Selwyn Huts Climate Info

9(2)(a)

Sea-level rise

Sea-levels are rising, and will continue to rise into the foreseeable future (i.e., sea levels will keep rising throughout the remainder of the 21st-century, and beyond).

New Zealand is tectonically active, so we need to account for Vertical Land Movement (VLM), which can increase or decrease the rate of sea-level rise.

For coastal areas bordering Lake Ellesmere, VLM rates range from +1.72 mm/year at the western-most part of the coast (site 4514), to -3.05 mm/year farther east. For the 14 relevant coastal locations (spanning site numbers 4501 – 4514, Figure 1), VLM rates are negative at 10 locations, positive at 2 locations near the sea/lake opening), and negligible at 2 sites.

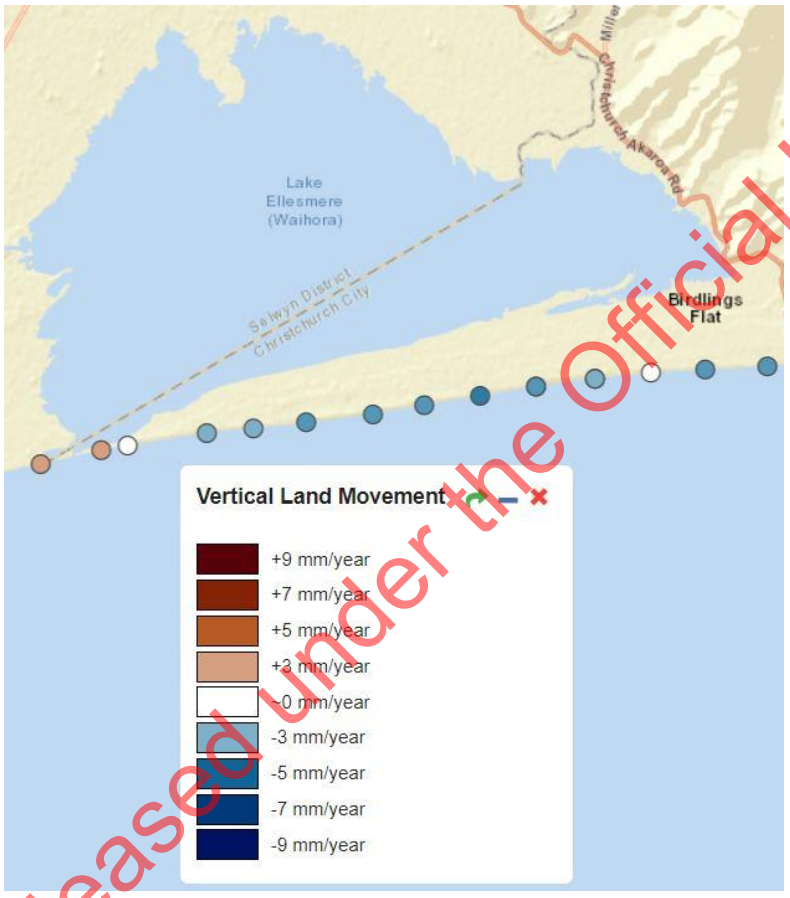

Figure 1. Vertical Land Movement rates for coastal areas bordering Lake Ellesmere.

Sea-level rise projections are presented for site 4514 and site 4506 in Table 1. These sites are chosen because they have the highest positive and negative vertical land movement rates of the 14 coastal sites adjacent to Lake Ellesmere. As a result, they indicate the approximate range of sea-level rise that may be expected for coastal sites by Lake Ellesmere. It is important to note there is uncertainty about the amount of sea-level rise that will occur under each scenario – this uncertainty is indicated by the shading in Figure 2 and Figure 3.

Table 1. Sea-level rise projections by 2040 and 2090 for a mid-range (SSP2-4.5) and high-range (SSP5-8.5) scenario. The sites presented have the highest positive and negative vertical land movement rates of the 14 coastal sites adjacent to Lake Ellesmere.

Site	Scenario	2040 SLR	2090 SLR
4514 (VLM +1.72 mm/yr)	SSP2-4.5	0.10 m	0.35 m
	SSP5-8.5	0.12 m	0.55 m
4506 (VLM -3.05 mm/yr)	SSP2-4.5	0.27 m	0.76 m
	SSP5-8.5	0.28 m	0.96 m

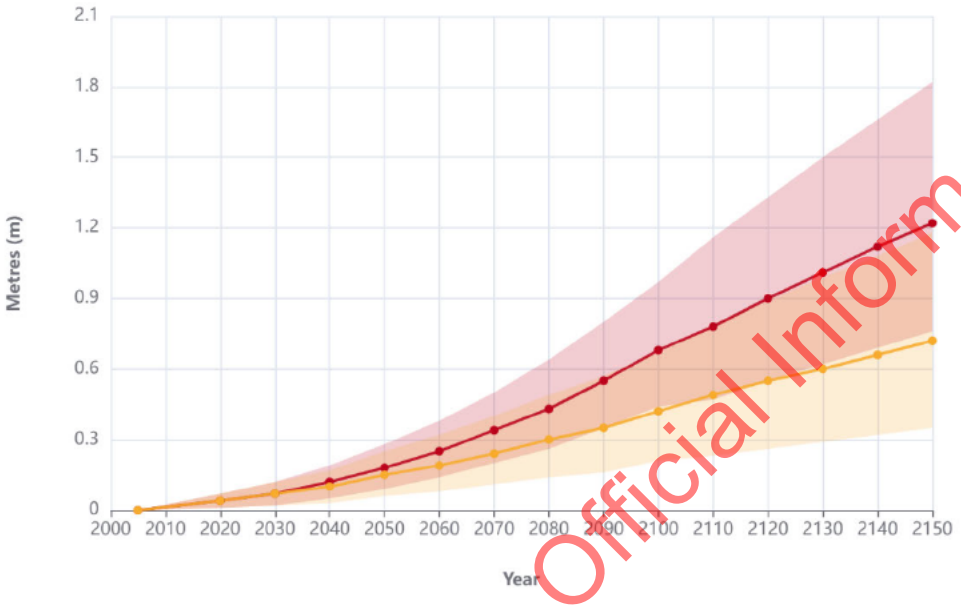

Figure 2. Sea-level rise projections (accounting for VLM) at site 4514. Two scenarios are shown: SSP2-4.5 (orange dots and shading) and SSP5-8.5 (red dots and shading).

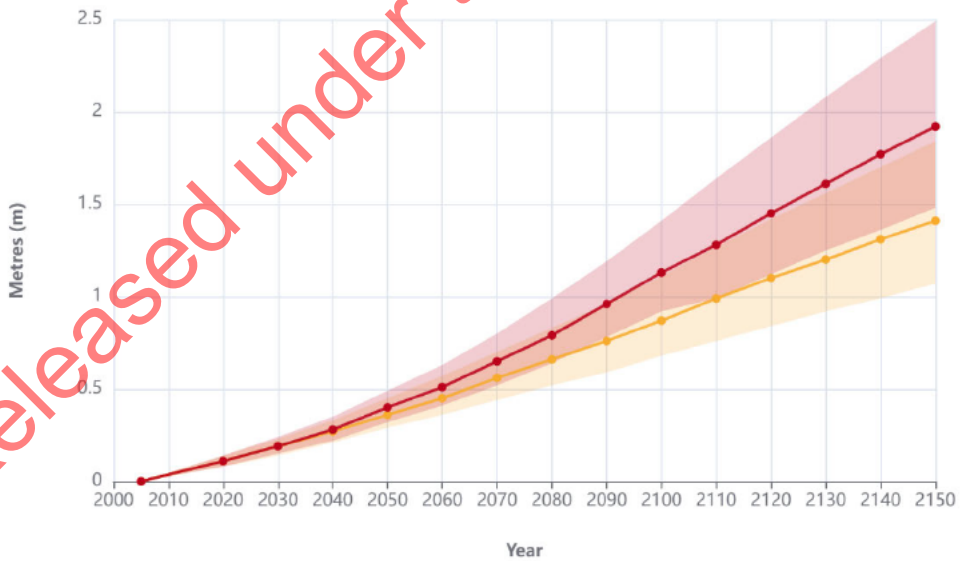

Figure 3. Sea-level rise projections (accounting for VLM) at site 4506. Two scenarios are shown: SSP2-4.5 (orange dots and shading) and SSP5-8.5 (red dots and shading).

Extreme rainfalls

Extreme rainfall events are projected to become more frequent and more intense in future.

Projections of changes to extreme rainfall events were generated for the Lower Selwyn Huts area (WGS84 Coordinates: -43.7383, 172.4429) using NIWA's High Intensity Rainfall Design System (HIRDs v4: https://hirds.niwa.co.nz/). One rainfall event duration was chosen: 24-hour duration (Table 2). Average recurrence intervals (ARI) are statistical measures that refer to the likelihood of a particular event occurring. A rainfall event with an ARI of 10 has a likelihood of occurring once every 10 years. However, it is important to note this doesn't mean i) it *will happen once* every 10 years, nor ii) it will *only* happen once every 10 years.

Table 2. Projected changes to extreme rainfall events at Lower Selwyn Huts.

24-hour duration rain event	Historic rainfall depth (mm)	Projected rainfall depths (mm)			
		2040		2090	
		RCP4.5	RCP8.5	RCP4.5	RCP8.5
5-year ARI	61	64 (+5%)	65 (+7%)	67 (+10%)	73 (+20%)
10-year ARI	73	78 (+7%)	78 (+7%)	80 (+10%)	89 (+22%)

Another way of interpreting the projected changes is as follows:

- For a 24-hour rainfall event:
  - By 2090 under RCP8.5, the existing 1-in-10 year event (73 mm) would become a 1-in-5 year event.

River flows

For rivers flowing into Lake Ellesmere, little change to average annual discharge is projected by mid 21st-century (±5%). By the end of the 21st-century, little change is projected for average annual discharge under RCP4.5 (±5%), with increases of 5-10% under RCP8.5.

These projected changes are illustrated in Figure 4.

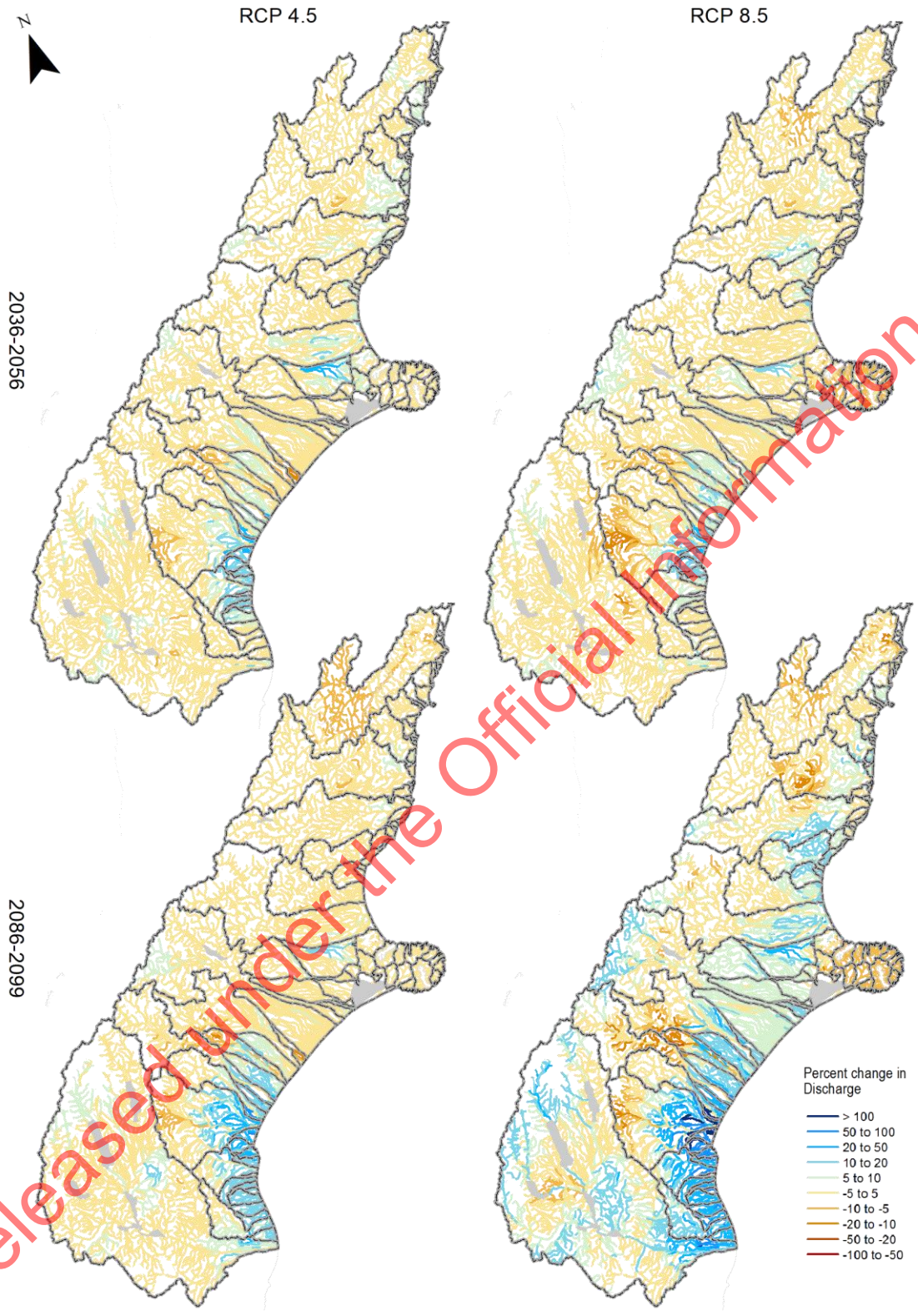

Figure 4. Percent changes in multi-model median of the average discharge across Canterbury for mid (top) and late-century (bottom). Climate change scenarios: RCP4.5 (left panels) and RCP8.5 (right panels). Time periods: mid-century (2036-2056) and end-century (2086-2099).