

32 Athenree

32.1 Site description

The Athenree shoreline is located at the northernmost end of the Tauranga Harbour. The site consists of approximately 2 km of consolidated shoreline and 4 km of low-lying estuarine area. The site is split into 9 cells based on differences in morphology, exposure and shoreline elevation (Figure 1-1). The eastern side of the shoreline is a relatively low energy environment with limited fetch and shallow intertidal flats.

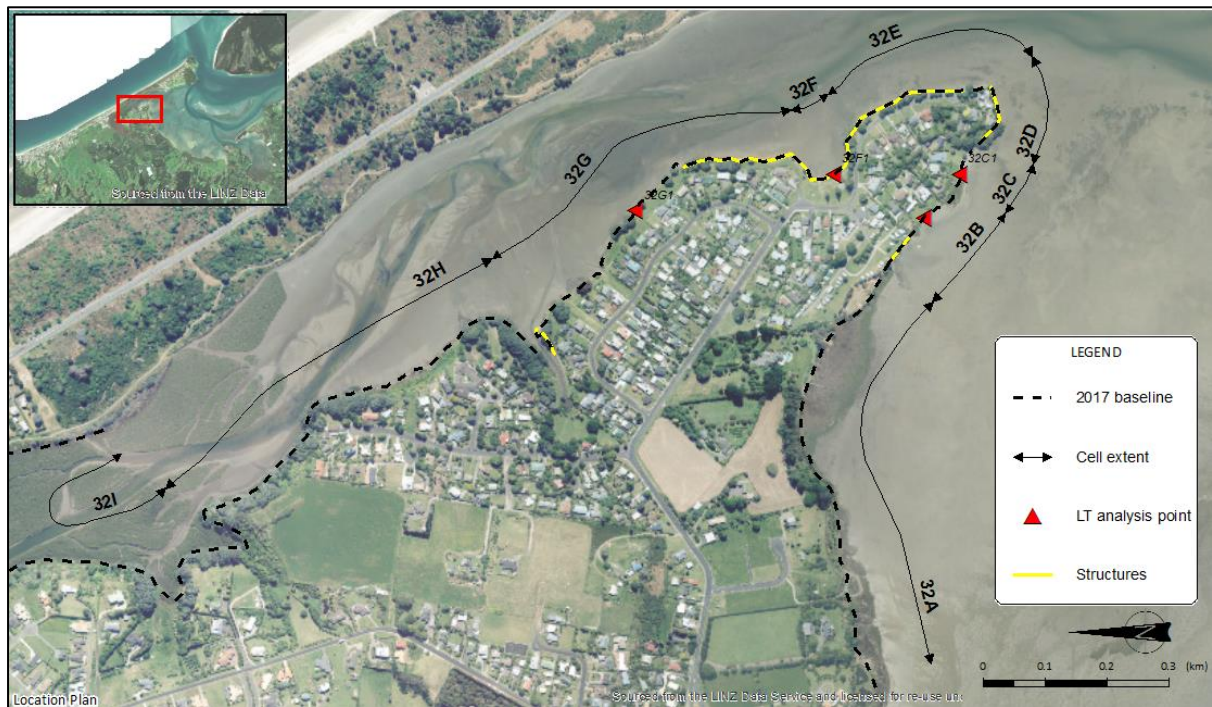


Figure 32-1 Location and cell extent along the Athenree shoreline within the Tauranga Harbour.

At the western extent of the Athenree shoreline there is low-lying estuarine shoreline with mangroves and salt marsh vegetation (Cell 32A) (Figure 32-2). Towards east there is a southwest-facing consolidated bank which is elevated approximately 1 m high (Cell 32B). Cell 32C is characterised by a low grass bank fronted with a small sandy high tide beach (Figure 32-2). On the southern tip of Athenree the shoreline is characterised by consolidated bank, ranging in elevation from RL 2 to 3 m. The south-facing bank (Cell 32D) is exposed to an average fetch of 5 km from south.

As the shoreline wraps around to an east-facing orientation the fetch exposure is reduced to less than 1 km. Cell 32E is consolidated bank, elevated approximately RL 2 m. Sections of the bank is protected by a seawall. The shoreline within Cell 32F is slightly lower elevation and consists of a gradual sloping backshore with a small boat ramp in the middle. There is a timber seawall which is now fronted with sediment and grass.

Further north the shoreline elevation increases to a consolidated bank ranging in elevation from RL 2 to 4 m (Cell 32G). At the northern end of Cell 32G there is small shallow inlet. North from the inlet the shoreline is characterised by a section of well-vegetated cliffs which a partially fronted with salt marsh. The cliffs range in elevation from RL 5 to 11 m. At the northern extent of the Athenree shoreline there is an expansive area of low-lying estuarine shoreline, characterised with mangroves and salt marsh vegetation (Cell 32I).



Figure 32-2 Site photos for Athenree. (A) Low-lying estuarine shoreline within Cell 32A. (B) Sandy high-tide beach (Cell 32C). (C) Consolidated bank (Cell 32E). (D) Sheltered, consolidated bank (Cell 32G).

32.2 Geology

The geological map of the area³³ indicates that the site comprises:

- Karioitahi Group – Late Pleistocene Stable Dune Deposits: Reddish to dark brown muddy sand and clay rich sandy paleosols. With rhyolitic ash and pumice lapilli.
- Tauranga Group – Late Miocene to Middle Pleistocene rhyolitic river deposits: Sand, mud and pumice with local gravel and peat beds.

The existing slope angles in this area are between 15° to 50° in areas of banks or low cliffs. The range of stable slope angles for the Athenree area are shown in Table 32-1 below.

The failure types observed around Athenree were typically shallow surface failures. The likelihood of deep seated movement is low.

32.3 Coastal processes

The southern side of Athenree is exposed to considerable fetch from the south, however there are extensive shallow intertidal flats fronting the shoreline which are likely to reduce exposure to wind-wave energy. The presence of mangroves within Cell 32A indicates that it is a relatively sheltered shoreline.

³³ Edbrooke, S.W. (compiler) 2001: *Geology of the Auckland area*. Institute of Geological & Nuclear Sciences 1:250,000 geological map 3. 1 sheet + 74 p. Lower Hutt, New Zealand. Institute of Geological & Nuclear Sciences Limited.

The shoreline within cells 32B to 32D are slightly more exposed, with evidence of bank undercutting in places and the presence of protection structures suggests there is active erosion. Based on regression analysis along the low bank within cells 32B and 32C the average long term erosion rate is estimated to be -0.1 m/yr.

The fetch exposure is minimal along the eastern side of Athenree, however the tidal channel is close to the shoreline and likely to contribute to erosion. Due to the presence of protection structures and overhanging trees, it is difficult to determine the long term erosion rates. However the presence of protection structures indicates there have been erosion issues in the past. Long term erosion rates within cells 32E and 32G and 32H are estimated to range from -0.02 to -0.1 m/yr.

The shoreline within Cell 32F is setback from the tidal channel. Historic aerials show that the shoreline within Cell 32F has accreted since 1982 with grass now growing in front of the seawall.

The extensive area of mangroves Cell 32I indicates that the upper reaches of the estuarine shoreline is a very sheltered environment.

32.4 Local considerations



Figure 32-3 Examples of protection structures along the Athenree shoreline. (A) Timber seawall (Cell 32E), (B) section of riprap (Cell 32E), (C) timber seawall (Cell 32E)

32.5 Adopted component values

Adopted component values are presented within Table 32-1. 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 32-1 Component values for cells along Athenree shoreline.

Site		32. Athenree								
Cell		32A	32B	32C	32D	32E	32F	32G	32H	32I
Cell centre (NZTM)	E	1862037	1862421	1862529	1862600	1862640	1862500	1862470	1862151	1861632
	N	5851316	5851146	5851076	5851016	5851152	5851293	5851581	5852058	5852883
Morphology		Low-lying estuarine	Consolidated	Consolidated	Consolidated	Consolidated	Consolidated	Consolidated	Consolidated	Low-lying estuarine
Geology		Stable dune deposit	Stable dune deposit	Stable dune deposit	Stable dune deposit	Stable dune deposit	Stable dune deposit	Stable dune deposit	Stable dune deposit	Holocene river deposits
Exposure (average fetch/direction)		4.5 km (S)	4.5 km (S)	4.5 km (S)	6 km (S)	0.2 km (east)	0.2 km (east)	0.2 km (east)	0.2 km (east)	0.2 km (east)
State		Natural	Protected	Natural	Protected	Protected	Partially protected	Protected	Natural	Natural
Short-term (m)	Min	<i>No CEIHA (Refer to future MHWS layer in Stephens, 2019)</i>	0	0	0	0	0	0	0	<i>No CEIHA (Refer to future MHWS layer in Stephens, 2019)</i>
	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		1	1	2	2	1	2	5	
	Mode		1.2	1.2	2.5	2.3	1.2	2.5	8	
	Max		1.5	1.5	3	2.5	1.5	4	11	
Stable angle (deg)	Min		24	30	24	24	24	24	24	
	Mode		26	32	26	26	26	26	26	
	Max		45	34	45	45	45	45	45	
Long-term (m)	Min		-0.15	-0.15	-0.15	-0.1	-0.1	-0.1	-0.1	
	Mode	-0.1	-0.1	-0.1	-0.05	-0.05	-0.05	-0.05		
	Max	-0.05	-0.05	-0.05	-0.02	-0.02	-0.02	-0.02		
Closure slope (beaches)/SLR response factor (cliffs)	Min	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
	Mode	0.2	0.2	0.2	0.2	0.2	0.2	0.2		
	Max	0.3	0.3	0.3	0.3	0.3	0.3	0.3		

32.6 Coastal erosion hazard assessment

Coastal erosion hazard distances for Athenree are presented within Table 32-2 and an overview map in Figure 32-4. 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 -3 m around the low consolidated shoreline to -12 m along the high cliffs within Cell 32H. The future P_{5%} erosion hazard for 1.6 m SLR in 2130 ranges from -17 m along the sheltered, low bank of Cell 32F to -30 m along the cliffs in Cell 32H.

Due to the presence of salt marsh and mangroves within Cell 32I, there is no current erosion hazard for the shoreline. Inundation as a consequence of SLR is likely to be a greater hazard for the low-lying estuarine shoreline in the future.

Table 32-2 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
Athenree	32A	Current	0.03	<i>No CEIHA (Refer to future MHWS layer in Stephens, 2019)</i>					
		50yr (2080)	0.12						
			0.2						
			0.4						
			0.6						
		100yr (2130)	0.22						
			0.6						
			0.8						
			1.25						
			1.6						
	32B	Current	0.03	-2	-3	-3	-4	-5	-5
		50yr (2080)	0.12	-5	-8	-8	-11	-11	-12
			0.2	-5	-8	-9	-12	-12	-14
			0.4	-5	-9	-10	-13	-14	-16
			0.6	-6	-10	-11	-14	-15	-17
		100yr (2130)	0.22	-7	-12	-14	-17	-19	-20
			0.6	-8	-15	-16	-21	-22	-25
			0.8	-9	-16	-17	-22	-24	-27
			1.25	-9	-17	-18	-24	-26	-29
			1.6	-10	-17	-19	-26	-28	-31
	32C	Current	0.03	-2	-3	-3	-4	-4	-5
		50yr (2080)	0.12	-5	-8	-8	-11	-11	-12
			0.2	-5	-9	-9	-12	-12	-13
			0.4	-6	-9	-10	-13	-14	-15
			0.6	-6	-10	-11	-14	-15	-17
			0.22	-8	-12	-14	-17	-18	-19

Site	Cell	Timeframe	SLR (m)	Probability of Exceedance							
				Min	P _{66%}	P _{50%}	P _{5%}	P _{1%}	Max		
		100yr (2130)	0.6	-8	-15	-16	-21	-23	-24		
			0.8	-9	-16	-17	-22	-24	-26		
			1.25	-9	-17	-18	-24	-27	-29		
			1.6	-9	-17	-19	-26	-28	-31		
	32D	Current		0.03	-3	-5	-5	-7	-7	-8	
		50yr (2080)	0.12	-6	-10	-10	-13	-14	-16		
			0.2	-7	-10	-11	-14	-15	-17		
			0.4	-7	-11	-12	-15	-17	-19		
			0.6	-7	-12	-13	-16	-18	-20		
		100yr (2130)	0.22	-9	-14	-16	-20	-21	-23		
			0.6	-10	-17	-18	-23	-25	-27		
			0.8	-10	-17	-19	-24	-26	-29		
			1.25	-11	-19	-20	-27	-29	-32		
			1.6	-11	-19	-21	-28	-30	-34		
		32E	Current		0.03	-3	-4	-5	-6	-6	-7
			50yr (2080)	0.12	-4	-7	-7	-10	-10	-11	
				0.2	-4	-7	-8	-10	-11	-12	
	0.4			-4	-8	-8	-11	-12	-13		
	0.6			-4	-8	-9	-12	-13	-14		
	100yr (2130)		0.22	-5	-9	-10	-14	-15	-16		
			0.6	-5	-10	-12	-16	-17	-19		
			0.8	-6	-11	-12	-17	-18	-20		
			1.25	-6	-12	-13	-18	-20	-22		
			1.6	-6	-12	-13	-19	-21	-24		
	32F		Current		0.03	-2	-3	-3	-4	-4	-4
			50yr (2080)	0.12	-3	-5	-6	-8	-8	-9	
				0.2	-3	-5	-6	-8	-9	-10	
		0.4		-3	-6	-7	-9	-10	-11		
		0.6		-3	-6	-7	-10	-11	-12		
		100yr (2130)	0.22	-4	-8	-8	-12	-13	-14		
			0.6	-4	-9	-10	-14	-15	-17		
			0.8	-4	-9	-10	-15	-16	-18		
			1.25	-5	-10	-11	-16	-18	-20		
			1.6	-5	-10	-11	-17	-19	-22		
		32G	Current		0.03	-3	-5	-5	-7	-8	-9
50yr (2080)			0.12	-4	-8	-8	-11	-12	-14		
			0.2	-4	-8	-9	-11	-13	-15		
	0.4		-4	-8	-9	-12	-14	-16			
	0.6		-4	-9	-10	-13	-14	-17			

Site	Cell	Timeframe	SLR (m)	Probability of Exceedance						
				Min	P _{66%}	P _{50%}	P _{5%}	P _{1%}	Max	
		100yr (2130)	0.22	-5	-10	-11	-15	-16	-19	
			0.6	-6	-11	-12	-17	-19	-22	
			0.8	-6	-12	-13	-18	-20	-23	
			1.25	-6	-12	-14	-19	-21	-25	
			1.6	-6	-13	-14	-20	-22	-26	
	32H	Current	0.03	-6	-12	-13	-19	-21	-26	
		50yr (2080)	0.12	-8	-15	-16	-22	-25	-30	
			0.2	-8	-15	-17	-23	-25	-31	
			0.4	-8	-16	-17	-24	-26	-32	
			0.6	-8	-16	-18	-24	-26	-33	
		100yr (2130)	0.22	-9	-18	-19	-26	-28	-35	
			0.6	-9	-19	-21	-28	-30	-38	
			0.8	-9	-19	-21	-28	-31	-39	
			1.25	-10	-20	-22	-29	-32	-41	
			1.6	-10	-21	-22	-30	-33	-42	
		32I	Current	0.03	<i>No CEIHA (Refer to future MHWS layer in Stephens, 2019)</i>					
			50yr (2080)	0.12						
				0.2						
				0.4						
				0.6						
100yr (2130)	0.22									
	0.6									
	0.8									
	1.25									
	1.6									

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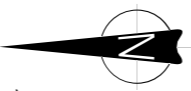
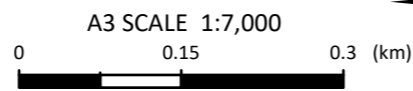


LEGEND

- Cell Extent
- Baseline (2014-2017)
- No current erosion (refer to future MHWS)
- Critical structures
- 2030 (current) - P66%
- 2030 (current) - P5%
- 2080 - 0.4m SLR - P66%
- 2080 - 0.6m SLR - P66%
- 2080 - 0.6m SLR - P5%
- 2130 - 0.8m SLR - P66%
- 2130 - 1.25m SLR - P66%
- 2130 - 1.25m SLR - P5%
- 2130 - 1.6m SLR - P5%
- Future MHWS7 - 1.6m SLR

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



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DRAWN	RHAU	Dec.18
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ARCFILE CEHA Overview2.mxd		
SCALE (AT A3 SIZE) 1:7,000		
PROJECT No. 1001628.1000		

Tauranga Harbour Coastal Erosion Assessment
 Erosion Hazard Overview
 Site 32: Athenree

FIGURE No. Figure 32-4

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