several techniques. This value has subsequently been used within a CBA to compare the benefits of adaptation options (including Avoid, Managed Retreat, Accommodate and Protect options) to a business as usual scenario.

3.2 Estimating losses and damages

Available erosion mapping was used to measure the area of land, infrastructure, and assets that may be at risk. A landuse map based on the City of Albany (CoA) Local Planning Scheme, and a CoA asset register have been compiled based on datasets supplied for this project. Three broad categories have been used for asset classification: assets delineated by area (e.g. landuse and groundcover), assets delineated by length (e.g. linear infrastructure), and assets located on a point (e.g. single assets).

All areas, infrastructure or assets within the mapped erosion zones have been identified within their expected year of loss. A set of unit rates have been developed for each category, based on a range of techniques, including market rates, state-wide estimates and replacement costs. This includes the following approaches:

- Residential and commercial land is based on estimated market values or scaled CoA rates
- Natural open space or conservation areas, such as parks, reserves, foreshores are based on estimated land-value only and do not include intangible values
- Linear infrastructure and point assets from standard replacement (construction) costs using unit rates

3.3 Summary of losses and damages

The losses and damages due to future erosion have been estimated for MU2-BIG4, MU3-Griffiths Street and MU3/4 foreshores. Appendix A presents the full damage estimates due to erosion, which are summarised in Figure 3-1.

In this assessment, damages occurring in the present day are considered equally to those occurring in the distant future, i.e. erosion of residential property in 2020 is not valued higher than losses in 2120 (i.e. no inflationary aspects are considered). These concepts are further explored in Section 5.1.1 which introduced a 'discount factor'.

The loss and damage results indicate MU2-Big4 and MU3-Griffiths Street would incur relatively minor damages until 2070. After this planning horizon the damages at MU3-Griffiths Street would increase steadily as residential properties are affected. Conversely MU3/4 foreshores experience higher initial damages, as foreshore infrastructure is affected between 2030-2070.

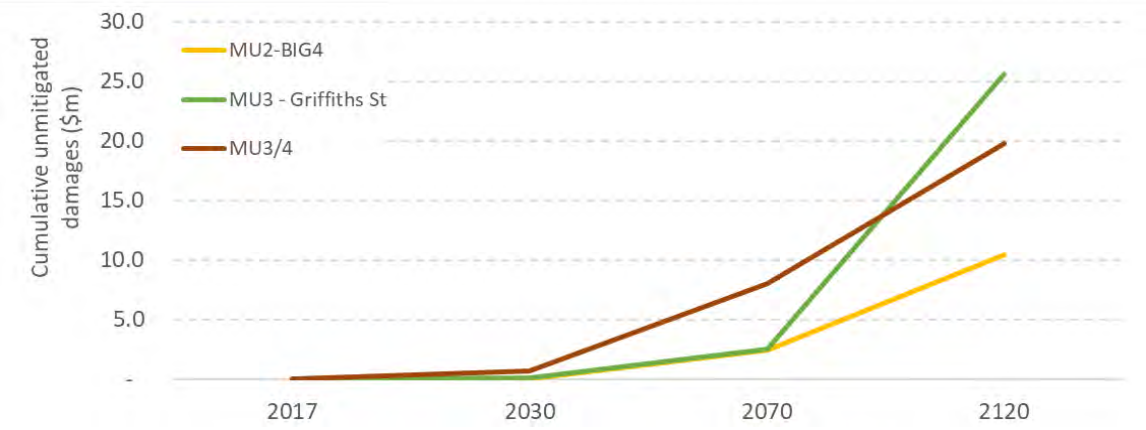

Figure 3-1: Cumulative damages due to erosion ($, Millions) with no discounting

The results of this economic assessment are based on long-term erosion projections only, assume a steady rate or erosion. It is important to therefore consider the episodic nature of a storm event. Even though a major erosive event is unlikely at any point in time, such an event would occur suddenly and could trigger a proportionally larger loss than the relatively even trends shown in Figure 3-1.

4 Options assessment

4.1 Introduction

Several adaptation options have been proposed to address erosion vulnerability. A full description of the options considered is presented in the wider CHRMAP project reports.

The construction year is typically proposed between 2030-2040, and an estimate of whole life costs prepared throughout their lifespan to 2120, including construction, intervention, training, maintenance, repairs, and upgrade fees. Purchase and demolition costs are included as required. Appendix B provides details of each management strategy construction data and cost estimates.

Each option includes an estimated performance in reducing erosion. This has been included to estimate the benefits of each options in Section 5. In the absence of complementary erosion modelling to evaluate each option, the performance has been used to scale the damages estimated in Section 3 for each asset/asset group. An option with a 'Very High' performance is therefore assumed to reduce the unmitigated erosion damages by 100%, and an option with a 'Moderate' performance by 50%. This approach may not be explicitly accurate, a reduction of 50% of the erosion risk may not necessarily equal 50% of the total undefended damages. However, it is considered a suitable approach for high-level, comparative assessments which does not require additional modelling.

It is expected that any preferred options taken forward will be subject to a full concept design, detailed design, and detailed numerical modelling to quantify their performance. At this later stage, it may be worthwhile to update the economic analysis.

4.2 Management strategies

The following management strategies or "options" have been proposed for each asset/asset-group. A full description of the options considered is presented in the wider CHRMAP project reports. Some options (MR and AV) have been combined as they complement each other and provide improved confidence to address erosion vulnerability. Their implementation timeframe and capital, maintenance and other costs are presented in Appendix B.

MU2-Big4

1. MR1 & AV2. Leave assets unprotected and avoid further development
2. MR2 & AV2. Relocate assets and avoid further development
3. PR7 Seawall - rock

MU3-Griffiths Street

1. MR2. Relocate assets
2. PR1. Sand nourishment
3. PR4/PR5 Nearshore structures - breakwaters
4. PR7 Seawall

MU3/4 foreshores

1. MR2. Relocate assets
2. AC4. Maintain and enhance nearshore system
3. PR4. Nearshore structures - breakwaters/headlands
4. PR5 Nearshore structures - groynes
5. PR7 Seawall

4.3 Timeframe and costs

The proposed implementation date, assumed performance, and total value of the whole life costs for each management strategy is presented in Table 4-1.

These estimates do not consider any differences between costs incurring now or in the distant future. These concepts are further explored in Section 5.1.1 through the use of a discount factor.

Table 4-1: Cumulative lifecycle costs ($, Millions) with no discounting

Option	Implementation timeframe	Assumed Performance once implemented*	Whole life cost ($ million)
MU2-Big4			
MR1 & AV2. Leave assets unprotected and avoid further development	2035	High (85%)	$ 6.6m
MR2 & AV2. Relocate assets and avoid further development	2035	Very High (100%)	$ 6.8 m
PR7 Seawall - Rock	2045	Very High (100%)	$ 4.9 m
MU3 - Griffiths Street			
MR2. Relocate assets	2040	High (85%)	$ 20.4 m
PR1. Sand nourishment	2040	Moderate (60%)	$ 8.4 m
PR4 Nearshore breakwaters	2040	High (85%)	$ 8.7 m
PR7 Seawall	2040	High (85%)	$ 4.7 m
MU 3/4 foreshores			
MR2. Relocate assets	2035	Very High (100%)	$ 32.5 m
AC4. Maintain and enhance nearshore system	2035	Moderate (60%)	$ 35.1 m
PR4. Nearshore structures - breakwaters/headlands	2035	Very High (100%)	$ 24.2 m
PR5 Nearshore structures - groynes	2035	High (75%)	$ 7.9 m
PR7 Seawall	2035	Very High (100%)	$ 18.2 m
* Assumed reduction in unmitigated erosion damages			

5 Cost-benefit assessment

A CBA has been completed to assess the benefits and costs of each adaptation option.

The options costs and economic assessments presented in the previous chapters have been extrapolated over distinct time horizons, extending to 2120 years from approximately present day (2017). These have been adjusted to calculate a Present Value (PV) by applying a discount rate for all future costs and benefits.

5.1.1 Discount rate

Selection of a discount rate is an important factor in the CBA calculations. This rate is applied to all future costs and benefits to incorporate a time preference for investment and damages. The selection of the discount value to use is difficult, and even the use of common "benchmarks" by government agencies in Australia can range between 4% to 10%. If the discount rate used is too high, it will result in less than adequate provision for future generations. If it is too low, a greater emphasis will be put on future generations than to current, present-day issues.

The choice of a discount factor is considered in several Australian reports, with the following recommendations:

- Geraldton CHRMAP Project (Rhelm 2018)[2] uses 7%, with sensitivity testing of 4% and 10%.
- Broome Townsite CHRMAP (Baird 2017)[3] uses 7%.
- The City of Bunbury - Climate Change Adaptation Options Assessment (ACIL Tasmin, 2012)[4] uses 3%.
- The report on "Exploring valuation methods for climate adaptation options, with particular reference to Australian coastal councils", prepared by the National Climate Change Adaptation Research Facility (NCCARF 2016)[5] suggest a rate of 4.5%.
- CoastAdapt[6] by NCCARF (2016)[7] references several other approaches, ranging from 1.3% to 10%

For this assessment a baseline discount factor of 7% has been applied, with sensitivity testing at 4% and 10%.

5.2 Cost-Benefit Assessment

The CBA was conducted to compare option benefits against whole life costs, both in terms of Present Values. Results are summarised in Table 5-1 for each asset/asset-group, in terms of BCR and NPV. Using the decision tools outlined in Section 2.4, preferred options would ideally have a BCR over 1 and a positive NPV. The higher the values, the greater the economic return.

No options were identified as having a positive economic return. For these options to be economically viable further consideration should be given to a staged response with further optimisation of engineered options. Options should focus on mitigating the current risks first, e.g. minor erosion to the foreshore, and delay investment in engineered options to align with a time where erosion risks become high (e.g. circa 2070). Such an adaptive scenario is likely to be more economically viable, without committing to hard engineered structures before they are needed.

2 Rhelm (2017) Geraldton Coastal Hazard Risk Management and Adaptation Planning (CHRMAP) Project, Appendix A5 (A.5 Economic Analysis). Accessed on 12 November 2018 from:
https://www.cgg.wa.gov.au/Profiles/cgg/Assets/ClientData/Documents/Infrastructure/CHRMAP/Part_2-Technical_Appendices.pdf

3 Baird (2017) Broome Townsite Coastal Hazard Risk Management and Adaptation Plan. See section 6.10.2.3 Cost-benefit analysis approach. Accessed on 12 November 2018 from:
http://www.broome.wa.gov.au/files/assets/public/building/major-projects/final-draft-chrmap.pdf

4 Acil Tasman (2012) Climate Change Adaptation Options Assessment. Accessed on 12 November 2018 from:
http://www.peronnaturaliste.org.au/wp-content/uploads/2016/12/PNP-Climate-Change-Adaptation-Options-Assessment-Report.pdf

5 Truong, C., Trück, S., Davies, P., and Mathew, S., 2016: Exploring valuation methods for climate adaptation options, with particular reference to Australian coastal councils. National Climate Change Adaptation Research Facility, Gold Coast

6 Wise, R. M., and T. Capon. (2016) Assessing the costs and benefits of coastal climate adaptation. CoastAdapt Information Manual

7 National Climate Change Adaptation Research Facility, Gold Coast

Table 5-1: Cumulative lifecycle costs

Option	Total costs (PV, $, Millions)	Total Benefits (PV, $, Millions)	BCR	NPV ($, Millions)
MU2 - Big4				
1MR1 & AV2. Leave assets unprotected and avoid further development	1.1	0.2	0.2	-0.9
2MR2 & AV2. Relocate assets and avoid further development	1.2	0.3	0.2	-0.9
PR7 Seawall - Rock **	0.4	0.2	0.5	-0.2
MU3 - Griffiths Street				
MR2. Relocate assets	3.2	0.2	0.1	-2.9
PR1. Sand nourishment	0.4	0.2	0.4	-0.3
PR4 Nearshore breakwaters	0.8	0.2	0.3	-0.6
PR7 Seawall **	0.5	0.2	0.5	-0.2
MU3/4 foreshores				
MR2. Relocate assets	8.5	0.7	0.1	-7.8
AC4. Maintain and enhance nearshore system	2.9	0.4	0.2	-2.5
PR4. Nearshore structures - breakwaters/headlands	3.2	0.7	0.2	-2.5
PR5 Nearshore structures - groynes**	1.1	0.5	0.5	-0.5
PR7 Seawall	2.5	0.5	0.2	-2.0
** nominates option with the highest BCR for each management unit.				

5.2.1 Sensitivity testing

A range of sensitivity tests have been carried out to identify the range of potential economic returns.

- Discount factor: Testing of 4% and 10% (base case was 7%)
- Capital and maintenance costs: Testing of +20% and -20%
- Damages and benefits: Testing of +20% and -20%.

The BCR of each option has been summarised within a box plot (see text below). The range of the box plot shows the potential variability within the economic assessment. Ideally the entire box would be above the BCR of 1, indicating that even with moderate changes to the economic parameters, the option would be viable. For options sitting above and below the BCR=1 threshold, there is the potential that with further refinement of designs, more detailed costing and modelling of benefits, the option may be economically viable.

The results of the sensitivity testing indicate some variability in different options, however generally none of the proposed option shows sufficient evidence to be considered economically viable. This further supports the use of a multi-staged response and a delayed construction date.

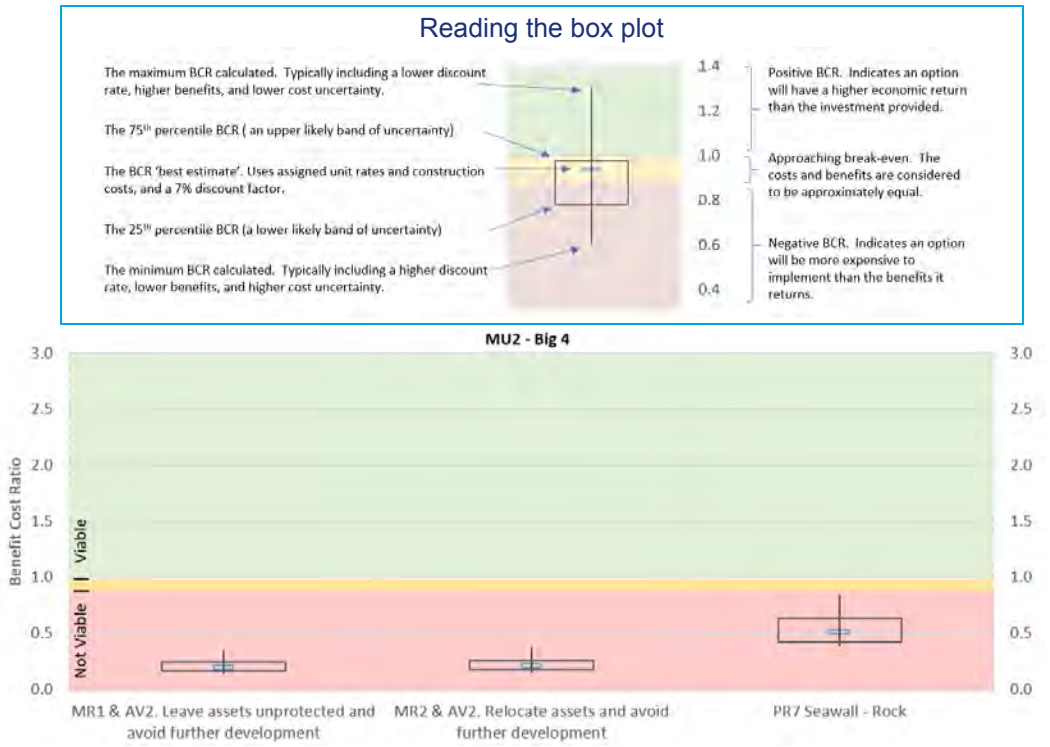

Figure 5-1: Sensitivity testing of options at MU2-Big4

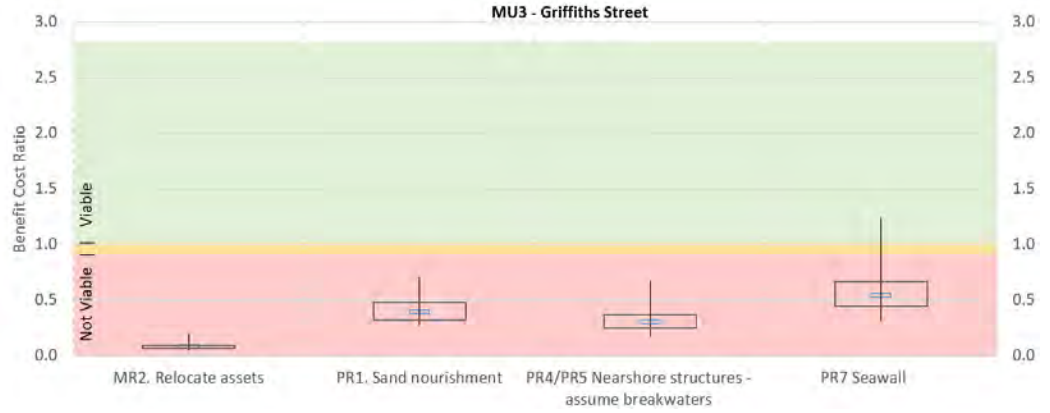

Figure 5-2: Sensitivity testing of options at MU3 - Griffiths Street

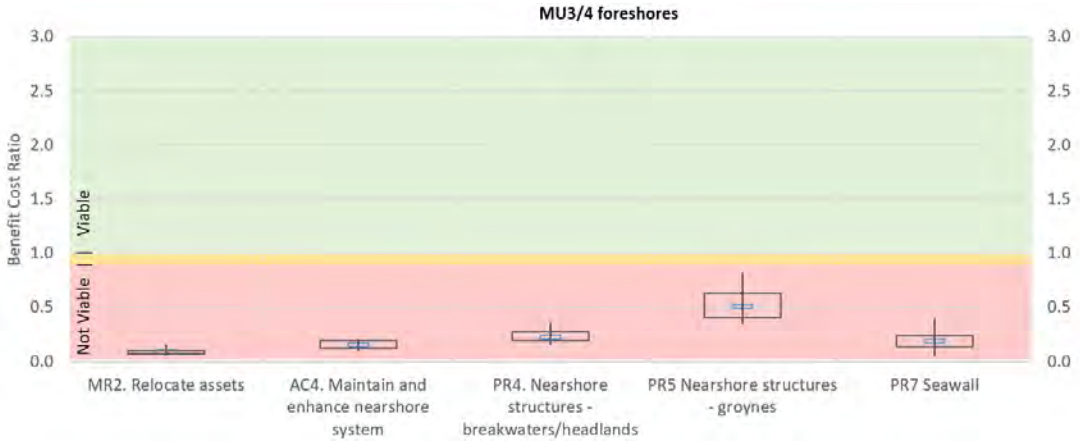

Figure 5-3: Sensitivity testing of options at MU3/4 foreshores

5.3 Testing of a delayed implementation date

Testing of an option's implementation date was undertaken for the three options with the highest BCR. The implementation date, including all construction costs, maintenance costs and expected benefits, were pushed back in ten-year increments and the BCR re-calculated. The results are shown in Figure 5-4. An option has a positive economic return when its BCR exceeds 1.

- For MU2-BIG 4, the seawall is considered economically viable if constructed after 2085. At this timeframe erosion has commenced at the seaward side of caravan park. This may not be considered an appropriate construction date due to the social impacts and other criteria considered in the MCA.
- For MU3-Griffiths Street, the seawall is considered economically viable if constructed after 2065.
- For MU3/4 foreshores, the nearshore groynes are not considered economically viable with a delayed construction date. However, they have the highest economic return if constructed in 2065.

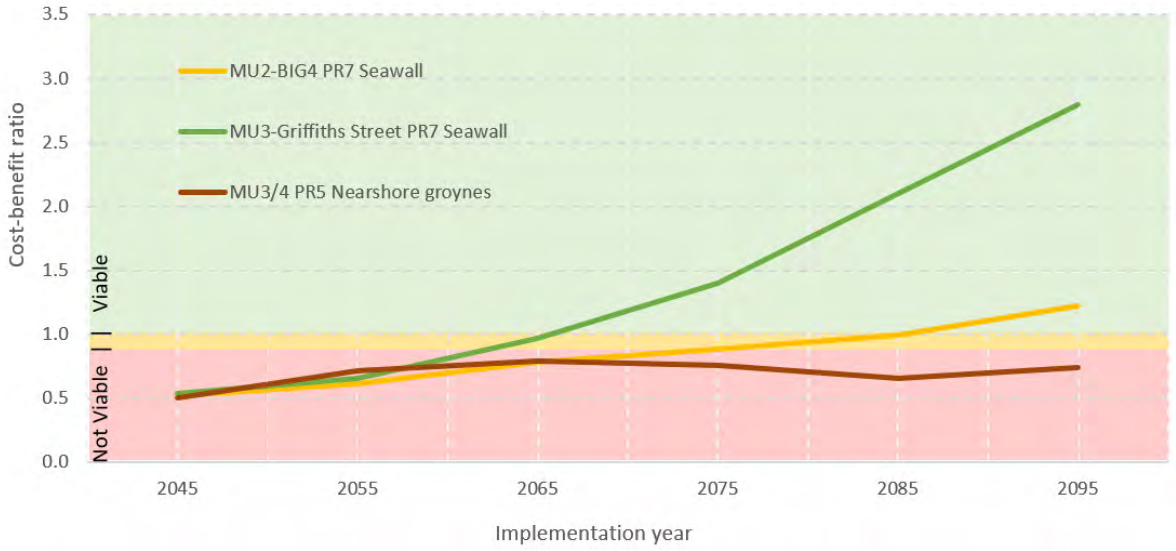

Figure 5-4: Estimated BCR for three options with delayed implementation dates.

5.4 Discussion of the economically preferred option

The CBA was conducted to compare option benefits against whole life costs, both in terms of Present Values. As currently proposed, no options were identified as having a positive economic return. The following options had the highest BCR for each asset/asset-group:

- MU2-Big4: PR7, Rock Seawall. BCR: 0.5
- MU3-Griffiths Street. PR7, Rock Seawall. BCR: 0.5
- MU3/4 foreshores: PR5 Nearshore structures - Groynes. BCR: 0.5.

No options were identified as having a positive economic return. For these options to be economically viable further consideration should be given to a staged response with further optimisation of engineered options. Options should focus on mitigating the current risks first, e.g. minor erosion to the foreshore, and delay investment in engineered options to align with a time where erosion risks become high (e.g. circa 2070).

Testing of a delayed implementation date of the highest ranking BCR options indicated prolonging the construction of hard defence at MU2-BIG4 and MU3-Griffiths Street can offer an economically viable option. Simply delaying the implementation date of the nearshore groynes at MU3/4 foreshores did not produce a positive BCR, and further optimisation will be required.

6 Summary

This cost-benefit methodology has been designed to provide a quantitative, economic assessment of a range of adaptation options proposed for the Emu Point to Middleton Beach Coastal Hazard Risk Management and Adaptation Plan (CHRMAP).

It provides information on the whole life costs of each option, the damages due to erosion that are avoided, and the economic benefits received within the Local Government Area. It has not included intangible, environmental or social values, which are the subject of a Multi-Criteria Analysis conducted separately.

Available erosion mapping

Existing erosion mapping is available throughout the Emu Point to Middleton Beach study area (Royal Haskoning DHV), which has been used for this analysis. The maps depict projected erosion extents for 2017, 2030, 2070 and 2120 planning horizons, with the 2017 shoreline position used to represent the present time. No new erosion modelling was undertaken for this project, and as such this analysis is considered high level only, to be used to understand the relative merits of a range of adaptation options.

This economic assessment has considered adaptation options for the following assets/asset-groups:

- Big 4 Middleton Beach Caravan Park in Management Unit 2
- Griffiths St. Properties in Management Unit 3
- Emu Beach and Emu Point foreshore reserves including toilet block on Boongarrie Street in Management Units 3 and 4

Erosion damages

Erosion modelling was used to estimate the financial damages likely to be experienced until 2120. The results indicate MU2-Big4 and MU3-Griffiths Street will incur relatively minor damages until 2070. After this planning horizon the damages at MU3-Griffiths Street will increase steadily as residential properties are affected. Conversely MU3/4 foreshores experience higher initial damages, as land and assets located close to the foreshore are affected in the short term.

Management strategies

Several management strategies or "options" have been proposed to minimise the effects of future erosion. Their construction year is typically proposed between 2030-2040, with whole life costs estimated throughout their lifespan to 2120. This has included costs for construction, intervention, training, maintenance, repairs and upgrades. Purchase and demolition costs are included as required.

Economic assessment

A CBA was completed to compare option benefits against whole life costs, in terms of Present Values. As currently proposed, no options were identified as having a positive economic return. The following options had the highest BCR for each management unit:

- MU2-Big4: PR7, Rock Seawall. BCR: 0.5
- MU3-Griffiths Street. PR7, Rock Seawall. BCR: 0.5
- MU3/4foreshores: PR5 Nearshore structures - Groynes. BCR: 0.5.

For these options to be economically viable further consideration should be given to a staged response with further optimisation of engineered options. Testing of a delayed implementation date of the highest ranking options indicated a delayed construction of the rock seawalls at MU2-BIG4 and MU3-Griffiths Street can offer an economically viable option. Simply delaying the implementation date of the nearshore groynes at the MU3/4 foreshores did not produce a positive BCR, and further optimisation will be required.

This economic analysis supports a staged management approach for each asset/asset-group that should focus on mitigating the current risks first, e.g. minor erosion to the foreshore, and delay investment in engineered options to align with a time where erosion risks become high (e.g. circa 2060-2070). These staged approaches are shown to be more economically viable, which benefits the community by not committing to hard engineered structures before they are needed. It is

important, however, to be aware that this may not be considered an appropriate approach due to the social impacts and other criteria considered in the MCA.

Appendices

A Appendix A - Damages due to erosion

A.1 MU2-BIG4 - Damages due to erosion

Table A-1: MU2-Big4 Losses of landuse and groundcover

Category	2017-2030		2030-2070		2070-2120		Total (2017-2120)	
	Loss (m2)	Damage ($, M)	Loss (m2)	Damage ($, M)	Loss (m2)	Damage ($, M)	Loss (m2)	Damage ($, M)
Caravan and camping grounds			5,195	$2.42	17,269	$8.03	22,464	$10.45
Conservation								
Golf course								
Hotel/Motel								
Residential land								
Road and road reserve								

A.2 MU3-Griffiths Street - damages due to erosion

Table A-2: MU3-Griffiths Street Losses of landuse and groundcover

Category	2017-2030		2030-2070		2070-2120		Total (2017-2120)	
	Loss (m2)	Damage ($, M)	Loss (m2)	Damage ($, M)	Loss (m2)	Damage ($, M)	Loss (m2)	Damage ($, M)
Caravan and camping grounds			3,257	$1.51	17,630	$8.20	20,887	$9.71
Conservation	10,776	$0.11	64,067	$0.64	56,026	$0.56	130,869	$1.31
Golf course								
Hotel/Motel								
Residential land					19,949	$13.55	19,949	$13.55
Road and road reserve			3,105	$0.04	11,732	$0.28	14,838	$0.32

Table A-3: MU3-Griffiths Street Losses of linear infrastructure

Category	2017-2030		2030-2070		2070-2120		Total (2017-2120)	
	Loss (m)	Damage ($, M)	Loss (m)	Damage ($, M)	Loss (m)	Damage ($, M)	Loss (m)	Damage ($, M)
Cycle lanes								
Overhead power			19	$0.00	272	$0.03	291	$0.03
Pathways and trails	156	$0.02	1,309	$0.17	250	$0.03	1,715	$0.22
Service lines								
Sewer infrastructure					151	$0.01	151	$0.01
Stormwater drainage pipes			7	$0.00	229	$0.05	236	$0.06
Underground cables					195	$0.17	195	$0.17
Underground Structures								
Water reticulation infrastructure					285	$0.07	285	$0.07

Table A-4: MU3-Griffiths Street Losses of point assets

Category	2017-2030		2030-2070		2070-2120		Total (2017-2120)	
	Loss	Damage ($, M)	Loss	Damage ($, M)	Loss	Damage ($, M)	Loss	Damage ($, M)
Facilities								
Sewer points					16	$0.04	16	$0.04
Stormwater drainage pits			1	$0.00	19	$0.04	20	$0.05
Stormwater pits								
Streetlights and power poles					5	$0.05	5	$0.05
Water reticulation nodes								
Other significant assets								
Facilities								

A.3 MU3/4-foreshores - damages due to erosion

Table A-5: MU3/4-foreshores - Losses of landuse and groundcover

Category	2017-2030		2030-2070		2070-2120		Total (2017-2120)	
	Loss (m2)	Damage ($, M)	Loss (m2)	Damage ($, M)	Loss (m2)	Damage ($, M)	Loss (m2)	Damage ($, M)
Caravan and camping grounds	178	$0.08	6,796	$3.16	10,966	$5.10	17,940	$8.34
Conservation	5,087	$0.05	7,056	$0.07	3,365	$0.03	15,507	$0.16
Golf course								
Hotel/Motel				$0.00	1,588	$0.87	1,588	$0.87
Residential land	448	$0.48	3,621	$3.48	8,723	$5.23	12,792	$9.20
Road and road reserves	412	$0.03	7,935	$0.26	6,206	$0.19	14,553	$0.47

Table A-6: MU3/4-foreshores -Losses of linear infrastructure

Category	2017-2030		2030-2070		2070-2120		Total (2017-2120)	
	Loss (m)	Damage ($, M)	Loss (m)	Damage ($, M)	Loss (m)	Damage ($, M)	Loss (m)	Damage ($, M)
Cycle lanes								
Overhead power		$0.00	278	$0.03	173	$0.02	452	$0.05
Pathways and trails	263	$0.03	188	$0.02	44	$0.01	495	$0.06
Service lines								
Sewer infrastructure	95	$0.01	425	$0.03	531	$0.04	1,051	$0.08
Stormwater drainage pipes								
Underground cables		$0.00	98	$0.08	84	$0.07	183	$0.16
Underground Structures								
Water reticulation infrastructure		$0.00	360	$0.08	209	$0.05	569	$0.13

Table A-7: MU3/4-foreshores -Losses of point assets

Category	2017-2030		2030-2070		2070-2120		Total (2017-2120)	
	Loss	Damage ($, M)	Loss	Damage ($, M)	Loss	Damage ($, M)	Loss	Damage ($, M)
Facilities	5	$0.01	10	$0.04		$0.00	15	$0.05
Sewer points	2	$0.00	15	$0.03	32	$0.07	49	$0.11
Stormwater drainage pits								
Stormwater pits								
Streetlights and power poles		$0.00	4	$0.04	3	$0.03	7	$0.07
Water reticulation nodes								
Other significant assets								

B Appendix B - Option cost estimates

Source: EvoCoast (3 October 2018)

Table A-8: MU2-BIG4 Options Costs

Category	Timeframe and costs (in thousands)		Effectiveness of option
	Capital costs	Maintenance costs	
MR1 & AV2. Leave assets unprotected and avoid further development	$250k in 2035 $3,900k in 2040 $250k in 2041 $200k in 2056 $1,500k in 2076	$50k in 2046 $100k in 2051 $50k in 2056 $100k in 2061 $50k in 2066 $100k in 2071	Nil to 2035 High after 2030
MR2 & AV2. Relocate assets and avoid further development	$3,900k in 2030 $200k in 2050	$50k in 2040 $50k in 2050 $50k in 2060	Nil to 2030 Very high after 2030
PR7 Seawall - ROCK	$1,731 in 2030	$422k in 2040 $346k in 2055 $346k in 2065 $346k in 2075 $346k in 2085 $692k in 2095 $346k in 2105 $346k in 2115	Nil to 2040 Very high after 2030

Table A-9: MU3-Griffiths Street Options Costs

Category	Timeframe and costs (in thousands)		Effectiveness of option
	Capital costs	Maintenance costs	
MR2. Relocate assets	$14,000k in 2040 $2,000k in 2080 $4,000k in 2100	$50k every 10 years commencing from 2040 (x9)	Nil to 2030 High after 2040
PR1. Sand nourishment	$844k in 2040	$844k every 8 years commencing from 2048 (x10)	Nil to 2040 Moderate after 2040
PR4/PR5 Nearshore structures - breakwaters	$ 3,110k in 2040 $1,866k in 2100	$933k every 15 years commencing from 2055 (x3) $933 every 15 years commencing from 2115 (x1)	Nil to 2040 High after 2040
PR7 Seawall	$ 1,669k in 2040	$334k every 10 years commencing from 2050 (x4) $668k in 2090 $334 every 10 years commencing from 2100 (x3)	Nil to 2040 High after 2040

Table A-10: MU3/4 Foreshores Options Costs

Category	Timeframe and costs (in thousands)		Effectiveness of option
	Capital costs	Maintenance costs	
MR2. Relocate assets	$ 26,657k in 2035 $250k in 2055 $2,000k in 2075 $5,000k in 2095	$50k every 10 years commencing from 2045 (x8)	Nil to 2035 Very high after 2035
AC4. Maintain and enhance nearshore system	$5,850k in 2035	$5,850k every 15 years commencing from 2050 (x5)	Nil to 2035 Moderate after 2035
PR4. Nearshore structures - breakwaters/headlands	$ 8,638k in 2035	$2,591k every 15 years commencing from 2050 (x5)	Nil to 2035 Very high after 2035
PR5 Nearshore structures - groynes	$ 2,825k in 2030 $1,130k in 2080	$565k every 10 years commencing from 2045 (x7)	Nil to 2035 High after 2035
PR7 Seawall	$ 6,484k in 2035 $2,594k in 2085	$1,297k every 10 years commencing from 2045 (x7)	Nil to 2035 Very high after 2035

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APPENDIX H

Suite of Preferred Options

ASSET : BEACH

Management Unit 1 - Ellen Cove

Protect
PR1. Sand nourishment

Manual placement of large volumes of sand on the beach to maintain the existing profile. Sand will need to be sourced from outside the study area.

COST :
$4.5 - 6.5 million over 100 years
Cost will be dependent on the rate at which the beach is lost and the volume and frequency of sand required to be replaced. The cost estimate assumes a volume of between 7,200–9,200m^3 will be required to be placed on the beach every 5-10 years over the next 100 year period.

TRIGGER:
A reduction in the usable beach width during normal condition to less than 20m measured from the seawall to the high water mark.
Note during storm events it is expected that the beach width will temporarily reduce while water levels are elevated.

LONGEVITY:
Approximately 2060
As sea level rises over the longer term, this option will reduce in effectiveness, with sand likely to be required to be placed at an ever increasing frequency/volume. It should be re-considered in parallel with the seawall in 2060.

Sand nourishment at Ellen Cove

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ASSET : FORESHORE

Management Unit 2 - Surfers & Golf Course

Avoid
AV2. Avoid further development in existing developed areas impacted by coastal hazards

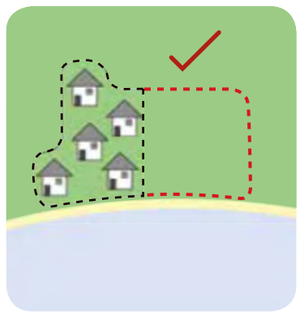
Avoid new assets close to the coast and move assets out of vulnerable areas as they get impacted or at the end of their normal asset replacement timeframes.
Note: assets are primarily public assets.

COST :
$750,000 over 100 years
Cost assumes an initial cost of $250,000 for assets at immediate risk and an ongoing monitoring cost of $5,000/year. It is assumed that the longer term cost of relocating assets landward, such as pathways, would be considered as part of the assets general depreciation cost.

TRIGGER:
At this location a distance of approximately 35m is required from the back of the beach (vegetation line) to absorb a severe storm. Assets within this zone should be relocated as they are replaced at the end of their life cycle.

LONGEVITY:
Approximately 2070
Expected to be effective in maintaining a beach until 2070 after which the retreat of additional assets may be required.

Avoid further development in vulnerable areas



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ASSET : BIG 4 HOLIDAY PARK

Management Unit 2 - Surfers & Golf Course

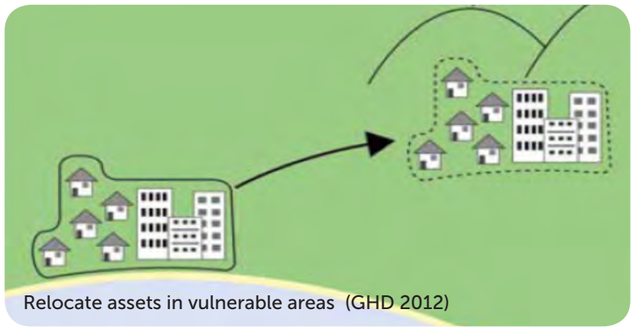
Managed Retreat
MR2. Staged relocation of assets

Assets would be required to be relocated before they become at risk from a severe storm event.

COST :
$6 - 8 million over 100 years
Cost is an estimate of the total cost to progressively remove all assets from the lease site and rehabilitate the area. It does not consider the loss of rates revenue to the City.

TRIGGER:
At this location a distance of approximately 35m is required from the back of the beach (vegetation line) to the lease boundary to absorb a severe storm. This would require a retreat in the current shoreline of approximately 15m at the southern end of the site.

LONGEVITY:
Approximately 2070
By retreat of the caravan park, this option is expected to be effective at ensuring a foreshore and beach until 2070, after which the retreat of additional assets may be required



Relocate assets in vulnerable areas (GHD 2012)

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ASSET : BIG 4 HOLIDAY PARK

Management Unit 2 - Surfers & Golf Course

Protect
PR7. Seawalls/revetments - Rock or GSC Sandbags

A new seawall would be constructed to provide protection to the caravan park and maintain public access to the coast.

COST :
$5-6 million over 100 years
The cost estimate assumes a $1-2 million capital cost and $3-4 million maintenance cost over the next 100 years

TRIGGER:
At this location a distance of approximately 35m is required from the back of the beach (vegetation line) to the lease boundary to absorb a severe storm. This would require a retreat in the current shoreline of approximately 15m at the southern end of the site.

LONGEVITY:
Approximately 2070
A new seawall would be expected to be designed to be effective for 50 years, to 2070. After which ongoing protection should be re-evaluated. It would not be effective at maintaining the beach which would be expected to be lost over this period.


Construction of buried seawall

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ASSET : GRIFFITHS ST. PROPERTIES

Management Unit 3 - Emu Beach

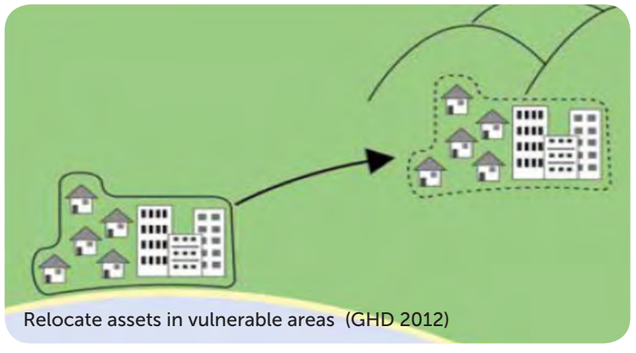
Managed Retreat
MR2. Relocate assets

Assets would be required to be relocated before they become at risk from a severe storm event.

COST :
$15 million over 100 years
Cost is an estimate of the total cost to purchase and remove the first row of properties. It does not consider the loss of rates revenue to the City.

TRIGGER:
At this location a distance of approximately 35m is required from the back of the beach (vegetation line) to the road to absorb a severe storm. This would require a retreat in the current shoreline of approximately 50m.

LONGEVITY:
Approximately 2110
By retreat, including the road and initial group of properties, this option is expected to be effective at ensuring a foreshore and beach until at least 2110, after which the retreat of additional assets may be required.



Relocate assets in vulnerable areas (GHD 2012)

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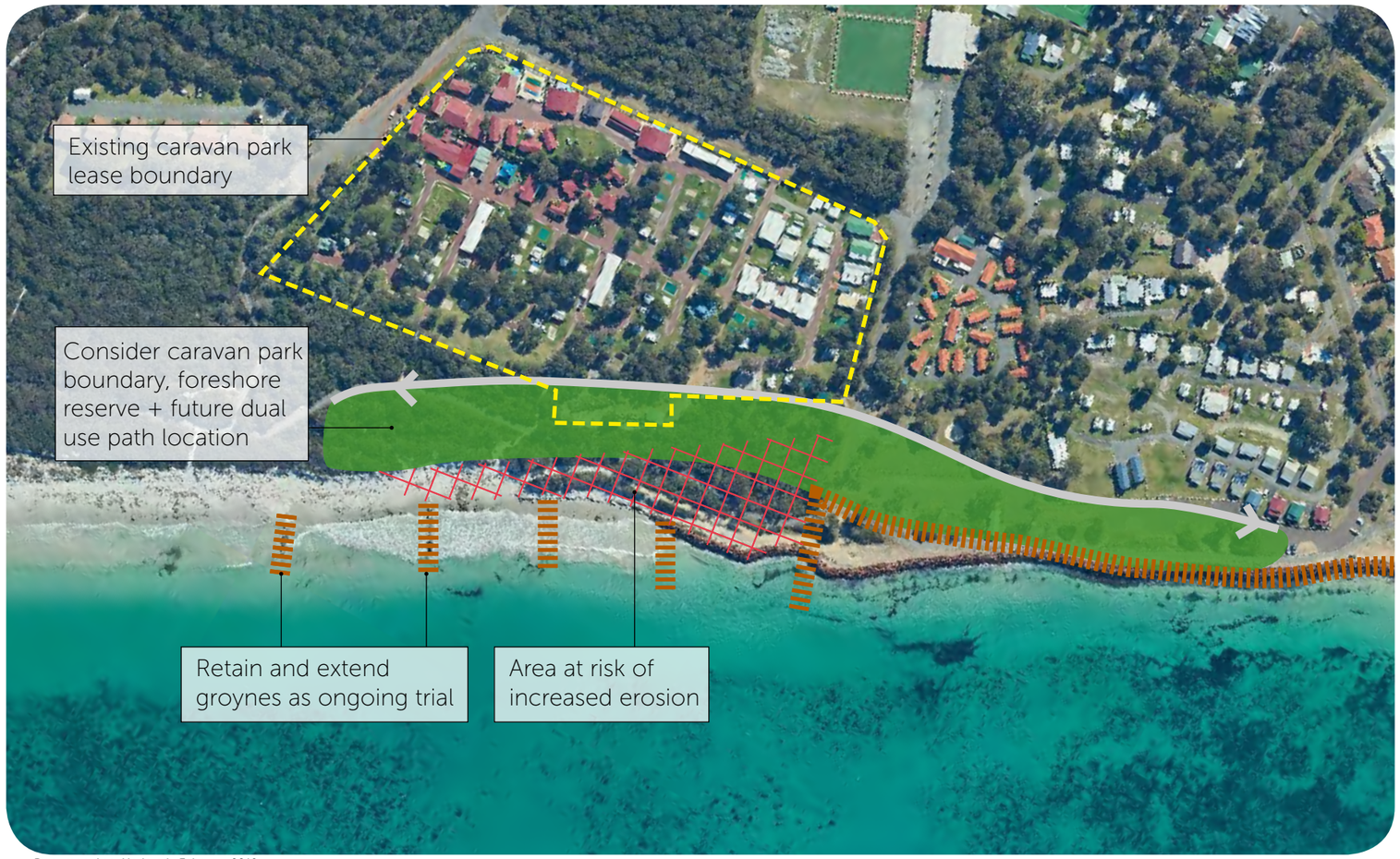
ASSET : BIG 4 EMU BEACH HOLIDAY PARK + DUAL USE PATH

Management Unit 3 - Emu Beach

Managed Retreat
MR2. Relocate assets

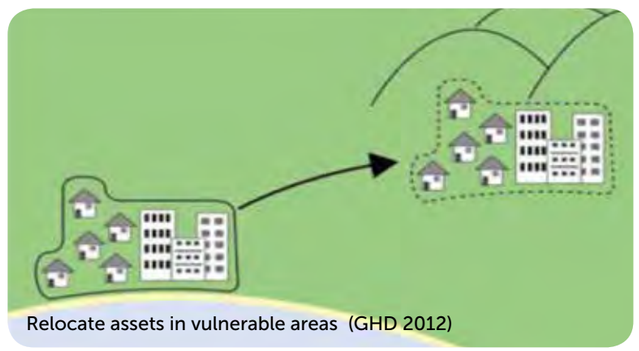


Assets would be required to be relocated before they become at risk from a severe storm event.

COST :
$3-4 million over 100 years
Cost is an estimate of the total cost to progressively remove all assets from the eastern portion of the lease site and rehabilitate the area. It does not consider the loss of rates revenue to the City.

TRIGGER:
At this location a distance of approximately 35m is required from the back of the beach (vegetation line) to the lease boundary to absorb a severe storm. This would require a retreat in the current shoreline of less than 10m for a small portion of the site.

LONGEVITY:
Approximately 2110
By retreat of the caravan park, this option is expected to be effective at ensuring a foreshore and beach until 2110. The alteration of the end of the current wall is likely to result in an improved foreshore and beach area.



Relocate assets in vulnerable areas (GHD 2012)

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ASSET : FORESHORE RESERVE

Management Unit 3 + 4 - Emu Beach and Emu Point

Accommodate
AC4. Maintain + enhance nearshore system - seagrass regeneration

Lockyer Shoal would be artificially rebuilt after a severe storm event to enhance the stabilisation of the beach.

COST :
$39 million over 100 years
The cost estimate assumes $6-7 million every 15 years for the placement of 60,000m³ of sand and seagrass planting to reinstate Lockyer Shoal after a severe storm event.

TRIGGER:
A severe storm event resulting in the loss of elevation of Lockyer Shoal or a 50% loss of seagrass cover.

LONGEVITY:
The effectiveness of this option is unproven and requires ongoing investigation.


Seagrass harvesting (BMT Oceanica 2013)


Integrated seawall + foreshore landscape (Esperance)

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ASSET : FORESHORE RESERVE

Management Unit 4 - Emu Point

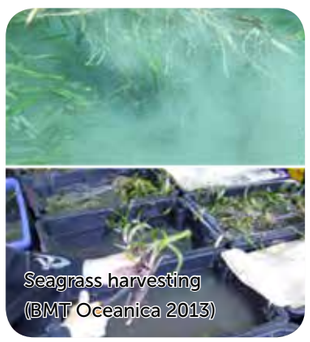
Protect
PR7. Seawall / revetments and parkland development

The existing seawall would be repaired and upgraded to provide protection over the next 50 years.

COST :
$19-20 million over 100 years
The cost estimate assumes a $6-7 million capital cost and $12-13 million maintenance cost over the next 100 years

TRIGGER:
A reduction in the condition of the existing seawall to poor or very poor and maintenance is no longer sustainable.

LONGEVITY:
Approximately 2070
A new seawall would be expected to be designed to be effective for 50 years, to 2070. After which a ongoing protection should be re-evaluated.


Seagrass harvesting (BMT Oceanica 2013)


Integrated seawall + foreshore landscape (Esperance)

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ASSET : SOUTH-EAST BEACH

Management Unit 5 - Oyster Harbour Beach

Protect
PR1. Sand nourishment

Manual placement of large volumes of sand on the beach to maintain the existing profile. Sand will need to be sourced from outside the study area.

COST :
$2 million over 100 years
Cost will be dependent on the rate at which the beach is lost and volume/frequency that sand is required to be replaced. The cost estimate assumes a volume of between 3,600 m^3 will be required to be placed on the beach every 8 years over the next 100 year period.

TRIGGER:
A reduction in the usable beach width during normal conditions to less than 10m measured from the seawall to the high water mark. Note during storm events it is expected that the beach width will temporarily reduce while water levels are elevated.

LONGEVITY:
Approximately 2060
As sea level rises over the longer term, this option will reduce in effectiveness, with sand likely to be required to be placed at an ever increasing frequency/volume. It should be re-considered in parallel with the seawall in 2060.


Sand nourishment at Oyster Harbour

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