

CENTRAL BARANGAROO

SYDNEY, AUSTRALIA

PEDESTRIAN WIND ASSESSMENT ADDENDUM –
CONCEPT PLAN MP06_0162 MOD 9

RWDI # 2206532

November 3, 2023

SUBMITTED TO

Infrastructure NSW

Level 27, 201 Kent Street
Sydney NSW 2000

SUBMITTED BY

Aman Choudhry, PhD, MIEAust

Senior Microclimate Engineer

aman.choudhry@rwdi.com

Michael Pieterse, M.A.Sc., P.Eng., CPEng., RPEN

Senior Project Manager | Associate Principal

michael.pieterse@rwdi.com

T: +61 2 8103 4020 x2324

RWDI Australia Pty Ltd

ABN 86 641 303 871



ACKNOWLEDGEMENT OF COUNTRY

We would like to acknowledge the Gadigal people who are the Traditional Custodians of this land. We would also like to pay respect to the Elders both past and present of the Eora Nation and extend that respect to all Aboriginal people.



EXECUTIVE SUMMARY

RWDI Australia Pty Ltd (RWDI) was retained to conduct a pedestrian wind assessment for the proposed Central Barangaroo development located in Sydney, Australia. The pedestrian-level wind microclimate assessment was conducted for the following configurations of the site:

- Existing Configuration:** Existing site with existing surrounding buildings;
Proposed Configuration: Proposed Development with existing surrounding buildings.

The wind conditions at the pedestrian-level on and around the Proposed Development were predicted using the results from a boundary-layer wind tunnel test combined with historical meteorological wind records for the area. Wind speeds have been evaluated against the RWDI pedestrian wind comfort criteria for pedestrian wind comfort and the AWES wind safety criterion for pedestrian safety, similar to earlier studies that have been undertaken for the site and surrounding precinct. The results of the assessment are summarised as follows:

Existing Site Conditions:

- Existing site conditions are characterised by exposure to the regional prevailing winds from the south and west throughout the year. Areas closer to the waterfront are noted to be windier and wind speeds exceeding the safety thresholds are observed along Wulugul Walk near the Crown Tower base, within the Barangaroo Harbour Park and the Hickson Park.
- Wind comfort conditions within the existing site generally remain consistent throughout the year. The eastern and northeastern ends experience lower wind speeds suitable for long-duration activities while the western and southwestern ends closer to the waterfront have higher wind speeds making most of these areas comfortable for active use. At the northwest corner of Crown Tower and Wulugul Walk, high wind speeds that will be perceived as uncomfortable are noted year-round. It is essential to note that the assessment represents the worst-case scenario without any landscaping.

Proposed Site Conditions:

- The overall wind microclimate generally remains consistent with the existing site conditions with the inclusion of the proposed massing for Central Barangaroo.
- High winds exceeding the safety criterion persist around Wulugul Walk and at the base of Crown Tower. While the safety exceedances in Hickson Park are resolved, additional exceedances occur in the South Plaza within the site due to westerly wind channeling between the blocks and at the northwest end of the site. Design elements to assist with these conditions have been discussed
- Wind comfort conditions are expected to remain largely consistent with the existing site. Most areas are likely to be comfortable for sitting through to strolling use. However, high wind areas around Crown Tower and northwestern Hickson Park still persist and will likely be uncomfortable. Wind comfort conditions are generally favorable around lobby entrances and the plazas during summers, but winter winds could impact the west end of the South Plaza. Desirable wind conditions for sitting or standing use are expected in public parklands, particularly when considering the impact of landscaping within the parks.

It is important to understand the current round of testing only represents an initial massing design and it is anticipated that further exploration and refinement will occur during the Development Application phase of the design scheme. This subsequent development phase will encompass building articulation and other elements that can effectively address wind-related aspects.



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1 INTRODUCTION

RWDI Australia Pty Ltd (RWDI) was retained to conduct a pedestrian wind assessment on and around the proposed Central Barangaroo development located in Sydney, Australia. This report presents the project objectives, background, and approach and discusses the results from the RWDI wind tunnel assessment. Commentary on conceptual wind control measures is also provided, where necessary.

The objective of the study is to assess the wind speeds in pedestrian areas within and around the study site and provide recommendations for minimising adverse wind effects, if needed. This quantitative assessment is based on wind speed measurements on a scale model of the Proposed Development and its surroundings in one of RWDI’s boundary-layer wind tunnels. These measurements were combined with the local wind records and compared with the appropriate criteria to gauge wind comfort and safety in pedestrian areas. It is understood that the assessment will focus on the wind conditions within the public domain in and around the proposed Central Barangaroo site including the pedestrian footpaths around the site, the primary entrances to the buildings, and the proposed amenity spaces.

1.1 Project Description

The project site is located between the Barangaroo Reserve, Barangaroo South and the nearby historic suburbs of Miller Point and Walsh Bay and adjacent to Barangaroo Station. As Barangaroo’s keystone project, Central Barangaroo will complete the sweep of city and foreshore experiences along the western waterfront of Sydney’s CBD to become the vibrant civic and community heart of Barangaroo. Images of the site and proposed massing are presented in Images 1A and 1B.

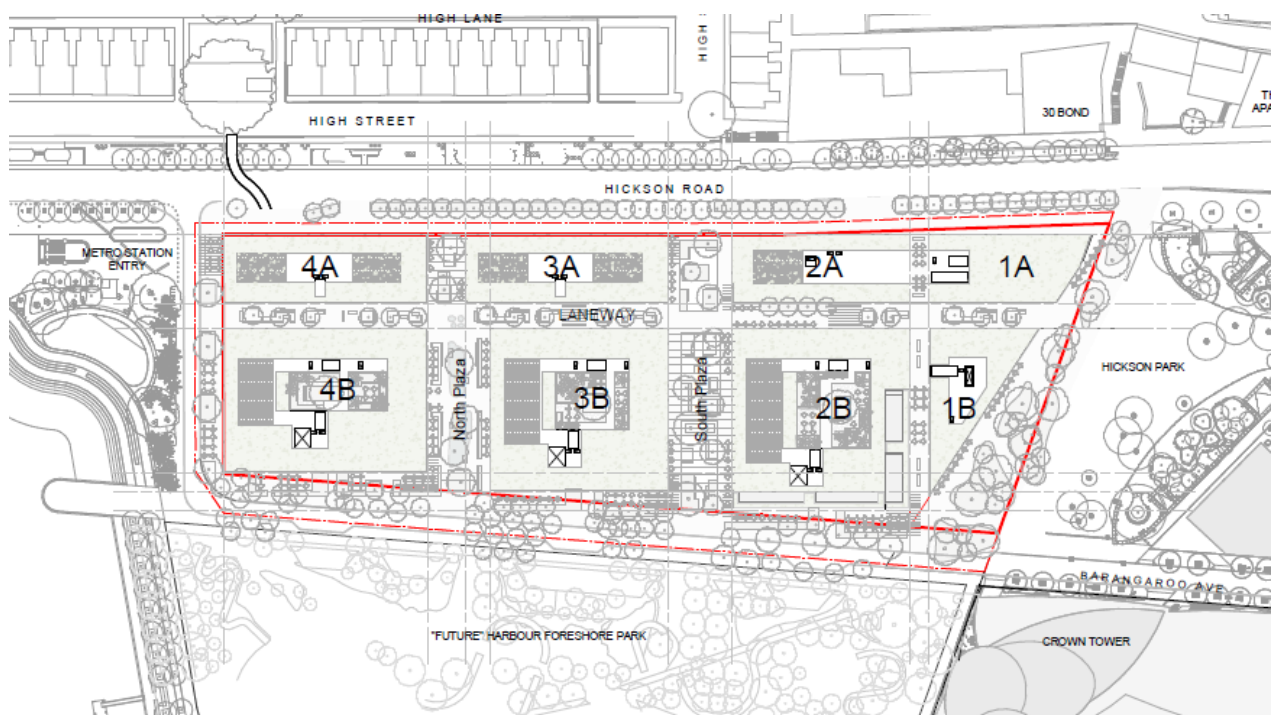


Image 1A: Site Plan

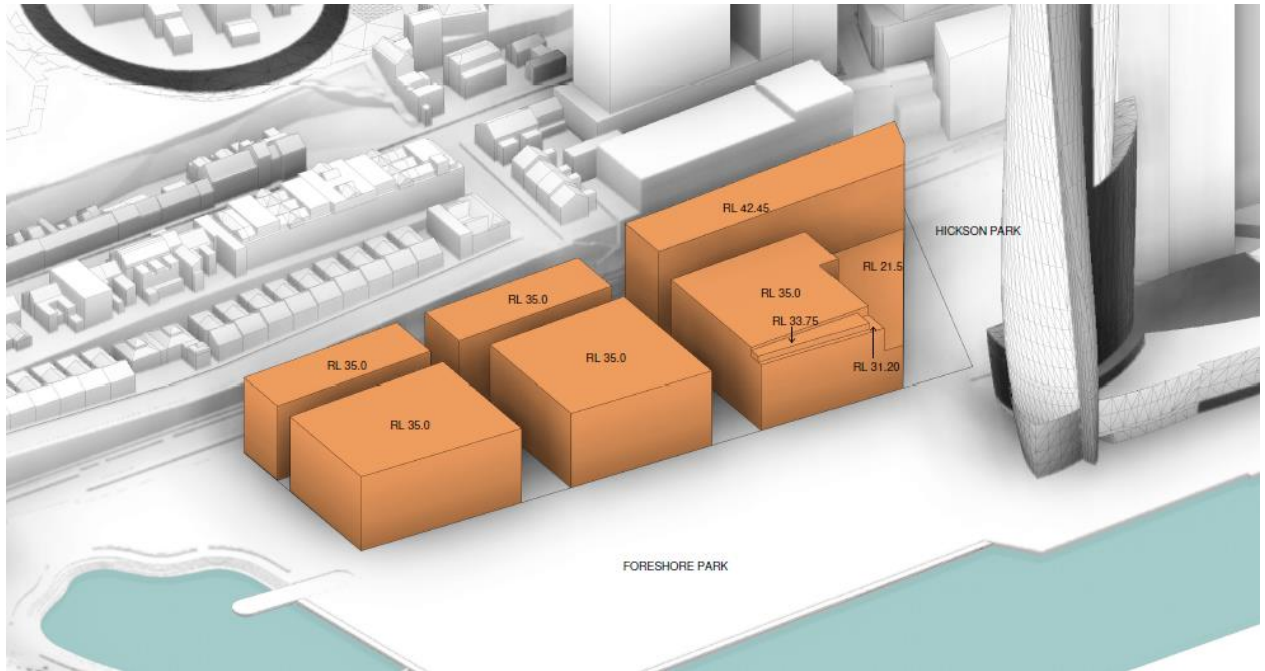


Image 1B: Massing Diagram

This modification application (**MOD 9**) seeks consent for modifications to the approved Barangaroo Concept Plan MP06_0162 (as modified by MOD 11) in relation to Central Barangaroo, Barangaroo Reserve (Cutaway only) and Barangaroo South (Barton Street and Hickson Park only).

MOD 9 results in modification to approved Concept Plan for Blocks 5, 6 and 7, updates to the Instrument of Approval and Statement of Commitments, and amendments to State Environmental Planning Policy (Precincts – Eastern Harbour City) 2021 (**PEHC SEPP**) as it applies to Barangaroo.

Following exhibition of the project from 12 July 2022 to 8 August 2022, MOD 9 has been refined by the project team. Extensive engagement has occurred with the Department of Planning and Environment (DPE) and Government Architect NSW (**GANSW**) to review key elements of the project including scale of built form compatibility, open space and public amenity.

Overall, it introduces a more simplified building envelope at a reduced and respectful scale to the surrounding heritage context, including additional public domain offering and the deletion of the previously proposed 20 storey tower as a response to submissions.

A summary of the changes is provided in the table below.



Comparison of Changes

COMPONENT	APPROVED	EXHIBITED	AMENDED*	CHANGE**
Overall Development Area				
Project area	22ha	22ha	22ha	None
Maximum Envelope Height				
Block 5	34	RL 44.5	RL 42.45	Reduced by RL 2.05
Block 6	29	RL 38.7	RL 35	Reduced by RL 3.7
Block 7	35	RL 73.7	RL 35	Reduced by RL 38.7
Gross floor area				
Residential	191,031m ²	190,031m ² (1,000m ² reduction)	237,031m ² (46,000m ² increase)	Increased by 47,000m ²
Tourist	76,000m ²	76,000m ²	76,000m ²	None
Retail	34,000m ²	71,800m ² (37,800m ² increase)	44,766m ² (10,766m ² increase)	Reduced by 27,034m ²
Active	5,000m ²	5,000m ²	5,000m ²	None
Community	10,000m ² <i>2,000m² within development Blocks 6 and 7</i>	Up to 19,000 m ² max <i>2,800m² within development Blocks 5, 6 and 7 (800m² increase)</i>	Up to 19,000 m ² max <i>2,800m² within development Blocks 5, 6 and 7 (800m² increase)</i>	None
GFA distribution	Block 5 - 29,688m ² Block 6 - 3,000m ² Block 7 - 15,000m ²	Flexible distribution and allocation permitted for all buildings in Blocks 6, 7 and 8 (below and above ground)	Flexible distribution and allocation permitted for all buildings in Blocks 6, 7 and 8 (below and above ground)	Control retained
Wintergardens	Not applied to Blocks 5, 6 and 7	Wintergardens to be excluded for the maximum residential and commercial GFA for Blocks 5, 6 and 7.	Wintergardens to be excluded for the maximum residential and commercial GFA for Blocks 5, 6 and 7.	Control retained
Building overhangs	None	A building overhang up to 3m wide located above ground level, and/or façade articulation elements up to 650mm wide above ground level	None	Control deleted

*Amendments compared against the current Concept Approval (Approval column)

**Changes compared between the exhibited project (Exhibited column) and the amended project (Amended column)



1.1.1 Modified Concept Plan Development Description

The modifications to the approved Concept Plan require amendments to Schedules of the Instrument of Approval, including the development description and relevant conditions of consent. The Instrument of Approval was last modified as part of MOD 11 on 22 October 2020.

As a result of the amendments previously outlined, the Condition ‘A1 Development Description’ of the approved Concept Plan for Barangaroo (MP06_0162) will be modified by MOD 9, as follows:

- (1) A mixed-use development involving a maximum of 667,686 sqm gross floor area (GFA), comprised of:
 - (a) a maximum of 237,031 sqm of residential GFA of which a maximum of 162,031 sqm will be in Barangaroo South;
 - (b) a maximum of 76,000sqm of GFA for tourist uses of which a maximum of 59,000 sqm will be in Barangaroo South;
 - (c) a maximum of 44,766 sqm of GFA for retail use of which a maximum of 30,000 sqm will be in Barangaroo South;
 - (d) a maximum of 5,000sqm of GFA for active uses in the Public Recreation zone of which 3,500 will be in Barangaroo South; and
 - (e) a minimum of 14,400sqm GFA for community use.

The exhibited MOD 9 application proposed a GFA increase of 144,355m² for Blocks 5, 6 and 7 (above and below ground). The amended MOD 9 application reduces this by 40,355m², resulting in a revised GFA increase of 104,000m² (above and below ground).

1.1.2 Modified Concept Plan

The key elements that make up the amended Concept Plan are summarised below.

Element	Description
Land Use	
Uses	Mixed-use development including retail, tourist, community, commercial and shop top housing
GFA	
Above Ground	Maximum 92,908m ²
Below Ground	Maximum 11,092m ²
Total	Maximum 104,000m ² (with a maximum 75,000m ² for residential)
Heights	
Block 5	RL 21.5, RL 31.2, RL 33.75, RL 35, and RL 42.45
Block 6	RL 35
Block 7	RL 35



1.1.3 Summary of Concept Plan Refinements Post Exhibition

A summary of the amendments since exhibition is provided below:

GFA Amendments

- Reduced total GFA permissible within Blocks 5, 6 and 7 from 144,355m² to 104,000m²,
- Reduced below ground GFA from 28,166m² to 11,092m²,
- Increased maximum residential component cap from 28,000m² to 75,000m², and
- No change to the Cutaway GFA uses of up to 24,000m².

Building Envelope Amendments

- Removal of the tower element at Block 7 at RL 73.7,
- Reduced building height with the tallest element located on Block 5 at RL 42.45,
- Amendments to the overall dimension and footprint of Blocks 5, 6 and 7 including new pedestrian connections open to the sky,
- Deletion of building cantilever elements into public domain,
- Refinements to the interface of Block 5 and Hickson Park, and
- Simplified building height and massing across the entire site with only three heights proposed to minimise visual impacts from Observatory Hill and Millers Point.

Open Space and Public Domain Amendments

- Increased provision of publicly accessible open space when compared to the approved Concept Plan,
- New north-south pedestrian link with a minimum width of 8m and open to the sky to facilitate visual links from Hickson Park to Nawi Cove,
- Expanded east-west pedestrian connections, known as Plaza North and Plaza South up to 20m wide and open to the sky,
- New east-west arcade between Blocks 5 and 6 with a minimum width of 6m, and
- Additional allowance for deep soil zones across the site.

Traffic and Access Amendments

- Retain Barangaroo Avenue as a one-way shared street, and
- Deletion of Barton Street as a proposed permanent street.

Statutory and Development Control Amendments

- Amendments to the SEPP mapping and provisions to align with amended building envelope GFA, building heights and land uses,
- Removal of proposed SEPP amendment to allow GFA to extend 25m into the RE1 Public Recreation zone below ground level,
- Removal of proposed SEPP amendment to allow building facades to extend by an additional 3m above ground and the 650mm façade articulation zone,
- Amended Design Excellence Strategy to be largely consistent with PEHC SEPP, and
- Amended Urban Design Guidelines to reflect amended building envelope outcomes,



1.1.4 Reference Scheme

The amended project is supported by a revised reference scheme, which demonstrates a proof-of-concept outcome that can be accommodated within the amended building envelopes. This includes consideration of potential basement layouts, access and loading arrangements, land use distribution and mix and typical floorplate layouts.

A summary of the potential land use outcomes and built form of the reference scheme is provided below.

ELEMENT		DESCRIPTION		
Land Use/GFA	Above Ground	Below Ground	Subtotal	
Residential	67,219m ²	2,581m ²	<u>69,800m²</u>	
Retail	10,420m ²	4,346m ²	<u>14,766m²</u>	
Hotel	14,841m ²	1,057m ²	<u>15,898m²</u>	
Community	428m ²	2,372m ²	<u>2,800m²</u>	
Commercial	736m ²		<u>736m²</u>	
Total	92,908m²	11,092m²	104,000m²	
Building Program				
Block 5	Three buildings ranging from 4, 8 and 10 storeys including food and beverage, hotel and residential uses			
Block 6	Two buildings at 8 storeys including ground level community, retail and upper level residential uses			
Block 7	Two buildings at 8 storeys including ground level retail and upper level residential uses			
Basement	Vehicular entry via Hickson Road to three levels of basement containing community, recreation and retail uses and back of house. Integration with Barangaroo Metro Station Concourse via Metro Escalators into Block 7 (exact location to be confirmed in detailed applications)			
Open Space and Public Domain (within site boundary)				
Hickson Park Promenade	1,434m ²			
12 x 20m plazas (Plaza North and Plaza South)	3,231m ²			
8m north-south link (open to the sky)	1,785m ²			
6m east-west lane (partial open to the sky)	489m ²			
Total	6,939m²			

2 BACKGROUND AND APPROACH

2.1 Wind Tunnel Study Model

To assess the local wind environment within and around the Proposed Development, a 1:400 scale model of the surroundings and site was constructed based on the Project Data (see Section 4), which is consistent with the amended concept plan building envelopes and supporting information prepared by SJB architects (dated 21 July 2023). Wind tunnel testing was conducted for the following configurations:

- Existing Configuration:** Existing site with Existing Surrounding Buildings (Image 2A); and
- Proposed Configuration:** Proposed Development with Existing Surrounding Buildings (Image 2B).

The wind tunnel model included all relevant surrounding buildings and topography within an approximately 480 m radius of the study site. The wind and turbulence profiles in the atmospheric boundary layer beyond the modelled area were also simulated in RWDI's wind tunnel. The wind tunnel model was instrumented with 126 specially designed wind speed sensors to measure mean and gust speeds at a full-scale height of approximately 2 m above local ground in pedestrian areas throughout the study site. Wind speeds were measured for 36 directions in 10-degree increments. The measurements at each sensor location were recorded in the form of ratios of local mean and gust speeds to the mean wind speed at a reference height above the model. The placement of wind measurement sensors was based on our experience and understanding of the pedestrian usage for this site and initial CFD assessments undertaken for the project site. The wind tunnel test procedure exceeds the guidelines set out in the Australasian Wind Engineering Society Quality Assurance Manual (AWES-QAM-2019).



Image 2A: Wind Tunnel Study Model – Existing Configuration

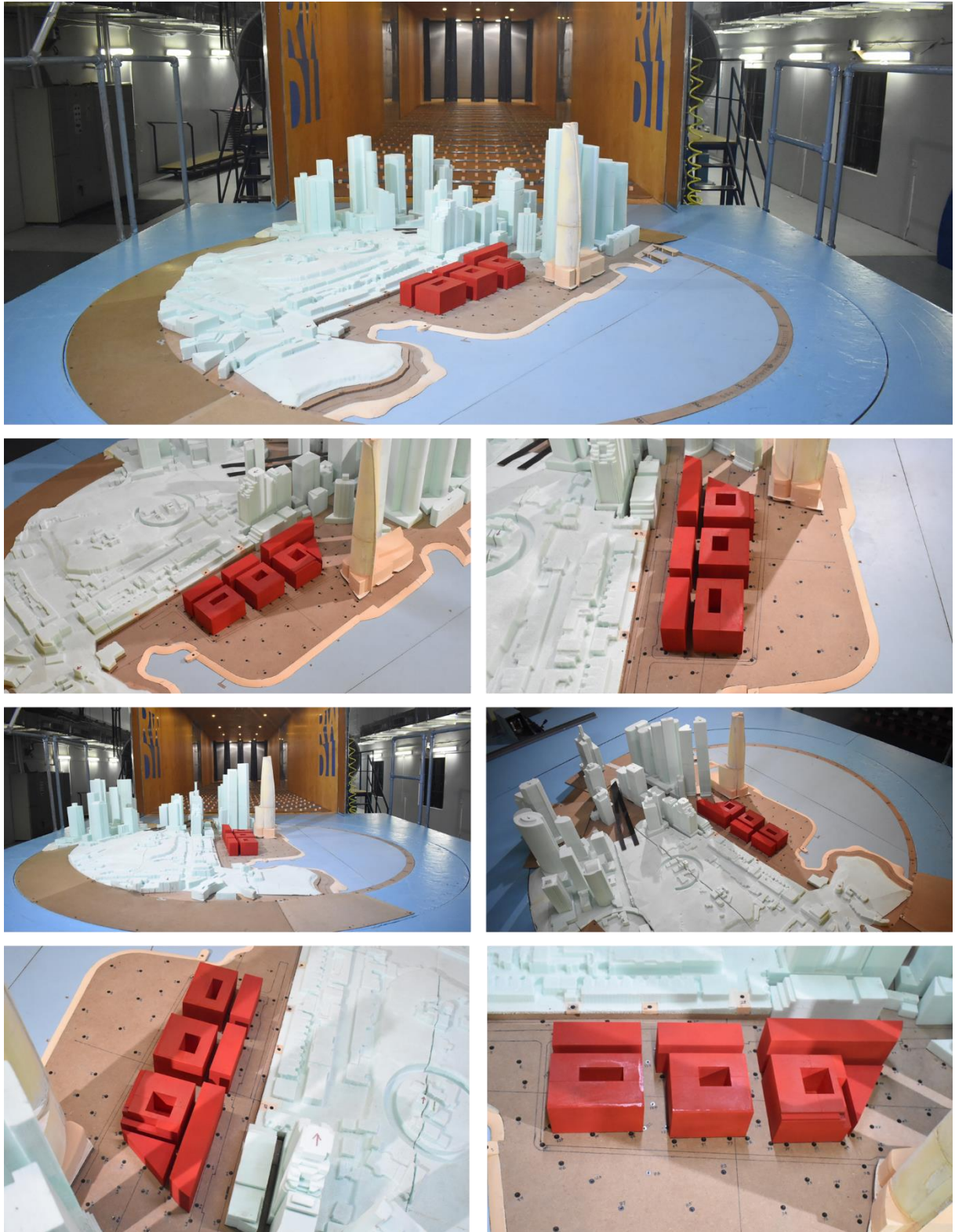


Image 2B: Wind Tunnel Study Model – Proposed Configuration

2.2 Meteorological Data

Wind statistics recorded at Sydney Airport between 1985 and 2020, inclusive, were analysed for the Summer (November - April) and Winter (May - October) seasons. Image 3 graphically depicts the directional distributions of wind frequencies and speeds for the two seasons. Winds from the northeast, south-southeast and south are predominant during the summer while winter winds tend to originate from the west-southwest through to northwest and from the southerly directions, as indicated by the wind roses shown in Image 3. Strong winds of a mean speed greater than 30 km/h measured at the airport (at an anemometer height of 10 m) occur more often in the summer (9.4%) than in the winter (7.1%).

Time-history of the wind for the period above were combined with the wind tunnel data to predict the frequency of occurrence of full-scale wind speeds at the site. The full-scale wind predictions were then compared with the wind criteria for pedestrian comfort and safety.



Image 3: Directional Distribution of Winds Approaching Sydney International Airport (1985 - 2020)



2.3 Pedestrian Wind Comfort and Safety Criteria

It is noted that the subject site sits outside of the Sydney DCP 2012 boundaries (per map Sheet 014), instead the 1996 DCP applies which use the older and now redundant gust-based approach to assess wind comfort. The RWDI pedestrian wind comfort criteria, which have been developed through research and consulting practice since 1974, have been utilised for the current assessment. These criteria, shown in Table below, have gained widespread acceptance among municipal authorities, building designers, and city planners globally. The criteria have also been in use consistently for the wind comfort assessment of the precinct (including earlier massing models of Central Barangaroo and the Crown Tower) and provide an additional comfort category of strolling over those proposed by Central Sydney Planning Strategy 2016-2036.

Pedestrian wind comfort is assessed using Gust Equivalent Mean (GEM) wind speeds, defined in the Table below. GEM quantifies the combined impact of mean and gust speeds on pedestrian comfort making it a reliable predictor for assessing wind conditions in built-up environments where higher turbulence is expected. It should be noted that factors such as regional wind climate, thermal conditions, age, health, and clothing can influence an individual's perception of the wind climate. Therefore, a comparison of wind speeds between the existing and proposed building configurations provides an objective assessment of local pedestrian wind conditions.

Table: RWDI Pedestrian Wind Comfort Criteria

Comfort Category	GEM Speed (km/h)	Description
Sitting	≤ 10	Calm or light breezes desired for outdoor restaurants and seating areas where one can read a paper without having it blown away
Standing	≤ 14	Gentle breezes suitable for main building entrances, bus stops, and other places where pedestrians may linger
Strolling	≤ 17	Moderate winds that would be appropriate for window shopping and strolling along a downtown street, plaza or park
Walking	≤ 20	Relatively high speeds that can be tolerated if one's objective is to walk, run or cycle without lingering
Uncomfortable	> 20	Strong winds of this magnitude are considered a nuisance for all pedestrian activities, and wind mitigation is typically recommended

Notes:

- (1) GEM Speed = max (Mean Speed, Gust Speed/1.85) and *Gust Speed = Mean Speed + 3*RMS Speed*; and
- (2) Wind conditions are considered to be comfortable if the predicted GEM speeds are within the respective thresholds for at least 80% of the time between 6:00 and 23:00. Nightly hours between 0:00 and 5:00 are excluded from the wind analysis for comfort since limited usage of outdoor spaces is anticipated.

The criterion for pedestrian safety is based on the guidelines of the Australasian Wind Engineering Society (AWES) (2014): If the maximum average 3-second gust speeds more than 83 km/h occurs for more than 9 hours (0.1% of the time) on an annual basis, the wind conditions are considered severe. Built-form response is necessary to alleviate safety concerns, in accordance with AWES Guidelines (2014). The pedestrian wind safety criterion as proposed in the Central Sydney Planning Strategy 2016-2036 has not been employed in the current assessment as this only requires showing compliance with the safety standard between 6 am and 10 pm (EST). However, the AWES guidelines and general wind engineering standards worldwide emphasize the importance



of assessing wind safety for a 24-hour period. This is because wind conditions can vary throughout the day and night with high risks associated with gusts also present during the excluded night hours. This approach also aligns with the broader standards used in wind engineering community globally to ensure comprehensive pedestrian safety throughout the day and are more stringent than the RWDI criterion employed in earlier studies.

3 RESULTS AND DISCUSSION

The predicted wind conditions are shown on site plans in Figures 1A through 3B located in the “Figures” section of this report. These conditions and the associated wind speeds are also presented in Table 1, located in the “Tables” section of this report. The following is a detailed discussion of the suitability of the predicted wind conditions for the anticipated pedestrian use of each area of interest. Note that wind tunnel tests have been carried out without any form of wind ameliorations or vegetation/landscaping to establish a baseline understanding of the wind conditions around the site, as per guidelines.

3.1 Generalised Wind Flows

In our discussion of wind conditions on and around the Proposed Development, reference may be made to the following generalised wind flows (see Image 4). If specific combinations of building and wind patterns coincide with prevailing winds, there is a higher potential for increased wind activity, resulting in uncomfortable or potentially unsafe conditions. To mitigate these effects, design considerations such as strategically setting back a tower from the edges of a podium, implementing deep canopies at ground level, utilising wind screens, incorporating tall trees with dense landscaping etc. (as demonstrated in Image 4) can effectively reduce high wind activity. The selection and effectiveness of these measures will depend on factors such as the site's exposure and orientation concerning prevailing wind directions, as well as the size and massing of the proposed buildings.

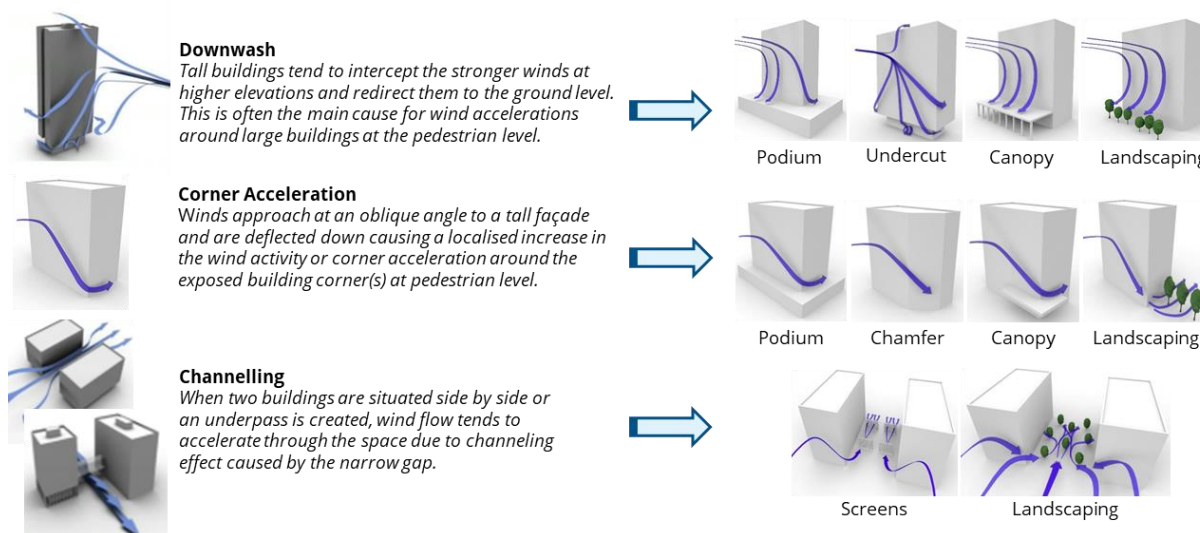


Image 4: General Wind Flows around Buildings and Examples of Wind Control Measures

3.2 Existing Configuration

3.2.1 Pedestrian Safety

Wind speeds exceeding the safety threshold can lead to hazards and may cause a high risk of accidents. The existing site is currently exposed to strong regional winds from the south and west. Safety exceedances due to high winds have been observed along the Wulugul Walk at the base of the Crown Tower (Sensors 51, 69 & 70), within the Barangaroo Harbour Park site (Sensor 60), and within Hickson Park (Sensors 43, 44 & 49).



3.2.2 Pedestrian Comfort

Wind conditions suitable for walking or strolling use are appropriate for footpaths and walkways as pedestrians will be active and less likely to remain in one area for prolonged periods of time. Lower wind speeds conducive to standing are preferred at main entrances, drop-off areas and communal/private terraces where pedestrians are likely to linger. Wind speeds comfortable for sitting use are preferred for areas intended for passive long-duration activities such as outdoor dining or café seating.

The wind comfort conditions within the existing park are generally consistent throughout the year. Wind speeds are typically lower closer to the eastern and northeastern ends of the site along High Street with conditions that will typically be suitable for long-duration activities. Moving towards the western and southwestern end, towards the Crown Tower and Wulugul Walk, the wind speeds tend to pick up. Conditions within Hickson Park and with the proposed Harbour Park are noted to be comfortable for active pedestrian use. Wind conditions at the Urban Theatre and Wulugul Walk at northwest corner of Crown Tower are noted to be uncomfortable for use throughout the year (Sensors 69 & 70). Note that wind conditions have been assessed without any landscaping and, therefore, represent the worst-case scenario.

3.3 Proposed Configuration

3.3.1 Pedestrian Safety

With the inclusion of the Proposed Development, the high winds in and around Wulugul Walk and at the base of Crown Tower generally remain consistent with the existing site conditions. However, the exceedances noted within Hickson Park for the existing scenario are resolved with the inclusion of the proposed massing of Central Barangaroo. Additional exceedances are noted within the South Plaza of the site (Sensors 76 & 114) due to the channelling of westerly winds between Buildings 3B and 2B, and towards the northern end of the site (Sensor 3) due to the redirection of westerly winds by Building 4B.

Note that, similar to the existing site, wind conditions have been assessed without any landscaping and, therefore, represent the worst-case scenario. It is also important to understand the results only represent the conditions around an initial massing design. It is anticipated that further exploration and refinement will occur during the Development Application phase of the design scheme. This subsequent development phase will encompass building articulation and other elements that can effectively address wind-related aspects. These elements will be further developed in consultation with the design team and can include the following (examples shown in Image 5):

- Awnings along the northern, western, and southern aspects of Buildings 3B & 4B and along the northern and western aspects of Building 2B.
- Corner articulation through vertical screening elements at the corners above the awnings, with particular emphasis on the northwest corner of Building 4B.
- Additional vertical screening (north-south aligned) within the North and South Plaza to buffer the winds further.
- Artwork / dense landscaping can be incorporated at the northwest end of the site to reduce pedestrian movement within the high wind areas and to mitigate the strong winds.

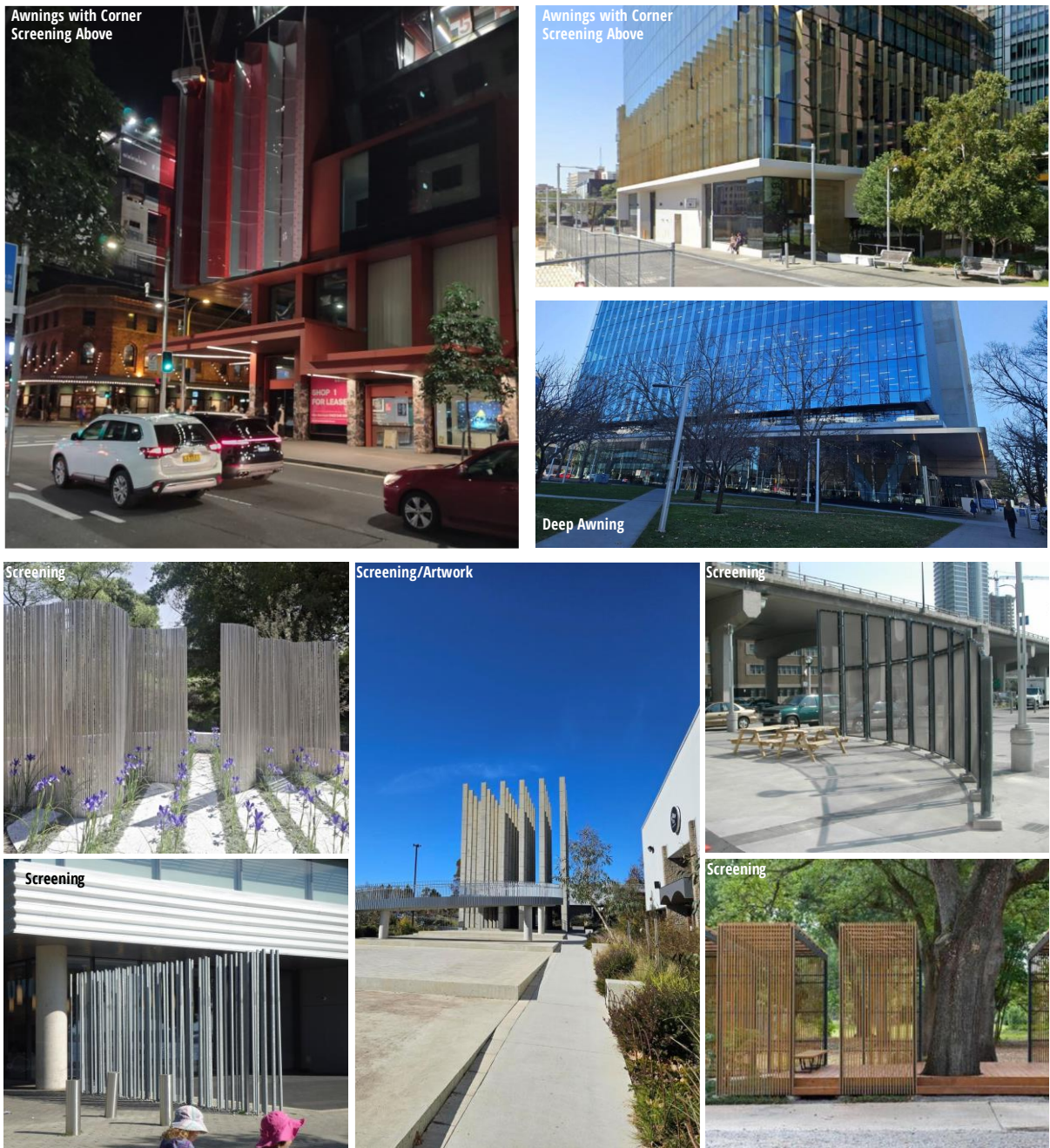


Image 5: Examples of Deep Awnings and Corner Profiles

3.3.2 Pedestrian Comfort

Upon completion of the Proposed Development, the wind microclimate conditions both within and around the site are expected to remain largely consistent, falling within a suitable range for sitting through to strolling use at majority of the locations. High wind areas, suitable for active walking use and those that will likely be perceived as uncomfortable, are generally located around the Crown Tower and within the northwestern parts of the Hickson Park. An additional exceedance in wind comfort is observed along Wulugul Walk (Sensor 71) during the summers. However, this is noted to be marginal in nature.



Wind conditions around all proposed lobby entrances along Barangaroo Avenue, the internal laneway and High Street are noted to be comfortable for the intended passive use of the spaces. Conditions are also comfortable for passive amenity use (sitting and standing) within the North and South Plaza during the summers. However, during winters, the west end of the South Plaza (Sensor 114) will be exposed to prevailing westerly regional winds. These can impact the overall wind and thermal comfort of the plaza area.

In public parklands and areas intended for passive activities, desirable wind conditions should be comfortable for sitting or standing use throughout the year. Harbour Park to the west of the proposed development site and Hickson Park to the south are the main public park areas. Wind conditions in Harbour Park are predicted to be comfortable for standing use close to the Proposed Development and for strolling and walking use closer to the waterfront throughout the year, consistent with the existing exposed conditions along the waterfront. On the other hand, Hickson Park would experience a mix of passive to active use conditions throughout the year. Areas closer to the proposed development site and along Hickson Road are noted to be calmer. However, the channelling of westerly and northwesterly winter winds can lead to conditions that are suitable for active use within most of the remaining park. Note that the wind conditions within the parkland have been assessed without any form of landscaping and, therefore, represent the worst-case scenario for wind comfort within these areas. With the inclusion of existing and future landscaping (Harbour Park), it is expected that the overall site conditions will generally be calmer than those observed as part of the wind tunnel tests.



4 STATEMENT OF LIMITATIONS

Limitations

This report entitled “*Central Barangaroo Pedestrian Wind Study*” was prepared by RWDI Australia Pty Ltd (“RWDI”) for Aqualand (“Client”). The findings and conclusions presented in this report have been prepared for the Client and are specific to the project described herein (“Project”). The conclusions and recommendations contained in this report are based on the information available to RWDI when this report was prepared.

The conclusions and recommendations contained in this report have also been made for the specific purpose(s) set out herein. Should the Client or any other third party utilise the report and/or implement the conclusions and recommendations contained therein for any other purpose or project without the involvement of RWDI, the Client or such third party assumes any and all risk of any and all consequences arising from such use and RWDI accepts no responsibility for any liability, loss, or damage of any kind suffered by Client or any other third party arising therefrom.

Finally, it is imperative that the Client and/or any party relying on the conclusions and recommendations in this report carefully review the stated assumptions contained herein and to understand the different factors which may impact the conclusions and recommendations provided.

Design Assumptions

RWDI confirms that the pedestrian wind assessment (the “**Assessment**”) discussed herein was performed by RWDI in accordance with generally accepted professional standards at the time when the Assessment was performed and in the location of the Project. No other representations, warranties, or guarantees are made concerning the accuracy or completeness of the information, findings, recommendations, or conclusions contained in this Report. This report is not a legal opinion regarding compliance with applicable laws.

The findings and recommendations set out in this report are based on the following information disclosed to RWDI. Drawings and information listed below were received and used to construct the scale model of Central Barangaroo (“**Project Data**”)

File Name	File Type	Date Received (dd/mm/yyyy)
CB Envelope 231026	.dwg	26/10/2023

The recommendations and conclusions are based on the assumption that the Project Data and Climate Data are accurate and complete. RWDI assumes no responsibility for any inaccuracy or deficiency in the information it has received from others. In addition, the recommendations and conclusions in this report are partially based on historical data and can be affected by a number of external factors, including but not limited to Project design, quality of materials and construction, site conditions, meteorological events, and climate change. As such, the conclusions and recommendations contained in this report do not list every possible outcome.

The opinions in this report can only be relied up on to the extent that the Project Data and Project Specific Conditions have not changed. Any change in the Project Data or Project Specific Conditions not reflected in this



report can impact and/or alter the recommendations and conclusions in this report. Therefore, it is incumbent upon the Client and/or any other third party reviewing the recommendations and conclusions in this report to contact RWDI in the event of any change in the Project Data and Project Specific Conditions in order to determine whether any such change(s) may impact the assumptions upon which the recommendations and conclusions were made.

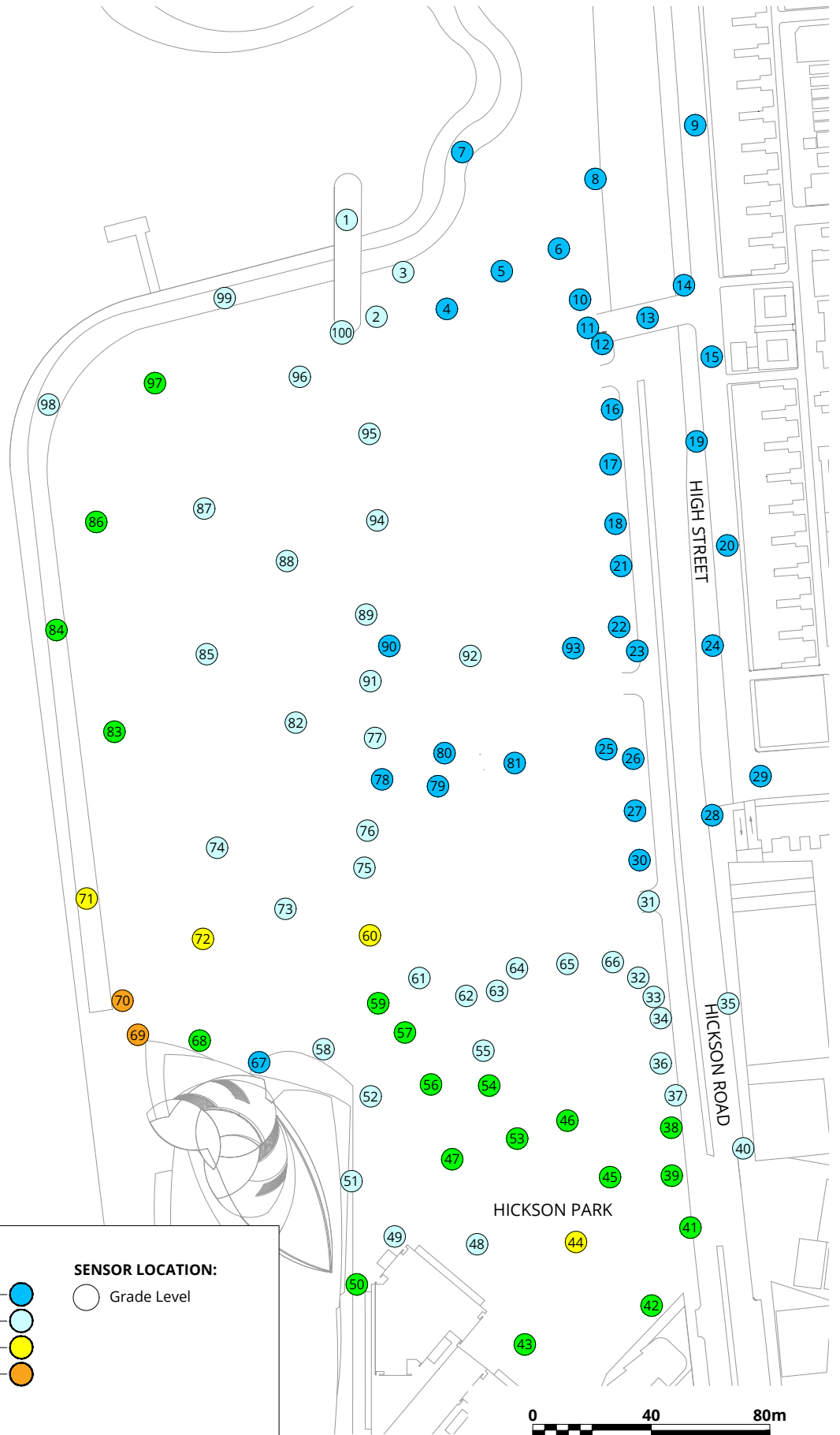


5 REFERENCES

- ASCE Task Committee on Outdoor Human Comfort (2004). *Outdoor Human Comfort and Its Assessment*, 68 pages, American Society of Civil Engineers, Reston, Virginia, USA.
- Australasian Wind Engineering Society (AWES), 2014, "Guidelines for Pedestrian Wind Effects Criteria".
- Australasian Wind Engineering Society, QAM-1, 2019, "Quality Assurance Manual: Wind Engineering Studies of Buildings".
- City of Sydney (1996). "Central Sydney Development Control Plans 1996".
- City of Sydney (2012). "Sydney Development Control Plan 2012".
- City of Sydney (2021). "Central Sydney Planning Strategy 2016-2036".
- Durgin, F. H. (1997). "Pedestrian Level Wind Criteria Using the Equivalent average", *Journal of Wind Engineering and Industrial Aerodynamics*, Vol. 66, pp. 215-226.
- Lawson, T.V. (1973). "Wind Environment of Buildings: A Logical Approach to the Establishment of Criteria", Report No. TVL 7321, Department of Aeronautic Engineering, University of Bristol, Bristol, England.
- Soligo, M.J., Irwin, P.A., and Williams, C.J. (1993). "Pedestrian Comfort Including Wind and Thermal Effects," *Third Asia-Pacific Symposium on Wind Engineering*, Hong Kong.
- Soligo, M.J., Irwin, P.A., Williams, C.J. and Schuyler, G.D. (1998). "A Comprehensive Assessment of Pedestrian Comfort Including Thermal Effects," *Journal of Wind Engineering and Industrial Aerodynamics*, Vol.77&78, pp.753-766.
- Williams, C.J., Hunter, M.A. and Waechter, W.F. (1990). "Criteria for Assessing the Pedestrian Wind Environment," *Journal of Wind Engineering and Industrial Aerodynamics*, Vol.36, pp.811-815.
- Williams, C.J., Soligo M.J. and Cote, J. (1992). "A Discussion of the Components for a Comprehensive Pedestrian Level Comfort Criteria," *Journal of Wind Engineering and Industrial Aerodynamics*, Vol.41-44, pp.2389-2390.
- Williams, C.J., Wu, H., Waechter, W.F., and Baker, H.A. (1999). "Experiences with Remedial Solutions to Control Pedestrian Wind Problems," *Tenth International Conference on Wind Engineering*, Copenhagen, Denmark.
- Wu, H. and Kriksic, F. (2012). "Designing for Pedestrian Comfort in Response to Local Climate", *Journal of Wind Engineering and Industrial Aerodynamics*, Vol.104-106, pp.397-407.
- Wu, H., Williams, C.J., Baker, H.A. and Waechter, W.F. (2004), "Knowledge-based Desk-Top Analysis of Pedestrian Wind Conditions", *ASCE Structure Congress 2004*, Nashville, Tennessee.

A decorative graphic on the left side of the page, featuring a blue triangular shape at the top left and a large, light grey curved shape that overlaps it. The word 'FIGURES' is centered within the grey shape.

FIGURES



LEGEND:

COMFORT CATEGORIES:


- Sitting ———— ●
- Standing ———— ●
- Walking ———— ●
- Uncomfortable ———— ●

SENSOR LOCATION:

- Grade Level

Pedestrian Wind Safety Conditions
 Existing Configuration
 Summer (November to April to October, 6:00 to 23:00)

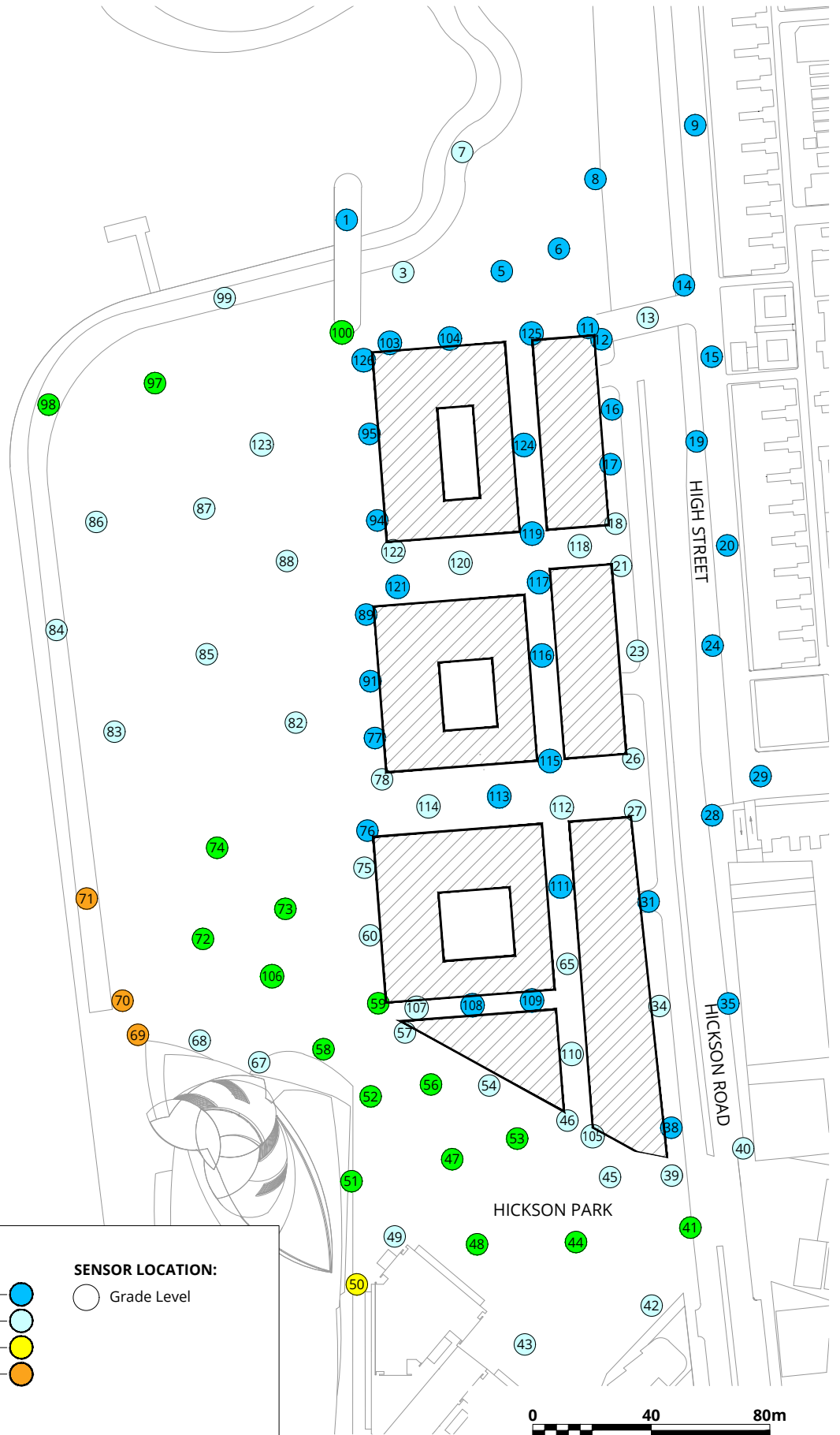
Central Barangaroo - Sydney, NSW

True North


Project #2206532

Drawn by: MBR	Figure: 1A
Approx. Scale: 1:2000	
Date Revised: July 26, 2023	





LEGEND:

COMFORT CATEGORIES:

- Sitting ———— ●
- Standing ———— ●
- Walking ———— ●
- Uncomfortable ———— ●

SENSOR LOCATION:

- Grade Level

Pedestrian Wind Safety Conditions
 Proposed Configuration
 Summer (November to April, 6:00 to 23:00)

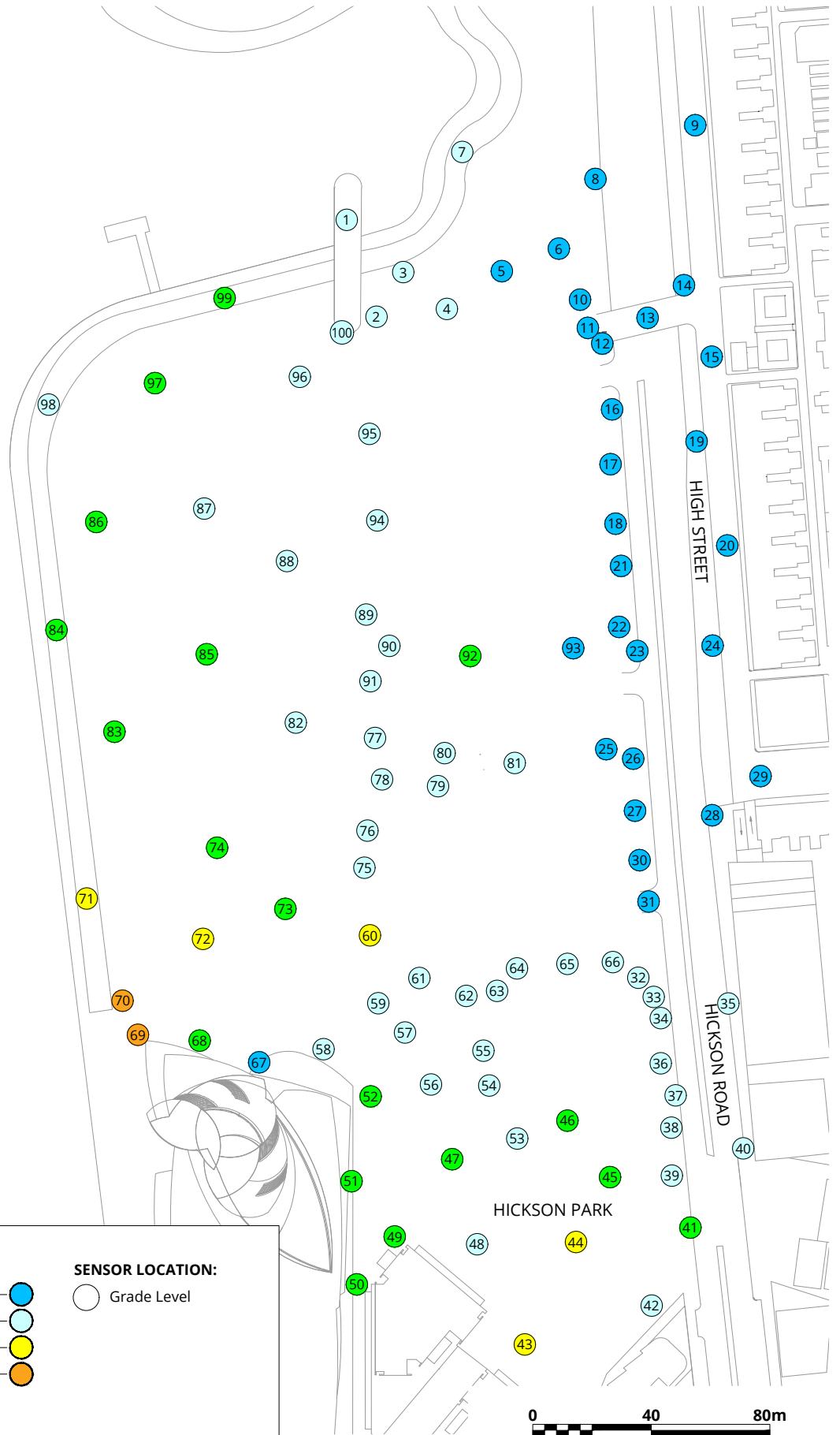
Central Barangaroo - Sydney, NSW



Project #2206532

Drawn by: MBR	Figure: 1B
Approx. Scale: 1:2000	
Date Revised: Nov. 1, 2023	





LEGEND:

COMFORT CATEGORIES:

- Sitting ———— ●
- Standing ———— ●
- Walking ———— ●
- Uncomfortable ———— ●

SENSOR LOCATION:

- Grade Level

Pedestrian Wind Comfort Conditions
 Existing Configuration
 Winter (May to October, 6:00 to 23:00)

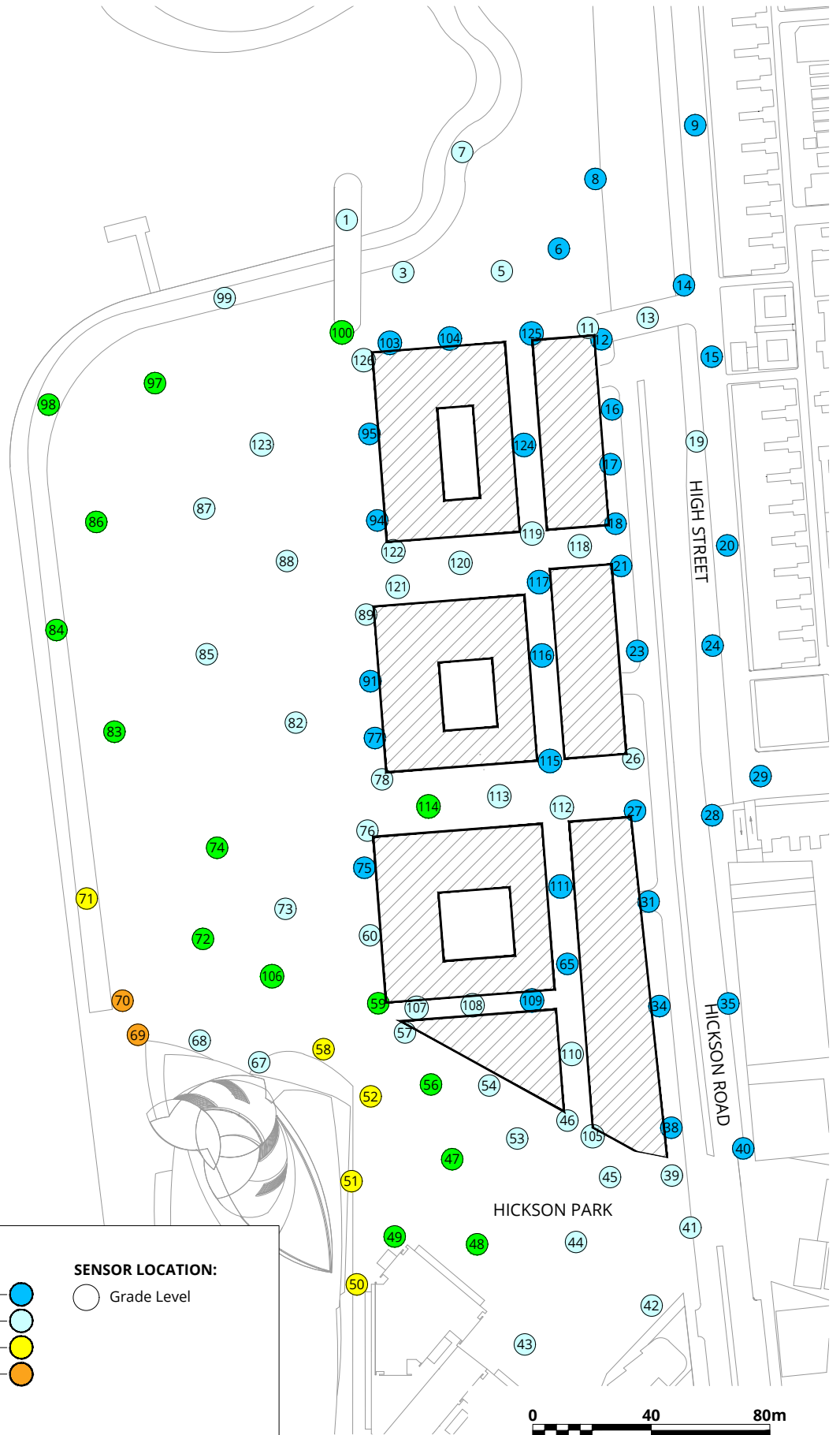
Central Barangaroo - Sydney, NSW



Project #2206532

Drawn by: MBR	Figure: 2A
Approx. Scale: 1:2000	
Date Revised: July 26, 2023	





LEGEND:

COMFORT CATEGORIES:

- Sitting ———— ●
- Standing ———— ●
- Walking ———— ●
- Uncomfortable ———— ●

SENSOR LOCATION:

- Grade Level

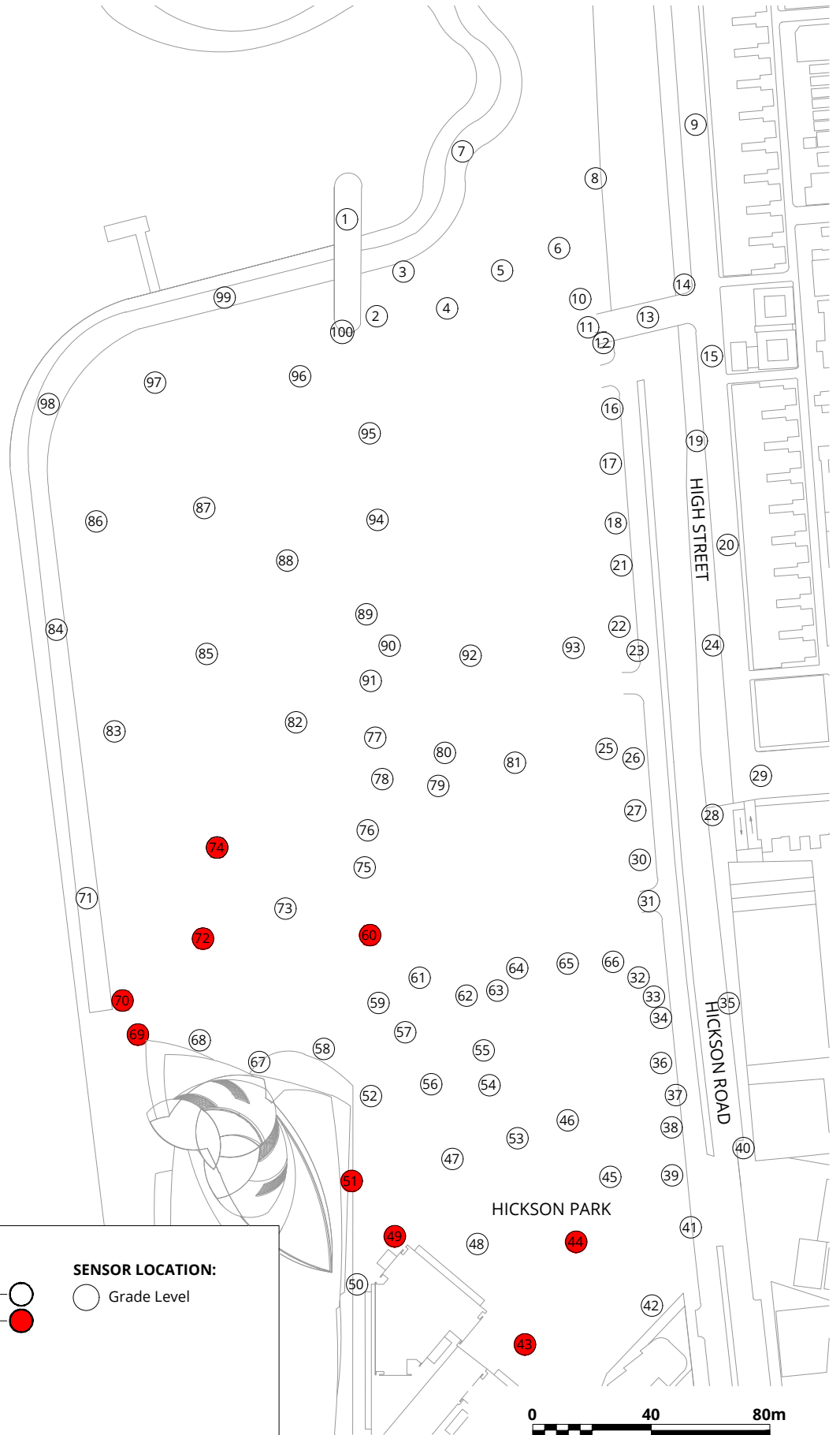
Pedestrian Wind Comfort Conditions
 Proposed Configuration
 Winter (May to October, 6:00 to 23:00)
 Central Barangaroo - Sydney, NSW



Project #2206532

Drawn by: MBR	Figure: 2B
Approx. Scale: 1:2000	
Date Revised: Nov. 1, 2023	





LEGEND:

SAFETY CATEGORIES:

Pass ———— ○

Exceeded ———— ●

SENSOR LOCATION:

○ Grade Level

Pedestrian Wind Safety Conditions
 Existing Configuration
 Annual (January to December, 0:00 to 23:00)

Central Barangaroo - Sydney, NSW



Project #2206532

Drawn by: MBR	Figure: 3A
Approx. Scale: 1:2000	
Date Revised: July 26, 2023	





LEGEND:

SAFETY CATEGORIES:

Pass ———— ○

Exceeded ———— ●

SENSOR LOCATION:

○ Grade Level

Pedestrian Wind Safety Conditions
 Proposed Configuration
 Annual (January to December, 6:00 to 22:00)

Central Barangaroo - Sydney, NSW



Project #2206532

Drawn by: MBR	Figure: 3B
Approx. Scale: 1:2000	
Date Revised: Nov. 1, 2023	



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TABLES

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
1	Existing	11	Standing	12	Standing	64	Pass
	Proposed	10	Sitting	12	Standing	57	Pass
2	Existing	11	Standing	12	Standing	63	Pass
	Proposed	5	Sitting	4	Sitting	21	Pass
3	Existing	11	Standing	12	Standing	62	Pass
	Proposed	12	Standing	14	Standing	84	Exceeded
4	Existing	10	Sitting	12	Standing	59	Pass
	Proposed	4	Sitting	4	Sitting	17	Pass
5	Existing	9	Sitting	10	Sitting	56	Pass
	Proposed	10	Sitting	11	Standing	66	Pass
6	Existing	8	Sitting	9	Sitting	52	Pass
	Proposed	10	Sitting	10	Sitting	59	Pass
7	Existing	9	Sitting	11	Standing	60	Pass
	Proposed	11	Standing	12	Standing	65	Pass
8	Existing	7	Sitting	8	Sitting	45	Pass
	Proposed	8	Sitting	9	Sitting	45	Pass
9	Existing	8	Sitting	9	Sitting	55	Pass
	Proposed	7	Sitting	8	Sitting	47	Pass
10	Existing	8	Sitting	9	Sitting	50	Pass
	Proposed	4	Sitting	4	Sitting	19	Pass
11	Existing	8	Sitting	9	Sitting	48	Pass
	Proposed	9	Sitting	11	Standing	69	Pass
12	Existing	7	Sitting	8	Sitting	47	Pass
	Proposed	9	Sitting	7	Sitting	41	Pass
13	Existing	6	Sitting	7	Sitting	44	Pass
	Proposed	12	Standing	12	Standing	58	Pass
14	Existing	6	Sitting	7	Sitting	48	Pass
	Proposed	8	Sitting	9	Sitting	59	Pass
15	Existing	6	Sitting	8	Sitting	55	Pass
	Proposed	7	Sitting	8	Sitting	52	Pass
16	Existing	8	Sitting	9	Sitting	47	Pass
	Proposed	8	Sitting	8	Sitting	37	Pass
17	Existing	7	Sitting	8	Sitting	43	Pass
	Proposed	9	Sitting	8	Sitting	40	Pass
18	Existing	7	Sitting	8	Sitting	45	Pass
	Proposed	12	Standing	9	Sitting	51	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
19	Existing	5	Sitting	7	Sitting	47	Pass
	Proposed	8	Sitting	11	Standing	70	Pass
20	Existing	6	Sitting	8	Sitting	53	Pass
	Proposed	6	Sitting	9	Sitting	59	Pass
21	Existing	8	Sitting	8	Sitting	43	Pass
	Proposed	12	Standing	9	Sitting	47	Pass
22	Existing	8	Sitting	9	Sitting	45	Pass
	Proposed	5	Sitting	5	Sitting	22	Pass
23	Existing	9	Sitting	9	Sitting	48	Pass
	Proposed	11	Standing	8	Sitting	46	Pass
24	Existing	6	Sitting	7	Sitting	44	Pass
	Proposed	9	Sitting	9	Sitting	56	Pass
25	Existing	9	Sitting	10	Sitting	50	Pass
	Proposed	4	Sitting	4	Sitting	19	Pass
26	Existing	10	Sitting	9	Sitting	46	Pass
	Proposed	12	Standing	11	Standing	63	Pass
27	Existing	10	Sitting	10	Sitting	46	Pass
	Proposed	12	Standing	10	Sitting	51	Pass
28	Existing	9	Sitting	10	Sitting	60	Pass
	Proposed	10	Sitting	9	Sitting	44	Pass
29	Existing	9	Sitting	10	Sitting	68	Pass
	Proposed	9	Sitting	8	Sitting	40	Pass
30	Existing	10	Sitting	10	Sitting	48	Pass
	Proposed	4	Sitting	4	Sitting	17	Pass
31	Existing	11	Standing	10	Sitting	52	Pass
	Proposed	10	Sitting	8	Sitting	45	Pass
32	Existing	12	Standing	11	Standing	57	Pass
	Proposed	4	Sitting	4	Sitting	17	Pass
33	Existing	13	Standing	12	Standing	58	Pass
	Proposed	6	Sitting	5	Sitting	28	Pass
34	Existing	12	Standing	12	Standing	59	Pass
	Proposed	12	Standing	10	Sitting	46	Pass
35	Existing	12	Standing	12	Standing	58	Pass
	Proposed	10	Sitting	8	Sitting	41	Pass
36	Existing	13	Standing	13	Standing	61	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
	Proposed	4	Sitting	4	Sitting	18	Pass
37	Existing	13	Standing	13	Standing	65	Pass
	Proposed	4	Sitting	4	Sitting	20	Pass
38	Existing	15	Strolling	14	Standing	68	Pass
	Proposed	10	Sitting	8	Sitting	48	Pass
39	Existing	15	Strolling	14	Standing	69	Pass
	Proposed	12	Standing	11	Standing	52	Pass
40	Existing	12	Standing	12	Standing	63	Pass
	Proposed	11	Standing	10	Sitting	48	Pass
41	Existing	16	Strolling	15	Strolling	71	Pass
	Proposed	15	Strolling	13	Standing	62	Pass
42	Existing	15	Strolling	14	Standing	64	Pass
	Proposed	13	Standing	12	Standing	59	Pass
43	Existing	16	Strolling	19	Walking	85	Exceeded
	Proposed	12	Standing	11	Standing	56	Pass
44	Existing	18	Walking	18	Walking	89	Exceeded
	Proposed	15	Strolling	14	Standing	64	Pass
45	Existing	17	Strolling	16	Strolling	81	Pass
	Proposed	13	Standing	13	Standing	65	Pass
46	Existing	16	Strolling	15	Strolling	74	Pass
	Proposed	13	Standing	11	Standing	56	Pass
47	Existing	16	Strolling	15	Strolling	70	Pass
	Proposed	17	Strolling	17	Strolling	77	Pass
48	Existing	14	Standing	14	Standing	68	Pass
	Proposed	16	Strolling	15	Strolling	73	Pass
49	Existing	14	Standing	17	Strolling	84	Exceeded
	Proposed	14	Standing	17	Strolling	86	Exceeded
50	Existing	17	Strolling	15	Strolling	65	Pass
	Proposed	19	Walking	19	Walking	84	Exceeded
51	Existing	13	Standing	17	Strolling	93	Exceeded
	Proposed	15	Strolling	18	Walking	100	Exceeded
52	Existing	14	Standing	16	Strolling	75	Pass
	Proposed	16	Strolling	19	Walking	88	Exceeded
53	Existing	15	Strolling	13	Standing	64	Pass
	Proposed	15	Strolling	13	Standing	63	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
54	Existing	15	Strolling	13	Standing	63	Pass
	Proposed	14	Standing	12	Standing	60	Pass
55	Existing	14	Standing	13	Standing	62	Pass
	Proposed	6	Sitting	5	Sitting	25	Pass
56	Existing	15	Strolling	14	Standing	66	Pass
	Proposed	16	Strolling	16	Strolling	75	Pass
57	Existing	15	Strolling	14	Standing	67	Pass
	Proposed	13	Standing	13	Standing	71	Pass
58	Existing	13	Standing	13	Standing	61	Pass
	Proposed	15	Strolling	18	Walking	79	Pass
59	Existing	15	Strolling	14	Standing	69	Pass
	Proposed	15	Strolling	16	Strolling	76	Pass
60	Existing	19	Walking	20	Walking	98	Exceeded
	Proposed	14	Standing	13	Standing	74	Pass
61	Existing	14	Standing	14	Standing	72	Pass
	Proposed	4	Sitting	4	Sitting	21	Pass
62	Existing	13	Standing	13	Standing	60	Pass
	Proposed	4	Sitting	3	Sitting	15	Pass
63	Existing	13	Standing	13	Standing	59	Pass
	Proposed	5	Sitting	4	Sitting	20	Pass
64	Existing	12	Standing	12	Standing	58	Pass
	Proposed	5	Sitting	4	Sitting	20	Pass
65	Existing	12	Standing	12	Standing	59	Pass
	Proposed	11	Standing	10	Sitting	51	Pass
66	Existing	11	Standing	11	Standing	55	Pass
	Proposed	4	Sitting	4	Sitting	17	Pass
67	Existing	9	Sitting	8	Sitting	51	Pass
	Proposed	12	Standing	13	Standing	67	Pass
68	Existing	15	Strolling	16	Strolling	82	Pass
	Proposed	14	Standing	13	Standing	64	Pass
69	Existing	25	Uncomfortable	23	Uncomfortable	91	Exceeded
	Proposed	23	Uncomfortable	22	Uncomfortable	91	Exceeded
70	Existing	23	Uncomfortable	22	Uncomfortable	89	Exceeded
	Proposed	23	Uncomfortable	22	Uncomfortable	91	Exceeded
71	Existing	19	Walking	19	Walking	83	Pass
	Proposed	21	Uncomfortable	20	Walking	88	Exceeded

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
72	Existing	18	Walking	19	Walking	90	Exceeded
	Proposed	17	Strolling	16	Strolling	84	Exceeded
73	Existing	13	Standing	15	Strolling	83	Pass
	Proposed	15	Strolling	13	Standing	76	Pass
74	Existing	14	Standing	17	Strolling	90	Exceeded
	Proposed	15	Strolling	15	Strolling	85	Exceeded
75	Existing	11	Standing	13	Standing	76	Pass
	Proposed	11	Standing	10	Sitting	60	Pass
76	Existing	11	Standing	13	Standing	76	Pass
	Proposed	9	Sitting	13	Standing	87	Exceeded
77	Existing	11	Standing	13	Standing	72	Pass
	Proposed	8	Sitting	9	Sitting	52	Pass
78	Existing	10	Sitting	12	Standing	74	Pass
	Proposed	12	Standing	14	Standing	78	Pass
79	Existing	10	Sitting	12	Standing	73	Pass
	Proposed	5	Sitting	4	Sitting	20	Pass
80	Existing	10	Sitting	11	Standing	69	Pass
	Proposed	5	Sitting	4	Sitting	22	Pass
81	Existing	10	Sitting	11	Standing	63	Pass
	Proposed	4	Sitting	4	Sitting	18	Pass
82	Existing	11	Standing	14	Standing	75	Pass
	Proposed	11	Standing	11	Standing	58	Pass
83	Existing	17	Strolling	17	Strolling	83	Pass
	Proposed	14	Standing	15	Strolling	86	Exceeded
84	Existing	17	Strolling	17	Strolling	77	Pass
	Proposed	14	Standing	16	Strolling	80	Pass
85	Existing	14	Standing	15	Strolling	79	Pass
	Proposed	12	Standing	13	Standing	77	Pass
86	Existing	16	Strolling	16	Strolling	77	Pass
	Proposed	14	Standing	15	Strolling	74	Pass
87	Existing	11	Standing	12	Standing	62	Pass
	Proposed	11	Standing	12	Standing	71	Pass
88	Existing	12	Standing	14	Standing	74	Pass
	Proposed	11	Standing	11	Standing	60	Pass
89	Existing	11	Standing	12	Standing	68	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
	Proposed	8	Sitting	12	Standing	79	Pass
90	Existing	10	Sitting	12	Standing	67	Pass
	Proposed	6	Sitting	5	Sitting	23	Pass
91	Existing	11	Standing	13	Standing	65	Pass
	Proposed	8	Sitting	9	Sitting	52	Pass
92	Existing	14	Standing	15	Strolling	69	Pass
	Proposed	5	Sitting	4	Sitting	19	Pass
93	Existing	9	Sitting	10	Sitting	56	Pass
	Proposed	5	Sitting	4	Sitting	19	Pass
94	Existing	11	Standing	13	Standing	66	Pass
	Proposed	7	Sitting	10	Sitting	64	Pass
95	Existing	11	Standing	13	Standing	66	Pass
	Proposed	7	Sitting	9	Sitting	62	Pass
96	Existing	13	Standing	13	Standing	73	Pass
	Proposed	-	-	-	-	-	-
97	Existing	15	Strolling	16	Strolling	72	Pass
	Proposed	15	Strolling	15	Strolling	73	Pass
98	Existing	13	Standing	13	Standing	63	Pass
	Proposed	17	Strolling	17	Strolling	70	Pass
99	Existing	13	Standing	15	Strolling	71	Pass
	Proposed	14	Standing	14	Standing	69	Pass
100	Existing	11	Standing	13	Standing	64	Pass
	Proposed	15	Strolling	16	Strolling	79	Pass
101	Existing	-	-	-	-	-	-
	Proposed	-	-	-	-	-	-
102	Existing	-	-	-	-	-	-
	Proposed	-	-	-	-	-	-
103	Existing	-	-	-	-	-	-
	Proposed	10	Sitting	8	Sitting	55	Pass
104	Existing	-	-	-	-	-	-
	Proposed	9	Sitting	9	Sitting	55	Pass
105	Existing	-	-	-	-	-	-
	Proposed	12	Standing	13	Standing	64	Pass
106	Existing	-	-	-	-	-	-
	Proposed	17	Strolling	16	Strolling	75	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
107	Existing Proposed	14	Standing	11	Standing	72	Pass
108	Existing Proposed	9	Sitting	11	Standing	58	Pass
109	Existing Proposed	7	Sitting	9	Sitting	59	Pass
110	Existing Proposed	11	Standing	11	Standing	53	Pass
111	Existing Proposed	8	Sitting	8	Sitting	39	Pass
112	Existing Proposed	11	Standing	12	Standing	60	Pass
113	Existing Proposed	10	Sitting	12	Standing	69	Pass
114	Existing Proposed	11	Standing	15	Strolling	91	Exceeded
115	Existing Proposed	8	Sitting	9	Sitting	62	Pass
116	Existing Proposed	7	Sitting	8	Sitting	45	Pass
117	Existing Proposed	6	Sitting	8	Sitting	48	Pass
118	Existing Proposed	12	Standing	12	Standing	61	Pass
119	Existing Proposed	10	Sitting	11	Standing	64	Pass
120	Existing Proposed	12	Standing	14	Standing	81	Pass
121	Existing Proposed	10	Sitting	11	Standing	69	Pass
122	Existing Proposed	11	Standing	13	Standing	78	Pass
123	Existing Proposed	11	Standing	11	Standing	63	Pass
124	Existing Proposed	10	Sitting	9	Sitting	49	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
125	Existing Proposed	9	Sitting	9	Sitting	50	Pass
126	Existing Proposed	7	Sitting	12	Standing	79	Pass

Season	Months	Hours	Comfort Speed (km/h)	Safety Speed (km/h)
Summer	November - April	6:00 - 23:00 for comfort	(20% Seasonal Exceedance)	(0.1% Annual Exceedance)
Winter	May - October	6:00 - 23:00 for comfort	≤ 10 Sitting	≤ 83 Pass
Annual	January - December	0:00 - 23:00 for safety	11 - 14 Standing	> 83 Exceeded
Configurations			15 - 17 Strolling	
Existing	Existing site and surrounds		18 - 20 Walking	
Proposed	Study building with existing surrounds		> 20 Uncomfortable	