Comparison of Relative Sea Level Rise projections presented in the Kāpiti Coast Coastal Hazards Susceptibility and Vulnerability Assessment Reports Volume 1 (2021) and Volume 2 (2022) with new information from more recent IPCC publications and MfE guidance.

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1.1 Introduction

This addendum sets out the comparison of relative sea level rise projections presented in the ***Kāpiti Coast Coastal Hazards Susceptibility and Vulnerability Assessment Volume 1: Methodology (IS355300-NC-RPT-0003-1) (Section 3) and Volume 2: Results (IS355300-NC-RPT-0004-2) (Section 2.1)*** to the more recent information that has become available since modelling for the Volume 2 report was undertaken in 2021, and the Volume 2 report subsequently being released in February 2022. This information includes:

- IPCC (2021) Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.
- NZ SeaRise Programme (2022) by Victoria University (In partnership with GNS, NIWA and Antarctic Science Platform).
- Ministry for the Environment (2022a) Interim guidance on the use of new sea-level rise projections. Wellington: Ministry for the Environment.
- Ministry for the Environment (2022b) Aotearoa New Zealand's first national adaptation plan. Wellington: Ministry for the Environment.

The IPCC (2021) report introduces the concept of Shared Socio-economic Pathways (SSP's) to replace Representative Concentration Pathways (RCP's) used in the previous IPCC (2014) SLR projections and adopted by the Ministry for the Environment (2017) *Coastal hazards and climate change: Guidance for local government*. Using the new SSP scenarios, IPCC (2021) provided updated global SLR projections, which had generally increased over a 100-year timeframe since the 2014 report. In addition to this, within New Zealand new information has been developed on local vertical land movement (VLM) around the coastline (NZ SeaRise, 2022), as well as national guidance for using the information in an adaptation planning context (MfE 2022a, 2022b). This new information therefore allows for an update of the RSLR projections for the Kāpiti Coast.

This addendum documents the new RSLR projections that have been developed for the Kāpiti Coast in light of the new information, and identifies that they are slightly different to that presented and used in the Volume 1 and Volume 2 reports. The range of RSLR used in the Volume 1 and 2 reports is still appropriate and the results are still relevant for identification of hazard susceptibility and adaptation planning purposes, however these new RSLR estimates will replace the data used to inform Table 3.2 of Volume 1 and Table 2.1 of Volume 2. This new information should be used in future coastal hazard assessment work (e.g. risk assessments for adaptation areas), and should be further updated as new information in regards to sea level

rise projections and vertical land movement becomes available. It is considered that changes to the existing work or reports are not required.

1.1.1 Addendum Structure

The structure of this addendum is as follows:

- Section 1.1 above presented an introduction and summary of this addendum.
- Section 1.2 provides a summary of the RSLR projections used in the Volume 1 and 2 reports to date for ease of understanding of the new data.
- Section 1.3 discusses the new SLR and VLM data that is available.
- Section1.4 compares the new data to that used in the Volume 1 and 2 reports, and identifies what needs to be changed or updated in future assessments.
- Section1.5 summarises the MfE (2022) *Interim guidance on the use of new sea-level rise projections* and the *National Adaptation Plan* (2022), and recommends how these may apply to future assessments as part of the Takutai Kāpiti adaptation process.
- Section 1.6 presents a summary of the above information.

1.2 Summary of projections of relative sea level rise used in the Jacobs Volume 2 report

The sea level rise projections due to climate change presented in the Jacobs Volume 1 (Table 3.2) and Volume 2 (Table 2.1) reports are based on the national projections provided by Ministry for the Environment (2017). These projections are from IPCC (2014) projections under four global greenhouse gas emissions scenarios (RCP scenarios) with a local New Zealand adjustment. These were then adjusted for an increase of 0.1 m by 2100 as a result of the interim IPCC (2019) report, which accounted for a better understanding of the contribution that the melting of the Antarctic Ice Sheet will have on global SLR.

Vertical land movement (VLM) was then added to the SLR projections to give a Relative Sea Level Rise (RSLR) projection for the Kāpiti Coast. Based on previous reports[1] which used cGPS[2] gauge records to identify VLM over the past 10-20 years for sites in Paekākāriki, Kāpiti, and Levin, an assumed range of -1 to -3 mm/yr VLM was then applied to the SLR projections to give the rates of RSLR along the Kāpiti Coast. VLM of -1 mm/yr was applied to the lower SLR scenario (RCP2.6), and -3 mm/yr was applied to the highest SLR projection (RCP8.5+) to cover the total range of RSLR possibilities.

By combining the SLR projections with the rate of VLM, the following RSLR projections reported in the Jacobs Volume 1 (Table 3.2) and Volume 2 (Table 2.1) reports are:

- For 2050 (e.g. 30 years): 0.2 m and 0.4 m
- For 2070 (e.g. 50 years): 0.3 m and 0.7 m
- For 2120 (e.g. 100 years): 0.6 m; 0.85 m; 1.25 m; and 1.65 m

[1] Beavan and Litchfield (2012); Bell and Hannah (2012); Bell et al (2018)

[2] cGPS: Continuous GPS (Global Positioning System) records provided by USA satellite system.

Figure 1 shows how the RSLR increments used in the Volume 2 assessment (black squares) relate to the RCP scenarios from MfE (2017) with VLM for the Kāpiti Coast.

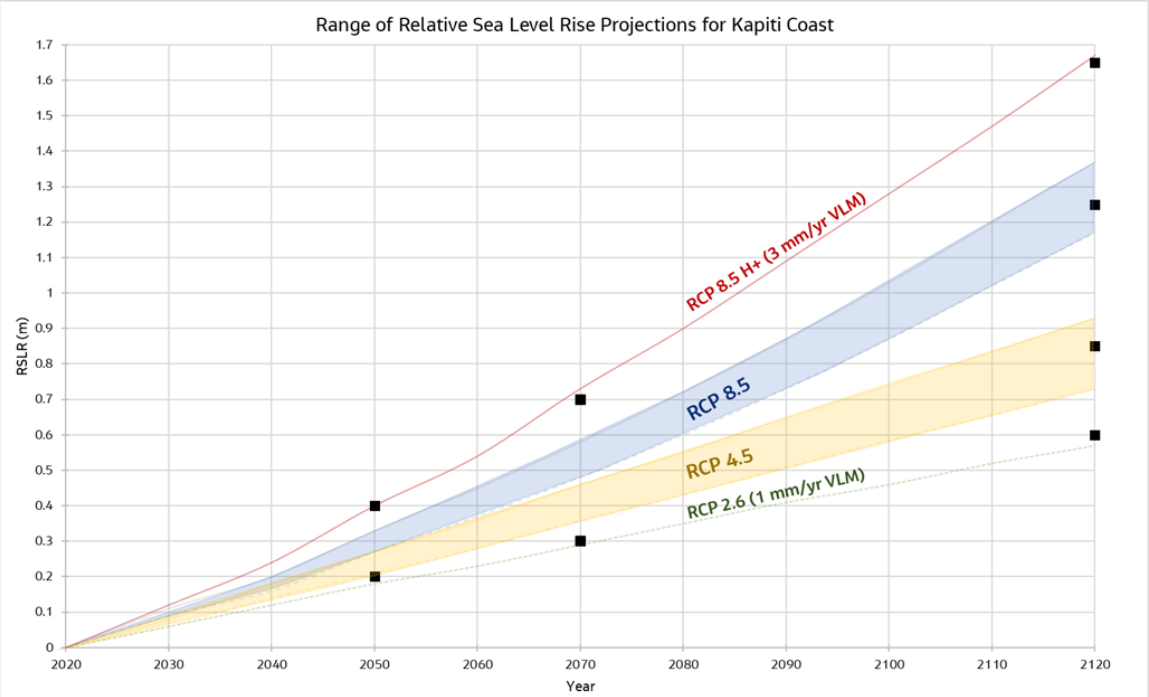

Figure 1: RSLR projections for the Kāpiti Coast from a 2020 baseline used in the Jacobs Volume 1 and 2 reports (black squares) against MfE (2017) projections with VLM component.

1.3 New information for sea level rise projections and vertical land movement

1.3.1 Updated Sea Level Rise Projections

In August 2021 the IPCC sixth assessment (AR6) was released, which moved away from the use of Representative Concentration Pathways (RCP[3]) referred to in the MfE (2017) guidance and the Jacobs Volume 1 and 2 report, to using RCP combined with Shared Socio-economic Pathways (SSP's[4]) to present projections of SLR.

IPCC (2021) presented updated global SLR projections from the previous assessments and interim reports, which supersede the projections presented in IPCC (2014); IPCC (2019) and MfE (2017). The direct comparison of the IPCC projections over the course of the most recent three reports is presented in Table 1.

[3] Representative Concentration Pathway (RCP) refers to the concentration of greenhouse gas under in the atmosphere under different emission scenarios, with the number label denoting the value of radiative forcing (W/m^2) in 2100 under each scenario

[4] Shared Scio-economic Pathways ((SSP) are scenarios of socioeconomic global change up to 2100 used to derive greenhouse gas emission scenarios under different global climate policies. As with the RCP's, the final number label denotes the value of radiative forcing (W/m^2) in 2100 under each scenario.

Table 1: Comparison of Global SLR projections from IPCC reports A5 (2014), SROCC (2019) and A6 ((2021) for the RCP-SSP 8.5 scenario from a 1995-2014 base level. Values are median values with the likely range given in brackets. Source: Table 9.8, IPCC (2021).

	RCP 8.5		SSP5-8.5
Source	**AR5 (IPCC, 2014) (m)**	**SROCC (IPCC, 2019) (m)**	**AR6 (IPCC, 2021) (m)**
Total projected SLR by 2100	0.71 (0.49-0.95)	0.81 (0.58-1.07)	0.77 (0.63-1.02)
Total projected SLR by 2150	(0.34-1.35)	1.27 (0.80-1.79)	1.35 (1.02-1.89)
Global Mean Sea Level rate 2080-2100 (mm/yr)	11.2 (7.5-15.7)	15 (10-20)	12.2 (8.8-17.7)

Following the release of IPCC (2021), the New Zealand Sea Rise "NZSeaRise" programme was released in April 2022. The projections in this online tool combine the IPCC (2021) SLR projections (downscaled to New Zealand), with localised rates of vertical land movement (VLM) at 2 km spacing along the total coastline of New Zealand to give projections of relative sea level rise (RSLR).

Figure 2 presents the difference in the updated nationally averaged SLR projections from the NZSeaRise dataset (excluding VLM) in comparison to the MfE (2017) projections, demonstrating an increase in magnitude of SLR projections since MfE (2017) across comparable climate future scenarios.

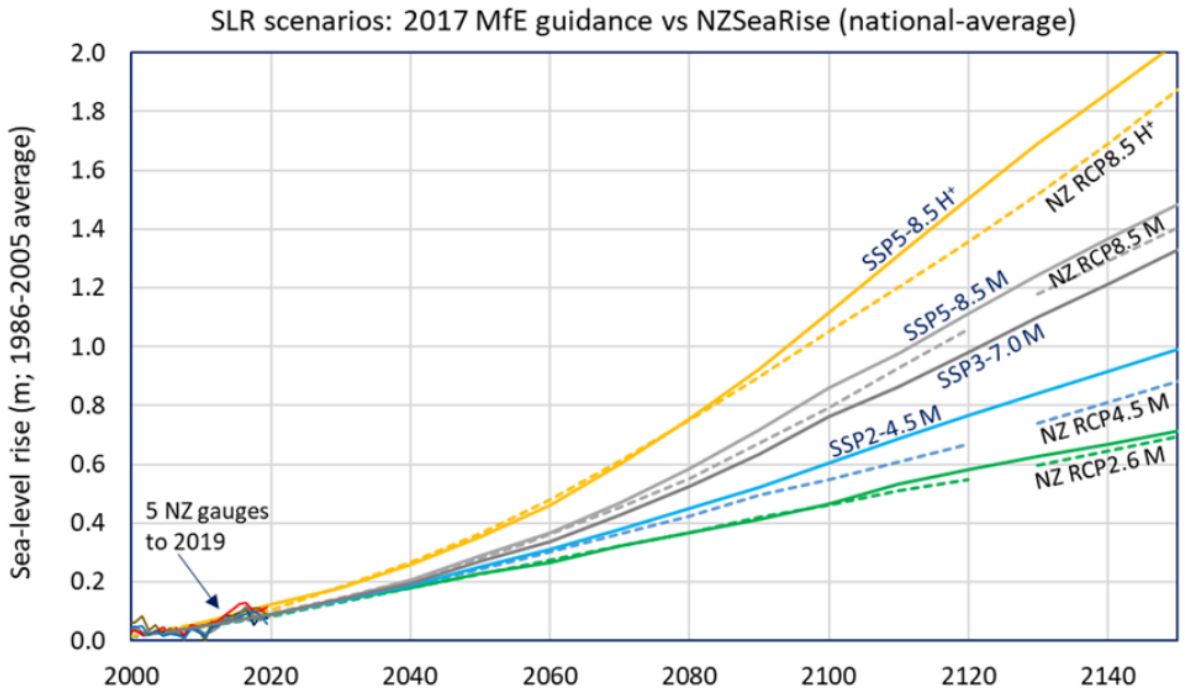

Figure 2: Comparison of the new nationally averaged NZSeaRise Projections (excluding VLM) (solid lines) with the matching equivalent suite of four sea-level rise (SLR)projections in the MfE (2017) guidance. SLR values are from a 1986-2005 zero baseline (Source: MfE, 2021).

1.3.2 New Vertical Land Movement Estimates

The inclusion of local VLM to the new SLR projections give an estimate of relative sea-level rise (RSLR), or sea-level rise relative to the local landmass. The measurements of VLM in the NZ SeaRise tool were determined using Synthetic Aperture Radar Interferometry (InSAR) data, where changes in VLM are measured

by comparing radar images from satellites as the ground moves further away (subsidence) or closer to (uplift) the satellite. The accuracy of the results was then tested against nearby GPS readings.

The VLM presented in the NZSeaRise tool is the median VLM taken from a short record of satellite imagery (2003-2011), with the assumption that land movements which occurred over this timeframe will continue into the future. There are several limitations with the dataset which should be recognised:

- The period over which these observations were taken is short and excludes some major tectonic events which have affected land levels, such as the 2016 Kaikoura Earthquake. With it being such a short timeframe of information, there is some uncertainty in how this should be extrapolated into the future.
- The information accounts for VLM along the coastline, but does not consider how VLM will change inland where coastal hazards such as coastal flooding and groundwater rise will impact coastal communities. There can be large variability in the VLM within the 2 km radius alongshore, and it is unknown how the VLM translates inland.

It is likely that this information will change and be updated as the record of satellite imagery increases, just as SLR projections will be updated when the next IPCC report is released in its next cycle.

Figure 3 shows a screen capture of the NZSeaRise data across the Kāpiti Coast District, with a total of 21 sites within the district boundaries. As shown in the inset of Figure 3, the average of the median VLM across the 21 sites is -1.07 mm/yr. The total range of median VLM is between 0 mm/yr to -1.75 mm/yr; with 50% of sites having medium VLM within -0.8 to -1.4 mm/yr.

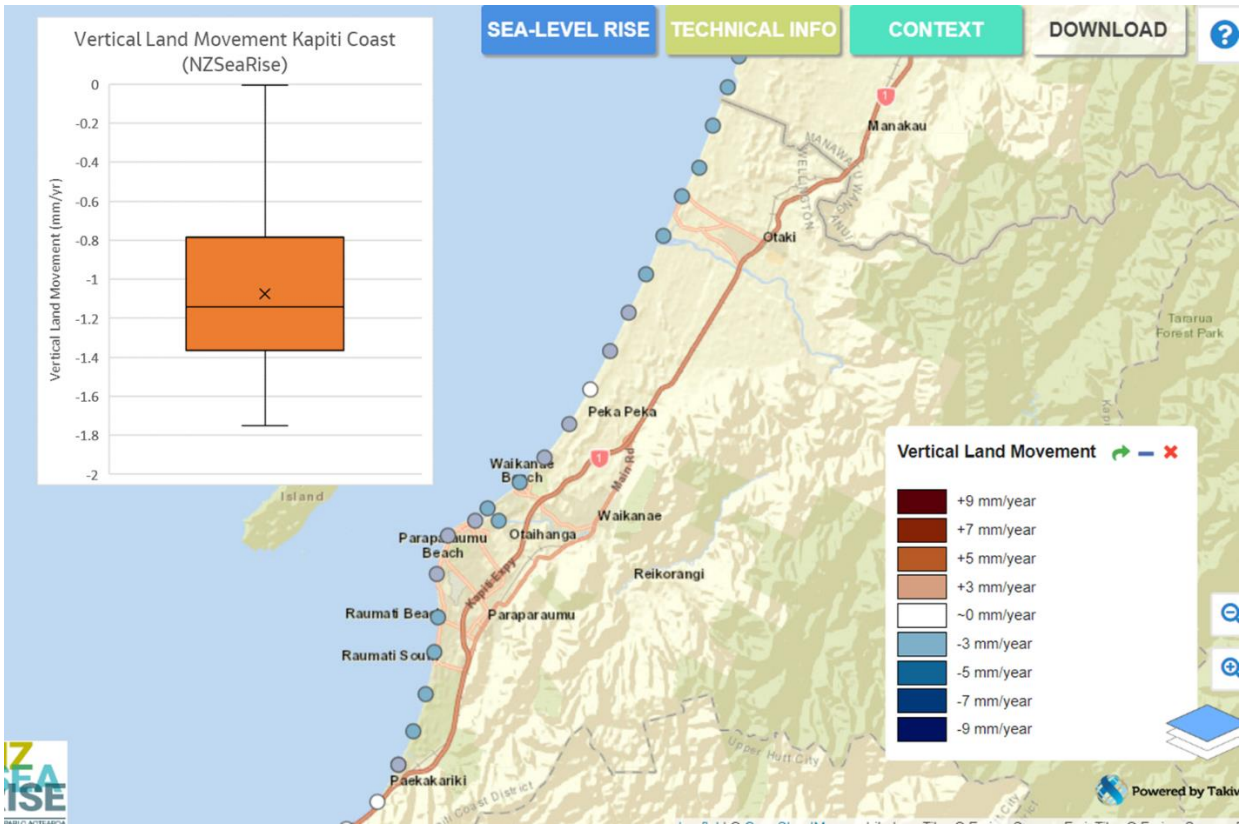

Figure 3: Screenshot of the NZ SeaRise sites on the Kāpiti Coast. Inset shows a box and whisker plot with the maximum and minimum median values being the extents of the whiskers, the central line being the median, and the 'X' being the mean value.

Additional data can be extracted from the NZ SeaRise tool to provide information at each site, including the maximum and minimum observations of VLM over the 2003-2011 record. As shown in Figure 4, minimum VLM observations (i.e. maximum subsidence) can be up to -3.6 mm/yr (site 2580), and maximum

observations (i.e. maximum uplift) can be up to +0.48 mm/yr (sites 2583, 2587-2590), with the maximum values showing low rates of uplift at most sites.

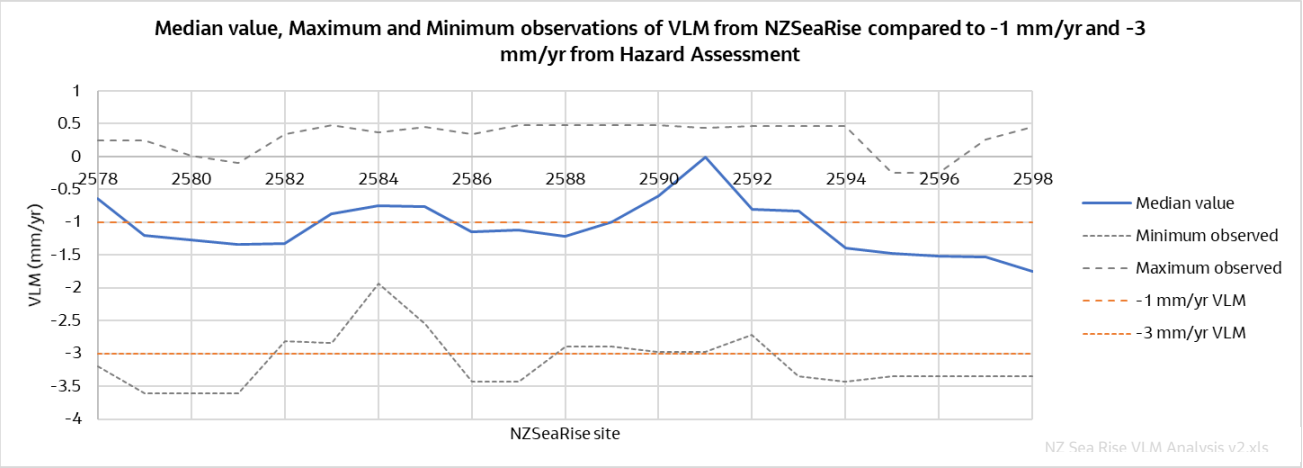

Figure 4: Median VLM compared to minimum and maximum observations at the sites.

The Jacobs Volume 1 and 2 reports used a range of -1 to -3 mm/yr of vertical land movement as a result of the available information at the time. As indicated in Figure 4, the lower VLM rate of -1 mm/yr used in the Jacobs assessment is closely aligned to the average of the median VLM rates measured across the district from the NZ SeaRise tool. The upper rate of VLM used in the Jacobs assessment could be considered to be conservative relative to the median dataset, however observations over the eight year period (2003-2011) have shown maximum subsidence rates can be in the order of -3 mm/yr and therefore it is not an unrealistic estimate of VLM to include in stress testing the impacts of the upper estimates of RSLR.

The MfE (2022a, page 14) states that in regions "*where the RSLR are broadly similar, rates can be averaged*". We consider the range of subsidence to across the Kāpiti Coast District be broadly similar (e.g. all sites are subsiding, within a 0.6 mm/yr range), and therefore it is appropriate to apply an averaged VLM for the district across all sites.

In light of this new information, we recommend that RSLR used in future assessments of coastal hazards on the Kāpiti Coast should use a rounded VLM of -1 mm/yr. However, the results of the Volume 2 report should still be utilised to stress test a high RSLR scenario for the possible -3 mm/yr VLM combined with sea level rise.

1.4 Comparison to RSLR Estimates Used in the Volume 2 Report

Table 2 presents the 10 yearly projections of RSLR from a 2020 base date incorporating a -1mm/yr VLM for three of the IPCC (2021) scenarios (SSP1-2.6, SSP2-4.5, SSP5-8.5), and the most extreme upper New Zealand scenario termed SSP5-8.5(H+), which is the 83rd percentile of the SSP5-8.5 scenario.

Figure 5 below presents these RSLR scenarios against the RSLR increments presented in the Jacobs Volume 1 and 2 reports. This figure demonstrates that the upper RSLR estimates presented in these reports are slightly above the updated RSLR projections due to the following reasons:

- The SLR projections used in the Jacobs Reports comprised of MfE (2017) projections with an adjustment of 0.1 m SLR at 2100 in light of the IPCC (2019) interim report and were rounded to the nearest 0.05m;
    - The new projections use the IPCC (2021) projections for SSP-RCP scenarios, with a localised New Zealand adjustment.
- The VLM used for the upper RSLR projection (RCP8.5H+) in the Jacobs reports was -3 mm/yr;

- The new projections shown in Figure 5 use only the lower -1 mm/yr VLM, which is aligned with the average median VLM (1.07 mm/yr) across the 21 NZ SeaRise sites in the Kāpiti District.

Table 2: SLR Projections from NZSeaRise with -1 mm/yr VLM (from 2020 base).

	Relative Sea Level Rise from 2020 (m)			
Year	**SSP1-2.6 + VLM**	**SSP2-4.5 + VLM**	**SSP5-8.5 + VLM**	**SSP5-8.5 (H+) + VLM**
2020	0	0	0	0
2030	0.05	0.05	0.06	0.07
2040	0.11	0.11	0.13	0.16
2050	**0.16**	**0.19**	**0.22**	**0.27**
2060	0.22	0.26	0.31	0.39
2070	**0.28**	**0.34**	**0.43**	**0.54**
2080	0.34	0.42	0.55	0.71
2090	0.39	0.5	0.7	0.89
2100	0.45	0.59	0.85	1.1
2110	0.53	0.69	0.98	1.31
2120	**0.58**	**0.77**	**1.13**	**1.51**
2130	0.64	0.86	1.27	1.71

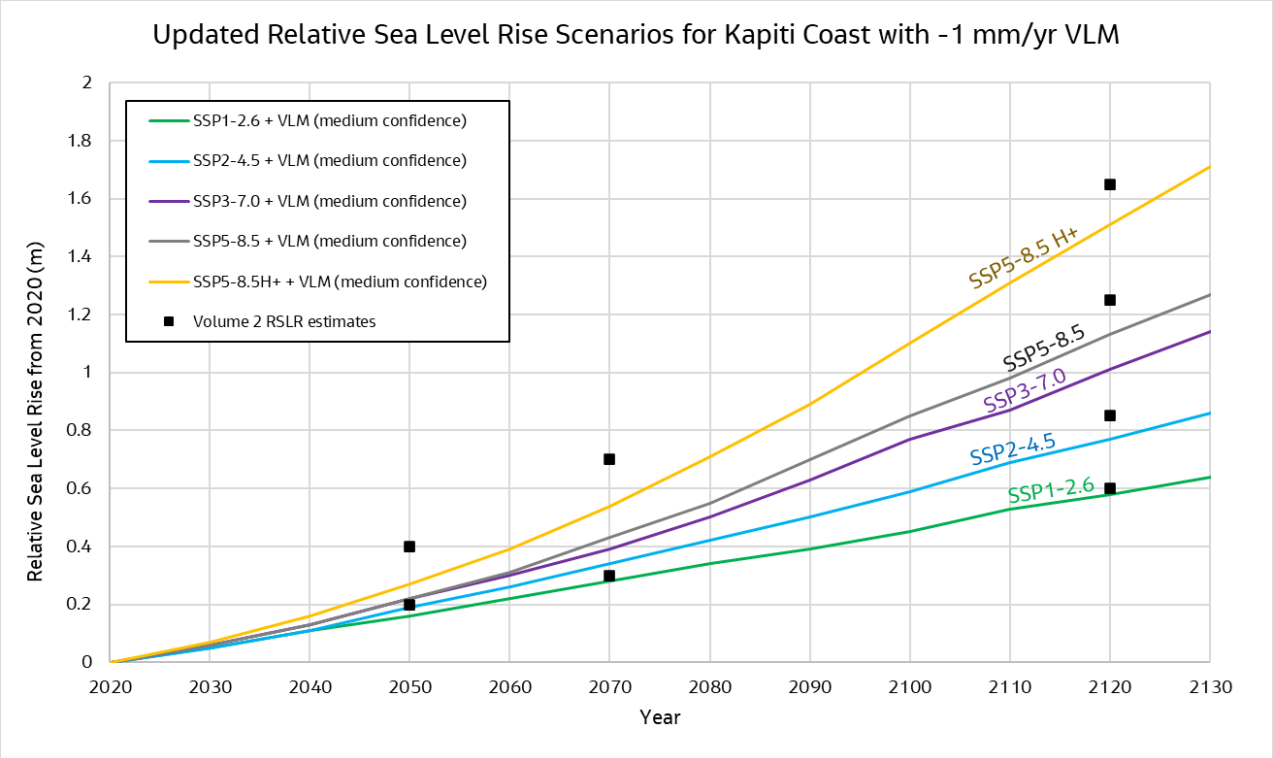

Figure 5: Updated RSLR projections from NZSeaRise tool with -1 mm/yr VLM, shown against RSLR estimates used in the Volume 2 report.

The Jacobs Volume 2 report used a -1 mm/yr VLM for the lower RCP2.6 scenario, hence the lower projections are still well aligned (green line in Figure 5). However, as can be seen in Figure 5, the upper RSLR increments from the Volume 2 report now sit above the SSP5-8.5 H+ projection with -1 mm/yr VLM by an average of 0.15 m across all three timeframes.

The increments of RSLR used in the Jacobs Volume 2 report encompass the full range of the SSP-RCP scenarios which are recommended in recent MfE publications to be considered in both land-use planning and adaptation planning (see following sections). It is recognised that the upper bound RSLR scenario from the Volume 2 report could be considered conservative in light of new information on VLM. However, we do not recommend updating the results of the Volume 2 report as the upper estimates are still considered to be representative of the total range of SSP scenarios that should be used to 'stress test' adaptation options.

1.5 Updates from Ministry for the Environment (2022a, 2022b)

Since the release of the Jacobs Volume 2 report, Ministry for the Environment (MfE) have produced two documents relevant to establishing the RSLR scenarios to be used in the Takutai Kāpiti project. These will be applied when completing further hazard assessment work (planning and adaptation) in the next phase of the project. These key information from these reports are summarised below.

1.5.1 MfE (July, 2022) Interim guidance on the use of new sea-level rise projections

The purpose of this document was to provide an update of the MfE (2017) guidance associated with the new SLR projections produced in the NZ SeaRise programme and supersedes Sections 5.3-5.7 of the 2017 guidance document.

Key recommendations from this document relevant to Takutai Kāpiti include:

- The use of the "medium confidence" SSP scenarios out to 2150, excluding the SSP1-1.9 scenario (e.g. SSP2-2.6, SSP2-4.5, SSP3-7.0, SSP5-8.5).
- The 83rd percentile of the SSP5-8.5 scenario (i.e. equivalent of the previous MfE (2017) RCP8.5H+ scenario) should be used to stress-test plans, policies and adaptation options, and for risk screening to determine coastal areas "potentially affected" [Policy 24, NZCPS].
- In areas where local subsidence is more accurately known or is being monitored, the SSP scenarios from NZSeaRise without VLM should be used, and the additional known VLM should then be added.
- Where VLM rates are broadly similar across a region, RSLR projections could be averaged across sites.
- For ongoing development of DAPP strategies to adapt existing development, this interim guidance should be used to determine which projections to apply. Adaptive pathways that emerge should use the range of future RSLR "medium confidence" projections provided from NZSeaRise to cross-check the realistic lifetime of adaptation options that make up the DAPP pathways.
- An update to the minimum transitional procedures of RSLR allowances (Table 3). This provides guidance for when the new information should be used in relation to project stage, where Takutai Kāpiti is considered to be an 'Ongoing DAPP project' (Table 3).

Table 3: Updates to the minimum translational procedures of RSLR allowances (source: MfE (2022a, Table 3)

Category	Description	RSLR allowances to use
A	Coastal subdivision, greenfield developments, and major new infrastructure	• Avoid new hazard risk by using "medium confidence" sea-level rise out to 2130 for the **SSP5-8.5 H+** (83rd percentile SSP5-8.5 or p83) scenario that includes the relevant VLM for the local/regional area. • Check the lifetime and utility of new developments using the median RSLR projections for the "low confidence" SSP scenarios out to 2150 and beyond.
B	Changes in land use and redevelopment (intensification)	• Adapt to hazards by conducting a risk assessment using the range of updated "medium confidence" RSLR scenarios (including VLM) out to 2130 with the dynamic adaptive pathways planning approach; or if a more immediate decision is needed: • Avoid new and increased hazard risk by using "medium confidence" sea-level rise out to 2130 and the **SSP5-8.5 H+** (83rd percentile SSP5-8.5 or p83) scenario that includes the relevant VLM for the local/regional area
C	Land-use planning controls for existing coastal development and assets planning. Use of single values at local/district scale transitional until dynamic adaptive pathways planning is undertaken	Use the **SSP5-8.5 M** scenario out to 2130, which includes the relevant VLM for the local/regional area
D	Non-habitable, shortlived assets with a functional need to be at the coast, and either low-consequences or readily adaptable (including services)	Use the **SSP5-8.5 M** scenario out to 2090 that includes the relevant VLM for the local/regional area.

Table 4: Table outlining when new information should be used in relation to a project stage (Soure: MfE, (2022a) Quick reference guide)

Project stage	Actions
New projects; or those at an early stage	Use updated NZSeaRise scenarios recommended in this interim guidance
Projects at a later stage	Continue to use scenarios recommended in the 2017 guidance, but stress test with VLM to understand how this impacts adaptation thresholds and timing.
Ongoing Dynamic Adaptive Planning Pathway (DAPP) projects	Use updated NZSeaRise scenarios recommended in this interim guidance from now and use all five "medium confidence" scenarios for adaptive pathways.

1.5.2 MfE (August, 2022) Aotearoa New Zealand's first national adaptation plan.

This document sets out Aotearoa New Zealand's long-term strategy and first National Adaptation Plan (NAP), which sets out the Government's approach to adaptation. This first national adaptation plan, and subsequent plans, will be prepared and implemented in accordance with this strategy. It is the first in a series of national adaptation plans that will be prepared every six years, where each plan will respond to a new national climate change risk assessment.

Two key recommendations from the NAP relevant to the Takutai Kāpiti project are:

- to screen for hazards and risks in coastal areas, use the Shared Socioeconomic Pathway scenario for fossil fuel intensive development (SSP5-8.5);
- for detailed hazard and risk assessments in coastal and non-coastal areas, use both the middle-of-the-road scenario (SSP2-4.5) and the fossil fuel intensive development scenario (SSP5-8.5) to 2130, for areas at high risk of being affected, adding the relevant rate of vertical land movement locally.

1.5.3 Summary of Guidance Updates

There are some differences between the two documents in relation to what is recommended for use in coastal planning, land use management, and adaptation planning; depending on the stage of the project.

In applying these documents in the context of the Takutai Kāpiti project, we have interpreted the guidance as follows:

- For a detailed hazard and risk assessment (e.g. the adaptation area risk assessments), the SSP2-4.5 and SSP5-8.5 scenarios should be assessed, as per the (MfE, 2022b) *Aotearoa New Zealand's first national adaptation plan.*
- For adaptation planning when DAPP's are being developed, pathways should be tested against the total range of RSLR scenarios to understand potential changes of timeframes and success in applied options, as per the MfE (2022a) *Interim guidance on the use of new sea-level rise projections.*

In line with the National Adaptation Plan, the SSP2-4.5 and SSP5-8.5 scenarios have been adopted for the risk assessments produced for each adaptation area. As with the previous assessments, the adopted projections for 2050, 2070, and 2130 are from a 2020 base date and have been rounded to the nearest 0.05 m. The resulting RSLR projections from a 2020 base date are presented in Table 5 below, along with the RSLR projections presented in the Jacobs Volume 2 assessment for comparison purposes.

Given the encapsulation of the SSP1-2.6 and SSP5-8.5 H+ scenarios in the results of the Volume 2 assessment, the Volume 2 results will be used to represent the total range of RSLR scenarios for stress testing DAPP developed by the CAP and potential land-use planning controls to be included in a future district plan change for coastal hazards.

Table 5: RSLR projections to be applied in Risk Assessments for each Adaptation Area, with comparison with projections presented in the Jacobs Volume 2 report. All projections are from a 2020 base data.

SSP-RCP Scenario	RSLR to be applied in Adaptation Area Risk Assessments			RSLR presented in Jacobs volume 2 Report		
	2050	2070	2130	2050	2070	2120
RCP2.6				0.2	0.3	0.6
SSP2-4.5	0.2	0.35	0.85			0.85
SSP5-8.5	0.2	0.45	1.25			1.25
SSP5-8.5H+				0.4	0.7	1.65

As can be seen from Table 5, the maximum timeframe projections have changed from 2120 in the Jacobs Volume 2 assessment to 2130 in the Risk Assessments. This is due to both MfE (2022a) and (2022b) pushing the longest time frame projections for coastal adaptation and land use planning out to 2130. However, as can also be seen from Table 5, this has not altered the absolute magnitude of RSLR projections applied over this 100+ year timeframe. This is due to the reduction in the VLM component of the RSLR, dropping from 2

mm/yr for these intermediate RSLR projections in the Jacobs Volume 2 assessment to 1mm/yr for the RSLR projections applied in the risk assessment.

As a result, the extent and depths modeled to be impacted by coastal inundation for the intermediate projections in the Volume 2 assessment and the projections over the maximum timeframe applied in the Risk Assessments are the same, since the time required to reach the RSLR projection has no bearing on the resulting inundation.

However, for coastal erosion, there are differences in the net Projected Future Shoreline Position (PFSP) with the difference in maximum timeframe, largely due to the 10-year difference in the time period of extrapolation of the historical long-term rate. These differences in PFSP are generally small, in the order of 10 m for the 1.25 m RSLR scenario, and less for the 0.85 m RSLR scenario. In some areas, such as the Northern Adaptation Area, the differences are positive, with less erosion projected to 2130, and in others such as in Paekākāriki, they are negative, with more erosion projected to occur to 2130.

1.6 Summary

In light of this new information and guidance, we recommend that future coastal assessments undertaken as part of Takutai Kāpiti project adopt the following RSLR and guidance measures:

- RSLR projections for the Kāpiti Coast District (including a rounded 1 mm/yr VLM) from the NZSeaRise tool presented in Table 2 will be used.
- In aligning with the National Adaptation Plan, SSP2-4.5 and SSP5-8.5 should be used for undertaking risk assessments for each adaptation area.
- Results presented in the Volume 2 represent the total range of SSP scenarios and VLM in the Kāpiti Coast, are still considered to be appropriate for use. The results from Volume 2 should be used to stress test DAPP developed by the CAP against the total range of RSLR scenarios, as per the MfE (2022a) Guidance.
- The intermediate values of RSLR for 2120 presented in the Jacobs Volume 2 report of 0.85 m and 1.25 m are the same magnitudes as RSLR by 2130 applied in the Risk Assessments. Therefore, there is no difference in the extent or depths of coastal inundation presented in the different reports for these maximum timeframes. However, for coastal erosion there are small differences to the PFSP, largely due to the extrapolation of the historical long-term rate being applied over slightly longer timeframes.

Any additional mapping of coastal erosion and coastal inundation that is undertaken using the projections in Table 5 will be uploaded to the web-viewer as it becomes available.

1.7 References

Beavan and Litchfield (2012) Vertical land movement around New Zealand coastline: implications for sea level rise. GNS Science.

Bell, R.G., Hannah, J. (2012). Sea-level variability and trends: Wellington Region. NIWA Report prepared for Greater Wellington Regional Council, June 2012.

Bell R.G., Denys P. Hannah J. (2018). Update on relative sea-level rise and vertical land motion: Wellington region. NIWA report prepared for Greater Wellington Regional Council, December 2018.

IPCC (2013). Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.

IPCC (2019). Special Report on the Ocean and Cryosphere in a Changing Climate: Summary for Policymakers. Report of the Intergovernmental Panel on Climate Change.

IPCC (2021) Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.

Ministry for the Environment (2017) Coastal Hazard and Climate Change Guidance to Local Government.

Ministry for the Environment (2022a) Interim guidance on the use of new sea-level rise projections. July 2022.

Ministry for the Environment (2022b) Urutau, ka taurikura: Kia tū pakari a Aotearoa i ngā huringa āhuarangi Adapt and thrive: Building climate-resilient New Zealand. Aotearoa New Zealand's First National Adaptation Plan. August 2022.