REPORT

Tonkin+Taylor

High-level identification of coastal erosion hazard areas within Tauranga Harbour

Western Bay of Plenty District

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Document control

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October 2021	1	Draft report for client review	R. Haughey	T. Shand	
October 2022	2	Final report addressing client comments	R. Haughey	T. Shand	R. Hansen
September 2024	3	Final report with updated mapping edits issued 25 March 2024 included	R. Haughey	T. Shand	R. Hansen

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Bay of Plenty Regional Council	1 PDF copy
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1 Introduction

As part of a coastal hazards project, completed in 2019, Tonkin + Taylor Ltd (T+T) assessed the coastal erosion hazard for selected sites within Tauranga Harbour (T+T, 2019). The study included 18 sites within the Western Bay of Plenty District and 14 sites within Tauranga City. For the Western Bay of Plenty District, sites were selected based on being existing and proposed development areas in locations considered likely to be prone to coastal erosion. This included some rural areas within Western Bay of Plenty with significant potential for future papakainga development. The remainder of the Western Bay of Plenty District's harbour shoreline was not assessed at the time. See Figure 1.1 for the extent of the previous study.

Bay of Plenty Regional Council (BOPRC) and Western Bay of Plenty District Council (WBOPDC) have engaged T+T to complete a high-level assessment to identify 50-year and 100-year coastal erosion hazard areas along the remainder of the harbour shoreline within the Western Bay of Plenty District.

The following report outlines the methodology used to define the high-level coastal erosion hazard areas based on existing data and presents 50-year and 100-year coastal erosion hazard areas for the remaining harbour areas in the Western Bay of Plenty.

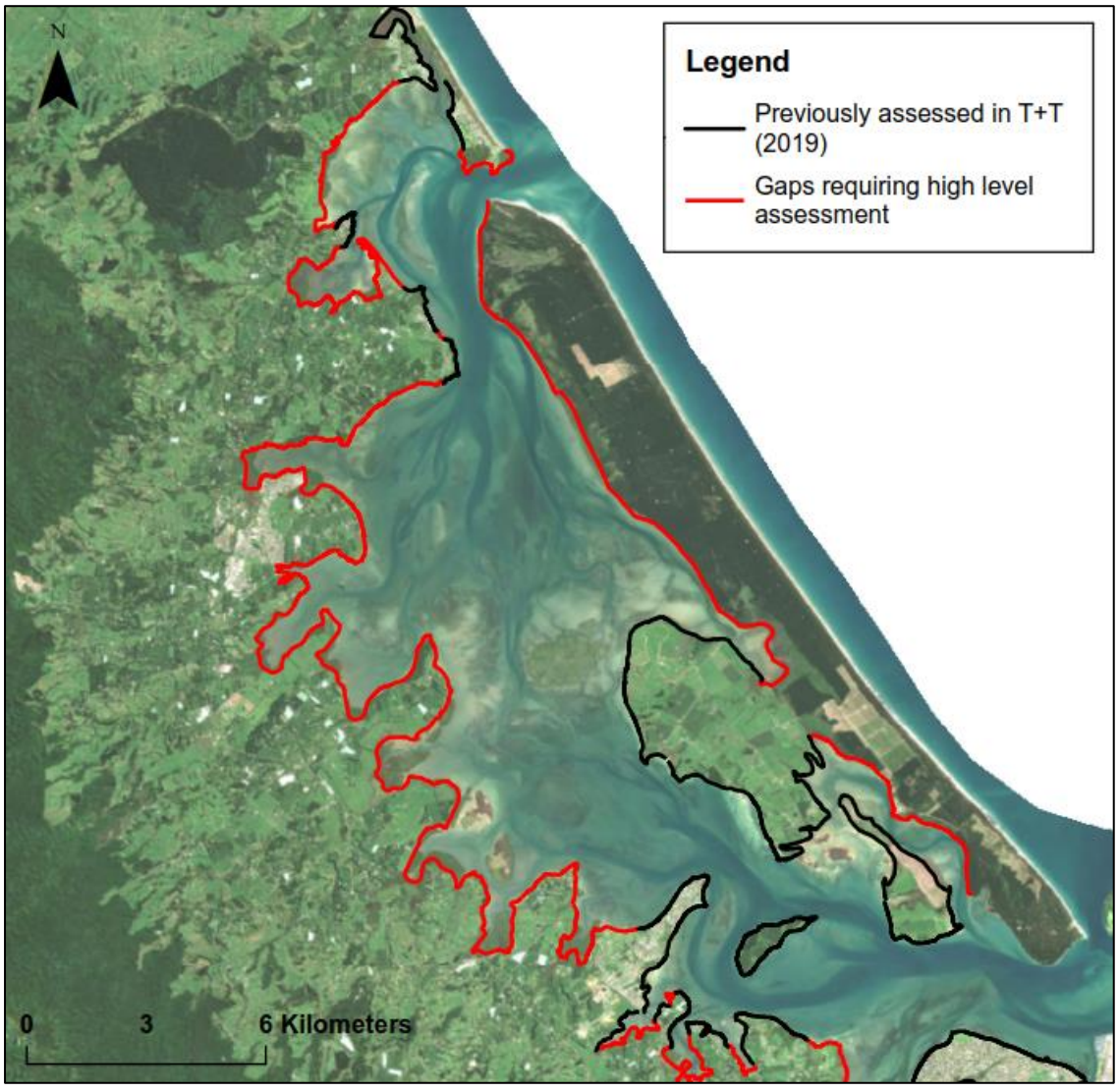

Figure 1.1: Extent of T+T (2019) assessments and the gaps which require information on coastal erosion hazard

2 Methodology

2.1 Approach

Ministry for the Environment guidelines (MfE, 2017) advocates the use of a two-level assessment for a coastal hazard assessment:

1. A *regional hazard screening* that identifies areas that may potentially be subject to coastal hazards. More detailed assessments can then be undertaken in future (if required) in areas identified as high risk.
2. A more *detailed hazard assessment* that enables a more thorough understanding of the coastal processes, uncertainties, and the effects of different future sea level rise scenarios, and the likelihood of hazard occurrence.

For the remaining areas we have adopted a regional hazard screening approach to identify areas that may potentially be subject to coastal hazards. This high-level approach is based on the existing values and analysis completed for the detailed CEHA around the harbour with results extrapolated to the remainder of the rural-zoned harbour shoreline.

2.2 Baseline derivation

A baseline is required to offset the coastal erosion hazard areas. For the previous detailed assessment (T+T, 2019), the baseline was digitised for each site using the vegetation edge identified in the latest available aerial. Comparisons with the T+T (2019) baseline, indicate that the 1 m RL (MVD-53) contour is a good estimate of the shoreline/vegetation edge and is roughly equivalent to MHWS.

For this assessment the baseline has been derived from the 1 m RL contour. Using the 2015 2 m DEM (Digital Elevation Model), a 1 m RL contour was generated. The contour was then smoothed by eye to create an appropriate baseline.

2.3 Cell splits

Due to different susceptibilities and processes, coastal erosion tends to differ between different shoreline morphologies. T+T (2019) broadly classified the harbour shoreline into three different morphological types:

- Consolidated cliffs and banks
- Unconsolidated shorelines (beach ridges)
- Low-lying estuarine areas

The remaining harbour shoreline has been split into high level coastal cells based on the morphological type using the latest available LiDAR and aerial photograph. The erosion offset along cliff shorelines is largely sensitive to cliff height and therefore the cliff shoreline has been split into four different height ranges:

- Consolidated banks (<4 m)
- Consolidated cliffs (4 to 10 m)
- Consolidated cliffs (10 to 20 m)
- Consolidated cliffs (>20 m)

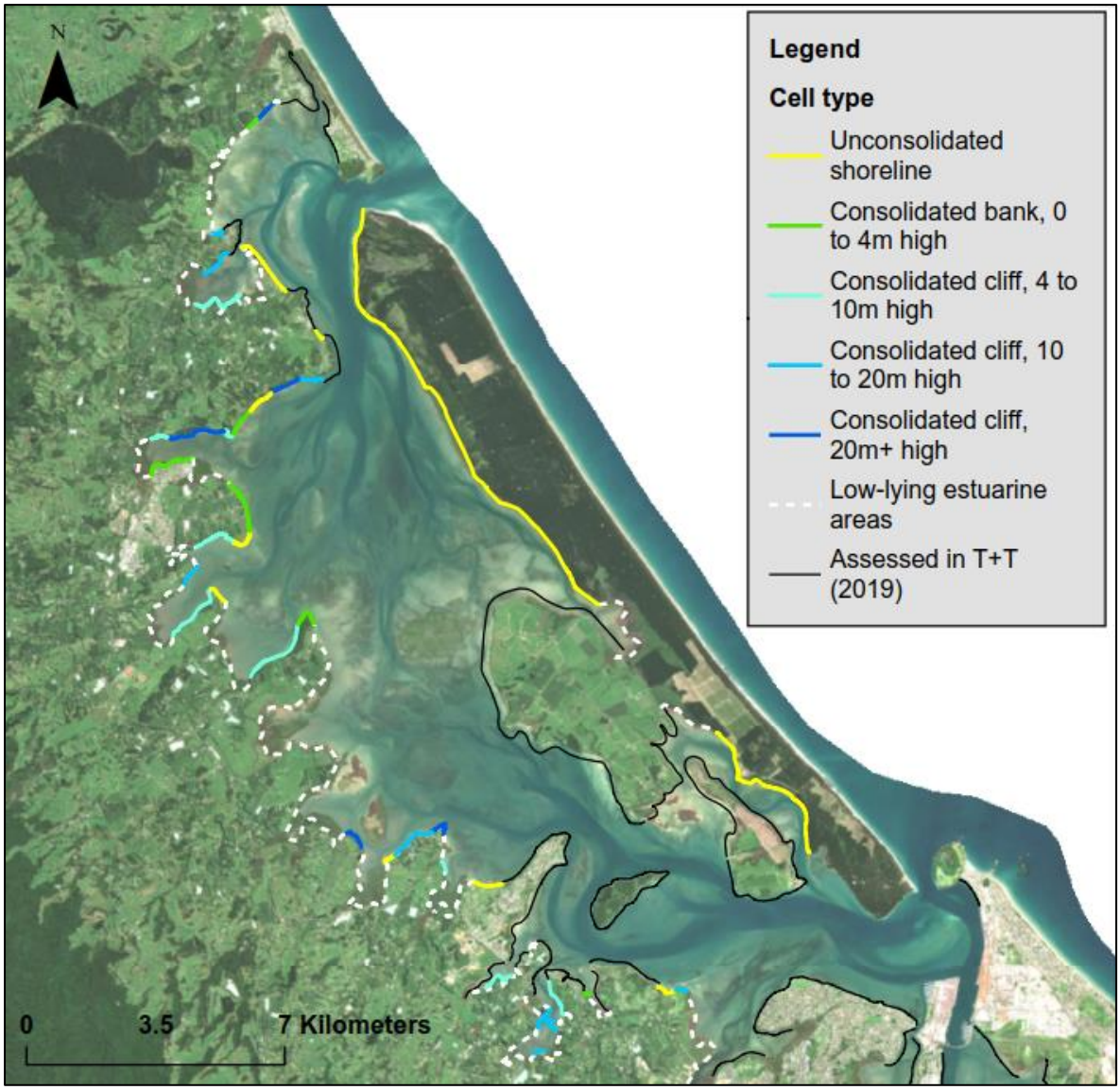

Figure 2.1: Overview of the cell splits

2.4 Derivation of coastal erosion hazard distances

The high-level identification of CEHA along the remaining harbour shoreline has been based on the existing offsets derived along the previously studied WBOPDC harbour shoreline as part of the T+T (2019) study. As agreed with WBOPDC, the existing values derived within the detailed assessment have been utilised for the following timeframe, SLR and probability scenarios:

- 50-year coastal erosion hazard area: 2080 0.6 m SLR $P_{66\%}$
- 100-year coastal erosion hazard area: 2130 1.25 m SLR $P_{66\%}$

The $P_{66\%}$ scenario in the detailed assessment (T+T, 2019) means there is a 66% chance of the erosion distance being exceeded within that timeframe and can be considered a likely scenario.

Table 2.1 provides a summary of the minimum, average and maximum CEHA distances derived for the different shoreline types in T+T (2019). Regional hazard screening assessments are typically conservative and are based on upper bound values, therefore the adopted values for the remaining harbour shoreline cells have been based on the maximum envelope calculated for the existing CEHA. Figure 2.2 and Figure 2.3 show the CEHA distances derived from T+T (2019) overlaid with the

adopted values for each shoreline type. A summary of the adopted values for each shoreline type is also provided in Table 2.2.

Table 2.1: Summary of CEHA values (m) derived for the WBOPDC harbour shoreline in T+T (2019)

Shoreline type		2080 0.6m SLR $P_{66\%}$			2130 1.25m SLR $P_{66\%}$		
		Min	Average	Max	Min	Average	Max
Unconsolidated shorelines		-8	-14	-22	-11	-23	-38
Consolidated cliffs/banks	0 to 4 m	-6	-13	-22	-8	-22	-38
	4 to 10 m	-13	-23	-37	-17	-33	-59
	10 to 20 m	-24	-36	-48	-33	-49	-67
	20 m +	-45	-50	-55	-59	-65	-70
Low-lying estuarine areas		No current erosion hazard. See future MHWS position.					

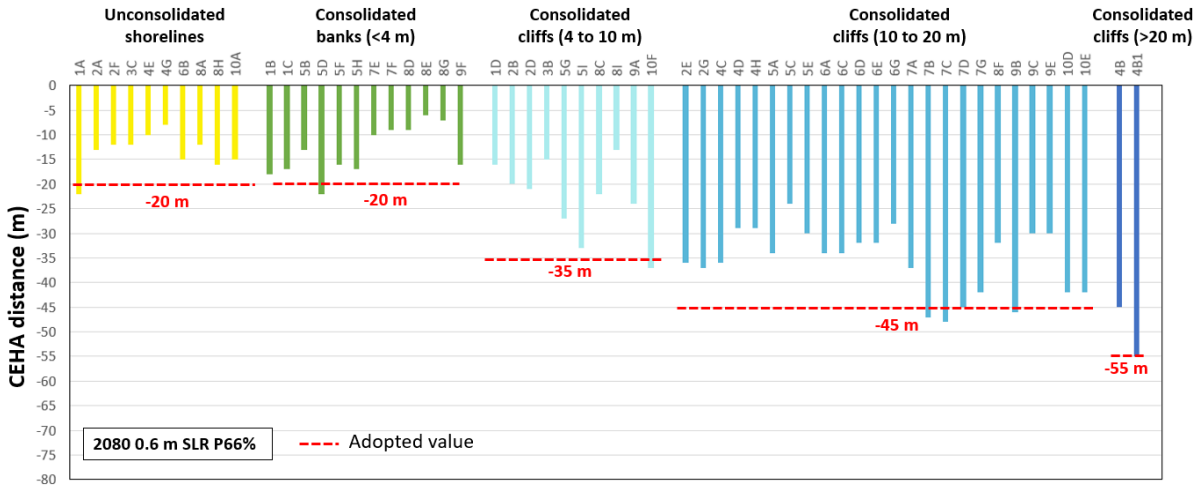

Figure 2.2: CEHA offsets (2080 0.6 m SLR $P_{66\%}$) derived for WBOPDC harbour shoreline cells by T+T (2019)

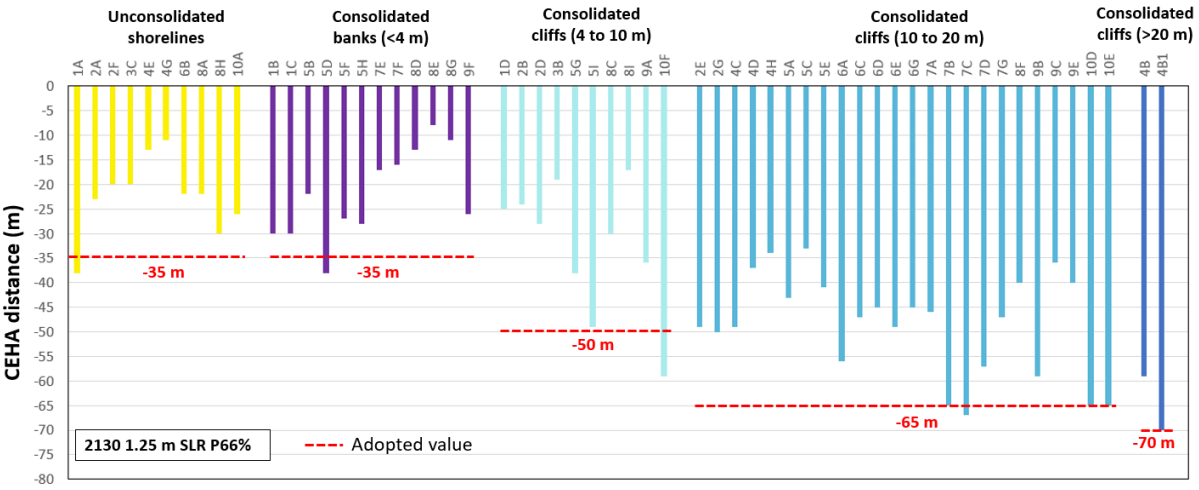

Figure 2.3: CEHA offsets (2130 1.25 m SLR $P_{66\%}$) derived for WBOPDC harbour shoreline cells by T+T (2019)

Table 2.2: Summary of adopted CEHA values for the remaining harbour shoreline within Western Bay of Plenty District

Shoreline type		Adopted values (m)	
		50-year CEHA	**100-year CEHA**
Unconsolidated shorelines		-20	-35
Consolidated cliffs/banks	0 to 4 m high	-20	-35
	4 to 10 m high	-35	-50
	10 to 20 m high	-45	-65
	20 m + high	-55	-70
Low-lying estuarine areas		No current erosion hazard. See future MHWS position.[1]	

1 The position of the future mean high water spring (MHWS) can be used to determine what areas are potentially at risk to becoming permanently inundated with SLR (refer to NIWA, 2019)

2.5 Mapping

The adopted CEHA values for each cell type have been offset from the baseline. Where the hazard values are different between adjacent coastal cells, the mapped CEHA is merged over a distance of at least 10 times the difference between values providing smooth transitions or along contours or material discontinuities where these are present. For example, transitioning from a cliff to a beach would generally follow the contour line.

3 Discussion

Figure 3.1 provides an example of the high-level 50-year and 100-year CEHA (dashed lines) compared with the CEHA from the detailed assessment in adjacent coastal cells (solid lines) (T+T, 2019). The comparison between the two datasets is generally good with the high-level CEHA being slightly larger.

The CEHA derived for the remaining harbour shorelines are high-level and are based on the assumption that the shoreline types across the harbour have similar erosion susceptibility. The detailed Tauranga Harbour assessment (T+T, 2019) identified shoreline exposure as being an important factor in influencing erosion susceptibility and therefore CEHA width. The WBOPDC remaining harbour shorelines appear to have similar shoreline exposures as the shorelines assessed in T+T (2019) and therefore the adoption of values based on T+T (2019) has been considered appropriate.

A significant portion of the remaining WBOPDC harbour shoreline is characterised by sheltered, low-lying estuarine areas in the upper reaches of the harbour. Erosion within these areas tends to be negligible with mangroves and salt marsh vegetation protecting the shoreline, however these areas may be exposed to other hazards such as permanent inundation. As discussed in T+T (2019), inundation from sea level rise may result in the shorelines migrating landward. Based on present day morphology, the position of the future mean high-water spring (MHWS), as presented within NIWA (2019), can be predicted to determine what areas are potentially at risk of becoming permanently inundated with SLR.

In some locations there may be land instability hazard along the upper slope which is unrelated to coastal processes. The T+T (2019) study and subsequently this study, only assesses erosion and instability along the coastal edge and does not include additional land instability which may occur near the coastal margin.

The CEHA derived within this assessment are high-level and are appropriate for identifying areas potentially susceptible to coastal erosion. A detailed assessment is recommended for any site-specific coastal erosion information. This would include analysis of site-specific erosion rates, underlying geology and shoreline morphology.

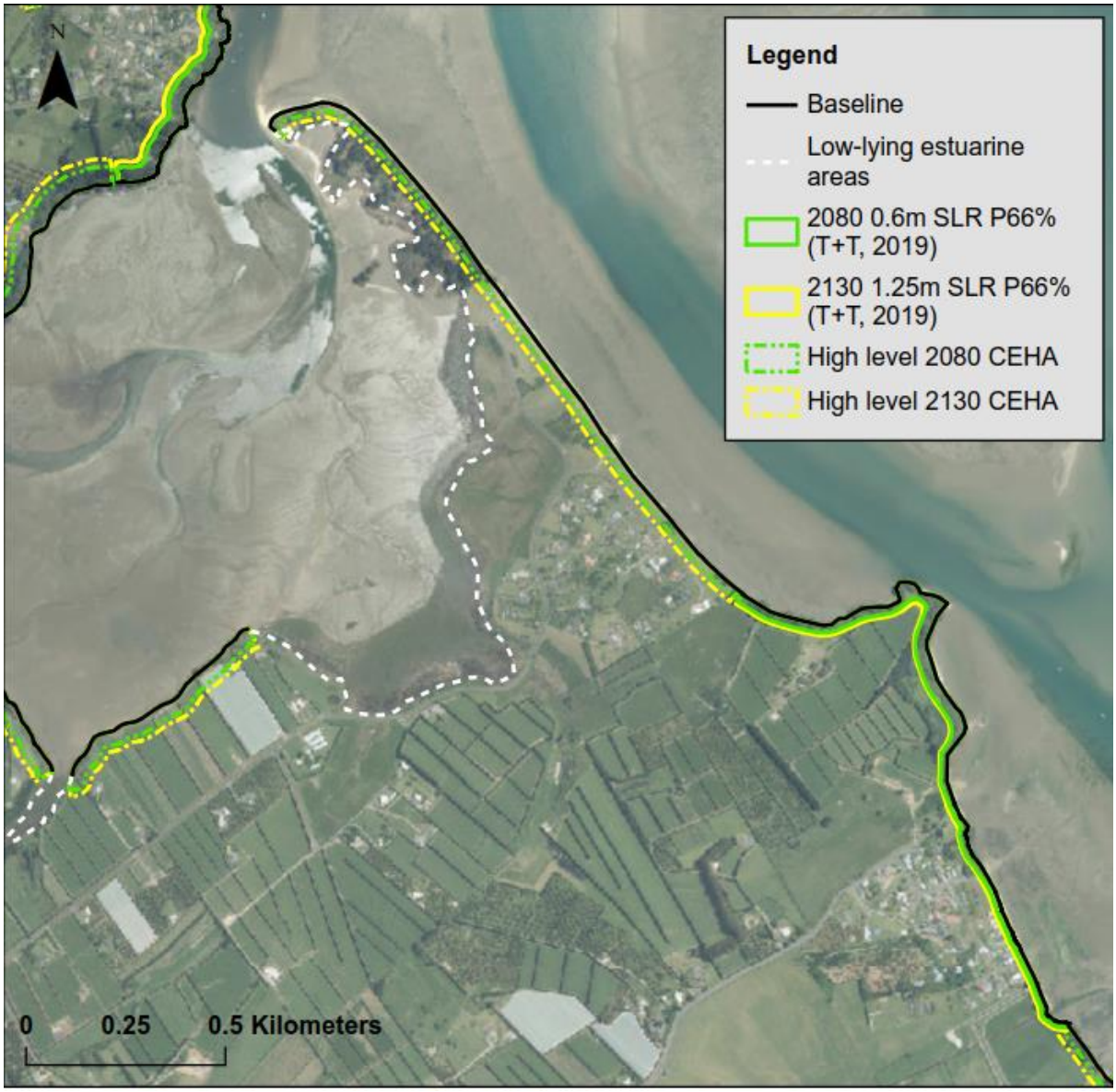

Figure 3.1: Example map of high level CEHA derived for the rural-zoned harbour shoreline within the Western Bay of Plenty District

4 Summary

A high level assessment has been completed to identify 50-year and 100-year coastal erosion hazard areas along the remainder of the Western Bay of Plenty District shoreline within Tauranga Harbour which were not previously assessed in T+T (2019).

The shoreline has been split into cells based on the different shoreline morphologies and heights. Adopted CEHA values have been based on the CEHA distances derived in T+T (2019) for shorelines with similar morphologies and therefore assumed erosion susceptibility. Regional hazard screening assessments are typically conservative and are based on upper bound values, therefore the adopted

values for the remaining harbour shoreline cells have been based on the maximum envelope calculated for the existing CEHA.

The CEHA derived within this assessment are high-level and are appropriate for identifying areas potentially susceptible to coastal erosion. A detailed assessment is recommended for any site-specific coastal erosion information. This would include analysis of site-specific erosion rates, underlying geology and shoreline morphology. Applicability

This report has been prepared for the exclusive use of our client Bay of Plenty Regional Council and Western Bay of Plenty District Council with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

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5 References

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T+T (2019). Tauranga Harbour Coastal Hazards Study. Coastal Erosion Assessment. Report prepared by Tonkin + Taylor Ltd for Bay of Plenty Regional Council.

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