ATTACHMENT 5

Wind Assessment

Prepared by:

CPP Wind Engineering Consultants

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QUALITATIVE WIND ASSESSMENT
CPP PROJECT 21957
1 AUGUST 2025

332-334 Water Street

Fortitude Valley, QLD

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Executive Summary

A qualitative assessment of the 332-334 Water Street development to be built in Fortitude Valley, QLD was conducted to provide an initial assessment of the surrounding pedestrian wind environment. The assessment was based on the local wind climate, CPP's experience in the region and on comparable projects, and the characteristics of the proposed development.

The wind environment around the development is likely to be generally suitable for pedestrian standing or walking style activities from a comfort perspective with reference to the Lawson criteria. Areas intended for long term stationary activity such as café outdoor dining and seating near the primary through-site connection on the south-west corner to the heritage precinct in the north-east are likely to require treatment such as awnings or local screening to ensure they are suitable for their intended use. All areas in the public domain in the vicinity of the subject site are expected to satisfy the relevant wind safety criterion.

Wind conditions on residential balconies are expected to be generally calm and comparable to buildings in the region. Relatively windy conditions on the rooftop terraces are expected due to their exposure to prevailing winds, and options for mitigation are provided in this report.

This report is a high-level qualitative assessment based on basic features of the local wind climate and proposed built environment.

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Document Tracking and Version Control

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1. Introduction

GENERAL INFORMATION

The assessment of the wind environment around developments can ensure adverse impacts are minimised and inform designers about the suitability of outdoor areas for their intended uses. Where necessary, design modifications can be made, or intervention measures added to mitigate areas with the potential for excessive wind speeds.

The proposed development is located in Fortitude Valley, approximately 1.5 kilometres from the Brisbane CBD. The surrounding terrain is comprised primarily of low-rise suburban development, with some larger towers predominantly to the east of the site, shown in Figure 1.

The proposed development comprises two towers: one 37 storeys (fronting Brunswick Street) and one 38 storeys (fronting Water Street), oriented approximately 90 degrees to each other with an approximate gap of 10 meters in between them, shown in Figure 2. As it is taller than most of the surrounding structures, the addition of the proposed development is expected to have some impact on the local wind conditions, and the extents are broadly discussed in this report.

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Figure 1: Aerial view of proposed development site (Google Earth, 2025).

Figure 2: Rendered image of proposed development viewed from the south-west.

2. Wind Climate

The proposed development lies approximately 11 km to the south-west of the Brisbane Airport anemometer, which provides the best source of historical wind data for the project. To enable a qualitative assessment of the wind environment, the wind frequency and direction information measured by the Bureau of Meteorology at a standard height of 10 m over the period 2000 – 2023 have been used in this analysis.

The wind rose for Brisbane Airport is shown in Figure 3. The arms of the wind rose point in the direction from where the wind is blowing, the width and colour of the arm represent the wind speed, and the length of the arm indicates the percentage of the time that the wind blows for that combination of speed and direction.

The distribution and frequency of winds on an annual basis were analysed to assess the project with regards to wind comfort and safety. As can be seen from the wind rose in Figure 3, winds from the north-north-east and south-south-west directions are predominant, with strong infrequent winds from the west. This wind assessment is structured around these prevailing wind directions.

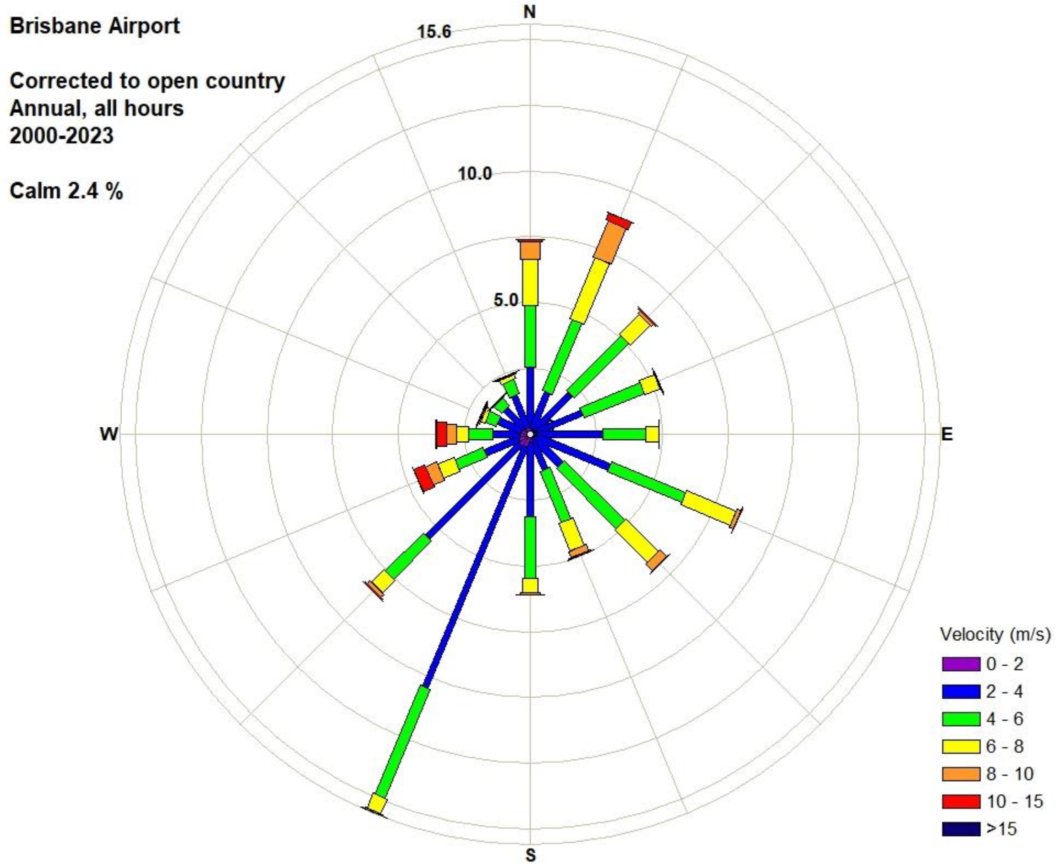

Figure 3: Probability of Wind Speeds by Direction Brisbane Airport –(2000 – 2023, All Hours).

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3. Wind Assessment Criteria

A number of researchers have suggested quantitative methods for assessing wind comfort and safety based on estimated wind speeds and local climate statistics. These criteria provide a means of evaluating the wind amenity of a location based on the frequency of threshold wind speeds, noting that pedestrians will tolerate higher wind speeds for a shorter time period than lower speeds. The comfort criteria also allow planners to assess the usability, with respect to the wind environment, of different locations for various purposes.

Brisbane City Council does not specify a method of assessing wind comfort or safety criteria. CPP uses a modified form of the widely-accepted pedestrian-level wind criteria developed by Lawson (1990). Lawson's criteria are divided into separate categories of comfort and distress (safety).

Lawson's criteria are based on wind speeds exceeded 5% of the time, and are described as categories for comfort ranging from 'Pedestrian Sitting' to 'Business Walking', allowing planners to judge the usability of locations for various intended purposes. The criteria also include a distress rating, for safety assessment, which is based on occasional (once or twice per year) wind speeds, to identify locations where wind speeds may be hazardous to pedestrians.

The categories and criteria are specified in Table 1. In general, wind conditions comfortable for Sitting and Standing are considered appropriate for areas such as entrances where pedestrians are likely to gather for longer durations, while wind conditions comfortable for Casual Walking and Business Walking are more appropriate for sidewalks where pedestrians are actively in transit. Locations rated as Uncomfortable are generally less suitable for most pedestrian activities and wind control solutions are often sought. Whether mitigation is needed at a location depends upon the intended pedestrian use of the location.

Satisfaction of the safety rating is generally required for areas accessible to the general public. A rating of 'Able-Bodied' may be acceptable for areas with managed access or where pedestrians are unlikely to be present under adverse conditions.

Pedestrians' perception of wind can often be subjective and vary depending on regional difference in wind climate and thermal conditions, as well as by individual. Calibration to the local wind environment should be taken into account when evaluating predicted wind comfort conditions. Note that the ratings of 'Uncomfortable' and 'Safety' are the words of the published wind criteria and applicability may vary by project and location.

Table 1: Wind Comfort and Safety criteria (after Lawson, 1990).

COMFORT RATING	U_{EQUIV}*	DESCRIPTION
Dining**	< 2 m/s	Calm / light breezes suitable for outdoor restaurant uses, seating areas, and other amenities based on CPP experience.
Sitting	2-4 m/s	Calm or light breezes suitable for long duration seating areas, and other amenities.
Standing	4-6 m/s	Gentle breezes suitable for sitting for shorter periods, main entrances and bus stops where pedestrians may linger.
Pedestrian Walking	6-8 m/s	Moderate winds appropriate for window shopping and strolling along a downtown street, or park.
Business Walking	8-10 m/s	Relatively high speeds that can be tolerated if one's objective is to walk, run, or cycle.
Uncomfortable	> 10 m/s	Strong winds unacceptable for all pedestrian activities; wind mitigation is typically required.

*U_{Equiv} = Max (U_{Mean}, U_{Gust} / 1.85).
*U_{Equiv} speeds are based on an annual exceedance of 5% (~8 hours / week) assessed over all hours.
** For regular outdoor dining, and in semi-enclosed spaces, it has been the experience of CPP that the comfort rating of Sitting may be windier than desired and a comfort criterion of 4 m/s or less may be more applicable.

SAFETY RATING	U_{EQUIV}*	DESCRIPTION
Pass	< 15 m/s	Meets wind safety criterion.
Able-Bodied	15-20 m/s	Acceptable where only able-bodied people would be expected; not acceptable for frail persons or cyclists
Fail	>20 m/s	Excessive wind speeds that can adversely affect a pedestrian's balance and footing. Wind mitigation is often required.

* U_{Equiv} = Max (U_{Mean}, U_{Gust} / 1.85).
*U_{Equiv} speeds are based on an annual exceedance of 0.022% (~2 / year or 1 / season) assessed over all hours.

4. Assessment

SITE DESCRIPTION

The development site is located at the corner of Water St and Brunswick St in the inner city Brisbane suburb of Fortitude Valley, surrounded primarily by low-medium rise buildings, with a region of open parkland to the west and clusters of mid-rise towers to the east of the site. Topography surrounding the site is relatively flat from a wind perspective and unlikely to significantly affect the wind climate at the site. Winds in such surrounds tend to experience less channelling than areas with many tall structures, with local effects instead being dictated by exposed buildings and their relation to prevailing strong wind directions. Several wind flow mechanisms such as downwash and channelling flow are described in Appendix A and the effectiveness of some common wind mitigation measures are described in Appendix B.

Figure 4: Plaza plan view of proposed development outdoor spaces.

WINDS FROM THE NORTH-NORTH-EAST

Winds from the north-north-east quadrant will approach the site over a region of medium-rise buildings. The existing neighbouring buildings (Cambridge Towers) to the immediate north-east and east of the site will offer some shielding from direct winds, however, will also generate a negative pressure region in their wake which will exacerbate downwash from the proposed development. The existence of this negative pressure region during winds from the north-east will draw stagnated flow from the upper levels of the proposed development toward ground level creating windy conditions within the plaza. As winds from this quadrant interact with the proposed development a pressure differential will form between the plaza and south-west entry to the site. This pressure differential will drive the downwash flow generated from the east and north facades of the proposed towers, respectively, through the gap between the towers, creating a region of local high-speed flow around the most constricted section between the towers. As the distance between the tower facades increases along the through-site link further to the south-west of the site, the flow along this pedestrian accessway will expand, reducing the wind speed with distance from the constriction, Figure 5. Changing the orientation of the walkway between staircases, Figure 5, could assist in improving wind conditions by orientating landscaping to be opposed to the net flow direction between the towers and provide more effective shielding to pedestrians.

Proposed seating areas within the plaza are expected to be impacted by downwash from the towers. Where possible, seating should be located away from the gap between the towers where the wind speeds are greatest. Alternatively, the addition of an awning over the proposed seating area on the south-east corner of Brunswick St tower, Figure 6, would be effective in improving wind amenity in this area. Provision of similar solid or porous (20-40%) canopies above other seating areas within the plaza, or vertical screening, such as dense landscaping, could also be utilised to create local areas of calm for longer term stationary activities.

As the north façade of the Brunswick St tower is exposed to winds from the north-north-east, a small amount of downwash would also be expected to form from this façade. This downwash flow would accelerate around the north-west corner of the tower before discharging along Brunswick St, slightly increasing the wind speeds in this area.

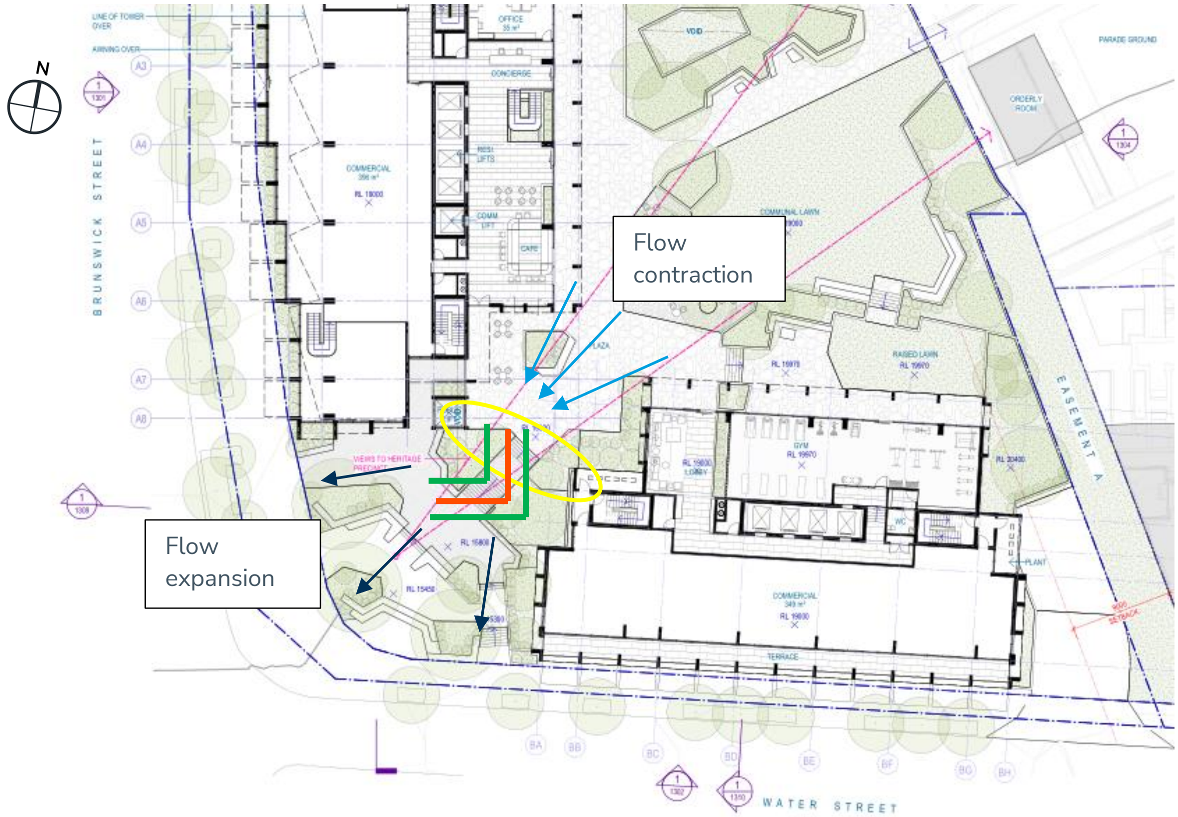

Figure 5: Suggestion for change in orientation to accessway to mitigate wind conditions. Pedestrian walkway in orange, landscaping in green. Expected region of high-speed flow circled in yellow with areas of flow contraction and expansion indicated with arrows.

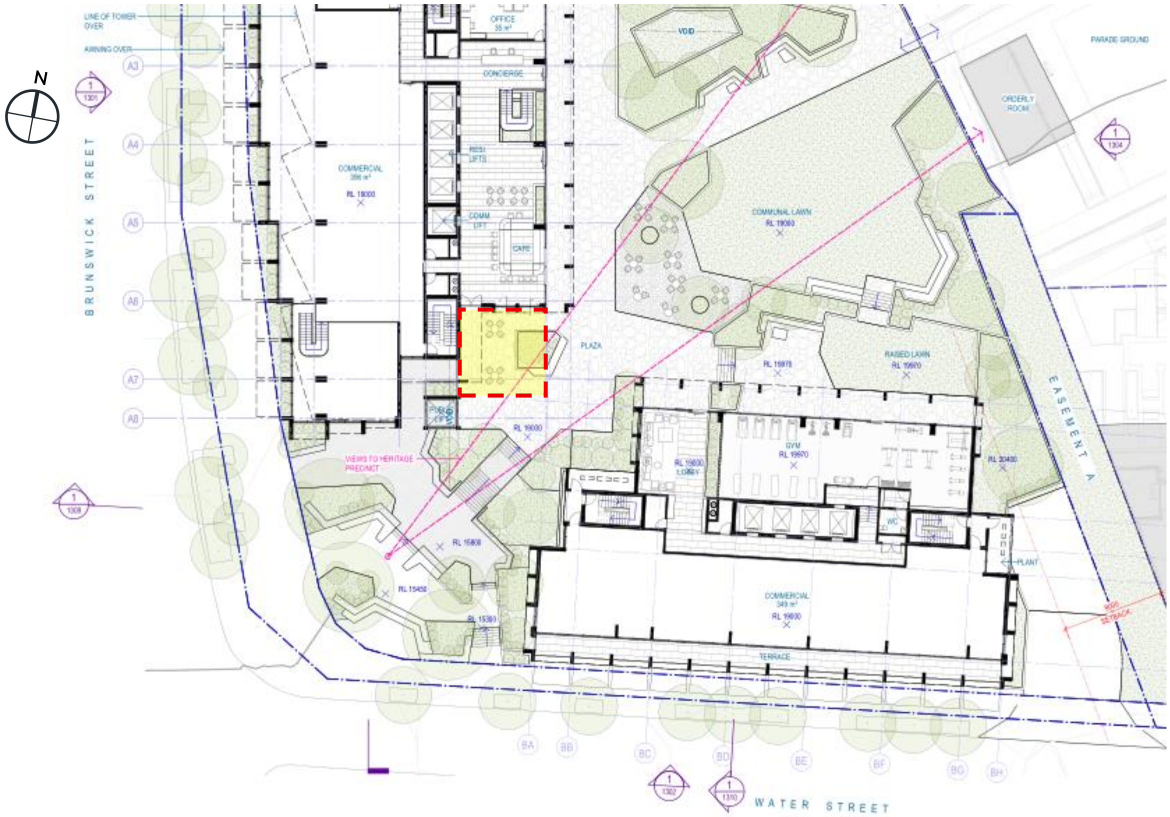

Figure 6: Suggested location of awning over café seating to assist in mitigating adverse wind conditions in the space between the proposed towers.

WINDS FROM THE SOUTH

Winds from the south quadrant will approach over a large region of low-rise suburban development closer to site, with the high-rise buildings of the Brisbane CBD further upstream. While these high-rise buildings are relatively close, they are unlikely to have a significant effect on the wind environment at the site. As winds from the south quadrant impinge on the broad south façade of the Water St tower the combined massing of the subject tower and adjacent Cambridge towers will encourage the downwash flow generated to be accelerated toward ground level and around the south-west corner of the Water St tower. This high-speed flow will discharge through the south-west site entry and along Brunswick St, increasing the wind conditions in this area. The awnings present on the podium of the Water St tower will provide some limited shielding to pedestrians along the Water St frontage, and increasing the depth or extending the awnings around the south-west corner of the podium (Figure 7) would assist in deflecting downwash flow away from the ground plane. Further, the inclusion of dense planting through the south-west entry area, orientated north-east to south-west, would also be beneficial in reducing the wind speed experienced through this pedestrian accessway. During winds from the south quadrant, the wind conditions within the plaza's public spaces are expected to be relatively mild due to being well shielded by the massing of the proposed development.

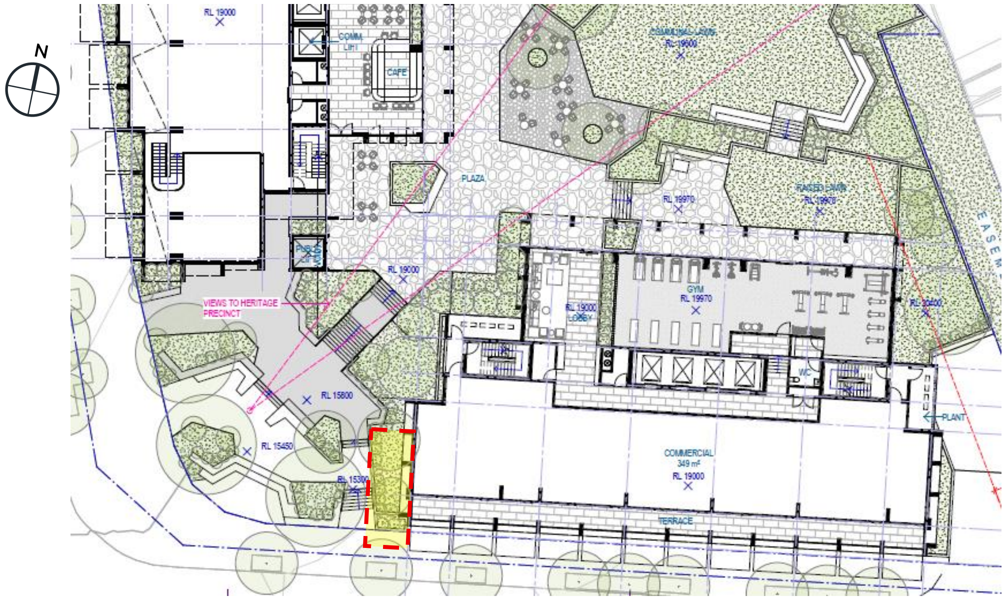

Figure 7: Corner awning mitigation option for Water St tower to improve wind conditions within the through-site link.

WINDS FROM THE WEST

Winds from the west quadrant will approach over a large region of low-rise suburban development and open country terrain, reaching the proposed development relatively unimpeded. As the approach winds impinge on the broad western façade of the Brunswick St tower, flow will be diverted toward the ground plane before accelerating around the north and south corners of the tower. The awnings on the western façade of the Brunswick St podium will help deflect some downwash away from pedestrians, however, the flow reaching ground level would worsen wind conditions at the north-west corner of the Brunswick St tower (east-west link connecting Brunswick St with the heritage precinct) and the aforementioned primary thoroughfare at the south-west of the site. Extending the awnings on the west façade around the podium corners, Figure 8, would assist in improving wind conditions. Similar mitigation measures as suggested in Figure 7 for winds from the south quadrant would be expected to provide similar benefit for winds from the west also.

All areas around the site are expected to pass the safety/distress criterion during winds from the south.

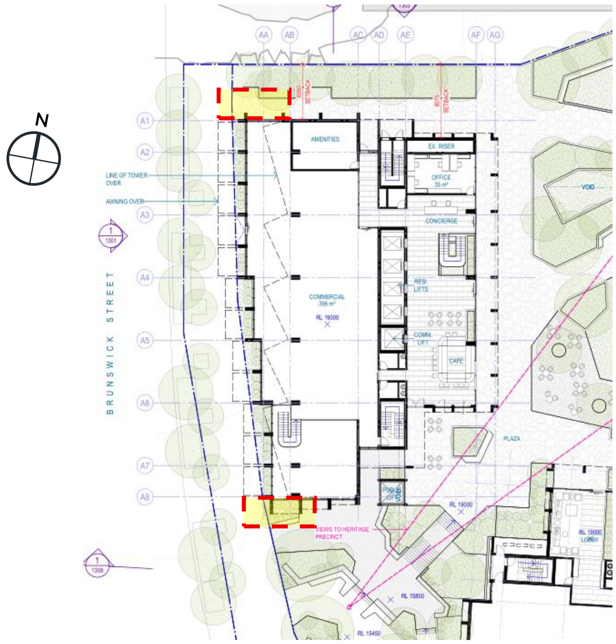

Figure 8: Possible corner awning mitigation for Brunswick St tower.

SUMMARY – PUBLIC DOMAIN

From a pedestrian comfort perspective, the wind environment around the proposed development site on the Water St and Brunswick St frontages is likely to be classified as acceptable for pedestrian standing or walking under Lawson. These pedestrian comfort levels would be suitable for public accessways, and for stationary short-term exposure activities. Similarly, within the plaza of the proposed development, wind conditions away from the towers would be expected to be classified as pedestrian standing, with locations surrounded by significant landscaping being suitable for longer-term stationary activities. Stronger wind conditions are expected to exist within the south-west site entry, with higher wind speeds at the narrowest point between the towers, and Lawson ratings between pedestrian walking and business walking.

All locations would be expected to satisfy the Lawson safety/distress criterion.

WIND CONDITIONS WITHIN THE DEVELOPMENT

BALCONIES

The current proposed angled orientation of the balconies with the inclusion of a solid blade wall at the most exposed end of each balcony will help in maintaining lower wind speeds within the balcony cavities. As such, a significant portion of these balconies will remain comfortable for most prevailing wind directions. Wind conditions within the balconies are expected to be classified as pedestrian standing, if calmer wind conditions are desired, increasing the balustrade height to approximately 1800 mm would be suggested.

ROOFTOP TERRACE AMENITY

As the proposed development is taller than buildings immediately surrounding the site, the rooftop terraces are relatively exposed to the prevailing westerly and southerly winds, for the Brunswick St tower and Water St tower respectively. Wind conditions on the proposed rooftop terraces (Figure 9), are expected to be classified as acceptable for pedestrian standing or walking from a Lawson comfort perspective. The rooftop balustrades in combination with the raised planters help in shielding and dispersing strong winds coming from the south and west for the pool areas. The massing of the rooftop extending the width of each tower provides shelter from northerly winds (Water St tower) and easterly winds (Brunswick St tower). If milder conditions are desired in this area, implementation of porous vertical screening or raised planters around the sun lounges would be suggested.

The BBQ outdoor dining areas are expected to experience similar wind conditions to the pool decks. The massing of the rooftop helps in providing shielding from winds from most directions. If calmer wind conditions are desired, increasing the balustrade height to approximately 1800 mm (Figure 9) would assist in promoting more comfortable wind conditions for a larger percentage of the time.

Figure 9: Resident's amenity on sky terraces with increased balustrades heights highlighted around BBQ area - southwest isometric view.

5. Conclusion

Cermak Peterka Petersen Pty. Ltd. has provided a qualitative assessment of the impact of the proposed 332-334 Water Street project on the local wind environment in and around the development site. Being larger than most surrounding structures, the proposed development will have some effect on the local wind environment. Wind conditions around the development are expected to be classified as acceptable for pedestrian standing or walking for most locations from a Lawson comfort perspective, with higher wind speeds expected near the podium corners due to downwash. Pressure driven flow through the gap between the towers of the proposed development is likely to yield windy conditions in this space, and through the south-west entry to the site, with conditions expected in the pedestrian to business walking range. Mitigation measures such as the implementation of awnings around podium corners would be recommended to help divert downwash flow away from the ground plane and publicly accessible areas. Residents' amenity on the rooftop terraces is expected to be suitable for pedestrian standing.

All locations would be expected to satisfy the Lawson safety/distress criterion.

References

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Appendix A – Wind Flow Mechanisms

When the wind hits a large, isolated building, the wind is accelerated down and around the windward corners, Figure A1 this flow mechanism is called downwash and causes the windiest conditions at ground level on the windward corners and sides of the building. In Figure A1 smoke is being released into the wind flow to allow the wind speed, turbulence, and direction to be visualised. The image on the left shows smoke being released across the windward face, and the image on the right shows smoke being released into the flow at about third height in the centre of the face.

Techniques to mitigate the effects of downwash winds on pedestrians include the provision of horizontal elements, the most effective being a podium to divert the flow away from pavements and building entrances. Awnings along street frontages perform a similar function, and the larger the horizontal element, the more effective it will be in diverting the flow.

Channelling occurs when the wind is accelerated between two buildings or along straight streets with buildings on either side.

Figure A2 shows the wind at mid and upper levels on a building being accelerated substantially around the corners of the building. When balconies are located on these corners, they are likely to be breezy, and will be used less by the owner due to the regularity of stronger winds. Owners quickly become familiar with when and how to use their balconies. If the corner balconies are deep enough, articulated, or have regular partition privacy fins, then local calmer conditions can exist.

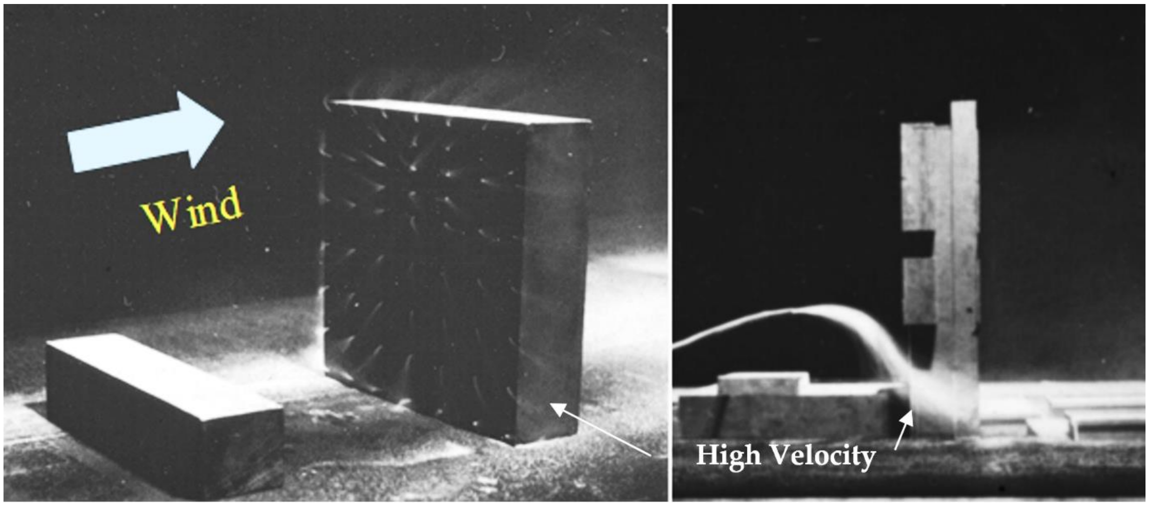

Figure A1: Flow visualisation around a tall building.

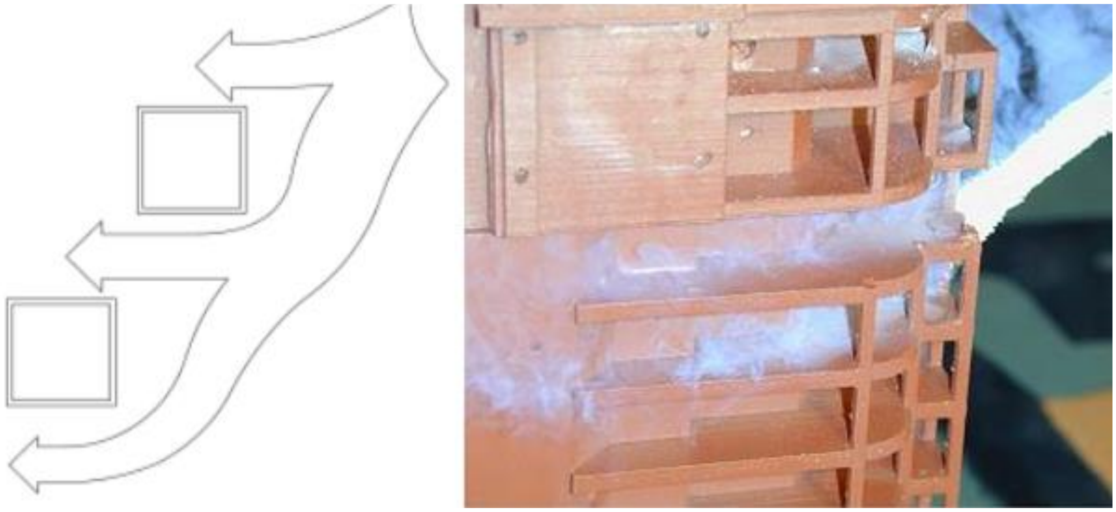

Figure A2: Channelling between buildings (L) and visualisation through corner balconies (R).

Appendix B - Wind Impact Planning Guidelines

It is well known that the design of a building will influence the quality of the ambient wind environment at its base. Below are some suggested wind mitigation strategies that should be adopted into precinct planning guidelines and controls (see also Cochran, 2004).

Building form – Canopies

A large canopy may interrupt the flow as it moves down the windward face of the building. This will protect the entrances and sidewalk area by deflecting the downwash at the second storey level, Figure B1. However, this approach may have the effect of transferring the breezy conditions to the other side of the street. Large canopies are a common feature near the main entrances of large office buildings.

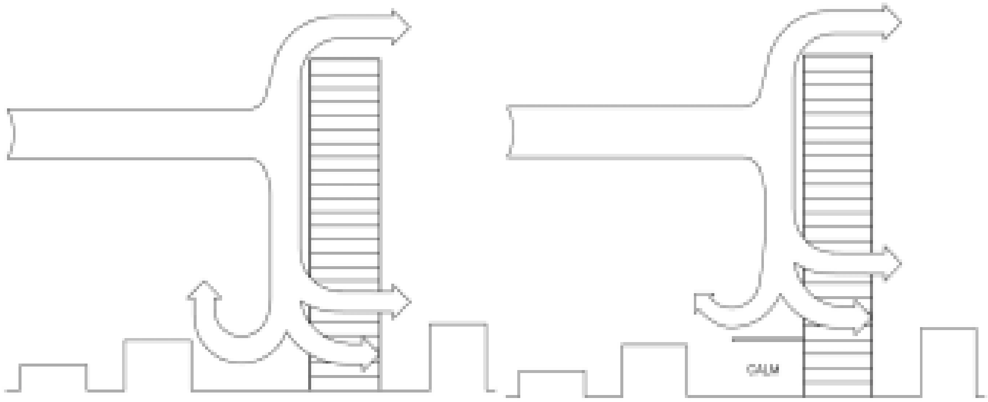

Figure B1: Canopy Windbreak Treatment. (L) Downwash to street level may generate windy conditions for pedestrians. (R) A large canopy is a common solution to this pedestrian-wind problem at street level.

Building form – Podiums

The architect may elect to use an extensive podium for the same purpose, Figure B2, if it complies with the design mandate. This is a common architectural feature for many major projects, but it may be counterproductive if the architect wishes to use the podium roof for long-term pedestrian activities, such as a pool or tennis court.

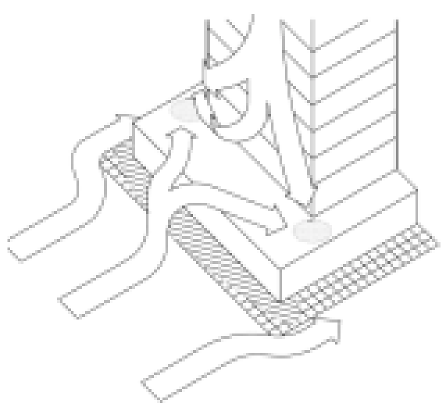

Figure B2:The tower-on-podium massing often results in reasonable conditions at ground level, but the podium may not be useable.

Building form – Arcades

Another massing issue, which may be a cause of strong ground-level winds, is an arcade or thoroughfare opening from one side of the building to the other. This effectively connects a positive pressure region on the windward side with a negative pressure region on the lee side; a strong flow through the opening often results, Figure B3. The uninvitingly windy nature of these open areas is a contributing reason behind the use of arcade airlock entrances (revolving or double sliding doors).

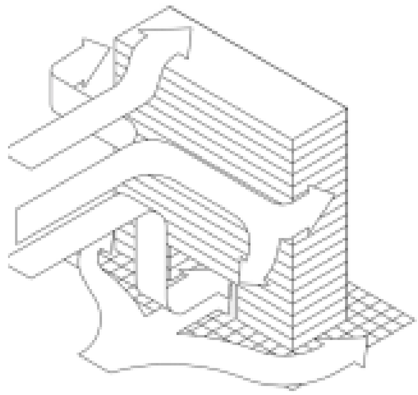

Figure B3: An arcade or open column plaza under a building frequently generates strong pedestrian wind condition.

Building form – Alcove

An entrance alcove behind the building line will generally produce a calmer entrance area at a mid-building location, Figure B4(L). In some cases, a canopy may not be necessary with this scenario, depending on the local geometry and directional wind characteristics. The same undercut design at a building corner is usually quite unsuccessful, Figure B4 (R), due to the accelerated flow mechanism described in Figure B1 and the ambient directional wind statistics. If there is a strong directional wind preference, and the corner door is shielded from those common stronger winds, then the corner entrance may work. However, it is more common for a corner entrance to be adversely impacted by this local building geometry. The result can range from simply unpleasant conditions to a frequent inability to open the doors.

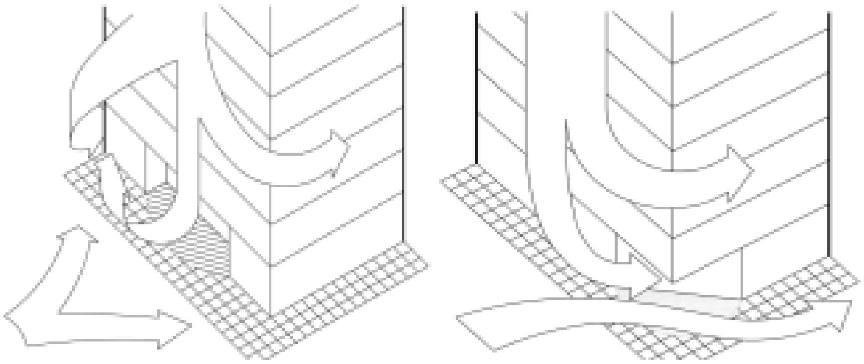

Figure B4: Alcove Windbreak Treatment. (L) A mid-building alcove entrance usually results in an inviting and calm location. (R) Accelerated corner flow from downwash often yields an unpleasant entrance area.

Building form – Façade profile and balconies

The way in which a building's vertical line is broken up may also have an impact. For example, if the floor plans have a decreasing area with increased height the flow down the stepped windward face may be greatly diminished. To a lesser extent the presence of many balconies can have a similar impact on ground level winds, although this is far less certain and more geometry dependent. Apartment designs with many elevated balconies and terrace areas near building ends or corners often attract a windy environment to those locations. Mid-building balconies, on the broad face, are usually a lot calmer, especially if they are recessed. Corner balconies are generally a lot windier and so the owner is likely to be selective about when the balcony is used or endeavours to find a protected portion of the balcony that allows more frequent use, even when the wind is blowing.

Use of canopies, trellises, and high canopy foliage

Downwash Mitigation – As noted earlier, downwash off a tower may be deflected away from ground-level pedestrian areas by large canopies or podium blocks. The downwash then effectively impacts the canopy or podium roof rather than the public areas at the base of the tower, Figure B2. Provided that the podium roof area is not intended for long-term recreational use (e.g. swimming pool or tennis court), this massing method is typically quite successful. However, some large recreational areas may need the wind to be deflected away without blocking the sun (e.g. a pool deck), and so a large canopy is not an option. Downwash deflected over expansive decks like these may often be improved by installing elevated trellis structures or a dense network of trees to create a high, bushy canopy over the long-term recreational areas. Various architecturally acceptable ideas may be explored in the wind tunnel prior to any major financial commitment on the project site.

Horizontally accelerated flows between two tall towers may cause an unpleasant, windy, ground-level pedestrian environment, which could also be locally aggravated by ground topography. Horizontally accelerated flows that create a windy environment are best dealt with by using vertical porous screens or substantial landscaping. Large hedges, bushes or other porous media serve to retard the flow and absorb the energy produced by the wind. A solidity ratio (i.e. proportion of solid area to total area) of about 60-70% has been shown to be most effective in reducing the flow's momentum. These physical changes to the pedestrian areas are most easily evaluated by a model study in a boundary-layer wind tunnel.

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