

Memo

To:	Kate McKenzie	Job No:	1020483
From:	Richard Reinen-Hamill	Date:	15 March 2023
Subject:	RC2022-039 Hokitika Seawall Extension. Coastal Engineering Review		

1 Purpose

West Coast Regional Council commissioned Tonkin + Taylor (T+T) to carry out a coastal engineering review on the assessment of effects on the environment of the proposed Hokitika Seawall Assessment prepared by Beca (2022) for council. Our preliminary assessment was included in our memo dated 17 May 2022. This memo sets out our final assessment after review of the S92 response letter dated 16 August 2022 and the detailed design report and appendices appended to the S92 response.

Our scope and findings are:

- The review of the technical information that was used to determine the design parameters of the seawall confirms that there is sufficient information and application of this information into appropriate design criteria for the proposed design.
- A review of the proposed revetment design, including:
 1. **the suitability of the 3.25% AEP design event:** The design parameters used for the design for a 3.25% event for a 10 to 15 year design life is adequate.
 2. **suitability of the location of the seawall:** The seawall is located to reduce impacts on the existing beach and reserve, while preserving the grass reserved area.
 3. **suitability of tie ins to the existing wall and the northern groyne and potential end erosion/scour effects:** The presence of any structure on the upper part of the beach will have some effect on natural processes, as the intended purpose is to reduce landward retreat. However, the wall cross section design and location as well as the termination tie in details are sufficient to reduce effects within the project area as much as possible, and seeks to transfer the relatively small impoundment loss effects from the project area to the north and these are expected to be limited to within some 900m of the northern end and manifest as a slight increase in existing erosion trends.
 4. likelihood of exacerbation of any existing erosion and loss of sand as a result of the design: The location of the wall and consideration of tie ins reduces as far as practicable existing erosion and loss of sand
 5. whether overtopping and drainage through the wall has adequately been provided for in the design: Overtopping and drainage through the relatively permeable armour crest and wall have been provided for, and any scour and damage to land that is still likely to occur is proposed to be managed by maintenance action.

2 Review of S92 information

We have added a column to the table included in our original memo to confirm adequacy of information provided.

Item	Original query/clarification	T+T review of 292 information
Performance of existing seawall designed and constructed in 2013	How has this structure performed and how different/similar are the design criteria and the current design? This provides confidence both on the design criteria and performance.	Covered in design report and clarified to acceptable levels.
Long term trends	What are the long term erosion trends at this location and how will this affect scour/toe depth and beach position? While SLR has been taken into account for water level it is unclear if beach adjustment over time including present and future trends have been considered. This speaks to the requirement of the seawall and the potential effects of the seawall both in the short and medium terms.	Appendix B of the detailed design report suggests that the shoreline has not yet eroded back to the 1943 shoreline, although this may be due to the various ad-hoc protection works. However, there is evidence of lee side erosion to the north of the groyne at Richards Drive between 19 June 2019 and 7 October 2019. Reviewing Google Earth images this may be due to the reported peaks and troughs of beach level variation, potentially also affected by impoundment loss from the temporary seawall construction, rather than from groyne effects, as sand transfer through the groyne is an identified transport mechanism in the Beca report and is evident from the GoogleEarth images.
Basis of Design Report (BDR) identifies there is a detailed design report and detailed design drawings are attached to this report.	<p>Can you provide Detailed Design Report? There are a number of matters identified in Section 6 that would be useful to see the design outcomes and process. Key issues to consider are:</p> <p>A reverse analysis on the stability of the seawall due to less frequent events that may still occur during the design period.</p> <p>Using the crest of the rock revetment as the height of the</p>	<p>Factors to derive rock parameters, such as the breaking wave index of 0.8 (Section 5.2, para 5) and cumulative addition of extreme water levels (Table 4) in addition to sea level rise and a factor for beach storm lowering, should result in a stable rock armour sizing for the design life.</p> <p>Provided with 2%AEP assessment</p> <p>Overtopping is likely under-estimated as crest level is used. However, report</p>

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	impermeable structure is likely to underestimate overtopping volumes and effects. EurOtop recommends using an average (c.f. Figure 1.8)	identifies that there is likely to be a risk of scour and erosion of the land behind the rock armour crest which will be managed if it occurs (Section 5.7). We note it could also be reduced by returning the underlayer up the landward side of the rock armour crest to ground level, or with a vertical timber wall or similar, but these options would take more material and cost.
Design life (BDR Section 3.2) – stated agreement with WCRC to be sought	What is the agreed design life? Speaks to the long term trend point above.	Confirmed to be 3.25%AEP with a 10 to 15 year life.
Material availability (BDR 4.1)	Given the same quarry is proposed as 2013, what was the quality results for the rock at that time? (additional information that would support the 2000 report information quoted).	Information provided and rationale for selecting 2.6T/m ³ appears appropriate and within the range of what can be expected from Limestone quarry's globally (typically between 2.3 and 2.7 T/m ³).
BDR Section 5.1 (Datums)	Any comment/ consideration of Vertical Land Movement as included in recent SeaRise website? Worth a statement to consider this new information.	Addressed, only small (10mm) predicted change and I assume this will not make a noticeable different to performance over design life.
BDR 5.7 Geotechnical information identifies very loose to loose material of between 0.65m to greater than 2 m depth overlying dense material	Locations of testing not shown. What are these depths of loose material in relation to a datum and does the proposed depth and design of the revetment take this into account?	Addressed and adequately responded. Doudation level of the toe of the wall of -0.92m NZVD below reported depth range of very loos material (Beca, pg 13).
AEE Section 5.4(b) effects on beach performance	No discussion on impoundment effect of the wall (and cumulative effects of this and adjacent wall) on shoreline evolution either in short, medium or long term. Unless this is what you are saying in 5.4.6? With	Addressed in Attachment E of s92 response. And agree with Beca conclusions <i>that the combined revetments potentially reduce the volume of sediment available to the net northerly longshore transport,</i>

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	life of 10 15 years should you also consider removal as an effect?	<i>which may result in shoreline retreat and rollback of the coastal barrier north of the site. Based on shoreline movements between Stafford Street and Richards Drive over the 2013 to 2021 period following construction of the existing revetment, such effects might extend some 900m north of the proposed revetment extension.</i>
No options assessment?	Some form of assessment to show that this is the preferred option from a effects basis is necessary.	An options assessment is included, recognising the preferred approach is based on a combination of factors.

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