



**CLIFTON TO TANGOIO
COASTAL HAZARD
STRATEGY**

ADAPTATION THRESHOLDS
DEVELOPMENT REPORT

SUMMARY REPORT
13 DECEMBER 2022



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Report Information

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PART A



Adaptation Threshold
Development Process

1 Introduction

The Northern and Southern Cell Assessment Panels (the Panels) for the Clifton to Tangoio Coastal Hazards Strategy (the Strategy) recommended a series of adaptative pathways to respond to coastal hazard risks.

These pathways, summarised in **Table 1**, 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.

In order for these adaptation pathways to be truly adaptive, signals, triggers and adaptation thresholds (STATs) 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.

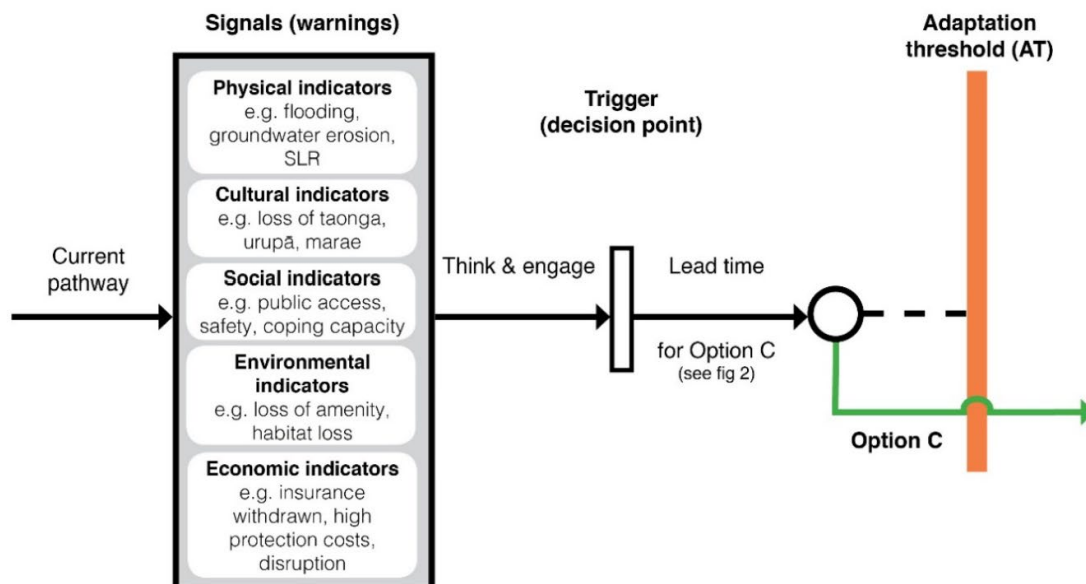
Table 1: Clifton to Tangoio Coastal Hazard's Strategy Recommend Adaptive Pathways: Revised 2021

Cell	Unit	Short term (0 - 20 years)	Medium term (20 - 50 years)	Long term (50 - 100 years)
Southern Cell	Clifton	Status quo	Sea wall	Managed Retreat
	Te Awanga	Renourishment + Groynes	Renourishment + Groynes	Renourishment + Groynes
	Haumoana	Renourishment + Groynes	Renourishment + Groynes	Managed Retreat
	Clive / East Clive	Status quo	Renourishment + Groynes	Retreat the Line / Managed Retreat
Northern Cell	Ahuriri	Status quo	Sea wall	Sea wall
	Pandora	Status quo	Storm surge barrier	Storm surge barrier
	Westshore	Renourishment	Renourishment + Control Structures	Renourishment + Control Structures
	Bay View	Status Quo / Renourishment	Renourishment + Control Structures	Renourishment + Control Structures
	Whirinaki	Status Quo / Renourishment	Renourishment + Control Structures	Sea wall

STATs are described below:

- **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/communities don't want to see happen.

Figure 1 illustrates the role of signals, triggers and adaptation thresholds in an adaptive pathway.



Source: Lawrence, J., Bell, R., Blackett, P., Stephens, S., Collins, D., Craddock-Henry, N. & Hardcastle, M. (2020). *Supporting decision making through adaptive tools in a changing climate: Practice Guidance on signals and triggers*. Wellington: Deep South Challenge.

Figure 1 Diagram showing the role of signals, triggers and adaptation thresholds in an adaptive pathway

This report focusses on the process that was used to develop adaptation thresholds for the priority units identified in the Strategy.

1.1 Deep South National Science Challenge Guidance

In 2020, the Deep South National Science Challenge released a practice guidance document “*Supporting decision making through adaptive tools in a changing climate – practice guidance on signals and triggers*”. This guidance recommended a 5-Phase, 13-task process to defining thresholds, signals and triggers, monitoring and review (related to Steps 7 – 10 of the MfE guidance process) as illustrated on **Figure 2** below.

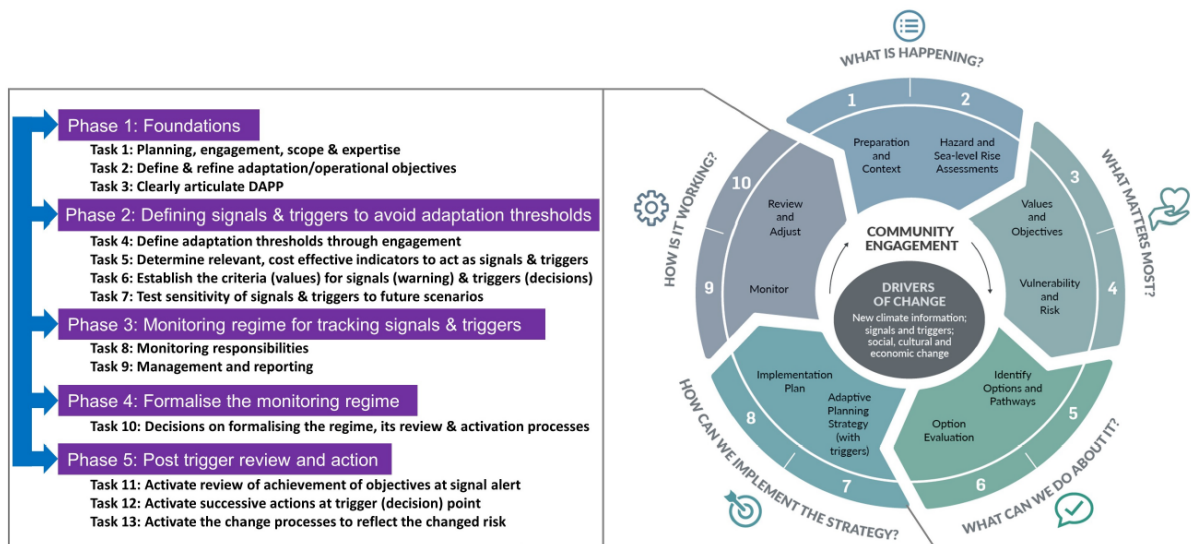


Figure 2 Thresholds, Signals and Triggers – the recommended process (Source: Deep South National Science Challenge)

The approach to developing adaptation thresholds for the Strategy was designed to align with this guidance.

2 Literature Review

In the first phase of work, a literature review was undertaken by Tom FitzGerald from Coastal Management Collective to provide guidance on current literature, recent practice and examples of the implementation of STATs.

The review provided a summary of current experience with adaptive planning approaches and STATs development.

It is noted that while some use of trigger points have been documented, at the time the literature review was undertaken there were no examples of STATs being developed and used in practice for natural hazards adaptation.

The literature review offers the following recommendations:

- Undertake a Gap analysis – it is important to understand work currently being undertaken by Councils that could be used to monitor, evaluate and report on signals, triggers and thresholds, including environmental, social, cultural, economic and governance areas.
- Community-driven – unsure that STATs are developed collaboratively to reflect a community's "lived values" of a place.
- Align with existing monitoring and evaluation activities including at a national, regional or area-specific scale.
- Monitoring, Evaluation, Reporting and Learning (MERL) plan – development of a robust, pragmatic and flexible MERL Plan is recommended to support adaptive planning decisions and track progress.

Appendix 1 contains the literature review in full.

3 Development process

The STATs development process was designed to first identify the adaptation thresholds, as illustrated in **Figure 3**.

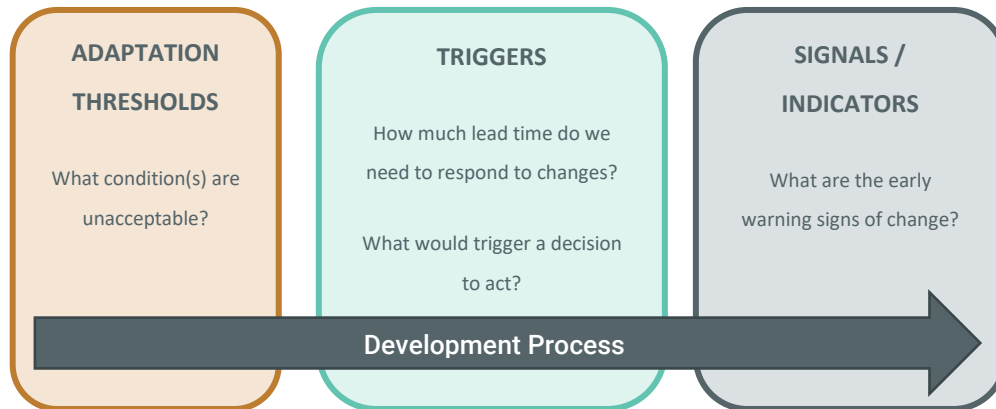


Figure 3 Development process of adaptation thresholds, triggers and signals.

Adaptation thresholds take into account a range of factors that may be influenced as a result of coastal hazards including physical/built environment, social, cultural and economic factors.

In order to develop meaningful and effective adaptation thresholds that span the range of factors, the values of both the community and Councils (in their role as asset managers and emergency management) was considered essential.

This report only covers the adaptation threshold development process. Signals and triggers are currently in development, but necessarily follow the development of adaptation thresholds. Key considerations for signals and triggers include that they 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.

4 Workshop series

The threshold development process was primarily centred around a series of workshops held with the community and Council asset managers & CDEM team members.

Figure 4 shows the threshold development process and the roles each of the groups played. For clarity, "TAG" in the Figure 4 refers to the Technical Advisory Group established for the Strategy, which is formed by senior staff from each Partner Council and the Chair of the Joint Committee. "Panel" in Figure 4 refers to a working group of community members, primarily formed by former members of the Northern and Southern Cell Assessment Panels but including new members.

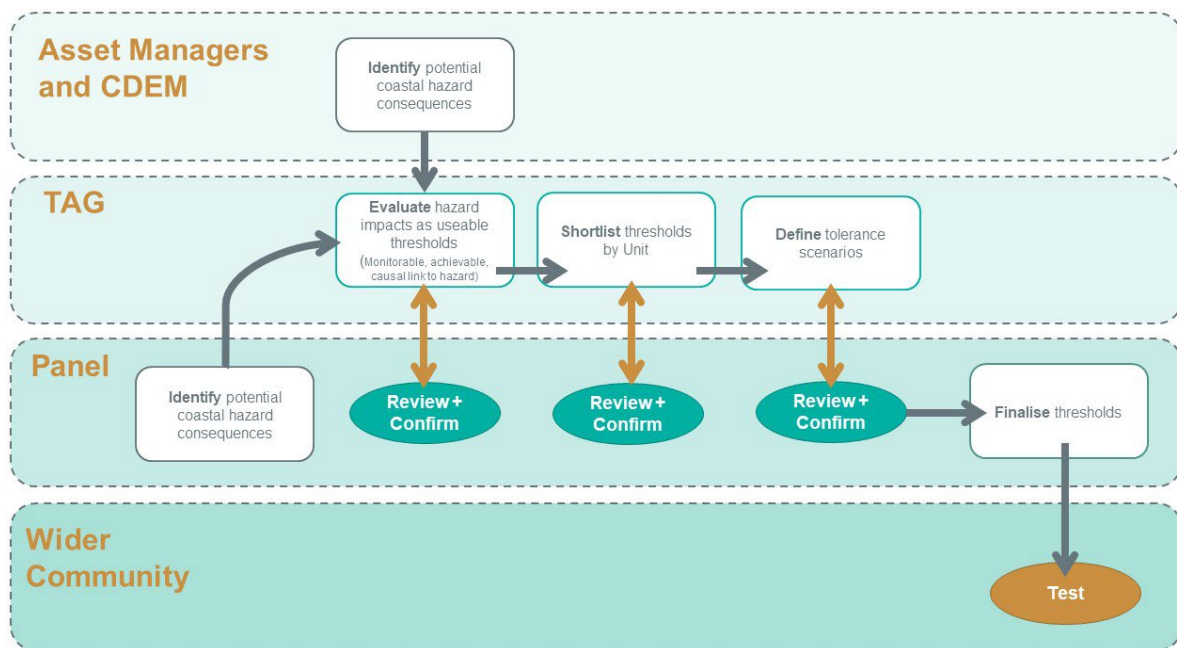


Figure 4 Workshop series

The following sections describe in more detail how proposed adaptation thresholds were developed through the workshop series.

4.1 Workshop #1: Consequences & elements at risk

For the first Panel workshop, our objectives were to communicate the role of adaptation thresholds and to get an initial understanding from community members of their experience, knowledge and concerns of the actual and potential consequences of coastal hazards.

To achieve this, we undertook a two-part exercise. We first sought to understand from the community, the consequences of coastal hazards occurring.

We then sought to understand the elements at risk of each of the identified consequences, and what these effects meant for individuals and their wider community. This part of the exercise encouraged participants to consider and identify a range of elements including physical, people (social and cultural) and economic factors.

A few weeks later, we ran an identical workshop with Council asset managers, engineers and CDEM team members to gain insights into Council perspectives on these issues. This workshop started from a clean page and was not shown the previous work by community members.

The information collected from both workshops was collated into a complete set and formed the basis for further workshops and discussions at TAG.

Figure 5 provides an example of the worksheet that was completed in these first workshops.

Coastal Hazard Consequence		Caused by		What would this mean for me & my community?			
Number	Description	Ind.	Ero.	Economic	Social	Cultural	Environmental
1.	Reduced stability of riverine stopbanks (particularly at mouth)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<ul style="list-style-type: none"> Increased costs for funding maintenance (costs passed on to community/beneficiary-pays) 	<ul style="list-style-type: none"> Stopbanks are decommissioned for recreational uses Compounding hazards if erosion not addressed (e.g. increasing FW flooding risk) Cycleways become disrupted /re-routed 	<ul style="list-style-type: none"> Access to traditional mahinga kai sites/practices affected 	<ul style="list-style-type: none"> Compounding impacts on nearby natural processes (e.g. fish spawning, sedimentation of estuaries, meandering river mouths etc)
2.	Access to and along the coastline limited (vehicles and pedestrian), due to steepness of beach escarpments	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<ul style="list-style-type: none"> Recreational commercial activities affected/cease 	<ul style="list-style-type: none"> Pedestrian safety increasingly vulnerable Local boat launching sites affected/un-usable No vehicles on many beaches – a PLUS! 	<ul style="list-style-type: none"> As above 	<ul style="list-style-type: none"> positive no vehicles on beaches (esp. sensitive ecosystems) Loss of natural ecosystems with nowhere to go/re-create
3.	Impact on tourism activities, campsites, freedom camping, use of pathways	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<ul style="list-style-type: none"> Reduced commercial operators Reduced 'choice' in location and market providers. Impact on HB reputation and marketing as active recreation destination/experience 	<ul style="list-style-type: none"> Multifaceted effect of reduced tourism Reduced amenity/wellbeing from limited recreational activities and coastal sense of place 	<ul style="list-style-type: none"> Loss of sense of place Disrupted whanau tradition over generations 	<ul style="list-style-type: none"> Inappropriate de-commissioning of assets/infrastructure/built stuff

Figure 5 Worksheet example from Workshop 1

A full summary of Workshop 1 outcomes is provided as Appendix 2.

Workshop 1 outcomes were then used to define a set of proposed adaptation thresholds. This was done by assessing the consequences and elements at risk against two criteria to determine their usefulness and applicability as potential adaptation thresholds. The evaluation and selection criteria used were:

1. Coastal hazards are the cause of the threshold being breached; and
2. Data to assess the threshold is available or can readily be collected and interpreted

It became evident through this process that potential adaptation thresholds could be grouped into one of four categories, as presented in Table 2. This categorisation shows implications for how the adaptation thresholds can be monitored, and what sorts of signals and triggers would later be required to support them.

Table 2 Threshold types

Type of threshold	Description	Example
Pass/Fail	The effects of the threshold either are experienced, or they are not	<i>Coastal Erosion causes overwhelming or damage to/leakage from septic tank(s)</i>
Frequency	The effects of the threshold are time sensitive and consideration of a duration of the effect and/or the frequency of the effect is needed	<i>Coastal inundation causing loss of road access for the majority of the community.</i> <i>How long: At least 24 hours</i> <i>How often: More than once every 5 years.</i>
Subjective	Subjective thresholds are those that are influenced or determined by people’s feelings or opinions.	<i>High levels of anxiety within the community regarding coastal hazard risks and impacts.</i>
Objective measure	Objectives thresholds are those that are those based on fact.	<i>Median house process for coastal properties decline in response to actual or perceived coastal hazard risks.</i>

Following this process, and with support from TAG, an assessment of the relevance of each potential adaptation threshold for each coastal unit was undertaken. This was based on spatial knowledge of the units and the assets within them and their risk exposure, including through using the [coastal hazard portal](#). Figure 6 shows an example how this information was captured, with the full results included in Appendix 3.

Coastal Hazard Consequence <small>(Identified through community workshop series + Council asset manager workshops – July & November 2021)</small>	Proposed Threshold <small>(Developed with feedback from community workshop series - February 2022)</small>	Likely source of data?	Threshold Evaluation and Selection			Relevant Unit								
			1. Coastal Hazards are the cause of the threshold being breached	2. Data to assess threshold is available or can readily be collected and interpreted	3. Selected as a threshold?	ALL UNITS	Aburri	Pandora	Westshore	Bay View	Whitnail	Clifton	Te Awanga	Huonora
Potential Physical/ Infrastructure Thresholds														
Loss of Road Access (Community Scale)	Coastal inundation in [NAME] causing loss of road access for the majority of the community. <i>How long: At least 24 hours</i> <i>How often: More than once every 5 years.</i>	Observed/ inspected/ reported by asset manager	✓	✓	✓			✓			✓	✓	✓	✓
	Coastal erosion in [NAME] causing loss of road access affecting the majority of the community.	Observed/ inspected/ reported by asset manager	✓	✓	✓				✓	✓	✓	✓	✓	✓
Loss of Road Access (Property Scale)	Coastal inundation in [NAME] causing loss of road access that affects individual properties. <i>How long: At least 24 hours</i> <i>How often: More than once every two years.</i>	Observed/ inspected/ reported by asset manager	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓
	Coastal erosion in [NAME] causing loss of road access that affects individual properties.	Observed/ inspected/ reported by asset manager	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓

Figure 6 Potential adaptation thresholds identified from workshops

4.2 Workshop #2: Draft Thresholds for consideration

The potential adaptation thresholds were presented to the Panel at a second workshop for their consideration, comment and amendment.

At the workshop, we undertook a small groups exercise to test the relevance of the potential thresholds for a specific unit, based on the consequences information from the previous workshops. Each group reviewed and commented on the suggested tolerance measures for each threshold and rated the importance of each potential threshold for the specific unit they were working on. This part of the exercise was designed to support a shortlisting process for final proposed adaptation thresholds for each unit.

Feedback from the group was collated and later worked through with the TAG team to refine and shortlist final proposed adaptation thresholds for each unit.

4.3 Workshop #3 Thresholds by unit

At the final workshop, the Panel was presented with a refined set of potential thresholds.

Thresholds were divided into those that applied to all units, and those that only applied to a specific coastal unit.

The Panel first examined the proposed adaptation thresholds to apply to all units. They discussed whether each proposed threshold was suitable to apply across all coastal units and commented on the threshold’s relevance and proposed threshold measures in terms of frequency and duration. **Figure 7** is a portion of the all-unit thresholds identified. The far right column of the table notes the rationale for any changes made as result of feedback in Workshop 3.

General Proposed Thresholds (apply to all Units)			
Threshold + Threshold Measure	Primary responsibility for monitoring and reporting to HBRC	Monitoring method/ data source	Rationale for changes made in response to feedback as a result of community workshop held 22 June 2022
Coastal inundation causing the loss of one or more essential services affecting the majority of the community. <i>How long: At least 48 hours</i> <i>How often: More often than once every 5 years.</i>	HBRC + Relevant TA	Observations during and following a coastal inundation event, including community feedback.	Majority of feedback suggested that in order for the impact to be substantial and therefore act as a threshold, not a trigger, duration should be extended to 48 hrs from 24 hrs
Community-wide coastal inundation causing damage to multiple buildings/service. <i>How long: Any duration</i> <i>How often: More often than once every 5 years.</i>	HBRC	Observations during and following a coastal inundation event, including community feedback.	Some feedback proposed reducing this threshold to 3 years however retained as 5 to have parity with above threshold.
Any serious injuries and/or fatalities that occur as a result of a coastal erosion or coastal inundation event.	Civil Defence	CDEM observations during and following a coastal erosion or coastal inundation event, including community feedback.	Extensive debate on this threshold. All agreed that no fatalities are acceptable. Generally agreed that for injuries, threshold should be for serious injuries caused as a result of coastal hazards. Note, there are some standard definitions available.
Civil Defence emergency is declared in response to coastal inundation or coastal erosion. <i>How often: More often than once every 10 years.</i>	Civil Defence	CDEM reporting during and following a coastal erosion or coastal inundation event, including community feedback.	Feedback suggested moving to 10 years from 5 to reflect that a Civil Defence Emergency is a major event that is not tolerable more frequently.

Figure 7 A portion of the whole of coast thresholds

The group then examined the unit specific thresholds. During this process, a number of potential thresholds were removed where they were identified as being better as a trigger due to the scale of the impacts or where there were clear management techniques to address the issue through other means, as shown in **Figure 8**.

Whirinaki Proposed Thresholds			
Threshold + Threshold Measure	Primary responsibility for monitoring and reporting to HBRC	Monitoring method/ data source	Rationale for changes made in response to feedback as a result of community workshop held 22 June 2022
Coastal erosion in Whirinaki affecting Whirinaki Road and/or North Shore Road, causing loss of road access for the majority of the community.	HDC	Observed/ inspected/ reported by Council asset managers during/ following coastal erosion or coastal inundation events.	No changes suggested but change made to specifically reference Whirinaki and North Shore Roads as loss of access to either of these roads from coastal erosion would affect the majority of the community.
Coastal erosion in Whirinaki causing loss of road access that affects individual properties.	HDC	Observed/ inspected/ reported by Council asset managers during/ following coastal erosion or coastal inundation events.	Feedback suggests that this threshold would be better as a trigger given the individual scale of effects – we have applied this rationale to all individual scale thresholds in all units.
Buildings in Whirinaki are deemed uninhabitable as a result of coastal hazards (e.g. loss of septic tanks, building structural integrity etc).	CDEM/ HDC	Observed/ inspected/ reported by Council asset managers during/ following coastal erosion or coastal inundation events.	No changes suggested
Rail access is disrupted as a result of coastal hazards. How long: more than 48 hours How often: More often than once annually	KiwiRail	Reported by KiwiRail	Feedback suggested that this could be extended duration as there are alternative options that could be utilised in the event that rail is unavailable. Alternatively, some feedback suggested that this is better as a trigger, as it is not directly a community matter. Given the low impact for the wider community as a result of this infrastructure being affected i.e. not a commuter service, it was decided that this threshold was no longer needed.

Figure 8 Whirinaki example of unit-specific thresholds and the amendments as a result of community feedback.

Appendix 4 provides a summary of the final feedback from the panel.

This feedback was then used to compile a final set of proposed adaptation thresholds, which were later presented and adopted by TAG.

5 Final adaptation thresholds for the Clifton to Tangoio Coastal Hazards Strategy

Table 3 presents the final proposed adaptation thresholds for the Strategy. The following key limitations are noted:

1. Tangata whenua perspectives are not reflected in the draft thresholds. This requires resolution through further engagement.
2. The thresholds have been developed in collaboration with community members and Council staff, but require tangata whenua involvement and testing with the wider community to be legitimatised and confirmed.

Table 3: Final Proposed Adaptation Thresholds

	Threshold + Threshold Measure	Primary responsibility for monitoring and reporting to HBRC (Proposed)
All Units	Coastal inundation causing the loss of one or more essential services affecting the majority of the community. <i>How long: At least 48 hours</i> <i>How often: More often than once every 5 years.</i>	HBRC + Relevant TA
	Community-wide coastal inundation causing damage to multiple buildings/service. <i>How long: Any duration</i> <i>How often: More often than once every 5 years.</i>	HBRC
	Any serious injuries and/or fatalities that occur as a result of a coastal erosion or coastal inundation event.	Civil Defence
	Civil Defence emergency is declared in response to coastal inundation or coastal erosion. <i>How often: More often than once every 10 years.</i>	Civil Defence
	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
	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. <i>How long: At least 7 days</i> <i>How often: More often than once every 5 years.</i>	Relevant TA

Threshold + Threshold Measure		Primary responsibility for monitoring and 08 reporting to HBRC (Proposed)
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.	NCC
	How long: At least 48 hours	
	How often: More often than once every 5 years.	
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.	HDC
	How long: At least 48 hours	
	How often: More often than once every 5 years.	
	Buildings in Haumoana are deemed uninhabitable as a result of coastal hazards (e.g. loss of septic tanks, building structural integrity etc).	CDEM/ HDC
Te Awanga	Coastal inundation in Te Awanga affecting Clifton Road causing loss of road access for the majority of the community.	HDC
	How long: At least 48 hours	
	How often: More often than once every 5 years.	
	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.	HDC
	How long: At least 48 hours	
	How often: More often than once every 5 years.	
	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

6 Signals, Triggers & future monitoring

Work has now commenced on the development of appropriate signals and triggers. These will be designed to provide clear early warnings of change, with sufficient lead-time to enable robust decision making around next steps.

We consider it important to have good knowledge of likely next actions in order to accurately define signals and triggers. For example, if the likely next action in response to a trigger being reached is increased beach nourishment, little lead time (months) will be required in order to take that action to avoid an adaptation threshold being reached. A physical structure in the Coastal Marine Area and its associated consenting and construction process will require significantly more lead time (years). Managed or planned retreat is likely to require 10 years plus lead time. Consideration of lead-time has significant implications for how signals and triggers are defined and monitored for each part of the coast.

A subsequent but necessary step, once the signals and triggers have been identified, is the need to develop a pragmatic monitoring programme.

This programme will provide the mechanism for tracking identified adaptation thresholds, signals and triggers over time. In the development of the monitoring programme, existing monitoring already undertaken by Councils or others will be identified and its efficiency for monitoring signals, triggers and adaptation thresholds evaluated to identify any gaps where additional monitoring is required.

We recommend that a dedicated website or page is developed to provide “live” reporting of signals, triggers and adaptation thresholds once these are in place and being monitored. A simple traffic light system overlaid with an interactive map would be used to graphically show whether signals, triggers and adaptation thresholds are nominal (green), approaching (amber) or reached (red). This would provide a valuable node of communication for community members, Councils and asset owners/managers, and could provide an online forum for self-reporting of monitoring data by community members or others.

PART B



Appendices

Appendix 2

Workshop 1 Outcomes

Appendix 3

Adaptation Threshold Development

Appendix 4

Panel feedback