Te Ara Tipuna Proposed Trail

COASTAL HAZARD ASSESSMENT: REVISED TRAIL ALIGNMENT

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Project Background

The Te Ara Tipuna project aims to establish a continuous interconnected network of walking, cycling and bridle trails around the East Cape, from Gisborne to Ōpōtiki. The objective is to provide a network of accessways for local communities and visitors, and to promote the regeneration of Ngati Porou and Te Whanau-a-Apanui through physical and cultural connections and economic opportunities.

The scale of the project has been reduced in 2025 to focus only on Ngati Porou, from Makorori near Gisborne to Potaka, and to be limited for now to a walking track only (referred to as Te Ara Tipuna 'Stage 1', and which is the subject of this resource consent application). The proposed trail is close to the coast at many of the beaches, and in places follows the beach or dunes (Figure 1). Approximately 35 km of the proposed trail is located on or directly adjacent to the beach.

This assessment considers what is known about coastal processes and hazards on the relevant shorelines and evaluates the potential effects of the trail for the purposes of the revised resource consent application. The report also highlights potential coastal issues where consents may not be required, including safety for trail users, potential risk to the trail due to erosion, public access and coastal flooding.

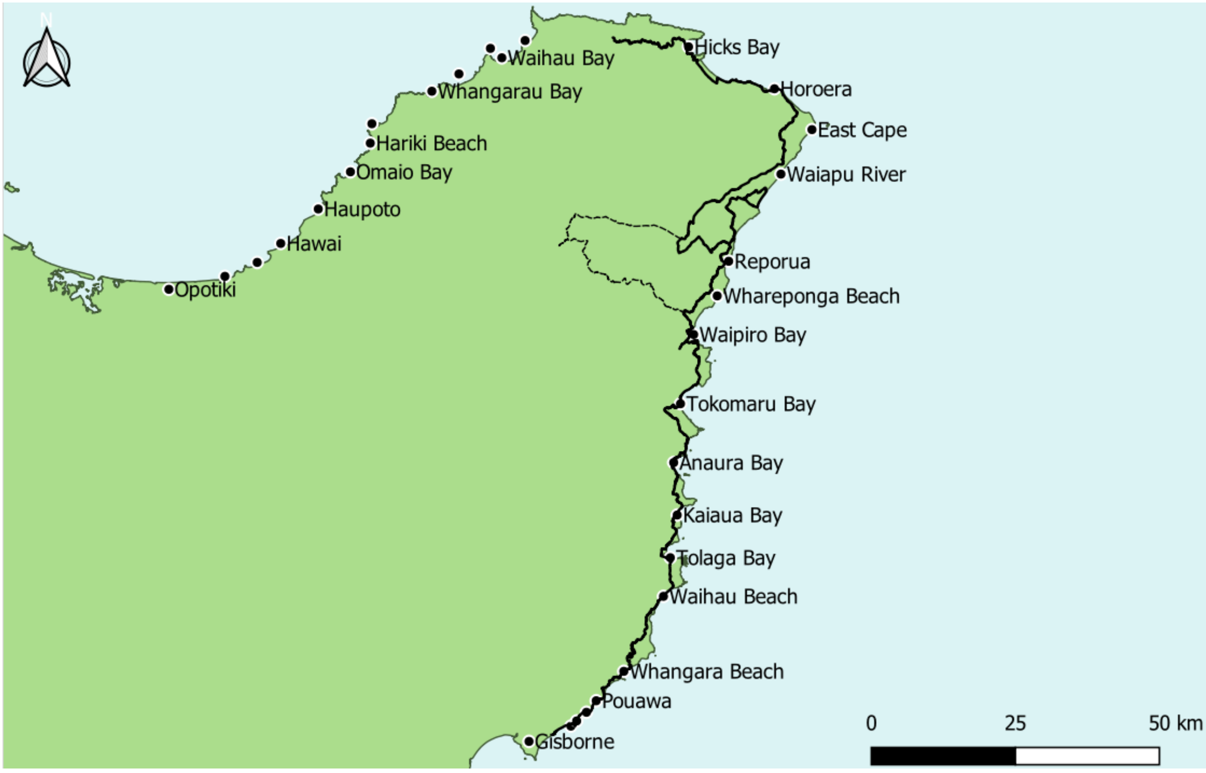

Figure 1: Proposed route of Te Ara Tipuna (Stage 1), with key coastal locations.

Project Details

The walkway will take varied forms and is simply marked with way finder posts in many areas without earthworks or vegetation disturbance. Where possible, the trail will follow existing farm tracks or public trails. In ecologically sensitive areas, vegetation disturbance and earthworks will be limited to that necessary to provide a narrow walking track. Benched tracks, gravel pathways, steps and bridges will be constructed where necessary.

The width and construction of the trail will be modified to suit the local setting. In coastal environments, the following assumptions are made when considering the likely effects of the proposed works:

- in dune areas the trail will be a simple track clearly marked with wayfinding posts to manage access
- there are no plans to construct erosion protection works to support the establishment of the trail.

The trail utilises existing tracks where it is practicable to do so. There are some stretches of existing track that are potentially vulnerable to coastal hazards.

This report applies existing knowledge. The Tairāwhiti coastline has been the focus of many coastal hazard assessments. There has been no additional investigation made to further quantify coastal hazards, except for observations of historic photography where it has been useful. This assessment has been undertaken as a desktop exercise, supported by field observations made by those who were able to access the coast.

Coastal hazards change over time at any given location. The landward extent of a coastal erosion hazard is influenced by long term shoreline change trends, and increasingly by the impact of accelerating sea level rise. Coastal inundation hazard is also expected to increase over time with projected sea level rise. This assessment assumes a trail lifespan of 50 years for the consideration of coastal hazards.

Coastal Processes and Environment

Large stretches of Tairāwhiti coastline are characterised by high cliffs (up to 100 m) formed from weak sedimentary rocks. Rock properties and bedding angles vary greatly, which influences erosion rates, landslide susceptibility and slope angle development. Extensive sand beach systems exist between cliff headlands, with numerous river and stream entrances. These beaches are dynamic shorelines and in many areas are experiencing slow ongoing erosion. Beaches are backed by dune systems or low-lying coastal plains of varied width and steeply rising land. The coastal margin is fronted by a rocky shore platform in some areas (including Tokomaru Bay and the East Cape area). The shore platform is covered in some areas by a narrow beach and backed by a low-lying coastal plain.

Small settlements exist at many of the beaches, but most of the Tairāwhiti shoreline is backed by coastal reserve and road, or by rural land. Significant townships exist at Tolaga Bay and Tokomaru Bay.

The following sections describe the main shoreline types and broadly summarise the key processes affecting these environments, as well as their likely response to future sea level rise. Appendix 1 provides an outline of current national recommendations for future sea level rise projections in New Zealand.

Sandy Beaches

Beaches are dynamic mobile shorelines that are constantly responding and adjusting to coastal processes and are particularly sensitive to the effects of human activities that influence sediment movement or hydrodynamics. Sandy beach shorelines undergo dynamic changes driven by storms, seasonal changes, river mouth dynamics and fluctuations in sediment supply. During storm events, sand is eroded from the beach and (sometimes) the dune and deposited offshore. During calm periods, this sediment is slowly worked back onto the beach by natural coastal processes. As a high tide beach is reformed, sand is blown from the beach and captured by vegetation to rebuild the dune.

Dunes are part of the active beach system and provide a buffer against erosion as well as often serving as a natural defence against coastal inundation. Dune environments are fragile and rely on vegetation to catch and hold wind-blown sand to remain stable and to rebuild following a period of erosion. In many developed areas, these environments are heavily degraded, and this can adversely affect the natural balance of the dynamic beach environment. Dunes are particularly sensitive to disturbance from earthworks and from increased foot traffic.

Natural climatic cycles and variability can alter weather patterns and the frequency and severity of storm events over decadal and multidecadal timeframes. This can drive cycles of erosion and accretion that are larger than that seen from individual storms. Studies of shoreline change on the Tairāwhiti coastline have indicated that sandy beach systems typically undergo dynamic fluctuations of 10-30 m over periods of years to decades, with larger fluctuations near stream and river mouths.

Natural and human factors such as net sediment budget and interruptions to sediment transport can drive longer-term progressive shoreline change (erosion or shoreline advance). Many Tairāwhiti beaches are dynamically stable, undergoing shoreline fluctuations over decadal time scales with little net change. At some sites, there is a long-term trend (typically less than 1 m per year) for shoreline retreat or progradation.

Future Sea Level Rise Effects

The impact of future accelerating sea level rise on beaches will depend on local dynamics, and particularly on sediment supply. In the absence of a strongly positive sediment budget, accelerated sea level rise is expected to slow or even reverse long term accretion. Sea level rise is likely to exacerbate erosion rates on currently retreating shorelines. While there are many possible factors influencing the way that a coastline might respond, the most broadly accepted conceptual model is that the active beach profile (including the nearshore, beach and dune) will translate and reform upwards and landwards in response to sea level rise. The horizontal movement in the shoreline depends on the natural beach slope and is expected to be more significant on wide dissipative sand beaches than steeper narrow beaches. This pattern of change may not occur where there is a large sediment supply, strong alongshore sediment transport or other complicating factors such as the presence of a rocky shore platform.

Gravel Beaches and Barriers

Gravel beaches differ from sandy beaches in terms of morphological features and mechanisms of erosion. Gravel and mixed sand-gravel beaches are typically backed by a “storm berm” which is formed when high energy waves deposit material at the top of the beach slope. Waves overtop the storm berm during extreme events and sediments are deposited on the landward side in a process is known as “rollover”. Some gravel is also eroded from the beach face and deposited low on the beach profile. During calm conditions, gravel can be transported up the beach face and form small berms. Although gravel beaches do experience dynamic fluctuations in shoreline position, these tend to be smaller than those observed at exposed sandy beaches. Where gravel beach barriers enclose river mouths these areas can be highly dynamic and complex.

In some areas, narrow mixed sand gravel beaches are seen landward of a rock reef, usually perched on a rocky platform and backed by higher grassed banks formed from sand and gravel deposits. These beaches are somewhat sheltered by the offshore reef and are less dynamic but are generally located away from major sediment supply and can be slowly eroding.

Future Sea Level Rise Effects

Coastal hazard assessments have assumed that accelerating sea level rise will drive shoreline retreat at gravel beaches due to berm rollover. Due to the relatively steep beach profile of mixed sand/gravel and gravel beaches, the horizontal retreat of these shorelines in response to sea level rise is likely to be less than at sandy beaches. Many factors will influence the response of coastlines close to major river entrances to future sea level rise, including changes in catchment management, rainfall, storm patterns and sediment supply.

Cliffs

Cliffs erode as a slow and continual process and do not undergo periods of episodic erosion and rebuilding like unconsolidated beach shorelines. Cliffs erosion has two components; gradual retreat of the cliff toe and face by marine and weathering processes, and episodic slope failures that relate to cliff lithology and geological structure. Rates of erosion at the toe depend on the geology and exposure and vary considerably on the Tairāwhiti coastline but are typically 0.1-0.3 m/yr (Tonkin & Taylor, 2016). Stable slope angle is influenced by geology and structure and is also highly variable.

Future Sea Level Rise Effects

The response of a cliff to rising sea level depends on the resistance of the geology and exposure to wave action. As more wave energy meets the base of the cliff due to rising sea level, the erosion rate of relatively "soft" cliffs is likely to increase. The erosion response will be further influenced by the presence (or absence) of a protective beach at the toe of the cliff. A broadly accepted approach to estimating future cliff erosion is to assume that future toe erosion rates will increase in a way that is influenced by the relationship between past and future rates of sea level rise. The latest coastal erosion hazard assessment by Tonkin & Taylor (2016) has estimated future cliff erosion using this approach.

Coastal Hazards

Tides and Coastal Inundation

Spring tidal range is approximately 1.7 m, with a MHWS[7] level of 1.07 m (GVD-26) (Table 1).

Table 1: Tidal components at Gisborne (GVD-26). Source: https://www.linz.govt.nz/sea/tides/tide-predictions/standard-port-tidal-levels, datum corrections supplied in Tonkin & Taylor (2016).

	MHWS	MLWS	Mean spring range	Mean sea level
Gisborne (GVD-26)	1.07 m	-0.65 m	1.72 m	0.21 m

Water levels at the coast can become significantly elevated during storm events, due to the inverse barometer effect[1] and wind and wave set-up against the coast. Wave overtopping also further

[1] When there is low atmospheric pressure over the ocean, the water level increases by 10 mm for every 1 hPa fall in atmospheric pressure.

exacerbates coastal flooding. The tidal range in Tairāwhiti is relatively small compared with other areas of New Zealand. This means that coastal inundation is heavily influenced by wave effects, which vary considerably with the physical setting and local geomorphology.

As the underlying mean sea level rises in the future, an increasing percentage of normal tides will exceed any given elevation. Storm tide frequency distributions are such that a relatively small change in base mean sea level can greatly influence the frequency of flooding at any given elevation. For example, NIWA (2020) notes that what is now a relatively frequent 1 in 5-year event would reach the same elevation as a current 500-year ARI storm tide with just 0.16 m of sea level rise. Therefore, events that are currently very rare are expected to occur much more frequently in coming decades due to long-term sea-level rise.

Extreme sea-levels from storm-tides and waves have most recently been assessed along the Tairāwhiti coastline by Stephens et al. (2014). Tonkin & Taylor (2016) note that a 1% AEP storm tide is estimated at 1.4 m (GVD-26) in the south of Tairāwhiti District, to 1.5 m (GVD-26) in the north, based on data provided by Stephens et al. (2014). These figures do not include an allowance for wave run-up, which is variable depending on the physical setting and exposure of the site.

Coastal Erosion

The outputs of coastal erosion studies are reflected in the Tairāwhiti Resource Management Plan as Areas Susceptible to Coastal Hazards, or "ASCH". The ASCH identify the width of coastal margin potentially vulnerable to coastal hazards over a 100-year timeframe and are based on (Gibb, 1994). ASCH areas have been established with a relatively precautionary approach to provide a method to screen proposed activities and highlight the need for more detailed coastal hazard assessments. ASCH may therefore overstate the hazard in many areas.

Detailed hazards assessment at four key sites (Tolaga Bay, Anaura Bay, Wainui Beach and Tokomaru Bay) were completed by Coastal Management Consultants between 1994 and 2008 (Gibb, 1998; Gibb, 1999; Gibb, 2008). These hazard zones have been recognised and adopted in the Tairāwhiti Resource Management Plan ("TRMP"):

- Extreme risk: likely to be subject to adverse effects from short-term dune line fluctuations and storm cut (20-year to 30-year timeframe).
- High risk: likely to be subject to net shoreline retreat from historical long-term retreat and sea level rise by 2050.
- Moderate risk: likely to be subject to net shoreline retreat from historical long-term retreat and sea level rise by 2100.
- Safety buffer: likely to be affected in longer term (beyond 2100).

The TRMP includes controls on activities that may impact dunes and other sensitive coastal environments within the identified hazard zones.

The ASCH area was updated and refine by Tonkin & Taylor (2016) along remaining areas of the coastline. This more recent study identifies "ASCE" (Areas Susceptible to Coastal Erosion). The ASCE are calculated at 10-yearly increments from 2015-2115. Planning maps have been produced for present day, 2065 and 2115 timeframes, and include the expected impact of future accelerated sea level rise.

Potential Effects of Trail Construction and Use

The proposed trail is generally a low-profile track, and in many coastal areas an unformed track. In most areas the construction and presence of the trail will therefore have little effect on the coastline or coastal hazards.

Inappropriate positioning, construction or management of the trail could exacerbate the existing coastal hazard risk, including:

- earthworks and associated vegetation disturbance on sensitive dune and coastal margin environments
- damage to dunes and coastal margins from increased pedestrian traffic
- increased coastal hazard risk due to placement of assets (including the trail and associated structures) within high-risk areas.

These potential effects are discussed below.

Earthworks

Earthworks have the potential to expose highly erodible (non-cohesive) soils in dune environments. Dune sediments are easily damaged both by direct physical disturbance, and by accelerated or chronic wind and coastal erosion if native vegetation is lost. Beaches and associated dunes are easily eroded and particularly vulnerable to projected sea level rise. Retention of natural dune volume is important for coastal resilience. Disturbance of these coastal margin sediments can exacerbate erosion rates, particularly in areas where the coastline has an existing erosion trend.

Where sections of the trail traverse dune environments, earthworks and vegetation disturbance should consider the vulnerability of the environment. The intent in these areas is to simply identify the trail using way finder markers, which will be used to clearly direct walkers to a defined trail. The alignment and location of the pathway only crosses the sensitive frontal dune where necessary to access the beach. Based on the plans available at the time of this report, there are no new structures proposed within sand dune environments.

Pedestrian Access to the Coast

Although therefore not a resource consent matter, the location and design of the trail should be managed to mitigate the physical disturbance associated with pedestrians accessing the beach. Increased foot traffic could degrade fragile coastal margins in some areas. It is expected that the "passport" system will provide trail users with information about the importance of using formed accessways and avoiding disturbing dune vegetation.

In some environments, coastal protection structures, existing infrastructure or natural geomorphology (erosion resistant and/or steeply rising land) prevents the coast from adjusting landward as it would naturally in response to sea level rise. Currently accessible beaches may become pinched out due to short- or long-term changes, or by coastal retreat in response to sea level rise. This could threaten the sustainability of beach sections of the walk at higher stages of the tide and alternative solutions may be required. It is difficult to predict the timeframes over which this access may be lost, due to natural fluctuations and the inherent uncertainty associated with predicting both sea level rise rates and the shoreline's response to sea level rise. Sections of coast where this issue is of greatest concern are summarised in Table 2 below and detailed further in Appendix 2.

Table 2: Locations where pedestrian access along the beach may become threatened by erosion and/or sea level rise.

Location	Day	Km	Issue
Makorori Beach	1	2	Road close to beach with narrow reserve, access along beach may be pinched out by erosion and/or sea level rise.
Waihau Bay	3	41-42	Trail along beach at base of the cliffs/rising land. Potential issue at high tide and/or storm conditions. Exacerbated by SLR.
Tokomaru Bay	7	95-96	Narrow reserve and beach already pinched out by protection works. Beach will become less available with sea level rise.

Increased Coastal Hazard Risk

Coastal hazard risk is the product of the coastal hazard and the consequence of that hazard occurring. The establishment of the trail at the coastal margin could increase the consequences of natural coastal erosion and therefore increase the total coastal erosion hazard risk. The trail alignment has been located as much as practicable to avoid areas likely to be impacted by coastal erosion hazard over the next 50 years. New stretches of trail on cliff shorelines have been aligned to avoid areas likely to be impacted by coastal cliff instability. Slope instability in cliff areas has been addressed in more detail in the geotechnical assessment.

Some sections of the proposed trail are subject to occasional coastal inundation during storm events. There are no new structures proposed within these areas that would exacerbate the coastal inundation hazard. Elevated water levels may, however, impact on the accessibility of the trail under storm conditions. These low-lying areas are also vulnerable to rare tsunami events. This may also be addressed as part of the "passport" system so that trail users are informed to consider the tidal state and weather conditions when travelling along beaches or low-lying coastal margins, and aware of tsunami hazard and response.

Although effort has been made to minimise coastal hazards, there are sections of the trail where there is no option but to locate it within the identified coastal hazard area. In many cases, the proposed trail is immediately adjacent to (or utilising) existing infrastructure that is at risk from coastal hazards. As an undefined trail identified with wayfinding posts, there is very little additional investment in vulnerable areas, and the trail is generally easily adaptable.

Coastal Structures

Placement of toilet and shelter buildings within an area vulnerable to coastal erosion or inundation could cause disturbance to sensitive coastal environments and add to coastal hazard risk. The location of all proposed new buildings on the Tairāwhiti coast has been reviewed against the identified coastal erosion hazard areas (Tonkin & Taylor, 2016), and all are located outside of coastal erosion areas likely to be vulnerable over the next 50 years. Two new swing bridges are currently proposed within the coastal marine area, at Pouawa and Te Araroa. Both structures are proposed well landward of the coast (>200 m) and are outside of the zones identified as likely to be vulnerable to coastal erosion.

The most significant potential adverse impact of the proposed works on the physical coastal environment is the possible future construction of erosion protection works that may be deemed necessary in the future to protect the trail where it is threated or damaged by coastal erosion. Such structures can cause adverse effects in the coastal environment, including accelerated lowering of the beach profile, exacerbated erosion on adjacent shorelines ("end effects") and loss of amenity values. These effects can exacerbate coastal hazard risk in the long term. This assessment has been made on the basis that there is no intention for physical works to be constructed to protect the proposed trail from coastal erosion.

Management Recommendations

The proposed trail traverses many coastal areas, including sand dunes, narrow coastal reserves, low lying coastal plains and coastal cliffs. This report has reviewed the available coastal hazard information to evaluate stretches of the proposed trail that may be vulnerable to coastal hazard over the next 50 years, including short term fluctuations and long-term trends in shoreline change, coastal inundation, and the potential effect of projected sea level rise.

The establishment of Te Ara Tipuna will have little or no effect on existing coastal hazards, based on the following conclusions and assumptions:

- the trail will be marked with simple way finding posts and there are no earthworks in sand dune areas, unless for the purposes of dune restoration or improvement of dune stability
- the trail itself does not create a barrier to natural coastal processes
- if the trail is threatened or damaged by coastal erosion, management actions will prioritise avoidance and adaptation of the trail alignment over the construction of protection works
- the trail does not include lowering of sand dunes or significant earthworks in coastal inundation areas, and will either avoid or be designed to withstand occasional coastal inundation in low-lying coastal margins
- coastal hazard risk is minimised by locating new buildings outside coastal hazard areas.

Although the establishment of the trail is unlikely to affect coastal hazard processes, users of the trail could be impacted by coastal hazards, and there is a risk of physical damage to the trail over time in some places. There are sections of the trail located close to erosional coastlines, and in some areas the road and/or other land-based assets are already threatened by coastal erosion, with little space to align the trail further landward.

Medium to long-term management of the trail will almost certainly require decisions to be made about protecting or adjusting the trail alignment. This assessment assumes that the key focus will be on avoidance of hazards and resilience through adaptation wherever possible. Any future physical works that may be required to protect the trail will be the subject of a separate process and will require resource consent. In many areas this will be linked with the management of the adjacent road. Such a process will require a detailed (site-specific) assessment of the potential effects.

Predicting each of the many components of coastal erosion hazard comes with considerable uncertainty, particularly the long-term rate and effect of future sea level rise. The likely lifespan of a section of trail close to the coast cannot be accurately predicted. Coastal erosion hazard could be managed in key areas with monitoring and a range of triggers and actions that relate to the coastal hazard risk profile over time. This approach would provide for coastal sections of the trail to be utilised while conditions allow, while planning for future actions to adapt to an increasing hazard risk over time and ensuring the objectives of Te Ara Tipuna are met in terms of resilience.

In low lying areas (particularly Tokomaru Bay and Tolaga Bay), the trail may be periodically inundated during coastal storm events, either directly by storm surge, or by wave run-up and over-wash close to the coast. This is currently only likely during very rare and extreme events but is expected to become more frequent over time with projected sea level rise. Sections of the trail that follow the beach may also be inaccessible during storm surge or high wave events, and beach lowering following erosion events may also affect access at times.

A “passport” system has been proposed, to provide trail users with information about appropriate behaviour and sensitive habitats or features (e.g. culturally significant sites, high value ecosystems etc). This system should include information about coastal hazards, including:

- avoiding unnecessary damage in sand dune environments, by sticking to defined accessways and trails
- awareness of tides and storm surge (i.e. some portions of the trail may not be safe during high stages of the tide, or during storm or high wave events)
- basic awareness of tsunami hazard (i.e. signs and actions).

Conclusions

Approximately 35 km of the proposed Te Ara Tipuna coastal trail (as planned at the time of preparing this report) is located directly adjacent to the beach and some of these sections are potentially vulnerable to damage from coastal erosion, particularly with future sea level rise. In many of these areas, other existing infrastructure is already at risk. It is not practicable to avoid all potential coastal hazard areas, and there will be a need to integrate management of the trail with coastal hazard management of other at-risk infrastructure. The proposal is to establish the trail in these areas with simple wayfinding posts, providing for minimal investment in hazard aeras and an adaptive approach to changing coastal margins.

Analysis of the trail proposal indicates that significant earthworks and coastal structures are generally restricted to areas away from the coastal margin. Where new structures are proposed (two swing bridges), they are located well landward of the beach and are not expected to have any impact on coastal hazards.

The trail (and associated works) is therefore expected to have an impact on coastal processes and coastal hazards that is less than minor. This assessment assumes that the creation and management of the trail reflects the potentially sensitive coastal margin, and an adaptive approach is taken to management of the trail over time in hazardous areas rather than the construction of erosion protection works.

References

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Appendix 1: Sea Level Rise

Sea level has been rising at approximately 2 mm per year for the last 100 years. Recent historical trends are therefore occurring with this rate of sea level rise. The average level of the sea is expected to continue to increase at an accelerating rate for the foreseeable future. This will have a significant impact on both coastal erosion and coastal inundation hazard in the future.

The Ministry for the Environment provides projections for future sea level rise around New Zealand and recommendations for the use of sea level rise projections for managing coastal areas (MfE, 2024). The guidelines recommend that a range of future sea level rise scenarios are considered to reflect the uncertainty in predicting future sea level rise rates. Five "plausible" Shared Socioeconomic Pathways (known as SSP scenarios) are recommended for coastal planning in New Zealand:

- SSP1-2.6 M – "Sustainability"
- SSP2-4.5 M – "Middle of the Road"
- SSP3-7.0 M – "Regional Rivalry"
- SSP5-8.5 M – "Fossil-fuel Development"
- SSP5-8.5 H+ - 83rd percentile (top of shaded "likely range" of SSP5-8.5)

Projected sea level rise for each of the SSP scenarios are shown in Figure 2. The range of projections indicates that sea level rise is likely to be between 0.3 m and 0.5 m over the next 50 years and 0.5 m and 1.1 m over the next 100 years. Sea level rise is expected to continue to increase beyond that time. The amount of sea level rise experienced at any given location can also be influenced by vertical land movement (uplift or subsidence). If land is dropping (subsidence) then sea level rise rates will be effectively increased relative to the land.

The NZSeaRise Programme[2] provides sea-level rise projections around New Zealand that include estimated vertical land movement and indicates a vertical land movement of +/-1.5 mm/yr in the Region. There is considerable uncertainty in defining these vertical land movement rates away from long term monitoring sites as much of the data is based on a relatively short satellite record.

NIWA (2020) concludes that NZ-wide sea level rise scenarios should be applied in the Tairāwhiti Region as available data indicates relatively small rates of subsidence and uplift are presently occurring, and that there is uncertainty about whether they will persist for decades. Any application of an adjustment for vertical land movement would need to reflect local conditions and cannot be generalised across the Region.

[2] https://www.searise.nz/

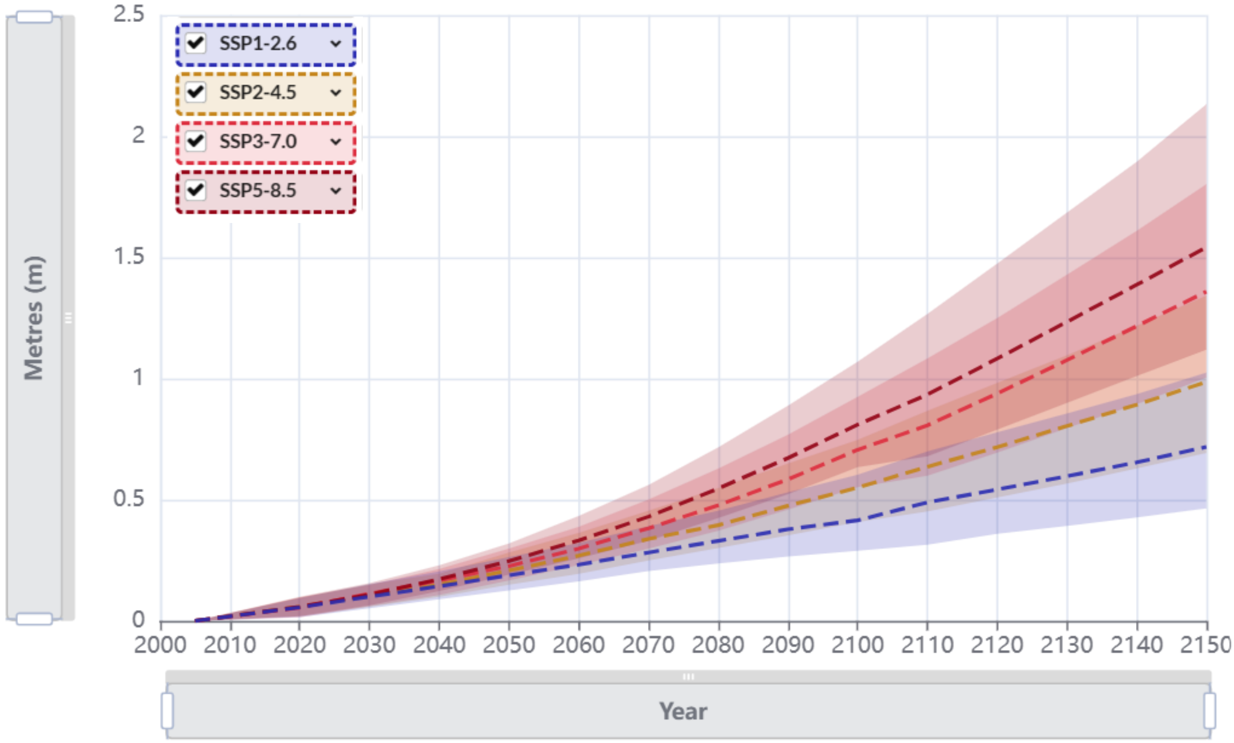


Figure 2: Potential future sea level rise scenarios for the period out to 2150 based on present interim national guidance (dashed lines). Shaded areas indicate the likely confidence intervals. Source: NZSeaRise, https://searise.takiwa.co/map, site #2132 at Gisborne.

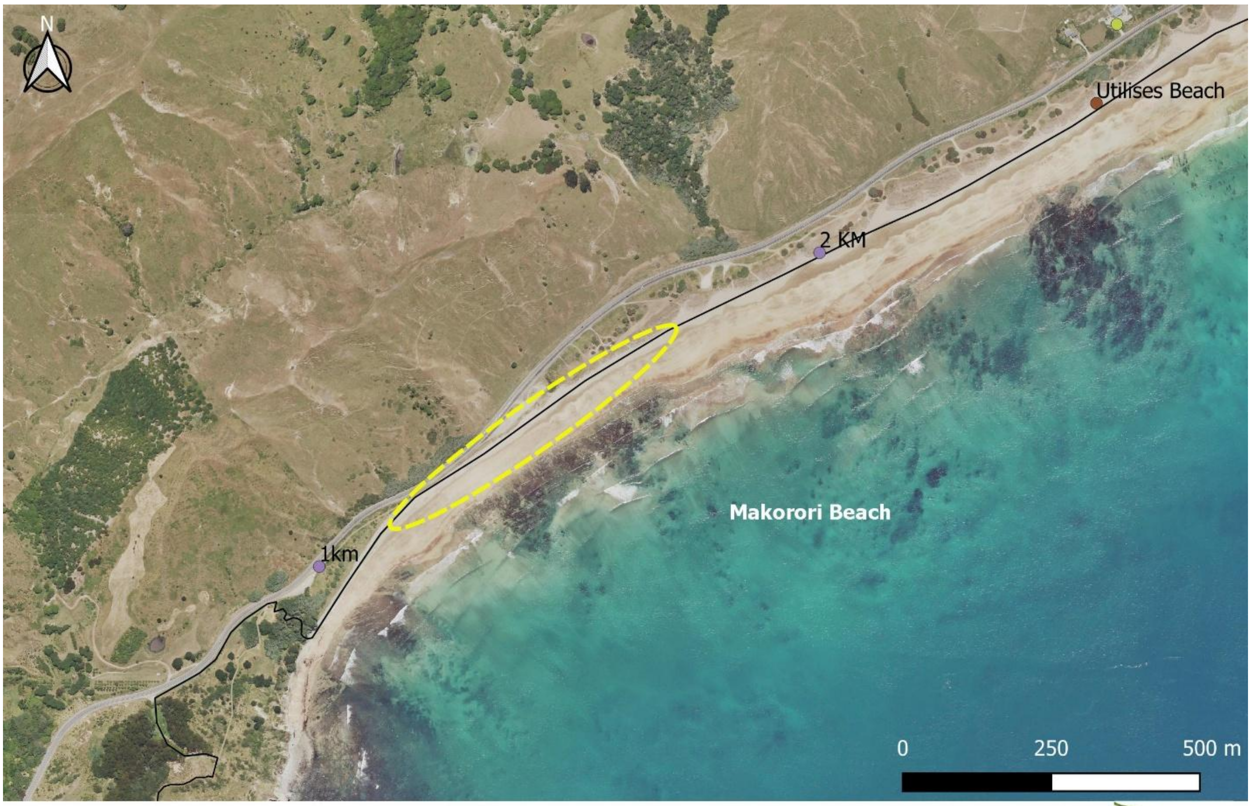
Appendix 2: Beach Sections Potentially Vulnerable to Coastal Squeeze

Day 1 - Makorori Headland and Beach (beach narrowing)

The revised route taken to access the beach on the northern side of Makorori Point traverses the vegetated coastal slope and accesses the beach at the southern end of Makorori Beach. The path uses existing steps, and no new structures are proposed. Existing coastal hazard data (Gibb, 1999) indicates the beach at this location is relatively stable.

Over time the access along the beach may be compromised with erosion (either dynamic changes or in response to sea level rise) where the reserve is particularly narrow (Figure 3). Any coastal protection works that may be constructed to protect the road in the future would further exacerbate the issue and would need to consider public access along this stretch of coast. Pedestrian access adjacent to the road in this area is also currently limited.

At the northern end of the beach the trail traverses the dunes to access the road crossing. Normal precautions will be necessary to avoid adverse impact on the dune environment here.



Potential coastal squeeze at Makorori Beach. Image source: Gisborne 0.3m Rural Aerial Photos (2017-2019), https://data.linz.govt.nz/layer/99025-gisborne-03m-rural-aerial-photos-2017-2019/. LICENSE: Creative Commons Attribution 4.0 International.

Figure 3: Narrow coastal reserve at Makorori Beach.

Day 3 - Waihau Bay ("Loisels")

This section of the trail at Waihau Bay follows the beach, which at some places is backed by a high cliffed coastline. Access here but may not be safe at all stages of the tide and/or under all conditions. Changes in beach state, specifically loss of beach volume and beach lowering could make access along the beach difficult and/or hazardous. This assessment has been desk-based and local knowledge may improve the assessment of this constraint. Future accelerated sea level rise is likely to exacerbate this problem.

Potential coastal squeeze at Waihau Bay. Image source: Gisborne 0.3m Rural Aerial Photos (2017-2019), https://data.linz.govt.nz/layer/99025-gisborne-03m-rural-aerial-photos-2017-2019/. LICENSE: Creative Commons Attribution 4.0 International.

Figure 4: Beach at base of cliffs at Waihau Bay.

Day 7 – Tokomaru Bay

Data presented in the available coastal hazard investigations indicates that northern parts of Tokomaru Bay beach are either stable or eroding over time. The area is backed by steep cliffs. The beach and reserve is very narrow, with limited capacity for adjustment. A high tide dry beach is mostly absent seaward of the protection works. Sea level rise is likely to drive ongoing erosion and beach loss. Ongoing management of the proposed trail is likely to be directly connected to management of the road.

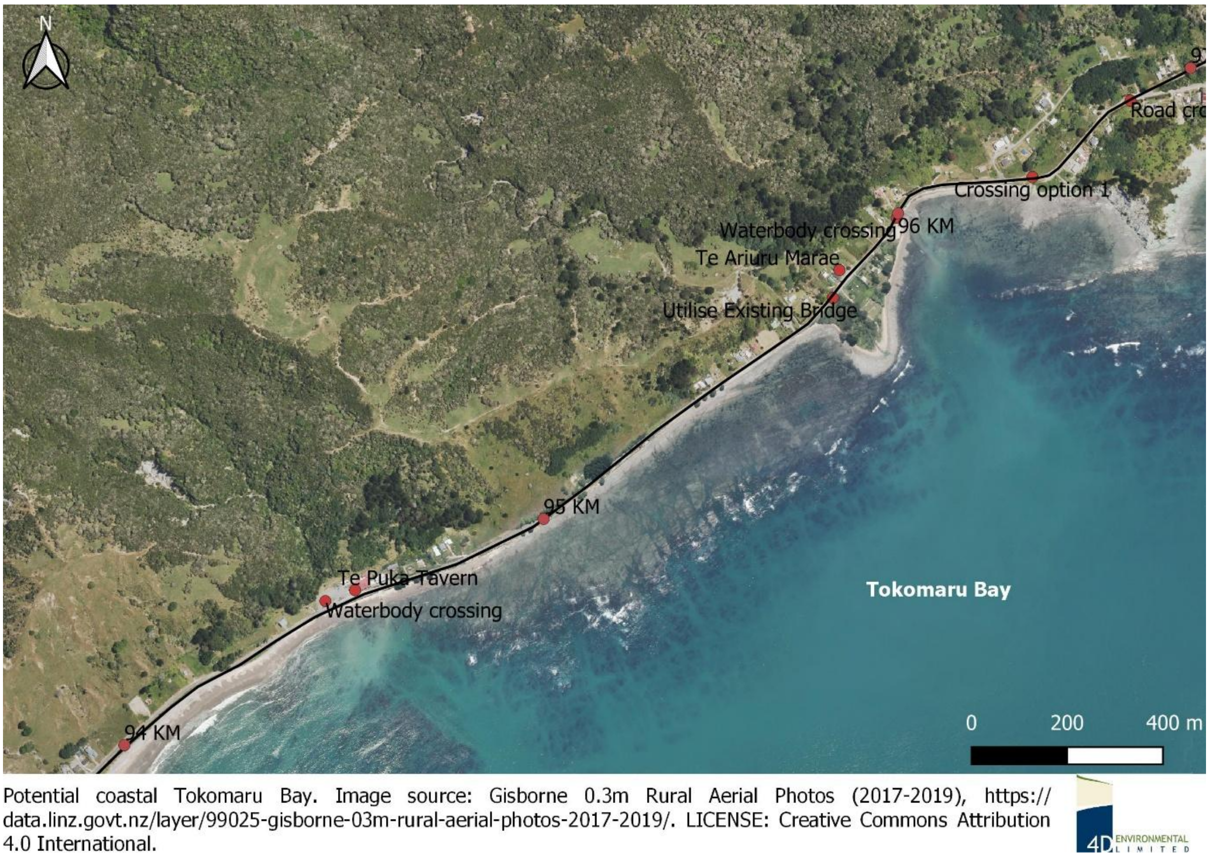
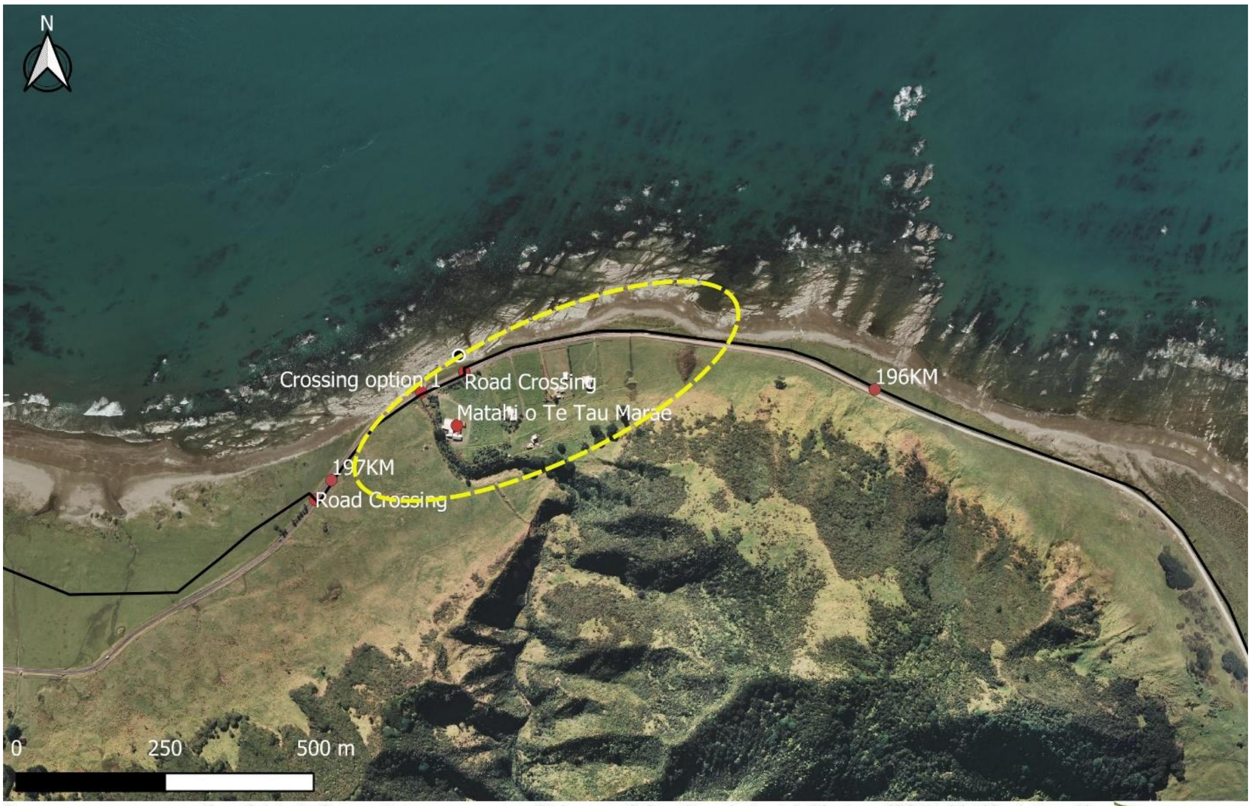


Figure 5: Narrow reserve at northern Tokomaru Bay.

Day 20: East Cape to Te Araroa

Some sections of the trail are located within a narrow reserve seaward of East Cape Road (e.g. 197 km, 200 km, Figure 6). A simple wayfinding track is proposed in these areas. Retention of a trail in this area is likely to be linked to the long-term management of road.



Narrow reserves north of East Cape. Image source: Gisborne 0.3m Rural Aerial Photos (2017-2019), https://data.linz.govt.nz/layer/99025-gisborne-03m-rural-aerial-photos-2017-2019/. LICENSE: Creative Commons Attribution 4.0 International.

Figure 6: Narrow reserve north of East Cape.