Natural hazard risk level assessments for PC81 proposed zoning changes

1. Purpose

This document sets out the methodology used to assess the natural hazard risk levels for the proposed zone changes in Plan Change 81 (PC81) and the site assessments. The approach applies the National Policy Statement for Natural Hazards (NPS-NH) and takes into consideration the natural hazards requirements set out in the Streamlined Planning Process Notice[1] for PC81.

This document is set out as follows:

- Section 2: sets out the statutory context and requirements
- Section 3: describes the natural hazards considered for the risk level assessments and a range of supporting technical information and assumptions for each hazard including information pertaining to each natural hazard in Appendix 1 Table A.
- Section 4: details the steps undertaken to complete the NPS-NH risk level assessment for each PC81 site (where applicable) including the template for the risk level assessments in Appendix 2 Table B.
- Section 5: notes how the natural hazard risk level assessment information has been carried through into the Background Report Site Assessment Report.

2. Statutory Context

2.1 NPS-NH and plan change processes

The NPS-NH requires local authorities to assess and manage the risks posed by natural hazards in a consistent, risk-based, and proportionate manner (Objective 1). The NPS-NH came into effect on 15 January 2026, with decision-makers required to give effect to the NPS-NH from this date. However, local authorities are not required to initiate changes to regional policy statements, regional plans, or district plans for the sole purpose of giving effect to the NPS-NH.

In preparing PC81, specific sections of the Resource Management Act 1991 (RMA) regarding national policy statements apply. Section 74(1)(ea) requires local authorities to prepare and change its district plan in accordance with a national policy statement. A district plan must also give effect to a national policy statement under Section 75(3)(a). Therefore, the proposed zoning changes in PC81 must be assessed against the provisions of the NPS-NH. This ensures the plan change is prepared in accordance with, and gives effect to, the NPS-NH and that the land can be appropriately developed for its intended zoning.

Natural hazard risk levels are assessed using the NPS-NH Figure 1 risk matrix by combining:

[1] The Resource Management (Direction to Tasman District Council to enter the Streamlined Planning Process for Plan Change 81 to the Tasman Resource Management Plan and Change 1 to the Tasman Regional Policy Statement) Notice 2026

1. the likelihood of a natural hazard event occurring (NPS-NH Table 1), and
2. the consequences for people and property (NPS-NH Table 2);

to determine the risk level from a natural hazard (clause 3.2(1) NPS-NH).

Section 4 Assessment Process sets out the process that staff developed to assess the natural hazard risk levels for the PC81 sites using the NPS-NH. The relevant figure and tables noted above are also included in Section 4 (Steps 3, 5 and 6).

2.2 NPS-NH implementation guide

The Ministry for the Environment released the National Policy Statement for Natural Hazards Implementation Guide (Implementation guide) on 6 May 2026. The guide provides a general overview of what the NPS-NH intends to achieve, along with detail to support implementation.

The guide notes that the NPS-NH will operate during the transition to the new planning system and was therefore designed to apply primarily to resource consenting, particularly subdivision and land-use decisions. However, while local authorities are not required to undertake plan changes solely to give effect to the NPS-NH, they are still required to have regard to the NPS-NH requirements when developing plan changes related to natural hazards. On that basis, the guide's implementation principles and recommendations are relevant to assessing how PC81 gives effect to the NPS-NH.

2.3 Streamlined planning process – notice of direction

The notice of direction to use the streamlined planning process for PC81 was gazetted on 21 April 2026. Included in the notice was direction relating to natural hazard assessments as follows:

"2c. a comprehensive natural hazards and climate change risk assessment (likelihood and consequence) for individual sites, access points, and the surrounding areas, including:

i. the compounding and residual effects of hazards
ii. the potential that they can be mitigated.
iii. utilisation of the best available information for flooding and coastal inundation, slips and instability taking into account the flooding and damage that occurred in 2025.
iv. taking into account the potential future costs of mitigating natural hazard and climate change risks for the proposed sites in a manner that is proportionate to the level of risk anticipated."

Most of the requirements listed above are included within the requirements of the NPS-NH, except for 'access points, and the surrounding areas' and 'compounding effects of hazards'. These additional requirements have also been considered within the relevant sections of this document and within the natural hazard risk level assessments (where appropriate).

2.4 Future Development Strategy context for PC81

The proposed PC81sites are largely derived from the Nelson Tasman Future Development Strategy 2022–2052 (FDS), a 30-year strategic growth framework prepared under the National Policy Statement on Urban Development. The FDS identified indicative locations for future housing and business growth across the Nelson Tasman region to meet long-term demand and infrastructure planning objectives. The FDS included extensive iwi, stakeholder and community engagement, and was publicly consulted using the Local Government Act 2002 process and adopted by the Nelson Tasman Joint Committee on 29 August 2022.

The adopted FDS growth sites were identified as 'indicative' only, with the Strategy expressly anticipating that more detailed and site-specific assessment would occur before rezoning is advanced through plan changes to the two Councils' respective resource management plans. PC81 proposes to deliver the first 10 years of growth identified in the FDS for Tasman.

The FDS was developed through a staged process that included high-level opportunities and constraints mapping and a multi-criteria assessment of potential growth sites. Natural hazard risk was considered alongside factors such as infrastructure feasibility, transport accessibility, highly productive land and other environmental constraints. Sites subject to significant or unresolvable constraints, including very high natural hazard risk, were excluded at this strategic planning stage. While the FDS pre-dates the NPS-NH, expert staff judgement applied within the FDS process has essentially given effect to the NPS-NH Policy 3 which requires the avoidance of very high natural hazard risk, e.g. in undertaking the natural hazard risk level assessments for PC81, no sites were scored as 'very high natural hazard risk'.

3. Natural hazards background information

3.1 Natural hazards considered in this assessment

The NPS-NH applies to the following natural hazards, with the Implementation Guide providing further guidance on the scope of each hazard:

a) flooding - referring to inundation of land that is normally dry, including:
   - fluvial flooding, where waterways overflow their banks due to excess water
   - pluvial flooding, where intense rainfall exceeds drainage capacity or soil absorption
   - groundwater flooding, where the water table rises above the surface, often after prolonged rainfall

b) landslips - referring to the downhill movement of soil, rock or debris under gravity, which may be triggered by rainfall or earthquake shaking (terms such as landslide, slippage and falling debris may also be used; types of landslip include rockfalls, topples, slides, flows, and creep). Note that in this document and the natural hazard risk level assessments, this hazard has been described as 'landslides/slope instability' which is consistent with terminology in the Tasman Resource Management Plan.

c) coastal erosion - referring to the retreat of the shoreline (either temporarily or permanently) due to tides and waves, including storm surges

d) coastal inundation - referring to inundation of land by seawater (including by storm surges and high tides)

e) active faults - referring to those faults that have ruptured the surface in the past and as identified in the New Zealand Active Faults Database

f) liquefaction, including lateral spread – referring to where loose, water-saturated soils lose strength due to earthquake shaking

g) tsunami - referring to a series of long-period waves, primarily those generated by underwater earthquake events from local, regional and distant sources where there is significant displacement of the seafloor.

The NPS-NH does not preclude decision-makers from managing natural hazard risk beyond the application of the NPS, including risks from other natural hazards. On this basis, the assessment process has also considered ‘wildfire’ where this is relevant to specific PC81 sites.

Appendix 1 Table A lists each of these hazards and details a range of supporting information that provides context for the assessment process set out in Section 4. The following sub-sections also provide information which supports the columns in Table A, as detailed below.

3.2 Screening criterion

Staff developed screening criteria for each natural hazard, as described in Column A Table A, Appendix 1, to determine whether a site was exposed to, or potentially affected by, that hazard. More information on how this was applied in the natural hazard risk level assessment process is described in Section 4 Assessment Process (Step 2 Hazards Screening).

3.3 Data sources (best available information)

The natural hazard risk level assessments are based on best available information, as detailed in Column B of Table A. Assessments have been undertaken even when that information is uncertain or incomplete as provided for in NPS-NH Policy 5 and Implementation Clause 3.4.

The PC81 notice of direction required the Council to utilise best available information ‘taking into account the flooding and damage that occurred in 2025’. PC81 sites were assessed against the known extent of the June and July 2025 floods along with other historic floods which Council holds records for. Only two sites near Wakefield were impacted in the 2025 flood events and this was considered in their respective flood hazard assessments.

3.4 Climate Change

Policy 6 of the NPS-NH requires the potential impacts of climate change to be considered over at least a 100-year planning horizon. This is in keeping with the New Zealand Coastal Policy Statement 2010 (NZCPS) and associated guidance, and the National Adaptation Plan 2022. These provide direction on considering the effects of climate change (including the use of climate change scenarios) over at least a 100-year planning horizon when identifying and assessing natural hazard risk levels for land use planning.

For the natural hazard risk level assessments, climate change has primarily been considered for coastal inundation and rainfall derived flood hazards, depending on the availability of suitable scenarios in model datasets. Column C of Table A (Appendix 1) describes the climate change information (where available), that has been applied during the assessments.

The NPS-NH Implementation Guide notes that changes to the risk profile of a hazard event under different climate change scenarios can be assessed by using the risk matrix in two ways:

- by holding the event likelihood constant (e.g., a 1 percent AEP event) and adjusting the consequence rating to reflect increased impacts under different climate scenarios (i.e., a more severe flood associated with the same AEP in the future)
- by assessing how a hazard event of a given magnitude may increase in likelihood over time, such that an event currently defined as a 1 percent AEP may become more frequent (e.g., becoming a 2 percent AEP event).

For these assessments the event likelihood was constant (primarily a 1% AEP event) and the consequence rating for coastal inundation and flooding was adjusted to reflect increased impacts under climate change scenarios.

3.4.1.1 Coastal inundation and sea-level rise

NZCPS Policy 24 Identification of Coastal Hazards requires councils to 'take into account national guidance and the best available information on the likely effects of climate change on the region or district'. Of relevance are the February 2024 Ministry for the Environment's Coastal Hazards and Climate Change Guidance (2024 Guidance), in conjunction with the NZ SeaRise: Te Tai Pari O Aotearoa programme (launched 2022).

The 2024 Guidance (page 51) states, "For making interim decisions on new coastal development or infrastructure and change in land use, such as intensification and upzoning, the precautionary interim allowance recommended (before an adaptive planning strategy is developed) is to use the SSP5-8.5 H+ based RSLR projection to identify areas 'potentially affected' by coastal hazards and climate change. Timeframes are also informed by the risk of being affected by coastal hazards, with greater or longer-term investments, such as infrastructure or new suburbs, needing assessment over at least a 100-year period out to 2130."

The Council has yet to start development of an adaptive planning strategy for the district, and therefore the recommended precautionary relative sea-level rise allowances as set out below (sourced from the 2024 Guidance), should be applied:

Interim precautionary relative sea-level rise allowances recommended to use for coastal planning and policy before undertaking a dynamic adaptive pathways planning approach for a precinct, district or region (Source: Table 8, pages 52-53, 2024 Guidance).

Planning category	Recommended interim precautionary RSLR allowances
A. Coastal subdivision, greenfield developments and major new infrastructure	Using a timeframe out to 2130 (≥100 years), apply the medium confidence SSP5-8.5 H+ based RSLR projection* that includes the relevant VLM rate for the local and/or regional area. (Note: approximately 1.6 metre rise in MSL, before including VLM.)
B. Changes in land use and redevelopment (intensification and upzoning)	Using a timeframe out to 2130 (≥100 years), apply the medium confidence SSP5-8.5 H+ based RSLR projection* that includes the relevant VLM rate for the local and/or regional area. (Note: approximately 1.6 metre rise in MSL, before including VLM.)
C. Land-use planning controls for existing coastal uses and assets (building additions)	Using a timeframe out to 2130 (≥100 years), apply the medium confidence SSP5-8.5 M based RSLR projection that includes the relevant VLM rate for the local and/or regional area. (Note: approximately 1.2 metre rise in MSL, before including VLM.
D. Non-habitable, short-lived assets with a functional need to be at the coast, which are either low consequences or readily adaptable (including services)	Using a timeframe out to 2075 (≥50 years), apply the medium confidence SSP5-8.5 M based RSLR projection that includes the relevant VLM rate for the local and/or regional area. (Note: approximately 0.5 metre rise in MSL, before including VLM.)

Notes:

* H+ is the 83rd percentile (or p83 at the top of the likely range on graphs in the NZ SeaRise platform).

i) Relative sea-level rise (SLR) projections that include satellite-derived vertical land movement (VLM) are available from the NZ SeaRise platform. Alternatively, locally monitored VLM can be applied to the SLR projections.

ii) M = median or p50 (50th percetile); MSL = mean sea level; RSLR = relative sea-level rise; SSP = shared socio-economic pathway used by the Intergovernmental Panel on Climate Change; VLM = vertical land movement.

The approximate rise in MSL can be considered broadly representative across Aotearoa New Zealand, because the absolute SLR from north to south only varies by ± 0.025 metres by 2150 (relative to the central location).

The National Adaptation Plan 2022 (NAP) states that when making or changing policy statements or plans under the RMA 1991, councils should use recommended climate change scenarios (as a minimum) to identify and assess risk from coastal hazards and the effects of climate change. Councils should screen for hazards and risks in coastal areas using the SSP5-8.5 scenario and use at least two IPCC scenarios1 (SSP2-4.5 and SSP5-8.5) for detailed hazard and risk assessments, adding the relevant rate of vertical land movement (VLM) locally. Additionally, the 2022 NAP recommends councils should stress-test plans, policies and strategies using a range of scenarios as relevant to the circumstances.

For PC81 sites, coastal inundation and sea-level rise was assessed against the 1% AEP coastal storm tide and up to 2m of relative sea-level rise. This equates to the climate change scenario of SSP5-8.5 H+ out to the year 2130 and includes vertical land movement.

3.4.1.2 Flooding

The recommended climate scenarios in the NAP also apply to flood hazards.

For rainfall derived flooding, the flood models utilised Earth Sciences New Zealand's HIRDs rainfall estimates. HIRDs includes rainfall estimates under future climate scenarios and these were used to model future flood events. Future rainfall estimates were generally aligned to a 100-year planning horizon though some older models used a shorter planning horizon. Column C of Table A (Appendix 1) details the climate change scenario and specific time horizon used in each of the flood models. For the flood models that include a coastal boundary, relative sea level rise was included when modelling future climate scenarios.

It is noted that Council flood models refer to climate change scenarios as 'RCP' (Representative Concentration Pathways), rather than the more recent approach of 'SSP' (Shared Socioeconomic Pathways). RCPs were based on emissions/radiation pathways, whereas SSPs include socio-economic drivers. The climate scenario of RCP8.5 translates to SSP5-8.5M.

3.5 Likelihood

The assessment of hazard likelihood draws on a combination of modelling outputs, expert judgement, and site-specific data sources. Column D of Table A (Appendix 1) describes how the likelihood level was determined for each hazard type.

3.6 Assumptions, uncertainties and limitations

The natural hazard risk level assessments for the PC81 rezoning sites have been based on best available information and expert judgement, within the limitations of the available data, hazard modelling, and plan-level assessment. A range of assumptions, uncertainties and limitations underpin the risk level assessments, including data availability, modelling constraints, the absence of detailed development proposals (e.g. outline development plans, site layout plans, etc.), and assumptions regarding the realism and proportionality of mitigation. Setting these assumptions out explicitly supports transparency and assists in understanding how uncertainty, mitigation, residual risk and proportionality have been applied consistently across the hazards and the sites.

Assumptions, uncertainties and limitations are described in three ways:

- In this document – general assumptions, uncertainties and limitations that apply to all hazards across all sites;
- In Column E in Table A – any assumptions, uncertainties and limitations relevant to each natural hazard;
- In the Notes column of each site assessment table – any assumptions, uncertainties and limitations specific to a particular site mitigation measure.

3.7 Compounding effects of hazards

PC81 notice of direction requires the Council to consider the compounding effects of natural hazards in the natural hazard risk level assessments (noting that this is not a requirement of the NPS-NH). Column F of Table A (Appendix 1) provides a high-level summary of potential compounding hazards associated with each natural hazard.

For flood models with a coastal boundary, relative sea-level rise was included when modelling future climate scenarios.

At the time of this assessment there is insufficient site-specific technical information for other hazards to consistently identify, quantify, or assign joint likelihoods for compounding hazard scenarios. Staff judgement was used to consider (at a high level) whether compounding hazards would change the consequence rating for each hazard assessment, as detailed in Section 4 Assessment Process.

4. Assessment Process

This section, in conjunction with the background information in Section 3, outlines the process staff undertook to assess PC81 sites against the NPS-NH. The information provided in Appendix 1 Table A details the screening criteria, data sources, assumptions and climate change information used for the natural hazard risk level assessments.

Appendix 2 Table B contains the assessment template used to document the outputs of the assessment (Steps 1–14 below). Each step in the methodology corresponds to specific fields within the template, ensuring consistent application of the assessment process across all sites and the different natural hazards.

Appendix 3 presents all the natural hazards risk level assessments for each PC81 site (where applicable).

Step 1. Site description in relation to natural hazards

For each PC81 site, staff:

- Identified the proposed zoning change and estimated yield (recognising that zoning and yield are an important consideration when assessing the potential consequence);
- Identified, using best available information (including maps, aerial images and models), all natural hazards relevant to the site (refer step 2).
- Prepared a summary of the natural hazards that may affect or impact the site, and the extent of exposure associated with each hazard. This included identifying the relevant hazard types, describing their general characteristics, and noting whether hazards affected all or part of the site.

The site-level hazard summary and the maps provide the contextual foundation for the subsequent risk level assessment and informs which hazards were taken forward into the NPS-NH assessment table for more detailed analysis.

Where relevant, stormwater servicing comments were included to provide context and comment on existing or planned stormwater infrastructure to service the intended development.

Step 2. Hazards screening

Each site was screened for individual natural hazards as detailed in Column A in Table A (Appendix 1) . The screening process involved reviewing available hazard mapping, model outputs, aerial imagery, LiDAR DEM and staff knowledge to determine whether a site is exposed to, or potentially impacted by, a particular natural hazard.

Where a natural hazard was identified as potentially affecting or impacting a site, it was included in the site's NPS-NH assessment table for assessment of the natural hazard risk level. Where no description is provided for a particular natural hazard in the site summary or assessment table, this indicates that the hazard was not identified as affecting the site, based on the best available information at the time of assessment.

For many of the PC81 sites, one or more natural hazards were identified, and some of those hazards affected only part of the site. This was recorded in the hazard summary for each site. As outlined in Step 5.1, risk level assessments were undertaken for all identified hazards regardless of the proportion of the site affected.

Natural hazard risk level assessments were not undertaken for sites where the proposed zoning is:

- *open space* because these zones do not anticipate residential or business use. As a result, they do not generate meaningful consequence ratings under the NPS-NH risk assessment; or
- *Rural 1 or Rural 2* because the land use considered for these sites is primary production[2]. The NPS-NH does not apply to primary production activities (Clause 1.3(2) NPS-NH).

Step 3. Likelihood assessment (Clause 3.2(1)(a))

For each hazard included in the assessment table, a likelihood rating was assigned using NPS-NH Table 1.

Where quantitative annual exceedance probabilities or recurrence intervals exist, they were directly used to determine the NPS-NH likelihood level.

Where only qualitative information exists, likelihood was assigned using expert judgement anchored to NPS-NH likelihood levels.

Column D of Table A (Appendix 1) describes how the likelihood level was determined for each hazard type.

NPS-NH – Table 1 Likelihood table

Likelihood level	**Annual exceedance probability (AEP)**	**Average recurrence interval (ARI) or 'return period'**
Almost certain	10% or more	Up to and including 10 years
Very likely	10% to 5%	Over 10 and up to and including 20 years
Likely	5% to 2%	Over 20 and up to and including 50 years
Possible	2% to 1%	Over 50 and up to and including 100 years
Unlikely	1% to 0.2%	Over 100 and up to and including 500 years
Rare	0.2% to 0.02%	Over 500 and up to and including 5,000 years
Very rare	less than 0.02%	More than 5,000 years

[2] Primary production (as defined in the National Planning Standards) means:

(a) any aquaculture, agricultural, pastoral, horticultural, mining, quarrying or forestry activities; and
(b) includes initial processing, as an ancillary activity, of commodities that result from the listed activities in a);
(c) includes any land and buildings used for the production of the commodities from a) and used for the initial processing of the commodities in b); but
(d) excludes further processing of those commodities into a different product.

Step 4. Existing mitigation (Clause 3.2 (2)(a) NPS-NH)

Any existing mitigation measures that currently reduce the risks from the natural hazard(s) on the site were described. Existing mitigation may include physical works (e.g., stopbank schemes in the wider area, drainage infrastructure) and existing planning controls where relevant (e.g. planning requirements for the Slope Instability Risk Area and Fault Rupture Risk Area).

Step 5. Consequence assessment under existing conditions (Clause 3.2 (1)(b) NPS-NH)

The consequence level for each hazard on the site was assessed using NPS-NH Table 2 considering:

- Damage to property, and
- Potential for injury or fatalities.

Table 2 Consequence table (NPS-NH)

Consequence level	**Damage to property**	**Potential for injury or fatalities**
Catastrophic	Severe damage to land and building(s), potential for collapse or total destruction of structures. Building(s) need to be demolished, rebuilt or relocated.	High threat to life safety, with probable fatalities and/or critical injuries.
Major	Major damage to land and building(s), including structural damage. Loss of use and substantial repair required.	Unsafe for people, with potential for many injuries, or critical injuries and/or fatalities.
Moderate	Some damage to land and non-structural damage to building(s). Limited loss of use, repairs required.	Unsafe for people, with potential for injuries, although expected to be minor.
Minor	Minor damage to land and building(s). No loss of use, minimal repairs required.	Isolated minor injuries possible.
Negligible	No loss of use, no building repairs required.	No injuries.

Consequences were assessed having regard to any existing mitigation measures (identified in Step 4) and the proposed new zoning category. The NPS-NH Implementation Guide states that if a different consequence level results for each column of Table 2, the level of risk should be determined by applying the highest consequence level in the risk matrix. This approach was used for these assessments.

In assessing consequences, consideration was also given to compounding effects. Staff judgement was used to consider (at a high level) whether compounding hazards would change the consequence rating.

5.1 Partial-site hazard exposure

Where a hazard affects only part of a site, the consequence rating was based on the portion of the site where the hazard occurs, and the assessment recorded the spatial limitation in the hazard description (Step 1). This approach ensures that the hazard is not understated, while still documenting that exposure may be localised within a site.

5.2 Proposed zoning

The proposed zoning for a site directly informs the consequence assessment as different zoning types lead to different land use and development, which in turn creates different levels of exposure and vulnerability from the natural hazards. Future development of the sites is assumed to be typical for the proposed zoning and to adopt a sensible layout that minimises the effects of natural hazards that may impact the site.

In residential and medium-density residential zones, consequence levels were generally assessed as higher because more people are present on site and for extended durations, including overnight. In contrast, industrial zones are typically places of work and involve activities such as warehousing or storage yards, where the exposure of people to natural hazards is generally lower, particularly overnight.

Buildings in industrial areas are typically less sensitive to natural hazard impacts. Accordingly, for many natural hazards, the consequence levels for potential injury or fatalities and property damage in industrial zones were assessed as less severe than for residential zones exposed to a similar hazard.

5.3 Access

PC81 notice of direction stated that access points should form part of the natural hazards risk level assessment (although it is not a requirement of the NPS-NH). For greenfield sites, access points were one of the factors considered in the consequence assessment (where relevant). For sites where intensification is proposed (e.g., Richmond, Brightwater and Motueka), individual access points have not been assessed because access is generally already established and it is difficult to anticipate where intensification may occur. Access arrangements for intensification sites are expected to be considered at the resource consent stage. Access has also been considered in the Infrastructure Report.

Step 6. Risk level under existing conditions (Clause 3.2 (1) NPS-NH)

The natural hazard risk levels (low, medium, high, very high) were determined using the likelihood level and the overall consequence level and the NPS-NH risk matrix – Figure 1.

NPS-NH – Figure 1 Risk matrix

Consequence Level	Likelihood Level						
	Almost Certain	Very Likely	Likely	Possible	Unlikely	Rare	Very Rare
ARI (years)	up to 10	10-20	20-50	50-100	100-500	500-5000	> 5000
AEP	10% or more	10% to 5%	5% to 2%	2% to 1%	1% to 0.2%	0.2% to 0.02%	< 0.02%
Catastrophic	Very High	Very High	Very High	High	Medium	Medium	Medium
Major	Very High	Very High	High	High	Medium	Medium	Medium
Moderate	High	High	High	Medium	Medium	Low	Low
Minor	Medium	Medium	Medium	Medium	Low	Low	Low
Negligible	Low	Low	Low	Low	Low	Low	Low

Step 7. Identify potential mitigation measures (Clause 3.2(2)(a) NPS-NH)

Potential mitigation measures were considered for each relevant natural hazard to indicate how the consequences of the natural hazard could reasonably be reduced at a plan level. This stage of the assessment did not consider detailed engineering design or site-specific solutions, which would ordinarily be developed and assessed at the resource consent stage.

Staff judgement was applied to identify mitigation measures that are considered realistic, practicable, and likely able to be implemented in practice, having regard to the scale and intensity of development anticipated by the proposed zoning. The assessment focused on mitigation measures that are commonly used and well-established, rather than theoretical or highly speculative interventions.

For the natural hazard risk level assessments, it was assumed that mitigation measures would be undertaken within the site as part of any subsequent development and that they would not result in significant off-site effects on the surrounding land (noting that consideration of surrounding areas was a PC81 notice of direction requirement). It is recognised that having to accommodate mitigation measures on the site may impact potential yields and that there may be other mitigation options, such as measures undertaken away from the site, that may have less impact on yields.

Mitigation terminology has been applied consistently across the assessments. Where generic terms are used (for example, “sensible layout”), this is intended to describe practical planning and design responses, such as locating buildings away from the more hazard-prone areas where possible, aligning roads and secondary flow paths with natural hazard pathways, and enabling hazards to pass through or around sites without adversely affecting buildings, people, or neighbouring property.

The potential mitigation measures identified for each site represent reasonable and proportionate options that would be expected to occur in practice. They are not intended to be an exhaustive list of all possible mitigation measures, nor do they assume mitigation irrespective of cost, complexity, or feasibility. At the resource consent stage, developers may propose alternative or more detailed mitigation measures that are appropriate to the specific development proposed, including solutions or technologies that were not anticipated at the time this plan-level assessment was undertaken.

All potential mitigation measures were assessed in the absence of a specific development proposal. Accordingly, mitigation assumptions reflect typical responses for the intended zoning and development type, rather than detailed or site-specific design solutions.

Step 8. Cost and complexity rating of potential mitigation measures (Clause 3.3(3) NPS-NH)

To support assessments under clause 3.3(3) of the NPS-NH, staff developed and applied a Low/ Medium/High rating to indicate the relative cost and complexity of potential mitigation measures, reflecting both financial cost and practical feasibility. This rating system was based on staff expert judgement and experience from past development in the district as detailed below:

Cost and complexity rating for potential mitigation measures

Rating	**Description**
Low	Costs and complexity in line with simple subdivision and/or land use, such as: • Geotechnical solutions such as building setbacks or simple engineered building foundations. • Some raising of ground and/or building platforms • Other small-scale physical works such as minor stormwater improvements, small retaining structures, detention tanks etc
Medium	Costs in line with a moderately complex subdivision and/or land use, such as: • Geotechnical solutions such as building setbacks, specified building locations, or engineered building foundations, • Moderate earthworks or recontouring of land to raise and/or stabilise ground • Raising of building platforms • Other small-medium scale physical works such as stormwater improvements, small retaining structures, detention basins etc
High	Costs and complexity in line with a significant/complex subdivision and/or land use, such as: • Geotechnical solutions such as significant engineered building foundations • Structures such as stopbanks, rock revetments or stormwater improvements that provide area-wide benefit • Significant earthworks or recontouring of land to raise and/or stabilise ground • Other large-scale physical works to mitigate natural hazards and may provide area-wide benefit

The NPS-NH Implementation Guide does not provide any guidance on cost effectiveness other than to note that cost effectiveness may include consideration of:

- technical feasibility of the mitigation measures
- longevity of the measures (and the level of service provided over time)
- any ongoing maintenance or monitoring requirements.

Staff consider that the rating system outlined above is consistent with these considerations.

Step 9. Consequence assessment with potential mitigation

The consequences levels (damage to property and potential for injury or fatalities) were reassessed using NPS-NH Table 2 taking into consideration both the existing and potential mitigation measures and the proposed zoning. Where the consequence level for damage to property differed from that for potential for injury or fatalities consequence, the higher of the two consequence levels is used to determine the overall consequence level for the risk matrix, consistent with Step 5. In reassessing consequences with potential mitigation, consideration was also given to compounding effects, and staff judgement was used to consider (at a high level) whether compounding hazards would change the consequence rating. The principles set out in Steps 5.1 and 5.2 continued to apply to this stage of the assessment.

Step 10. Risk level with potential mitigation

The Risk Matrix – Figure 1 from the NPS-NH was used to determine the risk level for each hazard applicable to the site by combining the likelihood level (Step 2) and the overall post-mitigation consequence level (Step 9).

Step 11. Residual risk assessment

Residual risk was considered and commented on. Residual risk was considered as:

1. what happens if the hazard magnitude exceeds the design benchmark used for mitigation (e.g. a flood larger than the stopbank is designed for), and
2. what happens if the mitigation fails (e.g., breach of a stopbank).

The residual risk varies depending on the natural hazard and type of mitigation measures assumed. For example, permanently raising land above the design flood level may result in relatively benign residual risk (shallow flooding over the raised land in larger events). Whereas, reliance on stopbanks may result in higher residual risk if overtopped or breached, because water can accumulate to greater depths over the protected land behind the stopbanks.

For slope instability hazards, some residual risk typically remains even where mitigation measures are identified. This reflects the potential for mitigation measures to fail under extreme conditions (such as intense or prolonged rainfall, or as a result of a significant earthquake). Mitigation measures often focus on protecting buildings or specific development areas rather than the wider site. As a result, damage to land outside mitigated areas may still occur. Residual risk is expected to be further managed through site-specific investigation, design, and construction controls at the resource consent and/or building consent stages.

Step 12. Proportionality assessment (Clause 3.3(3) NPS-NH)

Proportionality was assessed by qualitatively considering the cost and complexity of the development likely to occur at the site, including any potential mitigation measures needed to allow the development, relative to the assessed natural hazard risk level. The proportionality assessment is qualitative, based on staff judgement, rather than a formal quantitative cost-benefit analysis.

The proportionality assessment considers whether mitigation is straightforward and therefore more cost-effective (likely to be proportionate) versus complex and costly to execute (less likely to be proportionate). The process does not explicitly assess how mitigation costs would be spread across development scale or yield.

The proportionality assessment does not seek to determine development viability or economic return, which are matters for developers to consider for their individual proposals.

Step 13. Notes

Any assumptions, uncertainties, and evidence limitations specific to a site and hazard have been recorded. Assumptions, uncertainties and limitations common to each hazard are detailed in Column E Table A (Appendix 1).

Step 14. Overall comment

An overall site summary is provided drawing together hazard specific findings and the assessed hazard risk levels.

5. Natural hazard information presented in the Background Site Assessment Report - Proposed Plan Change 81 to the Tasman Resource Management Plan

The following key information from the natural hazard risk level assessments have been carried through into the Background Report:

- Natural hazard risk level assessment summary can be found in the Natural Hazards Considerations for each site; and
- Natural hazard comments have been incorporated into the Costs and Constraints part of the Options Assessment for each site location.

Full details of the natural hazards risk level assessments are presented in Appendix 3.

Appendix 1: Table A Natural hazard screening criteria, data sources and assessment assumptions

	Column A	Column B	Column C	Column D	Column E	Column F
Natural Hazard	**Screening criterion (include in assessment table when…)**	**Data Sources**	**Climate Change**	**Likelihood**	**Assumptions and limitations**	**Compounding effects**
Flooding	The site is within (or partly within): • a floodplain; or • an area where flooding has occurred in the past; or • an area where flood/stormwater modelling indicates inundation is expected to occur; or • watercourses are present on or adjacent to the site	Flood models (by catchment / settlement as available): • Takaka River 2023 • Mapua/Ruby Bay Tasman stormwater 2021 • Brightwater Wakefield stormwater 2024 • Moutere 2023 • Motueka River and Stopbanks 2020 • Motueka stormwater 2025 • Richmond stormwater 2026 Present day and future climate scenarios (as detailed in Column C) were considered. For areas where no flood modelling data is available: • LiDAR DEM data (including stream channels) • Staff knowledge of flooding	Climate change effects are incorporated through future model scenarios where available, generally aligned to a 100-year planning horizon though some older models used a shorter period. Increased rainfalls across the model domains and, where applicable, relative sea level rise on coastal boundaries were based on the climate change scenarios noted below. Present day only • Motueka River and Stopbanks 2020 Year 2090 • Motueka stormwater 2020 and 2025 (RCP6.0) • Mapua/Ruby Bay Tasman stormwater 2021 (RCP8.5) • Brightwater Wakefield stormwater 2024 (RCP8.5) Year 2100 • Takaka River 2023 (RCP8.5) • Moutere 2023 (RCP8.5) Year 2130 • Richmond stormwater 2026 (RCP8.5)	Flooding likelihood is determined using outputs from Council's flood-modelling datasets, with the 1% AEP event applied as the primary design event for planning purposes. Where model results indicate exposure to flood events with a higher frequency of occurrent the 10% AEP event was also assessed, for comparison. Larger and rarer modelled events were also reviewed as a sense check but typically produced lower risk levels due to their lower frequency of occurrence (consistent with MfE NPS-NH Implementation Guide). For sites where no flood modelling information is available, expert judgment, the LiDAR DEM, knowledge of past flood events, and hydrological records have been used to inform the assessment of the expected frequency of flooding at the various sites.	**Flood models** Flood models are simplifications of real flood behaviour and rely on various assumptions about land cover, infiltration rates, rainfall inputs, and hydraulic representation of structures and channels. As a consequence, there remains a degree of uncertainty with the modelled outputs and the resultant mapped flood depths and extents. The flood models are considered suitable for plan-level assessments. Each flood model has an accompanying technical report which details how the model was developed, including any assumptions or limitations specific to the model outputs. These are available on Council's website: Flooding | Tasman District Council **Stormwater network performance** Stormwater networks are assumed to be functioning as intended and not blocked by debris or other structures (such as sheds, retaining walls). Secondary flow paths are assumed to exist and operate during flood events where the network capacity is exceeded. Real-world flood pathways may differ from modelled pathways. **Off-site effects** Potential mitigation measures are assumed not to cause adverse off-site effects; are accommodated within the site; and do not transfer the hazard to neighbouring properties. For example, where the proposed mitigation measures include the raising of ground levels, it is assumed that this can be, and is, undertaken on site without causing off-site flood effects to neighbouring properties. The need to accommodate mitigation measures on site may limit the developability of a site or parts of a site. **Climate change** Climate change considerations rely on published guidance and available model	Flooding can be compounded by coastal inundation and sea-level rise, particularly in low-lying coastal and estuarine areas where elevated sea levels can impact the discharge of stormwater and river outflows to the coast. The increased frequency of intense rainfall events may trigger landslides or slope instability, increase sediment loads, and reduce the performance of stormwater networks, resulting in deeper and/or more widespread flooding.

Natural Hazard	Column A **Screening criterion (include in assessment table when…)**	Column B **Data Sources**	Column C **Climate Change**	Column D **Likelihood**	Column E **Assumptions and limitations**	Column F **Compounding effects**
					scenarios for rainfall and sea level rise over the 100-year planning horizon; where future scenario modelling exists it is used, and where it does not, expert judgement has been used to inform the assessment.	
Landslides / slope instability	The site is within (or partly within) the TRMP Slope Instability Risk Area, or the site includes steep slopes with susceptible geology identified via mapping and/or LiDAR DEM and local evidence.	• TRMP Slope Instability Risk Area as shown on the TRMP planning maps. • LiDAR DEM data • Staff knowledge of susceptible geology and slopes.	No information available as Council has not undertaken future modelled scenarios of slope instability for the Tasman district.	Landslide likelihood is based on rainfall triggers being the dominant driver, informed by historic events and local knowledge. Based on expert judgement, sites located wholly or partially within the TRMP Slope Instability Risk Area, or that area containing steeper slopes, are assessed as having a "Possible" likelihood of landslide occurrence. Sites situated on or partially underlain by Separation Point granite geology (where slope failure is known to occur more frequently) are assessed as having a "Likely" likelihood.	The assessment relies on district-scale geological mapping, LiDAR DEM data (landform and slope), and expert judgement and is appropriate for plan-level screening. No site-specific geotechnical investigation or modelling has been undertaken, and local ground conditions may vary from mapped information. Some residual risk typically remains for slope instability hazards even when mitigation measures are identified. This reflects the potential for mitigation measures to fail under extreme conditions (such as intense or prolonged rainfall, or because of a significant earthquake). Mitigation measures often focus on protecting buildings or specific development areas rather than the wider site. As a result, damage to land outside mitigated areas may still occur.	Landslide/slope instability hazards will be exacerbated by intense or prolonged rainfalls (the frequency and severity of which will increase with climate change), which can result in increased slope saturation (leading to an increased frequency of occurrence) and increased downslope impacts. Earthquake shaking can act as a trigger for slope failure, potentially compounding the ground shaking impacts, such as where the resultant landslides intersect with infrastructure, access routes, or watercourses.
Coastal inundation	The site is within (or partly within) areas identified as being land at or below the elevation of the sea at the adjacent coastline based on a relative sea level rise of 2m over the 100 year planning horizon. Land at or below the elevation of a 1% AEP storm-tide on top of the 2m relative sea level rise was also considered.	Coastal inundation from the TDC Coastal hazards assessment on Tasman/Te Tai o Aorere and Golden Bay/Mohua (2019). Present day and future climate scenarios (as detailed in Column C) were considered. LiDAR DEM data	SSP5-8.5 H+ scenario over the 100-year planning horizon (e.g. out to year 2130) to stress-test the PC81 sites for coastal inundation. This is to ensure the sites are resilient to coastal inundation hazards over the longer term and can be developed for the intended zoning.	Coastal inundation likelihood is tied to sea-level rise projections over the 100-year planning horizon and with the storm tide allowances. Where projections indicate a site (or part of a site) will be impacted by up to 2m of sea-level rise over the 100-year planning horizon (i.e. land that is below the adjacent sea level every high tide), a likelihood of 'Almost certain' is allocated. Where projections indicate a site (or part of a site) will be below the adjacent level of the sea during a 1% AEP storm tide on top of a 2m of sea-level rise, a likelihood of 'Possible' is allocated.	**Uncertainties and variations in the rates of VLM** The NZ SeaRise Programme has published rates of VLM for locations every 2 km around the New Zealand coastline. These rates of VLM are averages of all the VLM estimates within 5 km of the averaging location. Error estimates and the maximum and minimum VLM estimate are provided for each average VLM rate. In Tasman and Golden Bays the error estimates range from 0.62 mm/year near Puponga, to a maximum of 2.86 mm/year near Tamatea Point. Over 100 years, these rates compound to an uncertainty of between 0.06-0.29 m. VLM rates have been averaged for sections of the coastline with broadly similar shoreline characteristics, storm inundation levels, and rates of VLM. However, in some areas local rates of VLM may be higher than the average rate used for the bathtub modelling. **Vertical uncertainties with the land elevations represented by the LiDAR elevation surface**	Coastal inundation hazards will be compounded by sea-level rise, storm surge, and wave action, resulting in increased flood depths, greater frequency of inundation, and reduced drainage performance. Coastal inundation may also interact with river flooding and groundwater rise, particularly in estuarine and low-lying coastal margins.

Natural Hazard	Column A **Screening criterion (include in assessment table when…)**	Column B **Data Sources**	Column C **Climate Change**	Column D **Likelihood**	Column E **Assumptions and limitations**	Column F **Compounding effects**
					This vertical uncertainty is typically ~0.15-0.20 m (e.g., LINZ 2020, 2022). **Uncertainties with projections of storm-tide and wave setup elevation** Storm-tide and wave setup values have been derived from the NIWA Coastal Calculator for Tasman and Nelson Districts for sections of the coast that have broadly similar shoreline characteristics and wave climate. The Coastal Calculator presents the central (best) estimate of storm-tide plus wave setup. The upper 95% confidence interval of the extreme wave analysis is typically 0.02-0.04 m greater than the central (best) estimate. Wave setup is calculated using an empirical relationship between beach slope and offshore significant wave height—wave setup is therefore highly sensitive to beach slope. For localities where the local beach slope is steeper than the representative beach slope used for that section of the coast local wave setup will be underestimated. **Omission of dynamic components of inundation from storms such as wave runup.** The bathtub modelling approach deliberately does not include dynamic components of inundation from storms such as wave runup and overtopping of seawalls or structures at the coast. Wave runup is principally of concern to locations close to the coastline. However, when considering a 100-year timeframe out to the year 2130, it is not clear where the coastline may be at 2130. For areas close to the coastline at 2130, the static bathtub water level will therefore underestimate susceptibility to inundation during coastal storms.	
Coastal erosion	The site is adjacent to the coastal marine area and coastal erosion is plausible based on available datasets and professional judgement. Where a site is coastal-adjacent but local conditions indicate	Staff knowledge of coastal erosion.	No information available as Council has not undertaken future projections of coastal erosion rates for the Tasman district.			Coastal erosion is expected to be accelerated by sea-level rise, increased storm intensities, and coastal inundation, leading to shoreline retreat over time. Erosion processes may undermine land stability and increase exposure to coastal inundation and flooding,

Natural Hazard	Column A **Screening criterion (include in assessment table when…)**	Column B **Data Sources**	Column C **Climate Change**	Column D **Likelihood**	Column E **Assumptions and limitations**	Column F **Compounding effects**
	negligible erosion hazard (e.g., sheltered coast / bedrock shoreline), this is noted in the hazard description.					particularly where development is close to the coastal margin.
Active fault rupture	The site is intersected by an active fault, or faults considered to be capable of rupture, based on BECA's 2021 review of Tasman's active faults and/or published geological mapping. The assessment includes faults not currently mapped in TRMP layers.	TRMP Fault Rupture Risk Area as shown on the TRMP planning maps. Active fault information from Beca Review of Active Earthquake Faults in the Tasman District Published geological maps.	Not applicable	The likelihood of fault rupture is based on the recurrence interval information for the respective faults available in Table 4.1 of the Beca Review of Active Earthquake Faults in the Tasman District – Methodology Report.	Fault line assessment only considers development close to or straddling the faultline. General ground shaking associated with an earthquake is addressed through the Building Act 2004.	Fault rupture and associated ground shaking may trigger landslides. In coastal or near-coastal settings it may result in liquefaction and/or land subsidence. Where fault rupture extends offshore it may result in tsunami s.
Liquefaction	The site is within (or partly within) areas mapped as "liquefaction damage is possible" based on regional liquefaction susceptibility mapping.	Regional liquefaction susceptibility mapping from Beca Tasman Regional Liquefaction Assessment (2021).	Not applicable	Liquefaction likelihood is tied to earthquake shaking frequency, recognising local and regional sources; Beca's Tasman Regional Liquefaction Assessment 2021 identified that the Tasman district is likely to experience liquefaction under a 475-year return period earthquake.	Liquefaction susceptibility mapping provides district-scale indication. Local variability in near surface strata may produce isolated pockets of greater liquefaction susceptibility, which would be resolved through site investigation at later stages of the development process.	Liquefaction by definition will be associated with earthquake ground shaking. The effects of liquefaction may be compounded by high groundwater levels, flooding, or coastal inundation, which increase soil saturation and susceptibility.
Tsunami	The site is within (or partly within) tsunami evacuation zones (yellow/orange/red), which are used as a proxy for tsunami hazard exposure.	Tsunami evacuation zone mapping from GNS Tsunami modelling and evacuation zone mapping for Tasman and Golden Bay (used as a proxy for tsunami hazard exposure).	No information available as Council has not undertaken future projections for tsunami hazards for the Tasman district.	Tsunami likelihood is derived from the expected frequency of their source earthquakes. Local, regional and distant earthquake sources are considered. Based on the evacuation zone mapping, the likelihood of a tsunami impacting the yellow evacuation zone areas were considered to be 'very rare' (very long recurrence interval) events, and orange evacuation zone areas by 'rare' events. None of the PC81 sites were located in the red evacuation zones.	Tsunami hazard is assessed using evacuation zone maps as the best available proxy (recognising these reflect evacuation planning) and have been used to differentiate relative tsunami exposure and likelihood bands. Overall, the tsunami hazard in the Tasman district is assessed as lower than in many other parts of New Zealand due to the region's geographical setting, relative sheltering from major tsunami source areas, and the attenuated effects of distant-source tsunami by the time they reach Tasman and Golden Bays. While tsunami cannot be ruled out and residual risk remains, events capable of causing significant inundation are rare and characterised by very long recurrence intervals. On this basis, tsunami risk is not considered to be of a nature or scale that would, in itself, prevent or inhibit development at a plan level. Life safety is managed primarily through emergency management, evacuation planning, and	Tsunami impacts may be compounded by high tide, storm surge, or coastal inundation.

Natural Hazard	Column A **Screening criterion (include in assessment table when…)**	Column B **Data Sources**	Column C **Climate Change**	Column D **Likelihood**	Column E **Assumptions and limitations**	Column F **Compounding effects**
					site-specific responses at later stages of the development process.	
Wildfire	The NPS-NH does not include wildfire as a natural hazard requiring management under the NPS, likely due to the complexity of determining a hazard level. Commentary has been included for particular sites where there may be an increased likelihood of wildfire, however a NPS-NH risk assessment has not been undertaken.	Based on staff knowledge using the criteria of • areas of dense fire-prone vegetation (e.g. pine forest, kanuka, manuka or other expansive flammable species) • hilly areas (where fire spreads quicker) • locations that have limited or single access as advised by FENZ following the Pigeon Valley Fire in 2019.	No information available as Council has not undertaken future projections for wildfire for the Tasman district.	N/A	Wildfire can potentially occur anywhere across the Tasman district, however there are some communities that are particularly vulnerable (based on the criteria set out under Data Sources).	Wildfire may be compounded by drought conditions, strong winds, and steep terrain, increasing fire intensity and spread. Post-fire loss of vegetation can increase susceptibility to flooding, erosion, and slope instability during subsequent rainfall events.

Appendix 2 – Assessment table template

Site Identifier:

Current and proposed zoning: (Step 1)

Hazard maps: (Step 1)

Natural hazard comment: (Step 1)

Stormwater comment (where relevant):

Site hazard assessment

Step 2	Step 3 NPS-NH 3.2 (1)(a)	Step 4 NPS-NH 3.2 (2)(a)	Step 5 NPS-NH 3.2 (1)(b)		Step 6 NPS-NH 3.2 (1)	Step 7 NPS-NH 3.2 (2)(a)	Step 8 NPS-NH 3.3 (3)	Step 9 NPS-NH 3.2 (1)(b)		Step 10 NPS-NH 3.2 (1)	Step 11 NPS-NH 3.2 (2)(b)	Step 12 NPS-NH 3.3 (3)	Step 13 NPS- NH 3.4 (1) & (2)
Hazard	**Likelihood (NPS Table 1)**	**Existing mitigation**	**Consequence (NPS Table 2) assessment based on existing mitigations**		**Risk level (NPS matrix)**	**Potential mitigation measures (plan-level assumptions)**	**Cost rating of potential mitigation measures**	**Consequence (NPS Table 2) assessment based on existing and potential mitigations**		**Risk level (NPS matrix)**	**Residual risk comment**	**Is the cost of potential mitigations proportionate to the level of risk?**	**Notes**
			Damage to property	**Potential for injury or fatalities**				**Damage to property**	**Potential for injury or fatalities**				
e.g. Flooding													
e.g. Coastal inundation													
Overall Comment: (Step 14)													