Memorandum

To: Aimee Page – Projects Engineer, Far North Holdings Ltd

From: Alison Clarke – Senior Coastal Consultant, 4Sight Consulting Ltd

Date: 6 April 2021

Subject: Coastal Processes – Effects Overview Statement

Introduction

4Sight Consulting Limited (4Sight) has been engaged by Far North Holdings Limited (FNHL) to undertake a Coastal Processes Impact Assessment associated with the proposed reclamation at Rangitane Loop Road, Kerikeri ('the site'). The proposals are to reclaim part of the Coastal Marine Area (CMA) at this location to enable the installation of a new public boat ramp and car parking facility.

This memorandum provides a summary of the broad coastal processes operating in the area, followed by a high level assessment of the potential effects from the proposed works with respect to the local coastal regime. It is intended to support the fast-track application associated with the proposed reclamation and development.

Coastal Setting and Local Coastal Processes

The subject site is located at the southern end of Rangitane Loop Road, approximately 13km by road from Kerikeri town centre on Northland's east coast. The site is southeast facing on the northern shoreline of the Kerikeri Inlet and currently comprises a concrete boat ramp that provides access directly from the road onto the water. There is also an old timber jetty that is in poor condition. In general, the subject site is considered to be a relatively low energy environment due to the protection afforded from its sheltered location within the Bay of Islands. Wave energy entering the wider bay from the east is partially blocked by the Purerua Peninsular, Moturoa Island and its surrounding islands. Further sheltering to the site is provided by Motupapa Island and the Rahui Islands located inside the Kerikeri Inlet.

The coastal fringe in the vicinity of the subject site comprises a narrow band of mangroves. Beyond the site approximately 250m to the north there is an enclosed bay that comprises dense mangrove habitat, suggesting that the surrounding area is a relatively low energy, stable and sediment positive environment. The foreshore is characterised by a deep layer of fine muddy/silty sediment with a gravel/shell surface. The presence of fine coastal substrate material further reflects the low energy environment and is consistent with the comparatively sheltered nature of the site.

Due to the narrow exposure to swell waves entering the Bay of Islands from the east, the major coastal processes acting upon the subject shoreline will be locally derived wind waves during storm events and boat wakes from vessels operating within the wider area. Localised wind-driven tidal currents operating within the main channel of the Bay are also considered a significant driver of processes within the wider system.

In consideration of the potential wave energy acting upon the shoreline, the most significant fetch extends approximately 4km toward Motupapa Island (SE to NW) producing theoretical significant wave heights of up to 1.1m under extreme conditions. However, it is expected that wave heights operating at the subject coastline will be less due to the dissipation of wave energy as it passes through the islands. Given the prevailing south-westerly winds and unobstructed passage across the bay from this fetch direction, it is likely that the largest waves operating at the subject site will approach generally from this direction. Calculations of wave characteristics for a SW fetch of 2km for design purposes indicate a significant wave height in the order of 0.7m.

Tidal information[1] and a range of predicted extreme water levels for the location are provided in Table 1 below to give an indication of coastal inundation levels at the site. The extreme static water levels corresponding to the present day 100 year (i.e. 1% AEP) event and future sea level rise scenarios (2065 and 2115) has been obtained from Tonkin and Taylor's region-wide coastal inundation assessment[2] for the modelling point located within the Kerikeri Inlet. The water levels are presented relative to both CD and One Tree Point Vertical Datum 1964 (OTP-64).

Table 1: Relevant tidal variables and predicted extreme static water levels (i.e. storm tide + wave set-up) for Kerikeri Inlet. Source: LINZ and Tonkin and Taylor (2017).

Return Period	Extreme Static Water Level CD (m)	Extreme Static Water Level OTP-64 (m)
MHWS	2.4	1.1
Current day 1% AEP	3.1	1.8
2065 2% AEP	3.5	2.2
2115 1% AEP	4.1	2.8

Proposed Development

The proposed development entails a reclamation within the coastal marine area (CMA) to provide an all tide boat ramp and car parking area. The reclamation will be constructed with rock lined batters to provide protection and dissipate wave energy. Inspection of the concept plans prepared by Shorewise Engineering (dated 27/11/2020) identify that the rock armouring comprising of rough angular rock material with a mean diameter of 0.8m surrounding the reclamation with a 1V:2.5H slope. On the southern side of the reclamation, a new public boat ramp is proposed which will protrude from the car park into the CMA. The ramp will be 8m wide in total, comprising of two 3m wide lanes and a central 2m wide pontoon. The ramp extends approximately 40m out through the intertidal area at a 1:8 slope.

The elevation of the car park structure is shown to be RL3.55m (4.85m CD). Under present day conditions, the proposed design should be sufficient to prevent overtopping under the 1% AEP storm surge event in consideration of the predicted significant wave heights calculated for the site (~0.7m). When incorporating a future sea level rise of 1m, the design will still allow for 0.75m of freeboard above the 2115 1% AEP static water level (4.1m CD), which means the car park may be subject to wave splash at high tide during extreme storm events.

High Level Coastal Processes Impact Assessment

Overall, the area is generally considered to be relatively low energy and therefore the potential for the proposed reclamation and development to have a significant impact on local coastal processes is minimal. Although the proposed boat ramp and car park will extend perpendicular into the intertidal zone, these structures will not occupy a significant amount of the coastal space nor do they represent a significant obstruction to coastal processes, due to their low-profile nature.

It is acknowledged that the proposed boat ramp may act like a small groyne, particularly on the western side of the structures there is potential for material coming down from the catchment to accumulate. However, the proposed structures are similar to other natural (e.g. reef feature) and built structures (e.g. boat ramp, jetty) already existing in the general area. Given the low energy regime and cohesive nature of the substrate sediments, it is expected that it would not take long for the system to adjust to their presence. Further, some isolated deposition at this location is not likely to be a problem and is in keeping with the existing environmental setting which is depositional in nature and destined to infill.

The proposed reclamation will increase the structural footprint within the CMA to create space for the proposed marine facilities and associated car park. When considered on an individual basis, the area of foreshore that will be removed from the system is comparatively small relative to the wider Kerikeri Inlet.

[1] Obtained from secondary port tidal information for Doves Bay https://www.linz.govt.nz/sea/tides/tide-predictions

[2] Tonkin and Taylor Ltd. (2017). Coastal Flood Hazard Zones for Select Northland Sites: 2017 Update. Prepared for Northland Regional Council. Report Reference 1001049.

Inspection of the preliminary plans identifies that the reclamation does not extend into the main channel at this location. Given that the main tidal currents are situated beyond the area of the proposed reclamation reduces the chance of there being any significant alteration to the tidal currents and regime.

Due to the sheltered nature of the subject area, the wave climate is dominated by waves generated by wind events from the southwest through to the southeast and boat wakes from vessels operating within the wider Kerikeri Inlet. The proposed boat ramp and car park are unlikely to impact the overall wave/wake climate of the area due to the scale of the proposed activities in the context of these larger processes. There will likely be some turbulence associated with the perpendicular ramp structure, but this is expected to be localised and not notably different to the existing situation.

In consideration of the rock batter surrounding the reclamation, the low slope (1V:2.5H) in conjunction with a sufficiently deep foundation toe (depth to be confirmed at detailed design) will protect the base and limit any potential undermining of the toe of the structure resulting from local wave activity. It is also considered that the placed rock will be able to settle and adjust to changing substrate levels in the event of any scour activity. Increased wave reflection is not expected off the sloped rough face of the rock armour when compared to that of the existing coastal edge, which is currently more vertical in nature comprising an over-steepened vegetated bank with informal rock armouring at the base.

As noted above, neither the proposed structure or reclamation protrude into the main channel, nor are they considered significant enough to represent a barrier to trap material. As such it is unlikely to have an impact in terms of sediment starvation downstream. In any case, the major sedimentation transportation processes occurring in the vicinity of the subject site are more likely to be associated with the inlet filling up with sediment coming down from the catchment. For these reasons it is considered that the potential effects from the proposed reclamation on the local sediment transportation regime will be less than minor.

With regard to the likely effect of climate change on the project, the proposed reclamation and boat ramp are not considered to increase the potential impact of storm surge or sea level rise as these processes operate at a significantly larger scale than the proposed development. This assessment has considered the potential for the reclamation to be overtopped during an extreme storm tide event under a future sea level rise scenario of 1m. We have determined a maximum static water level of 4.1m CD for the year 2115 based on Tonkin and Taylor's coastal inundation model at this location. With the crest height of the car parking area set to 4.85m CD, the design allows for 0.75m freeboard to account for additional wave activity operating above the static water level. This means that, at worst, the car park may be subject to wave splash at high tide during extreme storm events, but only once the effects of future sea level rise are realised (i.e. towards the end of the 100-year timeframe considered).

Summary

A description of the site's geomorphology and coastal processes are provided above. This information has been used to gain an understanding of the potential environmental effects of the proposed reclamation and development on the surrounding coastal environment.

In general, the area is considered to be relatively low energy and, as a result, the risk from changes to local coastal processes on adjoining areas is low. When considering the comparatively small size of the proposed reclamation relative to the wider system, it is unlikely that the proposals will have a measurable effect on local coastal processes. The reclamation does not protrude into the main channel, and therefore development in that part of the foreshore is not expected to be majorly disruptive to local sediment transport processes. Further, due to the low-profile nature of the boat ramp, the proposed structure does not occupy a significant amount of the coastal space and therefore it appears unlikely that there will be any discernible changes to the larger coastal processes operating within the subject area.