35 Moureeses Bay

35.1 Description and geomorphology

Moureeses Bay is an east facing beach bounded by headlands and reefs located 4 km north of Whananaki. Figure 35.1 shows the site and its division into four coastal cells for the purpose of assessing coastal erosion hazards. Site photos are presented in Figure 35.2 to show the geomorphic features of these cells.

The site is 800 m long and includes two headlands and two consolidated terraces fronted by beaches. The terrace fronted beaches typically have a stable high tide backshore but there is little accommodation space for dune formation. Each beach is flanked by greywacke cliffs and are bounded by headlands. Three streams discharge into Moureeses Bay, at the north, centre and south of the site. These streams have carved a valley in the underlying Waipapa greywacke cliff formation that provide a small low-lying area where coastal and colluvium sediments accumulated.

A section of sandy beach is present for the length of the site and is characterised by a typically dry backshore, seaward sloping intertidal zone and a foreshore with rock outcrops and reefs. The beach is comprised of well sorted medium sand that is consistent alongshore and across-shore.

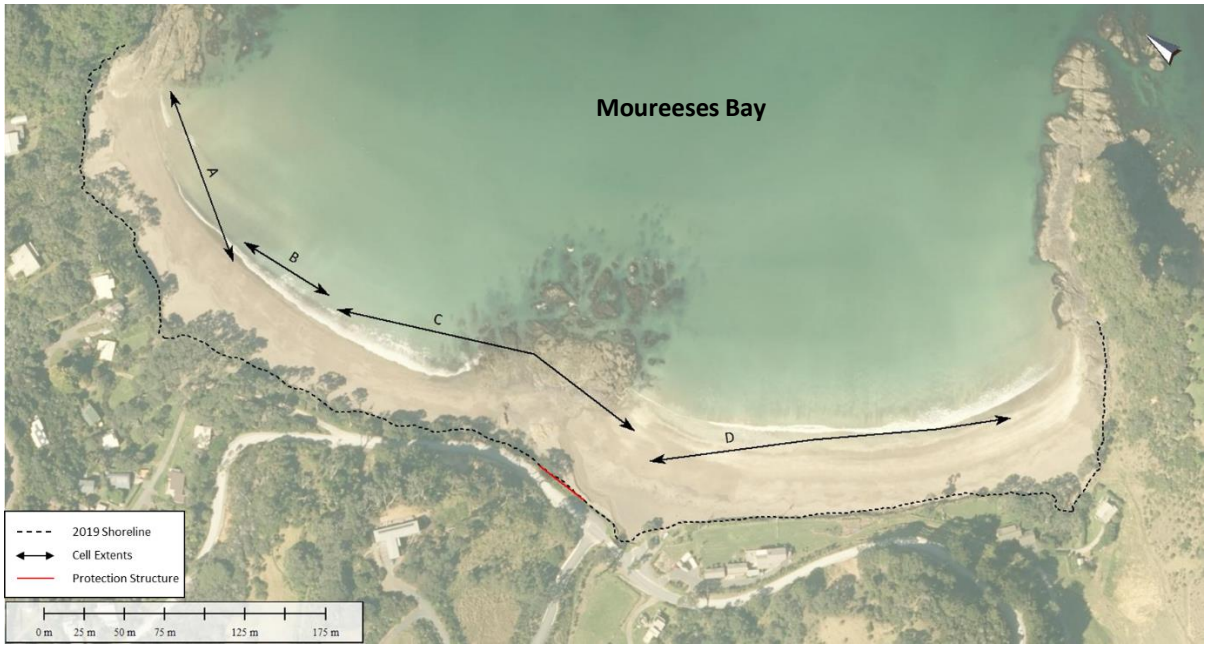


Figure 35.1: Map showing 2019 shoreline position and cell extents with background aerial imagery from 2014.

Figure 35.2: Photos from Moureeses Bay site visit on 21/01/2020.

35.2 Local considerations

A gravel road extends from the south end of the site to the reserve at the north end of the beach. The road runs close to the coastal edge and cliff crest at the transition from the southern beach to the central headland. A retaining wall has been built to stabilise the stream channel entrance onto the beach. Streams at the north, south and centre of the site meander over the beach face in response to rainfall events. A couple of houses are located seaward of the road at southern beach on coastal terrace and the main section of housing on the hillslope above the northern beach.

35.3 Component values

The site is split into four cells based on discrete spatial differences in geomorphology, resulting in two cliff sites and two consolidated coastal terrace cells. Of the cliff sites, Cell A is located at the north end and is characterised by a modern dynamic beach face that is backed by a vegetated cliff of Waipapa greywacke geology with an average height of 23 m (Figure 7.1A). The other cliff cell (Cell C) is located at the central headland and has the same geology, but a graded road has levelled the cliff to a mean height of height of 8 m. Both cliff cells have the same stable angle and cliff sea level rise response factor as assessed by an engineering geologist.

Sand dunes are not present at Moureeses and the non-cliff sections of coast are backed by a grassed coastal terrace with an average height of 2.5–3 m. The shorelines at these cells (B and D) are considered to be consolidated and the cliff projection method was applied for assessing coastal erosion hazards. The seaward face of the grassed coastal terrace defines the shoreline at these cells and the underlying material is mostly consolidated and is likely similar to that of the neighbouring cliffs. Therefore, the stable angles from Cell A and C were adopted for Cells B and D.

Historic shoreline change at Moureeses Bay is spatially variable, with the highest rate of erosion at the northern cliff section (Cell A) where the mean long-term rate is -0.15 m/yr. The headland cliff at the centre of the site (Cell C) was more stable with a mean long-term rate of -0.02 m/yr, which is potentially influenced by construction and maintenance of the road. The southern and northern coastal terrace sites were historically stable, with a mean long-term rate of -0.03 and -0.02 m/yr respectively. Adopted long-term rates did not consider positive values because erosion on consolidated shorelines is not balanced by accretion. Positive rates may result from landslides and slips.

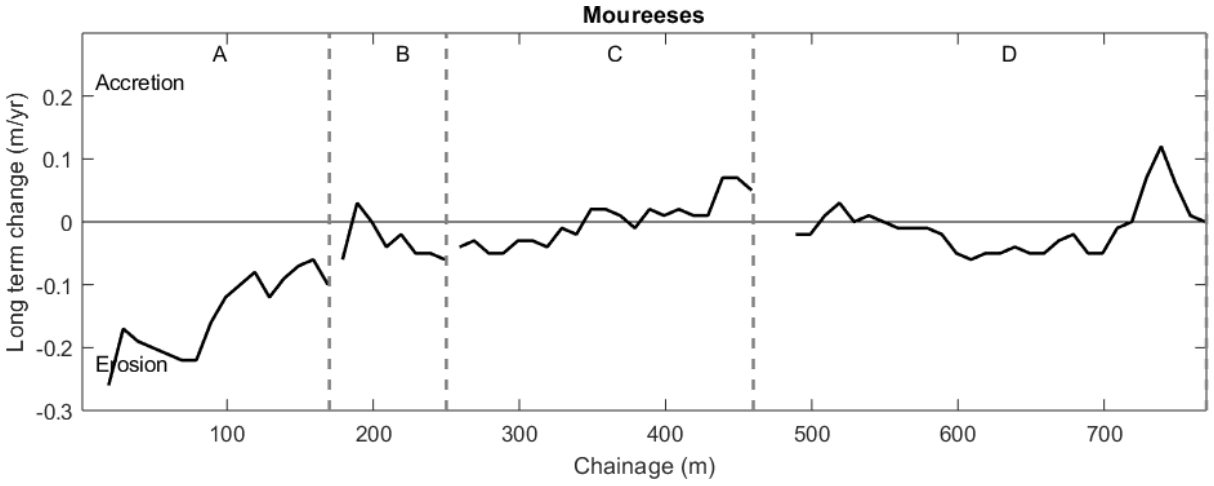


Figure 35.3: Rate of long-term shoreline change along the site showing each cell.

Table 35.1: Component values for Erosion Hazard Assessment

Site		7. Moureeses Bay			
Cell		**7A**	**7B**	**7C**	**7D**
Cell centre (NZTM)	E	1731646	1731631	1731664	1731742
	N	6072711	6072638	6072510	6072298
Chainage, m (from N)		0-160	160-250	250-480	480-760
Morphology		Waipapa greywacke cliff	Waipapa greywacke terrace	Waipapa greywacke cliff	Waipapa greywacke terrace
Short-term (m)	Min	-	-	-	-
	Mode	-	-	-	-
	Max	-	-	-	-
Dune/Cliff elevation (m above toe or scarp)	Min	17	0.5	7	0.5
	Mode	23	3.0	8	2.5
	Max	30	7.5	9	3.8
Stable angle (deg)	Min	26.6	26.6	26.6	26.6
	Mode	30.15	30.15	30.15	30.15
	Max	33.7	33.7	33.7	33.7
Long-term (m) -ve erosion +ve accretion	Min	-0.20	-0.06	-0.05	-0.06
	Mode	-0.15	-0.03	-0.02	-0.02
	Max	-0.10	0.00	0.00	0.02
Closure slope (beaches) / Cliff response factor	Min	0.2	0.2	0.2	0.2
	Mode	0.3	0.3	0.3	0.3
	Max	0.4	0.4	0.4	0.4

Table 35.2: Adopted sea level rise values (m) based on four scenarios included in MfE (2017) adjusted to 2019 baseline

Coastal type	Year	RCP2.6M	RCP4.5M	RCP8.5M	RCP8.5+
Consolidated cliff	2080	0.29	0.34	0.46	0.64
	2130	0.52	0.66	1.09	1.41

35.4 Coastal erosion hazard assessment

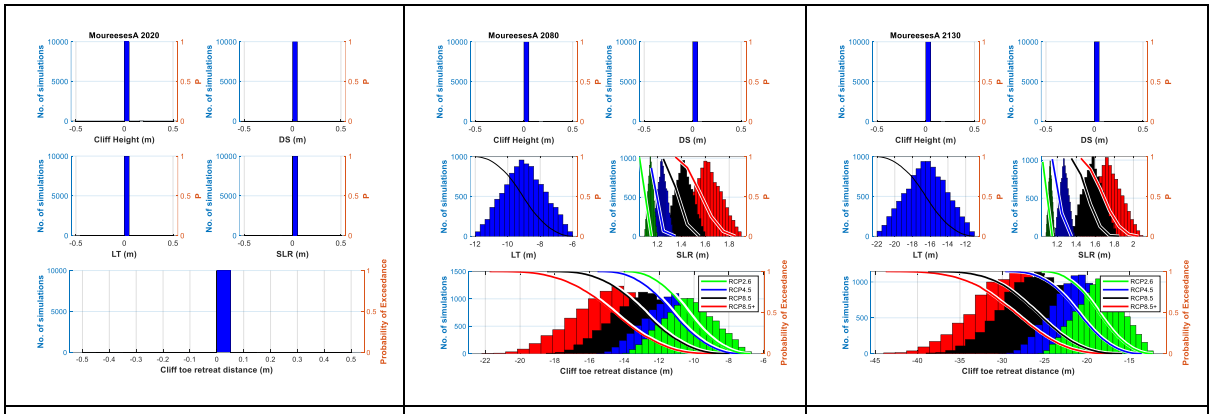
Histograms of individual components and resultant CEHZ distances computed using a Monte Carlo technique are shown in Figure 35.4 to Figure 35.7. Future shoreline (cliff toe) distances are presented within Table 35.3 to Table 35.5 and mapped in Figure 35.8.

All cells at Moureeses Bay were assessed using the cliff method, and the cliff projection method was adopted to map the CEHZs. Results from the probabilistic assessment are therefore based on future cliff toe erosion distances, instead of the total CEHZ distances. Future toe distances to 2080 range

from 1 to 12 m for RCP8.5. For 2130, the cliff toe is recession distances range from7 to 33 m using RCP8.5 and ranging from 8 to 36 m using RCP8.5+.

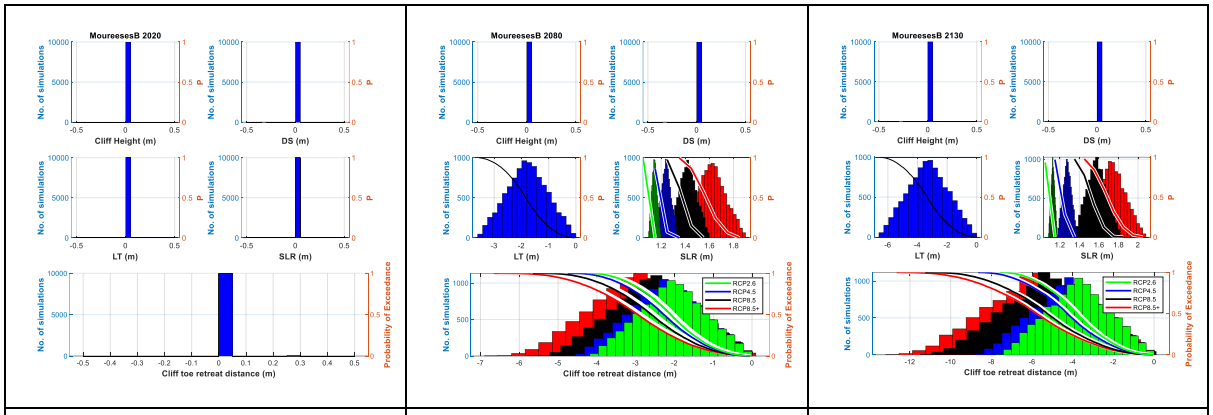
The total coastal erosions hazard zones for Moureeses were identified using the cliff projection method, where LiDAR derived profiles were used to project the stable angle and future toe at transect locations spaced in 10 m intervals for the length of each cliff cell. A summary of the resulting total coastal erosion hazard zone is presented in Table 35.6.

Figure 35.9 shows the available historic shorelines for Moureeses Bay.



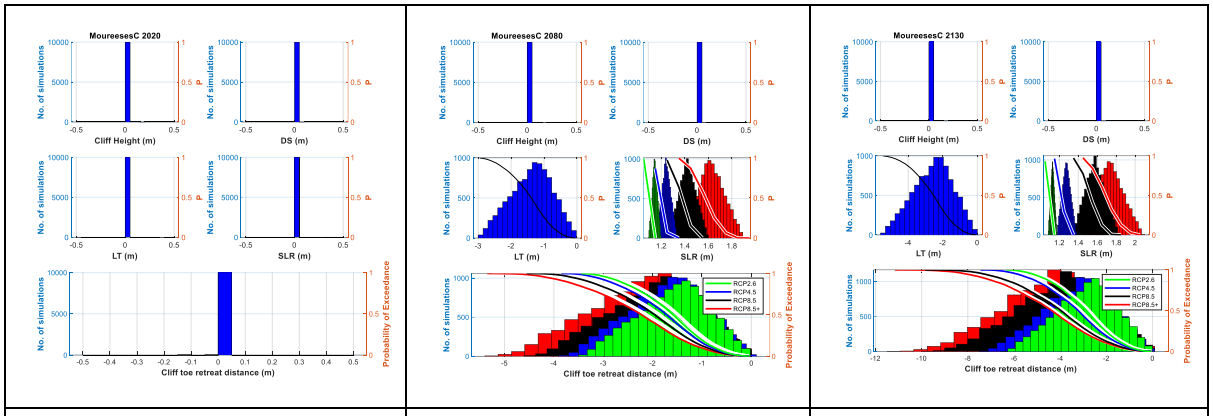
2020	2080	2130

Figure 35.4: Histograms of parameter samples and the resultant shoreline distances for 2020, 2080 and 2130 timeframes for cell 35A



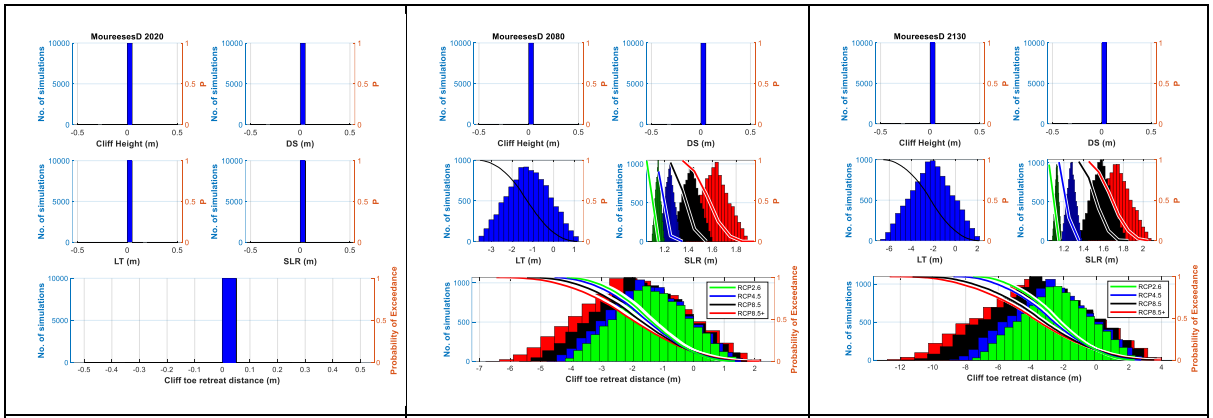
2020	2080	2130

Figure 35.5: Histograms of parameter samples and the resultant shoreline distances for 2020, 2080 and 2130 timeframes for cell 35B



2020	2080	2130

Figure 35.6: Histograms of parameter samples and the resultant shoreline distances for 2020, 2080 and 2130 timeframes for cell 35C



2020	2080	2130

Figure 35.7: Histograms of parameter samples and the resultant shoreline distances for 2020, 2080 and 2130 timeframes for cell 35D

Table 35.3: Coastal Erosion Hazard Zone Widths (m) Projected for 2020

Site		35. Moureeses			
	Cell	35A*	35B*	35C*	35D*
Probability of CEHZ (m) Exceedance	Min	0	0	0	0
	99%	0	0	0	0
	95%	0	0	0	0
	90%	0	0	0	0
	80%	0	0	0	0
	70%	0	0	0	0
	66%	0	0	0	0
	60%	0	0	0	0
	50%	0	0	0	0
	40%	0	0	0	0
	33%	0	0	0	0
	30%	0	0	0	0
	20%	0	0	0	0
	10%	0	0	0	0
	5%	0	0	0	0
	1%	0	0	0	0
	Max	0	0	0	0

*Cliff projection method has been used, so cliff toe position has been tabulated, which has been assumed to be unchanged from the adopted 2019 baseline. Actual CEHZ width will be greater depending on cliff height and stable slope angle.

Table 35.4: Coastal Erosion Hazard Zone Widths (m) Projected for 2080

Site		35. Moureeses															
Cell		35A				35B				35C				35D			
RCP scenario		2.6	4.6	8.5	8.5+	2.6	4.6	8.5	8.5+	2.6	4.6	8.5	8.5+	2.6	4.6	8.5	8.5+
Probability of CEHZ (m) Exceedance	Min	-7	-7	-8	-9	0	0	0	0	0	0	0	0	1	2	2	2
	99%	-7	-8	-9	-10	0	0	0	0	0	0	0	0	1	1	1	1
	95%	-8	-9	-10	-11	-1	-1	-1	-1	0	-1	-1	-1	1	1	1	1
	90%	-8	-9	-10	-12	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	0
	80%	-9	-10	-11	-13	-1	-1	-2	-2	-1	-1	-1	-1	0	0	0	-1
	70%	-10	-10	-12	-13	-2	-2	-2	-2	-1	-1	-1	-2	-1	-1	-1	-1
	66%	-10	-11	-12	-14	-2	-2	-2	-2	-1	-1	-2	-2	-1	-1	-1	-1
	60%	-10	-11	-12	-14	-2	-2	-2	-3	-1	-1	-2	-2	-1	-1	-1	-2
	50%	-10	-11	-13	-15	-2	-2	-3	-3	-2	-2	-2	-2	-1	-2	-2	-2
	40%	-11	-12	-13	-15	-2	-2	-3	-3	-2	-2	-2	-2	-2	-2	-2	-2
	33%	-11	-12	-14	-16	-2	-3	-3	-3	-2	-2	-2	-3	-2	-2	-2	-3
	30%	-11	-12	-14	-16	-3	-3	-3	-4	-2	-2	-2	-3	-2	-2	-2	-3
	20%	-12	-13	-14	-17	-3	-3	-3	-4	-2	-2	-3	-3	-2	-3	-3	-3
	10%	-12	-13	-15	-18	-3	-3	-4	-5	-3	-3	-3	-4	-3	-3	-4	-4
	5%	-13	-14	-16	-18	-3	-4	-4	-5	-3	-3	-4	-4	-3	-4	-4	-5
	1%	-13	-15	-17	-20	-4	-4	-5	-6	-3	-3	-4	-5	-4	-4	-5	-5
	Max	-14	-16	-19	-22	-4	-5	-6	-7	-3	-4	-5	-6	-4	-5	-6	-7
	CEHZ1	-12*				-2*				-2*				-1*			

*Cliff projection methodology used, so distance to future cliff toe position has been tabulated. Actual CEHZ width will be greater depending on cliff height and stable slope angle.

Table 35.5: Coastal Erosion Hazard Zone Widths (m) Projected for 2130

Site		35. Moureeses															
Cell		35A				35B				35C				35D			
RCP scenario		2.6	4.6	8.5	8.5+	2.6	4.6	8.5	8.5+	2.6	4.6	8.5	8.5+	2.6	4.6	8.5	8.5+
Probability of CEHZ (m) Exceedance	Min	-12	-13	-16	-17	0	0	0	0	0	0	0	0	2	3	4	4
	99%	-13	-15	-18	-19	0	-1	-1	-1	0	0	-1	-1	2	2	2	3
	95%	-14	-16	-20	-21	-1	-1	-2	-2	-1	-1	-1	-1	1	1	1	1
	90%	-15	-17	-21	-23	-2	-2	-2	-3	-1	-1	-2	-2	0	0	0	0
	80%	-16	-18	-23	-25	-2	-3	-3	-4	-2	-2	-2	-3	-1	-1	-1	-1
	70%	-17	-19	-24	-26	-3	-3	-4	-4	-2	-2	-3	-3	-1	-2	-2	-2
	66%	-17	-20	-24	-27	-3	-3	-4	-5	-2	-3	-3	-4	-2	-2	-2	-2
	60%	-18	-20	-25	-27	-3	-4	-5	-5	-2	-3	-3	-4	-2	-2	-3	-3
	50%	-19	-21	-26	-28	-4	-4	-5	-6	-3	-3	-4	-4	-3	-3	-4	-4
	40%	-19	-22	-27	-30	-4	-5	-6	-6	-3	-4	-4	-5	-3	-3	-4	-5
	33%	-20	-22	-28	-31	-4	-5	-6	-7	-3	-4	-5	-5	-3	-4	-5	-5
	30%	-20	-23	-28	-31	-5	-5	-6	-7	-4	-4	-5	-6	-4	-4	-5	-6
	20%	-21	-24	-29	-33	-5	-6	-7	-8	-4	-5	-6	-6	-4	-5	-6	-7
	10%	-22	-25	-31	-35	-6	-7	-8	-9	-5	-5	-7	-7	-5	-6	-7	-8
	5%	-23	-26	-33	-36	-6	-7	-9	-10	-5	-6	-7	-8	-6	-7	-8	-9
	1%	-24	-28	-35	-39	-7	-8	-10	-11	-6	-7	-8	-9	-7	-8	-10	-11
	Max	-25	-30	-39	-45	-8	-9	-11	-13	-6	-7	-10	-11	-7	-9	-11	-13
	CEHZ2	-33*				-9*				-7*				-8*			
	CEHZ3	-36*				-10*				-8*				-9*			

*Cliff projection methodology used, so distance to future cliff toe position has been tabulated. Actual CEHZ width will be greater depending on cliff height and stable slope angle.

Table 35.6: Summary of CEHZ distances for cliff cells mapped using cliff projection method

	CEHZ1			CEHZ2			CEHZ3		
Cell	**Min (m)**	**Average (m)**	**Max (m)**	**Min (m)**	**Average (m)**	**Max (m)**	**Min (m)**	**Average (m)**	**Max (m)**
35A	-14	-26	-77	-35	-61	-102	-38	-66	-106
35B	-3	-11	-51	-12	-42	-79	-13	-43	-80
35C	-4	-4	-6	-10	-11	-13	-11	-12	-14
35D	-2	-19	-55	-11	-32	-81	-12	-33	-82

Notes: Dashed CEHZ indicates greater uncertainty around stream mouths and backshore topography.
Northland 0.4m Rural Aerial Photos (2014-2016).

A4 SCALE 1:3,000

0 0.1 (km)

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PROJECT No.	1012360	

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Coastal Erosion Hazard Assessment
Moureeses
Site: 35

FIGURE No. Figure 35-8

Rev. 1

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Notes: Dashed CEHZ indicates greater uncertainty around stream mouths and backshore topography.
Northland 0.4m Rural Aerial Photos (2014-2016).

A4 SCALE 1:3,000

0 0.1 (km)

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Historic Shorelines
Moureeses
Site: 35

FIGURE No. Figure 35-9

Rev. 1

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