



Meeting of the Hawke's Bay Regional Council

Date: 28 August 2024
Time: 11.00am
Venue: Council Chamber
Hawke's Bay Regional Council
159 Dalton Street
NAPIER

Attachments Excluded From Agenda

Item	Title	Page
5.	Clifton to Tangoio Coastal Hazards Strategy 2120	
	Attachment 1: Clifton to Tangoio Coastal Hazards Strategy 2120 <i>online only</i>	2

Clifton to Tangoio Coastal Hazards Strategy 2120



Clifton to Tangoio Coastal Hazards Strategy 2120



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Page 2

Clifton to Tangoio Coastal Hazards Strategy 2120



Contents

Executive Summary	4
PART A: CONTEXT	5
Introduction	6
Northern and Southern Cell Assessment Panels.....	6
Vision and Objectives	6
The Coastline.....	8
Climate Change, Hazards, and Risks.....	10
Strategy Development Process	12
PART B: STRATEGIC DIRECTION.....	23
Strategic Overview	24
Mātauranga Māori	24
Signals, Triggers and Thresholds	26
Regulatory Framework.....	29
Coastal Ecology.....	31
Coastal Hazard Responses – Immediate Actions	32
<i>Bay View and Westshore</i>	<i>32</i>
<i>Haumoana and Te Awanga</i>	<i>36</i>
Coastal Hazard Responses – Short Term.....	43
<i>Whirinaki.....</i>	<i>43</i>
Coastal Hazard Responses (all Priority Units) – Medium and Long-Term.....	44
Funding Principles	45
Monitoring, Review and Adjustment	48
PART C: IMPLEMENTATION	50
Action Plan	50
Strategy Action Plan	51
Implementation.....	53
Appendices	54
1. Acknowledgements.....	54
2. Glossary of abbreviations and terms	55
3. References.....	56



Executive Summary

The Clifton to Tangoio Coastal Hazards Strategy 2120 is a coordinated approach to identifying and responding to the hazards of coastal erosion and coastal inundation (overtopping and flooding from the sea), and the influence of climate change and sea level rise, over the next 100 years.

The Strategy covers the coastline between Tangoio in the north, and Clifton in the south. Centred around the city of Napier, this is the most populated stretch of coastline in Te Matau-a-Māui Hawke's Bay.

Coastal settlements within the Strategy area, including Tangoio, Whirinaki, Bay View, East Clive, Haumoana, Te Awanga and Clifton, and a number of suburbs of Napier including Westshore, Ahuriri and Pandora, are exposed to the risks of coastal erosion and/or coastal inundation. These coastal hazards have been prevalent for decades; in Haumoana, the complete loss of homes has already been experienced. With climate change, these risks will continue to increase and change.

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 development process has been underpinned and driven by a collaborative, community-up process, led by the Northern and Southern Cell Assessment Panels. The Panels were formed by community members, mana whenua, local business, Department of Conservation, and other representatives. With support from independent technical expertise, the Panels carefully considered a wide range of options before recommending 100-year, adaptive pathways for nine priority locations along the coast.

The work of the Panels, and their recommendations, provides the foundation for this Strategy.

The Strategy is set out in three parts:

Context which provides an overview of the Strategy, its vision, objectives and development process

Strategic Actions which sets out the key strategic actions that have been identified to achieve the vision and objectives of the Strategy

Implementation which sets out how Strategy actions will be implemented.

Twenty key actions are identified to drive Strategy implementation. Most actions are supported by underlying technical reference reports to provide context and guidance for implementation.

Critically, the actions and overall Strategy are underpinned by an adaptive planning approach. While we know climate change will continue to impact our coastline, we have no certainty on the degree of impact or pace of change. By remaining flexible, keeping future options open, establishing triggers to drive actions, and a monitoring programme to help identify when change is happening, the Strategy can respond effectively to an uncertain future.

Successfully implemented, the vision of the Strategy can be realised, and our coastal communities and values can achieve a resilient future.

This Strategy provides a model that can be built on and adapted for other communities in Te Matau-a-Māui Hawke's Bay, with regional-scale resilience an ultimate goal.



Context

Clifton to Tangoio
Coastal Hazards Strategy 2120

Clifton to Tangoio Coastal Hazards Strategy 2120



Introduction

The Clifton to Tangoio Coastal Hazards Strategy 2120 is a coordinated approach to identifying and responding to the hazards of coastal erosion and coastal inundation (overtopping and flooding from the sea), and the influence of climate change and sea level rise, over the next 100 years.

Following a collaborative development process by the Hastings District Council, Napier City Council and Hawke's Bay Regional Council (Partner Councils), Maungaharuru-Tangitū Trust, Mana Ahuriri Trust and Tamatea Pōkai Whenua, Strategy implementation is being led by the Hawke's Bay Regional Council.

The Strategy is set out in three parts:

Context which provides an overview of the Strategy, its vision, objectives and development process

Strategic Actions which sets out the key strategic actions that have been identified to achieve the vision and objectives of the Strategy

Implementation which sets out how the strategic actions will be implemented.

Northern and Southern Cell Assessment Panels

The Northern and Southern Cell Assessment Panels (the Panels) were fundamental to Strategy development. Their work and recommendations, as presented in their 2018 report (Bendall 2018), provides the foundation and direction for the Strategy. This Strategy is the response to those recommendations and proposes the implementation of actions that will build long-term resilience. The process the Panel's followed to arrive at their recommendations is summarised on page 16.

Vision and Objectives

As part of the work of the two Community Panels, a vision and objectives were developed to define what a successful outcome for the Strategy looks like. The vision and objectives remain unchanged from those developed with the Panels:

Vision

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

It is highlighted that the Strategy's vision is deliberate in the use of the term 'resilient'. The Strategy is not seeking to achieve absolute protection from coastal hazards risks; this is not realistic. Instead, the Strategy is seeking to provide for a resilient future, which is about the ability to anticipate and minimise the adverse impacts of coastal hazards and adapt in a way that allows for learning and thriving.

Clifton to Tangoio Coastal Hazards Strategy 2120



Objectives

1. To take a long-term approach to coastal hazards impact management in order to develop resilient communities out to 2120.
2. To identify the choice or series of choices that provide the most cost-effective outcome for the Hawke's Bay community, while addressing economic, environmental, cultural, and social issues.
3. To ensure cultural concerns are considered prior to options being progressed.
4. To take a consistent, coordinated, and shared approach between Hastings District Council, Napier City Council and Hawke's Bay Regional Council.
5. To take an informed, consultative, and coordinated approach with stakeholders and interest groups.
6. To make decisions that align with national-level guidance, directions, and policies, including the New Zealand Coastal Policy Statement 2010 and findings of the Parliamentary Commissioner for the Environment.
7. To ensure that responses to coastal hazards are developed in an integrated way that considers risk, cost, impacts, and indirect effects.
8. To ensure that responses to coastal hazards are assessed on the basis of adaptability and the site-specific nature of the particular coastal hazard, and do not preclude or unnecessarily constrain choices to adopt different options into the medium and longer-term horizons.
9. To take into account the impact of coastal hazards responses on natural coastal processes, and any resulting impacts on other parts of the coast.
10. To make evidence-based decisions founded on best practice coastal science and good data.
11. 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.
12. To ensure the timely provision of information on hazards, risks and uncertainties to private landowners and the wider community to encourage prudence in decision-making relating to private property.
13. To avoid creating perverse incentives for private landowners to undertake actions that increase costs and risks to the wider community.
14. To minimise public costs arising from decisions made by private landowners, which incur unnecessary risks despite available information.

For the avoidance of doubt, these objectives are not listed in any deliberate order of priority.

Clifton to Tangoio Coastal Hazards Strategy 2120



The Coastline



Figure 1: Clifton to Tangoio Coastal Hazards Strategy 2120 area

The Strategy covers the coastline between Tangoio in the north, and Clifton in the south (Figure 1); centred around the city of Napier, today this represents the most populated stretch of coastline in Te Matau-a-Māui Hawke's Bay.

Early occupation of Te Matau-a-Māui Hawke's Bay spans the hundreds of years leading up to the arrival of Ngāti Kahungunu, circa AD1550, continuing uninterrupted until the arrival of explorers, sealers, and whalers in the late 1700s (Ropiha 2017).

Pre-settlement occupation of the area included:

- fortified pā, strategically sited on cliff tops or on islands that afforded vigil over the ocean with natural landforms such as steep gullies, hilltops or spurs providing security from attack by enemies
- kāinga, villages located close to protective pā with easy access to freshwater where daily activities occurred
- māra, cultivations of kūmara and other crops
- nohoanga, temporary locations of seasonal fishing and hunting activity.

This coast has experienced significant changes since European settlement, in part due to human-induced environmental impacts, but to a considerable extent by the 1931 earthquake that altered land elevations (Komar & Harris 2014).

At the same time, episodes of extreme storm waves and progressively rising sea levels have impacted this coast, locally resulting in the erosion of beaches and sea cliffs (Komar & Harris 2014).

Today, coastal settlements at Tangoio, Whirinaki, Bay View, East Clive, Haumoana, Te Awanga and Clifton, and a number of suburbs of Napier including Westshore, Ahuriri and Pandora, are exposed to the risks of coastal erosion and/or coastal inundation.

These coastal hazards have been prevalent for decades, and in some places, such as Haumoana, have already resulted in the complete loss of homes.

Clifton to Tangoio Coastal Hazards Strategy 2120



Figure 2: Looking north – part of Ahuriri can be seen in the foreground, with part of Pandora Lagoon visible to the left. Westshore is in the middle ground, with Bay View distantly visible to the north.



Figure 3: Looking south - Haumoana in the foreground, and Cape Kidnappers in the distance. Te Awanga can also just be seen further along the coast from Haumoana.

Clifton to Tangoio Coastal Hazards Strategy 2120



Climate Change, Hazards, and Risks

Global sea levels have changed significantly over Earth's history – sea levels have been much higher than they are now, and much lower.

Long-term tide records in Aotearoa New Zealand show that sea levels are going up; we have experienced a rise of around 0.2 metres since 1900, with the rate of rise increasing over time.

The key drivers of sea level rise are:

- ocean temperature (thermal expansion)
- adding water to the ocean from melting glaciers, ice sheets, etc
- changes in winds and ocean currents
- land subsiding (vertical land movement).

We can't predict what future sea levels will be, but we can make projections using different inputs and assumptions.

One of the most important assumptions is trajectories of global greenhouse gas emissions – will we do a good job of reducing emissions, carry on as we have been, or get worse?

The Intergovernmental Panel on Climate Change (IPCC) uses scenarios called Shared Socio-economic Pathways or SSPs (formerly Representative Concentration Pathways or RCPs) to show these possible futures.

The NZ SeaRise: Te Tai Pari O Aotearoa programme (www.searise.nz) has released sea-level rise projections out to the year 2300 for every 2km of the coast of New Zealand.

By combining New Zealand data with SSPs, we get an idea of what some possible futures might be (Figure 4). The further ahead in time we look, the more uncertain and variable the possible outcomes become.

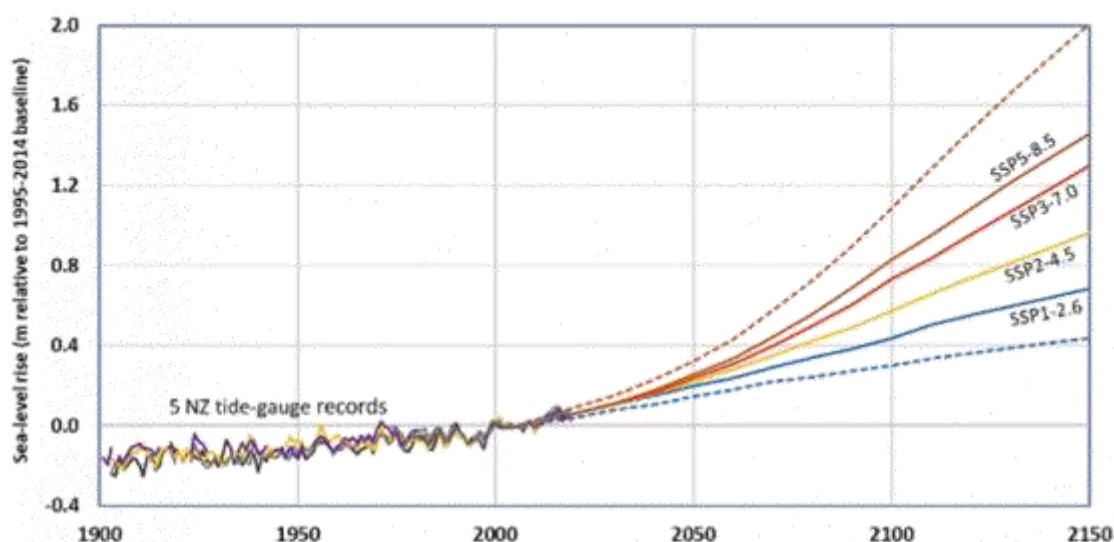


Figure 4: Projections for Sea Level Rise in New Zealand including historic tide data. Source: www.searise.nz

Clifton to Tangoio Coastal Hazards Strategy 2120



Councils are tasked (through the New Zealand Coastal Policy Statement 2010, Policy 24) with looking at least 100 years ahead to plan for coastal hazards and climate change. That means planning for significant uncertainty.

A good plan will allow actions to be completed in time to avoid the worst impacts being experienced by people and communities. But we don't want to act too early – that would mean spending money and impacting people unnecessarily.

Adaptive pathways planning (also called Dynamic Adaptive Pathways Planning or DAPP) is one approach to identify what actions to take and when to effectively respond to coastal hazards.

The Strategy has been guided by the 2017 version of the Ministry for the Environment's *Coastal hazards and climate change guidance*, most recently updated in 2024 (Ministry for the Environment 2024). This guidance sets out a 10-step decision making process (Figure 5). The process followed by the Strategy has been strongly influenced by this approach and largely follows it, particularly in the development of adaptive pathways. The Strategy's development process is fully described from page 12.



Figure 5: Ministry for the Environment 10-step decision cycle.

Clifton to Tangoio Coastal Hazards Strategy 2120



Strategy Development Process

The Strategy has been developed in 4 stages, as outlined in Figure 6 and described in the following sections.



Figure 6: Strategy development process

Stage 1: Define the Problem

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 work was undertaken by specialist consultants Tonkin & Taylor, who produced two reports: *Coastal Hazards Assessment* (Tonkin & Taylor 2016a) and *Coastal Risk Assessment* (Tonkin & Taylor 2016b). The coastal hazard assessment work was independently peer reviewed by Professor Paul Kench of Auckland University.

A key data set informing both the hazard and risk assessment work is the wealth of beach profile information available between Tangoio and Clifton (Table 1). A series of 23 profiles along the shoreline provide long term trends for erosion and accretion and changing beach profiles. The profile locations are regularly spaced (1-2km increments) between Clifton and Tangoio and have been surveyed for more than 40 years in most locations; in some cases, survey data is available from the 1930s. Beach profile surveys were undertaken generally once a year until 2004. In 2004, surveys were carried out every month, and have subsequently been surveyed multiple times a year.

The *Coastal Hazard Assessment* (Tonkin & Taylor 2016a) built on this beach profile information, previous hazard studies and ongoing research and investigations into the coastal processes of the Strategy area. The report quantifies the possible extent of the following hazards:

- coastal erosion (storm cut, trends, effects of sea level rise)
- coastal inundation (storm surge, set-up, run-up, overtopping and sea level rise)
- tsunamis.

Clifton to Tangoio Coastal Hazards Strategy 2120



Table 1: Beach Profile Surveys: Clifton to Tangoio

Profile Number	Location	First survey date
HB1	Clifton	27/04/1972
HB2	Te Awanga	23/01/1973
HB3	Southern end of Haumoana	21/11/1974
HB4	Haumoana	13/11/1974
HB5	East Clive	4/10/1989
HB6	Clive	4/10/1989
HB7	Waitangi/Awatoto	1/01/1939
HB8	Awatoto	1/01/1946
HB9	Te Awa Avenue	19/12/1983
HB10	Te Awa Avenue	19/12/1983
HB11	Marine Parade	21/03/1930
HB12	Northern end of Marine Parade	13/11/1974
HB13	Southern end of Westshore	27/08/1975
HB14	Westshore	20/09/1979
HB15	Northern end of Westshore	27/05/1948
HB16	Southern end of Bay View	21/08/1974
HB17	Bay View	20/12/1995
HB18	Northern end of Bay View	5/12/1991
HB19	Southern end of Whirinaki	5/12/1991
HB20	Whirinaki	12/11/1974
HB21	Northern end of Whirinaki	5/12/1991
HB22	Tangoio	5/12/1991
HB23	Tangoio	5/12/1991

Coastal erosion

Coastal erosion hazards were assessed using a probabilistic approach to determine the potential future shoreline position in 2065 and 2120. The approach considered historic erosion trends

evidenced by beach profiles, storm effects and backshore slope stability as well as the possible effects of sea level rise. The probabilistic approach recognises there will always be inherent uncertainties associated with projections, and provides a more transparent way of capturing and presenting such uncertainty. This method results in a range of potential hazard zone extents, ranging from virtually certain to exceptionally unlikely.

Coastal Inundation

The coastal inundation hazard extent was determined for both permanent and extreme inundation along the open coast for present day and for the years 2065 and 2120 for a 10% annual exceedance probability (AEP), 1% AEP and 0.5% AEP event (i.e., a 10-year, 100 year and 200-year return period). Permanent inundation extents were based on the predicted rise in sea level added to present day tidal levels.

Tsunami

Tsunami modelling was also undertaken in this coastal hazard assessment, however, has not been progressed further under the Strategy because tsunami hazard is principally a civil defence planning and response issue. The Strategy has focused on the priority coastal hazards of coastal erosion and coastal inundation, and, through future reviews, is intended to consider new information including additional coastal hazards and multi-hazard assessments.

A mapping tool was also developed to show the newly-mapped hazard extents. This information is available online through the Hawke's Bay Hazard Information Portal at: gis.hbrc.govt.nz/hazards/

The *Coastal Risk Assessment* (Tonkin & Taylor 2016a) provides a regional scale coastal hazard risk assessment using the results of a coastal hazard assessment.

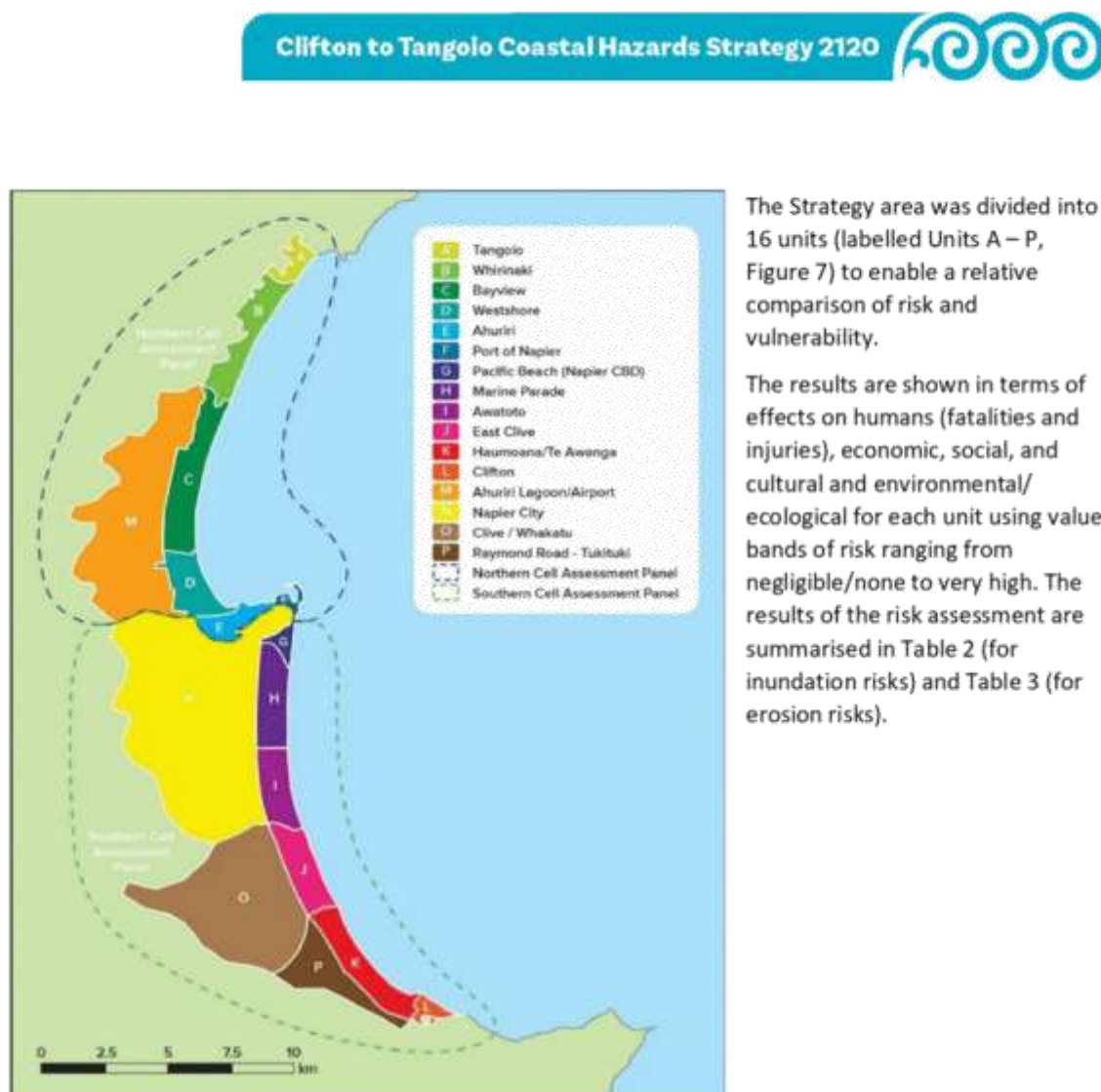


Figure 7: Coastal Units

Table 2: Summary of coastal inundation risk classification.

Mapping unit	1% AEP inundation Current				1% AEP 2065				1% AEP 2120			
	Human	Economic	Social/Cult	Env/Ecol	Human	Economic	Social/Cult	Env/Ecol	Human	Economic	Social/Cult	Env/Ecol
A	Very low	Negligible	None	None	Very low	Negligible	None	None	Very low	Negligible	None	None
B	Very low	Negligible	Moderate	None	Very low	Negligible	Moderate	None	Very low	Very low	Moderate	None
C	Very low	Negligible	None	None	Very low	Negligible	None	None	Very low	Negligible	None	None
D	Very low	Very low	Low	Very high	Very low	Low	Low	Very high	Very low	Low	Low	Very high
E	Very low	Low	Low	Very high	Very low	Moderate	Low	Very high	Very low	Moderate	Low	Very high
F	Very low	Low	None	None	Very low	Low	None	None	Very low	Low	None	None
G	Very low	Negligible	None	None	Very low	Negligible	None	None	Very low		Low	None
H	Very low	Very low	Low	None	Very low	Very low	Low	None	Very low	Very low	Low	None
I	Very low	Negligible	Moderate	Moderate	Very low	Very low	Moderate	Moderate	Very low	Low	Moderate	Moderate
J	Very low	Negligible	None	High	Very low	Moderate	None	High	Very low	Very high	None	Very high
K	Very low	Low	None	Moderate	Very low	Moderate	None	Moderate	Very low	High	Moderate	High
L	Very low	Negligible	None	None	Very low	Low	Moderate	None	Very low	Low	Moderate	None
M	Very low	Negligible	Low	Very high	Very low	Negligible	Low	Very high	Very low	Negligible	Low	Very high
N	Very low	Negligible	None	High	Very low	Negligible	None	High	Very low	Very low	None	High
O	Very low	Negligible	None	None	Very low	Negligible	None	None	Very low	Low	None	None
P	Very low	Negligible	None	None	Very low	Negligible	None	None	Very low	Negligible	None	None

Clifton to Tangoio Coastal Hazards Strategy 2120



Table 3: Summary of coastal erosion risk classification.

Mapping unit	P1% Current				P1% 2065				P1% 2120			
	Human	Economic	Social/Cult	Env/Ecol	Human	Economic	Social/Cult	Env/Ecol	Human	Economic	Social/Cult	Env/Ecol
A	Very low	Very low	None	None	Very low	Very low	None	None	Very low	Very low	None	None
B	Very low	Low	None	None	Very low	Moderate	None	None	Very low	High	None	None
C	Very low	Very low	None	None	Very low	Low	None	None	Very low	Moderate	None	None
D	Very low	Very low	Low	None	Very low	High	Low	None	Very low	Very high	Moderate	None
E	Very low	Very low	None	None	Very low	Moderate	Low	None	Very low	Moderate	Low	None
F	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
G	Very low	Low	None	None	Very low	Low	None	None	Very low	Moderate	Low	None
H	Very low	Very low	None	None	Very low	Negligible	None	None	Very low	Negligible	None	None
I	Very low	Very low	None	None	Very low	Negligible	None	None	Very low	Negligible	None	None
J	Very low	Negligible	None	None	Very low	Low	None	None	Very low	Very high	None	None
K	Very low	Low	None	None	Very low	Moderate	None	None	Very low	High	None	None
L	Very low	Very low	None	None	Very low	Low	Moderate	None	Very low	Low	Moderate	None
M	Very low	Negligible	None	None	Very low	Negligible	None	None	Very low	Negligible	None	None
N	Very low	Negligible	None	None	Very low	Negligible	None	None	Very low	Negligible	None	None
O	Very low	Negligible	None	None	Very low	Negligible	None	None	Very low	Negligible	None	None
P	Very low	Negligible	None	None	Very low	Negligible	None	None	Very low	Negligible	None	None

Stage 2: Framework for Decisions

Stage 2 began in 2016 and included the development of a decision-making framework to design responses to the hazard and risk information developed in Stage 1.

The approach was based on a community decision-making model and utilised a range of decision-making tools including Multi-Criteria Decision Analysis (MCDA), Dynamic Adaptive Planning Pathways (DAPP) and Real Options Analysis (ROA).

The Strategy was the first in New Zealand to implement Ministry for the Environment's *Coastal hazards and climate change guidance* (Ministry for the Environment 2024). While the Strategy process is described differently (i.e., 4 stages, rather than 10 steps), the principles outlined in the guidance have been followed, particularly in the use of DAPP.

Also during Stage 2, a funding model think-piece report was prepared. 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 public/private benefits, the sharing of costs between councils, and mechanisms for securing funds, including a proposal for establishing a Coastal Contributory Fund.

Clifton to Tangoio Coastal Hazards Strategy 2120



Stage 3: Develop Responses

Stage 3 commenced in 2017 and involved the implementation of the decision-making framework developed in Stage 2. Two Assessment Panels were formed to drive the

community-led process (Table 4, Table 5); the Northern Panel focused on the Strategy area north of the Port of Napier (Units A to E), and the Southern Panel focusing on the equivalent area south of the Port (Units G to L).

Table 4: Northern Cell Evaluation Panel Structure

Panel 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 Trust (1)	Technical Advisory Group (6)
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)		

Table 5: Southern Cell Evaluation Panel Structure

Panel Members	Observer Participants	Support Roles
Tangata Whenua (3)	HBRC Councillor (1)	Independent Chair (1)
Clifton/Te Awanga Community (3)	NCC Councillor (1)	Kaumatua (1)
Haumoana Community (3)	HDC Councillor (1)	Facilitator (1)
East Clive Community (4)	Mana Ahuriri Trust (1)	Assistant Facilitator (1)
Marine Parade Community (1)	Tamatea Pōkai Whenua (previously He Toa Takitini) (1)	Technical Advisory Group (6)
Recreational Interests (1)	Port of Napier (1)	Technical Advisory Group (3)
Awatoto Businesses (1)		Panel Secretary (1)
Napier CBD Businesses (1)		Living at the Edge (2)
NZTA / Lifelines (1)		
Department of Conservation (1)		
Regional representative (1)		
Total Voting (20)		

Clifton to Tangoio Coastal Hazards Strategy 2120



The Panels worked through a structured decision-making assessment process completed through a series of 11 workshops during 2017 and 2018 (Figure 8).

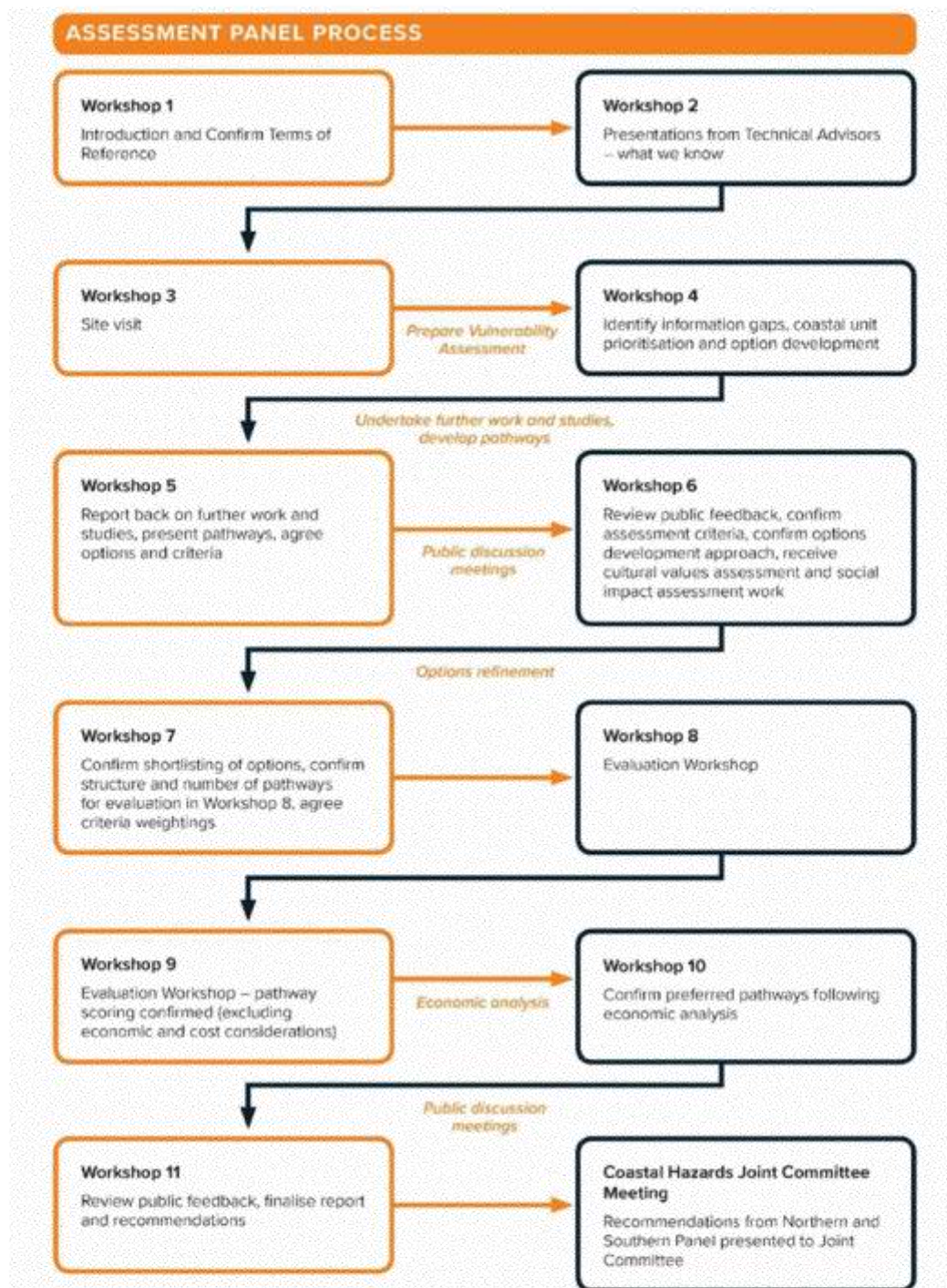


Figure 8: Assessment Panel process

Clifton to Tangoio Coastal Hazards Strategy 2120



Applying a modified DAPP process, the Panels developed 100-year pathways for 9 priority units along the coast. Each pathway is built from a combination of short term (approx. 0 – 20 years), medium term (approx. 20 – 50 years) and long term (approx. 50 – 100 years) hazard response actions.

Six potential pathways were developed for each priority unit based on the outcomes of a high-level vulnerability assessment. The range of pathways were designed to represent the spectrum of possible responses; from no or low

intervention, to soft engineering (e.g., beach re-nourishment), hard engineering (e.g., sea walls) and retreat. The pathways were then assessed using multi-criteria decision analysis (MCDA) to determine an order of preference, in terms of each pathway's performance against defined criteria developed by the Panels (Table 6).

The MCDA assessment excluded cost as a criterion for assessing pathway performance. This was done so that cost considerations could be applied separately, rather than directly affecting the ranking of options through MCDA.

Table 6: Assessment criteria developed by the Panels to apply to all pathways using MCDA

Criteria	Description
Technical Assessment Criteria	Manages the risks of storm surge inundation <ul style="list-style-type: none"> ➤ Reduced exposure to risks from storm surge inundation ➤ Meets objectives over long timeframes ➤ Proportionate to the scale and nature of risk
	Manages the risks of coastal erosion <ul style="list-style-type: none"> ➤ Reduced exposure to risks from coastal erosion ➤ Meets objectives over long timeframes ➤ Proportionate to the scale and nature of risk
	Ability to adapt to increasing risks <ul style="list-style-type: none"> ➤ Readily responds to uncertain climate outcomes ➤ Includes measures to support future adjustments
	Risk transfer <ul style="list-style-type: none"> ➤ Exacerbation of hazard risk in other areas ➤ The transfer of risk to others, including future generations
Impact Assessment Criteria	Socio-economic Impacts <ul style="list-style-type: none"> ➤ Social effects, for example <ul style="list-style-type: none"> ➤ effects on community safety ➤ loss of amenity value ➤ decline in recreational values, community facilities ➤ Indirect economic / industry impacts (e.g., tourism, fishing)
	Relationship of Māori and their culture and traditions with their ancestral lands, water, sites, wāhi tapu, and other taonga <ul style="list-style-type: none"> ➤ Impacts on any cultural sites of significance ➤ Maintains access to, and enables the carrying out of, customary activities
	Natural Environments Impacts <ul style="list-style-type: none"> ➤ Impacts on natural coastal ecosystems ➤ Impacts on the natural character of the coastal environment

Clifton to Tangoio Coastal Hazards Strategy 2120



Capital construction and maintenance costs for each pathway were then introduced. By considering each pathway against its non-cost (i.e., MCDA) and cost assessments, the Panels then confirmed a recommended pathway for each of the 9 priority units. Table 7 below shows an example of the summary sheets used to compile assessment outcomes and select a preferred pathway.

Table 7: Example of pathway analysis summary

Unit K1 Haumoana										
Pathway	Short term	→	Medium term	→	Long term	MCDA score	MCDA ranking	Cost+ Loss ¹ (\$M)	Cost+ Loss ¹ ranking	Short term build costs ³ (\$M)
PW 1	Renourishment	→	Managed retreat	→	Managed retreat	61	3=	24.15	6	10.55 (0.70/yr)
PW 2	Renourishment + control structures	→	Renourishment + control structures	→	Managed retreat	72	1	17.08	2	12.90 (0.85/yr)
PW 3	Renourishment + control structures	→	Renourishment + control structures	→	Retreat the line	61	3=	16.77	1	12.90 (0.85/yr)
PW 4	Renourishment + control structures	→	Renourishment + control structures	→	Renourishment + control structures	62	2	18.48	35	12.90 (0.85/yr)
PW 5	Renourishment + control structures	→	Renourishment + control structures	→	Renourishment + control structures	50	4	20.00	4	12.90 (0.85/yr)
PW 6	Sea wall	→	Sea wall	→	Sea wall	46	5	18.67	5	15.74 (1.15/yr)
PW 30	Retreat the line	→		→		--	--	14.94	--	--

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

²Value for money measure – how much it costs to ‘purchase’ each MCDA point based on the MCDA score and total cost estimate (operational + capital costs) of each 100-yr pathway.

³Mid-point 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 yrs.

Clifton to Tangoio Coastal Hazards Strategy 2120



The Panels produced the report *Clifton to Tangoio Coastal Hazards Strategy 2120 Report of the Northern and Southern Cell Assessment Panels* (Bendall 2017) that captured their process and final recommendations.

The Clifton to Tangoio Coastal Hazards Strategy Joint Committee (Joint Committee), and subsequently each Partner Council, confirmed its receipt of the report and agreed to proceed to

Stage 4 of Strategy development based on its recommendations.

The final recommended pathways from the Panels are presented in Table 8 and Table 9. These pathways were later refined through further community engagement in 2021 and 2022 with updates to the pathways shown as [blue underline text](#).

Table 8: Recommend Pathways: Northern Cell Assessment Panel

Unit	Preferred Pathway	Short Term (= 0-20 yrs)	→	Medium Term (= 20 – 50 yrs)	→	Long Term (= 50 – 100 yrs)
Whirinaki (B)	Pathway 4	Status quo/ renourishment	→	Renourishment + control structures	→	Sea wall
Bay View (C)	Pathway 3	Status quo/ renourishment	→	Renourishment + control structures	→	Renourishment + control structures
Westshore (D)	Pathway 3	Renourishment	→	Renourishment + control structures	→	Renourishment + control structures
Ahuriri (E1)	Pathway 6	Status quo	→	Sea wall	→	Sea wall
Pandora (E2)	Pathway 3	Status quo	→	Storm surge barrier	→	Storm surge barrier

Table 9: Recommend Pathways: Southern Cell Assessment Panel

Unit	Preferred Pathway	Short Term (= 0-20 yrs)	→	Medium Term (= 20 – 50 yrs)	→	Long Term (= 50 – 100 yrs)
East Clive (J)	Pathway 1	Status quo	→	Renourishment + control structures	→	Retreat the line / managed retreat
Haumoana (K1)	Pathway 2	Renourishment + control structures	→	Renourishment + control structures	→	Managed retreat
Te Awanga (K2)	Pathway 3	Renourishment + control structures	→	Renourishment + control structures	→	Renourishment + control structures
Clifton (L)	Pathway 5	Status quo	→	Sea wall	→	Managed retreat

Note the use of the generic term, 'Control Structures' in the recommended pathways refers to structures that are designed to hold the beach in situ and/or build up beach sediment. These structures are usually groynes but may also include offshore breakwaters and constructed reefs.

An important concept is that each pathway is adaptive; the timeframe of each action (short, medium and long) can be brought forward or delayed, depending on the actual effects of coastal hazards and climate change over time. If sea level rises more than expected or at a faster rate, actions can be implemented earlier in response; if less or slower, actions can be delayed. If necessary, the actions themselves can also be reviewed or changed.



Stage 4: Implementation Planning and Response

Stage 4 commenced in 2019 when 8 interrelated workstreams were established (Figure 9) to build further detail around the Assessment Panel recommendations and to develop a proposed Strategy of Council for public notification and comment.

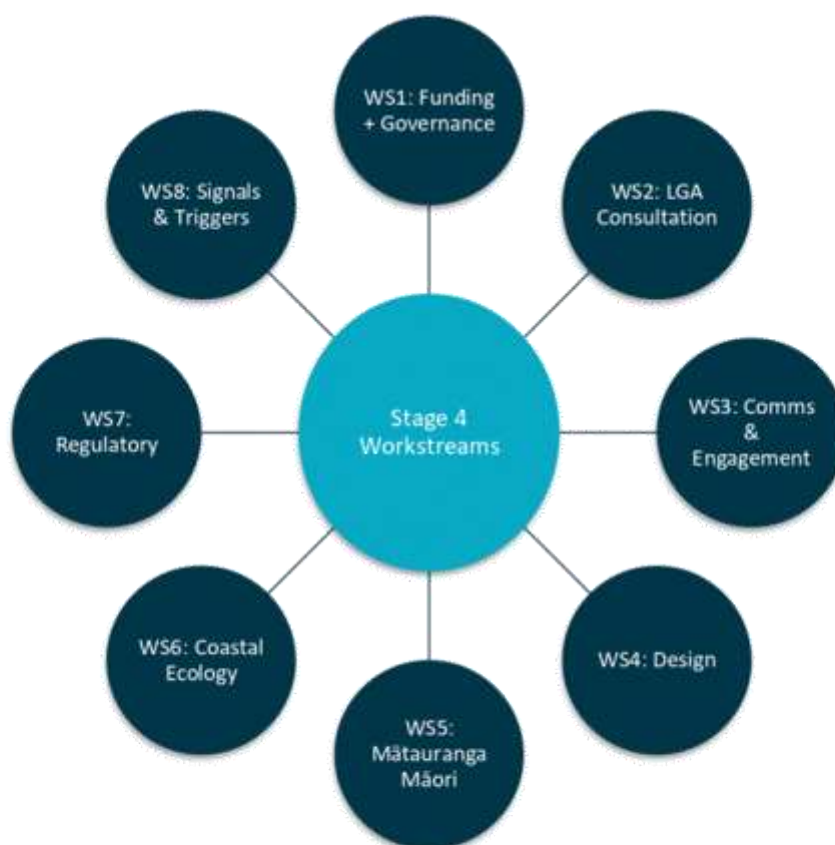


Figure 9: Stage 4 Workstreams

A key challenge was that the Strategy development process was jointly and equally funded by Partner Councils since its inception. However, the Strategy needed to shift from development to implementation, and significant capital and operational expenditure is required to implement the pathways as recommended by the Panels.

The Partner Councils needed to agree how these funds would be raised, and who would lead the consenting, construction, and maintenance requirements. Uncertainties in current legislation about the respective roles of each council in managing hazard risks (i.e., the role of regional councils relative to territorial authorities) and in the funding and implementation of works under the Strategy added to the complexity of the issue.

Clifton to Tangoio Coastal Hazards Strategy 2120



To facilitate an outcome, the Joint Committee engaged Raynor Asher KC to lead a Funding Review. Mr Asher was tasked with answering the following question:

Which council or councils should lead and fund the implementation of coastal hazard mitigation projects (including design, consenting, construction and maintenance cost) under the Strategy?

In undertaking his review, Mr Asher engaged with the Joint Committee, staff and councillors from each Partner Council, considered material developed to date under the Strategy, reviewed relevant historical information, legislation, and case law, and was assisted with local legal advice.

Mr Asher completed his review and presented his findings in the report *Review and Recommendations for the Clifton to Tangoio Coastal Hazards Strategy Joint Committee* (Asher 2021). His primary recommendation was that Hawke's Bay Regional Council should lead Strategy implementation.

The Joint Committee and Partner Councils accepted his recommendations, and the Partner Councils subsequently entered into a Memorandum of Transition (MOT) which was signed by the Chief Executives of all three partner councils on 23 May 2022.

The purpose of the MOT is to:

- Provide a mechanism for the Partner Councils to confirm the agreed arrangements for implementing the Strategy;
- Set out the proposed transfer of assets recommended by the Funding Review; and
- Provide the means for Hawke's Bay Regional Council to undertake a new activity through its Long Term Plan process under the Local Government Act 2002.

Hawke's Bay Regional Council subsequently ran a public consultation process in July 2022 to seek any feedback on its proposal to lead Strategy implementation as set out in the MOT. Following that process, Hawke's Bay Regional Council resolved that it would lead Strategy implementation, subject to confirming this change in its Long Term Plan.

This Strategy document has been prepared with; the recommendations of the Community Panels, further details and refinements added by the Councils through the Stage 4 workstreams, and under the agreed arrangements for Strategy implementation confirmed in the MOT.

Strategic direction

Clifton to Tangoio
Coastal Hazards Strategy 2120



Strategic Overview

To achieve the vision of the Strategy, actions are directed across eight strategic areas:

Mātauranga Māori which sets out the ongoing programme of work to weave Mātauranga Māori through Strategy implementation and review.

Signals, Triggers and Thresholds which sets out the draft adaptation thresholds developed for the Strategy and sets out actions to develop accompanying signals and triggers to drive decisions and actions.

Regulatory Framework which sets out how the local regulatory framework established by key planning documents such as the District Plans, Regional Plan, Regional Coastal Environment Plan and Regional Policy Statement should be amended to address maladaptation risks and to complement rather than hinder the implementation of pathway actions under the Strategy.

Coastal Ecology which sets out actions to build greater knowledge of coastal ecological values within the Strategy area.

Coastal Hazard Actions – Immediate which sets out the pathway actions to be taken as soon as practicable to respond to urgent coastal hazard issues in key locations within the Strategy area.

Coastal Hazard Actions – Short-term which sets out the pathway actions to be taken when trigger points are reached, with an expectation that works will be required to be undertaken in the short term (i.e., within the next 20 years).

Coastal Hazard Actions – Medium and Long Term which sets out the pathway actions that may be taken when trigger points are reached in the medium and longer term (i.e., over next 50-100+ years). These actions are based on current assessments of effective and appropriate actions but will be regularly reviewed over time.

Funding Principles which set out the overall approach to paying for works under the Strategy, with an expectation that the specific rating

models will be developed through Long Term Plan and Annual Plan processes.

Each aspect of strategic direction and associated actions to drive implementation are presented in the following sections.

Mātauranga Māori

This coastal interface was the most active area of human habitation in Te Matau-a-Māui, the initial and enduring home of tipuna for centuries and from their occupation are the inherent mana whenua rights of today.

The interface between the whenua and moana is the area of interest of the Clifton to Tangoio Coastal Hazards Strategy 2120. To mana whenua, the terrain is continuous, that is the whenua is whenua regardless of its covering, be it forest, grassland, freshwater or sea. These variations exhibit their own mauri and allow for diverse life to inhabit within.

The protection, restoration, enhancement, access, and traditional usage of the Takutaimoana is paramount in every circumstance, whether that threat is a coastal hazard, development hazard, industrial hazard, land use hazard or weather-related hazard. In actioning Kaitiakitanga, mana whenua are also enacting Rangatiratanga, Manaakitanga, Whanaungatanga as expected by and for the whānau and hapū.

The Mātauranga Māori Workstream has been established through the Strategy in collaboration with Maungaharuru-Tangitū Trust, Mana Ahuriri Trust, and Tamatea Pōkai Whenua (the Post-Settlement Governance (PSGE) Partners) and under the direct leadership of the Joint Committee.

The purpose of the workstream is *to weave Mātauranga Māori through the ongoing development and implementation of the Clifton to Tangoio Coastal Hazards Strategy.*

Clifton to Tangoio Coastal Hazards Strategy 2120



Five objectives have been defined for the workstream:

1. Develop a Mātauranga framework to articulate the values of tāngata whenua around the coast in a way that respects and protects intellectual property and Mātauranga.
2. Facilitate and support effective tāngata whenua participation in consultation and engagement processes into all aspects of the Strategy.
3. Inform the ongoing development of all workstreams under the Strategy.
4. Provide expertise to support TAG and Joint Committee meetings and deliberations.
5. Maintain cultural safety, protect intellectual property rights, and ensure any information provided by tāngata whenua is appropriately gathered, stored, applied, and protected.

To achieve these objectives, three key outputs are being developed:

Cultural Values Frameworks

Develop cultural framework documents based on areas of interest of the three Post Settlement Governance Entities (PSGEs), that:

- a. capture what's important and valued by whānau, and the depth of relatedness at the coast and spiritual connections
- b. articulate aspirations of whānau and hapū
- c. provide a mechanism for mātauranga (knowledge) to guide the development and implementation of the Strategy
- d. support cross-application e.g., has utility for the Kotahi Plan, District Plans, Resource Management reform, etc.

Mātauranga Māori Implementation and Reporting Plan

Develop a plan to incorporate the Cultural Values Frameworks into the Strategy development and implementation process and monitor outcomes for success.

Taiao Monitoring Plan

Develop an actionable plan for gathering and reporting on coastal attributes and values identified by the Values Frameworks to establish a baseline of information that can support analysis of impacts from climate change, coastal hazards and efforts to respond to and mitigate coastal hazards risks.

The Mātauranga Māori workstream continues to be an area of active work for the Strategy. The workstream outputs noted above remain in development. This is a partnership project, between the Partner Councils and the three PSGEs, and it will proceed at a pace and timeframe that aligns with the capacity and interests of all parties involved in their development.

The Strategy will continue to drive this collaborative effort under the Mātauranga Māori Workstream and must be flexible enough to accommodate outputs as they are developed and agreed, including through adjustment and revision to the Strategy if required.

Actions

Action 1: Continue to resource the development of:

1. Cultural Values Framework(s)
2. Mātauranga Māori Implementation and Reporting Plan
3. a Taiao Monitoring Plan (or alternative outputs as may be agreed with PSGE Partners) under the Mātauranga Māori Workstream and seek to align the Strategy with these outputs as they are confirmed.

Actions for **Mātauranga Māori** should be progressed with specialist expertise and with guidance from the following report:

- Ropiha, A. (2017). *Assessment of cultural values report: Coastal Hazards Strategy 2120 Clifton to Tangoio Mai Te Matau a Māui ki Tangoio*.

Clifton to Tangoio Coastal Hazards Strategy 2120



Signals, Triggers and Thresholds

The Panels recommended adaptative pathways to respond to coastal hazard risks.

These pathways have been determined by the Panels as being their preferred method for responding to coastal hazard risks for each unit, based on a range of assessment criteria and financial metrics and on current knowledge and climate change/sea level rise projections.

For these adaptation pathways to be truly adaptive, signals, triggers and adaptation thresholds need to be developed that enable changes in coastal areas to be monitored and decisions made before performance measures desired by the community are no longer being met or start to fail.

- **Signals** are an early warning of change that identifies when a trigger point or adaptation threshold may be approaching.

- **Triggers** are a decision point or points. They are designed to be set to allow sufficient time to take an action before an adaptation threshold is reached.
- **Adaptation thresholds** describe a situation where performance measures are no longer being met or start to fail. Essentially, adaptation thresholds describe a situation that people and communities don't want to see happen.

Through Stage 4 of the Strategy development, proposed adaptation thresholds have been developed through workshops and discussions with community members and council staff with asset management and emergency management expertise. The process of development is reported (Kissick 2022).

The proposed adaptation thresholds are presented in Table 10.

Table 10: Proposed and Draft Adaptation Thresholds.

	Threshold + Threshold Measure	Primary responsibility for monitoring and reporting to HBRC
All Units	Coastal inundation causing the loss of one or more essential services affecting the majority of the community. <i>How long:</i> At least 48 hours. <i>How often:</i> More often than once every 5 years.	HBRC + relevant TA
	Community-wide coastal inundation causing damage to multiple buildings/service. <i>How long:</i> Any duration. <i>How often:</i> More often than once every 5 years.	HBRC
	Any serious injuries and/or fatalities that occur as a result of a coastal erosion or coastal inundation event.	CDEM
	Civil Defence emergency is declared in response to coastal inundation or coastal erosion. <i>How often:</i> More often than once every 10 years.	CDEM
	50% of an affected coastal community consider that a permanent loss of amenity has occurred as a result of coastal erosion or coastal inundation impacts.	HBRC

Clifton to Tangoio Coastal Hazards Strategy 2120



	Threshold + Threshold Measure	Primary responsibility for monitoring and reporting to HBRC
All Units	50% of the community report actual or perceived property purgatory effects i.e., actual or foreseeable damage to their properties from coastal erosion or coastal inundation and uncertainty about being able to recover their losses.	HBRC
	50% of properties are unable to secure building insurance for losses from coastal hazards.	HBRC
	Access to and use of the beach, coastal reserves and/or recreational facilities is prevented as a result of coastal inundation. How long: At least 7 days. How often: More often than once every 5 years.	Relevant TA
	Unit-Specific Thresholds	
Whirinaki	Coastal erosion in Whirinaki affecting Whirinaki Road and/or North Shore Road, causing loss of road access for the majority of the community.	HDC
	Buildings in Whirinaki are deemed uninhabitable as a result of coastal hazards (e.g., loss of septic tanks, building structural integrity etc).	CDEM/ HDC
Bay View	Coastal erosion in Bay View affecting Le Quesne Road, causing loss of road access for majority of the community.	NCC
Westshore	No unit specific thresholds – only Whole Coast Thresholds apply.	
Ahuriri	No unit specific thresholds – only Whole Coast Thresholds apply.	
Pandora	Coastal inundation in Pandora affecting Thames Street and Severn Street causing loss of road access for the majority of the community. How long: At least 48 hours. How often: More often than once every 5 years.	NCC
East Clive	Buildings in East Clive are deemed uninhabitable as a result of coastal hazards (e.g., loss of septic tanks, building structural integrity etc).	CDEM/ HDC
Haumoana	Coastal inundation in Haumoana affecting Haumoana and/or Beach Road causing loss of road access for the majority of the community. How long: At least 48 hours. How often: More often than once every 5 years.	HDC
	Buildings in Haumoana are deemed uninhabitable as a result of coastal hazards (e.g., loss of septic tanks, building structural integrity etc).	CDEM/ HDC

Clifton to Tangoio Coastal Hazards Strategy 2120



	Unit-Specific Thresholds	Primary responsibility for monitoring and reporting to HBRC
Te Awanga	Coastal inundation in Te Awanga affecting Clifton Road causing loss of road access for the majority of the community. <i>How long:</i> At least 48 hours. <i>How often:</i> More often than once every 5 years.	HDC
	Coastal erosion in Te Awanga affecting Clifton Road causing loss of road access affecting the majority of the community.	HDC
	Buildings in Te Awanga are deemed uninhabitable as a result of coastal hazards (e.g., loss of septic tanks, building structural integrity etc).	CDEM/ HDC
Clifton	Coastal inundation in Clifton affecting Clifton Road causing loss of road access for the majority of the community. <i>How long:</i> At least 48 hours. <i>How often:</i> More often than once every 5 years.	HDC
	Coastal erosion in Clifton affecting Clifton Road causing loss of road access affecting the majority of the community.	HDC
	Buildings in Clifton are deemed uninhabitable as a result of coastal hazards (e.g., loss of septic tanks, building structural integrity etc).	CDEM/ HDC

Actions

Action 2: Test and confirm the proposed adaptation thresholds through community consultation.

Action 3: Develop signals and triggers for each priority unit that are practical and cost-effective to monitor, and provide sufficient lead time on the relevant adaptation threshold such that actions can be implemented before the threshold is reached.

Action 4: Resource and implement an effective monitoring programme for signals, triggers, and adaptation thresholds, including mechanisms for reporting back to the community on signal, trigger, and adaptation threshold status within each coastal unit (such as a web tool dashboard or similar).

Actions for **Signals, Triggers and Thresholds** should be progressed with guidance from the following reports:

- Kissick, D. (2022). *Clifton To Tangoio Coastal Hazard Strategy adaptation thresholds development report*. Traverse Environmental Limited.



Regulatory Framework

The existing regulatory planning framework (with a focus on the Resource Management Act 1991) at a district, regional and national level provides critical context for Strategy implementation.

Work under the Regulatory Workstream in Stage 4 identified three key objectives that should be achieved by the existing regulatory framework:

1. consistency in the management of coastal hazard risks across the region
2. avoidance or mitigation of the risk of maladaptation from the implementation of adaptation actions
3. provision for the implementation of the Strategy within the regulatory planning framework.

Changes to the existing regulatory planning framework are needed to achieve these objectives. The changes are focussed at three levels:

- Nationally – while councils are limited to an advocacy role, national consistency and clarity should be sought in the management of coastal hazards including through relevant legislation, National Policy Statements and National Environmental Standards, and through climate change specific strategies and plans including the National Climate Change Risk Assessment and the National Adaptation Plan.
- Regional Policy Statement – as the overarching resource management tool for the region.
- Regional Plan and District Plan(s) – as the key tools for managing land use and subdivision within the coastal environment of the region, both above and below Mean High Water Springs.

The objectives and actions to achieve these changes are discussed in the following sections.

Consistency in coastal hazard risk management

The existing regulatory planning framework has an inconsistent approach to the management of coastal hazard risks. This includes the inconsistent application of Coastal Hazard Zones in District Plans and the Regional Coastal Environment Plan, and the status of activities that apply within these zones.

This can result in confusion, inconsistency in managing coastal hazard risks, and implementation challenges for councils.

Addressing this inconsistency can begin with the area covered by this Strategy and be extended as future coastal hazard adaptation work in the region is undertaken.

Maladaptation

Maladaptation is a concept which is defined in the IPCC *Climate Change Synthesis Report 2023*, and adopted by the *National Climate Change Risk Assessment for Aotearoa New Zealand 2020* (NCCRA) as:

Actions that may lead to increased risk of adverse climate-related outcomes, including via increased greenhouse gas (GHG) emissions, increased or shifted vulnerability to climate change, more inequitable outcomes, or diminished welfare, now or in the future. Most often, maladaptation is an unintended consequence.

Maladaptation can lead to increased coastal hazard risks, increases or shifts in the community's vulnerability to coastal hazards, inequitable outcomes and reduced welfare for existing communities and future generations.

Clifton to Tangoio Coastal Hazards Strategy 2120



Some examples of potentially maladaptive outcomes that could eventuate in connection with Strategy implementation include:

- subdivision and development of land in an area subject to coastal hazard risks following an adaptation action that reduces exposure to coastal hazards risks in the short term
- removal of coastal hazard zoning and associated development restrictions in response to coastal hazard adaptation action being implemented
- not maintaining adaptability of pathway actions through revision and refinement in response to new and changing information about hazard risks and sea level rise
- a network utility operator upgrading their infrastructure assets believing a council will maintain an existing coastal protection structure even though that protection structure has a limited design lifespan.

Strategy Implementation

Challenges with gaining and implementing resource consents for pathway actions have the potential to impede the implementation of pathways under the Strategy.

It is important that an appropriate balance can be reached between providing for Strategy-endorsed adaptation actions in the pathways, while ensuring there is robust evaluation of any detailed proposals for works, as necessary through the relevant consenting process.

Strategy implementation considerations need to extend beyond the implementation of the short-term pathway actions. This requires consideration of the lead time and planning requirements associated with longer-term actions including managed retreat.

Actions

Action 5: Strengthen coastal hazard management direction in the Regional Policy Statement to:

1. Drive a regionally consistent and effective approach to coastal hazard risk management across regional and district plans, including addressing current areas of inconsistency.
2. Provide specific objectives and policies in relation to:
 - a. the implementation of climate adaptation strategies including the Strategy
 - b. the avoidance of maladaptation
 - c. the future implementation of managed/planned retreat.

Action 6: Actively participate in the development of new legislation and national direction (through formal submissions, and other processes and avenues) to share lessons learnt and barriers encountered through the Strategy development process. Advocate for changes to support effective local adaptation action.

Action 7: Actively participate in the development of local plans/plan changes and future growth and development strategies prepared by local authorities to seek consistency with the direction of the Strategy.

Actions for **Regulatory Framework** should be progressed with guidance from the following reports/resources:

- Kissick, D. (2024). *Clifton To Tangoio Coastal Hazard Strategy regulatory workstream background paper*. Traverse Environmental Limited.
- Mitchell Daysh. (2020a). *Consentability of short-term adaptation responses – Stage 4 Clifton to Tangoio Coastal Hazard Strategy 2120*.
- Mitchell Daysh. (2020b). *Policy and regulatory review – Stage 4 Clifton to Tangoio Coastal Hazard Strategy 2120*.

Clifton to Tangoio Coastal Hazards Strategy 2120



Coastal Ecology

There are a range coastal ecological values along the Clifton to Tangoio coastline that will be impacted by natural hazards and climate change, but that may also be adversely affected by actions taken to reduce coastal hazards risks for people and communities.

While individual hazard response actions may have little ecological impact, the progressive cumulative impact of multiple actions over the 50 to 100-year timeframe considered by the Strategy could be significant.

The key ecological issues arising from the proposed interventions are likely to be related to positive and negative effects of/on:

- benthic communities that are smothered by deposited or redistributed sand and gravel
- invasive pests, which can be spread by sediment dredging and disposal of sediment containing viable pests
- water quality through sediment suspension and redispersal
- benthic communities buried beneath control structures
- attached/immobile shoreline species due to the hardening of the shoreline by artificial structures (this may also increase susceptibility to the colonisation and proliferation of invasive, marine pests)
- habitat characteristics and quality caused by sudden, localised changes in coastal processes through the construction of coastal structures
- physical disturbance of the Coastal Marine Area (CMA) by machinery involved in the construction of structures or beach renourishment
- birds that either favour or are adversely affected by interventions and associated construction activities

- fish that either favour or are adversely affected by interventions and associated construction activities
- coastal wetlands through physical disturbance and occupation.
- dune planting.

To better understand these potential effects and identify measures to avoid, remedy or mitigate them, more data is required. This will be particularly important ahead of any future resource consent process for coastal hazard responses.

To support this, an Ecological Monitoring Plan has been prepared to guide a monitoring programme to address existing gaps in data and to develop a more complete picture of existing coastal ecological values. Additional work with mana whenua to refine the proposed monitoring programme is proposed.

Actions

Action 8: Work with mana whenua to refine and develop a coastal ecological monitoring programme for the Strategy area.

Action 9: Commence coastal ecological monitoring, guided by the *Ecological Monitoring Plan* prepared by Coast & Catchment and the outcome of engagement with mana whenua.

Actions for **Coastal Ecology** should be progressed with guidance from the following reports/resources:

- Kelly, K., Sim-Smith, C. (2023). *Hawke's Bay coastal hazards ecological effects of mitigation measures: Phase 1, gap analysis*. (HBRC Report No. 5562). Coast & Catchment.
- Kelly, K., Sim-Smith, C. (2023). *Hawke's Bay coastal hazards ecological monitoring plan*. (Report No. 2023-10). Coast & Catchment.



Coastal Hazard Responses – Immediate Actions

Urgent risk mitigation works at **Bay View**, **Westshore**, **Haumoana** and **Te Awanga** are proposed to commence as soon as practicable following adoption of the Strategy.

In these locations, ongoing coastal hazards issues have led to a determination that the trigger point for action has already been reached.

Bay View and Westshore

On-shore gravel renourishment is proposed as the first pathway action at Bay View and Westshore to offset losses from erosion and build resilience to coastal inundation, with off-shore sand nourishment also proposed at Westshore utilising suitable Port of Napier dredged material (Figures 10 to 13).

Current coastline at Bay View (as at July 2024)



Figure 10: Bay View - current view.

Clifton to Tangoio Coastal Hazards Strategy 2120



Bay View coastline with proposed pathway action



Figure 11: Bay View Pathway Action – indicative location of proposed on-shore gravel nourishment

Clifton to Tangoio Coastal Hazards Strategy 2120



Current coastline at Westshore (as at July 2024)



Figure 12: Westshore- current view

Clifton to Tangoio Coastal Hazards Strategy 2120



Westshore coastline with proposed pathway action



Figure 13: Westshore Pathway Action – indicative location of proposed on-shore gravel nourishment and off-shore sand placement

Concept design elements:

- increased gravel nourishment (15,300 m³/y existing + 24,000 m³/y additional)
- sand nourishment at Westshore utilising suitable Port of Napier dredged material
- works focused on critical areas allowing erosion in less critical areas
- gravel barrier construction for low level wave-overtopping protection at critical areas
 - northern Westshore 11,000 m³.

Clifton to Tangoio Coastal Hazards Strategy 2120



Haumoana and Te Awanga

The construction of groyne(s) to hold gravel within the coastal unit, complemented by on-shore gravel renourishment to offset losses from erosion and build resilience to coastal inundation is proposed at Haumoana and Te Awanga (Figures 14 to 19). There are two potential design variants for this solution at Haumoana and Te Awanga¹. Each option achieves similar benefits, using either a higher capital cost or higher operational cost model:

- **Option A:** Tukituki groyne extension (20m) + operational nourishment (52,000 m³/yr). General coast stability but not in specific areas allowing for some erosion in less critical areas. Includes gravel barrier construction for a higher-level of inundation protection at Te Awanga and a lower-level of protection in Haumoana.
- **Option B:** 4 groynes + Tukituki groyne extension (10m) + initial (239,000 m³/yr) and operational (28,000 m³/yr) nourishment. Optimised alternative with protection focused on critical areas allowing erosion in less critical areas. Includes gravel barrier construction for a higher-level of inundation protection at Te Awanga and a lower-level of protection in Haumoana.

The final selection of the preferred design variant will be determined through optimisation and detailed design.

During early engagement on the concept design for Te Awanga, community members have expressed concern about the height of the gravel bund proposed to provide some protection from coastal inundation. Hastings District Council has also approved funding for a section of armouring along the Te Awanga coastline and is in the process of seeking resource consents. Detailed design will need to take these factors into account as part of confirming a final design for Te Awanga.

¹ For reference purposes, Option A refers to Option C2, and Option B refers to Option D2 as presented in Beya 2021.

Clifton to Tangoio Coastal Hazards Strategy 2120



Current coastline at Haumoana (as at July 2024)



Figure 14: Haumoana- current view.

Clifton to Tangoio Coastal Hazards Strategy 2120



Haumoana coastline with proposed pathway action (Option A)



Figure 15: Haumoana Pathway Action (Option A) indicative location of proposed on-shore gravel nourishment and single groyne

Clifton to Tangoio Coastal Hazards Strategy 2120



Haumoana coastline with proposed pathway action (Option B)



Figure 16: Haumoana Pathway Action (Option B) indicative location of proposed on-shore gravel nourishment and groynes

Clifton to Tangoio Coastal Hazards Strategy 2120



Current coastline at Te Awanga (as at July 2024)



Figure 17: Te Awanga - current view.

Clifton to Tangoio Coastal Hazards Strategy 2120



Te Awanga coastline with proposed pathway action (Option A)



Figure 18: Te Awanga Pathway Action (Option A) indicative location of proposed on-shore gravel nourishment with single groyne further north at Tukituki River mouth

Clifton to Tangoio Coastal Hazards Strategy 2120



Te Awanga coastline with proposed pathway action (Option B)



Figure 19: Te Awanga Action (Option B) indicative location of proposed on-shore gravel nourishment with 3 groynes and groyne further north at Tukituki River mouth

Actions

Action 10: Develop detailed designs for the urgent risk mitigation works (on-shore gravel renourishment + groynes) at Bay View, Westshore, Haumoana and Te Awanga.

Action 11: Secure resource consents for the urgent risk mitigation works (on-shore gravel renourishment + groynes) at Bay View, Westshore, Haumoana and Te Awanga.

Action 12: Confirm and operationalise physical works programme(s) once resource consent and other relevant approvals are secured for

the urgent risk mitigation works at Bay View, Westshore, Haumoana and Te Awanga.

Actions for **Coastal Hazard Responses – Immediate** should be progressed with guidance from the following reports / resources:

- Beya, J. (2021). *Short-term concept design and costing - Clifton to Tangoio 2120 coastal hazards strategy - Stage 4 - design workstream: Wave, shoreline evolution and gravel barrier response modelling - groynes design and cost estimates*. (HBRC Report No. 5537). Hawke's Bay Regional Council.
- Mitchell Daysh. (2020a). *Consentability of short-term adaptation responses – Stage 4 Clifton to Tangoio Coastal Hazard Strategy 2120*.



Coastal Hazard Responses – Short Term

Pathway actions at **Whirinaki** are proposed to commence in accordance with a defined trigger point.

Whirinaki

On-shore gravel renourishment is proposed as the first pathway action at Whirinaki to offset losses from erosion and build resilience to coastal inundation in the short term once trigger points are reached.

Further design work is required to determine volumes and locations of renourishment.

Actions

Action 13: Develop detailed designs for short-term risk mitigation works (on-shore gravel renourishment) at Whirinaki.

Action 14: Secure resource consents and any other necessary approvals for short-term risk mitigation works (on-shore gravel renourishment) at Whirinaki.

Action 15: Confirm and operationalise physical works programme(s) to enable commencement of works at Whirinaki once trigger point is reached (refer Strategic Action 3).

Actions for **Coastal Hazard Responses – Short-term** should be progressed with guidance from the following reports/resources:

- Beya, J. (2021). *Short-term concept design and costing - Clifton to Tangoio 2120 coastal hazards strategy - Stage 4 - design workstream: Wave, shoreline evolution and gravel barrier response modelling - groynes design and cost estimates*. (HBRC Report No. 5537). Hawke's Bay Regional Council.
- Mitchell Daysh. (2020a). *Consentability of short-term adaptation responses – Stage 4 Clifton to Tangoio Coastal Hazard Strategy 2120*.

Clifton to Tangoio Coastal Hazards Strategy 2120



Coastal Hazard Responses (all Priority Units) – Medium and Long-Term

Pathway actions in **all priority units** are proposed to commence in the medium and longer term in accordance with trigger points.

Over time, through the monitoring of signals and triggers and through Strategy reviews, additional units may be added. Pathway actions may also be modified either in terms of sequence, timing, or the nature of proposed works.

Pathway actions for the medium and longer-term are therefore indicative at this time and will be regularly reviewed. These are presented in Table 11.

However, it is important that actions with significant lead-in times are identified, and preparatory works are commenced such that action can follow within a reasonable period following a trigger point being reached. For example, an effective managed retreat response is likely to take many years of planning and preparatory work (e.g., potential land acquisition and zoning changes) before it can be actioned. This preparatory work needs to be identified and commenced well before actions are likely to be required.

Table 11: Indicative Medium- and Longer-Term Pathway Actions.

Unit	Short Term (≈ 0-20 yrs)	→	Medium Term (≈ 20 – 50 yrs)	→	Long Term (≈ 50 – 100 yrs)
Whirinaki (B)	Status quo/ renourishment	→	Renourishment + control structures	→	Sea wall
Bay View (C)	Status quo/ renourishment	→	Renourishment + control structures	→	Renourishment + control structures
Westshore (D)	Renourishment	→	Renourishment + control structures	→	Renourishment + control structures
Ahuriri (E1)	Status quo	→	Sea wall	→	Sea wall
Pandora (E2)	Status quo	→	Storm surge barrier	→	Storm surge barrier
East Clive (J)	Status quo	→	Renourishment + control structures	→	Retreat the line / managed retreat
Haumoana (K1)	Renourishment + control structures	→	Renourishment + control structures	→	Managed Retreat
Te Awanga (K2)	Renourishment + control structures	→	Renourishment + control structures	→	Renourishment + control structures
Clifton (L)	Status quo	→	Sea wall	→	Managed retreat

Clifton to Tangoio Coastal Hazards Strategy 2120



Actions

Action 16: Periodically review medium and longer-term pathway actions in accordance with the defined Strategy Review Process to ensure they remain effective and feasible over time.

Action 17: Identify the preparatory work requirements for medium and longer-term pathway actions that involve significant lead-times, particularly the proposed storm surge barrier for Pandora and managed retreat. Commence preparatory work as necessary to address long lead times for medium and longer-term actions.

Actions for **Coastal Hazard Responses – Medium and Long-term** should be progressed with guidance from the following reports/resources:

- Beya, J. (2022). *Short-term concept design and costing - Clifton to Tangoio 2120 coastal hazards strategy - design workstream: Flood defences Pandora Unit*. (HBRC Report No. 5588). Hawke's Bay Regional Council.
- Tonkin and Taylor. (2022). *Hawke's Bay Coastal Strategy: Implementation approaches and indicative costs for planned retreat*.

Funding Principles

Works requiring funding

Under the Strategy, coastal hazard risk mitigation works are proposed to be deployed as soon as possible in the Bay View, Westshore, Haumoana and Te Awanga units as the first set of pathway actions.

Pathway actions in other units will be required in the short, medium and longer term, once trigger points are reached.

The proposed risk mitigation works for each of the urgent units is:

- Bay View: on-shore gravel nourishment
- Westshore: on-shore gravel nourishment + offshore sand nourishment
- Haumoana: on-shore gravel nourishment + groyne(s)
- Te Awanga: on-shore gravel nourishment + groyne(s).

Cost estimates for these works (total costs across all four units) are:

- \$11.3M to \$34.2M in capital costs
- \$3.6M to \$4.7M in annual operating costs.

The following six funding principles (in no order of priority) have been developed to determine how these costs are to be met. These principles support section 101(3)(a)(ii) Local Government Act 2002 (LGA) as amended, including the distribution of benefits between the community as a whole, any identifiable part of the community, and individuals.

Principle 1: Equitable

The funding approach shall seek equitable outcomes considering, in particular, the benefits and costs of the risk mitigation works, and the need to avoid perverse outcomes and maladaptation.

Principle 2: Enduring

The funding approach shall be resilient to political cycles, legislative changes, changes in central government policies, ongoing impacts from coastal hazards and changing market conditions.

The funding approach shall be able to be applied in a consistent way to new coastal units that require action in response to trigger points being reached.

Clifton to Tangoio Coastal Hazards Strategy 2120



Principle 3: Simplicity

To the extent practicable, the funding approach shall be administratively simple, cost effective to implement, and able to be communicated to all rate payers.

Principle 4: Capital Value

All rates collected to fund the Strategy are calculated on the basis of capital value; this is the best tool to be used as capital values reflect the assets (land and improvements) being afforded some protection through risk mitigation works.

Principle 5: Targeted vs. General Rate Allocation

The general basis for the funding model is that the costs for risk mitigation works are allocated in accordance with the assessed benefits of the works.

As a baseline, the cost allocation for each risk mitigation project is:

- 70% to the properties within the relevant unit
- 25% to the sub-region (Napier City and Hastings District)
- 5% to the region (including Wairoa & Central Hawke's Bay districts).

At Westshore, where there are greater subregional and regional benefits from reducing coastal hazards risks for the airport, transport corridors and reserves, the baseline cost allocation approach is modified to:

- 55% to the properties within the unit
- 25% to the sub-region (Napier City and Hastings District)
- 10% to the Napier area
- 10% to the region (including Wairoa & Central Hawke's Bay districts).

Principle 6: Proportionality

Costs allocated to a unit are distributed to individual properties based on the level of assessed benefit received from the works (high, medium or low). Individual properties have been allocated to these categories through a benefits-mapping exercise undertaken independently by Tonkin + Taylor (in 2024). The categories are described as:

- High = currently exposed to inundation risk. Currently exposed to erosion risk. Direct and significant benefit from the proposed Strategy works.
- Medium = currently exposed to inundation risk. Exposed to erosion risk in future. Direct benefit from the proposed Strategy works.
- Low = some exposure to current inundation risks. Exposed to erosion risk in the longer term. Indirect benefits from the proposed Strategy works.

Property-specific costs shall be proportional to the assessed benefit, such that a high benefit property pays more than an equivalent medium benefit property, and a medium benefit property pays more than an equivalent low benefit property.

Application of Principles and Funding Model Refinement

The six funding principles have been developed by the Joint Committee to guide and inform the development of the Regional Council's funding model for Strategy implementation.

The Joint Committee has prepared a working draft funding model to consider the application of these principles, and the associated rating impacts for average and outlier properties.

Clifton to Tangoio Coastal Hazards Strategy 2120



However, there is further refinement and development work required by Section 101(3) of the Local Government Act (2002) (LGA) that can only be undertaken by the Regional Council in order to prepare a fully functional funding model to test through community consultation. The Joint Committee has been deliberate about leaving this work to the Regional Council, as the primary decision-maker and only agency that is able to consider the specific organisational and ratepayer implications from various funding model refinements.

To assist the Regional Council with this work, the Joint Committee recommends that the following matters are taken into account (in no particular order):

- Acknowledging that, because the benefit-mapping exercise has been undertaken as a strictly technical and GIS-based exercise, a ground-truthing exercise is required, including confirming the location of buildings/improvements to determine benefits at a property scale, and to review where properties may have been inadvertently missed or included.
- That there should be consistency of differential/proportionality within and between units for properties with an assessed high, medium and low benefit.
- That the use of capital value to set rates, while recommended as the most effective approach, may create conflicts on a case-by-case basis with Principle 6 Proportionality (for example, a medium benefit property with a high capital value may end up with more to pay than a high benefit property with a low capital value). These needs should be considered and weighed up against other principles.
- That the rating impact on outlier properties (lowest and highest paying) needs to be given careful consideration.
- That a principled approach should be maintained throughout the funding model refinement process, to ensure that the final outcome is reasoned and defensible, avoids perverse outcomes, and includes an assessment of section 101(3)(b) LGA.
- That consideration should be given to the extent to which the actions or inaction of individuals or a group contribute to the need to undertake the activity (i.e., are there exacerbators of risk). For example, everyone has contributed to climate change.
- It is highlighted that, at the time of writing, (mid-2024) a Parliamentary Select Committee Inquiry into Climate Adaptation is underway. The purpose of the Inquiry is to develop and recommend high-level objectives and principles for the design of a climate change adaptation model for New Zealand, to support the development of policy and legislation to address climate adaptation. In future, the Strategy may need accommodate any new legislative or policy outcomes of this Inquiry.

Actions

Action 18: Secure funding for urgent and short-term pathway actions through a Long Term Plan amendment.

Action 19: Investigate the establishment of a long-term contributory fund to offset future debt requirements for coastal hazard risk mitigation and to share costs across current and future generations.



Monitoring, Review and Adjustment

To ensure the Strategy remains adaptive to changing conditions and circumstances, new information and future uncertainty, a formal review process is required.

Strategy reviews will occur in two ways:

1. Periodic reviews, and
2. Triggered reviews.

Periodic Reviews

A periodic review is a formalised review of the entire Strategy at pre-determined intervals to ensure it remains relevant, fit for purpose, and supported by current information.

Periodic reviews will be collaborative in nature; effective engagement with mana whenua, communities, and key stakeholders will be required. The degree of collaboration from participants should be commensurate with the scale of changes being contemplated. Any substantive changes or revisions to the Strategy need to follow a formal consultation and adoption process under the LGA.

There is a close connection between Hawke's Bay Regional Council's Long Term Plan and implementing actions under the Strategy. For efficiency, periodic reviews should be timed to conclude in the year prior to a Long Term Plan review process. The interval between periodic reviews should be set to balance the needs of maintaining an adaptive and relevant Strategy, with the resource and cost implications of full review processes, and community expectations of stable policy settings.

Taking these aspects into account, the proposed review sequence for the first two periodic reviews is outlined in Table 12. Future review dates should be set as part of each periodic review.

Table 12: Periodic Strategy Review Sequence

Action	Year	Review Period	Outcomes Confirmed
Strategy adoption	2024	n/a	2024 – 2027 Three-Year Financial Plan (amendment)
Periodic Review 1	2032	7 years	2033 – 2043 Long Term Plan
Periodic Review 2	2041	8 years	2042 – 2052 Long Term Plan

Triggered Reviews

By supplementing periodic reviews with triggered reviews, the Strategy is made flexible and responsive to actual events and changing circumstances.

To be effective, triggered reviews should be targeted and efficiently completed within a short time period. This will reduce resource demands and ensure that triggered reviews don't result in a Strategy that is in a state of constant review and change.

Examples of circumstances or events that may result in a triggered review are listed in Table 13.

Clifton to Tangoio Coastal Hazards Strategy 2120



Table 13: Triggered Strategy Review Process

Triggering Event	Considerations for whether a review is required
Trigger or threshold reached within a priority unit	Determine whether the risk mitigation actions set out in the Strategy for the short medium and long term remain fit for purpose and effective.
Treaty Settlement outcome confirmed in legislation	Determine whether elements of the Strategy need to be amended or reconsidered to respond to settlement outcomes.
Significant new climate change or hazard information received	Determine whether significant new information affects or influences the approach of the Strategy.
New legislation, policy or guidance from central government	Determine whether the new legislation, policy or guidance influences, aligns or misaligns with the approach of the Strategy.
Major hazard event occurs	Determine whether the approach of the Strategy remains relevant and appropriate, or whether changes are required in response to the impact of the event and recovery efforts.
Other	Subject to circumstances, timing and impacts, flexibility to be retained for other events to trigger a review of the Strategy.

When a triggering event occurs, a decision is required on whether a review process needs to follow, and if so, what process the review should take. Council staff will be tasked with preparing an analysis of the triggering event, assessing implications for the Strategy, and recommending whether or not a review process is required. This analysis is to be transparently reported to the appropriate committee of the Regional Council for elected member decision making.

These review processes will require active management and full integration within the Regional Council work programmes to ensure that they occur.

Actions

Action 20: Integrate and formalise procedures for Periodic and Triggered Strategy Reviews within the Regional Council work programmes.

Implementation

*Clifton to Tangoio
Coastal Hazards Strategy 2120*



Strategy Action Plan

Twenty key actions have been identified throughout the Strategy. The following table captures these actions into a single action plan. Regular reporting to the Regional Council on progress under the Action Plan will occur at least every 6-months.

Action 1: Continue to resource the development of:

1. Cultural Values Framework(s)
2. Mātauranga Māori Implementation and Reporting Plan
3. a Taiao Monitoring Plan (or alternative outputs as may be agreed with PSGE Partners) under the Mātauranga Māori Workstream and seek to align the Strategy with these outputs as they are confirmed.

Action 2: Test and confirm the proposed adaptation thresholds through community consultation.

Action 3: Develop signals and triggers for each priority unit that are practical and cost-effective to monitor, and provide sufficient lead time on the relevant adaptation threshold such that actions can be implemented before the threshold is reached.

Action 4: Resource and implement an effective monitoring programme for signals, triggers, and adaptation thresholds, including mechanisms for reporting back to the community on signals, trigger, and adaptation threshold status within each coastal unit (such as a web tool dashboard or similar).

Action 5: Strengthen coastal hazard management direction in the Regional Policy Statement to:

1. Drive a regionally consistent and effective approach to coastal hazard risk management across regional and district plans, including addressing current areas of inconsistency.
2. Provide specific objectives and policies in relation to:
 - a. the implementation of climate adaptation strategies including the Strategy
 - b. the avoidance of maladaptation
 - c. the future implementation of managed/planned retreat.

Action 6: Actively participate in the development of new legislation and national direction (through formal submissions and other processes and avenues) to share lessons learnt and barriers encountered through the Strategy development process. Advocate for changes to support effective local adaptation action.

Action 7: Actively participate in the development of local plans/plan changes and future growth and development strategies prepared by local authorities to seek consistency with the direction of the Strategy.

Action 8: Work with mana whenua to refine and develop a coastal ecological monitoring programme for the Strategy area.

Action 9: Commence coastal ecological monitoring, guided by the *Ecological Monitoring Plan* prepared by Coast & Catchment and the outcome of engagement with mana whenua.

Clifton to Tangoio Coastal Hazards Strategy 2120



Action 10: Develop detailed designs for the urgent risk mitigation works (on-shore gravel renourishment + groynes) at Bay View, Westshore, Haumoana and Te Awanga.

Action 11: Secure resource consents for the urgent risk mitigation works (on-shore gravel renourishment + groynes) at Bay View, Westshore, Haumoana and Te Awanga.

Action 12: Confirm and operationalise physical works programme(s) once resource consent and other relevant approvals are secured for the urgent risk mitigation works at Bay View, Westshore, Haumoana and Te Awanga.

Action 13: Develop detailed designs for short-term risk mitigation works (on-shore gravel renourishment) at Whirinaki.

Action 14: Secure resource consents and any other necessary approvals for short-term risk mitigation works (on-shore gravel renourishment) at Whirinaki.

Action 15: Confirm and operationalise physical works programme(s) to enable commencement of works at Whirinaki once trigger point is reached (refer Strategic Action 3).

Action 16: Periodically review medium and longer-term pathway actions in accordance with the defined Strategy Review Process to ensure they remain effective and feasible over time.

Action 17: Identify the preparatory work requirements for medium and longer-term pathway actions that involve significant lead-times, particularly the proposed storm surge barrier for Pandora and managed retreat. Commence preparatory work as necessary to address long lead times for medium and longer-term actions.

Action 18: Secure funding for urgent and short-term pathway actions through a Long Term Plan amendment.

Action 19: Investigate the establishment of a long-term contributory fund to offset future debt requirements for coastal hazard risk mitigation and to share costs across current and future generations.

Action 20: Integrate and formalise procedures for Periodic and Triggered Strategy Reviews within the Regional Council work programmes.



Implementation

In May 2022, the Partner Councils entered into a Memorandum of Transition (see discussion on page 21). The Memorandum confirmed agreement in principle, subject to Hawke's Bay Regional Council adopting an amendment to its Long Term Plan, that:

1. Hawke's Bay Regional Council will take charge of adapting to coastal hazards risks on the Clifton to Tangoio coast, including adopting and implementing the Strategy.
2. Hastings District Council and Napier City Council will transfer their assets relevant to mitigating and adapting to the impacts of coastal hazards affecting Napier City and the Hastings District to Hawke's Bay Regional Council, subject to a detailed Asset Transfer Agreement being confirmed; and
3. An advisory committee formed by elected representatives of the Partner Councils and Tāngata Whenua will be established to replace the existing Joint Committee and to provide ongoing to provide advice to and support for Hawke's Bay Regional Council in undertaking its coastal hazards adaptation functions for the Clifton to Tangoio coastline.

These three key elements (and the further detail set out in the Memorandum of Transition) provide the framework for implementing the Strategy.



Appendices

1. Acknowledgements

The original members of the Northern and Southern Assessment Panels provided unwavering energy and dedication over 14 months of evening and weekend meetings and workshops, community events and engagements to develop their carefully considered recommendations. Their efforts have been fundamental and invaluable to the development of the Strategy. We wish to acknowledge and thank them all.

Northern Cell Assessment Panel members:

- Hoani Taurima, Mana Whenua
- Garry Huata, Mana Whenua
- Tim Tinker, Regional
- Douglas Dickson, Whirinaki Community
- Mark Levick, Whirinaki Community
- Dorothy Pilkington, Bay View Community
- Mike Penrose, Westshore Community
- Martin Rockel, Westshore Community
- Steve Loughlin, Recreational Interests
- Shaun Thompson-Gray, Ahuriri / Pandora Community
- Michel de Vos, Port of Napier
- Craig Daly, Ahuriri / Pandora Businesses
- Oliver Postings, Lifelines
- Sarah Owen, Department of Conservation

Southern Cell Assessment Panel members:

- Aki Paipper, Mana Whenua
- Te Kaha Hawaikirangi, Mana Whenua
- Maurice Smith, Clifton/Te Awanga Community
- Martin Bates, Clifton/Te Awanga Community
- Tom Evers-Swindell, Clifton/Te Awanga Community
- Mike Harris, Haumoana Community
- Keith Newman, Haumoana Community
- Dave Wells, Haumoana Community
- Bruce Meredith, Clive/East Clive Community
- Duncan Powell, Clive/East Clive Community
- Waylyn Tahuri-Whaipakanga, Clive/East Clive Community
- Brent McNamara, Clive/East Clive Community
- Mark Mahoney, Marine Parade Community
- Paul Hursthouse, Recreational Interests
- Jamie Thompson, Awatoto Businesses
- Connie Norgate, Department of Conservation
- Jagwinder Pannu, Lifelines
- Peter Kay, Regional

Community Workshop Series Attendees

A community workshop series was held through 2020, 2021 and 2022 to assist with the development of concept plans for short term actions, adaptation thresholds, and what managed retreat may look like in future. Many former panel members returned to lend their support to this process, and a number of new faces joined. We wish to acknowledge and thank:

- | | | |
|------------------------|----------------------|-----------------------------|
| ◦ Martin Bates | ◦ Matt Goodin | ◦ Craig Daly |
| ◦ Mike Harris | ◦ Peter Kay | ◦ Jenny Nelson-Smith |
| ◦ Jagwinder Pannu | ◦ Keith Newman | ◦ Brent McNamara |
| ◦ Te Kaha Hawaikirangi | ◦ Jamie Thompson | ◦ Waylyn Tahuri-Whaipakanga |
| ◦ Maurice Smith | ◦ Bruce Meredith | ◦ Martin Rockel |
| ◦ Mark Mahoney | ◦ Paul Hursthouse | ◦ Tim Tinker |
| ◦ Doug Dickson | ◦ Tom Evers-Swindell | ◦ Oliver Postings |
| ◦ Yvonne Forrest | ◦ Dorothy Pilkington | ◦ Michel de Vos |
| ◦ Harvey Burgess | ◦ Hoani Taurima | |



2. Glossary of abbreviations and terms

Benthic	Refers to anything associated with or occurring on the bottom of a body of water.
Coastal inundation	In this Strategy also referred to as inundation. Means overtopping and flooding from the sea. Such sea level anomaly can result from several processes including astronomical tides, storm-surge, and high seas.
Coastal unit	An area of the coast defined for management by the Strategy. Coastal units have been defined through consideration of the location of coastal communities, key assets, coastal processes, and hazard extents. The Strategy has defined 16 units in total, with 9 identified as priorities in this iteration of the Strategy.
Control structure	Structures that are designed to hold the beach in situ and/or build up beach sediment. These structures are usually groynes or sea walls but may also include offshore breakwaters and artificial reefs.
Groyne	A structure usually made of rock or concrete extending from the shore into the sea, usually perpendicular or slightly oblique to the shoreline. Designed to catch and trap gravel and sand moving along the shoreline in the surf zone, leading to the build-up of sand and gravel on the shore.
Renourishment	The artificial placement of sand or gravel on an eroded shoreline to compensate for losses through erosion.
Resilience	The ability to anticipate and resist the effects of a disruptive event, minimise adverse impacts, respond effectively post-event, maintain or recover functionality, and adapt in a way that allows for learning and thriving.
Sea wall	A structure usually made of rock or concrete extending along the shoreline. Designed to withstand severe wave action and storm surge, preventing coastal erosion by reflecting wave energy back into the sea.
Storm surge barrier	A structure placed at a harbour entrance or river that allows water to pass over or through it in normal conditions, and has gates or bulkheads that can be closed/raised/inflated against storm surges or high tides to prevent flooding.



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Clifton to Tangoio Coastal Hazards Strategy 2120



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