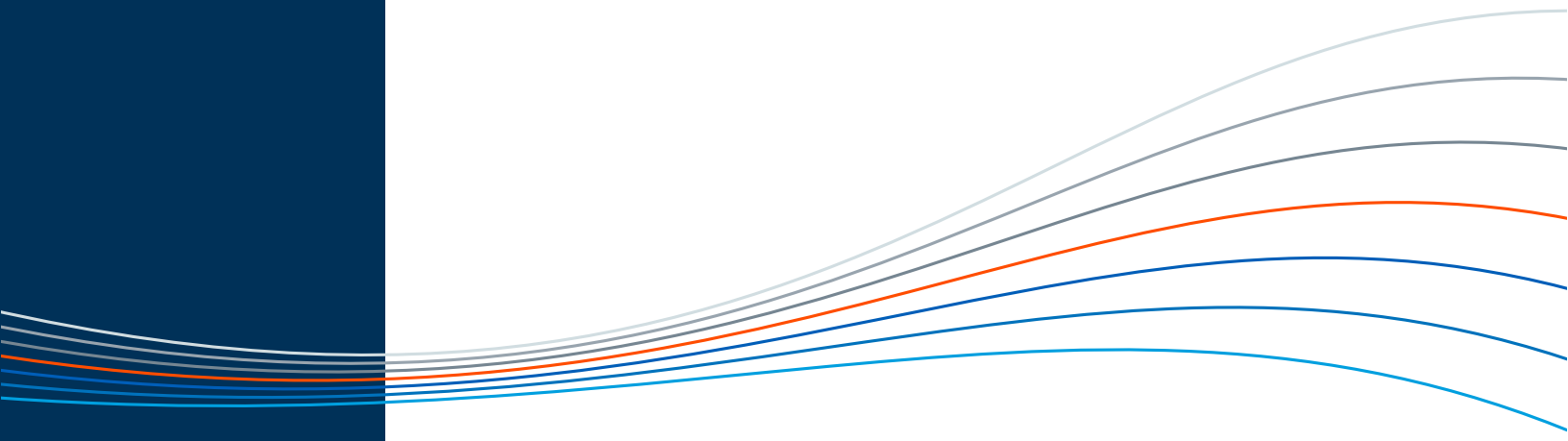
CPP WIND ENGINEERING CONSULTANTS

PEDESTRIAN WIND ASSESSMENT
CPP PROJECT 22670
26 MAY 2026

5 Blue Street

North Sydney, NSW



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Executive Summary

A wind tunnel study of the 5 Blue Street development, to be built in North Sydney, NSW was conducted to assess the surrounding pedestrian wind environment. Measurements of winds likely to be experienced by pedestrians were combined with wind statistics and compared to wind comfort and safety criteria.

The wind tunnel testing was performed in a natural boundary layer wind tunnel of CPP. A model of the project was fabricated to a 1:400 length scale and centred on a turntable in the wind tunnel. Replicas of existing and approved surrounding buildings within a 570 m radius were constructed and placed on the turntable. Approach boundary layers representative of the environment surrounding the proposed development was established in the test section of the wind tunnel.

Measurements of winds likely to be experienced by pedestrians were made with a hot-film anemometer at 18 locations for 16 wind directions each. These points were tested around the development site focusing on pedestrian access routes, entries, and outdoor seating or recreation areas. The measurements were combined with site specific wind statistics to produce results of wind speed versus the percentage of time that wind speed is exceeded for each location.

The results of the wind assessment can be summarized as follows:

REMOTE LOCATIONS:

Locations remote to the site were tested to establish baseline wind conditions for the North Sydney area. These locations were found to be generally suitable for Pedestrian Standing to Walking with reference to the Lawson comfort criteria, which is generally acceptable for the use of these spaces as pedestrian accessways. No noticeable impact from the proposed site was recorded, and all tested locations satisfied the recommended safety criteria.

SITE PERIMETER:

The wind environment around the development was found to be generally suitable for pedestrian standing or walking style activities from a comfort perspective with reference to the Lawson criteria. These conditions are expected to be suitable for pedestrian movement and general access to and from the site, however localised mitigation would be recommended if any spaces are intended for seating or outdoor dining. Locations on north and west corners were found to experience stronger wind conditions as a result of downwash from the façades of the tower, which are slightly stronger compared to the existing configuration, in the Pedestrian Walking to Business Walking comfort categories, Able-Bodied exceedances of the recommended safety threshold; mitigation strategies to reduce the impact of downwash at these corners has been discussed to improve wind conditions at these locations.

PLAZA:

Conditions were found to be generally suitable for Pedestrian Sitting to Standing with reference to the Lawson comfort criteria. Windier conditions were measured in the centre of the plaza which is more exposed to channelled flow from the north and south, rated as Pedestrian Walking under the Lawson comfort criteria and mitigation strategies which could be considered to improve wind comfort in this space are discussed in this report. All tested locations in the plaza satisfied the safety criteria.

Document Tracking and Version Control

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Contents

1. Introduction

GENERAL INFORMATION

Pedestrian wind studies are conducted to investigate pedestrian comfort and safety in and around developments. This assessment of the wind environment around developments can 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.

This report contains information regarding the local wind climate analysis, wind tunnel testing and analysis procedures, a discussion of the test results, and recommendations to improve wind conditions in areas where any adverse wind conditions may be identified. The test parameters and configurations are summarised in Table 1: Wind Tunnel Test ParametersTable 1.

All data collection was performed in accordance with the guidelines of the Australasian Wind Engineering Society (2019), and the American Society of Civil Engineers (1999, 2021). While analytical methods such as computational fluid dynamics (CFD) have some utility in the field of pedestrian wind comfort, they are not yet capable of reliably and accurately predicting gust wind speeds for assessment of wind conditions from a safety perspective.

Table 1: Wind Tunnel Test Parameters

SUMMARY OF TEST PARAMETERS	
GENERAL INFORMATION	
Model Scale	1:400
Surrounding Model Radius (full scale)	570 m
Approach Terrain Category	Intermediate between Open Water and Built-up approach (similar to AS1170.2 Terrain Category 2) (67.5° – 157.5°) Intermediate between Open Water and Built-up approach (similar to AS1170.2 Terrain Category 2.5) (180° – 270°) Built-up environment approach (similar to AS1170.2 Terrain Category 3) (292.5° – 45°)
ENVIRONMENTAL WINDS STUDY	
Number of test locations	18
Reference height (full scale)	200 m
TEST CONFIGURATION(S)	
Configuration A (Locations XX)	Proposed site and any/all approved or under construction developments within the modelled test radius as shown in Figure 1.
Configuration B (Locations XX.1)	Existing site configuration
Configuration C (Locations XX.2)	Configuration A with added south-western awning mitigation

2. Methodology

WIND TUNNEL MODEL

The anticipated wind conditions around the project site were evaluated through wind tunnel testing of a 1:400 scale model of the development and surrounding area. This scale allowed for an adequate portion of surrounding developments and terrain to be included within an approximately 570 m radius of the site and all the relevant building details to be modelled accurately. The boundary-layer wind conditions beyond the modelled area were also appropriately simulated in one of CPP's wind tunnels (see Appendix A). The models were mounted on the turntable, located near the downstream end of the wind tunnel test section, allowing rotation of the modelled area for examination of wind speeds from any approach wind direction.

Photographs of the test and surrounds models installed in the wind tunnel are given in Figure 1.

MEASUREMENT POINTS

For this study, wind speed measurements were recorded at 18 locations to evaluate pedestrian wind comfort and safety in and around the project site. The selected test locations are shown in Figure 3 to Figure 5**Error! Reference source not found.**.

Wind speed measurements were made at the model scale equivalent of 1.5 to 2.1 m above the surface for 16 wind directions at 22.5° intervals. Locations were chosen to determine the degree of pedestrian wind comfort and safety at building corners where relatively severe conditions are frequently found, near building entrances and passageways, at outdoor recreation areas and terraces.

The hot-film signal was sampled for a period corresponding to one hour in full scale. All wind speed data were digitally filtered to obtain the two to three second running mean wind speed at each point; this is the basis for the various acceptability criteria. These local wind speeds, U, were normalised by the tunnel reference wind speed, U_{ref}. Mean and turbulence statistics were calculated and used to calculate the normalised effective peak gust using:

$$\frac{U_{pk}}{U_{ref}} = \frac{U + 3U_{rms}}{U_{ref}}$$

The mean and gust equivalent mean velocities relative to the free stream wind tunnel reference wind speed at a full-scale elevation of 200 m are plotted in polar form in Appendix B. The graphs show wind speed magnitude and the approach wind direction for which that wind speed was measured. The polar plots aid in visualisation of the effects of the nearby structures or topography, the relative significance of various wind azimuths, and whether the mean or gust wind speed is of greater importance.

The measured local wind speeds were combined with wind climate data described in the following section to allow assessment of the pedestrian wind environment.

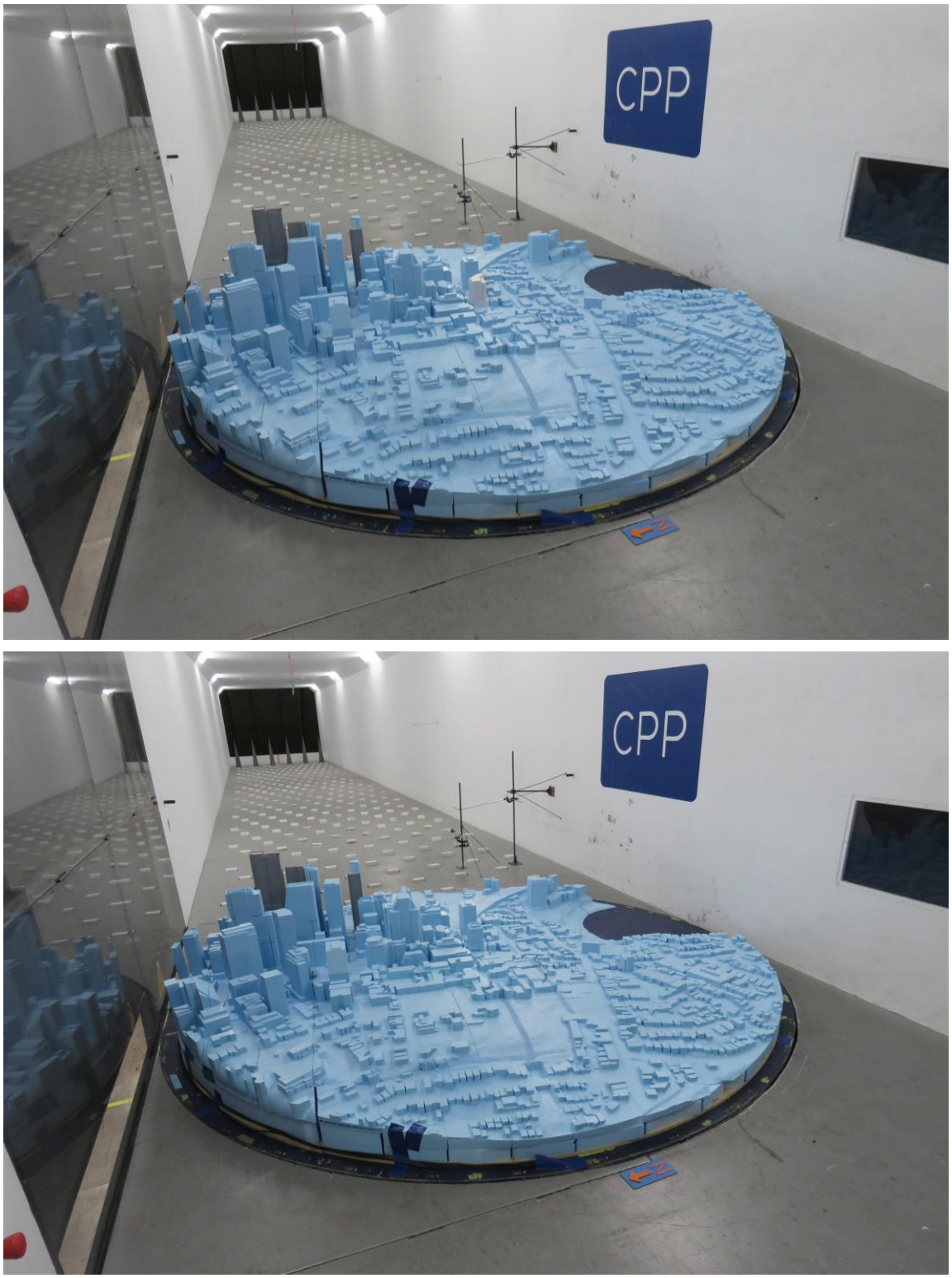


Figure 1a: Photographs of Wind Tunnel Test and Surrounds Model – Configurations A (top) and B (bottom)

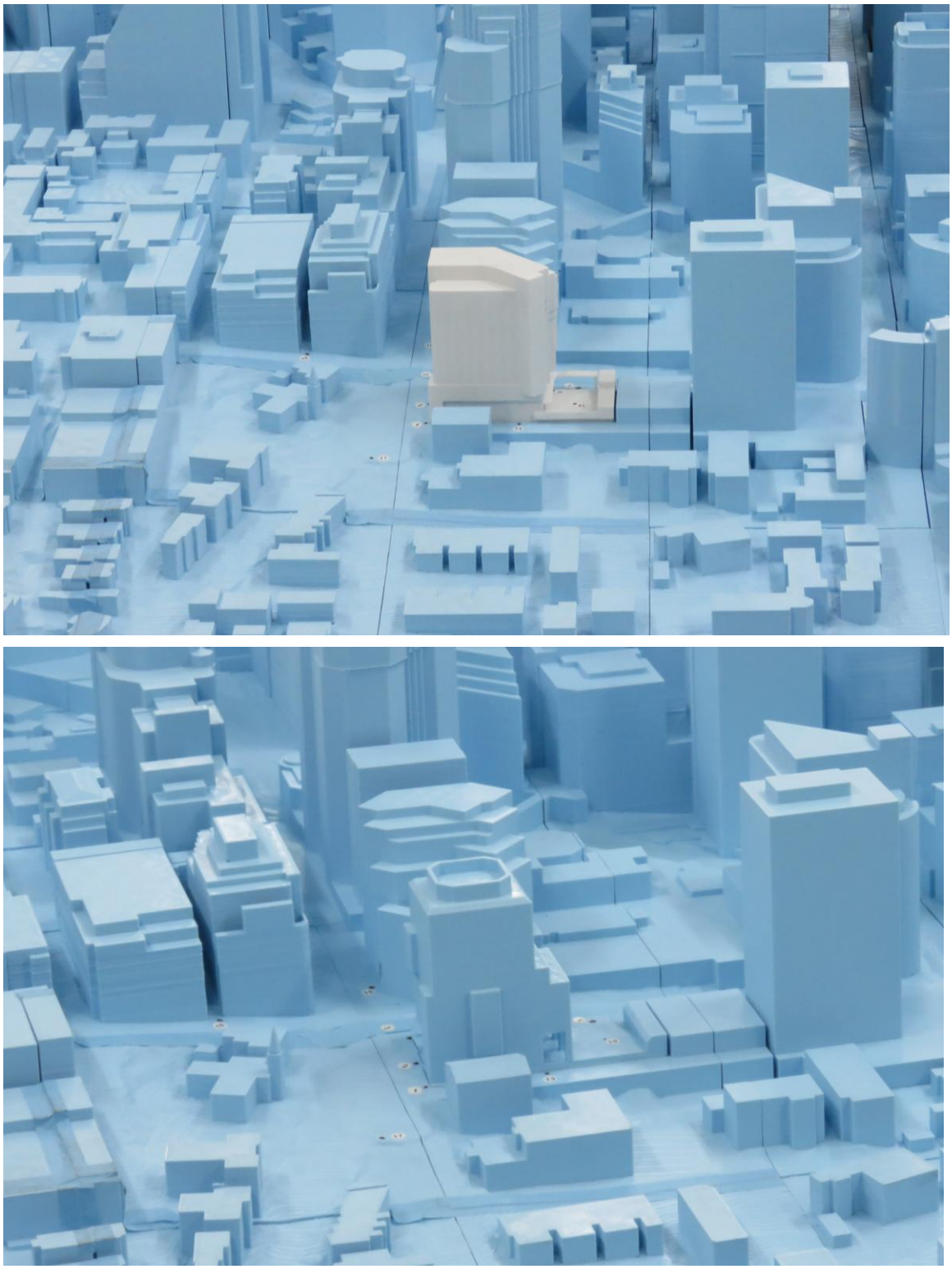


Figure 1b: Photographs of Wind Tunnel Test Model - Configurations A (top) and B (bottom)

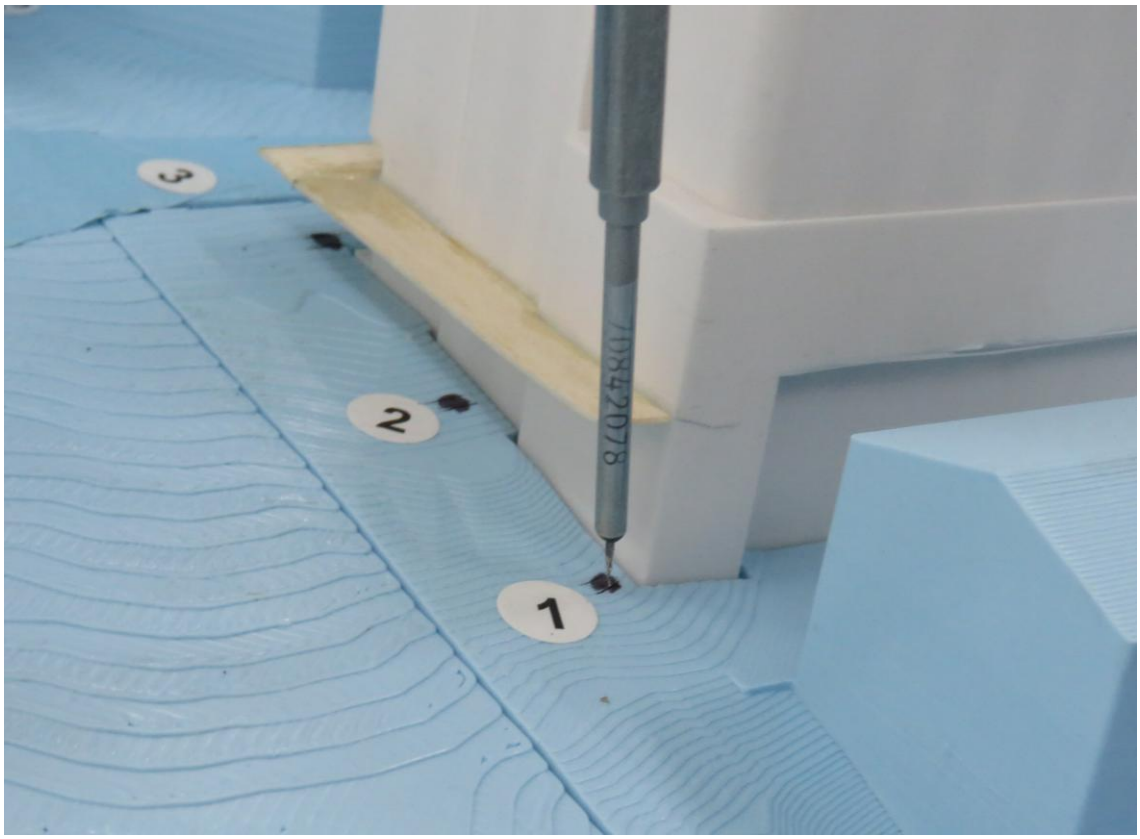


Figure 1c: Photographs of Wind Tunnel Test Model – Configuration C, awning mitigation scheme

WIND CLIMATE

The measured wind speed data were normalized to an approach reference wind speed and then combined with a climatological model (wind frequency and direction) derived from data measured at a standard height of 10 m at the Sydney International Airport. The project site is located approximately 11 kilometres to the north of the airport which provides the best source of historical wind data for the project.

This data is portrayed in the wind roses in Figure 2. The arms of the wind roses 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 percent of the time that the wind blows for that combination of speed and direction. These data were then adjusted to the site location using an analytical method to account for the exposure of the project site for each 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 2, winds from the north-east, south, and west quadrants are predominant. The locations tested around the development site may be susceptible to winds from these directions, depending on the relative position of the location tested to the geometry of the proposed development and surrounds.

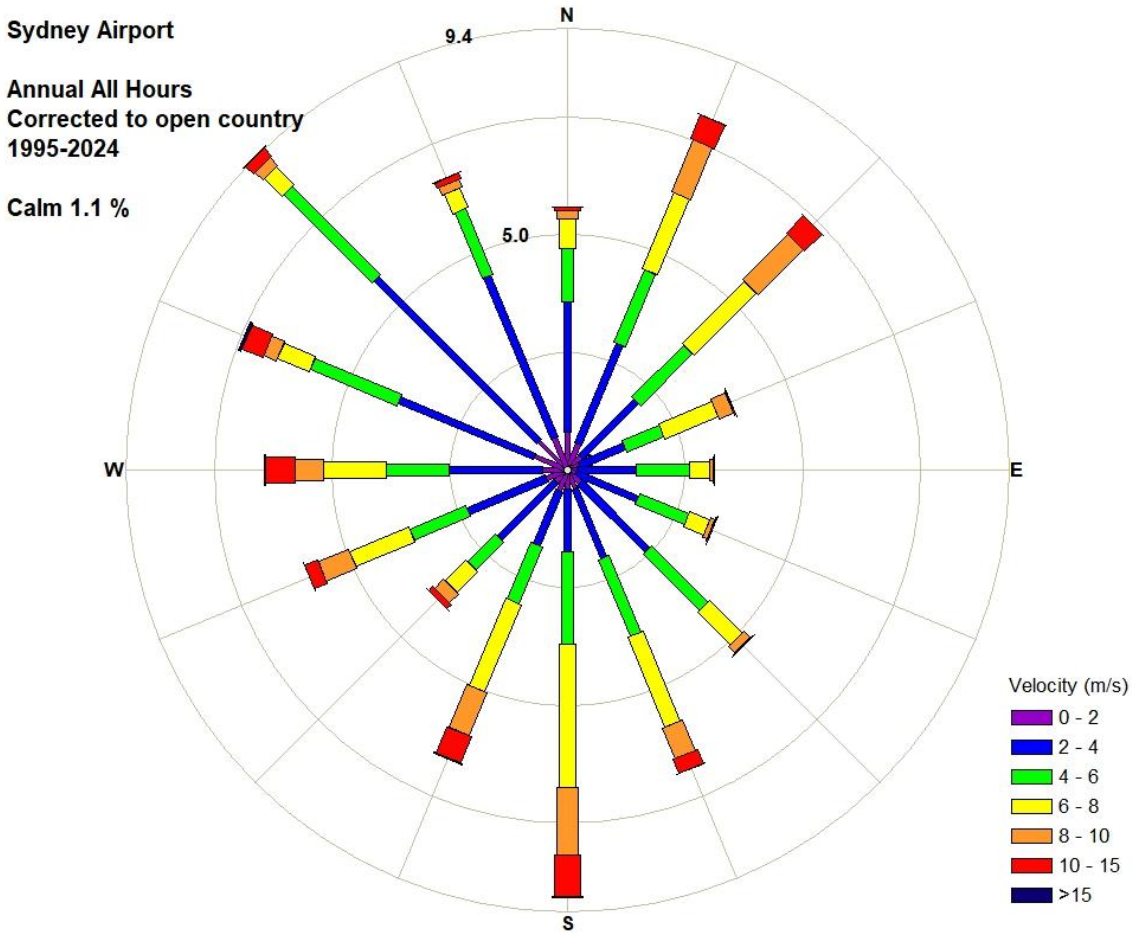


Figure 2: Probability of Wind Speeds by Direction – Sydney International Airport (1995 – 2024, All Hours)

WIND ASSESSMENT CRITERIA

To enable a quantitative assessment of the wind environment, the wind tunnel data and climatological model are combined to calculate wind speeds for comparison with pedestrian wind comfort and safety criteria at each test point.

A number of researchers have suggested quantitative methods for assessing wind comfort and safety based on wind tunnel data and local climate statistics. 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). The comfort criteria allow planners to assess the usability, with respect to the wind environment, of different locations for various purposes, such as for long-duration activities (e.g., sitting at an outdoor café) or strolling on walkways.

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 2.

Table 2: 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.
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), 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 2 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), based on an annual exceedance of 0.022% (~2 / year or 1 / season) assessed over all hours.

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.

3. Results

A summary of the assessed comfort and safety ratings for each test location is given in Table 3. Results are presented for each location number with the nomenclature 'X.0' for Configuration A, 'X.1' for Configuration B, and 'X.2' for Configuration C respectively. The results of the study are graphically presented in Figure 3 to Figure 6 in which measurement locations are displayed on a site plan and colour coded to denote the predicted wind comfort and safety rating. The central colour indicates the comfort rating for the location, and the colour of the outer ring indicates whether the location passes or exceeds the distress criterion.

From the cumulative wind speed distributions for each location, the percentage of time each of the Lawson comfort rating wind speeds are exceeded are presented in tabular form under the polar plots in Appendix B. In addition, the wind speeds corresponding to the 5% (comfort) and 0.022% (safety) thresholds are provided for direct comparison to the criteria. These plots also include directional criterion lines for the Lawson comfort levels to provide additional information regarding directional sensitivity at each location.

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. Although conditions may be classified as acceptable, there may be certain wind directions that cause regular strong events.

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. Mitigation measures are generally required to address any locations deemed to fail the safety assessment.

Table 3: Summary of wind comfort and safety assessment results

Description / Location		Comfort rating, 5% exceedance wind speed (m/s)		
		Proposed case (X)	Existing case (X.1)	Mitigation case (X.2)
Site perimeter	1	5.7		
	2	5.9	6.3	
	3	8.3	7.8	8.0
	4	4.4		
	5	7.5	6.6	6.3
	6	5.6	5.6	4.8
	7	5.9	5.6	
	8	7.0	7.1	
	9	4.8		
	10	5.0		
Plaza	11	5.9		
	12	6.3	4.9	
	13	3.3		
	14	3.4		
Surrounds	15	6.2	6.3	
	16	6.3	6.5	
	17	4.9		
	18	5.3		

Description / Location		Safety rating, 0.022% exceedance wind speed (m/s)		
		Proposed case (X)	Existing case (X.1)	Mitigation case (X.2)
Site perimeter	1	12.8		
	2	12.8	13.8	
	3	16.4	15.6	15.7
	4	8.7		
	5	15.6	13.4	14.3
	6	13.7	14.0	11.1
	7	14.9	14.1	
	8	16.4	14.8	
	9	10.2		
	10	11.6		
Plaza	11	12.8		
	12	13.2	9.6	
	13	6.5		
	14	7.3		
Surrounds	15	12.4	12.8	
	16	12.3	13.4	
	17	9.2		
	18	12.2		

LEGEND

Comfort Criteria

- Outdoor Dining
- Pedestrian Sitting
- Pedestrian Standing
- Pedestrian Walking
- Business Walking
- Uncomfortable

Safety Criteria

- Passes safety criteria
- Able bodied
- Fails safety criteria

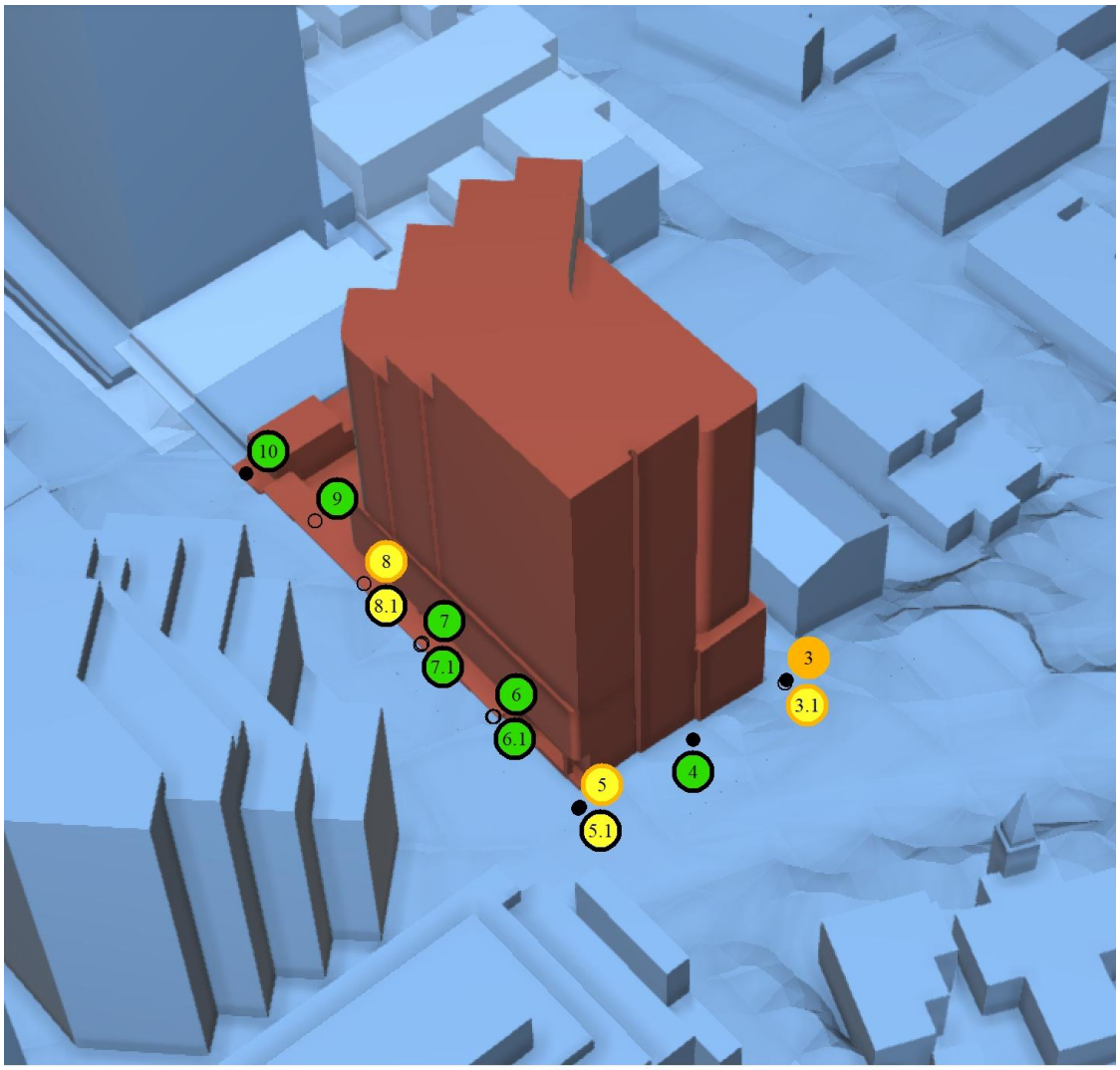


Figure 3: Pedestrian wind speed measurement locations with comfort/safety ratings – North-west isometric view

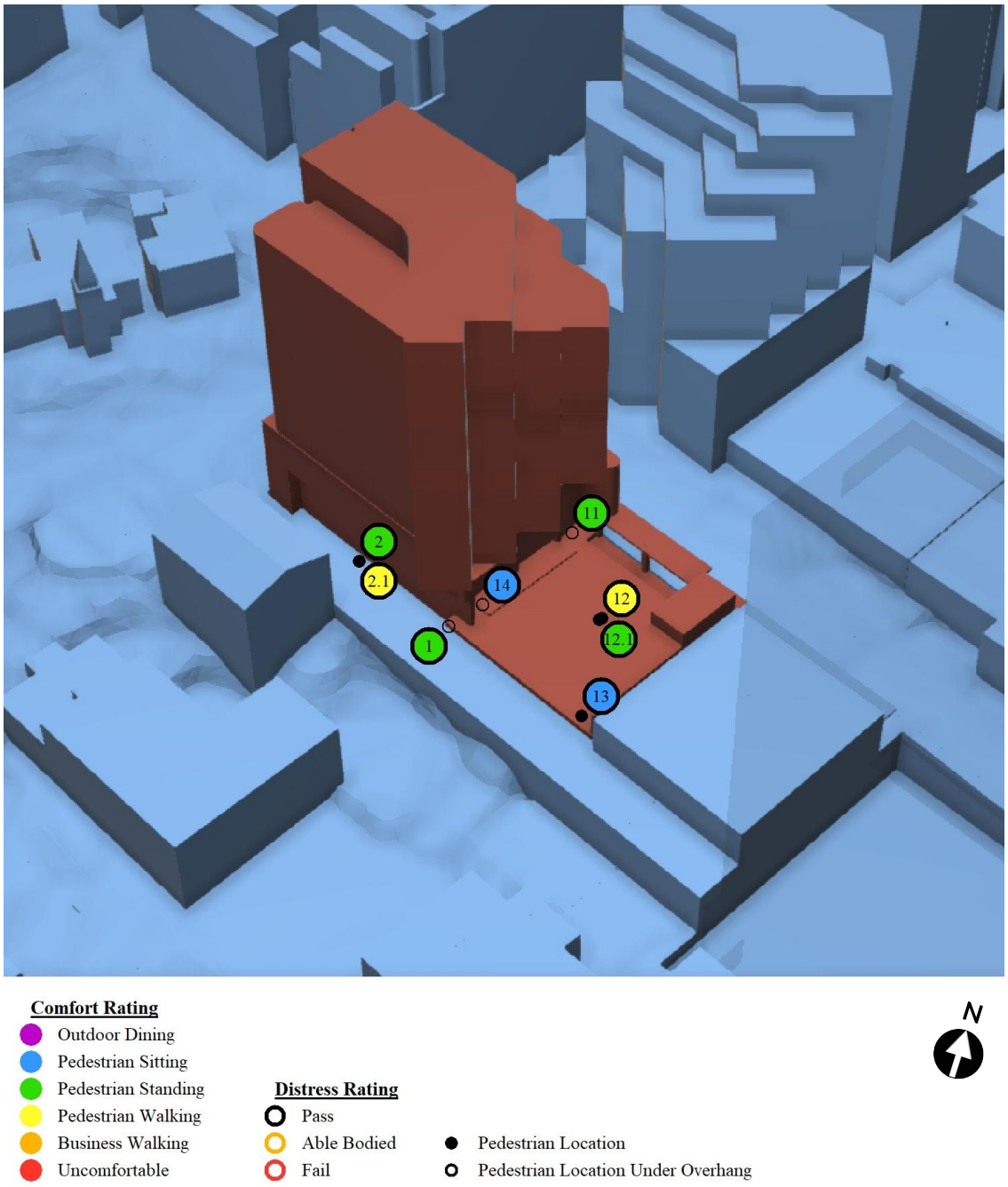


Figure 4: Pedestrian wind speed measurement locations with comfort/safety ratings – South-east isometric view

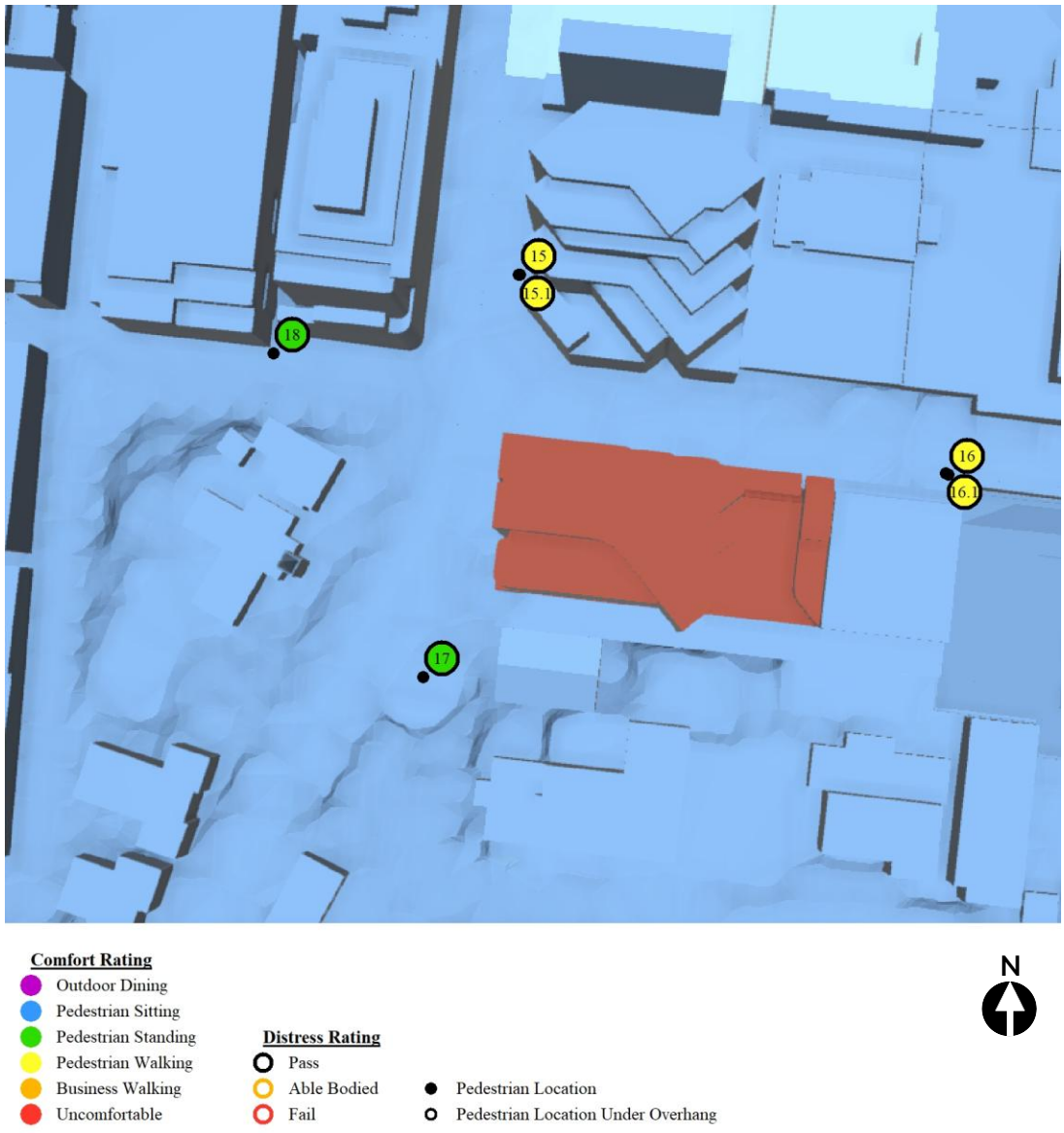


Figure 5: Pedestrian wind speed measurement locations with comfort/safety ratings – Surrounds

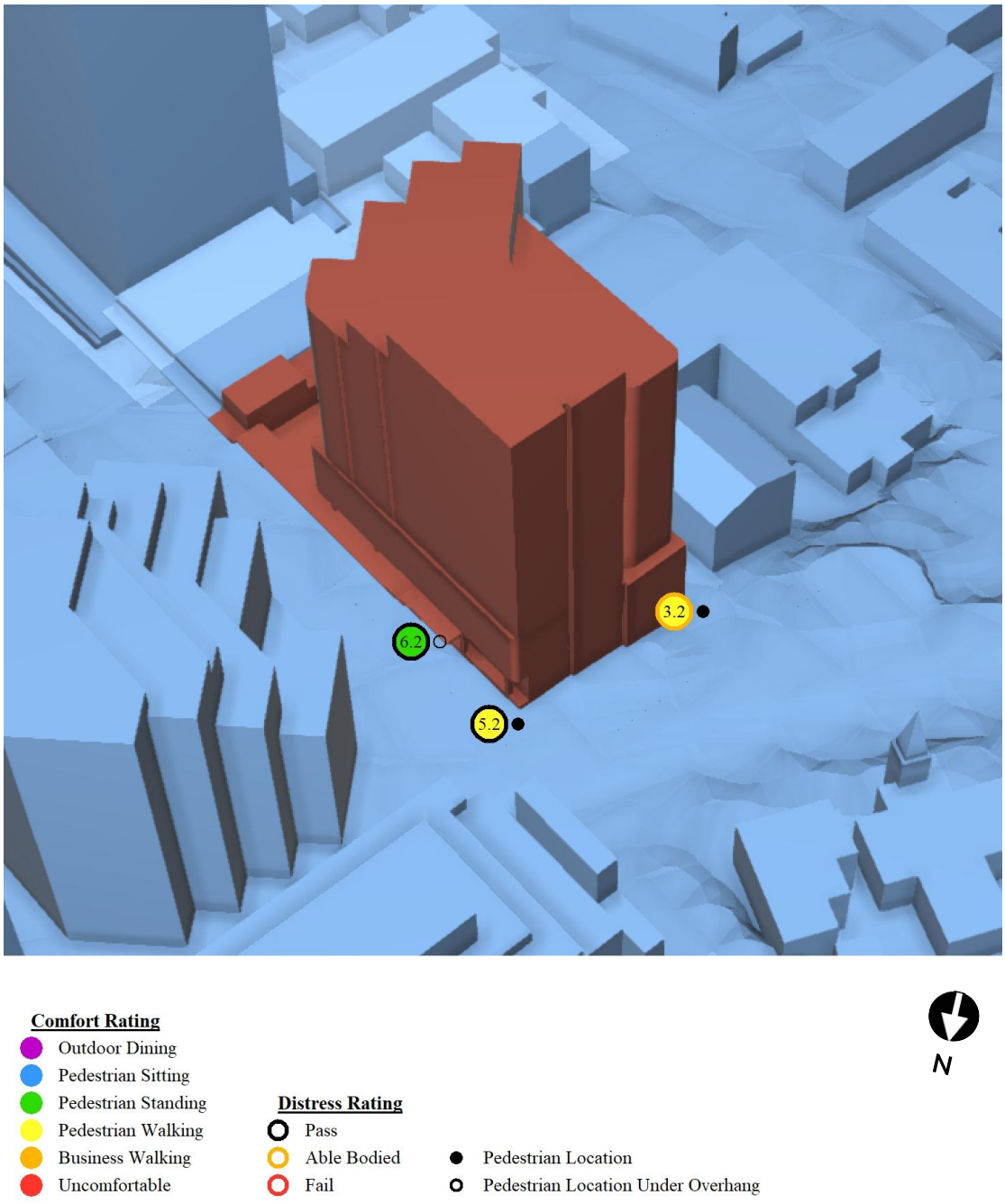


Figure 6: Pedestrian wind speed measurement locations with comfort/safety ratings - North-west isometric view, mitigation case

4. Discussion

SURROUNDS

Testing of the locations remote to the site are covered by Locations 15-18, located on Blue St, Blues Point Rd and Miller St, and are intended to provide a baseline for general wind conditions around the development. Wind conditions at these locations vary between Pedestrian Standing and Pedestrian Walking based on their proximity to nearby structures and exposure to prevailing strong wind directions. These Lawson comfort ratings align with the expected mobile and short-term stationary use of the area along local footpaths and storefronts.

Winds from the south and west have the largest impact on pedestrian comfort in these areas, similar to those on the site as a whole. These results are generally representative of the area as the site and its surrounds are more exposed to the south and west directions and have fewer large structures upwind to provide shielding. Testing for both existing and proposed configurations was undertaken at Locations 15-16 to the north and east of the proposed development and demonstrate an unchanged comfort rating of Pedestrian Walking in both cases, supporting that the proposed development is not expected to have significant impact on wind conditions outside of the immediate vicinity of the site. All tested locations passed the Lawson safety criteria,

SITE PERIMETER

Wind conditions around the site are presented at Locations 1-10 in Figure 3 and Figure 4 with a majority of points rated suitable for Pedestrian Standing to Pedestrian Walking under the Lawson criteria. Areas with these ratings are expected to be suitable for pedestrian movement and short-term stationary activities for a majority of the time.

Conditions away from the corners of the tower are generally milder, with Pedestrian Standing ratings at Locations 2, 4, 6, and 7 on all sides of the tower. These areas are expected to be generally suitable for use for pedestrian accessways and short-term stationary activity. Conditions at Locations 6 and 7 on Blue St are appropriate for a main entrance to the building where there is expected to be increased pedestrian traffic.

The building corners at Locations 3, 5, 8 are windier with Lawson comfort ratings of Pedestrian Walking to Business Walking and all with safety exceedances of Able-Bodied. Wind conditions at these areas are driven by downwash off the towers from predominantly westerly and southerly winds accelerating around the corners. These conditions are slightly stronger than the existing configuration due to the small increase in massing of the building

An awning which extends to the north-west corner of the building (depicted in solid yellow in Figure 7) would help redirect downwash from off the north and west façades of the proposed tower away from the ground plane. A configuration with this awning was tested for Locations 3, 5 & 6, with the outcome shown in Figure 6. Results show an improvement to the comfort and safety in this area, with Location 5 receiving a "Pass" safety rating and Location 3 having an improved comfort rating of Pedestrian Walking.

Location 3 is significantly impacted by southerly winds off the south façade and would benefit from the aforementioned awning wrapping around this corner of the building (see the dashed yellow area in Figure 7). It is understood that implementation of an awning around this corner may be difficult due to the intended adaptive re-use of the existing structure on this side of the development. As this exceedance is

localised to this south-west corner of the building, incorporating landscaping and dense planting such as trees with dense foliage or hedges near this corner may be considered to break up stronger gusts moving around the corner of the building.

In general, conditions are generally expected to be comfortable for pedestrian standing style activities in most areas, with windier conditions at the corners of the tower more suitable for walking style activity. The use of awning structures to improve wind conditions at the north and west corners of the site is recommended to ensure pedestrian safety. All locations except 3, 5 and 8 pass the safety/distress criterion.

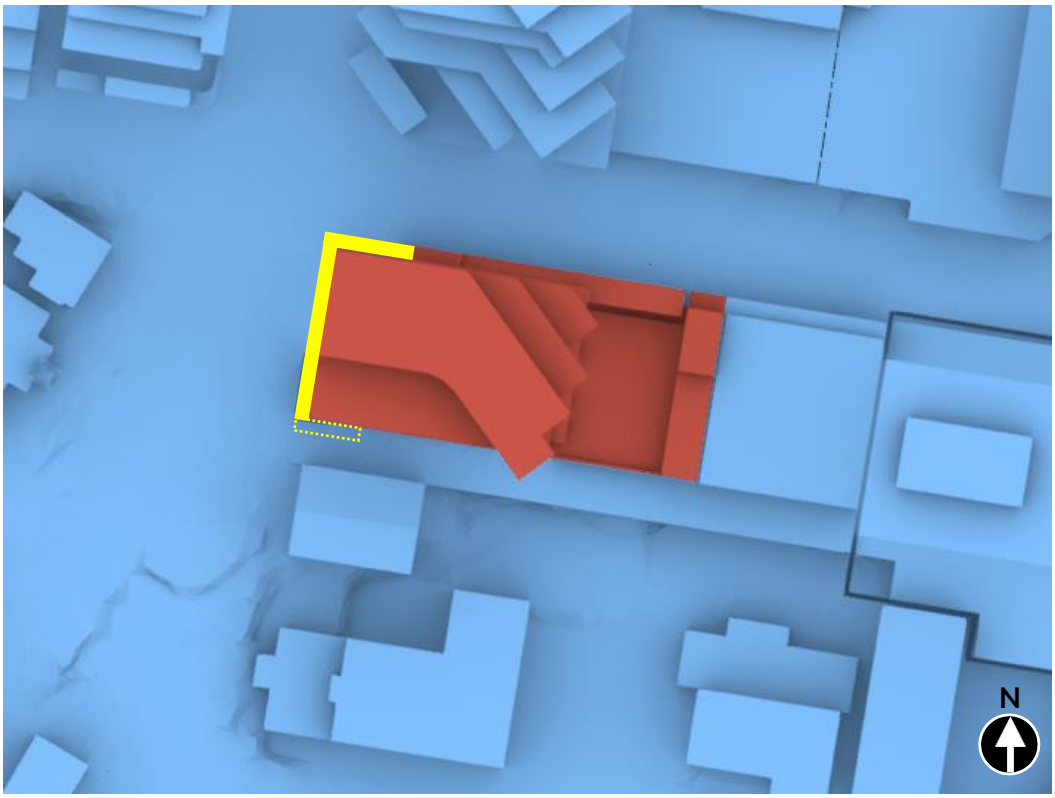


Figure 7: Mitigation additional awning location on site (marked in yellow)

PLAZA

Analysis of wind conditions in the Plaza areas covers Locations 11-14 in Figure 4. Conditions on the plaza area of the proposed site are generally mild, particularly near the east and west edges; with all but one location being rated between Pedestrian Sitting and Pedestrian Standing. Areas with this comfort rating would be suitable for short to medium term stationary activity for a majority of the time.

Location 12 in the centre of the plaza with a rating of Pedestrian Walking is windier in the Proposed case than in Existing, where it receives a Pedestrian Standing rating. Winds at this location are primarily flowing from the south directions, passing over the southern balustrade of the plaza and re-attaching at ground level before flowing out onto Blue St to the north. The slightly narrower width of the wind channel compared to the existing plaza for flow paths approaching from the south contributes to windier conditions in the area. Mitigation in the form of raised planters with dense planting placed at spaced intervals across the plaza would aid in baffling oncoming winds and pushing some flow overhead to

improve wind comfort, enabling longer-term stationary use in the central plaza area. The current design benefits from glazing on the site where the east façade meets the open plaza, providing some protection to these spaces. These elements are beneficial to wind comfort for pedestrian use of the space and extending them would provide further protection at seating spaces such as those at Location 14. All measured locations on the plaza pass the safety/distress criterion.

APPLICABILITY

Testing was performed without existing and proposed trees and other plantings to provide a worst-case assessment. Heavy landscape planting typically reduces wind speeds by less than 10% and in general should not be relied upon to mitigate strong winds due to variation in size and foliage and difficulty in accurate modelling. Further, trees or other plantings may pose a safety risk if damaged during high winds.

The results presented within this report are based on the schematic labelled “260430 Z5B Wind Model.dwg” received by CPP on 30 April 2026. If significant changes to the design of the development have occurred beyond this date or new information regarding the status of surrounding buildings becomes available, it is recommended that CPP be contacted to evaluate the impact of any changes.

5. Conclusion

CPP has conducted a wind tunnel study to quantify the pedestrian-level wind environment for the proposed 5 Blue Street development. In general, most pedestrian-accessible areas around the site are assessed as suitable for Pedestrian Standing or Pedestrian Walking under the Lawson comfort criteria. Conditions around the site perimeter are generally suitable for Pedestrian Standing or Pedestrian Walking, though downwash conditions from exposed facades likely requiring mitigation are noted for zones along the north and west facades of the tower. The plaza area of the site demonstrates acceptable conditions for pedestrian use but may benefit from some mild mitigation measures to improve comfort in the centre of the space. No significant adverse wind conditions as a result of the proposed development are foreseen, and all public domain areas satisfied the safety criterion.

References

American Society of Civil Engineers (1999), *Wind Tunnel Studies of Buildings and Structures* (ASCE Manual of Practice Number 67).

American Society of Civil Engineers (2021), *Wind Tunnel Testing for Buildings and Other Structures* (ASCE 49-21).

American Society of Civil Engineers (2021), *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7–22).

Lawson, T.V. (1990), "The Determination of the Wind Environment of a Building Complex before Construction" Department of Aerospace Engineering, University of Bristol, Report Number TVL 9025.

Australasian Wind Engineering Society (2019), Wind Engineering Studies of Buildings (AWES-QAM-1-2019).

Appendix A – Wind Tunnel Test Facilities

The wind tunnel testing was performed at the CPP wind engineering laboratory in Sydney, Australia. Specifications for the wind tunnel used for this project are given in Figure A1.

The mean wind speed profile approaching the modelled area for each direction has the form:

$$\frac{U}{U_{ref}} = \left(\frac{z}{z_{ref}} \right)^{n}$$

in which U is the mean wind speed at height z, U_{ref} is a reference wind speed at reference height z_{ref}, and n is a constant which depends on the characteristics of the upstream roughness for each direction.

The profiles of longitudinal turbulence intensity in the flow approaching the modelled area are also modelled. The turbulence intensities are appropriate for the approach mean wind speed profiles selected.

CPP SYDNEY WIND TUNNEL	
DIMENSIONS	
Test section length	21 m
Test section width	3 m
Ceiling height	2.4 m
DRIVE SPECIFICATIONS	
Total power	110 kW
Type of drive	Single Axle motor/12 blade axial fan
Speed Control	Variable frequency drive
FLOW CHARACTERISTICS	
Mean Wind Speed	0 to 20 m/s
Boundary-layer thickness*	1.2 m (nominal)
Turbulence	About 2% at entrance to test section
Longitudinal pressure gradient	Zero by blockage tolerant roof

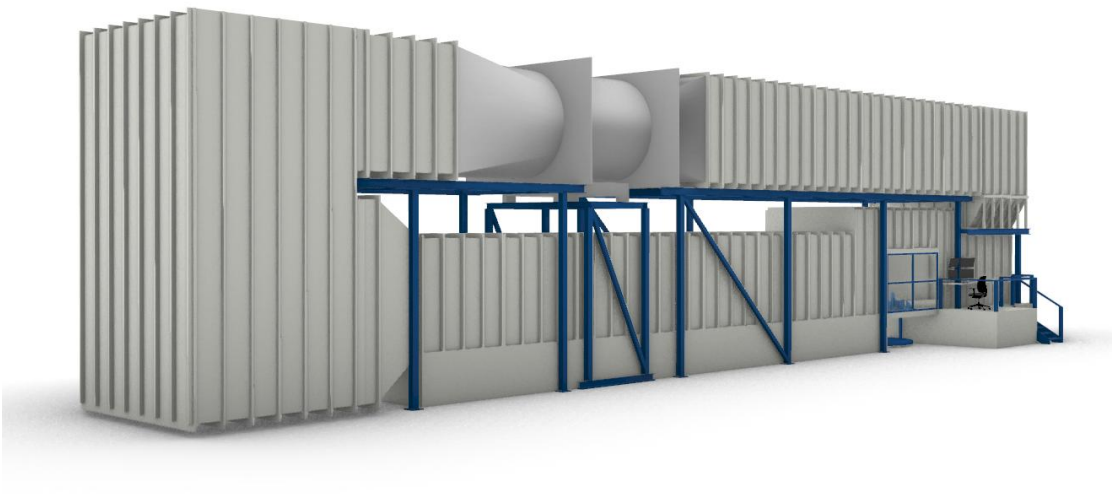
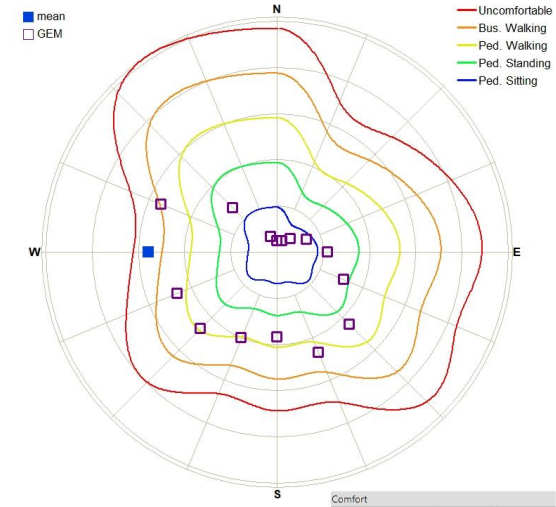


Figure A1: CPP Wind Tunnel - Sydney, Australia

Appendix B - Directional wind results

LOCATION 1



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	33.79	42.72	42.72
4	9.34	16.99	16.99
6	2.75	4.16	4.16
8	0.92	1.22	1.22
10	0.21	0.30	0.30

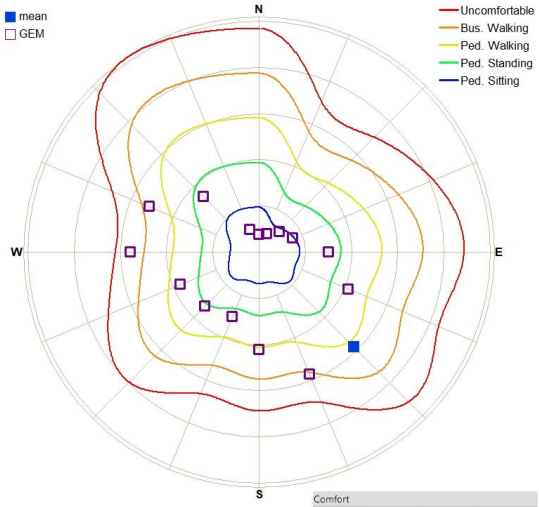
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	5.0	5.7	5.7
Rating	Ped Standing	Ped Standing	Ped Standing

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	12.5	12.8	12.8
Rating	Pass	Pass	Pass

LOCATION 2



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	37.74	44.83	45.05
4	13.13	16.83	17.38
6	3.64	4.59	4.78
8	0.98	1.32	1.35
10	0.18	0.30	0.31

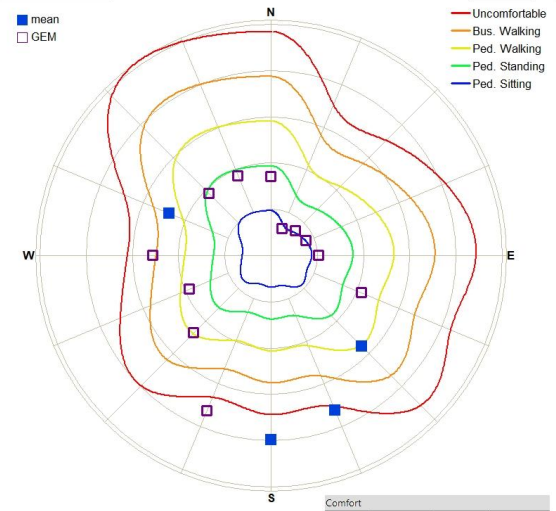
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	5.5	5.8	5.9
Rating	Ped Standing	Ped Standing	Ped Standing

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	12.1	12.8	12.8
Rating	Pass	Pass	Pass

LOCATION 3



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	45.89	52.11	52.80
4	24.06	25.56	27.25
6	13.29	12.01	14.81
8	5.14	4.46	5.94
10	1.78	1.42	2.16

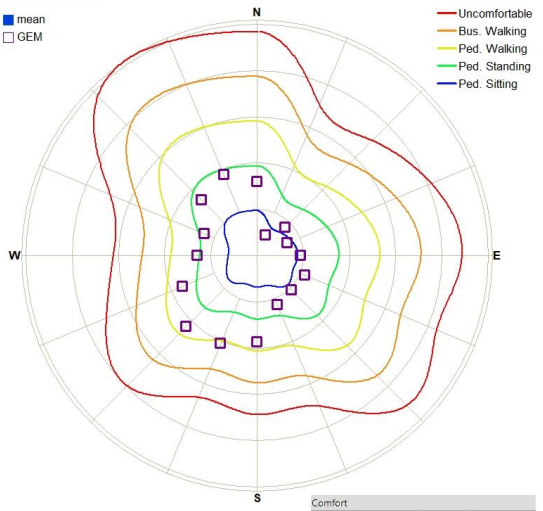
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	8.0	7.7	8.3
Rating	Ped Walking	Ped Walking	Bus Walking

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	16.2	15.5	16.4
Rating	Able Body	Able Body	Able Body

LOCATION 4



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	18.57	35.04	35.04
4	1.88	7.68	7.68
6	0.11	0.93	0.93
8	0.00	0.06	0.06
10	0.00	0.00	0.00

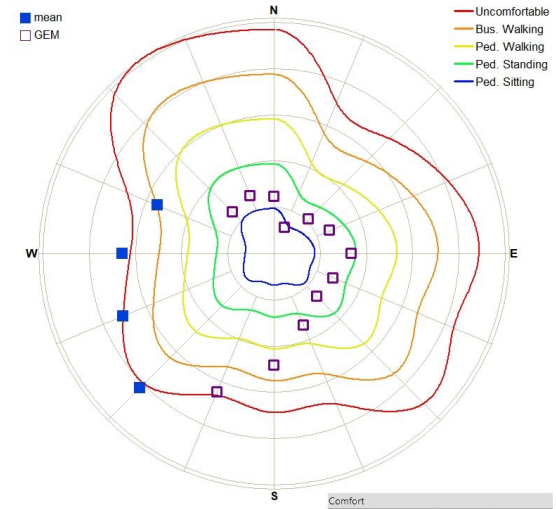
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	3.2	4.4	4.4
Rating	Ped Sitting	Ped Standing	Ped Standing

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	6.8	8.7	8.7
Rating	Pass	Pass	Pass

LOCATION 5



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	39.28	49.88	50.64
4	17.32	20.74	21.78
6	8.87	9.29	10.64
8	3.57	3.12	4.06
10	1.25	0.88	1.40

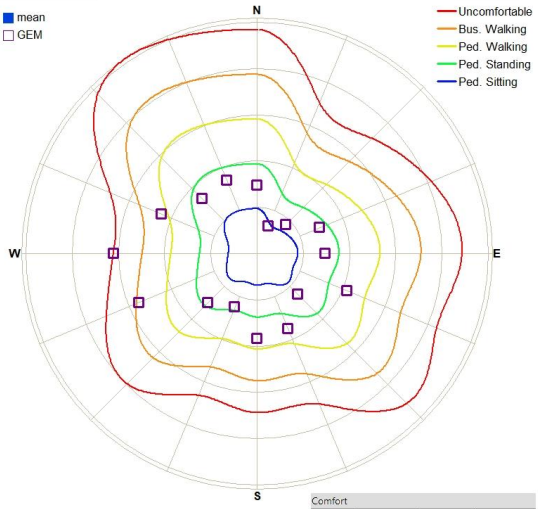
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	7.2	7.1	7.5
Rating	Ped Walking	Ped Walking	Ped Walking

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	15.5	14.3	15.6
Rating	Able Body	Pass	Able Body

LOCATION 6



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	29.12	46.87	46.87
4	6.11	12.36	12.36
6	1.74	4.09	4.09
8	0.64	1.22	1.22
10	0.17	0.41	0.41

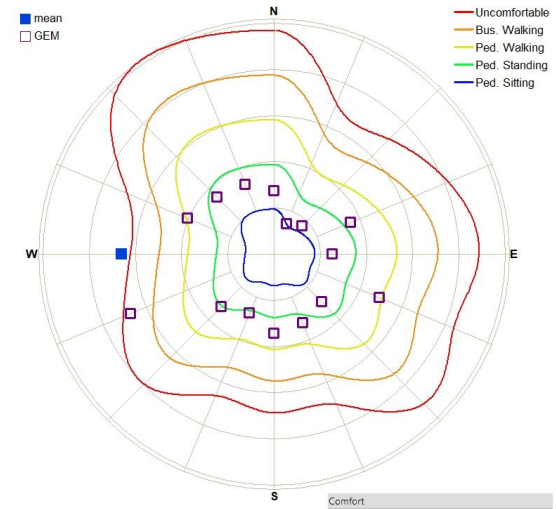
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	4.2	5.6	5.6
Rating	Ped Standing	Ped Standing	Ped Standing

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	12.3	13.7	13.7
Rating	Pass	Pass	Pass

LOCATION 7



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	30.95	47.54	47.67
4	7.75	13.03	13.15
6	3.18	4.82	5.08
8	1.12	1.68	1.86
10	0.47	0.57	0.69

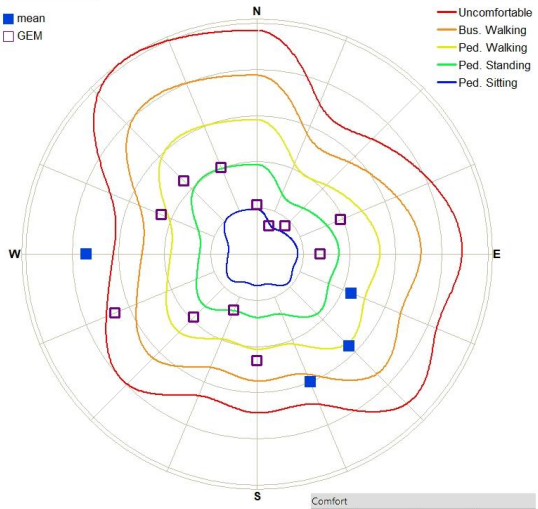
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	5.0	5.8	6.0
Rating	Ped Standing	Ped Standing	Ped Standing

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	14.4	14.3	14.9
Rating	Pass	Pass	Pass

LOCATION 8



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	47.02	55.09	55.93
4	17.45	20.46	22.18
6	6.67	7.25	8.67
8	2.35	2.24	3.01
10	0.89	0.72	1.07

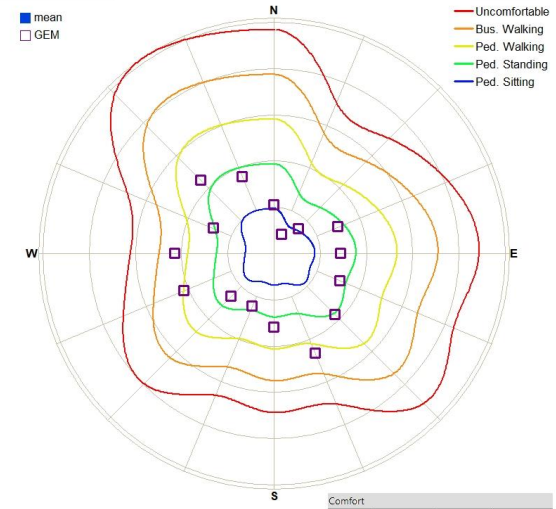
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	6.5	6.6	7.0
Rating	Ped Walking	Ped Walking	Ped Walking

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	16.2	14.8	16.4
Rating	Able Body	Pass	Able Body

LOCATION 9



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	24.04	44.14	44.14
4	4.04	10.28	10.28
6	0.60	1.87	1.87
8	0.05	0.28	0.28
10	0.00	0.03	0.03

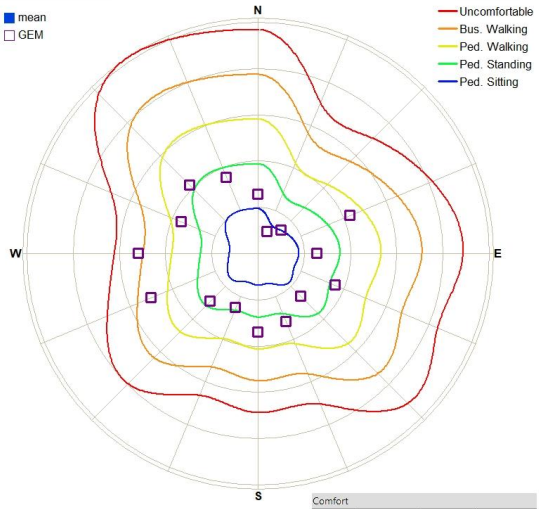
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	3.8	4.8	4.8
Rating	Ped Sitting	Ped Standing	Ped Standing

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	8.5	10.2	10.2
Rating	Pass	Pass	Pass

LOCATION 10



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	26.79	44.81	44.81
4	5.16	11.06	11.06
6	0.98	2.42	2.42
8	0.24	0.59	0.59
10	0.03	0.10	0.10

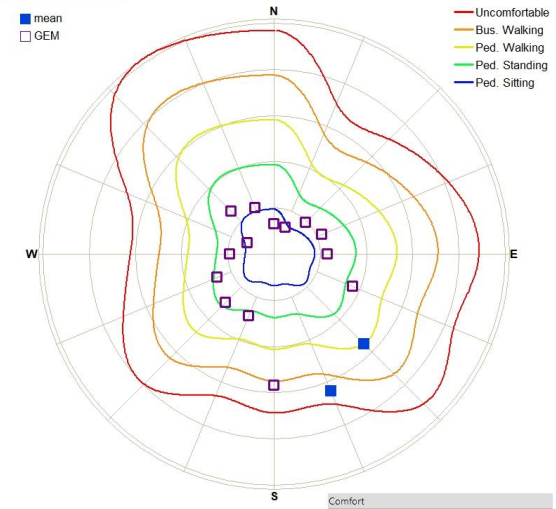
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	4.0	5.0	5.0
Rating	Ped Sitting	Ped Standing	Ped Standing

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	10.4	11.6	11.6
Rating	Pass	Pass	Pass

LOCATION 11



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	23.77	36.78	37.26
4	9.53	12.51	13.66
6	3.11	3.52	4.82
8	0.77	0.83	1.29
10	0.19	0.13	0.28

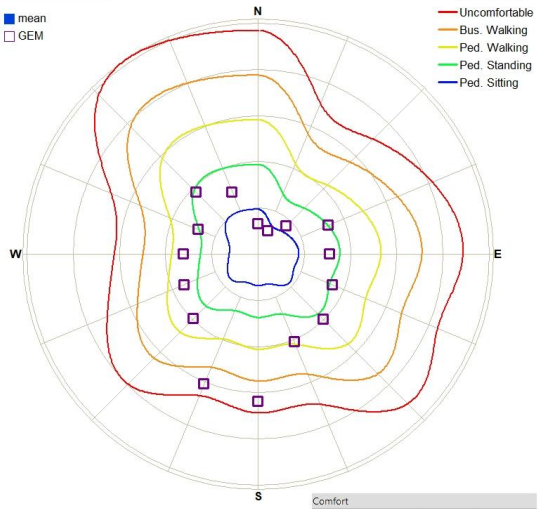
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	5.2	5.4	5.9
Rating	Ped Standing	Ped Standing	Ped Standing

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	12.6	11.7	12.8
Rating	Pass	Pass	Pass

LOCATION 12



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	33.72	46.35	46.35
4	10.68	17.06	17.06
6	2.34	6.20	6.20
8	0.34	1.86	1.86
10	0.03	0.44	0.44

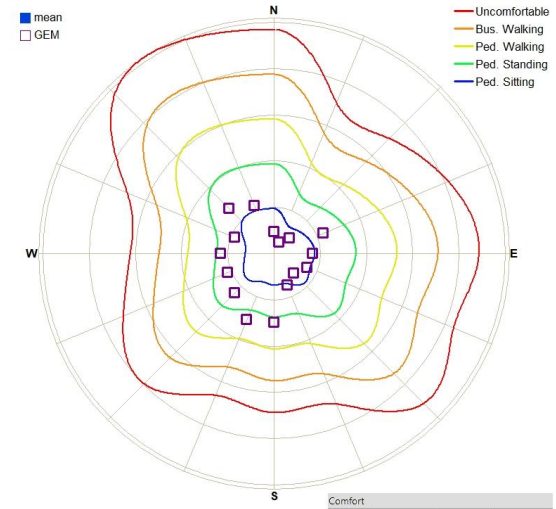
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	5.0	6.3	6.3
Rating	Ped Standing	Ped Walking	Ped Walking

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	10.2	13.2	13.2
Rating	Pass	Pass	Pass

LOCATION 13



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	6.57	20.87	20.87
4	0.06	2.01	2.01
6	0.00	0.07	0.07
8	0.00	0.00	0.00
10	0.00	0.00	0.00

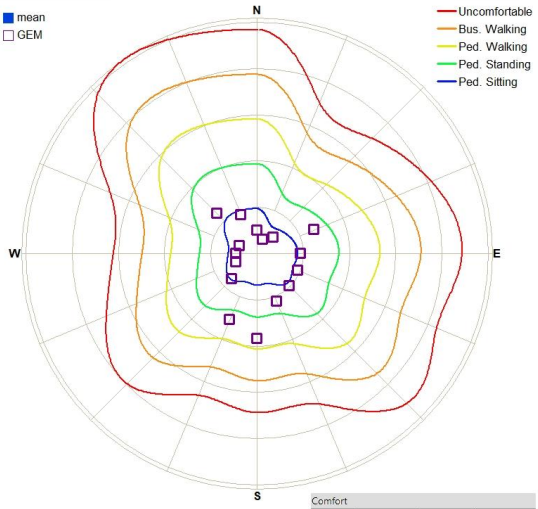
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	2.1	3.3	3.3
Rating	Ped Sitting	Ped Sitting	Ped Sitting

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	4.3	6.5	6.5
Rating	Pass	Pass	Pass

LOCATION 14



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	7.53	18.66	18.66
4	0.13	2.88	2.88
6	0.00	0.21	0.21
8	0.00	0.01	0.01
10	0.00	0.00	0.00

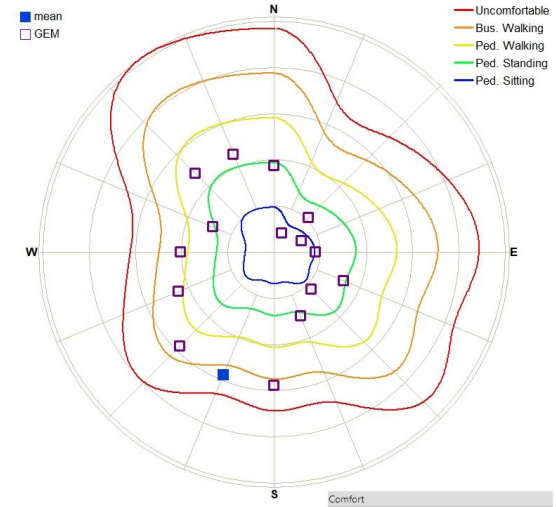
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	2.2	3.4	3.4
Rating	Ped Sitting	Ped Sitting	Ped Sitting

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	4.7	7.3	7.3
Rating	Pass	Pass	Pass

LOCATION 15



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	33.42	48.16	48.17
4	11.29	18.23	18.26
6	3.32	6.04	6.10
8	0.71	1.47	1.49
10	0.13	0.25	0.26

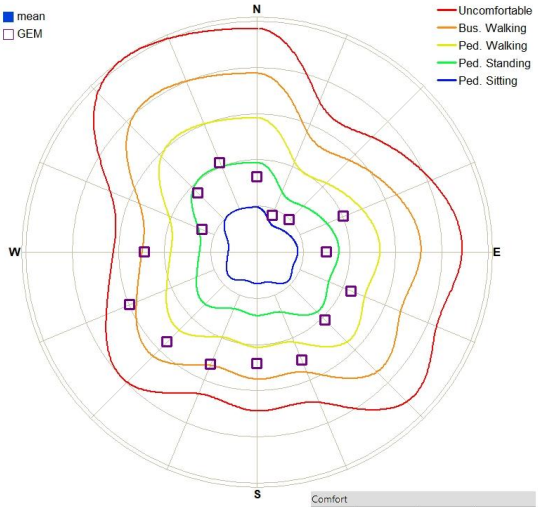
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	5.4	6.2	6.2
Rating	Ped Standing	Ped Walking	Ped Walking

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	11.7	12.4	12.4
Rating	Pass	Pass	Pass

LOCATION 16



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	40.70	55.72	55.72
4	14.40	22.19	22.19
6	3.41	6.47	6.47
8	0.62	1.44	1.44
10	0.14	0.25	0.25

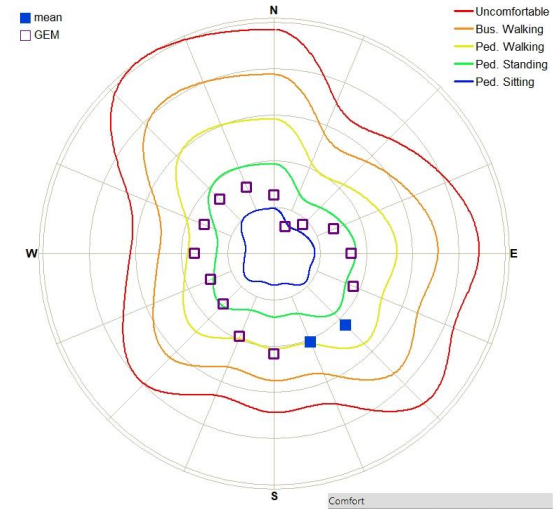
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	5.5	6.3	6.3
Rating	Ped Standing	Ped Walking	Ped Walking

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	11.9	12.3	12.3
Rating	Pass	Pass	Pass

LOCATION 17



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	34.96	44.87	45.19
4	7.22	10.88	11.44
6	0.71	1.61	1.68
8	0.05	0.11	0.12
10	0.00	0.00	0.01

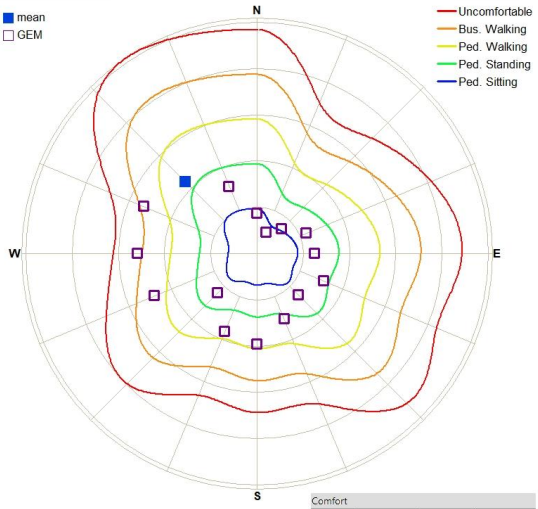
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	4.3	4.8	4.9
Rating	Ped Standing	Ped Standing	Ped Standing

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	8.5	9.1	9.2
Rating	Pass	Pass	Pass

LOCATION 18



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	34.44	44.57	44.61
4	7.61	12.72	12.73
6	1.90	3.18	3.19
8	0.61	0.89	0.89
10	0.14	0.20	0.20

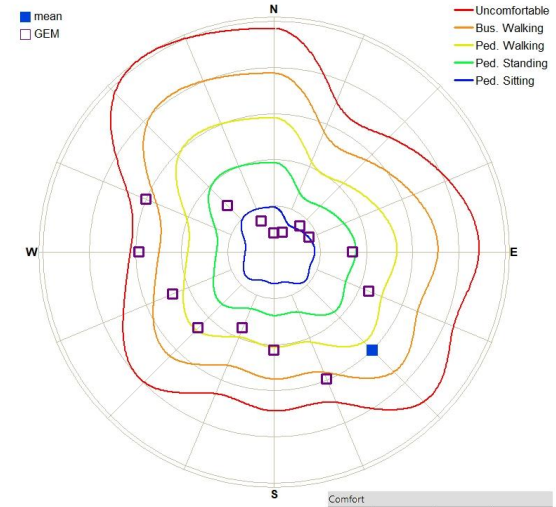
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	4.5	5.3	5.3
Rating	Ped Standing	Ped Standing	Ped Standing

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	11.8	12.2	12.2
Rating	Pass	Pass	Pass

LOCATION 2.1



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	41.42	48.05	48.20
4	16.16	20.67	21.09
6	5.06	6.12	6.28
8	1.72	1.92	1.96
10	0.48	0.53	0.54

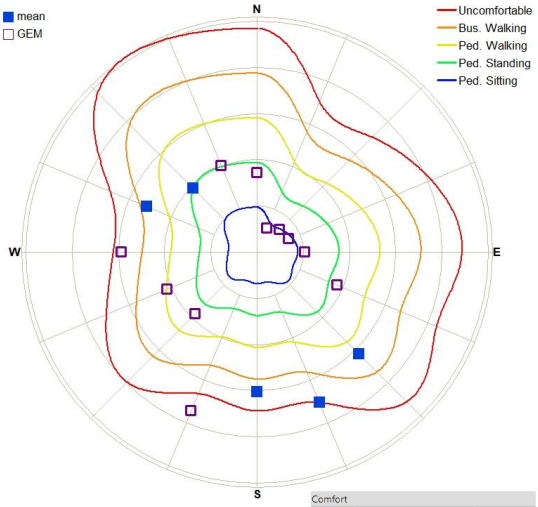
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	6.0	6.2	6.3
Rating	Ped Standing	Ped Walking	Ped Walking

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	13.6	13.8	13.8
Rating	Pass	Pass	Pass

LOCATION 3.1



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	46.42	52.37	53.12
4	23.95	25.67	27.26
6	10.80	10.73	12.90
8	3.49	3.83	4.64
10	0.91	1.16	1.47

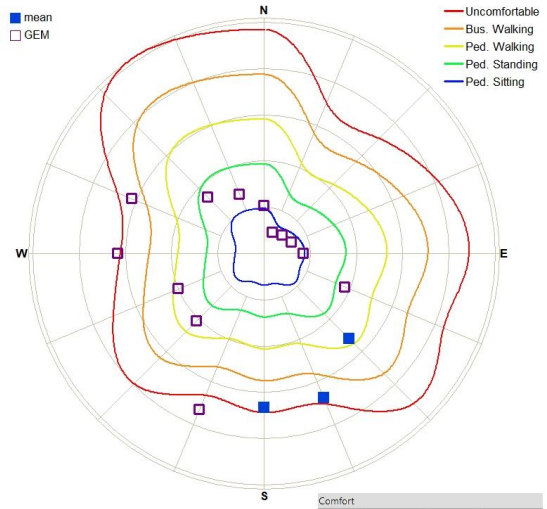
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	7.3	7.4	7.8
Rating	Ped Walking	Ped Walking	Ped Walking

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	14.3	15.2	15.6
Rating	Pass	Able Body	Able Body

LOCATION 3.2



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	42.69	48.96	49.45
4	23.10	25.94	27.11
6	10.55	11.88	13.46
8	3.75	4.54	5.17
10	1.03	1.57	1.81

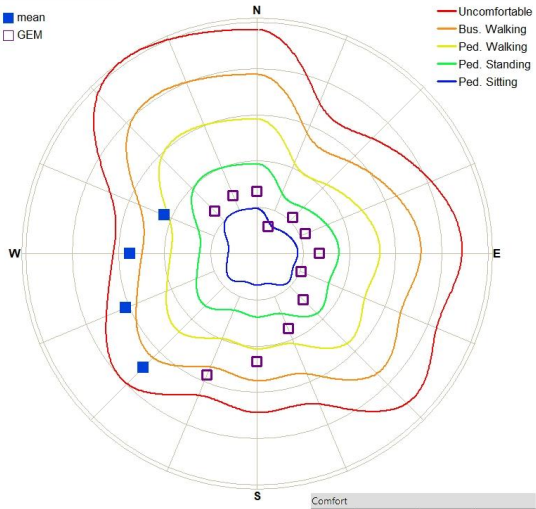
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	7.4	7.8	8.0
Rating	Ped Walking	Ped Walking	Ped Walking

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	14.5	15.6	15.7
Rating	Pass	Able Body	Able Body

LOCATION 5.1



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	35.61	47.36	48.05
4	14.89	18.16	19.02
6	5.92	6.44	7.33
8	1.81	1.64	2.13
10	0.42	0.32	0.48

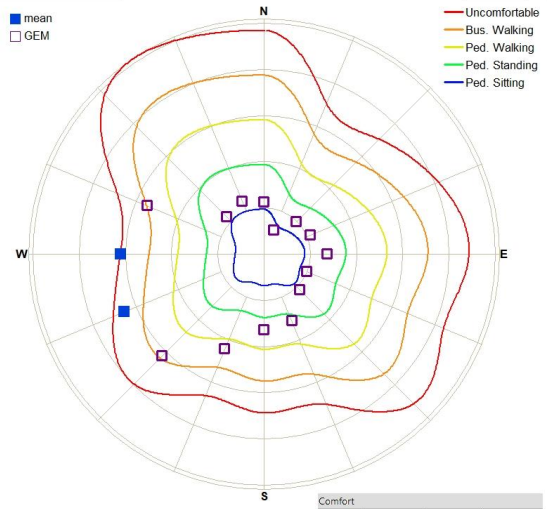
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	6.2	6.3	6.6
Rating	Ped Walking	Ped Walking	Ped Walking

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	13.2	12.6	13.4
Rating	Pass	Pass	Pass

LOCATION 5.2



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	30.34	43.93	44.00
4	11.05	15.35	15.45
6	5.01	6.00	6.15
8	1.66	2.01	2.10
10	0.54	0.63	0.68

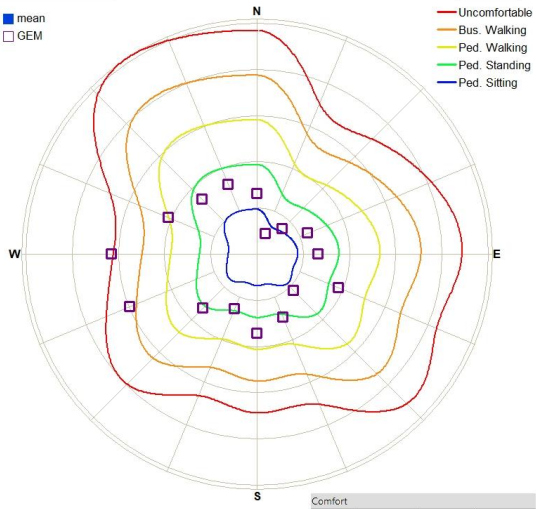
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	5.9	6.3	6.3
Rating	Ped Standing	Ped Walking	Ped Walking

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	14.2	14.2	14.3
Rating	Pass	Pass	Pass

LOCATION 6.1



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	21.89	43.03	43.03
4	5.18	11.15	11.15
6	1.54	4.16	4.16
8	0.56	1.31	1.31
10	0.13	0.48	0.48

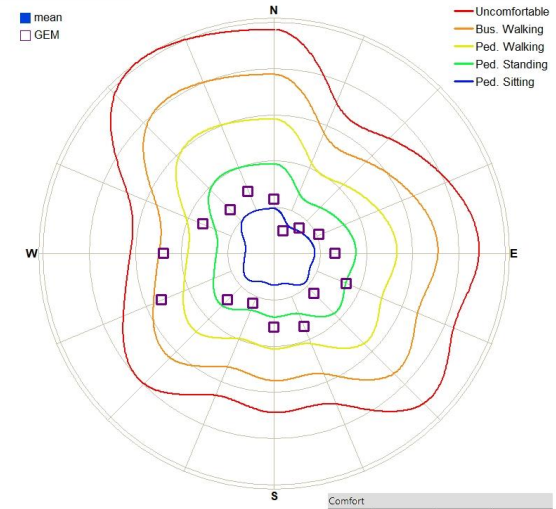
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	4.0	5.6	5.6
Rating	Ped Sitting	Ped Standing	Ped Standing

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	11.9	14.0	14.0
Rating	Pass	Pass	Pass

LOCATION 6.2



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	18.18	37.84	37.84
4	3.00	8.60	8.60
6	0.69	2.06	2.06
8	0.10	0.46	0.46
10	0.01	0.07	0.07

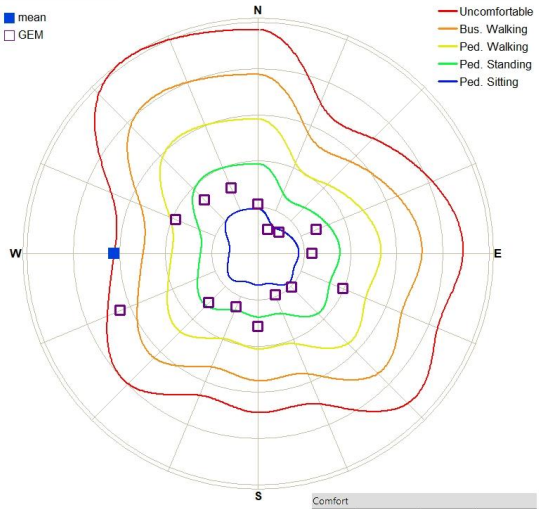
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	3.4	4.8	4.8
Rating	Ped Sitting	Ped Standing	Ped Standing

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	9.3	11.1	11.1
Rating	Pass	Pass	Pass

LOCATION 7.1



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	19.97	37.54	37.59
4	6.47	10.14	10.18
6	2.45	4.24	4.32
8	0.86	1.44	1.47
10	0.34	0.47	0.50

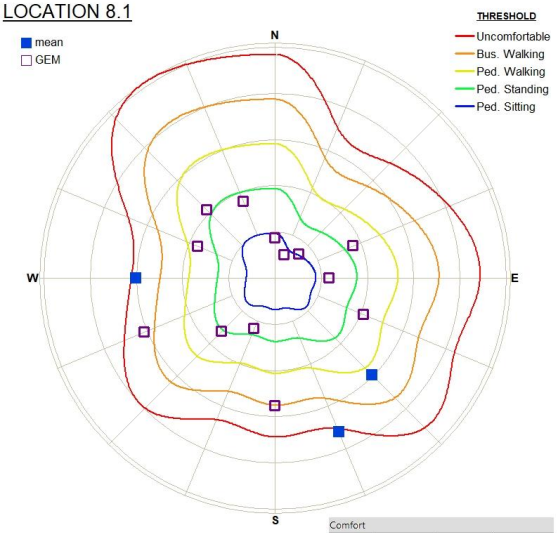
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	4.5	5.5	5.6
Rating	Ped Standing	Ped Standing	Ped Standing

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	13.6	14.0	14.1
Rating	Pass	Pass	Pass

LOCATION 8.1



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	40.48	50.36	50.90
4	16.34	21.43	22.61
6	6.56	7.89	9.56
8	2.14	2.24	2.97
10	0.70	0.53	0.87

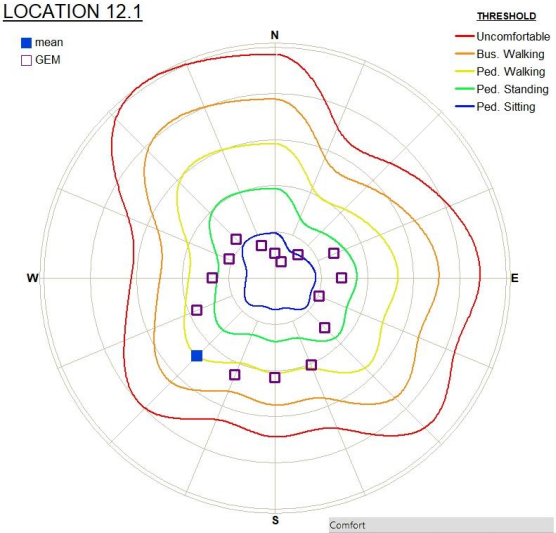
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	6.4	6.7	7.1
Rating	Ped Walking	Ped Walking	Ped Walking

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	14.5	13.5	14.8
Rating	Pass	Pass	Pass

LOCATION 12.1



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	26.56	36.63	36.69
4	9.04	11.12	11.19
6	1.62	1.91	1.94
8	0.17	0.19	0.20
10	0.01	0.01	0.01

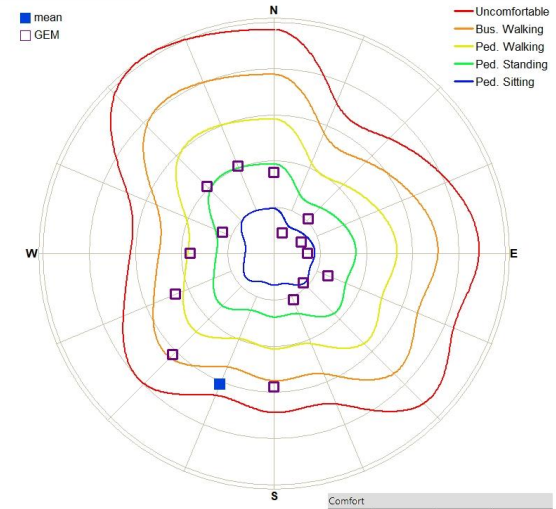
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	4.7	4.9	4.9
Rating	Ped Standing	Ped Standing	Ped Standing

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	9.4	9.6	9.6
Rating	Pass	Pass	Pass

LOCATION 15.1



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	30.99	42.25	42.34
4	10.40	16.70	16.89
6	3.47	5.81	6.27
8	0.90	1.49	1.70
10	0.20	0.27	0.34

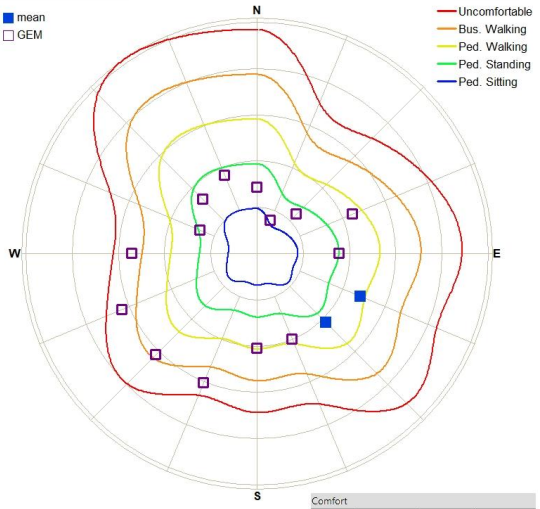
Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	5.3	6.2	6.3
Rating	Ped Standing	Ped Walking	Ped Walking

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	12.4	12.5	12.8
Rating	Pass	Pass	Pass

LOCATION 16.1



% of time in excess of wind speed V

V (m/s)	MEAN	GEM	COMBINED
2	41.81	55.21	55.47
4	15.21	20.70	21.03
6	4.03	7.08	7.12
8	0.81	2.02	2.03
10	0.17	0.49	0.49

Comfort

(5%)	MEAN	GEM	COMBINED
V (m/s)	5.6	6.5	6.5
Rating	Ped Standing	Ped Walking	Ped Walking

Safety

(0.022%)	MEAN	GEM	COMBINED
V (m/s)	12.1	13.4	13.4
Rating	Pass	Pass	Pass