



WIND ENGINEERING
CONSULTANTS

PEDESTRIAN WIND ASSESSMENT
CPP PROJECT 20066
14 NOVEMBER 2025

Crescent Parklands

1 Crescent Street, Holroyd

CPP Wind Engineering
Consultants
2/500 Princes Highway
St Peters NSW 2044,
Australia
Info-syd@cppwind.com
cppwind.com

PREPARED FOR:

Tiberius (Holroyd) Pty Ltd
Level 3, 30 Kings Road,
West Perth WA 6005

PREPARED BY:

Julian Kiono
Project Engineer
jkiono@cppwind.com

Graeme Wood, PhD
Senior Principal
gwood@cppwind.com

Executive Summary

This report has been prepared on behalf of Tiberius (Holroyd) Pty.Ltd. in association with a State Significant Development Application (**SSDA**) for a proposed mixed-use development at 1 Crescent Street, Holroyd (**the site**).

The report responds to matters raised by the Department of Planning, Housing and Infrastructure (**DPHI**), Cumberland City Council, other State government authorities /agencies, utility service providers and the community during public exhibition of SSD-70283710.

The report also assesses the proposed amendments to the original proposal, including changes to the following:

- Stage A – Mixed use podium, Buildings 1 to 3 and supporting infrastructure
- Stage B – Buildings 4 and 5 and supporting infrastructure
- Stage C – Buildings 6 and 7 and supporting infrastructure

The proposed changes extend beyond minor refinements which can be accommodated via a Submissions Report. As a result, a combined Submissions and Amendment Report has been prepared and consent sought from DPHI to amend the SSDA as per section 37 of the *Environmental Planning and Assessment Regulation 2021* (**the Regulation**).

To understand the cumulative impact of the above design refinements, the project description has been updated to reflect the proposed amendments to the scheme as originally lodged with DPHI for assessment.

The amended description is provided as follows:

- Site establishment works, tree removal, site preparation, earthworks and excavation, services augmentation, and remediation works.
- Development of seven residential buildings comprising four shop top housing buildings and three residential flat buildings as outlined below:
 - Buildings 1-3 are integrated with an eastern mixed-use podium building, while Building 4 is situated above mixed residential / commercial space, offering shop-top housing.
 - Buildings 5-7 consist of residential flat buildings.
- Delivery of 15% of the total floor space as affordable housing to be distributed across each of the 7 residential buildings, or within a consolidated building proposed proportionately as buildings are developed.
- Approximately 134,208 m² total floor space comprising:
 - A total of 2,496 m² retail GFA and approximately 2,710 m² commercial GFA.
 - 1,374 residential apartments
 - Communal amenity facilities for residents.
 - Building services areas.
- Activation of Crescent Street through a mix of amenity areas and pockets of open space.
- Shared car parking for Buildings 1 to 3 and the commercial and retail tenancies within the podium.
- Shared car parking for Buildings 4 to 7 within the above ground parking structures adjoining Buildings 4 to 5 and 6 to 7.
- Landscaping and accompanying place making works including:
 - Public open space, hard and soft landscape works.
 - Ground and rooftop communal open space.
 - Publicly accessible through-site links.

- At grade car parking for the park, forecourt and retail areas.
- Vehicle access via a new internal publicly accessible road and vehicle accessway.
- New pedestrian footpaths and access arrangements to the site.
- Café tenancy within park-side structure.
- Staged completion of a public park.
- Associated works involving the widening of Crescent Street and upgrades to the Crescent Street and Woodville Road intersection.

Table 1 identifies the relevant matters raised by DPHI and sets out the Applicant's response to these submissions.

Table 1: Applicant response to submissions

No.	Issue Raised	Applicant Response	Section of Report
1	Provide an updated wind impact assessment, including wind tunnel testing, which:	a) Table 5 shows the comfort and safety ratings of each location. The thoroughfare between building (Locations 26 and 14) has a comfort rating of 9.4 m/s and 9.2 m/s respectively, and a safety rating of 19.4 m/s and 18.1 m/s respectively. Showing a high wind speed flowing between the gaps of Building 3 and 4, and Building 5 and 6.	a) Section 3
	a) provides quantitative evidence to support for the conclusions of the desktop WIA study		
	b) considers impacts to public and private spaces, including relevant points along pedestrian routes and within the public open space, communal open spaces, balconies and any areas intended for sitting or dining	b) Pedestrian Routes and within public open space generally achieve a rating of Pedestrian Standing with reference to the Lawson criteria. Strong wind conditions are experienced on the building corners and between building gaps, achieving ratings of Pedestrian Walking and Business Walking. Milder wind conditions are experience in private spaces with a comfort rating of Outdoor Dining and Pedestrian Standing.	b) Section 4
	c) identifies comfort and wind safety conditions in pre / post development scenarios and include appropriate mitigation measures to address any identified issues.	c) Pre-development is expected to have Pedestrian Walking comfort rating and passing the safety criteria. Post-development creates stronger wind conditions at some locations, especially at the thoroughfare between buildings, and milder at the other. Mitigation measures such as connection corner awnings and dense landscaping at these corners are some of the effective ways to address this issue.	c) Section 4

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- | | | | |
|----|--|---------------------------------------|---------------|
| d) | The TIA's Swept Path annotations recommended the removal of various planted areas adjacent to road corners to allow for adequate service vehicle manoeuvres. However, these are the same areas the Wind Report recommends for dense planting to address wind impacts. The TIA, Wind Report and architectural plans must be updated to incorporate adequate and consistent mitigation measures. | d) Refer to Appendix B – TOA Response | d) Appendix B |
| e) | The Wind Report provides wind assessment points for the podium COS (p18 to 20). However, these points do not adequately cover the spaces to allow for a full appreciation of wind impacts. The report must be updated to include additional assessment points as follows: <ul style="list-style-type: none">o Building 1/2/3 – provide an additional point within the land area at the SW corner.o Building 4/5 – provide two points at the southern end of the podium.o Building 6/7 – provide a point within the large lawn area and at the central southern part of the podium. | e) Refer to Appendix B – TOA Response | e) Appendix B |
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Table 2 identifies updated mitigation measures relevant for the amended proposal.

Table 2: Revised mitigation measures

No.	Revised Mitigation Measures	Refer to Section 4 of Report
1	Dense landscaping near the narrow gaps of Building 3 and 4, and Building 5 and 6 corners.	Section 4
2	Extended corner awnings on the gaps of Building 3 and 4, and Building 5 and 6 corners.	Section 4
3	Increasing northern podium balustrades and north-facing balconies to approximately 1.8 m.	Section 4
4	Implementation of corner awnings, connecting to both Buildings 6 and 7.	Section 4

A wind tunnel study of the Crescent Parklands, to be built in 1 Crescent Street, Holroyd 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 1:300 length scale and centred on a turntable in the wind tunnel. Replicas of existing and approved surrounding buildings within a 430 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 wind speeds likely to be experienced by pedestrians were made with a hot-film anemometer at 41 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:

GROUND LEVEL:

The wind environment around the development was found to be generally suitable for Pedestrian Sitting and Pedestrian Standing style activities from a comfort perspective with reference to the Lawson criteria. Stronger wind conditions were experienced on the north-east corner of Building 1 and west corners of Building 7, resulting in a comfort rating of Pedestrian Walking. Stronger wind conditions were experienced near the gaps between Building 3 & 4 and Building 5 & 6, due to flow channelled through these. These locations have a comfort rating of Pedestrian Walking and Business Walking. Five locations in these gaps and one location to the north-east corner of Building 1 exceeded the safety criteria. Local mitigation measures are provided to manage these exceedances. All other tested locations on the ground level were found to satisfy the Lawson safety criterion.

PODIUM TERRACE:

Wind conditions on the podium terraces were found to be generally suitable for Pedestrian Standing and Pedestrian Walking with reference to the Lawson comfort criteria. One location near the Lawn/Outdoor

Gym area on the Stage A podium terrace experienced stronger wind conditions, resulting in a Business Walking comfort rating. This location, as well as the area on Stage B podium terrace between Buildings 4 and 5 exceed the safety/distress criteria; local mitigation recommendations are provided to address this although these are private spaces and residents would only access when the environmental conditions were acceptable for their intended usage.

BALCONIES:

The wind conditions on the balconies were found to be generally suitable for Outdoor Dining and Pedestrian Standing with reference to the Lawson comfort criteria. These conditions are governed by the relative exposure to prevalent winds, and shielding effect of neighbouring buildings. All tested locations on the balconies were found to satisfy the recommended safety criteria.

Document Tracking and Version Control

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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 3.

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 3: Wind Tunnel Test Parameters

SUMMARY OF TEST PARAMETERS	
GENERAL INFORMATION	
Model Scale	1:300
Surrounding Model Radius (full scale)	430 m
Approach Terrain Category	Built-up environment approach
ENVIRONMENTAL WINDS STUDY	
Number of test locations	41
Reference height (full scale)	135 m
TEST CONFIGURATION	
Configuration	Site and surroundings as they currently exist and any/all approved or under construction developments within the modelled test radius as shown in Figure 1.

2. Methodology

WIND TUNNEL MODEL

The anticipated wind conditions around the project site were evaluated through wind tunnel testing of a 1:300 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 430 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 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 41 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 6.

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 135 m are plotted in polar form in Appendix C. 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.

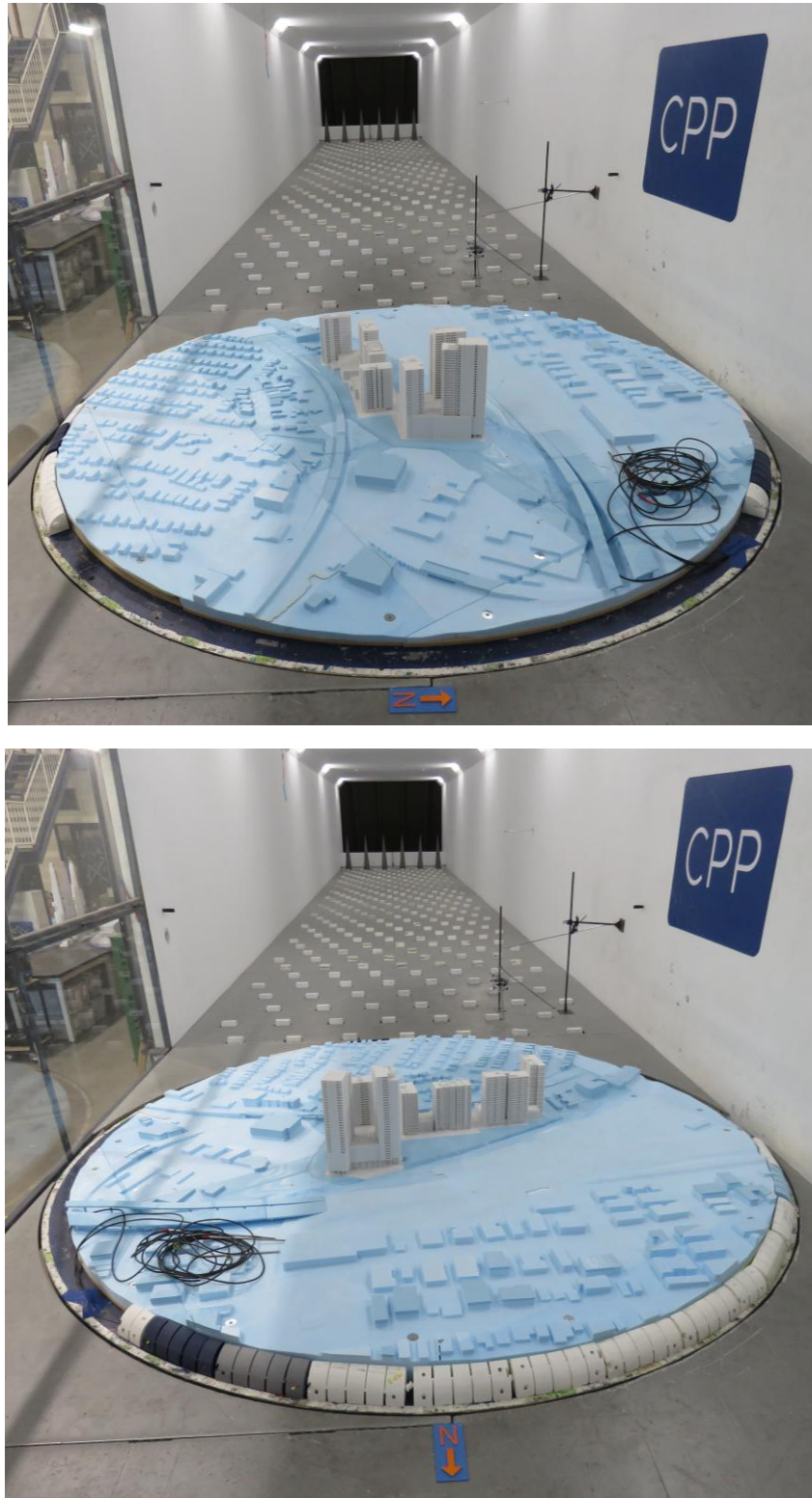


Figure 1a: Photographs of Wind Tunnel Test and Surrounds Model

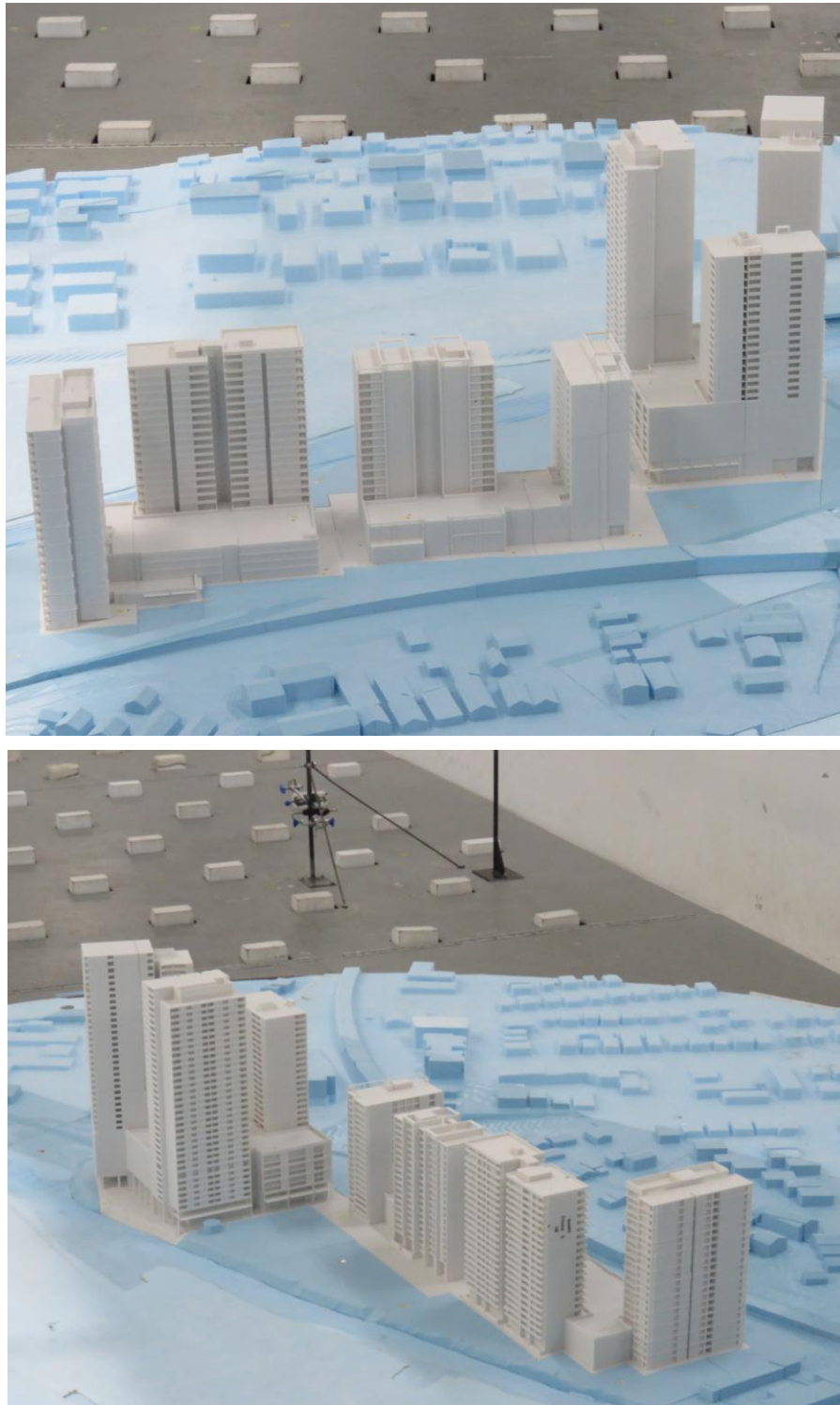


Figure 1b: Photographs of Wind Tunnel Test Model – Close up

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 Bankstown Airport. The project site is located approximately 10 km to the north of the airport, which provides the best source of historical wind data for the project.

These data are 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-west quadrant are predominant, with secondary winds occurring from the southeast quadrants. 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.

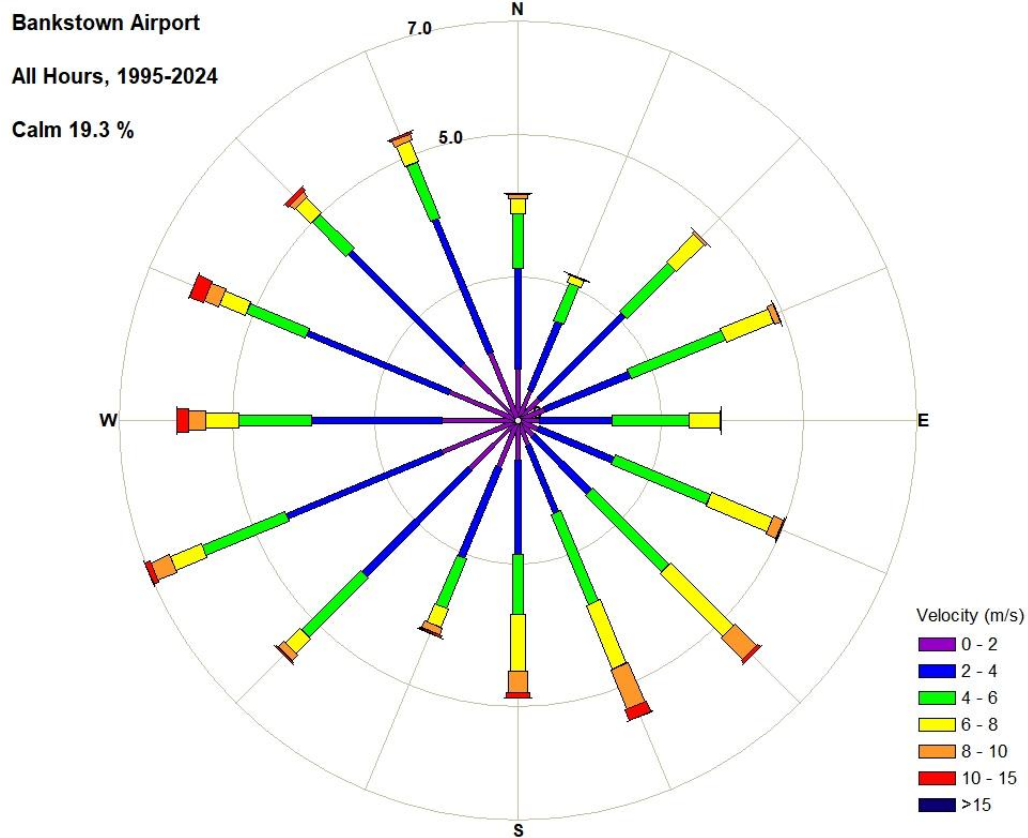


Figure 2: Probability of Wind Speeds by Direction – Bankstown Airport (1995 – 2024, All Hours)

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. The SSDA does not have any specific wind comfort or safety criteria.

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 4.

Table 4: 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.
* $U_{Equiv} = \text{Max} (U_{Mean}, U_{Gust} / 1.85)$, 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.

* $U_{Equiv} = \text{Max}(U_{Mean}, U_{Gust} / 1.85)$, 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 5. 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 number represents the location identifier, 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 C. 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 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 5: Summary of wind comfort and safety assessment results

Description / Location		Wind Tunnel Results	
		Comfort rating, 5% exceedance wind speed (m/s)	Safety rating, 0.022% exceedance wind speed (m/s)
Ground Level	1	7.9	14.8
	2	5.3	12.4
	3	2.8	6.0
	4	5.3	11.0
	5	6.3	12.2
	6	4.3	8.0
	7	5.7	10.6
	8	4.0	7.6
	9	6.7	12.3
	10	6.8	12.9
	11	3.8	10.6
	12	4.7	8.9
	13	8.2	16.7
	14	9.2	18.1
	15	5.3	11.7
	16	6.1	13.1
	17	6.1	12.2
	18	2.4	6.5
	19	4.1	8.7
	20	5.0	11.1
	21	7.6	19.3
	22	5.3	12.4
	23	4.1	7.7
	24	6.3	12.0
	25	6.6	15.1
	26	9.4	19.4
	27	3.2	6.4
	28	6.4	13.3
	29	7.8	15.1
Podium Terrace	30	5.3	12.4
	31	6.6	11.7
	32	7.5	14.9
	33	8.3	15.4
	34	7.4	15.1
	35	4.7	9.0
	36	4.2	8.7
	37	6.5	13.9
Balconies	38	4.3	13.2
	39	1.5	2.8
	40	4.4	12.4
	41	1.8	4.1

LEGEND

Comfort Criteria

	Outdoor Dining
	Pedestrian Sitting
	Pedestrian Standing
	Pedestrian Walking
	Business Walking
	Uncomfortable

Safety Criteria

	Passes safety criteria
	Able bodied
	Fails safety criteria

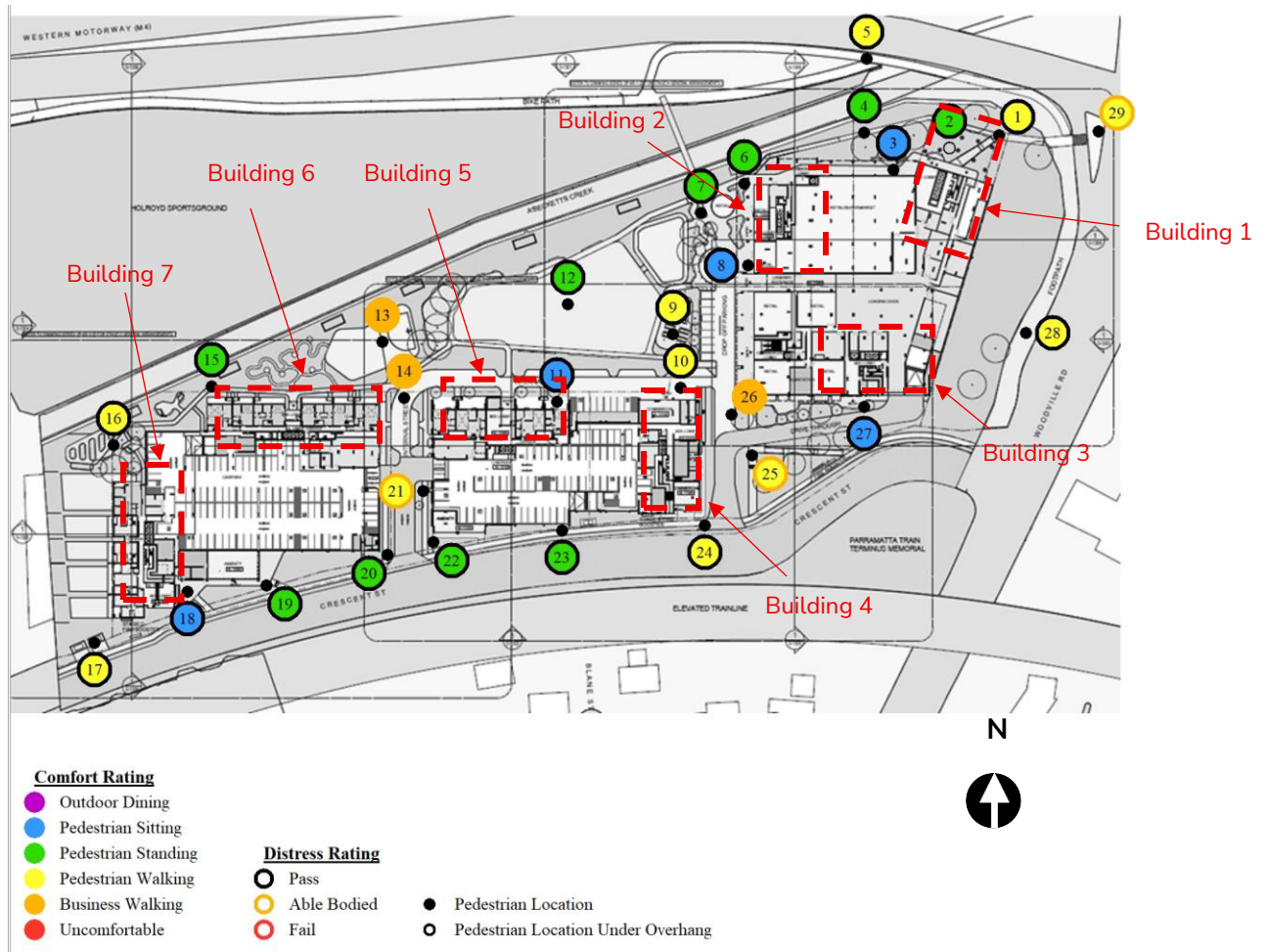
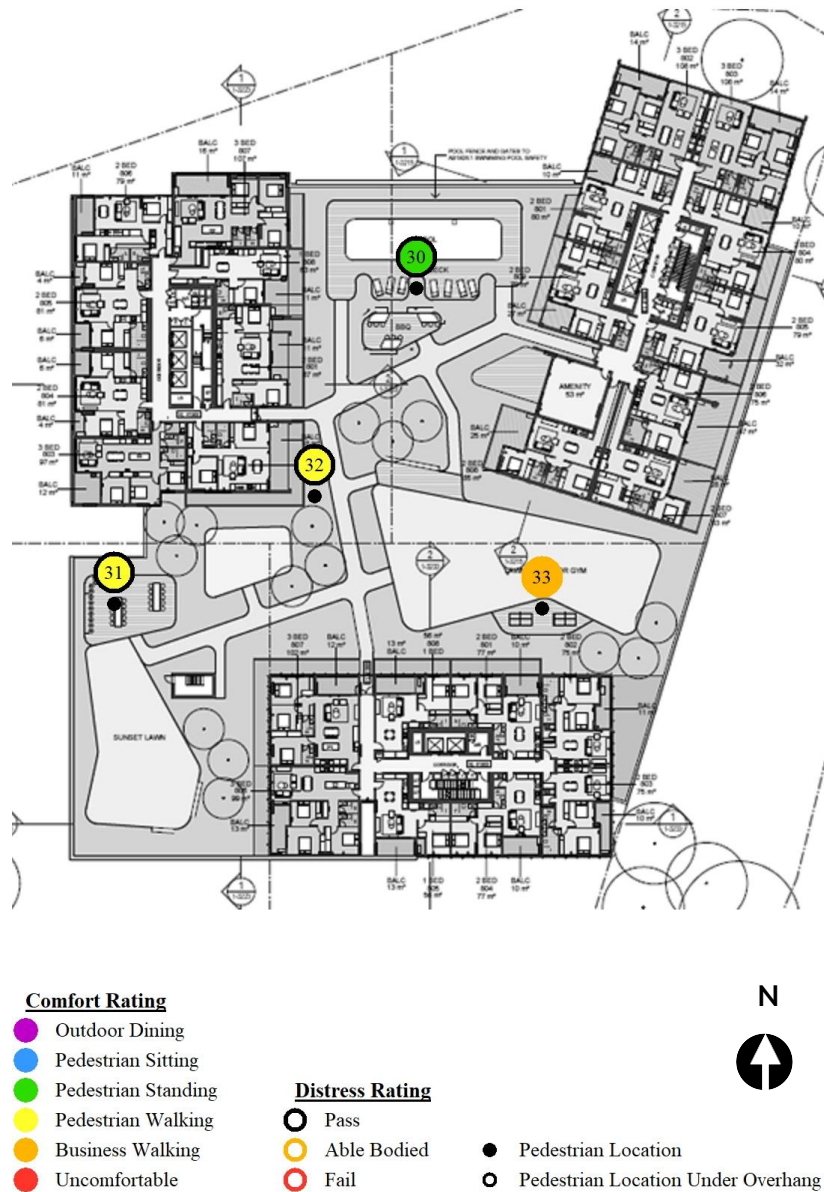
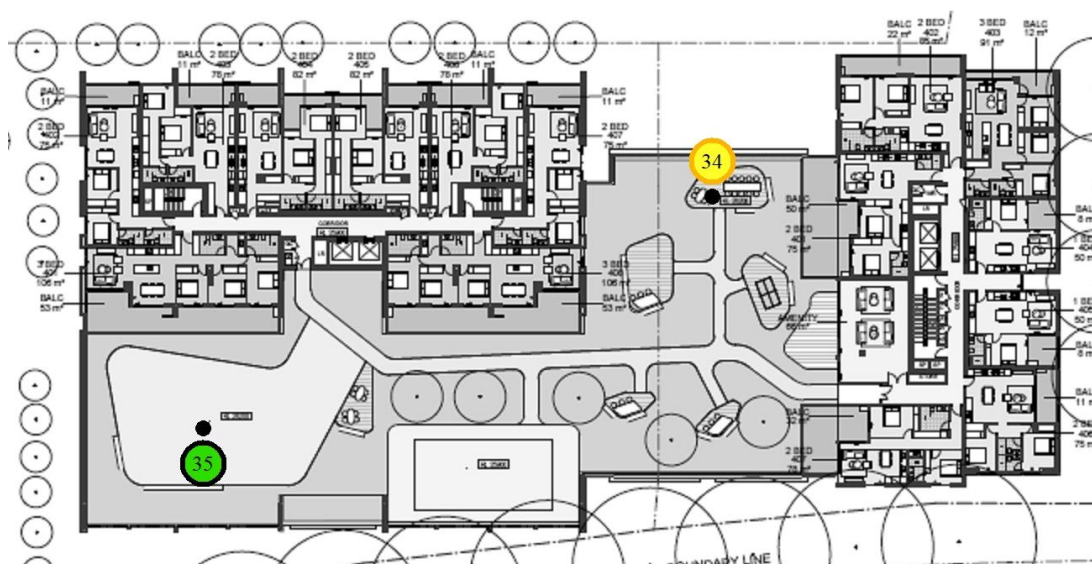


Figure 3: Pedestrian wind speed measurement locations with comfort/safety ratings – Ground Level





Comfort Rating

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

Distress Rating

- Pass
- Able Bodied
- Fail
- Pedestrian Location
- Pedestrian Location Under Overhang

Figure 5: Pedestrian wind speed measurement locations with comfort/safety ratings – Stage B Podium Terrace

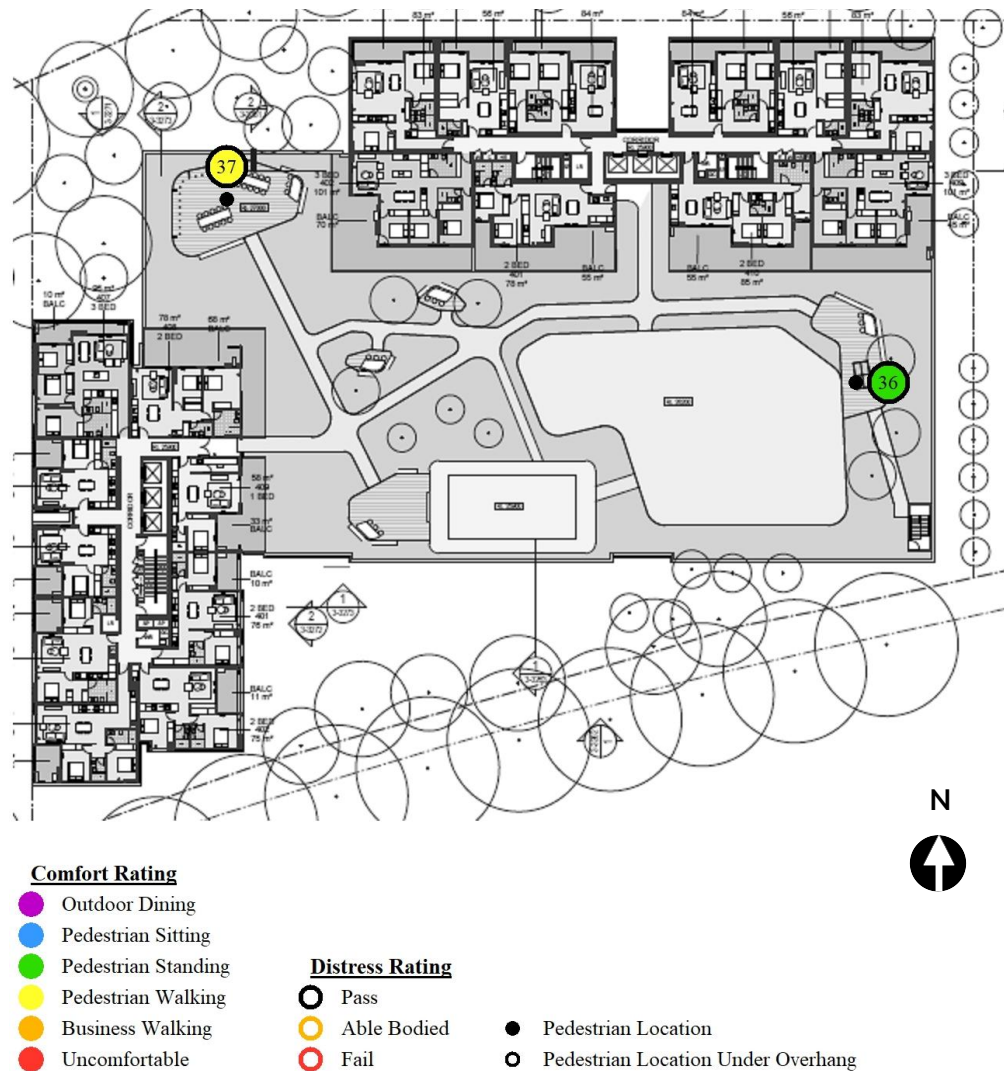
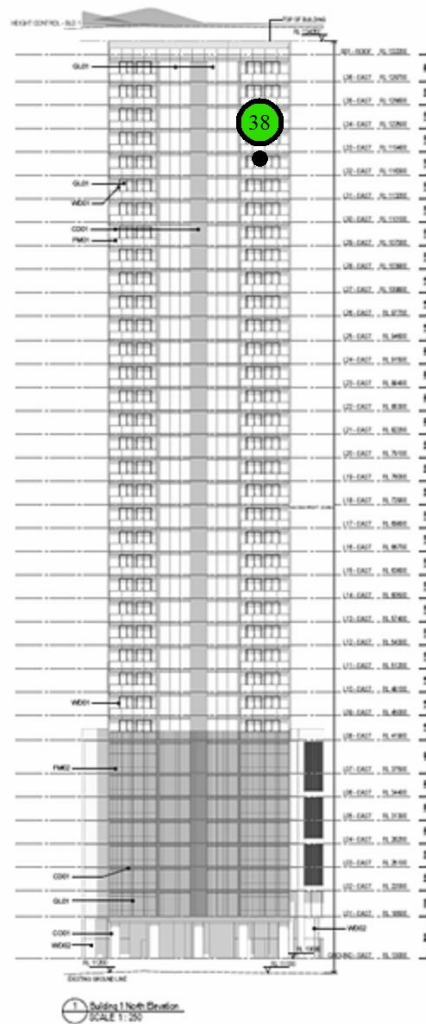


Figure 6: Pedestrian wind speed measurement locations with comfort/safety ratings – Stage C Podium Terrace



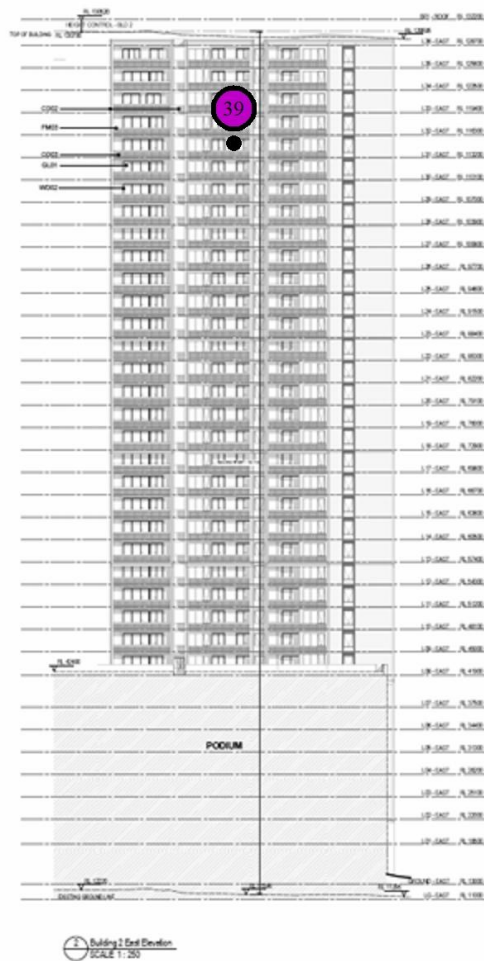
Comfort Rating

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

Distress Rating

- Pass
- Able Bodied
- Pedestrian Location
- Fail
- Pedestrian Location Under Overhang

Figure 7: Pedestrian wind speed measurement locations with comfort/safety ratings – Building 1 Balconies (North elevation)



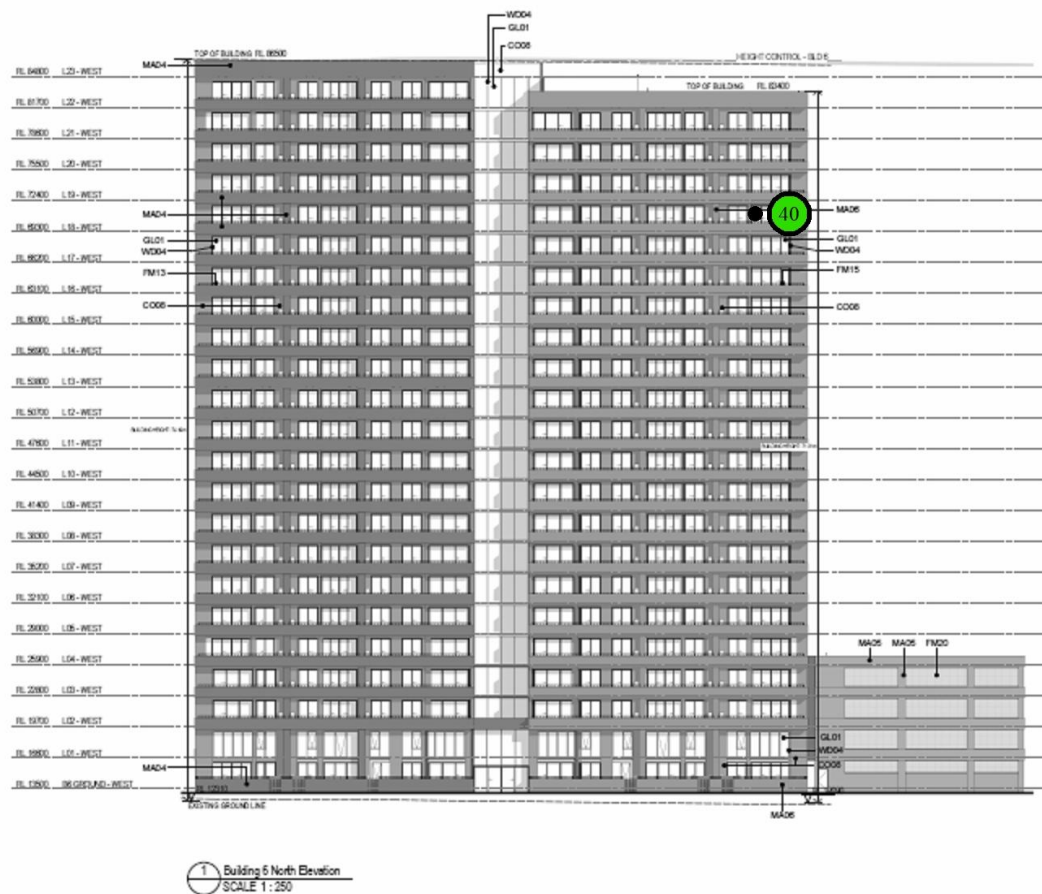
Comfort Rating

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

Distress Rating

- Pass
- Able Bodied
- Fail
- Pedestrian Location
- Pedestrian Location Under Overhang

Figure 8: Pedestrian wind speed measurement locations with comfort/safety ratings – Building 2 Balconies (East Elevation)



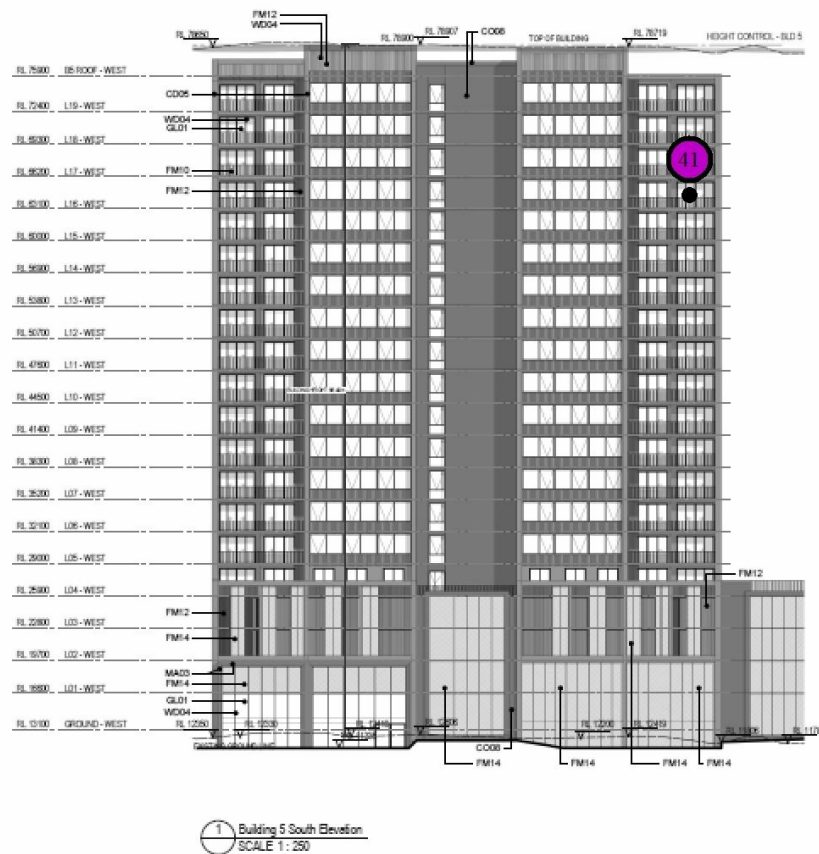
Comfort Rating

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

Distress Rating

- Pass
- Able Bodied
- Fail
- Pedestrian Location
- Pedestrian Location Under Overhang

Figure 9: Pedestrian wind speed measurement locations with comfort/safety ratings – Building 6 Balconies (North Elevation)



Comfort Rating

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

Distress Rating

- Pass
- Able Bodied
- Fail
- Pedestrian Location
- Pedestrian Location Under Overhang

Figure 10: Pedestrian wind speed measurement locations with comfort/safety ratings – Building 5
Balconies (South Elevation)

4. Discussion

GROUND LEVEL

The comfort and distress ratings at ground level are presented in Figure 3. In general, wind conditions around the development are rated as suitable for Pedestrian Sitting and Pedestrian Standing, with stronger wind conditions experienced around Building corners and gaps between stages of podiums. These areas are rated as Pedestrian Walking and Business Walking.

To the north-east side of development, near the corner of Building 1 (Locations 1, 5, and 29), is rated as Pedestrian Walking. This is due to the exposure to the prevalent winds from the north-west and south-east. Additionally, winds from the south-east would impinge the broad face of Building 1, generating a component of downwash. The wind flow is accelerated down and around this corner and undercroft, creating windier conditions. Location 29 to the north-east of the development on the pedestrian crossing has a marginal exceedance of the safety locating at 15.1 m/s.

Similarly, on the west corners of Building 7, Locations 16 and 17, where prevalent winds from the north-west would impinge on the broad face of Building 7 and accelerate around the western corners, resulting in Pedestrian Walking comfort rating.

Majority of the locations around the site, including entrances and pedestrian pathway, are classified as suitable for Pedestrian Sitting and Standing. The addition of podium and entrance awnings on the north side and podium on the south side helps in redirecting some of the downwash flow away from the building entrances.

Wind conditions near the gaps and between podium stages (Locations 9, 10, 13, 14, 21, and 24-26) experienced windier conditions, with a comfort rating of Pedestrian Walking and Business Walking. As the prevalent winds from the north-west and south-east are channelled through these spaces. Some of these locations exceed the safety/distress criteria with an Able-Bodied rating. An effective way to improve wind conditions would be to implement dense landscaping around these corners to break strong wind gusts, as well as extending corner awnings on the south-west corner of Stage A podium to redirect some downwash flows away from the ground level. Furthermore, the wind conditions can be improved for a larger proportion of time by implementing small-scale screening structures or raised planters around the south-east area of the outdoor café seating area (Location 9). These mitigations are shown in Figure 11 below.

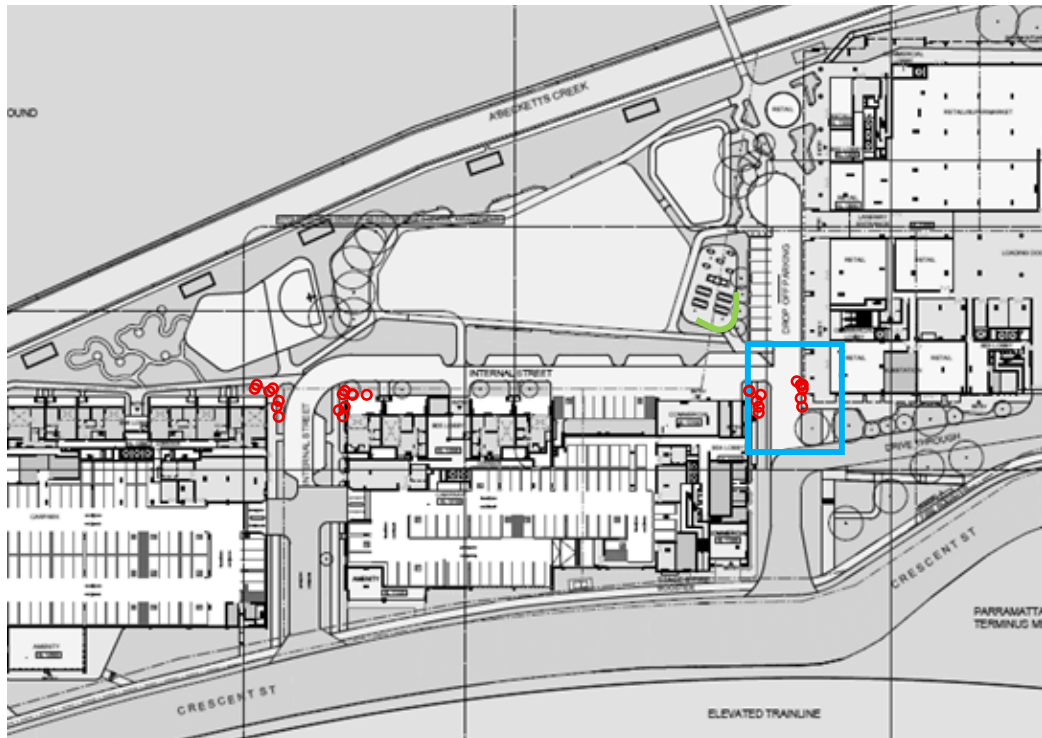


Figure 11: Mitigation measures – Dense landscaping (red), Extended awnings (blue), and porous screening/raised planters (green).

PODIUM TERRACE

Conditions on the podium terraces are shown in Figure 4 to Figure 6, and are split into different stages of podium terrace:

Stage A Podium Terrace

Stronger wind conditions are experienced on the south-east side of Stage A podium terrace, near the Lawn/Outdoor Gym area (Location 33). This location is classified as Business Walking from a comfort perspective and slightly exceed the safety criteria. This is due to flow channelling through the gap between Buildings 1 and 3. The winds from the south-east and north-west quadrants impinge the broad faces of Building 1, and the flow is accelerated through this gap. Locations 30-32 are milder, with comfort ratings of Pedestrian Standing and Pedestrian Walking. With the exception of Location 33, all tested locations satisfy the Lawson distress rating.

Stage B Podium Terrace

Wind conditions on Stage B podium terrace falls into Pedestrian Standing and Pedestrian Walking (Locations 35 and 34 respectively). Location 34 marginally exceeds the safety criteria, experiencing channelled flow between Buildings 4 and 5. Localised mitigation measures such as implementation of raised planters around the outdoor seating area and increasing the height of the northern podium balustrades to approximately 1.8 m could improve wind conditions.

Stage C Podium Terrace

Wind conditions at Stage C podium terrace are classified as Pedestrian Standing and Pedestrian Walking (Location 36 and 37 respectively). Due to the Building orientation, Location 37 experienced slightly windier condition as winds from the east and south impinge the broad face of Buildings 6 and 7, resulting in accelerated flow down and through the gaps between the buildings. If milder wind conditions are desired at this location, implementation of corner awnings, connecting to both buildings on this gap would redirect flow away from this location.

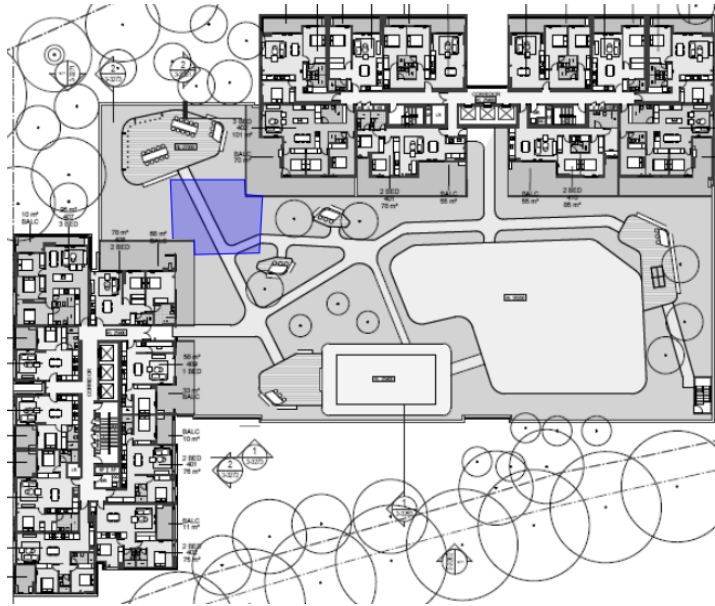


Figure 12: Mitigation measures – Connecting corner awnings to both buildings 6 and 7.

BALCONIES

Wind comfort conditions on the balconies are shown in Figure 7 to Figure 10. In general, harsher wind conditions are measured on the balconies facing north (Locations 38 and 40), due to the relative exposure to the prevalent winds from the north-west. These locations have a comfort rating of Pedestrian Standing. If wind conditions are to be improved, an effective mitigation measure is to increase the balustrade heights to approximately 1.8 m. Locations 39 and 41 experienced milder wind conditions with a comfort rating of Outdoor Dining.

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 3D model received by CPP on 5 September 2025. 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 Crescent Parklands development. In general, wind conditions near the entrances and pedestrian footpath are assessed as suitable for Pedestrian Sitting and Pedestrian Standing, with stronger wind conditions on the north-east and west corners of Buildings 1 and 7 respectively. Stronger wind conditions were experienced between the buildings and on the podium due to channelled flow between the buildings. Wind conditions on the podium terraces are generally reasonable with a comfort rating of Pedestrian Sitting and Pedestrian Standing, though strong conditions exist on the north-east gap between Building 1 and Building 3, and north gap between Buildings 4 and 5, experienced windy conditions and fall into Pedestrian Walking and Business Walking comfort rating. These locations slightly exceed the safety criteria. Wind conditions on the balconies experienced milder wind conditions and has a comfort rating of Outdoor Dining and Pedestrian Standing. These conditions are considered typical for conditions on balconies.

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).

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 TUNNELS	
DIMENSIONS	
Test section length	21 m (69 ft)
Test section width	3 m (10 ft)
Ceiling height	2.4 m (8 ft)
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 (0 to 66 ft/s)
Boundary-layer thickness*	1.2 m (4 ft) (nominal)
Turbulence	About 2% at entrance to test section
Longitudinal pressure gradient	Zero by blockage tolerant roof

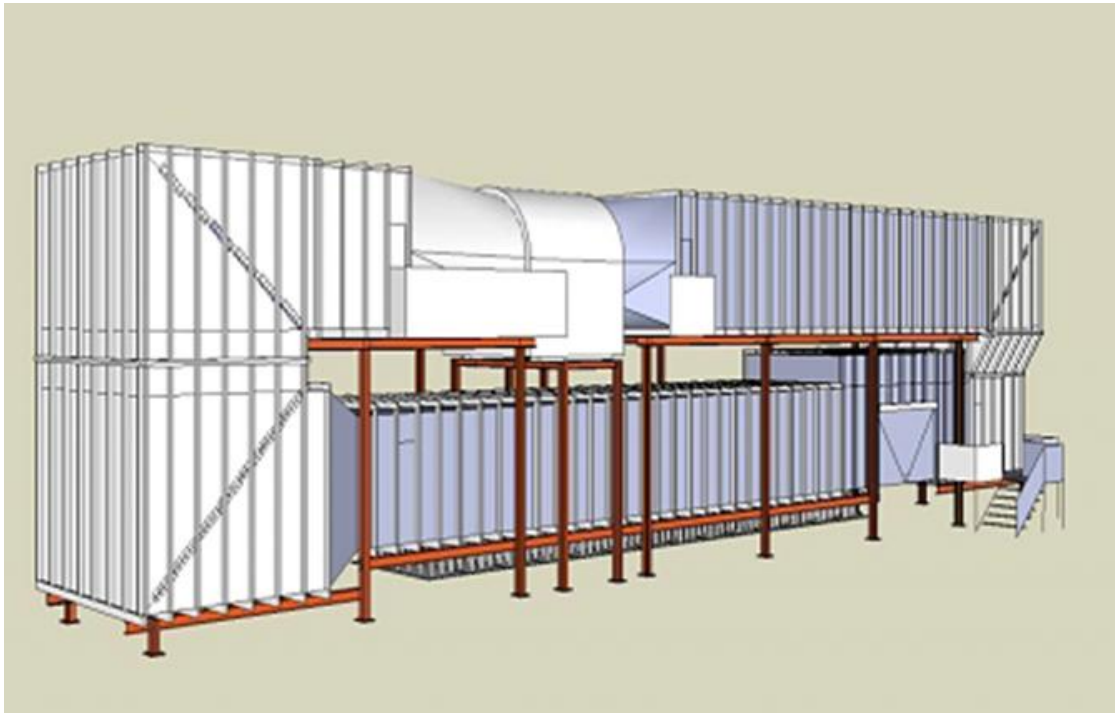


Figure A1: CPP Wind Tunnel - Sydney, Australia

Appendix B – TOA Response

29 October 2025

Department of Housing, Planning and Infrastructure
4 Parramatta Square
12 Darcy Street
Parramatta NSW 2150

Ref: **20066**

Attn: Transfer of Authority

CPP Wind Engineering
Consultants
500 Princes Highway,
Unit2
St. Peters, NSW 2044
Australia

T: +61 (0)2 9551 2000

F: +61 (0)2 9557 9447

Qualitative Assessment on Additional Locations for Crescent Parklands

CPP has previously provided a pedestrian wind assessment on behalf of Tiberius (Holroyd) Pty. Ltd. in association with a State Significant Development Application (SSDA) for a proposed mixed-use development at 1 Crescent Street, Holroyd (the site). The Department have reviewed the Response to Submission package submitted by Tiberius (Holroyd) Pty. Ltd. and have some comments regarding the report. This letter addresses these comments and responds to the requests.

The TOA Response Requests are presented in Table B1.

Table B1: The TOA Response Request

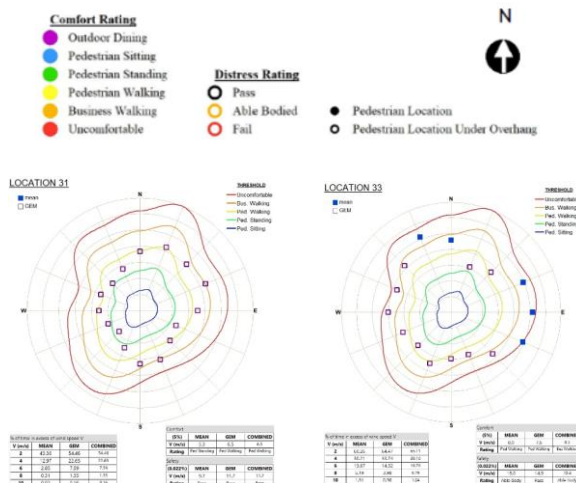
Item	TOA Response Request
DPHI-B-15-B	The TIA's Swept Path annotations recommended the removal of various planted areas adjacent to road corners to allow for adequate service vehicle manoeuvres. However, these are the same areas the Wind Report recommends for dense planting to address wind impacts. The TIA, Wind Report and architectural plans must be updated to incorporate adequate and consistent mitigation measures.
DPHI-B-15-C	The Wind Report provides wind assessment points for the podium COS (p18 to 20). However, these points do not adequately cover the spaces to allow for a full appreciation of wind impacts. The report must be updated to include additional assessment points as follows: - o Building 1/2/3 – provide an additional point within the land area at the SW corner. - o Building 4/5 – provide two points at the southern end of the podium. - o Building 6/7 – provide a point within the large lawn area and at the central southern part of the podium.

The wind conditions in this area are governed by the overall massing of the development. The proposed mitigation measures through dense landscaping aims to provide local protection rather than changing the fundamental flow pattern. Removal of the dense landscaping would therefore create slightly windier conditions in these areas.

CPP Response to DPHI-B-15-C

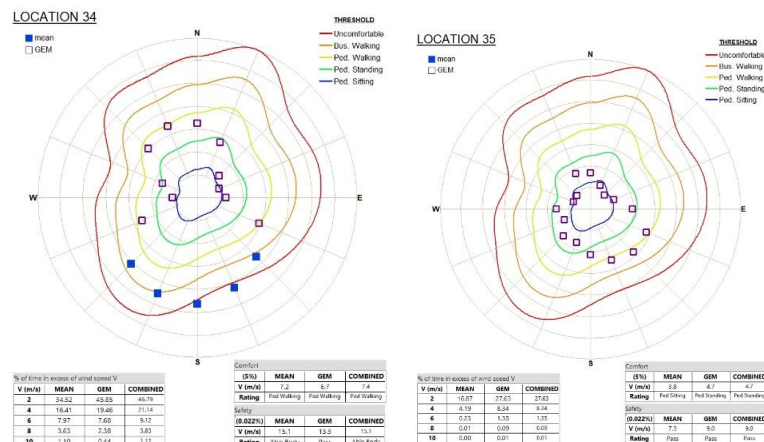
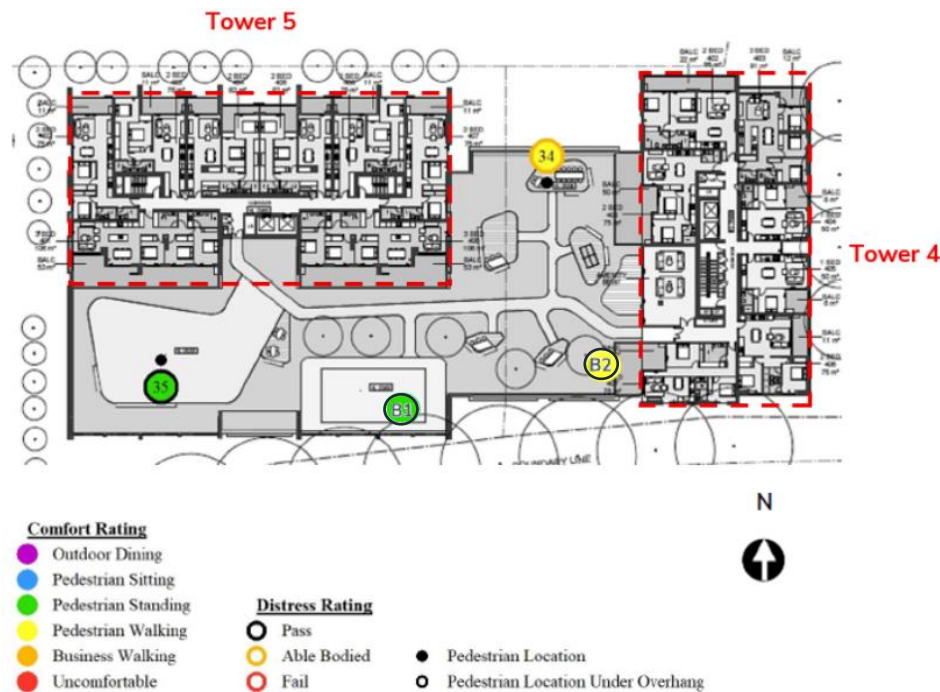
A qualitative assessment has been conducted on the additional locations requested by the Department of Planning, Housing and Infrastructure.

The site plan shows the layout of the University of Hong Kong campus. Three towers are highlighted with red dashed borders and labeled in red: Tower 1 (top right), Tower 2 (top left), and Tower 3 (bottom center). Other labeled areas include the Main Library, Lecture Theatre, and various courtyards. The plan also features a grid system with letters A-D and numbers 1-4. Various landmarks and buildings are labeled, including the Main Library, Lecture Theatre, and various courtyards. The plan includes a grid system with letters A-D and numbers 1-4.



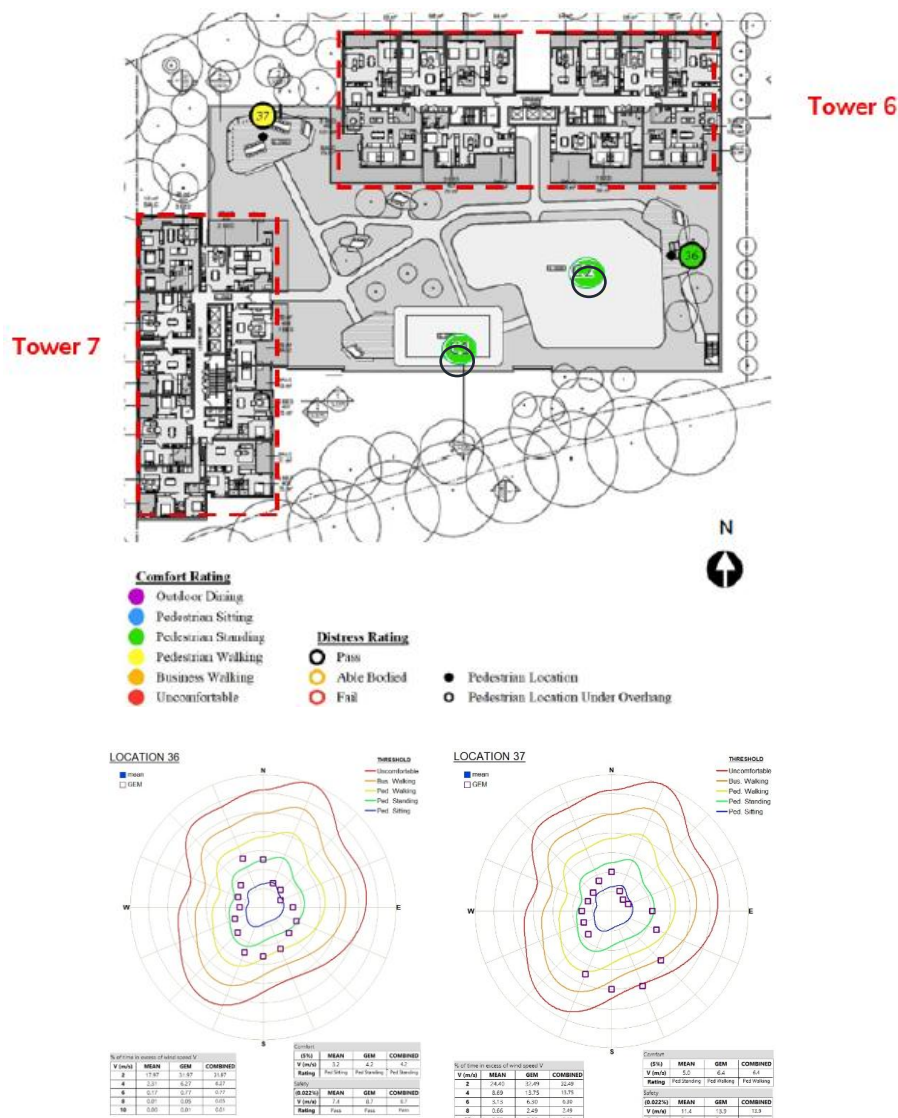
The proposed additional location (A1) is located at the western side of Building 3. Neighbouring Locations 31 and 33 are rated from a comfort perspective as Pedestrian Walking and Business Walking respectively. The polar plots show the rating at these locations is the governed by exposure to wind directions that are channelled between the buildings. Location 33 experienced windier conditions as winds from the east and north-west impinge on the broad faces of Tower 1 channelling the flow through this location. This results in a slight exceedance of the comfort criterion for pedestrian walking and safety ratings (8.3 and 15.4 m/s respectively, please refer to the Table 6). Location A1 is on the perimeter of the tall buildings and would be sheltered during winds from the east quadrant, more exposed to winds from the south and west, and more remote from channelling effect. The expected comfort classification for Location A1 is expected to be Pedestrian Walking and pass the distress criteria. Similar to Location 31 with different wind directions contributing to the classification.

Building 4/5 – provide two points at the southern end of the podium:



Locations B1 and B2 are located at the southern end of the podium. Neighbouring Locations 34 and 35 are rated Pedestrian Walking and Pedestrian Standing respectively. Similar to the ratings in Stage A podium, the rating at these locations is governed by the exposure to wind directions that are channelled between the taller buildings. Being located between the buildings, Location 34 experiences windier conditions for winds from the north and south quadrants generating strong channelled flow at this location. This results in a marginal exceedance of the safety criteria (15.1 m/s). Being relatively close to Building 5, Location 35 is well-shielded for the majority of wind directions and only exposed to winds from the south-east quadrant. By comparison, Locations B1 and B2 are less exposed than Location 34 to the channelled flow between the buildings, and slightly more exposed than Location 35. Locations B1 and B2 would be expected to be rated as suitable for Pedestrian Standing and Pedestrian Walking respectively from a comfort perspective and pass the safety criterion.

Building 6/7 – provide a point within the large lawn area and at the central southern part of the podium.



Locations C1 and C2 are located on the large lawn area to the south of the podium. Similar to the classification on the Stage A and B podium, the wind rating at these locations is governed by the exposure to wind directions that produce channelled flow between the buildings. The wind flow mechanism for Location 37 is similar to Location 34, where winds from the south to south-east quadrant are funnelled through the gap between buildings. This results in a slight exceedance of the Pedestrian Standing comfort threshold (6.4 m/s). Location 36 is remote from the constriction experiences improved wind conditions and is classified as Pedestrian Standing with a wind speed of 4.2 m/s, which is only marginally above the Pedestrian Sitting level of 4 m/s. Locations C1 and C2 are similarly sheltered for winds from the north and west quadrant and less affected by channelling flow. The comfort classification for both Locations C1 and C2 is expected to be Pedestrian Standing and pass the safety criteria.

Table 6: 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.			

Conclusion

A qualitative assessment has been conducted on the additional locations on the podium terraces requested by the Department of Planning, Housing and Infrastructure. The wind conditions at these locations are governed by the relative exposure to wind directions producing channelled flow between the buildings or accelerating around the compound massing of the development. The wind tunnel study focuses on the windier locations, hence the wind conditions at these additional locations would be expected to be marginally better than those measured as noted in the Figures, having comfort ratings of Pedestrian Standing and Pedestrian Walking with reference to the Lawson criteria. All locations would be expected to pass the safety and distress criteria.

Please contact the undersigned should you have any questions regarding the above.

Yours sincerely,



Julian Kiono
Project Engineer

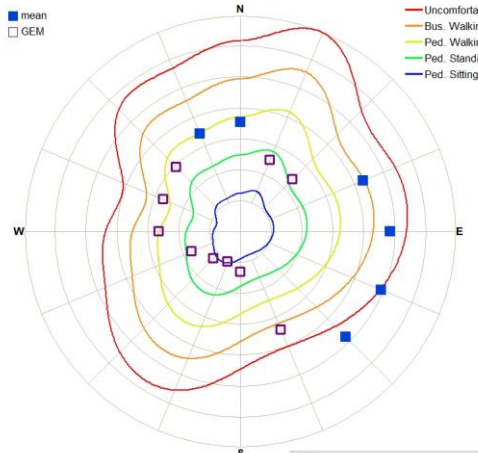
cc: Graeme Wood, PhD
Senior Principal

References:

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.

Appendix C - Directional wind results

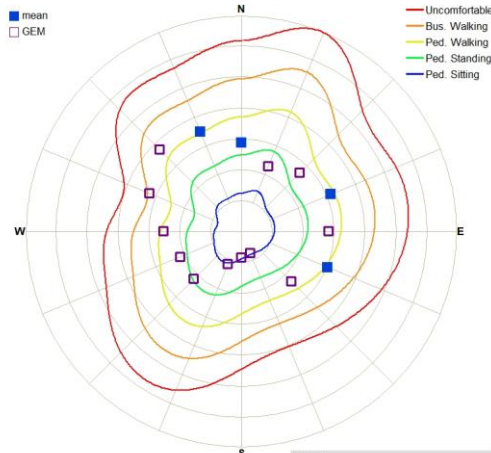
LOCATION 1



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	40.69	48.96	49.76
4	21.27	21.09	23.84
6	11.41	9.11	12.76
8	4.36	2.05	4.93
10	1.21	0.25	1.29

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	7.7	6.9	7.9
Rating	Ped Walking	Ped Walking	Ped Walking
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	14.7	12.4	14.8
Rating	Pass	Pass	Pass

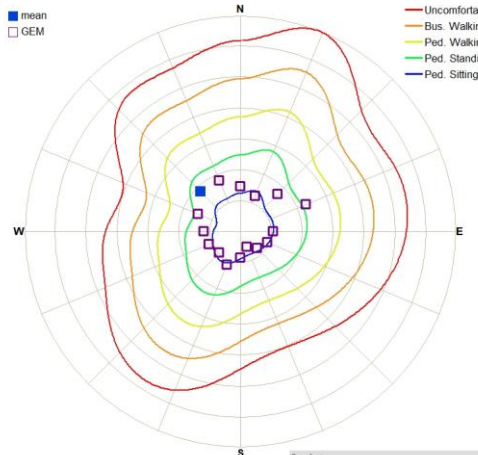
LOCATION 2



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	36.58	44.29	44.87
4	11.17	13.89	14.71
6	2.40	2.61	2.92
8	0.57	0.66	0.71
10	0.13	0.16	0.16

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	5.0	5.2	5.3
Rating	Ped Standing	Ped Standing	Ped Standing
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	12.1	12.3	12.4
Rating	Pass	Pass	Pass

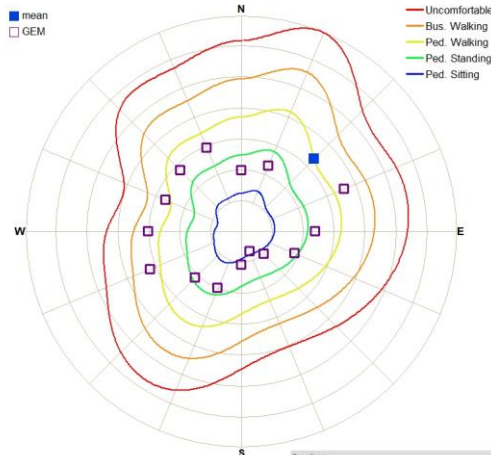
LOCATION 3



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	6.55	12.18	12.98
4	0.45	1.10	1.13
6	0.02	0.02	0.02
8	0.00	0.00	0.00
10	0.00	0.00	0.00

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	2.1	2.8	2.8
Rating	Ped Sitting	Ped Sitting	Ped Sitting
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	5.9	5.9	6.0
Rating	Pass	Pass	Pass

LOCATION 4

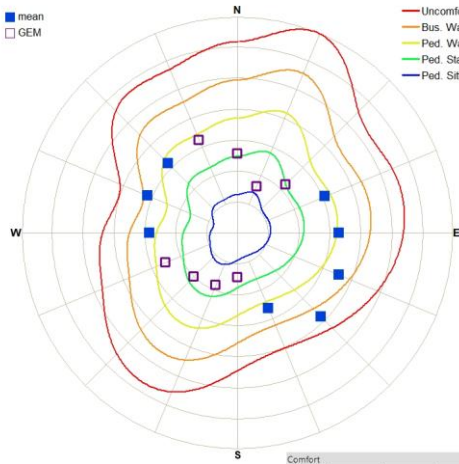


% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	27.02	41.25	41.84
4	7.40	10.86	11.18
6	1.71	3.14	3.26
8	0.14	0.58	0.59
10	0.01	0.08	0.08

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	4.6	5.2	5.3
Rating	Ped Standing	Ped Standing	Ped Standing
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	9.0	11.0	11.0
Rating	Pass	Pass	Pass

LOCATION 5

■ mean
□ GEM

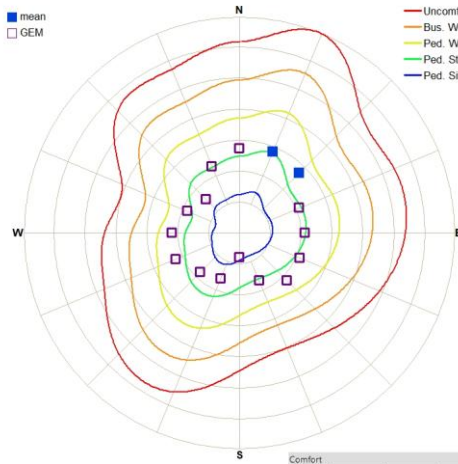


% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	45.89	49.44	31.00
4	18.62	16.53	19.62
6	6.18	3.94	6.38
8	1.39	0.60	1.44
10	0.22	0.07	0.22

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	6.2	5.7	6.3
Rating	Ped. Walking	Ped. Standing	Ped. Walking
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	12.2	11.0	12.2
Rating	Pass	Pass	Pass

LOCATION 6

■ mean
□ GEM

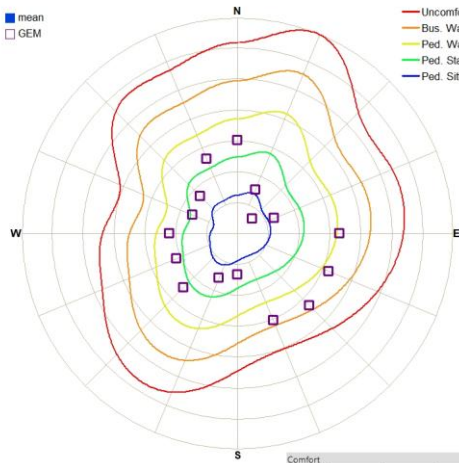


% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	23.49	37.92	36.44
4	2.79	6.57	6.90
6	0.22	0.48	0.52
8	0.01	0.02	0.02
10	0.00	0.00	0.00

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	3.4	4.2	4.3
Rating	Ped. Sitting	Ped. Standing	Ped. Standing
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	7.4	8.0	8.0
Rating	Pass	Pass	Pass

LOCATION 7

■ mean
□ GEM

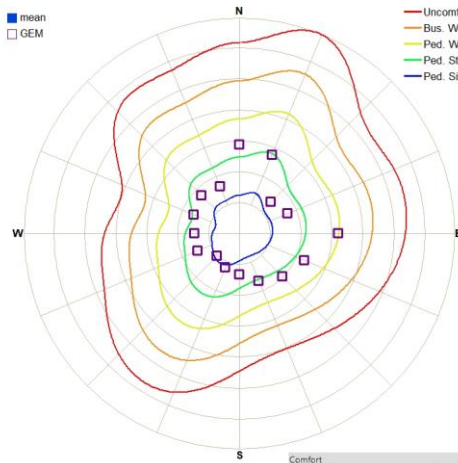


% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	24.37	38.36	38.36
4	8.30	14.25	14.25
6	1.56	4.00	4.00
8	0.15	0.49	0.49
10	0.01	0.04	0.04

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	4.6	5.7	5.7
Rating	Ped. Standing	Ped. Standing	Ped. Standing
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	9.4	10.5	10.5
Rating	Pass	Pass	Pass

LOCATION 8

■ mean
□ GEM

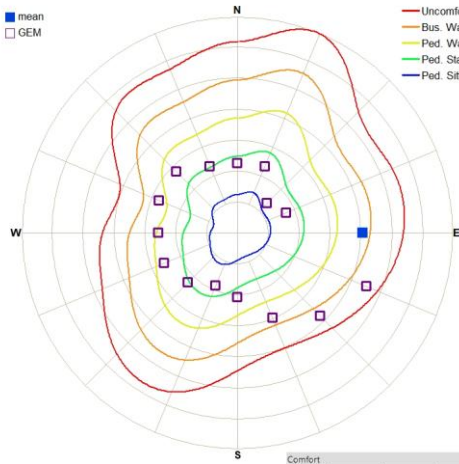


% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	18.06	30.76	30.76
4	1.31	5.03	5.03
6	0.03	0.36	0.36
8	0.00	0.01	0.01
10	0.00	0.00	0.00

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	3.0	4.0	4.0
Rating	Ped. Sitting	Ped. Sitting	Ped. Sitting
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	6.1	7.6	7.6
Rating	Pass	Pass	Pass

LOCATION 9

■ mean
□ GEM

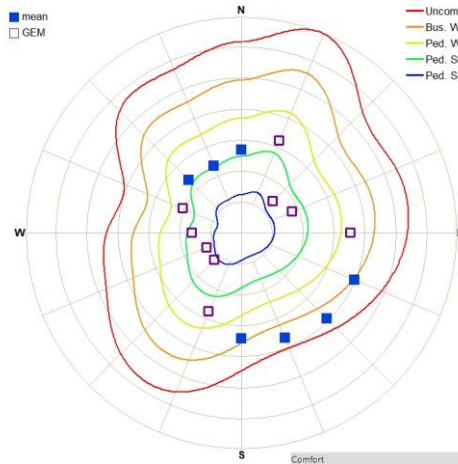


% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	37.44	48.14	48.14
4	11.59	16.49	16.52
6	3.07	7.83	7.87
8	0.38	1.99	2.00
10	0.02	0.27	0.27

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	5.3	6.7	6.7
Rating	Ped Standing	Ped Walking	Ped Walking
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	10.0	12.3	12.3
Rating	Pass	Pass	Pass

LOCATION 10

■ mean
□ GEM

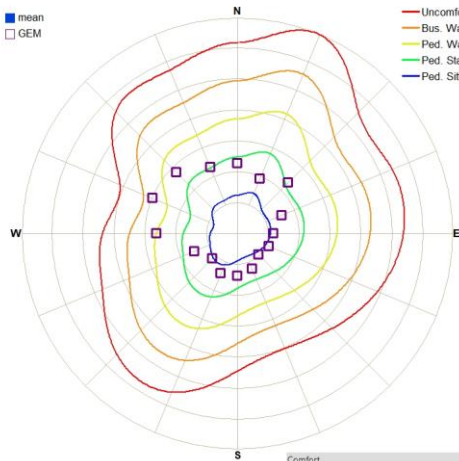


% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	36.12	42.30	43.53
4	17.69	16.30	18.26
6	7.76	5.70	7.94
8	2.18	0.88	2.19
10	0.35	0.08	0.35

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	6.0	6.1	6.6
Rating	Ped Walking	Ped Walking	Ped Walking
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	12.9	11.4	12.9
Rating	Pass	Pass	Pass

LOCATION 11

■ mean
□ GEM

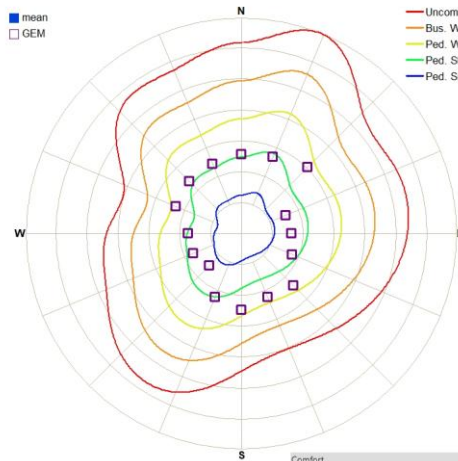


% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	16.43	29.56	29.56
4	2.45	4.35	4.35
6	0.56	1.19	1.19
8	0.07	0.34	0.34
10	0.00	0.05	0.05

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	3.1	3.8	3.8
Rating	Ped Sitting	Ped Sitting	Ped Sitting
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	8.7	10.6	10.6
Rating	Pass	Pass	Pass

LOCATION 12

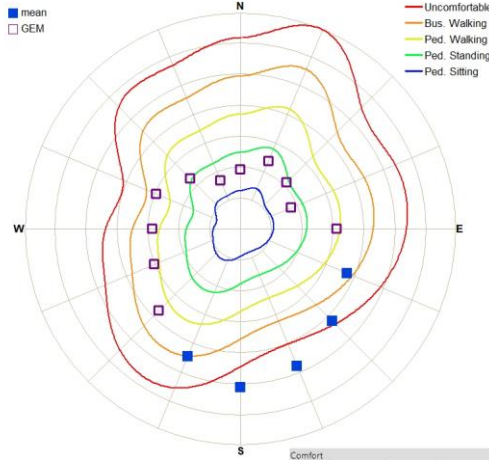
■ mean
□ GEM



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	22.18	41.83	41.83
4	2.25	9.24	9.24
6	0.05	1.16	1.16
8	0.00	0.08	0.08
10	0.00	0.00	0.00

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	3.4	4.7	4.7
Rating	Ped Sitting	Ped Standing	Ped Standing
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	6.4	8.9	8.9
Rating	Pass	Pass	Pass

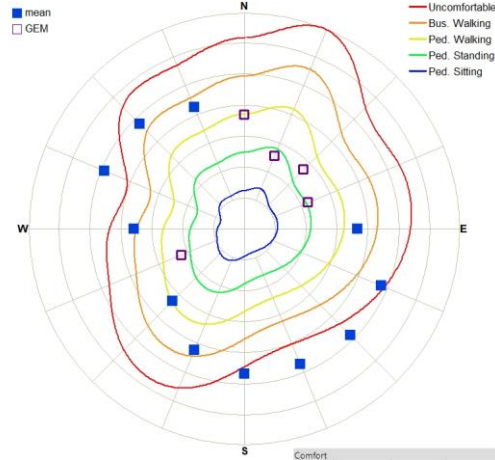
LOCATION 13



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	42.47	53.60	34.16
4	21.40	23.92	25.46
6	10.91	10.55	12.52
8	5.10	3.80	5.59
10	2.00	0.83	2.08

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	7.9	7.5	8.2
Rating	Ped Walking	Ped Walking	Bus Walking
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	16.7	14.3	16.7
Rating	Able Body	Pass	Able Body

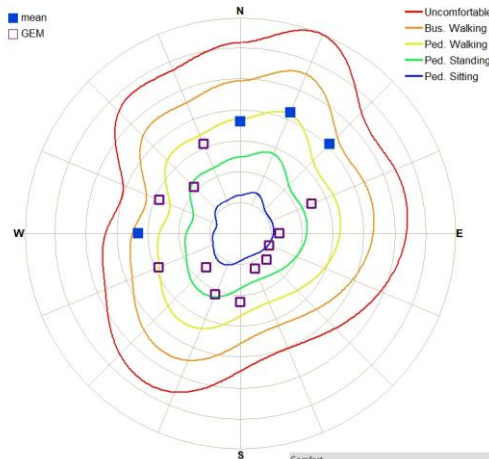
LOCATION 14



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	58.88	60.44	63.00
4	32.85	28.01	34.64
6	16.83	10.86	17.06
8	8.53	3.36	8.57
10	3.41	0.92	3.41

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	9.2	7.3	9.2
Rating	Bus Walking	Ped Walking	Bus Walking
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	18.1	14.8	18.1
Rating	Able Body	Pass	Able Body

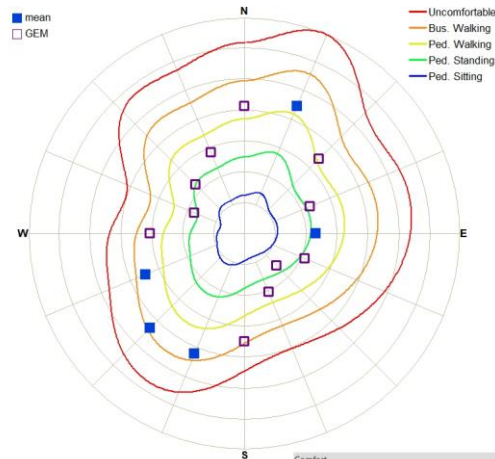
LOCATION 15



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	30.21	40.93	41.67
4	9.17	10.34	12.13
6	2.55	2.57	3.48
8	0.54	0.51	0.76
10	0.12	0.08	0.15

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	4.9	5.0	5.3
Rating	Ped Standing	Ped Standing	Ped Standing
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	11.6	11.1	11.7
Rating	Pass	Pass	Pass

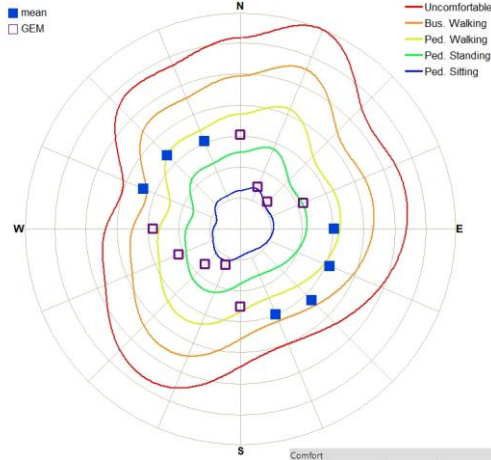
LOCATION 16



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	47.38	52.54	54.28
4	14.16	16.33	18.55
6	3.94	4.43	5.47
8	0.98	0.94	1.43
10	0.23	0.16	0.32

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	5.5	5.8	6.1
Rating	Ped Standing	Ped Standing	Ped Walking
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	12.8	12.0	13.1
Rating	Pass	Pass	Pass

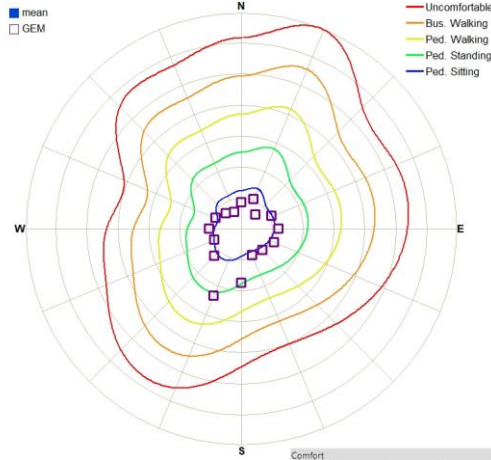
LOCATION 17



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	43.10	46.74	47.94
4	16.60	16.21	16.17
6	5.11	3.78	3.39
8	1.12	0.61	1.15
10	0.20	0.08	0.20

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	6.0	5.6	6.0
Rating	Ped. Standing	Ped. Standing	Ped. Walking
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	12.1	11.1	12.1
Rating	Pass	Pass	Pass

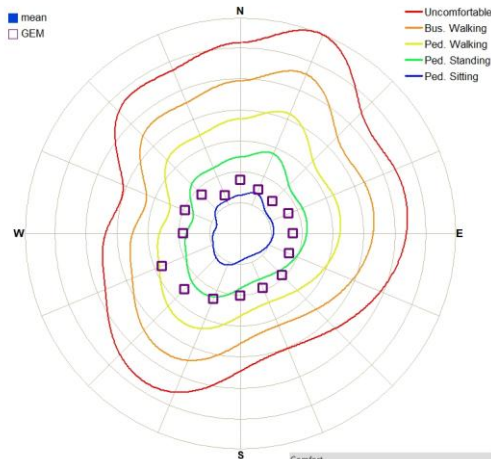
LOCATION 18



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	2.84	9.55	9.55
4	0.23	0.63	0.63
6	0.01	0.04	0.04
8	0.00	0.00	0.00
10	0.00	0.00	0.00

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	1.7	2.4	2.4
Rating	Outdoor Dining	Ped. Sitting	Ped. Sitting
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	5.8	6.5	6.3
Rating	Pass	Pass	Pass

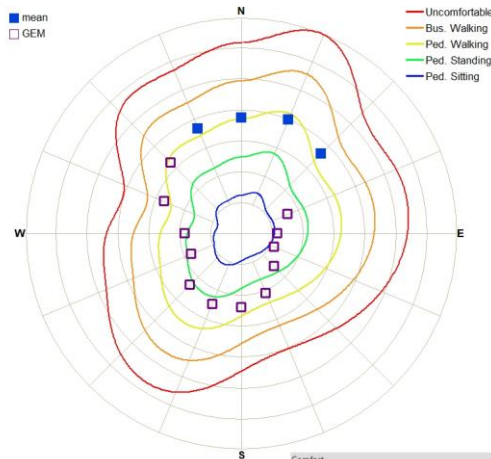
LOCATION 19



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	20.47	34.04	34.04
4	1.96	5.63	5.63
6	0.18	0.67	0.67
8	0.01	0.06	0.06
10	0.00	0.00	0.00

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	3.1	4.1	4.1
Rating	Ped. Sitting	Ped. Standing	Ped. Standing
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	7.5	8.7	8.7
Rating	Pass	Pass	Pass

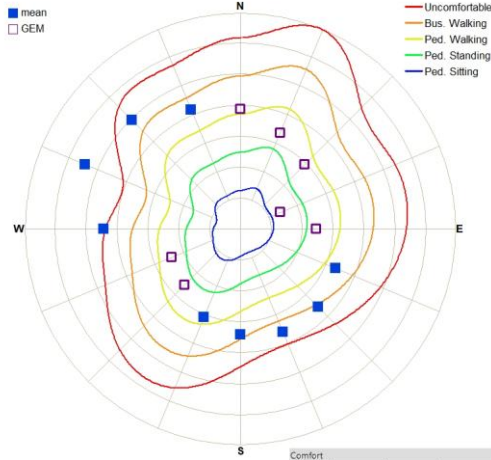
LOCATION 20



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	30.08	43.06	43.47
4	7.65	10.62	11.50
6	2.03	2.24	2.62
8	0.38	0.40	0.49
10	0.06	0.05	0.07

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	4.5	4.9	5.0
Rating	Ped. Standing	Ped. Standing	Ped. Standing
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	10.9	10.8	11.1
Rating	Pass	Pass	Pass

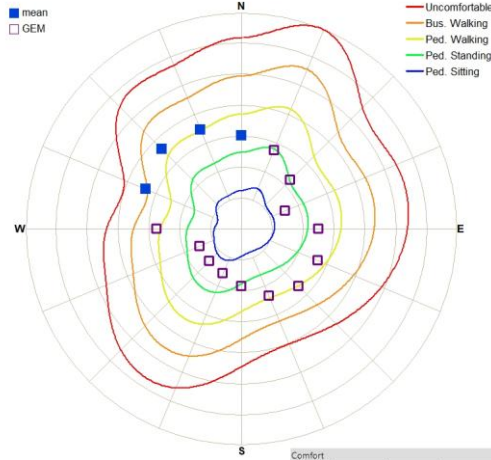
LOCATION 21



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	54.33	56.96	59.07
4	27.90	24.66	29.73
6	11.18	7.38	11.30
8	4.26	2.57	4.29
10	1.71	1.01	1.71

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	7.6	6.6	7.6
Rating	Ped Walking	Ped Walking	Ped Walking
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	19.3	16.3	19.3
Rating	Able Body	Able Body	Able Body

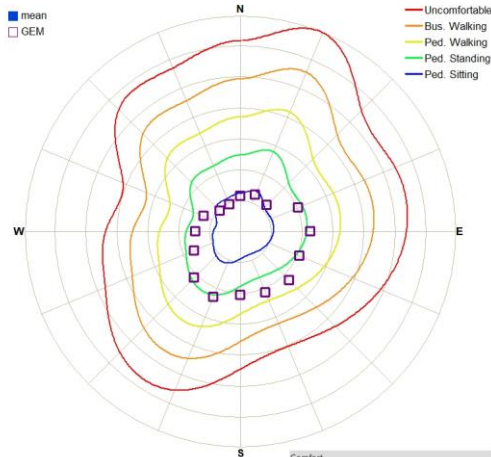
LOCATION 22



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	36.35	46.51	46.84
4	9.85	13.08	13.66
6	2.23	2.76	3.03
8	0.72	0.70	0.81
10	0.18	0.14	0.19

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	4.8	5.2	5.3
Rating	Ped Standing	Ped Standing	Ped Standing
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	12.3	11.8	12.4
Rating	Pass	Pass	Pass

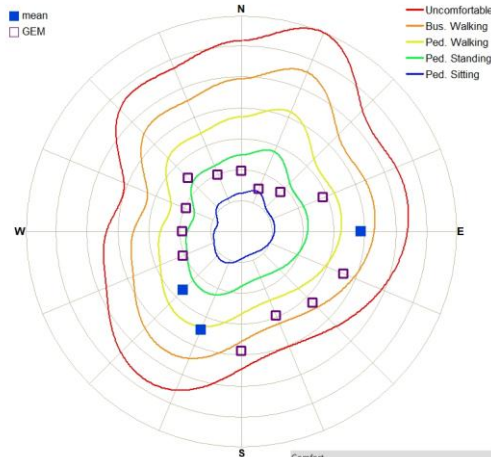
LOCATION 23



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	18.51	29.78	29.78
4	0.56	5.82	5.82
6	0.01	0.29	0.29
8	0.00	0.02	0.02
10	0.00	0.00	0.00

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	2.9	4.1	4.1
Rating	Ped Sitting	Ped Standing	Ped Standing
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	5.6	7.6	7.6
Rating	Pass	Pass	Pass

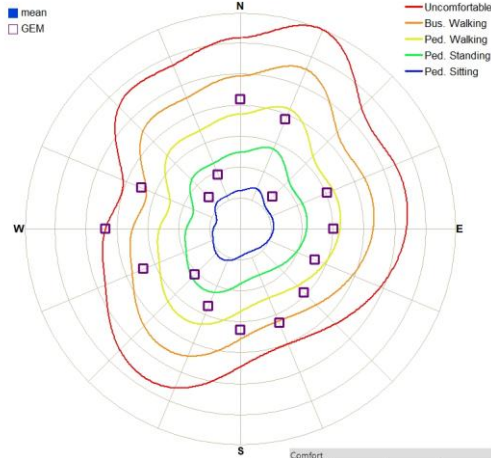
LOCATION 24



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	36.15	46.30	46.62
4	13.31	19.36	19.63
6	3.46	6.21	6.67
8	0.50	1.09	1.17
10	0.05	0.15	0.15

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	5.5	6.2	6.3
Rating	Ped Standing	Ped Walking	Ped Walking
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	10.8	12.0	12.0
Rating	Pass	Pass	Pass

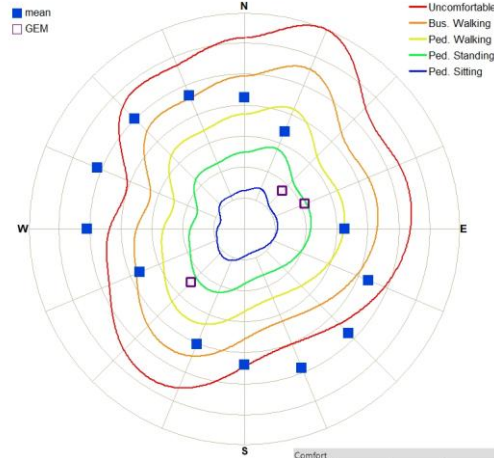
LOCATION 25



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	37.96	51.97	51.97
4	11.71	23.44	23.44
6	2.58	7.62	7.62
8	0.82	2.28	2.28
10	0.28	0.63	0.63

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	5.1	6.6	6.6
Rating	Ped. Standing	Ped. Walking	Ped. Walking
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	14.3	15.1	15.1
Rating	Pass	Able Body	Able Body

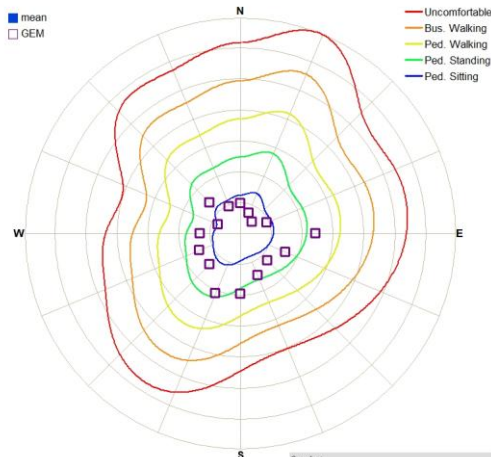
LOCATION 26



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	60.15	59.42	63.30
4	36.23	26.44	36.97
6	18.16	10.78	18.24
8	9.02	3.54	9.02
10	3.94	0.92	3.94

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	9.4	7.4	9.4
Rating	Bus. Walking	Ped. Walking	Bus. Walking
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	19.4	14.7	19.4
Rating	Able Body	Pass	Able Body

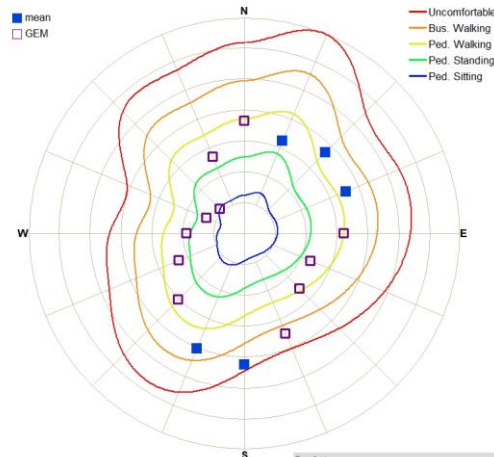
LOCATION 27



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	8.31	18.77	18.77
4	0.26	1.71	1.71
6	0.01	0.04	0.04
8	0.00	0.00	0.00
10	0.00	0.00	0.00

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	2.5	3.2	3.2
Rating	Ped. Sitting	Ped. Sitting	Ped. Sitting
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	5.4	6.4	6.4
Rating	Pass	Pass	Pass

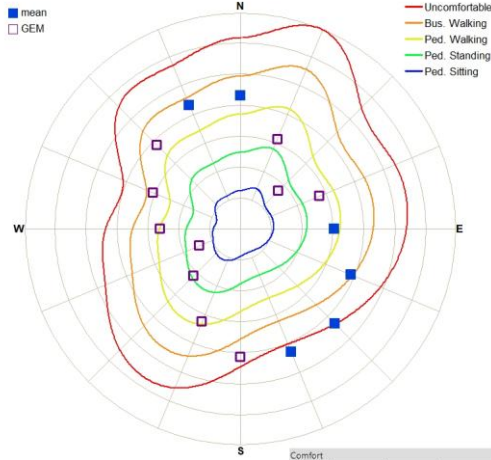
LOCATION 28



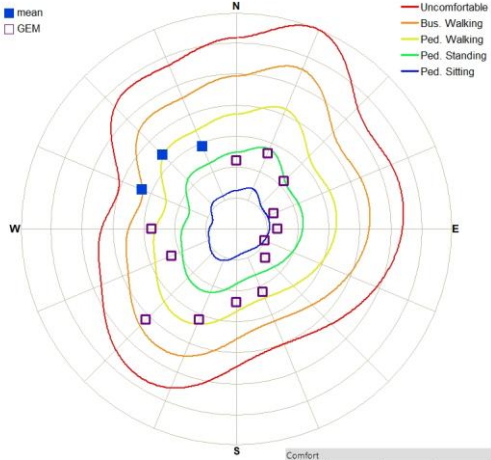
% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	43.70	49.84	50.69
4	16.73	19.60	21.33
6	5.72	5.23	6.79
8	1.54	1.14	1.78
10	0.33	0.17	0.36

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	6.2	6.0	6.4
Rating	Ped. Walking	Ped. Walking	Ped. Walking
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	13.2	12.1	13.3
Rating	Pass	Pass	Pass

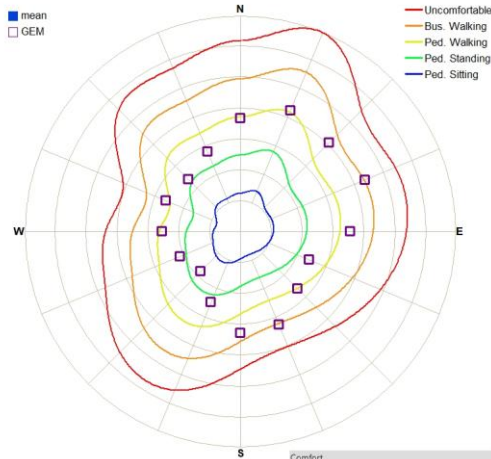
LOCATION 29



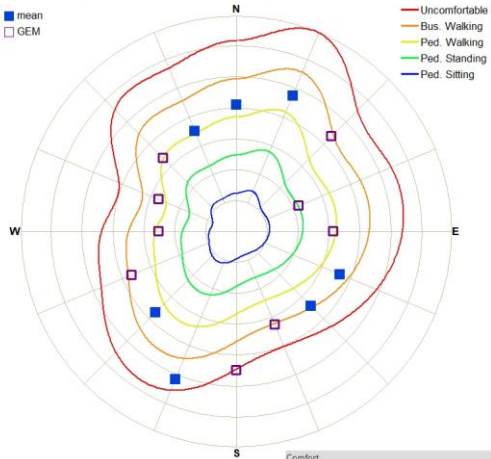
LOCATION 30



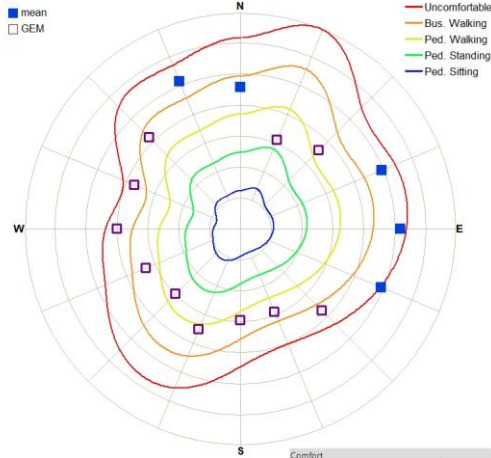
LOCATION 31



LOCATION 32



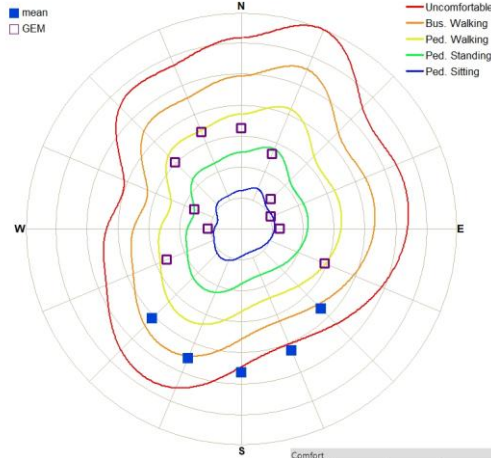
LOCATION 33



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	60.26	64.47	65.11
4	30.21	33.74	26.16
6	13.67	14.32	16.76
8	5.19	3.98	6.19
10	1.31	0.96	1.64

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	8.0	7.6	8.3
Rating	Ped Walking	Ped Walking	Bus Walking
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	15.0	14.9	15.4
Rating	Able Body	Pass	Able Body

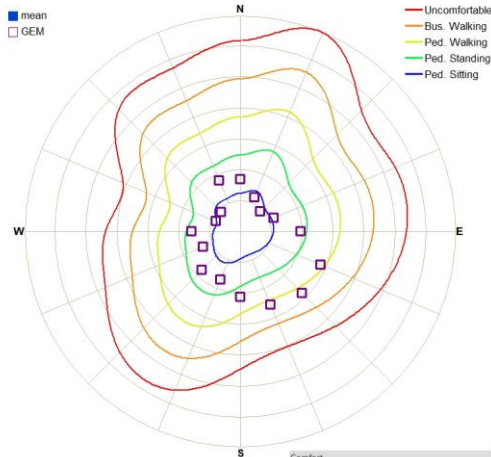
LOCATION 34



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	34.32	45.85	46.79
4	16.41	19.46	21.14
6	7.97	7.68	9.12
8	3.63	2.38	3.83
10	1.10	0.44	1.12

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	7.2	6.7	7.4
Rating	Ped Walking	Ped Walking	Ped Walking
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	15.1	13.3	15.1
Rating	Able Body	Pass	Able Body

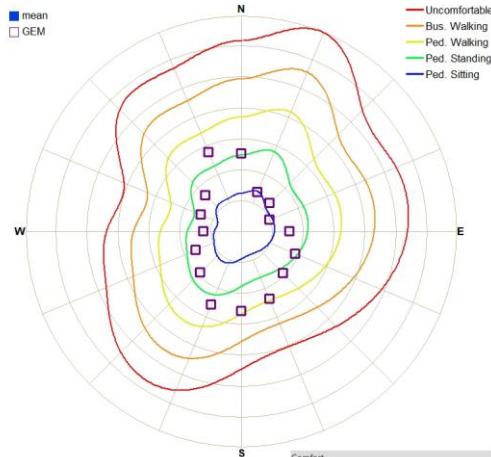
LOCATION 35



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	16.87	27.63	27.63
4	4.19	8.34	8.34
6	0.23	1.35	1.35
8	0.01	0.09	0.09
10	0.00	0.01	0.01

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	3.8	4.7	4.7
Rating	Ped Sitting	Ped Standing	Ped Standing
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	7.3	9.0	9.0
Rating	Pass	Pass	Pass

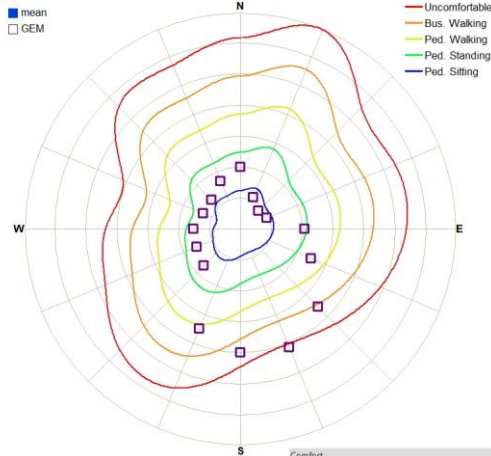
LOCATION 36



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	17.97	31.97	31.97
4	2.31	6.27	6.27
6	0.17	0.77	0.77
8	0.01	0.05	0.05
10	0.00	0.01	0.01

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	3.2	4.2	4.2
Rating	Ped Sitting	Ped Standing	Ped Standing
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	7.4	8.7	8.7
Rating	Pass	Pass	Pass

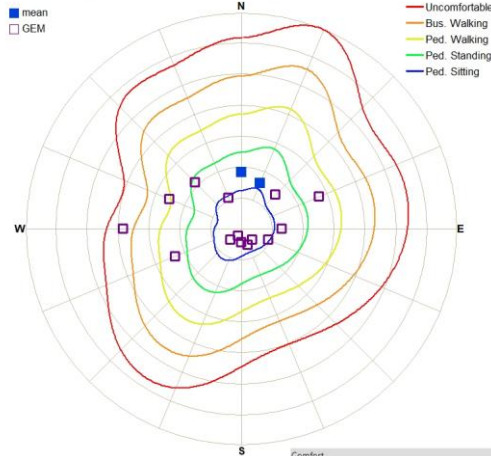
LOCATION 37



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	24.40	32.49	32.49
4	8.69	13.75	13.75
6	3.13	6.30	6.30
8	0.66	2.49	2.49
10	0.09	0.60	0.60

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	5.0	6.4	6.4
Rating	Ped. Standing	Ped. Walking	Ped. Walking
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	11.4	13.9	13.9
Rating	Pass	Pass	Pass

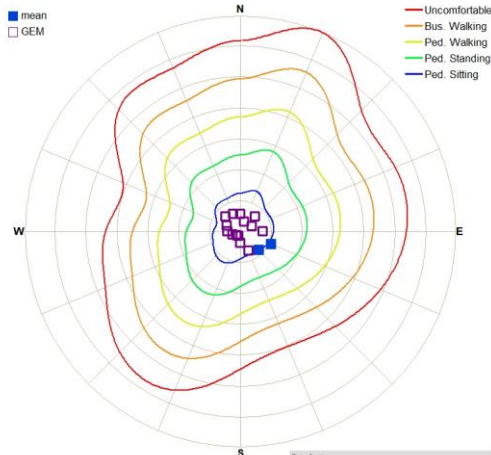
LOCATION 38



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	12.70	20.76	21.06
4	1.89	6.06	6.09
6	0.36	1.76	1.76
8	0.06	0.62	0.62
10	0.00	0.23	0.23

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	2.9	4.3	4.3
Rating	Ped. Sitting	Ped. Standing	Ped. Standing
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	8.6	13.2	13.2
Rating	Pass	Pass	Pass

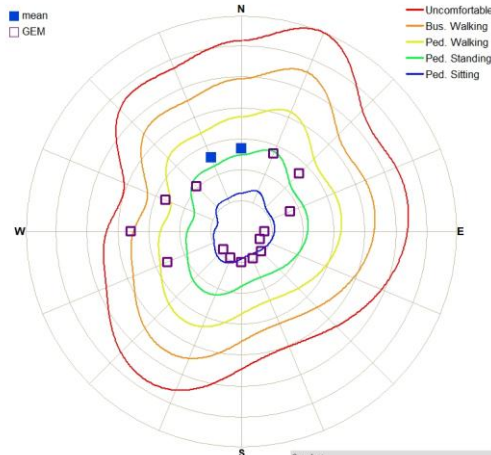
LOCATION 39



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	0.09	0.77	0.99
4	0.00	0.00	0.00
6	0.00	0.00	0.00
8	0.00	0.00	0.00
10	0.00	0.00	0.00

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	1.4	1.4	1.5
Rating	Outdoor Dining/Outdoor Dining	Outdoor Dining/Outdoor Dining	Outdoor Dining
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	2.8	2.7	2.8
Rating	Pass	Pass	Pass

LOCATION 40



% of time in excess of wind speed V			
V (m/s)	MEAN	GEM	COMBINED
2	18.65	28.48	28.90
4	3.36	6.36	6.51
6	0.97	1.87	1.82
8	0.11	0.54	0.54
10	0.01	0.16	0.16

Comfort			
(5%)	MEAN	GEM	COMBINED
V (m/s)	3.4	4.3	4.4
Rating	Ped. Sitting	Ped. Standing	Ped. Standing
Safety			
(0.022%)	MEAN	GEM	COMBINED
V (m/s)	9.3	12.4	12.4
Rating	Pass	Pass	Pass

