NORTHERN CELL

Pathway One | **Coastal Unit E1: Ahuriri**

Short term	Medium term	Long term
STATUS QUO[1,2,6,7] Beach maintenance and planting employed in the short term and in response to storm events	**RETREAT THE LINE**[17] Assets at western end no longer protected and will eventually be removed	**MANAGED RETREAT**[18] In response to storm events and increasing risks properties in coastal hazard zone will be subjected to a managed retreat

NOTES:

Pathway provides minimal increase in standard of protection.

Retreat the Line option would move the defence line back to the main road and would include the construction of a stopbank. Properties seawards of the line would be allowed to live out their residual life, but would eventually be removed/relocated.

Managed retreat would be initiated In response to increasing risk, inundation events or failure of the seawall and subsequent erosion.

NORTHERN CELL

Pathway Two	Coastal Unit E1: Ahuriri

Short term	Medium term	Long term

STATUS QUO[1,2,6,7]

Beach maintenance and planting employed in the short term and in response to storm events

RETREAT THE LINE[17]

Assets at western end no longer protected and will eventually be removed

SEAWALL[16]

More substantial seawall constructed along whole unit to provide protection against erosion and inundation.

NOTES:

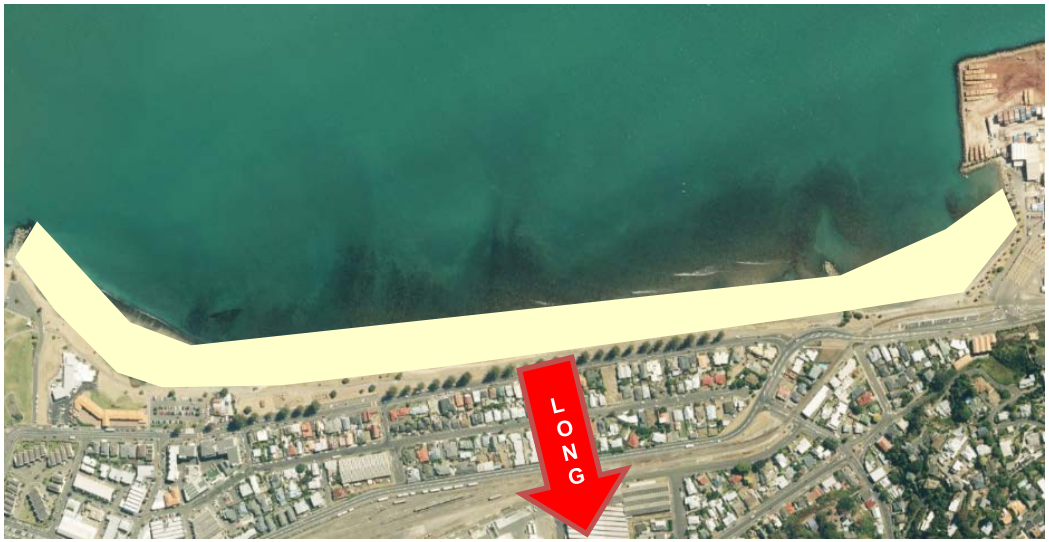
Seawall likely to be upgraded rock revetment with impermeable core.

Retreat the Line option would move the defence line back to the main road and would include the construction of a stopbank. Properties seawards of the line would be allowed to live out their residual life, but would eventually be removed/relocated.

NORTHERN CELL

Pathway Three | **Coastal Unit E1: Ahuriri**

Short term	Medium term	Long term
STATUS QUO/ RENOURISHMENT[1,3,16] Structures maintained, additional gravel/sand renourishment and maintainance as required.	**RENOURISHMENT + CONTROL STRUCTURES**[3,13,14,15] Additional beach renourishment and structure maintenance as required	**MANAGED RETREAT**[18] Property and Assets relocated inland, natural character of coastline reinstated



NOTES:

A point will be reached in the long term where the renourishment and controlling structures fail to provide an adequate standard of protection against inundation. This will trigger a managed retreat of assets in the hazard zone.

Low lying assets at the western end of the unit will likely have to retreat first.

NORTHERN CELL

Pathway Four | **Coastal Unit E1: Ahuriri**

Short term	Medium term	Long term

STATUS QUO/ RENOURISHMENT[1,3,16]

Structures maintained, additional gravel/sand renourishment and maintainance as required.

RENOURISHMENT + CONTROL STRUCTURES[3,13,14,15]

Additional beach renourishment and structure maintenance as required

SEAWALL[16]

More substantial seawall constructed along whole unit to provide protection against erosion and inundation.

NOTES:

In order to protect lower lying assets at the west of the unit seawall may have to be constructed there in the MT

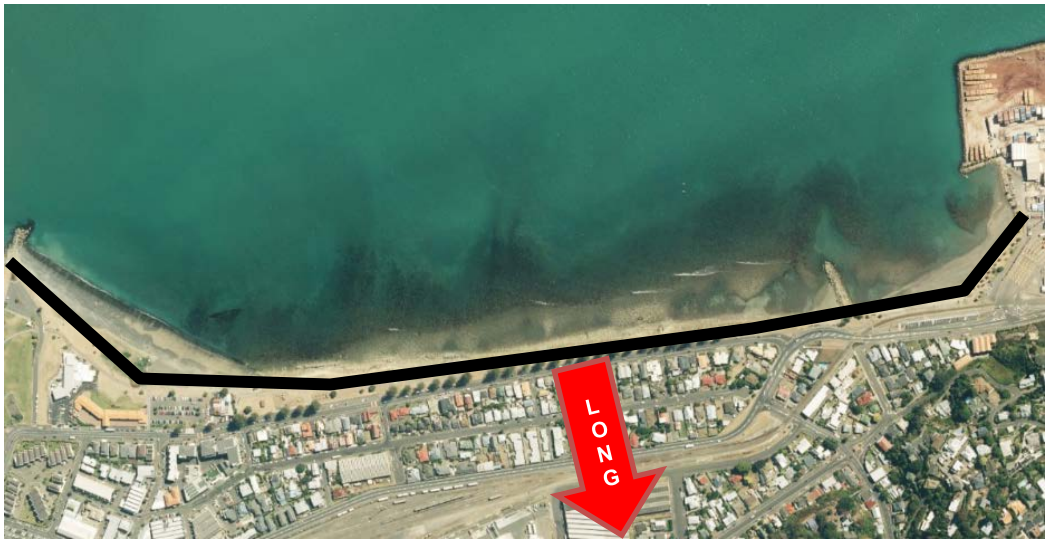
Seawall likely to be rock revetment with impermeable core.

For this unit consideration may also be given to concrete wall, due to the number of assets and relatively short length.

NORTHERN CELL

Pathway Five | **Coastal Unit E1: Ahuriri**

Short term	Medium term	Long term
STATUS QUO[1,2,6,7] Beach maintenance and planting employed in the short term and in response to storm events	**SEA WALL**[16] Constructed as primary protection for inundation and erosion.	**MANAGED RETREAT**[18] Property and Assets relocated inland, natural character of coastline reinstated



NOTES:

Seawall constructed as a rock revetment

A point will be reached in the long term where the seawall fails to provide an adequate standard of protection against inundation. This will trigger a managed retreat of assets in the hazard zone.

Low lying assets at the western end of the unit will likely have to retreat first.

NORTHERN CELL

Pathway Six | **Coastal Unit E1: Ahuriri**

Short term	Medium term	Long term
STATUS QUO[1,2,6,7] Beach maintenance and planting employed in the short term and in response to storm events	**SEA WALL**[16] Constructed as primary protection for inundation and erosion.	**SEA WALL**[16] Height will need increasing in order to offset the impacts of sea level rise. Maintenance as required

NOTES:

Hold the line for the long term

For this unit consideration may also be given to concrete wall, due to the number of assets and relatively short length.

NORTHERN CELL

Pathway One	Coastal Unit E2: Pandora

Short term	Medium term	Long term

STATUS QUO

No change, area at harbour entrance at risk of flooding

INUNDATION PROTECTION[10]

Stopbank to provide protection in the medium term

MANAGED RETREAT

Assets subject to a managed retreat as risk of inundation increases over time

NOTES:

Assets at risk in the short term

Stopbank at Marina may require additional rock armour protection.

Detailed design to assess potential for return flow through drainage system and need for additional flood gates.

NORTHERN CELL

Pathway Two | **Coastal Unit E2: Pandora**

Short term	Medium term	Long term
INUNDATION PROTECTION[10] Stopbank to provide protection at harbour entrance	**INUNDATION PROTECTION[10]** Stopbank to provide protection in the medium term	**MANAGED RETREAT** Assets subject to a managed retreat as risk of inundation increases over time

NOTES:

Stopbank at Marina may require additional rock armour protection

Detailed design to assess potential for return flow through drainage system and need for additional flood gates.

NORTHERN CELL

Pathway Three | **Coastal Unit E2: Pandora**

Short term	Medium term	Long term
INUNDATION PROTECTION[10] Stopbank to provide protection at harbour entrance	**INUNDATION PROTECTION[10]** Stopbank to provide protection in the medium term	**INUNDATION PROTECTION[10]** Stopbank to provide protection in the long term, may require raising subject to sea level rise

NOTES:

Stopbanks may require additional rock armour protection and raising through time to combat increasing sea level rise.

Boat ramp will be provided.

Detailed design to assess potential for return flow through drainage system and need for additional flood gates.

NORTHERN CELL

Pathway Four | **Coastal Unit E2: Pandora**

Short term	Medium term	Long term
INUNDATION PROTECTION[10] Stopbank to provide protection at harbour entrance	**INUNDATION PROTECTION + FLOOD GATE[9,10]** Stopbank to provide protection in the medium term. Flood Gate Installed	**INUNDATION PROTECTION + FLOOD GATE[9,10]** Flood gate to reduce the still water level during storm surge and required stopbank height

NOTES:

Effectiveness of flood gate to be assessed with a hydraulic analysis under different conditions. This will reduce the requirement for stopbank height and extent (red dotted line)

Stopbanks in outer harbour may require additional rock armour protection and raising through time to combat increasing sea level rise.

Detailed design to assess potential for return flow through drainage system and need for additional flood gates.

NORTHERN CELL

Pathway One	Coastal Unit D: Westshore

Short term	Medium term	Long term

RENOURISHMENT[2,3,4,6,7]

Regular gravel and sand renourishment to offset erosion losses in combination with beach maintenance and planting

MANAGED RETREAT[18]

Property and Assets relocated outside coastal hazard zone, natural character of coastline reinstated

MANAGED RETREAT[18]

Property and Assets relocated outside coastal hazard zone, natural character of coastline reinstated

NOTES:

Combination of gravel renourishment and offshore sand nourishment in the short term. (***Gravel*** – Land based replenishment at key areas. ***Sand*** – Material placed offshore, using marine plant, and allowed to naturally migrate northwards and towards the beach raising foreshore levels)

Gravel – Land based replenishment at key areas

Sand – Material placed offshore and allowed to naturally migrate northwards and towards the beach raising foreshore levels

Staged managed retreat of assets over the medium to long term when risk becomes unacceptable due to erosion losses and sea level rise.

NORTHERN CELL

Pathway Two	Coastal Unit D: Westshore

Short term	Medium term	Long term

RENOURISHMENT[2,3,4,6,7]

Regular gravel and sand renourishment to offset erosion losses in combination with beach maintenance and planting

RENOURISHMENT + CONTROL STRUCTURES[3,13,14]

Structures used to maintain beach with additional gravel renourishment

MANAGED RETREAT[18]

Property and Assets relocated outside coastal hazard zone, natural character of coastline reinstated

NOTES:

Combination of gravel renourishment and offshore sand bar in the short term. (***Gravel*** – Land based replenishment at key areas. ***Sand*** – Material placed offshore, using marine plant, and allowed to naturally migrate northwards and towards the beach raising foreshore levels)

Beach control structures will be required in the medium term, typically groynes. Gravel nourishment only.

Consideration given to retreating defence line to raised gravel bank behind gravel barrier.

A seawall may be required to protect exposed assets at the Eastern end.

Staged managed retreat of assets over the long term when risk becomes unacceptable due to erosion losses and sea level rise.

NORTHERN CELL

Pathway Three | **Coastal Unit D: Westshore**

Short term	Medium term	Long term
RENOURISHMENT[2,3,4,6,7] Regular gravel and sand renourishment to offset erosion losses in combination with beach maintenance and planting	**RENOURISHMENT + CONTROL STRUCTURES**[3,13,14] Structures used to maintain beach with additional gravel renourishment	**RENOURISHMENT + CONTROL STRUCTURES**[3,13,14] Structures raised and/or lengthened and size/crest elevation of beach increased

NOTES:

Combination of gravel renourishment and offshore sand bar in the short term. (***Gravel*** – Land based replenishment at key areas. ***Sand*** – Material placed offshore, using marine plant, and allowed to naturally migrate northwards and towards the beach raising foreshore levels)

Beach control structures will be required in the medium term, typically groynes. Gravel nourishment only.

Consideration given to retreating defence line to raised gravel bank behind gravel barrier.

A seawall may be required to protect exposed assets at the Eastern end.

Structures raised and lengthened over long term, with additional beach renourishment, in order to offset effects of sea level rise.

NORTHERN CELL

Pathway Four | **Coastal Unit D: Westshore**

Short term	Medium term	Long term
RENOURISHMENT[2,3,4,6,7] Regular gravel and sand renourishment to offset erosion losses in combination with beach maintenance and planting	**RENOURISHMENT + CONTROL STRUCTURES**[3,13,14] Structures used to maintain beach with additional gravel renourishment	**SEA WALL**[16] Constructed as primary protection for inundation and erosion. No requirement to nourish beach.

NOTES:

Combination of gravel renourishment and offshore sand bar in the short term. (***Gravel*** – Land based replenishment at key areas. ***Sand*** – Material placed offshore, using marine plant, and allowed to naturally migrate northwards and towards the beach raising foreshore levels)

Beach control structures will be required in the medium term, typically groynes. Gravel nourishment only.

Consideration given to retreating defence line to raised gravel bank behind gravel barrier.

A seawall may be required to protect exposed assets at the Eastern end.

Introduction of large seawall (rock revetment) in the long term, which removes the requirement to renourish the beach.

NORTHERN CELL

Pathway Five | **Coastal Unit D: Westshore**

Short term	Medium term	Long term
RENOURISHMENT + CONTROL STRUCTURES[3,13,14] Structures used to maintain beach with additional gravel renourishment	**RENOURISHMENT + CONTROL STRUCTURES**[3,13,14] Additional beach renourishment and structure maintenance as required	**SEA WALL**[16] Constructed as primary protection for inundation and erosion. No requirement to nourish beach.

NOTES:

Gravel renourishment in the short term (No Sand) in combination with the staged introduction of a groyne field or offshore breakwaters.

Consideration given to retreating defence line to raised gravel bank behind gravel barrier.

A seawall may be required to protect exposed assets at the Eastern end.

Introduction of large seawall (rock revetment) in the long term, which removes the requirement to renourish the beach.

NORTHERN CELL

Pathway Six	Coastal Unit D: Westshore

Short term	Medium term	Long term
SEA WALL[16] Constructed as primary protection for inundation and erosion. No requirement to nourish beach.	**SEA WALL[16]** Maintenance as required	**SEA WALL[16]** Height will need increasing in order to offset the impacts of sea level rise. Maintenance as required

NOTES:

Staged construction of seawall (rock revetment) in the short term, which removes the requirement to renourish the beach.

Seawall will need to be raised in the long term in order to offset the impacts of sea level rise and climate change.

Consideration given to retreating defence line to raised gravel bank behind gravel barrier.

NORTHERN CELL

Pathway One | **Coastal Unit C: Bayview**

Short term	Medium term	Long term
STATUS QUO[2,3,6,7] Beach maintenance and planting, presumes renourishment downdrift	**MANAGED RETREAT**[18] Property and Assets relocated outside coastal hazard zone, natural character of coastline reinstated	**MANAGED RETREAT**[18] Property and Assets relocated outside coastal hazard zone, natural character of coastline reinstated

NOTES:

Under the status quo scenario renourishment at Westshore will partially offset erosion losses. If this is no longer the case gravel renourishment may be required.

Staged managed retreat of assets over the medium to long term when risk becomes unacceptable due to erosion losses and sea level rise.

State Highway 2 may need to be protected with a seawall in the long term.

NORTHERN CELL

Pathway Two | **Coastal Unit C: Bayview**

Short term	Medium term	Long term

STATUS QUO/ RENOURISHMENT[1,3]

Regular gravel renourishment to offset erosion losses in combination with beach maintenance and planting

RENOURISHMENT + CONTROL STRUCTURES[3,13]

Additional beach renourishment and structures used to maintain beach.

MANAGED RETREAT[18]

Property and Assets relocated outside coastal hazard zone, natural character of coastline reinstated

NOTES:

Gravel renourishment in the short term.

Continued renourishment with the stage introduction of a groyne field in the medium term.

Continued renourishment at Westshore would reduce the requirement and frequency of beach replenishment.

Staged managed retreat of assets over the long term when risk becomes unacceptable due to erosion losses and sea level rise.

State Highway 2 may need to be protected with a seawall in the long term.

NORTHERN CELL

Pathway Three | **Coastal Unit C: Bayview**

Short term	Medium term	Long term
STATUS QUO/ RENOURISHMENT[1,3] Regular gravel renourishment to offset erosion losses in combination with beach maintenance and planting	**RENOURISHMENT + CONTROL STRUCTURES[3,13]** Additional beach renourishment and structure maintenance as required	**RENOURISHMENT + CONTROL STRUCTURES[3,13]** Structures raised and/or lengthened and size/crest elevation of beach increased

NOTES:

Gravel renourishment in the short term.

Continued renourishment with the stage introduction of a groyne field in the medium term.

Continued renourishment at Westshore would reduce the requirement and frequency of beach replenishment.

Structures raised and lengthened over long term, with additional beach renourishment, in order to offset effects of sea level rise.

NORTHERN CELL

Pathway Four | **Coastal Unit C: Bayview**

Short term	Medium term	Long term
STATUS QUO/ RENOURISHMENT[1,3] Regular gravel renourishment to offset erosion losses in combination with beach maintenance and planting	**RENOURISHMENT + CONTROL STRUCTURES**[3,13] Additional beach renourishment and structure maintenance as required	**SEA WALL**[16] Constructed as primary protection for inundation and erosion. No requirement to nourish beach.

NOTES:

Gravel renourishment in the short term.

Continued renourishment with the stage introduction of a groyne field in the medium term.

Continued renourishment at Westshore would reduce the requirement and frequency of beach replenishment.

Introduction of large seawall (rock revetment) in the long term, which removes the requirement to renourish the beach.

NORTHERN CELL

Pathway Five | **Coastal Unit C: Bayview**

Short term	Medium term	Long term
STATUS QUO[2,3,6,7] Beach maintenance and planting, presumes renourishment downdrift	**SEA WALL**[16] Constructed as primary protection for inundation and erosion. No requirement to nourish beach.	**MANAGED RETREAT**[18] Property and Assets relocated outside coastal hazard zone, natural character of coastline reinstated

NOTES:

Under the status quo scenario renourishment at Westshore will partially offset erosion losses. If this is no longer the case gravel renourishment may be required.

Introduction of seawall (rock revetment) in the medium term as required, which removes the requirement to renourish the beach.

Staged managed retreat of assets over the long term when risk becomes unacceptable, due to erosion losses and sea level rise exceeding seawall design limits.

NORTHERN CELL

Pathway Six | **Coastal Unit C: Bayview**

Short term	Medium term	Long term
STATUS QUO[2,3,6,7] Beach maintenance and planting, presumes renourishment downdrift	**SEA WALL**[16] Constructed as primary protection for inundation and erosion. No requirement to nourish beach.	**SEA WALL**[16] Height will need increasing in order to offset the impacts of sea level rise. Maintenance as required

NOTES:

Staged construction of seawall (rock revetment) in the short term, which removes the requirement to renourish the beach.

Seawall will need to be raised in the long term in order to offset the impacts of sea level rise and climate change.

NORTHERN CELL

Pathway One | **Coastal Unit B: Whirinaki**

Short term	Medium term	Long term
STATUS QUO[2,3,6,7] Beach maintenance and planting, presumes renourishment downdrift	**MANAGED RETREAT**[18] Property and Assets relocated outside coastal hazard zone, natural character of coastline reinstated	**MANAGED RETREAT**[18] Property and Assets relocated outside coastal hazard zone, natural character of coastline reinstated

NOTES:

Under the status quo scenario downdrift will partially offset erosion losses. If this is no longer the case gravel renourishment may be required.

Staged managed retreat of assets over the medium to long term when risk becomes unacceptable due to erosion losses and sea level rise.

State Highway 2 would need to be setback at Whiranaki Bluff, or defended with a seawall

NORTHERN CELL

Pathway Two | **Coastal Unit B: Whirinaki**

Short term	Medium term	Long term
STATUS QUO/ RENOURISHMENT[1,3] Regular gravel renourishment to offset erosion losses in combination with beach maintenance and planting	**RENOURISHMENT + CONTROL STRUCTURES[3,13]** Additional beach renourishment and structure maintenance as required	**MANAGED RETREAT[18]** Property and Assets relocated outside coastal hazard zone, natural character of coastline reinstated

NOTES:

Gravel renourishment in the short term.

Additional renourishment in the medium term in combination with the staged introduction of a groyne field.

Staged managed retreat of assets over the long term when risk becomes unacceptable due to erosion losses and sea level rise.

State Highway 2 would need to be setback at Whiranaki Bluff, or defended with a seawall

NORTHERN CELL

Pathway Three | **Coastal Unit B: Whirinaki**

Short term	Medium term	Long term
STATUS QUO/ RENOURISHMENT[1,3] Regular gravel renourishment to offset erosion losses in combination with beach maintenance and planting	**RENOURISHMENT + CONTROL STRUCTURES[3,13]** Additional beach renourishment and structure maintenance as required	**RENOURISHMENT + CONTROL STRUCTURES[3,13]** Structures raised and/or lengthened and size/crest elevation of beach increased

NOTES:

Gravel renourishment in the short term.

Additional renourishment in the medium term in combination with the staged introduction of a groyne field.

Structures raised and lengthened over long term, with additional beach renourishment, in order to offset effects of sea level rise.

State Highway 2 would need to be setback at Whiranaki Bluff, or defended with a seawall

NORTHERN CELL

Pathway Four

Coastal Unit B: Whirinaki

Short term	Medium term	Long term
STATUS QUO/ RENOURISHMENT[1,3] Regular gravel renourishment to offset erosion losses in combination with beach maintenance and planting	**RENOURISHMENT + CONTROL STRUCTURES[3,13]** Additional beach renourishment and structure maintenance as required	**SEA WALL[16]** Constructed as primary protection for inundation and erosion. No requirement to nourish beach.

NOTES:

Gravel renourishment in the short term.

Additional renourishment in the medium term in combination with the staged introduction of a groyne field.

Introduction of large seawall (rock revetment) in the long term, which removes the requirement to renourish the beach.

State Highway 2 would need to be setback at Whiranaki Bluff, or defended with a seawall

NORTHERN CELL

Pathway Five | **Coastal Unit B: Whirinaki**

Short term	Medium term	Long term

STATUS QUO/ RENOURISHMENT[1,3]

Regular gravel renourishment to offset erosion losses in combination with beach maintenance and planting

SEA WALL[16]

Constructed as primary protection for inundation and erosion. No requirement to nourish beach.

MANAGED RETREAT[18]

Property and Assets relocated outside coastal hazard zone, natural character of coastline reinstated

NOTES:

Renourishment in the short term to offset erosion losses.

Introduction of seawall (rock revetment) in the medium term, which removes the requirement to renourish the beach.

Staged managed retreat of assets over the long term when risk becomes unacceptable, due to erosion losses and sea level rise exceeding seawall design limits.

State Highway 2 would need to be setback at Whiranaki Bluff, or defended with a seawall

NORTHERN CELL

Pathway Six	Coastal Unit B: Whirinaki

Short term	Medium term	Long term
STATUS QUO[1]	**SEA WALL**[16] Constructed as primary protection for inundation and erosion. No requirement to nourish beach.	**SEA WALL**[16] Height will need increasing in order to offset the impacts of sea level rise. Maintenance as required

NOTES:

Staged construction of seawall (rock revetment) in the medium term, which removes the requirement to renourish the beach.

Seawall will need to be raised in the long term in order to offset the impacts of sea level rise and climate change.

State Highway 2 would be impacted.