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Pace Development Group Pty Ltd

Woolworths, Elsternwick

Wind Impact Assessment

30N-20-0244-TNT-6795636-3

26 August 2024

Job Title:	Woolworths, Elsternwick
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Prepared For:	**Prepared By:**
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Rev. 00	Report Update from 30N-18-0057-TNT-639635-2	27 Jan 2021	EY
Rev. 01	Updated Drawings	10 Feb 2021	EY
Rev. 02	Minor Amendments	11 Feb 2021	EY
Rev. 03	Updated Drawings	20 Aug 2024	RI

Executive Summary

Pace Development Group Pty Ltd commissioned Vipac Engineers and Scientists Ltd to prepare a statement of wind effects for the ground level areas adjacent to the proposed mixed-use development at **10-16 Selwyn St, Elsternwick**. This appraisal is based on Vipac's experience as a wind-engineering consultancy.

Drawings of the proposed development were provided by **Fender Katsalidis** in **August 2024**. The findings of this study can be summarized as follows:

- With the proposed design the ground level footpaths would be expected to have wind levels within the walking comfort criterion;
- With the proposed design the wind conditions at the front of the entrances would be expected to be within the criterion for standing comfort.
- With the proposed design, the wind conditions at the communal terrace areas are expected to be within the recommended comfort criterion for walking; and
- With the proposed design, the wind conditions at the private terrace areas are expected to be within the recommended comfort criterion for walking.

Educating occupants about wind conditions at open terrace/balcony areas during high-wind events and fixing loose, lightweight furniture on the terrace are highly recommended.

The assessments provided in this report have been made based on experience of similar situations in Melbourne and around the world. As with any opinion, it is possible that an assessment of wind effects based on experience and without experimental validation may not account for all complex flow scenarios in the vicinity.

To refine and optimise the extent of recommended wind control measures, experimental validation through wind tunnel testing is recommended at the design development stage.

Table of Contents

1 Introduction

Pace Development Group Pty Ltd commissioned Vipac Engineers and Scientists Ltd to prepare a statement of wind effects for the ground level areas adjacent to the proposed mix-use development at **10-16 Selwyn St, Elsternwick**. This appraisal is based on Vipac's experience as a wind-engineering consultancy.

The proposed development is bounded by Selwyn St to the west, Sinclair St to the North, and existing developments in all other directions (see Figure 1). The proposed development consists of two 9-level towers above a common 2-level podium (see Figure 2). The proposed development is predominantly surrounded within a 1.5 km radius by a mix of residential and office developments, with the Elsternwick golf course to the southwest, Rippon Lea House and Gardens to the northwest.

This report details the opinion of Vipac as an experienced wind engineering consultancy regarding the wind effects in ground level public areas and access-ways adjacent to the development as proposed. No wind tunnel testing has been carried out for this development at this stage. Vipac has carried out wind tunnel studies on a large number of developments of similar shape and having similar exposure to that of the proposed development. These serve as a valid reference for the prediction of wind effects for this development. Empirical data for typical buildings in boundary layer flows has also been used to estimate likely ground level wind conditions adjacent to the proposed development [2] & [3].

Drawings of the proposed development were provided by **Fender Katsalidis** in **August 2024** as listed in Appendix C of this report.

Figure 1: Site plan of the proposed development site at 10-16 Selwyn St, Elsternwick.

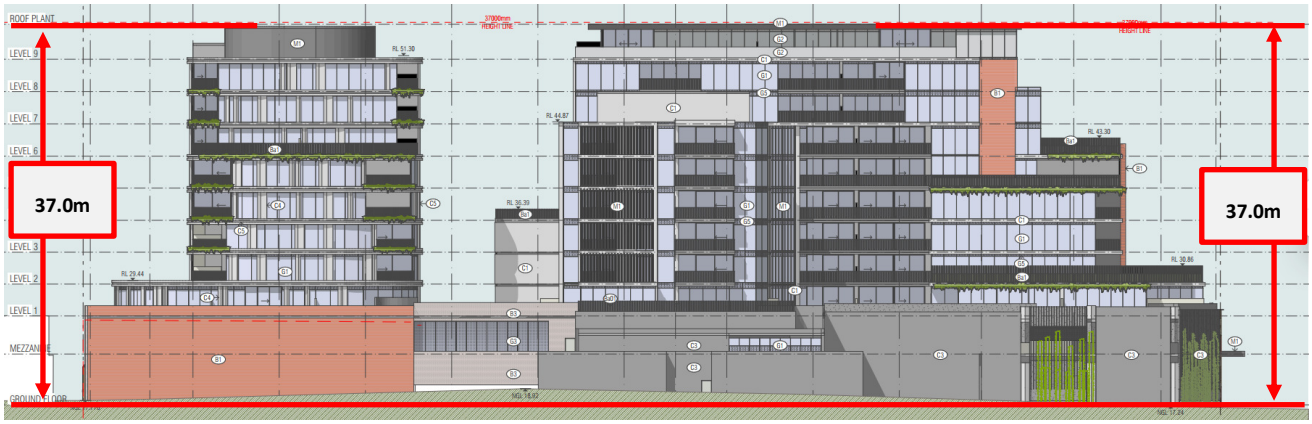


Figure 2: East elevation of the proposed development with its height in meters.

2 Analysis Approach

When considering whether a proposed development is likely to generate adverse wind conditions in adjacent ground level areas, Vipac considers five main points:

- The exposure of the proposed development to wind;
- The regional wind climate;
- The geometry and orientation of the proposed development;
- The interaction of flows with adjacent developments;
- The assessment criteria, determined by the intended use of the public areas affected by wind flows generated or augmented by the proposed development.

The pedestrian wind comfort at specific locations around a site may be assessed by predicting the worst annual 3-second wind gust expected at that location. The location may be deemed generally acceptable for its intended use if the annual 3-second gust is within the threshold values noted in Section 2.5. For cases where Vipac predicts that a location would not meet its appropriate comfort criterion we may recommend the use of wind control devices and/or local building geometry modifications to achieve the desired comfort rating. For complex flow scenarios or where predicted flow conditions are well in excess of the recommended criteria, Vipac recommends scale model wind tunnel testing to determine the type and scope of the wind control measures required to achieve acceptable wind conditions.

2.1 Site Exposure

The proposed development is predominantly surrounded within a 2.2km radius by a mix of residential and commercial developments, with the Elsternwick golf course to the southwest, Rippon Lea House and Gardens to the northwest. For the current study, the site of the proposed development is considered to be within Terrain Category Terrain 3 for all wind directions [1] (see Figure 3).

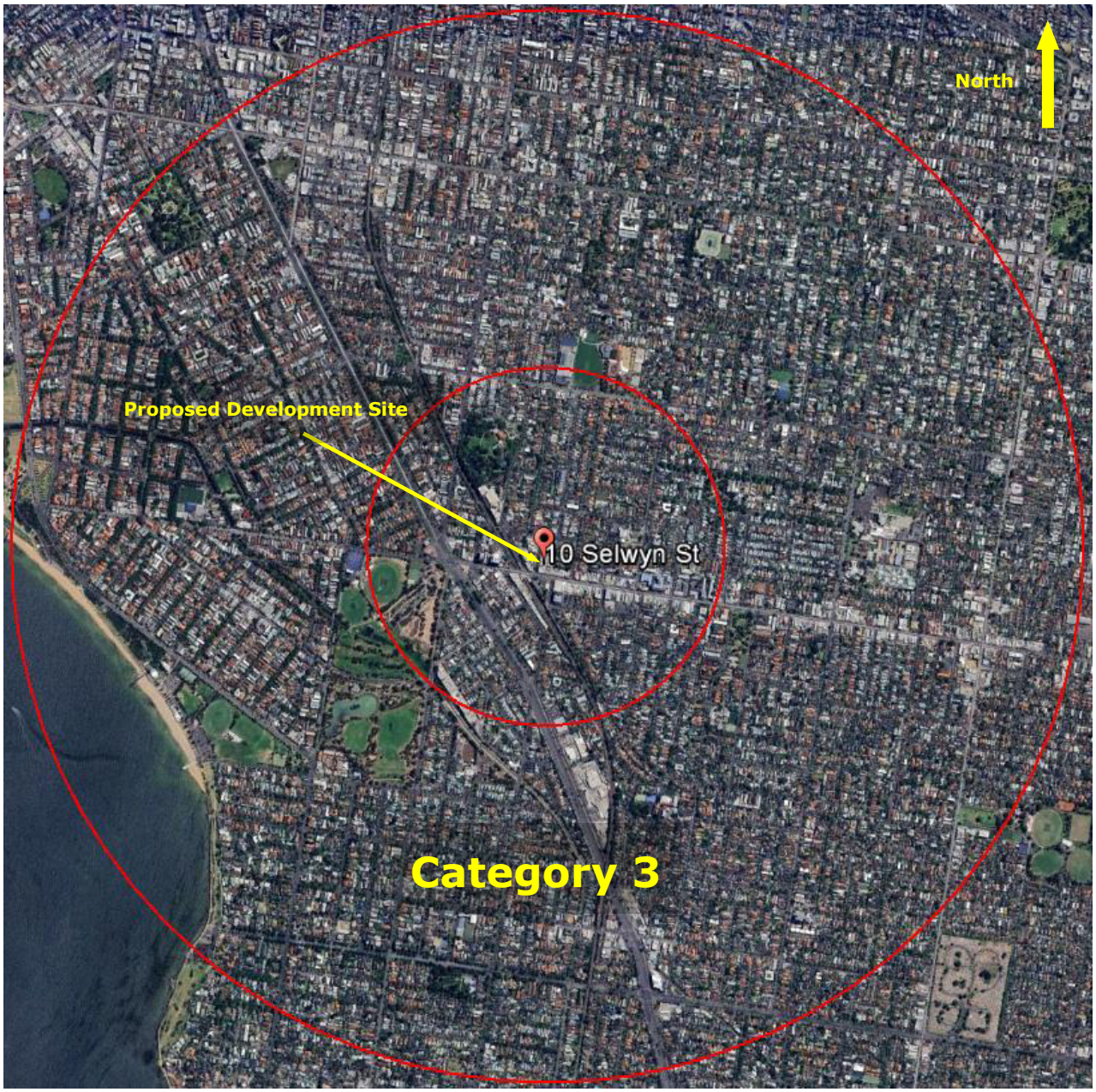


Figure 3: Assumed terrain categories for wind speed estimation.

2.2 Regional Wind Climate

The mean and gust wind speeds have been recorded in the Melbourne area for over 30 years. This data has been analysed and the directional probability distribution of wind speeds has been determined. The directional distribution of hourly mean wind speed at the gradient height, with a probability of 0.1% of time and 20% of time exceeded are shown in Figure 4. The wind data at this free stream height is common to all Melbourne city sites and may be used as a reference to assess ground level wind conditions at the site.

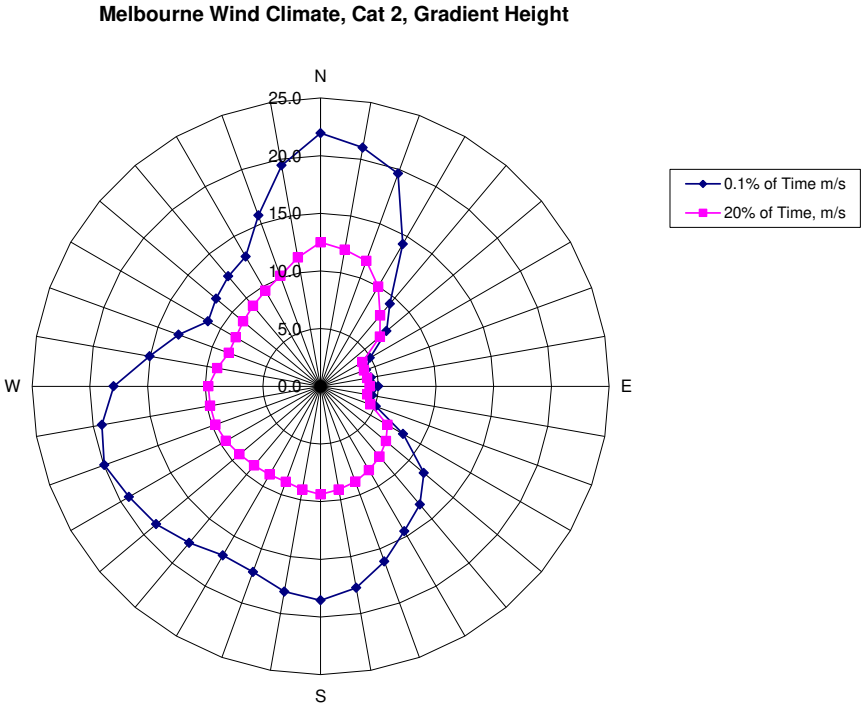


Figure 4: Directional Distribution of Mean Hourly Wind Velocities (m/s) for 0.1% and 20% exceeded at Gradient Height for Melbourne.

2.3 Building Geometry and Orientation

The proposed development consists of two 9-level towers above a common 2 level podium. The overall plan-form dimensions of the building are 62.2 m x 110.5 m (Figure 5) with the long axis running north to south. The main retail entrance areas and lobby entrances and car entry are located on the west side of the building on Selwyn St, and the loading entrance is located on Sinclair St to the North. The main footpaths are also along Selwyn and Sinclair Streets.

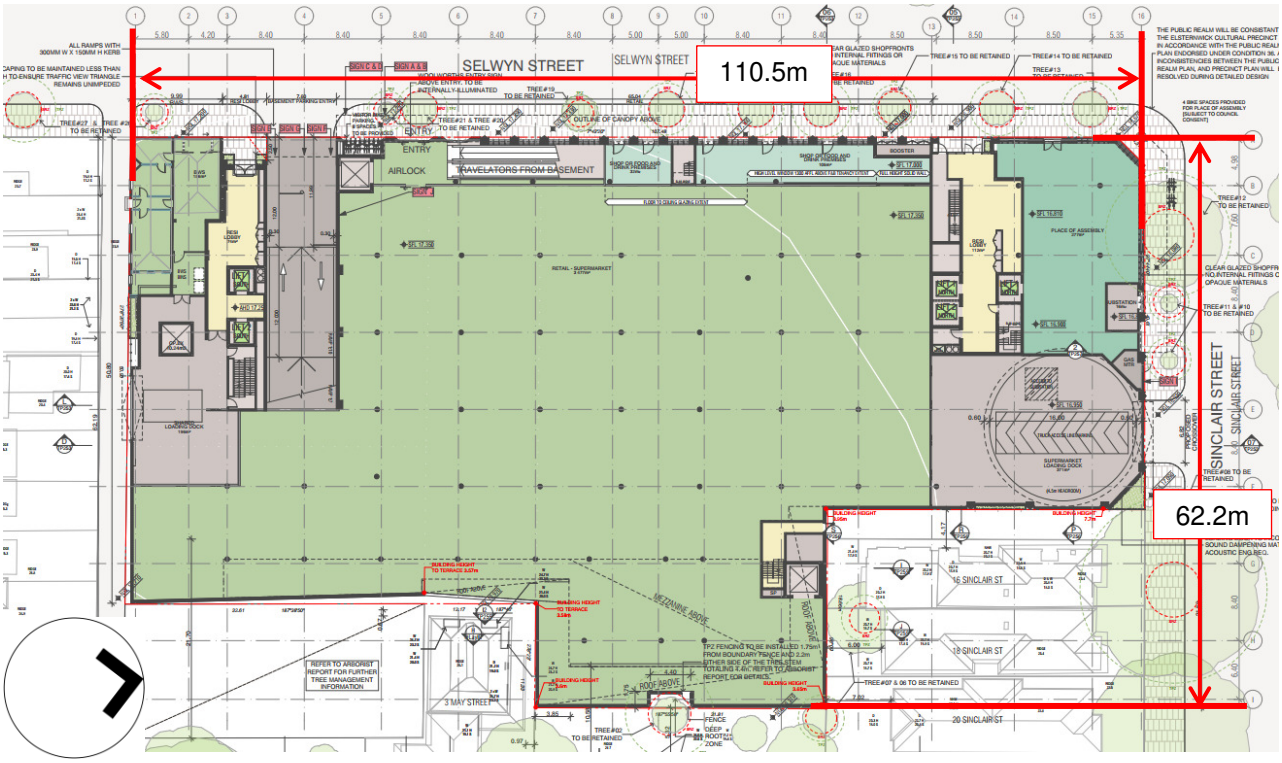


Figure 5: Ground Level Plan of the proposed development showing the approximate dimensions of the building.

2.4 Flow Interactions with Adjacent Developments

The buildings immediately adjacent to the proposed development site, with their approximate number of floors are shown in Figure 6. The prevailing winds are from the north and southwest. The ground level pedestrian areas are somewhat sheltered by neighbouring buildings from westerly winds; however, the ground level is relatively exposed from prevailing winds from the north.

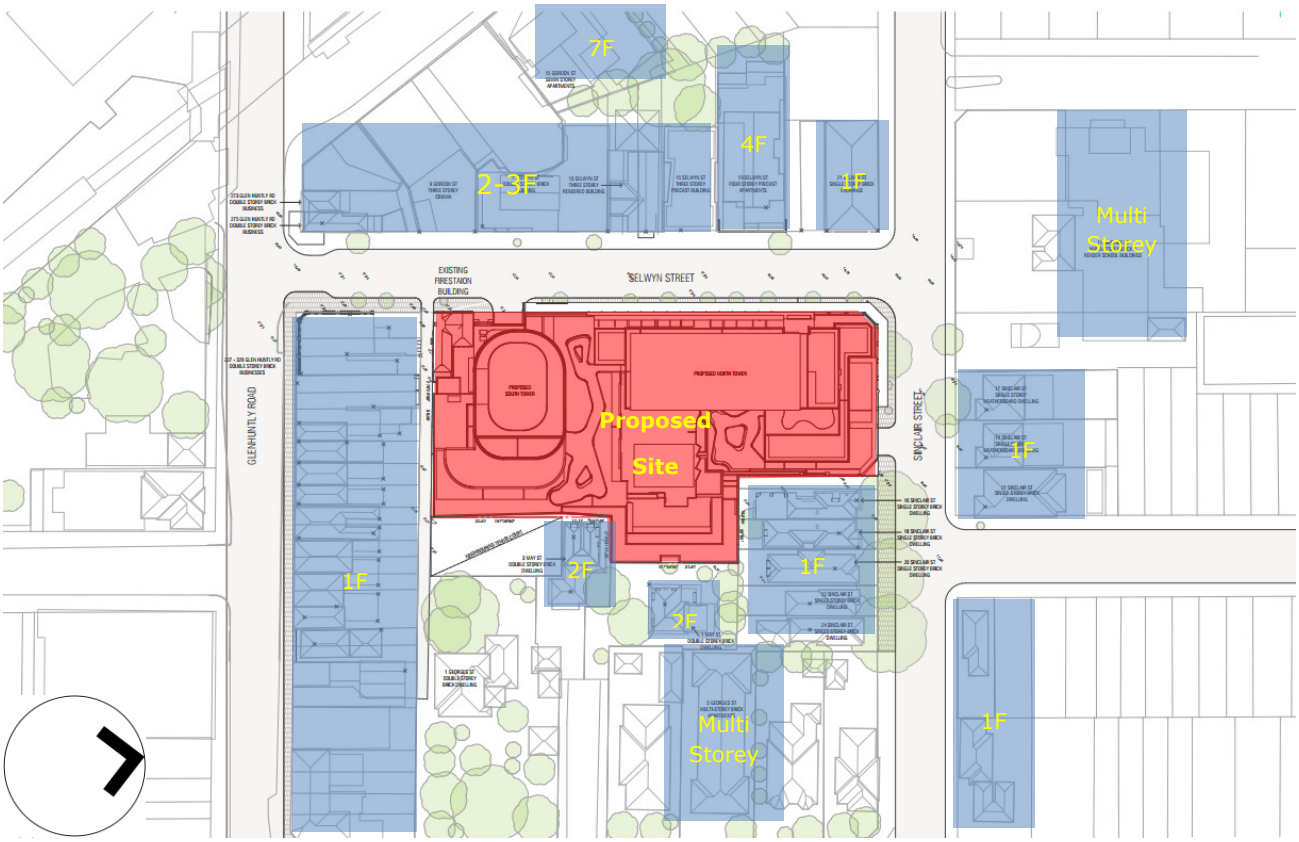


Figure 6: Immediately adjacent buildings and their approximate number of floors (F) overlaid.

2.5 Assessment Criteria

The following wind comfort criteria detailed in Table 1 were applied in this study.

Table 1: Wind Comfort Criteria as per Clause 58.04-4

Unsafe	Comfortable
Annual maximum 3 second gust wind speed exceeding **20m/sec** with a probability of exceedance of 0.1% considering at least 16 wind directions.	Hourly mean wind speed or gust equivalent mean speed from all wind directions combined with probability of exceedance less than 20% of the time, equal to or less than: **3m/sec** for sitting areas (outdoor cafés) **4m/sec** for standing areas (window shopping, queuing) **5m/sec** for walking areas (steady steps for most pedestrians)

This criterion specifically calls for the safety criterion to be used to assess infrequent winds (e.g. peak event of ≤ 0.1% of the time); and the perceived pedestrian comfort to be assessed based on frequently occurring winds (e.g. winds that occurs 80% of the time).

In Table 1, the mean wind velocity is defined as the maximum of hourly mean or gust equivalent mean (Gust/1.85)

This criteria specifies that safe and comfortable wind conditions must be achieved in publicly accessible areas within a distance equal to half the longest width of the building measured from all facades or half the overall height of the building, whichever is greater, as shown in Figure 7.

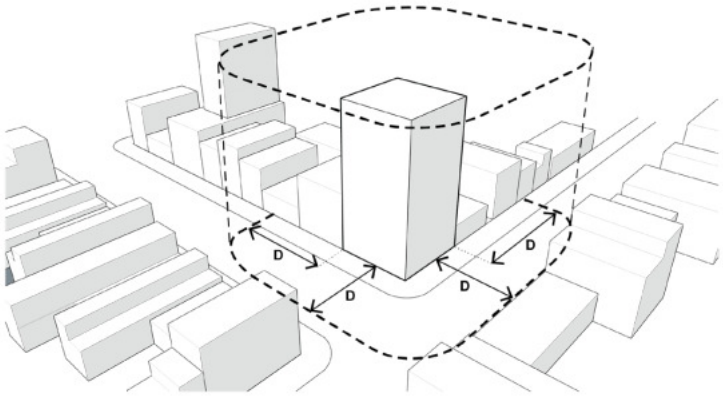


Figure 7: Assessment distance.

2.6 Use of Adjacent Pedestrian Occupied Areas & Recommended Comfort Criteria

The following table lists the specific areas adjacent to the development and the corresponding recommended criteria.

Table 2: Recommended application of criteria

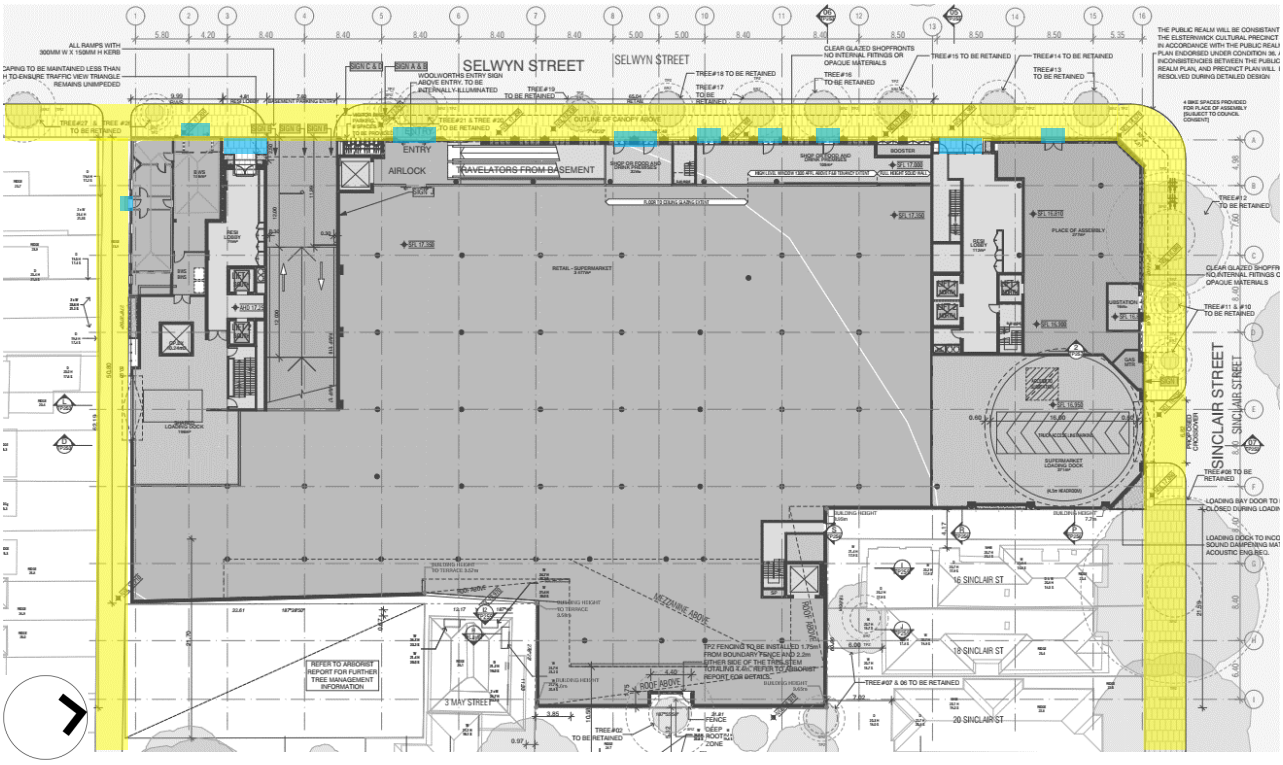
Area	Specific location	Recommended Criteria
Public Footpaths and Access ways	Around the proposed development on Selwyn and Sinclair Streets (Figure 8)	Walking
Building entrances	Entrances to the residential lobby, offices or retail spaces. (Figure 8)	Standing
Communal Roof Terraces and Private Terraces	Podium roof amenity areas on Level 1 (Figure 9), and communal terraces on Levels 5 and 6 of the north tower (Figure 10 and Figure 11)	Walking (see discussion below)

2.6.1 Balcony and Rooftop areas Recommended Criterion Discussion

Balconies are located on all facades of the proposed development. Vipac recommends as a minimum that balcony/rooftop terrace areas meet the criterion for walking since:

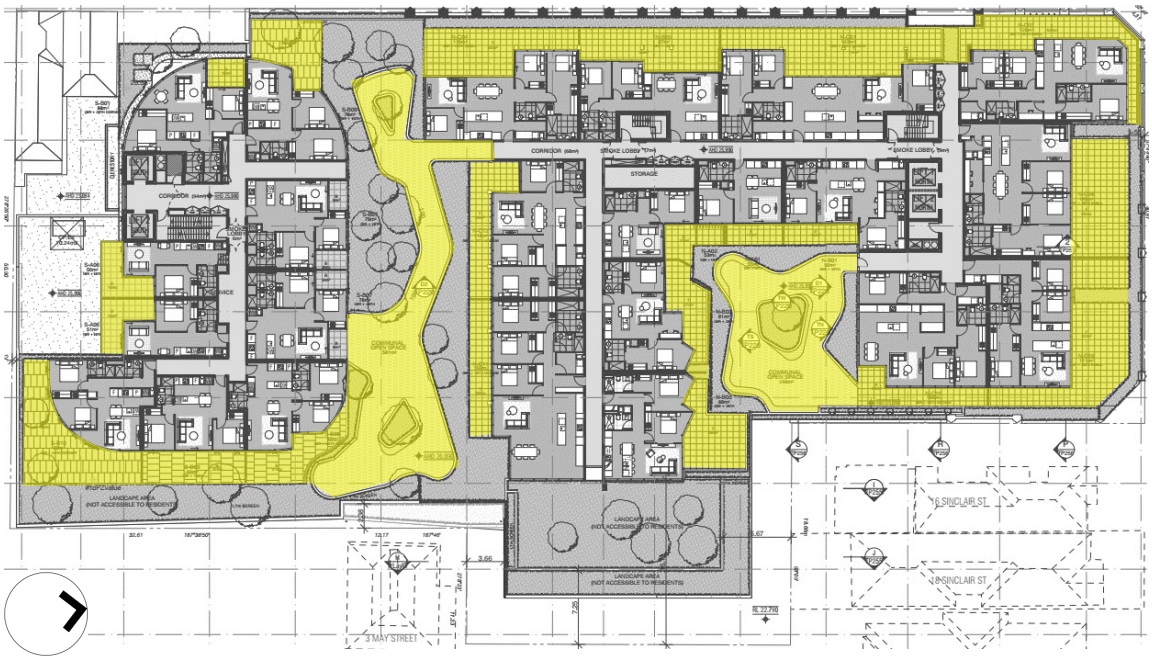
- these areas are not public spaces;
- the use of these areas is optional;
- many similar developments in Melbourne and other Australian capital cities experience wind conditions on balconies and elevated deck areas in the vicinity of the criterion for walking.

However, it should be noted that meeting the walking criterion on elevated recreation areas will be no guarantee that occupants will find wind conditions in these areas acceptable at all times.



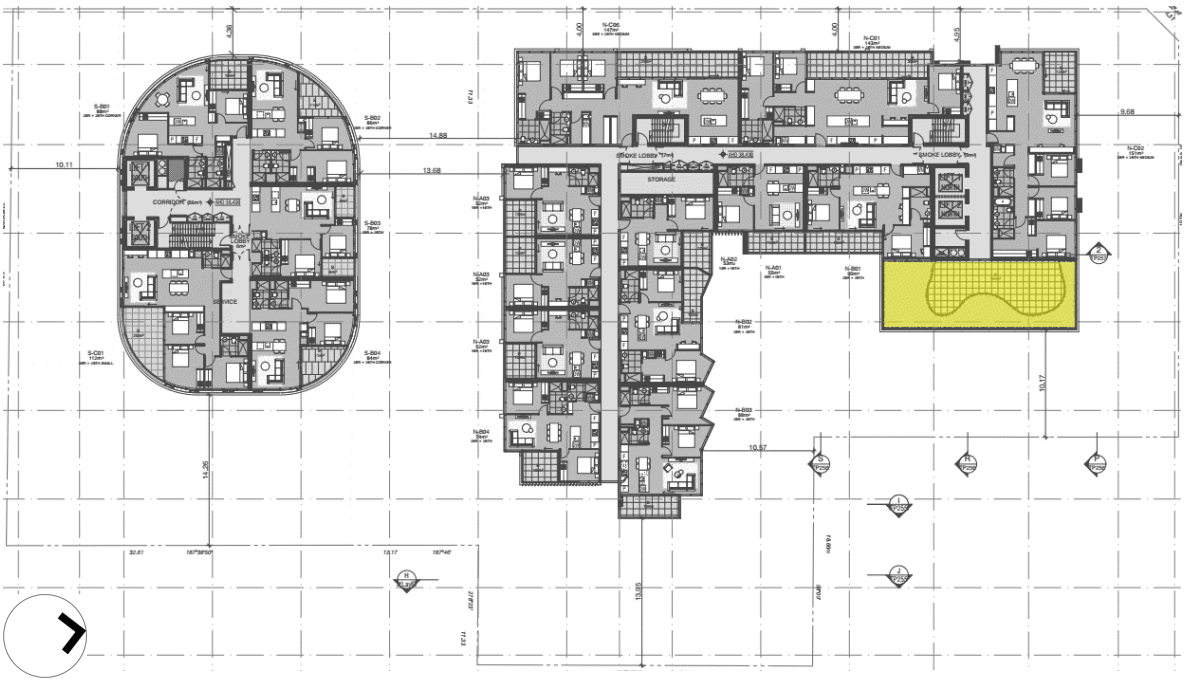
Recommended to fulfil Walking *Recommended to fulfil Standing*

Figure 8: Ground level plan of the proposed development with the recommended comfort criterion overlaid.



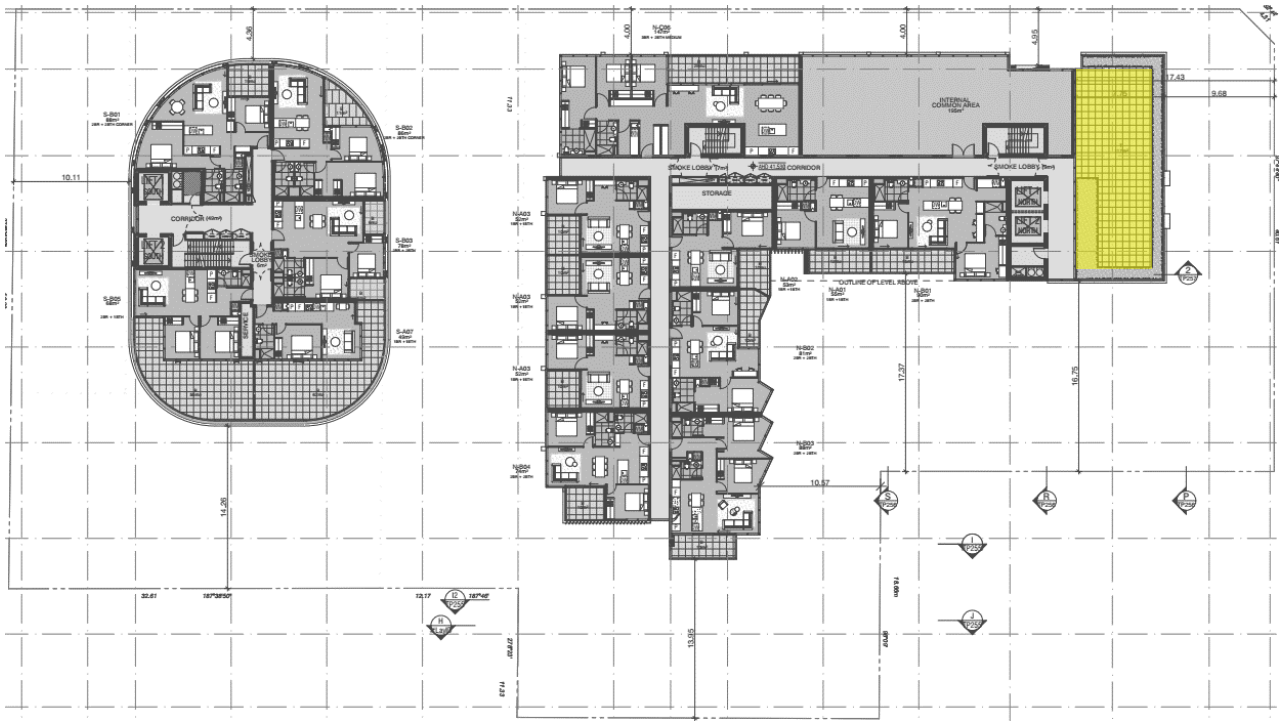
Recommended to fulfil Walking

Figure 9: Level 01 plan of the proposed development with the recommended comfort criterion overlaid.



Recommended to fulfil Walking

Figure 10: Level 5 plan of the proposed development with the recommended comfort criterion overlaid.



Recommended to fulfil Walking

Figure 11: Level 6 plan of the proposed development with the recommended comfort criterion overlaid.

3 Pedestrian Level Wind Effects

3.1 Discussion & Recommendations

3.1.1 Ground Floor

The southern towner is rounded and is setback from the Selwyn Street frontage by approximately 4meters minimum. Similarly, the northern tower is setback 4m from Selwyn Street and approximately 7m from Sinclair Street minimum. The proposed development also features a canopy that runs along Selwyn Street and wraps around the norther western corner along Sinclair Street. These features are expected to be beneficial to the ground level wind environment and are expected to protect the surrounding pedestrian pathways from adverse winds. As such, footpaths are expected to be within the recommended walking comfort criterion.

Most entrances are shielded by the canopy and the proposed colonnades, whereas the entrances to the residential lobbies feature an airlock as well as a setback design. The entrance along the southern laneway is not expected to experience adverse winds. As such, it is expected that all main entrances would have wind conditions within the recommended standing criterion.

3.1.2 Communal Terraces

Level 1

The podium rooftop amenity areas located on Level 1 are expected to have high wind conditions channelling between the two towers. However, the proposed design features dense landscaping islands and trees to disrupt these adverse flows as well as 1.5-1.7m high solid screens. In combination with the shielding received from the existing developments to the west, wind speeds are expected to be within the recommended walking comfort criterion.

The communal open space for the northern tower is sufficiently setback, as well as featuring dense landscaping. As such wind speeds are expected to be within the recommended walking comfort criterion.

Level 5

Facing the less dominant easterly direction, in combination with the 1m high planter boxes along the perimeter, wind speeds are expected to be within the recommended walking comfort criterion.

Level 6

Due to the relatively small dimensions and 1m high planter boxes along the perimeter, wind speeds are expected to be within the recommended walking comfort criterion.

3.1.2.1 Private Terraces

The private terraces have proposed a number of design features that are expected to be beneficial to the wind environment. These include the following:

- Small dimensions for most terraces;
- Setback design for most terraces;
- 1m high planter boxes along the perimeter for the larger terraces; and
- 1.7m high privacy screens

As such, wind speeds at all private terraces are expected to be within the recommended walking comfort criterion.

The wind conditions would be expected to fulfil the safety criterion throughout the site.

After careful consideration, Vipac predicts wind levels to be elevated in some locations due to the proposed development. However, they are not expected to exceed the recommended comfort / safety criteria for their respective locations. As such, no recommendations for wind amelioration have been provided.

It should be noted that this study is based on experience only and has not utilised any experimental data for the analysis.

Vipac recommends a wind tunnel test be conducted in the detail design stage to quantify the wind conditions and determine the proper wind control measures wherever necessary.

4 Conclusions

An assessment of the likely wind conditions at pedestrian level and communal terraces of the proposed development at **10-16 Selwyn St, Elsternwick** has been made.

Vipac has carefully considered the form and exposure of the proposed development, nominated criteria for various public areas according to their function and referred to past experience to produce our opinion of likely wind conditions. Based on this assessment, the following conclusions are drawn:

- With the proposed design the ground level footpaths would be expected to have wind levels within the walking comfort criterion;
- With the proposed design the wind conditions at the front of the entrances would be expected to be within the criterion for standing comfort.
- With the proposed design, the wind conditions at the communal terrace areas are expected to be within the recommended comfort criterion for walking; and
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Educating occupants about wind conditions at open terrace/balcony areas during high-wind events and fixing loose, lightweight furniture on the terrace are highly recommended.

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To refine and optimise the extent of recommended wind control measures, experimental validation through wind tunnel testing is recommended at the design development stage.

This Report has been Prepared
For
Pace Development Pty Ltd
By

VIPAC ENGINEERS & SCIENTISTS LTD.

Appendix A Environmental Wind Effects

Atmospheric Boundary Layer

As wind flows over the earth it encounters various roughness elements and terrain such as water, forests, houses and buildings. To varying degrees, these elements reduce the mean wind speed at low elevations and increase air turbulence. The wind above these obstructions travels with unattenuated velocity, driven by atmospheric pressure gradients. The resultant increase in wind speed with height above ground is known as a wind velocity profile. When this wind profile encounters a tall building, some of the fast moving wind at upper elevations is diverted down to ground level resulting in local adverse wind effects.

The terminology used to describe the wind flow patterns around the proposed Development is based on the aerodynamic mechanism, direction and nature of the wind flow.

Downwash – refers to a flow of air down the exposed face of a tower. A tall tower can deflect a fast moving wind at higher elevations downwards.

Corner Accelerations – when wind flows around the corner of a building it tends to accelerate in a similar manner to airflow over the top of an aeroplane wing.

Flow separation – when wind flowing along a surface suddenly detaches from that surface and the resultant energy dissipation produces increased turbulence in the flow. Flow separation at a building corner or at a solid screen can result in gusty conditions.

Flow channelling – the well-known "street canyon" effect occurs when a large volume of air is funnelled through a constricted pathway. To maintain flow continuity the wind must speed up as it passes through the constriction. Examples of this might occur between two towers, in a narrowing street or under a bridge.

Direct Exposure – a location with little upstream shielding for a wind direction of interest. The location will be exposed to the unabated mean wind and gust velocity. Piers and open water frontage may have such exposure.

Appendix B References

[1] *Structural Design Actions, Part 2: Wind Actions*, Australian/New Zealand Standard 1170.2:2011

[2] *Wind Effects on Structures* E. Simiu, R Scanlan, Publisher: Wiley-Interscience

[3] *Architectural Aerodynamics* R. Aynsley, W. Melbourne, B. Vickery, Publisher: Applied Science Publishers

Appendix C Drawing List

Drawings Received: **August 2024**

TP000	A	COVER SHEET	TOWN PLANNING
TP002	A	DEMOLITION PLAN	TOWN PLANNING
TP003	A	SITE PLAN	TOWN PLANNING
TP004	A	PROJECT SUMMARY	TOWN PLANNING
TP096	A	BASEMENT 4 FLOOR PLAN	TOWN PLANNING
TP097	A	BASEMENT 3 FLOOR PLAN	TOWN PLANNING
TP098	A	BASEMENT 2 FLOOR PLAN	TOWN PLANNING
TP099	A	BASEMENT 1 FLOOR PLAN	TOWN PLANNING
TP100	A	GROUND FLOOR PLAN	TOWN PLANNING
TP100A	A	MEZZANINE LEVEL FLOOR PLAN	TOWN PLANNING
TP101	A	LEVEL 01 FLOOR PLAN	TOWN PLANNING
TP102	A	LEVEL 02 FLOOR PLAN	TOWN PLANNING
TP103	A	LEVEL 03 FLOOR PLAN	TOWN PLANNING
TP104	A	LEVEL 04 FLOOR PLAN	TOWN PLANNING
TP105	A	LEVEL 05 FLOOR PLAN	TOWN PLANNING
TP106	A	LEVEL 06 FLOOR PLAN	TOWN PLANNING
TP107	A	LEVEL 07 FLOOR PLAN	TOWN PLANNING
TP108	A	LEVEL 08 FLOOR PLAN	TOWN PLANNING
TP109	A	LEVEL 09 FLOOR PLAN	TOWN PLANNING
TP110	A	ROOF FLOOR PLAN	TOWN PLANNING
TP200	A	NORTH ELEVATION	TOWN PLANNING
TP201	A	SOUTH ELEVATION	TOWN PLANNING
TP202	A	EAST ELEVATION	TOWN PLANNING
TP203	A	WEST ELEVATION	TOWN PLANNING
TP250	-	SECTION AA	TOWN PLANNING
TP251	-	SECTION BB	TOWN PLANNING
TP252	A	SECTION CC	TOWN PLANNING
TP253	-	SECTION DD	TOWN PLANNING
TP254	-	SECTION EE & FF & GG	TOWN PLANNING
TP255	-	SECTION HH & II & JJ	TOWN PLANNING
TP256	-	SECTION PP	TOWN PLANNING
TP304	-	SHADOW DIAGRAMS	TOWN PLANNING
TP305	-	SHADOW DIAGRAMS	TOWN PLANNING
TP306	-	SHADOW DIAGRAMS	TOWN PLANNING
TP307	-	SHADOW DIAGRAMS	TOWN PLANNING
TP500	-	MATERIAL FINISHES	TOWN PLANNING