STUDENT CENTRE AND LIBRARY - UNIVERSITY OF AUCKLAND
AUCKLAND, NZ

PEDESTRIAN WIND ASSESSMENT

RWDI # 2606217

12 NOVEMBER 2026

SUBMITTED TO

University of Auckland
Level 8, 49 Symonds Street
Auckland 1010

SUBMITTED BY

RWDI Australia Pty Ltd
Suite 23.02, 1 Oxford Street,
Surry Hills NSW 2010
ABN 86 641 303 871

rwdi.com

© 2026 RWDI Australia Pty Ltd ("RWDI") ALL RIGHTS RESERVED
This document is intended for the sole use of the party to whom it is addressed and may contain information that is privileged and/or confidential. If you have received this in error, please notify us immediately. Accessible document formats provided upon request.
® RWDI name and logo are registered trademarks in Canada and the United States of America

DOCUMENT CONTROL

Version	Status	Date	Prepared By	Reviewed By
A	Initial	12 October 2026	RL	AMC
B	Update for wind conditions with inclusion of vegetation	27 October 2026	AMC	JL
C	Update for comments	30 October 2026	AMC	JL
D	Update for initial Council comments	12 November 2026	AMC	JL

NOTE

The information contained in this document produced by RWDI is solely for the use of the client identified on the front page of this report. Our client becomes the owner of this document upon full payment of our **Tax Invoice** for its provision. This document must not be used for any purposes other than those of the document's owner. RWDI undertakes no duty to or accepts any responsibility to any third party who may rely upon this document.

We understand and agree that our client will submit this report as part of an application under the Fast-track Approvals Act 2024 and that an Expert Consenting Panel as the consenting authority will use this report for the purposes of assessing that application.

QUALITY ASSURANCE

RWDI Australia Pty Ltd operates a Quality Management System which complies with the requirements of AS/NZS ISO 9001:2015. This management system has been externally certified by SAI Global and Licence No. QEC 13457 has been issued for the following scope: The provision of consultancy services in acoustic engineering, air quality and wind engineering; and the sale, service, support and installation of acoustic monitoring and related systems and technologies.

1. INTRODUCTION

RWDI Australia Pty Ltd (RWDI) was retained to undertake a pedestrian wind assessment of the proposed Student Centre and Library at the University of Auckland in Auckland, NZ. The development site is bounded by Princes Street to the west, Alfred Street to the north, and the Tē Tūātea open public space to the south. The location of the site within its broader existing surrounding context is shown in Image 1.

The Proposed Development comprises a eight level building, including two basement levels and six above-ground levels, with rooftop plant in addition. The development will accommodate a range of student services including social and event spaces and a new contemporary library with supporting infrastructure. The development will include multiple access points from Princes Street, Alfred Street and the Tē Tūātea with a connecting bridge to Kate Edger Information Commons. Smaller outdoor breakout spaces are proposed on Levels 1 & 2 and larger outdoor terraces are located on Levels 4 & 5 along the western aspect. Image 2 shows the west elevation of the development.

This desk-based report discusses the potential impacts of the massing of the Proposed Development on the local wind microclimate and assesses the outdoor wind comfort based on the usability of spaces. The findings of the report are informed by Computational Fluid Dynamics (CFD) simulations for the prevailing wind directions that show the likely wind flow patterns around the proposed massing. Conceptual wind control measures and design advice have also been provided, where necessary, to alleviate any predicted adverse wind conditions.

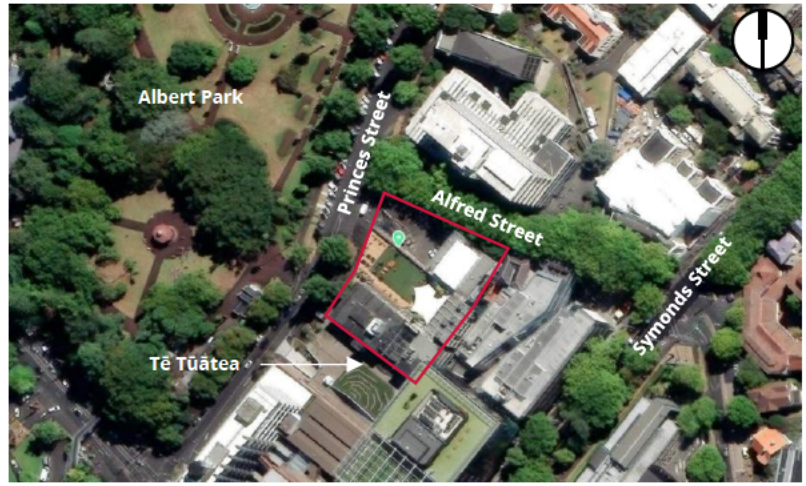

Image 1: Project Location and Surrounding Context
Source: Nearmap

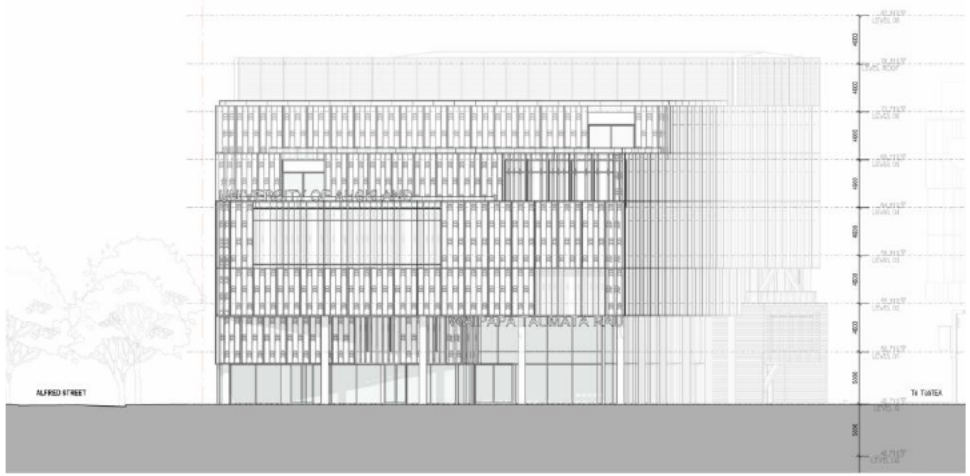

Image 2: West Elevation

2. BACKGROUND AND METHODOLOGY

2.1 Objectives and Scope

The objective of this assessment is to provide an evaluation of the wind comfort conditions around the Proposed Development site using a 1:1 scale computational model. Predicting outdoor wind conditions is a complex process that involves the combined assessment of building geometry, orientation, position and height of surrounding buildings, upstream terrain and the local wind climate. Computational Fluid Dynamics is a useful tool for this as it not only combines the impact of these various parameters but can also provide a visual reference for the merits of a particular design of the building.

This analysis was, therefore, based on the following:

- A review of the regional long-term meteorological data.
- Use of the Orbital Stack Direct, an in-house CFD tool, to provide numerical estimation of potential wind conditions around the site for the prevailing winds. The simulation models have been based on the information provided to RWDI during September 2026.
- RWDI's engineering judgement, experience, and expert knowledge of wind flows around buildings including wind tunnel studies undertaken for similar projects in the region.

Note that other microclimate issues such as those relating to cladding and structural wind loads, door operability, building air quality, noise, vibration, etc. are not part of the scope of this assessment.

2.2 CFD in Urban Wind Modelling

CFD is a numerical technique that can be used for simulating wind flows in complex environments. For this analysis, CFD techniques were used to generate a virtual wind tunnel where flows around the site and its surroundings were simulated in full scale. The computational domain that covered the site and its surroundings was divided into millions of small cells where calculations were performed, yielding a prediction of wind conditions across the entire study domain. CFD excels as a tool for wind modelling, presenting early design advice, comparing different design and site scenarios, resolving complex flow physics, and helping diagnose problematic wind conditions.

While the computational modelling method used in the current assessment does not explicitly simulate the transient behaviour of turbulent wind, its effects were estimated based on other calculated quantities. RWDI has found this approach to be appropriate for the assessment of typical wind comfort conditions. Wind safety issues, which relate to transient, higher-speed gusts, are discussed qualitatively, based on the CFD predictions and RWDI's extensive wind-tunnel experience for other projects in the area. In order to quantify the transient behaviour of wind and refine any conceptual mitigation measures, a more detailed assessment would be required using either boundary-layer wind tunnel or more detailed transient computational modelling.

2. BACKGROUND AND METHODOLOGY

2.3 Simulation Model

Wind flows were simulated using Orbital Stack, an in-house computational fluid dynamics (CFD) tool that has been validated using RWDI's historical wind tunnel test data and experience. Simulations were conducted for the following site configurations:

- Config 1: Proposed Development with existing surrounding building (see Image 3a)
- Config 2: Proposed Development with existing surrounding buildings and landscape (see Image 3b)

For this computational study, the 3D models were simplified to focus on elements most likely to influence local wind flows in and around the site (AWES Guidelines[1]). Hence, smaller architectural and accessory features on the surrounding buildings, were excluded from the model. Local topographic variations were modelled to account for the changes in the wind speeds that can occur due variations in terrain.

Note that for Config 2, the simulation model included a simplified representation of the existing landscape surrounding the site, including the established tree canopy within Albert Park. Based on a review of available satellite imagery, the larger trees surrounding the site were considered to be predominantly evergreen and were represented accordingly. While the shelter provided by individual trees will vary depending on species, foliage density, size and seasonal characteristics, research indicates that both deciduous and evergreen vegetation can provide meaningful reductions in wind speeds. On this basis, the adopted landscape representation is considered appropriate for the current assessment.

2.4 Methodology

Winds approaching from sixteen cardinal directions were simulated accounting for the effects of the atmospheric boundary layer and terrain impacts upwind of the project site. The wind field was assumed to be steady in time and, as such, the transient effects of strong wind gusts and vortex shedding was not included directly. Turbulence was modelled in the wind simulations by a Reynolds Averaged Navier-Stokes (RANS) approach using the k-epsilon (RNG) turbulence closure. These results were then combined with the meteorological data (Section 3) to determine the variation of wind speeds in the areas of concern at typical pedestrian chest height (i.e., 1.5 m above local grade). These conditions were then assessed against the wind criteria for pedestrian comfort (Section 4) and, the spaces were categorised accordingly.

The method for CFD simulation is consistent with internationally recognised good practice, and meets the requirements set out in the Australasian Wind Engineering Society Computational Wind Engineering Quality Assurance Manual (2024)[2].

Qualitative reviews have also been provided for the existing site based on past simulations and wind tunnel tests of neighbouring developments.

1. Australasian Wind Engineering Society (AWES), 2024, "Guidelines for Pedestrian Wind Effects Criteria".
2. Australasian Wind Engineering Society, QAM-3, 2024, "AWES Computational Wind Engineering Quality Assurance Manual".

Proposed Development
Existing Buildings

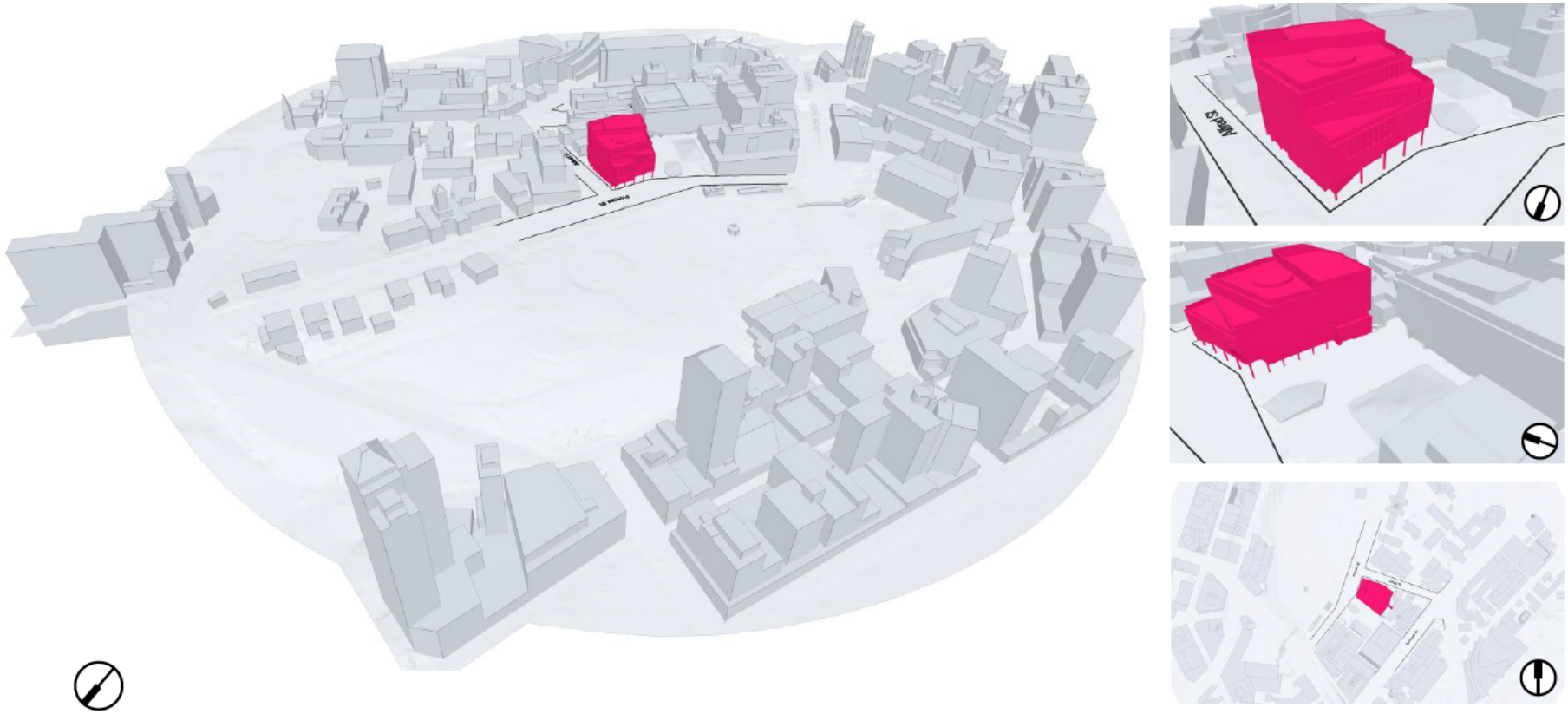

Image 3a: Computer Model of the Config 1
Proposed Configuration

Proposed Development
Existing Buildings
Landscape



Image 3b: Computer Model of the Config 2
Proposed Configuration with Landscape

2.5 Factors Affecting Wind Flows

In the discussion of wind conditions on and around the proposed development, reference may be made to the following generalised wind flows (see Image 4). If these building / wind combinations occur for prevailing winds, there is a greater potential for increased wind activity and uncomfortable or potentially unsafe conditions. Design details such as setting back a tower from the edges of a podium for a prevailing wind direction, deep canopies close to ground level, wind screens / tall trees with dense landscaping, etc. can help reduce high wind activity. The choice and effectiveness of these measures would depend on the exposure and orientation of the site with respect to the prevailing wind directions and the size and massing of the proposed buildings.

Conversely, in areas where higher wind velocities are desired for increased thermal comfort, design measures can be implemented to enhance wind flow. For instance, channels aligned with prevailing wind directions can be integrated into the design to promote increased wind infiltration in regions prone to stagnant conditions. Such measures are particularly beneficial in areas with generally milder wind climates and high humidity levels, such as those closer to the equator.

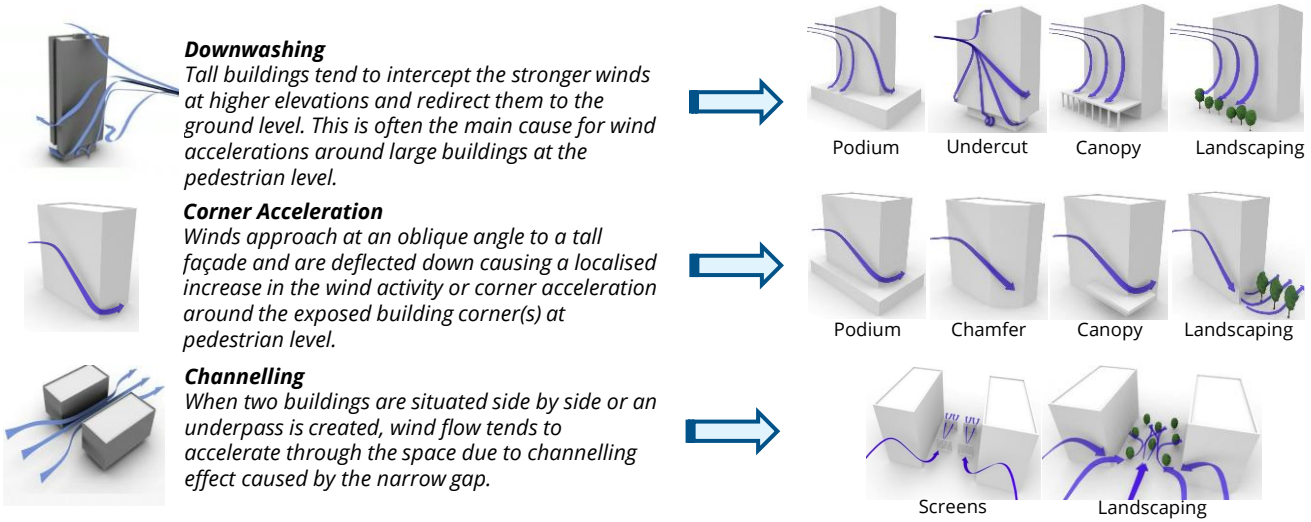

Image 4: General Wind Flow around Buildings with Examples of Common Wind Measures

3. METEOROLOGICAL DATA

Meteorological data recorded at Auckland International Airport from 1999 to 2023 were used to characterise the regional wind climate, including the frequency, direction and strength of winds relevant to the assessment. The distributions of wind frequency and directionality are shown in Image 5.

The records indicate that winds from the north-east and south-west sectors are common throughout the year. Strong winds, with mean speeds exceeding 10 m/s at a height of 10 m at the airport, also predominantly originate from these sectors and may contribute to uncomfortable or unsafe wind conditions, depending on local site exposure and the development design.

Note that the Auckland Airport wind records have not been applied directly at the development site. For the CFD simulations, direction-specific atmospheric boundary layer inlet profiles were used to account for the influence of upwind terrain and surface roughness surrounding the project site. The CFD simulations were then used to determine site-specific wind speeds, which were combined with the Auckland Airport meteorological record to establish the expected frequency and magnitude of winds at the site. The resulting wind conditions were subsequently assessed against the applicable pedestrian wind criteria discussed in Section 4.

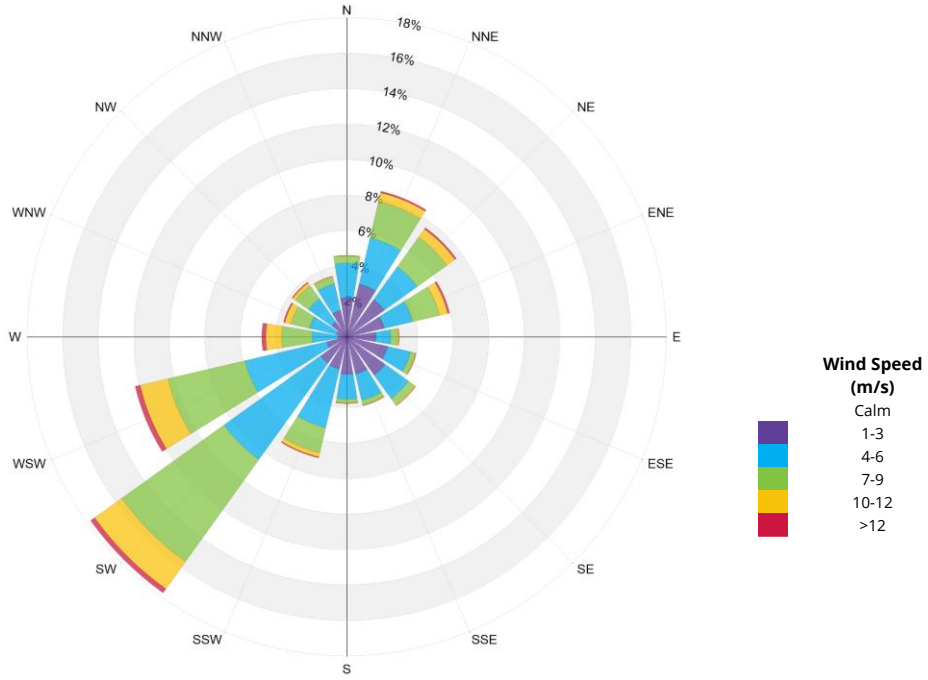

Image 5: Directional Distribution of Winds Approaching Auckland International Airport
Recorded from 1999-2023

4. PEDESTRIAN WIND CRITERIA

4.1 Pedestrian Wind Safety Criterion

Pedestrian safety is associated with excessive gusts that can adversely affect a pedestrian's balance and footing. If strong winds that can affect a person's balance (>25 m/s) with an annual exceedance of one hour per year occur, the wind conditions are considered severe. These are assessed qualitatively in the assessment and are usually coincident with areas of high wind activity as noted in the report.

4.2 Pedestrian Wind Comfort Criteria

The Auckland Unitary Plan (H8.6.28) contains wind related standards to facilitate a comfortable environment for designated pedestrian activities. The standards detail the requirements related to pedestrian wind comfort, with the objective of mitigating adverse wind effects generated by tall buildings exceeding 25 m in height. The standard requires that a new building must not cause mean wind speed around it to exceed the category for the intended use of the area (as set out in Image 4).

The wind comfort levels are categorised based on typical/intended pedestrian activity and are expressed in terms of their suitability for various levels of human activity. The categorisation is based on conservative wind speeds; higher the activity level, higher the wind speed one can typically tolerate while engaged in the activity. Note that wind conditions are assessed at a typical pedestrian chest height and are considered suitable for the intended use of the space if the associated mean winds are expected for at least 80% of the time. Wind control measures are typically required at locations where the occurrence frequencies of wind speeds exceed the threshold values for specific pedestrian activities.

Furthermore, note that these criteria for wind forces represent average wind tolerance and can be subjective with regional differences in wind climate and thermal conditions as well as variations in age, health, clothing, etc. also impacting and individual's perception of the wind climate. For a full assessment of comfort, a thermal comfort study is required.

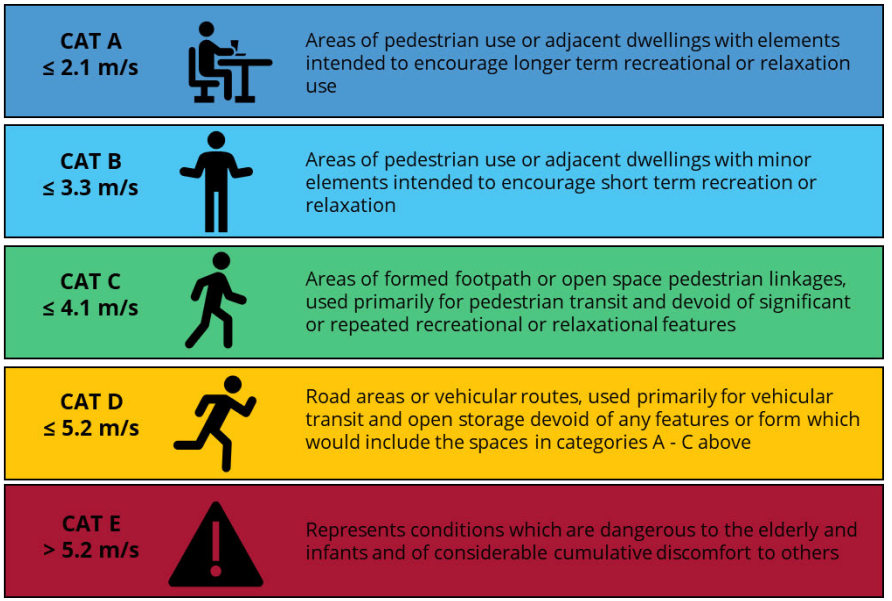

Image 6: Pedestrian Wind Comfort Criteria

5. RESULTS AND DISCUSSIONS

5.1 Existing Site Conditions (Qualitative Review)

The exposure of the site to regional prevailing winds is illustrated in Image 7 and discussed below:

1. The area to the immediate north and north-east comprises of the mid-rise existing University of Auckland General Library building, dense and established trees within Albert Park and Old Government House, and, further from the site, mid- to high-rise buildings within Auckland Central. These are expected to provide a significant reduction in winds approaching from the north-east sector.
2. Similar to the north-east sector, the winds approaching from south-west are expected to be buffered by the dense trees within Albert Park and the cluster of mid- to high-rise buildings within Auckland Central.

As noted above, the existing site is expected to be sheltered from prevailing winds due to surrounding buildings and dense vegetation within Albert Park. Hence, wind impacts within and around the existing site are expected to be low with conditions likely to be suitable for sitting to standing use (Categories A and B). Without considering the vegetation, higher winds can be anticipated and are likely to range from Categories A – B in more sheltered spaces to Categories C – D around corners of existing buildings such as the General Library. Wind speeds exceeding the comfort or safety limits are not expected.

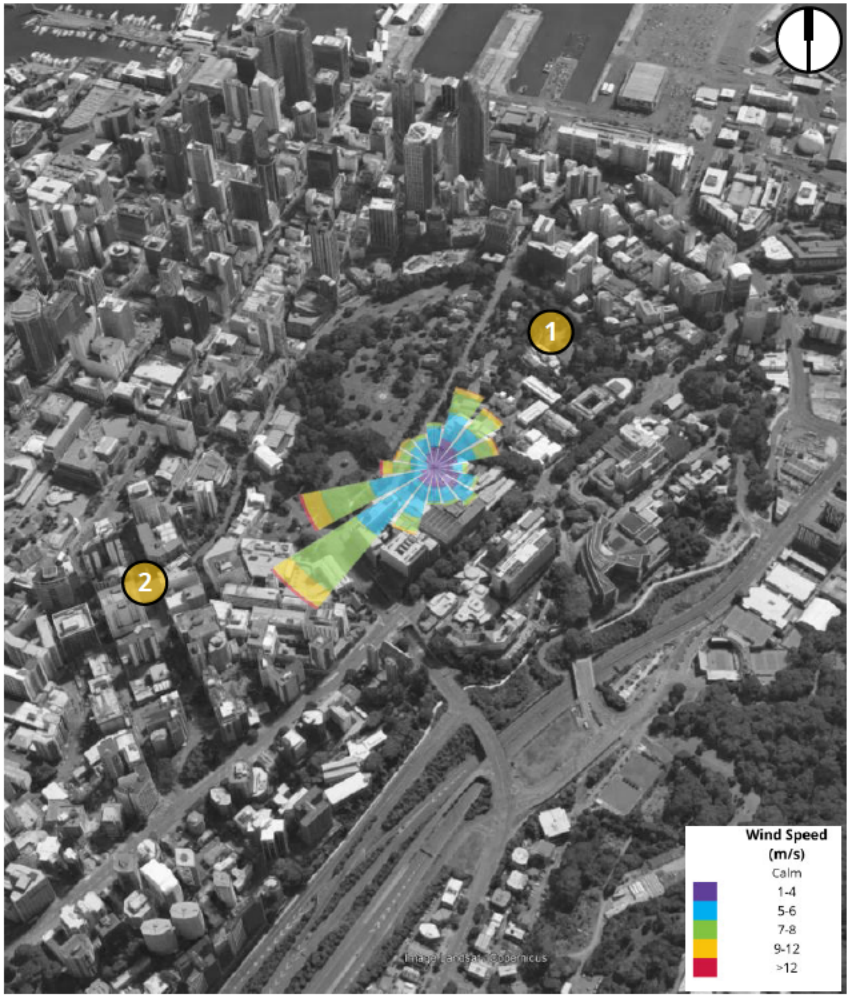

Image 7: Exposure of Site to Regional Prevailing Winds
Source: Nearmap

5.2 Proposed Configuration (Configs 1 and 2)

The predicted wind comfort conditions are presented in Images 8a – 8b for the Proposed Configuration of the site. The results are shown with and without the inclusion of surrounding and on-site vegetation to provide a holistic understanding of final pedestrian wind comfort conditions. Interaction of the prevailing winds with the Proposed Configuration without any landscape are also shown in Appendix A (Images A1 and A2).

The majority of the ground level site wind conditions range from Category B to Category C and, with respect to standard H8.6.28.1. With the inclusion of vegetation within the park areas to the north-west and along Alfred Street, wind conditions are predicted to fall within Categories A and B at most locations. Overall, the results with the inclusion of landscape provide a useful reference of the expected pedestrian-level wind conditions for the final configuration of the site.

A summary of the wind comfort conditions in terms of standard H8.6.28.1(a) and the relevant table and figure is provided below.

- **Pedestrian Thoroughfares:** With the inclusion of existing dense tree planting within Albert Park and along Alfred and Princes Street, the wind conditions are expected to achieve compliance with Categories A and B of H8.6.28.1(a). Hence, no additional mitigation is considered necessary.
- **Tē Tūātea:** The Tē Tūātea is located between School of Computer Science Building and the Proposed Development and is sheltered from prevailing wind impacts by these buildings. The existing surrounding tree planting and proposed vegetation within the communal square are expected achieve compliance with Categories A and B of H8.6.28.1(a) with a small area near the south-east corner achieves Category C. While the square would generally be classified for Categories A and B, no additional mitigation is considered necessary to mitigate the small area of Category C near the south-east corner as it will primarily be used as a pedestrian transit area.
- **Entrances:** Several entrances are located along the various aspects of the Proposed Development. These are situated away from building corners and benefit from shelter by the development and surrounding buildings. Conditions at these entrances are expected to achieve Categories A and B without consideration of surrounding landscape. With landscape, the conditions are expected to achieve Category A. Hence, no additional mitigation is required for these spaces.

Furthermore, considering the relative height of the subject building with respect to the surrounding context and based on RWDI's experience with nearby projects, strong winds exceeding the wind safety criteria are not expected within or around the development site.

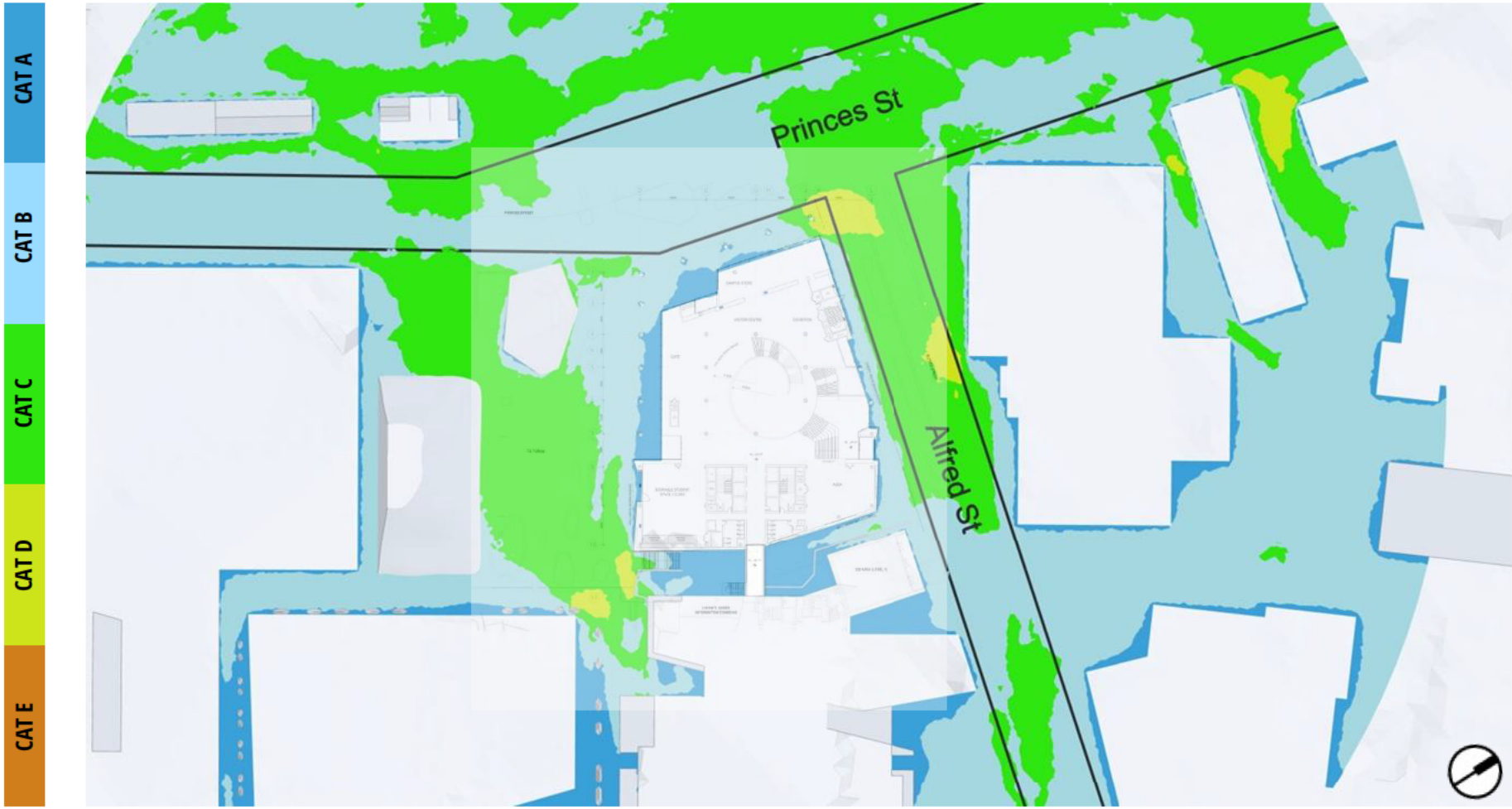

Image 8a: Annual Wind Comfort Conditions – Ground
Config 1: Proposed Configuration



Image 8b: Annual Wind Comfort Conditions – Ground
Config 2: Proposed Configuration with Landscape

7. STATEMENT OF LIMITATIONS

Wind comfort conditions around the proposed Student Centre and Library at the University of Auckland are discussed in this report. This assessment is based on CFD analysis of the proposed massing of the buildings using Orbital Stack. The findings of the report should be assessed based on the limitations listed below:

1. The analysis presented was based on the historical climate conditions for the region.
2. It is noted that the conditions presented herein depict statistical conditions for certain seasons. It would be prudent to consider that specific seasonal trends (e.g., a heatwave) would be expected to result in ambient conditions which could create longer durations of uncomfortable conditions. Thermal comfort studies provide a more a holistic assessment of perceived comfort.
3. The effect of climate change (i.e., forward predictions of trends in meteorological conditions) has not been considered in the analysis. However, the use of the latest meteorological information should give some indication.
4. The CFD simulations were conducted using a steady-state analysis. This means that the wind speed predictions represent an 'average' of the expected conditions within and around the development. As such, RWDI would expect the comfort conditions to be more dynamic in reality than the 'static' images presented herein.
5. Gusts are an important part of the overall wind microclimate that can impact safety, and these have only been considered qualitatively in the current assessment. A more detailed assessment would be required using either a boundary-layer wind tunnel or more detailed transient computational modelling to evaluate the gust response of the development as the design evolves.

8. APPLICABILITY OF ASSESSMENT

This report entitled "*Student Centre and Library University of Auckland : Pedestrian Wind Assessment*", dated 12 November 2026, was prepared by RWDI Australia Pty Ltd ("RWDI"). The findings and conclusions presented in this report have been prepared for the Client and are specific to the project described herein ("Project"). The conclusions and recommendations contained in this report are based on the information made available to RWDI in September 2026. In the event of any significant changes to the design, construction or operation of the building or addition of surroundings in the future, RWDI could provide an assessment of their impact on the wind conditions discussed in this report. It is the responsibility of others to contact RWDI to initiate this process.

Because the contents of this report may not reflect the final design of the Project or subsequent changes made after the date of this report, RWDI recommends that it be retained by Client during the final stages of the project to verify that the results and recommendations provided in this report have been correctly interpreted in the final design of the Project.

The conclusions and recommendations contained in this report have also been made for the specific purpose(s) set out herein. Should the Client or any other third party utilise the report and/or implement the conclusions and recommendations contained therein for any other purpose or project without the involvement of RWDI, the Client or such third party assumes any and all risk of any and all consequences arising from such use and RWDI accepts no responsibility for any liability, loss, or damage of any kind suffered by Client or any other third party arising therefrom.

Finally, it is imperative that the Client and/or any party relying on the conclusions and recommendations in this report carefully review the stated assumptions contained herein and to understand the different factors which may impact the conclusions and recommendations provided.

APPENDIX A

STREAMLINES AND WIND FLOWS

APPENDIX A

Config 1 – Proposed Configuration

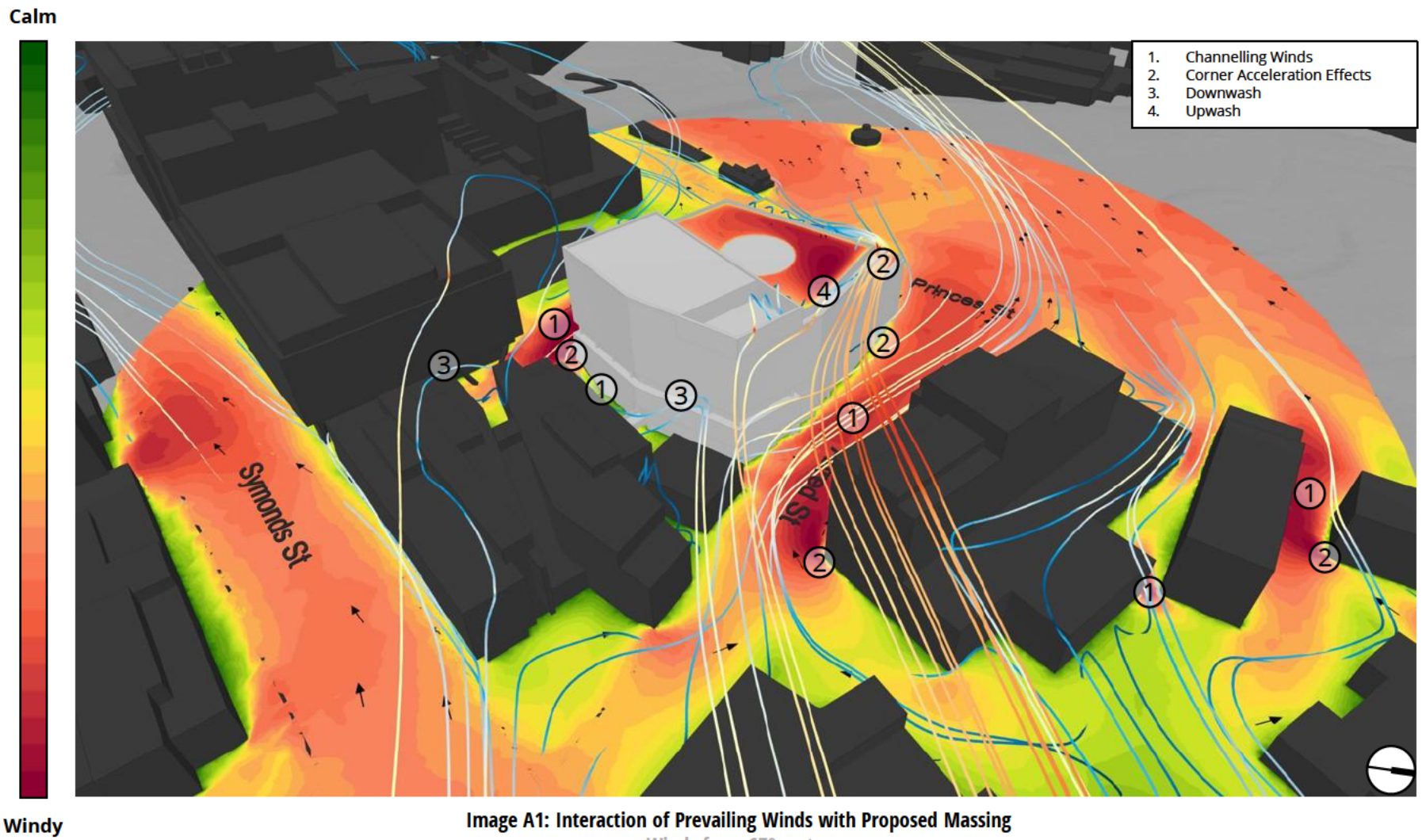

Image A1: Interaction of Prevailing Winds with Proposed Massing
Winds from 67° sector

APPENDIX A

Config 1 – Proposed Configuration

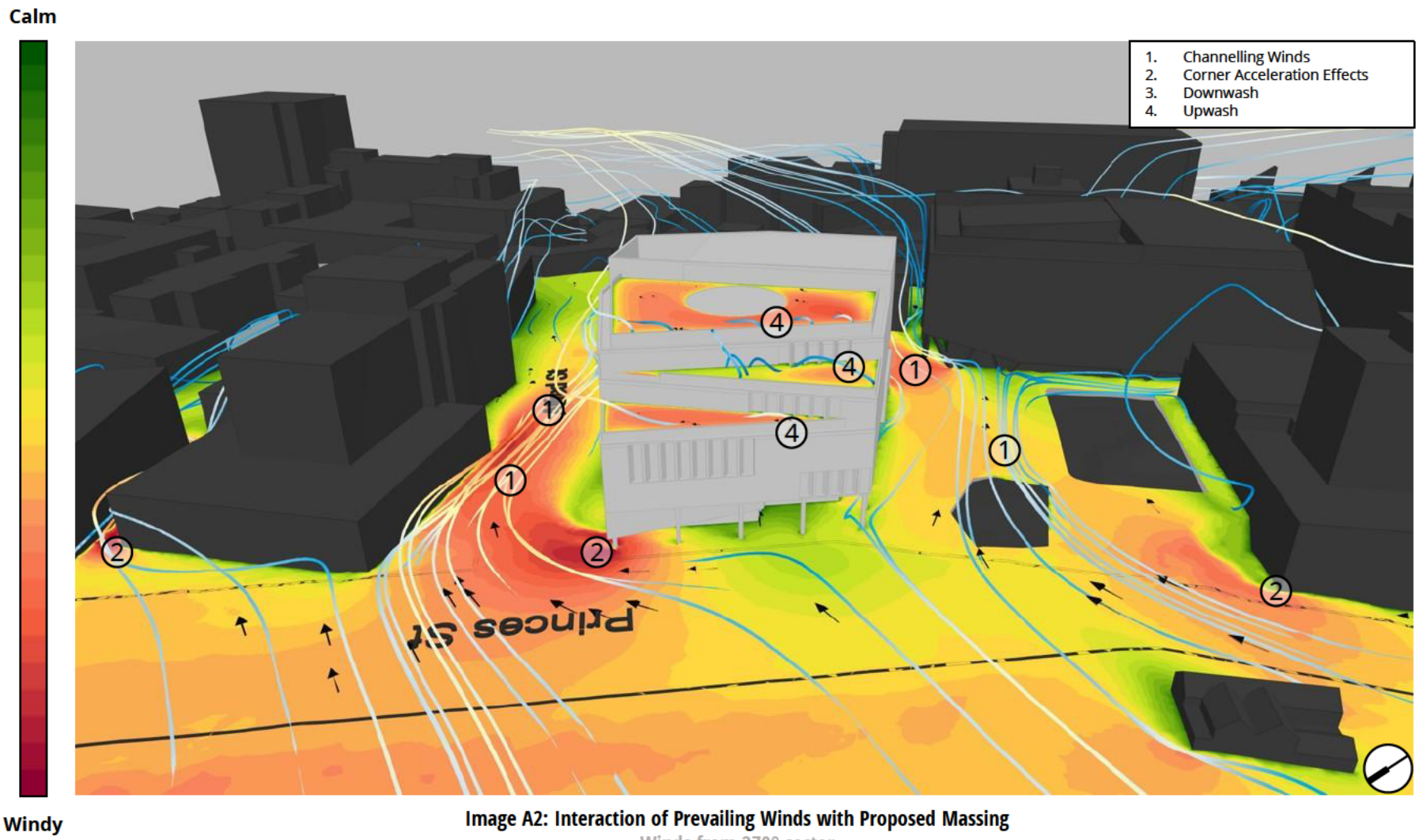

Image A2: Interaction of Prevailing Winds with Proposed Massing
Winds from 270° sector

APPENDIX B

URBAN DESIGN STRATEGIES

APPENDIX B

For the wider precinct, wind-responsive urban design should adhere to the following hierarchy of design decisions:

Neighbourhood and Street Orientation

The first step involves focusing on decisions that can optimise walkability. This stage includes implementing design changes to enhance overall wind comfort and should include consideration for the following practices (see Image B1):

- Orienting street grids to provide a shelter against the winds can assist with overall wind comfort levels. Identify the primary wind for the precinct and work with street orientation to mitigate winds and reduce channelling effects.
- Non-uniformity in building heights can also induce favourable wind effects. However, care should be taken when positioning taller buildings, as such structures should be located upwind to provide shelter for areas downwind of them. Taller buildings should also be aligned such that they reduce wind redirection. Any channels between such towers should be avoided for long-duration activation.
- Introducing non-uniformity within street design and building layout can interrupt wind channelling within the corridors. This approach can mitigate high wind effects, but care should be taken when designing usage of outdoor spaces. Spacing between buildings can also be adjusted to increase or decrease the funnelling wind effect as needed to improve natural ventilation.

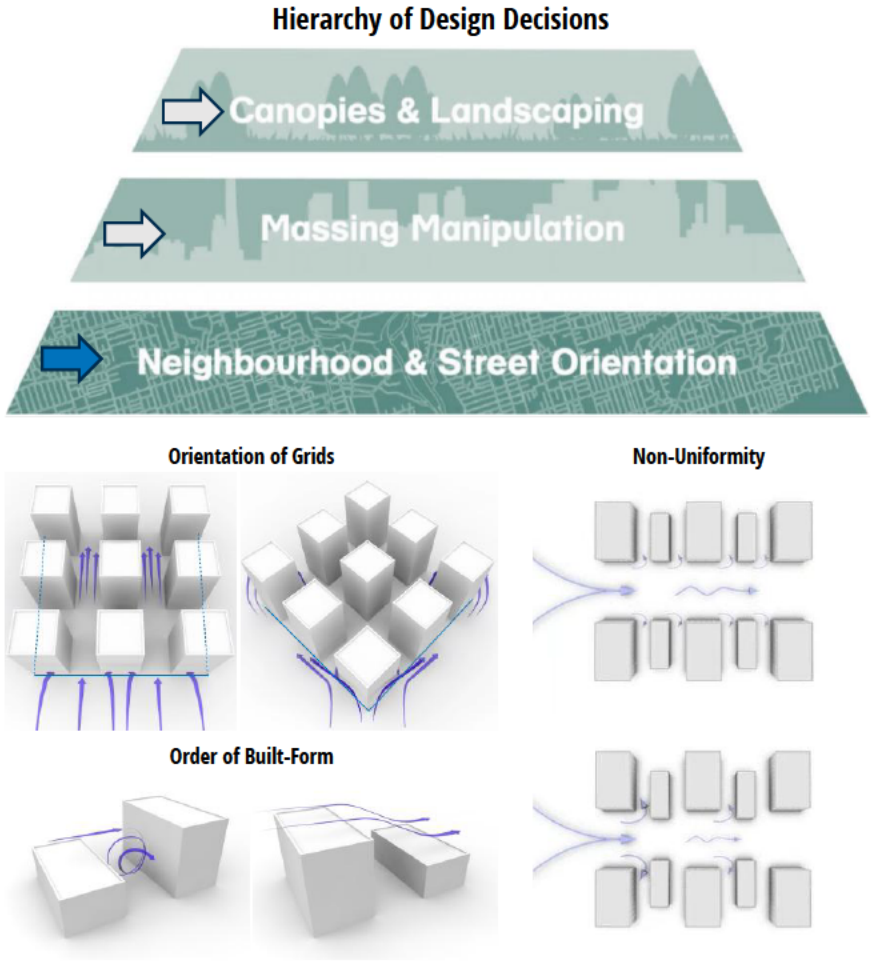

Image B1: Neighbourhood and Street Orientation

APPENDIX B

Massing Manipulation and Building Design

After establishing a satisfactory orientation, the next step involves manipulating the massing at an individual building level. Some examples of massing adjustments that should be considered are noted in Image B2. This process includes the following key strategies:

- Implementing **aerodynamic tower profiles** can assist in reducing wind impacts at ground level, as winds can wrap around the towers due to the reduced resistance.
- **Setbacks or the step-like recessions** in a building's profile can help in breaking up wind flow and reducing wind. These setbacks can be employed to maintain winds above local street levels and are recommended for all taller structures exposed to the regional winds.
- Strongest winds are typically found around corners where pressure-driven flows can create uncomfortable or unsafe winds. Hence, altering the design of building corners by **rounding or chamfering** can soften these wind impacts. Similarly, areas near corners should be avoided for long-duration use.
- **Varying the height and width** of buildings can influence wind patterns. Taller buildings can serve to intercept winds and bring these to the street levels, leading to adverse effects if not carefully considered. Similarly, variations in widths can disrupt and diffuse wind flows and prevent the formation of wind tunnels if placed strategically.

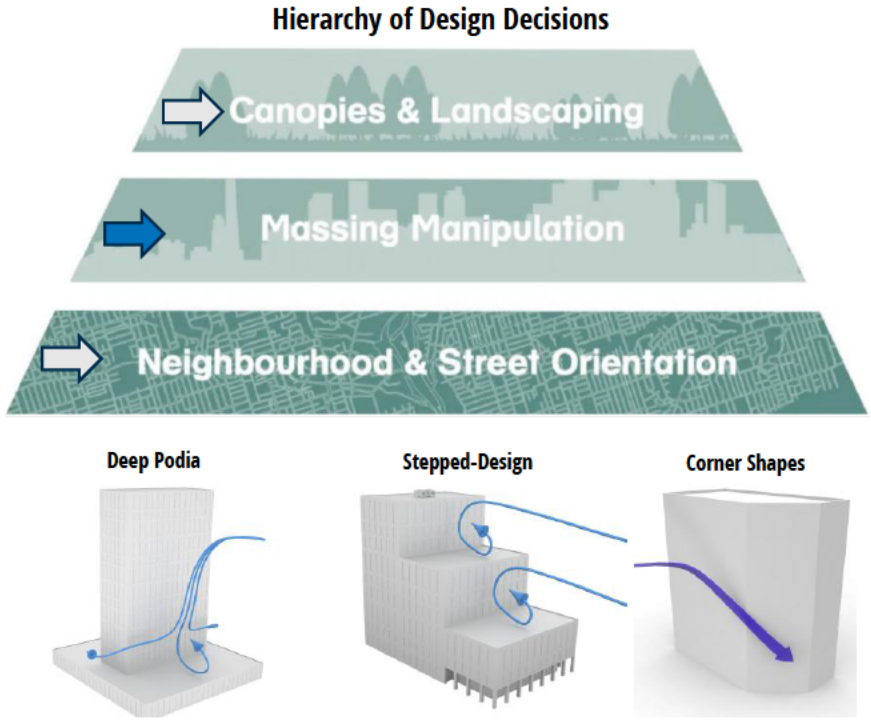

Image B2: Massing Manipulation

Localised Passive Measures

Once an appropriate grid is established and building forms, orientations, and arrangements have been decided, the next steps focus on localised measures which are used to address specific wind-related issues and fine-tune the microclimate to improve wind and thermal comfort (see Image B3). Elements can include:

- **Horizontal elements**, such as deep canopies, are designed to protect against vertical winds. These can be placed over entrances, walkways, and public spaces to shield pedestrians from potential downwash and provide shaded areas, enhancing both thermal comfort and reducing wind intensity.
- **Vertical elements** like wind screens are used to protect against horizontal winds. These can be strategically placed to Block or redirect prevailing winds, reducing wind speeds in targeted areas and preventing the formation of wind tunnels due to channelling.
- **Landscaping and Wind Art** are three-dimensional elements that can influence both horizontal and vertical wind flows. Landscaping can create windbreaks and reduce wind speeds, while wind art can serve as both functional and decorative features that can reduce wind momentum. These can be situated strategically around building corners or in key areas where reduced winds are desired.

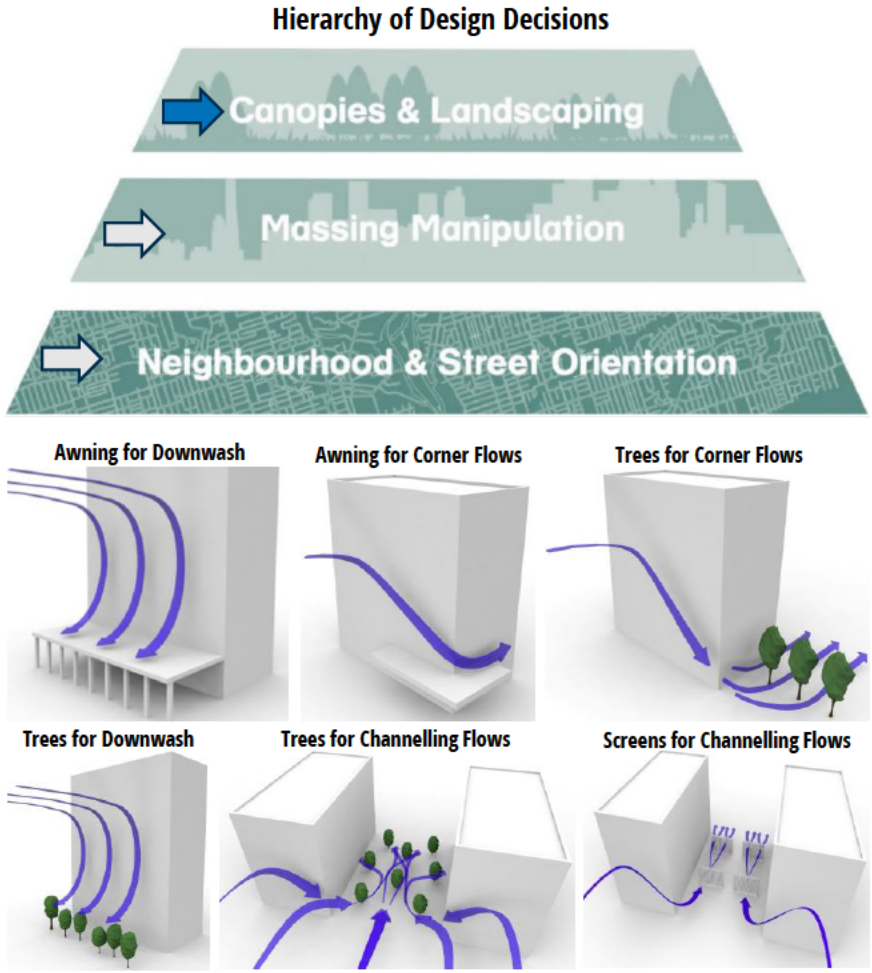

Image B3: Localised Measures