7 Plummers Point

7.1 Site description

Plummer's Point is located within the southern basin of the Tauranga Harbour, just south of Omokoroa Peninsula. The shoreline comprises approximately 1.5 km of cliffs and 0.5 km of low-lying shoreline. The site is split into 7 cells based on differences in morphology and exposure (Figure 7-1).

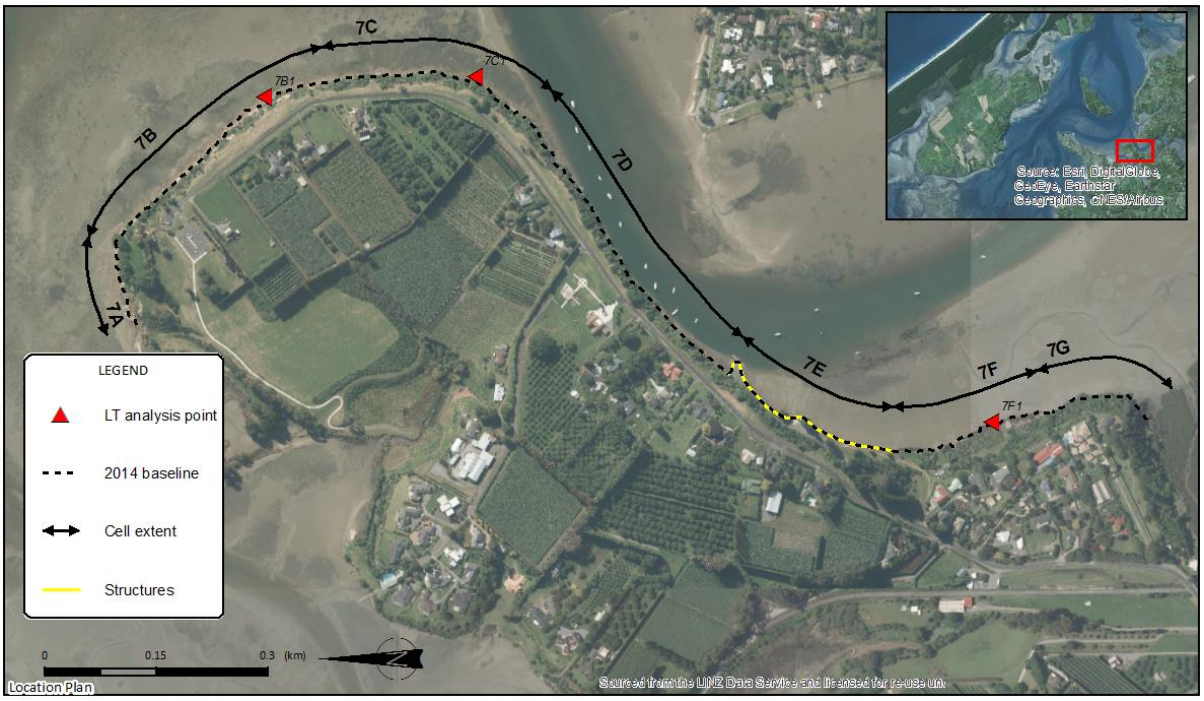

Figure 7-1 Location and cell extent of the Plummer's Point shoreline within Tauranga Harbour.

At the northern end, below Ongarahu Pa, there are north-facing cliffs, elevated approximately RL 14 m (Cell 7A). The cliffs are mostly vegetated although there are sections where slips have occurred leaving bare cliff face (Figure 7-2A). The cliffs wrap around to a northeast-facing aspect where they are exposed to an average fetch of 4 km (Cell 7B). Cliff elevations range from RL 12 to 15 m.

South of Cell 7B the cliffs change to a direct easterly orientation and are exposed to an average fetch of 9 km (Cell 7C). Along the east-facing cliffs the vegetation is less dense and in many sections a grass covered talus slope has formed (Figure 7-2B). Along the base of the cliffs are small patches of sandy beach and accumulated rock debris.

Further around the point are southeast-facing cliffs that are situated close to the tidal channel (Cell 7D) (Figure 7-2C). Vegetation is typically dense, however there are sections of bare cliff face where recent slips have occurred.

Along Kotuku Reserve there is approximately 0.2 km of protected, consolidated shoreline, including rock revetment around the boat ramp and pontoon and a seawall along the grass bank (Cell 7E). South of Kotuku Reserve is a section of approximately 0.3 km of low consolidated shoreline (Cell 7F) (Figure 7-2D). At the southernmost end of the site is a short section of well-vegetated, east-facing, cliffs, ranging in elevation from RL 16 to 18 m (Cell 7G) (Figure 7-2D).

In general, the southern section of Plummer's Point (Cells 7D to 7G) is relatively sheltered with an average fetch less than 1 km.

Figure 7-2 Site photos for Plummer's Point. (A) North-facing cliff (Cell 7A), (B) east-facing cliff (Cell 7C), (C) south-facing cliff (Cell 7E), (D) consolidated shoreline (Cells Cell 7F & 7G).

7.2 Geology

The geological map of the area[8] indicates that the site comprises:

- Matua Subgroup: Poorly to moderately sorted gravel with minor sand and silt underlying terraces; includes minor fan deposits and loess.

Field observations of cliff exposures include interbedded ash layers at the top of the cliffs and reworked ignimbrites at the base of the cliffs.

The existing slope angles in this area are between 5° to 20° in low bank areas, and between 30° to 60° in areas of cliffs. The range of stable slope angles for Plummer's Point are shown in Table 7-1 below.

The failure types observed around Plummer's Point were typically shallow surface failures on steep cliff faces. These resulted in areas of debris collecting at the base of the cliffs. Some of the debris is being removed by tidal processes. There is a low to moderate likelihood that deep seated landslips could occur in this area based on field observations of the landslips at this time.

[8] Leonard, G.S.; Begg, J.G.; Wilson, C.J.N. (compilers) 2010: *Geology of the Rotorua area*. Institute of Geological & Nuclear Sciences 1:250,000 geological map 5. 1 sheet + 102 p. Lower Hutt, New Zealand. GNS Science.

7.3 Coastal processes

The north and east-facing cliffs are exposed to waves from the north, northeast and east. The eastern side of Plummer's Point (Cell 7B and Cell 7C) has the largest fetch of approximately 12 km across from Mount Maunganui. While the north-facing cliff (Cell 7A) is slightly more sheltered by Omokoroa Peninsula. There is approximately 400 m of intertidal flats in front of the east-facing cliffs, which are likely to dissipate some of the wave energy.

There is evidence of wave under cutting along both the east and north facing cliffs. Long term erosion rates for the north-facing cliffs (Cell 7A) are estimated to be between -0.05 and -0.15 m/yr. Historic aerials indicate that the highest long term erosion rate occurs along the east-facing cliffs (Cells 7B and 7C), where erosion rates range from -0.1 to -0.25 m/yr. Similarly, Opus (2015) estimated the average erosion rate along the cliffs to be -0.14 m/yr. Waves and tidal currents appear to influence the shoreline stability through both causing toe erosion of the cliff and removing slope debris.

Although the south-facing cliff (Cell 7D) is slightly more sheltered from wave energy, it is located close to the tidal channel, where tidal currents are likely to continually remove slope debris from the cliff toe and contribute to the erosion rate. Tree cover makes it difficult to determine long term shoreline trends. Opus (2015) estimate the average erosion rate to be slightly less (-0.12 m/yr) than the adjacent east-facing cliffs (Cell 7C). Therefore, long term erosion rates are estimated to be between -0.1 and -0.2 m/yr.

The consolidated shoreline at the southern extent of Plummer's Point (Cells 7E, 7F and 7G) is relatively sheltered from waves and strong tidal currents as it is protected by Te Puna West and fronted by approximately 150 m of intertidal flat. Regression analysis indicates long term erosion rates are between -0.02 to -0.1 m/yr.

SLR response factors for the exposed cliffs along Cells 7B and 7C range from 0.2 to 0.4. The rest of the Plummer's Point shoreline is more sheltered, therefore response factors for the other cells range from 0.1 to 0.3.

7.4 Local considerations

At the northern end of Kotuku Reserve is a section of rock revetment and rip rap extends from the pontoon to the boat ramp (Figure 7-3A). The revetment is approximately 1 m to 1.5 m high. South of the boat ramp is a small section of revetment followed by approximately 100 m of timber wall (approximately 0.5 m to 1 m high) (Figure 7-3B). The wall is in good condition however there is evidence of slight wave overtopping at the northern end. At the southern edge of the seawall an unprotected section of grass bank shows wave undercutting, indicating that without the seawall the grass reserve would be subject to erosion.

Figure 7-3 Protection structures at Plummer's Point. (A) Rock revetment, (B) timber seawall.

7.5 Adopted component values

Adopted component values are presented in Table 7-1. The short term values are equal to zero for the consolidated cells as short term erosion is not applicable for consolidated shorelines (see section 4.6.2 in main report).

Table 7-1 Adopted component values for the cells around Plummer's Point.

Site		7. Plummer's Point						
Cell		**7A**	**7B**	**7C**	**7D**	**7E**	**7F**	**7G**
Cell centre (NZTM)	**E**	1868729	1868906	1869017	1868768	1868547	1868532	1868578
	N	5828347	5828230	5827927	5827676	5827422	5827191	5827019
Morphology		Consolidated	Consolidated	Consolidated	Consolidated	Consolidated	Consolidated	Consolidated
Geology		Matua Subgroup	Matua Subgroup	Matua Subgroup	Matua Subgroup	Matua Subgroup	Matua Subgroup	Matua Subgroup
Exposure (average fetch + direction)		1.5 km (N)	4 km (NE)	9 km (E)	0.5 km (SE)	0.5 km (SE)	0.5 km (NE)	0.5 km (NE)
State		Natural	Natural	Natural	Natural	Protected	Natural	Natural
Short-term (m)	Min	0	0	0	0	0	0	0
	Mode	0	0	0	0	0	0	0
	Max	0	0	0	0	0	0	0
Dune/Cliff elevation (m above toe or scarp)	Min	13	12	13	13	1	0.5	16
	Mode	14	13	13.5	15	1.5	1	17
	Max	15	14	14	17	2	1.2	18
Stable angle (deg)	Min	24	24	24	24	24	30	24
	Mode	26	26	26	26	26	32	26
	Max	60	50	45	55	40	34	40
Long-term (m)	Min	-0.15	-0.25	-0.25	-0.2	-0.1	-0.1	-0.1
	Mode	-0.1	-0.15	-0.15	-0.15	-0.05	-0.05	-0.05
	Max	-0.05	-0.1	-0.1	-0.1	-0.02	-0.02	-0.02
Closure slope (beaches)/SLR response factor (cliffs)	Min	0.1	0.2	0.2	0.1	0.1	0.1	0.1
	Mode	0.2	0.3	0.3	0.2	0.2	0.2	0.2
	Max	0.3	0.4	0.4	0.3	0.3	0.3	0.3

7.6 Coastal erosion hazard assessment

Coastal erosion hazard distances for Plummers Point are presented within Table 7-2 and an overview map in Figure 7-4. Histograms of individual components and resultant erosion hazard distances using a Monte Carlo technique are shown in Appendix B. For the purpose of this assessment all coastal erosion protection structures have been ignored (refer to main report Section 4.5.4).

The current $P_{66\%}$ erosion hazard ranges from as low as -1 m along the sheltered shoreline south of Kotuku Reserve (Cell 7F) to -22 m along the east-facing cliffs adjacent to Plummers Point Road (Cell 7C).

The future $P_{5\%}$ for 1.6 m SLR in 2130 ranges from -16 m to -71 m. Overall the hazard distances are largest where the cliff heights and fetch exposure are greatest (Cell 7B & Cell 7C).

Table 7-2 Coastal erosion hazard widths (m) for current, 2080 and 2130 timeframes.

Site	Cell	Timeframe	SLR (m)	Probability of Exceedance					
				Min	$P_{66\%}$	$P_{50\%}$	$P_{5\%}$	$P_{1\%}$	Max
Plummers Point	7A	Current	0.03	-9	-16	-18	-30	-32	-34
		50yr (2080)	0.12	-12	-21	-23	-35	-37	-40
			0.2	-12	-21	-24	-36	-38	-41
			0.4	-13	-22	-25	-37	-39	-43
			0.6	-13	-23	-26	-37	-40	-45
		100yr (2130)	0.22	-14	-26	-28	-40	-43	-47
			0.6	-15	-28	-31	-43	-47	-51
			0.8	-16	-29	-32	-44	-48	-52
			1.25	-17	-31	-33	-46	-50	-54
			1.6	-17	-31	-34	-47	-51	-56
	7B	Current	0.03	-12	-19	-22	-29	-31	-34
		50yr (2080)	0.12	-18	-28	-30	-38	-41	-45
			0.2	-19	-29	-32	-41	-43	-47
			0.4	-21	-32	-35	-44	-47	-52
			0.6	-21	-34	-37	-47	-50	-55
		100yr (2130)	0.22	-24	-36	-38	-48	-52	-58
			0.6	-28	-42	-45	-57	-61	-67
			0.8	-29	-44	-47	-60	-65	-71
			1.25	-31	-48	-51	-65	-72	-79
			1.6	-32	-50	-54	-69	-75	-84
	7C	Current	0.03	-15	-22	-24	-31	-32	-34
		50yr (2080)	0.12	-21	-30	-32	-40	-42	-46
			0.2	-23	-32	-34	-42	-44	-48
			0.4	-24	-35	-37	-46	-48	-53
			0.6	-26	-37	-39	-48	-51	-57

Site	Cell	Timeframe	SLR (m)	Probability of Exceedance					
				Min	$P_{66\%}$	$P_{50\%}$	$P_{5\%}$	$P_{1\%}$	Max
Plummers Point	7C	100yr (2130)	0.22	-27	-38	-41	-50	-53	-58
			0.6	-31	-45	-47	-58	-63	-68
			0.8	-32	-47	-50	-62	-66	-73
			1.25	-34	-51	-54	-67	-73	-82
			1.6	-35	-53	-56	-71	-77	-87
	7D	Current	0.03	-11	-20	-22	-33	-36	-40
		50yr (2080)	0.12	-17	-27	-30	-41	-44	-48
			0.2	-18	-28	-31	-42	-45	-50
			0.4	-19	-30	-33	-44	-47	-52
			0.6	-19	-31	-34	-45	-48	-54
		100yr (2130)	0.22	-23	-35	-38	-49	-52	-57
			0.6	-25	-39	-42	-53	-56	-63
			0.8	-26	-40	-43	-55	-58	-65
			1.25	-27	-42	-45	-57	-61	-70
			1.6	-28	-43	-46	-59	-63	-73
	7E	Current	0.03	-2	-3	-3	-4	-5	-5
		50yr (2080)	0.12	-3	-6	-6	-8	-9	-10
			0.2	-3	-6	-7	-9	-10	-11
			0.4	-3	-7	-7	-10	-11	-12
			0.6	-3	-7	-8	-10	-11	-13
		100yr (2130)	0.22	-4	-8	-9	-13	-14	-15
			0.6	-5	-9	-10	-15	-16	-18
			0.8	-5	-10	-11	-16	-17	-19
			1.25	-5	-10	-12	-17	-19	-21
			1.6	-5	-11	-12	-18	-20	-23
	7F	Current	0.03	-1	-2	-2	-3	-3	-3
		50yr (2080)	0.12	-2	-5	-5	-7	-8	-8
			0.2	-3	-5	-5	-8	-8	-9
			0.4	-3	-5	-6	-9	-9	-11
			0.6	-3	-6	-6	-9	-10	-12
		100yr (2130)	0.22	-4	-7	-8	-11	-12	-13
			0.6	-4	-8	-9	-14	-15	-16
			0.8	-4	-9	-10	-14	-16	-18
			1.25	-4	-9	-10	-16	-17	-20
			1.6	-5	-10	-11	-16	-18	-21
	7G	Current	0.03	-20	-28	-30	-37	-38	-41
		50yr (2080)	0.12	-21	-31	-33	-40	-42	-46
			0.2	-21	-31	-33	-40	-42	-47
			0.4	-22	-32	-34	-41	-43	-48
			0.6	-22	-32	-34	-42	-44	-49

Site	Cell	Timeframe	SLR (m)	Probability of Exceedance					
				Min	$P_{66\%}$	$P_{50\%}$	$P_{5\%}$	$P_{1\%}$	Max
	7G	100yr (2130)	0.22	-23	-34	-36	-43	-46	-49
			0.6	-23	-35	-37	-45	-48	-52
			0.8	-24	-36	-38	-46	-48	-53
			1.25	-24	-36	-39	-47	-50	-55
			1.6	-24	-37	-39	-47	-51	-56

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Notes: Aerial photograph sourced from the LINZ Data Service (dated 2015)

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Tauranga Harbour Coastal Erosion Assessment

Erosion Hazard Overview

Site 7: Plummers Point

FIGURE No. Figure 7-4

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