Clifton to Tangoio Coastal Hazards Strategy 2120

REPORT OF THE NORTHERN AND SOUTHERN CELL ASSESSMENT PANELS

FINAL REPORT
14 February 2018

PROJECT PARTNERS

NAPIER CITY COUNCIL
Te Kaunihera o Ahuriri

MANA AHURIRI INCORPORATED

HASTINGS DISTRICT COUNCIL

MAUNGAHARURU TANGITŪ

HAWKE'S BAY REGIONAL COUNCIL

HE TOA TAKITINI
"Our Strength is in Unity"

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National SCIENCE Challenges

RESILIENCE TO NATURE'S CHALLENGES

Kia manawaroa – Ngā Ākina o Te Ao Tūroa

General project support and critique + aligned research

REPORT STATUS

Report Status	Final
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Review By	Stephen Daysh, Mitchell Daysh Ltd

FOREWORD

The Northern and Southern Cell Assessment Panels were formed in early 2017 to consider a critical, vexed and confronting question for Hawke's Bay; how will we, as a community, respond to the effects on our coast of rising seas and climate change?

Panel members are primarily volunteers, representing a broad cross section of our community. They include mana whenua and coastal community representatives, representatives of the broader communities of Napier and Hastings, business interests, asset managers, and the Department of Conservation, as the central Government agency responsible for the New Zealand Coastal Policy Statement 2010.

With input from some of New Zealand's leading technical experts, the Panels have considered what our coast might look like in 50 and 100 years' time. They have considered a broad range of options for responding to those changes, from building coastal defences to shifting whole communities away from at-risk areas.

In undertaking this task, Panel members have given an enormous amount of their time and energy; armed with folders overflowing with technical reports, summary information, surveys, and community feedback, they have soldiered on through evening and full day workshops and weekend site visits to develop and deliver their recommendations. On behalf of my fellow Councillors from the Hawke's Bay Regional Council, and my colleagues at the Napier City Council and Hastings District Council, I wish to extend my deep gratitude to them for their commitment and hard work.

This report is a synthesis of this huge amount of work. It presents the recommendations of the Northern and Southern Cell Assessment Panels, the reasons for those recommendations, and the process taken to arrive at them.

We live on a dynamic coastline, one that is still changing in response to the 1931 earthquake. With climate change, it is certain that this change will continue, and accelerate. We know we will experience higher sea levels and more storms. We know private property and public assets will be affected. What we don't know is how far, and how fast, sea levels will rise. We need to be prepared.

This report is a call to action. It offers a forward-thinking, flexible, well-reasoned and responsive plan for responding to the effects of climate change on our coastline. It is developed and supported by our local communities.

Doing nothing is no longer a viable response to these challenges.

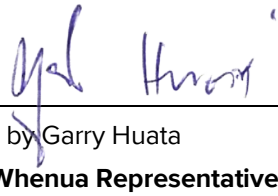
Peter Beaven

Chair, Clifton to Tangoio Coastal Hazards Strategy Joint Committee
Chair, Northern and Southern Cell Assessment Panels
Councillor, Hawke's Bay Regional Council

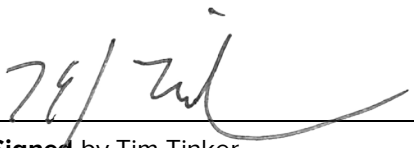
The following report captures both the evaluation process and recommendations of the Northern and Southern Cell Assessment Panels, which were formed to complete Stage 3 of the Clifton to Tangoio Coastal Hazards Strategy 2120.

Northern Cell Assessment Panel voting members

Signed by Hoani Taurima
Mana Whenua Representative



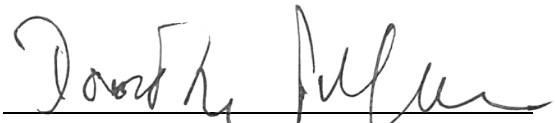
Signed by Garry Huata
Mana Whenua Representative



Signed by Tim Tinker
Regional Representative

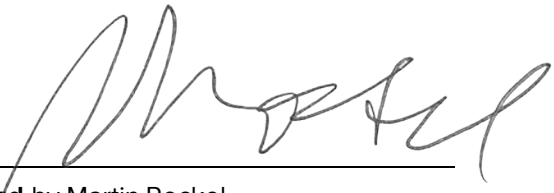
Signed by Douglas Dickson
Whirinaki Community Representative

Signed by Mark Levick
Whirinaki Community Representative

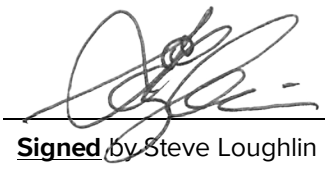


Signed by Dorothy Pilkington
Bay View Community Representative

Signed by Mike Penrose
Westshore Community Representative



Signed by Martin Rockel
Westshore Community Representative



Signed by Steve Loughlin
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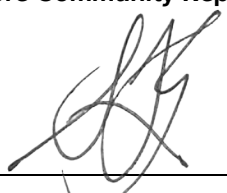


Signed by Shaun Thompson-Gray
Ahuriri / Pandora Community Representative

Signed by Michel de Vos

Port of Napier Representative

Signed by Craig Daly

Ahuriri / Pandora Businesses Representative

Signed by Oliver Postings

Lifelines Representative

Signed by Sarah Owen

Department of Conservation Representative

Southern Cell Assessment Panel voting members

Signed by Aki Paipper

Mana Whenua Representative

Signed by Te Kaha Hawaikirangi

Mana Whenua Representative

Signed by Maurice Smith

Clifton/Te Awanga Community Representative

Signed by Martin Bates

Clifton/Te Awanga Community Representative

Signed by Tom Evers-Swindell

Clifton/Te Awanga Community Representative

Signed by Mike Harris

Haumoana Community Representative

Signed by Keith Newman

Haumoana Community Representative

Signed by Dave Wells

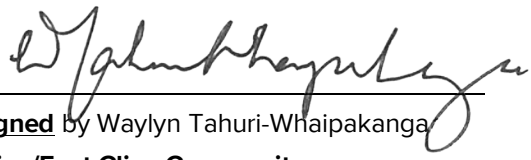
Haumoana Community Representative

Signed by Bruce Meredith

Clive/East Clive Community Representative

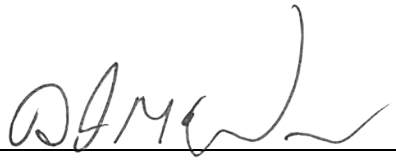
Signed by Duncan Powell

Clive/East Clive Community Representative



Signed by Waylyn Tahuri-Whaipakanga

Clive/East Clive Community Representative

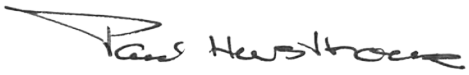


Signed by Brent McNamara

Clive/East Clive Community Representative

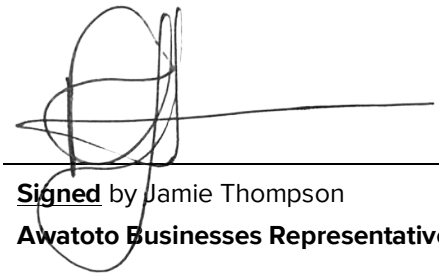
Signed by Mark Mahoney

Marine Parade Community Representative



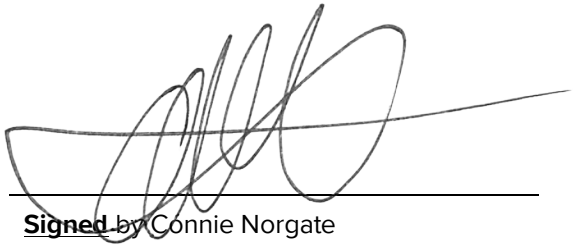
Signed by Paul Hursthouse

Recreational Interests Representative



Signed by Jamie Thompson

Awatoto Businesses Representative

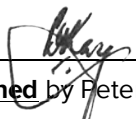


Signed by Connie Norgate

Department of Conservation Representative

Signed by Jagwinder Pannu

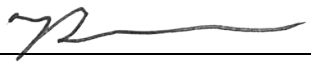
Lifelines Representative



Signed by Peter Kay

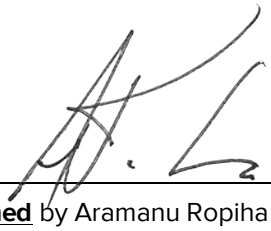
Regional Representative

Facilitation Team members



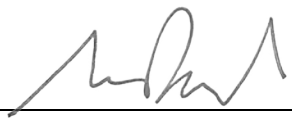
Signed by Peter Beaven

Panel Chair

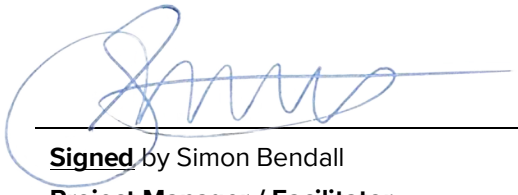


Signed by Aramanu Ropiha

Kaitiaki o te Roopu

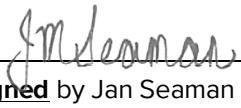


Signed by Stephen Daysh
Facilitator



Signed by Simon Bendall
Project Manager / Facilitator

Signed by Monique Thomsen
Panel Secretary



Signed by Jan Seaman
Panel Secretary

CONTENTS

PART A

Overview

1. INTRODUCTION

This report presents the evaluation process and recommendations of the Northern and Southern Cell Assessment Panels (the "Assessment Panels" or "Panels"), which were formed to complete Stage 3 of the Clifton to Tangoio Coastal Hazards Strategy 2120 ("the Strategy").

1.1 PURPOSE OF THIS REPORT

The purpose of this report is to:

- Provide an overview of the purpose and process of the Strategy;
- Describe the formation of the Assessment Panels, their Terms of Reference and scope;
- Outline the process adopted by the Assessment Panels for identifying and assessing options for responding to coastal hazards risks in identified priority areas of the coast; and
- Present the recommendations of the Assessment Panels.

1.2 REPORT STRUCTURE

The report is structured into four parts, as follows:

Part A: Overview
Introduces the Strategy and provides background material relevant to the work of the Assessment Panels.

Part B: Assessment Panel Recommendations
Presents the recommendations of the Northern and Southern Cell Assessment Panels for how the communities of Napier and Hastings should respond to coastal hazards in priority areas of the coast between Clifton and Tangoio.

Part C: Assessment Panel Process
Details the process the Assessment Panels undertook to develop their recommendations, principally through a series of 11 workshops and associated meetings, site visits and technical sessions.

Part D: Appendices
Provides links to access the supporting material and reports developed and used by the Assessment Panels in forming their recommendations.

2. CONTEXT

The New Zealand Coastal Policy Statement 2010 requires Local Authorities to consider and plan for coastal hazards risks. Under Policy 24 (1), Local Authorities are required to:

> *"Identify areas in the coastal environment that are potentially affected by coastal hazards (including tsunami), giving priority to the identification of areas at high risk of being affected. Hazard risks, over at least 100 years, are to be assessed..."*

Storms, wave direction and energy, beach and cliff profiles, local geomorphology, and the presence of man-made structures all contribute to a changing coastline which can present a variety of hazards for those that live, work and play in the coastal environment.

Overriding these processes, climate change is undoubtedly accelerating the pace of change and presenting new challenges to coastal communities through sea level rise and the increased frequency and severity of storm events.

In her 2015 report[1], the Parliamentary Commissioner for the Environment explains that sea levels have already risen significantly due to the impact of humans on the climate, and that it is certain that it will continue to rise for centuries to come.

The Intergovernmental Panel on Climate Change ("IPCC") predicts that sea levels will rise by a further 20 to 40 centimetres by the middle of this century. This increase is 'locked in'; it is forecast under all IPCC scenarios for future global greenhouse gas emissions. This means that any global reduction in greenhouse gas emissions is predicted to make little difference to the rate of sea level rise for several decades.

The Parliamentary Commissioner for the Environment emphasised however that much is uncertain – how rapidly sea levels will rise and how different coastal areas will be affected – and that this uncertainty grows over time. She highlighted the need for New Zealand to take the time to prepare carefully for the uncertain long-term effects of climate change and rising seas.

3. THE CLIFTON TO TANGOIO COASTAL HAZARDS STRATEGY 2120

3.1 OVERVIEW

The Strategy represents a co-ordinated approach to identifying and responding to coastal hazards and the influence of sea level rise over the next 100 years. It provides a platform for long-term planning and decision making.

The Strategy is being developed through a Joint Committee formed by elected representatives from the Hawke's Bay Regional Council ("HBRC"), He Toa Takitini, the Napier City Council ("NCC"), Mana Ahuriri Incorporated, the Hastings District Council ("HDC") and the Maungaharuru-Tangitū Trust.

The Strategy:

- Covers the coastal area between Clifton to Tangoio;
- Seeks to develop a planned response to coastal hazards out to the year 2120;
- Will assess and respond to the following coastal hazards;
    - Coastal erosion (storm cut, trends, effects of sea level rise)

[1] Parliamentary Commissioner for the Environment, November 2015. Preparing New Zealand for rising seas: Certainty and Uncertainty.

- Coastal inundation (storm surge, set-up, run-up, overtopping and sea level rise)

- Incorporates climate change as an overriding influence.

The vision of the Strategy is:

> *That coastal communities, businesses and critical infrastructure from Tangoio to Clifton are resilient to the effects of coastal hazards.*

The Strategy is founded on the following objectives:

- To take a long-term approach to coastal hazards impact management in order to develop resilient communities out to 2120;
- To identify the choice or series of choices that provide the most cost-effective outcome for the Hawkes Bay community, while addressing economic, environmental, cultural and social issues;
- To ensure cultural concerns are considered prior to options being progressed;
- To take a consistent, coordinated and shared approach between Hastings District Council, Napier City Council and Hawke's Bay Regional Council;
- To take an informed, consultative and coordinated approach with stakeholders and interest groups;
- To make decisions that align with national-level guidance, directions and policies, including the New Zealand Coastal Policy Statement and findings of the Parliamentary Commissioner for the Environment;
- To ensure that coastal hazards responses are developed in an integrated way that considers risk, cost, impacts and indirect effects;
- To ensure that coastal hazards responses are assessed on the basis of adaptability and the site-specific nature of the particular coastal hazard; and not preclude or unnecessarily constrain choices to adopt different options into the medium and longer-term horizons;
- To take into account the impact of coastal hazards responses on natural coastal processes, and any resulting impacts on other parts of the coast;
- To make evidence-based decisions founded on best practice coastal science and good data;
- To make decisions on a level of community resilience to coastal hazards that is consistent with the likelihood of the risk, the magnitude of the consequences, and the community's appetite for risk acceptance;
- To ensure the timely provision of information on hazards, risks and uncertainties to private landowners and the wider community in order to encourage prudence in decision-making relating to private property;
- To avoid creating perverse incentives for private landowners to undertake actions that increase costs and risks to the wider community; and

- To minimise public costs arising from decisions made by private landowners, which incur unnecessary risks despite available information.

3.2 STRATEGY DEVELOPMENT PROCESS

The Strategy was initiated in 2014 with the establishment of a Technical Advisory Group ("TAG") formed by senior Council staff and advisors, and the Clifton to Tangoio Coastal Hazards Strategy Joint Committee ("Joint Committee"). The Strategy is being developed in four key stages, followed by an ongoing monitoring and review process (Figure 1).

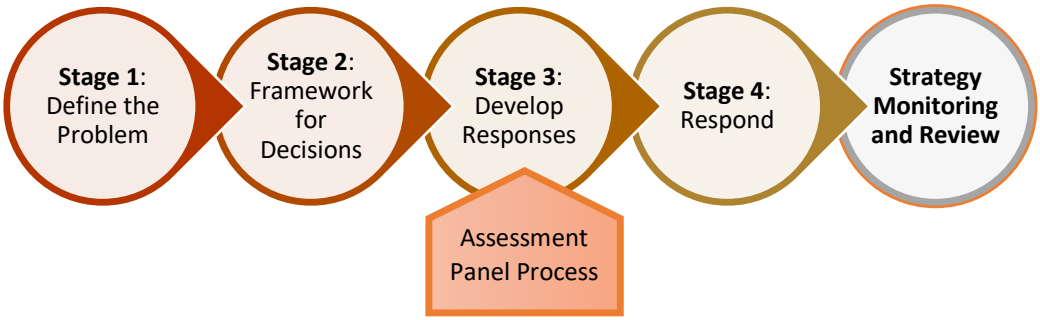


Figure 1. Clifton to Tangoio Coastal Hazard Strategy – Process of Development

Stage 1 commenced in late 2014. Fundamental to Stage 1 was the identification of the extent of coastal erosion and coastal inundation hazards out to 2120, and the risks these present. This technical study was undertaken by Tonkin & Taylor with oversight from TAG and the Joint Committee. This work resulted in two reports being produced: Coastal Hazards Assessment[2] and Coastal Risk Assessment[3]. The coastal hazard assessment work was independently peer reviewed by Professor Paul Kench of Auckland University.

A mapping tool was also developed to show the newly mapped hazard extents. This information is provided through the Hawke's Bay Hazard Information Portal at: http://www.hbemergency.govt.nz/hazards/portal.

Stage 2 comprised development of a bespoke decision-making framework for the 100-year Strategy by Mitchell Daysh[4], based on a community decision-making model and utilising a range of decision making tools including Multi-Criteria Decision Analysis process ("MCDA"), Dynamic Adaptive Planning Pathways ("DAPP") and Real Options Analysis ("ROA"). During this stage, a funding model think-piece report was prepared by Maven Consulting[5]. The preliminary funding model identified options for how planned responses to coastal hazards risks identified in the Strategy might be paid for. The report covers

[2] Tonkin & Taylor, 2016. Clifton to Tangoio Coastal Hazards Strategy 2120 - Coastal Hazard Assessment.
[3] Tonkin & Taylor, 2016. Hawke Bay Coastal Strategy - Coastal Risk Assessment.
[4] Mitchell Daysh, 2017. Clifton to Tangoio Coastal Hazards Strategy 2120 – Stage Two Report: Decision Making Framework.
[5] Maven & Environmental Management Services Limited, 2016. Stage Two – Clifton to Tangoio Coastal Hazards Strategy 2120: Hazards Response Funding Model.

public / private benefits, the sharing of costs between Councils, and mechanisms for securing funds, including the proposed establishment of a Coastal Contributory Fund. Stage 2 was completed at the end of 2016.

Stage 3 is the subject of this report. In Stage 3, the decision-making framework that was developed in Stage 2 has been implemented by the two Assessment Panels to arrive at recommended responses to coastal hazards risks over the 100-year strategy period. The process undertaken by the Assessment Panels, and the outcomes reached, are presented in the following parts of this report.

Stage 4 will include the development of an Implementation Plan for the coastal hazards responses recommended in Stage 3, provided the Assessment Panels' recommendations in this report are approved by the Joint Committee and the partner Councils. It is anticipated that Stage 4 will include the sequencing of works to be implemented in the short-term, and the identification of any supporting funding and policy actions, including potential regional and district plan changes. It is noted that the Assessment Panels have consistently raised the need for the district and regional plan regulatory framework to align with and support agreed Strategy outcomes.

Stage 4 will also see the development of triggers (decision points) to determine when to transfer to the next (or different) coastal hazard response option for each priority unit of the Strategy Area.

Strategy Monitoring and Reviews will be ongoing over at least the next 100 years, with formal Strategy reviews planned to occur at 10-year intervals over this period. Strategy monitoring will include ongoing data collection and the monitoring of climate change projections and triggers. This monitoring may result in a formal review of the Strategy being implemented earlier than the planned 10-year interval.

The 10-yearly Strategy reviews will:

- Consider new data collected over the proceeding period (e.g. beach profiles, wave climate, sediment movement, erosion losses, etc.);
- Consider the efficacy of coastal hazard response actions implemented under the Strategy over the proceeding period;
- Review the established triggers (decision points);
- Consider any new information from the IPCC and other reputable sources regarding climate change and sea level rise projections;
- Consider any new studies or information regarding coastal erosion, coastal inundation or other hazards (for example the influence of sea level rise on groundwater levels in the Strategy area); and
- Any other relevant information as may be identified.

Taking the above into account, the review will consider whether the actions identified by the Strategy remain appropriate or should be modified.

3.3 NATIONAL LEVEL INPUT

3.3.1 Living at the Edge

Living at the Edge ("the Edge") is a component of the Resilience to Nature's Challenges National Science Challenge. The Edge team includes researchers and technical experts from New Zealand Universities and Crown Research Institutes with experience in coastal hazards, climate change and adaptation. In 2016, the Edge selected Hawke's Bay as a case study opportunity, and throughout 2017 have been acting as a "critical friend" for the Strategy.

The Edge research team's input, critique and advice have assisted TAG to develop the decision-making framework, including valuable advice on the application of decision-making tools for addressing uncertainty and change and costing methodologies, and support and input on surveys and interviews conducted to inform the social impact assessment.

The Edge also undertook a survey of the wider Hawke's Bay community to gauge perceptions of coastal issues, conducted a literature review to aid in discussions of managed retreat, provided information and gave advice on the physical processes and scenarios used, and undertook regular evaluation surveys of the Assessment Panel members' experiences of the process.

We understand that the Edge will be publishing a range of papers on the process and outcomes of their work in parallel to the Strategy.

3.3.2 Coastal Hazards and Climate Change: Guidance for Local Government

Late in December 2017, the Ministry for the Environment ("MfE") released "Coastal hazards and climate change: Guidance for local government" as an update to the 2008 version[6]. The guidance:

- provides information on the effects of climate change on coastal hazards, incorporating the latest science and relevant legislation, information from the Parliamentary Commissioner for the Environment's 2015 report on sea-level rise, and feedback from stakeholders;
- recommends a new 'pathways' approach to adaptive planning that is dynamic and flexible. It is designed to be used when there is uncertainty about future physical conditions affecting the coastal environment;
- contains new sections on collaborative approaches to engaging with communities (which is central to the adaptive planning approach), and local government roles and responsibilities; and
- outlines a 10-step decision-making process that councils and communities can follow when planning for the effects of climate change on coastal hazards (Figure 2).

[6] Ministry for the Environment, 2017. Coastal hazards and climate change: Guidance for local government. Publication Reference ME 1341.

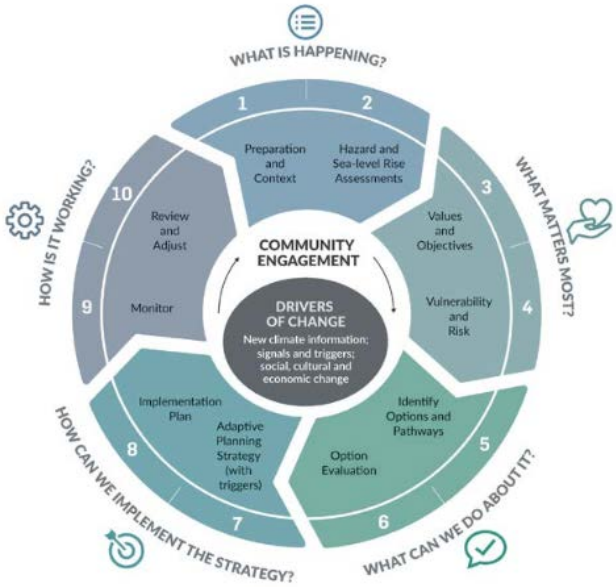


Figure 2. 10 Step Decision Cycle[7]

While the MfE coastal guidance document was released late in the Strategy development process and following the conclusion of the Assessment Panels' work, there is a high degree of alignment between the process adopted by the Strategy and the 10-step process suggested by the MfE guidance (Figure 2). This consistency was enabled through discussions with several of the MfE guidance authors who were also part of the Living at the Edge research team. This ensured that the development of the Strategy's decision-making framework report[8] could reflect key elements of the guidance approach (which was in a draft form through 2017 and not publicly available). Table 1 provides an overview of this alignment.

Table 1. 2017 MfE Coastal Guidance alignment with the Strategy Development Process

MfE Guidance Step	Alignment with the Strategy
a. Preparation and Context	Completed through Stage 1 and 2 of the Strategy with the establishment of the Joint Committee and Technical Advisory Group, the completion of the Hazard and Risk Assessment by Tonkin & Taylor and the development of the Decision-Making Framework. The methodologies employed in the hazard and risk assessment work by Tonkin & Taylor used a smaller number of sea-level rise scenarios than recommend in the Guidance but were otherwise consistent with the approach outlined.
b. Hazard and sea level rise assessments	
c. Values and Objectives	

7 Source: Ministry for the Environment

8 Mitchell Daysh, 2017. Clifton to Tangoio Coastal Hazards Strategy 2120 – Stage Two Report: Decision Making Framework

d. Vulnerability and Risk	Completed by the Northern and Southern Cell Assessment Panels with input from technical advisors through Stage 3 of the Strategy, including the cultural values assessment, surveys undertaken in support of the social impact assessment and the use of high level vulnerability assessments to assist with the determination of priorities and the development of pathways.
e. Identify Options and Pathways	
f. Option Evaluation	
g. Adaptive Planning Strategy (with triggers)	To be completed in Stage 4 of the Strategy, including the development of triggers to monitor.
h. Implementation Plan	
i. Monitor	To be undertaken through the Strategy monitoring and Review process, including through the monitoring of triggers and formal Strategy reviews at least every 10 years (or earlier in response to triggers being reached).
j. Review and Adjust	

PART B

Assessment Panel Recommendations

4. INTRODUCTION

The following sections detail the principal and supplementary recommendations developed by the Assessment Panels. The process the Assessment Panels took to arrive at these recommendations is summarised briefly here, with the detail of the process provided in **Part C** of this report.

5. CONTEXT: THE ASSESSMENT PANEL PROCESS

To provide brief context in relation to the following recommendations (refer to Part C of this report for full detail), the Assessment Panels developed their recommendations through an 11 workshop programme (Figure 3).

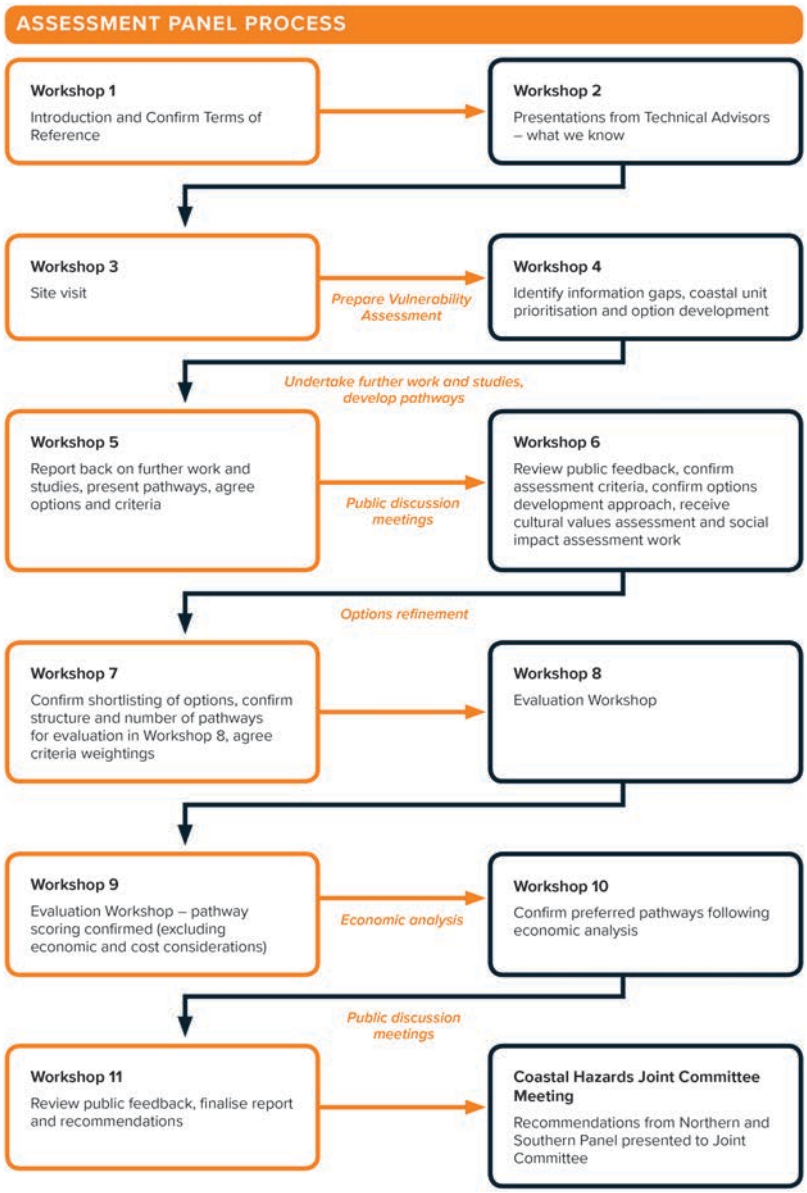


Figure 3. Assessment Panel Workshop Programme

The decision-making framework[9] that was developed in Stage 2, and utilised by the Assessment Panels through the 11 workshop programme, was designed to respond to complex technical information, long timeframes, high levels of uncertainty, and multiple (and sometimes competing) values and interests.

A key part of the process was the use of the Multi-Criteria Decision Analysis ("MCDA") process to assess and rank (in order of preference) a range of possible pathways for identified priority units along the coast.

The pathways to be assessed for each priority unit were confirmed following an extensive options development process and used the principles of Dynamic Adaptive Planning Pathways ("DAPP"). In this Strategy, pathways are a combination of a short term (0 – 20 years), medium term (20 – 50 years) and long term (50 – 100 years) hazard response actions. An example pathway is provided below:

Short term (0 – 20 years)	→	**Medium term (20 – 50 years)**	→	**Long term (50 – 100 years)**
Renourishment + Groynes	→	Renourishment + Groynes	→	Managed Retreat

An important principle of the pathways is their adaptiveness; the timeframe for shifting between actions, and the specifics of future actions, can be adjusted in response to changing hazards risks and pre-defined triggers (decision points).

Using MCDA, the Assessment Panels ranked up to 6 pathways for each priority coastal unit, in terms of their technical efficacy and any adverse impacts they may create, from most preferred to least preferred.

Economic analysis was then applied to the pathways, principally in the form of Real Options Analysis ("ROA"), which is an expanded version of cost-benefit analysis.

Taking into account the MCDA ranking, the ranking using economic analysis, and feedback from the broader community, the Assessment Panels then formed their final recommendations.

Part C of this report provides a full description of the process and decision-making tools employed by the Assessment Panels in arriving at the following recommendations.

6. CONTEXT: TECHNICAL BASIS FOR RECOMMENDATIONS

The Assessment Panels' recommendations are based on the following:

- Pathways were developed in response to the Coastal Hazards and Risk Assessments produced by Tonkin & Taylor as Stage 1 of the Strategy.

[9] Mitchell Daysh, 2017. Clifton to Tangoio Coastal Hazards Strategy 2120 – Stage Two Report: Decision Making Framework.

- For coastal erosion, the Coastal Hazards Assessment modelled a range of potential sea level rise scenarios to develop probabilistic erosion lines (i.e. erosion lines mapped with probabilities of occurrence at different time periods). Sea level rise scenarios of between 0.6 and 1.5 metres (with a mode of 1.0 metre) were used over the 100-year planning horizon.
- For coastal inundation, a building block approach was used where the inundation hazard extents were mapped based on a 1%AEP (or 1 in 100 year) storm surge event + wave set-up at the coast + 0.5 metre (at 2065) or 1.0 metre (at 2120) of sea level rise. It is acknowledged that these values may be reached sooner or later than the prescribed years, however it provides a good indication of vulnerability based on the latest predictions.
- The options forming the pathways have been developed to a conceptual-level for comparison purposes. Detailed design will be initiated for the selected pathways as part of Stage 4 of the Strategy. Matters such as any staging of implementation, any sub-options within units, the actual location and extent of structures and other details will be confirmed at that time.
- Where managed retreat is identified in a preferred pathway, it is acknowledged that significant additional work and extensive planning is required to determine the specifics of how this would occur.

7. CONTEXT: COASTAL UNITS FOR ASSESSMENT

The recommendations of the Assessment Panels are given based on coastal 'units' defined by Tonkin & Taylor as part of the Risk Assessment work in Stage 1 (Figure 4). The units are based on a combination of ward boundaries, land area units and topography. The units are identified from north to south along the coast (A to L), with four additional units (M to P) extending landward to incorporate land areas that may be affected by coastal inundation and tsunami.

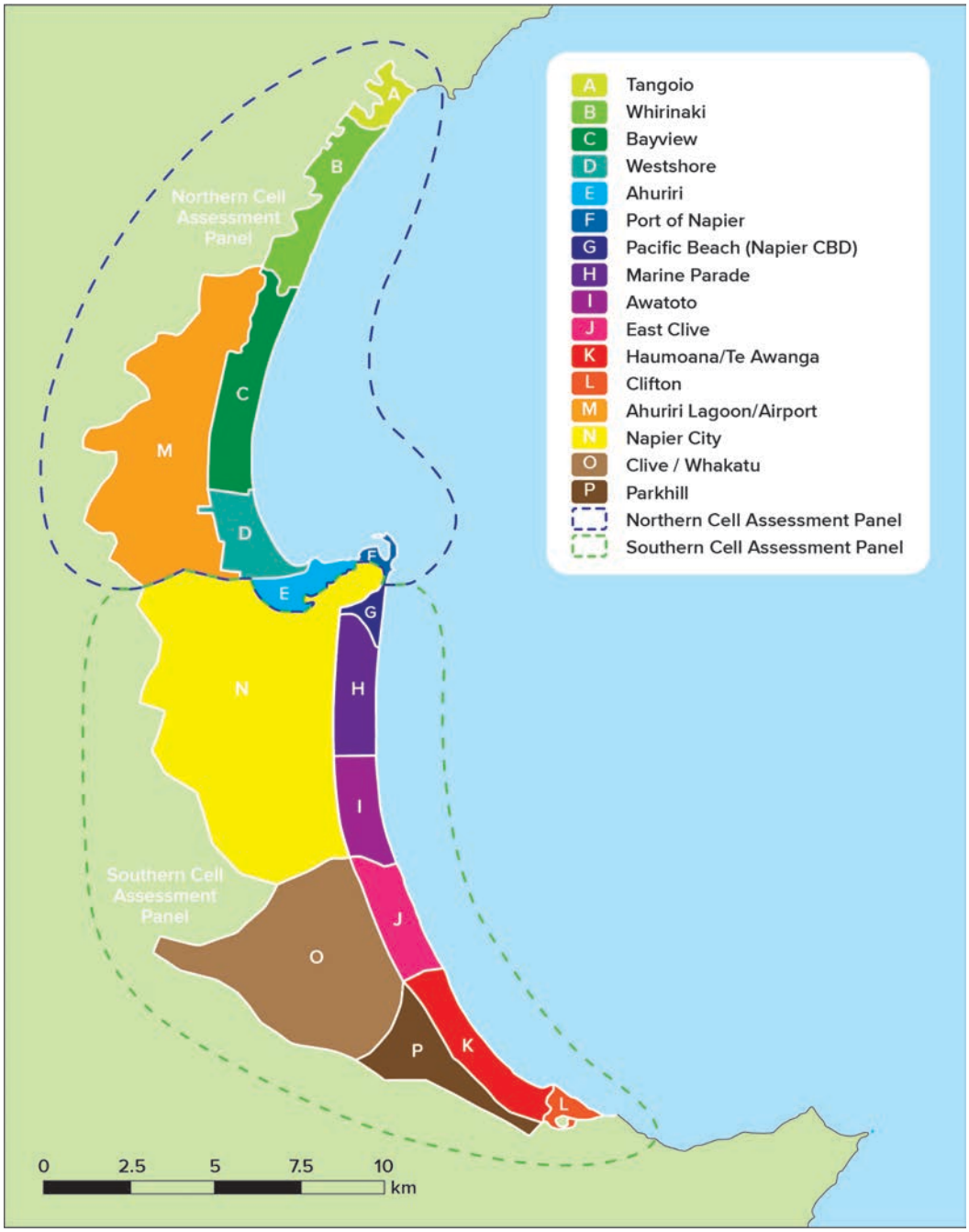


Figure 4. Assessment Panel areas and Coastal Units.

8. RECOMMENDATIONS OF THE NORTHERN CELL ASSESSMENT PANEL

8.1 RECOMMENDATION ONE: COASTAL UNIT PRIORITISATION

A. Prioritise the following coastal units for assessment and pathway development:

- Ahuriri (Unit E1)
- Pandora (Unit E2)
- Westshore (Unit D)
- Bay View (Unit C)
- Whirinaki (Unit B)

B. Based on current information, the following coastal units may not require adaptation responses for inundation or erosion over the next 100 years. This interim position is to be reviewed at the next Strategy review point, or earlier if a trigger point is reached:

- Ahuriri Lagoon / Airport (Unit M)
- Tangoio (Unit A)

8.2 RECOMMENDATION TWO: PATHWAY FOR AHURIRI (UNIT E1)

UNIT E1: AHURIRI – PATHWAY 6				
Short term (0 – 20 years)	→	Medium term (20 – 50 years)	→	Long term (50 – 100 years)
Status quo	→	**Sea wall**	→	**Sea wall**

8.2.1 Pathway Concept Plan

8.2.2 Pathway Notes

- Status Quo means to maintain current coastal management approaches.
- Seawall likely to be rock revetment with impermeable core. For this unit, consideration may also be given to a concrete wall, due to the number of assets and relatively short length.

8.2.3 Rationale supporting the recommendation

- 2nd highest scoring pathway under Multi-Criteria Decision Analysis ("MCDA") undertaken by the Panel.
- Preferred pathway under economic analysis undertaken by an independent economist.
- Considered to be the preferred pathway overall, taking into account the MCDA scores and economic analysis.
- Retains flexibility and ability to adapt when triggers are reached.
- The vote in favour of Pathway 6: 10 members in favour (full support).

8.3 RECOMMENDATION THREE: PATHWAY FOR PANDORA (UNIT E2)

UNIT E2: PANDORA – PATHWAY 3				
Short term (0 – 20 years)	→	Medium term (20 – 50 years)	→	Long term (50 – 100 years)
Inundation Protection	→	**Inundation Protection**	→	**Inundation Protection**

8.3.1 Pathway Concept Plan

8.3.2 Pathway Notes

- Inundation protection means to install stop banks to provide greater protection from storm surge inundation.

8.3.3 Rationale supporting the recommendation

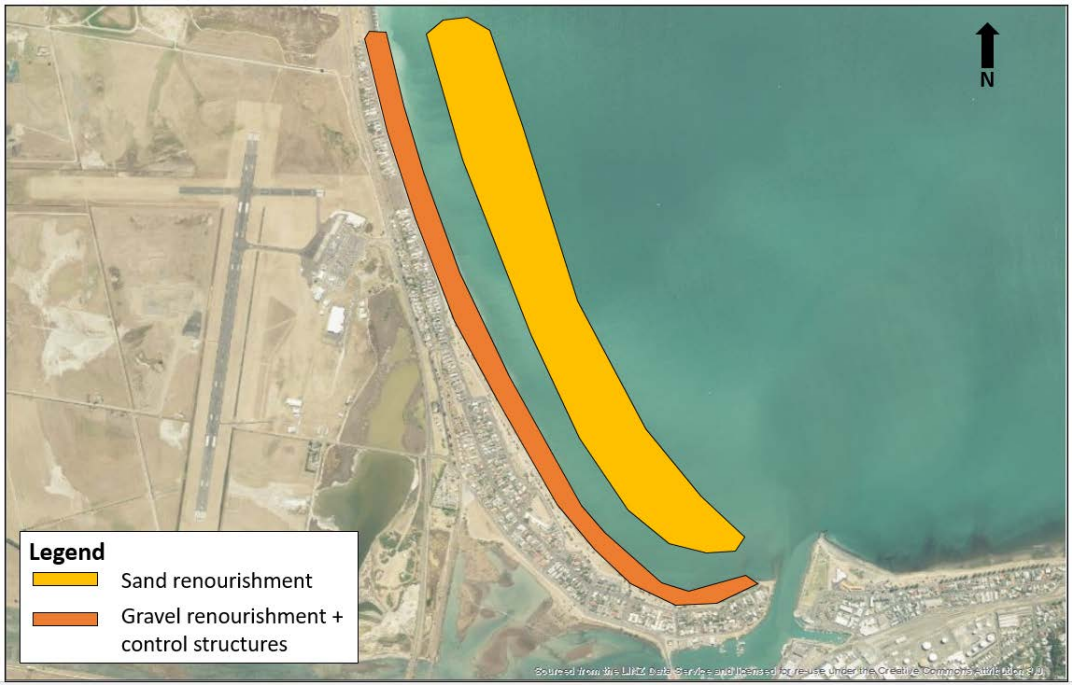
- 3rd highest scoring pathway under Multi-Criteria Decision Analysis ("MCDA") undertaken by the Panel.
- Preferred pathway under economic analysis undertaken by an independent economist.
- Considered to be the preferred pathway overall, taking into account the MCDA scores and economic analysis.
- Retains flexibility and ability to adapt when triggers are reached.
- Economist identified another possible pathway worth considering strictly on economic grounds (Pathway 11); Panel considered this in detail and determined that it was not sufficiently different to warrant further investigation.
- One Panel member did not vote in favour of Pathway 3, and preferred Pathway 11 on economic grounds.
- The vote in favour of Pathway 3: 8 members in favour, 1 member against[10].

8.4 RECOMMENDATION FOUR: PATHWAY FOR WESTSHORE (UNIT D)

UNIT D: WESTSHORE – PATHWAY 3				
Short term (0 – 20 years)	→	Medium term (20 – 50 years)	→	Long term (50 – 100 years)
Renourishment	→	**Renourishment + Control Structures**	→	**Renourishment + Control Structures**

[10] 10 members were present for voting for Ahuriri, 9 members were present for voting for Pandora, Westshore, Bay View and Whirinaki.

8.4.1 Pathway Concept Plan



8.4.2 Pathway Notes

- Combination of gravel renourishment and offshore sand bar in the short term (Gravel – Land based replenishment at key areas. Sand – Material placed offshore, using marine plant, and allowed to naturally migrate northwards and towards the beach raising foreshore levels).
- Note supplementary recommendations regarding cultural concerns with renourishment.
- Control structures may be groynes or offshore breakwater and will be required in the medium term. Gravel nourishment (no sand) will occur at this time.
- Consideration given to retreating defence line to raised gravel bank behind gravel barrier.
- A seawall may be required to protect exposed assets at the Eastern end.
- Structures raised and lengthened over long term, with additional beach renourishment, in order to offset effects of sea level rise.

8.4.3 Rationale supporting the recommendation

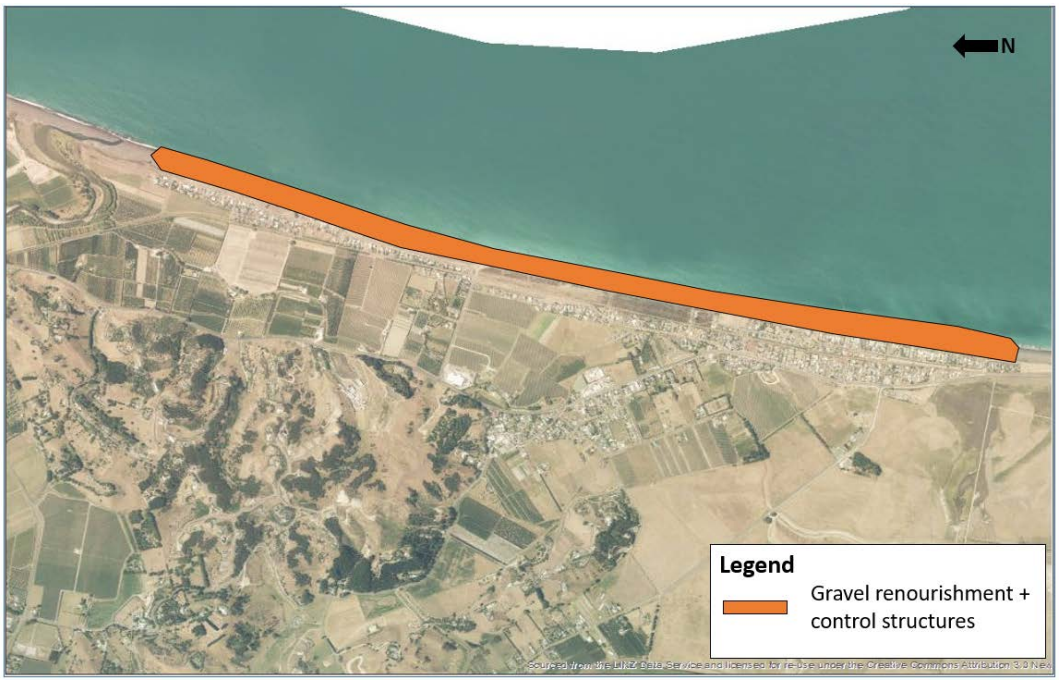
- 4th equal score under Multi-Criteria Decision Analysis ("MCDA") undertaken by the Panel.
- Preferred pathway under economic analysis undertaken by an independent economist.
- Considered to be the preferred pathway overall, taking into account the MCDA score and economic analysis.

- Retains flexibility and ability to adapt when triggers are reached.
- Economist identified another possible pathway worth considering strictly on economic grounds (Pathway 9); the Panel considered this, but preferred Pathway 3, particularly considering knock-on effects on Bay View and Whirinaki.
- The vote in favour of Pathway 3: 9 members in favour (full support).

8.5 RECOMMENDATION FIVE: PATHWAY FOR BAY VIEW (UNIT C)

UNIT C: BAY VIEW – PATHWAY 3				
Short term (0 – 20 years)	→	Medium term (20 – 50 years)	→	Long term (50 – 100 years)
Status Quo / Renourishment	→	**Renourishment + Control Structures**	→	**Renourishment + Control Structures**

8.5.1 Pathway Concept Plan



8.5.2 Pathway Notes

- Gravel renourishment in the short term.
- Control structures may be groynes or offshore breakwater, introduced in a staged manner in the medium term. Gravel renourishment continues.
- Continued renourishment further south at Westshore would reduce the requirement and frequency of beach replenishment in this unit.
- Control structures raised and lengthened over long term, with additional beach renourishment, in order to offset effects of sea level rise.

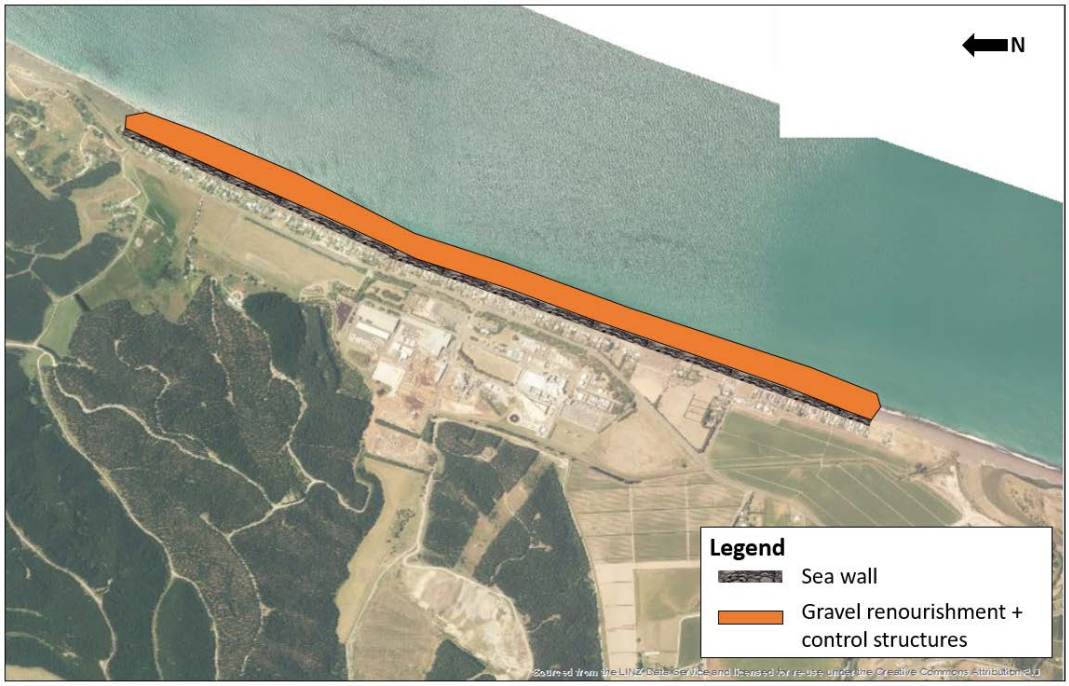
8.5.3 Rationale supporting the recommendation

- 5th highest score under Multi-Criteria Decision Analysis ("MCDA") undertaken by the Panel.
- Ranked 2nd under economic analysis undertaken by an independent economist.
- Considered to be the preferred pathway overall, taking into account the MCDA score and economic analysis, and the preferred pathway at Westshore which will provide some benefit for Bay View.
- Retains flexibility and ability to adapt when triggers are reached.
- The vote in favour of Pathway 3: 9 members in favour (full support).

8.6 RECOMMENDATION SIX: PATHWAY FOR WHIRINAKI (UNIT B)

UNIT B: WHIRINAKI – PATHWAY 4				
Short term (0 – 20 years)	→	Medium term (20 – 50 years)	→	Long term (50 – 100 years)
Status Quo / Renourishment	→	**Renourishment + Control Structures**	→	**Sea wall**

8.6.1 Pathway Concept Plan



8.6.2 Pathway Notes

- Gravel renourishment in the short term.
- Control structures may be groynes or offshore breakwater, introduced in a staged manner in the medium term. Gravel renourishment continues.

- Introduction of large seawall (rock revetment) in the long term, which removes the requirement to renourish the beach.
- State Highway 2 would need to be setback at Whirinaki Bluff, or defended with a seawall.

8.6.3 Rationale supporting the recommendation

- Highest score under Multi-Criteria Decision Analysis ("MCDA") undertaken by the Panel.
- Ranked 3rd under economic analysis undertaken by an independent economist.
- Considered to be the preferred pathway overall, taking into account the MCDA score and economic analysis.
- In support of this conclusion, the Panel noted the presence of urupā, State Highway and marae near coast which require protection as well as beneficial effects from preferred pathways at Westshore and Bay View.
- Retains flexibility and ability to adapt when triggers are reached.
- The vote in favour of Pathway 4: 9 members in favour (full support).

8.7 NORTHERN PANEL SUPPLEMENTARY RECOMMENDATIONS

8.7.1 General

A. The Panel would like there to be more commonality between HDC and NCC in the interpretation of the building code and the provisions of the district plans.

B. The Panel would see value in remaining as a reference group while the Implementation Plan is developed, including considering the trigger points between steps within the pathways.

8.7.2 Westshore (Unit D)

A. Biggest risk culturally from the preferred pathway (Pathway 3) is impacts on Te Pania and other reefs from sediment / turbidity caused by renourishment. Expect that controls are in place to ensure that only appropriate material is used i.e. fine to course sand, not silt. Expect that consent conditions are imposed requiring appropriate monitoring of any effects of renourishment on Pania / Rangatira Reefs and reefs to the north and that appropriate actions would be required in the event that an adverse effect is identified. Assume renourishment at medium and long term is with gravel, not sand.

B. The Panel supports the ongoing monitoring of turbidity around Pania reef currently being undertaken by the Port of Napier.

C. The area between Westshore and Bay View is vulnerable to erosion and effects on lifeline assets e.g. State Highway, railway, gas pipeline, fibre optic and other utilities.

D. From a recreational perspective, there is a considerable desire to restore and maintain amenity value by rebuilding the beach and nearshore area with sand which has been eroded over the past 20-30 years.

E. There may be an opportunity to make use of the sand available through the port maintenance dredging and the proposed new port berth project to satisfy some or all of the required sand needed to replenish Westshore. Alternative sources of suitable sand may be required to be sourced to provide sand of suitable size or volume.

8.7.3 Bay View (Unit C)

A. Biggest risk culturally from the preferred pathway (Pathway 3) is impacts on reefs from sediment / turbidity caused by renourishment. Expect that controls are in place to ensure that only appropriate material is used. Expect that consent conditions are imposed requiring appropriate monitoring of any effects of renourishment on reefs and that appropriate actions would be required in the event that an adverse effect is identified.

8.7.4 Whirinaki (Unit B)

A. Biggest risk culturally from the preferred pathway (Pathway 4) is impacts on reefs from sediment / turbidity caused by renourishment. Expect that controls are in place to ensure that only appropriate material is used. Expect that consent conditions are imposed requiring appropriate monitoring of any effects of renourishment on reefs and that appropriate actions would be required in the event that an adverse effect is identified.

9. RECOMMENDATIONS OF SOUTHERN CELL ASSESSMENT PANEL

9.1 RECOMMENDATION ONE: COASTAL UNIT PRIORITISATION

A. Prioritise the following coastal units for assessment and pathway development:

- Clifton (Unit L)
- Te Awanga (Unit K2)
- Haumoana (Unit K1)
- East Clive (Unit J)

B. Confirm the following coastal units for assessment and possible pathway development at the next Strategy review point, or earlier if a trigger point is reached:

- Awatoto (Unit I)
- Clive / Whakatu (Unit O)

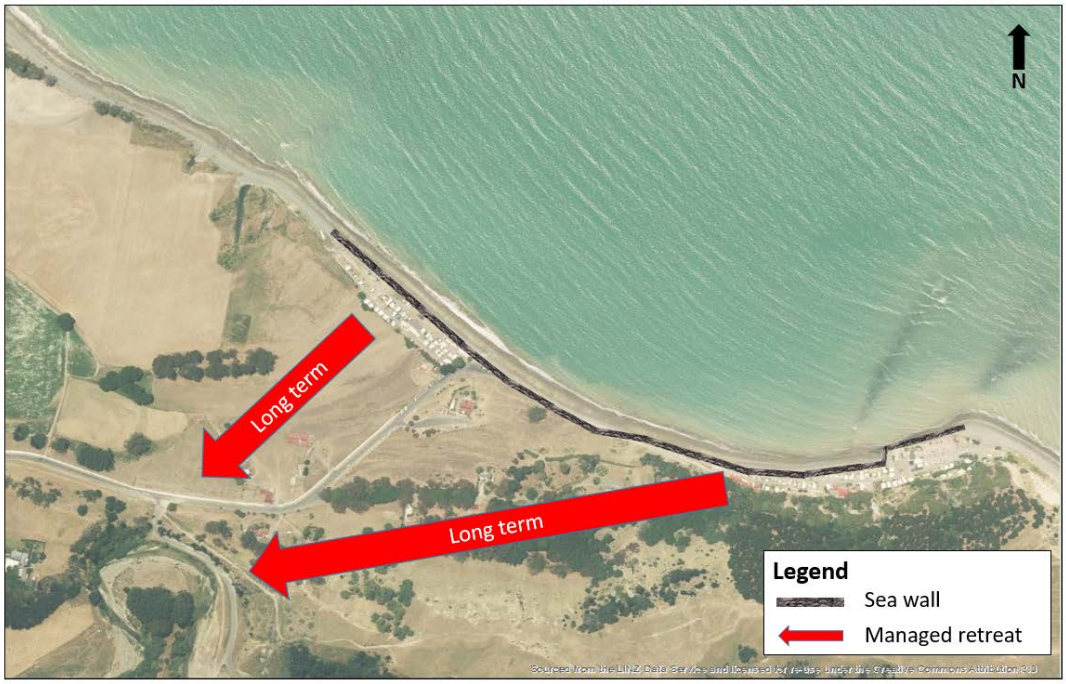
C. Based on current information, the following coastal units may not require adaptation responses for inundation or erosion over the next 100 years. This interim position will be reviewed at the next Strategy review point, or earlier if a trigger point is reached:

- Pacific Beach – Napier CBD (Unit G)
- Napier City (Unit N)
- Marine Parade (Unit H)
- Parkhill (Unit P)

9.2 RECOMMENDATION TWO: PATHWAY FOR CLIFTON (UNIT L)

UNIT L: CLIFTON – PATHWAY 5				
Short term (0 – 20 years)	→	Medium term (20 – 50 years)	→	Long term (50 – 100 years)
Sea wall	→	**Sea wall**	→	**Managed Retreat**

9.2.1 Pathway Concept Plan



9.2.2 Pathway Notes

- Sea wall is a rock revetment. Stopbanks may also be required to prevent outflanking.
- The length of the wall is subject to detailed design and economic analysis, consequently it may only cover part of the unit. The rest of the unit would be subject to natural processes.

9.2.3 Rationale supporting the recommendation

- Highest scoring pathway under Multi-Criteria Decision Analysis ("MCDA") undertaken by the Panel.
- Preferred pathway under economic analysis undertaken by an independent economist.
- Retains flexibility and ability to adapt when triggers are reached.
- The vote in favour of Pathway 5: 10 members in favour (full support).

9.3 RECOMMENDATION THREE: PATHWAY FOR TE AWANGA (UNIT K2)

UNIT K2: TE AWANGA – PATHWAY 3				
Short term (0 – 20 years)	→	Medium term (20 – 50 years)	→	Long term (50 – 100 years)
Renourishment + Groynes	→	**Renourishment + Groynes**	→	**Renourishment + Groynes**

9.3.1 Pathway Concept Plan

9.3.2 Pathway Notes

- Dune planting and beach maintenance employed as part of the strategy.
- In order to keep pace with sea level rise and climate change, groynes will need to be increased in height. This will also require increasing the size of the beach through renourishment to provide an equivalent standard of protection.
- Clifton Road north of Te Awanga may be defended with the same approach or relocated inland.

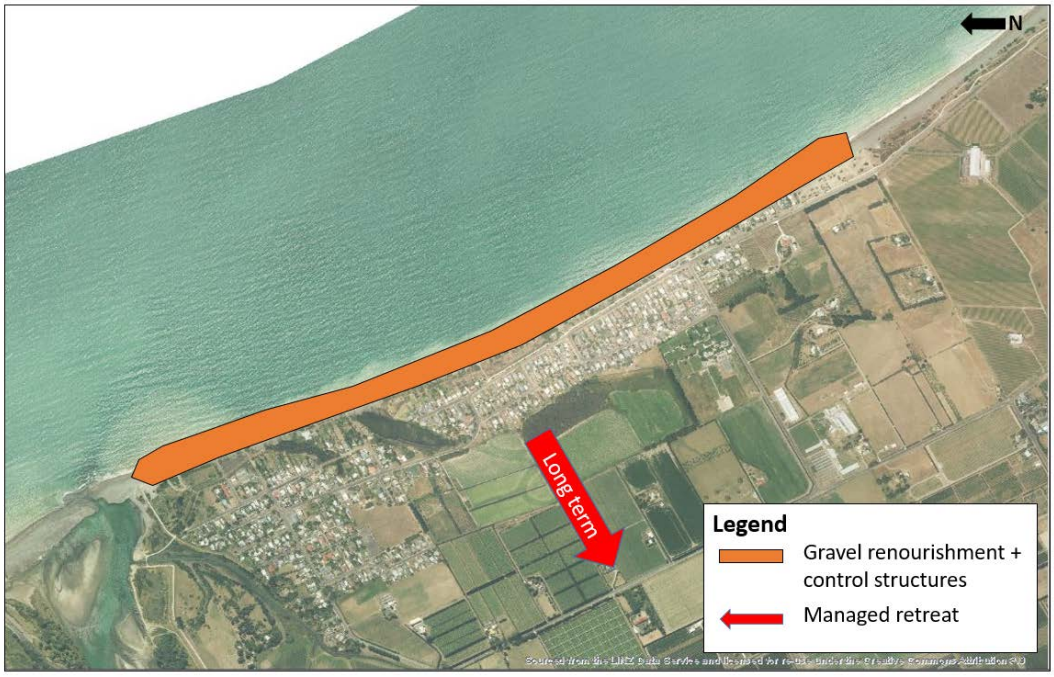
9.3.3 Rationale supporting the recommendation

- Highest scoring pathway under Multi-Criteria Decision Analysis ("MCDA") undertaken by the Panel.
- Preferred pathway under economic analysis undertaken by an independent economist.
- Retains flexibility and ability to adapt when triggers are reached.
- The vote in favour of Pathway 3: 10 members in favour (full support).

9.4 RECOMMENDATION FOUR: PATHWAY FOR HAUMOANA (UNIT K1)

UNIT K1: HAUMOANA– PATHWAY 2				
Short term (0 – 20 years)	→	Medium term (20 – 50 years)	→	Long term (50 – 100 years)
Renourishment + Groynes	→	**Renourishment + Groynes**	→	**Managed Retreat**

9.4.1 Pathway Concept Plan



9.4.2 Pathway Notes

- Additional beach renourishment may be required in the medium term to compensate for abrasion losses. Raising of stopbanks may also be necessary to address inundations risks, including the option of installing a flood gate.
- In the long term, a planned managed retreat of all properties at unacceptable risk.

9.4.3 Rationale supporting the recommendation

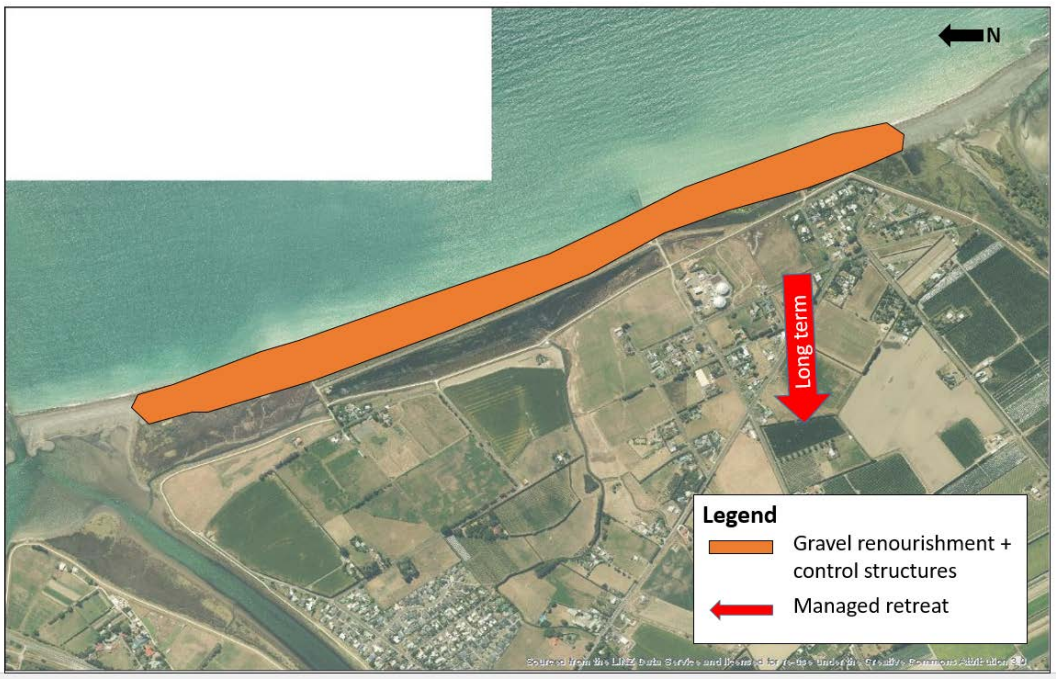
- Highest scoring pathway under Multi-Criteria Decision Analysis ("MCDA") undertaken by the Panel.
- Scored favourably under economic analysis undertaken by an independent economist.
- Some options scored higher under economic analysis (e.g. Pathway 3) but Pathway 2 scored significantly better under MCDA and so remains the Panel's preferred option. It is noted that Pathway 2 and 3 are the same in the short and medium term, and only diverge in their long term action.

- Retains flexibility and ability to adapt when triggers are reached.
- The vote in favour of Pathway 2: 10 members in favour (full support).

9.5 RECOMMENDATION FIVE: PATHWAY FOR CLIVE (UNIT J)

UNIT J: CLIVE/EAST CLIVE – PATHWAY 1				
Short term (0 – 20 years)	→	Medium term (20 – 50 years)	→	Long term (50 – 100 years)
Status Quo	→	**Renourishment + Groynes**	→	**Retreat the Line / Managed Retreat**

9.5.1 Pathway Concept Plan



9.5.2 Pathway Notes

- With ongoing maintenance of existing groynes in the short term immediate hazard risks are mitigated, planting utilised to reduce erosion rates.
- Gravel nourishment with groynes required to protect the whole unit in the medium term.
- For this unit adaption of existing groynes and potentially increasing the number most practical option.
- Long-term retreating the line and construction of new stopbanks. This may necessitate a planned managed retreat of some infrastructure.

9.5.3 Rationale supporting the recommendation

- Highest scoring pathway under Multi-Criteria Decision Analysis ("MCDA") undertaken by the Panel.
- Ranked 3rd under economic analysis undertaken by an independent economist.
- The Panel debated whether to select Pathway 2 instead, because of its high MCDA score and that it was the preferred pathway under economic analysis, however opted to retain Pathway 1, noting the only difference was in the long-term action.
- Retains flexibility and ability to adapt when triggers are reached.
- The vote in favour of Pathway 1: 10 members in favour (full support).

9.6 SOUTHERN PANEL SUPPLEMENTARY RECOMMENDATIONS

9.6.1 All Units

A. We need to be mindful of care of the environment and doing our best to leave a legacy of good guardianship. We should be concerned about not only human welfare but the welfare of all living things, respecting interconnectedness/cause and effect principles and that if we don't do this it will be to the detriment of all.

B. The pathways as recommended will result in hard engineering along virtually the whole of the southern cell. There is concern about the effects of this approach on the natural character of the beautiful coastline.

C. Managed retreat has been in the 'too hard box'; we have not paid enough attention to it, it's costing and possible funding models.

D. Once signed and adopted, Councils should incorporate the Strategy into Regional and District Plans. Until such time as the planning framework has been changed to facilitate Strategy outcomes, if a consent application is consistent with the Strategy, and urgency is identified within the Strategy, there should be an ability for Councils to give weight to the Strategy, and in doing so, hasten the consenting process.

9.6.2 Clifton (Unit L)

A. Consider groyne-head at end of sea wall to build up beach and low tide access if this is adopted for Clifton.

B. There is a high degree of urgency for Clifton to respond to current erosion losses – urgent action is required.

9.6.3 Te Awanga (Unit K2)

A. The Councils should look at the existing vertical railway irons - we feel this is a genuine short-term solution for this community whilst this Strategy is being developed and implemented. A functional, and preferably aesthetically improved option of this nature could be implemented and used as an experimental short-term measure, together with crest maintenance, and monitored for effectiveness.

B. If any existing railway irons are removed (e.g. for health and safety reasons) then a suitable, alternative needs to be put in its place.

C. Look at options to enhance the existing vertical railway irons with art / public works of art that acknowledge and reflect the cultural heritage of this coast.

D. Special consideration needs to be given to consulting with surfers / people with knowledge of the surf break where there are any artificial interventions that may affect the surf break.

9.6.4 Haumoana (Unit K1)

A. Area down by the Domain / Grange Road is at risk now from inundation /flooding through failure to maintain the crest – this needs urgent attention.

B. Vehicle access to / through and behind the beach crest needs to be managed. Acknowledging that there are strong community values associated with this access, viable access to the beach needs to be maintained but the beach crest needs to be off limits; it needs to made clear what you can and can't do and why. The beach crest must be built up.

C. Vehicles turning around at the groyne end of the beach are causing significant erosion / losses. This also needs to be addressed.

D. Groyne saddle needs to be filled so that the beach can build back up.

E. Support the Reserve Management Plan prepared by Hastings District Council which includes works to maintain / enhance the beach crest and manage vehicle access.

F. Noting an impending threat at Clifton, efforts have been made to bring in a revetment to respond and this is commended. However, an imminent threat also exists at Cape View Corner. Urge that rocks are placed here and beach crest maintenance carried out to give a temporary respite while long term solution is developed. There is a duty of care to protect power, water and road at Cape View Corner which supplies the entire Cape Coast area.

9.6.5 Haumoana (Unit K1) – "H21" Properties

The Panel wishes to acknowledge the unique circumstances that apply to the properties from 1 to 41 (odd numbers only) Clifton Road, Haumoana ("the H21"), and the importance of Cape View Corner, which maintains access to Te Awanga and includes important infrastructure, including the Clifton Road Reserve and properties to the south.

The Panel further recognises that the long-term pathways recommended for Unit K (Haumoana and Te Awanga) have been designed at a high level for the broader Unit K, and not specifically for the H21 properties. As such, once implemented the Unit K pathways will provide some benefit for the H21 but this may not happen quick enough, and it will not translate to a high standard of protection.

Having met with the owners of the H21 at a dedicated workshop on 30 January 2018, and considered these special circumstances, the Panel has identified further actions under the Strategy to complement the recommended pathway for the broader Unit K. These are:

A. As a matter of urgency, small groyne(s) + renourishment, and where necessary rock revetments, at Cape View Corner are constructed that precede but complement the Unit K pathways.

B. Landowners need to be provided with an ability (through changes to Resource Management Act planning documents) to install their own individual protections / improvements on private land where consistent with the Strategy and complementary to the Unit K pathways, so that the regulatory bar is not set too high for appropriate private action;

C. That a working group of Panel Members, supported by TAG and technical advisors, is appointed to:

   i. Consider modelling outputs of various design options for Cape View Corner and costing information to confirm final design;

   ii. Ensure the design does not cause downstream effects on the northern side of the groynes (for example, the houses on Beach Road);

   iii. Ensure that access to and along the beach is not compromised; and

   iv. Ensure that the design is sustainable and does not create further issues that would then need to be addressed with further interventions.

9.6.6 Clive / East Clive (Unit J)

A. Beach scraping, crest management and planting is required as short-term measure as an enhancement to the status quo.

9.6.7 Awatoto (Unit I)

A. Awatoto (Unit I) has not been considered in this iteration of the Strategy (note Recommendation One in Section 9.1) but the section of Awatoto that extends from the Waitangi Reserve to the northern end of Waitangi Road is at equal risk of inundation as Units J through L. With the implementation of protection measures for Units J through L, what is yet unknown is any unforeseen impacts these measures may have on Awatoto, including impacts on the Waitangi Reserve. The unknown impacts (positive/negative) of the cessation of the gravel extraction at the Winstone, Awatoto site are also noted, including the previous continuous build-up of the sea wall by Winstone heavy machinery. If negative impacts do occur, and the risks for Awatoto increase, the Strategy may need to be reviewed earlier than the suggested 10-year period.

PART C

Assessment Panel Process

10. INTRODUCTION

The following sections detail the formation of the Assessments Panels and the process they undertook to develop their recommendations (as presented in **Part B** of this report).

10.1 THE DECISION-MAKING FRAMEWORK (STAGE 2 REPORT)

As outlined in Part A of this report, the Strategy has been developed as a 4-stage process to identify responses to coastal hazards risks between Clifton and Tangoio over the next 100 years.

As part of the Strategy development, the Joint Committee and TAG were cognisant of the long history of coastal hazards impacts along this stretch of coastline; it is a challenging, emotive, complex and very present issue that, in some cases, requires a broadly agreed and technically sound response as a matter of urgency. It was clear that community involvement would be vital to the success of the Strategy.

With these issues in mind, careful consideration was given to the process by which coastal hazard responses could be developed and applied. As a result, Stage 2 of the Strategy was dedicated to designing a decision-making framework that could consider the technical information developed through the hazard and risks assessment work in Stage 1, and, working directly with the community, come up with well-considered and broadly supported long term plans for responding to those risks.

Working with TAG, a proposed decision-making framework was developed by Mitchell Daysh, and presented in a report to the Joint Committee in 2016. It was subsequently further developed in collaboration with members from Living at the Edge and Tonkin & Taylor to refine the approach and achieve consistency with the to-be-released national guidance that was being developed by MfE at the time (refer to Section 3.3.2 in Part A of this report).

The report[11], adopted by the Joint Committee in 2017 and used as the basis for Stage 3 of the Strategy, recommended a process of community-led decision making. In summary:

1. Two Assessment Panels are formed to represent the interests of communities and agencies exposed to coastal hazards risks;
2. The Assessment Panels work through a structured decision-making assessment process to develop and evaluate potential options / pathways for responding to identified risks over time in priority coastal units;
3. Preferred options / pathways are confirmed through the application of Multi Criteria Decision Analysis, Dynamic Adaptive Planning Pathways, Real Options Analysis and Benefit Cost Analysis methodologies;
4. Preferred options / pathways are recommended back to each Council for final decision making.

[11] Mitchell Daysh, 2017. Clifton to Tangoio Coastal Hazards Strategy 2120 – Stage Two Report: Decision Making Framework

The following sections detail the actual process undertaken throughout Stage 3, from the formation of the Assessment Panels through to the confirmation of their final recommendations.

11. ASSESSMENT PANEL PROCESS DESIGN

11.1 PANEL STRUCTURE

As part of the Risk Assessment work undertaken in Stage 1, Tonkin & Taylor has defined 16 'units' within the Strategy focus area between Clifton and Tangoio. The units were based on a combination of ward boundaries, land area units and topography. The units are identified from north to south along the coast (A to L), with four additional units (M to P) extending landward to incorporate land areas that may be affected by coastal inundation and tsunami.

Each unit received a coastal hazard risk assessment result, and responses for each unit would need to be considered individually, but with cognisance of any interrelationships between units (i.e. where an action in one unit may affect outcomes in another).

Forming Assessment Panels to consider each of the 16 units presented a range of options, from one panel being convened to consider all 16 units, to 16 panels considering one unit each, and all the various permeations in between.

The recommendation from Mitchell Daysh and TAG that was adopted by the Joint Committee was a North / South option, where two panels are formed to cover the area from the Port of Napier north to Tangoio, and the Port of Napier south to Clifton. The reasons for adopting this structure were that it:

- Grouped units with interrelated coastal processes;
- Ensured that each Partner Council was jurisdictionally involved in both Panel areas; and
- Struck a good balance between administrative and process cost efficiency and community representation; too many panels would be difficult to operate, but with fewer panels the number of panel members required for representation purposes increases.

The 16 units identified by Tonkin & Taylor and the areas of responsibility for each Assessment Panel are presented in Figure 5.

Note that the extent of Unit F (Port of Napier) is constrained to land owned by the Port. As an independently owned asset, the owners would need to make their own decisions about responding to sea level rise and changing coastal hazards risks; on this basis, Unit F was not included as a unit for the Assessment Panel to develop recommended actions for.

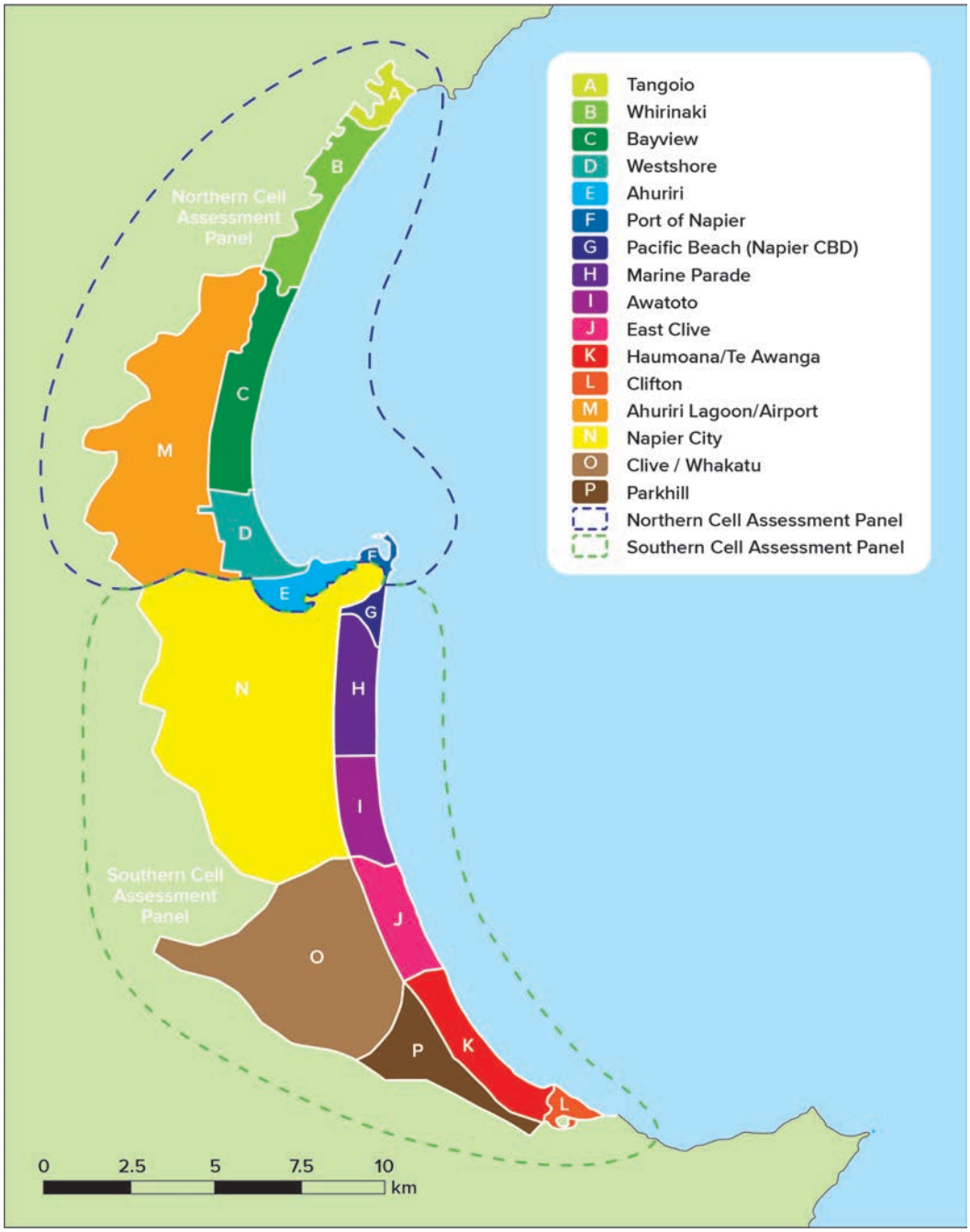


Figure 5. Assessment Cell Evaluation Panel areas and Coastal Units.

With a two-panel design, panel seats where pre-defined to provide a good cross section of interested and affected parties. A series of public meetings were held to call for volunteers for each of the available community positions; organisation/ agency members were nominated by their respective agency. Following this process, the final Assessment Panel structure was confirmed as outlined in Table 2 and Table 3 for the Northern and Southern Panels respectively.

Table 2. Northern Cell Assessment Panel

Full Voting Members	Observer Participants	Support Roles
Tangata Whenua (3)	HBRC Councillor (1)	Independent Chair (1)
Whirinaki Community (3)	NCC Councillor (1)	Kaitiaki o te Roopu (1)
Bay View Community (2)	HDC Councillor (1)	Facilitator (1)
Westshore Community (2)	Maungaharuru-Tangitū Trust (1)	Assistant Facilitator (1)
Ahuriri / Pandora Community (2)	Mana Ahuriri Incorporated (1)	Technical Advisory Group (4)
Recreational Interests (1)		Panel Secretary (1)
Port of Napier (1)		Living at the Edge (2)
Ahuriri / Pandora Businesses (1)		
NZTA / Lifelines (1)		
Department of Conservation (1)		
Regional Representative (1)		
Total Voting (18)		**Total Non-Voting (16)**

Table 3. Southern Cell Assessment Panel

Full Voting Members	Observer Participants	Support Roles
Tangata Whenua (3)	HBRC Councillor (1)	Independent Chair (1)
Clifton/Te Awanga Community (3)	NCC Councillor (1)	Kaitiaki o te Roopu (1)
Haumoana Community (3)	HDC Councillor (1)	Facilitator (1)
Clive / East Clive Community (4)	Mana Ahuriri Incorporated (1)	Assistant Facilitator (1)
Marine Parade Community (1)	He Toa Takitini (1)	Technical Advisory Group (3)
Recreational Interests (1)	Port of Napier (1)	Panel Secretary (1)
Awatoto Businesses (1)		Living at the Edge (2)
Napier CBD Businesses (1)		
NZTA / Lifelines (1)		
Department of Conservation (1)		
Regional Representative (1)		
Total Voting (20)		**Total Non-Voting (16)**

11.2 TERMS OF REFERENCE

A draft Terms of Reference was developed to describe the purpose and scope of the Assessment Panels and to establish a number of operational protocols. The Terms of Reference was formally adopted by both of the Assessment Panels at their first workshop.

A link to access the adopted Terms of Reference is provided in **Part D Appendices**[12].

11.3 PANEL PROCESS

The Assessment Panels worked through a structured decision-making assessment process which was completed through a series of 11 workshops during 2017 (Figure 6 and Figure 7).

[12] Note – the same Terms of Reference was adopted by both Assessment Panels

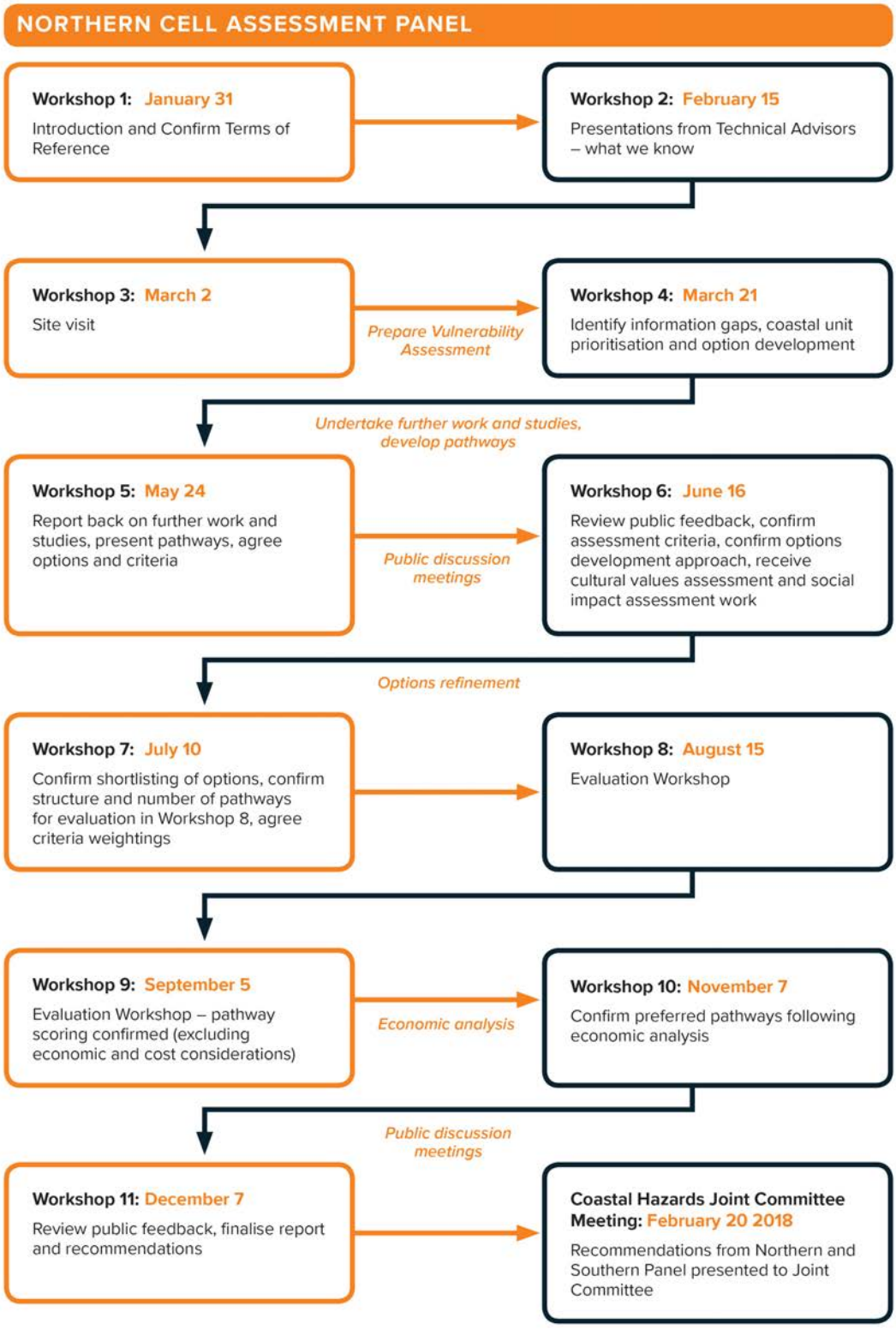


Figure 6. Northern Cell Assessment Panel workshop timeline

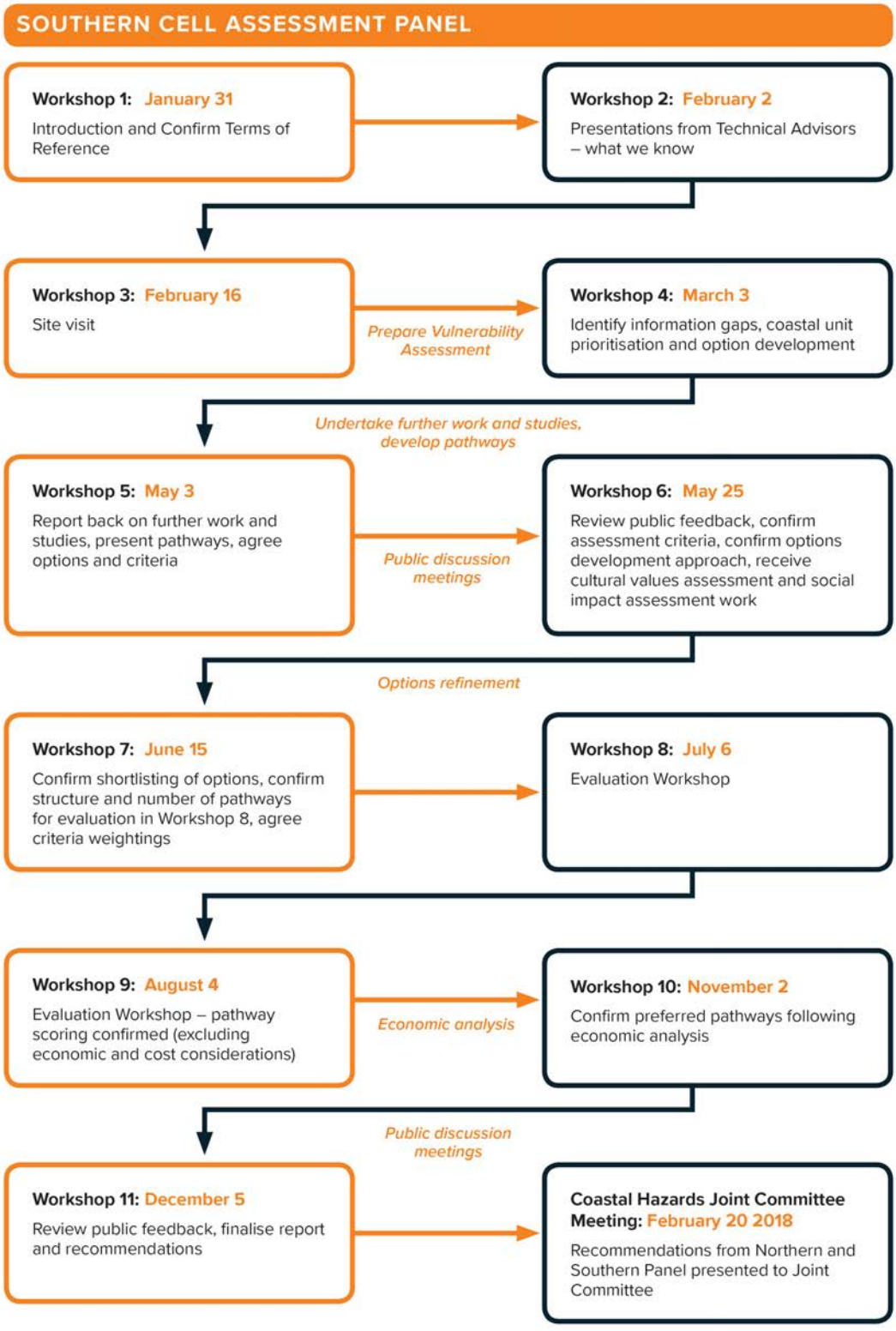


Figure 7. Southern Cell Assessment Panel workshop timeline

11.4 DECISION MAKING TOOLS

As briefly introduced in **Part B** of this report, the Assessment Panels employed the decision-making framework[13] that was developed in Stage 2 to arrive at their recommendations.

The framework was designed to respond to complex technical information, long timeframes, high levels of uncertainty, and multiple (and sometimes competing) values and interests.

The key components of the framework are:

- Multi-Criteria Decision Analysis ("MCDA")
- Dynamic Adaptive Planning Pathways ("DAPP")

Which were supported by the following studies and investigations:

- Coastal Hazard Assessment
- Coastal Risk Assessment
- Cultural Values Assessment
- Social Impact Assessment and Valuation
- Real Options Analysis

These are described in further detail below.

11.4.1 Multi-Criteria Decision Analysis

Multi-Criteria Decision Analysis ("MCDA") is an established technique for assessing multiple and sometimes complex options. Generically, the process involves the following steps:

- **Defining objective(s)**: what you are trying to achieve?
- **Determining options to assess:** this is often done by developing a "long-list" of potential options that could achieve the objective, and then refining the options down to a manageable number for assessment, considering matters such as technical efficacy, practicality, and the ability to implement.
- **Developing the assessment criteria**: criteria (for example, social, cultural, environmental and/or economic) against which the performance of options can be assessed (scored).
- **Weighting assessment criteria**: weightings reflect the relative importance of each decision criterion to the decision.

[13] Mitchell Daysh, 2017. Clifton to Tangoio Coastal Hazards Strategy 2120 – Stage Two Report: Decision Making Framework.

- **Scoring the options**: the expected performance of each option against each decision criterion.
- **Calculating weighted scores**: combine the weights and scores for each option to derive an overall value and order of preference for the options (from most to least preferred).

11.4.2 Dynamic Adaptive Planning Pathways

Dynamic Adaptive Planning Pathways ("DAPP") planning[14] has particular utility for making decisions in the coastal context where ever-changing risk profiles are present, and there is increasing (with time) uncertainty around rates and magnitude of changes.

Importantly, DAPP does not prescribe a single, final solution. Flexibility is retained, and future options are left open for future decision points.

This general approach has been employed by the Assessment Panels in the development of "pathways" for each priority unit. In this Strategy, the DAPP process was adapted, whereby pathways are a combination of short term (0 – 20 years), medium term (20 – 50 years) and long term (50 – 100 years) hazard response actions.

An important principle of the pathways is their adaptiveness; the timeframe for shifting between actions, and the specifics of future actions, can shift in response to changing hazards risks and pre-defined triggers (decision points). For example, the short-term action may indeed last 20 years, but it could be more or less depending on a number of factors which are currently uncertain. Triggers will be established in the Stage 4 of the Strategy to determine when to shift between each action[15]. With regular Strategy review periods, the pathways recommended for each priority unit over the 100-year period will be able to be reviewed and may well change in response to new information.

11.4.3 Cultural Values Assessment and Hīkoi

A Cultural Values Assessment[16] was developed by Aramanu Ropiha, an independent researcher and Kaitiaki o te Roopu for the Assessment Panels. The report was peer reviewed by representatives from Maungaharuru-Tangitū Trust, Mana Ahuriri Incorporated and He Toa Takitini.

The report provided an overview of the cultural values in the coastal area from Tangoio to Clifton to guide the decision making, and included:

- a brief history of the pre-settlement patterns of occupation;
- whakapapa of the original occupants and how they are manifest in present hapū whānui;

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[14] Haasnoot M, Kwakkel JH, Walker WE, ter Maat J. 2013. Dynamic adaptive policy pathways: A method for crafting robust decisions for a deeply uncertain world. Global Environmental Change 23(2): 485–498.

[15] Trigger points for transferring to the next (or different) action will be established as part of Stage 4 of the Strategy. Examples of possible triggers include specified sea level rise thresholds, frequency of damage-causing events and/or extent of erosion losses.

[16] Aramanu Ropiha, 2017. Assessment of Cultural Values Report – Coastal Hazards Strategy 2120 Clifton to Tangoio Mai Te Matau a Māui ki Tangoio.

- a compilation of wāhi tapu and sites of significance that are registered by public sector agencies;
- hapū management plans with cultural values that are registered with local government;
- agreements between hapū and the Crown related to the Treaty claimant process; and
- identification of gaps in the information reviewed with proposed remedies.

The report was supplemented with a cultural values wānanga and hīkoi for Panel members, hosted by Matahiwi Marae on 1 July 2016 and facilitated by historian Pat Parsons and Aramanu Ropiha. Following a powhiri at Matahiwi Marae, the hīkoi took members from both Assessment Panels on a bus tour of the entire Strategy area, highlighting historical use and occupation, and places and sites of significance. This was an enlightening and valuable experience for Panel members, and provided important contextual information for the decisions making process.

11.4.4 Social Impact Assessment and Valuation

The social impact of coastal hazards (inundation and erosion) on the communities in each priority unit was assessed by Maven Consulting Limited in three reports, covering the Cape Coast area[17], East Clive[18], and the Northern Cell priority units[19].

The purpose of the studies was to provide:

- A clearer understanding of social issues and impacts from coastal hazards;
- Meaningful engagement with community stakeholders;
- Analysis of social outcomes that would occur if there were no human intervention to address coastal hazards (beyond current interventions); and
- A valuation (estimated monetary value) of those outcomes using social impact measurement methodologies (Social Return on Investment).

The study was developed from interviews with residents and stakeholders and supported by other background information and reports.

The assessments assumed a status quo scenario, i.e. no change in interventions compared to those carried out at the present time. In effect, this provided a “baseline” social impact associated with doing nothing in response to coastal hazards.

The projected social outcomes were valued using financial proxies and value mapping to estimate a social cost (in monetary terms) to each community. Monetary value helps decision-makers to consider adaptation responses that are economically consistent with

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17 Maven Consulting Limited, 2017. Cape Coast Area Coastal Hazards Social Impact Assessment & Valuation.

18 Maven Consulting Limited, 2017. East Clive Area Coastal Hazards 2017 -2120 – Social Impact Assessment & Valuation.

19 Maven Consulting Limited, 2017. Coastal Hazards Social Impact Assessment & Valuation for Ahuriri/Pandora, Westshore, Bay View and Whirinaki.

social outcome costs, and to apportion the adaptation costs between public and private benefit.

A common theme is the large proportion of social outcome attributable to negative wellbeing amongst those residents whose properties are most at risk to the threat of coastal hazards. This negative wellbeing is a function of anxiety and concern caused by:

- Their ability to take necessary action to protect their property from erosion and storm surges (what are the solutions, what will the government do?);
- Current and future insurability of homes (excesses, exclusions, and eventual refusal to provide cover);
- Ability to raise mortgage finance (which is directly related to insurability);
- Future saleability of property as hazards increase;
- Physical damage caused by erosion or storm events; and
- Perceived "oppression" by territorial authorities using regulatory powers to force retreat as the only option.

The studies provided useful insights and references for Panel members to inform their decision making. To assist in the scoring of the social impact criterion in the MCDA process, Maven Consultants Limited attended the evaluation workshops to provide guidance on the outcome of the report and how this could assist scoring of the pathways.

Further application of this work has been in the development of a funding model in parallel to the work of the Assessment Panels, where the assessed social impact of coastal hazards has assisted a preliminary consideration of potential public-private apportionment of costs for implementing hazard mitigation responses. This work is ongoing.

11.4.5 Real Options Analysis

Real Options Analysis ("ROA") was used as the primary means of applying economic analysis to the pathways. The ROA was undertaken by Infometrics and presented in two reports covering the northern[20] and southern[21] priority units.

ROA is an expanded version of cost-benefit analysis that assesses whether there is value in waiting for more information before an expensive and possibly irreversible investment is undertaken, and whether an alternative investment might suffice in the meantime.

The ROA provides a costing assessment that enables decision making that can be flexibly implemented over time as the climate changes and as its impacts increase. This ensures that decisions taken today do not create further risks which are costly to reverse in the future, and that a range of options have been assessed for their ability to meet community objectives over time.

[20] Infometrics, 2017. Real Options Analysis of Strategies to Manage Coastal Hazard Risks: Northern Units B – E.
[21] Infometrics, 2017. Real Options Analysis of Strategies to Manage Coastal Hazard Risks: Southern Units J – L.

The ROA complements MCDA and the application of the Dynamic Adaptive Planning Pathways framework. The manner in which this was done by the Assessment Panels is discussed further in Section 12.8.

Broadly, the results of the ROA demonstrate that a flexible investment strategy, enabling a change of course in the future, is more likely to deliver a lower cost outcome than pursuing a single option.

11.4.6 Supplementary Technical Workshop

Early in the process, Panel members were inundated with complex technical information covering coastal processes, climate change, hazard effects and the options available to respond to those hazards. The pace of the 11-workshop programme was such that it was difficult for Panel members to fully come to grips with this information and seek clarifications where necessary.

To respond to this issue, a supplementary workshop was held as a joint workshop with both Panels in April 2017. The session was particularly focused on managed retreat, as a topic of much debate and focus for many Panel members. Presenters from Tonkin & Taylor and the Edge research team provided examples of managed retreat from the United Kingdom and the USA. An open question and answer session was also held with a panel of technical experts, providing Panel members with the opportunity to ask questions and expand their understanding of any technical matters.

A link is provided in **Part D Appendices** to access the minutes of this workshop and a compiled "Questions and Answers" sheet that evolved from it.

11.4.7 Community Feedback Sessions

Two community feedback sessions were held for each Panel (four sessions in total) as part of the decision-making process.

The first community feedback meetings were held between Panel Workshops 4 and 5, on 17 May 2017 at the Haumoana Hall for the Southern Panel, and on 6 June 2017 in the Westshore Surf Life Saving Club for the Northern Panel.

The meetings sought feedback on the:

- Identification of priority units;
- Long and short lists of hazard response options; and
- Draft MCDA assessment criteria.

The meetings were structured as “drop in” sessions, allowing members of the public to attend at any time during a 2-hour window to meet Panel Members and members of TAG, receive information and provide feedback. All feedback received was compiled and presented to the Panels at Workshop 5 to aid in their decision making.

The second set of community feedback meetings were held between Workshops 10 and 11, on 22 November 2017 for the Southern Panel, and 29 November 2017 for the Northern Panel. The venues and format were the same, with feedback sought on the:

- Development of pathways;
- Scoring of pathways through MCDA;
- Outcome of economic analysis; and
- Preliminary recommendations of the Panels in each priority unit.

Feedback received was used by the Panels to finalise their recommendations.

A link is provided in **Part D Appendices** to access the written feedback received from all community feedback sessions.

12. KEY DECISIONS

Through their process of 11 workshops, a range of key decisions were made by the Assessment Panels that led to the formation of their final recommendations. These key decisions are captured below, with a cross reference provided to the workshop in which the decisions were taken. A link is provided in **Part D Appendices** to access the full confirmed minutes of all workshops of the Northern and Southern Assessment Panels.

12.1 VULNERABILITY ASSESSMENT AND PRIORITISATION OF UNITS (WORKSHOP 4)

It was recognised by the Assessment Panels that forming recommendations for all the units identified by Tonkin & Taylor would be an immense task. However, the risk profiles and urgency of decision-making required was different for each unit. On this basis, a decision was made by the Assessment Panels to select priority units as the point of focus for this iteration of the Strategy.

Prioritisation decisions were made based on a high-level vulnerability assessment prepared by Mitchell Daysh that was designed from, and complimented, the risk assessment developed by Tonkin & Taylor in Stage 1.

The vulnerability assessment further assessed the extent to which assets affected by erosion and/or inundation will be sensitive to those effects, and their scope to adapt. It acknowledged that the Tonkin & Taylor risk assessment was ‘desktop’ only and provided

ground-truthing of sensitivity and capacity to adapt. For each unit within the Strategy area, the vulnerability assessment considered:

- The nature of any affected historic sites;
- The nature of impacts on any ecological areas;
- The possible flow-on economic impacts;
- If higher-sensitivity population groups were present; and
- The timeframe / immediacy of projected impacts.

The vulnerability assessment outcomes are summarised below[22]:

- **Unit A (Tangoio)** has a low vulnerability due to low risk of erosion or inundation. Eight lease-tenure holiday homes on Beach Road will possibly be affected by erosion of access by 2065. Erosion will possibly encroach directly onto these properties by 2120.
- **Unit M (Ahuriri Lagoon / Airport)** has low vulnerability due to no erosion risk, while inundation risk is restricted to the estuary which is not sensitive to inundation. Midden sites are also not sensitive to inundation.
- **Unit B (Whirinaki)** has erosion risks for North Shore Road and Whirinaki Road. Alternative access likely to be needed to about 60 properties by 2065. Up to 40 properties could possibly be directly affected by erosion by 2065. State Highway 2 is also likely to be affected by 2065. 80 properties are likely to be directly affected by 2120. No significant inundation risk over the entire period. The archaeological site identified at Esk River mouth is believed to be no longer intact due to natural erosion and land-filling activity.
- **Unit C (Bay View)** has future erosion risks for properties on Le Quesne Road, likely affecting Le Quesne Road itself and access to about 80 houses at the northern end of the road by 2065. By 2065 there will possibly also be 15 properties directly affected by erosion. By 2120, 60 properties are likely to be directly affected by erosion and another 40 with loss of access. No significant inundation risks over entire period.
- **Unit E (Ahuriri)** The main risk at Ahuriri is storm inundation, especially in Pandora Industrial Area. About 30 industrial properties on Thames Street are at risk by 2065. The entire Pandora area (approximately 160 industrial premises, plus apartment complexes) are at risk by 2120. Properties on Hardinge Road and in the Ahuriri retail area are also at risk from inundation by 2120 (affecting or partly affecting about 100 properties). Possible erosion of Hardinge Road by 2120, but no direct effects on housing. Ecological area (Ahuriri estuary) and identified historic sites, in practice, are not likely to be adversely affected by inundation or erosion.
- **Unit D (Westshore)** By 2065 The Esplanade, parts of Charles Street, and 7 (possibly 20) properties are likely to be at risk from erosion. 12 properties are likely to lose

[22] Use of terms 'likely' and 'possible' in the vulnerability assessment are adopted from the Tonkin & Taylor Risk Assessment where 'likely' is an event that will probably happen (66 – 90% chance of occurring) and 'possible' is an event that might happen (33 – 66% chance or occurring).

existing street access. By 2120, access to approximately 50 homes on The Esplanade and Charles Street is likely to be lost and 30 homes (possibly 120) likely to be directly affected by erosion. By 2120, about 90 houses potentially at risk from storm inundation, with 8 at risk prior to 2065. Identified historic sites are a WWII pill-box and former freezing works site. Ecological area subject to inundation is the Ahuriri estuary (in practice, not vulnerable to this effect).

- **Units G, H & P (Napier CBD, Marine Parade & Parkhill)** have low vulnerability due to low projected risk of erosion or inundation over 100-year strategy period.
- **Unit N (Napier City)** risks relate only to inundation in a very small portion of Ahuriri Estuary outfall channel, currently permanently under water. The Estuary itself is primarily in Units D, E and M (Northern cell). Vulnerability in Unit N therefore considered low.
- **Unit O (Clive/Whakatu)** has long term inundation risks, but a time delay before this risk becomes significant (2120) is projected.
- **Unit I (Awatoto)** also has inundation risks, but slowly increasing over time. Identified historic and ecological sites are not sensitive to periodic inundation.
- **Unit J (East Clive)** has slightly increasing risk to coastal property over next 50 years and longer term risk to wastewater treatment plant. Relatively sparsely populated. Estuarine areas are adapted to inundation.
- **Unit L (Clifton)** at current risk, including camping areas and boat ramp. Wider community implications from loss of these facilities.
- **Unit K (Haumoana / Te Awanga)** already affected by erosion & inundation risk. Risks will materially increase over time. Houses and public infrastructure affected. Sensitivity influenced by number of homes affected. Ability to adapt will vary. More room to move at Te Awanga, on existing sections. Haumoana more space-constrained (therefore greater vulnerability).

The vulnerability assessment then grouped units into vulnerability categories, based on assessed future risk, sensitivity and capacity to cope and adapt:

- **High Vulnerability**: Unit D (Westshore), Unit K (Haumoana /Te Awanga)
- **Moderate-High Vulnerability**: Units C (Bay View), Unit B (Whirinaki), Unit E (Ahuriri), Unit J (East Clive), Unit L (Clifton)
- **Low-Moderate Vulnerability**: Unit I (Awatoto), Unit O (Clive/Whakatu)
- **Low Vulnerability**: Unit A (Tangoio), Unit M (Ahuriri Lagoon / Airport), Unit G (Napier CBD), Unit G (Napier City), Unit H (Marine Parade), Unit P (Parkhill)

The Assessment Panels adopted a recommendation to focus their efforts on those units with High and Moderate-High Vulnerability (Units D, K, C, B, E, J and L); other units would be reviewed at the next Strategy review point (or earlier if triggers are reached earlier).

For assessment purposes, the Southern Panel made a further decision to split Unit K (Haumoana /Te Awanga) into two units – K1 (Te Awanga) and K2 (Haumoana). This was

considered appropriate by the Panel given the unique communities that were present in each location, each with different challenges, values and aspirations; it acknowledged that the preferred response for Te Awanga may not suite Haumoana and vice versa. The unique circumstances that apply to the properties from 1 to 41 (odd numbers only) Clifton Road, Haumoana ("the H21") were also recognised by the Panel. These properties were considered in a special workshop held with the owners of the H21 on 30 January 2018, in which specific recommendations were developed (refer to Section 9.6.5).

The Northern Panel made a similar decision with respect to Unit E (Ahuriri), splitting it into Unit E1 (Ahuriri) and E2 (Pandora) for assessment purposes. This recognised the considerable differences between the units, with Pandora being an inland area with no erosion risk but some significant inundation risk, and Ahuriri being coastal with limited inundation risk and some erosion risk. The areas are also very different in occupation and use, with Pandora primarily an industrial area, and Ahuriri commercial and residential.

Given the above decisions, the priority units selected by the Assessment Panels are summarised in Table 4.

Table 4. Northern and Southern Panel Priority Units for Assessment

Northern Panel Priority Units	Southern Panel Priority Units
Unit E1 (Ahuriri)	Unit L (Clifton)
Unit E2 (Pandora)	Unit K1 (Te Awanga)
Unit D (Westshore)	Unit K2 (Haumoana)
Unit C (Bay View)	Unit J (East Clive)
Unit B (Whirinaki)	

12.2 MCDA OBJECITVE (WORKSHOPS 5 AND6)

The Assessment Panels developed and agreed the following objective for the MCDA assessment:

To develop responses to coastal hazards risks that:

- *Manage our communities' exposure to coastal hazards risks;* and
- *Provide flexibility to respond to increasing hazard risks as they change over time.*

12.3 MCDA ASESSMENT CRITERIA (WORKSHOP 7)

The Assessment Panels invested a significant amount of time debating and developing the assessment criteria to be used through the MCDA process. The criteria were also tested by TAG, through dry-run evaluation workshops designed to test the applicability, utility and clarity of each criterion.

This work resulted in an agreed set of criteria, and a scoring guide to assist with interpretation and scoring of options, that was the same for both the Northern and Southern Panels, as presented in Table 5.

The criteria are split into two categories; technical assessment criteria which focus on the efficacy of the option for responding to coastal hazards risks; and impact assessment criteria which focus on the impact of implementing that option. For example, managed retreat as an option may score highly under the technical assessment criteria as a technically robust response to erosion and inundation risks, but may score poorly under the impact criteria when considering the adverse impacts on communities of implementing that option.

Table 5. Agreed MCDA Assessment Criteria and Scoring Guide

Criteria		Description	Scoring Guide
Technical Assessment Criteria	Manages the risks of storm surge inundation	▸ Reduced exposure to risks from storm surge inundation ▸ Meets objectives over long timeframes ▸ Proportionate to the scale and nature of risk	5 – High / Good 4 – 3 – Mid 2 – 1 – Low / Bad
	Manages the risks of coastal erosion	▸ Reduced exposure to risks from coastal erosion ▸ Meets objectives over long timeframes ▸ Proportionate to the scale and nature of risk	5 – High / Good 4 – 3 – Mid 2 – 1 – Low / Bad
	Ability to adapt to increasing risks	▸ Readily responds to uncertain climate outcomes ▸ Includes measures to support future adjustments	5 – High / Good 4 – 3 – Mid 2 – 1 – Low / Bad
	Risk transfer	▸ Exacerbation of hazard risk in other areas ▸ The transfer of risk to others, including future generations	5 – Low / Good 4 – 3 – Mid 2 – 1 – High / Bad

Impact Assessment Criteria	Socio-economic Impacts	▸ Social effects e.g.
		  ▸ Effects on community safety
		  ▸ Loss of amenity value
		  ▸ Decline in recreational values, community facilities
		▸ Indirect economic / industry impacts (e.g. tourism, fishing)
			5 – Low / Good
			4 –
			3 – Mid
			2 –
			1 – High / Bad

	Relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga	▸ Impacts on any cultural sites of significance ▸ Maintains access to, and enables the carrying out of, customary activities	5 – Low / Good 4 – 3 – Mid 2 – 1 – High / Bad
	Natural Environments Impacts	▸ Impacts on natural coastal ecosystems ▸ Impacts on the natural character of the coastal environment	5 – Low / Good 4 – 3 – Mid 2 – 1 – High / Bad

12.4 ECONOMIC CRITERION

As will be noted from the above list of criteria, there is no criterion included to consider the economic aspects of a given pathway (such as affordability). It was a deliberate decision of the Assessment Panels to complete economic analysis as an extra step in the assessment process, that was separate to but complemented the MCDA outcome.

The Assessment Panels made this decision on the basis that economic considerations would be critical to the ability to implement a given pathway – if it is unaffordable, it cannot be advanced. Economic considerations are therefore a critical failure issue, rather than a measure of performance, and justified separate analysis.

12.5 ASSESSMENT CRITERIA WEIGHTINGS (WORKSHOP 7)

Under MCDA, weightings are applied to each assessment criterion to determine the relative importance of that criterion to achieving the objective.

All criteria in this Strategy were 'weighted' on a scale of 1 to 3:

- 1 – Important
- 2 – Very important
- 3 – Critical

Weightings reflect that while all criteria are important, they are not all equally important to the task at hand.

The agreed weightings (Table 6 and Table 7) varied slightly between the Assessment Panels, reflecting a difference in priorities and values.

Table 6. Northern Panel Criteria Weightings

Criterion	Weighting (1-3)	Reasons
Manages the risks of storm surge inundation	3	Responding to this hazard is a primary reason for the Strategy
Manages the risks of coastal erosion	3	Responding to this hazard is a primary reason for the Strategy
Ability to adapt to increasing risks	1	The Strategy has a 10-year review process which will enable it to be responsive to changing science etc. The pathways have a degree of adaptability "built in" – i.e. no pathway is itself inherently inflexible
Risk transfer	2	The pathways will be considered as a whole at the end, therefore risk transfer between units will be considered – given this will be taken into account, this lowers the weighting but still an important consideration. Note that anything done in the south will impact further up the coast.

Criterion	Weighting (1-3)	Reasons
Socio-economic Impacts	3	Everything we are doing here is about the community – if there was no one living here we wouldn't even be having this discussion. The parks, sportsgrounds the beach etc – there is a lot of valued assets along the coast that are hugely valued by people. Note: this weighting went to a vote, with 6 / 5 in favour of a weighting of 3. Those favouring 2 felt that it was more important to have an effective option at controlling erosion and inundation and this should outweigh other considerations.
Relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga	3	The coast is highly significant for tangata whenua as a place to live, gather food, travel, etc. There is both the heritage (past) values of occupations and use, and the present day cultural values associated with access and use – this criteria must have the highest weighting accordingly
Natural Environments Impacts	1	Whatever we do to deal with inundation and erosion will have an affect on the natural character of the coast. The coast in this area is also already modified. The NZCPS favours natural responses but doesn't discount hard engineering. Some of these factors will also be considered in the criteria above (cultural). Note: this weighting went to a vote, with 6 / 5 in favour of a weighting of 1. Those favouring 2 felt that a 2 is relative to the other impact assessment criteria i.e. it is less important given the reasons stated, but not so significantly that it should be weighted a 1

Table 7. Southern Panel Criteria Weightings

Criterion	Weighting (1-3)	Reasons
Manages the risks of storm surge inundation	3	Critical consideration – this is the reason for the Strategy, and erosion and inundation are related
Manages the risks of coastal erosion	3	Critical consideration – this is the reason for the Strategy, and erosion and inundation are related and should be equally weighted
Ability to adapt to increasing risks	3	Bedrock principle for how we should look at long term responses to coastal hazards risks. We are basing our decisions today on models, and there is a lot of uncertainty; retaining flexibility is critical.

Risk transfer	1	There is always going to be some risks – this can be managed and should not paralyse action – need to allow some flexibility to act. If we do our job right, other units and future generations are already being considered. We do need to be aware of the potential for compounding risk transfer over time given future uncertainty. A weighting of 1 was supported 11 / 4 by the Panel (with 4 members preferring a weighting of 2 on the basis that risk may be a fact of life but there is a discernment around the acceptable level of compounded risk transfer in the face of multiple pathways).
Socio-economic Impacts	3	This is a critical consideration – the socio-economic impact of a pathway is as important as the mitigation of erosion and inundation risks.
Relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga	3	Where there is a site of significance that may be impacted this must be a critical consideration. Treaty obligation and key consideration under RMA.
Natural Environments Impacts	2	The natural state of the coast is a fundamental part of our enjoyment of this area and the values we hold, but whatever we do there will be an impact on the coast (could be positive or negative), including doing nothing.

12.6 PATHWAY DEVELOPMENT

The Assessment Panels ultimately evaluated 6 possible pathways in each priority unit (4 in Unit E2 Pandora and Unit J East Clive). The pathways were developed following an extensive option development process described in the following sections.

12.6.1 Option Long List (Workshop 4)

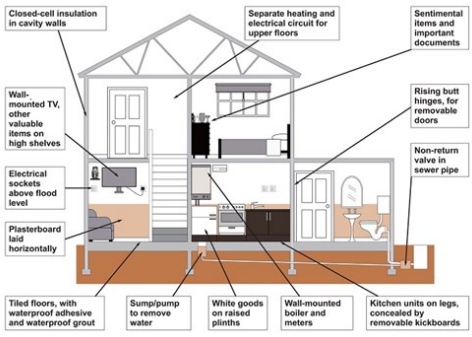
Panel members commenced the coastal hazard response option development process on a “blank-page” basis; any option could be offered up and nothing was considered off the table at this point in the discussion.

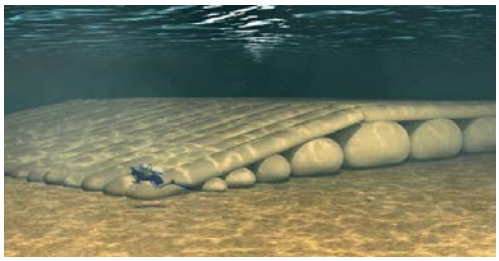
Having identified all possible options on a unit by unit basis, and having sought advice from technical advisors on any other options that may be worth considering, a ‘long list’ of potential options across all units was compiled and adopted (Table 8).

Table 8. Long List of Coastal Hazard Response Options

Option	Description	Representative Image
1: Status Quo	Maintain current coastal management approaches – i.e. do nothing new.	
2: Planting	Planting of beach crest areas to improve retention of material, reduce erosion and limit wave overtopping.	
3: Re-nourishment – Gravel	Renourishment of gravel on foreshore area to offset erosion losses, increase beach size and potentially crest height. Larger beach can dissipate more wave energy and reduce/prevent wave overtopping.	
4: Re-Nourishment (sand)	Material placed offshore, using marine plant, and allowed to naturally migrate towards the beach raising foreshore levels. This helps to smooth out the beach profile and can help protect the beach by increasing wave energy dissipation.	

Option	Description	Representative Image
5: Beach face de-watering	The artificial lowering (through pumps / drains) of the water table within beaches to help promote the accretion of sediment.	
6: Beach Scraping	Redistribution of available sediments to maximise beach crest width and standard of protection.	
7: Enhance Shingle Crest	Raising of dune level at low elevations to reduce inundation risk	
8: Wetland or lagoon creation	Installing or enhancing coastal marshes and wetland areas to dissipate wave energy and reduce inundation risk.	

Option	Description	Representative Image
9: Flood gate	Adjustable gates used to prevent storm surges from entering existing waterways, in turn preventing up-stream overtopping and flooding.	
10: Install / enhance Inundation Protection	Increase existing / install new stop banks to provide greater protection from storm surge inundation	
11: Inundation Accommodation	Implementation of policy to improve flood resilience of current and future properties	
12: Vertical Permeable Sill	A structure within the gravel beach that dissipates wave energy, reducing erosion losses through backwash and longshore drift and promotes the retention of gravel behind the structure. Existing examples at Te Awanga.	

Option	Description	Representative Image
13: Groynes and Nourishment	Limits the movement of sediment (gravels and sand) along the coast through longshore drift, thereby reducing localised losses to erosion. Nourishment is used to supply sand / gravel to the area protected by the groynes	
14: Breakwater	Shore parallel offshore breakwater (crest above MHWS). Structures break waves, promote the build up of sediment in the lee of the structure and reduce longshore drift.	
15: Offshore Reef	Shore parallel offshore reef (crest below MHWS). Structures break waves, promote the build up of sediment in the lee of the structure and reduce longshore drift.	
16: Sea Wall	A large structure of rocks and/or concrete that absorbs/reflects wave energy and provides a physical barrier to erosion. Crest height of structure designed to limit overtopping and inundation.	
17: Retreat the Line	Primary defence line retreated inland providing a high standard of inundation protection to properties behind the new defence. (Situation unchanged for those in front)	

Option	Description	Representative Image
18: Managed Retreat	A strategic relocation of assets and people away from areas at risk, enabling restoration of those areas to their natural state	

12.6.2 Short list of Options (Workshop 5)

The Assessment Panels then developed a short list of options for each priority unit. This was done by considering each of the 18 long-listed options and determining the practicality of each option in each priority unit. With technical advice, where an option was not practical for a particular unit, it was discarded. Table 9 presents the options discarded by the Assessment Panels from the long list for each priority unit, together with the rationale for each decision.

Table 9. Options Discarded from Long list for each Priority Unit

Priority Unit	Options Discarded[23]	Rationale
Unit E1 (Ahuriri)	5. Beach face de-watering	Has not been proven to be reliably successful, and success has only been realised on sandy beaches. Not suitable for this coastline.
	8. Wetland or lagoon creation	Insufficient space to create additional wetland areas big enough to offer any coastal hazard mitigation benefit
	9. Flood gate	No waterways in this location suitable for this option
	10. Install / enhance inundation protection (stop banks)	Limited space to install
	12. Vertical permeable sill	High wave energy environment. Limited benefit. Benefits to sediment retention are not enough to substantially reduce risk
	17. Retreat the line	No practical location to move the line of defence to
Unit E2 (Pandora)	3. Renourishment (gravel)	Not suitable for estuarine environment
	4. Renourishment (sand)	Not suitable for estuarine environment

[23] Option numbering in this column refers to the option numbers as listed in Table 8.

Priority Unit	Options Discarded[23]	Rationale
	5. Beach face de-watering	Has not been proven to be reliably successful, and success has only been realised on sandy beaches. Not suitable for this coastline.
	6. Beach-scraping	No functional beach crest in this location
	7. Enhance shingle crest	No functional beach crest in this location
	8. Wetland or lagoon creation	Insufficient space to create additional wetland areas big enough to offer any coastal hazard mitigation benefit
	12. Vertical permeable sill	High wave energy environment. Limited benefit. Benefits to sediment retention are not enough to substantially reduce risk
	13. Groynes + nourishment	Not suitable for estuarine environment
	14. Breakwater	Not suitable for estuarine environment
	15. Offshore Reef	Predicted reduction in wave energy not sufficient to reduce risk, requires larger breakwater structure
	17. Retreat the line	No practical location to move the line of defence to
Unit D (Westshore)	5. Beach face de-watering	Has not been proven to be reliably successful, and success has only been realised on sandy beaches. Not suitable for this coastline.
	8. Wetland or lagoon creation	Insufficient space to create additional wetland areas big enough to offer any coastal hazard mitigation benefit
	9. Flood gate	No waterways in this location suitable for this option
	10. Install / enhance inundation protection (stop banks)	Limited space to install
	12. Vertical permeable sill	High wave energy environment. Limited benefit. Benefits to sediment retention are not enough to substantially reduce risk
	17. Retreat the line	No practical location to move the line of defence to
Unit C (Bay View)	4. Renourishment (sand)	High wave energy environment; sand will be rapidly lost. Insufficient reduction in wave energy to protect coastal assets
	5. Beach face de-watering	Has not been proven to be reliably successful, and success has only been realised on sandy beaches. Not suitable for this coastline.

Priority Unit	Options Discarded[23]	Rationale
	8. Wetland or lagoon creation	Insufficient space to create additional wetland areas big enough to offer any coastal hazard mitigation benefit
	9. Flood gate	No waterways in this location suitable for this option
	10. Install / enhance inundation protection (stop banks)	Limited space to install
	12. Vertical permeable sill	High wave energy environment. Limited benefit. Benefits to sediment retention are not enough to substantially reduce risk
	17. Retreat the line	No practical location to move the line of defence to
Unit B (Whirinaki)	4. Renourishment (sand)	High wave energy environment; sand will be rapidly lost. insufficient reduction in wave energy to protect coastal assets
	5. Beach face de-watering	Has not been proven to be reliably successful, and success has only been realised on sandy beaches. Not suitable for this coastline.
	8. Wetland or lagoon creation	Insufficient space to create additional wetland areas big enough to offer any coastal hazard mitigation benefit
	9. Flood gate	No waterways in this location suitable for this option
	10. Install / enhance inundation protection (stop banks)	Limited space to install
	12. Vertical permeable sill	High wave energy environment. Limited benefit. Benefits to sediment retention are not enough to substantially reduce risk
	17. Retreat the line	No practical location to move the line of defence to
Unit L (Clifton)	4. Renourishment (sand)	High wave energy environment; sand will be rapidly lost. insufficient reduction in wave energy to protect coastal assets
	5. Beach face de-watering	Has not been proven to be reliably successful, and success has only been realised on sandy beaches. Not suitable for this coastline.
	6. Beach-scraping	No functional beach crest in this location
	7. Enhance shingle crest	No functional beach crest in this location
	9. Flood gate	No waterways in this location suitable for this option

Priority Unit	Options Discarded[23]	Rationale
	10. Install / enhance inundation protection (stop banks)	Limited space to install
	15. Offshore Reef	Predicted reduction in wave energy not sufficient to reduce risk, requires larger breakwater structure
	17. Retreat the line	No practical location to move the line of defence to
Unit K1 (Te Awanga)	4. Renourishment (sand)	High wave energy environment; sand will be rapidly lost. insufficient reduction in wave energy to protect coastal assets
	5. Beach face de-watering	Has not been proven to be reliably successful, and success has only been realised on sandy beaches. Not suitable for this coastline.
	9. Flood gate	No waterways in this location suitable for this option
	10. Install / enhance inundation protection (stop banks)	Limited space to install
Unit K2 (Haumoana)	4. Renourishment (sand)	High wave energy environment; sand will be rapidly lost. insufficient reduction in wave energy to protect coastal assets
	5. Beach face de-watering	Has not been proven to be reliably successful, and success has only been realised on sandy beaches. Not suitable for this coastline.
	10. Install / enhance inundation protection (stop banks)	Limited space to install
Unit J (East Clive)	4. Renourishment (sand)	High wave energy environment; sand will be rapidly lost. insufficient reduction in wave energy to protect coastal assets
	5. Beach face de-watering	Has not been proven to be reliably successful, and success has only been realised on sandy beaches. Not suitable for this coastline.
	9. Flood gate	No waterways in this location suitable for this option
	12. Vertical permeable sill	High wave energy environment. Limited benefit. Benefits to sediment retention are not enough to substantially reduce risk

12.6.3 Option Refinement and Pathway Development (Workshop 7)

The short listing process still produced a large number of potential option combinations for each priority unit, both concurrently and through time. This would have made assessing the options overly onerous. The Assessment Panels sought the advice of Tonkin & Taylor, who were also supported by members of the Edge research team, to further refine the shortlisted options for each unit and to develop the refined short lists into pathways.

The direction from the Assessment Panels to Tonkin & Taylor was to:

- Reduce the number of pathways in each priority unit for MCDA scoring, with a preferred maximum of 6 pathways per unit;
- Remove options that have limited benefit;
- Ensure that any options being included in a pathway are;
  - Technically Feasible;
  - Practical to implement;
  - Realistic; and
  - Maximise adaptability

Tonkin & Taylor and Edge presented the results of this work to both Assessment Panels, and a series of pathways was ultimately adopted for each priority unit. The final pathways that were assessed through MCDA are summarised in Table 10. A link is provided in the **Part D Appendices** of this report to access the full set of 1-page summary sheets that provide further detail on each pathway.

Table 10. Final Pathways to be assessed for each Priority Unit.

Priority Unit	Pathway	Short Term	→	Medium Term	→	Long Term
Unit E1 (Ahuriri)	Pathway 1	Status quo	→	Retreat the Line	→	Managed Retreat
	Pathway 2	Status quo	→	Retreat the Line	→	Sea wall
	Pathway 3	Status quo/ Renourishment	→	Renourishment + Control Structures	→	Managed Retreat
	Pathway 4	Status quo/ Renourishment	→	Renourishment + Control Structures	→	Sea wall
	Pathway 5	Status quo	→	Sea wall	→	Managed Retreat
	Pathway 6	Status quo	→	Sea wall	→	Sea wall

Priority Unit	Pathway	Short Term	→	Medium Term	→	Long Term
Unit E2 (Pandora)	Pathway 1	Status quo	→	Inundation Protection	→	Managed Retreat
	Pathway 2	Inundation Protection	→	Inundation Protection	→	Managed Retreat
	Pathway 3	Inundation Protection	→	Inundation Protection	→	Inundation Protection
	Pathway 4	Inundation Protection	→	Inundation Protection + Flood Gate	→	Inundation Protection + Flood Gate
Unit D (Westshore)	Pathway 1	Renourishment	→	Managed Retreat	→	Managed Retreat
	Pathway 2	Renourishment	→	Renourishment + Control Structures	→	Managed Retreat
	Pathway 3	Renourishment	→	Renourishment + Control Structures	→	Renourishment + Control Structures
	Pathway 4	Renourishment	→	Renourishment + Control Structures	→	Sea wall
	Pathway 5	Renourishment + Control Structures	→	Renourishment + Control Structures	→	Sea wall
	Pathway 6	Sea wall	→	Sea wall	→	Sea wall
Unit C (Bay View)	Pathway 1	Status quo	→	Managed Retreat	→	Managed Retreat
	Pathway 2	Status quo / Renourishment	→	Renourishment + Control Structures	→	Managed Retreat
	Pathway 3	Status Quo/ Renourishment	→	Renourishment + Control Structures	→	Renourishment + Control Structures
	Pathway 4	Status Quo/ Renourishment	→	Renourishment + Control Structures	→	Sea wall
	Pathway 5	Status quo	→	Sea wall	→	Managed Retreat
	Pathway 6	Status quo	→	Sea wall	→	Sea wall

Priority Unit	Pathway	Short Term	→	Medium Term	→	Long Term
Unit B (Whirinaki)	Pathway 1	Status quo	→	Managed Retreat	→	Managed Retreat
	Pathway 2	Status quo/ Renourishment	→	Renourishment + Control Structures	→	Managed Retreat
	Pathway 3	Status quo/ Renourishment	→	Renourishment + Control Structures	→	Renourishment + Control Structures
	Pathway 4	Status quo/ Renourishment	→	Renourishment + Control Structures	→	Sea wall
	Pathway 5	Status quo/ Renourishment	→	Sea wall	→	Managed Retreat
	Pathway 6	Status quo	→	Sea wall	→	Sea wall
Unit L (Clifton)	Pathway 1	Renourishment	→	Managed Retreat	→	Managed Retreat
	Pathway 2	Renourishment + Control Structures	→	Renourishment + Control Structures	→	Managed Retreat
	Pathway 3	Renourishment + Control Structures	→	Renourishment + Control Structures	→	Renourishment + Control Structures
	Pathway 4	Renourishment + Control Structures	→	Renourishment + Control Structures	→	Sea wall
	Pathway 5	Sea wall	→	Sea wall	→	Managed Retreat
	Pathway 6	Sea wall	→	Sea wall	→	Sea wall
Unit K2 (Te Awanga)	Pathway 1	Renourishment	→	Retreat the Line	→	Managed Retreat
	Pathway 2	Renourishment + Control Structures	→	Renourishment + Control Structures	→	Retreat the Line
	Pathway 3	Renourishment + Control Structures	→	Renourishment + Control Structures	→	Renourishment + Control Structures
	Pathway 4	Renourishment + Control Structures	→	Renourishment + Control Structures	→	Sea wall

Priority Unit	Pathway	Short Term	→	Medium Term	→	Long Term
	Pathway 5	Renourishment	→	Sea wall	→	Retreat the Line
	Pathway 6	Sea wall	→	Sea wall	→	Sea wall
Unit K2 (Haumoana)	Pathway 1	Renourishment	→	Managed Retreat	→	Managed Retreat
	Pathway 2	Renourishment + Control Structures	→	Renourishment + Control Structures	→	Managed Retreat
	Pathway 3	Renourishment + Control Structures	→	Renourishment + Control Structures	→	Retreat the Line
	Pathway 4	Renourishment + Control Structures	→	Renourishment + Control Structures	→	Renourishment + Control Structures
	Pathway 5	Renourishment + Control Structures	→	Renourishment + Control Structures	→	Sea wall
	Pathway 6	Sea wall	→	Sea wall	→	Sea wall
Unit J (Clive / East Clive)	Pathway 1	Status Quo	→	Renourishment + Control Structures	→	Retreat the Line / Managed Retreat
	Pathway 2	Status Quo	→	Renourishment + Control Structures	→	Renourishment + Control Structures
	Pathway 3	Status Quo	→	Sea wall	→	Retreat the Line / Managed Retreat
	Pathway 4	Status Quo	→	Sea wall	→	Sea wall

12.7 MCDA SCORING

With a confirmed set of criteria, criteria weightings, and pathways for assessment, the Assessment Panels commenced the process of scoring the pathways. This involved a number of steps, as below.

12.7.1 Recommended Technical Pre-Scoring

At Workshop 6, the Assessment Panels considered a number of options to streamline the process of scoring potential coastal hazard responses through MCDA, given the large number of decision points required (28 pathways for the Northern Panel's priority units, 22 pathways for the Southern Panel, each to be assessed against the 7 assessment criteria).

As one of these streamlining measures, it was agreed that TAG would convene a Technical Team that would meet ahead of Workshop 8 to develop recommended scores for the technical assessment criteria (Criteria 1 – 4). The recommended scores, together with a rationale for those scores, would be presented back to the Panels at Workshop 8 for consideration. Panel members would then debate the recommendations and ask questions directly of the Technical Team. Ultimately, the Assessment Panels must decide whether to accept the recommendations or not, but it was considered that this process of debating recommended scores for criteria 1 – 4 would be more efficient than starting with a 'blank page' in Workshop 8.

Following this direction from the Assessment Panels, a Technical Team consisting of representatives from Tonkin & Taylor, TAG and Council Asset Managers and with input from Edge, met on 4 July 2017 to consider the Southern Cell priority units. Panel members were invited to attend this workshop as observers. The equivalent session was held for the Northern Cell priority units on 9 August 2017.

The recommended technical criteria scores were presented back to the respective Assessment Panels at Workshops 8 and 9 for consideration and further discussion.

12.7.2 Recommended Mana Whenua Pre-Scoring

In a similar process adopted for the technical assessment criteria 1 – 4, it was identified that particular expertise was required to develop scores for each pathway against criterion 6 "The relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga".

To that end, the Mana Whenua Panel Members for both Assessment Panels, supported by members of TAG and the Kaitiaki o te Roopu (Aramanu Ropiha) convened to develop recommended scoring for criterion 6 for the Southern and Northern Assessment Panels, on 4 July 2017 and 3 August 2017 respectively.

The Mana Whenua Representatives recorded the following overriding factors that informed their scoring of pathways against the cultural criterion:

- Preferred that a beach be maintained where possible for coastal access / use.
- Accept that in general we should let nature take its course in preference to hard intervention.
- Preferred that the coast is held/returned to a natural state, as much as possible – the 'vista' is important (remove sea walls).
- Prefer not to split communities artificially (e.g. retreat the line picks winners)
- In general, no sites of historic significance are considered to be affected by the pathways as they have been developed for the Southern Cell priority units, however there is an urupā in the Whirinaki unit in current use (Petane Marae).
- Do want to see historic values recognised / commemorated as part of any future coastal works.
- Where habitat can be protected, enhanced or re-created that is a strong benefit (e.g. wetlands).

- Protection of habitat for mahinga kai and taonga species, also another reason why we decided that the coast should return to a natural state.

The above factors are informed by the principles of whanaungatanga, kaitiakitanga, mauri, and the relationships between Tangaroa, Tāwhirimātea and Rūaumoko.

The recommended cultural criterion scores were presented back to the respective Assessment Panels at Workshops 8 and 9 for consideration and further discussion.

12.7.3 Final MCDA scoring (Workshops 8 and 9)

Through two consecutive facilitated workshops, the Assessment Panels developed (with consideration of the recommended scores for Criteria 1 – 4 and 6) their final MCDA scoring for each pathway in each priority unit. Importantly, the reasons for each score were recorded.

A link to access the full MCDA scoring sheets from the Northern and Southern Assessment Panels is provided in **Part D Appendices** of this report.

Weighted scores where then calculated, and an order of preference for pathways in each priority unit was established.

As noted, the MCDA scoring was an incomplete analysis as it did not include a consideration of economics and affordability, and so a further step was required to arrive at a final order of preference for the pathways.

12.8 ECONOMIC ANALYSIS (WORKSHOP 10)

To overlay economic considerations with the MCDA outcome, a Real Options Analysis ("ROA") was undertaken and presented to the Assessment Panels. A link to access the full ROA reports for the Southern and Northern Assessment Panels is provided in **Part D Appendices**.

As part of the ROA process, the permeations of options to produce pathways was re-tested using economic criteria; that is, the options and pathways were interrogated to determine whether there were other pathways (in addition to the 6 pathways in each priority unit identified by the Assessment Panels) that were worth considering on economic grounds.

This analysis resulted in a confirmation that the Assessment Panels had competed a robust process to identify pathways, and that those confirmed pathways were sound. Four additional pathways were also identified as potentially worthy of consideration (Table 11).

Table 11. Additional potential pathways identified through economic analysis

Priority Unit	New Pathway	Short Term	→	Medium Term	→	Long Term
Unit E2 (Pandora)	Pathway 11	Status quo	→	Inundation Protection	→	Inundation Protection
Unit D (Westshore)	Pathway 9	Renourishment + Control Structures	→	Renourishment + Control Structures	→	Renourishment + Control Structures
Unit K1 (Te Awanga)	Pathway 30	Retreat the Line	→	No further action	→	No further action
Unit K2 (Haumoana)	Pathway 30	Retreat the Line	→	No further action	→	No further action

The four additional pathways had not been assessed through MCDA, however the Assessment Panels considered each on its merits and in each case made a decision on whether the new pathway should be adopted for MCDA assessment.

In each case, the Assessment Panels decided that the pathways were either not appropriate for the unit, or were not sufficiently different to an existing confirmed pathway to warrant separate assessment. These discussions are recorded in the minutes of Workshop 10, and served as an additional test of the validity, robustness and completeness of the pathway assessed in each priority unit.

In addition to a range of other outputs from the ROA process, two measured used specially by the Assessment Panels were the Cost + Loss figure and a Value for Money measure for each pathway.

The Cost + Loss figure is equal to the total cost estimate (operational + capital costs) for building and maintaining the full 100-year pathway (discounted over time), plus a calculated loss figure from damage caused by events that exceed a 1 in 100-year chance of occurrence. The loss figure reflects the fact that defended assets within a hazard area (e.g. houses behind a sea wall, or groyne field) cannot enjoy 100% protection, given both the uncertainties associated with climate change effects and the inevitable limitations of engineering design standards.

The Value for Money measure is a calculated figure to aid a comparison of “bang for buck” between each pathway. It compares the total cost estimate (operational + capital costs) for building and maintaining each 100-year pathway (discounted over time), against how many MCDA “points” (weighted scores) the pathway received. The result is a measure of how much each MCDA point costs. As an example, from Unit E1 (Ahuriri) Pathway 5 received a Value for Money measure of $173,000 per MCDA point, where Pathway 6 is $57,000 per MCDA point, representing better value for money.

To compliment the ROA outputs, the Assessment Panels also heard from the Chief Financial Officer of the Napier City Council and Hastings District Council who provided an

indication of the likely rating impact of implementing each pathway. This was based on a number of assumptions, including the public / private apportionment of cost, but did provide a measure of affordability for Assessment Panels to consider. A summary of this information was provided by showing short term build costs as a rating impact (how much new money the Council would need to collect) to implement the first stage of each pathway.

12.9 IDENTIFICATION OF PREFERRED PATHWAYS AND FINAL RECOMMENDATIONS (WORKSHOP 10)

The information developed through the MCDA process and economic analysis was compiled into summary sheets for each priority unit to aid the Assessment Panels with forming their final recommendations. The summary sheets provided a description of each pathway in each priority unit, together with the following information on each pathway:

- MCDA score
- MCDA ranking
- Cost + Loss value
- Cost + Loss ranking
- Value for Money measure
- Value for Money ranking
- Short term build costs
- Rating requirement

These summary sheets were important decision-making tools, and served to assist the debate. The summary sheets for all priority units are provided in Figures 8 to 16 below.

Unit E1: Ahuriri											
Pathway	**Short term**	→	**Medium term**	→	**Long term**	**MCDA Score**	**MCDA Ranking**	**Cost + Loss[1] ($m)**	**Cost + Loss[1] Ranking**	**VFM[2] ($'000/ point)**	**VFM[2] Ranking**	**Short Term build costs[3] ($m)**
PW 1	Status quo	→	Retreat the Line	→	Managed Retreat	54	**4**	15.31	**4**	211	**6**	0.29 (0.02 / yr)
PW 2	Status quo	→	Retreat the Line	→	Sea wall	51	**5**	10.72	**3**	111	**3**	0.29 (0.02 / yr)
PW 3	Status quo/ Renourishment	→	Renourishment + Control Structures	→	Managed Retreat	58	**3=**	16.08	**6**	205	**5**	1.30 (0.08 / yr)
PW 4	Status quo/ Renourishment	→	Renourishment + Control Structures	→	Sea wall	58	**3=**	10.16	**2**	81	**2**	1.30 (0.08 / yr)
PW 5	Status quo	→	Sea wall	→	Managed Retreat	65	**1**	15.43	**5**	173	**4**	0.29 (0.02 / yr)
PW 6	Status quo	→	Sea wall	→	Sea wall	61	**2**	8.93	**1**	57	**1**	0.29 (0.02 / yr)

[1] Cost + loss is equal to the total cost estimate (operational + capital costs) for the full 100 year pathway + residual losses due to events that exceed a 1 in 100-year chance of occurrence.

[2] Value for Money measure – how much it costs to "purchase" each MCDA point based on the MCDA score and total cost estimate (operational + capital) of each 100 year pathway

[3] Mid-point cost scenario (including operational costs) for the first stage of each pathway (i.e the short term option). Numbers in brackets are the annual rating cost of the short term option over 20 years.

Figure 8. Summary Table for Unit E1: Ahuriri

Unit E2: Pandora											
Pathway	**Short term**	→	**Medium term**	→	**Long term**	**MCDA Score**	**MCDA Ranking**	**Cost + Loss[1] ($m)**	**Cost + Loss[1] Ranking**	**VFM[2] ($'000/ point)**	**VFM[2] Ranking**	**Short Term build costs[3] ($m)**
PW 1	Status quo	→	Inundation Protection	→	Managed Retreat	51	**2**	12.36	**2**	193	**2**	0.00 (0.00 / yr)
PW 2	Inundation Protection	→	Inundation Protection	→	Managed Retreat	54	**1**	13.39	**3**	202	**3**	2.00 (0.16 / yr)
PW 3	Inundation Protection	→	Inundation Protection	→	Inundation Protection	49	**3**	10.08	**1**	138	**1**	2.00 (0.16 / yr)
PW 4	Inundation Protection	→	Inundation Protection + Flood Gate	→	Inundation Protection + Flood Gate	45	**4**	19.05	**4**	349	**4**	2.00 (0.16 / yr)
PW11	*Status quo*	→	*Inundation Protection*	→	*Inundation Protection*	-	-	*9.05*	-	-	-	-

[1] Cost + loss is equal to the total cost estimate (operational + capital costs) for the full 100 year pathway + residual losses due to events that exceed a 1 in 100-year chance of occurrence.

[2] Value for Money measure – how much it costs to "purchase" each MCDA point based on the MCDA score and total cost estimate (operational + capital) of each 100 year pathway

[3] Mid-point cost scenario (including operational costs) for the first stage of each pathway (i.e the short term option). Numbers in brackets are the annual rating cost of the short term option over 20 years.

Figure 9. Summary Table for Unit E2: Pandora

Unit D: Westshore											
Pathway	**Short term**	→	**Medium term**	→	**Long term**	**MCDA Score**	**MCDA ranking**	**Cost + Loss[1] ($m)**	**Cost + Loss[1] ranking**	**VFM[2] ($'000/ point)**	**VFM[2] ranking**	**Short Term build costs[3] ($m)**
PW 1	Renourishment	→	Managed Retreat	→	Managed Retreat	65	**1**	91.6	**6**	1392	**6**	13.26 (0.71 / yr)
PW 2	Renourishment	→	Renourishment + Control Structures	→	Managed Retreat	60	**2**	53.2	**5**	839	**5**	13.26 (0.71 / yr)
PW 3	Renourishment	→	Renourishment + Control Structures	→	Renourishment + Control Structures	51	**4=**	25.2	**1**	387	**1**	13.26 (0.71 / yr)
PW 4	Renourishment	→	Renourishment + Control Structures	→	Sea wall	54	**3**	28.9	**2**	432	**2**	13.26 (0.71 / yr)
PW 5	Renourishment + Control Structures	→	Renourishment + Control Structures	→	Sea wall	51	**4=**	29.0	**3**	459	**3**	16.17 (1.09 / yr)
PW 6	Sea wall	→	Sea wall	→	Sea wall	47	**5**	31.2	**4**	546	**4**	21.96 (1.59 / yr)
PW9	*Renourishment + Control Structures*	→	*Renourishment + Control Structures*	→	*Renourishment + Control Structures*	-	-	*25.3*	-	-	-	-

[1] Cost + loss is equal to the total cost estimate (operational + capital costs) for the full 100 year pathway + residual losses due to events that exceed a 1 in 100-year chance of occurrence.

[2] Value for Money measure – how much it costs to "purchase" each MCDA point based on the MCDA score and total cost estimate (operational + capital) of each 100 year pathway

[3] Mid-point cost scenario (including operational costs) for the first stage of each pathway (i.e the short term option). Numbers in brackets are the annual rating cost of the short term option over 20 years.

Figure 10. Summary Table for Unit D: Westshore

Unit C: Bay View										
Pathway	**Short term** →	**Medium term** →	**Long term**	**MCDA Score**	**MCDA ranking**	**Cost + Loss[1] ($m)**	**Cost + Loss[1] ranking**	**VFM[2] ($'000/ point)**	**VFM[2] ranking**	**Short Term build costs[3] ($m)**
PW 1	Status quo →	Managed Retreat →	Managed Retreat	62	**2**	21.34	**6**	336	**6**	0.44 (0.03 / yr)
PW 2	Status quo / Renourishment →	Renourishment + Control Structures →	Managed Retreat	64	**1**	19.06	**5**	280	**5**	3.84 (0.20 / yr)
PW 3	Status Quo/ Renourishment →	Renourishment + Control Structures →	Renourishment + Control Structures	51	**5**	12.70	**2**	207	**2**	3.84 (0.20 / yr)
PW 4	Status Quo/ Renourishment →	Renourishment + Control Structures →	Sea wall	57	**4**	14.68	**3**	220	**3**	3.84 (0.20 / yr)
PW 5	Status quo →	Sea wall →	Managed Retreat	60	**3**	17.32	**4**	270	**4**	0.44 (0.03 / yr)
PW 6	Status quo →	Sea wall →	Sea wall	48	**6**	11.10	**1**	187	**1**	0.44 (0.03 / yr)

[1] Cost + loss is equal to the total cost estimate (operational + capital costs) for the full 100 year pathway + residual losses due to events that exceed a 1 in 100-year chance of occurrence.

[2] Value for Money measure – how much it costs to "purchase" each MCDA point based on the MCDA score and total cost estimate (operational + capital) of each 100 year pathway

[3] Mid-point cost scenario (including operational costs) for the first stage of each pathway (i.e the short term option). Numbers in brackets are the annual rating cost of the short term option over 20 years.

Figure 11. Summary Table for Unit C: Bay View

Unit B: Whirinaki											
Pathway	**Short term**	→	**Medium term**	→	**Long term**	**MCDA Score**	**MCDA ranking**	**Cost + Loss[1] ($m)**	**Cost + Loss[1] ranking**	**VFM[2] ($'000/ point)**	**VFM[2] ranking**	**Short Term build costs[3] ($m)**
PW 1	Status quo	→	Managed Retreat	→	Managed Retreat	59	**3=**	32.29	**6**	515	**6**	0.48 (0.03 / yr)
PW 2	Status quo/ Renourishment	→	Renourishment + Control Structures	→	Managed Retreat	60	**2**	25.39	**5**	363	**5**	4.12 (0.21 / yr)
PW 3	Status quo/ Renourishment	→	Renourishment + Control Structures	→	Renourishment + Control Structures	56	**4**	15.76	**2**	189	**2**	4.12 (0.21 / yr)
PW 4	Status quo/ Renourishment	→	Renourishment + Control Structures	→	Sea wall	62	**1**	17.74	**3**	203	**3**	4.12 (0.21 / yr)
PW 5	Status quo/ Renourishment	→	Sea wall	→	Managed Retreat	59	**3=**	23.64	**4**	340	**4**	0.48 (0.03 / yr)
PW 6	Status quo	→	Sea wall	→	Sea wall	55	**5**	14.16	**1**	163	**1**	0.48 (0.03 / yr)

[1] Cost + loss is equal to the total cost estimate (operational + capital costs) for the full 100 year pathway + residual losses due to events that exceed a 1 in 100-year chance of occurrence.

[2] Value for Money measure – how much it costs to "purchase" each MCDA point based on the MCDA score and total cost estimate (operational + capital) of each 100 year pathway

[3] Mid-point cost scenario (including operational costs) for the first stage of each pathway (i.e the short term option). Numbers in brackets are the annual rating cost of the short term option over 20 years.

Figure 12. Summary Table for Unit B: Whirinaki

Unit L: Clifton										
Pathway	**Short term**	→	**Medium term**	→	**Long term**	**MCDA Score**	**MCDA ranking**	**Cost + Loss[1] ($m)**	**Cost + Loss[1] ranking**	**VFM[2] ($'000/ point)**	**VFM[2] ranking**	**Short Term build costs[3] ($m)**
PW 1	Renourishment	→	Managed Retreat	→	Managed Retreat	67	**2**	12.20	**6**	173	**5**	7.12 (0.44 / yr)
PW 2	Renourishment + Control Structures	→	Renourishment + Control Structures	→	Managed Retreat	59	**3**	10.47	**5**	159	**4**	6.25 (0.40 / yr)
PW 3	Renourishment + Control Structures	→	Renourishment + Control Structures	→	Renourishment + Control Structures	52	**4**	9.60	**3**	156	**3**	6.25 (0.40 / yr)
PW 4	Renourishment + Control Structures	→	Renourishment + Control Structures	→	Sea wall	43	**6**	10.29	**4**	205	**6**	6.25 (0.40 / yr)
PW 5	Sea wall	→	Sea wall	→	Managed Retreat	70	**1**	8.83	**2**	110	**1**	5.23 (0.38 / yr)
PW 6	Sea wall	→	Sea wall	→	Sea wall	49	**5**	7.65	**1**	126	**2**	5.23 (0.38 / yr)

[1] Cost + loss is equal to the total cost estimate (operational + capital costs) for the full 100 year pathway + residual losses due to events that exceed a 1 in 100-year chance of occurrence.

[2] Value for Money measure – how much it costs to "purchase" each MCDA point based on the MCDA score and total cost estimate (operational + capital) of each 100 year pathway

[3] Mid-point cost scenario (including operational costs) for the first stage of each pathway (i.e the short term option). Numbers in brackets are the annual rating cost of the short term option over 20 years.

Figure 13. Summary Table for Unit L: Clifton

Unit K2: Te Awanga										
Pathway	**Short term**	→	**Medium term**	→	**Long term**	**MCDA Score**	**MCDA ranking**	**Cost + Loss[1] ($m)**	**Cost + Loss[1] ranking**	**VFM[2] ($'000/ point)**	**VFM[2] ranking**	**Short Term build costs[3] ($m)**
PW 1	Renourishment	→	Retreat the Line	→	Managed Retreat	50	**4**	24.15	**6**	403	**6**	8.84 (0.55 / yr)
PW 2	Renourishment + Control Structures	→	Renourishment + Control Structures	→	Retreat the Line	58	**2**	17.08	**2**	194	**2**	8.98 (0.60 / yr)
PW 3	Renourishment + Control Structures	→	Renourishment + Control Structures	→	Renourishment + Control Structures	62	**1**	16.77	**1**	171	**1**	8.98 (0.60 / yr)
PW 4	Renourishment + Control Structures	→	Renourishment + Control Structures	→	Sea wall	53	**3**	18.48	**3**	232	**3**	8.98 (0.60 / yr)
PW 5	Renourishment	→	Sea wall	→	Retreat the Line	43	**5=**	20.00	**5**	329	**5**	8.84 (0.55 / yr)
PW 6	Sea wall	→	Sea wall	→	Sea wall	43	**5=**	18.67	**4**	291	**4**	9.08 (0.66 / yr)
PW 30	*Retreat the Line*					--	--	*14.94*	--	--	--	

[1] Cost + loss is equal to the total cost estimate (operational + capital costs) for the full 100 year pathway + residual losses due to events that exceed a 1 in 100-year chance of occurrence.

[2] Value for Money measure – how much it costs to "purchase" each MCDA point based on the MCDA score and total cost estimate (operational + capital) of each 100 year pathway

[3] Mid-point cost scenario (including operational costs) for the first stage of each pathway (i.e the short term option). Numbers in brackets are the annual rating cost of the short term option over 20 years.

Figure 14. Summary Table for Unit K2: Te Awanga

Unit K1: Haumoana										
Pathway	**Short term** →	**Medium term** →	**Long term**	**MCDA Score**	**MCDA ranking**	**Cost + Loss[1] ($m)**	**Cost + Loss[1] ranking**	**VFM[2] ($'000 / point)**	**VFM[2] ranking**	**Short Term build costs[3] ($m)**
PW 1	Renourishment →	Managed Retreat →	Managed Retreat	61	**3=**	24.15	**6**	682	**6**	10.55 (0.70 / yr)
PW 2	Renourishment + Control Structures →	Renourishment + Control Structures →	Managed Retreat	72	**1**	17.08	**2**	360	**3**	12.90 (0.85 / yr)
PW 3	Renourishment + Control Structures →	Renourishment + Control Structures →	Retreat the Line	61	**3=**	16.77	**1**	256	**2**	12.90 (0.85 / yr)
PW 4	Renourishment + Control Structures →	Renourishment + Control Structures →	Renourishment + Control Structures	62	**2**	18.48	**3**	233	**1**	12.90 (0.85 / yr)
PW 5	Renourishment + Control Structures →	Renourishment + Control Structures →	Sea wall	50	**4**	20.00	**5**	362	**4**	12.90 (0.85 / yr)
PW 6	Sea wall →	Sea wall →	Sea wall	46	**5**	18.67	**4**	404	**5**	15.74 (1.15 / yr)
PW 30	*Retreat the Line*			--	--	*14.94*		--	--	

[1] Cost + loss is equal to the total cost estimate (operational + capital costs) for the full 100 year pathway + residual losses due to events that exceed a 1 in 100-year chance of occurrence.

[2] Value for Money measure – how much it costs to "purchase" each MCDA point based on the MCDA score and total cost estimate (operational + capital) of each 100 year pathway

[3] Mid-point cost scenario (including operational costs) for the first stage of each pathway (i.e the short term option). Numbers in brackets are the annual rating cost of the short term option over 20 years.

Figure 15. Summary Table for Unit K1: Haumoana

Unit J: Clive / East Clive											
Pathway	**Short term**	→	**Medium term**	→	**Long term**	**MCDA Score**	**MCDA ranking**	**Cost + Loss[1] ($m)**	**Cost + Loss[1] ranking**	**VFM[2] ($'000/ point)**	**VFM[2] ranking**	**Short Term build costs[3] ($m)**
PW 1	Status Quo	→	Renourishment + Control Structures	→	Retreat the Line / Managed Retreat	78	**1**	40.78	**3**	403	**3**	1.35 (0.07 / yr)
PW 2	Status Quo	→	Renourishment + Control Structures	→	Renourishment + Control Structures	76	**2**	18.61	**1**	76	**1**	1.35 (0.07 / yr)
PW 3	Status Quo	→	Sea wall	→	Retreat the Line / Managed Retreat	62	**3**	43.25	**4**	546	**4**	1.35 (0.07 / yr)
PW 4	Status Quo	→	Sea wall	→	Sea wall	50	**4**	21.77	**2**	178	**2**	1.35 (0.07 / yr)

[1] Cost + loss is equal to the total cost estimate (operational + capital costs) for the full 100 year pathway + residual losses due to events that exceed a 1 in 100-year chance of occurrence.

[2] Value for Money measure – how much it costs to "purchase" each MCDA point based on the MCDA score and total cost estimate (operational + capital) of each 100 year pathway

[3] Mid-point cost scenario (including operational costs) for the first stage of each pathway (i.e the short term option). Numbers in brackets are the annual rating cost of the short term option over 20 years.

Figure 16. Summary Table for Unit J: Clive/East Clive

12.10 EVALUATION OUTCOMES (WORKSHOP 11)

The Panels considered feedback from the final community discussion sessions and reviewed a draft of this report before confirming their final recommendations for each priority unit (Table 12 and Table 13). The Panels also captured a number of supplementary recommendations that were developed throughout the 11-workshop process. These recommendations are presented in full in **Part B** of this report.

Table 12. Final Preferred Pathways – Northern Panel

UNIT E1: AHURIRI – PATHWAY 6				
Short term (0 – 20 years)	→	Medium term (20 – 50 years)	→	Long term (50 – 100 years)
Status quo	→	**Sea wall**	→	**Sea wall**
UNIT E2: PANDORA – PATHWAY 3				
Short term (0 – 20 years)	→	Medium term (20 – 50 years)	→	Long term (50 – 100 years)
Inundation Protection	→	**Inundation Protection**	→	**Inundation Protection**
UNIT D: WESTSHORE – PATHWAY 3				
Short term (0 – 20 years)	→	Medium term (20 – 50 years)	→	Long term (50 – 100 years)
Renourishment	→	**Renourishment + Control Structures**	→	**Renourishment + Control Structures**
UNIT C: BAY VIEW – PATHWAY 3				
Short term (0 – 20 years)	→	Medium term (20 – 50 years)	→	Long term (50 – 100 years)
Status Quo / Renourishment	→	**Renourishment + Control Structures**	→	**Renourishment + Control Structures**
UNIT B: WHIRINAKI – PATHWAY 4				
Short term (0 – 20 years)	→	Medium term (20 – 50 years)	→	Long term (50 – 100 years)
Status Quo / Renourishment	→	**Renourishment + Control Structures**	→	**Sea wall**

Table 13. Final Preferred Pathways – Southern Panel

UNIT L: CLIFTON – PATHWAY 5				
Short term (0 – 20 years)	→	Medium term (20 – 50 years)	→	Long term (50 – 100 years)
Sea wall	→	**Sea wall**	→	**Managed Retreat**
UNIT K2: TE AWANGA – PATHWAY 3				
Short term (0 – 20 years)	→	Medium term (20 – 50 years)	→	Long term (50 – 100 years)
Renourishment + Groynes	→	**Renourishment + Groynes**	→	**Renourishment + Groynes**
UNIT K1: HAUMOANA– PATHWAY 2				
Short term (0 – 20 years)	→	Medium term (20 – 50 years)	→	Long term (50 – 100 years)
Renourishment + Groynes	→	**Renourishment + Groynes**	→	**Managed Retreat**
UNIT J: CLIVE/EAST CLIVE – PATHWAY 1				
Short term (0 – 20 years)	→	Medium term (20 – 50 years)	→	Long term (50 – 100 years)
Status Quo	→	**Renourishment + Groynes**	→	**Retreat the Line / Managed Retreat**

PART D

Appendices

13. APPENDICES

The following supporting reports and Assessment Panel outputs are referred to in this report and/or have been produced by the Assessment Panels as part of their process.

Given the significant volume of material involved (more than 500 pages), these reports and outputs are not reproduced in this report, but are compiled and available for download from the Strategy website at www.hbcoast.co.nz/panels.

13.1 APPENDIX LIST

Appendix 1	Panel Membership List
Appendix 2	Assessment Panels Terms of Reference
Appendix 3	Northern Cell Assessment Panel Workshop Minutes: › Workshop 1 – 31 January 2017 › Workshop 2 – 15 February 2017 › Workshop 3 – 2 March 2017 › Workshop 4 – 21 March 2017 › Workshop 5 – 24 May 2017 › Workshop 6 – 16 June 2017 › Workshop 7 – 10 July 2017 › Workshop 8 – 15 August 2017 › Workshop 9 – 5 September 2017 › Workshop 10 – 7 November 2017 › Workshop 11 – 7 December 2017
Appendix 4	Southern Cell Assessment Panel Workshop Minutes: › Workshop 1 – 31 January 2017 › Workshop 2 – 2 February 2017 › Workshop 3 – 16 February 2017 › Workshop 4 – 3 March 2017 › Workshop 5 – 3 May 2017 › Workshop 6 – 25 May 2017 › Workshop 7 – 15 June 2017 › Workshop 8 – 6 July 2017 › Workshop 9 – 4 August 2017 › Workshop 10 – 2 November 2017 › Workshop 11 – 5 December 2017

Appendix 5	Supplementary Workshop – 27 April 2017 › Workshop minutes › Technical questions and answers
Appendix 6	Feedback from Public Discussion Sessions › Northern Cell Community meeting – 6 June 2017 › Southern Cell Community Meeting – 17 May 2017 › Northern Cell Community meeting – 29 November 2017 › Southern Cell Community Meeting – 22 November 2017
Appendix 7	Cultural Values Report - Clifton to Tangoio Coastal Hazards Strategy 2120
Appendix 8	Social Impact Assessment and Valuation Report: Cape Coast Area
Appendix 9	Social Impact Assessment and Valuation Report: East Clive Area
Appendix 10	Social Impact Assessment and Valuation Report: Ahuriri/Pandora, Westshore, Bayview and Whirinaki
Appendix 11	Real Options Analysis of Strategies to Manage Coastal Hazard Risks: Northern Units B-E
Appendix 12	Real Options Analysis of Strategies to Manage Coastal Hazard Risks: Southern Units J-L
Appendix 13	Northern Cell Final Pathways (one-page summaries)
Appendix 14	Southern Cell Final Pathways (one-page summaries)
Appendix 15	MCDA Scoring Matrix – Northern Cell Priority Units
Appendix 16	MCDA Scoring Matrix – Southern Cell Priority Units