P.O. Box 185
Orewa
Phone 09 428 0040
021 627 193
Email coastal@daviscoastal.co.nz

Our Ref: 23028

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Mr Luke Faithfull
Mitchell Daysh
Level 2
33 Totara Street
Mount Maunganui 3116

Per email: luke.faithfull@mitchelldaysh.co.nz

Dear Mr Faithfull

Memorandum - Section 92 RC14513
Coastal Engineering Aspects

This memorandum addresses aspects raised in the Additional Section 92 request from Western Bay of Plenty District Council dated 25 March 2025 under the subheading Coastal Engineering.

1. *The justification in the coastal report is that the northern extent of the Type 2 structure is to prevent erosion resulting from the Three Mile Creek meandering, and the resultant beach lowering that would be expected in the mouth of a creek. However, Three Mile Creek is constrained by existing rock and geotextile training walls, groynes, and is regularly dredged to maintain flow. This management of the creek has resulted in the beach accreting significantly in front of properties at 9, 11, and 13 Glen Isla Place. With consideration of the existing structures, please provide justification as to why the proposed design is the preferred solution. Additionally ensure that the alternatives considered have taken into consideration these existing structures.*

1.1 Coastal Management Approach

Management and design of a beach front requires a holistic analysis of the processes, features and effects. The coastal system at Waihi Beach is broad and shore linear with natural processes affecting stretches of coastline rather than isolated properties.

It is therefore, appropriate to consider the full extent of the residential enclave at Glen Isla. The area, or cell, addressed extends from the morphological change at Three Mile Creek, continuously past the developed backshore of Glen Isla residences, to Island View Reserve where there is a change in use. The lack of built structure at the Reserve allows alternative management.

Therefore, although while the groyne is in place, the risk from storm cut erosion damage may decrease to the north of the cell, it would be a significantly poorer solution to address only part of the cell. The extent that armouring of the northern end is required depends on the uncertainty of storm cut, long term retreat and the future of the groyne Consent. The armouring extending across the cell is the obvious solution.

1.2 Purpose of Structure to Address Erosion risk in Storm Events

The "justification" or purpose of the proposed armouring as set out in the Engineering Design Report, Davis Coastal Consultants, October 2024, (**Design Report**) is to allow the normal function of an enhanced (vegetated) dune under most conditions but provide protection from the risk of coastal erosion due to storm events and long-term retreat of the shoreline.

The risk of larger storm cut than has occurred to date is of particular concern to the Applicant. There is a real risk short term beach retreat could put the properties at risk. Historic studies of likely maximum storm cut estimate that short term events could result in erosion in the order of 20 - 40m. The *Assessment of Storm Cut Dune Erosion* (Eco Nomos 2003) for Environment Bay of Plenty noted for "… *sea walled areas north of Island View, the maximum likely storm cut dune line erosion ranges from 30-35 metres (50-year return period erosion) and 35-40 metres (100-year return period erosion).* The *Coastal Protection Areas Re-assessment* for the Western Bay of Planty District Council (T&T 2015) assessed the upper bound for short term retreat as 20m. However, the analysis was based on historic monitoring data obtained since 1990. Statistically there is a very high chance (70%) that the 1 in 100-year storm has not occurred over the 35 years (1990-2025) of monitoring.

1.3 Accretion due to Training Walls and Groyne

Based on the more landward dune line and lower foreshore, the Design Report notes in Section 3.4 that, for the properties adjacent to Three Mile Creek, "*…the risk of further erosion around the outlet has been decreased by the installation of the groynes but it is still higher than the surrounding beach".*

Comparison of historic shoreline in Section 3.5 of the Assessment of Coastal Processes, Davis Coastal Consultants, October 2024 (Coastal Processes Report) indicates the current (2024) shoreline more retreated than before the groyne in 1986-1999, except for a very localised area (20m approx.) immediately adjacent to the groyne. The groyne therefore, while improving the exacerbating effects of the stormwater discharge does not fully address them.

During large storm events the beach is lowered at the inlet allowing larger waves closer to shore and greater erosive energy to impact on the dunes. During the Gabriele storm large areas of planted back shore were lost, with greater landward excursion occurring adjacent Three Mile Creek and the groynes, than further away from the outlet.

1.4 Justification of Preferred Solution and Alternatives Consideration considering the groynes

Consideration of alternatives within the Design Report discusses and allows for the actions of the groynes. Section 3,3 of the report notes the area immediately around the groyne is more seaward than it would be without the groyne. However, the Report notes that soft engineering solutions alone such as renourishment and planting are not practicable.

This has been graphically demonstrated by the storm erosion suffered over the Gabrielle/Hale storm set. Large storm cut scarps with mature spinifex trailing over the face resulted demonstrating the limitation of natural dune measures for addressing large storm events. This is consistent with the typical natural response of coastal dunes confined by historic development. The groynes while promoting a slightly more landward dune position close to the groyne do not address the major storm cut events.

The maintenance of the training groynes and continuation of the dredging at Three Mile Creek is not within the control of the Applicant as it is a WBOPDC asset and may be discontinued at their discretion. The existing Consented life is understood to be relatively short. Future Consents will be subject to public consultation, Council budget and policy constraints and at the direction of elected representatives of the Community.

Coupled with this uncertain future management, it is likely that, as the most seaward structures, the groynes will be most at risk of damage from Climate Change driven sea level rise. Increasing damage to the groyne end following sea level rise may influence decisions on their future, long before the properties at northern Glen Isla are threatened.

The continued presence and operation of the groynes is therefore, not a factor that can be relied upon when considering the future management of this part of the shoreline. Any solution developed needs to be consistent with both the groynes remaining and their removal or failure.

The proposal provides for a natural dune area to be re-established and enhanced over the top of and in front of a backstop engineered structure. The proposal is completely consistent with the ongoing presence and operation of the groyne structures. Similarly, if the groynes are removed in future years the proposed solution is suitable to act independently to address the storm erosion events.

The more landward some parts of the Type 2 wall will tend not to be subject to exposure by storm events to the same extent the southern end is. However, it is in the range of possibilities that it will be required to protect the properties behind in an extreme event. Further, it would be very difficult to accurately predict at which stage any given part will be mobilised given the uncertainties of sea level rise and issues over the groynes raised above. It would therefore be difficult to decide at which point to terminate this section of wall, especially within a scenario of rising sea levels. It is a far more robust solution to continue the armouring to a terminal point with a shore perpendicular structure and "natural" feature.

Conversely, the more landward parts of the seawall will not have any appreciable effects on the dune system over the Consent period. They can readily be constructed and buried without permanent effect. The design decision was therefore to address the beachfront comprehensively from the watercourse through to the end of the residential development.

2. *Following on from the above question, if a softer engineering solution was proposed for the Type 2 frontage, the alignment of the Type 1 frontage could be pulled back closer to the property boundary. This would delay the exposure of the proposed rock structure and would reduce the effects of the beach and dune processes. Please provide details of alternative arrangements that may have been considered, particularly with consideration of the alignment and extent of the hard structures.*

The appropriate "soft engineering" solution for any sandy beach is the use of a natural vegetated dune system to provide a dynamic buffer to storm erosion. Within the "soft engineering solution" pedestrian access, plant fertilization and wind protection of the establishing vegetation is managed.

All these measures form part of the existing proposal. The proposed structure will be covered by 0.5m of sand and located in an area where it will only be exposed during extreme fluctuations in the beach profile areas. Accordingly, the current proposal is for a full soft engineering approach to management of the relevant shoreline.

Soft engineering methods manage the regular fluctuations of shoreline well. However, where the width of the dune system is constrained by backshore development, as it is at the subject site, the dune system can be completely removed by large storm events. There are therefore, risks at the site associated with the uncertain extent of storm retreat, and future shoreline retreat associated with rising sea level.

The Cyclone Gabriel/Hale storm sequence represents the most significant retreat on a 35 year monitoring record in some locations including the subject site. However, there is no basis to determine that similar and worse storm driven erosion will not occur at any time. As set out above considerably larger storm cuts are possible

The constraint of the dune system is the result of local government planning decisions to allow residential development in these locations. It is that historical planning that constrains the currently available management techniques for the shoreline.

With the dune managing short term fluctuation but further protection required from extreme events or climate change effects, the obvious solution is to;

1. Allow and enhance the process of dune fluctuation for management of short-term fluctuations.

2. Provide an engineering solution behind the viable extent of the fluctuation, that provides surety that the part of the dune and fixed assets behind the dune system are protected.

There is then a decision and judgement of where to locate the fixed line of engineered structure. The distance landward is limited by the location of existing backshore development and intended future use of that area.

As discussed in Section 3.4.2 of the Design Report, location of a structure further landward will tend to reduce the frequency and extent of any exposure of the structure. However, once landward of an area of regular dune fluctuation, moving the structure further landward provides diminishing benefits. At some stage it is so far landward it is out of the active zone and no benefit is gained by a more landward position. Conversely, on a constrained shoreline further movement landward may have increasing impacts on the values of the backshore.

As discussed, and suggested in the Section 92 request, the location of the northern end of the proposed engineered structure is sufficiently landward that, with the groyne structures present, it is unlikely to be exposed over its design life other than perhaps temporarily following an extreme storm event. It has been located with an allowance for provision of a 5-8m corridor of public reserve behind the protection, protecting a large established Norfolk Pine, allowing a vegetated backshore coastal dune environment and a potential future public access link.

The location of the more southern section requires more judgement. It has been located at the very upper extent of the known fluctuation of the dune system but maintaining backshore corridor at 5-6m. Based on the previous decades of monitoring data, only the upper course (1-1.5m) of rock would have been exposed by beach fluctuation and this would

have occurred just once over those decades. After such an event, as the wall is located within a healthy dune system, protected vegetation from within the 5-6m strip and remnant over the wall, will quickly recolonise sediment moved ashore post storm events, re-covering the wall. This natural replenishment of the beach since the Gabrielle storm sequence can be observed at the site and extensively along the Bay of Plenty coastline.

To locate the wall further landward would make little difference to the foredune, possibly preventing minor temporary exposure once in 30-50 years. However, such landward location would impinge on the backshore corridor. The 5-6m strip of land completes a link of public land from Seaforth Road along Three Mile Creek across the front of the Glen Isla Place properties to Island View Reserve. Once replanted it will provide continuation of the extensive planted backshore area in the Reserve and the vegetated sequence across backshore and foreshore. In the future, if high tide beach access becomes limited due to future sea level rise this area provides a ready link to the existing access along the southern bank of Three Mile Creek.

In effect locating the wall further landward neglects consideration of the future states of the beach and in particular fails to provide for future access under a sea level rise scenario. It is the better coastal management decision to maintain the 5-6m esplanade and associated future public access and/or natural backshore vegetation link.

Regards,

Craig Davis
BE, CPEng, IntPE(NZ), CMEngNZ