Leppington Civic Centre (SSD-99319962)

Environmental Wind Impact - Desktop Study

Leppington (1) 88 Development Pty Ltd

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Prepared by:

SLR Consulting Australia

SLR Project No.: 610.033886.00001

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29 May 2026

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
R01-v1.1	25 May 2026	Dr Farzin Ghanadi	Dr Neihad Al-Khalidy	Dr Neihad Al-Khalidy
	Click to enter a date.			
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Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Leppington (1) 88 Development Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

Executive Summary

This qualitative wind assessment has been prepared by SLR Consulting Australia Pty Ltd (SLR)on behalf of Leppington (1) 88 Development Pty Ltd (**the Applicant**) to address the project-specific Secretary's Environmental Assessment Requirements (SEARs) issued the proposed State Significant Development Application (SSDA) SSD-99319962. The development is located at 173-183 Rickard Road, Leppington (the Site) and is located within the South West Growth Area (**SWGA**) within the Camden Local Government Area (**LGA**).

The assessment has been made on the basis of our best engineering judgment and on the experience gained from (decades of) scale-model Wind Tunnel Testing and CFD Simulation analysis of a range of similar scale developments.

The site is bounded by Rickard Road to the east, car parking areas to the north, and existing grasslands in the remaining directions. The surrounding built environment is characterised predominantly by low-rise developments and open grassland areas in all directions, with Leppington Train Station situated to the north of the site (refer Figure 10). In terms of topography, the broader site context exhibits a gradual upward incline from west to east across both the development site and its surrounding areas.

Site Wind Climate

Based on long-term wind data from nearby Bureau of Meteorology stations, the site experiences two main wind seasons. Summer winds primarily come from the northeast, southeast, and south, with the strongest gusts from the southeast and southerly winds. In winter and early spring, winds mostly originate from the west, with the strongest winds occurring inland.

Existing Wind Environment

Close to the ground, the "regional" wind patterns described above are affected by the local terrain, topography and built environment, all of which influence the "local" wind environment.

- As noted in **Section 1.3**, the site is currently surrounded by low rise development and grassland to all directions.
- The site will, therefore, will have limited wind shielding, leaving it exposed to stronger winds from multiple directions.

Future Wind Environment

In terms of the *future* wind environment with the proposed Development, the following features of the development are noted as being of most significance:

Lower Ground – refer Figure 22

- Retain the proposed/existing trees and landscaping surrounding the development to assist in mitigating local wind speeds. It is recommended that all vegetation be evergreen and densely foliated to ensure effective year-round wind protection
- Maintain the proposed recessed setback and canopy at the key entry points to provide effective wind shelter, reduce direct wind penetration, and improve pedestrian comfort. Similar entrance treatments must be incorporated across all primary building entrances to improve wind protection, reduce façade downwash effects, and create a more comfortable pedestrian environment.

- Where designated seating or dining areas are proposed, position these spaces beneath proposed horizontal wind protection elements such as pergolas, shade cloth structures, or similar overhead screening features to assist in reducing downwash effects and improving pedestrian comfort. Alternatively, locate seating and dining areas beneath proposed mature canopy trees, or within recessed building setbacks and beneath deep awnings, to maximise wind shelter and enhance the usability and amenity of outdoor spaces.

Ground Level – refer Figure 23

- Uphold the proposed/existing trees/landscaping on the sides of the development to mitigate the impact of local wind speeds. It is recommended that all trees/landscaping to be evergreen and densely foliating to maintain its effectiveness throughout the year
- Maintain the proposed recessed setback and canopy at the key entry points to provide effective wind shelter, reduce direct wind penetration, and improve pedestrian comfort. Similar entrance treatments must be incorporated across all primary building entrances to improve wind protection, reduce façade downwash effects, and create a more comfortable pedestrian environment.
- Where designated seating or dining areas are proposed, position these spaces beneath proposed horizontal wind protection elements such as pergolas, shade cloth structures, or similar overhead screening features to assist in reducing downwash effects and improving pedestrian comfort. Alternatively, locate seating and dining areas beneath proposed mature canopy trees, or within recessed building setbacks and beneath deep awnings, to maximise wind shelter and enhance the usability and amenity of outdoor spaces.
- Keep the proposed planter boxes throughout the through-link, with vegetation reaching a minimum combined height of approximately 1.5 m, to increase surface roughness and reduce wind speeds. The latest design incorporates additional planter boxes adjacent to the stair access and at the corner of the through-site link to assist in mitigating local wind speeds by disrupting airflow, reducing wind channelling through the link, and providing a degree of shelter within these exposed areas.
- Keep the proposed landscaping and mature trees near the northern entrance of the through link to provide additional shielding from high-speed wind penetration.

Upper Ground – refer Figure 24

- Install vertical windbreak elements with a minimum total height of approximately 1.5 m along exposed outer edges of communal open areas. These may comprise solid balustrades, planter boxes, and dense vegetation strategically arranged around the perimeter.
- Introduce planter boxes throughout site links, with vegetation reaching a minimum combined height of approximately 1.5 m, to increase surface roughness and reduce wind speeds.

Elevated Communal Open Space – Levels 1 and 2 (refer Figure 25 and Figure 26)

- Keep the proposed 1.5 m high windscreen along the outer edges of all exposed Level 1 and Level 2 communal areas.
- Keep the proposed awnings above the retail entrances.

- Keep the proposed landscaping and vertical screening elements surrounding the designated standing and seating areas within this area. Consider supplementary horizontal windbreak elements, such as pergolas, or overhead shade structures, in highly exposed locations to further reduce downwash and improve occupant comfort.
- Ensure designated seating, dining, or communal spaces are positioned within sheltered zones or behind windbreak treatments to maximise comfort and usability.

Elevated Communal Open Space – Level 12 (Building 04) – refer Figure 27

- Install vertical windbreak elements with a minimum height of approximately 1.8 m along exposed outer perimeters. These can include solid balustrades, planter boxes, and landscaping elements to improve comfort and mitigate elevated wind exposure.

Elevated Private Balconies – refer Figure 28

- For upper-level and corner balconies, where wind exposure is typically greatest, incorporate a nested or single-aspect balcony design where feasible to improve shielding.
- Increase vertical windbreak heights along balcony edges to approximately 1.5 m where required.
- Configure balcony balustrades to achieve a minimum effective solidity of approximately 70% (maximum 30% open area) to significantly reduce wind penetration and improve balcony usability.
- Alternatively, undertake detailed quantitative assessments such as Computational Fluid Dynamics during detailed design to refine balcony wind mitigation strategies, particularly for highly exposed balconies intended for year-round use.

With the incorporation of proposed windbreak mitigation treatments, all amenity locations within the proposed development including ground and all terrace level locations are expected to achieve the target Lawson Comfort Criteria and Melbourne Safety Criterion established for the project.

The above analysis has been made on the basis of our best engineering judgment and on the experience gained from scale model wind tunnel testing or computational fluid dynamics analysis of a range of developments.

Summary

On the basis of the above, the overall effect of the proposed development on the local wind microclimate is predicted to be “not significant” (refer **Section 3.2**) and the proposed development should satisfy the nominated Wind Acceptability criteria for the project.

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1.0 INTRODUCTION

This qualitative wind assessment has been prepared by SLR Consulting Australia Pty Ltd (SLR)on behalf of Leppington (1) 88 Development Pty Ltd (the Applicant) to address the project-specific Secretary's Environmental Assessment Requirements (SEARs) issued the proposed State Significant Development Application (SSDA) SSD-99319962. The development is located at 173-183 Rickard Road, Leppington (the Site) and is located within the Southwest Growth Area (SWGA) within the Camden Local Government Area (LGA).

The project seeks detailed development consent for the construction of a mixed-use development to deliver Leppington Civic Centre, comprising shop top housing to support residential development and commercial land uses at 173-183 Rickard Road, Leppington.

Specifically, the SSDA seeks consent for:

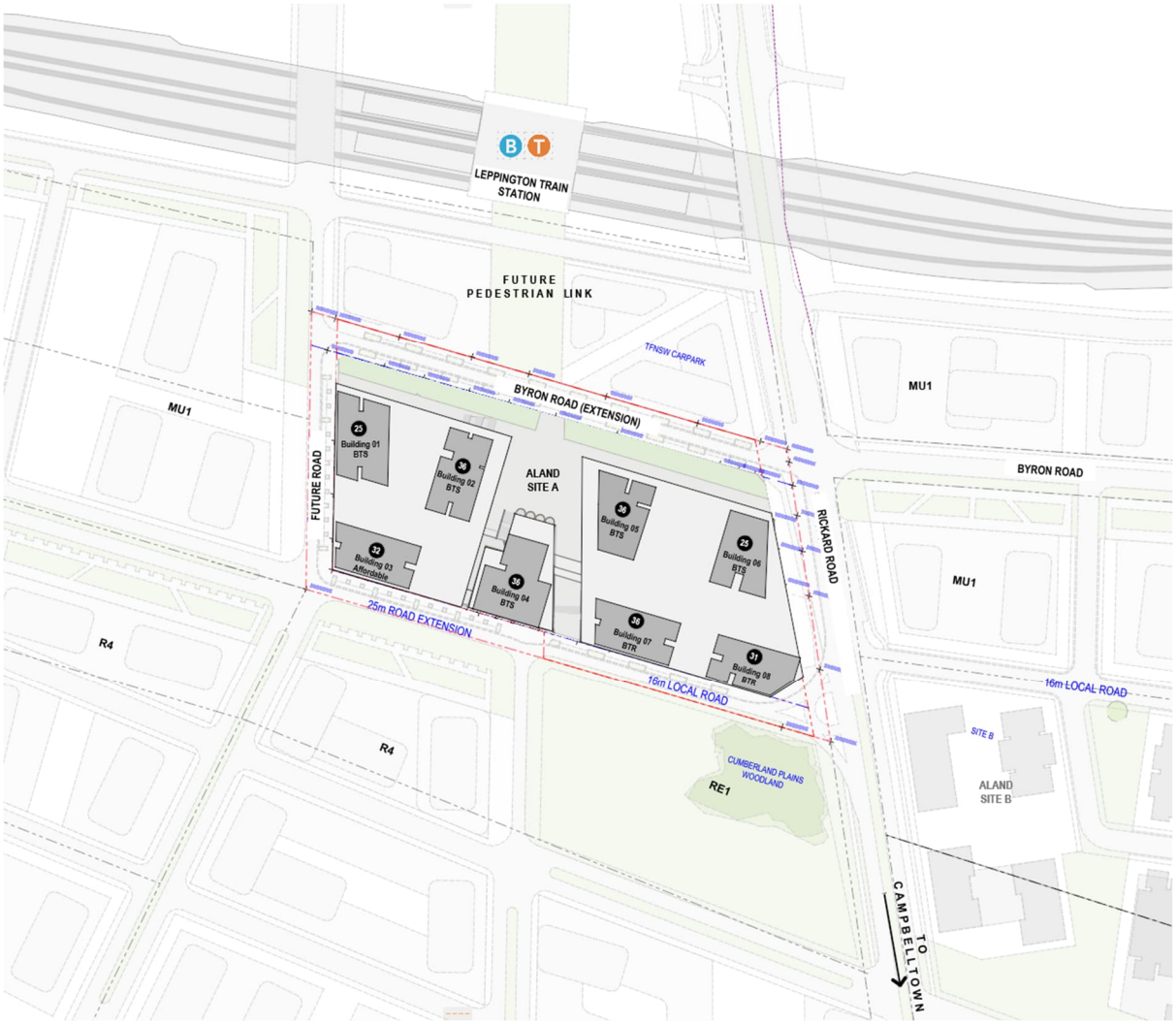
- Demolition and earthworks to prepare the site for future development.
- Delivery of new roads and approximately 6,500 sqm of open space.
- Delivery of 8 residential buildings to accommodate a total of 1493 units, comprising of:
    - Build to Sell Apartments: 864
    - Build to Rent Apartments: 412
    - Affordable Apartments 217 (representing circa 15% of total residential yield)
- Delivery of a 156-key hotel (non-residential).
- Approximately 40,500 sqm of non-residential Gross Floor Area (GFA).
- Loading and car parking facilities on the lower ground and basement levels.

The proposed development is supported by concurrent rezoning application to seek amendments to Appendix 5 Camden Growth Centres Precinct Plan within the *State Environmental Planning Policy (Precincts – Western Parkland City) 2021* pursuant to the concurrent rezoning process through the Housing Delivery Authority (**HDA**) planning pathway. This concurrent rezoning will provide the rezoning and variations to development standards required to facilitate the delivery of the Leppington Civic Centre and Leppington Town Centre, generally in accordance with the Leppington Town Centre State-Assessed Rezoning Proposal (**SARP**).

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Leppington (1) 88 Development Pty Ltd to provide a qualitative (expert opinion) study assessing the environmental wind impact of a proposed mixed-use development at 173-183 Rickard Leppington (Site A), NSW 2179.

The assessment has been made on the basis of our best engineering judgment and on the experience gained from (decades of) scale-model Wind Tunnel Testing and CFD Simulation analysis of a range of similar scale developments.

Figure 1 SSDA – Proposed Works



I FARZIN GHANADI CONFIRM THIS QUALITATIVE WIND ASSESSMENT ADDRESSES THE REQUIREMENT OF SEAR NO. SSD-81995211. I FURTHER CONFIRM THAT NONE OF THE INFORMATION CONTAINED IN THIS QUALITATIVE WIND ASSESSMENT IS FALSE OR MISLEADING.

YOURS SINCERELY

DR FARZIN GHANADI
ASSOCIATE CONSULTANT - CFD, WIND & ENERGY

SEARS ITEM	REPORT REFERENCE
7. Environmental Amenity • *Assess amenity impacts on the surrounding locality, including solar access, visual privacy, view loss and view sharing, as well as **wind**, lighting and reflectivity impacts. A high level of environmental amenity for any surrounding residential or other sensitive land uses must be demonstrated.*	*Section 5 and Section 6*
23. Public Space • *If public space is proposed as part of the development, demonstrate how the development:* o *maximises the amenity of public spaces in line with their intended use, such as through adequate facilities, solar access, shade and **wind** protection.*	*Section 5 and Section 6*

1.1 Detailed Project Description and Proposed Works

The proposal seeks consent for:

- **Approval of a Concurrent Rezoning Amendment:** To facilitate the built form proposed under SSD- 99319962, concurrent amendments are sought to the WPC SEPP pursuant to the concurrent rezoning process facilitated by the HDA planning pathway. This concurrent rezoning seeks to vary existing controls under the WPC, whilst also seeking broad alignment with the LTC SARP which is expected to be finalised by DPHI mid-2026. Specifically, the project seeks to amend the WPC SEPP as follows:
  - Amend the Land Zoning Map to rezone the site from B3 Commercial Centre to MU1 Mixed Use.
  - Amend Clause 4.3 to increase the height of buildings control from 24m to 138.5m.
  - Introduce a floor space ratio control of 5.8:1 for the entire site, equates to approximately 188,000sqm of GFA.
  - Incorporating a site-specific provision, requiring the provision of a minimum of 6,500sqm of public open space

- **State Significant Development consent for the proposed development:** The SSDA seeks detailed consent for the following works:
  - Demolition of existing structures, clearing of vegetation and site preparation works across the site.
  - Subdivision of the site to create separate lots and road reserves.
  - Bulk earthworks and civil infrastructure works across the site.
  - Construction of an internal street (road) network.
  - Construction of 8 residential buildings to accommodate a total of 1493 units, comprising of:
    - Build to Sell Apartments: 864
    - Build to Rent Apartments: 412
    - Affordable Apartments 217 (representing circa 15% of total residential yield)
  - Delivery of approximately 40,500m2 of non-residential floor space, including:
    - Hotel (with ancillary function spaces)
    - Centre-based child care facility, accommodating approx. 70 children.
    - Pub (licensed)
    - Shop – neighbourhood supermarket, discount department store (DDS), other retail
    - Retail liquor store
    - Food and beverage premises
    - Vehicle repair station – Tyre and auto, carwash
    - Recreation facility (indoor) – Indoor swim school, Gym

- Delivery of retail and residential parking spaces across seven (7) basement levels
- Delivery of an active and connected public domain, including:
  - Approximately 6,500sqm of public open space in the form of north-south and east-west linear parks that connect with the broader town centre.
  - communal open space for all residential occupants and visitors.
- Street landscaping, tree planting and public domain works throughout the site.
- Installation of building signage to support wayfinding and building identification across the precinct.

Representative perspective and elevation views of the proposed development are shown in **Figure 3** to **Figure 10**.

Figure 2 Representative perspective of the Proposed Development

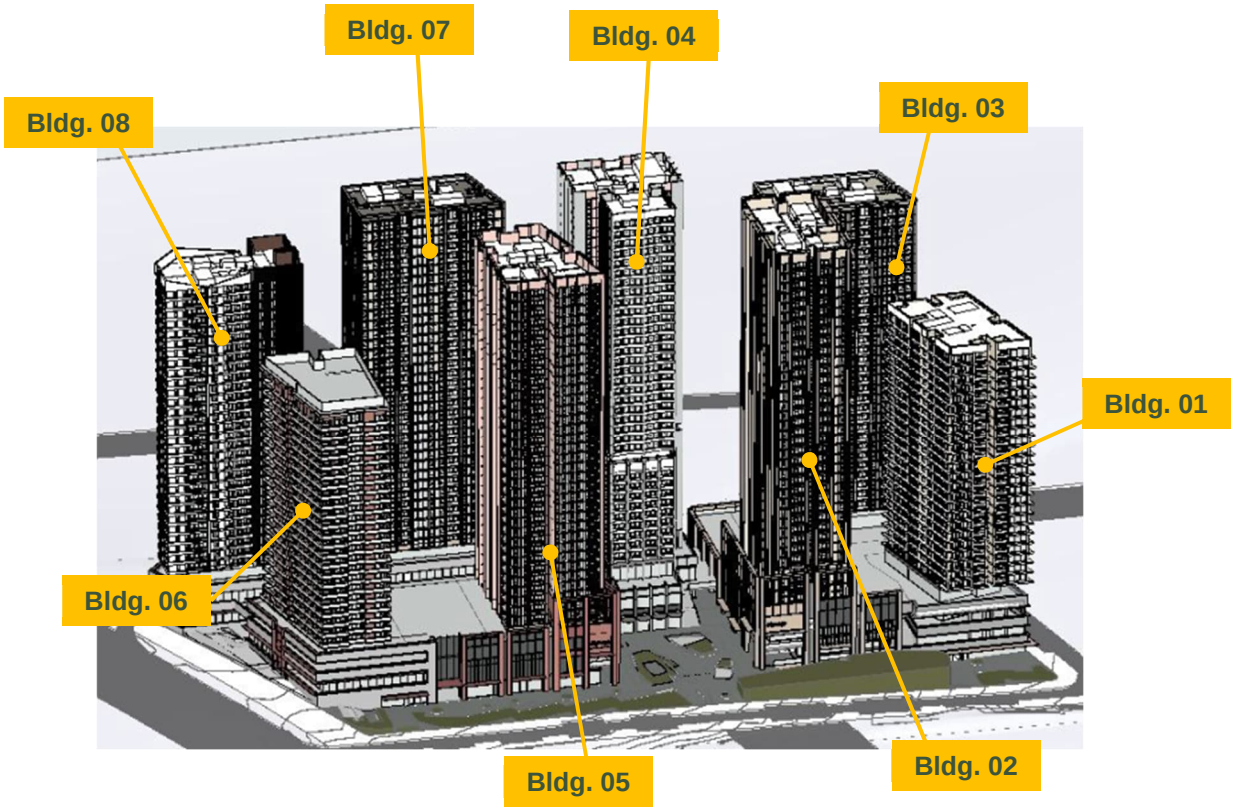


Figure 3 Representative elevation vies of the Proposed Development- Building 01

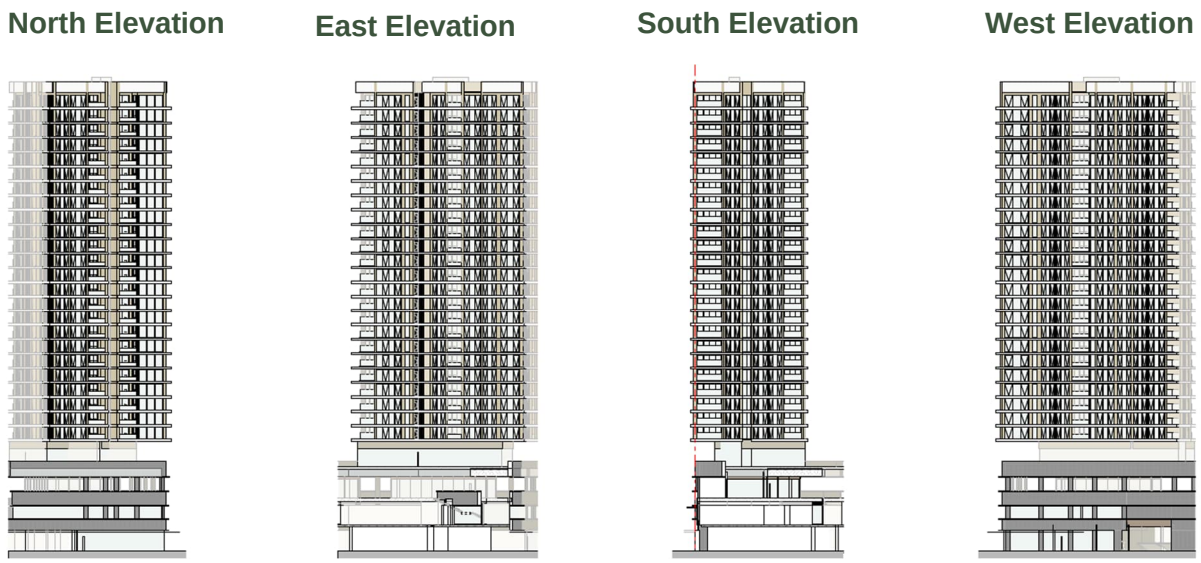


Figure 4 Representative elevation vies of the Proposed Development- Building 02

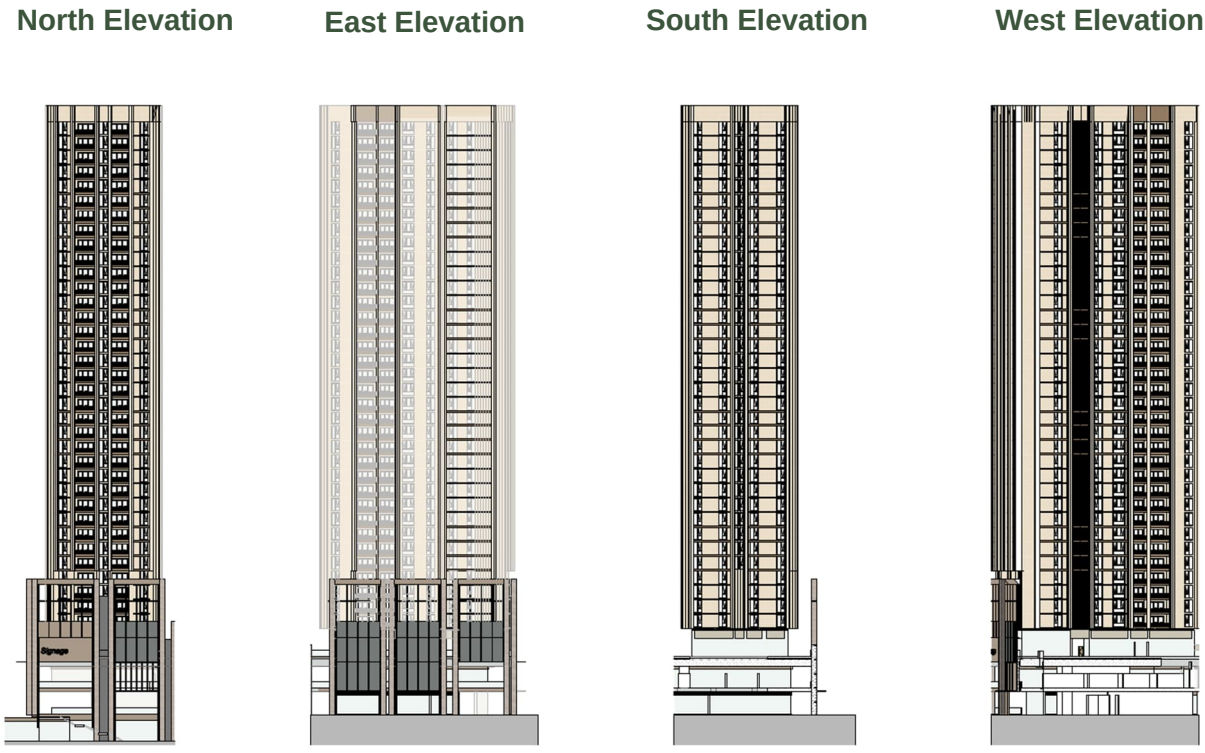


Figure 5 Representative elevation vies of the Proposed Development- Building 03

East Elevation | North Elevation | South Elevation | West Elevation

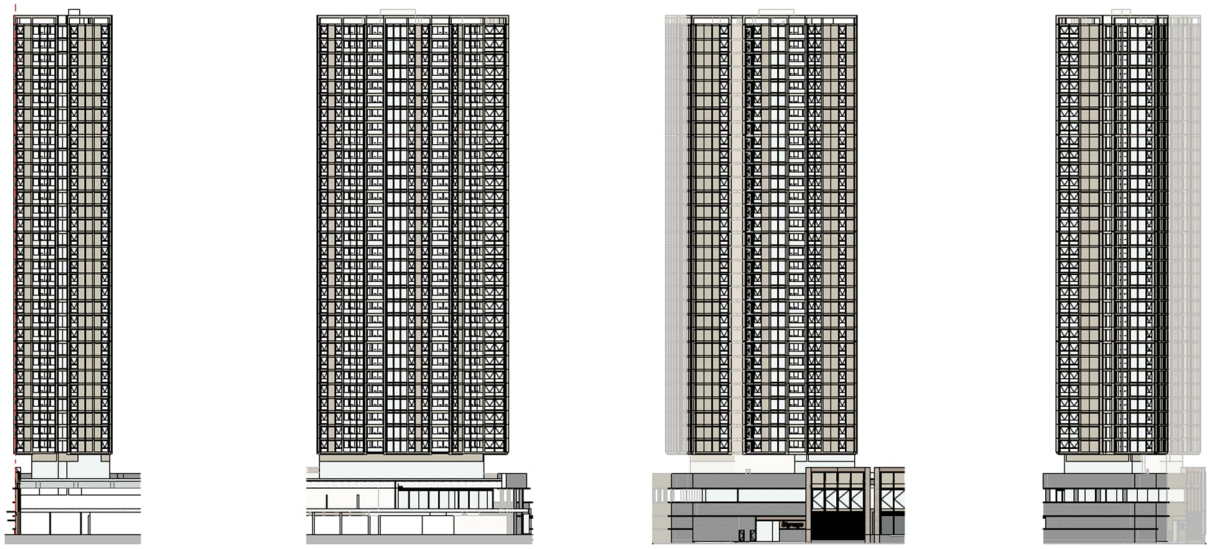


Figure 6 Representative elevation vies of the Proposed Development- Building 04

East Elevation | North Elevation | South Elevation | West Elevation

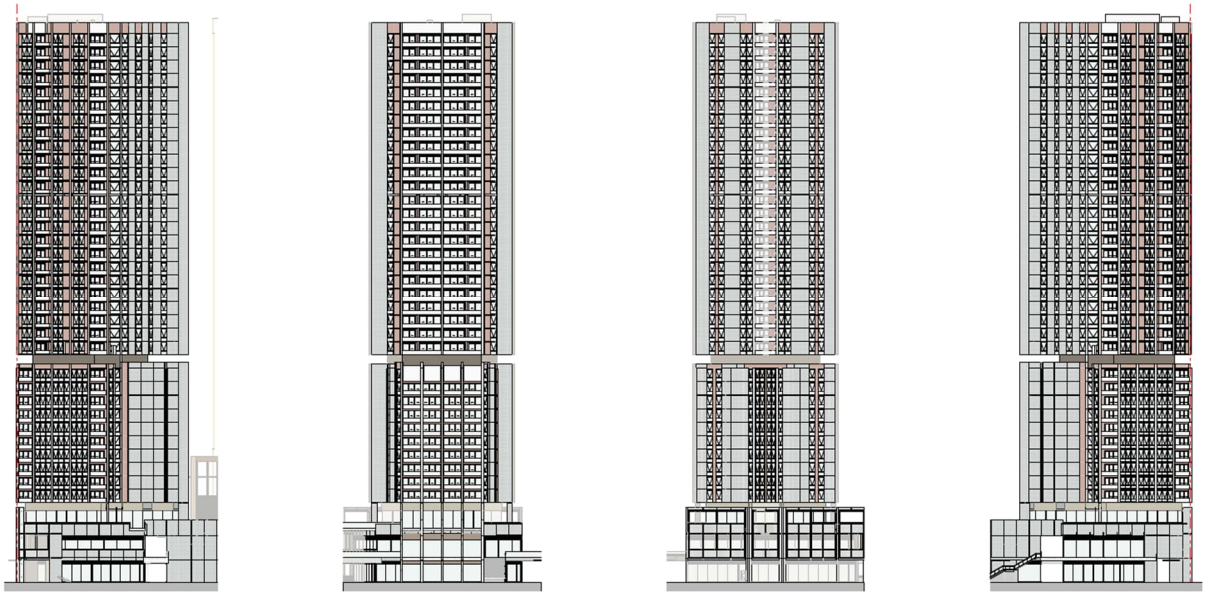


Figure 7 Representative elevation vies of the Proposed Development- Building 05

North Elevation East Elevation South Elevation West Elevation

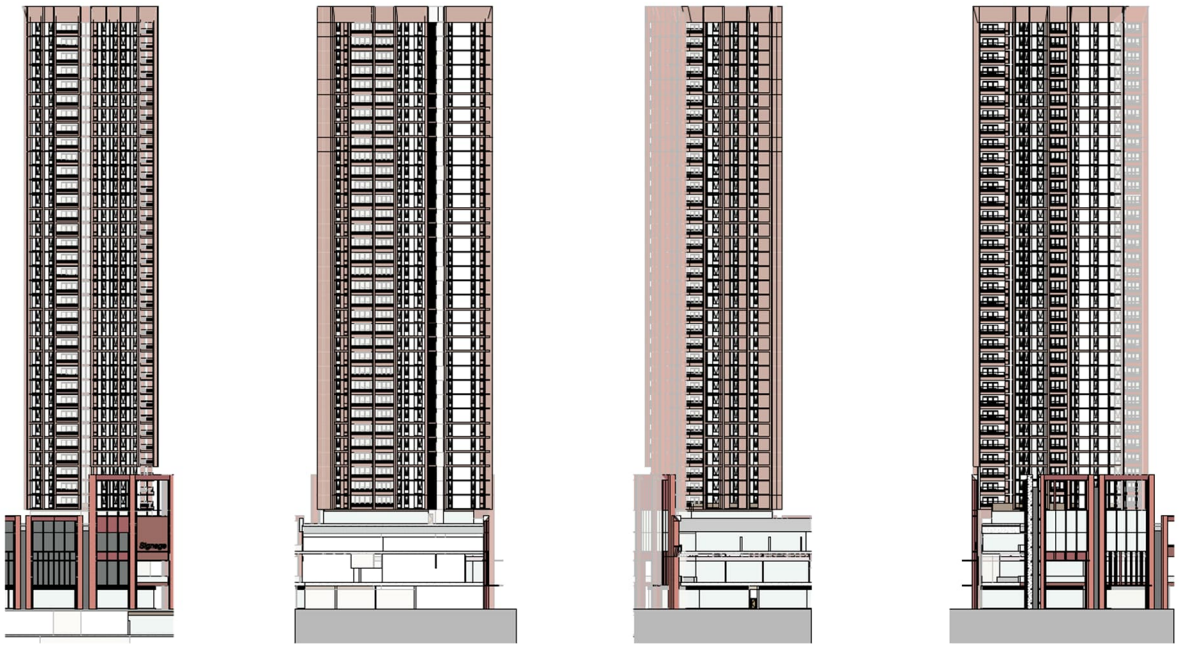
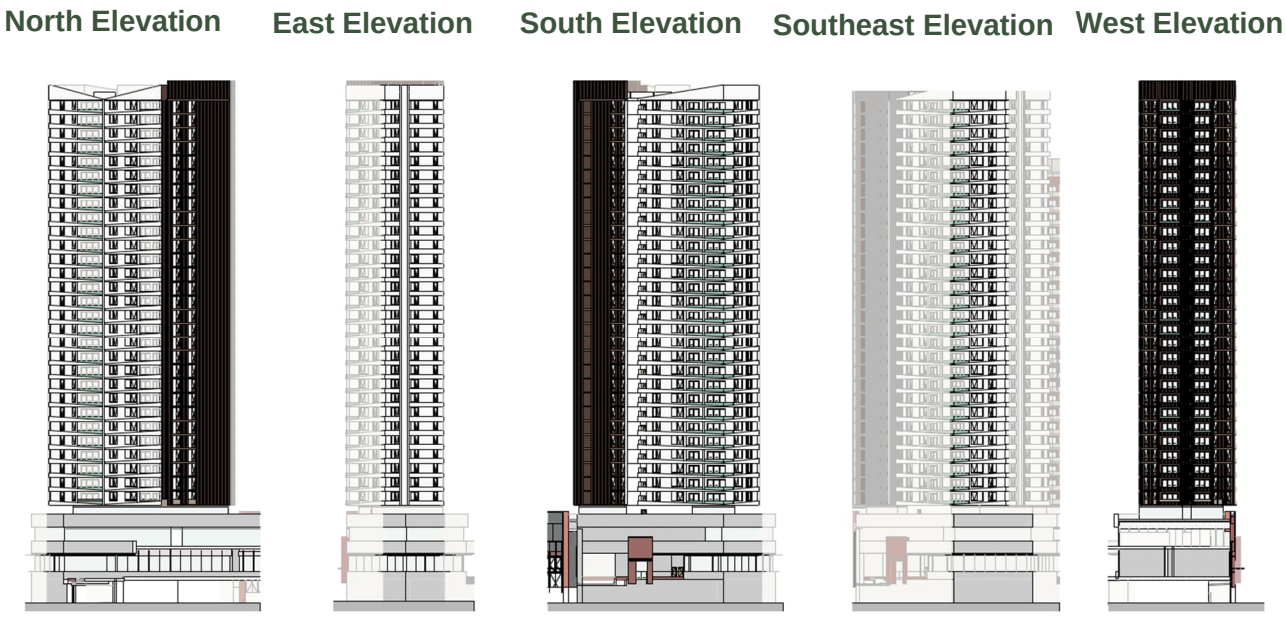


Figure 8 Representative elevation vies of the Proposed Development- Building 06

North Elevation East Elevation South Elevation West Elevation

Figure 9 Representative elevation vies of the Proposed Development- Building 07

Figure 10 Representative elevation vies of the Proposed Development- Building 08

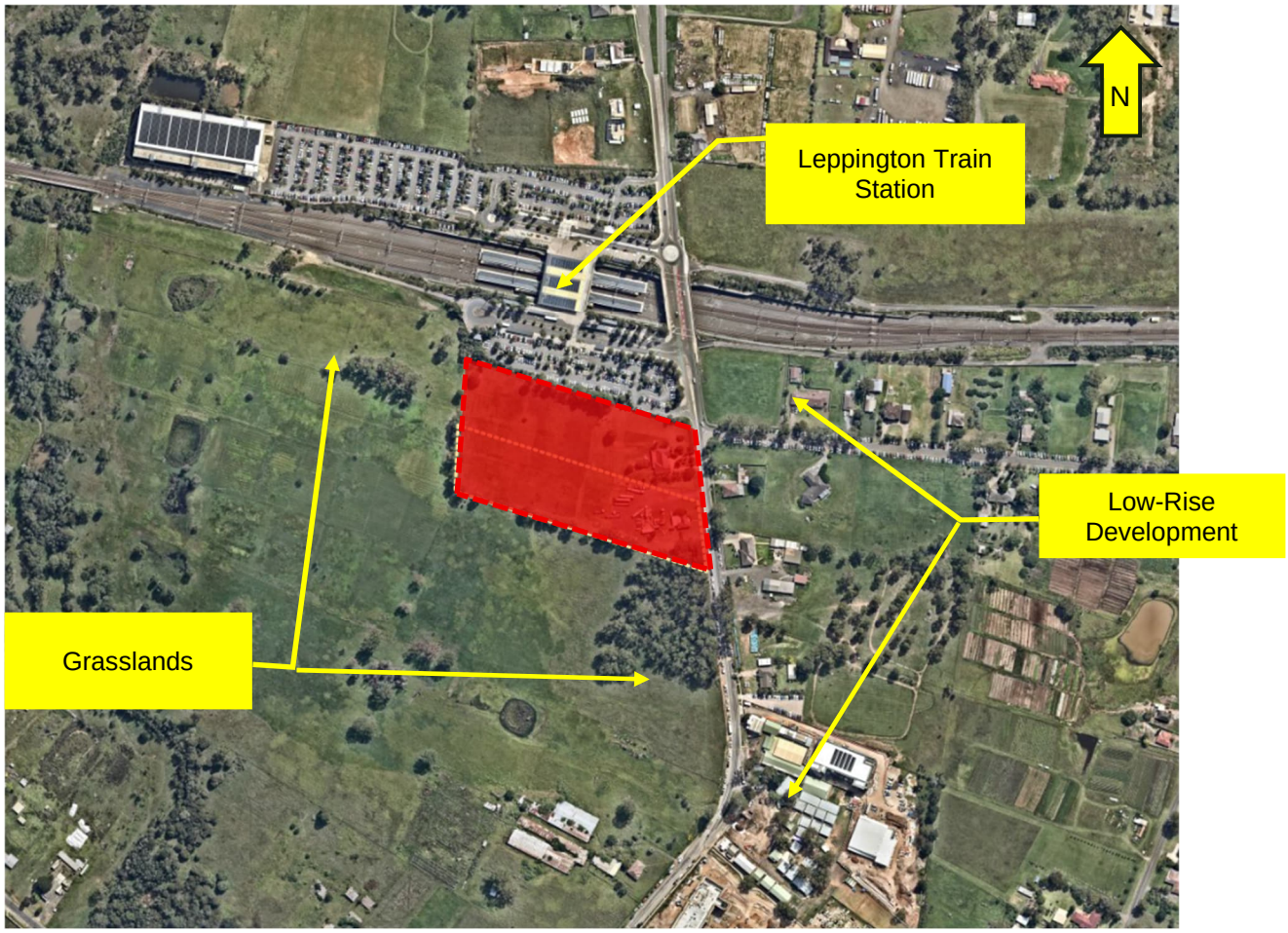


1.2 Surrounding Built Environment

In terms of the surrounding terrain and topography (refer **Figure 11**):

- The surrounding built environment consists of low-rise developments and grasslands in all directions.
- Leppington Train Station is located to the north of the site.
- The surrounding topography exhibits a gradual upward incline from west to east across the site and its neighbouring areas.

Figure 11 Project Site Surrounds



2.0 SYDNEY'S WIND CLIMATE

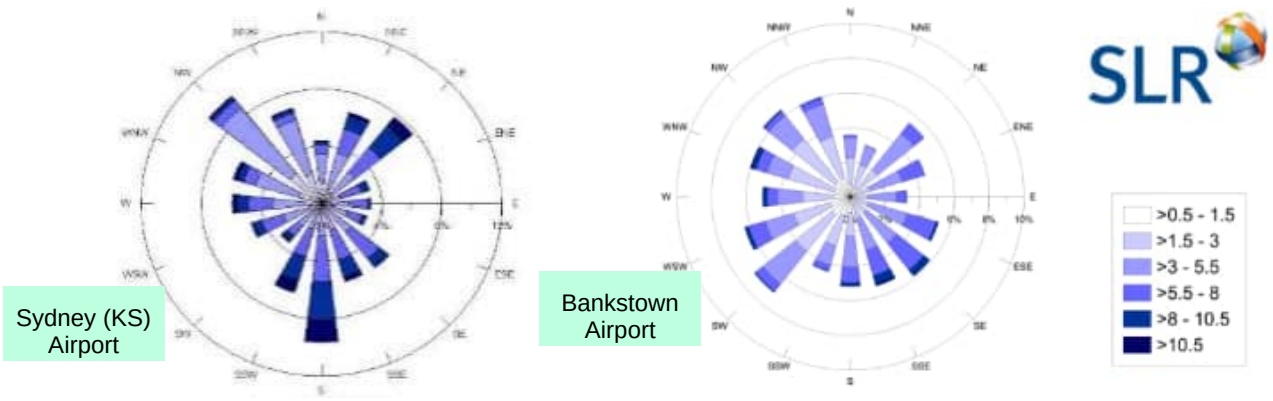
The data of interest in this study are the mean hourly wind speeds and largest gusts experienced throughout the year (especially higher, less frequent winds), how these winds vary with azimuth, and the seasonal break-up of winds into the primary Sydney Region wind seasons.

2.1 Annual and Seasonal Variations

Key characteristics of Sydney's Regional Wind Climate are illustrated in two representative wind roses shown in **Figure 12** taken from Bureau of Meteorology (BoM) data recorded during the period 1999-2017 at Sydney (Kingsford Smith) Airport and Bankstown Airport. A review of the associated seasonal wind roses (refer **Appendix A**) shows that Sydney is affected by two primary wind seasons with relatively short (1-2 month) transition periods in between:

- Summer winds occur mainly from the northeast, southeast and south. While northeast winds are the more common prevailing wind direction (occurring typically as offshore land-sea breezes), southeast and southerly winds generally provide the strongest gusts during summer. Both northeast winds (as sea breezes) and stronger southerly winds associated with "Southerly Busters" and "East Coast Lows" typically have a significantly greater impact along the coastline. Inland, these systems lose strength and have altered wind direction characteristics.
- Winter/Early Spring winds occur mainly from west quadrants and to a lesser extent from the south. West quadrant winds provide the strongest winds during winter and in fact for the whole year, particularly at locations away from the coast.

Figure 12 Annual Wind Roses for Sydney (KS) Airport and Bankstown Airport (BoM Data)



2.2 Wind Exposure at the Site – the "Local"' Wind Environment

Close to the ground, the "regional" wind patterns described above are affected by the local terrain, topography and built environment, all of which influence the "local" wind environment.

- As noted in **Section 1.3**, the site is currently surrounded by low rise development and grassland to all directions.
- The site will, therefore, will have limited wind shielding, leaving it exposed to stronger winds from multiple directions.

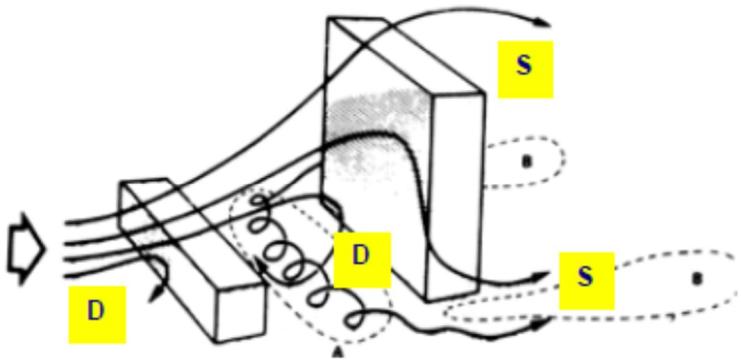
3.0 BUILDING-WIND INTERACTION – GENERAL OBSERVATIONS

The impact of wind flowing past buildings has well known general impacts at ground level – refer **Figure 13**. In general, the taller the building, the more pronounced the impact on ground level winds.

- **Downwash winds "D"** are the winds which impact on the windward face of a building and are then deflected downwards to Ground Level in a vertical direction; and

- Accelerating **Shearflow winds "S"** are the winds which experience acceleration as they pass by the building edges and roof as the wind flow moves around and past the building.

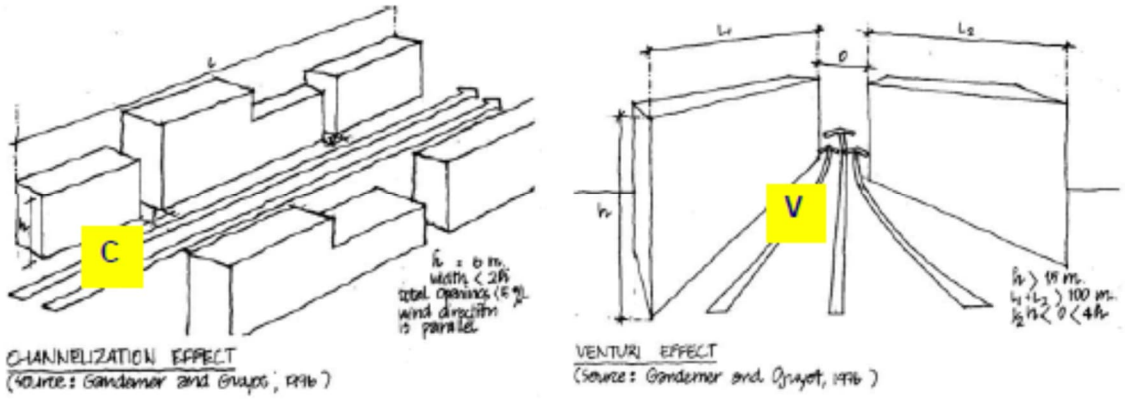
Figure 13 Windflow Patterns Past Regular-Shaped Buildings



The grouping of buildings can also have an impact on resulting pedestrian winds – refer to **Figure 14.**

- **Channelling Effect winds "C"** result when there are rows of parallel buildings (especially taller ones) where the gaps in between line up with prevailing wind directions.
- **Venturi Effect winds "V"** result when wind flow is forced to pass between two converging buildings or groups of buildings with a resulting increase in flow.

Figure 14 Windflow Patterns Past Groups of Buildings

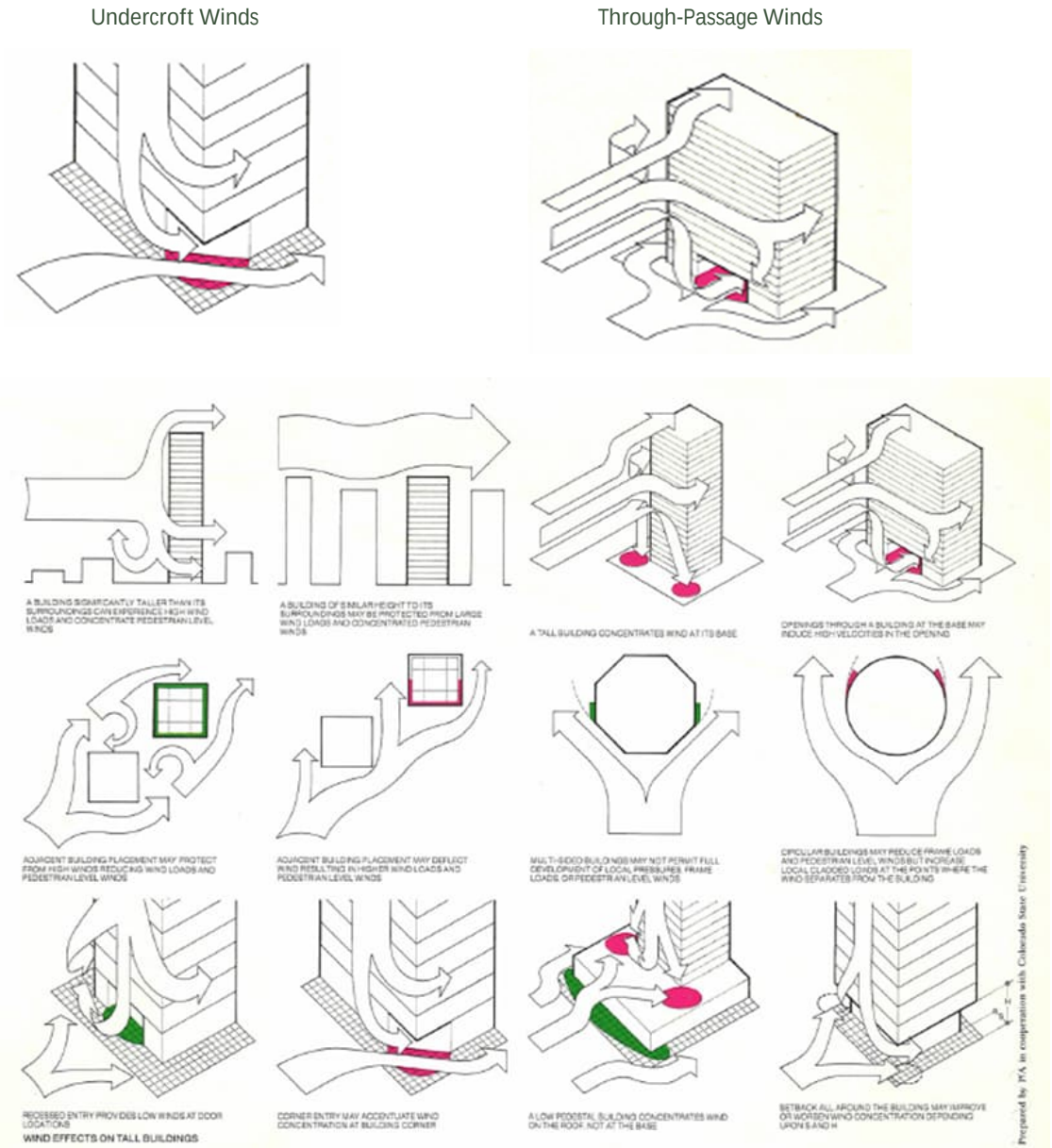


Local building details can also influence winds in the immediate vicinity – refer **Figure 15**.

The **"Undercroft"** effect is a well-known adverse building-wind characteristic as depicted in the generic building wind effect diagrams shown below. The winds are induced towards the negative pressure area within the undercroft, creating concentrated adverse wind flow through undercroft. This same pressure difference between the windward and leeward facades of a building can induce a strong wind tunnel effect through any open passage located at the base of a building – the **"Through Passage"** effect.

These and other common building-related wind impacts are depicted in **Figure 15**.

Figure 15 Undercroft Winds and Through-Passage Winds



4.0 WIND ACCEPTABILITY CRITERIA

4.1 Standard Local Government Criteria

The choice of suitable criteria for evaluating the acceptability of particular ground level conditions has been the subject of international research over the past few decades. One of the commonly accepted set of acceptability criteria developed from this research, currently referenced by many Australian Local Government Development Control Plans, is summarised in **Table 1**. The limiting wind speed criteria in **Table 1** are based on the maximum wind gust occurring (on average) once per year.

Table 1 Standard Local Government Wind Acceptability Criteria

Type of Criteria	Limiting Gust Wind Speed Occurring Once Per Year	Activity Concerned
Safety	24 m/s	Knockdown in Isolated Areas
	23 m/s	Knockdown in Public Access Areas
Comfort	16 m/s	Comfortable Walking
	13 m/s	Standing, Waiting, Window Shopping
	10 m/s	Dining in Outdoor Restaurant

The primary objectives relating to the above wind impact criteria are as follows:

- The general objective is for annual 3-second gust wind speeds to remain at or below the so-called 16 m/s “Walking Comfort” criterion. Whilst this magnitude may appear somewhat arbitrary, its value represents a level of wind intensity above which the majority of the population would find unacceptable for comfortable walking on a regular basis at any particular location.

- In many urban locations, either because of exposure to open water conditions or because of street “canyon” effects, etc, the 16 m/s “Walking Comfort” level may already be currently exceeded. In such instances a new development should ideally not exacerbate existing adverse wind conditions and, wherever feasible and reasonable, ameliorate such conditions.

- It can be seen in **Table 1** that the recommended limiting wind speeds for spaces designed for activities such as seating, outdoor dining, etc., are lower (ie more stringent) than for “walking comfort”.

4.2 Application of Wind Criteria

The criteria provided in Table 1 (especially in relation to Comfort) should not be viewed as “hard” numbers as the limiting values were generally derived from subjective assessments of wind acceptability. Such assessments have been found to vary considerably with the height, strength, age, etc., of the pedestrian concerned. A further factor for consideration is the extent of windy conditions, and some relaxation of the above criteria may be acceptable for small areas under investigation provided the general site satisfies the relevant criteria.

5.0 WIND IMPACT OF THE PROPOSED DEVELOPMENT

5.1 Areas of Interest in Relation to Wind Impact

Based on the design many aspects of the proposed development have been designed in such way as to avoid direct exposure to the stronger prevailing winds impacting the site. The previous section provided guidance as to the areas where the adopted wind acceptability criteria had the potential to be exceeded and an indication as to the likely local optimum wind treatment strategy, eg whether the wind condition of interest is likely to arise from accelerating winds which require vertical windbreaks (such as landscaping) or downwash winds which require horizontal windbreaks (such as awnings, canopies). In the absence of dedicated wind mitigation solutions, the wind conditions of potential concern in relation to the proposed development include:

- Buildings and development entry points
- Pedestrian walkways around/within the buildings
- Shared elevated Communal open spaces
- Private balconies

Figure 16 Areas of interest – Lower Ground

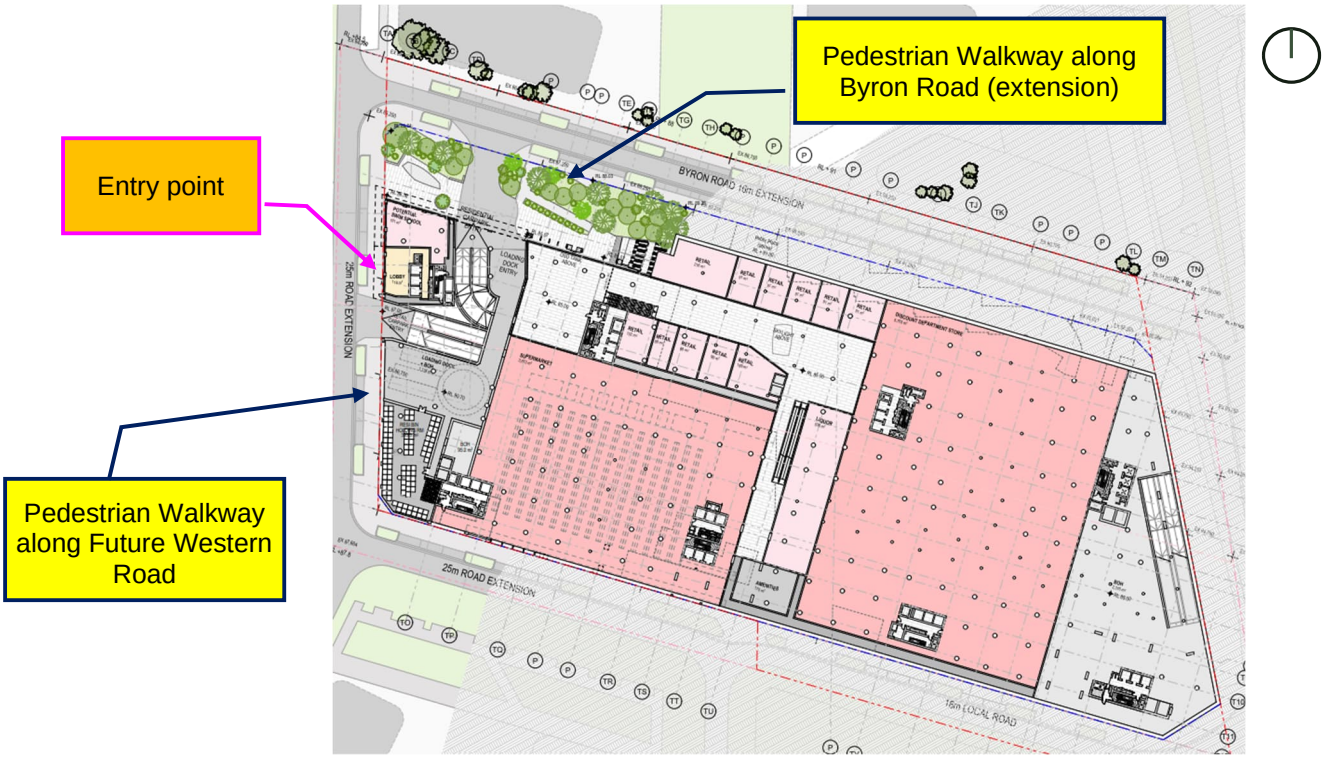


Figure 17 Areas of interest – Ground Floor

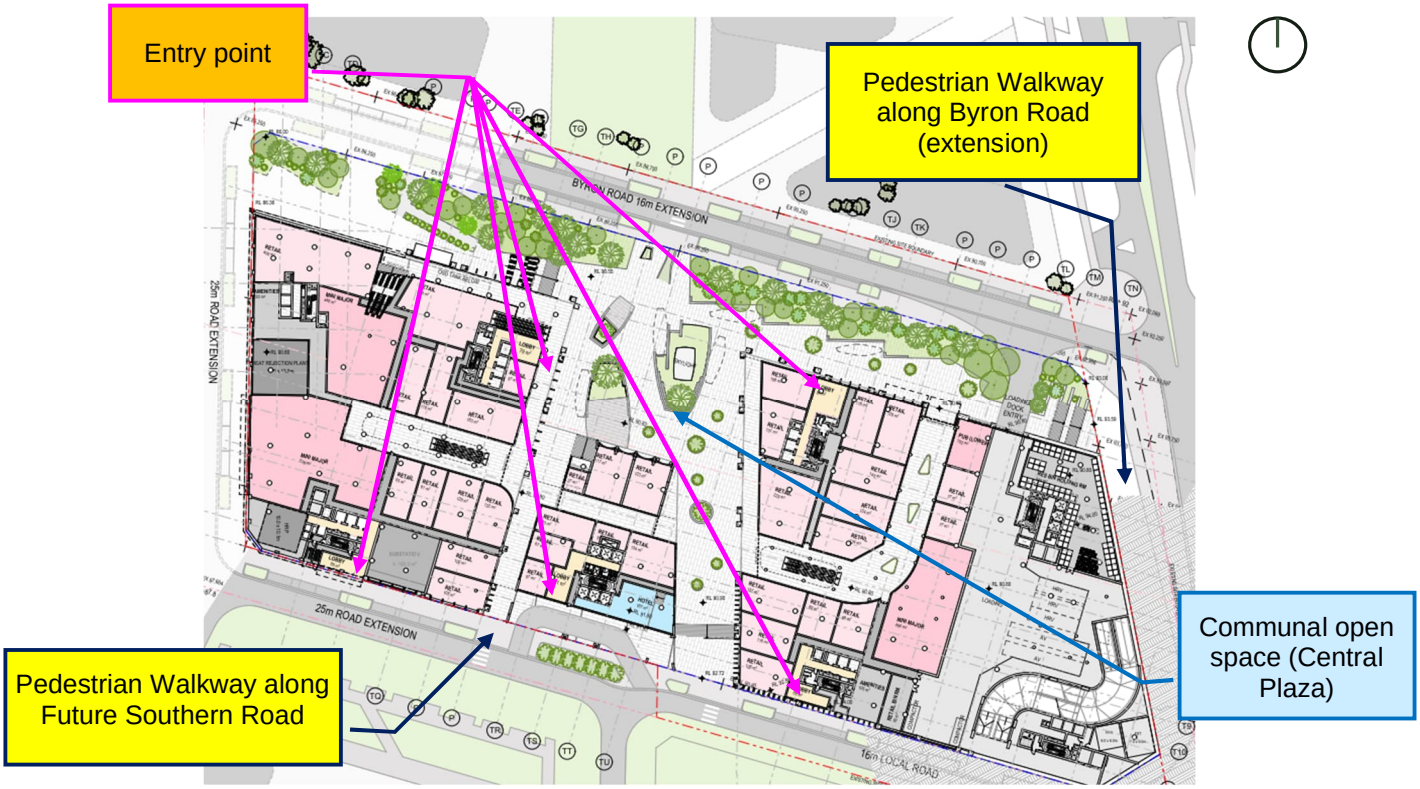


Figure 18 Areas of interest – Upper Ground

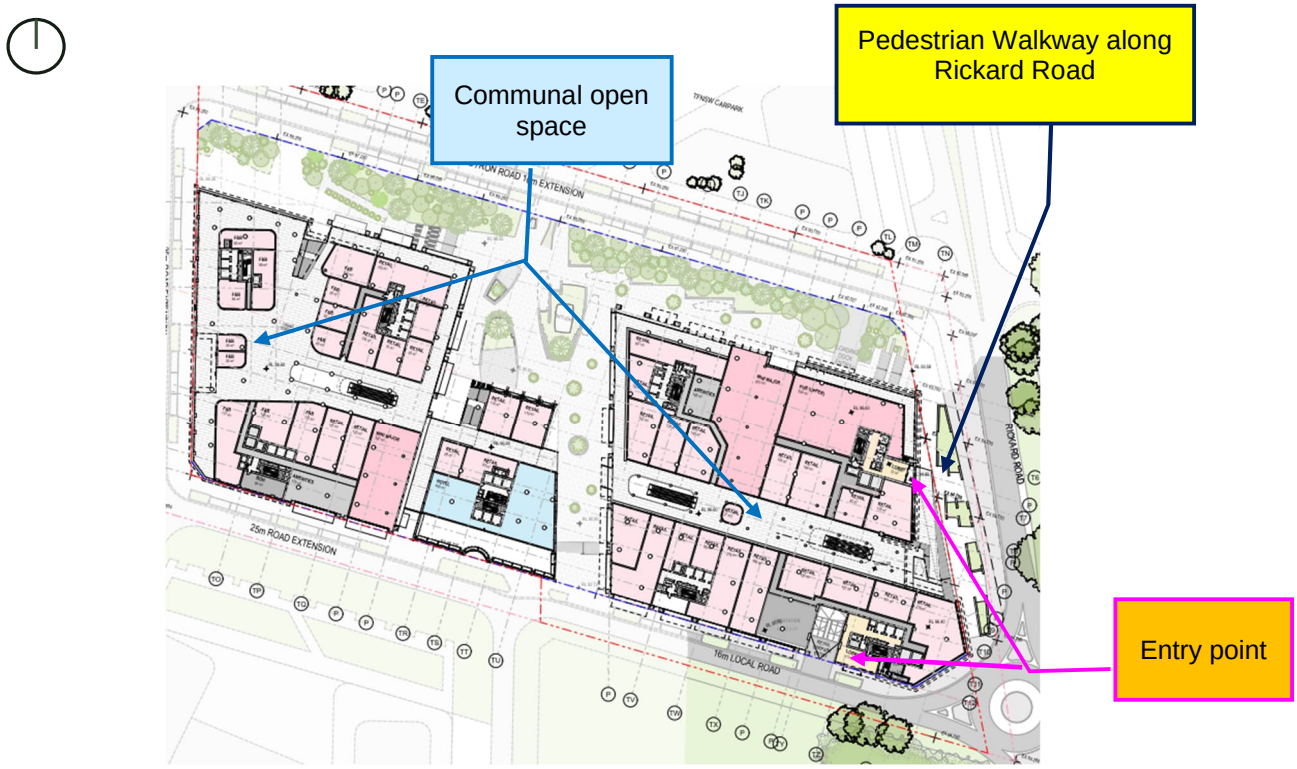


Figure 19 Areas of interest – Level 1

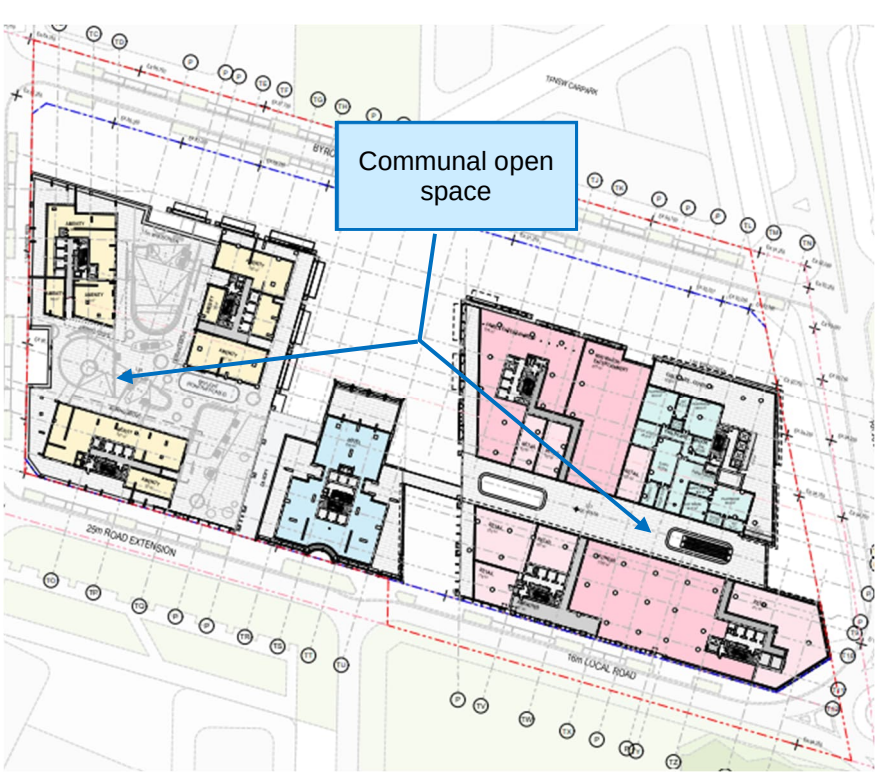


Figure 20 Areas of interest – Level 2

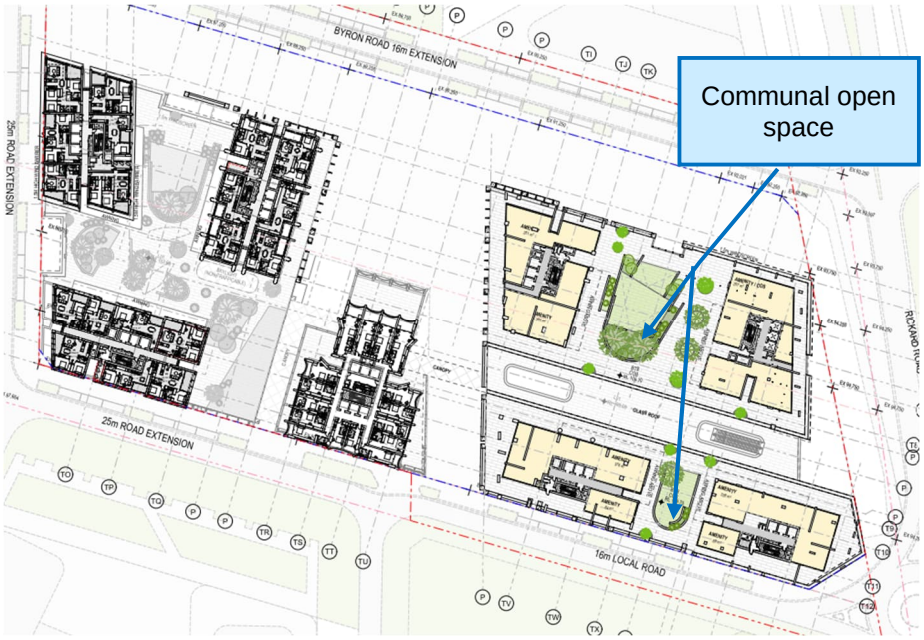
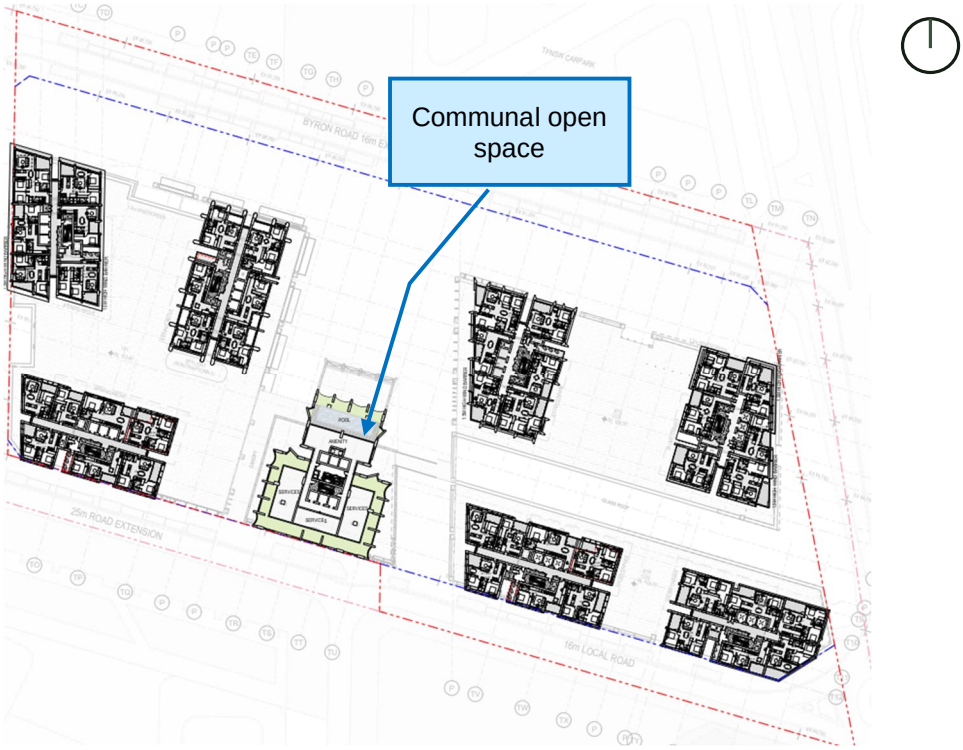


Figure 21 Areas of interest – Level 12 (Building 04)



5.2 Future Wind Impact at All Areas of Interest

The wind impact of the proposed development is described by examining the impact of key prevailing wind conditions on areas of interest within and external to the development.

The key directions analysed are:

- NE and S/SE winds for summer months and
- SW-NW (Westerly) winds for winter months.

The predicted wind environment at the site is examined in terms of both the:

- Existing Winds, and
- Future Winds with the addition of the proposed development.

The above predictions are made on the basis of our best engineering judgement and (decades of) experience in carrying out Environmental Wind Tunnel Testing and CFD Simulation Studies.

The above predictions are made without necessarily assuming any benefit from the already planned landscaping for the proposed development.

Prevailing Wind Direction: **NORTHEAST Winds**

Period of Annual Cycle: **Summer**

Location	Future Compliance	Key Factors
Pedestrian Walkway along Byron Road (extension)	**Compliance achievable if mitigation measures implemented**	The upcoming developments could cause wind channelling and downwash along these Pathways. To minimize the impact of high-speed winds on the footpaths, the strategic placement of landscaping and sizable trees in the vicinity can be instrumental in enhancing wind reduction efforts.
Pedestrian Walkway along Future Western Road	**Likely comply**	Although NE winds are generally mild, and the alignment of the development will limit the influence of prevailing winds, there is a possibility of high-speed winds swirling around the corners of the proposed building and may create wind conditions that are close to limits for building entry points (standing comfort). This impact will be alleviated by the large trees with a generous canopy, landscaping along the footpath and also the proposed deep setback in this area.
Pedestrian Walkway along Future Southern Road	**Likely comply**	The alignment of the development will limit the influence of these winds within this area.
Pedestrian Walkway along Rickard Road	**Compliance achievable if mitigation measures implemented**	The proposed development has the potential to generate localised wind channelling effects within this area. Accordingly, the strategic placement of landscaping and vegetation will play an important role in mitigating wind speeds and improving pedestrian comfort. In addition, façade downwash from the upper building levels may create wind conditions approaching comfort thresholds, reinforcing the importance of maintaining effective wind mitigation measures in these locations.
Communal open space on ground floor	**Compliance achievable if mitigation measures implemented**	The communal open space on ground level is exposed to relatively strong winds from the NE due to limited upstream shielding. In addition, façade downwash from the upper building levels may create wind conditions approaching standing comfort thresholds. These impacts can be effectively mitigated through the incorporation of large-canopy trees, horizontal windbreak and strategically placed landscaping within the communal open area, which will help disrupt wind flows, reduce wind speeds, and enhance overall comfort.
Lobby entrances	**Compliance achievable if mitigation measures implemented**	The proposed development has the potential to generate localised wind channelling and façade downwash from the upper building levels, which may result in wind conditions approaching standing comfort thresholds near east-facing building entry points. Accordingly, the strategic integration of landscaping and dense vegetation, together with horizontal wind mitigation measures such as awnings, will play an important role in reducing local wind speeds, minimising downwash impacts, and enhancing pedestrian comfort within these areas.
Elevated communal open area on upper ground	**Compliance achievable if mitigation measures implemented**	While the orientation of the development is expected to minimise direct exposure to prevailing northeasterly winds, there remains potential for localised wind acceleration and corner vortex effects around the building edges. Additionally, the proposed built form may contribute to wind channelling within this area, together with façade downwash from the upper building levels. These potential impacts can be effectively mitigated through the incorporation of large-canopy trees, strategically positioned landscaping, and appropriately designed horizontal windbreak elements such as pergolas or shade structures to improve pedestrian comfort.

Location	Future Compliance	Key Factors
Elevated communal open area on level 1 and level 2	**Compliance achievable if mitigation measures implemented**	There is potential for localised wind acceleration and corner vortex effects around the building edges, while the proposed built form may also contribute to wind channelling within this area, together with façade downwash from the upper building levels. These potential wind impacts can be effectively mitigated through the integration of large-canopy trees, strategically positioned landscaping, and well-designed horizontal wind mitigation measures such as pergolas, awnings, or shade structures, thereby reducing wind speeds and enhancing pedestrian comfort.
Elevated communal open area on level 12 (Building 04)	**Compliance achievable if mitigation measures implemented**	The communal open space on level 12 (building 04) is exposed to relatively strong winds from the NE due to limited upstream shielding. Consequently, some vertical windbreaks on the outer perimeter of this area are required to restrict the impact of the prevailing winds.
Upper level corner balconies	**Compliance achievable if mitigation measures implemented**	The elevated private open spaces (balconies) are exposed to strong winds from NE with insufficient shielding. Consequently, some vertical windbreaks on the outer perimeter of this area are required to restrict the impact of the prevailing winds.

Prevailing Wind Direction: **SOUTHEAST (& SOUTH) Winds**

Period of Annual Cycle: **Summer (Southeast) All-Year-Round (South)**

Location	Future Compliance	Key Factors
Pedestrian Walkway along Byron Road (extension)	**Borderline compliance**	While the alignment of the development will limit the influence of prevailing winds, there is a possibility of high-speed winds swirling around the corners of the proposed building. This impact can be alleviated by the large trees with a generous canopy and landscaping along the footpath.
Pedestrian Walkway along Future Western Road	**Compliance achievable if mitigation measures implemented**	The upcoming developments could cause wind channelling and along these Pathways. To reduce the impact of high-speed winds on the footpaths, the strategic placement of landscaping and sizable trees in the vicinity can be instrumental in enhancing wind reduction efforts.
Pedestrian Walkway along Future Southern Road	**Compliance achievable if mitigation measures implemented**	Although mid-rise developments to the south of the site provide partial shielding, southerly to south-easterly winds may still accelerate as they traverse the elevated communal open space, resulting in localised shear flow effects. Accordingly, the implementation of vertical windbreaks along the outer perimeter is recommended to limit wind penetration and improve overall comfort within this area.
Pedestrian Walkway along Rickard Road	**Compliance achievable if mitigation measures implemented**	Downwash from building facades above may create wind conditions that are close to limits. To further minimize the impact of high-speed winds on the footpaths, the strategic placement of landscaping and sizable trees in the vicinity can be instrumental in enhancing wind reduction efforts.
Communal open space on ground floor	**Compliance achievable if mitigation measures implemented**	This area may experience increased winds due to channelling from the S/SE. In addition downwash from building facades above may create wind conditions that are close to limits. Consequently, targeted mitigation measures will be required, including the strategic placement of landscaping and sizable trees around the designated seating area, together with horizontal windbreak elements such as pergolas or shade structures, to effectively reduce wind speeds and enhance overall pedestrian comfort.
Elevated communal open area on upper ground	**Compliance achievable if mitigation measures implemented**	While the orientation of the development is expected to minimise direct exposure to prevailing S/SE winds, there remains potential for localised wind acceleration and corner vortex effects around the building edges. Additionally, the proposed built form may contribute to wind channelling within this area, together with façade downwash from the upper building levels. These potential impacts can be effectively mitigated through the incorporation of large-canopy trees, strategically positioned landscaping, and appropriately designed horizontal windbreak elements such as pergolas or shade structures to improve pedestrian comfort.
Elevated communal open area on level 1 and level 2	**Compliance achievable if mitigation measures implemented**	There is potential for localised wind acceleration and corner vortex effects around the building edges, while the proposed built form may also contribute to wind channelling within this area, together with façade downwash from the upper building levels. These potential wind impacts can be effectively mitigated through the integration of large-canopy trees, strategically positioned landscaping, and well-designed horizontal wind mitigation measures such as pergolas, awnings, or shade structures, thereby reducing wind speeds and enhancing pedestrian comfort.

Location	Future Compliance	Key Factors
Elevated communal open area on level 12 (Building 04)	**Compliance achievable if mitigation measures implemented**	The communal open space on level 12 (building 04) is exposed to relatively strong winds from the NE due to limited upstream shielding. Consequently, some vertical windbreaks on the outer perimeter of this area are required to restrict the impact of the prevailing winds.
Upper level corner balconies	**Compliance achievable if mitigation measures implemented**	The elevated private open spaces (balconies) are exposed to strong winds from NE with insufficient shielding. Consequently, some vertical windbreaks on the outer perimeter of this area are required to restrict the impact of the prevailing winds.

Prevailing Wind Direction: **WESTERLY Winds (SW-NW)**

Period of Annual Cycle: **Winter / Early Spring**

Location	Future Compliance	Key Factors
Pedestrian Walkway along Byron Road (extension)	**Compliance achievable if mitigation measures implemented**	The potential exists for the proposed developments to induce wind channelling onto this walkway during west winds. This impact can be alleviated by the large trees with a generous canopy and landscaping along the street footpath.
Pedestrian Walkway along Future Western Road	**Compliance achievable if mitigation measures implemented**	Downwash from building facades above may create wind conditions that are close to limits. Consequently, effective wind mitigation strategies are essential in this zone to diminish the wind levels. Landscaping planned for this area will assist in mitigating these winds.
Pedestrian Walkway along Future Southern Road	**Compliance achievable if mitigation measures implemented**	The potential for wind channelling onto this area exists with the proposed development. To reduce the impact of high-speed winds on the footpaths, the strategic placement of landscaping and sizable trees can be instrumental in enhancing wind reduction efforts.
Pedestrian Walkway along Rickard Road	**Minimal Increase Likely comply**	The alignment of the development will limit the influence of prevailing winds in this area.
Communal open space on ground floor	**Likely comply**	Westerly winds may experience accelerated shearflow as they pass through the elevated communal space on roof; however, this impact is expected to be significantly reduced through the implementation of the proposed large vertical windbreak surrounding the area.
Elevated communal open area on upper ground , level1 and level 2	**Compliance achievable if mitigation measures implemented**	This area may experience increased winds due to channelling from the SW/NW. In addition, downwash from building facades above may create wind conditions that are close to limits. Consequently, targeted mitigation measures will be required, including the strategic placement of landscaping and sizable trees around the designated seating area, together with horizontal windbreak elements such as pergolas or shade structures, to effectively reduce wind speeds and enhance overall pedestrian comfort.
Elevated communal open area on level 12 (Building 04)	**Compliance achievable if mitigation measures implemented**	This communal open space on level 6 benefits from partial shielding provided by the neighbouring buildings to the west of Building 04 However, westerly winds may wrap around the building corners, leading to localised wind acceleration within the area. Accordingly, the incorporation of vertical windbreaks is recommended to mitigate these effects and improve overall wind conditions within the communal space.
Upper level corner balconies	**Compliance achievable if mitigation measures implemented**	The elevated private open spaces (balconies) are exposed to strong winds from NE with insufficient shielding. Consequently, some vertical windbreaks on the outer perimeter of this area are required to restrict the impact of the prevailing winds.

6.0 MITIGATION AND TREATMENT RECOMMENDATIONS

On the basis of the expected wind impacts outlined in **Section 6**, the following recommendations for wind amelioration features are made in areas where winds are expected to approach or exceed the relevant 10 m/s, 13 m/s or 16 m/s criterion depending on the designed use for that area.

Lower Ground – refer Figure 22

- Maintain the proposed/existing trees/landscaping on the sides of the development to mitigate the impact of local wind speeds. It is recommended that all trees/landscaping to be evergreen and densely foliating to maintain its effectiveness throughout the year
- Maintain the proposed recessed setback and canopy at the key entry points to provide effective wind shelter, reduce direct wind penetration, and improve pedestrian comfort. Similar entrance treatments must be incorporated across all primary building entrances to improve wind protection, reduce façade downwash effects, and create a more comfortable pedestrian environment.
- Where designated seating or dining areas are proposed, position these spaces beneath proposed horizontal wind protection elements such as pergolas, shade cloth structures, or similar overhead screening features to assist in reducing downwash effects and improving pedestrian comfort. Alternatively, locate seating and dining areas beneath proposed mature canopy trees, or within recessed building setbacks and beneath deep awnings, to maximise wind shelter and enhance the usability and amenity of outdoor spaces.

Ground– refer Figure 23

- Keep the proposed/existing trees/landscaping on the sides of the development to mitigate the impact of local wind speeds. It is recommended that all trees/landscaping to be evergreen and densely foliating to maintain its effectiveness throughout the year.
- Maintain the proposed recessed setback and canopy at the key entry points to provide effective wind shelter, reduce direct wind penetration, and improve pedestrian comfort. Similar entrance treatments must be incorporated across all primary building entrances to improve wind protection, reduce façade downwash effects, and create a more comfortable pedestrian environment.
- Where designated seating or dining areas are proposed, position these spaces beneath proposed horizontal wind protection elements such as pergolas, shade cloth structures, or similar overhead screening features to assist in reducing downwash effects and improving pedestrian comfort. Alternatively, locate seating and dining areas beneath proposed mature canopy trees, or within recessed building setbacks and beneath deep awnings, to maximise wind shelter and enhance the usability and amenity of outdoor spaces.
- Keep the proposed planter boxes throughout the through-link, with vegetation reaching a minimum combined height of approximately 1.5 m, to increase surface roughness and reduce wind speeds. The latest design incorporates additional planter boxes adjacent to the stair access and at the corner of the through-site link to assist in mitigating local wind speeds by disrupting airflow, reducing wind channelling through the link, and providing a degree of shelter within these exposed areas.

- Keep the proposed landscaping and mature trees near the northern entrance of the through link to provide additional shielding from high-speed wind penetration.

Upper Ground– refer Figure 24

- Install vertical windbreak elements with a minimum total height of approximately 1.5 m along the outer edges of exposed upper-ground communal open areas to reduce wind speeds and improve pedestrian comfort. The elements can be achieved through a combination of elements such as solid balustrades, planter boxes, and vegetation/trees, strategically situated around the perimeter.
- Introduce planter boxes throughout the site link, with vegetation reaching a minimum combined height of approximately 1.5 m, to increase surface roughness and reduce corridor wind speeds.

Elevated communal open space on Level 1 and Level 2 – refer Figure 25 and Figure 26

- Maintain the proposed 1.5 m high windscreen along the outer edges of all exposed Level 1 and Level 2 communal areas.
- Keep the proposed awnings above the retail entrances.
- Keep the proposed landscaping and vertical screening elements surrounding the designated standing and seating areas within this area. Consider supplementary horizontal windbreak elements, such as pergolas, or overhead shade structures, in highly exposed locations to further reduce downwash and improve occupant comfort.
- Ensure designated seating, dining, or communal areas are located within sheltered zones or proposed mature canopy trees or recessed building forms.

Elevated communal open space on Level 12 (Building 04) – refer Figure 27

- It is advised for the elevated open spaces on level 12 (Building 04) to install vertical windbreaks, reaching a height of 1.8 meters, along the outer perimeter. This can be achieved through a combination of elements such as solid balustrades, planter boxes, and vegetation/trees, strategically situated around the perimeter.

Elevate Private Balconies – refer Figure 28

- For the private balconies located on the upper levels, particularly at corner locations where wind exposure is typically highest due to increased acceleration and limited upper-level shielding afforded to the site, the currently permeable balustrades are likely to provide limited wind shielding to occupants. It is therefore recommended that:
    - Incorporate a nested design with a single open aspect,
    - or enhancing the height of the vertical windbreaks along the edges of these balconies to 1.5m.
    - also, balustrades along the outer edges of these balconies be designed configured to achieve a minimum effective solidity of approximately 70% (i.e. maximum 30% open area). This level of solidity has been found to significantly reduce local wind penetration and improve usability of the balcony space by limiting direct wind ingress at seated and standing height.

- Alternatively, utilize quantitative assessments like Computational Fluid Dynamics in the detailed design phase to assess wind speeds and implement appropriate shielding, especially for balconies with west exposure. During the Detailed Design phase, further modelling can confirm zones of the building where additional wind mitigation measures may be beneficial for balconies and terraces intended for year-round use, particularly considering the strongest winds during winter/early spring

The qualitative assessment presented above is based on SLR's wind engineering expertise and professional judgement. A detailed quantitative environmental wind tunnel assessment is recommended to accurately quantify pedestrian-level wind conditions and verify the adequacy and effectiveness of the proposed wind mitigation measures.

Figure 22 Wind Mitigation for the Development – Lower Ground

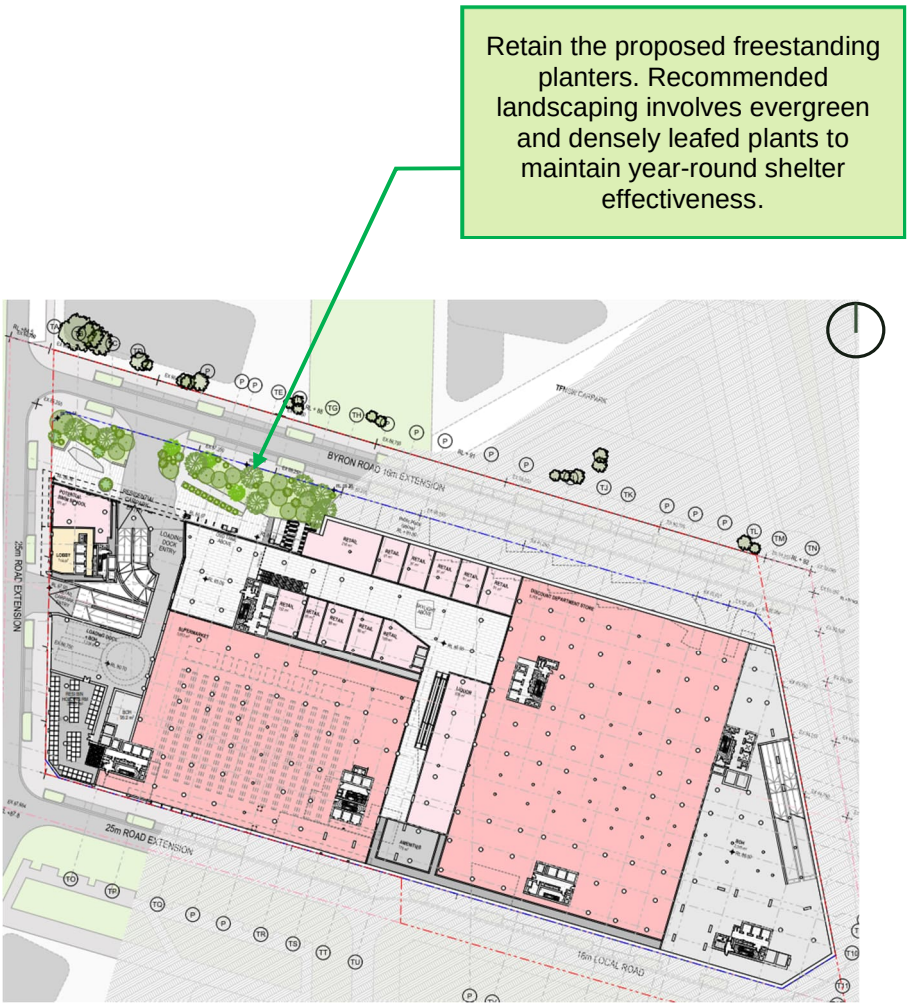
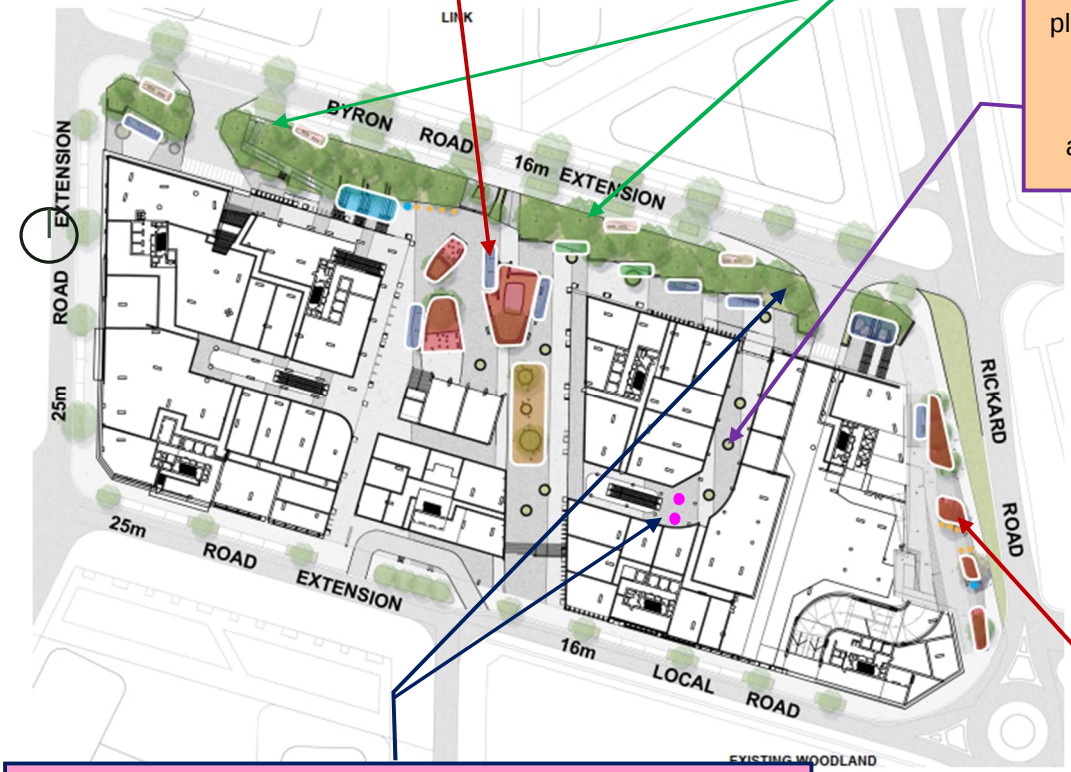


Figure 23 Wind Mitigation for the Development – Ground

Where designated seating or dining areas are proposed, horizontal windbreak elements such as pergolas, shade cloth structures, or similar overhead screening are recommended to reduce downwash impacts.

Retain the proposed freestanding planters. Recommended landscaping involves evergreen and densely leafed plants to maintain year-round shelter effectiveness.

Keep the proposed planter boxes within the link, with vegetation reaching a minimum combined height of approximately 1.5 m.



- Retain planned landscaping elements to the north. Mature trees of approximately 3 m height near the link entrances for additional shielding against high-speed wind penetration.
- The latest design incorporates additional planter boxes adjacent to the stair access and at the corner of the through-site link to assist in mitigating local wind speeds by disrupting airflow, reducing wind channelling through the link, and providing a degree of shelter within these exposed areas.

These seating areas should be strategically located beneath the proposed trees or, alternatively, beneath recessed building setbacks or deep awnings.

- Retain the recessed setback and the proposed canopies at the main entry points to provide effective wind shelter and reduce direct wind penetration into the entrance area.
- This mitigation approach can be effectively implemented in front of the retail entrance to enhance wind protection and create a more comfortable arrival experience.

Figure 24 Wind Mitigation for the Development – Upper Ground

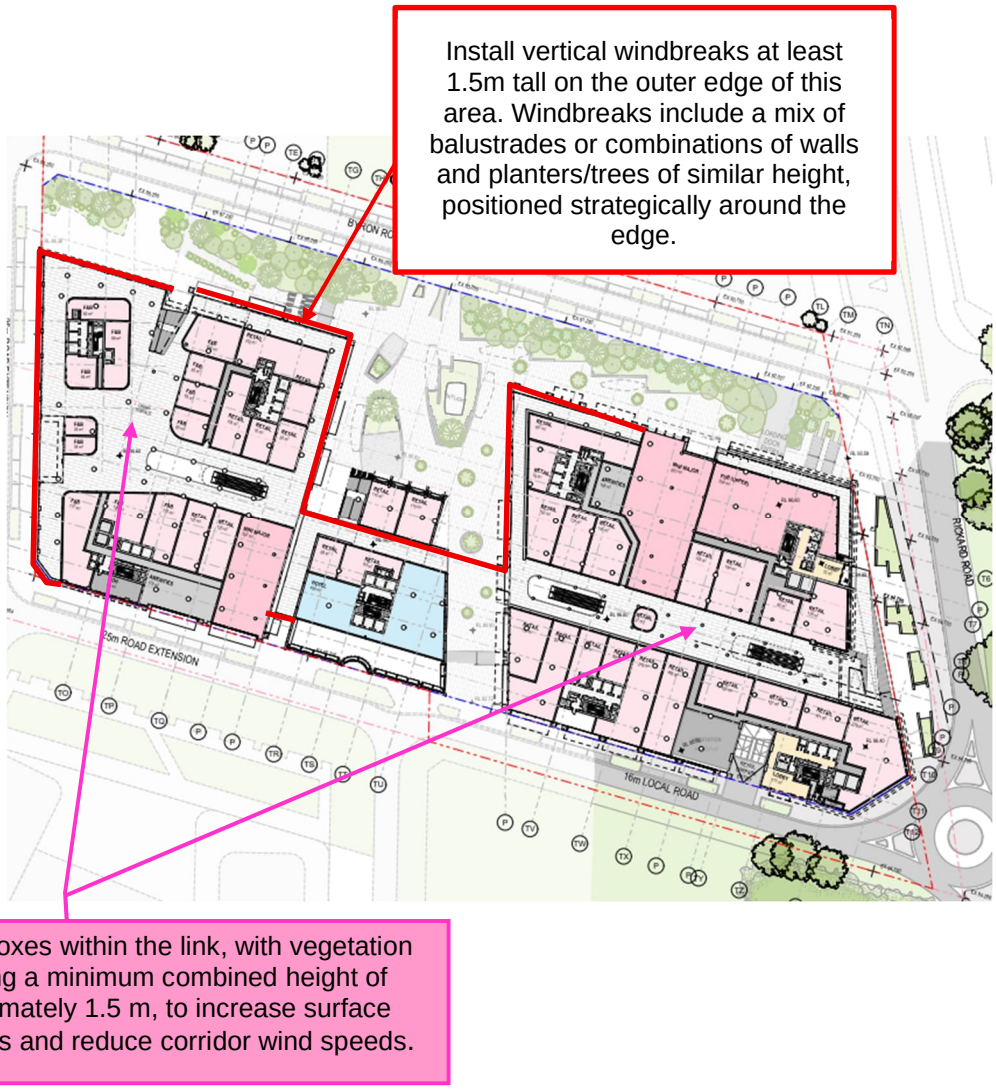


Figure 25 Wind Mitigation for the Development – Level 1

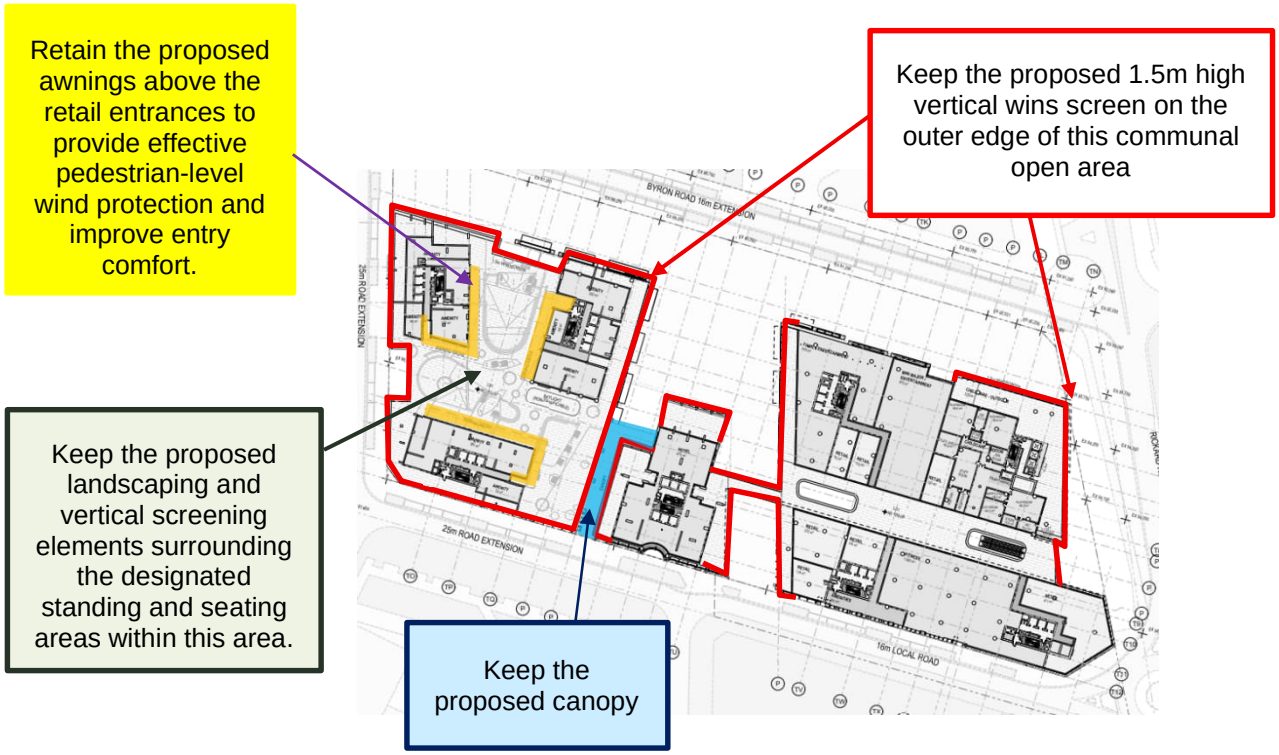


Figure 26 Wind Mitigation for the Development – Level 2

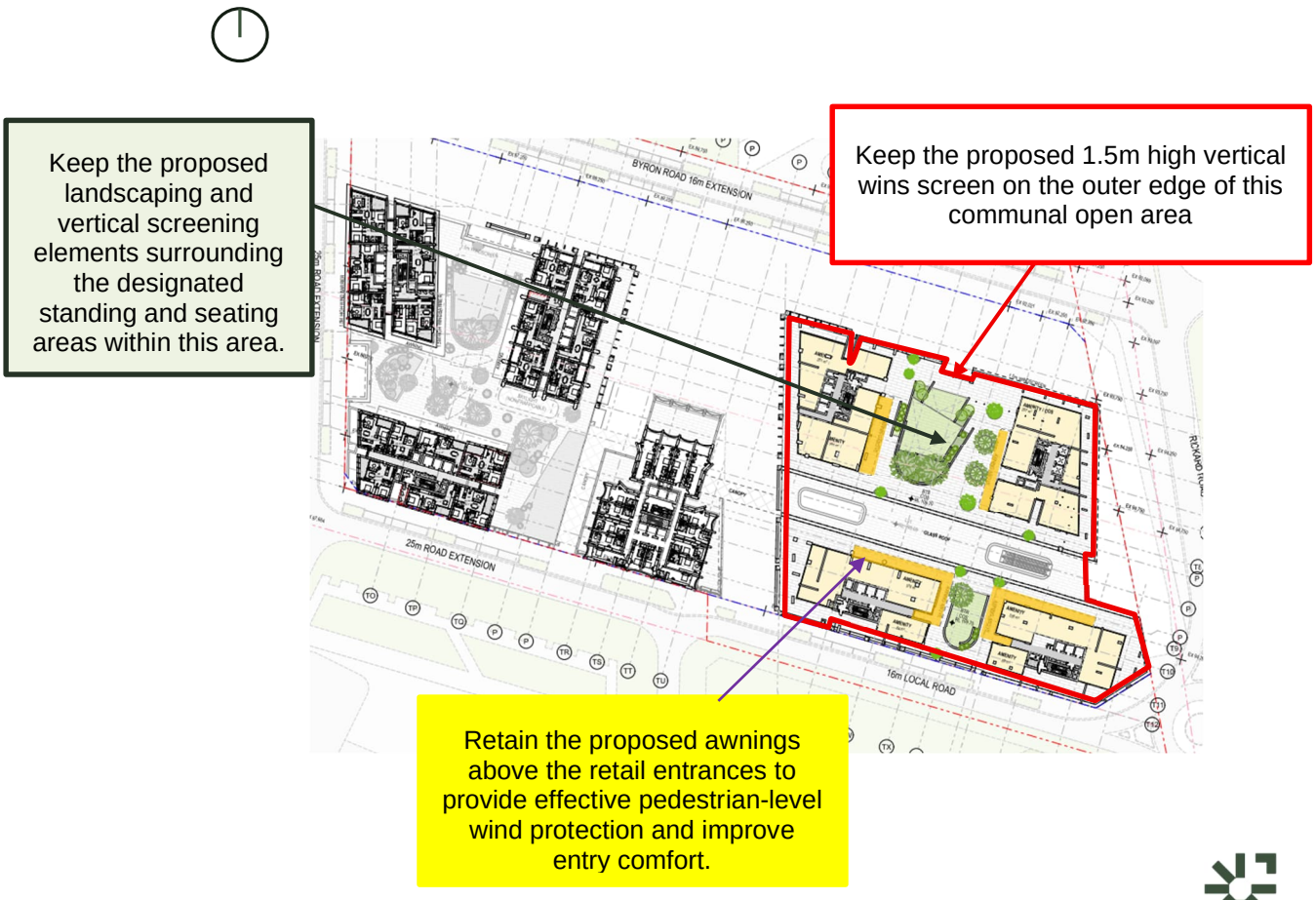


Figure 27 Wind Mitigation for the Development – – Level 12 (Building 04)

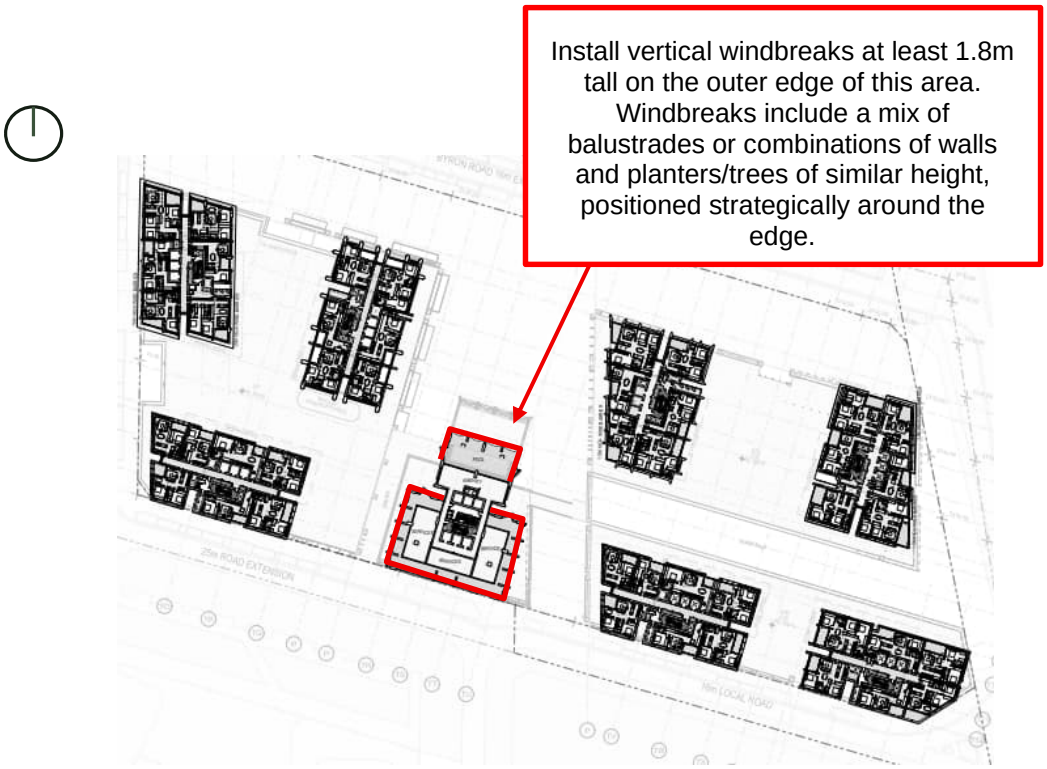


Figure 28 Wind Mitigation for the Development – Private corner balconies

The circled corner balconies at levels above 5 require shielding to prevailing wind directions, as a result of limited upper-level shielding afforded to the site. As such, consider maintaining the proposed balustrade height for private balconies on these levels, incorporating a nested design with a single open aspect or enhancing the height of the vertical windbreaks along the edges of these balconies to 1.5m.

7.0 POTENTIAL IMPACTS OF LIKELY FUTURE DEVELOPMENT

A number of future developments have been identified within the broader vicinity of the proposed development site. These include the following projects currently in planning or early design stages:

- SSD-84430209 - 156-166 Rickard Road, Leppington (Leppington Residential Core Precinct - Site B)
- SSD-94455963 - 122 Dickson Road, Leppington
- SSD-82157706 - 213 Bringelly Road, Leppington
- SSD-87123457 – 297 Bringelly Road, Leppington
- SSD-82158457 – 230 Rickard Road, Leppington
- DA2025/455 – 141 Byron Road, Leppington
- DA2024/313 – 182 Byron Road, Leppington

At the time of this assessment, the detailed building configurations for most of these developments—including their final heights, massing arrangements, podium layouts, and architectural forms—have not yet been finalised. As such, it is not possible to undertake a detailed assessment of their wind impacts at this stage. A comprehensive evaluation would require confirmed building geometry, façade articulation, and landscape details in order to accurately simulate potential wind interactions.

Nevertheless, a qualitative consideration of the likely wind effects associated with these future developments can be undertaken. The proposed future buildings may influence wind conditions at the subject development site from multiple wind directions depending on their final scale and orientation. In general, the introduction of additional built form within the surrounding area is expected to increase the overall surface roughness of the urban environment, which can provide greater shielding of the site at pedestrian level compared with the current situation. At present, the surrounding context is relatively open in several directions, meaning that incoming winds can approach the site with limited upstream obstruction.

The addition of these future buildings is therefore likely to reduce wind speeds in certain areas, particularly at ground level and within sheltered communal spaces, through upstream wind blocking. However, depending on the final arrangement, height distribution, and spacing between these future buildings, there is also potential for localised wind acceleration or channelling effects to occur.

Once the surrounding developments progress to more advanced design stages and their final building envelopes become available, a more detailed wind assessment—potentially including computational fluid dynamics (CFD) modelling or wind tunnel testing—may be undertaken if required to confirm the cumulative wind effects across the precinct.

8.0 Conclusion

This qualitative wind assessment has been prepared by SLR Consulting Australia Pty Ltd (SLR)on behalf of Leppington (1) 88 Development Pty Ltd (**the Applicant**) to address the project-specific Secretary's Environmental Assessment Requirements (SEARs) issued the proposed State Significant Development Application (SSDA) SSD-99319962. The development is located at 173-183 Rickard Road, Leppington (the Site) and is located within the South West Growth Area (**SWGA**) within the Camden Local Government Area (**LGA**).

The assessment has been made on the basis of our best engineering judgment and on the experience gained from (decades of) scale-model Wind Tunnel Testing and CFD Simulation analysis of a range of similar scale developments.

The site is bounded by Rickard Road to the east, car parking areas to the north, and existing grasslands in the remaining directions. The surrounding built environment is characterised predominantly by low-rise developments and open grassland areas in all directions, with Leppington Train Station situated to the north of the site (refer Figure 10). In terms of topography, the broader site context exhibits a gradual upward incline from west to east across both the development site and its surrounding areas.

Site Wind Climate

Based on long-term wind data from nearby Bureau of Meteorology stations, the site experiences two main wind seasons. Summer winds primarily come from the northeast, southeast, and south, with the strongest gusts from the southeast and southerly winds. In winter and early spring, winds mostly originate from the west, with the strongest winds occurring inland.

Existing Wind Environment

Close to the ground, the "regional" wind patterns described above are affected by the local terrain, topography and built environment, all of which influence the "local" wind environment.

- As noted in **Section 1.3**, the site is currently surrounded by low rise development and grassland to all directions.
- The site will, therefore, will have limited wind shielding, leaving it exposed to stronger winds from multiple directions.

Future Wind Environment

In terms of the *future* wind environment with the proposed Development, the following features of the development are noted as being of most significance:

Lower Ground – refer Figure 22

- Retain the proposed/existing trees and landscaping surrounding the development to assist in mitigating local wind speeds. It is recommended that all vegetation be evergreen and densely foliated to ensure effective year-round wind protection
- Maintain the proposed recessed setback and canopy at the key entry points to provide effective wind shelter, reduce direct wind penetration, and improve pedestrian comfort. Similar entrance treatments must be incorporated across all primary building entrances to improve wind protection, reduce façade downwash effects, and create a more comfortable pedestrian environment.

- Where designated seating or dining areas are proposed, position these spaces beneath proposed horizontal wind protection elements such as pergolas, shade cloth structures, or similar overhead screening features to assist in reducing downwash effects and improving pedestrian comfort. Alternatively, locate seating and dining areas beneath proposed mature canopy trees, or within recessed building setbacks and beneath deep awnings, to maximise wind shelter and enhance the usability and amenity of outdoor spaces.

Ground Level – refer Figure 23

- Uphold the proposed/existing trees/landscaping on the sides of the development to mitigate the impact of local wind speeds. It is recommended that all trees/landscaping to be evergreen and densely foliating to maintain its effectiveness throughout the year
- Maintain the proposed recessed setback and canopy at the key entry points to provide effective wind shelter, reduce direct wind penetration, and improve pedestrian comfort. Similar entrance treatments must be incorporated across all primary building entrances to improve wind protection, reduce façade downwash effects, and create a more comfortable pedestrian environment.
- Where designated seating or dining areas are proposed, position these spaces beneath proposed horizontal wind protection elements such as pergolas, shade cloth structures, or similar overhead screening features to assist in reducing downwash effects and improving pedestrian comfort. Alternatively, locate seating and dining areas beneath proposed mature canopy trees, or within recessed building setbacks and beneath deep awnings, to maximise wind shelter and enhance the usability and amenity of outdoor spaces.
- Keep the proposed planter boxes throughout the through-link, with vegetation reaching a minimum combined height of approximately 1.5 m, to increase surface roughness and reduce wind speeds. The latest design incorporates additional planter boxes adjacent to the stair access and at the corner of the through-site link to assist in mitigating local wind speeds by disrupting airflow, reducing wind channelling through the link, and providing a degree of shelter within these exposed areas.
- Keep the proposed landscaping and mature trees near the northern entrance of the through link to provide additional shielding from high-speed wind penetration.

Upper Ground – refer Figure 24

- Install vertical windbreak elements with a minimum total height of approximately 1.5 m along exposed outer edges of communal open areas. These may comprise solid balustrades, planter boxes, and dense vegetation strategically arranged around the perimeter.
- Introduce planter boxes throughout site links, with vegetation reaching a minimum combined height of approximately 1.5 m, to increase surface roughness and reduce wind speeds.

Elevated Communal Open Space – Levels 1 and 2 (refer Figure 25 and Figure 26)

- Keep the proposed 1.5 m high windscreen along the outer edges of all exposed Level 1 and Level 2 communal areas.
- Keep the proposed awnings above the retail entrances.

- Keep the proposed landscaping and vertical screening elements surrounding the designated standing and seating areas within this area. Consider supplementary horizontal windbreak elements, such as pergolas, or overhead shade structures, in highly exposed locations to further reduce downwash and improve occupant comfort.
- Ensure designated seating, dining, or communal spaces are positioned within sheltered zones or behind windbreak treatments to maximise comfort and usability.

Elevated Communal Open Space – Level 12 (Building 04) – refer Figure 27

- Install vertical windbreak elements with a minimum height of approximately 1.8 m along exposed outer perimeters. These can include solid balustrades, planter boxes, and landscaping elements to improve comfort and mitigate elevated wind exposure.

Elevated Private Balconies – refer Figure 28

- For upper-level and corner balconies, where wind exposure is typically greatest, incorporate a nested or single-aspect balcony design where feasible to improve shielding.
- Increase vertical windbreak heights along balcony edges to approximately 1.5 m where required.
- Configure balcony balustrades to achieve a minimum effective solidity of approximately 70% (maximum 30% open area) to significantly reduce wind penetration and improve balcony usability.
- Alternatively, undertake detailed quantitative assessments such as Computational Fluid Dynamics during detailed design to refine balcony wind mitigation strategies, particularly for highly exposed balconies intended for year-round use.

With the incorporation of proposed windbreak mitigation treatments, all amenity locations within the proposed development including ground and all terrace level locations are expected to achieve the target Lawson Comfort Criteria and Melbourne Safety Criterion established for the project.

The above analysis has been made on the basis of our best engineering judgment and on the experience gained from scale model wind tunnel testing or computational fluid dynamics analysis of a range of developments.

Summary

On the basis of the above, the overall effect of the proposed development on the local wind microclimate is predicted to be “not significant” (refer **Section 3.2**) and the proposed development should satisfy the nominated Wind Acceptability criteria for the project.

9.0 Feedback

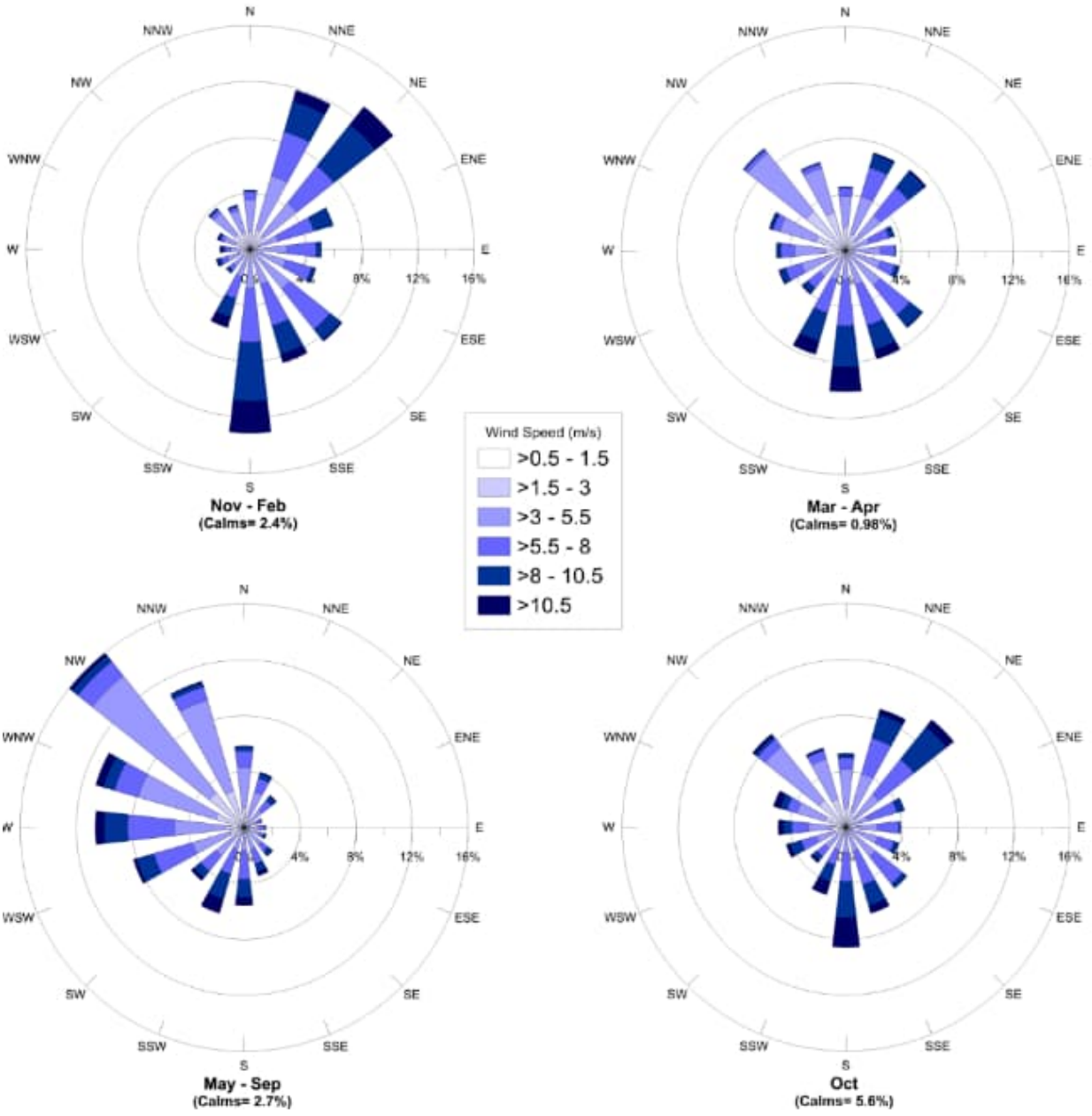
At SLR, we are committed to delivering professional quality service to our clients. We are constantly looking for ways to improve the quality of our deliverables and our service to our clients. Client feedback is a valuable tool in helping us prioritise services and resources according to our client needs.

To achieve this, your feedback on the team's performance, deliverables and service are valuable and SLR welcome all feedback via https://www.slrconsulting.com/en/feedback.

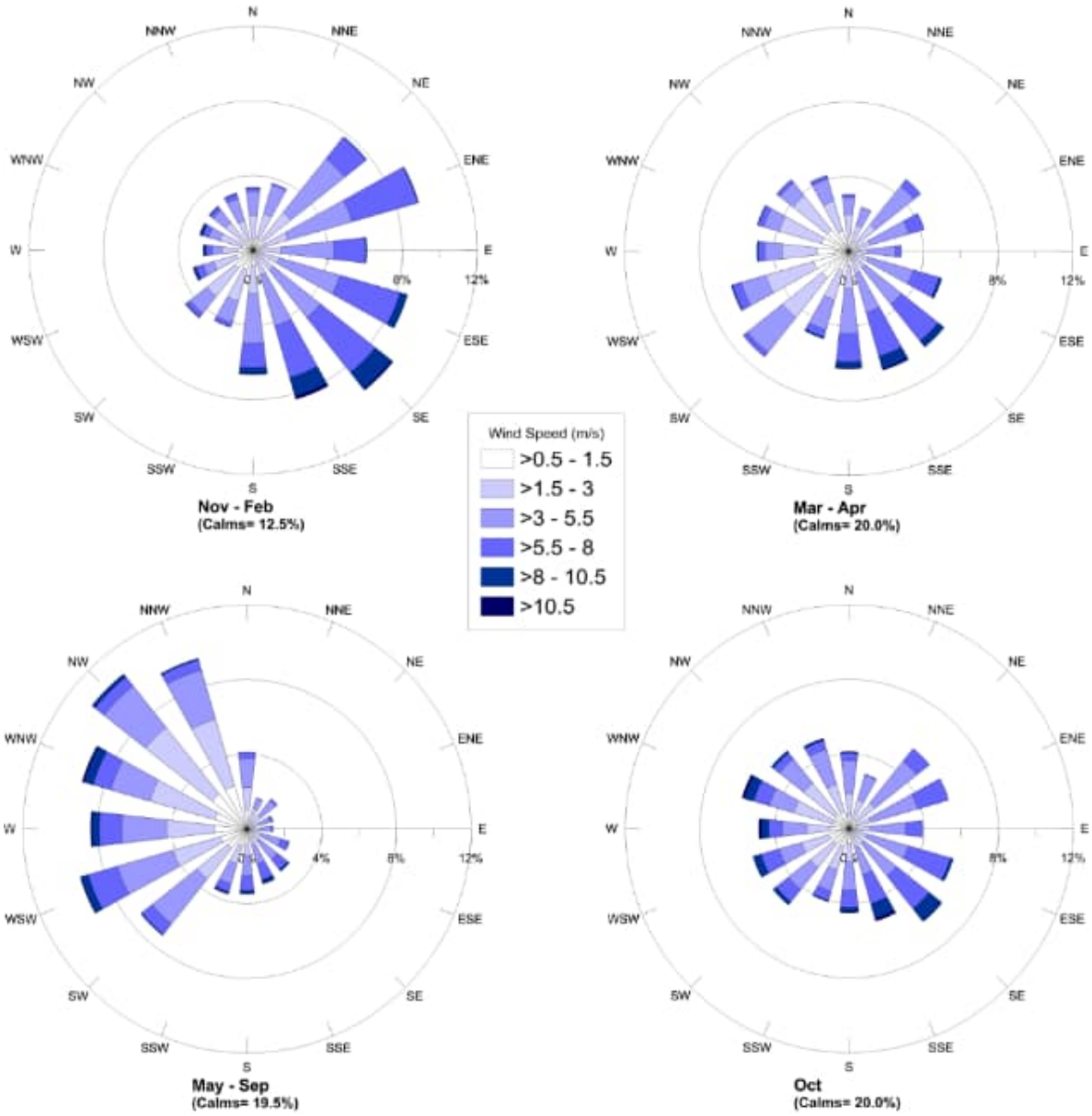
We recognise the value of your time and we will make a $10 donation to our Charity Partner - Lifeline, for every completed form.

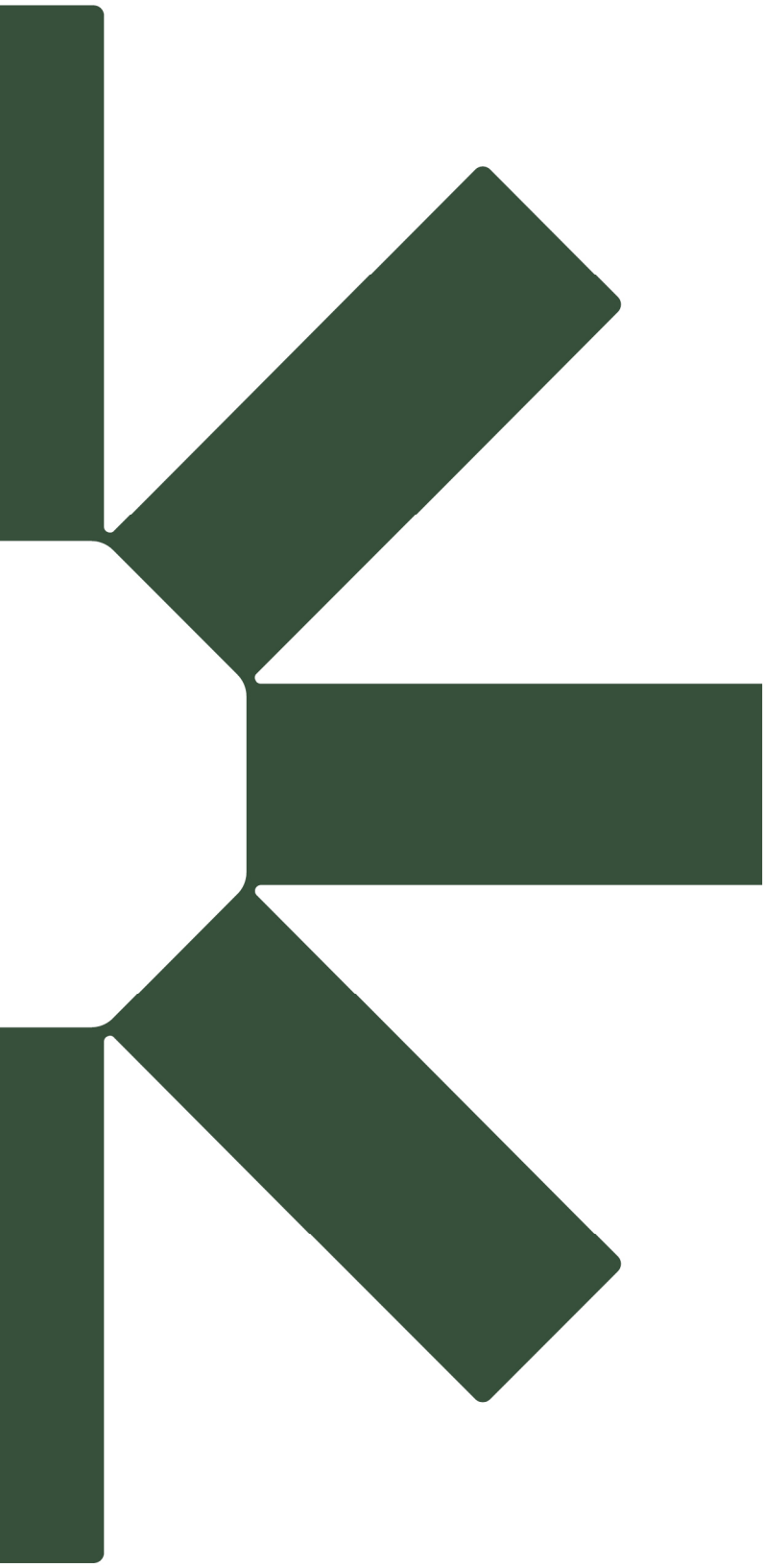
Appendix A Seasonal Wind Roses for Bureau of Meteorology Met Stations at Sydney (Kingsford Smith) Airport and Bankstown Airport

Sydney Airport AWS
(Observations)
1999-2017
600.09300



Bankstown Airport AWS
(Observations)
1999-2017
600.09300





Making Sustainability Happen