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Climate Change Resilience for Homestar Homes

Technical Guidance for Climate Change Risk Assessment & Adaptation Planning for Homestar Homes

homestar

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1.0 Introduction

This technical guidance has been developed to support project teams in applying the New Zealand Green Building Council (NZGBC) Climate Change Resilience for Buildings and Homes Guidance to meet the requirements of the Homestar v5.1 Credit LV5 – Adaptation and Resilience.

This technical guidance for Homestar should be read in conjunction with the Homestar Technical Manual and the NZGBC Climate Change Resilience in Buildings & Homes: Guidance for Climate Change Risk Assessment & Adaptation Planning document.

The NZGBC Climate Change Resilience for Buildings and Homes document sets out a four-stage process to carry out a climate change risk assessment and develop an adaptation plan for a building or home in New Zealand. It is consistent with both 'Arotakenga Huringa Āhuarangi: A Framework for the National Climate Change Risk Assessment for Aotearoa New Zealand'[1] and 'He kupu ārahi mō te aromatawai tūraru huringa āhuarangi ā-rohe A guide to local climate change risk assessments'.[2]

1.1 Purpose of this technical guidance

The purpose of this guidance for Homestar projects is to translate the framework and tools provided in the NZGBC Climate Change Resilience for Buildings and Homes document to support project teams to meet the requirements of Homestar Credit LV5 – Adaptation and Resilience.

Homestar v5.1 offers two pathways of compliance for Homestar Credit LV5 - Adaptation and Resilience. A basic approach is available through the completion of an NZGBC supplied climate change checklist. This can be completed by a designer, architect, or Homestar Practitioner. The second, more comprehensive pathway requires a detailed report from a suitably experienced professional. The guidance in this document is particularly relevant to project teams taking the second approach.

This technical guidance was developed to reduce the risk for Homestar project teams that pursue the Adaptation and Resilience Credit. Through engagement with Homestar users and assessors, it was determined that transparency is one of the most important aspects to successfully meet the requirements of the Homestar Adaptation and Resilience Credit. Project teams are strongly encouraged to transparently demonstrate how climate change risks are identified and addressed throughout a project's lifecycle.

It seeks to provide clear technical guidance for completing the climate change checklist, undertaking a climate change risk assessment, and developing a climate adaptation plan in a manner that satisfies Homestar credit requirements. It clarifies the minimum expectations for climate change data, hazards, risk elements, and evidence required for credit achievement.

2.0 Homestar Credit Requirements

The Homestar Adaptation and Resilience Credit seeks to ensure that homes have been designed and constructed to respond and adapt to changing conditions and extreme weather events over their anticipated lifespan.

The structure and requirements of the credit are summarised in Table 1 below.

As described in the submission guidelines for Homestar, if a project meets the requirements for the full 2 point Credit Achievement (completion of an in-depth climate risk report and adaptation plan), then the requirement

[1] Ministry for the Environment. 2019. Arotakenga Huringa Āhuarangi: A Framework for the National Climate Change Risk Assessment for Aotearoa New Zealand. Wellington: Ministry for the Environment.

[2] Ministry for the Environment. 2021. He kupu ārahi mō te aromatawai tūraru huringa āhuarangi ā-rohe / A guide to local climate change risk assessments. Wellington: Ministry for the Environment.

to complete the climate change checklist is considered to have been met. i.e., The project team is not required to submit a climate change checklist.

Table 1: Homestar Credit LV5 Adaptation and Resilience overview

Name	Adaptation and Resilience
Outcome	Evaluate and prepare solutions that address the home's capacity to respond and adapt to changing conditions and extreme weather events.
Credit Criteria	
Credit Achievement 1	Up to two points are available where the project team has identified climate risks and implemented at least two solutions to either prevent and/or mitigate the risks of climate change to support adaptation and resilience. The project team must complete a simplified climate change checklist to identify climate change risks. Points Available: 0.5 OR The project team must complete an in-depth report identifying climate risks and provide a building specific adaptation plan Points Available: 1
Credit Achievement 2	At least two adaptation solutions have been implemented that specifically address any high or extreme climate change risks identified in the risk assessment component of the adaptation plan. Points Available: 1
Additional Information	
Related Credits	• Energy Use (EF4). • Site Water & Ecology (EN5). • Eco-Friendly Living (LV3).
SDG Alignment	• Goal 11: Sustainable Cities and Communities. • Goal 13: Climate Action.

2.1 Homestar Credit alignment with the risk assessment and adaptation planning process

The NZGBC Climate Change Resilience for Buildings and Homes document sets out a four-stage process to carry out a climate change risk assessment and develop an adaptation plan for a building or home. Figure 1 below shows the alignment between the four NZGBC guidance stages and the requirements for the Homestar Adaptation and Resilience Credit.

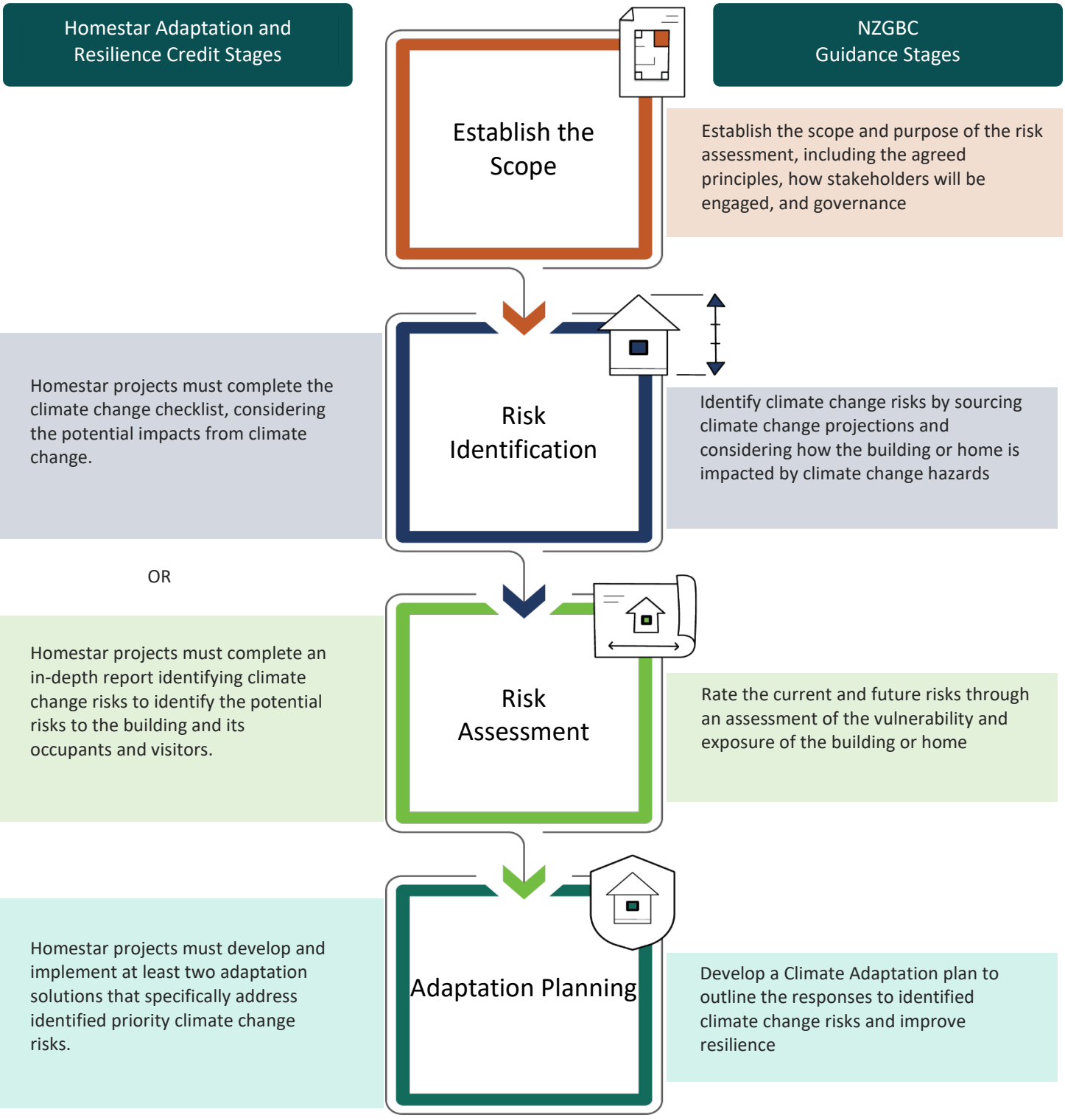

Figure 1: Alignment between the NZGBC Climate Change Resilience for Buildings and Homes document stages and Homestar Buildings Credit 16 Climate Change Resilience requirements

3.0 Adaptation and Resilience Credit Stages

3.1 Climate change checklist or in-depth climate risk report

Climate change checklist

The climate change checklist is intended to prompt early consideration of climate change risks and adaptation actions in a project. Completion of the checklist is required for projects to achieve 0.5 points for the climate change risk credit criteria.

Project teams must indicate 'Yes' or 'No' in the Pre-screening Checklist and not leave any rows blank. This is where the project identifies if the risk is relevant to the project. If 'Yes' is indicated for a question, project teams are expected to insert a note providing further explanation to the question.

In the checklist, project team members must consider potential impacts from climate change when completing the checklist in their submission form. The potential impacts to consider when responding to the checklist include, but are not limited to:

- The exposure of the building to flood areas, coastal inundation areas, and areas with potential bushfire risk. For example, buildings located in close proximity to the coast or flood plains.
- Climate hazard impacts to surrounding areas, such as building users being unable to safely enter or leave the site due to landslide.
- Direct damage or failure of building components, such as roof damage due to flooding from internal gutters.
- Accelerated deterioration of building components or reduced design life. For example, increasing rate of deterioration of rubber seals on windows resulting in a short lifespan.
- Impacts to the health and wellbeing of building occupants and visitors. For example, increased risk of heat stress due to high temperatures.
- Indirect risks from impacts to other interdependent systems and services (e.g. transport networks, power, water, telecommunications). For example, loss of electricity due to impacts on the local network infrastructure during extreme winds.

Both historic and future climate change and hazard data should be used when completing the checklist.

Appendix A of this technical guidance provides an example of responses that are suitable to meet the expectations of the climate change checklist for Homestar projects.

In-depth climate risk report

Alternatively, to achieve the full one point for the climate change risk credit criteria, a Homestar project team can choose to complete an in-depth report identifying climate risks providing a building specific adaptation plan. This must be completed by a suitably qualified professional using a recognised methodology.

If a Homestar project team chooses to complete an in-depth climate risk report, then they are not required to complete the climate change checklist.

To comply with Homestar requirements, the in-depth climate risk report must contain at a minimum, the following information:

- A summary of the building's characteristics (site, location, climatic characteristics).
- A summary of locally relevant climate change projections and associated hazards (noting the minimum requirements for climate change scenarios, timeframes, and hazards detailed in the previous section). For example, relevant climate change projections may include average temperature

changes, extreme temperature changes (i.e. number of hot days), extreme rainfall depth changes (e.g. 1% AEP 24-hour rainfall depth), and coastal hazards such as relative sea-level rise and coastal erosion.

- Identification of the potential risks to the building and its occupants and visitors, such as direct damage, accelerated deterioration, or failure of building components, and impacts on health and wellbeing of occupants and visitors.
- A list of actions and responsibilities for all 'high' and 'extreme' climate change risks identified.
- Details of stakeholder consultation that was undertaken during plan preparation and how the issues raised have been incorporated.

The in-depth climate risk report should include a register of risks to the building and related elements, capturing the risk ratings, justifications for ratings, and related treatment options for 'high' and 'extreme' climate change risks.

Using the NZGBC Guidance for the climate change checklist or in-depth report

Section 3.0 Identifying Climate Change Risks in the NZGBC Climate Change Resilience for Buildings and Homes document provides Homestar users with support to complete the climate change checklist and begin an in-depth climate risk report. Like the checklist, the Risk Identification stage seeks to prompt early consideration of a building's likely climate change risks. In this stage, the user will identify the local climate hazards for their project area and assess these against the potential elements at risk in the building.

The 'Climate Change Risk Identification Matrix' example template provided in the 'Climate Change Risk & Adaptation Workbook' can be used to identify potential climate change risks and inform a Homestar user's response in the climate change checklist.

Section 4.0 Assessing Climate Change Risks in the NZGBC Climate Change Resilience for Buildings and Homes document provides Homestar users with support to complete a climate change risk assessment. This can be used as the basis for the in-depth climate risk report required to achieve the Homestar credit. The risk assessment stage assigns risk ratings to the identified climate change risks, taking into account each of the climate change scenarios and timeframes required for the risk assessment.

The 'Climate Change Risk Assessment Register' example template provided in the 'Climate Change Risk & Adaptation Workbook' can be used to document and detail the identified climate change risks for Homestar users.

- Homestar credit achievement requirements to observe #1: Selecting climate change scenarios and timeframes

  Homestar requires that project teams must use at a minimum Representative Concentration Pathway (RCP) 8.5 as specified in the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report or any newer version (e.g. SSP3-7.0), at two time horizons (e.g. 2050 and 2100) that are relevant to the project's lifespan.

  The NZGBC Climate Change Resilience for Buildings and Homes document contains information of the climate change resources publicly available to support a climate change risk assessment and adaptation planning process.

  The project must justify in the in-depth climate risk report the selection of the climate change projections and RCP (or SSP) scenario used (noting RCP 8.5 or equivalent as a minimum should be used). Project teams are strongly encouraged to use SSP3-7.0 in lieu of RCP 8.5 where able.

- Homestar credit achievement requirements to observe #2: Climate change hazards to consider

  Homestar requires that project teams must consider at a minimum, but not limited to, the following climate change hazards:

- Sea-level rise and coastal inundation.
- Increase in rainfall and flooding.
- Solar radiation.
- Temperature increase (including heat island effect).
- Extreme weather conditions (including wind and storms).
- Subsidence or ground movement.
- Groundwater rise and potential for increased liquefaction vulnerability.
- Increase in potential for fire weather and drought.

These climate change hazards are included in the 'Climate Change Risk Identification Matrix' example template provided in the 'Climate Change Risk & Adaptation Workbook'. Section 3.0 Identifying Climate Change Risks in the NZGBC Climate Change Resilience for Buildings and Homes document provides further guidance for understanding and sourcing information for these climate change hazards.

For transparency, where a climate change hazard listed above is assessed as not posing a potential risk to any building element, Homestar users should provide comments explaining the rationale in the space provided.

For example, where a building is not located near the coast, or is located on flat ground with no potential for landslide, these features should be explained. Similarly, for flood risk, if the specific design of the building or site has resulted in reducing or removing the flood hazard, then this should be clearly explained. This will support the Homestar assessor to ensure that mandatory climate change hazards have not been overlooked.

- Homestar credit achievement requirements to observe #3: Using a recognised risk assessment approach

  For the Homestar credit, the following recognised approaches can be used to undertake the risk assessment:

  - Ministry for the Environment, 2021: A Guide to Local Climate Change Risk Assessments.
  - Australian Standard 5334:2013: Climate change adaptation for settlements and infrastructure - A risk based approach.
  - Australian Greenhouse Office, 2006: Climate Change Risks and Impacts: A Guide for Government and Business.

  The NZGBC Climate Change Resilience for Buildings and Homes document is consistent with the Ministry for the Environment 2021: A Guide to Local Climate Change Risk Assessments.

- Homestar credit achievement requirements to observe #4: Using a suitably qualified professional

  A suitably qualified professional is required to develop a project-specific Climate Change Risk Assessment and develop a project-specific Climate Change Adaptation Plan. For the purposes of this Homestar credit, a suitably qualified professional is defined as someone in a relevant field such as Environmental Science, Environmental Engineering, Planning or similar qualification, with at least three years' practical experience in climate change risk assessments, or an individual supervised by a suitably qualified practitioner or a business with verified practitioner capability.

3.2 Climate adaptation plan and solutions

To fully achieve the one credit point for the climate adaptation criteria in the Homestar Adaptation and Resilience credit, a project-specific climate adaptation plan must be developed and implemented. A climate adaptation plan should outline the responses to identified priority risks for the building.

To comply with Homestar requirements, a climate adaptation plan must include at least two solutions that have been implemented, that specifically address any 'high' or 'extreme' rated climate change risks identified in the risk assessment. A climate adaptation plan should contain the following information:

- A risk register of all potential 'high' and 'extreme' climate change risks identified to the building and its occupants and visitors.
- Specific adaptation design responses for at least two risks identified as 'high' or 'extreme', and associated responsibilities for action.
- Strategies to ensure the implementation of other design specific adaptation measures are delivered upon.
- Details of stakeholder consultation that was undertaken during preparation of the Climate Adaptation Plan and how the issues raised have been incorporated.

If no 'high' or 'extreme' risks are identified, then this would indicate the building has been designed to an appropriate standard of climate resilience. The justifications for risk ratings should be captured within the risk assessment to provide the necessary evidence required for this Homestar credit. In this instance, no adaptation design responses will be required.

Justifications should be technically accurate and detailed. For instance, while a hypothetical building is projected to be exposed to impacts from extreme rainfall in the future, its gutter systems have been designed suitably to cope with the appropriate extreme rainfall event (e.g. a 1% AEP 24-hour rainfall), with an allowance for climate change reflecting SSP3-7.0 at end of life.

- For example, "future rainfall intensities for the 1 in 100 year storm (1% AEP) are predicted to be 125mm/hour at 50 years (i.e. the buildings lifespan). The buildings gutters have a lifespan of 25 years and have been designed to manage up to 112mm/hour. Long-term risk is assumed reduced due to replacement gutters having the capacity for the next 25 years based on the equivalent of SSP3-7.0 projections at that time. This information will be transferred to the homeowner upon completion."

Using the NZGBC Guidance for a climate change risk assessment

Section 5.0 Adaptation Planning in the NZGBC Climate Change Resilience for Buildings and Homes document provides Homestar users with support to develop a climate adaptation plan. The adaptation planning stage uses the outcomes from the risk assessment to form a climate change adaptation plan for a building.

The 'Climate Adaptation Plan' example template provided in the 'Climate Change Risk & Adaptation Workbook' can be used to document and detail the responses to identified priority risks for the building.

4.0 Homestar Submission Content

Submissions for the Homestar Adaptation and Resilience Credit must contain both the Homestar climate change checklist and/or evidence to support claims made in the submission.

The example templates provided in the 'Climate Change Risk & Adaptation Workbook' from the NZGBC Climate Change Resilience for Buildings and Homes document can be used to evidence a climate change risk assessment and adaptation planning process, however other project specific information must be provided by the project team to meet credit requirements. Table 2 below provides an overview of where 'Climate Change Risk & Adaptation Workbook' example templates can be used to evidence claims made in a Homestar submission.

Table 2: Overview of where 'Climate Change Risk & Adaptation Workbook' example templates can be used to support Homestar submission evidence recommendations.

Recommended evidence	Do the templates meet evidence requirements?	Further information
Completed & signed climate change checklist.	Excluded	Homestar users must use the climate change checklist provided in the Homestar v5 Calculation Tool.
Provide an in-depth report identifying climate risk and building-specific adaptation plan and relevant evidence supporting claims in the report.	In Part	The templates provided in the Climate Change Risk & Adaptation Workbook can use used to document and detail a climate change risk assessment process and adaptation plan action. However, an evidence submission should be supported by additional project specific information, including detail of the climate change projection data used, risk assessment matrix, and any assumptions or project specific context important to the risk and adaptation outcomes.
Climate Adaptation Plan (or relevant extracts) demonstrating the compliance.	In Full	The Climate Change Risk Register and Climate Adaptation Plan templates provide space for users to detail existing and proposed risk controls, treatments, and track adaptation performance.
Drawings and specifications demonstrating design responses to the Climate Adaptation Plan.	Excluded	Additional project specific information should be provided to meet this evidence requirement.
Commissioning report or other technical document demonstrating design responses to the Climate Adaptation Plan.	Excluded	Additional project specific information should be provided to meet this evidence requirement.

Appendix A: Homestar Climate Change Checklist Example Response

Table 3: Example response for the Homestar climate change checklist

Climate Change Pre-screening Checklist Criteria	Criteria response Yes/No	Comments If answered yes, provide further explanation
Have future climate change projections for the project location been reviewed based on relevant national or local climate projections?	Yes	A climate change risk assessment was undertaken in early 2026 using SSP3-7.0 for Auckland over three time horizons; present day-2040, 2041-2060, and 2081-2100. Future climate change projections that have been reviewed include temperature, rainfall, flooding, groundwater, coastal inundation, wind, and storms. Details of the climate change projections have been presented to the Client to clearly show the projected changes within the building lifespan as presented on pages 8-12 of this document.[3]
Has the project area been impacted previously by extreme climate events? Please indicate which events.	Yes	In January 2023 (Auckland Anniversary Weekend floods), the building's garage was flooded due to excess surface water. This event was a 1 in 200 year storm event (0.5% AEP). Flooding during extreme weather events has been highlighted as an ongoing risk to the project, however adaptation measures were implemented as detailed in the response to the adaptation options question below.
Is the project located in or adjacent to a flood plain or flood prone area?	Yes	The project is located inside the council mapped 1% AEP flood plains and overland flow paths (including modelled climate change scenarios). Please refer to page 9 of this document for images.[4]

Climate Change Pre-screening Checklist Criteria	Criteria response Yes/No	Comments If answered yes, provide further explanation
Is the project located adjacent to the coastline, tidally influenced waterway, or within an area with	Yes	The project is not located adjacent to the coastline or a tidally influenced waterway. It is located in an area with high groundwater levels due to poor ground drainage, which means it is at increased risk of flooding during heavy rainfall events. This has been presented to the Client as a risk to the

[3] This is an example only - these pages have not been provided here. This demonstrates that project teams may provide project specific information on the climate change projections including relevant information reports, images, and maps.

[4] This is an example only – these pages have not been provided here. This demonstrates that project teams may typically present any images backing up the claim made in this table.

potential for high or tidally influenced groundwater levels?		building during future heavy rainfall events, in line with the flooding seen during Auckland Anniversary Weekend floods.
Is the project located in an area with potential bushfire risk?	No	No, the project is located at an inner city site with a very low bushfire risk.
Have other possible hazards been considered? (i.e. earthquake, landslide, extreme wind)	Yes	Other relevant hazards considered for this project include extreme wind, landslide, and earthquake. The site is not located on steep land, and no active or mapped landslip features have been identified, so landslide risk is considered low. The project is, however, exposed to strong wind and storm events, which may increase in intensity over the building lifespan. Potential impacts include damage to roof cladding, rain penetration around openings, and disruption to site access during severe weather. These hazards have been highlighted to the Client and considered in the design response.
Have risks to the building elements, operation, or occupants been identified?	Yes	High intensity rainfall has been identified as having potential to impact gutter and onsite drainage. Damage or failure of these systems could lead to damage of the building, impact on its function, and health and wellbeing of occupants and visitors. Flooding around the building could restrict the buildings function as occupants and visitors are unable to access or leave the building. Projected increases in average temperatures, of up to 3.8 °C by the end of the century, at this site could lead to: • Increased risk of overheating to occupants and visitors. • Risk of HVAC capacity mismatch leading to reduce efficiency and premature system failure. • Faster deterioration of building elements. • Increase risk of planting failure, even with local natives.

Climate Change Pre-screening Checklist Criteria	Criteria response Yes/No	Comments If answered yes, provide further explanation
Have adaptation options been identified for any key risks? If yes, please describe design or operational measure.	Yes	Drainage design has been undertaken to allow for future rainfall under a high warming scenario SSP3-7.0. Floor level freeboard has been set at 500mm above 1% AEP (including climate change) event and 300mm bunding has been included to the landscape design near garage and parking areas. This is adequate to manage the 157mm rainfall in 24 hours (SSP3-7.0, 1% AEP rainfall event). All overland flows are managed to flow away from the building. Foundations have

		been designed for the local ground conditions including groundwater heights. Other potential adaptation measures have been highlighted to the Client, based on the hazards identified but none implemented. These include: Heavy rainfall/flooding: • Increase in gutter and downpipe capacity suitable for their lifetime. • Planting that is resistant to damage and disease due to waterlogged ground and can support stormwater management. Overheating: • Lighter roof colour. • Increase in building and landscape shading to mitigate overheating risk. • Use of materials that can remain robust in elevated temperatures. • Canopy coverage in landscaping to reduce risk of heat island and lower localised temperatures.
Has the project considered alternative provisions to basic human needs? (i.e. access to potable water, electricity, etc. in a climate event)	Yes	The project has considered alternative provisions to support basic human needs during a climate event, particularly short-term loss of potable water, electricity, and access during heavy rainfall events. The building includes rainwater storage for non-potable use, and the Client has been advised to maintain an emergency potable water supply for occupants. The design also provides for passive survivability through operable windows for natural ventilation, external shading, and building layout that supports acceptable indoor conditions during temporary power outages.

Climate Change Pre-screening Checklist Criteria	Criteria response Yes/No	Comments If answered yes, provide further explanation
Will the project accommodate occupants who may be vulnerable to the impacts of climate extremes? (e.g. children, elderly, low mobility, seeking medical treatment). Please indicate potential groups of vulnerable occupants and which hazards they are likely exposed to.	Yes	The building is designed to be accommodating to low mobility occupants and visitors within the design. The project has been designed to support accessible use which may include those with low mobility. Flooding poses the greatest risk to these building occupants, particularly for low mobility occupants and users to access and exit the site.

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