PAGEWOOD DEVELOPMENT

Lot E - Qualitative Environmental Wind Assessment

Prepared for:

Karimbla Constructions Services (NSW) Pty Ltd
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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Karimbla Constructions Services (NSW) 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.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.13932-R24-v2.0	17 August 2021	Mark Hobday	Neihad Al-Khalidy	Neihad Al-Khalidy
610.13932-R24-v1.0	21 December 2020	James Cleary	Neihad Al-Khalidy	Neihad Al-Khalidy

EXECUTIVE SUMMARY

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Karimbla Constructions Services (NSW) Pty Ltd to provide a qualitative assessment of the predicted environmental wind conditions associated with the proposed 17-storey Lot E development, located within Pagewood Green Phase B. The report will form part of the development application to Bayside Council.

The proposed Development is located in Pagewood bounded by Bunnerong Road to the east, Banks Avenue to the west, Heffron Road to the north and Tingwell Boulevard to the south.

To the west and northwest of the proposed development site are golf courses, while the north clockwise around to the southeast of the site consists mostly of low-level residential housing. South of the site is the initial phase of the Pagewood Green development, which comprises five heavily developed sites with a mixture of high-rise and mid-rise towers. Immediately southeast of the site is once more open golf course associated with Bonnie Doon Golf Club, with there being some low-level commercial development beyond that.

Prevailing wind directions of interest in Sydney are from northeast, south, southeast and west quadrants. Their seasonal variation is described in **Section 2** of this report.

Existing Winds

Existing street level wind conditions in the vicinity of the site could be close to or greater than 16 m/s “walking comfort” criterion for some prevailing wind directions, resulting from channelling of winds along aligning streets and the relatively open surrounding environment.

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:

- The winds along the surrounding footpaths should remain at similar levels or be reduced providing the current proposed landscaping plan is retained.
- There may be some potential for wind channelling between buildings, the proposed landscaping should mitigate this.
- Vegetation and landscaping are recommended to be retained to protect building podium and rooftops.
- Some additional windbreaks are recommended to the ground, podium, tower levels and rooftops.

Accordingly, it has been predicted that most ground levels wind speeds within public access areas surrounding the development should remain at their present levels or be reduced with the addition of the proposed development and its wind mitigation treatments.

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 and CFD analysis of a range of developments. The conclusions of this SLR report can be quantified using wind tunnel testing or CFD analysis.

CONTENTS

DOCUMENT REFERENCES

TABLES

CONTENTS

FIGURES

APPENDICES

1 Introduction

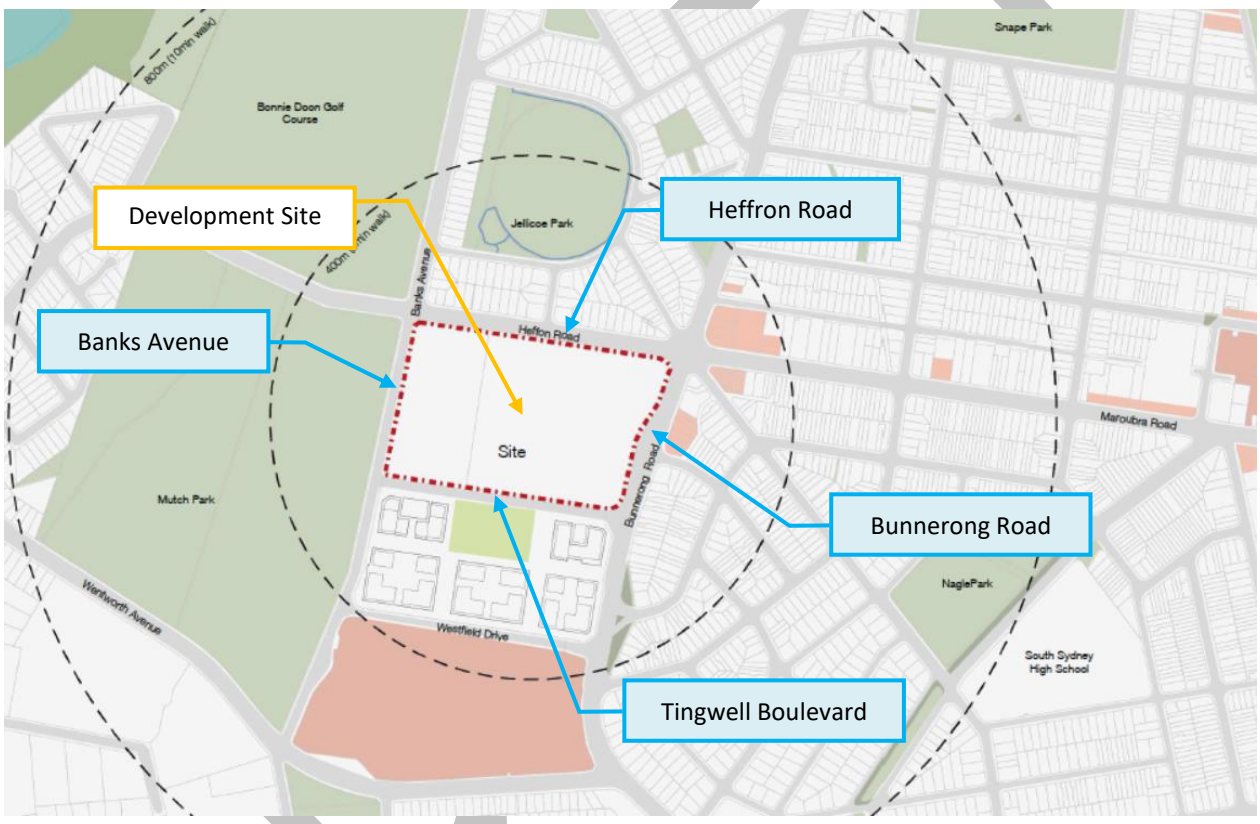
SLR Consulting Australia Pty Ltd (SLR) has been engaged by Karimbla Constructions Services (NSW) Pty Ltd to provide a qualitative assessment of the predicted environmental wind conditions associated with the proposed 17-storey Lot E development, located within Pagewood Development.

The report will form part of the development application to Bayside Council.

1.1 Location of Proposed Site

The proposed Development is located in Pagewood bounded by Bunnerong Road to the east, Banks Avenue to the west, Heffron Road to the north and Tingwell Boulevard to the south - refer **Figure 1**.

Figure 1 Development Site Location



1.2 Phase B Site Map

Outlined within **Figure 2** is a map of the proposed Phase B masterplan, Lot E is located just north of Lot B, with and will be bounded by new streets to the north, south and west; community parkland has been proposed to the east of the lot.

Figure 2 Phase B Site Plan

1.3 Site Surrounds

To the west and northwest of the proposed development site are golf courses, while the north clockwise around to the southeast of the site consists mostly of low-level residential housing. South of the site is the initial phase of the Pagewood Green development, which comprises five heavily developed sites with a mixture of high-rise and mid-rise towers. Immediately southeast of the site is once more open golf course associated with Bonnie Doon Golf Club, with there being some low-level commercial development beyond that.

Figure 3 Site Surrounds

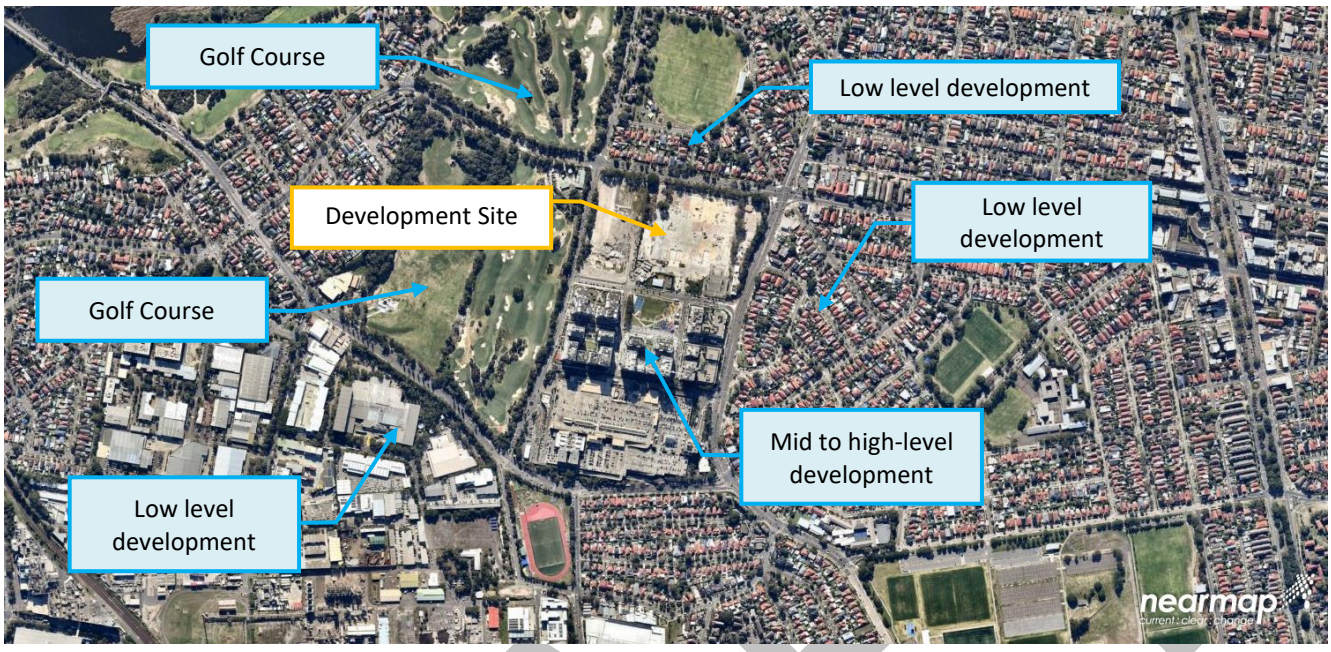


Image: Nearmap: 1 June 2020

1.4 Development Description

The proposed 17 storey Lot E mixed use development will consist of two residential towers inclusive of the following:

- Basement car parking;
- Ground Floor with retail tenancies, residential apartments, building lobbies, car parking, along with waste collection and plant rooms;
- Level 1 (Mezzanine) with residential apartments and car parking;
- Level 2 and 3 with residential apartments and car parking;
- Level 4 podium with residential apartments, pool, gym, sauna and communal open space; and
- Residential apartment towers, reaching to Level 15 for eastern tower and Level 16 for western tower.
- Rooftop Communal Open Spaces on the Western and Eastern Tower

North elevation is shown in **Figure 4**.

Figure 4 North Elevation

2 Sydney's Wind Climate

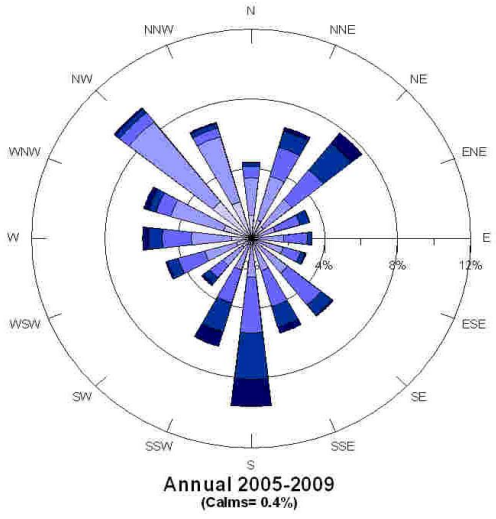
The data of interest in this study are the annual extreme, mean hourly wind speeds and largest gusts experienced throughout the year, how these winds vary with azimuth, and the seasonal break-up of winds into the primary Sydney wind seasons.

2.1 Seasonal Winds

In relation to key characteristics of the Sydney Region Wind Climate (refer wind roses provided in **Appendix A**) relevant to the wind impact assessment of the proposed development, we note that Sydney is affected by two primary wind seasons:

- 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 south winds generally provide the strongest gusts during summer.
- Winter/Early Spring winds occur mainly from the west and the south.
  - West quadrant winds (southwest to northwest) provide the strongest winds during winter and in fact for the whole year.

Figure 5 Annual Sydney Wind Rose for years 2005-2009



The figure above shows the stronger winds in dark blue from the northeast, south and west.

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 and topography.

- Limited shielding to the northeast afforded by low-rise buildings;
- "Significant" shielding from surrounding medium-rise apartments;

- There is also the potential for channelling along O' Riordan Street between the proposed development and low-rise buildings;

3 Wind Acceptability Criteria

3.1 Standard Local Government Criteria

The choice of suitable criteria for evaluating the acceptability of particular ground level conditions has been the subject of relatively recent research. The acceptability criteria that have been developed from this research and currently referenced by most Australian Local Government Development Control Plans have been summarised below in **Table 1**.

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/sec "Walking Comfort" criterion. Whilst this magnitude may appear somewhat arbitrary, its value represents a level of wind intensity 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 than for "walking comfort".

3.2 Application of Standard Council Wind Criteria

The criteria provided in **Table 1** 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 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 conditions satisfy the relevant criteria.

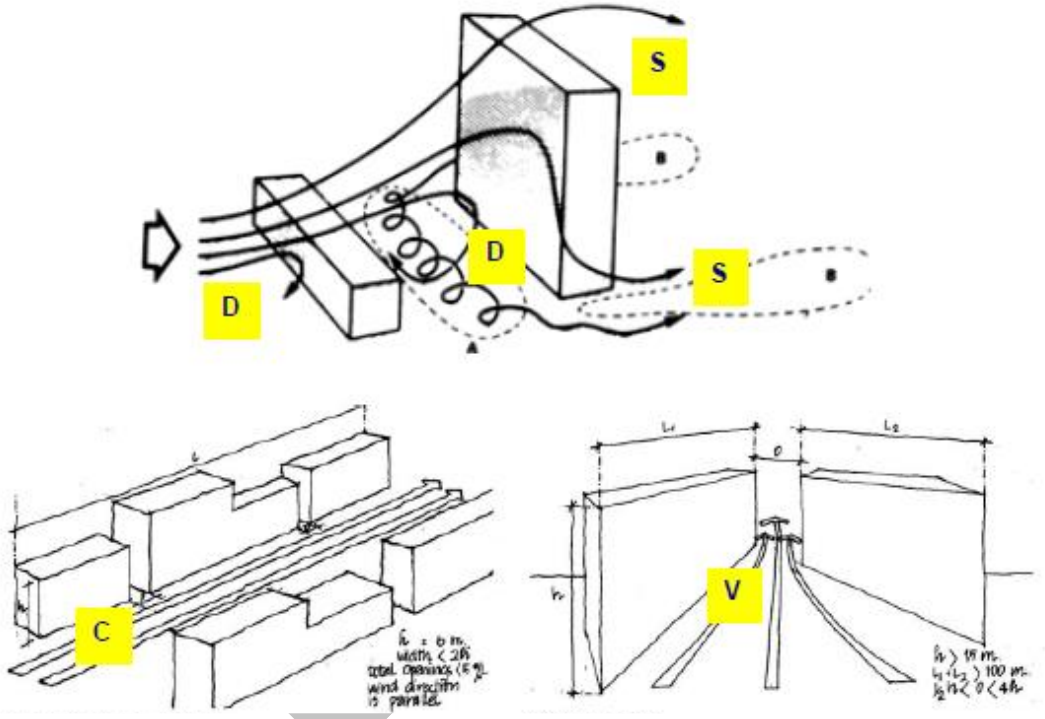
Finally, it is noted that the limiting wind speed criteria in **Table 1** are based on the maximum wind gust occurring (on average) once per year. Winds at all other times, i.e. monthly winds, weekly winds, etc., would be of lesser magnitude. So for example, a location with a maximum annual gust of 10 m/sec would experience winds throughout the year of a generally very mild nature, conducive to stationary activities (seating, dining, etc).

4 Building Wind Interaction – Some General Observations

The impact of wind flowing past buildings has well known general impacts at ground level – refer **Figure 6**:

- **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
- Accelerating **Shearflow winds "S"** are the winds which experience an acceleration as they pass by the building edges and roof, as the wind flow moves around and past the building
- In general, the taller the building, the more pronounced the impact on ground level winds. Local building details can also influence winds in the immediate vicinity; eg building undercrofts are often associated with local acceleration of winds.

Figure 6 Wind flow Patterns Past Regular Shaped Buildings

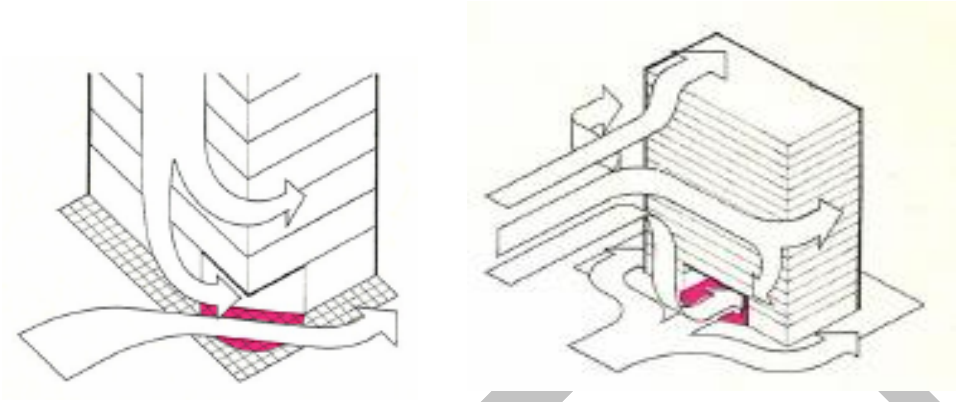


The grouping of buildings can also have an impact on resulting pedestrian winds – refer **Figure 6**:

- **Canyon 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.

- **"Undercroft"** effect is a well-known adverse building-wind characteristic as depicted in the generic building wind effect diagrams shown in **Figure 7**. The winds are induced towards the negative pressure area within the undercroft, creating concentrated adverse wind flow through undercrofts.

Figure 7 Undercroft Wind



Building Undercrofts (left) and Building Cross-Façade Openings (right) can induce concentrated adverse wind flow past and through a building.

5 Wind Impact of the Proposed Development

5.1 Existing Winds – Wind Impacts and Effects

Existing street level wind conditions in the vicinity of the site could be close to or greater than 16 m/s "walking comfort" criterion for some prevailing wind directions, resulting from channelling of winds along aligning streets. The surrounding built environment which consists of dense low-level residential development and some higher-level development provides generous wind shielding to the majority of prevailing wind directions.

Northeast Winds

Dense medium to lower level shielding is provided to the northeast, consisting of low-level residential housing just beyond the site, with dense existing landscaping surrounding the proposed site. Northeast winds are generally mild and the potential for exceedance of the 16 m/s criterion along pedestrian pathways is small, i.e. occurrences, if any, are likely to be very infrequent.

Southerly Winds

Shielding to the south is significant at both high and low levels and should provide shielding to the majority of the site and neighbouring pedestrian areas. There is some potential for isolated wind channelling impacting around intersections of Studio Drive and Finch Drive, with southerly winds possibly channelling along both streets. This could lead to localised exceedances of the 16 m/s along the southern site boundary.

Westerly Winds

Areas west of the site are currently very open with limited upstream shielding provided to the site by way of vegetation of built environment. Given this, there is a high potential for exceedance of the 16 m/s criterion along pedestrian pathways and the surrounding ground level environment.

Upper Level Winds

Existing upper level wind conditions at the site are likely to exceed the 10 m/s "outdoor eating" comfort criterion for some prevailing wind directions at elevations above the height limits of surrounding buildings.

5.2 Future Winds – Predicted Wind Flow Patterns

The following sections analyse the expected impacts of the proposed development on the pedestrian wind environment in the adjacent streetscape.

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

Areas of interest (i.e. surrounding footpaths, primary entry points, internal public access areas, seating and dining areas, etc) are identified in **Figure 8** and **Figure 9** and **Figure 10**.

Figure 8 Areas of Interest (Ground Floor)

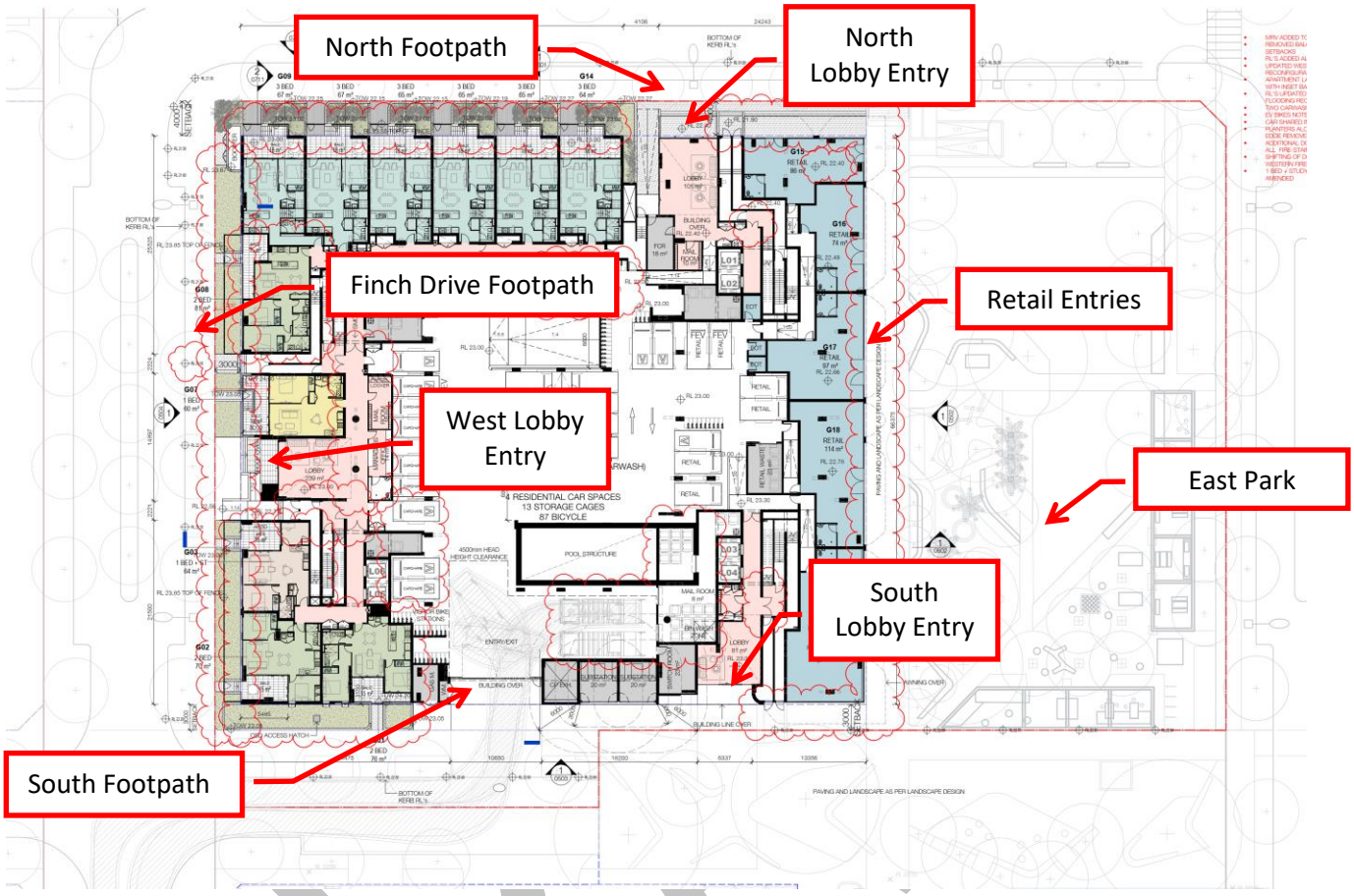


Figure 9 Areas of Interest (Level 1 Podium)

Figure 10 Areas of Interest (Roof Communal Space)

Tower A **Tower B**

5.2.1 Northeast Winds

Location	Wind Impact
East Park	Potential impact here should be **less than 10m/s**, affected by: • Shielding from upstream buildings. • Shielding from existing landscaping. • Shielding from proposed landscaping.
North Footpath	Potential impact here should be **less than 16m/s**, affected by: • Shielding from upstream buildings. • Shielding from existing landscaping. • Shielding from proposed landscaping. • Potential downwash from towers. • Towers set back from podium level and above.
Finch Drive Footpath	Potential impact here should be **less than 16m/s**, affected by: • Shielding from upstream buildings. • Shielding from existing landscaping. • Shielding from proposed landscaping. • Shielding from the development itself.
South Footpath	Potential impact here should be **less than 16m/s**, affected by: • Shielding from upstream buildings. • Shielding from existing landscaping. • Shielding from proposed landscaping. • Shielding from the development itself.
North Lobby Entry	Potential impact here should be **less than 13m/s**, affected by: • Shielding from upstream buildings. • Shielding from existing landscaping. • Shielding from proposed landscaping. • Potential downwash from towers. • Towers set back from podium level and above. • Setback of entry from levels above.
West Lobby Entry	Potential impact here should be **less than 13m/s**, affected by: • Shielding from upstream buildings. • Shielding from existing landscaping. • Shielding from proposed landscaping. • Shielding from the development itself.
South Lobby Entry	Potential impact here should be **less than 13m/s**, affected by: • Shielding from upstream buildings. • Shielding from existing landscaping. • Shielding from proposed landscaping. • Shielding from the development itself.
Retail Entries	Potential impact here should be **less than 13m/s**, affected by: • Shielding from upstream buildings. • Shielding from existing landscaping. • Shielding from proposed landscaping. • Potential downwash from levels above. • 2.5m protrusion of roof, walls and arches from retail façade

Location	Wind Impact
Communal Open Space	Potential impact here should be **less than 10m/s**, affected by: • Reduced upstream shielding from built environment. • Some shielding from the development itself. • Potential wind channelling between buildings. • Shielding from proposed landscaping.
Outdoor Pool	Potential impact here should be **less than 10m/s**, affected by: • Reduced upstream shielding from built environment. • Some shielding from the development itself. • Potential wind channelling between buildings. • Shielding from proposed landscaping.
East Tower Entries	Potential impact here should be **less than 13m/s**, affected by: • Shielding from the development itself.
West Tower Entries	Potential impact here should be **less than 13m/s**, affected by: • Shielding from the development itself.
Upper Level Balconies (Level 4 and Above)	Potential impact here could be **close to or exceeding 10 m/s**, affected by: • Reduced upstream shielding. • Stronger upper level winds.
Rooftop Communal Open Space	Potential impact here could be **close to or exceeding 10 m/s**, affected by: • Some shielding from the development itself. • Shielding from proposed landscaping. • Stronger upper level winds. • Potential wind channelling between buildings.

5.2.2 South and Southeast Winds

Location	Wind Impact
East Park	Potential impact here should be **less than 10m/s**, affected by: • Shielding from upstream buildings. • Shielding from proposed landscaping.
North Footpath	Potential impact here should be **less than 16m/s**, affected by: • Shielding from upstream buildings. • Shielding from proposed landscaping. • Shielding from the development itself.
Finch Drive Footpath	Potential impact here should be **less than 16m/s**, affected by: • Shielding from upstream buildings. • Potential wind channelling along Finch Drive. • Shielding from proposed landscaping.
South Footpath	Potential impact here should be **less than 16m/s**, affected by: • Shielding from upstream buildings. • Potential downwash winds from development façade. • Shielding from proposed landscaping.
North Lobby Entry	Potential impact here should be **less than 13m/s**, affected by: • Shielding from upstream buildings. • Shielding from proposed landscaping. • Shielding from the development itself.

Location	Wind Impact
West Lobby Entry	Potential impact here should be **less than 13m/s**, affected by: • Shielding from upstream buildings. • Potential wind channelling along Finch Drive. • Shielding from proposed landscaping. • Shielding from the development itself.
South Lobby Entry	Potential impact here could be **close to or exceeding 13 m/s**, affected by: • Shielding from upstream buildings. • Shielding from proposed landscaping. • Potential downwash winds from development façade.
Retail Entries	Potential impact here should be **less than 13m/s**, affected by: • Shielding from upstream buildings. • Shielding from proposed landscaping. • Shielding from the development itself.
Communal Open Space	Potential impact here could be **close to or exceeding 10 m/s**, affected by: • Shielding from upstream buildings. • Some shielding from the development itself. • Shielding from proposed landscaping. • Potential wind channelling between buildings.
Outdoor Pool	Potential impact here could be **close to or exceeding 10 m/s**, affected by: • Shielding from upstream buildings. • Some shielding from the development itself. • Shielding from proposed landscaping. • Potential wind channelling between buildings.
East Tower Entries	Potential impact here should be **less than 13m/s**, affected by: • Shielding from the development itself.
West Tower Entries	Potential impact here should be **less than 13m/s**, affected by: • Shielding from the development itself.
Upper Level Balconies (Level 4 and Above)	Potential impact here could be **close to or exceeding 10 m/s**, affected by: • Shielding from upstream development. • Stronger upper level winds.
Rooftop Communal Open Space	Potential impact here could be **close to or exceeding 10 m/s**, affected by: • Some shielding from the development itself. • Shielding from proposed landscaping. • Stronger upper level winds. Potential wind channelling between buildings.

5.2.3 Westerly Winds

Location	Wind Impact
East Park	Potential impact here should be **less than 10m/s**, affected by: • Shielding from the development itself. • Shielding from proposed landscaping.
North Footpath	Potential impact here should be **less than 16m/s**, affected by: • Potential for wind channelling along North Street. • Shielding from proposed landscaping.
Finch Drive Footpath	Potential impact here should be **less than 16m/s**, affected by: • Potential for downwash winds from the development itself. • Shielding from proposed landscaping.
South Footpath	Potential impact here should be **less than 16m/s**, affected by: • Potential for wind channelling along South Street. • Shielding from proposed landscaping.
North Lobby Entry	Potential impact here should be **less than 13m/s**, affected by: • Potential for wind channelling along North Street. • Shielding from proposed landscaping.
West Lobby Entry	Potential impact here should be **less than 13m/s**, affected by: • Potential for downwash winds from the development itself. • Shielding from proposed landscaping. • Awning provided above lobby entry.
South Lobby Entry	Potential impact here should be **less than 13m/s**, affected by: • Potential for wind channelling along South Street. • Shielding from proposed landscaping.
Retail Entries	Potential impact here should be **less than 13m/s**, affected by: • Shielding from the development itself. • Shielding from proposed landscaping.
Communal Open Space	Potential impact here should be **less than 10m/s**, affected by: • Shielding from the development itself. • Shielding from proposed landscaping.
Outdoor Pool	Potential impact here should be **less than 10m/s**, affected by: • Shielding from the development itself. • Shielding from proposed landscaping.
East Tower Entries	Potential impact here should be **less than 13m/s**, affected by: • Shielding from the development itself.
West Tower Entries	Potential impact here should be **less than 13m/s**, affected by: • Shielding from the development itself.
Upper Level Balconies (Level 4 and Above)	Potential impact here could be **close to or exceeding 10 m/s**, affected by: • Reduced shielding from upstream buildings. • Stronger upper level winds.
Rooftop Communal Open Space	Potential impact here could be **close to or exceeding 10 m/s**, affected by: • Some shielding from the development itself. • Shielding from proposed landscaping. • Stronger upper level winds. Potential wind channelling between buildings.

6 Wind Amelioration Recommendations

On the basis of the expected wind impacts outlined in previous four sections, recommendations for wind break features are made in areas where winds are expected to

- Approach or exceed 10 m/s or 13 m/s depending on the designed use for hat area.

These wind mitigation recommendations are summarised in **Table 2**.

Table 2 Recommended Wind Mitigation

Location of Interest	Wind Impact Potential	Windbreak Treatment/Recommendation
East Park	**Low** Winds should be below 10 m/s for all prevailing wind directions.	**No Mitigation Required** Retain existing and proposed landscaping. Additional landscaping could be added to further reduce wind speeds.
North Footpath	**Low** Winds should be below 16 m/s for all prevailing wind directions.	**No Mitigation Required** Retain existing and proposed landscaping. Additional landscaping could be added to further reduce wind speeds.
Finch Drive Footpath	**Low** Winds should be below 16 m/s for all prevailing wind directions.	**No Mitigation Required** Retain existing and proposed landscaping. Additional landscaping could be added to further reduce wind speeds.
South Footpath	**Low** Winds should be below 16 m/s for all prevailing wind directions.	**No Mitigation Required** Retain existing and proposed landscaping. Additional landscaping could be added to further reduce wind speeds.
North Lobby Entry	**Low** Winds should be below 13 m/s for all prevailing wind directions.	**No Mitigation Required** Retain existing and proposed vegetation, along with protrusion of level above building entry. Additional landscaping could be added to further reduce wind speeds.
West Lobby Entry	**Low** Winds should be below 13 m/s for all prevailing wind directions.	**No Mitigation Required** Retain existing and proposed vegetation. Retain provided awning over lobby entry. Additional landscaping could be added to further reduce wind speeds.

Location of Interest	Wind Impact Potential	Windbreak Treatment/Recommendation
South Lobby Entry	**Low – Moderate** Winds could be above 13 m/s for South and Southeast winds.	**Mitigation Required** A horizontal windbreak is recommended over lobby entry. Windbreak should be an awning or similar wind shielding and should protrude a minimum of 3.0m from the lobby façade. Additional landscaping could further reduce wind speeds.
Retail Entries	**Low** Winds should be below 13 m/s for all prevailing wind directions.	**No Mitigation Required** Retain existing and proposed vegetation. Retain protrusion of levels above and support arches. Additional landscaping could be added to further reduce wind speeds.
Communal Open Space	**Low – Moderate** Winds could be above 10 m/s for South and Southeast winds.	**Mitigation Required** A vertical windbreak is recommended to the southern boundary of the podium level. Windbreak can be in the form of balustrade, balustrade plus planter, wind screens or other practical wind shielding. Windbreak should total a minimum of 1800mm in height. Additional landscaping could further reduce wind speeds.
Outdoor Pool	**Low – Moderate** Winds could be above 10 m/s for South and Southeast winds.	**Mitigation Required** A vertical windbreak is recommended to the southern boundary of the podium level. Windbreak can be in the form of balustrade, balustrade plus planter, wind screens or other practical wind shielding. Windbreak should total a minimum of 1800mm in height.
East Tower Entries	**Low** Winds should be below 13 m/s for all prevailing wind directions.	**No Mitigation Required** Retain current set back of tower entries from external building façade. Additional landscaping to podium open space could further reduce wind speeds.

Location of Interest	Wind Impact Potential	Windbreak Treatment/Recommendation
West Tower Entries	**Low** Winds should be below 13 m/s for all prevailing wind directions.	**No Mitigation Required** Retain current set back of tower entries from external building façade. Additional landscaping to podium open space could further reduce wind speeds.
Upper Level Balconies (Level 4 and Above)	**High** Winds could be above 10 m/s for All prevailing wind directions.	**Mitigation Required** Some balconies may require additional shielding via full height balustrades, partial sliding shutters, pull down screens or other practical wind shielding. SLR recommends these mitigations be employed on balconies for level 4 and above. SLR recommends utilising CFD analysis to quantify wind speeds at balconies and determine appropriate wind shielding during detailed design. All other balconies should retain existing shielding and mitigation devices.
Rooftop Communal Open Space	**High** Winds could be above 10 m/s for Northeast, West and Southeast winds.	**Mitigation Required** A vertical windbreak is recommended to the east and west boundary of the Roof Communal Open Spacesl. Windbreak can be in the form of balustrade, balustrade plus planter, wind screens or other practical wind shielding. Windbreak should total a minimum of 1800mm in height.

Figure 11 Mitigation Recommendations Ground Level

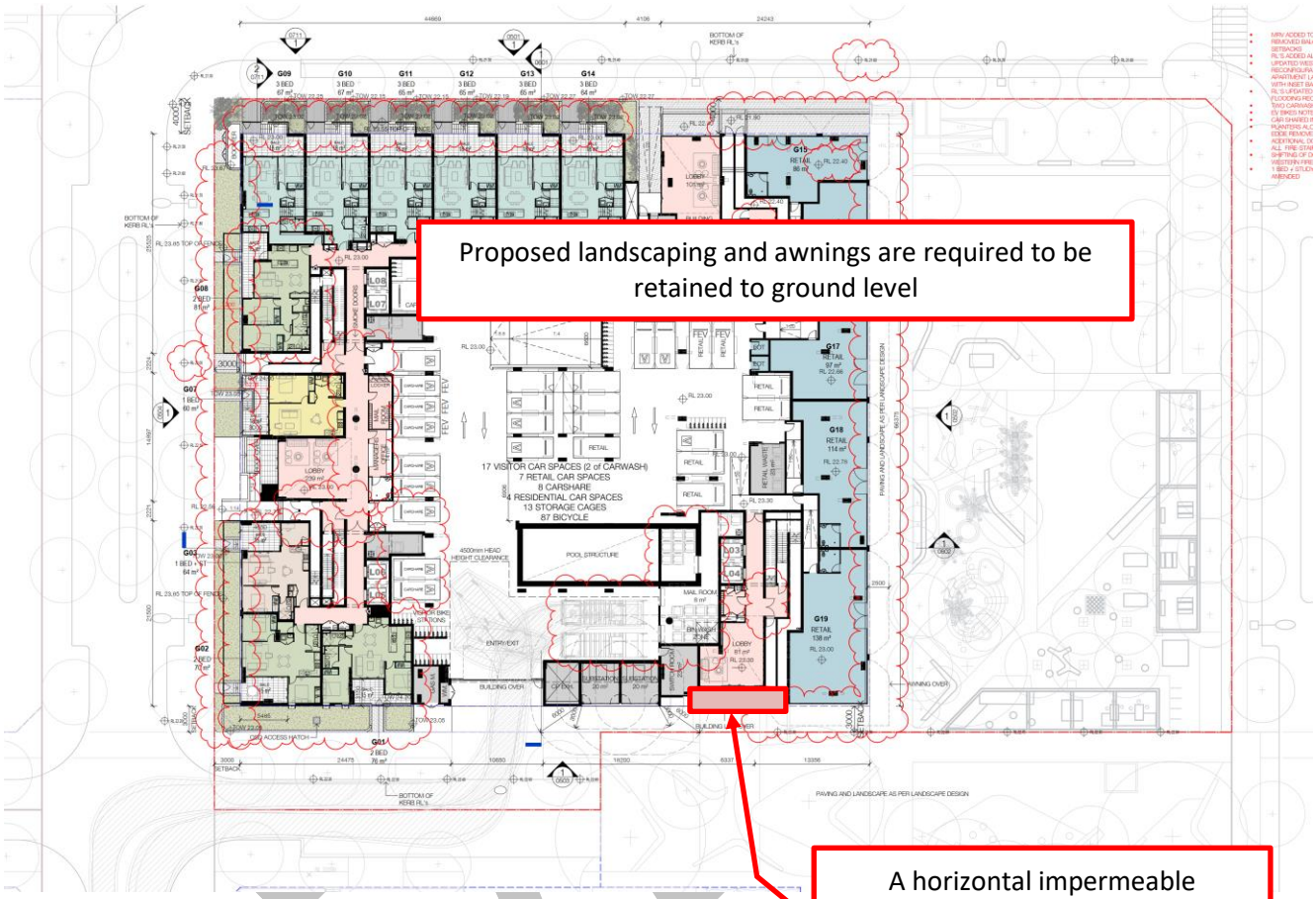


Figure 12 Mitigation Recommendation Podium

Figure 13 Mitigation Recommendation Tower Levels

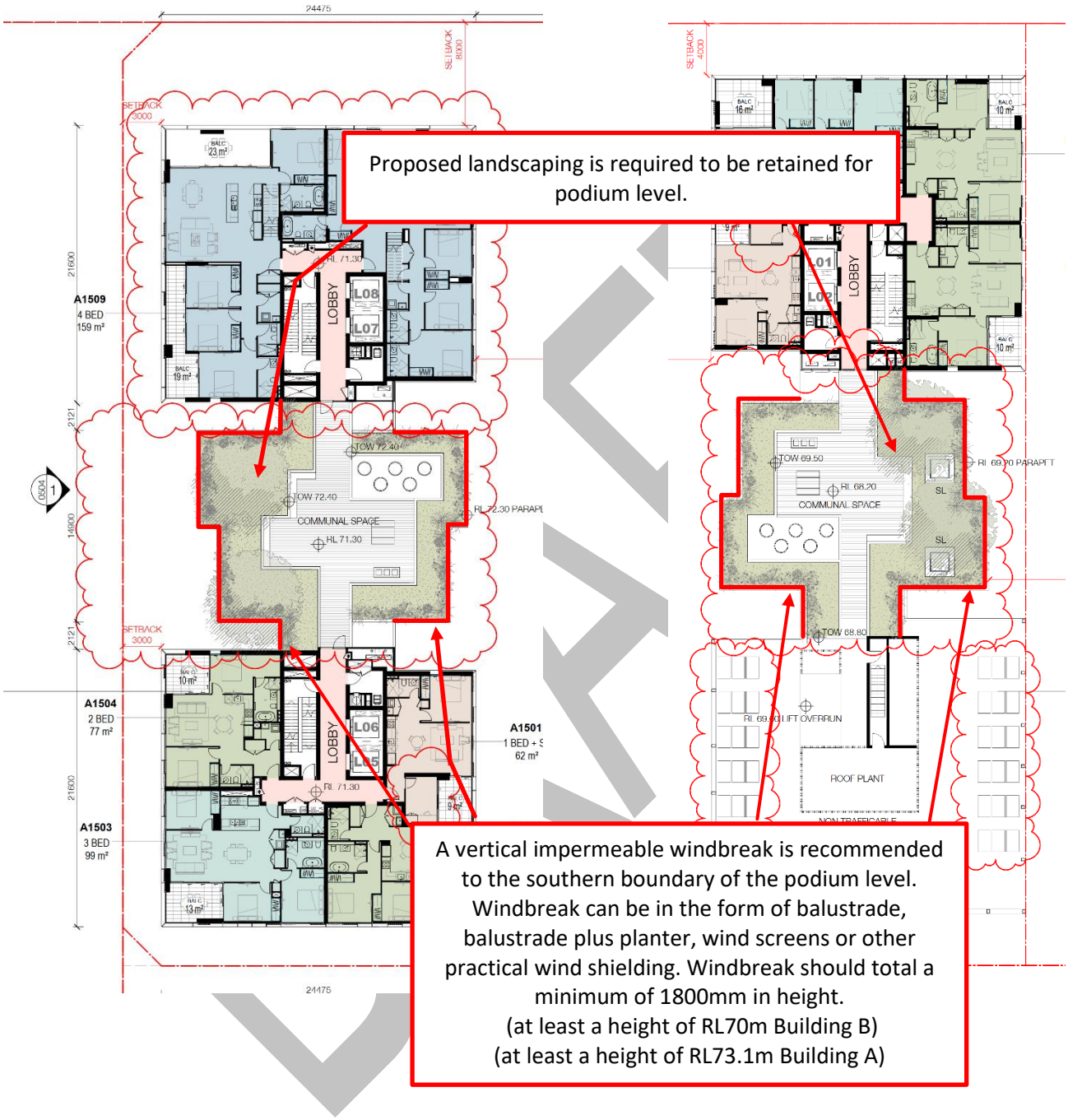
Some balconies may require additional shielding via full height balustrades, partial sliding shutters, pull down screens or other practical wind shielding. SLR recommends these mitigations be employed on balconies for level 4 and above.

SLR recommends utilising CFD analysis to quantify wind speeds at balconies and determine appropriate wind shielding during detailed design.

All other balconies should retain existing shielding and mitigation devices.

Figure 14 Mitigation Recommendation Roof Levels

Tower A **Tower B**



7 Conclusion

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Prevailing wind directions of interest in Sydney are from northeast, south, southeast and west quadrants. Their seasonal variation is described in **Section 2** of this report.

Existing Winds

Existing street level wind conditions in the vicinity of the site could be close to or greater than 16 m/s “walking comfort” criterion for some prevailing wind directions, resulting from channelling of winds along aligning streets and the relatively open surrounding environment.

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:

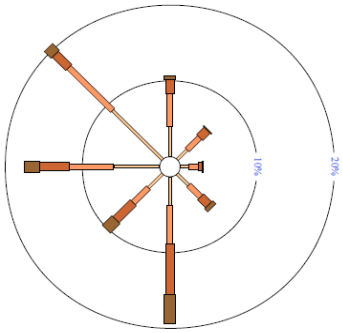
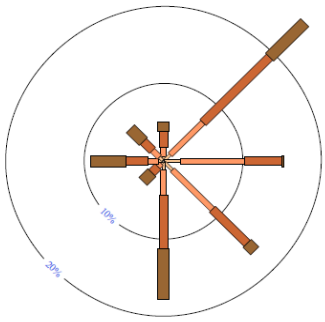
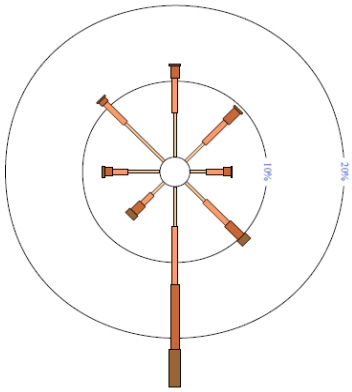
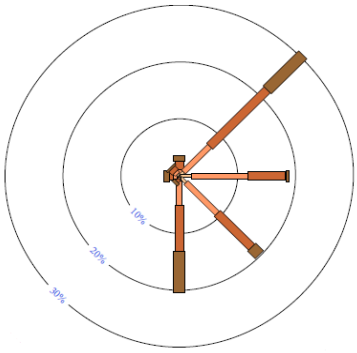
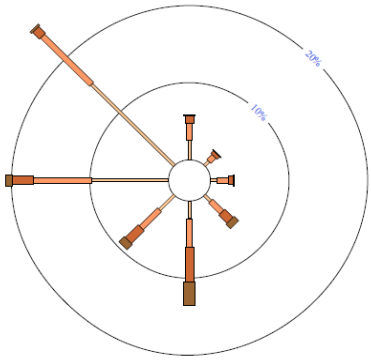
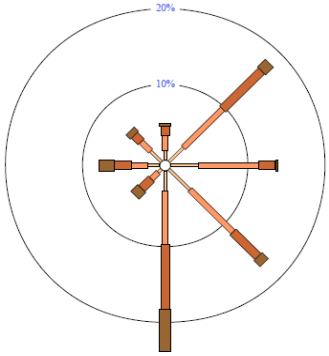
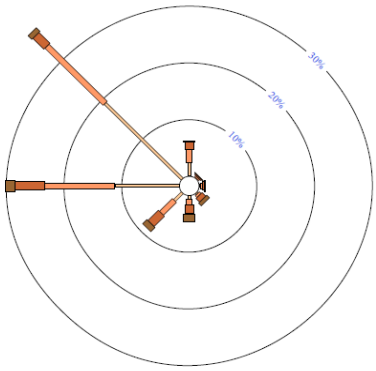
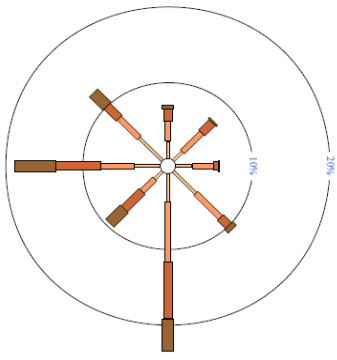
- The winds along the surrounding footpaths should remain at similar levels or be reduced providing the current proposed landscaping plan is retained.
- There may be some potential for wind channelling between buildings, the proposed landscaping should mitigate this.
- Vegetation and landscaping are recommended to be retained to protect building podium and rooftops.
- Some additional windbreaks are recommended to the ground, podium, tower levels and rooftops.

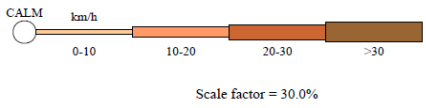
Accordingly, it has been predicted that most ground levels wind speeds within public access areas surrounding the development should remain at their present levels or be reduced with the addition of the proposed development and its wind mitigation treatments.

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 and CFD analysis of a range of developments. The conclusions of this SLR report can be quantified using wind tunnel testing or CFD analysis.

APPENDIX A

Sydney Wind Roses

	Morning Winds	Afternoon Winds
Spring		
Summer		
Autumn		
Winter		



Scale factor = 30.0%

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