

Coastal Protection Works and Monitoring:

The Coastal Hazard Assessment has identified the potential for coastal erosion hazard to affect the development. This hazard relates to slope instability that could occur as the toe of the bank is slowly undermined by coastal processes. Existing information indicates the toe of the bank is probably eroding very slowly (0.03-0.05 m/yr). This may be accelerated by future sea level rise. Accurately predicting coastal erosion rates at site is challenging because the rates are slow and therefore difficult to measure. It is also difficult to predict the effect that rising sea level will have on erosion rates, as the shoreline response will depend on many factors.

My analysis suggests that coastal erosion is not an immediate threat to the development, but instability in the bank caused by as little as 2 m of toe erosion could start to affect the land seaward of the buildings within 50 years. Direct impact on the proposed buildings within 50 years is possible but less likely.

There is very little scope for adaptation or adjustment of the proposed structures and activities in response to coastal erosion within the property with the proposed development. It is therefore necessary to consider coastal hazard risk in relation to the property boundary. I therefore suggest two potential approaches to managing coastal erosion hazard risk over the lifespan of the development:

1. Construct a retaining wall within the boundary of the property as a mitigation measure (at the time of development) to stabilise the slope so that instability in the reserve that occurs due to toe erosion does not impact the development.
2. Undertake monitoring to understand current erosion rates and to what for any signs of slope failure. Be prepared to construct retaining works if required.

An assessment of the overall level of risk proportionate with each of the two options is provided below for completeness:

- Option 1: Given the level of coastal erosion risk is low in the short term and uncertain over the lifespan of the development, it is not considered necessary to install a structure pre-emptively to mitigate against potential coastal erosion. With this approach, a structure may be buried for many decades before being exposed. On this basis, a monitoring regime (as set out in Option 2 below) is recommended.
- Option 2: The slow and incremental nature of coastal erosion in this setting means that coastal erosion hazard risk will evolve gradually, allowing time for monitoring and response. For this reason I have recommended simple low cost monitoring to determine erosion rates and predict more accurately over time if and when the development may be affected. If coastal erosion rates are at the lower end of the predicted range, and sea level rise effects are buffered by sedimentation and vegetation it is possible that the development will not be impacted by coastal erosion over its lifespan, or that required mitigation will be minor. If erosion at the toe of the coastal bank causes slope instability over time, a retaining wall may be required. Council has recently endorsed this approach for an approved consent (BUN60403972) which established two three level standalone buildings across the Site.

- The conditions proffered in support of the application on an Augier basis are set out below for completeness:

X. *The Consent holder must inspect/monitor erosion and instability at the time of initiation of construction and a 5 yearly basis including:*

i. Site inspection by a geologist or engineer to identify any features indicating stability, including head scarp, cracking or slumping.

ii. Site inspection by a coastal scientist or coastal engineer, direct measurements of horizontal retreat of the toe of the bank, and a photographic record of the bank and intertidal area.

X. *If any features indicating instability are observed within 2m of the property boundary, or the horizontal erosion of the toe of the bank exceeds 2 m, a detailed assessment of slope stability and/or coastal erosion must be undertaken to evaluate coastal erosion and slope stability risk, review the frequency and methods of monitoring and determine the need for remedial action.*

X. *In the event, evidence of erosion and/or instability is found, remedial action must be undertaken immediately where the consent holder must provide for Council approval:*

a. details of ground stabilisation works,

b. details of sediment/erosion controls associated with the above works,

c. details of replacement planting,

d. a timeframe for each stage of implementation, and

e. documentation requirements and timeframes for its submission to Council to ensure that such ground stabilisation works have been completed to a satisfactory degree.

All works shall then be carried out with the detail and dates approved by Council, and thereafter retained and maintained, to the satisfaction of the Council.

The additional requirement for inspection/monitoring for erosion to occur at the time of initiation of construction has been introduced noting that should the consent be approved, the applicant has five years to give effect and implement the consents, should the application be approved.

In terms of policy 24 and 25 of the NZCPS, the following assessment is provided:

- The Site is not identified as being within an area at high risk of being affected by a coastal hazard. The proposed development does not increase the risk of adverse effects from coastal inundation or cause an immediate increase in coastal hazard risk. Episodic natural hazard “events” are not expected to impact the proposed development. The hazard risk in this case relates to the potential for coastal erosion hazard risk to develop gradually in the medium to long term. The rate of toe erosion at the site has historically been very slow, and measuring these rates accurately has been inhibited by obscuring

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vegetation and mapping limitations. Prediction of future rates is further complicated by accelerating sea level rise. The CHA estimates approximately 2-6 m of toe retreat over a 50-80-year timeframe, depending on underlying shoreline retreat rate and the impact of future sea level rise. If erosion rates are consistent with the lower estimates, the proposed development may not be affected by coastal erosion over its expected lifespan. However, given the uncertainty and necessary precaution, the CHA calculations suggest that in 50+ years. It is likely that coastal erosion will affect the seaward edge of the property and it is possible that the seaward edge of Building A could be exposed.

- The proposed development does not increase the risk of adverse effects from coastal inundation or cause an immediate increase in coastal hazard risk. Future coastal erosion risk generated across the Site is able to be appropriately mitigated through the proffered conditions of consent outlined above in this further response.

As set out in the planning report, the Coastal Report and Further Response prepared by 4D Environmental in support of this application has provided a number of recommendations which have been adopted in the form of conditions of consent proffered by the applicant, noting that a refinement is proposed to one of the condition through this application and which are considered to appropriately mitigate any coastal or natural hazard related effects. On this basis, the condition approach recommended through this application is appropriate, and proportionate to the level of current risk. Overall, the proposal is not inconsistent with or contrary to Policy 24 or 25 or the NZCPS.

Proposed Plan Change 120:

I have also undertaken a review of the relevant proposed rules as detailed in Chapter E36- Natural Hazards of the AUP-OP in Plan Change 120, set to be notified on the 3rd of November.

Proposed Plan change 120 defines Coastal Erosion Hazard Area 1 as the area affected by 0.28 m of relative sea level rise.

My coastal hazard assessment identified coastal hazard associated with a number of scenarios, including SSP2-4.5M 2075, which provides for 0.3 m of relative sea level rise over a 50-year timeframe and this hazard area is essentially limited to the coastal reserve. Coastal Erosion Area 2 is the area landward of Area 1 that may be affected by up to 0.55 m of sea level rise and Area 3 represents up to 1.52 m of sea level rise. Scenario SSP8.5 2075 in my report includes sea level rise of 0.41 m, and SSP8.5+ +VLM is calculated based on 1.74 m of relative sea level rise.

Although the areas do not align cleanly, my assessment indicates that the proposed development overlaps Coastal Hazard Area 2 and 3 to an extent broadly approximated by my chosen scenarios as outlined above. The exact landward alignment of Area 2 and Area 3 are less relevant in this case, as the proposed development does not allow for erosion to impact on any part of the property.

Any structure to protect the seaward margin of the property will be identified as Coastal Hazard Area 2.

My hazard report presented a range of timeframes and sea level rise scenarios. They were not chosen to reflect coastal erosion hazard area 1, 2, 3 as it was completed prior to release of Plan Change 120. However, they are not dissimilar from the criteria that define these three areas.

- CEHZ 2075 (SSP2-4.5M): 50 year timeframe, 0.3 m SLR (PPC120 definition of Area 1 is 0.28 m of relative sea level rise).
- CEHZ 2075 (SSP5-8.5M): 50 year timeframe, 0.41 m SLR (PPC120 definition of Area 2 is 0.28-0.55 m of relative sea level rise)
- CEHZ 2130 (SSP5-8.5H+ + VLM): 100+ yr timeframe, 1.74 m SLR (PPC120 definition of Area 3 is 0.55-1.52 m of relative sea level rise).

My hazard report indicates that coastal hazard area 1 as currently defined is limited to the width of the coastal reserve (see Figure 10 of the original Coastal Hazards Assessment).



Area 2 is likely to include some of the seaward area of the property, which will be occupied by landscaping and the driveway etc.

Area 3 is the longer term and much more significant sea level rise. Prediction of the response of the shoreline to this amount of sea level rise is very difficult to predict. This could lead to erosion that could expose the basement of building A. These areas are outlined in the Figure below.

Development is therefore proposed within Area 2 and Area 3, so is therefore “potentially tolerable”.

Having considered the proposed policy 1B Risk Settings and Management Methodology approach proposed by the Council and as applicable within existing urbanised areas, the following points are noted:

- The activity is identified as being sensitive to natural hazards.
- The level of coastal erosion hazard risk is assessed as being low in the short term.

The activity is identified as being 'potentially tolerable', meaning that resource consent is required under E36.4.1A (Rule 214) which is a Restricted Discretionary Activity.

For activities where natural risk is potentially tolerable in accordance with Table E36.3.1B.1 in coastal erosion hazard area 2 and coastal erosion hazard area 3, the following matters of discretion apply:

- (a) Type of activity being undertaken and its sensitivity to natural hazard events including the consequences of a natural hazard event;*
- (b) The possible effects on public safety and other property resulting from the proposed development or activity;*
- (c) The effects on landscape values, associated earthworks and land form modifications;*
- (d) The effects on public access;*
- (e) The methods provided to manage activities and uses within the site, including safe egress from buildings and structures or and the site and the management of people and property during a coastal hazard event;*
- (f) Any exacerbation of an existing coastal hazard or creation of a new coastal hazard as a result of the proposed activity or development and possible effects on public safety and other property;*
- (g) The proposed use of, necessity for and design of hard engineering solutions to mitigate the hazard;*
- (h) The ability to relocate buildings or structures, including the proposed duration of occupation of the buildings or structures, taking into account the long term likely effects of climate change; and*
- (i) The ability to design, construct and maintain buildings or structures so that they are resilient to the effects of the hazard.*

An assessment of the proposal has been undertaken against the relevant matters of discretion, with the key conclusions set out as follows:

- Whilst the proposed activity is identified as being sensitive to natural hazards, the level of natural hazard risk to the Site associated with coastal erosion is assessed as being low in the short term and uncertain over the lifespan of the development. My analysis suggests that coastal erosion is not an immediate threat to the development, but instability in the bank

caused by as little as 2 m of toe erosion could start to affect the land seaward of the buildings within 50 years. Direct impact on the proposed buildings within 50 years is possible but less likely. On this basis, the condition approach recommended through this application is appropriate, and proportionate to the level of current risk.

- The proposed development does not affect the processes driving coastal erosion or exacerbate hazard at the neighbouring properties.
- There is no ability to relocate buildings or structures proposed as part of this development, however, coastal erosion related effects can be mitigated through the installation of an in-ground palisade wall or other form of appropriate structure, as set out in the proposed conditions.
- Any actual or potential effects on landscape values, associated earthworks and land form modifications resulting from coastal erosion hazard risk is assessed as being low;
- Public access to the foreshore seaward of the site is currently very restricted, due to the steep sloping bank and heavy vegetation. The intertidal area is also almost completely covered with mangroves and has a muddy substrate that makes movement difficult. Public access to this section of CMA is therefore of limited value. It is my understanding that there are no plans for work on the esplanade reserve and that the esplanade reserve adjacent to the site is not part of any planned greenway route. The proposed development does not adversely affect public access to the CMA.

Conclusion

Overall, it is concluded that through the proffering of conditions of consent (as outlined above) in support of this application, the proposed development is tolerable within this site-specific context, and any natural hazard related effects including those relating to coastal erosion are able to appropriately mitigated and acceptable.