Takutai Kāpiti.

Raumati Adaptation Area

Shortlisted Pathway information for MCDA process

Presentation: CAP Workshop 13th December 2023

Information compiled by the Takutai Kāpiti Technical Advisory Group
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Reminder of Adaptation Options and Actions for the Raumati Adaptation Area (RAA)

OPTIONS

ENHANCE | ACCOMMODATE | PROTECT | RETREAT | AVOID

ACTIONS

We maintain and improve what we are already doing	We live with the hazard	We keep the hazard away	We move away from the hazard	We don't move into the way of the hazard in the first place
				
• Enhance existing erosion protection structures • Enhance existing inundation protection • Enhance access and ramps • Emergency management • Environmental monitoring • Community education and risk awareness • Private owners' responsibility	• Relocatable buildings • Raising floor levels • Flood-proofing buildings • Flood proofing infrastructure	**Soft Engineering (Erosion)** • Renourishment • Dune reconstruction **Hard Engineering (Erosion)** • Sea walls (vertical, revetment, buried, interlocking) **Inundation controls** • Culvert outfalls • Flood gates • Stopbanks • Earth bunds • Pump stations	• Retreat • Re-establish the line with a setback sea wall	• Raising minimum floor levels of new builds • Reduce further intensification or development • Trigger-based or time limited land use consents • Zoning and setback controls

How to read the Adaptation Area Draft Pathways sheets

High Level Adaptation Option agreed November 2023 workshop

NB: Signals and triggers transition from one action to the next.

Refers to menu of Adaptation options (from October 2023 workshop).
NB: Some pathway options comprise of more than one adaptation action.

Number of dwellings at risk (*Range indicates the lower SSP2-4.5 and higher SSP5-8.5 scenario; no range if the same number of properties is affected for each scenario)*

Explanatory technical notes

Raumati Adaptation Area Draft Pathways

Management Unit	9A Raumati (North of Wharemauku Stream)	Pathway:	1

RSLR 0.2 m (~ 2050) – 85 Properties at risk of erosion
RSLR 0.35 – 0.45 (~ 2070) – 86-95 Properties at risk of erosion
RSLR 0.85 – 1.25 (~ 2130) –138-149 Properties at risk of erosion

Short term	Medium term	Long term
Status Quo[1] and Enhance[4]	**Enhance Package[2,4]**	**Retreat & Protect - Seawall[9]**
Continue maintaining existing structures under the current management regime (i.e. reactive repair, private maintenance). Increased community education and emergency management.	*Private owners increase the resilience of their structures by adding material to existing structures (e.g. sea walls). This would continue to be an uncoordinated approach (in terms of structure design).*	*A hybrid approach of retreat and hard engineering that involves retreating the minimum number of properties possible and re-establishing the shoreline landward of the existing shoreline with a constructed sea wall.*

Notes:

In the short-term, private structures along the coastline will continue to be privately managed under the current management regime – which usually consists of reactive repair following large events. This current regime is a piecemeal approach to managing erosion.

As sea level rises, changes to the planning framework could allow for owners of private structures to increase the resilience of their own seawalls by adding material to either the toes of the structure, or the top of the structure to increase crest elevation and try to reduce overtopping.

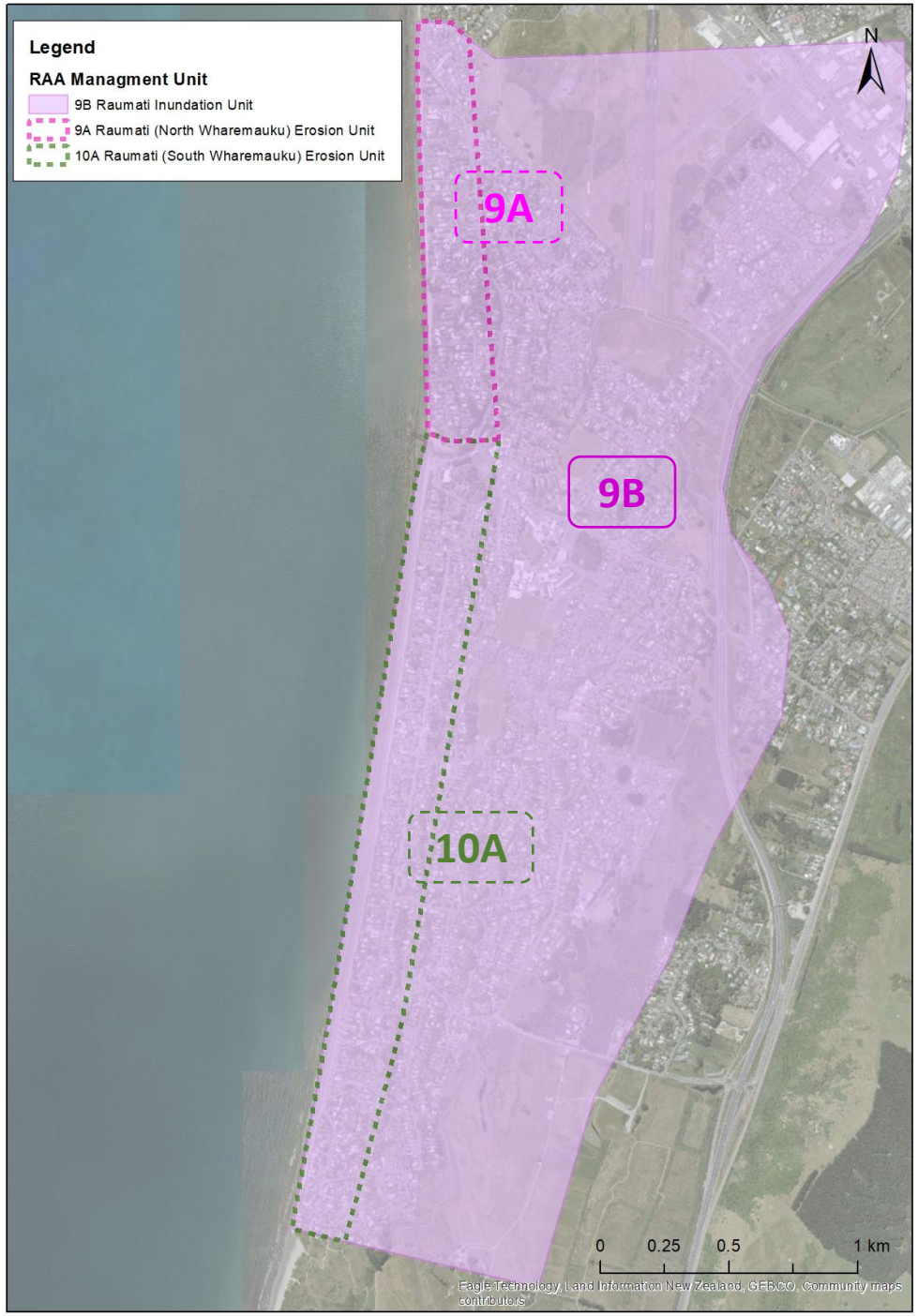
Over the longer term, retreat of the line is undertaken by retreating a small amount of properties and re-establishing the line further landward than the current alignment by constructing a new seawall in the new position.

7

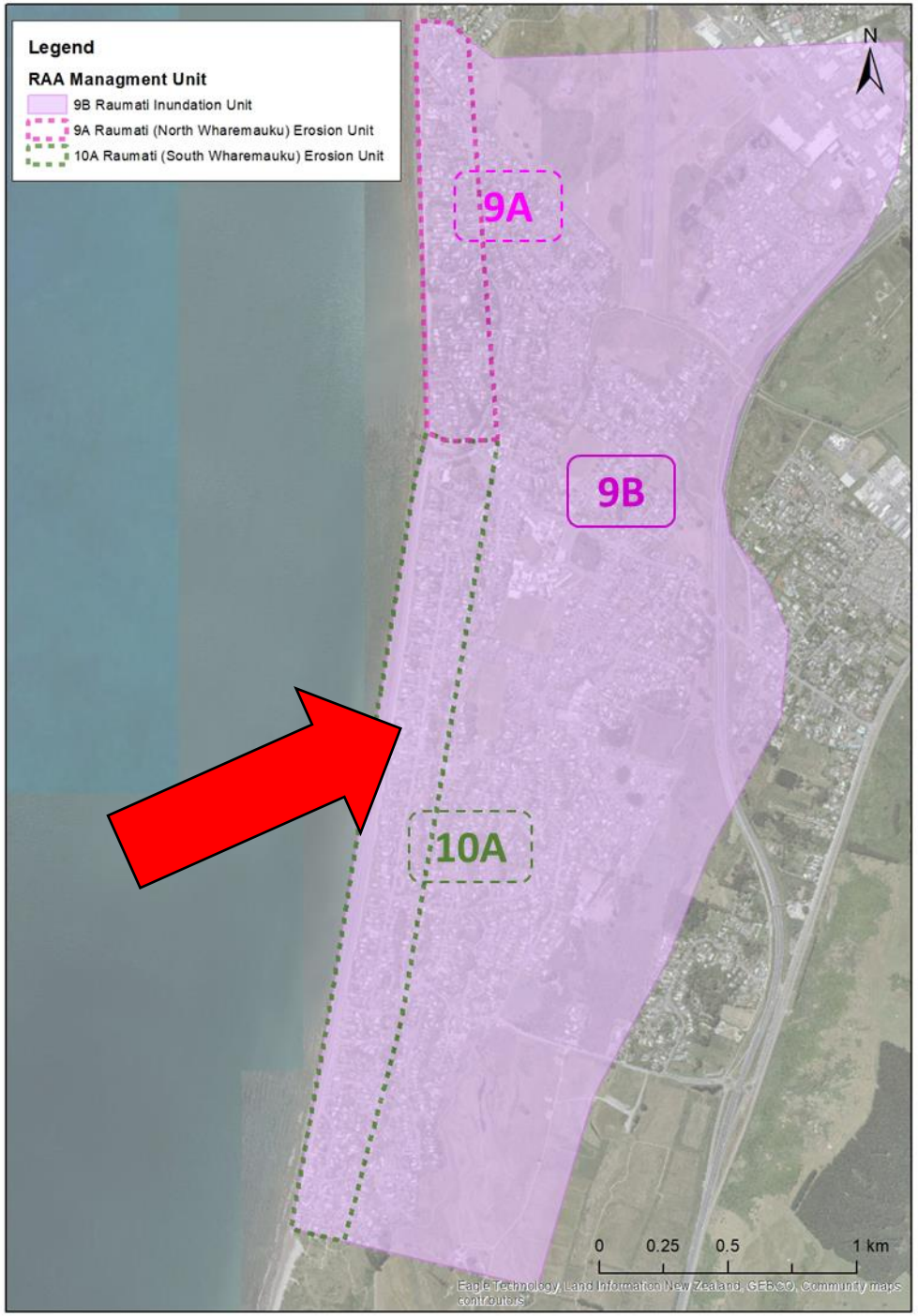
Legend

2130 predicted shoreline at SSP5 8.5 (33-66%) – with no adaptation actions

Raumati Adaptation Area Management Units



Unit 10A: Raumati (South of Wharemauku Stream)



Management Unit:	**10A Raumati (South of Wharemauku Stream)**	Pathway:	1

RSLR 0.2 m (~ 2050) – 195 Properties at risk of erosion
RSLR 0.35 – 0.45 m (~ 2070) – 234-250 Properties at risk of erosion
RSLR 0.85 – 1.25 m (~ 2130) – 452-480 Properties at risk of erosion

Short term

Status Quo[1] and Enhance[4]

Planned works in the LTP for like-for-like replacement of the Raumati sea wall, increased community education and emergency management.

Medium term

Enhance Package[2,4]

Adding material to the sea wall to increase resilience and design life and increased community education and emergency management.

Long term

Protect - Sea wall[12]

New coordinated sea wall along the same alignment as the Raumati sea wall.

Notes:

In the short term, works planned in the LTP to replace the Raumati sea wall like-for-like will continue to go ahead, with an expected design life of 25 years.

In the medium term, the sea wall could continue to be enhanced by adding material to the crest to increase elevation and prevent overtopping, as well as to the foundation of the wall to reduce the impacts of toe scour and undermining of the structure.

Over the long term, once the enhanced sea wall is no longer effectively managing the risks of coastal erosion, a new replacement sea wall could be constructed along the same alignment.

Raumati Adaptation Area Draft Pathways

Management Unit:	**10A Raumati (South of Wharemauku Stream)**	Pathway:	2

RSLR 0.2 m (~ 2050) – 195 Properties at risk of erosion
RSLR 0.35 – 0.45 m (~ 2070) – 234-250 Properties at risk of erosion
RSLR 0.85 – 1.25 m (~ 2130) – 452-480 Properties at risk of erosion

Short term

Status Quo[1] and Enhance[4]

Planned works in the LTP for like-for-like replacement of the Raumati sea wall, increased community education and emergency management.

Medium term

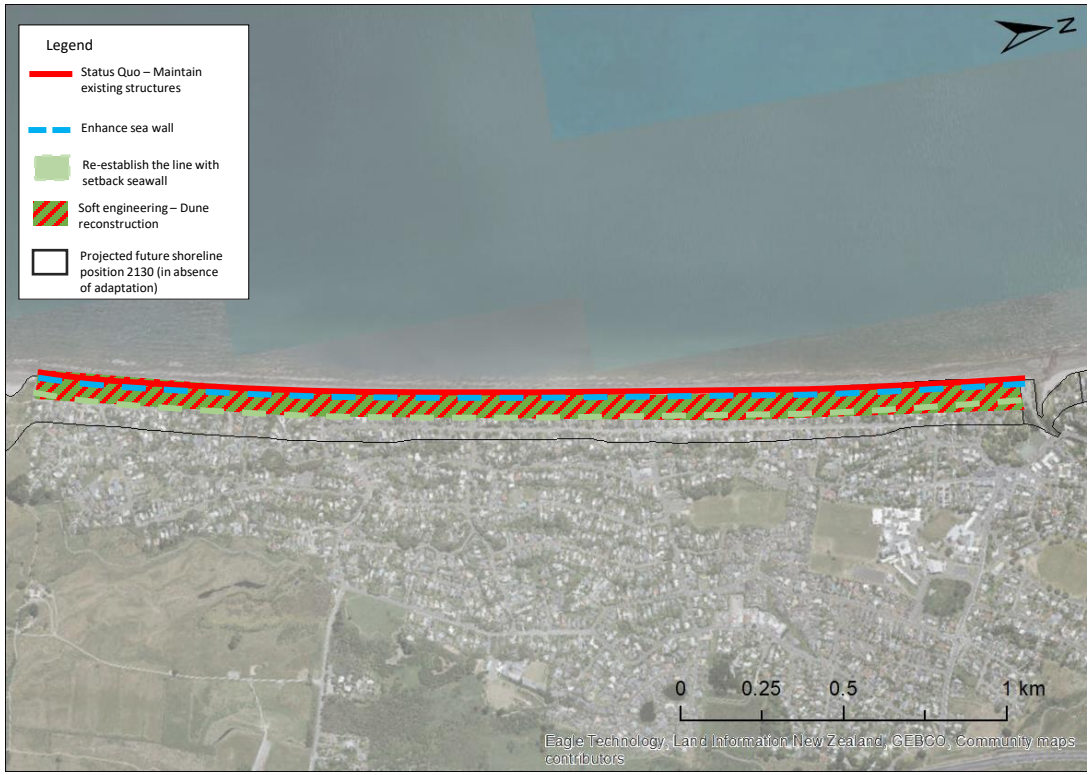
Enhance Package[2,4]

Adding material to the sea wall to increase resilience and design life and increased community education and emergency management.

Long term

Re-establish the line with sea wall[9] & Dune reconstruction[11]

A hybrid approach of retreat and hard engineering that involves retreating the minimum number of properties possible and re-establishing the shoreline landward of the existing shoreline with a constructed sea wall. Dune reconstruction to be undertaken in front of the seawall to provide additional protection.



Notes:

In the short term, works planned in the LTP to replace the Raumati sea wall like-for-like will continue to go ahead, with an expected design life of 25 years.

In the medium term, the sea wall could continue to be enhanced by adding material to the crest to increase elevation and prevent overtopping, as well as to the foundation of the wall to reduce the impacts of toe scour and undermining of the structure.

Over the long term, when existing sea wall can no longer effectively manage the erosion risks, retreat of the protection line is undertaken by retreating a small number of properties and re-establishing a new sea wall further landward than the current alignment. In front of the sea wall, dune reconstruction could be undertaken to build additional nature resilience of the wall, and provide for other coastal values (e.g. ecological, landscape).

Management Unit:	**10A Raumati (South of Wharemauku Stream)**	Pathway:	3

RSLR 0.2 m (~ 2050) – 195 Properties at risk of erosion
RSLR 0.35 – 0.45 m (~ 2070) – 234-250 Properties at risk of erosion
RSLR 0.85 – 1.25 m (~ 2130) – 452-480 Properties at risk of erosion

Short term

Status Quo[1] and Enhance[4]

Planned works in the LTP for like-for-like replacement of the Raumati sea wall, increased community education and emergency management.

Medium term

Protect - Sea wall[12]

New coordinated sea wall along the same alignment as the Raumati sea wall.

Long term

Enhance existing erosion protection (Sea wall)[2]

Adding material to the sea wall to increase resilience and design life.

Notes:

In the short term, works planned in the LTP to replace the Raumati sea wall like-for-like will continue to go ahead, with an expected design life of 25 years.

Over the medium term, once the existing sea wall is no longer effectively managing the risks of coastal erosion, a new replacement sea wall could be constructed along the same alignment.

In the long term, the replacement sea wall will continue to be enhanced by adding material to the crest to increase elevation and prevent overtopping, as well as to the foundation of the structure to reduce the impacts of toe scour and undermining of the structure.

Management Unit:	**10A Raumati (South of Wharemauku Stream)**	Pathway:	4

RSLR 0.2 m (~ 2050) – 195 Properties at risk of erosion
RSLR 0.35 – 0.45 m (~ 2070) – 234-250 Properties at risk of erosion
RSLR 0.85 – 1.25 m (~ 2130) – 452-480 Properties at risk of erosion

Short term

Status Quo[1] and Enhance[4]

Planned works in the LTP for like-for-like replacement of the Raumati sea wall, increased community education and emergency management.

Medium term

Re-establish the line with sea wall[9]

A hybrid approach of retreat and hard engineering that involves retreating the minimum number of properties possible and re-establishing the shoreline landward of the existing shoreline with a constructed sea wall.

Long term

Enhance existing erosion protection (Sea wall)[2]

Enhance and maintain the setback sea wall as the shoreline retreats back to that position so that the setback seawall can hold the line.

Notes:

In the short term, works planned in the LTP to replace the Raumati Sea wall like-for-like will continue to go ahead, with an expected design life of 25 years.

Over the medium term, when existing sea walls can no longer effectively manage the erosion risks, retreat of the protection line is undertaken by retreating a small number of properties and re-establishing a new seawall further landward than the current alignment.

In the longer term, as the shoreline retreats back to the setback sea wall, the sea wall will continue to be enhanced in order to continue to manage the effects of erosion from the setback position.

Management Unit:	**10A Raumati (South of Wharemauku Stream)**	Pathway:	5

RSLR 0.2 m (~ 2050) – 195 Properties at risk of erosion
RSLR 0.35 – 0.45 m (~ 2070) – 234-250 Properties at risk of erosion
RSLR 0.85 – 1.25 m (~ 2130) – 452-480 Properties at risk of erosion

Short term

Status Quo[1] and Enhance[4]

Planned works in the LTP for like-for-like replacement of the Raumati sea wall, increased community education and emergency management.

Medium term

Re-establish the line with sea wall[9] & Dune reconstruction[11]

A hybrid approach of retreat and hard engineering that involves retreating the minimum number of properties possible and re-establishing the shoreline landward of the existing shoreline with a constructed sea wall. Enough setback will be allowed for dune reconstruction to be undertaken to enhance the natural environment in front of the setback seawall.

Long term

Protect – Beach renourishment[10]

Adding sediment to the beach system, either onshore or in the nearshore to maintain the dune re-construction undertaken in the medium term.

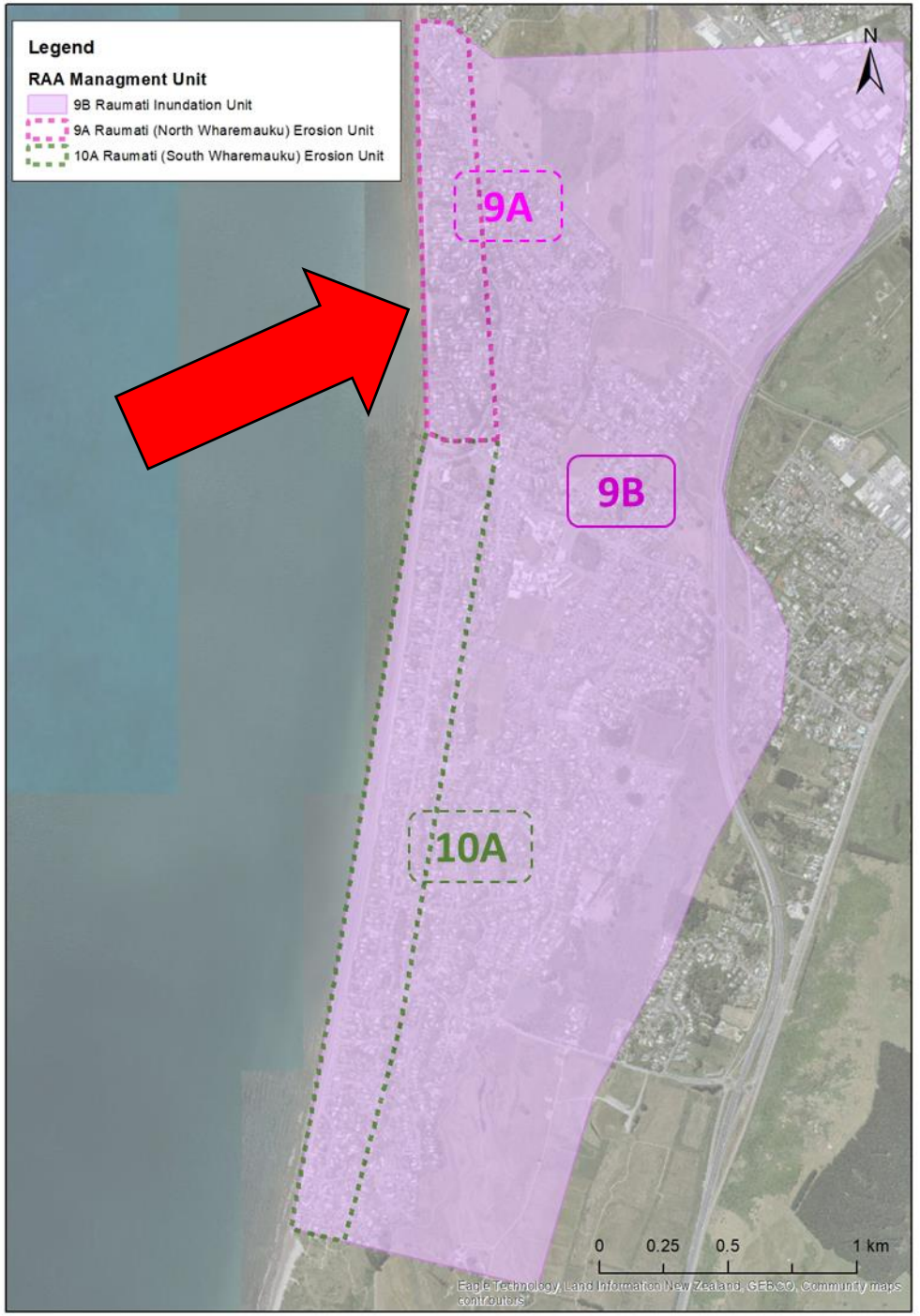
Notes:

In the short term, works planned in the LTP to replace the Raumati sea wall like-for-like will continue to go ahead, with an expected design life of 25 years.

Over the medium term, when existing sea walls can no longer effectively manage the erosion risks, retreat of the protection line is undertaken by retreating a small number of properties and re-establishing a new sea wall further landward than the current alignment. In front of the sea wall, dune reconstruction could be undertaken to build additional nature resilience of the wall, and provide for other coastal values (e.g. ecological, landscape).

Over the long term, beach renourishment could be undertaken to continue to maintain the constructed dune and maintain the beach system, with the setback sea wall being the final line of defence.

Unit 9A: Raumati (North of Wharemauku Stream)



Management Unit:	**9A Raumati (North of Wharemauku Stream)**	Pathway:	1

RSLR 0.2 m (~ 2050) – 85 Properties at risk of erosion
RSLR 0.35 – 0.45 m (~ 2070) – 86-95 Properties at risk of erosion
RSLR 0.85 – 1.25 m (~ 2130) –138-149 Properties at risk of erosion

Short term

Status Quo[1] and Enhance[4]

Continue maintaining existing structures under the current management regime (i.e. reactive repair, private maintenance). Increased community education and emergency management.

Medium term

Enhance Package[2,4]

Private owners increase the resilience of their structures by adding material to existing structures (e.g. sea walls) and increased community education and emergency management.

Long term

Re-establish the line with sea wall[9]

A hybrid approach of retreat and hard engineering that involves retreating the minimum number of properties possible and re-establishing the protection line further landward with a new constructed sea wall.

Notes:

In the short-term, private structures along the coastline will continue to be privately managed under the current management regime – which usually consists of reactive repair following large events. This current regime is a piecemeal approach to managing erosion.

As sea level rises, changes to the planning framework could allow for owners of private structures to increase the resilience of their own seawalls by adding material to either the foundation of the structure to reduce impacts of toe scour and undermining, or the top of the structure to increase crest elevation and try to reduce overtopping. This would continue to be a piecemeal, uncoordinated approach to managing erosion.

Over the longer term, retreat of the protection line is undertaken by retreating a small number of properties and re-establishing a new sea wall further landward than the current alignment. This sea wall would be a coordinated design and construction approach.

Management Unit:	**9A Raumati (North of Wharemauku Stream)**	Pathway:	2

RSLR 0.2 m (~ 2050) – 85 Properties at risk of erosion
RSLR 0.35 – 0.45 m (~ 2070) – 86-95 Properties at risk of erosion
RSLR 0.85 – 1.25 m (~ 2130) –138-149 Properties at risk of erosion

Short term

Enhance Package[2,4]

Private owners increase the resilience of their structures by adding material to existing structures (e.g. sea walls) and increased community education and emergency management.

Medium term

Protect - Sea wall[12]

New coordinated sea wall along current seawall alignment in front of the properties.

Long term

Re-establish the line with sea wall[9]

A hybrid approach of retreat and hard engineering that involves retreating the minimum number of properties possible and re-establishing the protection line further landward with a new constructed sea wall.

Notes:

In the short-term, changes to the planning framework could allow for owners of private structures to increase the resilience of their own sea walls by adding material to either the foundation of the structure to reduce impacts of toe scour and undermining, or the top of the structure to increase crest elevation and reduce overtopping. This would continue to be an uncoordinated approach to managing the erosion risk.

Once existing walls begin to fail and can no longer effectively manage the erosion risks, a coordinated new sea wall along the current alignment could be constructed.

Over the longer term, retreat of the protection line is undertaken by retreating a small number of properties and re-establishing a new sea wall further landward than the current alignment. This sea wall would be a coordinated design and construction approach.

Management Unit:	**9A Raumati (North of Wharemauku Stream)**	Pathway:	3

RSLR 0.2 m (~ 2050) – 85 Properties at risk of erosion
RSLR 0.35 – 0.45 m (~ 2070) – 86-95 Properties at risk of erosion
RSLR 0.85 – 1.25 m (~ 2130) –138-149 Properties at risk of erosion

Short term

Enhance Package[2,4]

Private owners increase the resilience of their structures by adding material to existing structures (e.g. sea walls) and increased community education and emergency management.

Medium term

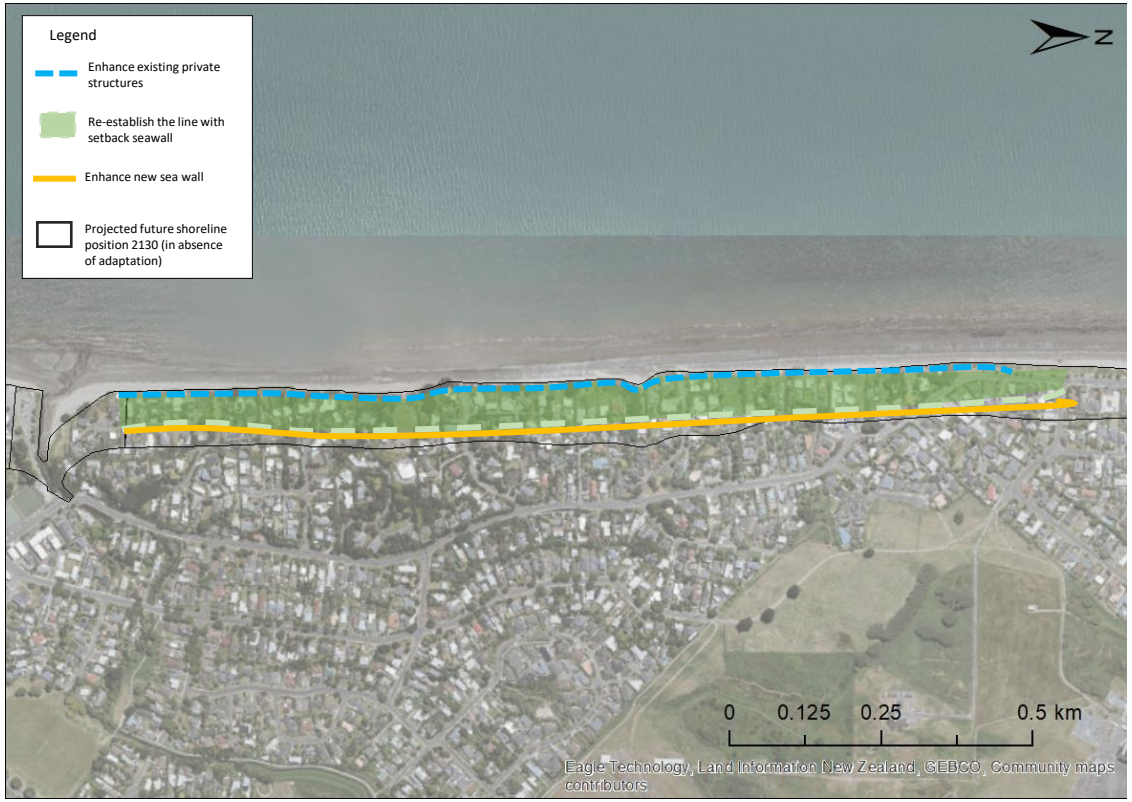
Re-establish the line with sea wall[9]

A hybrid approach of retreat and hard engineering that involves retreating the minimum number of properties possible and re-establishing the protection line further landward with a new constructed sea wall.

Long term

Enhance existing erosion protection (Sea wall)[2]

Enhance and maintain the setback sea wall as the shoreline retreats back to that position.



Notes:

In the short-term, changes to the planning framework could allow for owners of private structures to increase the resilience of their own sea walls by adding material to either the foundation of the structure to reduce impacts of toe scour and undermining, or the top of the structure to increase crest elevation and reduce overtopping. This would continue to be an uncoordinated approach to managing the erosion risk.

Over the medium term, when existing sea walls can no longer effectively manage the erosion risks, retreat of the protection line is undertaken by retreating a small number of properties and re-establishing a new seawall further landward than the current alignment. This sea wall would be a coordinated design and construction approach.

Over the long term, as the shoreline retreats back to the setback sea wall, the structure could be enhanced in order to continue to manage the effects of erosion from the setback position.

Management Unit:	**9A Raumati (North of Wharemauku Stream)**	Pathway:	4

RSLR 0.2 m (~ 2050) – 85 Properties at risk of erosion
RSLR 0.35 – 0.45 m (~ 2070) – 86-95 Properties at risk of erosion
RSLR 0.85 – 1.25 m (~ 2130) –138-149 Properties at risk of erosion

Short term

Enhance Package[2,4]

Private owners increase the resilience of their structures by adding material to existing structures (e.g. sea walls) and increased community education and emergency management.

Medium term

Re-establish the line with sea wall[9] & Dune reconstruction[11]

A hybrid approach of retreat and hard engineering that involves retreating the minimum number of properties possible and re-establishing the shoreline landward of the existing shoreline with a constructed sea wall. Dune reconstruction to be undertaken in front of the sea wall to provide additional resilience.

Long term

Protect – Beach renourishment[10]

Adding sediment to the beach system, either onshore or in the nearshore to maintain the dune re-construction undertaken in the medium term.

Notes:

In the short-term, changes to the planning framework could allow for owners of private structures to increase the resilience of their own sea walls by adding material to either the foundation of the structure to reduce impacts of toe scour and undermining, or the top of the structure to increase crest elevation and reduce overtopping. This would continue to be an uncoordinated approach to managing the erosion risk.

Over the medium term, when existing sea walls can no longer effectively manage the erosion risks, retreat of the protection line is undertaken by retreating a small number of properties and re-establishing a new sea wall further landward than the current alignment. Infront of the seawall, dune reconstruction could be undertaken to build additional nature resilience of the wall, and provide for other coastal values (e.g. ecological, landscape).

Over the long term, beach renourishment could be undertaken to continue to maintain the constructed dune and maintain the beach system, with the setback sea wall being the final line of defence.

Management Unit:	**9A Raumati (North of Wharemauku Stream)**	Pathway:	5

RSLR 0.2 m (~ 2050) – 85 Properties at risk of erosion
RSLR 0.35 – 0.45 m (~ 2070) – 86-95 Properties at risk of erosion
RSLR 0.85 – 1.25 m (~ 2130) –138-149 Properties at risk of erosion

Short term

Protect - Sea wall[12]

New coordinated sea wall along the front of properties along existing shoreline position.

Medium term

Enhance existing erosion protection (Sea wall)[2]

Add material to the sea wall to increase resilience.

Long term

Enhance existing erosion protection (Sea wall)[2]

Add material to the sea wall to increase resilience.

Notes:

In the short-term, the current structure private structures could be removed and replaced with a new sea wall. This seawall would involve a coordinated design and construction approach.

Over the medium and long term, this sea wall would continue to be enhanced in its current alignment. This could be done by adding material to the foundation of the wall to reduce the impacts of toe scour undermining the structure; and by increasing the height of the wall to reduce overtopping.

Management Unit:	**9A Raumati (North of Wharemauku Stream)**	Pathway:	6

RSLR 0.2 m (~ 2050) – 85 Properties at risk of erosion
RSLR 0.35 – 0.45 m (~ 2070) – 86-95 Properties at risk of erosion
RSLR 0.85 – 1.25 m (~ 2130) –138-149 Properties at risk of erosion

Short term

Protect - Sea wall[12]

New coordinated sea wall along the front of properties along existing shoreline position.

Medium term

Re-establish the line with sea wall[9]

A hybrid approach of retreat and hard engineering that involves retreating the minimum number of properties possible and re-establishing the shoreline landward of the existing shoreline with a constructed sea wall.

Long term

Enhance existing erosion protection (Sea wall)[2]

Enhance the setback sea wall as the shoreline retreats back to that position.

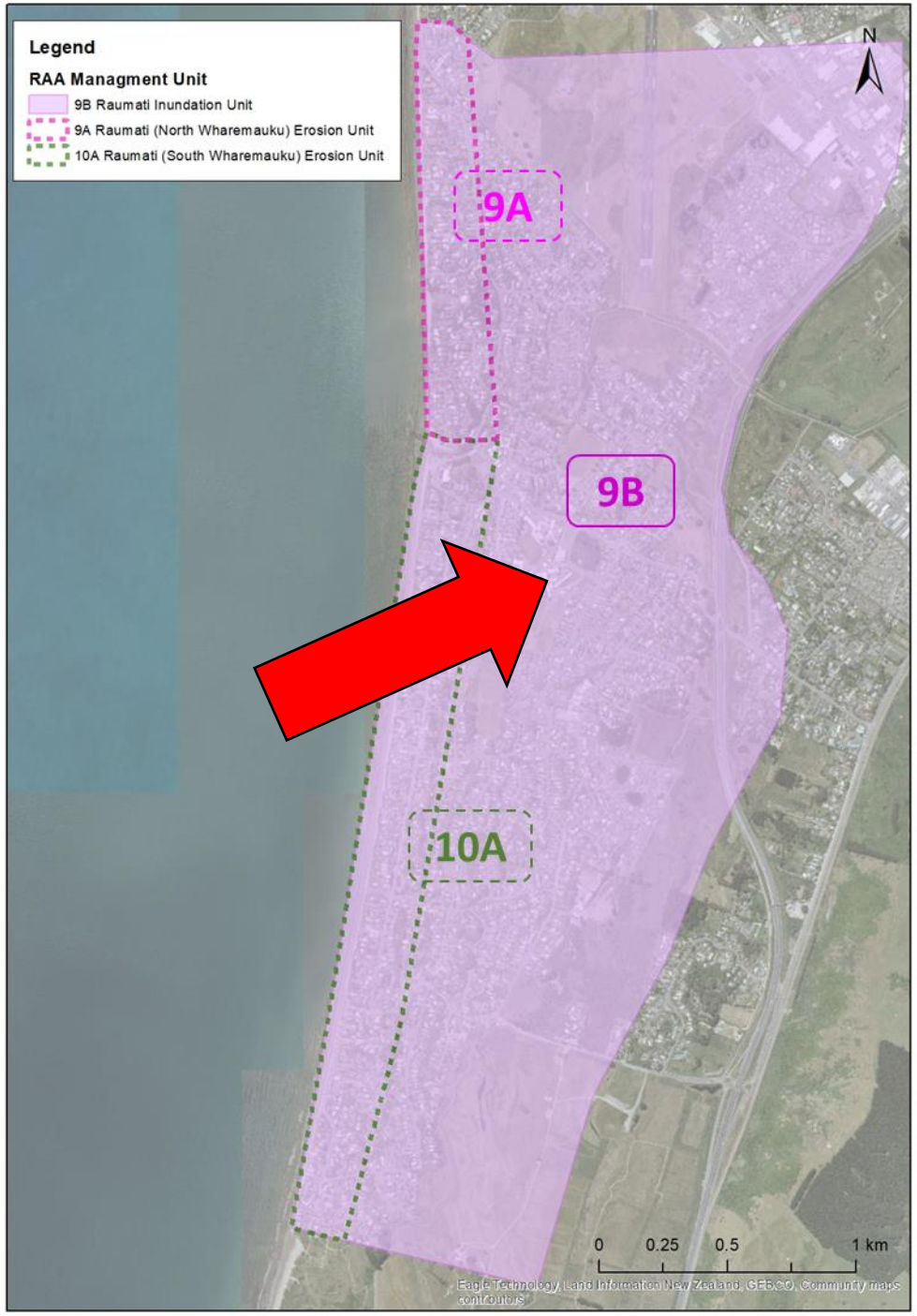
Notes:

In the short-term, the current structure private structures could be removed and replaced with a new sea wall.

Over the medium term, when existing seawalls are no longer effectively managing the erosion risk, retreat of the protection line is undertaken by retreating a small number of properties and re-establishing a new seawall further landward than the current alignment.

Over the long term, as the shoreline retreats back to the setback sea wall, it could be enhanced in order to continue to manage the effects of erosion from the setback position.

Unit 9B: Raumati Inundation Unit



Raumati Adaptation Area Draft Pathways

Management Unit:	**9B Raumati Inundation Unit**	Pathway:	1

RSLR 0.2 m (~ 2050) – 75 Properties at risk of Inundation
RSLR 0.35 – 0.45 m (~ 2070) – 96-114 Properties at risk of Inundation
RSLR 0.85 – 1.25 m (~ 2130) – 223-458 Properties at risk of Inundation

Short term	Medium term	Long term
Status Quo[1] and Enhance[4]	**Enhance Package[3,4]**	**Hard Protection Package[13,14,15]**
Maintain existing management infrastructure, increase community education and emergency management →	*Enhance existing inundation protection, and increase community education and emergency management* →	*Installation of floodgates, pump stations and stopbanks to prevent sea water entering the settlements*

Notes:
Over the short term, continue to maintain existing flood management infrastructure, and increase community education and awareness about longer term hazards. Also increase community preparedness and emergency management.

Over the medium term, undertake upgrades and maintenance of existing infrastructure to manage the short-medium term flood risk for the area. This could include installing flap-valves on existing outfalls to prevent backflow in storm events.

Over the longer term, feasibility of increased hard protection schemes including small sections of stopbanks around the Wharemauku Stream and pump stations would be investigated, and if feasible could be installed to manage coastal water entering the settlement via low lying waterways and the stormwater network.

Raumati Adaptation Area Draft Pathways

Management Unit:	**9B Raumati Inundation Unit**	Pathway:	2

RSLR 0.2 m (~ 2050) – 75 Properties at risk of Inundation
RSLR 0.35 – 0.45 m (~ 2070) – 96-114 Properties at risk of Inundation
RSLR 0.85 – 1.25 m (~ 2130) – 223-458 Properties at risk of Inundation

Short term	Medium term	Long term
Status Quo[1] and Enhance[4]	**Enhance Package[3,4]**	**Accommodate [5, 7] Package**
Maintain existing management infrastructure, increase community education and emergency management →	*Enhance existing inundation protection, and increase community education and emergency management* →	*Pro-actively raise floors of homes which could be flooded, and/or flood proof homes and infrastructure*

Notes:
Over the short term, continue to maintain existing flood management infrastructure, and increase community education and awareness about longer term hazards. Also increase community preparedness and emergency management.

Over the medium term, undertake upgrades and maintenance of existing infrastructure to manage the short-medium term flood risk for the area. This could include installing flap-valves on existing outfalls to prevent backflow in storm events.

Over the longer term, dwellings where the flood risk is not being effectively managed through the broader flood protection scheme would be proactively raised so floor levels were above projected water levels in large storms to avoid being flooded, or they would be flood-proofed by sealing the buildings. Although dwellings would be protected, access to properties and services may still be impacted.

Raumati Adaptation Area Draft Pathways

Management Unit:	**9B Raumati Inundation Unit**	Pathway:	3

RSLR 0.2 m (~ 2050) – 75 Properties at risk of Inundation
RSLR 0.35 – 0.45 m (~ 2070) – 96-114 Properties at risk of Inundation
RSLR 0.85 – 1.25 m (~ 2130) – 223-458 Properties at risk of Inundation

Short term

Status Quo[1] and Enhance[4]

Maintain existing management infrastructure, increase community education and emergency management

Medium term

Hard Protection Package[13,14,15]

Installation of floodgates, pump stations and stopbanks to prevent sea water entering the settlements

Long term

Enhance [2, 4] Package

Enhance new inundation protection, increase community education and emergency management

Notes:
Over the short term, continue to maintain existing flood management infrastructure, and increase community education and awareness about longer term hazards. Also increase community preparedness and emergency management.

Over the medium term, feasibility of increased hard protection schemes including small sections of stopbanks around Wharemauku Stream and pump stations would be investigated, and if feasible could be installed to manage coastal water entering the settlement via low lying waterways and the stormwater network.

Over the longer term, undertake upgrades and maintenance of flood protection infrastructure to manage the increasing flood risk for the area.