# Mettams & Watermans Coastal Adaptation Options

Workshop 4

m p rogers & associates pl

# Welcome and Introductions

# Outline / Agenda

- Introductions
- Workshop 3 Minutes and Actions
- Summary of recent Stakeholder Engagement
- Recap Workshops to Date
- Recap Options
- Adaptation Options Assessment & MCA
  - Mettams Pool
  - Watermans Bay
- Next Steps

# Workshop 3 – Actions

- Aither to consider more detailed daily/seasonal visitation profiles for Mettams and Watermans Bay, breaking down different user groups and activities
- City to provide results/graphs from 2019 community survey to assist in how each beach is used by the community
- MRA to experiment with different weightings of the criteria in MCA (sensitivity testing)

# Stakeholder Engagement Update

| Item | Date | From | Content |
|---|---|---|---|
| 1 | 21 October | North Coast Community | Tabled at previous meeting. Indicating preference for change of process and requesting representation on PWT. |
| 2 | 7 November | CoS, Andrew Murphy | Extended response was copied to PWT. |
| 3 | 13 November | North Coast Community | Letter with attachments. Further reiterating position above. |
| 4 | 14 November | CoS, Andrew Murphy | Acknowledged correspondence and advised process is ongoing, no decision made. |
| Meeting | 29 November | Coastal Advisory Group Meeting | Hosted by CoS. MRA presented options. |
| 5 | 6 December | Simon Foster<br>North Coast Community | Email: Advising reiterating keen to engage with the City. Concerned about Wkshop 3 slidepack. |
| 6 | 8 December | Dr Jeff Hansen, UWA Oceans Institute | Concerned the CoS is rushing the process. |
| 7 | 9 December | CoS, Andrew Murphy | Response to Dr Hansen - acknowledgement of letter and advised will table at Wkshop 4. Advised will provide detailed response. |
| 8 | 9 December | Simon Foster (North Coast Community) | Reiterating keen to engage with CoS. Concerned re Wkshop 3 slidepack. |
| 9 | 9 December | CoS, Andrew Murphy | Response to Simon Foster. Explaining link to slidepack reinstated. |
| 10 | 9 December | Philip Rix, Watermans Bay resident | Requested opportunity for increased community representation on PWT. Concerned about Wkshop 3 slidepack. |
| 11 | 9 December | CoS, Andrew Murphy | Response to Philip Rix: Acknowledged correspondence and advised will provide a detailed response. |

# Workshops 1 - 3 Recap

# Recap

- Assets at risk
- History of erosion over several decades
  - Reduction in sediment feed
  - Sea level rise
- Number of previous technical assessments and investigations
- Discussed project objectives
- Discussed coastal processes
- Discussed concept options
- Outlined MCA criteria, basis and weightings

# Concept Coastal Adaptation Options

# Concept Coastal Adaptation Options

- Developed coastal adaption concepts to manage impacts and meet objectives
- The primary objective is coastal adaptation
- Concepts include:
  - Sand Nourishment
  - Seawall
  - Groynes / Headland Enhancements
  - Offshore breakwaters
  - Submerged breakwaters (reef)

# Success Criteria & Project Objectives

- Reminder on criteria
- Strongly influences options and assessment

| | Success Criteria / Project Objectives |
|---|---|
| 1 | Preserve the function and opportunity for recreation activities along the coastline (such as walking/running, swimming and surfing). |
| 2 | Preserve the existing hospitality venues along the coastline and access to them. |
| 3 | Ensure the natural environment is protected and sustained in its current condition or an improved condition (concerning the dunes and flora and fauna). |
| 4 | Develop solutions to coastal processes that are sustainable (financially, socially and built form) and locally responsive. |
| 5 | Revisit regularly with community and key stakeholders their values in relation to development adjacent the coastline. |
| 6 | Maintain services that maximise community benefit for all. |
| 7 | Ensure the coastline is safe and accessible to all. |
| 8 | Achieve a balance between access needs and environmental sensitivities. |

# Concept Coastal Adaptation Options

| Options \ Success Criteria | Preserve Opportunity for recreation activities | Ensure natural environment is protected in current condition or improved | Develop solutions that are sustainable (financially, socially and built form) | Ensure the coastline is safe and accessible to all. |
|---|---|---|---|---|
| Beach Nourishment | ✓ | ✓ | ? | ✓ |
| Seawall (vertical) | ✓ | X | ? | ? |
| Groynes / Headland Enhancement | ? | X | ? | ? |
| Offshore Breakwaters (emergent) | X | X | ? | ? |
| Submerged Breakwaters (reefs) | ✓ | X | ? | ? |

# Combined Coastal Adaptation Options

## Mettams Pool

| Combination of options to meet success criteria | Beach Nourishment | Seawall (vertical) | Groynes / Headland Enhancement | Offshore Breakwaters (emergent) | Submerged Breakwaters (reefs) |
|---|---|---|---|---|---|
| Beach Nourishment | ✓ | ✓ | X * | X * | ✓ |
| Seawall (vertical) | - | - | X | X | X |
| Groynes / Headland Enhancement | - | X | - | X | X |
| Offshore Breakwaters (emergent) | - | X | X | - | X |
| Submerged Breakwaters (reefs) | - | X | X | X | - |

# Combined Coastal Adaptation Options

## Watermans Bay

| Combination of options to meet success criteria | Beach Nourishment | Seawall (vertical) | Groynes / Headland Enhancement | Offshore Breakwaters (emergent) | Submerged Breakwaters (reefs) |
|---|---|---|---|---|---|
| Beach Nourishment | ✓ | ✓ | ? | X * | ✓ |
| Seawall (vertical) | - | - | X | X | X |
| Groynes / Headland Enhancement | - | X | - | X | X |
| Offshore Breakwaters (emergent) | - | X | X | - | X |
| Submerged Breakwaters (reefs) | - | X | X | X | - |

# Mettams – Concept Options

# Mettams – Beach Nourishment


LAYOUT
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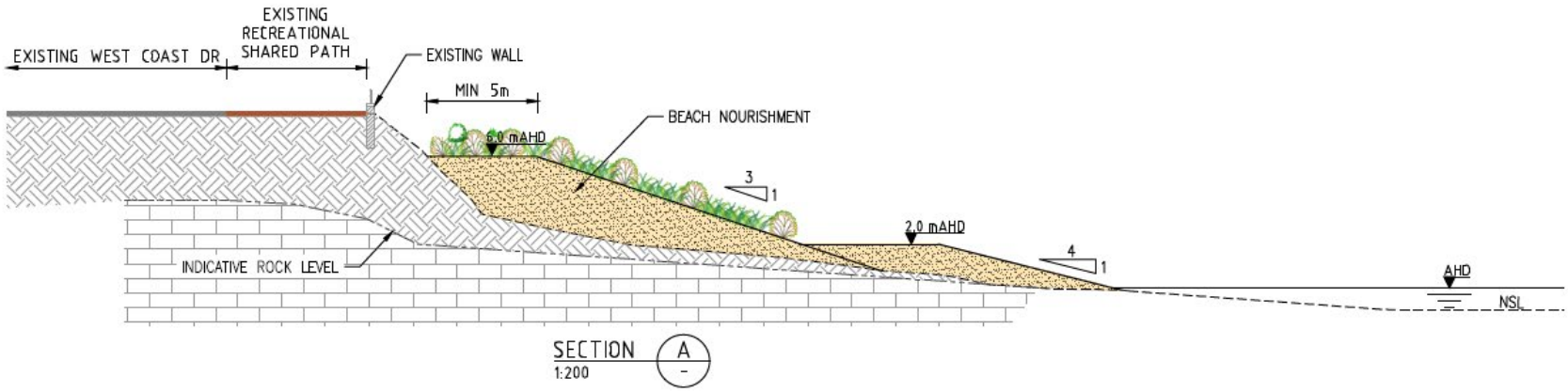
LEGEND:

BEACH NOURISHMENT

0.0 CONTOURS

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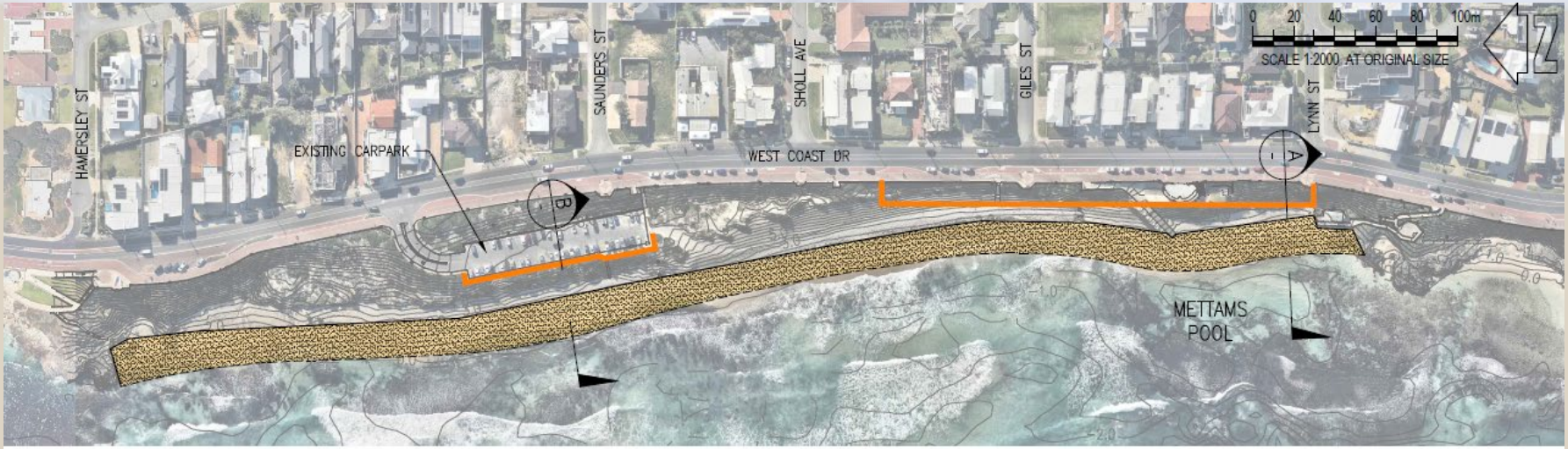
# Mettams – Seawall

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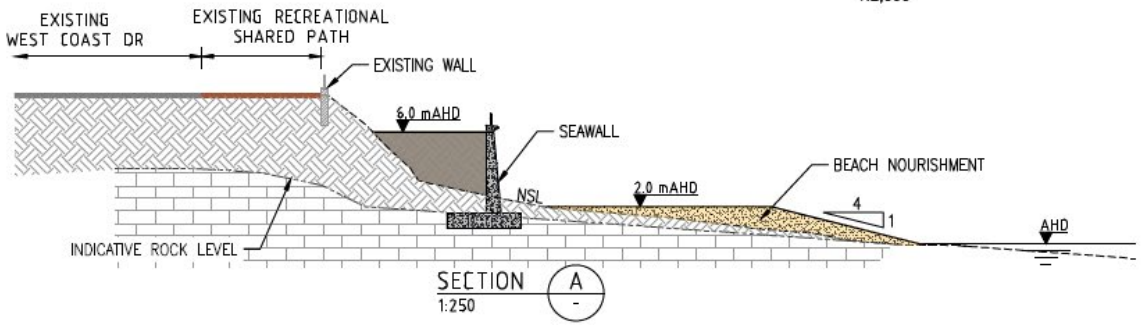


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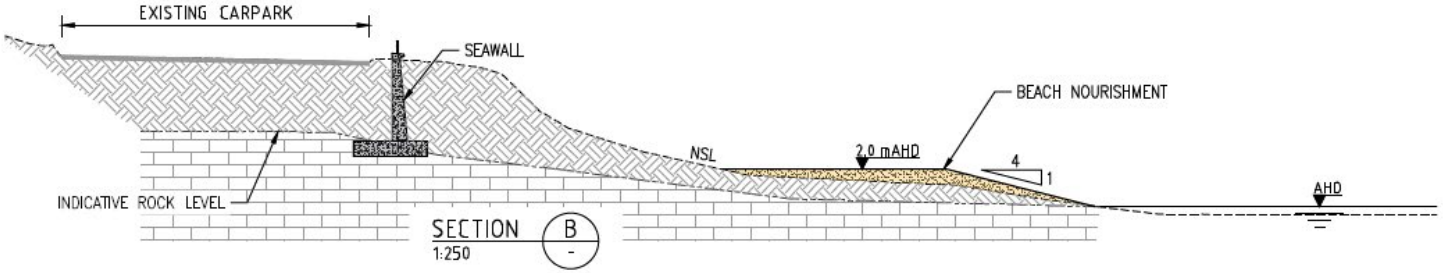


SECTION B
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LEGEND:

- SEAWALL
- BEACH NOURISHMENT
- 0.0 CONTOURS

# Mettams – Groyne / Headland


LAYOUT
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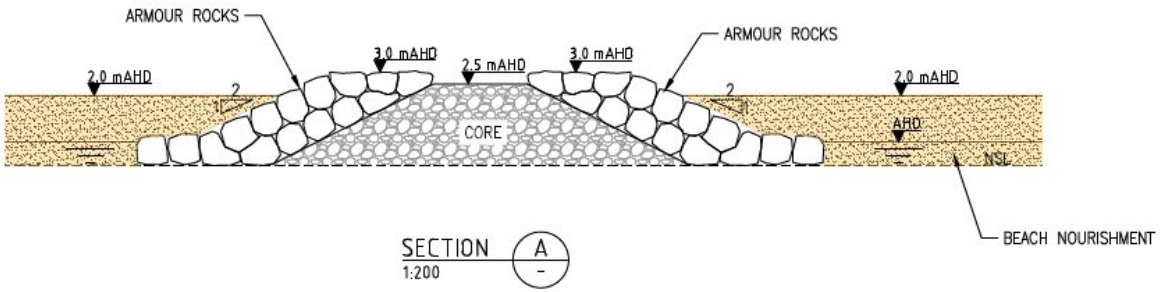
LEGEND:

ROCK GROYNE/HEADLAND ENHANCEMENT

BEACH NOURISHMENT

0.0 CONTOURS

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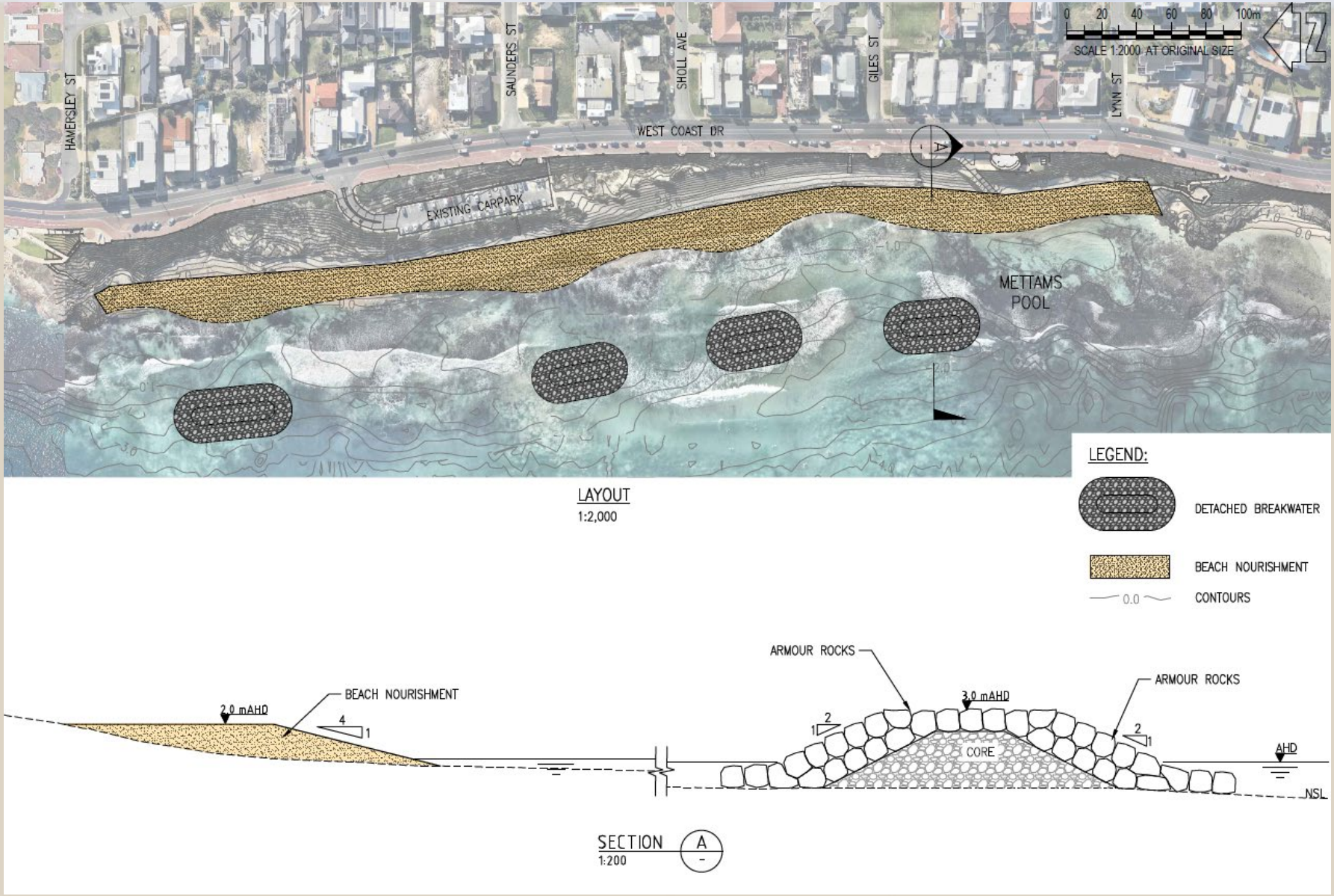
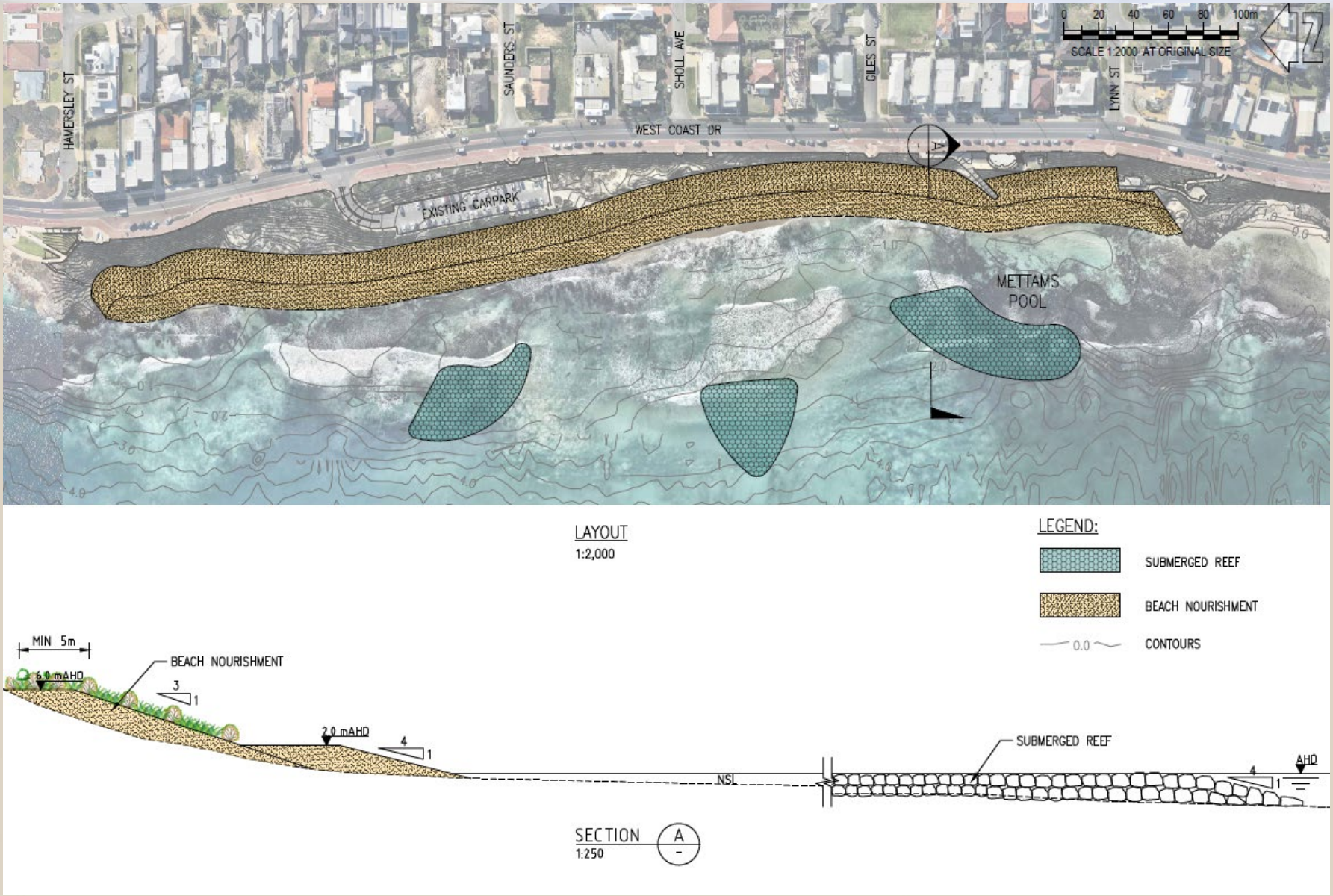
# Mettams – Offshore Breakwaters

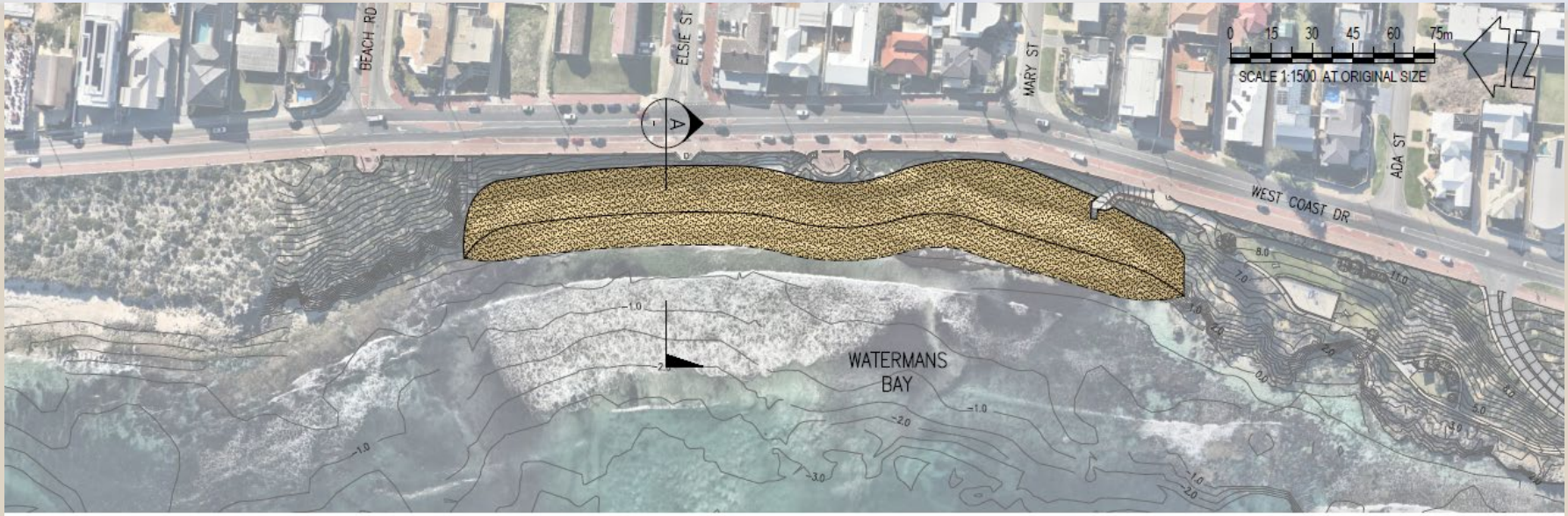


# Mettams – Submerged Reef



# Watermans – Concept Options

# Watermans – Beach Nourishment

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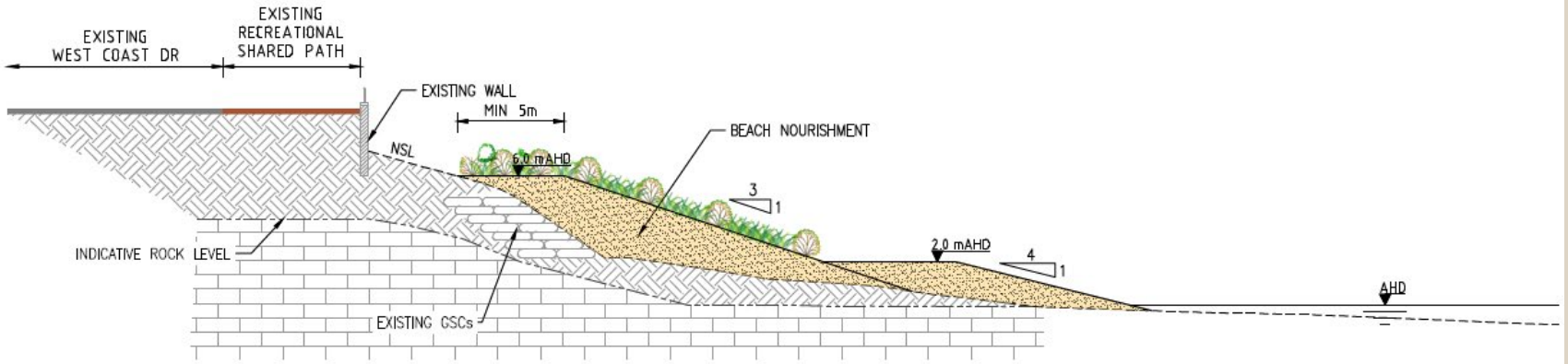
LEGEND:
BEACH NOURISHMENT
0.0 CONTOURS

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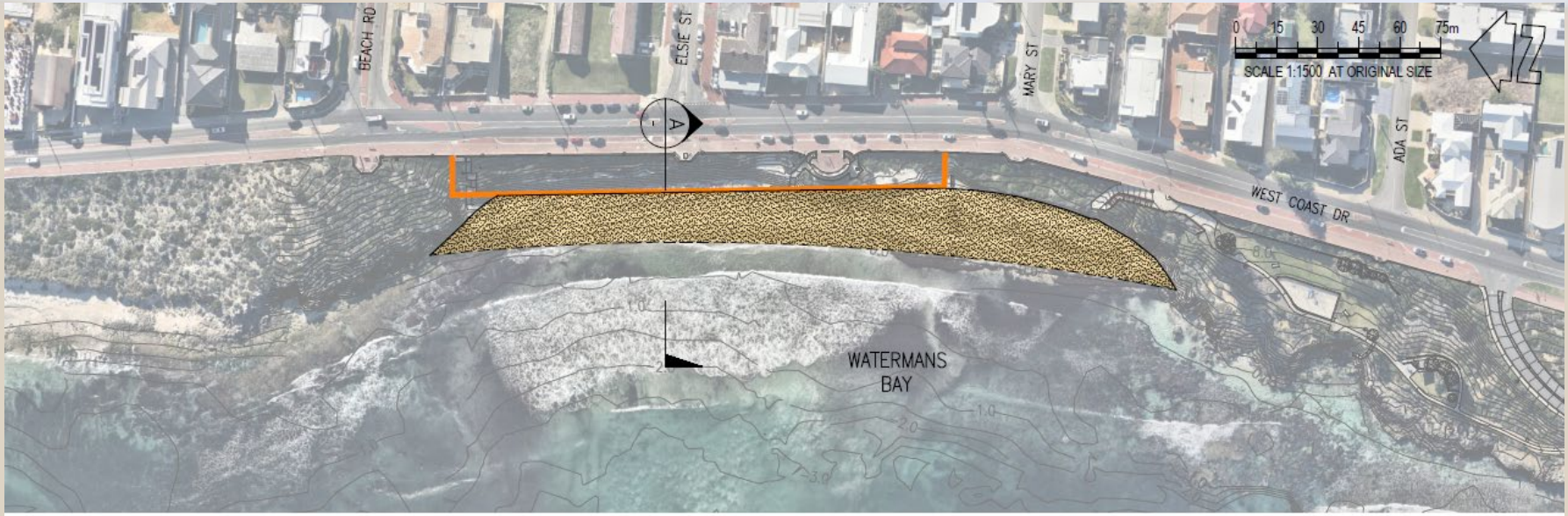
# Watermans – Seawall

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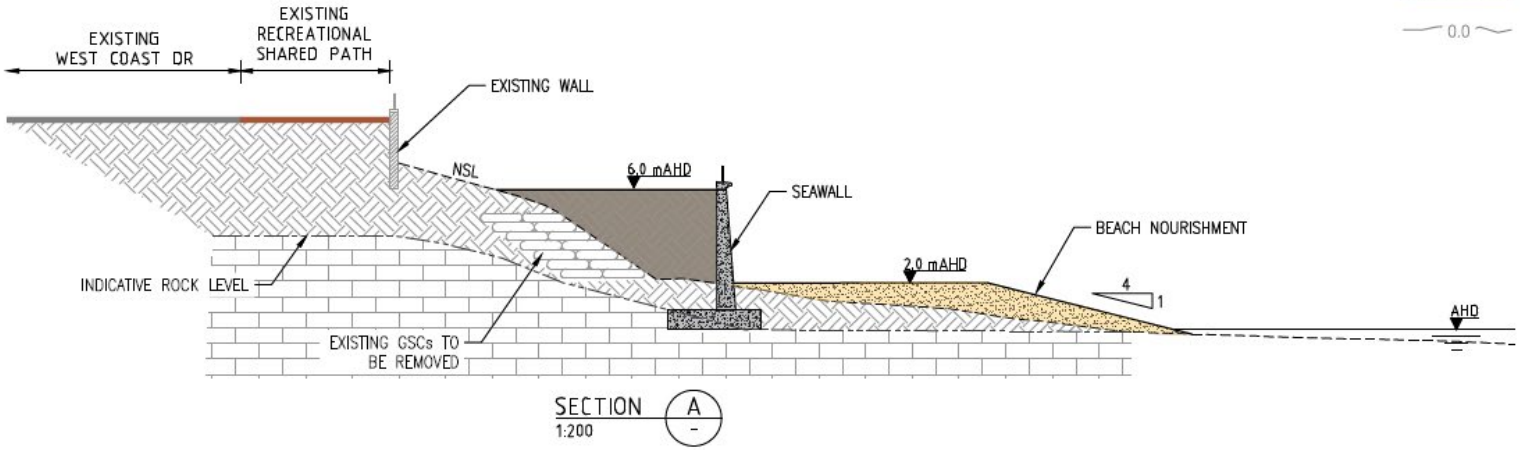
LEGEND:
SEAWALL
BEACH NOURISHMENT
0.0 CONTOURS

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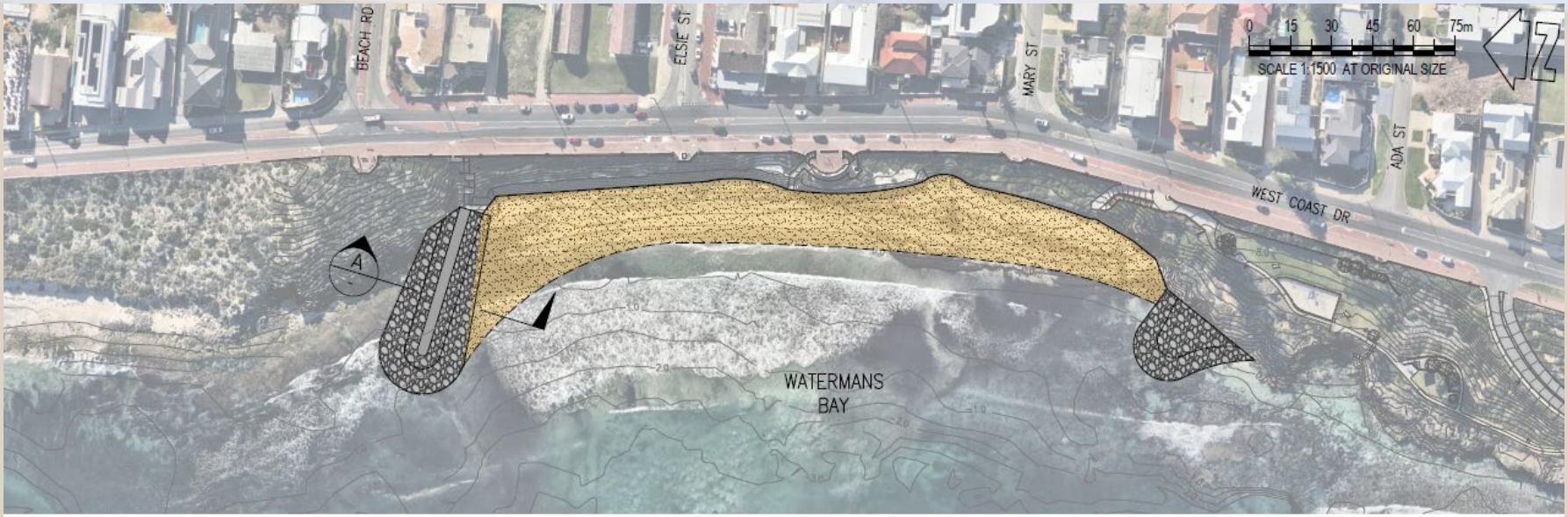
# Watermans – Groyne / Headland

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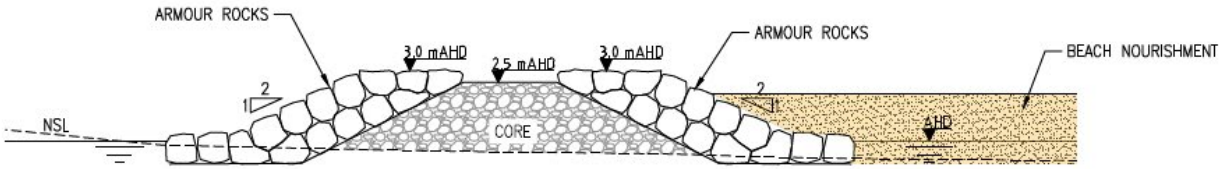
LEGEND:

ROCK GROYNE/HEADLAND ENHANCEMENT

BEACH NOURISHMENT

0.0 CONTOURS

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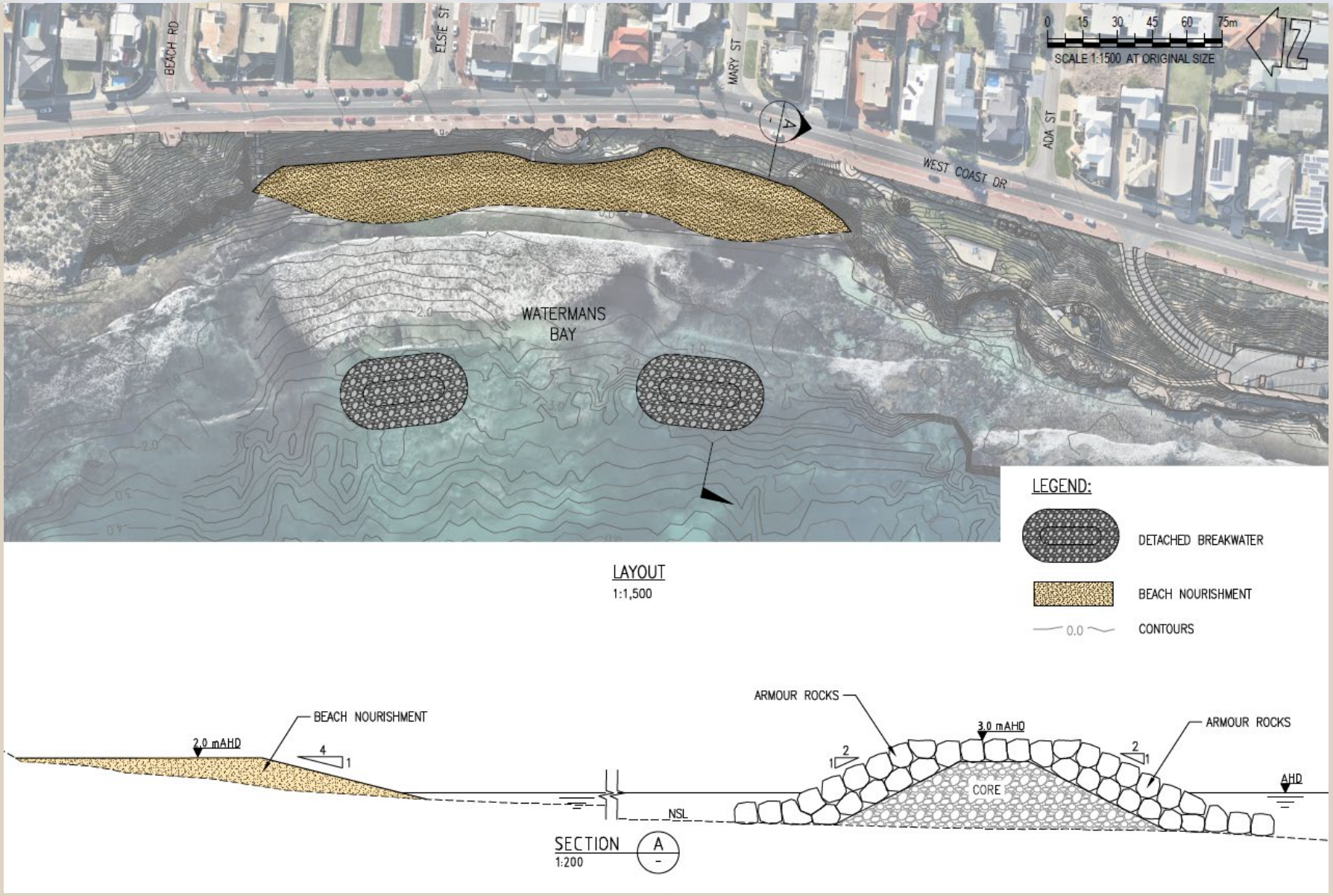
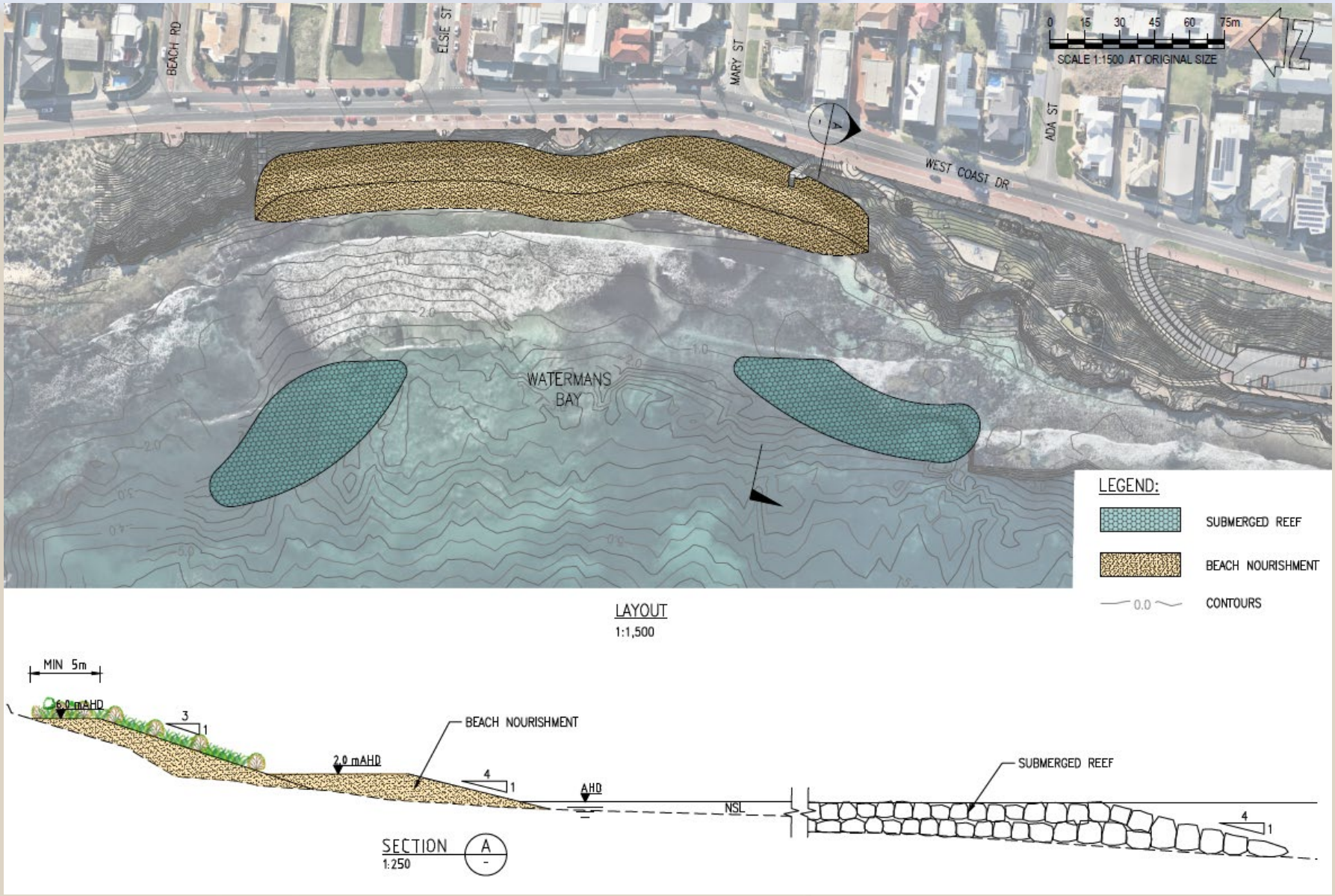
# Watermans – Offshore Breakwaters



# Watermans – Submerged Reef



# Multi Criteria Analysis

# Performance Criteria & Weightings

- General broad categories
- Can be weighted

| Criteria | Technical | Social | Environmental | Economic |
|---|---|---|---|---|
| Weighting | 25% | 25% | 25% | 25% |

# Technical Criteria

| TECHNICAL | | | | |
|---|---|---|---|---|
| | | | | |
| Description | | Effectiveness | Adaptability | Legal / approval requirements |
| | | Weighting 60% | Weighting 30% | Weighting 10% |
| Rating Description | | Expected effectiveness of the scheme at achieving the key objectives without ongoing modifications or risks of failure/poor outcomes. | Ease with which option can be modified to account for changes in conditions, etc in the future | Extent of effort and time required to receive approval for option |
| Rating Scale | 1 | Not expected to be effective | Modification not possible | Extreme effort required - >12 month timeframe for approvals |
| | 2 | Slightly effective | Only slight modifications possible with large effort | Significant effort required to achieve approvals 6 to 12 month period |
| | 3 | Effective | Reasonable potential for modification with some effort | Some issues with approvals, but addressed over 3 to 6 month period |
| | 4 | Very effective | Modifications readily possible with moderate level of effort | Minor issues with approvals, but easily addressed |
| | 5 | Completely effective | Complete modification of option easily achieved | No issues with approvals |

# Social Criteria

| SOCIAL | | | | | |
|---|---|---|---|---|---|
| | | | | | |
| Description | | Provide beach and active recreation opportunities | Provide coastal amenity | Ensure the coastline is accessible for all | Provide recreational facilities including ablutions and changerooms, shade and shelter |
| | | Weighting 30% | Weighting 30% | Weighting 20% | Weighting 20% |
| Rating Description | | Extent that the option provides useable beach area and active recreation opportunities | Extent that the option provides opportunities for passive recreation and amenity, such as provision of dual use path and areas to sit and view the water. | Ranking based on provision and likely functionality of access to the beach. | Ranking based on provision and likely functionality of the ablutions, changerooms, shade and shelter. |
| Rating Scale | 1 | Significant loss in beach area and active recreation opportunities | Significant loss of amenity and passive recreation opportunities | Access not provided | Ablutions, changerooms, shade and shelter not provided |
| | 2 | Slight decrease in beach area and active recreation opportunities | Slight decrease in amenity and passive recreation opportunities | Access provided but with potential loss of functionality due to change in beach or areas of beach usage | Ablutions, changerooms, shade and shelter provided but with potential loss of functionality due to change in beach or areas of beach usage |
| | 3 | No net change in beach area and active recreation opportunities | No net change to amenity and passive recreation opportunities | Access provided within scheme with minimal potential for loss of functionality | Ablutions, changerooms, shade and shelter provided within scheme with minimal potential for loss of functionality |
| | 4 | Slight increase in beach area and active recreation opportunities | Slight increase in amenity and passive recreation opportunities | Access provided with for all most of the time | Ablutions, changerooms, shade and shelter provided with improved functionality |
| | 5 | Significant increase in beach area and active recreation opportunities | Significant increase in amenity and passive recreation opportunities | Access provided for all at all times | Ablutions, changerooms, shade and shelter ideally situated |

# Environmental Criteria

| ENVIRONMENTAL | | | |
|---|---|---|---|
| | | | |
| Description | | Preservation of beach environment (beach and vegetated dunes) | Preservation of Marine Park |
| | | Weighting 50% | Weighting 50% |
| Rating Description | | How well the option protects or provides for preservation of the beach environment, including dunes | How well the option protects or provides for preservation of the marine park environment |
| Rating Scale | 1 | Significant loss of beach environment | Significant loss of marine park environment |
| | 2 | Slight loss of beach environment | Slight loss of marine park environment |
| | 3 | No net change in beach environment | No net change in marine park environment |
| | 4 | Slight increase in beach environment | Slight increase in marine park environment |
| | 5 | Significant increase in beach environment | Significant increase in marine park environment |

# Economic Criteria

- Capital and maintenance costs estimated for each
- Highest cost = 1, lowest cost = 5
- Sliding scale between

## Mettams Pool

| ECONOMIC | | | |
|---|---|---|---|
| Description | | Capital cost | Operating/ maintenance cost |
| | | Weighting 50% | Weighting 50% |
| Rating Description | | Capital cost to construct | Ongoing operating and maintenance costs to maintain over 50 year period |
| Rating Scale | 1 | $8.3 million | $15.9 million |
| | 2 | $6.8 million | $15.0 million |
| | 3 | $5.4 million | $14.2 million |
| | 4 | $3.9 million | $13.3 million |
| | 5 | $2.4 million | $12.4 million |

## Watermans Bay

| ECONOMIC | | | |
|---|---|---|---|
| Description | | Capital cost | Operating/ maintenance cost |
| | | Weighting 50% | Weighting 50% |
| Rating Description | | Capital cost to construct | Ongoing operating and maintenance costs to maintain |
| Rating Scale | 1 | $6.6 million | $14.6 million |
| | 2 | $5.4 million | $13.9 million |
| | 3 | $4.1 million | $13.2 million |
| | 4 | $2.9 million | $12.5 million |
| | 5 | $1.6 million | $11.8 million |

# Assessment

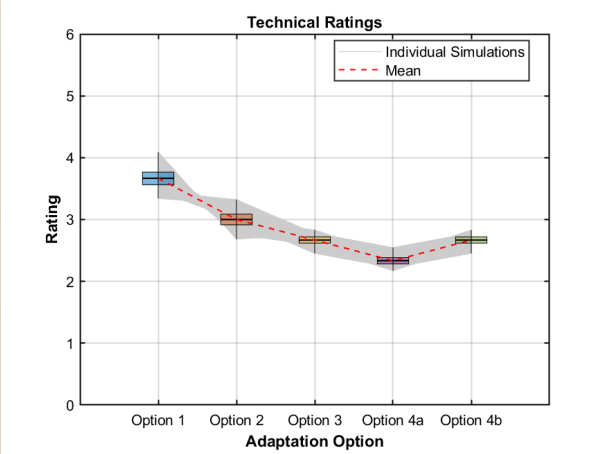
- Aim is to be as objective as possible
- Use rating criteria, project objectives and success criteria to score
- Need to be justifiable to ratings
- Need to be consistent between options and across concepts

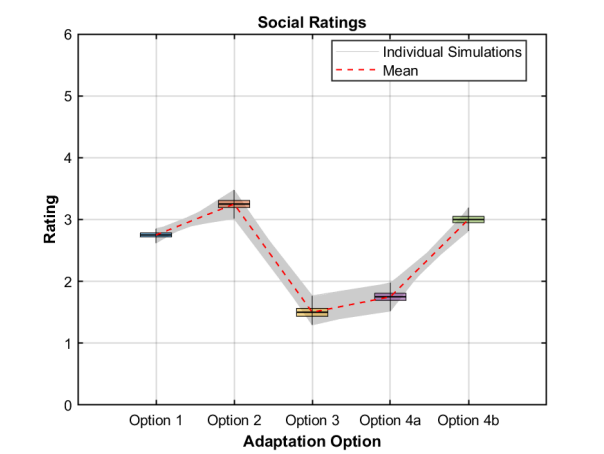
# Multi Criteria Analysis
# Mettams Pool

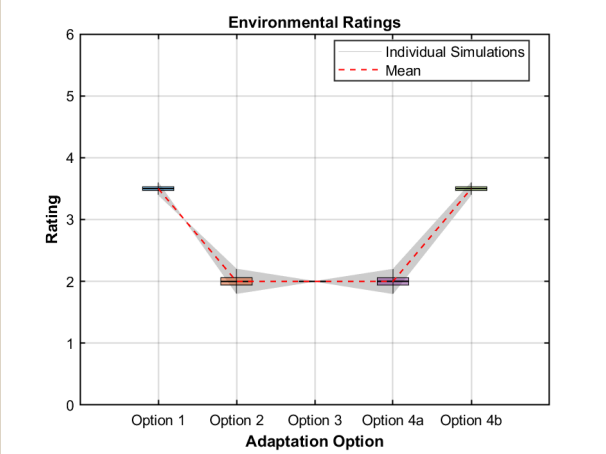
# MCA – Mettams Pool

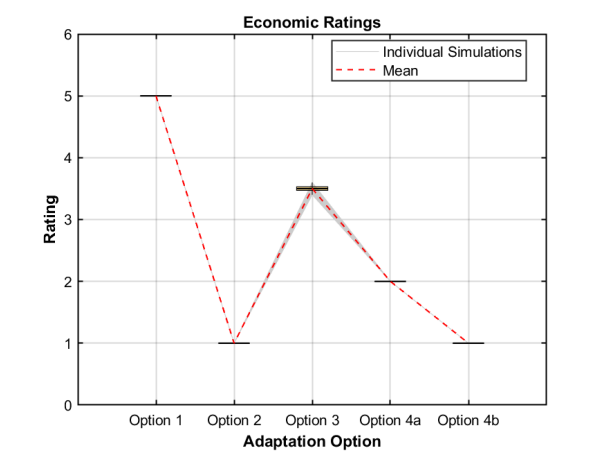
| | | | Technical | | | Social | | | | Environment | | Economic | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Weighting 25% | | | Weighting 25% | | | | Weighting 25% | | Weighting 25% | | |
| Option | Type | Description | Effectiveness | Adaptability | Legal / approval requirements | Provide beach and active recreation opportunities | Provide coastal amenity | Ensure the coastline is accessible for all | Provide recreational facilities including ablutions and changerooms, shade and shelter | Preservation of beach environment (beach and vegetated dunes) | Preservation of Marine Park | Capital cost | Operating/ maintenance cost | Weighted Score |
| | | | 60% | 30% | 10% | 30% | 30% | 20% | Weighting 20% | Weighting 50% | Weighting 50% | Weighting 50% | Weighting 50% | |
| 1 | Sand Nourishment | Construction of sand buffer and biennial beach nourishment to protect upland structures while maintaining the current beach amenity. | 3 | 5 | 3 | 3 | 3 | 2 | 3 | 4 | 3 | 5 | 5 | 3.7 |
| | | | 3.6 | | | 2.8 | | | | 3.5 | | 5.0 | | |
| 2 | Seawall & Beach Nourishment | Construction of a vertical seawall directly in front of at-risk assets for protection as well as biennial beach nourishment to maintain beach amenity. | 4 | 2 | 3 | 3 | 2 | 4 | 4 | 1 | 3 | 1 | 1 | 2.4 |
| | | | 3.3 | | | 3.1 | | | | 2.0 | | 1.0 | | |
| 3 | Groynes / Headland Enhancement & Beach Nourishment | Construction of groynes / headland enhancement in combination with biennial beach nourishment to provide usable beach compartments and infrastructure protection. | 3 | 3 | 2 | 1 | 1 | 1 | 3 | 2 | 2 | 4 | 3 | 2.5 |
| | | | 2.9 | | | 1.4 | | | | 2.0 | | 3.5 | | |
| 4a | Detached Breakwaters & Beach Nourishment | Construction of detached breakwaters in combination with biennial beach nourishment to provide a usable beach compartment and infrastructure protection. | 3 | 2 | 2 | 1 | 1 | 2 | 3 | 3 | 1 | 2 | 2 | 2.1 |
| | | | 2.6 | | | 1.6 | | | | 2.0 | | 2.0 | | |
| 4b | Submerged Reefs & Beach Nourishment | Construction of submerged reefs and sand buffer in combination with biennial beach nourishment to protect upland structures while maintaining the current beach amenity. | 3 | 3 | 2 | 4 | 3 | 2 | 3 | 4 | 3 | 1 | 1 | 2.6 |
| | | | 2.9 | | | 3.1 | | | | 3.5 | | 1.0 | | |

# Sensitivity – Mettams Pool

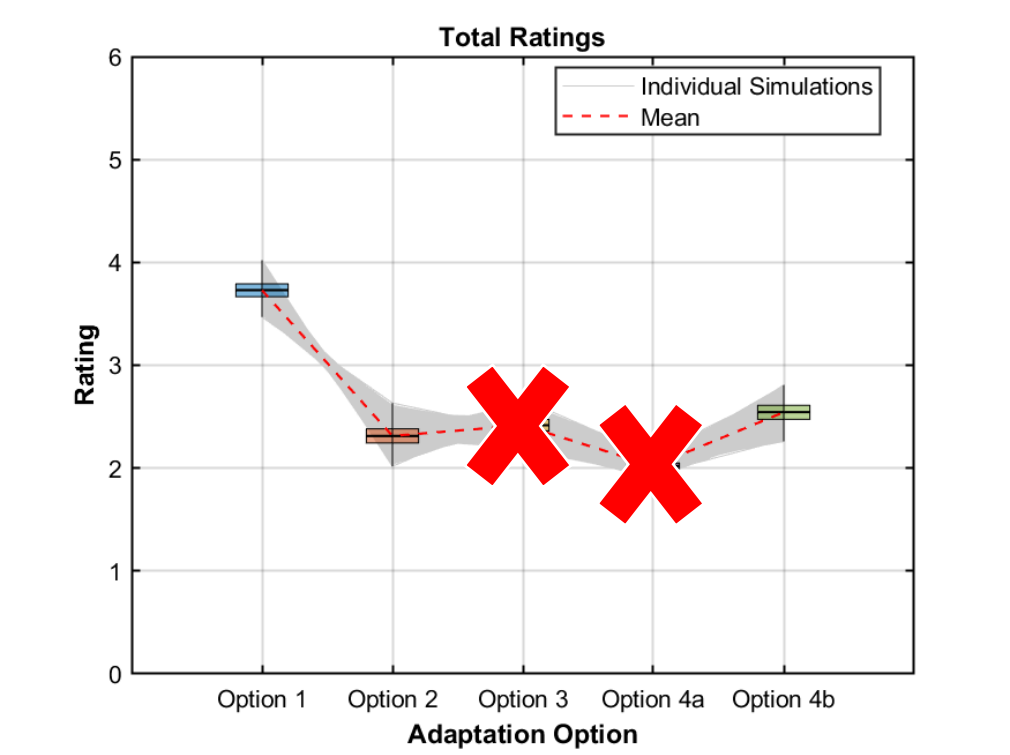


# Sensitivity – Mettams Pool




| Sand Nourishment | Seawall + Sand Nourishment | Groynes / Headlands + Sand Nourishment | Offshore Breakwaters + Sand Nourishment | Submerged Reef + Sand Nourishment |
|---|---|---|---|---|

# Preferred & Considerations Mettams Pool

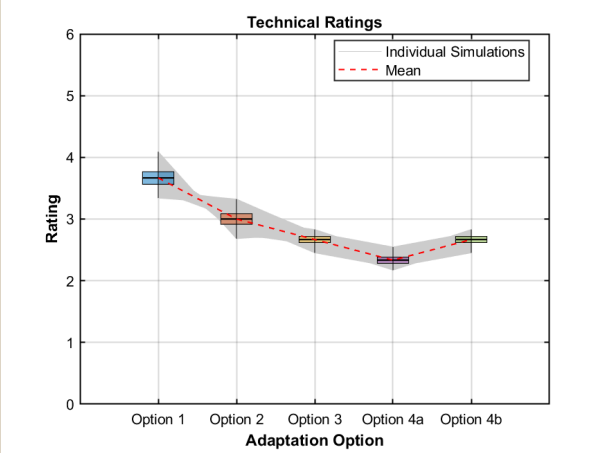
- Outcome indicates that SAND NOURISHMENT is preferred coastal adaptation option
- Sensitivity testing changes outcomes of other option, but SAND still ranked highest
- Heavily linked to success criteria and defined objectives from CHRMAP
- Across life of project, lowest cost
- Retains some risk – needs to be worked through
- Options for sourcing (onshore, offshore)
- Options for placement methodology

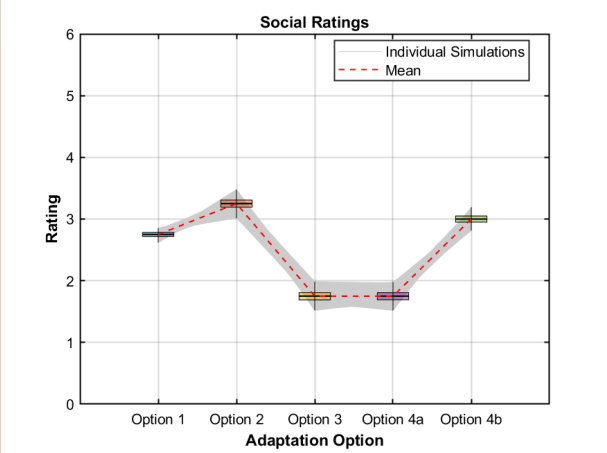
# Multi Criteria Analysis Watermans Bay

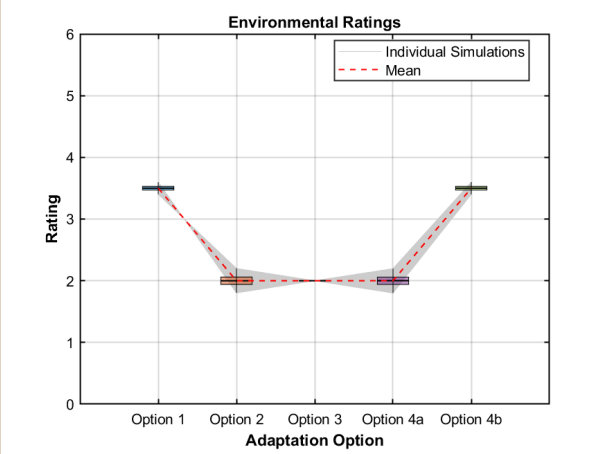
# MCA – Watermans Bay

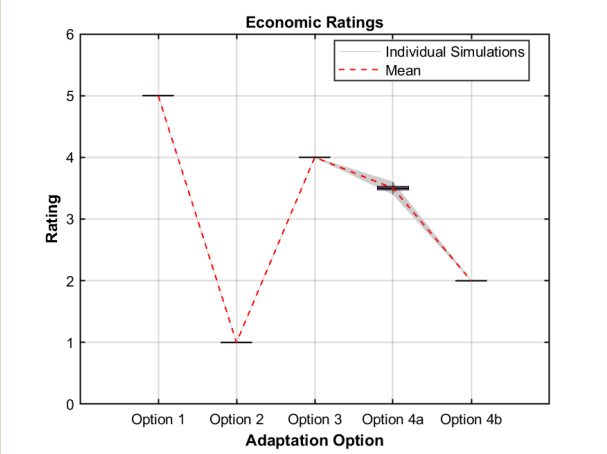
| | | | Technical | | | Social | | | | Environment | | Economic | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Weighting 25% | | | Weighting 25% | | | | Weighting 25% | | Weighting 25% | | |
| Option | Type | Description | Effectiveness | Adaptability | Legal / approval requirements | Provide beach and active recreation opportunities | Provide coastal amenity | Ensure the coastline is accessible for all | Provide recreational facilities including ablutions, changerooms, shade, shelter | Preservation of beach environment (beach and vegetated dunes) | Preservation of Marine Park | Capital cost | Operating/ maintenance cost | Weighted Score |
| | | | 60% | 30% | 10% | 30% | 30% | 20% | 20% | 50% | 50% | 50% | 50% | |
| 1 | Sand Nourishment | Construction of sand buffer and biennial beach nourishment to protect upland structures while maintaining the current beach amenity. | 3 | 5 | 3 | 3 | 3 | 2 | 3 | 4 | 3 | 5 | 5 | 3.7 |
| | | | 3.6 | | | 2.8 | | | | 3.5 | | 5.0 | | |
| 2 | Seawall & Beach Nourishment | Construction of a vertical seawall directly in front of at-risk assets for protection as well as biennial beach nourishment to maintain beach amenity. | 4 | 2 | 3 | 3 | 2 | 4 | 4 | 1 | 3 | 1 | 1 | 2.4 |
| | | | 3.3 | | | 3.1 | | | | 2.0 | | 1.0 | | |
| 3 | Groynes / Headland Enhancement & Beach Nourishment | Construction of groynes / headland enhancement in combination with biennial beach nourishment to provide usable beach compartments and infrastructure protection. | 3 | 3 | 2 | 1 | 2 | 1 | 3 | 2 | 2 | 4 | 4 | 2.7 |
| | | | 2.9 | | | 1.7 | | | | 2.0 | | 4.0 | | |
| 4a | Detached Breakwaters & Beach Nourishment | Construction of detached breakwaters in combination with biennial beach nourishment to provide a usable beach compartment and infrastructure protection. | 3 | 2 | 2 | 1 | 1 | 2 | 3 | 3 | 1 | 4 | 3 | 2.4 |
| | | | 2.6 | | | 1.6 | | | | 2.0 | | 3.5 | | |
| 4b | Submerged Reefs & Beach Nourishment | Construction of submerged reefs and sand buffer in combination with biennial beach nourishment to protect upland structures while maintaining the current beach amenity. | 3 | 3 | 2 | 4 | 3 | 2 | 3 | 4 | 3 | 2 | 2 | 2.9 |
| | | | 2.9 | | | 3.1 | | | | 3.5 | | 2.0 | | |

# Sensitivity – Watermans Bay

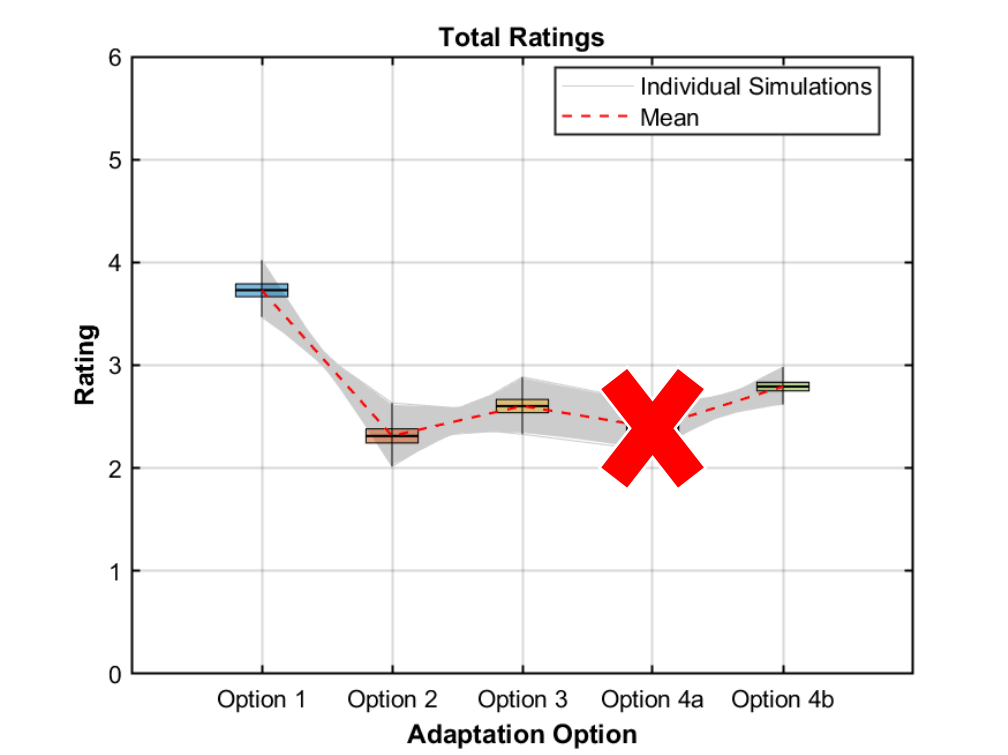


# Sensitivity – Watermans Bay




| Sand Nourishment | Seawall + Sand Nourishment | Groynes / Headlands + Sand Nourishment | Offshore Breakwaters + Sand Nourishment | Submerged Reef + Sand Nourishment |
|---|---|---|---|---|

# Preferred & Considerations Watermans Bay

- Outcome indicates that SAND NOURISHMENT is preferred coastal adaptation option
- Sensitivity testing changes outcomes of other option, but SAND still ranked highest
- Heavily linked to success criteria and defined objectives from CHRMAP
- Across life of project, lowest cost
- Retains some risk – needs to be worked through
- Options for sourcing (onshore, offshore)
- Options for placement methodology

# Next Steps

# Next Steps – This Project Scope

- Work being fully documented and justified
- Recommendations made about next steps, considerations and any gaps or required works
- Reports will be produced summarising all work
- Separately, Aither work through BDA
- Communications and consultation summary report prepared
- Presented to council for consideration

# Next Steps – Future Works

- Dependent on council resolutions / decisions
- Ongoing community consultation on work, outcomes and recommendations
- Any gaps or recommended additional investigations
- Detailed design and assessment
  - Refines the preferred option
  - Further investigations
  - Approvals
- Implementation

# Any other business

# Closing

## Andrew Murphy

# Thank you