Attachment A24

RFI Response - 20 January 2022
757-763 George Street, Haymarket

20 January 2021

Graham Jahn
Director of City Planning, Development and Transport
City of Sydney
Town Hall House
Level 2, 456 Kent Street,
SYDNEY, NSW 2000

Attention: Sally Peters

Dear Sally,

RE: RESPONSE TO REQUEST FOR FURTHER INFORMATION – 757 – 763 GEORGE STREET, HAYMARKET

This letter has been prepared on behalf of Samprian Pty Ltd (the Applicant) in relation to their land at 757 – 763 George Street, Haymarket (the site). The site is the subject of a Planning Proposal (PP ref no PP-2020-1110.) that seeks to amend the height of buildings and floor space ratio (FSR) development standards that apply to the site under the *Sydney Local Environmental Plan 2012* (Sydney LEP 2012). The purpose of this letter is to respond to the matters raised by the City of Sydney (Council) in their Request for Information letter dated 12 November 2022.

The Planning Proposal for site was submitted to Council on 31 October 2020 and seeks to facilitate the delivery of a commercial / hotel tower that adaptively reuses the heritage item contained within the site. Since the lodgement of the application, the Applicant has worked in close consultation with Council to revise the design and address a range of concerns.

This letter should be read in conjunction with the following supporting attachments:

- Architectural design response package prepared by Grimshaw (**Attachment 1**)
- Wind Impact Assessment Prepared by Windtech (**Attachment 2**)

A response to each of the issues raised is set out in the sections below.

1. Wind results

Issue (summary): *The proposed envelope results in a windy environment, including two locations with a wind comfort rating of 'uncomfortable' and an exceedance of the wind safety standard. While meeting the average wind criteria is important, it is not the sole determinant of an appropriate response to wind. Accordingly, it is recommended that additional wind testing is undertaken to identify opportunities for wind mitigation including amending the planning envelope geometry, to help calm these locations.*

Response

Council identified that two testing locations fail to meet the wind comfort rating and exceed the wind safety standard. These testing point locations consist of **Point 10** and **Point 12** which are identified in **Figure 1** below.

Section 5.1.9 of the draft CSPS DCP contains the relevant controls relating to required wind comfort and safety levels. Windtech previously conducted a revised wind study and compared the results against two sets of criteria: one for pedestrian safety, and one for pedestrian comfort. The wind testing and analysis of results were conducted in line with a template supplied by Council in their correspondence dated 25 March 2021 and Procedure B, Schedule 11 of the draft CSPS DCP. The testing points within the surrounding public domain tested were approved by Council in their email correspondence dated 29 July 2021.

The wind testing results conclude that Points 10 and 12, as shown in **Figure 1** below, exceed the relevant criteria thereby resulting in a minor non-compliance with Section 5.1.9. Specifically:

- Point 10 provides a minor exceedance to the wind speed comfort criteria; and
- Point 12 provides a minor exceedance to the wind speed and safety criteria.

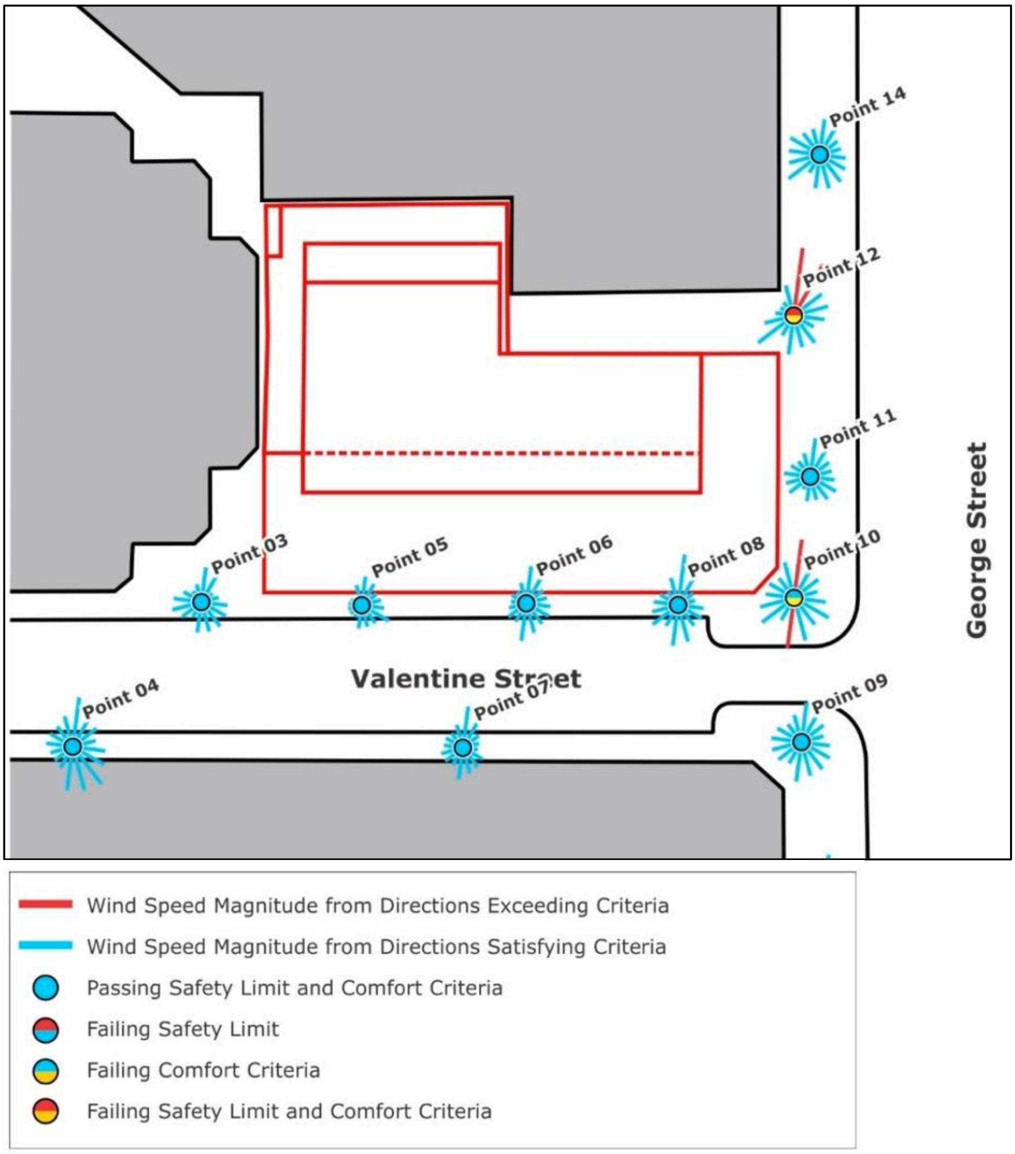


Figure 1 – Wind testing locations and compliance with wind comfort and safety criteria

Notwithstanding the above, the proposal complies with Procedure B, Schedule 11. Schedule 11, Procedure B(4) requires that proposals when compared against a compliant base case envelope are 'to demonstrate equivalent (improved) wind comfort, wind safety and daylight levels in adjacent Public Places relative to the base case building massing. For wind speed the comfort values should be averaged and compared. When averaged, the proposal, relative to a complying base case, complies with the wind speed comfort and wind speed and safety criteria.

Notwithstanding this, in response to Council's letter dated 12 November 2021 and Section 5.1.9 of the draft CSPS DCP, the following is provided:

- Windtech have undertaken further wind testing (**Appendix 2**) to assess whether the proposal is capable of complying with Section 5.1.9. The results confirm that the proposal, and specifically Points 10 and 12, is capable of achieving full compliance with the applicable wind provisions subject to minor design changes and mitigation measures, including the existing heritage awning and a small building chamfer along the north-eastern corner of the podium. These are discussed further below.

- As confirmed at the meeting with Council on 30 November 2021, where awnings are expected to be retained or be constructed, the wind mitigation effects of these awnings may be factored into the wind tunning testing.

- The updated wind testing consisted of a re-test of all 18 study points and accounted for the **existing awning associated with the heritage listed Sutton Forest Meat Building** at 757 – 759 George Street which is not proposed for removal and is expected to remain in perpetuity.

- The preferred envelope incorporated the wind mitigation design measures recommended by Windtech which included small **building chamfer** which is shown in green below in **Figure 1**. This area has already been removed in the indicative scheme and as such would not have an impact on the available FSR.

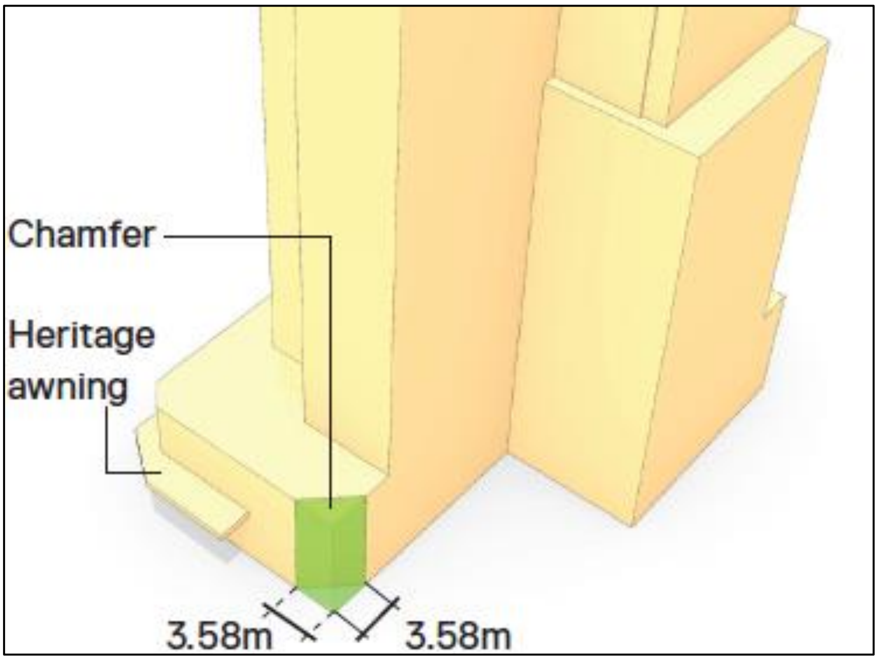


Figure 1: Podium Chamfer (Source: Grimshaw)

- Testing was performed for two massing variations of the development, which are denoted by the following scenarios:
  - With the existing surrounding buildings and the inclusion of the **Base Case** Massing with the heritage awning. In this report, this test case is referred to as the "Base Case".
  - With the existing surrounding buildings and the inclusion of the **Proposed Case** Massing with the heritage awning and a small building chamfer along the north-eastern corner of the podium. In this report, this test case is referred to as the "Proposed Case".

- This chamfer can be accommodated within the proposed site-specific DCP envelope and readily included within the detailed design at the design competition phase. Further, with this chamfer the scheme continues to comply with the daylight / skyview factor testing requirements of Schedule.
- With the existing surrounding buildings and the inclusion of the Proposed Case massing with the heritage awning and a small building chamfer along the north-eastern corner of the podium, the results of the study demonstrate that wind conditions for all trafficable outdoor locations within and around the development will be suitable for their intended uses and comply with Section 5.1.9.
- Subject to Council's review of the updated wind testing, the site-specific DCP will be updated to require that a future detailed design satisfy the wind provisions set out in the site specific DCP. It is requested that the proposed DCP envelope and preferred scheme to not incorporate the recommended podium chamber in order to give architectural consortiums flexibility at the design competition phase. Instead, the site-specific DCP wind provisions will provide Council with surety that the detailed design at the design competition phase will satisfy Council's relevant wind criterion. It is noted that this approach is consistent with the proposal for 187 Thomas Street which was supported by Council to proceed to Gateway Determination.

  The site-specific DCP provisions would consist of the following:

  1) *A qualitative wind effects report is to be submitted with a detailed development application for the subject site.*
  2) *The quantitative wind effects report is to demonstrate that the proposed development will not:*
     a) *Cause a wind speed that exceeds the Wind Safety Standard, the Wind Comfort Standard for Walking and the Wind Comfort Standard for Sitting in Parks Except where the existing wind speeds exceed the standard; and*
     b) *Worsen, by increasing spatial extent and/or frequency and/or speed, an existing wind speed that exceeds the Wind Safety Standard, the Wind Comfort Standard for Walking and the Wind Comfort Standard for Siting in Parks.*
  3) *The quantitative wind effects report is further to demonstrate that the proposed development incorporates all reasonable measures to create a comfortable wind environment that is consistent with the Wind Comfort Standards for Sitting and Standing.*

  Wind Safety Standard is an annual maximum peak 0.5 second gust wind speed in one hour measured between 6am to 10pm Eastern Standard Time of 24m per second.

  Wind Comfort Standard for Walking is an hourly mean wind speed, or gust equivalent mean wind speed, whichever is greater for each wind direction, for no more than 292 hours per annum measured between 6am and 10pm Eastern Standard Time (i.e. 5% of those hours) of 8m per second.

In light of the above, the proposed envelope; wind mitigation measures; and site-specific DCP provisions provide assurance that the future development of the site in accordance with the Planning Proposal envelope is capable of achieving compliance with the wind criteria under Section 5.1.9 of the DCP. The site-specific DCP and recommended mitigation measures provide adequate guidance to inform design at the design competition and detailed DA phases.

2. Planning envelope

Issue (summary): *Overall, the revised planning envelope is highly constrained and does not include sufficient flexibility to address environmental amenity issues. In particular, the planning envelope does not meet the architectural articulation quotient of include a suitable façade zone as required by the draft Central Sydney DCP.*

In the amended information, the locations identified as architectural articulation are not actually located within the proposed envelope and therefore cannot be accepted. It is recommended that a minimum of 15% architectural articulation is included within the proposed planning envelope, calculated per floor to ensure there is sufficient flexibility within the envelope on each floor, not volumetrically. Further an appropriate façade zone for sun shading is to be included.

Response

The proposed DCP envelope as submitted alongside the RFI Response dated 22 February 2021 reflects Council's preferred setbacks. In accordance with Council's letter dated 22 February 2021, the northern setback has been revised to reflect the setbacks provided by Capitol Terrace to the immediate north. At its narrowest point, the northern setback to the common boundary reaches 1.6m. Capitol Terrace provides 1.2m setback to its boundary. Combined, the total building separation amounts to a minimum of 2.8m.

The amendments to the northern setback were discussed and supported by Council in written email correspondence dated 2 June 2021 subject to environmental amenity testing.

The scheme incorporates an **articulation zone of 11% which includes a zone for shading devices and the like**. The proposed articulation zones do represent a non-compliance with *Section 3.3 – Design Excellence and Competitive Design Processes* dated February 2020.

Notwithstanding this, the scheme complies with the articulation requirements set out in the *Draft Guideline for Site Specific Planning Proposal's* in Central Sydney (considered at the Council meeting held 14th December 2020) (Schedule 12). The articulation requirements set out in this guideline superseded the former controls dated February 2020 (Schedule 11). However, due to the date of lodgement, it is acknowledged that the Planning Proposal is subject to the *Design Excellence and Competitive Design Processes* dated February 2020.

In accordance with Council's request, Grimshaw has undertaken a **comparative analysis** against the new *Draft Guideline for Site Specific Planning Proposal's* (Schedule 12) as provided in **Appendix 1**. As demonstrated in the analysis, the benefits to be achieved through the application of the articulation requirements under Schedule 12 would be nominal. Further, this would only serve to deliver an impracticable design and development outcome given the geometry and constraints of the site.

As provided below and demonstrated in the Grimshaw design package, 11% articulation is considered acceptable for proposal given the characteristic of the site and design outcomes achievable. Enforcing any further articulation zone required would be unreasonable and would negatively impact the development, without any tangible benefit to the design. The proposed articulation is considered acceptable for the following reasons:

- The proposed 11% design articulation provides a reasonable zone for articulation within the future design excellence competitions, while protecting the minimally viable scheme and the objectives of the CSPS.
- Given the nature of the site and inherent constraints, the proposed envelope already includes inbuilt architectural articulation. This articulation is largely a result of the increased setbacks incorporated into the building through the Planning Proposal process. Specifically, the proposed DCP envelope, prior to the subtraction of the required architectural articulation, adopts the following:
    - Articulation and separation from heritage building

- Separation from 187 Thomas Street
- Notch for daylight access to Capitol terrace apartments
- Building separation and easement articulation

Furthermore, as outlined in the Architectural Design Report of the Planning Proposal, the envelope is capable of supporting either a DGU or a Closed Cavity Façade System without the inclusion of a 15% articulation zone.

- Accommodating a 15% articulation zone would result in significantly smaller floor plates which are unreasonably restrictive in size and functionality. For this reason, the inclusion of a 15% articulation zone (750mm shade structure zone) would result in an inferior design outcome and would constrain the opportunity to achieve design excellence at the design competition phase. This would also result in floor plate sizes which are not economically viable and capable of attracting a range of potential commercial tenants. Therefore, imposing such a control would only serve to significantly burden the future development of the site, with nominal architectural benefit to be gained.
- The reduction in FSR would constrain the opportunity for the scheme to deliver additional employment generating floor space. This is contrary to the objectives of the CSPS. The objectives of the CSPS are articulated via a range of 'key moves'. 'Key Move 4' identifies that the revised controls aim to '*provide for employment growth is new tower clusters*'. The proposal seeks to facilitate a hotel which is a commercial land use. The Economic Impact Assessment that accompanied the Planning Proposal identifies that the proposal will contribute to the creation of 127 jobs and $8.5 million of indirect investment. A reduction in FSR from 12:1 to ~8:1 would reduce both the amount of jobs the proposal would create and the amount of indirect investment.

As identified above and in the attached, the site presents a unique scenario whereby the site size, geometry and heritage item result in a scenario where a full application of the relevant articulation controls would significantly hinder the opportunity for the future development of the site to achieve the objectives and intended outcomes of the draft CSPS. As such, there must be reasonable consideration of these outcomes in determining a level of dispensation against these, now superseded, controls in order to deliver a viable development.

In light of the above, the proposed articulation zones and variation to the DCP demonstrate an acceptable outcome in the context of the site characteristics and would continue to facilitate a design capable of achieving design excellence as well as the objectives of the CSPS.

3. Public benefit offer

Issue: *Your public benefit offer of a community infrastructure contribution in accordance with rates in the City's Guideline is currently being considered by the City. However, it is noted that as part of the Central Sydney Planning framework, contributions shifted to a broad and integrated infrastructure contribution as the preferred option, rather than one linked to uplift. As such, the draft Central Sydney Contributions Plan has since replaced community infrastructure contributions for planning proposals.*

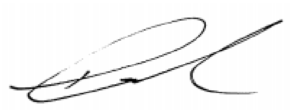
An infrastructure contribution in line with the draft Contributions Plan will help the City deliver essential public domain upgrades in Central Sydney, particularly along George and Quay Streets and at Railway Square. A monetary contribution consistent with the draft Central Sydney Contribution Plan of 3% capital investment value, offered payable prior to construction certificate, is recommended for consideration in a revised public benefit offer. The public benefit is the earlier timing compared to the current COVID direction allowing for contributions to be paid before OC.

Response

It is acknowledged that the proposal is now subject to the *draft Central Sydney Contributions Plan* and that a monetary contribution consistent with this plan of 3% capital investment value is required and. Subject to the resolution of the above matters, a revised public benefit offer will be forthcoming.

We trust the information provided as part of this response fully satisfies Council's queries as raised in their letter dated 12 November 2022. Should you wish to discuss, please do not hesitate to contact the undersigned.

Yours sincerely



Tom Cook

Director

757-763 George Street
Sydney

1230

Response to RFI
20 January—2022

GRIMSHAW

01 - Wind results

Council comment:

Two locations with a wind comfort rating of 'uncomfortable' and an exceedance of the wind safety standard.

Suggestion:

1231

Additional wind testing to identify opportunities for wind mitigation, including amending the planning envelope's geometry to help calm these locations.

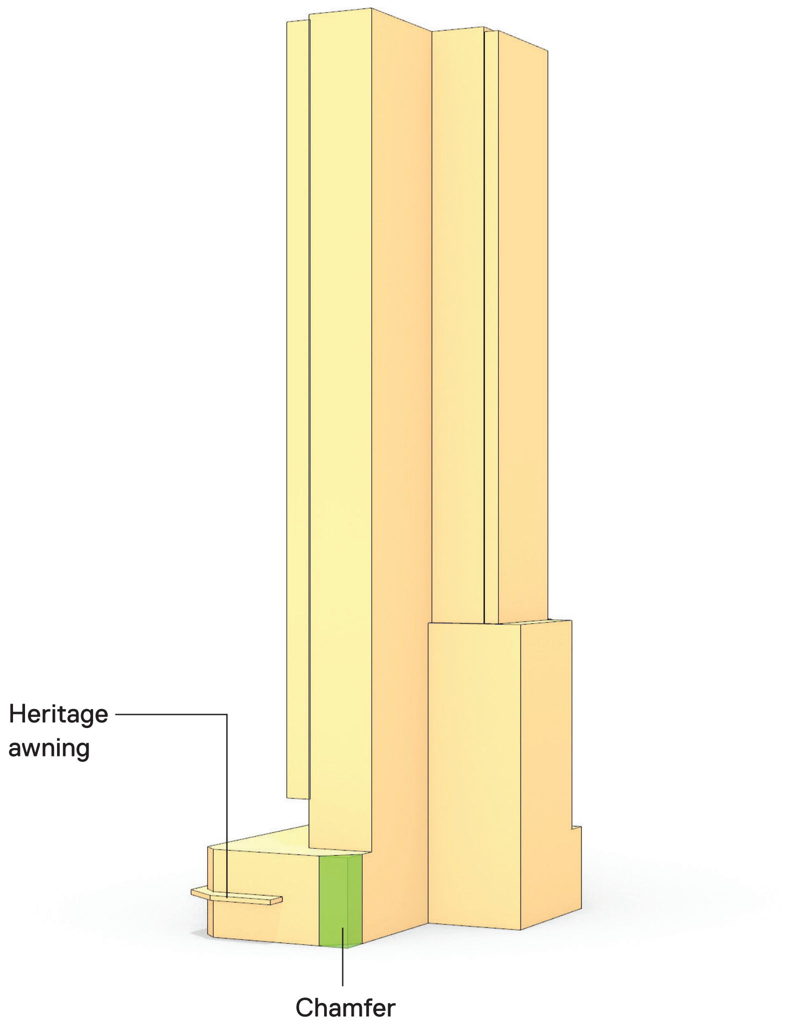
01 - Wind results

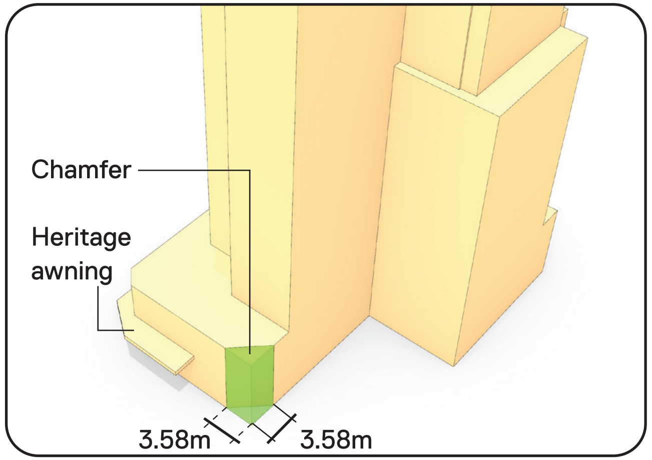
As requested by Council we have undergone further wind tunnel testing to prove how the envelope can achieve compliance and eliminate the minor exceedences to Points 10 and 12.

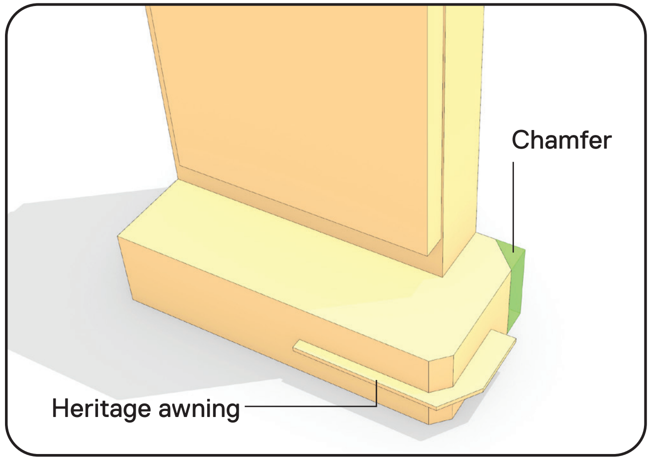
Windtech's study proved that Point 10 will be pass with the inclusion of the heritage awning above.

For Point 12, a small chamfer at the podium level of 3.58m x 3.58m is enough to make the test point compliant. It is worth noting that this area has already been removed in the indicative scheme and as such would not have an impact on the available FSR.

1232







02 - Planning envelope

Council comment:

The revised planning envelope is highly constrained and does not include sufficient flexibility to address environmental amenity issues… the planning envelope does not meet the architectural articulation quotient or include a suitable façade zone as required by the draft Central Sydney DCP.

1233

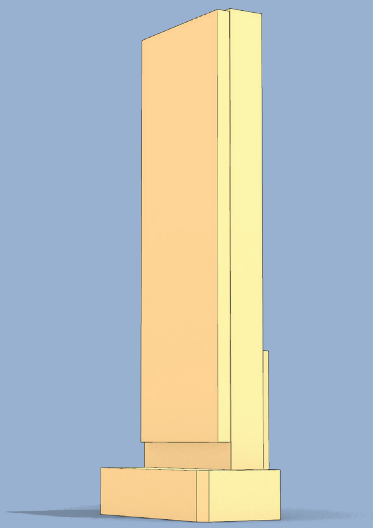
Suggestion:

The planning envelope should be further revised and resubmitted to the City for assessment. It is recommended this revised envelope include a lower GFA that would provide the flexibility to respond to the above issues and accommodate sufficient setbacks to the northern boundary that would protect the amenity of your hotel should the adjoining site redevelop in the future.

Proposed DCP Envelope

- → 11% Articulation
- → 12:1 FSR
- → 12,243 m² GFA (above ground)
- → 147 m² GFA (below ground)

1234



SITE AREA (m²)	1,030.7	
TOTAL GBA (m²)	16,830	
TOTAL GFA (m²)	12,243	ABOVE GROUND
FSR (X:1)	11.88	ABOVE GROUND
TOTAL GFA (m²)	147	BELOW GROUND
FSR (X:1)	0.14	BELOW GROUND
TYPICAL NLA (m²)	315	
TOTAL NLA (m²)	10,931	
ENVELOPE ARTICULATION	11.0%	
BUILDING LEVELS	32	
BUILDING HEIGHT (RL)	117.87	
BUILDING HEIGHT	114.87	
ENVELOPE ARTICULATION (%)[1]	11.0	
ENVELOPE ARTICULATION (m³)	7,280.82	

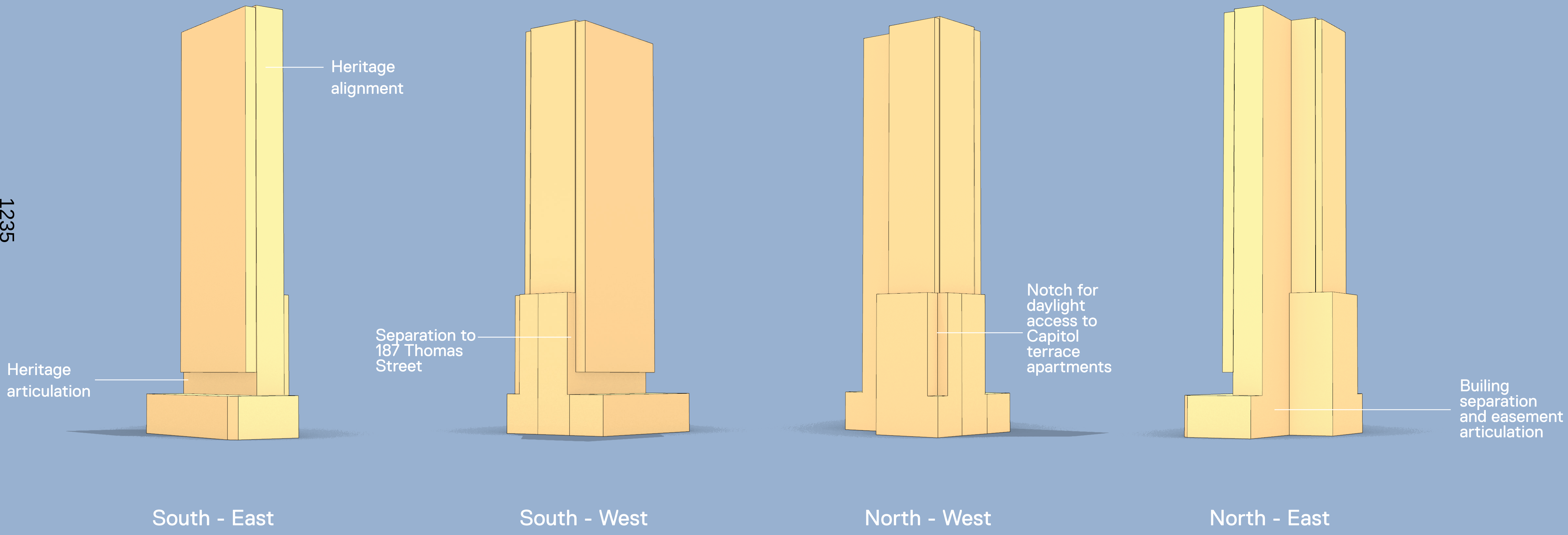
NOTES
1 - ENVELOPE AREA MEASURED AT FLOOR LEVEL RL
2 - GROSS BUILDING AREA ESTIMATED AS ENVELOPE VOLUME (EXCL. ARTICULATION) / LEVEL AS PER DESIGN EXCELLENCE AND COMPETITIVE DESIGN PROCESS ITEM d(vii)
3 - GROSS FLOOR AREA ESTIMATED AS 84% OF GROSS BUILDING AREA PER LEVEL AS PER DESIGN EXCELLENCE AND COMPETITIVE DESIGN PROCESS ITEM d(viii)
4 - NLA ESTIMATED AS 75% OF GROSS BUILDING AREA

LEVEL	FLOOR TO FLOOR (m)	RL (m AHD)	ENVELOPE AREA (m²)[1]	ENVELOPE VOLUME	GBA (m²)[2]	GFA (m2)[3]	NLA (m2)[4]
			18,909.62	66,189.30	16,829.56	12,390.04	10,931.29
			ARTICULATION (%)	11.00			
			EXCL. ARTICULATION	58,908.48			
32	3.18	113.94	472.59	1,502.85	420.61		
31	3.18	110.76	472.59	1,502.85	420.61	353.31	315.46
30	3.18	107.58	472.59	1,502.85	420.61	353.31	315.46
29	3.18	104.40	472.59	1,502.85	420.61	353.31	315.46
28	3.18	101.22	472.59	1,502.85	420.61	353.31	315.46
27	3.18	98.04	472.59	1,502.85	420.61	353.31	315.46
26	3.18	94.86	472.59	1,502.85	420.61	353.31	315.46
25	3.18	91.68	472.59	1,502.85	420.61	353.31	315.46
24	3.18	88.50	472.59	1,502.85	420.61	353.31	315.46
23	3.18	85.32	472.59	1,502.85	420.61	353.31	315.46
22	3.18	82.14	472.59	1,502.85	420.61	353.31	315.46
21	3.18	78.96	472.59	1,502.85	420.61	353.31	315.46
20	3.18	75.78	472.59	1,502.85	420.61	353.31	315.46
19	3.18	72.60	472.59	1,502.85	420.61	353.31	315.46
18	3.18	69.42	472.59	1,502.85	420.61	353.31	315.46
17	3.18	66.24	472.59	1,502.85	420.61	353.31	315.46
16	3.18	63.06	472.59	1,502.85	420.61	353.31	315.46
15	3.18	59.88	472.59	1,502.85	420.61	353.31	315.46
14	3.18	56.70	472.59	1,502.85	420.61	353.31	315.46
13	3.18	53.52	472.59	1,502.85	420.61	353.31	315.46
12	3.18	50.34	472.59	1,502.85	420.61	353.31	315.46
11	3.18	47.16	472.59	1,502.85	420.61	353.31	315.46
10	3.18	43.98	581.51	1,849.20	517.54	434.74	388.16
9	3.18	40.80	581.51	1,849.20	517.54	434.74	388.16
8	3.18	37.62	581.51	1,849.20	517.54	434.74	388.16
7	3.18	34.44	581.51	1,849.20	517.54	434.74	388.16
6	3.18	31.26	581.51	1,849.20	517.54	434.74	388.16
5	3.18	28.08	581.51	1,849.20	517.54	434.74	388.16
4	3.18	24.90	488.40	1,553.10	434.67	365.13	326.00
3	3.18	21.72	488.40	1,553.10	434.67	365.13	326.00
2	4.32	17.40	993.08	4,290.11	883.84	742.43	662.88
1	5.40	12.00	993.08	5,362.64	883.84	742.43	662.88
B1	4.50	7.50	1,030.28	4,636.27	916.95	147.00	
B2	4.50	3.00	1,030.28	4,636.27	916.95		

Proposed DCP Envelope

The below indicates how the proposed DCP Envelope is articulated prior to the subtraction of the required architectural articulation. This has been done to ensure a positive urban outcome. A more simplified mass could have been proposed which would allow for a higher percentage of architectural articulation.

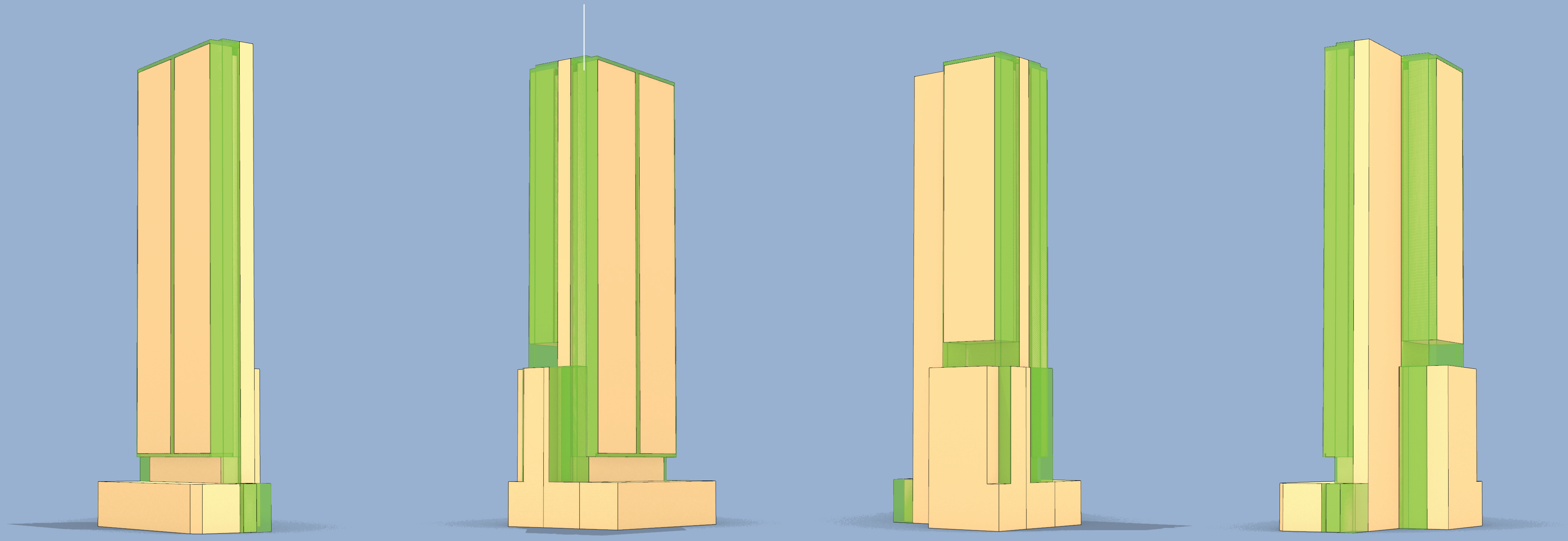
1235



Architectural articulation

Articulation within proposed DCP Envelope

(not including facade zone)



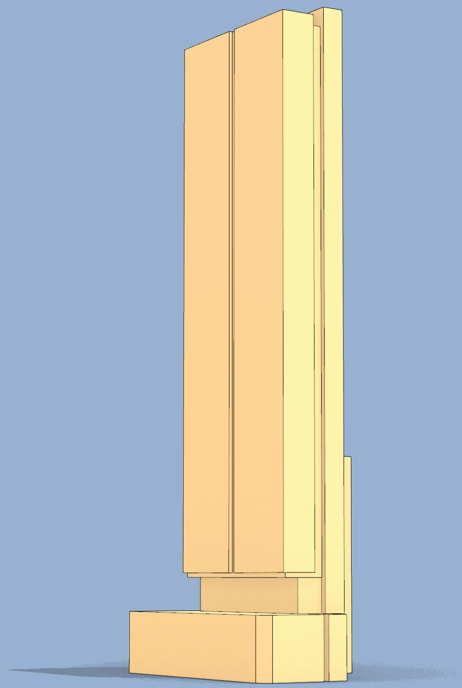
South - East

South - West

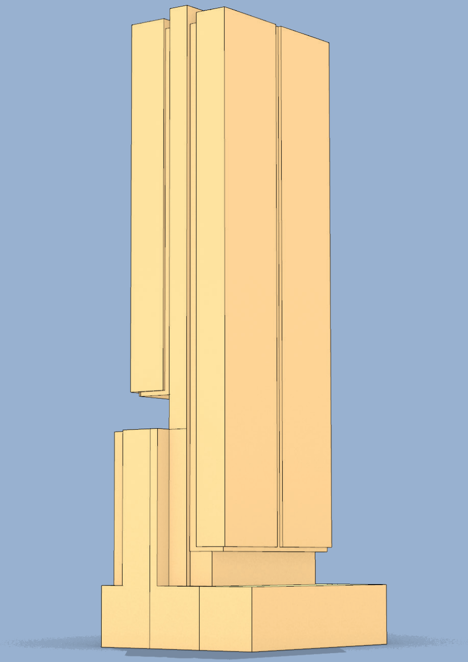
North - West

North - East

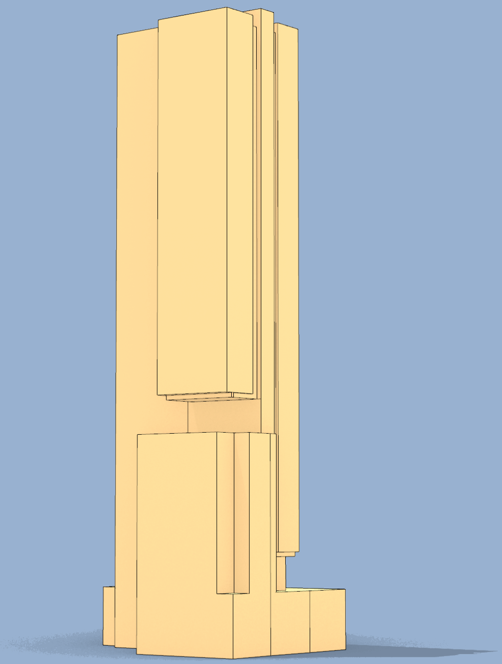
Indicative scheme



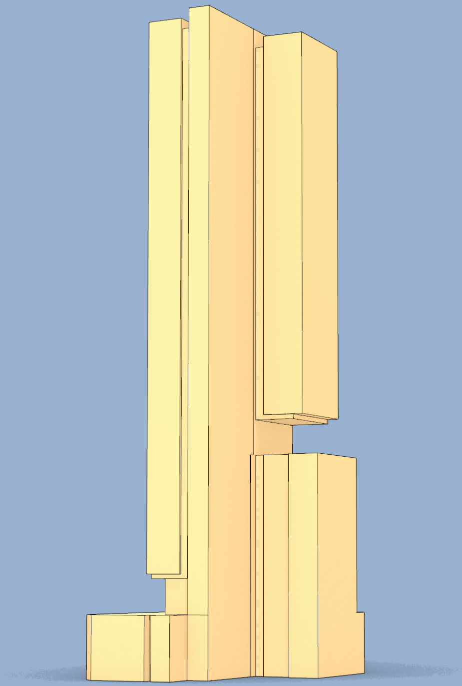
South - East



South - West



North - West



North - East

Articulation Options

1238

Option 01

Site Area	Articulation
→ 1,031 m²	→ 15%
Building Height	**FSR**
→ 105.87m (33 storeys)	→ 11.8:1

SITE AREA (m^2)	1,030.7	
TOTAL GBA (m^2)	16,475	
TOTAL GFA (m^2)	12,030	ABOVE GROUND
FSR (X:1)	11.67	ABOVE GROUND
TOTAL GFA (m^2)	147	BELOW GROUND
FSR (X:1)	0.14	BELOW GROUND
TYPICAL NLA (m^2)	301	
TOTAL NLA (m^2)	10,741	
ENVELOPE ARTICULATION	15.0%	
BUILDING LEVELS	33	
BUILDING HEIGHT (RL)	117.87	

TYPICAL FLOOR GBA	401 m²
TYPICAL FLOOR GFA	337 m²
TYPICAL FLOOR NLA	301 m²

Option 02

Site Area	Articulation
→ 1,031 m²	→ 13.5%
Building Height	**FSR**
→ 105.87m (33 storeys)	→ 12:1

SITE AREA (m^2)	1,030.7	
TOTAL GBA (m^2)	16,766	
TOTAL GFA (m^2)	12,243	ABOVE GROUND
FSR (X:1)	11.88	ABOVE GROUND
TOTAL GFA (m^2)	147	BELOW GROUND
FSR (X:1)	0.14	BELOW GROUND
TYPICAL NLA (m^2)	307	
TOTAL NLA (m^2)	10,931	
ENVELOPE ARTICULATION	13.5%	
BUILDING LEVELS	33	
BUILDING HEIGHT (RL)	117.87	

TYPICAL FLOOR GBA	409 m²
TYPICAL FLOOR GFA	343 m²
TYPICAL FLOOR NLA	307 m²

Option 03

Site Area	Articulation
→ 1,031 m²	→ 11%
Building Height	**FSR**
→ 105.87m (32 storeys)	→ 12:1

SITE AREA (m^2)	1,030.7	
TOTAL GBA (m^2)	16,830	
TOTAL GFA (m^2)	12,243	ABOVE GROUND
FSR (X:1)	11.88	ABOVE GROUND
TOTAL GFA (m^2)	147	BELOW GROUND
FSR (X:1)	0.14	BELOW GROUND
TYPICAL NLA (m^2)	315	
TOTAL NLA (m^2)	10,931	
ENVELOPE ARTICULATION	11.0%	
BUILDING LEVELS	32	
BUILDING HEIGHT (RL)	117.87	

TYPICAL FLOOR GBA	420 m²
TYPICAL FLOOR GFA	353 m²
TYPICAL FLOOR NLA	315 m²

Preferred

Option 04 (December 2020 Amendment)

Site Area	Articulation
→ 1,031 m²	→ 8%
Building Height	**FSR**
→ 105.87m (32 storeys)	→ 12.4:1

SITE AREA (m^2)	1,030.7	
TOTAL GBA (m^2)	17,397	
TOTAL GFA (m^2)	12,656	ABOVE GROUND
FSR (X:1)	12.28	ABOVE GROUND
TOTAL GFA (m^2)	147	BELOW GROUND
FSR (X:1)	0.14	BELOW GROUND
TYPICAL NLA (m^2)	326	
TOTAL NLA (m^2)	11,300	
ENVELOPE ARTICULATION	8.0%	
BUILDING LEVELS	32	
BUILDING HEIGHT (RL)	117.87	

TYPICAL FLOOR GBA	435 m²
TYPICAL FLOOR GFA	365 m²
TYPICAL FLOOR NLA	326 m²

Schedule 12 Comparison

Sky View Factor

As requested by Council we undertook additional Schedule 12 analysis to compare the scheme against the current regulation.

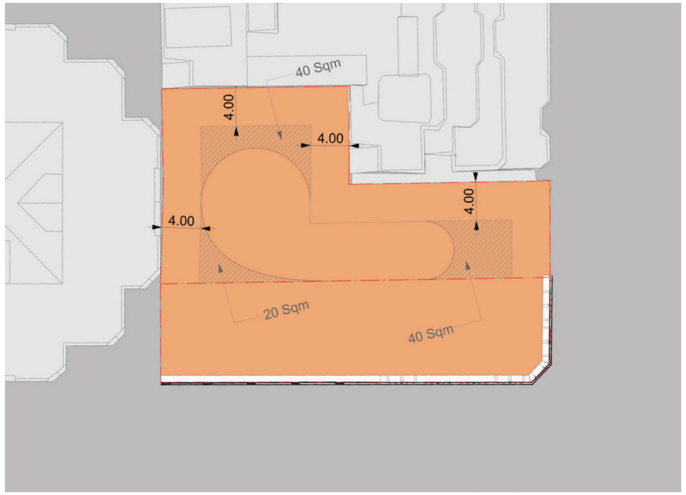
For consistency the proposed envelope maintained the same setbacks as lodged October 2021.

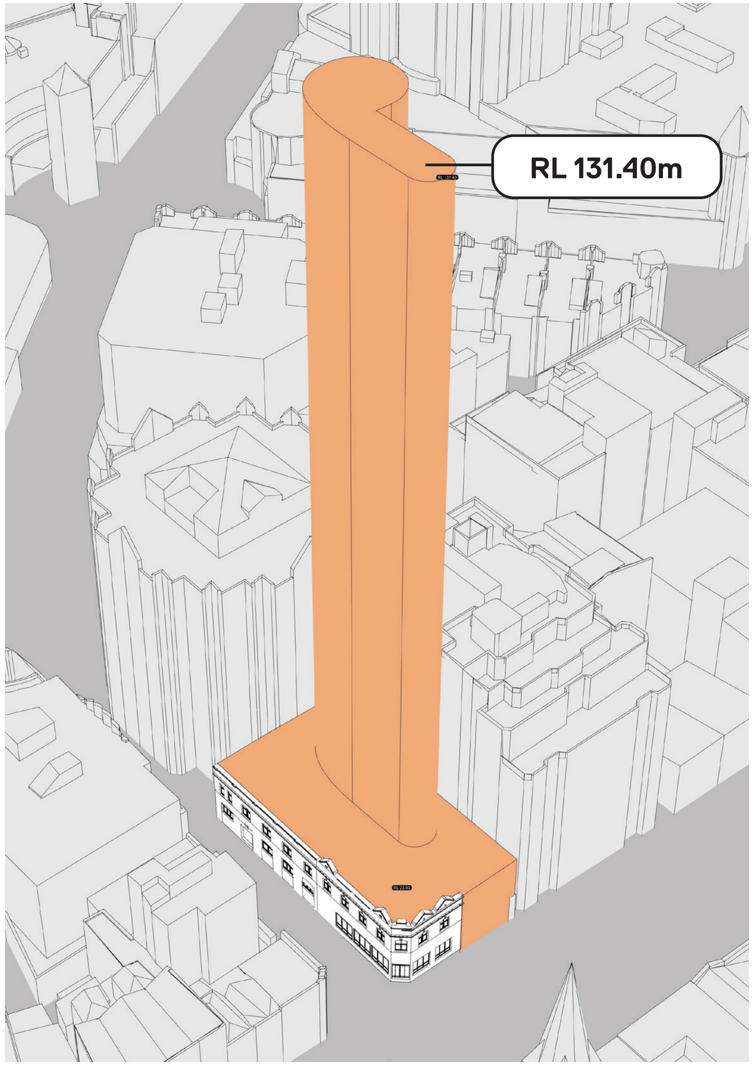
While the updated regulation allows for an articulation zone of 8% inclusive of facade zone for buildings up to 120m, the requirement for filleting to all corners of the base case massing reduces the envelope significantly.

Please find the FSR calculations on the following page.

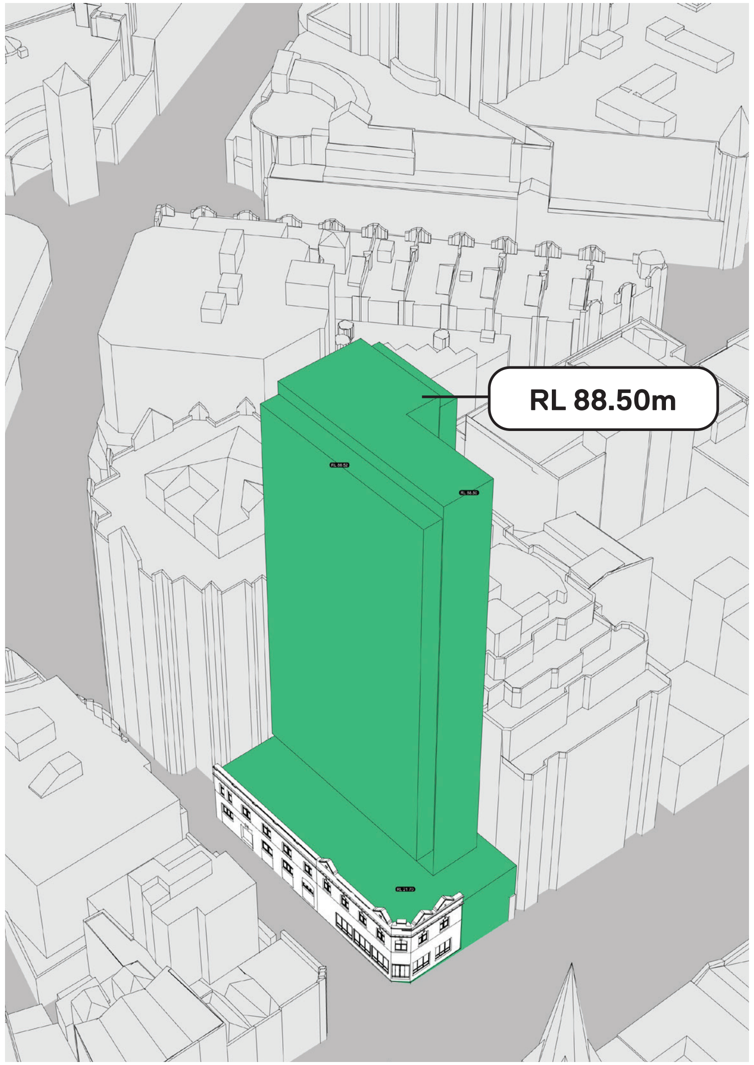
1239

Base Case Massing Setbacks





Base Case Massing



Passing envelope

Schedule 12 Comparison

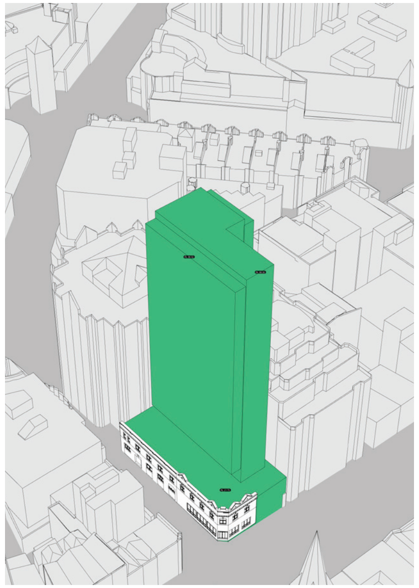
→ 8% Articulation

→ 9.3:1 FSR

→ 9,414 m² GFA (above ground)

→ 147 m² GFA (below ground)

1240



SITE AREA (m²)	1,030.7	
TOTAL GBA (m²)	13,438	
TOTAL FSR (X:1)	9.28	
TOTAL GFA (m²)	9,414	ABOVE GROUND
FSR (X:1)	9.13	ABOVE GROUND
TOTAL GFA (m²)	147	BELOW GROUND
FSR (X:1)	0.14	BELOW GROUND
TYPICAL NLA (m²)	326	
TOTAL NLA (m²)	8,406	
ENVELOPE ARTICULATION	8.0%	
BUILDING LEVELS	23	
BUILDING HEIGHT (RL)	88.50	
BUILDING HEIGHT	85.50	

NOTES
1 - ENVELOPE AREA MEASURED AT FLOOR LEVEL RL
2 - GROSS BUILDING AREA ESTIMATED AS ENVELOPE VOLUME (EXCL. ARTICULATION) / LEVEL AS PER DESIGN EXCELLENCE AND COMPETITIVE DESIGN PROCESS ITEM d(vii)
3 - GROSS FLOOR AREA ESTIMATED AS 84% OF GROSS BUILDING AREA PER LEVEL AS PER DESIGN EXCELLENCE AND COMPETITIVE DESIGN PROCESS ITEM d(viii)
4 - NLA ESTIMATED AS 75% OF GROSS BUILDING AREA

LEVEL	FLOOR TO FLOOR (m)	RL (m AHD)	ENVELOPE AREA (m²)[1]	ENVELOPE VOLUME	GBA (m²)[2]	GFA (m2)[3]	NLA (m2)[4]
			14,577.73	**52,420.13**	**13,438.26**	**9,561.28**	**8,405.61**
			ARTICULATION (%)	8.00			
			EXCL. ARTICULATION	48,226.52			
24 (Top of Building)	-	88.50	-	-	-	-	-
23	3.18	85.32	334.33	1,063.17	334.33	-	-
22	3.18	82.14	472.14	1,501.41	434.37	364.87	325.78
21	3.18	78.96	472.14	1,501.41	434.37	364.87	325.78
20	3.18	75.78	472.14	1,501.41	434.37	364.87	325.78
19	3.18	72.60	472.14	1,501.41	434.37	364.87	325.78
18	3.18	69.42	472.14	1,501.41	434.37	364.87	325.78
17	3.18	66.24	472.14	1,501.41	434.37	364.87	325.78
16	3.18	63.06	472.14	1,501.41	434.37	364.87	325.78
15	3.18	59.88	472.14	1,501.41	434.37	364.87	325.78
14	3.18	56.70	472.14	1,501.41	434.37	364.87	325.78
13	3.18	53.52	472.14	1,501.41	434.37	364.87	325.78
12	3.18	50.34	472.14	1,501.41	434.37	364.87	325.78
11	3.18	47.16	472.14	1,501.41	434.37	364.87	325.78
10	3.18	43.98	589.09	1,873.31	541.96	455.25	406.47
9	3.18	40.80	589.09	1,873.31	541.96	455.25	406.47
8	3.18	37.62	589.09	1,873.31	541.96	455.25	406.47
7	3.18	34.44	589.09	1,873.31	541.96	455.25	406.47
6	3.18	31.26	589.09	1,873.31	541.96	455.25	406.47
5	3.18	28.08	589.09	1,873.31	541.96	455.25	406.47
4	3.18	24.90	496.28	1,578.17	456.58	383.53	342.43
3	3.18	21.72	496.28	1,578.17	456.58	383.53	342.43
2	4.32	17.40	994.63	4,296.80	915.06	768.65	686.29
1	5.40	12.00	994.63	5,371.00	915.06	768.65	686.29
B1	4.50	7.50	1,030.68	4,638.06	948.23	147.00	
B2	4.50	3.00	1,030.68	4,638.06	948.23		

GRIMSHAW

Sydney
Level 2, 333 George Street
Sydney
NSW 2000
Australia
T +61 (02) 9253 0200

Melbourne
21 Bouverie Street
Melbourne
VIC 3053
Australia
T +61 (03) 9321 2600

Los Angeles
1308 Factory Place, #201
Los Angeles
CA 90013
USA
T +1 310 499 7140

London
57 Clerkenwell Road
London
EC1M 5NG
UK
T +44 (0) 207 291 4141

Dubai
Building 7, 5th Floor,
Unit A501, Dubai Design District,
PO Box 333242
Dubai, UAE
T +971 4244 1255

New York
637 West 27th Street
New York
NY10001
USA
T +1 646 293 3600

Paris
15 Rue Eugene Varlin
Paris
75010
France
T +33 (0)7 85 31 27 87

1241

grimshaw.global

Doc Ref: WD154-16F03(rev0)- WE Letter

Date: December 24, 2021

To: Ceerose Pty Ltd

Address: 447-451 Parramatta Road
Leichhardt, NSW 2040

RE: 757-763 GEORGE STREET, HAYMARKET WIND ENVIRONMENT LETTER

Windtech Consultants have previously undertaken detailed wind tunnel testing for the Ground Level areas of the proposed 757-763 George Street development in Haymarket, Sydney (ref: WD154-16F02, dated 24 December 2021). Further testing was conducted to determine the impact of additional building modifications with regards to wind comfort/safety at Study Point locations 10 and 12 for the 'Proposed Case'. The 'Proposed Case' refers to the proposed case massing with the inclusion of the heritage awning and a small building chamfer along the north-eastern corner of the podium. The building modifications tested are described below:

- Modification 1 – With the inclusion of the heritage awning and without the building chamfer on the north-east corner.
- Modification 2 – With the inclusion of the heritage awning and a large building chamfer along the north-eastern corner of the podium.
- Modification 3 – With the inclusion of the heritage awning, a double storey cut-out at level 10 along the northern façade and without the building chamfer on the north-east corner.
- Modification 4 – With the inclusion of the heritage awning, a double storey cut-out at level 10 along the northern façade and a small building chamfer along the north-eastern corner of the podium.
- Modification 5 – With the inclusion of the heritage awning, a double storey cut-out at level 10 along the northern façade and a large building chamfer along the north-eastern corner of the podium.
- Modification 6 – With the inclusion of the heritage awning and a corner cut out along the north-eastern corner of the podium.

The results of the wind tunnel study are presented in the form of directional plots in Appendix A for study point locations 10 and 12, and summarised in Tables 1 and Table 2.

Table 1: Wind Tunnel Results Summary – Point 10

Alteration No.	GEM (5% exceedance)			Annual Gust			Final Result
	Criterion (m/s)	Results (%)	Grade	Criterion (m/s)	Results (m/s)	Grade	
Proposed Case	8.0	5%	Pass	24	21	Pass	Pass
Building Modification 1	8.0	5%	Pass	24	21	Pass	Pass
Building Modification 2	8.0	4%	Pass	24	19	Pass	Pass
Building Modification 3	8.0	3%	Pass	24	19	Pass	Pass
Building Modification 4	8.0	3%	Pass	24	18	Pass	Pass
Building Modification 5	8.0	2%	Pass	24	20	Pass	Pass

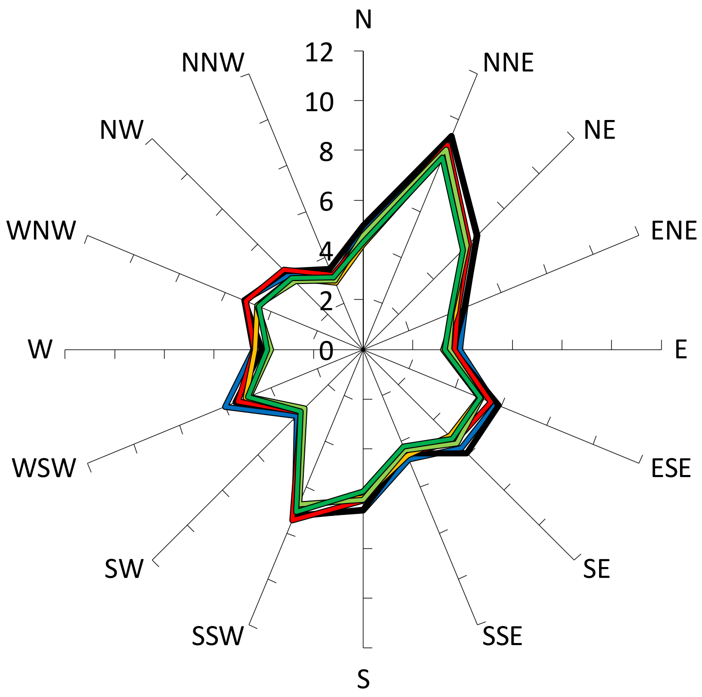
Table 2: Wind Tunnel Results Summary – Point 12

Alteration No.	GEM (5% exceedance)			Annual Gust			Final Result
	Criterion (m/s)	Results (%)	Grade	Criterion (m/s)	Results (m/s)	Grade	
Proposed Case	8.0	1%	Fail	24	19	Pass	Pass
Building Modification 1	8.0	9%	Pass	24	27	Fail	Fail
Building Modification 2	8.0	3%	Pass	24	24	Pass	Pass
Building Modification 3	8.0	8%	Fail	24	26	Fail	Fail
Building Modification 4	8.0	2%	Pass	24	20	Pass	Pass
Building Modification 5	8.0	4%	Pass	24	23	Pass	Pass
Building Modification 6	8.0	4%	Pass	24	22	Pass	Pass

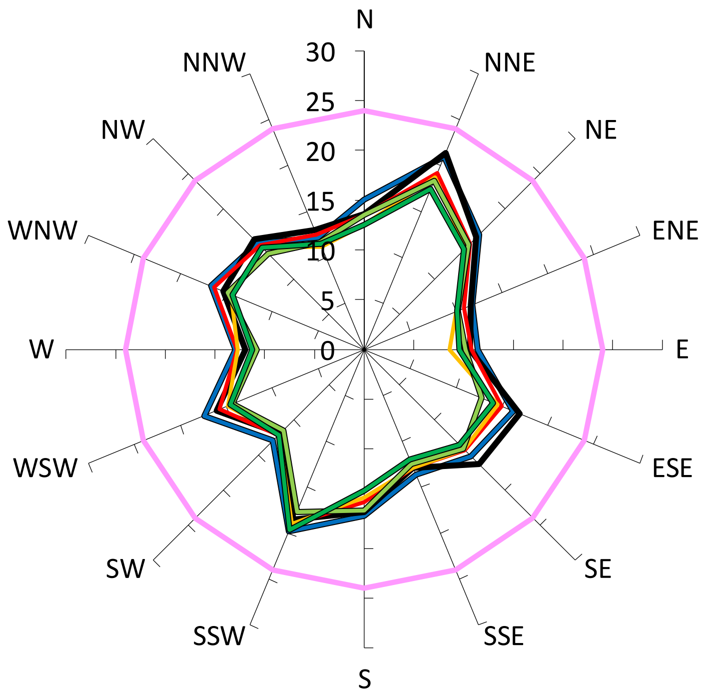
APPENDIX A DIRECTIONAL PLOTS OF WIND TUNNEL RESULTS

Results for Point 10

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)



Comfort Criteria: 8m/s with 5% probability of exceedence

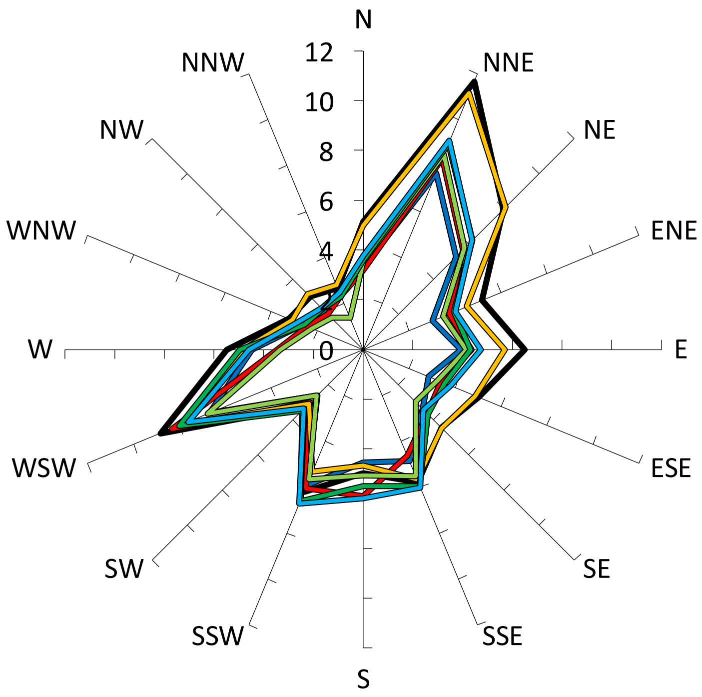


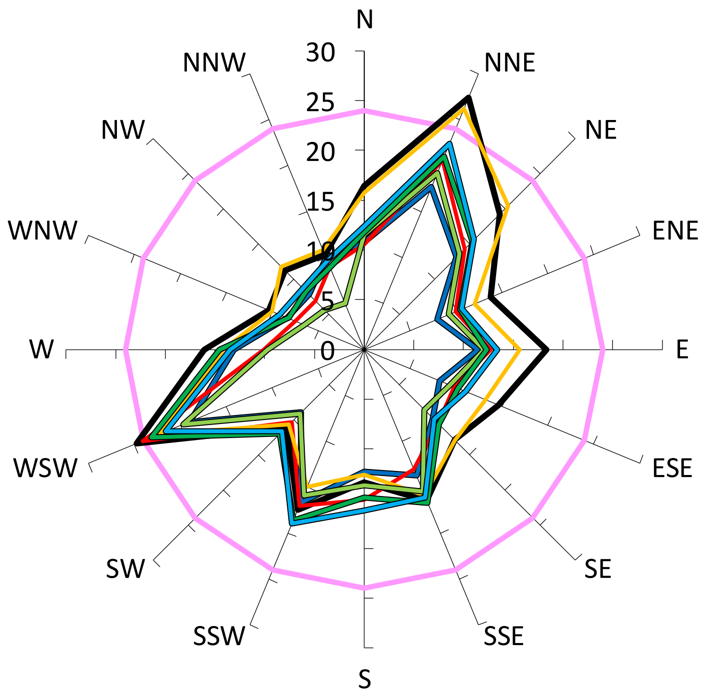
Safety Limit: 24m/s

Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
Proposed Case	5%	21
Building Modification 1 - With heritage awning and without building chamfer	5%	21
Building Modification 2- With heritage awning and large chamfer	4%	19
Building Modification 3- With heritage awning and level 10 cut-out and without building chamfer	3%	19
Building Modification 4- With heritage awning, level 10 cut-out and small chamfer	3%	18
Building Modification 5- With heritage awning, level 10 cut-out and large chamfer	2%	20

Results for Point 12

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)





Comfort Criteria: 8m/s with 5% probability of exceedence

Safety Limit: 24m/s

Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
Proposed Case	1%	19
Building Modification 1 - With heritage awning and without building chamfer	9%	27
Building Modification 2- With heritage awning and large chamfer	3%	24
Building Modification 3- With heritage awning and level 10 cut-out and without building chamfer	8%	26
Building Modification 4- With heritage awning, level 10 cut-out and small chamfer	2%	20
Building Modification 5- With heritage awning, level 10 cut-out and large chamfer	4%	23
Building Modification 6- With heritage awning and corner cut-out on podium	4%	22

DOCUMENT CONTROL

Date	Revision History	Issued Revision	Prepared By (initials)	Instructed By (initials)	Reviewed & Authorised by (initials)
December 24, 2021	Initial.	0	MM	SWR	AFM/EV

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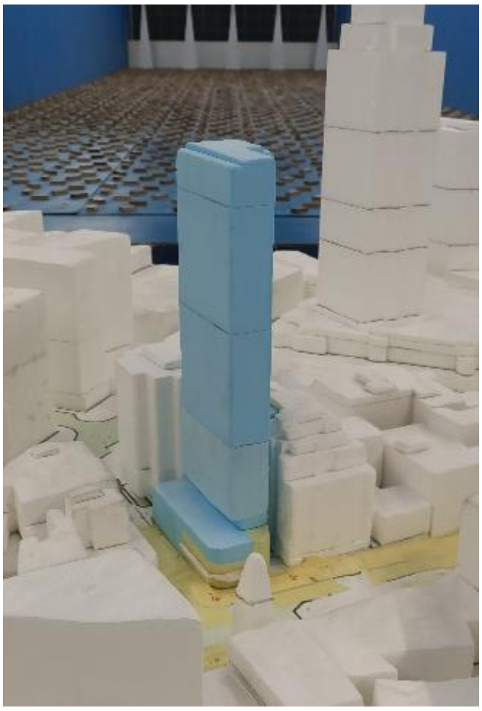

PEDESTRIAN WIND ENVIRONMENT STUDY

757-763 GEORGE STREET, HAYMARKET

WD154-16F02(REV2)- WE REPORT

FEBRUARY 1, 2022

Prepared for:

Ceerose Pty Ltd

447-451 Parramatta Road
Leichhardt, NSW 2040

DOCUMENT CONTROL...

Date	Revision History	Issued Revision	Prepared By (initials)	Instructed By (initials)	Reviewed & Authorised by (initials)
December 24, 2021	Initial.	0	MM	SWR	TR
January 31, 2022	Updated Table Heading	1	MM	SWR	TR
February 1, 2022	Updated Results	2	MM	SWR	EV/TR

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EXECUTIVE SUMMARY

This report presents the results of a detailed investigation into the wind environment impact of 757-763 George Street, located in Haymarket, Sydney. Testing was performed at Windtech's boundary layer wind tunnel facility. The wind tunnel has a 3.0m wide working section and a fetch length of 14m, and measurements were taken from 16 wind directions at 22.5 degree increments. Testing was carried out using a 1:300 detailed scale model of the development. The effects of nearby buildings and land topography have been accounted for through the use of a proximity model which represents an area with a radius of 375m.

Testing was performed for two massing variations of the development, which are denoted by the following scenarios:

- With the existing surrounding buildings and the inclusion of the Base Case Massing with the heritage awning. In this report, this test case is referred to as the "Base Case".
- With the existing surrounding buildings and the inclusion of the Proposed Case Massing with the heritage awning and a small building chamfer along the north-eastern corner of the podium. In this report, this test case is referred to as the "Proposed Case".

Peak gust and mean wind speeds were measured at selected critical outdoor trafficable locations within and around the subject development. Wind velocity coefficients representing the local wind speeds are derived from the wind tunnel and are combined with a statistical model of the regional wind climate (which accounts for the directional strength and frequency of occurrence of the prevailing regional winds) to provide the equivalent full-scale wind speeds at the site. The wind speed measurements are compared with criteria for pedestrian comfort and safety, based on Gust-Equivalent Mean (GEM) and annual maximum gust winds, respectively.

The model was tested in the wind tunnel without the effect of any forms of wind ameliorating devices such as screens, balustrades, etc., which are not already shown in the architectural drawings. The effect of vegetation was also excluded from the testing.

The results of the study indicate that wind conditions for all trafficable outdoor locations within and around the development will be suitable for their intended uses for both the Base Case Massing and the Proposed Case Massing.

CONTENTS

1 INTRODUCTION

A wind tunnel study has been undertaken to assess wind speeds at selected critical outdoor trafficable areas within and around the subject development. The test procedures followed for this wind tunnel study were based on the guidelines set out in the Australasian Wind Engineering Society Quality Assurance Manual (AWES-QAM-1-2019), ASCE 7-16 (Chapter C31), and CTBUH (2013).

A scale model of the development was prepared, including the surrounding buildings and land topography. Testing was performed at Windtech's boundary layer wind tunnel facility. The wind tunnel has a 3.0m wide working section and a fetch length of 14m, and measurements were taken from 16 wind directions at 22.5 degree increments. The wind tunnel was configured to the appropriate boundary layer wind profile for each wind direction. Wind speeds were measured using either Dantec hot-wire probe anemometers or pressure-based wind speed sensors, positioned to monitor wind conditions at critical outdoor trafficable areas of the development.

The model was tested in the wind tunnel without the effect of any forms of wind ameliorating devices such as screens, balustrades, etc., which are not already shown in the architectural drawings. The effect of vegetation was also excluded from the testing. The wind speeds measured during testing were combined with a statistical model of the regional wind climate to provide the equivalent full-scale wind speeds at the site. The measured wind speeds were compared against appropriate criteria for pedestrian comfort and safety, and in-principle treatments have been recommended for any area which was exposed to strong winds. These treatments could be in the form of retaining vegetation that is already proposed for the site, or including additional vegetation, screens, awnings, etc. Note however that, in accordance with the AWES Guidelines (2014), only architectural elements or modifications are used to treat winds which represent an exceedance of the existing wind conditions and exceed the safety limit.

2 WIND TUNNEL MODEL

Wind tunnel testing was carried out using a 1:300 scale model of the development and surroundings. The study model incorporates all necessary architectural features on the façade of the development to ensure an accurate wind flow is achieved around the model, and was constructed using a Computer Aided Manufacturing (CAM) process to ensure that a high level of detail and accuracy is achieved. The effect of nearby buildings and land topography has been accounted for through the use of a proximity model, which represents a radius of 375m from the development site. Photographs of the wind tunnel model are presented in Figures 1. A plan of the proximity model is provided in Figure 2.

Testing was performed for two massing variations of the development, which are denoted by the following scenarios:

- With the existing surrounding buildings and the inclusion of the Base Case Massing with the heritage awning. In this report, this test case is referred to as the "Base Case".
- With the existing surrounding buildings and the inclusion of the Proposed Case Massing with the heritage awning and a small building chamfer along the north-eastern corner of the podium. In this report, this test case is referred to as the "Proposed Case".

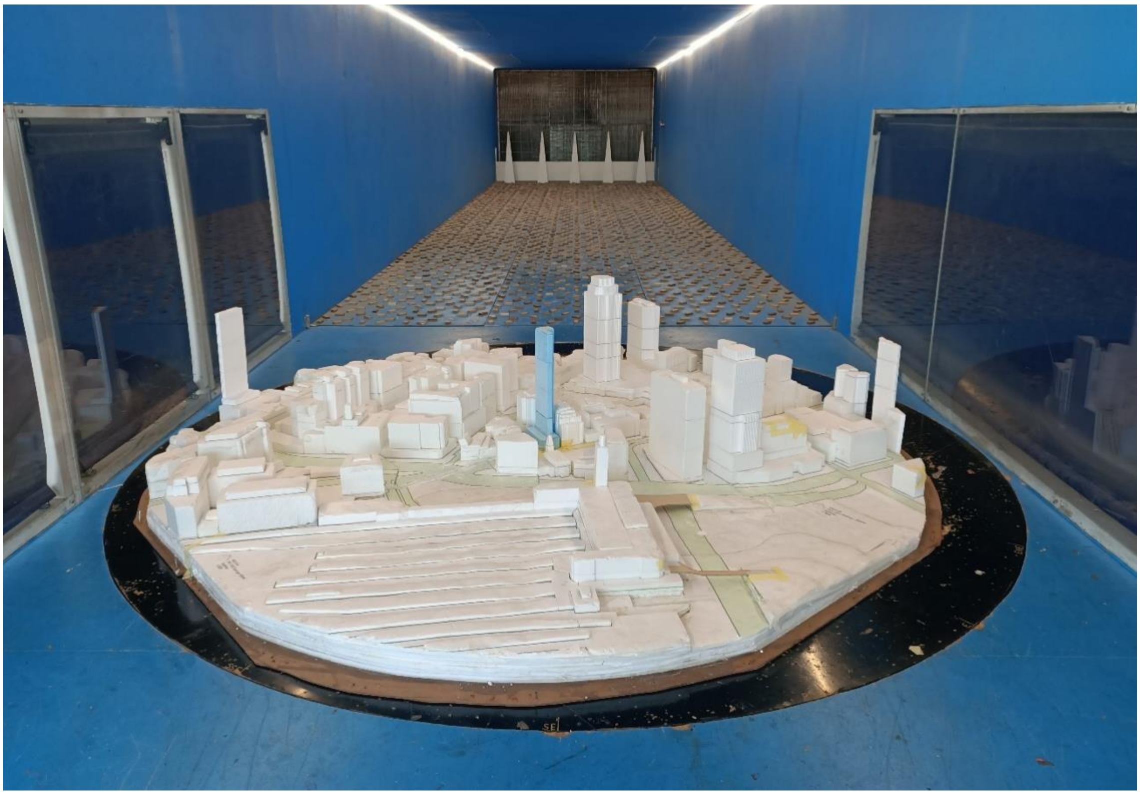

Figure 1a: Photograph of the Wind Tunnel Model (Base Case, view from the south-east)

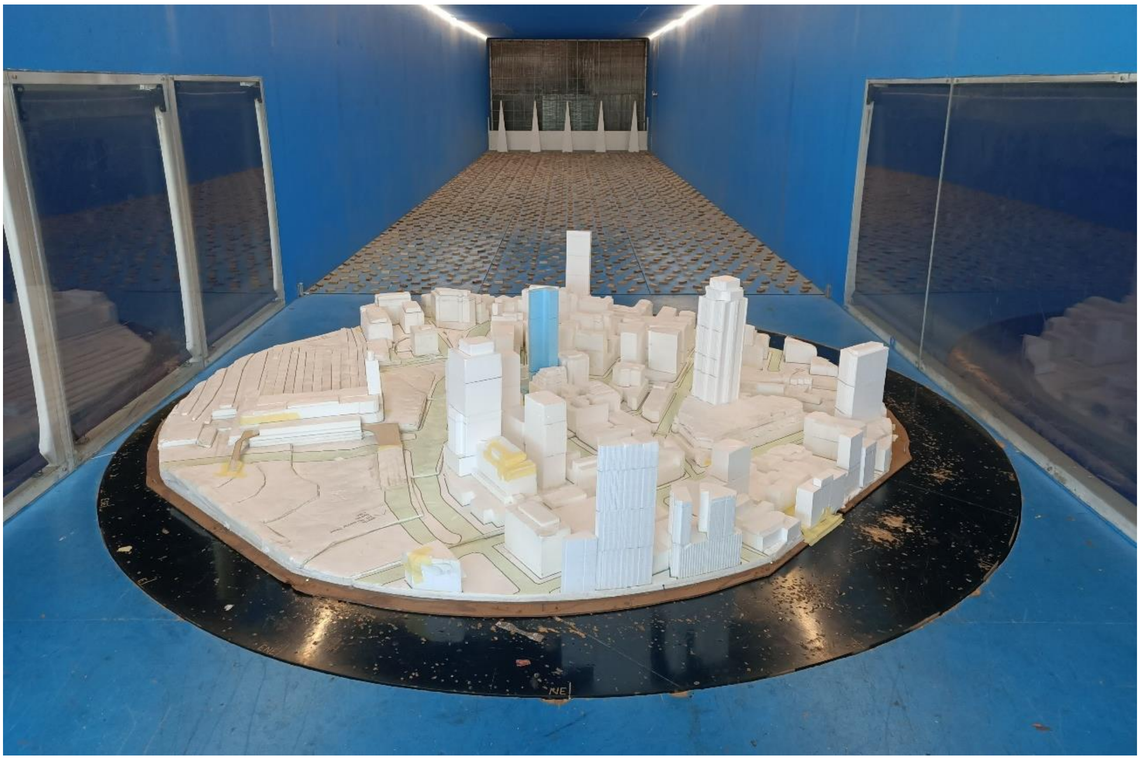

Figure 1b: Photograph of the Wind Tunnel Model (Base Case, view from the north-east)

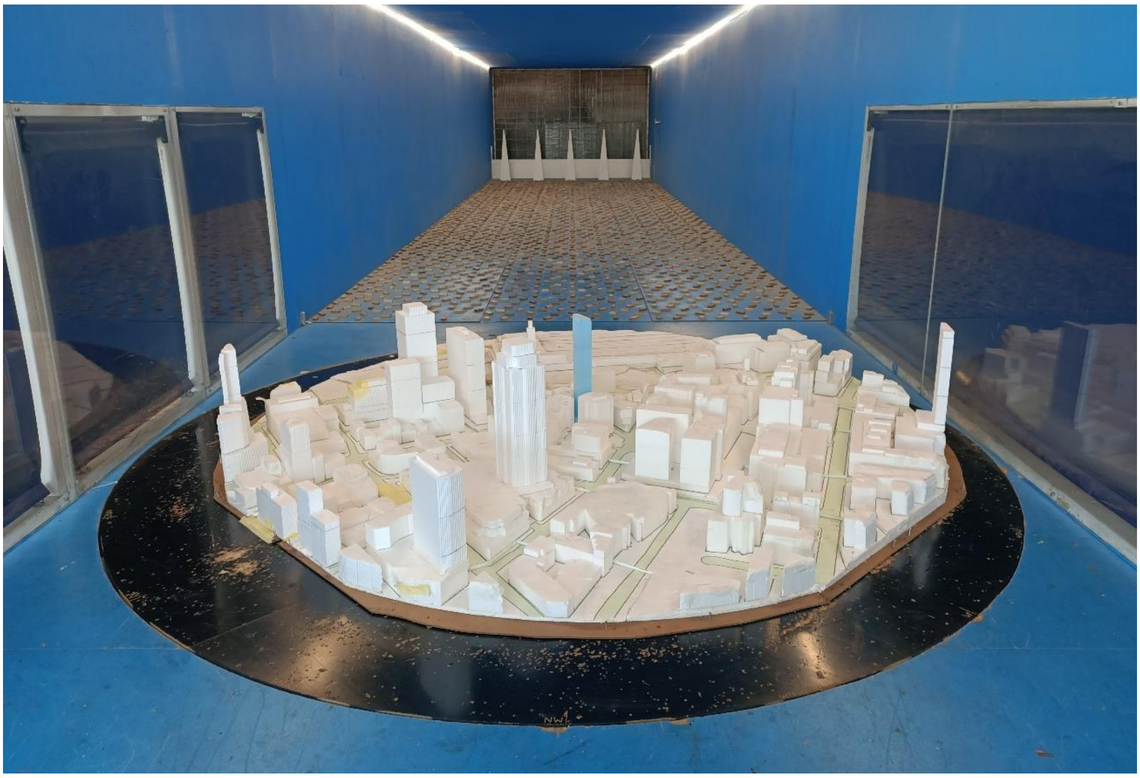

Figure 1c: Photograph of the Wind Tunnel Model (Base Case, view from the north-west)

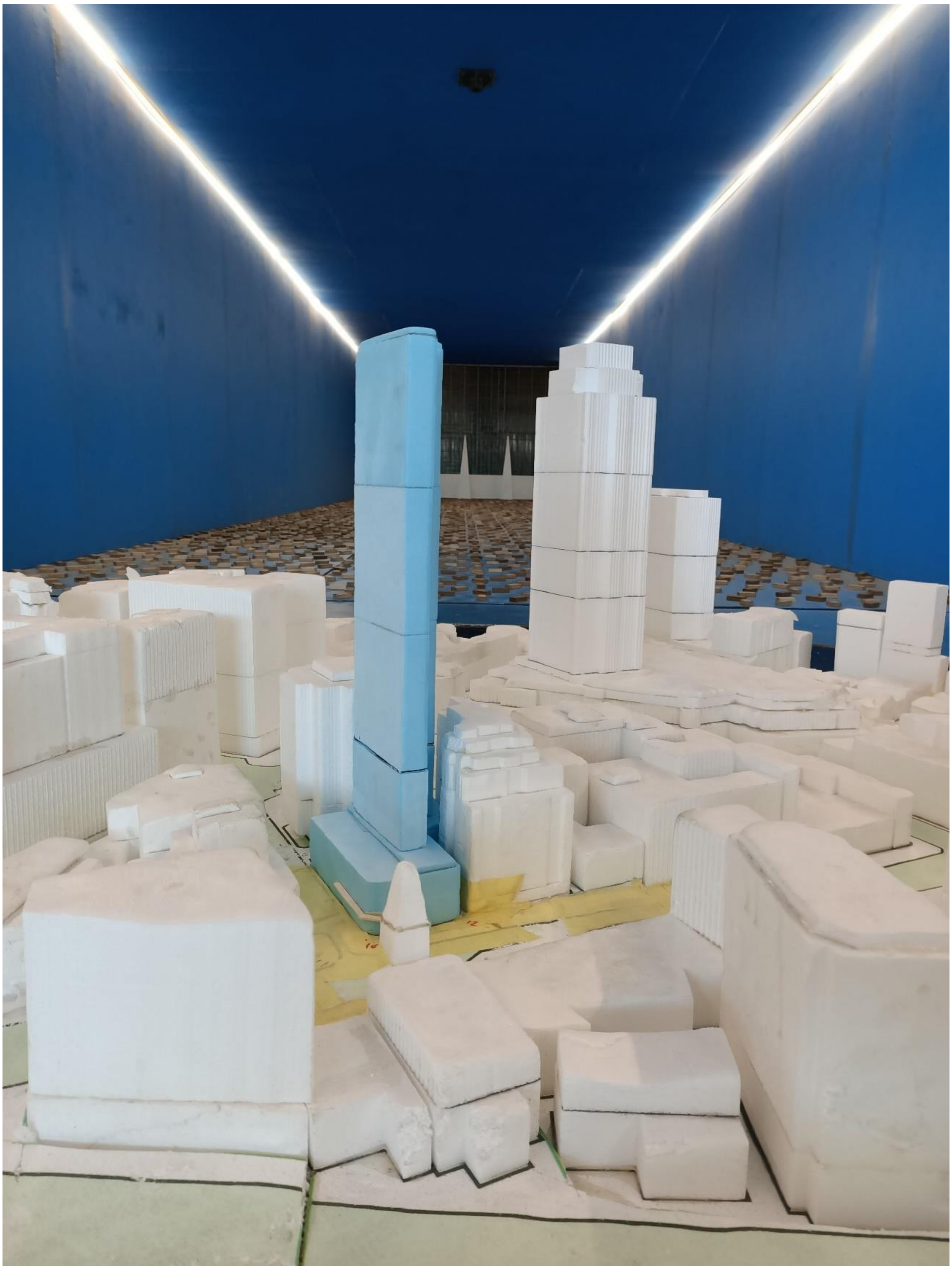

Figure 1d: Photograph of the Wind Tunnel Model (Base Case, view from the south-east)

Figure 1e: Photograph of the Wind Tunnel Model (Proposed Case, view from the south)

Figure 1f: Photograph of the Wind Tunnel Model (Proposed Case, view from the west)

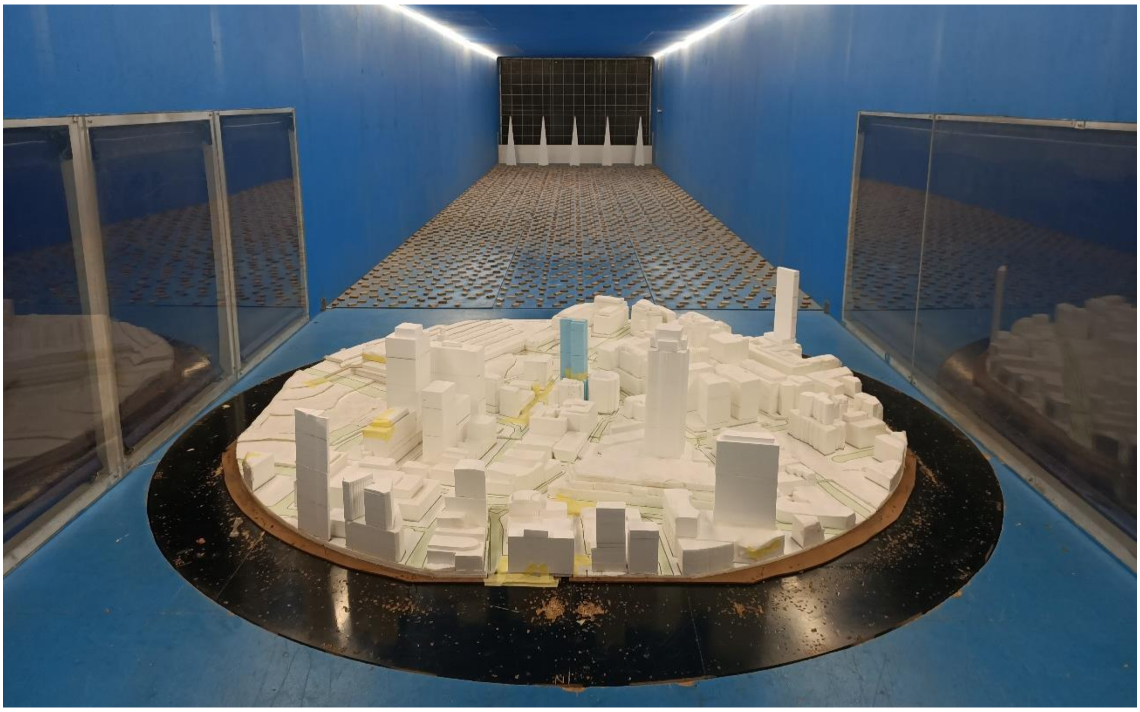

Figure 1g: Photograph of the Wind Tunnel Model (Proposed Case view from the north)

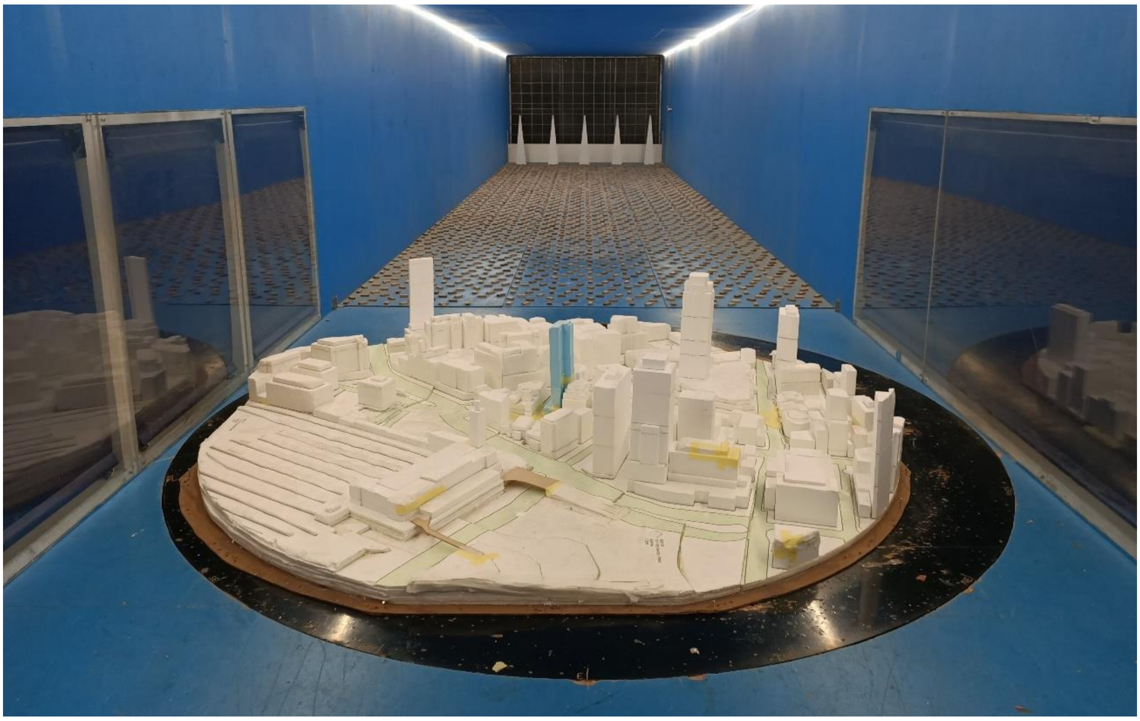

Figure 1h: Photograph of the Wind Tunnel Model (Proposed Case, view from the east)

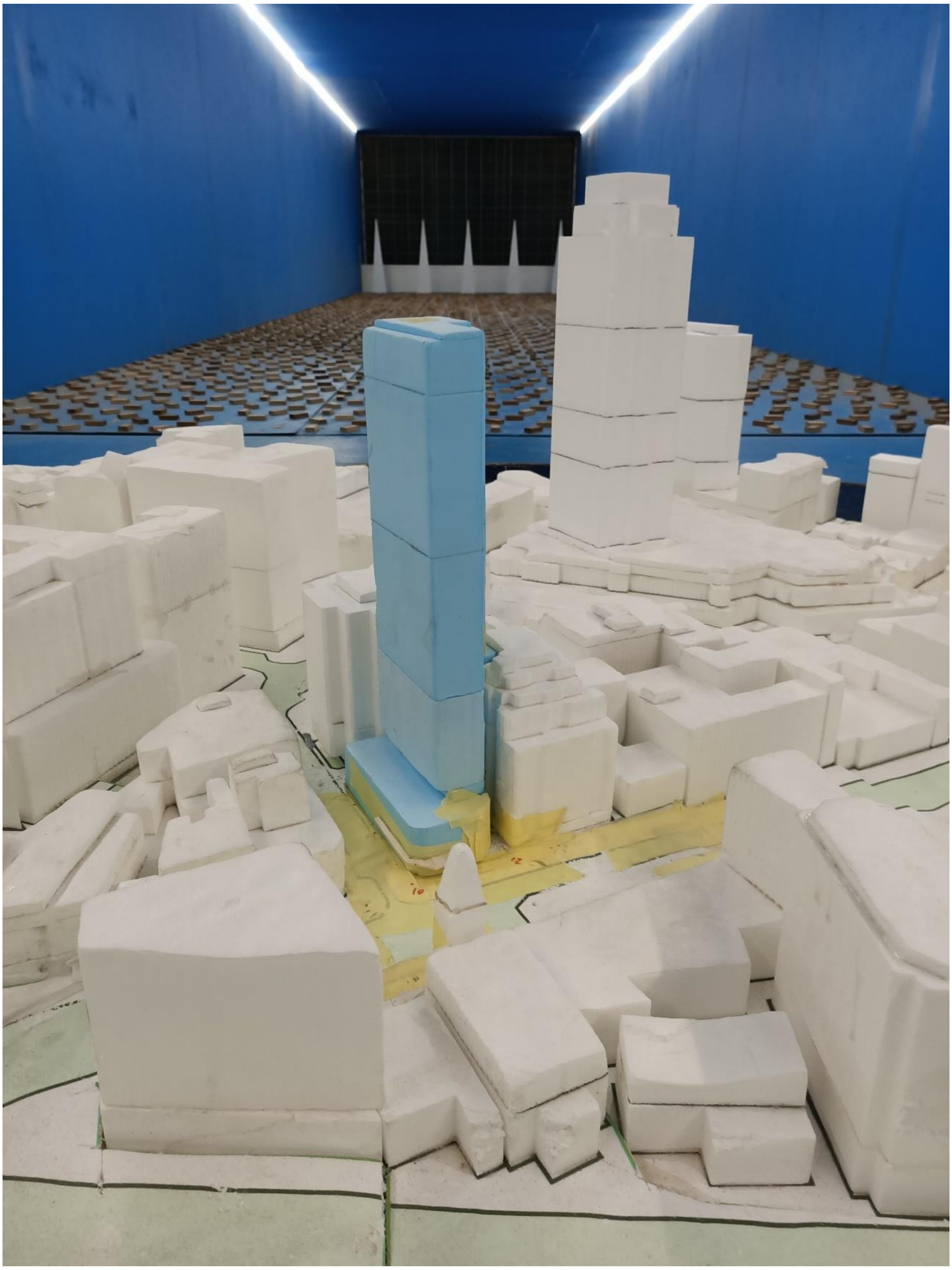

Figure 1i: Photograph of the Wind Tunnel Model (Proposed Case, view from the south-east)

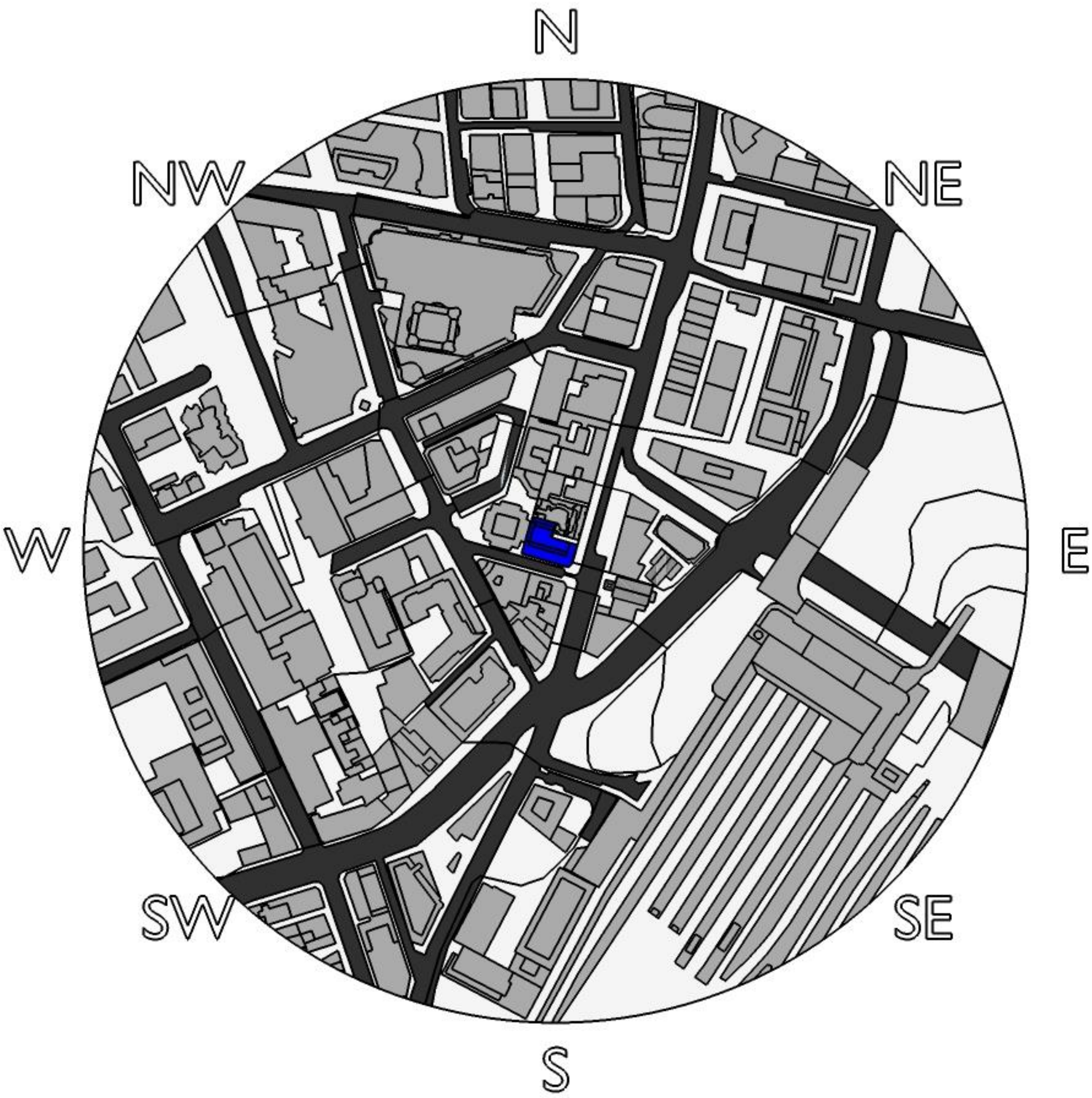

Figure 2: Proximity Model Plan

3 BOUNDARY LAYER WIND PROFILES AT THE SITE

The roughness of the surface of the earth has the effect of slowing down the wind near the ground. This effect is observed up to the boundary layer height, which can range between 500m to 3km above the earth's surface depending on the roughness of the surface (ie: oceans, open farmland, etc). Within this range the prevailing wind forms a boundary layer wind profile.

Various wind codes and standards and other publications classify various types of boundary layer wind flows depending on the surface roughness z_0. Descriptions of typical boundary layer wind profiles, based on D.M. Deaves and R.I. Harris (1978), are summarised as follows:

- Flat terrain (0.002m < z_0 < 0.003m). Examples include inland water bodies such as lakes, dams, rivers, etc, and the open ocean.
- Semi-open terrain (0.006m < z_0 < 0.01m). Examples include flat deserts and plains.
- Open terrain (0.02m < z_0 < 0.03m). Examples include grassy fields, semi-flat plains, and open farmland (without buildings or trees).
- Semi-suburban/semi-forest terrain (0.06m < z_0 < 0.1m). Examples include farmland with scattered trees and buildings and very low-density suburban areas.
- Suburban/forest terrain (0.2m < z_0 < 0.3m). Examples include suburban areas of towns and areas with dense vegetation such as forests, bushland, etc.
- Semi-urban terrain (0.6m < z_0 < 1.0m). Examples include centres of small cities, industrial parks, etc.
- Urban terrain (2.0m < z_0 < 3.0m). Examples include centres of large cities with many high-rise towers, and also areas with many closely-spaced mid-rise buildings.

The boundary layer wind profile does not change instantly due to changes in the terrain roughness. It can take many kilometres (at least 100km) of a constant surface roughness for the boundary layer wind profile to achieve a state of equilibrium. Hence an analysis of the effect of changes in the upwind terrain roughness is necessary to determine an accurate boundary layer wind profile at the development site location.

The proximity model accounts for the effect of the near field topographic effects as well as the influence of the local built forms. To account for further afield effects, an assessment of the upwind terrain roughness has been undertaken based on the method given in AS/NZS1170.2:2011, using a fetch ranging from 20 to 60 times the study reference height (as per the recommendation by AS/NZS1170.2:2011). An aerial image showing the surrounding terrain is presented in Figure 3 for a range of 3.6km from the edge of the proximity model used for the wind tunnel study. The resulting mean and gust terrain and height multipliers at the site location are presented in Table 1, referenced to the study reference height (which is approximately half the height of the subject development since typically we are most interested in the wind effects at the ground plane). Details of the boundary layer wind profiles at the site are combined with the regional wind model (see Section 4) to determine the site wind speeds.

Table 1: Approaching Boundary Layer Wind Profile Analysis Summary (at the study reference height)

Wind Sector (degrees)	Terrain and Height Multiplier $k_{tr,T=1hr}$ (hourly)	$k_{tr,T=10min}$ (10min)	$k_{tr,T=3s}$ (3sec)	Turbulence Intensity I_v	Equivalent Terrain Category (AS/NZS1170.2:2011 naming convention)
0	0.77	0.80	1.18	0.180	2.7
30	0.83	0.86	1.21	0.157	2.3
60	0.75	0.78	1.17	0.189	2.8
90	0.71	0.75	1.14	0.204	3.0
120	0.79	0.83	1.19	0.169	2.5
150	0.75	0.79	1.17	0.187	2.8
180	0.61	0.65	1.08	0.256	3.5
210	0.71	0.75	1.15	0.202	3.0
240	0.71	0.75	1.15	0.202	3.0
270	0.71	0.75	1.15	0.202	3.0
300	0.76	0.80	1.17	0.182	2.7
330	0.78	0.82	1.18	0.175	2.6

NOTE: These terrain and height multipliers are to be applied to a basic regional wind speed averaged over 3-seconds. Divide these values by 1.10 for a basic wind speed averaged over 0.2-seconds, 0.69 for a basic wind speed averaged over 10-minutes, or 0.66 for a basic wind speed averaged over 1-hour.

For each of the 16 wind directions tested in this study, the approaching boundary layer wind profiles modelled in the wind tunnel closely matched the profiles listed in Table 1. Plots of the boundary layer wind profiles used for the wind tunnel testing are presented in Appendix D of this report.

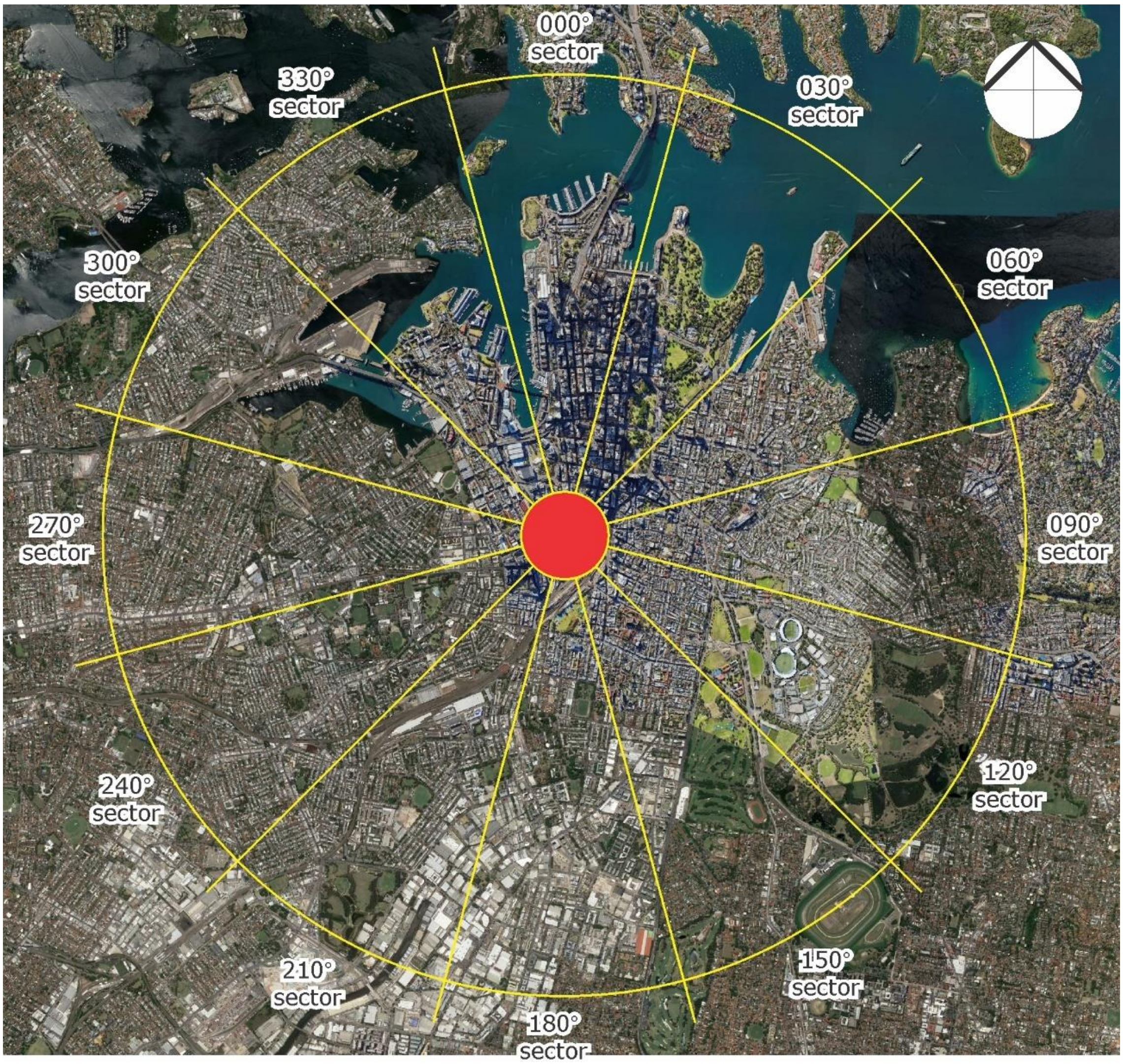

Figure 3: Aerial Image of the Surrounding Terrain (radius of 3.6km from the edge of the proximity model)

4 REGIONAL WIND MODEL

The regional wind model used in this study was determined from an analysis of measured directional mean wind speeds obtained at the meteorological recording station located at Kingsford Smith Airport (Sydney Airport). Data was collected from 1995 to 2016 and corrected so that it represents winds over standard open terrain at a height of 10m above ground for each wind direction. From this analysis, directional probabilities of exceedance and directional wind speeds for the region are determined. The directional wind speeds are summarised in Table 2. The directional wind speeds and corresponding directional frequencies of occurrence are presented in Figure 4.

The data indicates that the southerly winds are by far the most frequent winds for the Sydney region, and are also the strongest. The westerly winds occur most frequently during the winter season for the Sydney region, and although they are typically not as strong as the southerly winds, they are usually a cold wind and hence can be a cause for discomfort for outdoor areas. North-easterly winds occur most frequently occur during the warmer months of the year for the Sydney region, and hence are usually welcomed within outdoor areas since they are typically not as strong as the southerly or westerly winds.

The recurrence intervals examined in this study are for exceedances of 5% (per 90 degree sector) of the pedestrian comfort criteria using Gust-Equivalent Mean (GEM) wind speeds, and annual maximum wind speeds (per 22.5 degree sector) for the pedestrian safety criterion. Note that the 5% probability wind speeds presented in Table 2 are only used for the directional plot presented in Figure 4 and are not used for the integration of the probabilities.

Table 2: Regional Directional Wind Speeds (hourly means, at 10m height in standard open terrain) (m/s)

Wind Direction	5% Exceedance	Annual Maximum
N	5.9	9.9
NNE	9.9	12.9
NE	9.7	12.3
ENE	7.5	10.0
E	6.3	9.3
ESE	6.2	9.1
SE	7.0	10.1
SSE	8.5	12.2
S	10.3	13.9
SSW	10.0	14.1
SW	6.9	11.9
WSW	9.3	13.6
W	9.8	14.4
WNW	8.8	14.3
NW	6.7	12.6
NNW	5.5	10.7

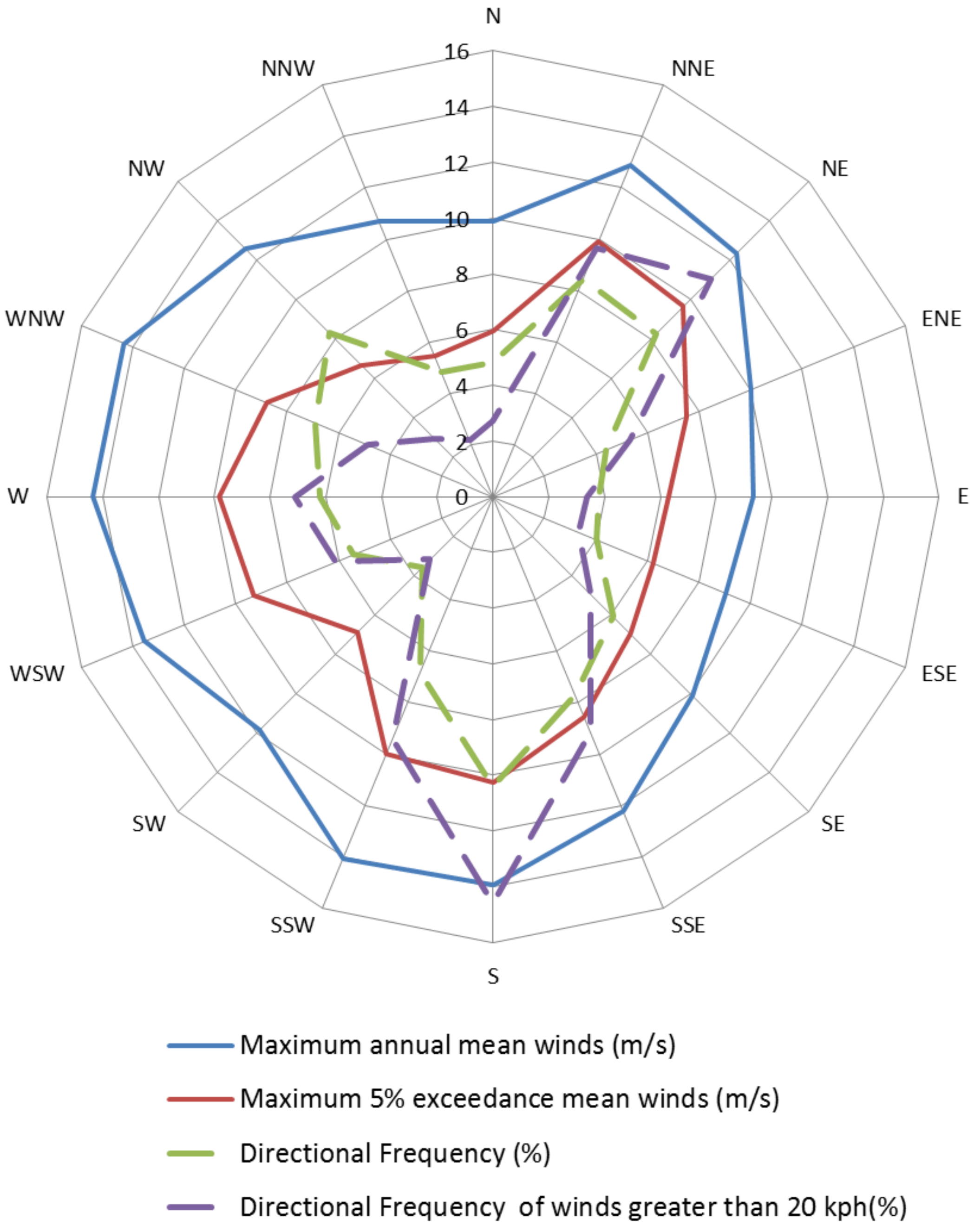

Figure 4: Annual and 5% Exceedance Hourly Mean Wind Speeds, and Frequencies of Occurrence, for the Sydney Region (at 10m height in standard open terrain)

5 PEDESTRIAN WIND COMFORT AND SAFETY

The acceptability of wind conditions for an area is determined by comparing the measured wind speeds against an appropriate criteria. This section outlines how the measured wind speeds were obtained, the criteria considered for the development, as well as the critical trafficable areas that were assessed and their corresponding criteria designation.

5.1 Measured Wind Speeds

Wind speeds were measured using either Dantec hot-wire probe anemometers or pressure-based wind speed sensors, positioned to monitor wind conditions at critical outdoor trafficable areas of the development. The reference mean free-stream wind speed measured in the wind tunnel, which is at a full-scale height of 200m and measured 3m upstream of the study model.

Measurements were acquired for 16 wind directions at 22.5 degree increments using a sample rate of 1,024Hz. The full methodology of determining the wind speed measurements at the site from either the Dantec Hot-wire probe anemometers or pressure-based wind speed sensors is provided in Appendix B. Based on the results of the analysis of the boundary layer wind profiles at the site (see Section 3), and incorporating the regional wind model (see Section 4), the data sampling length of the wind tunnel test for each wind direction corresponds to a full-scale sample length ranging between 30 minutes and 1 hour. Research by A.W. Rofail and K.C.S. Kwok (1991) has shown that, in addition to the mean and standard deviation of the wind being stable for sample lengths of 15 minutes or more (full-scale), the peak value determined using the upcrossing method is stable for sample lengths of 30 minutes or more.

5.2 Wind Speed Criteria Used for This Study

For this study, the measured wind conditions for the various critical outdoor trafficable areas around the subject development are compared against the criteria presented in the Draft Sydney Development Control Plan 2012 - Central Sydney Planning Review Amendment, which supersedes the criteria detailed in the City of Sydney Development Control Plan 2012 (SDCP2012).

For pedestrian comfort, the Draft Sydney DCP 2012 requires that the hourly mean wind speed, or Gust-Equivalent Mean (GEM) wind speed (whichever is greater for each wind direction), must not exceed 8m/s for walking, 6m/s for standing, and 4m/s for sitting. These are based on a 5% probability of exceedance.

For pedestrian safety, the Draft Sydney DCP 2012 defines a safety limit criterion of 24m/s, based on an annual maximum 0.5 second gust wind speed, which applies to all areas.

Furthermore, in accordance with the provisions of the Draft Sydney DCP 2012, the existing conditions for the pedestrian footpaths around the site are also analysed as part of this study to determine the impact of the subject development. If it is found that the existing conditions exceed the relevant criteria, then the target wind speed for that area with the inclusion of the proposed development is to at least match the existing site conditions.

In accordance with the provisions of the Draft Sydney DCP 2012, the wind speed assessment is undertaken for winds occurring between 6am and 10pm (AEST).

A more detailed comparison of published criteria for pedestrian wind comfort and safety is provided in Appendix A.

For this study the measured wind conditions of the selected critical outdoor trafficable areas are compared against two sets of criteria; one for pedestrian safety, and one for pedestrian comfort. The safety criterion is applied to the annual maximum gust winds, and the comfort criteria is applied to Gust Equivalent Mean (GEM) winds. In accordance with ASCE (2003), the GEM wind speed is defined as follows:

$$GEM = max\left(\bar{V}, \frac{\hat{V}}{1.85}\right) \quad (5.1)$$

where:

$\bar{V}$ is the mean wind speed.

$\hat{V}$ is the gust wind speed.

The criteria considered in this study are summarised in Tables 3 and 4 for pedestrian comfort and safety, respectively. The results of the wind tunnel study are presented in the form of directional plots attached in Appendix C of this report. For each study point there is a plot of the GEM wind speeds using the comfort criteria, and a plot for the annual maximum gust wind speeds using the safety criterion.

Table 3: Pedestrian Comfort Criteria (Draft Sydney DCP 2012)

Classification	Description	Maximum 5% Exceedance GEM Wind Speed (m/s)
Sitting	Outdoor areas that involve seating such as parks, dining areas in restaurants, amphitheatres, etc.	4
Standing	Short duration stationary activities (generally less than 1 hour), including window shopping, waiting areas, etc.	6
Walking	For pedestrian thoroughfares, private swimming pools, most communal areas, private balconies and terraces, etc.	8

Table 4: Pedestrian Safety Criterion (Draft Sydney DCP 2012)

Classification	Description	Annual Maximum Gust Wind Speed (m/s)
Safety	Safety criterion applies to all trafficable areas.	24

5.3 Layout of Study Points

For this study, a total of 18 study point locations on the Ground Level along the pedestrian footpaths along George Street and Valentine Street around the proposed development site were selected for analysis in the wind tunnel.

The locations of the various study points tested for this study, as well as the target wind speed criteria for the various outdoor trafficable areas of the development, are presented in Figure 5 in the form of marked-up plans. It should be noted that only the most critical outdoor locations of the development have been selected for analysis.

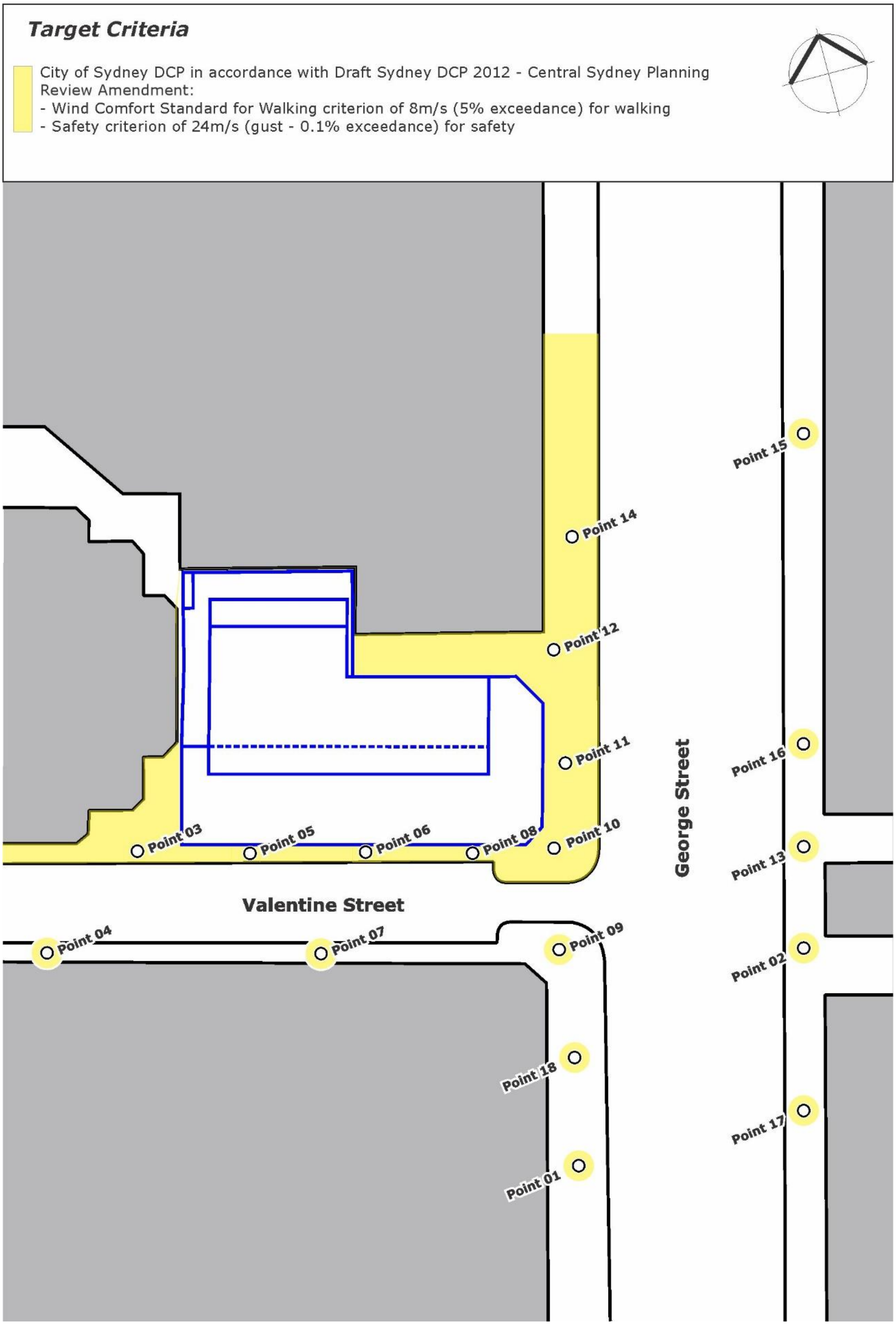

Figure 5: Study Point Locations and Target Wind Speed Criteria – Ground Floor Plan

6 RESULTS AND DISCUSSION

The results of the wind tunnel study are presented in the form of directional plots in Appendix C for all study points locations, summarised in Table 9 and Table 10, and shown on marked-up plans in Figures 6.

Testing was performed for two massing variations of the development, which are denoted by the following scenarios:

- With the existing surrounding buildings and the inclusion of the Base Case Massing with the heritage awning. In this report, this test case is referred to as the "Base Case".
- With the existing surrounding buildings and the inclusion of the Proposed Case Massing with the heritage awning and a small building chamfer along the north-eastern corner of the podium. In this report, this test case is referred to as the "Proposed Case".

The wind speed criteria that the wind conditions should achieve are also listed in Tables 6 to 10 for each study point location, as well as in Figures 5.

The results of the study indicate that wind conditions for all trafficable outdoor locations within and around the development will be suitable for their intended uses.

The results of the study demonstrate that the Proposed Case exhibits comfortable wind conditions relative to the Base Case, utilising a comparison of the average wind speed of the equivalent 5% exceedance wind speeds listed in Table 6 for each scenario.

The results of the study indicate that wind conditions all trafficable outdoor locations within and around the development will be suitable for their intended uses. As a general note, the use of loose glass-tops and light-weight sheets or covers (including loose BBQ lids) is not appropriate on high-rise outdoor terraces and balconies. Furthermore, lightweight furniture is not recommended unless it is securely attached to the balcony or terrace floor slab.

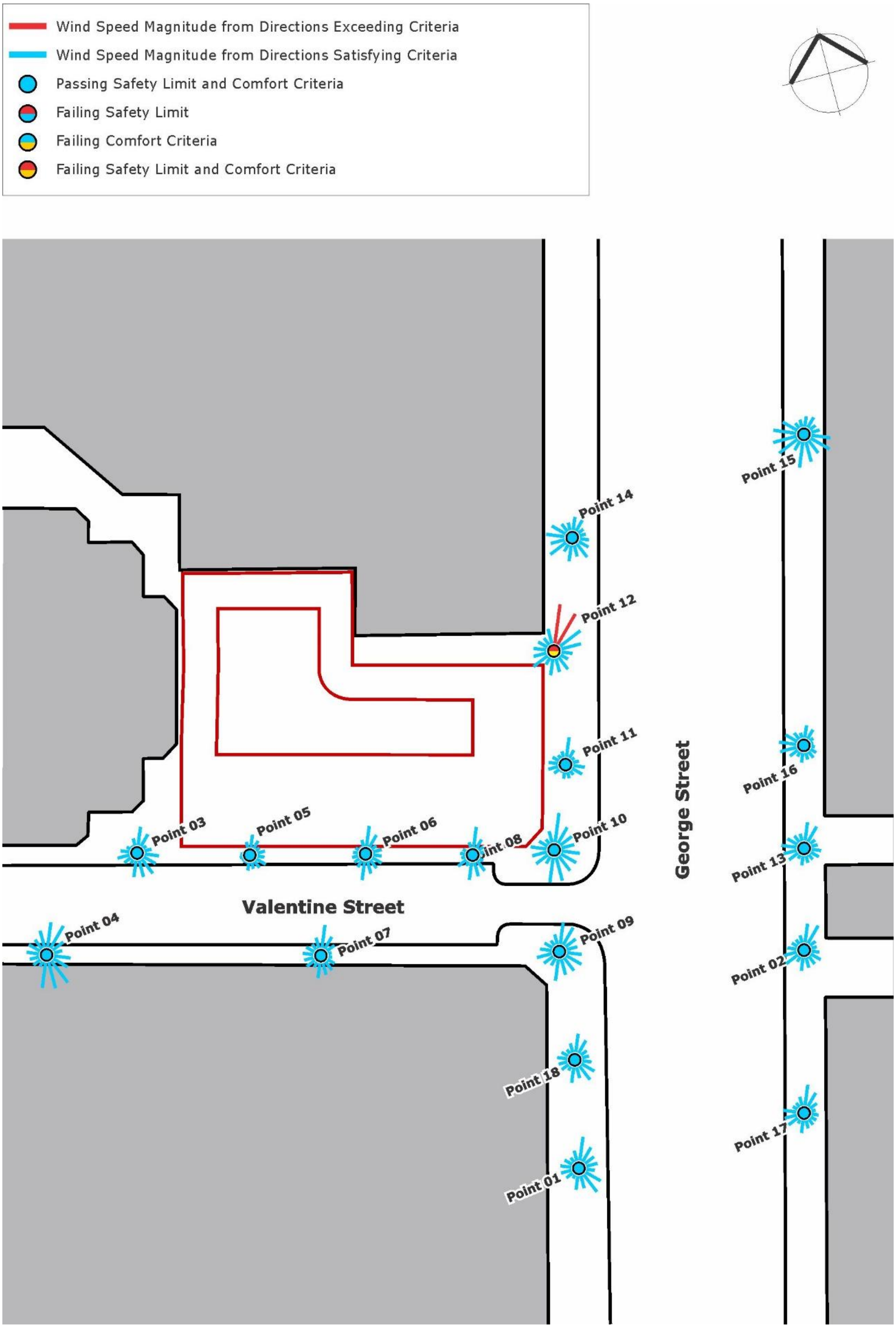

Figure 6a: Wind Tunnel Results – Base Case
(results shown without treatments applied)

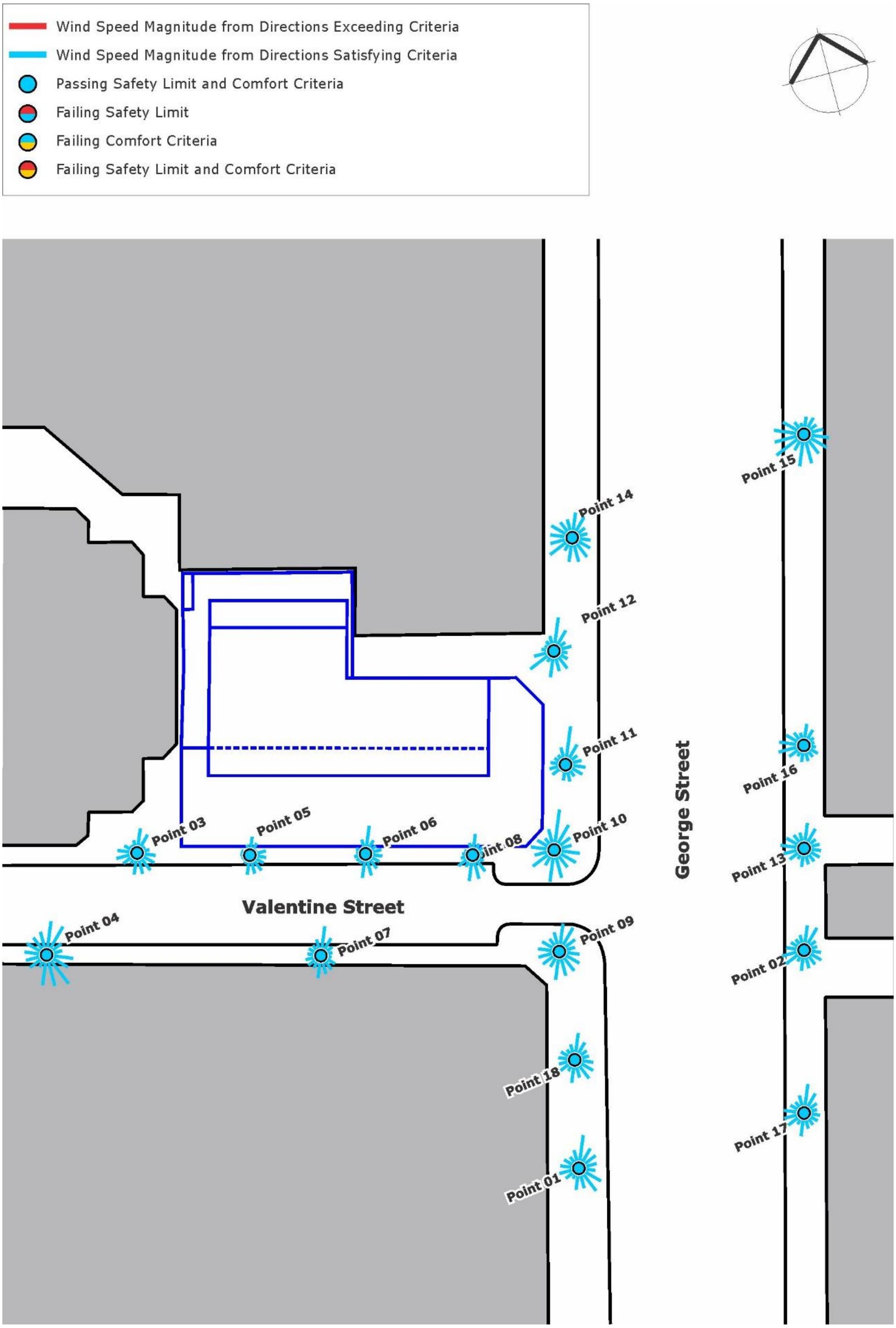

Figure 6b: Wind Tunnel Results – Proposed Case
(results shown without treatments applied)

Table 5: Target Wind Speed Comfort Criteria

Legend	
Comfort Criteria	Wind Speed range (m/s)
Pedestrian Sitting	2 - 4
Pedestrian Standing	4 - 6
Pedestrian Walking	6 - 8
Uncomfortable	> 8

Table 6: Equivalent 5% Exceedance Wind Speeds and Target Criteria

Equivalent 5% exceedance wind speeds (m/s)			
Test Location	Criteria	Base Case	Proposed Case
P01	6 - 8	6.4	6.5
P02	6 - 8	5.7	5.5
P03	6 - 8	5.8	5.3
P04	6 - 8	7.9	7.9
P05	6 - 8	4.0	4.3
P06	6 - 8	5.5	5.3
P07	6 - 8	5.7	5.4
P08	6 - 8	5.4	5.1
P09	6 - 8	6.5	6.4
P10	6 - 8	7.5	7.8
P11	6 - 8	5.1	6.6
P12	6 - 8	9.1	6.5
P13	6 - 8	5.4	5.4
P14	6 - 8	6.0	6.2
P15	6 - 8	7.5	7.4
P16	6 - 8	5.1	5.2
P17	6 - 8	5.4	5.6
P18	6 - 8	5.6	5.5
Average		6.1	6.0

Table 7: Target Wind Speed Safety Criteria

Legend	
Safety Criteria (m/s)	Result
<24	Pass
≥24	Fail

Table 8: Annual Gust Wind Speed and Safety Criteria

Safety - Annual Gust Speed (m/s)			
Test Location	Criteria	Base Case	Proposed Case
P01	24	18	19
P02	24	16	15
P03	24	15	14
P04	24	19	20
P05	24	12	12
P06	24	16	16
P07	24	18	17
P08	24	16	15
P09	24	19	18
P10	24	20	21
P11	24	15	19
P12	24	28	19
P13	24	16	17
P14	24	18	18
P15	24	22	22
P16	24	18	18
P17	24	16	17
P18	24	16	16
Average		17.7	17.4

Table 9: Wind Tunnel Results Summary - Base Case

Study Point	GEM (5% exceedance)			Annual Gust			Final Result	Description of Treatment
	Criterion (m/s)	Results (%)	Grade	Criterion (m/s)	Results (m/s)	Grade		
Point 01	8.0	1%	Pass	24	18	Pass	Pass	
Point 02	8.0	< 1%	Pass	24	16	Pass	Pass	
Point 03	8.0	< 1%	Pass	24	15	Pass	Pass	
Point 04	8.0	5%	Pass	24	19	Pass	Pass	
Point 05	8.0	< 1%	Pass	24	12	Pass	Pass	
Point 06	8.0	< 1%	Pass	24	16	Pass	Pass	
Point 07	8.0	< 1%	Pass	24	18	Pass	Pass	
Point 08	8.0	< 1%	Pass	24	16	Pass	Pass	
Point 09	8.0	1%	Pass	24	19	Pass	Pass	
Point 10	8.0	3%	Pass	24	20	Pass	Pass	
Point 11	8.0	< 1%	Pass	24	15	Pass	Pass	
Point 12	8.0	11%	Fail	24	28	Fail	Fail	
Point 13	8.0	< 1%	Pass	24	16	Pass	Pass	
Point 14	8.0	1%	Pass	24	18	Pass	Pass	
Point 15	8.0	4%	Pass	24	22	Pass	Pass	
Point 16	8.0	< 1%	Pass	24	18	Pass	Pass	
Point 17	8.0	< 1%	Pass	24	16	Pass	Pass	
Point 18	8.0	< 1%	Pass	24	16	Pass	Pass	

Table 10: Wind Tunnel Results Summary - Proposed Case

Study Point	GEM (5% exceedance)			Annual Gust			Final Result	Description of Treatment
	Criterion (m/s)	Results (%)	Grade	Criterion (m/s)	Results (m/s)	Grade		
Point 01	8.0	1%	Pass	24	19	Pass	Pass	
Point 02	8.0	< 1%	Pass	24	15	Pass	Pass	
Point 03	8.0	< 1%	Pass	24	14	Pass	Pass	
Point 04	8.0	5%	Pass	24	20	Pass	Pass	
Point 05	8.0	< 1%	Pass	24	12	Pass	Pass	
Point 06	8.0	< 1%	Pass	24	16	Pass	Pass	
Point 07	8.0	< 1%	Pass	24	17	Pass	Pass	
Point 08	8.0	< 1%	Pass	24	15	Pass	Pass	
Point 09	8.0	1%	Pass	24	18	Pass	Pass	
Point 10	8.0	5%	Pass	24	21	Pass	Pass	
Point 11	8.0	2%	Pass	24	19	Pass	Pass	
Point 12	8.0	1%	Pass	24	19	Pass	Pass	
Point 13	8.0	< 1%	Pass	24	17	Pass	Pass	
Point 14	8.0	1%	Pass	24	18	Pass	Pass	
Point 15	8.0	4%	Pass	24	22	Pass	Pass	
Point 16	8.0	1%	Pass	24	18	Pass	Pass	
Point 17	8.0	< 1%	Pass	24	17	Pass	Pass	
Point 18	8.0	< 1%	Pass	24	16	Pass	Pass	

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APPENDIX A PUBLISHED ENVIRONMENTAL CRITERIA

A.1 Wind Effects on People

The acceptability of wind in an area is dependent upon the use of the area. For example, people walking or window-shopping will tolerate higher wind speeds than those seated at an outdoor restaurant. Quantifying wind comfort has been the subject of much research and many researchers, such as A.G. Davenport, T.V. Lawson, W.H. Melbourne, and A.D. Penwarden, have published criteria for pedestrian comfort for pedestrians in outdoor spaces for various types of activities. This section discusses and compares the various published criteria.

A.2 A.D. Penwarden (1973) Criteria for Mean Wind Speeds

A.D. Penwarden (1973) developed a modified version of the Beaufort scale which describes the effects of various wind intensities on people. Table A.1 presents the modified Beaufort scale. Note that the effects listed in this table refers to wind conditions occurring frequently over the averaging time (a probability of occurrence exceeding 5%). Higher ranges of wind speeds can be tolerated for rarer events.

Table A.1: Summary of Wind Effects on People (A.D. Penwarden, 1973)

Type of Winds	Beaufort Number	Hourly Mean Wind Speed (m/s)	Effects
Calm	0	0 - 0.3	
Calm, light air	1	0.3 - 1.6	No noticeable wind
Light breeze	2	1.6 - 3.4	Wind felt on face
Gentle breeze	3	3.4 - 5.5	Hair is disturbed, clothing flaps, newspapers difficult to read
Moderate breeze	4	5.5 – 8.0	Raises dust, dry soil and loose paper, hair disarranged
Fresh breeze	5	8.0 – 10.8	Force of wind felt on body, danger of stumbling
Strong breeze	6	10.8 – 13.9	Umbrellas used with difficulty, hair blown straight, difficult to walk steadily, wind noise on ears unpleasant
Near gale	7	13.9 – 17.2	Inconvenience felt when walking
Gale	8	17.2 - 20.8	Generally impedes progress, difficulty balancing in gusts
Strong gale	9	20.8 – 24.5	People blown over

A.3 A.G. Davenport (1972) Criteria for Mean Wind Speeds

A.G. Davenport (1972) also determined a set of criteria in terms of the Beaufort scale and for various return periods. Table A.2 presents a summary of the criteria based on a probability of exceedance of 5%.

Table A.2: Criteria by A.G. Davenport (1972)

Classification	Activities	5% exceedance Mean Wind Speed (m/s)
Walking Fast	Acceptable for walking, main public accessways.	7.5 - 10.0
Strolling, Skating	Slow walking, etc.	5.5 - 7.5
Short Exposure Activities	Generally acceptable for walking & short duration stationary activities such as window-shopping, standing or sitting in plazas.	3.5 - 5.5
Long Exposure Activities	Generally acceptable for long duration stationary activities such as in outdoor restaurants & theatres and in parks.	0 - 3.5

A.4 T.V. Lawson (1975) Criteria for Mean Wind Speeds

In 1973, T.V. Lawson, while referring to the Beaufort wind speeds of A.D. Penwarden (1973) (as listed in Table A.1), quoted that a Beaufort 4 wind speed would be acceptable if it is not exceeded for more than 4% of the time, and that a Beaufort 6 wind speed would be unacceptable if it is exceeded more than 2% of the time. Later, in 1975, T.V. Lawson presented a set of criteria very similar to those presented in A.G. Davenport (1972) (as listed in Table A.2). These criteria are presented in Table A.3 and Table A.4 for safety and comfort respectively.

Table A.3: Safety Criteria by T.V. Lawson (1975)

Classification	Activities	Annual Mean Wind Speed (m/s)
Safety (all weather areas)	Accessible by the general public.	0 – 15
Safety (fair weather areas)	Private areas, balconies/terraces, etc.	0 – 20

Table A.4: Comfort Criteria by T.V. Lawson (1975)

Classification	Activities	5% exceedance Mean Wind Speed (m/s)
Business Walking	Objective Walking from A to B.	8 - 10
Pedestrian Walking	Slow walking, etc.	6 - 8
Short Exposure Activities	Pedestrian standing or sitting for short times.	4 – 6
Long Exposure Activities	Pedestrian sitting for a long duration.	0 - 4

A.5 W.H. Melbourne (1978) Criteria for Gust Wind Speeds

W.H. Melbourne (1978) introduced a set of criteria for the assessment of environmental wind conditions that were developed for a temperature range of 10°C to 30°C and for people suitably dressed for outdoor conditions. These criteria are presented in Table A.5, and are based on maximum gust wind speeds with a probability of exceedance of once per year.

Table A.5: Criteria by W.H. Melbourne (1978)

Classification	Activities	Annual Gust Wind Speed (m/s)
Limit for Safety	Completely unacceptable: people likely to get blown over.	23
Marginal	Unacceptable as main public accessways.	16 - 23
Comfortable Walking	Acceptable for walking, main public accessways	13 - 16
Short Exposure Activities	Generally acceptable for walking & short duration stationary activities such as window-shopping, standing or sitting in plazas.	10 - 13
Long Exposure Activities	Generally acceptable for long duration stationary activities such as in outdoor restaurants & theatres and in parks.	0 - 10

A.6 Comparison of the Published Wind Speed Criteria

W.H. Melbourne (1978) presented a comparison of the criteria of various researchers on a probabilistic basis. Figure A.1 presents the results of this comparison, and indicates that the criteria of W.H. Melbourne (1978) are comparatively quite conservative. This conclusion was also observed by A.W. Rofail (2007) when undertaking on-site remedial studies. The results of A.W. Rofail (2007) concluded that the criteria by W.H. Melbourne (1978) generally overstates the wind effects in a typical urban setting due to the assumption of a fixed 15% turbulence intensity for all areas. It was observed in A.W. Rofail (2007) that the 15% turbulence intensity assumption is not real and that the turbulence intensities at 1.5m above ground is at least 20% and in a suburban or urban setting is generally in the range of 30% to 60%.

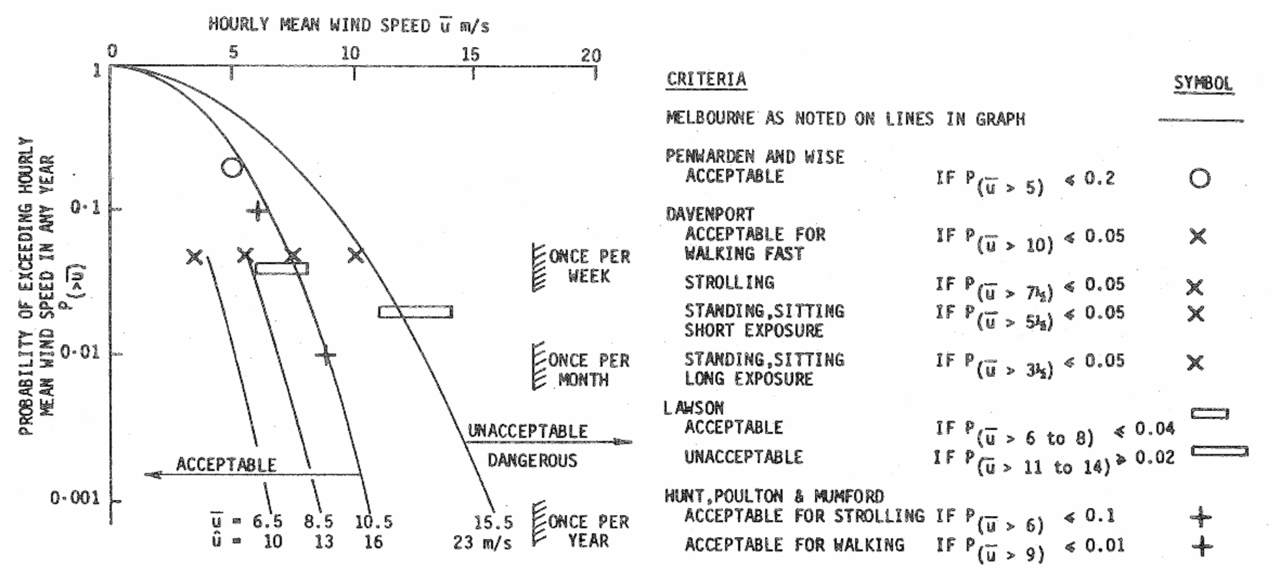

Figure A.1: Comparison of Various Mean and Gust Wind Environment Criteria, assuming 15% turbulence and a Gust Factor of 1.5 (W.H. Melbourne, 1978)

A.7 References relating to Pedestrian Comfort Criteria

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APPENDIX B DATA ACQUISITION

The wind tunnel testing procedures utilised for this study were based on the guidelines set out in the Australasian Wind Engineering Society Quality Assurance Manual (AWES-QAM-1-2019), ASCE 7-16 (Chapter C31), and CTBUH (2013). The wind speed measurements for the wind tunnel study were determined as coefficients using data acquired by either Dantec hot-wire probe anemometers or pressure-based wind speed sensors and converted to full-scale wind speeds using details of the regional wind climate obtained from an analysis of directional wind speed recordings from the local meteorological recording station(s).

B.1 Measurement of the Velocity Coefficients

The study model and proximity model were setup within the wind tunnel which was configured to the appropriate boundary layer profile, and the wind velocity measurements were monitored using either Dantec hot-wire probe anemometers or pressure-based wind speed sensors at selected critical outdoor locations. The wind velocity results presented in this study for each study point are representative of wind at a full-scale height of approximately 1.5m above ground/slab level. In the case of the Dantec hot-wire probe anemometers, the support of the probe is mounted such that the probe wire is vertical as much as possible to ensure that the measured wind speeds are independent of wind direction along the horizontal plane. In addition, care was taken in the alignment of the hot-wire probe wire and in avoiding wall-heating effects.

Wind speed measurements were made in the wind tunnel for 16 wind directions, at 22.5° increments. Data was acquired for each wind direction using a sample rate of 1024Hz. The sample length was determined to produce a full-scale sample time that is sufficient for this type of study. In the case of the pressure-based wind speed sensors, the phase lag between the various channels where data is acquired simultaneously is within 10% of a typical pressure cycle, and the signal is low-pass filtered at 500Hz and then digital filtering is applied over this range to provide an unbiased response from the pressure measurement system (A.W. Rofail, 2004).

The mean, gust and standard deviation velocity coefficients were determined from the data acquired in the wind tunnel. The gust velocity coefficients were also derived for each wind direction from by the following relation:

$$\hat{C}_V = \bar{C}_V + g \cdot \sigma_{C_V} \qquad \text{B.1}$$

where:

$\hat{C}_V$ is the gust velocity coefficient.

$\bar{C}_V$ is the mean velocity coefficient.

g is the peak factor, taken as 3.0 for a 3-sec gust and 3.4 for a 0.5-sec gust.

σ_{C_V} is the standard deviation of the velocity coefficient measurement.

In the case of a Dantec hot-wire probe anemometer, the velocity coefficient is obtained as follows:

$$C_V = \frac{C_{V,study}}{C_{V,200m}} \tag{B.2}$$

where:

$C_{V,study}$ is the velocity coefficient measurement obtained from the Dantec hot-wire probe anemometer at the study point location.

$C_{V,200m}$ is the velocity coefficient measurement obtained from the Dantec hot-wire probe anemometer at the free-stream reference location at 200m height upwind of the model in the wind tunnel.

However, in the case of the pressure-based wind speed sensors, these are determined from the measured differential mean, standard deviation and maximum pressure coefficients obtained from the wind speed sensor. For this analysis all calculations are performed on the square root of the differential pressure measurements. The velocity coefficient at the pressure-based wind speed sensor location is then calculated as follows:

$$C_V = \frac{\alpha + \beta\sqrt{\Delta p}}{V_{200m}} \tag{B.3}$$

where:

C_V is the velocity coefficient measurement at the study point location.

α is a calibration coefficient for the pressure-based wind speed sensor.

β is a calibration coefficient for the pressure-based wind speed sensor.

Δp is the differential pressure obtained from the pressure-based wind speed sensor at the study point location.

V_{200m} is the wind speed at the free-stream reference location of 200m height (full-scale) in the wind tunnel, which is determined directly in the wind tunnel using a pitot static probe.

B.2 Calculation of the Full-Scale Results

The full-scale results determine if the wind conditions at a study location satisfy the designated criteria of that location. More specifically, the full-scale results need to determine the probability of exceedance of a given wind speed at a study location. To determine the probability of exceedance, the measured velocity coefficients were combined with a statistical model of the local wind climate that relates wind speed to a probability of exceedance. Details of the wind climate model are outlined in Section 4 of the main report.

The statistical model of the wind climate includes the impact of wind directionality as any local variations in wind speed or frequency with wind direction. This is important as the wind directions that produce the highest wind speed events for a region may not coincide with the most wind exposed direction at the site.

The methodology adopted for the derivation of the full-scale results for the maximum gust and the GEM wind speeds are outlined in the following sub-sections.

B.3 Maximum Gust Wind Speeds

The full-scale maximum gust wind speed at each study point location is derived from the measured coefficient using the following relationship:

$$V_{study} = V_{ref,RH}\left(\frac{k_{200m,tr,T=1hr}}{k_{RH,tr,T=1hr}}\right)C_V \qquad \text{B.4}$$

where:

V_{study} is the full-scale wind speed at the study point location.

$V_{ref,RH}$ is the full-scale reference wind speed at the study reference height. This value is determined by combining the directional wind speed data for the region (detailed in Section 4) and the upwind terrain and height multipliers for the site (detailed in Section 3).

$k_{200m,tr,T=1hr}$ is the hourly mean terrain and height multiplier at the free-stream reference location of 200m height.

$k_{RH,tr,T=1hr}$ is the hourly mean terrain and height multiplier at the study reference height (Section 3).

C_V is the velocity coefficient, obtained from either Equation B.2 (in the case of Dantec hot-wire probe anemometers) or Equation B.3 (in the case of pressure-based wind speed sensors).

The value of $V_{ref,RH}$ varies with each prevailing wind direction. Wind directions where there is a high probability that a strong wind will occur have a higher directional wind speed than other directions. To determine the directional wind speeds, a probability level must be assigned for each wind direction. These probability levels are set following the approach used in AS/NZS1170.2:2011, which assumes that the major contributions to the combined probability of exceedance of a typical load effect comes from only two 45 degree sectors.

B.4 Maximum Gust-Equivalent Mean Wind Speeds

The contribution to the probability of exceedance of a specified wind speed (ie: the desired wind speed for pedestrian comfort, as per the criteria) was calculated for each wind direction. These contributions are then combined over all wind directions to calculate the total probability of exceedance of the specified wind speed. To calculate the probability of exceedance for a specified wind speed a statistical wind climate model was used to describe the relationship between directional wind speeds and the probability of exceedance. A detailed description of the methodology is given by T.V. Lawson (1980).

The criteria used in this study is referenced to a probability of exceedance of 5% of a specified wind speed.

B.5 References relating to Data Acquisition

American Society of Civil Engineers (ASCE), ASCE-7-16, 2016, "Minimum Design Loads for Buildings and Other Structures".

Australasian Wind Engineering Society, QAM-1, 2019, "Quality Assurance Manual: Wind Engineering Studies of Buildings", edited by Rofail A.W., et al.

Council on Tall Buildings and Urban Habitat (CTBUH), 2013, "Wind tunnel testing of high-rise buildings", CTBUH Technical Guides.

Lawson, T.V., 1980, "Wind Effects on Buildings - Volume 1, Design Applications". Applied Science Publishers Ltd, Ripple Road, Barking, Essex, England.

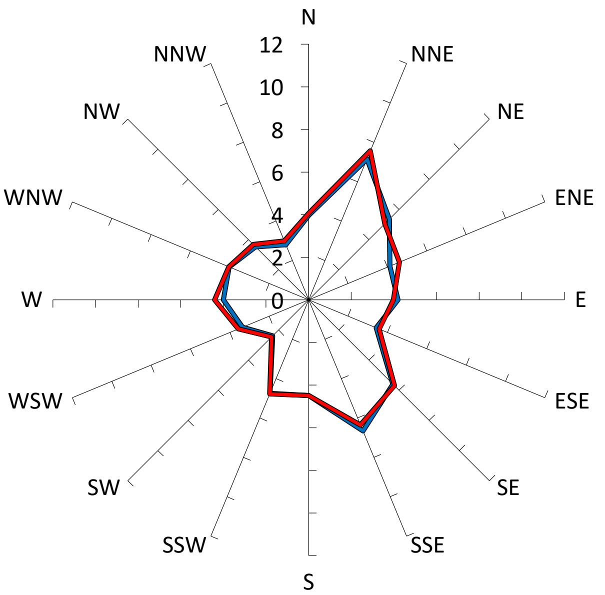
Rofail A.W., Tonin, R., and Hanafi, D., 2004, "Sensitivity of frequency response to type of tubing", Australasian Wind Engineering Workshop, Darwin.

Standards Australia and Standards New Zealand, AS/NZS 1170.2, 2011, "SAA Wind Loading Standard, Part 2: Wind Actions".

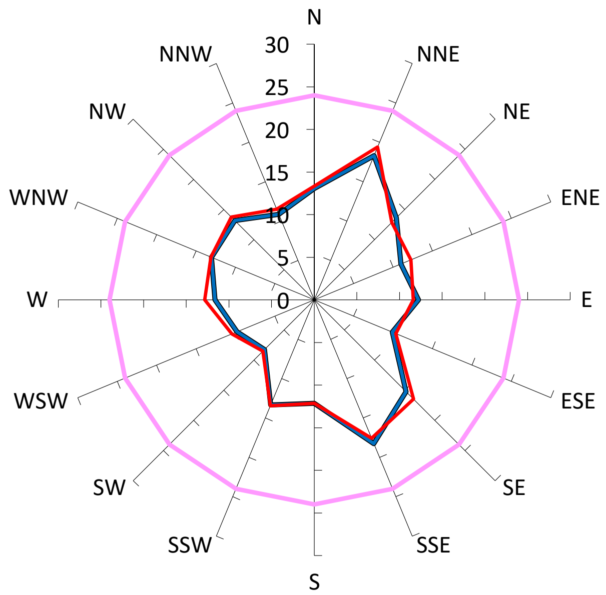
APPENDIX C DIRECTIONAL PLOTS OF WIND TUNNEL RESULTS

Results for Point 01

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)



Comfort Criteria: 8m/s with 5% probability of exceedence

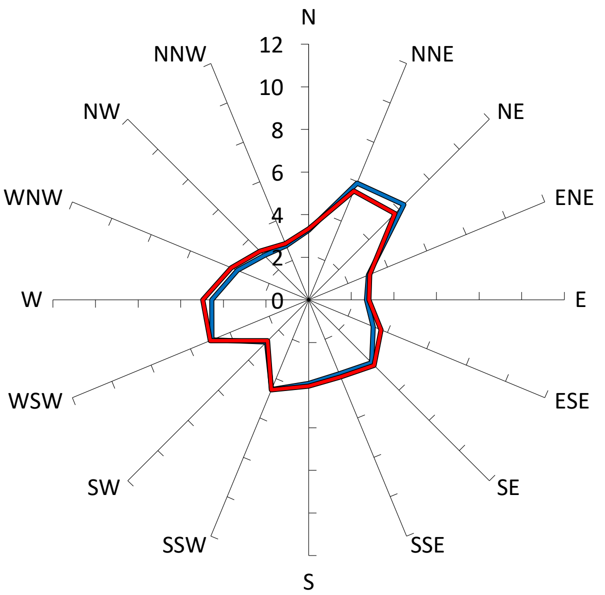


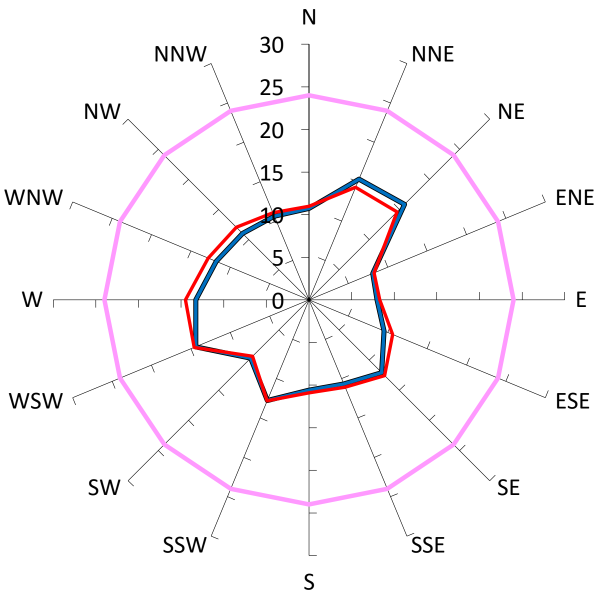
Safety Limit: 24m/s

Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
Base Case: With the heritage awning	1%	18
Proposed Case: With the heritage awning and small chamfer	1%	19

Results for Point 02

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)





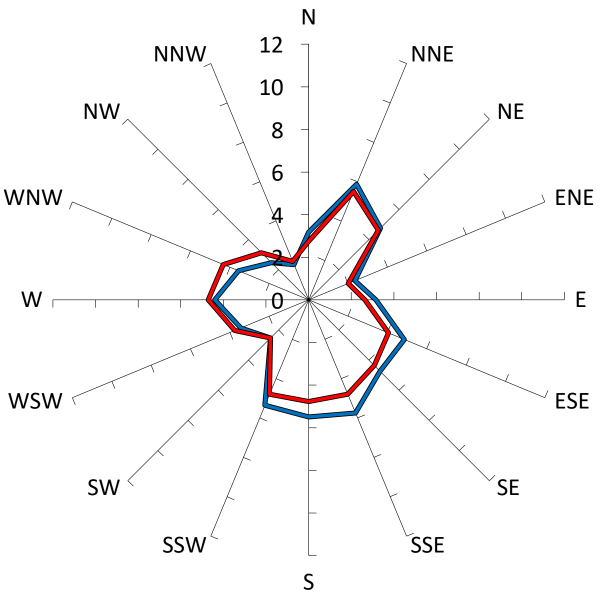
Comfort Criteria: 8m/s with 5% probability of exceedence

Safety Limit: 24m/s

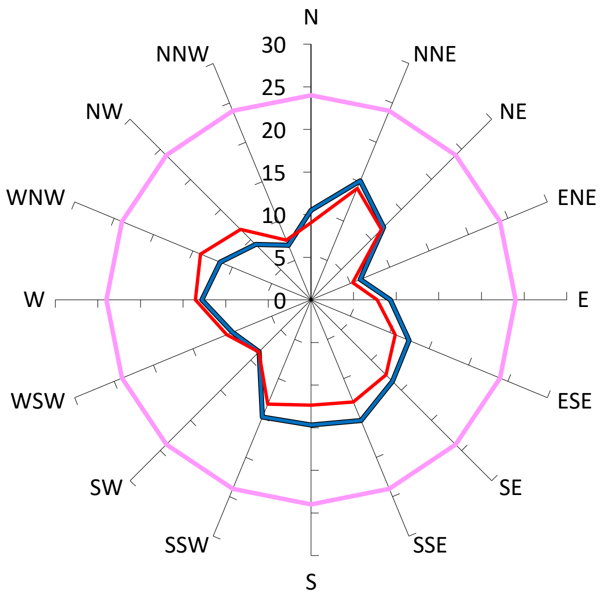
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
Base Case: With the heritage awning	< 1%	16
Proposed Case: With the heritage awning and small chamfer	< 1%	15

Results for Point 03

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)



Comfort Criteria: 8m/s with 5% probability of exceedence

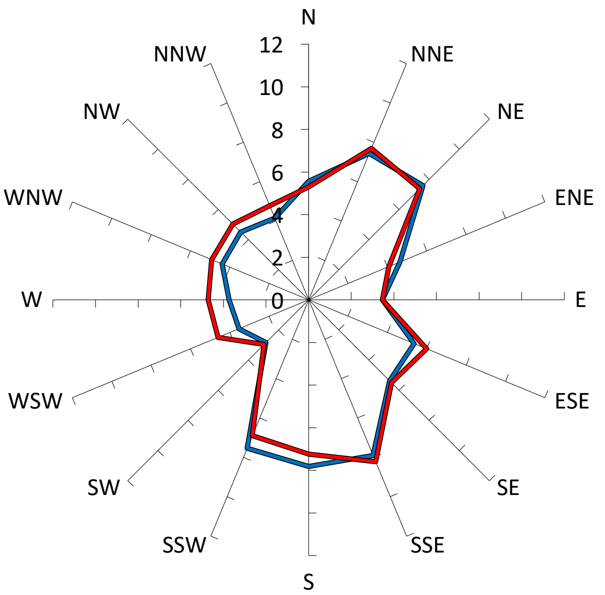


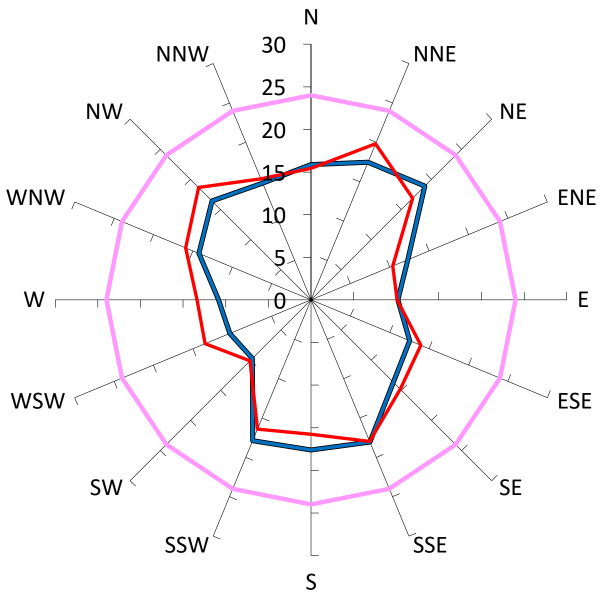
Safety Limit: 24m/s

Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
Base Case: With the heritage awning	< 1%	15
Proposed Case: With the heritage awning and small chamfer	< 1%	14

Results for Point 04

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)





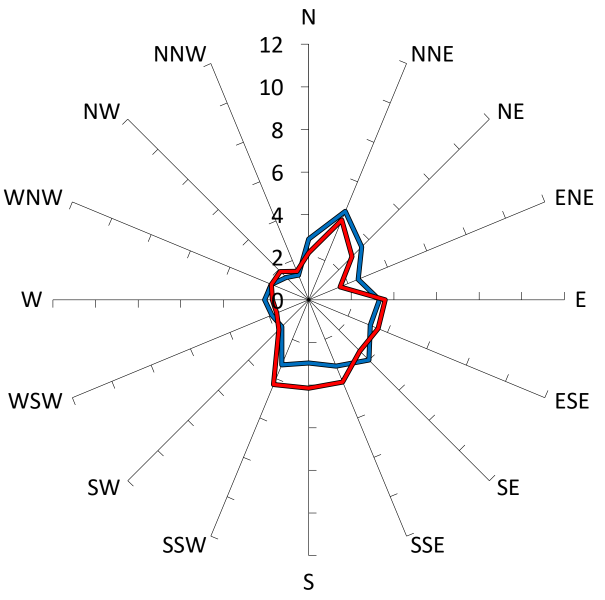
Comfort Criteria: 8m/s with 5% probability of exceedence

Safety Limit: 24m/s

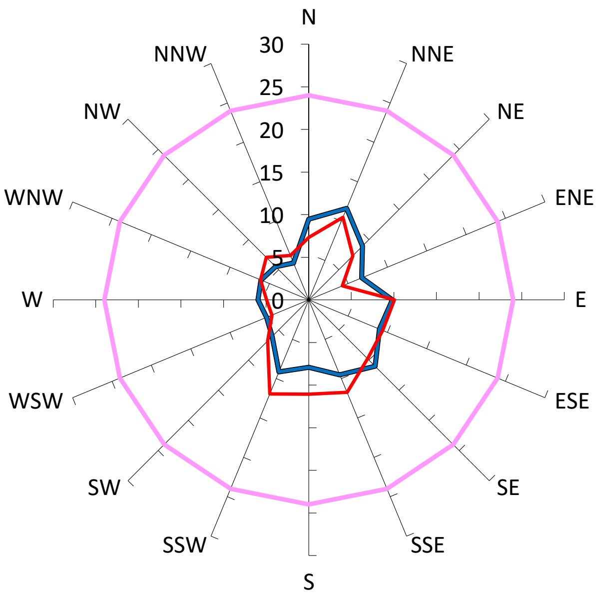
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
Base Case: With the heritage awning	5%	19
Proposed Case: With the heritage awning and small chamfer	5%	20

Results for Point 05

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)



Comfort Criteria: 8m/s with 5% probability of exceedence

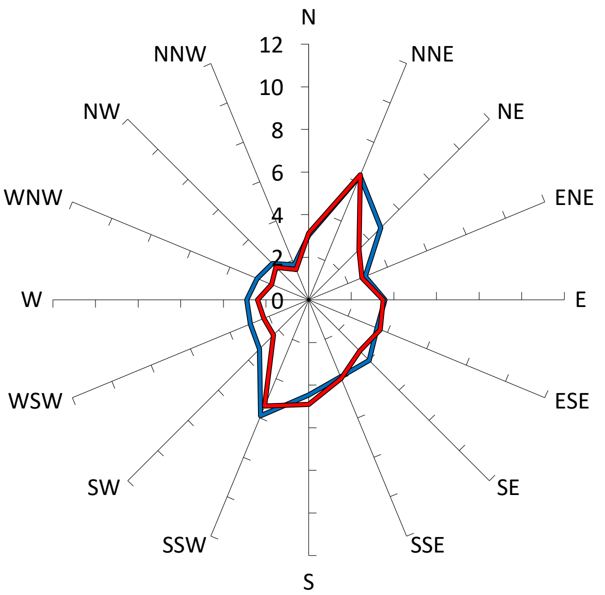


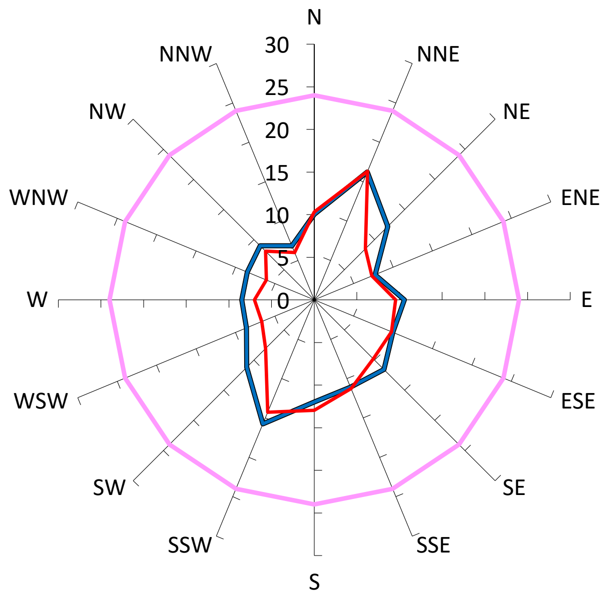
Safety Limit: 24m/s

Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
Base Case: With the heritage awning	< 1%	12
Proposed Case: With the heritage awning and small chamfer	< 1%	12

Results for Point 06

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)





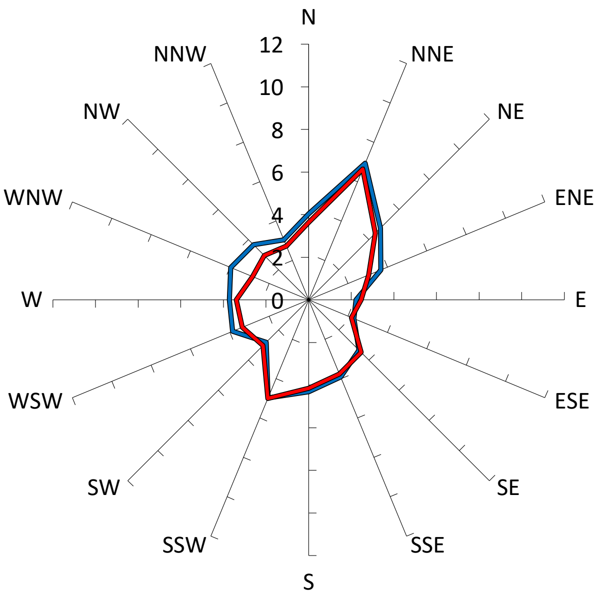
Comfort Criteria: 8m/s with 5% probability of exceedence

Safety Limit: 24m/s

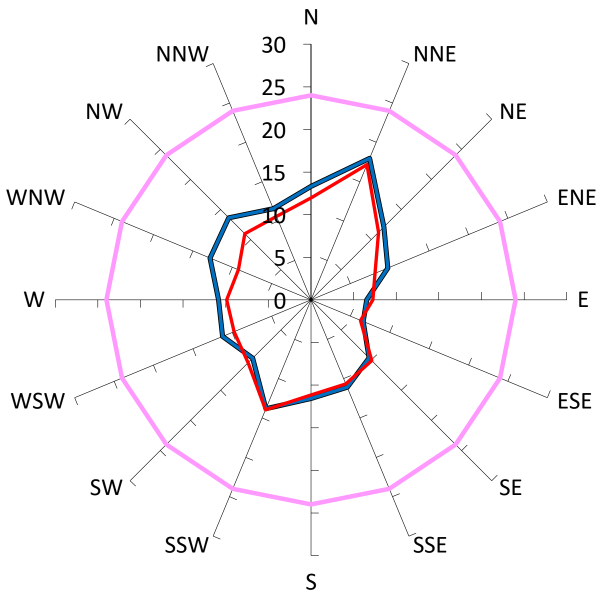
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
Base Case: With the heritage awning	< 1%	16
Proposed Case: With the heritage awning and small chamfer	< 1%	16

Results for Point 07

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)



Comfort Criteria: 8m/s with 5% probability of exceedence

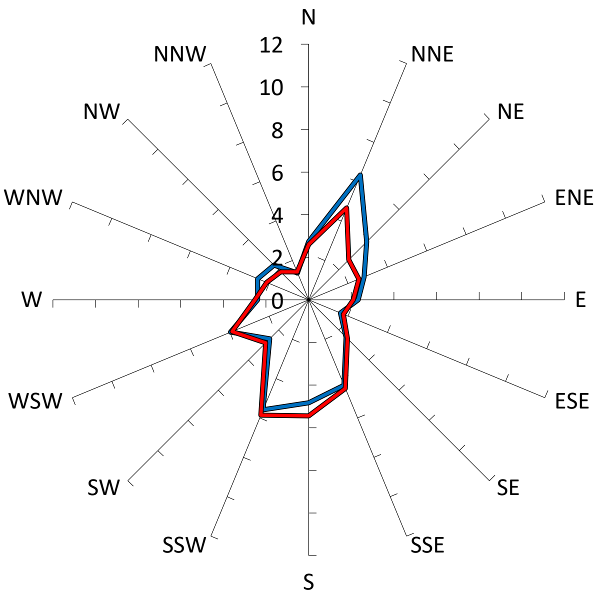


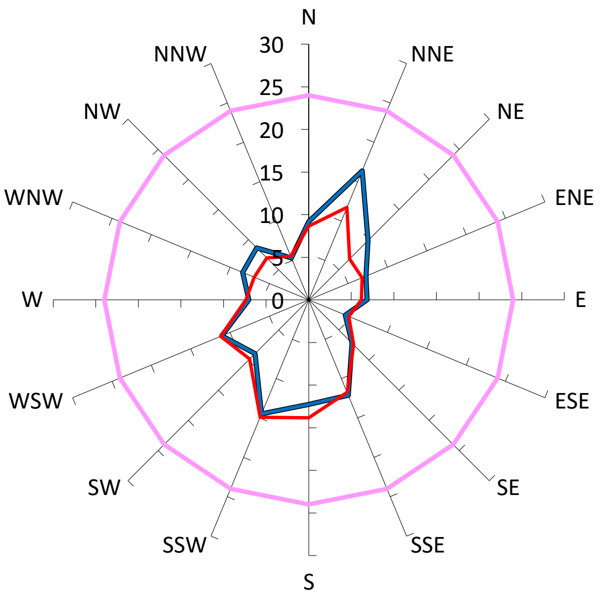
Safety Limit: 24m/s

Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
Base Case: With the heritage awning	< 1%	18
Proposed Case: With the heritage awning and small chamfer	< 1%	17

Results for Point 08

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)





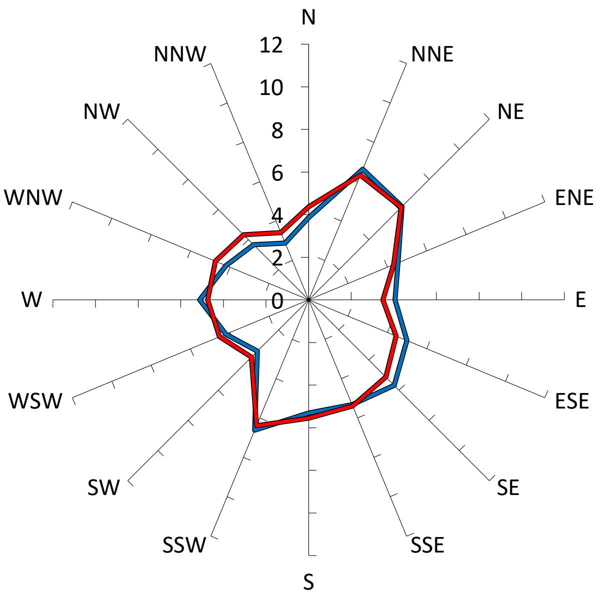
Comfort Criteria: 8m/s with 5% probability of exceedence

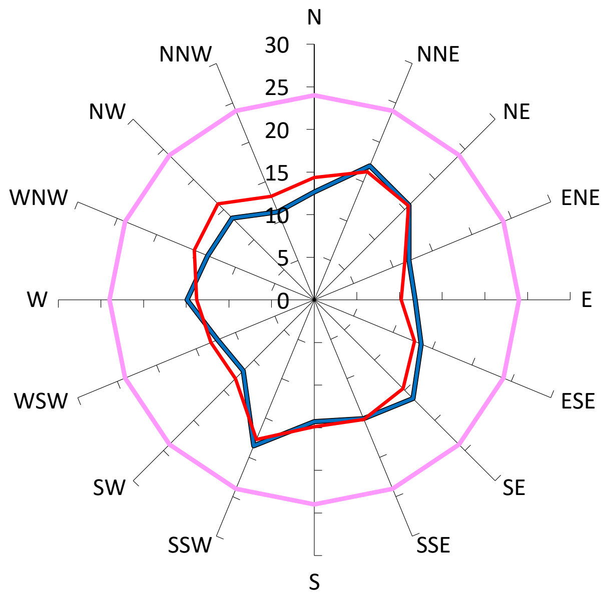
Safety Limit: 24m/s

Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
Base Case: With the heritage awning	< 1%	16
Proposed Case: With the heritage awning and small chamfer	< 1%	15

Results for Point 09

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)





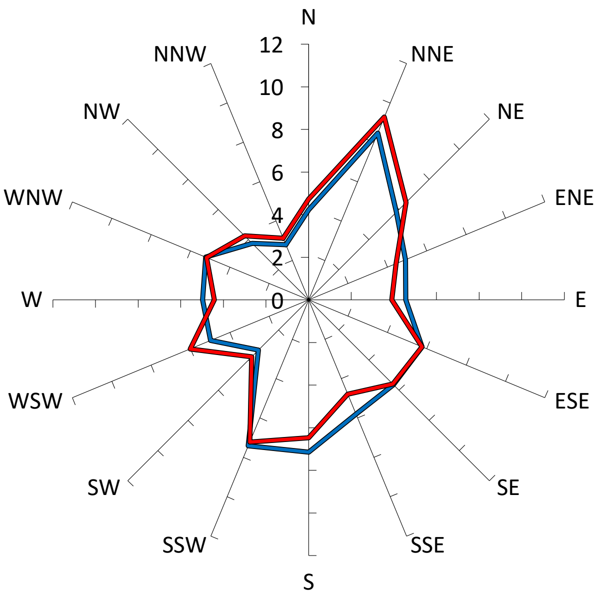
Comfort Criteria: 8m/s with 5% probability of exceedence

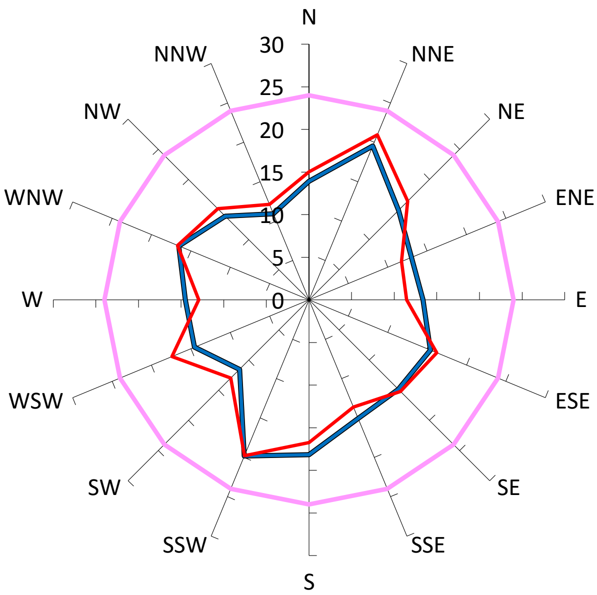
Safety Limit: 24m/s

Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
Base Case: With the heritage awning	1%	19
Proposed Case: With the heritage awning and small chamfer	1%	18

Results for Point 10

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)





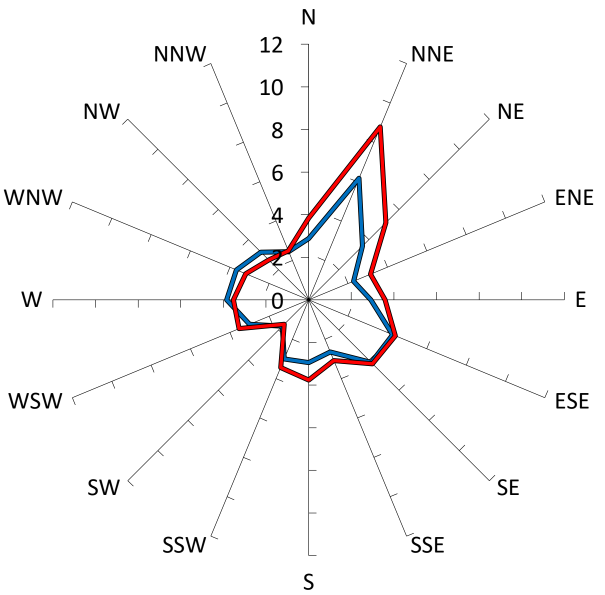
Comfort Criteria: 8m/s with 5% probability of exceedence

Safety Limit: 24m/s

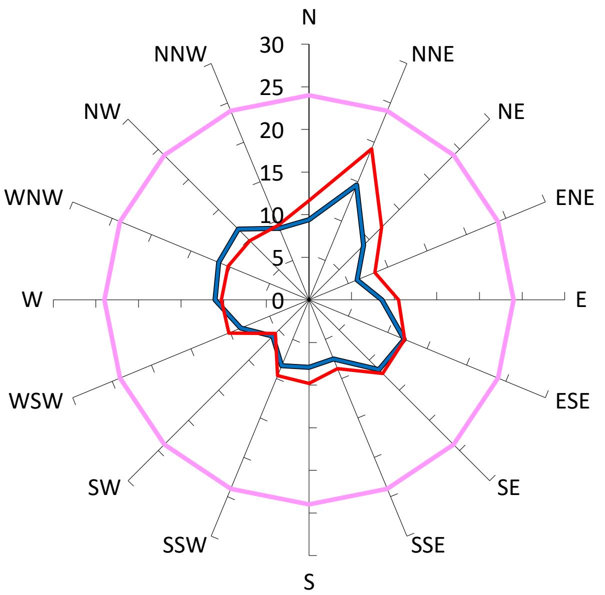
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
Base Case: With the heritage awning	3%	20
Proposed Case: With the heritage awning and small chamfer	5%	21

Results for Point 11

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)



Comfort Criteria: 8m/s with 5% probability of exceedence

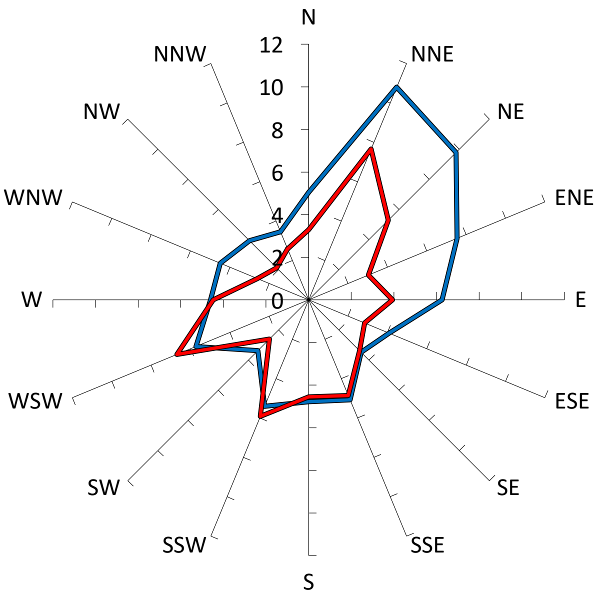


Safety Limit: 24m/s

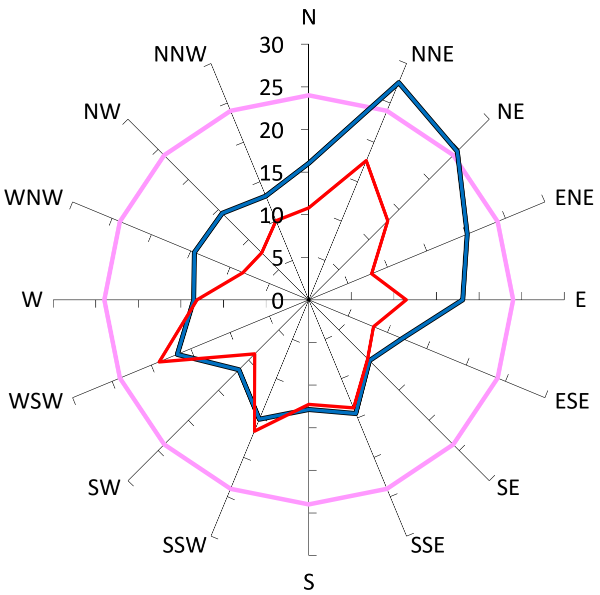
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
Base Case: With the heritage awning	< 1%	15
Proposed Case: With the heritage awning and small chamfer	2%	19

Results for Point 12

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)



Comfort Criteria: 8m/s with 5% probability of exceedence

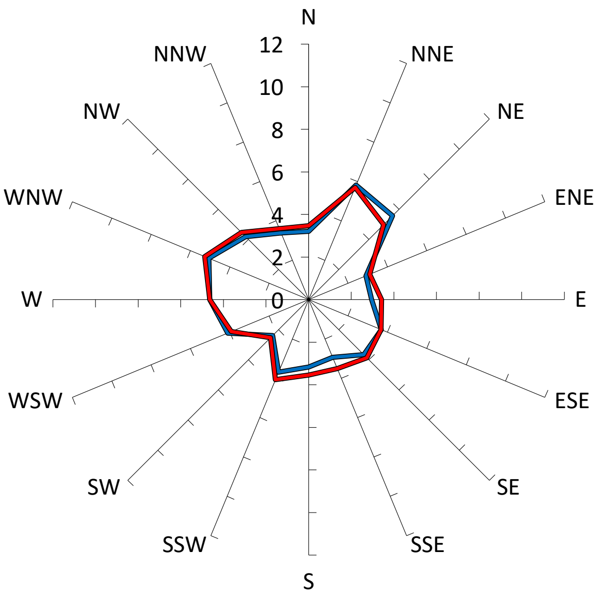


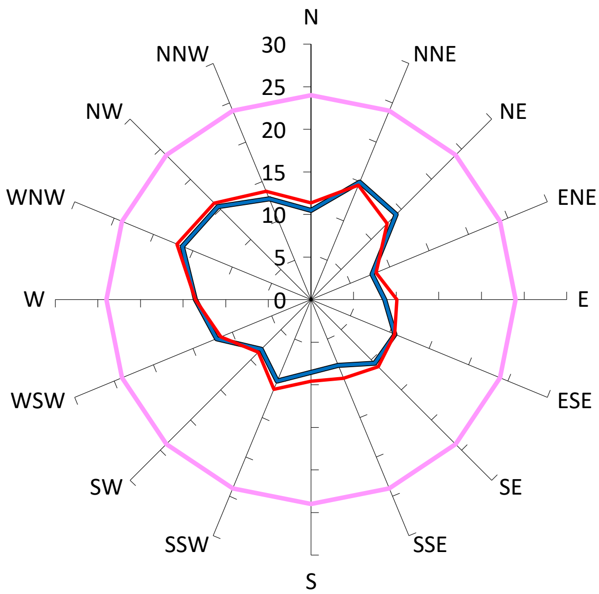
Safety Limit: 24m/s

Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
Base Case: With the heritage awning	11%	28
Proposed Case: With the heritage awning and small chamfer	1%	19

Results for Point 13

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)





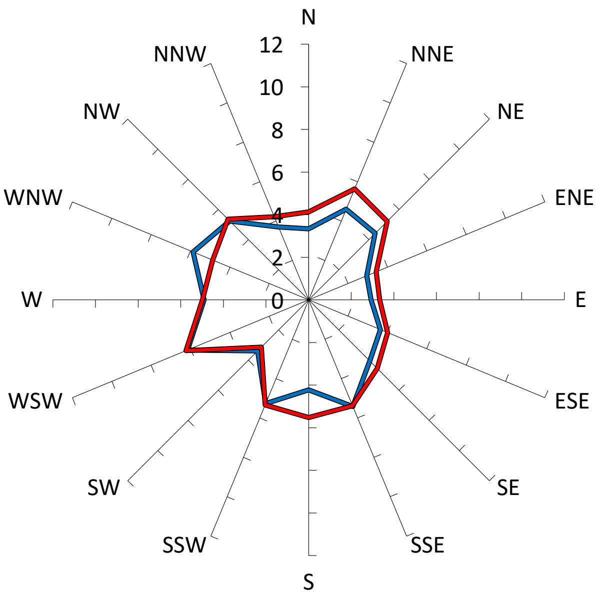
Comfort Criteria: 8m/s with 5% probability of exceedence

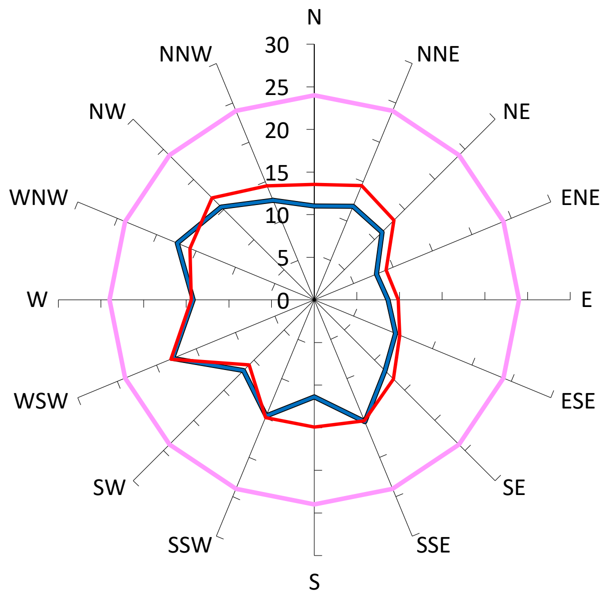
Safety Limit: 24m/s

Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
Base Case: With the heritage awning	< 1%	16
Proposed Case: With the heritage awning and small chamfer	< 1%	17

Results for Point 14

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)





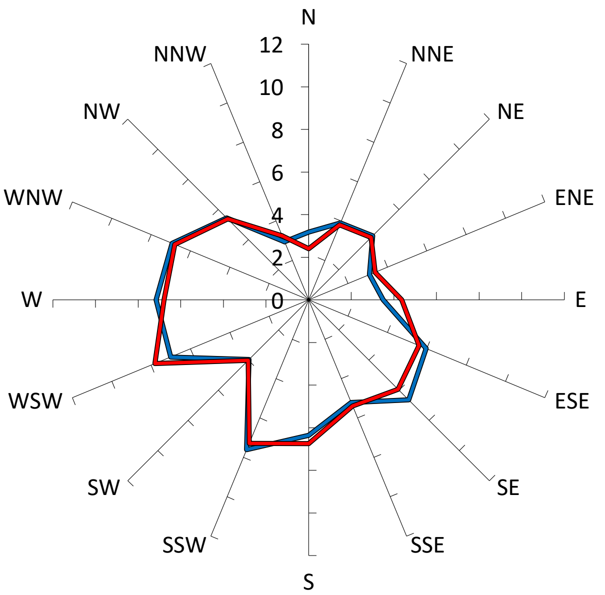
Comfort Criteria: 8m/s with 5% probability of exceedence

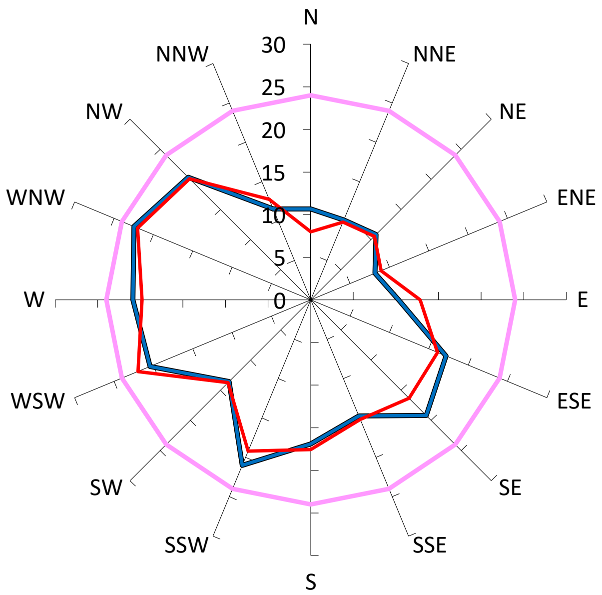
Safety Limit: 24m/s

Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
Base Case: With the heritage awning	1%	18
Proposed Case: With the heritage awning and small chamfer	1%	18

Results for Point 15

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)





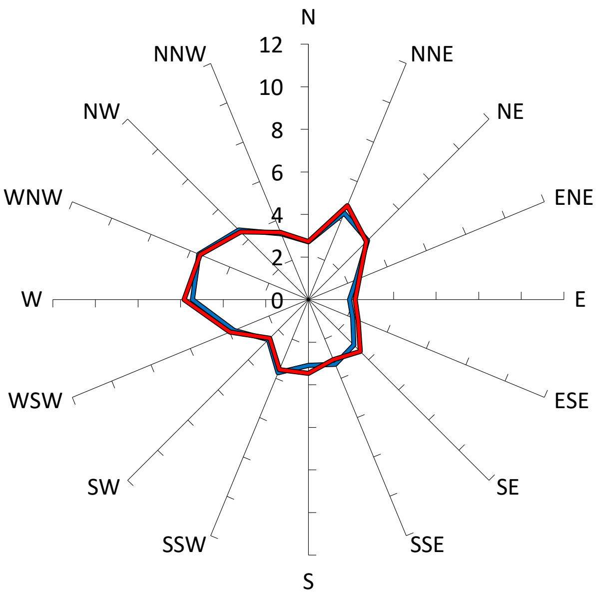
Comfort Criteria: 8m/s with 5% probability of exceedence

Safety Limit: 24m/s

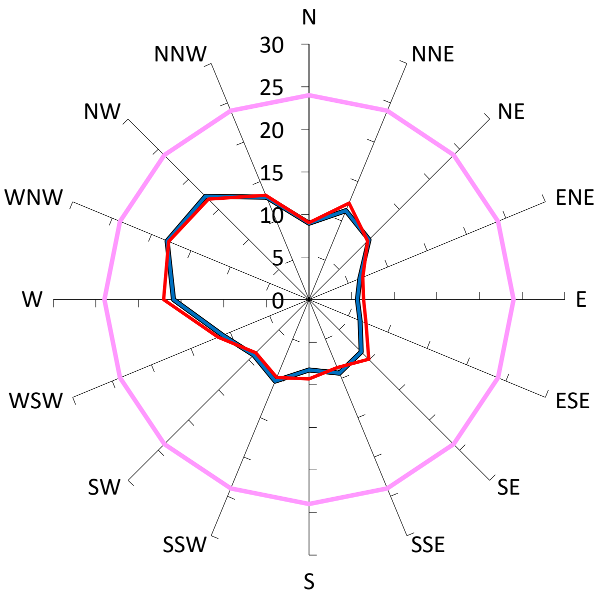
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
Base Case: With the heritage awning	4%	22
Proposed Case: With the heritage awning and small chamfer	4%	22

Results for Point 16

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)



Comfort Criteria: 8m/s with 5% probability of exceedence

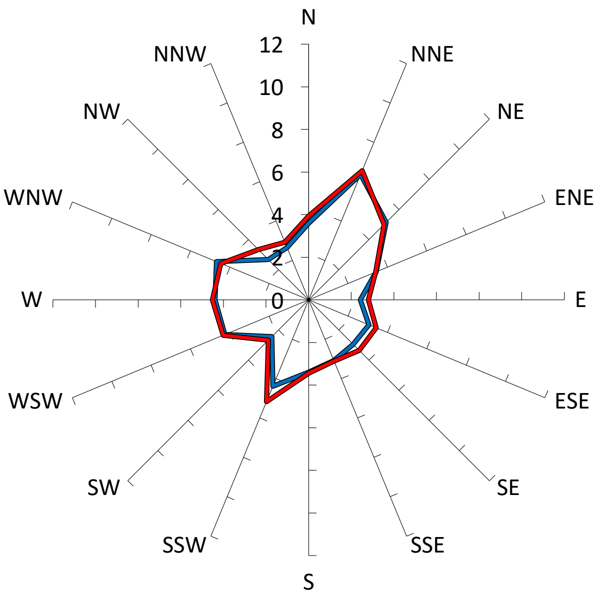


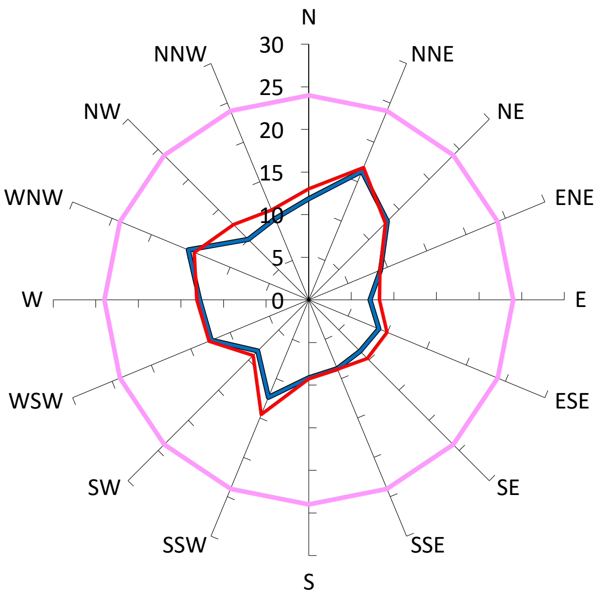
Safety Limit: 24m/s

Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
Base Case: With the heritage awning	< 1%	18
Proposed Case: With the heritage awning and small chamfer	1%	18

Results for Point 17

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)





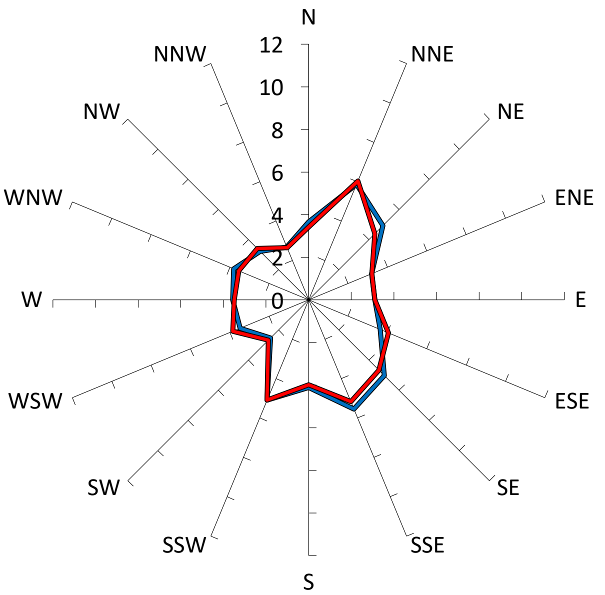
Comfort Criteria: 8m/s with 5% probability of exceedence

Safety Limit: 24m/s

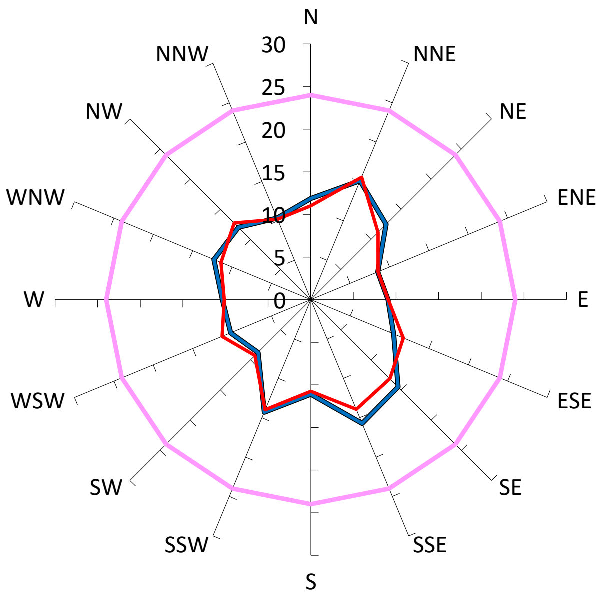
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
Base Case: With the heritage awning	< 1%	16
Proposed Case: With the heritage awning and small chamfer	< 1%	17

Results for Point 18

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)



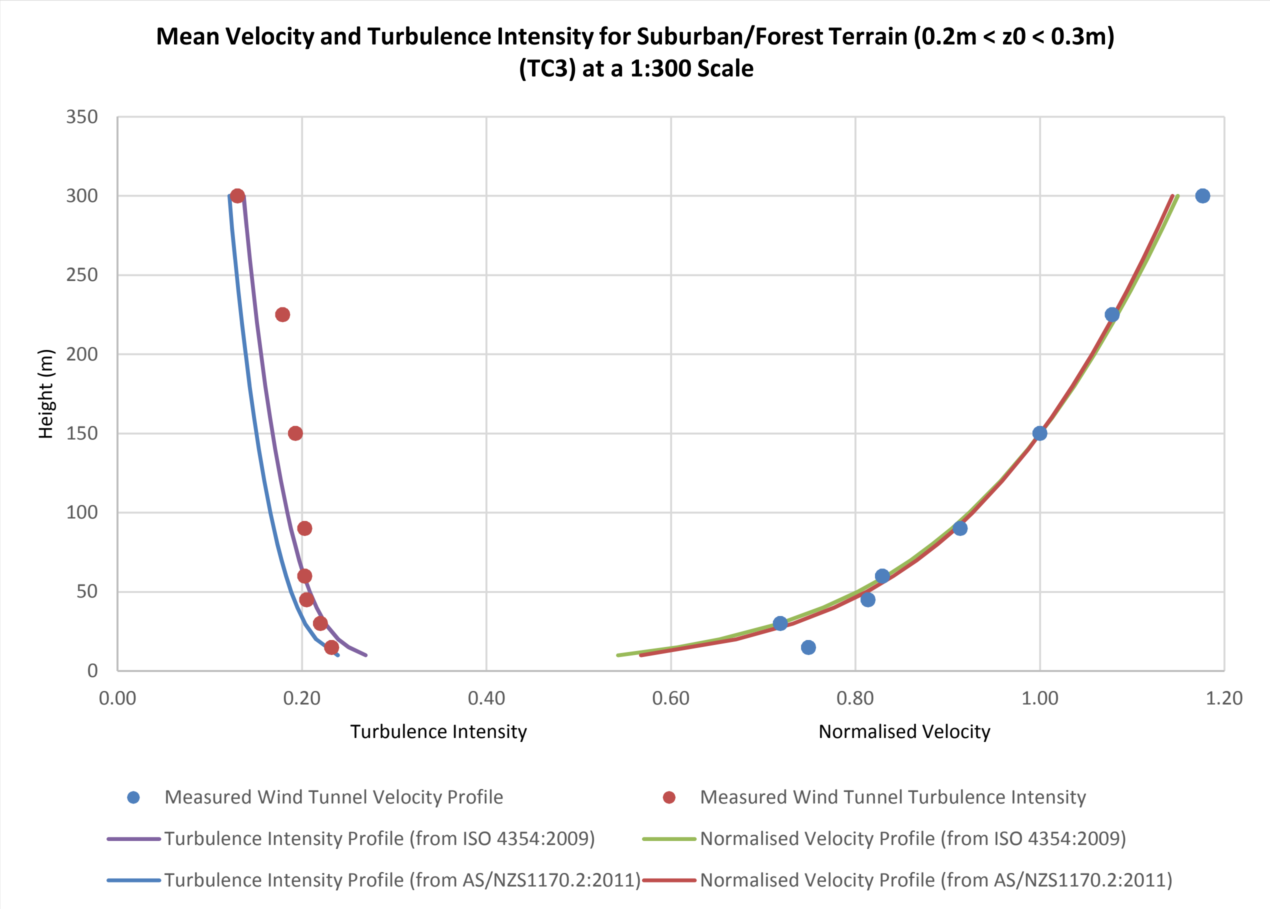
Comfort Criteria: 8m/s with 5% probability of exceedence

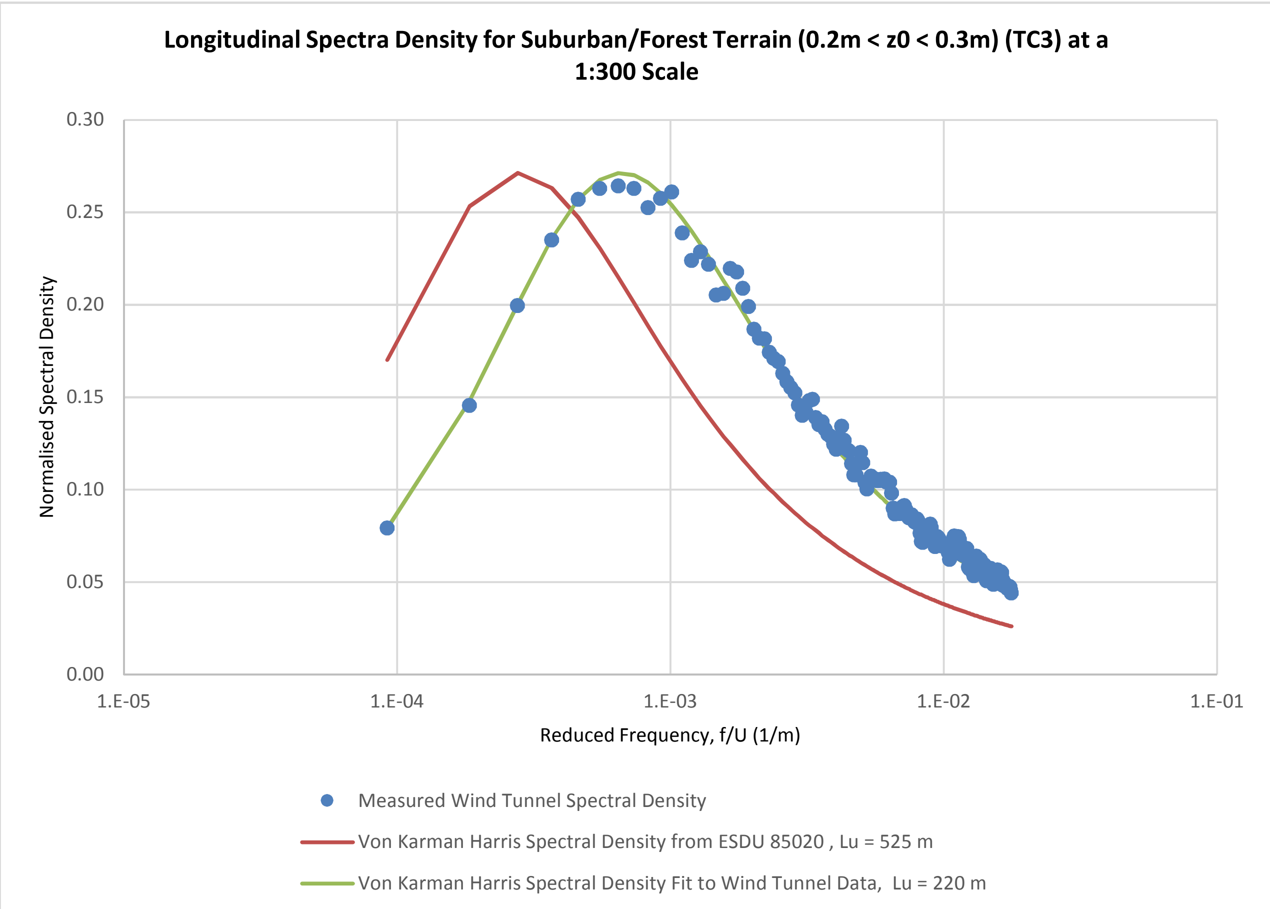


Safety Limit: 24m/s

Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
Base Case: With the heritage awning	< 1%	16
Proposed Case: With the heritage awning and small chamfer	< 1%	16

APPENDIX D VELOCITY AND TURBULENCE INTENSITY PROFILES





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