

Blackwattle Bay
State Significant Precinct

Attachment 39:

Pedestrian Wind Environment Study

Stage 2

June 2021





PEDESTRIAN WIND ENVIRONMENT STUDY

BLACKWATTLE BAY, SYDNEY

WD758-14F02(REV3)- WE REPORT

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Prepared for:

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DOCUMENT CONTROL

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February 19, 2021	Addition of the Seasonal Analysis in the Appendix E	2	NN	SWR	HK/NT
May 21, 2021	Updated Site Plans on Figures, Based on the Latest Site Plan Received on the 14 th May, 2021	3	NN	SWR	HK

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EXECUTIVE SUMMARY

This report presents the results of a detailed investigation into the wind environment impact of the development located at Blackwattle Bay, Sydney. The State Significant Precinct (SSP) Study requirements were issued for Blackwattle Bay (formerly "Bays Market District") in 2017. The SSP study requirements for this Pedestrian Wind Environment Wind Tunnel Study are listed in Table 1 below, along with the sections of the report that cover the respective requirements.

Table 1: Pedestrian Wind Environment Wind Tunnel Study Report Requirements

23.0	Wind Tunnel Study Requirements	Report Section References
23.1	Provide a complete understanding of the existing wind characteristics of the precinct. Consider the wind climate of Sydney, local characteristics such as topography that modify this wind climate for the precinct and the impact of existing buildings on wind conditions.	Section 2,3,4
23.2	Ensure early consideration of potential wind impacts and amelioration approaches through the layout and arrangement of the public domain and the built form.	Section 6.1
23.3	Advise on measures to ensure the suitability of areas for their intended use with regard to the impact of wind on comfort and safety. In particular, this is to focus on the public space areas intended to be used for seating (ie the foreshore reserve, outdoor dining areas on footpaths and public plazas) and standing (ie building entries); and, also for outdoor private recreation areas to be suitable for sitting (eg balconies, decks and outdoor communal private open space). Advise on the placement, orientation, shape and external design of buildings, and relevant wind mitigation devices including screens and awnings.	Section 6.1 & 6.2
23.4	Any advice on landscaping of public space must accord with the City of Sydney's Public Design Manual and the Public Domain design. In general landscaping can only be used for wind mitigation if it is already in place.	Section 6.2
23.5	Include areas surrounding the precinct that may be wind affected as a result of the proposal.	Section 5.3
23.6	Undertake an assessment to demonstrate that subject to any recommended measures, wind will not have an unacceptable impact on the proposal, and the proposal will not generate unacceptable wind impacts.	Section 6.2
23.7	Wind tunnel testing is required.	Section 2-6

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 1:400 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 600m.

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 initially 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. Testing demonstrated a number of areas within and around the masterplan precinct area exceeded the relevant safety criteria. As a result, multiple renditions of the masterplan massing design with the inclusion of architectural treatments were tested. These alterations and treatments include; awning and building form changes to the tower(s)/podium(s) to reduce the impacts of downwash, vertical screening and podium cut-outs to reduce the impacts of localised winds side streaming and chamfered corners to reduce the wind accelerating locally around building corners.

With the inclusion of recommended architectural building form changes and architectural elements/features, it is noted that all ground floor areas within and around the proposed masterplan achieve the safety criteria, or are better than or equivalent to the existing site wind conditions.

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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).

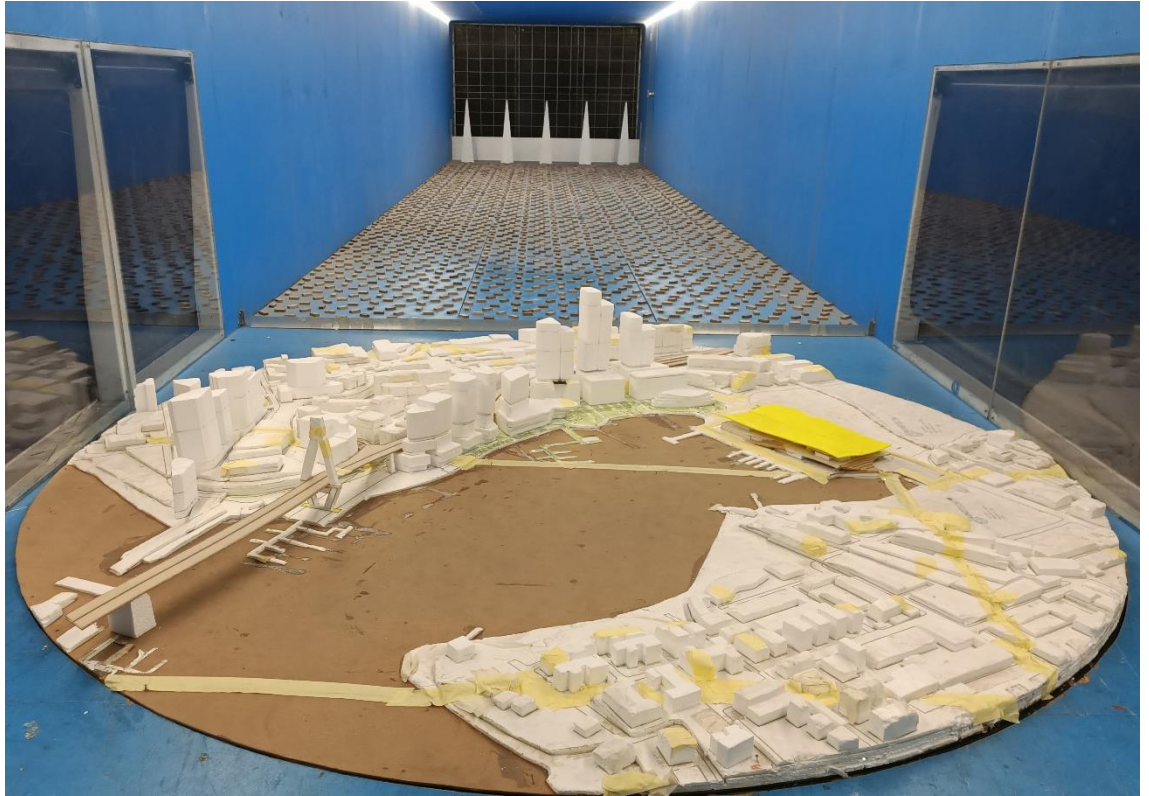
A scale model of the development was prepared, including the surrounding buildings and land topography. Testing was performed at Windtech's boundary layer wind tunnel facility. The wind tunnel has a 3.0m wide working section and a fetch length of 14m, and measurements were taken from 16 wind directions 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 Dantec hot-wire probe anemometers, 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. Testing demonstrated a number of areas within and around the masterplan precinct area exceeded the relevant safety criteria. As a result, multiple renditions of the masterplan massing design with the inclusion of architectural treatments were tested, in accordance with the AWES Guidelines (2014). These alterations and treatments include; awning and building form changes to the tower(s)/podium(s) to reduce the impacts of downwash, vertical screening and podium cut-outs to reduce the impacts of localised winds side streaming and chamfered corners to reduce the wind accelerating locally around building corners.

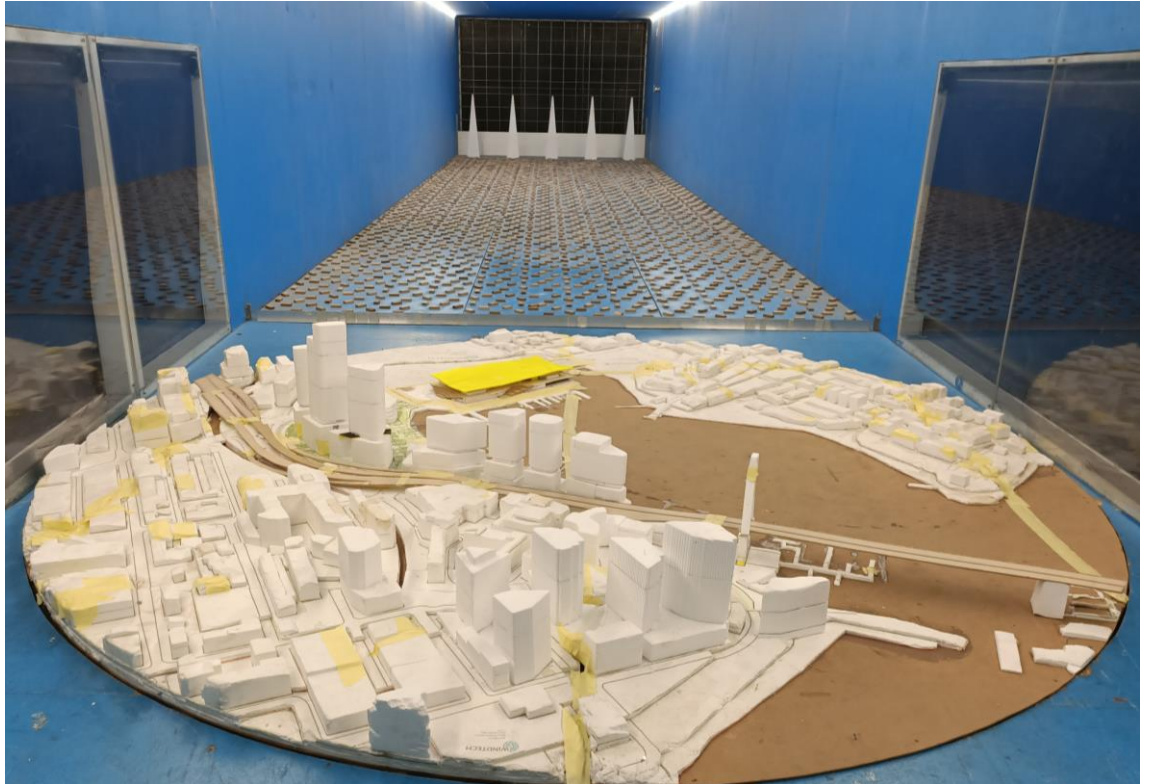
Wind tunnel testing was carried out using a 1:400 scale model of the development and surroundings. The study model incorporates all necessary architectural features on the façade of the development to ensure an accurate wind flow is achieved around the model, and was constructed using a Computer Aided 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 600m 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.



**Figure 1a: Photograph of the Wind Tunnel Model
(proposed scenario, view from the south)**



**Figure 1b: Photograph of the Wind Tunnel Model
(proposed scenario, view from the west)**



**Figure 1c: Photograph of the Wind Tunnel Model
(proposed scenario, view from the north)**



**Figure 1d: Close up photograph of the Wind Tunnel Model
(proposed scenario, view from the east)**



**Figure 1e: Close up photograph of the Wind Tunnel Model
(proposed scenario, view from the south-west)**

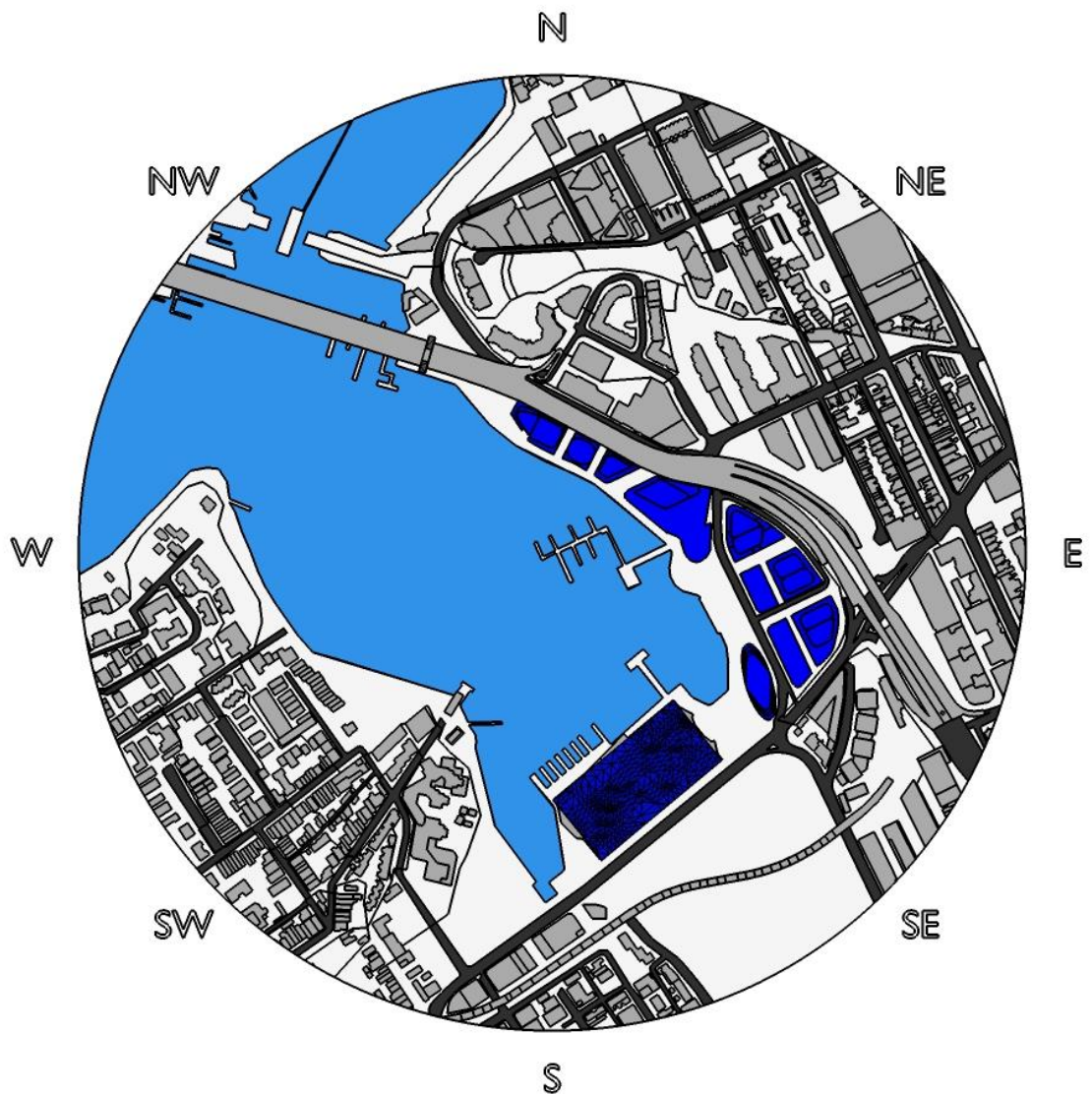


Figure 2: Proximity Model Plan

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 Deaves & Harris (1978), are summarised as follows:

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

For this study this has been undertaken based on the method given in AS/NZS1170.2:2011, which uses a "fetch" length of 60 times the study reference height. However, it should be noted that this "fetch" commences *beyond* a "lag distance" area, which has a length of 20 times the study reference height (in accordance with AS/NZS1170.2:2011), so the actual "fetch" of terrain analysed is the area between 20 and 60 times the study reference height away from the site. The proximity model accounts for the effect of the near field topographic effects as well as the influence of the local built forms.

An aerial image showing the surrounding terrain is presented in Figure 3 for a range of 5.1km 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 2, referenced to the study reference height (which is approximately half of 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 2: Approaching Boundary Layer Wind Profile Analysis Summary
(at the study reference height)**

Wind Sector (degrees)	Terrain and Height Multiplier			Turbulence Intensity I_v	Equivalent Terrain Category (AS/NZS1170.2:2011 naming convention)
	$k_{tr,T=1hr}$ (hourly)	$k_{tr,T=10min}$ (10min)	$k_{tr,T=3s}$ (3sec)		
0	0.89	0.92	1.26	0.138	2.0
30	0.85	0.88	1.24	0.153	2.3
60	0.91	0.95	1.27	0.130	1.8
90	0.80	0.84	1.21	0.173	2.7
120	0.75	0.79	1.18	0.195	3.0
150	0.70	0.74	1.15	0.219	3.2
180	0.71	0.75	1.16	0.213	3.2
210	0.73	0.77	1.17	0.201	3.1
240	0.75	0.79	1.18	0.195	3.0
270	0.78	0.82	1.20	0.179	2.8
300	0.84	0.88	1.23	0.156	2.4
330	0.89	0.93	1.26	0.137	2.0

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 2. Plots of the boundary layer wind profiles used for the wind tunnel testing are presented in Appendix D of this report.

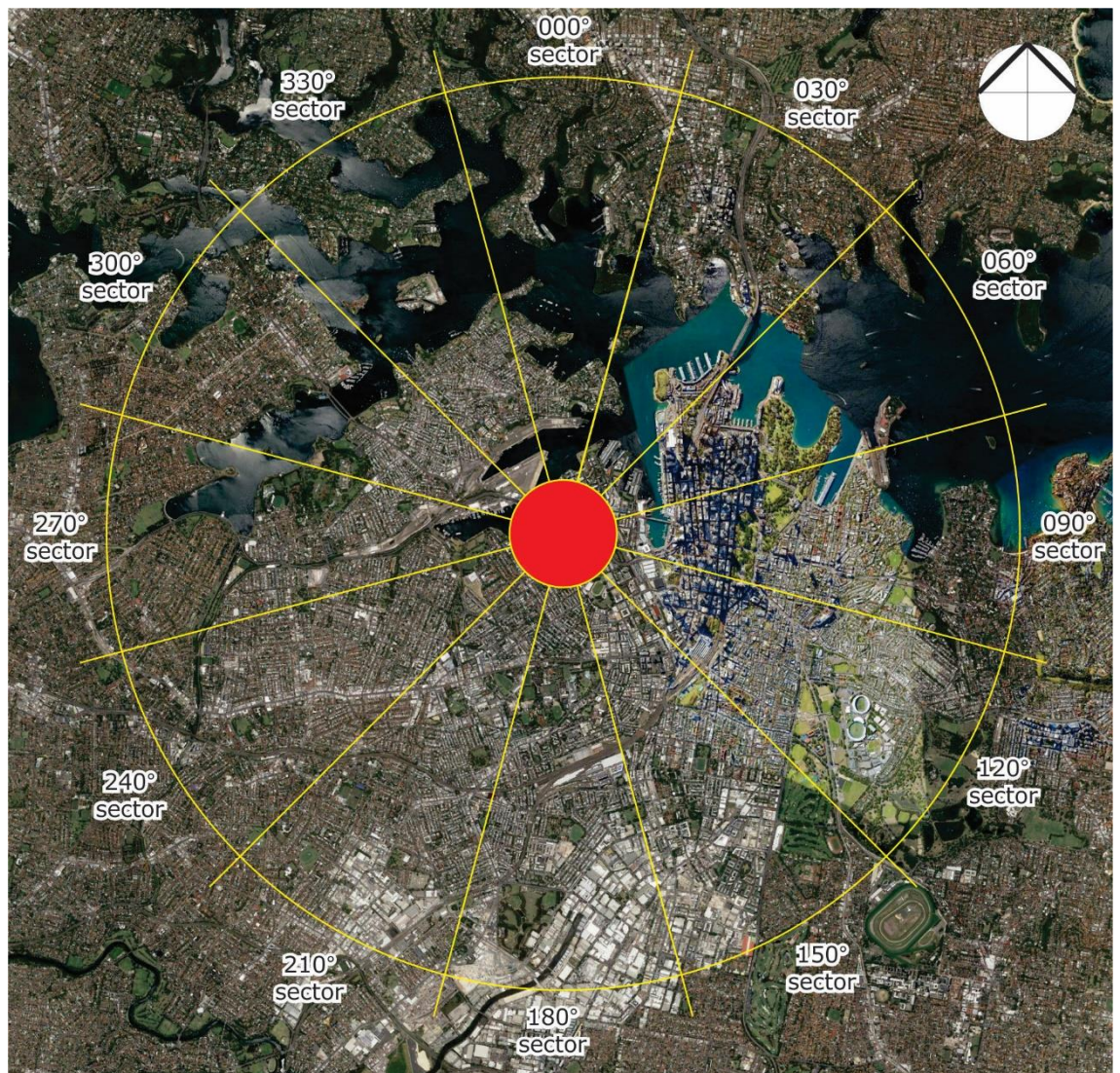


Figure 3: Aerial Image of the Surrounding Terrain
(radius of 5.1km from the edge of the proximity model, which is coloured red)

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 between 6am to 10pm and corrected so that it represents wind speeds 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 3. 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) for 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 3 are only used for the directional plot presented in Figure 4 and are not used for the integration of the probabilities.

Table 3: Directional Wind Speeds (m/s)
(hourly means, referenced to 10m above ground in standard open terrain)

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

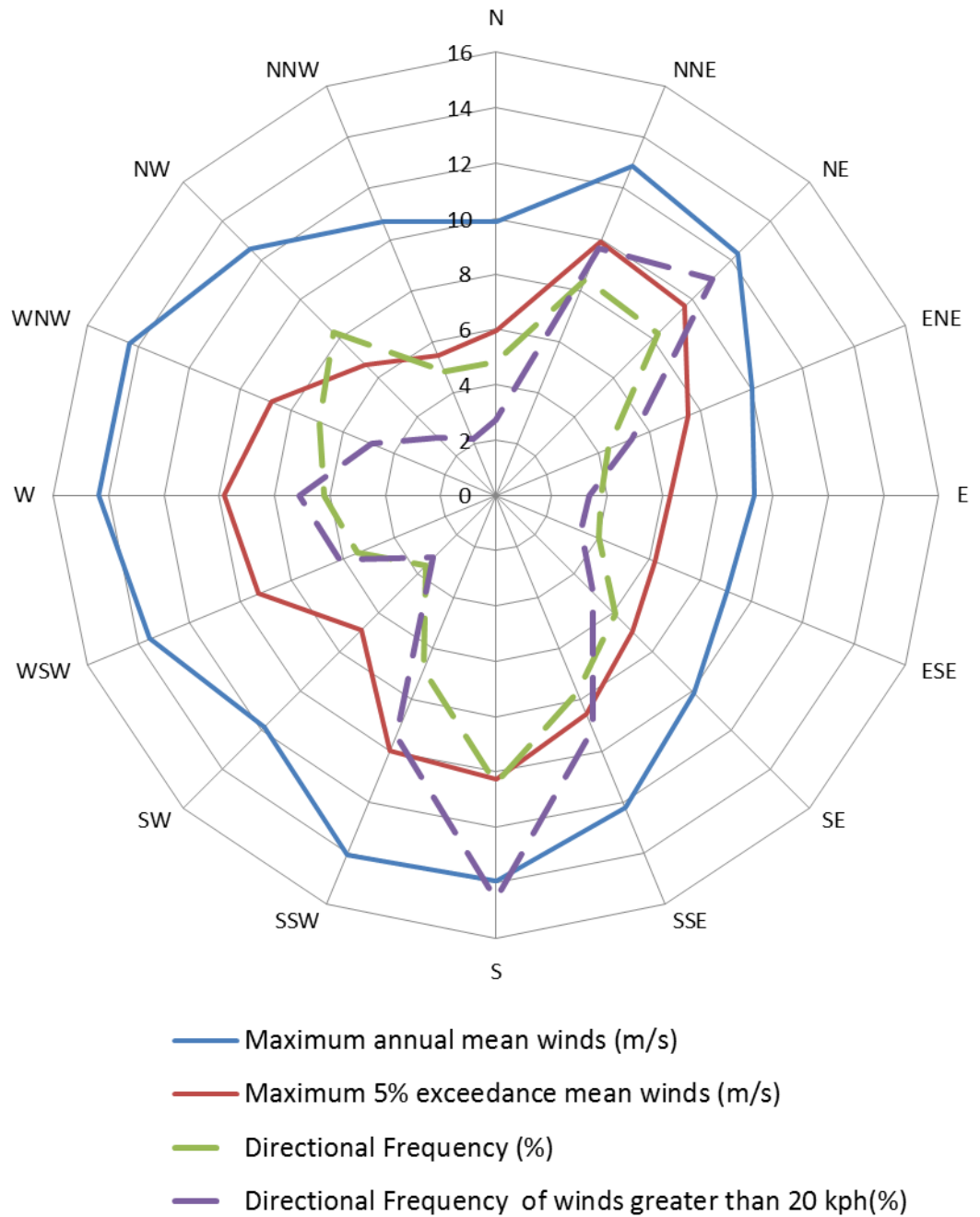


Figure 4: Annual and 5% Exceedance Hourly Mean Wind Speeds, and Frequencies of Occurrence, for the Sydney Region (referenced to 10m above ground in standard open terrain)

5 PEDESTRIAN WIND COMFORT AND SAFETY

The acceptability of wind conditions of 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 Dantec hot-wire probe anemometers, 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 the Dantec Hot-wire probe anemometers 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 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 4 and 5 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 4: 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 5: 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 91 study point locations around the ground floor trafficable areas of the masterplan development were selected for analysis in the wind tunnel. This includes the following:

- 7 study points located under the ANZAC bridge along Bowman Street.
- 22 study point located around Buildings A, B and C's pedestrian footpaths, recreational facilities and through site links.
- 2 study points located on the pedestrian ramp extending from the ANZAC bridge, point 12 is located on the ramp and point 11 is located under the ramp.
- 8 study points located arounds Building D's pedestrian footpaths, recreational facilities and other outdoor trafficable areas.
- 24 study points located within and around Buildings E-J's pedestrian footpaths, recreational facilities and cross through links and other outdoor trafficable areas.
- 8 study points located within and around the central waterfront parkland and Building K's pedestrian footpaths and recreational facilities.
- 13 study points located around the southern proposed Fish Market development's footpaths, recreational activities, and other outdoor trafficable areas.
- 4 study points located on the proposed Jetties along the waterfront of the master plan development.
- 3 study points located around on the local footpaths and other outdoor trafficable area outside the master plan's northern, eastern and southern site boundaries.

Note that only the most critical outdoor locations have been selected for analysis, in accordance with the AWES Guidelines (2014). For example, study points are located adjacent to building corners to capture potential corner acceleration, along podium/tower facades to capture localised side streaming and downwash wind and along surrounding zones to determine if the masterplan impacts areas outside the site plan. The building labels and locations of the various study points tested for this study are presented in Figure 5. Each of the study points were assessed to determine which criteria the proposed development satisfied. It should be noted that only the most critical outdoor locations of the development have been selected for analysis.

Target Criteria

- City of Sydney DCP in accordance with Draft Sydney DCP 2012 - Central Sydney Planning Review Amendment:
- Wind Comfort Standard for Walking criterion of 8m/s (5% exceedance) for walking
 - Safety criterion of 24m/s (gust - 0.1% exceedance) for safety

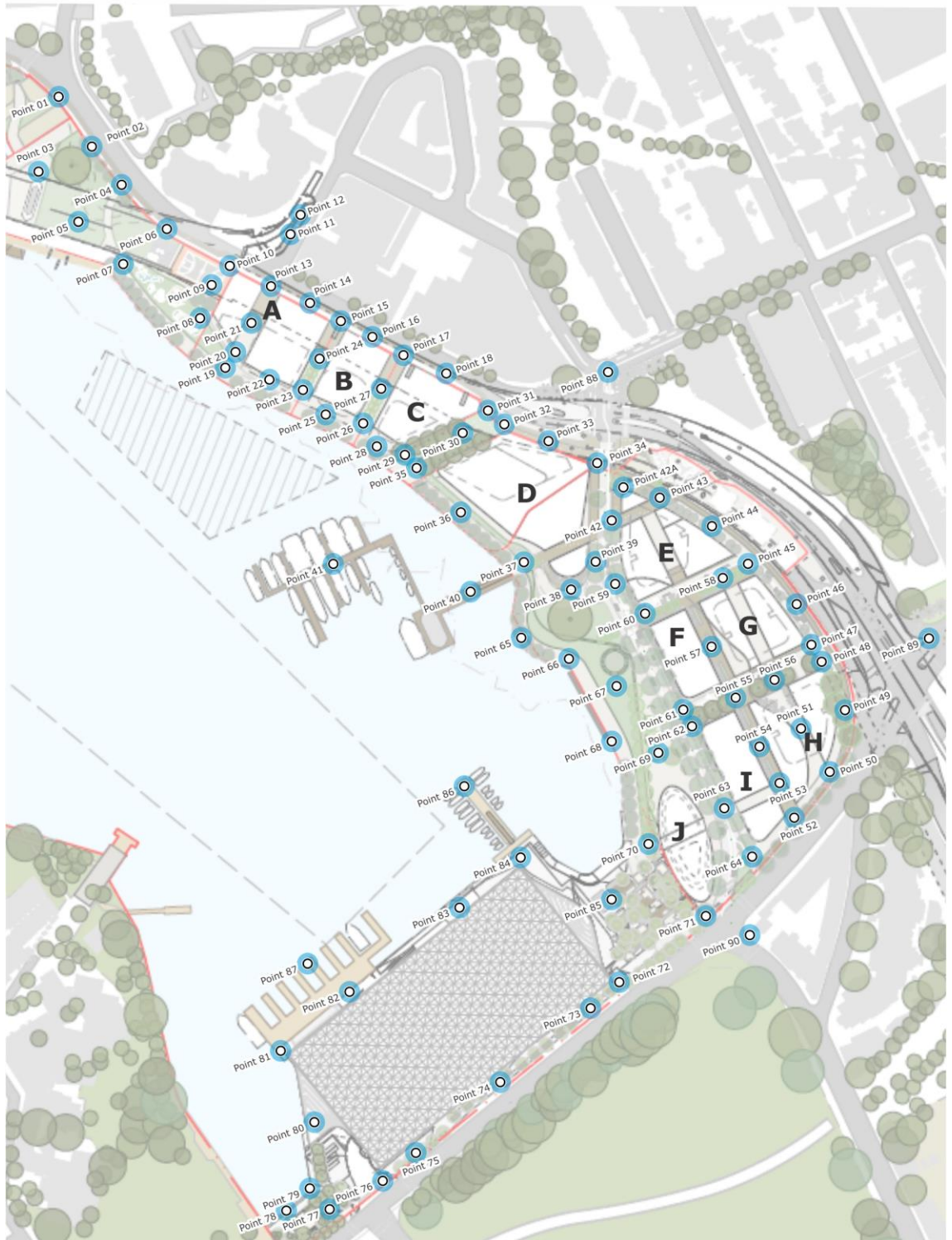


Figure 5: Study Point Locations

6 RESULTS AND DISCUSSION

6.1 Initial Testing

The wind tunnel study results of the initial testing is of the model (based on the drawing set received on the 2nd of November, 2020) are presented in the form of directional plots in Appendix C for all study points locations, summarised in Table 6, and shown on marked-up plans in Figure 6. A seasonal analysis was also conducted for selected points around the masterplan and is presented in Appendix E. No vegetation or other treatments were included as part of this initial testing.

The results show that the majority of the areas within around the development masterplan satisfied the safety criteria as a result of the suitable masterplan and building designs, despite the site's direct exposure to the north-easterly, southerly and westerly prevailing winds.

Building features designed to mitigate adverse wind effects were considered throughout the massing design, such as the tower setbacks from the podium edges mitigating the potential down wash, creating safe pedestrian accessible areas particularly around Buildings A-C and along the waterfront of Building D. The inclusion of stepped facades and chamfered corners at key locations of the buildings has also helped areas to east of Building D and at the southern and north-western corners of building F and I to be safe for pedestrians to commute through. In addition, the shielding provided by the towers themselves within the masterplan from the three Sydney prevailing winds has created a safe and, in most cases, a comfortable environment for walking along the water entire waterfront areas.

Testing demonstrated a number of areas within and around the masterplan precinct area exceeded the relevant safety criteria. As a result, multiple renditions of the masterplan massing design with the inclusion of architectural treatments were tested. These alterations and treatments include; awning and building form changes to the tower(s)/podium(s) to reduce the impacts of downwash, vertical screening and podium cut-outs to reduce the impacts of localised winds side streaming and chamfered corners to reduce the wind accelerating locally around building corners.

A final revision of the masterplan design with the recommended treatments are presented within Section 6.2.

Table 6: Wind Tunnel Results Summary (Initial Results)

Study Point	Walking Comfort GEM (5% exceedance)			Annual Gust Safety Criterion			Comments
	Criterion (m/s)	Results (%)	Grade	Criterion (m/s)	Results (m/s)	Grade	
Point 01	8.0	1%	Pass	24	18	Pass	-
Existing		0%	Pass		15	Pass	
Point 02	8.0	0%	Pass	24	15	Pass	-
Existing		1%	Pass		17	Pass	
Point 03	8.0	2%	Pass	24	21	Pass	-
Existing		6%	Fail		23	Pass	
Point 04	8.0	1%	Pass	24	17	Pass	-
Existing		2%	Pass		19	Pass	
Point 05	8.0	7%	Fail	24	22	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		5%	Pass		22	Pass	
Point 06	8.0	3%	Pass	24	20	Pass	-
Existing		6%	Fail		25	Fail	
Point 07	8.0	1%	Pass	24	17	Pass	-
Existing		0%	Pass		15	Pass	
Point 08	8.0	6%	Fail	24	20	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		1%	Pass		18	Pass	
Point 09	8.0	0%	Pass	24	17	Pass	-
Existing		1%	Pass		18	Pass	
Point 10	8.0	14%	Fail	24	24	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		1%	Pass		18	Pass	
Point 11	8.0	2%	Pass	24	20	Pass	-
Existing		0%	Pass		18	Pass	
Point 12	8.0	8%	Fail	24	21	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		2%	Pass		20	Pass	
Point 13	8.0	5%	Pass	24	20	Pass	-
Existing		1%	Pass		18	Pass	
Point 14	8.0	0%	Pass	24	13	Pass	-
Existing		0%	Pass		14	Pass	
Point 15	8.0	2%	Pass	24	20	Pass	-
Existing		0%	Pass		14	Pass	
Point 16	8.0	0%	Pass	24	12	Pass	-
Existing		0%	Pass		14	Pass	
Point 17	8.0	0%	Pass	24	16	Pass	-
Existing		0%	Pass		16	Pass	
Point 18	8.0	0%	Pass	24	11	Pass	-
Existing		0%	Pass		16	Pass	

Study Point	Walking Comfort GEM (5% exceedance)			Annual Gust Safety Criterion			Comments
	Criterion (m/s)	Results (%)	Grade	Criterion (m/s)	Results (m/s)	Grade	
Point 19	8.0	15%	Fail	24	23	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		0%	Pass		17	Pass	
Point 20	8.0	19%	Fail	24	23	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		0%	Pass		17	Pass	
Point 21	8.0	5%	Pass	24	20	Pass	-
Point 22	8.0	1%	Pass	24	18	Pass	-
Existing		0%	Pass		17	Pass	
Point 23	8.0	4%	Pass	24	21	Pass	-
Existing		0%	Pass		17	Pass	
Point 24	8.0	6%	Fail	24	17	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Point 25	8.0	3%	Pass	24	22	Pass	-
Existing		4%	Pass		23	Pass	
Point 26	8.0	10%	Fail	24	21	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		4%	Pass		23	Pass	
Point 27	8.0	14%	Fail	24	21	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Point 28	8.0	2%	Pass	24	19	Pass	-
Existing		4%	Pass		23	Pass	
Point 29	8.0	22%	Fail	24	27	Fail	Safety exceedance resolved via mitigation measures. Refer to Figure 7b. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		4%	Pass		23	Pass	
Point 30	8.0	13%	Fail	24	23	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Point 31	8.0	12%	Fail	24	21	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		0%	Pass		17	Pass	
Point 32	8.0	17%	Fail	24	23	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		0%	Pass		17	Pass	
Point 33	8.0	10%	Fail	24	22	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		0%	Pass		17	Pass	
Point 34	8.0	21%	Fail	24	24	Pass	

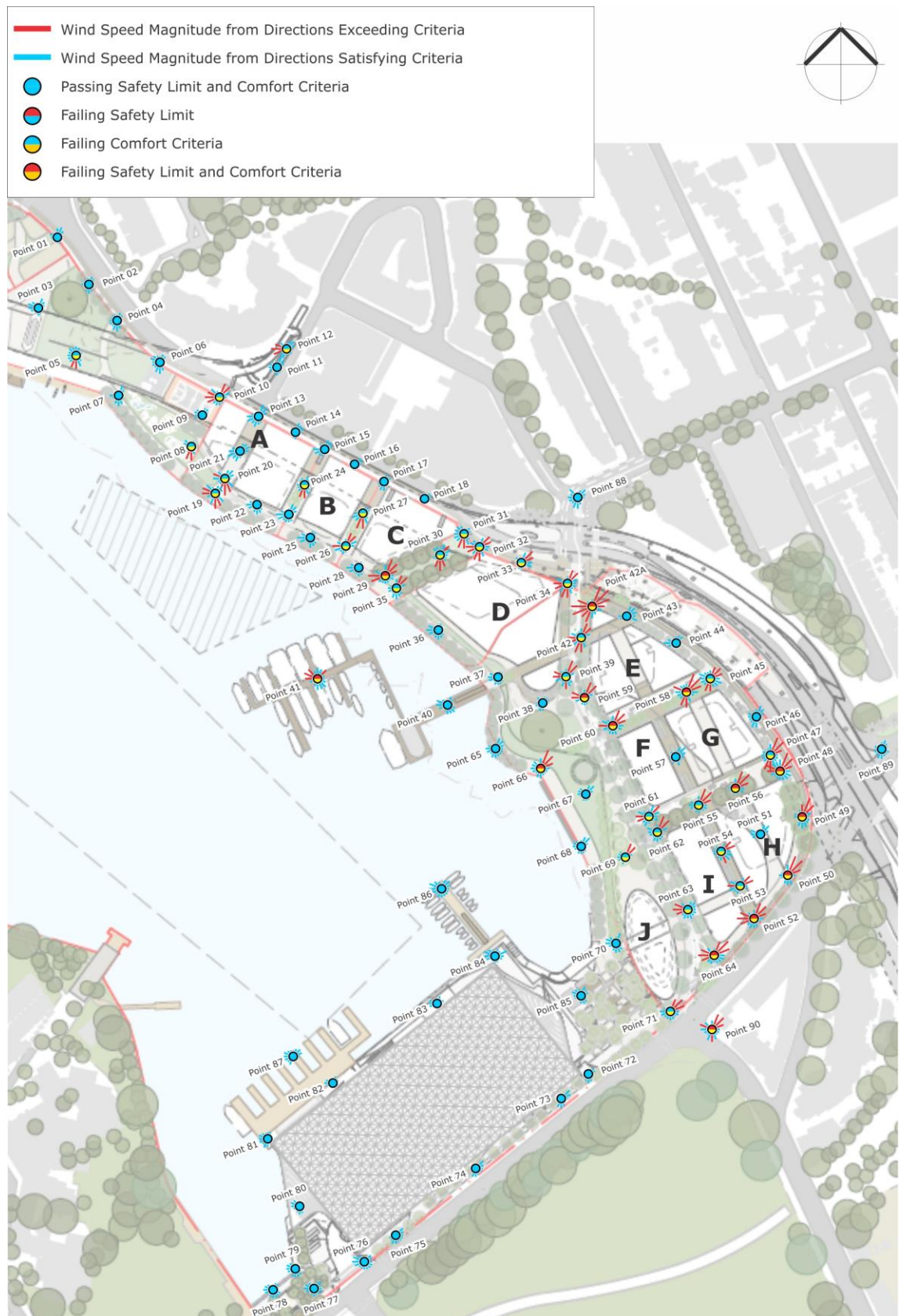
Study Point	Walking Comfort GEM (5% exceedance)			Annual Gust Safety Criterion			Comments
	Criterion (m/s)	Results (%)	Grade	Criterion (m/s)	Results (m/s)	Grade	
Existing		1%	Pass		20	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Point 35	8.0	9%	Fail	24	20	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		4%	Pass		23	Pass	
Point 36	8.0	2%	Pass	24	23	Pass	-
Point 37	8.0	1%	Pass	24	20	Pass	-
Existing		2%	Pass		21	Pass	
Point 38	8.0	0%	Pass	24	16	Pass	-
Point 39	8.0	17%	Fail	24	24	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Point 40	8.0	3%	Pass	24	22	Pass	-
Existing		5%	Pass		23	Pass	
Point 41	8.0	10%	Fail	24	28	Fail	Better than or equivalent to Existing Conditions.
Existing		21%	Fail		29	Fail	
Point 42	8.0	22%	Fail	24	24	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		1%	Pass		19	Pass	
Point 43	8.0	2%	Pass	24	19	Pass	-
Point 44	8.0	2%	Pass	24	20	Pass	-
Existing		1%	Pass		18	Pass	
Point 45	8.0	15%	Fail	24	23	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		6%	Fail		21	Pass	
Point 46	8.0	3%	Pass	24	20	Pass	-
Point 47	8.0	25%	Fail	24	24	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		2%	Pass		22	Pass	
Point 48	8.0	22%	Fail	24	28	Fail	Safety exceedance resolved via mitigation measures. Refer to Figure 7a. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		0%	Pass		16	Pass	
Point 49	8.0	16%	Fail	24	26	Fail	Safety exceedance resolved via mitigation measures. Refer to Figure 7a. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		0%	Pass		16	Pass	
Point 50	8.0	16%	Fail	24	26	Fail	Safety exceedance resolved via mitigation measures. Refer to Figure 7a. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		0%	Pass		16	Pass	
Point 51	8.0	2%	Pass	24	17	Pass	-

Study Point	Walking Comfort GEM (5% exceedance)			Annual Gust Safety Criterion			Comments
	Criterion (m/s)	Results (%)	Grade	Criterion (m/s)	Results (m/s)	Grade	
Point 52	8.0	23%	Fail	24	25	Fail	Safety exceedance resolved via mitigation measures. Refer to Figure 7a. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		1%	Pass		19	Pass	
Point 53	8.0	9%	Fail	24	20	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Point 54	8.0	11%	Fail	24	21	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Point 55	8.0	15%	Fail	24	23	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Point 56	8.0	15%	Fail	24	25	Fail	Safety exceedance resolved via mitigation measures. Refer to Figure 7a. Exceeds comfort criteria which can be resolved at a later design stage.
Point 57	8.0	3%	Pass	24	21	Pass	-
Point 58	8.0	27%	Fail	24	26	Fail	Safety exceedance resolved via mitigation measures. Refer to Figure 7a. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		6%	Fail		21	Pass	
Point 59	8.0	15%	Fail	24	26	Fail	Safety exceedance resolved via mitigation measures. Refer to Figure 7a and 7b. Exceeds comfort criteria which can be resolved at a later design stage.
Point 60	8.0	19%	Fail	24	25	Fail	Safety exceedance resolved via mitigation measures. Refer to Figure 7a and 7b. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		5%	Pass		21	Pass	
Point 61	8.0	11%	Fail	24	24	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Point 62	8.0	13%	Fail	24	24	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Point 63	8.0	8%	Fail	24	24	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Point 64	8.0	23%	Fail	24	26	Fail	Safety exceedance resolved via mitigation measures. Refer to Figure 7b. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		1%	Pass		19	Pass	

Study Point	Walking Comfort GEM (5% exceedance)			Annual Gust Safety Criterion			Comments
	Criterion (m/s)	Results (%)	Grade	Criterion (m/s)	Results (m/s)	Grade	
Point 65	8.0	2%	Pass	24	19	Pass	-
Existing		12%	Fail		25	Fail	
Point 66	8.0	16%	Fail	24	27	Fail	Better than or equivalent to existing site conditions
Existing		12%	Fail		25	Fail	
Point 67	8.0	1%	Pass	24	19	Pass	-
Existing		3%	Pass		20	Pass	
Point 68	8.0	2%	Pass	24	20	Pass	-
Existing		3%	Pass		20	Pass	
Point 69	8.0	7%	Fail	24	24	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Point 70	8.0	2%	Pass	24	20	Pass	-
Existing		4%	Pass		22	Pass	
Point 71	8.0	13%	Fail	24	24	Pass	Better than or equivalent to existing site conditions
Existing		10%	Fail		24	Pass	
Point 72	8.0	0%	Pass	24	15	Pass	-
Existing		4%	Pass		20	Pass	
Point 73	8.0	1%	Pass	24	18	Pass	-
Existing		4%	Pass		20	Pass	
Point 74	8.0	1%	Pass	24	17	Pass	-
Existing		8%	Fail		24	Pass	
Point 75	8.0	0%	Pass	24	16	Pass	-
Existing		3%	Pass		21	Pass	
Point 76	8.0	3%	Pass	24	20	Pass	-
Existing		19%	Fail		23	Pass	
Point 77	8.0	1%	Pass	24	18	Pass	-
Existing		5%	Pass		23	Pass	
Point 78	8.0	1%	Pass	24	18	Pass	-
Existing		5%	Pass		23	Pass	
Point 79	8.0	1%	Pass	24	18	Pass	-
Existing		5%	Pass		23	Pass	
Point 80	8.0	1%	Pass	24	18	Pass	-
Existing		6%	Fail		25	Fail	
Point 81	8.0	1%	Pass	24	18	Pass	-
Existing		10%	Fail		23	Pass	
Point 82	8.0	0%	Pass	24	16	Pass	-
Point 83	8.0	0%	Pass	24	16	Pass	-
Point 84	8.0	5%	Pass	24	20	Pass	-
Point 85	8.0	1%	Pass	24	17	Pass	-
Point 86	8.0	5%	Pass	24	23	Pass	-
Existing		8%	Fail		24	Pass	

Study Point	Walking Comfort GEM (5% exceedance)			Annual Gust Safety Criterion			Comments
	Criterion (m/s)	Results (%)	Grade	Criterion (m/s)	Results (m/s)	Grade	
Point 87	8.0	2%	Pass	24	20	Pass	-
Point 88	8.0	4%	Pass	24	24	Pass	-
Point 89	8.0	1%	Pass	24	14	Pass	-
Point 90	8.0	18%	Fail	24	25	Fail	Safety exceedance resolved via mitigation measures. Refer to Figure 7a and 7b. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		10%	Fail		24	Pass	
Point 42A	8.0	34%	Fail	24	30	Fail	Safety exceedance resolved via mitigation measures. Refer to Figure 7a. Exceeds comfort criteria which can be resolved at a later design stage.

Note that, for any study points listed in all Table 6 with two rows of results data, the second row is for the existing site conditions. The test results shown in Table 6 are without any treatments applied. If treatment is required, the treatment is described in Table 6 and outlined in Section 6.2.



**Figure 6: Wind Tunnel Results – Initial Results
(results shown without treatments applied)**

6.2 Treatment Testing

For the localised areas that exceed the safety criteria, the building forms were modified, and localised treatment strategies employed to mitigate the safety exceedances within these areas.

The results of the treatments testing are presented in the form of directional plots in Appendix C for all study points locations, summarised in Table 6, and shown on marked-up plans in Figure 8. Note 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.

The treatments were based on the drawing set received on the 11th of January 2021, and the updated masterplan received on the 14th of May 2021, and the additional treatment recommendations tested are shown in Figure 7a, and Figure 7b.

- A wraparound awning at the level 1 slab on the north-eastern and south-western aspects of the building E podium, meeting the western distributor, as illustrated in Figure 7a, and Figure 7b.
- A rounded full height chamfer at the northern edge of Building E's north-easterly podium notch, as illustrated in Figure 7a.
- A wraparound awning that spans out 3m from the level 1 slab on the north-eastern and south-western aspects of the Building G podium, as illustrated in Figure 7a.
- A full height corner wind screen on the ground floor that extends out at a 45-degree angle to the north-eastern aspect of the Building G podium that extends to the edge of the proposed awning above, as illustrated in Figure 7a.
- A wraparound awning that spans out 3m from the level 1 slab on the north-eastern and north-western aspects of the Building H podium, as illustrated in Figure 7a.
- A full height impermeable vertical wind screen at the southern end of the proposed wrap around awning proposed above, as illustrated in Figure 7a.
- A vertical impermeable wind screen and the north-eastern edge of the podium cut out, as illustrated in Figure 7a.
- A full height impermeable wind screen on the ground floor at the southern corner of Building C so that it follows the podium form of the podium above, as illustrated in Figure 7b.
- Full height impermeable wind screen on the ground floor at the southern corner of Building I so that it's extending parallel to the building's south-western aspect and to the edge of proposed awning, as illustrated in Figure 7b.
- Full height impermeable wind screen within Building H's under-croft area on top of the podium. It is to extend perpendicularly from the building's south-western façade to the edge of the podium below, as illustrated in Figure 7b.

With the inclusion of these treatments to the design, all ground floor areas within and around the development masterplan, based on the building massings modelled, achieves the safety criteria, or are better than or equivalent to existing conditions.

Treatments Legend

- Extend the wrap around awning at the level 1 slab, ensuring that the northern area of the awning spans out to meet with the western distributor
- Rounded full height chamfer at the northern edge of the north-easterly podium notch
- Wrap around awning that spans out 3m from the level 1 slab on the building G podium
- Full height impermeable wind screens on buildings G and H
- Wrap around awning that spans out 3m from the level 1 slab on the building H podium
- Vertical impermeable wind screen and the north-eastern edge of the podium cut out
- Podium cut-outs were reinstated

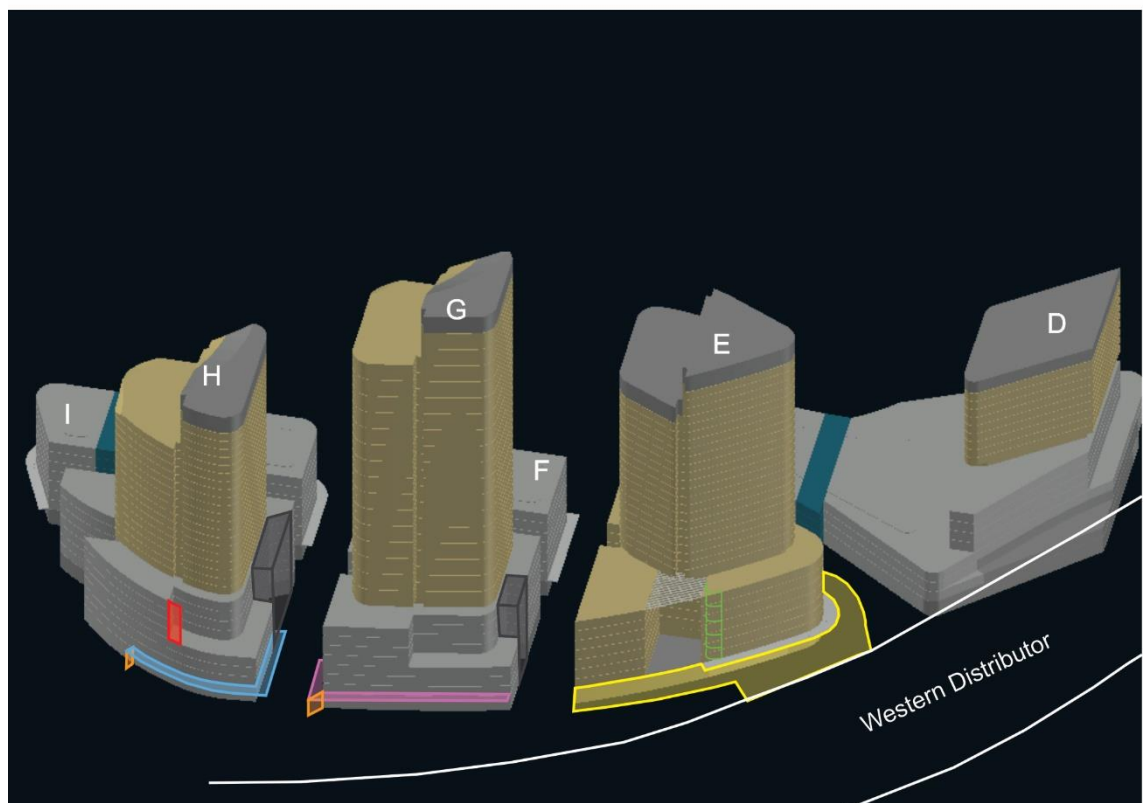


Figure 7a: Tested Treatments – North-Easterly View

Treatments Legend

- Full height impermeable corner wind screen on building C
- Full height impermeable corner wind screen on building I
- Full height impermeable podium wind screen on building H
- Podium cut-out and the section of awning was reinstated

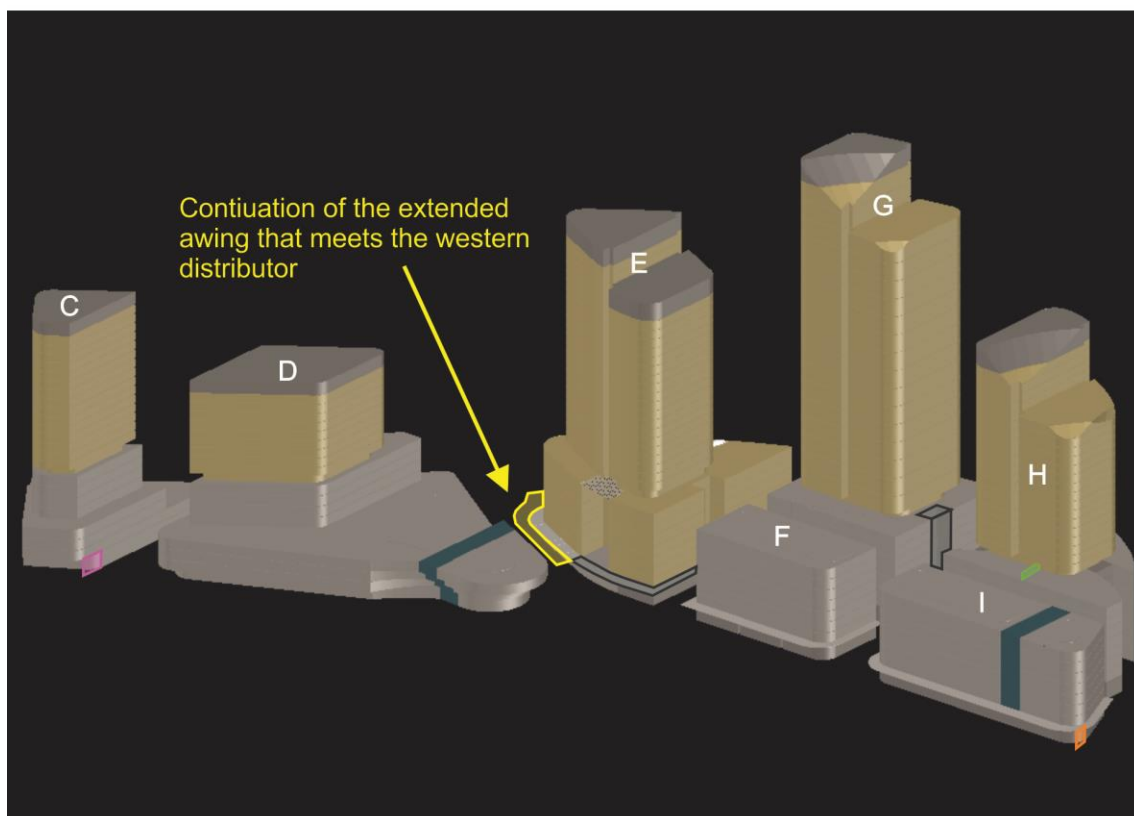


Figure 7b: Tested Treatments – Westerly View

Table 7: Wind Tunnel Results Summary (Treatment Results)

Study Point	Walking Comfort GEM (5% exceedance)			Annual Gust Safety Criterion			Final Result	Comments
	Criterion (m/s)	Results (%)	Grade	Criterion (m/s)	Results (m/s)	Grade		
Point 29	8.0	15%	Fail	24	23	Pass	Fail	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		4%	Pass		23	Pass	Pass	
Point 48	8.0	13%	Fail	24	24	Pass	Fail	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		0%	Pass		16	Pass	Pass	
Point 49	8.0	7%	Fail	24	19	Pass	Fail	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		0%	Pass		16	Pass	Pass	
Point 50	8.0	2%	Pass	24	19	Pass	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		0%	Pass		16	Pass	Pass	
Point 52	8.0	16%	Fail	24	23	Pass	Fail	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		1%	Pass		19	Pass	Pass	
Point 56	8.0	14%	Fail	24	24	Pass	Fail	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Point 58	8.0	9%	Fail	24	19	Pass	Fail	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		6%	Fail		21	Pass	Fail	
Point 59	8.0	9%	Fail	24	23	Pass	Fail	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Point 60	8.0	7%	Fail	24	23	Pass	Fail	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		5%	Pass		21	Pass	Pass	
Point 64	8.0	8%	Fail	24	20	Pass	Fail	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		1%	Pass		19	Pass	Pass	
Point 66	8.0	15%	Fail	24	25	Fail	Fail	Better than or equivalent to existing site conditions
Existing		12%	Fail		25	Fail	Fail	
Point 90	8.0	18%	Fail	24	24	Pass	Fail	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.
Existing		10%	Fail		24	Pass	Fail	
Point 42A	8.0	3%	Pass	24	19	Pass	Pass	Satisfies safety criterion. Exceeds comfort criteria which can be resolved at a later design stage.

Note that, for any study points listed in all Table 7 with two rows of results data, the second row is for the existing site conditions. The treatments are shown in Figures 8.

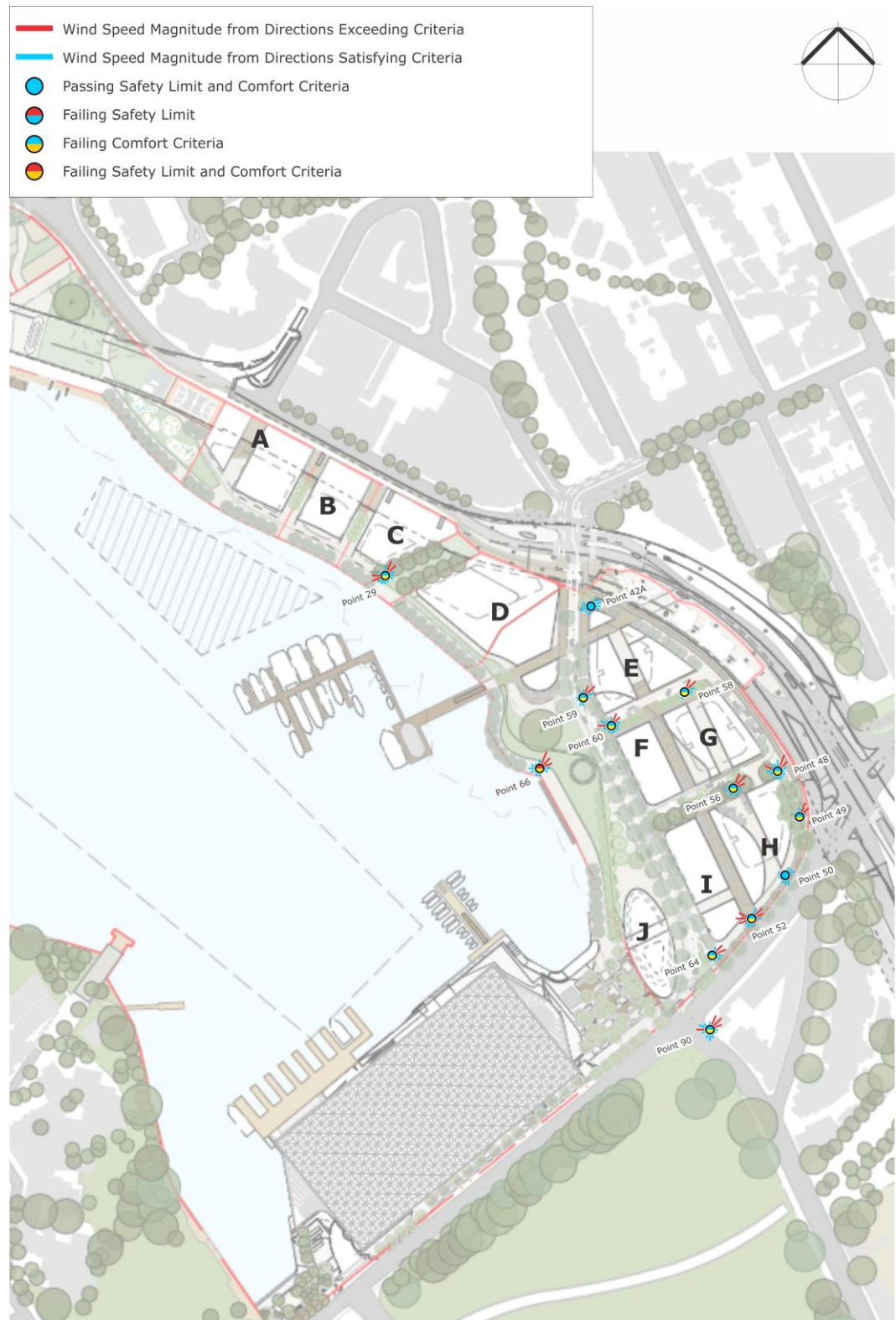


Figure 8: Wind Tunnel Results – Treatment Results
(results shown with massing changes and treatments applied)

The intended use of the spaces can be determined at a more detailed design stage at an individual building level. The comfort conditions can be improved through the use of landscaping, adjustments to the building form, or other localised mitigation measures at a more detailed design stage. The effect of staging should also be considered to ensure that wind conditions are suitable throughout the construction of each development. It should be noted that the areas that are affected by the prevailing westerly winds, shown in Figure 6 (the colder winter winds), the vegetation/tree planting should be of an evergreen variety to ensure that they are effective all year round.

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

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.1.1 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 - 0.25	
Calm, light air	1	0.25 - 1.55	No noticeable wind
Light breeze	2	1.55 - 3.35	Wind felt on face
Gentle breeze	3	3.35 - 5.45	Hair is disturbed, clothing flaps, newspapers difficult to read
Moderate breeze	4	5.45 - 7.95	Raises dust, dry soil and loose paper, hair disarranged
Fresh breeze	5	7.95 - 10.75	Force of wind felt on body, danger of stumbling
Strong breeze	6	10.75 - 13.85	Umbrellas used with difficulty, hair blown straight, difficult to walk steadily, wind noise on ears unpleasant
Near gale	7	13.85 - 17.15	Inconvenience felt when walking
Gale	8	17.15 - 20.75	Generally impedes progress, difficulty balancing in gusts
Strong gale	9	20.75 - 24.45	People blown over

A.1.2 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.1.3 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.1.4 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	Human 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.2 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%.

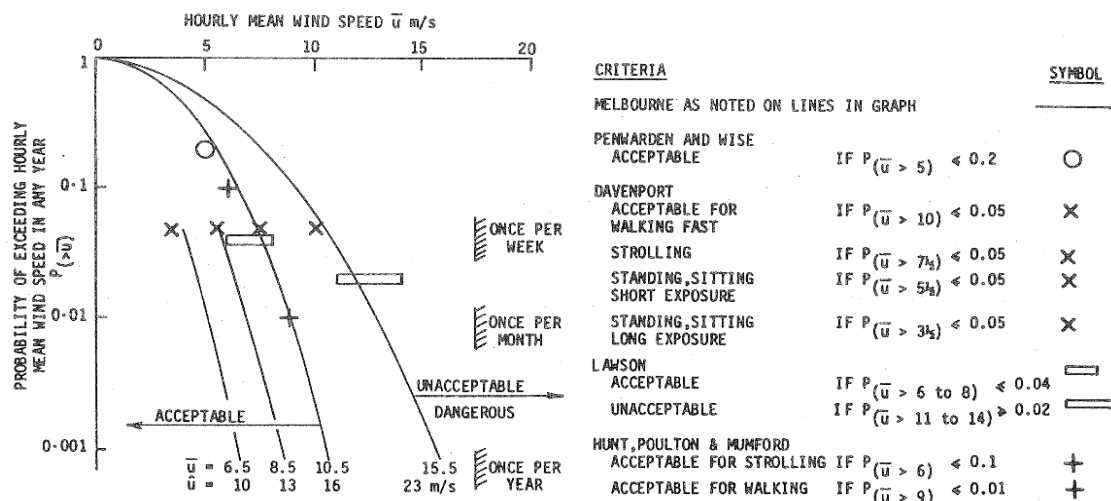


Figure A.1: Comparison of Various Mean and Gust Wind Environment Criteria, assuming 15% turbulence and a Gust Factor of 1.5 (W.H. Melbourne, 1978)

A.3 References relating to Pedestrian Comfort Criteria

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APPENDIX B DATA ACQUISITION

The wind tunnel testing procedures 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 acquired as coefficients by Dantec hot-wire anemometers 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 Dantec hot-wire probe anemometers at selected critical outdoor locations. The anemometers were positioned at each study location at a full-scale height of approximately 1.5m above ground/slab level. The support of the probe was mounted such that the probe wire was 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 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. The output from the hot-wire probes was obtained using a National Instruments 12-bit data acquisition card. The 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.

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

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

Where:

\hat{C}_V is the gust coefficient.

\bar{C}_V is the mean coefficient.

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

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

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.2.1 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:

$$V_{study} = V_{ref,RH} \left(\frac{k_{200m,tr,T=1hr}}{k_{RH,tr,T=1hr}} \right) C_V \quad \text{B.2}$$

Where:

V_{study} is the full-scale wind speed at the study point location, in m/s.

$V_{ref,RH}$ is the full-scale reference wind speed, measured 3m upstream 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 standard deviation of the wind speed.

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

C_V is the velocity coefficient measurement obtained from the hot-wire anemometer, which is derived from the following relationship:

$$C_V = \frac{C_{V,study}}{C_{V,200m}} \quad \text{B.3}$$

Where:

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

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

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.2.2 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.3 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.

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

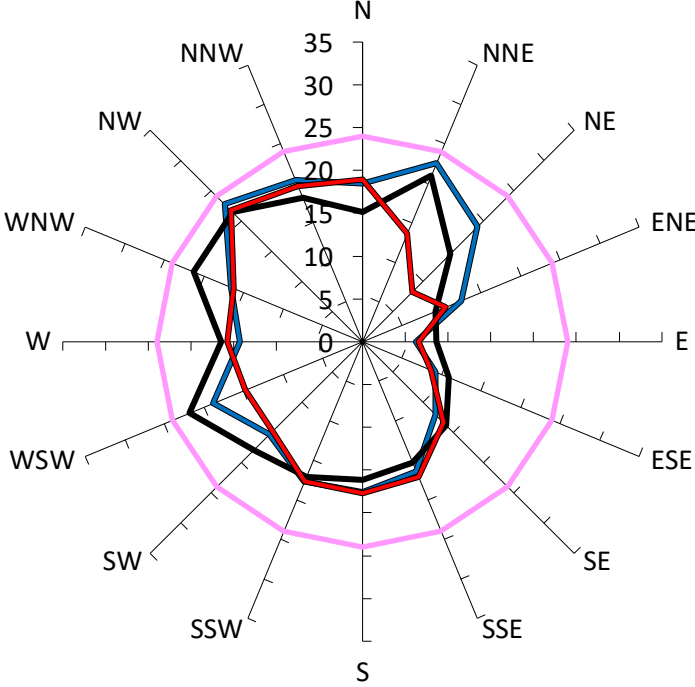

APPENDIX C DIRECTIONAL PLOTS OF WIND TUNNEL RESULTS

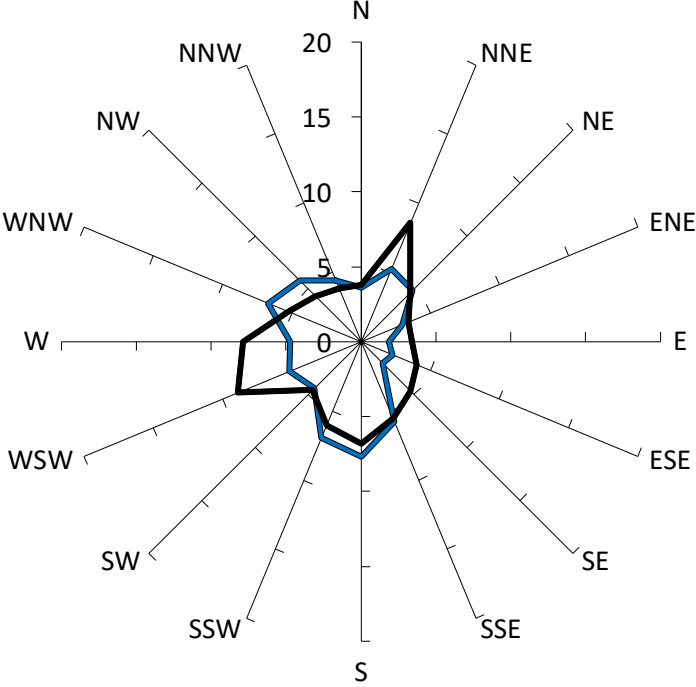
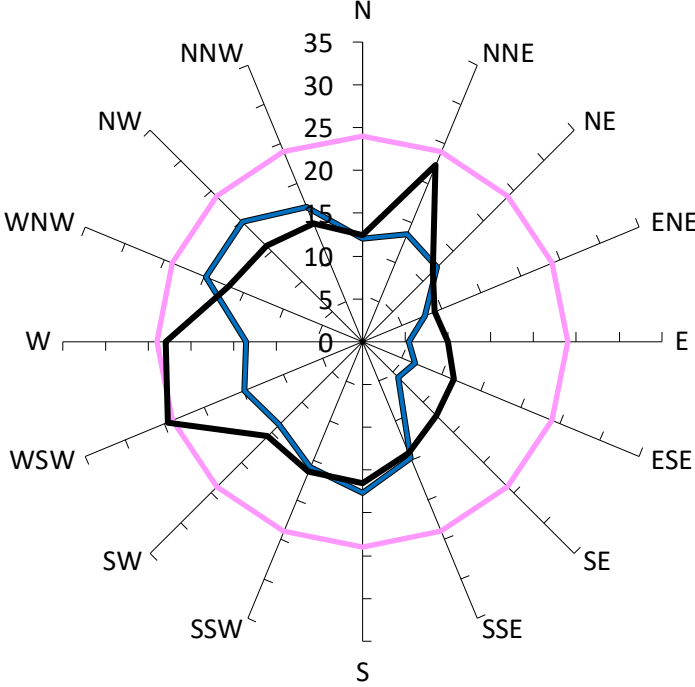













Results for Point 03			
Gust Equivalent Mean (m/s)		Maximum Gust (m/s)	
Comfort Criteria: 8m/s with 5% probability of exceedence		Safety Limit: 24m/s	
Description		GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).		5%	24
With development "as proposed", no vegetation or other treatments.		2%	21
Existing site conditions		6%	23
WD758-13- Bays Market District, Blackwattle Bay			8/10/2020

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
With development "as proposed", no vegetation or other treatments.	1%	17
Existing site conditions	2%	19
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

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
 With development "as proposed", no vegetation or other treatments.		7%	23
 Existing site conditions		5%	22
 Updated Proposed Masterplan design for WD758-13 (rev1), No changes were made around this point		7%	22
			
			
			
			
			
WD758-13- Bays Market District, Blackwattle Bay			8/10/2020

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
 With development "as proposed", no vegetation or other treatments.	3%	20
 Existing site conditions	6%	25
		
		
		
		
		
		
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

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
With development "as proposed", no vegetation or other treatments.	1%	17
Existing site conditions	0%	15
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

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
— With development "as proposed", no vegetation or other treatments.		10%	23
— Existing site conditions		1%	18
— Updated Proposed Masterplan design WD758-13 (rev1), Southern edge of Building A was rounded/chamfered		6%	20
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WD758-13- Bays Market District, Blackwattle Bay			8/10/2020

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
 With development "as proposed", no vegetation or other treatments.	0%	17
 Existing site conditions	1%	18
		
		
		
		
		
		
WD758-13- Bays Market District, Blackwattle Bay		
8/10/2020		



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
 With development "as proposed", no vegetation or other treatments.	2%	20
 Existing site conditions	0%	18
		
		
		
		
		
		
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

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
 With development "as proposed", no vegetation or other treatments.		7%	23
 Existing site conditions		2%	20
 Updated Proposed Masterplan design for WD758-13 (rev1), No changes were made around this point		8%	21
			
			
			
			
			
WD758-13- Bays Market District, Blackwattle Bay			8/10/2020

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
 With development "as proposed", no vegetation or other treatments.	13%	23
 Existing site conditions	1%	18
 Updated Proposed Masterplan design for WD758-13 (rev1), No changes were made around this point	5%	20
		
		
		
		
		
WD758-13- Bays Market District, Blackwattle Bay		
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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
 With development "as proposed", no vegetation or other treatments.	0%	13
 Existing site conditions	0%	14
		
		
		
		
		
		
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020



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
With development "as proposed", no vegetation or other treatments.	0%	12
Existing site conditions	0%	14
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

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
With development "as proposed", no vegetation or other treatments.	0%	16
Existing site conditions	0%	16
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

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
With development "as proposed", no vegetation or other treatments.	0%	11
Existing site conditions	0%	16
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 19		
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
With development "as proposed", no vegetation or other treatments.	12%	23
Existing site conditions	0%	17
Updated Proposed Masterplan design WD758-13 (rev1), Southern edge of Building A was rounded/chamfered and building setbacks of buildings B and C were increased to 6m	15%	23
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 20		
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
With development "as proposed", no vegetation or other treatments.	16%	24
Existing site conditions	0%	17
Updated Proposed Masterplan design WD758-13 (rev1), Southern edge of Building A was rounded/chamfered and building setbacks of buildings B and C were increased to 6m	19%	23
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 21		
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
With development "as proposed", no vegetation or other treatments.	7%	22
Updated Proposed Masterplan design WD758-13 (rev1), Southern edge of Building A was rounded/chamfered	5%	20
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

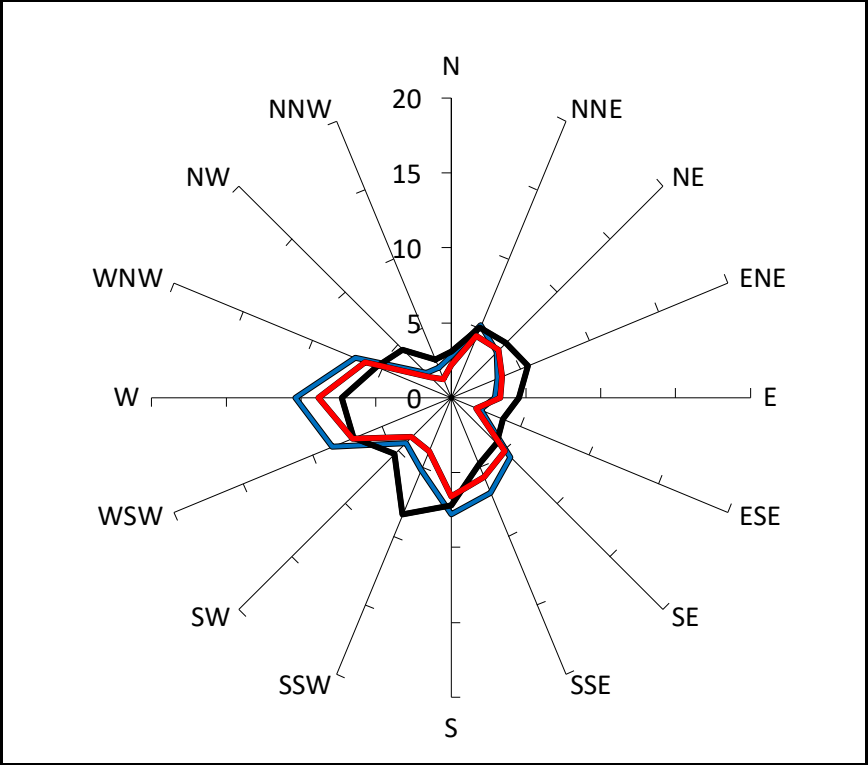
Results for Point 22		
Gust Equivalent Mean (m/s)	Maximum Gust (m/s)	
Comfort Criteria: 8m/s with 5% probability of exceedence	Safety Limit: 24m/s	
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
With development "as proposed", no vegetation or other treatments.	1%	18
Existing site conditions	0%	17
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 23		
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
With development "as proposed", no vegetation or other treatments.	4%	21
Existing site conditions	0%	17
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 24			
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
With development "as proposed", no vegetation or other treatments.		16%	22
Updated Proposed Masterplan design WD758-13 (rev1), Southern edge of Building A was rounded/chamfered and building setbacks of Buildings B and C were increased to 6m		6%	17
WD758-13- Bays Market District, Blackwattle Bay			8/10/2020

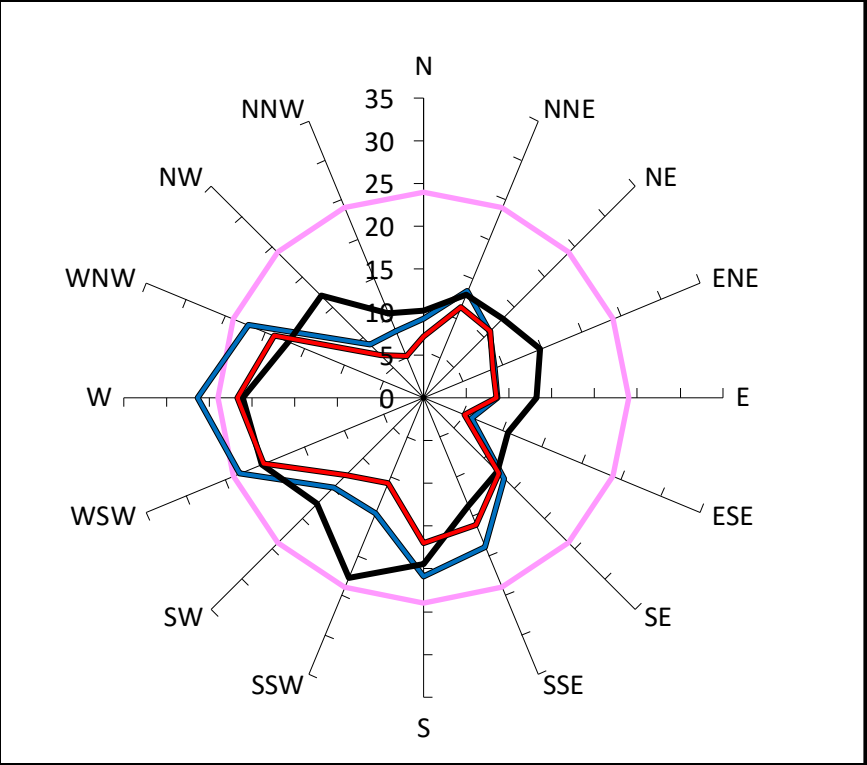
Results for Point 25

Gust Equivalent Mean (m/s)	
1	1.0
2	1.5
3	2.0
4	2.5
5	3.0
6	3.5
7	4.0
8	4.5
9	5.0
10	5.5
11	6.0
12	6.5
13	7.0
14	7.5
15	8.0
16	8.5
17	9.0
18	9.5
19	10.0
20	10.5
21	11.0
22	11.5
23	12.0
24	12.5
25	13.0
26	13.5
27	14.0
28	14.5
29	15.0
30	15.5
31	16.0
32	16.5
33	17.0
34	17.5
35	18.0
36	18.5
37	19.0
38	19.5
39	20.0
40	20.5
41	21.0
42	21.5
43	22.0
44	22.5
45	23.0
46	23.5
47	24.0
48	24.5
49	25.0
50	25.5
51	26.0
52	26.5
53	27.0
54	27.5
55	28.0
56	28.5
57	29.0
58	29.5
59	30.0
60	30.5
61	31.0
62	31.5
63	32.0
64	32.5
65	33.0
66	33.5
67	34.0
68	34.5
69	35.0
70	35.5
71	36.0
72	36.5
73	37.0
74	37.5
75	38.0
76	38.5
77	39.0
78	39.5
79	40.0
80	40.5
81	41.0
82	41.5
83	42.0
84	42.5
85	43.0
86	43.5
87	44.0
88	44.5
89	45.0
90	45.5
91	46.0
92	46.5
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94	47.5
95	48.0
96	48.5
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113	57.0
114	57.5
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117	59.0
118	59.5
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120	60.5
121	61.0
122	61.5
123	62.0
124	62.5
125	63.0
126	63.5
127	64.0
128	64.5
129	65.0
130	65.5
131	66.0
132	66.5
133	67.0
134	67.5
135	68.0
136	68.5
137	69.0
138	69.5
139	70.0
140	70.5
141	71.0
142	71.5
143	72.0
144	72.5
145	73.0
146	73.5
147	74.0
148	74.5
149	75.0
150	75.5
151	76.0
152	76.5
153	77.0
154	77.5
155	78.0
156	78.5
157	79.0
158	79.5
159	80.0
160	80.5
161	81.0












Comfort Criteria: 8m/s with 5% probability of exceedence
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Maximum Gust (m/s)



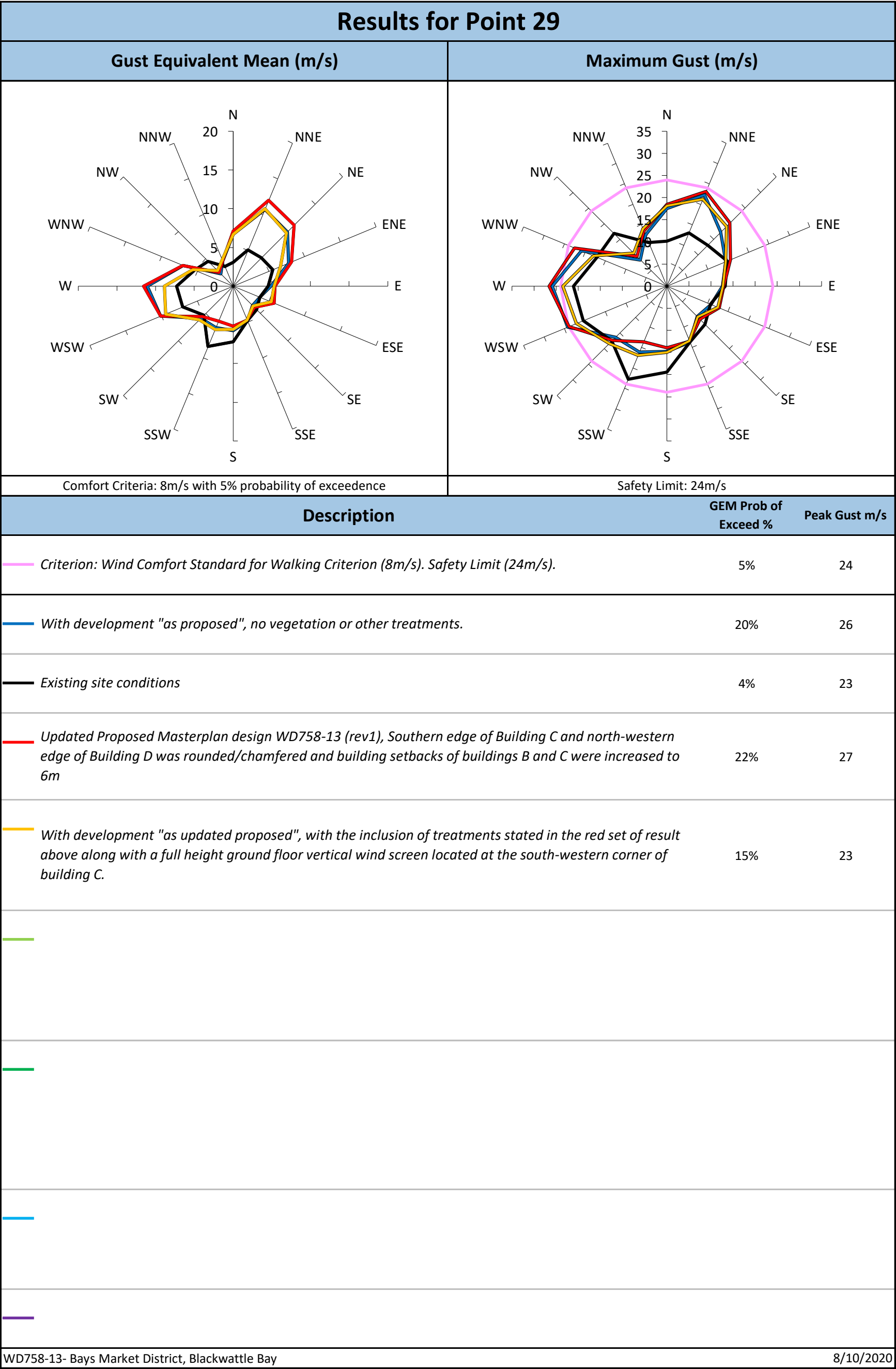
Safety Limit: 24m/s

Description		GEM Prob of Exceed %	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
	With development "as proposed", no vegetation or other treatments.	8%	26
	Existing site conditions	4%	23
	Updated Proposed Masterplan design WD758-13 (rev1), Southern edge of Building A was rounded/chamfered and building setbacks of Buildings B and C were increased to 6m	3%	22
			
			
			
			
			

Results for Point 26		
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
With development "as proposed", no vegetation or other treatments.	11%	21
Existing site conditions	4%	23
Updated Proposed Masterplan design WD758-13 (rev1), Southern edge of Building A was rounded/chamfered and building setbacks of Buildings B and C were increased to 6m	10%	21
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 27		
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
<div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
<div></div> With development "as proposed", no vegetation or other treatments.	18%	22
<div></div> Updated Proposed Masterplan design WD758-13 (rev1), Southern edge of Building A was rounded/chamfered and building setbacks of Buildings B and C were increased to 6m	14%	21
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WD758-13- Bays Market District, Blackwattle Bay		
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Results for Point 28		
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
With development "as proposed", no vegetation or other treatments.	2%	19
Existing site conditions	4%	23
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020



Results for Point 30		
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
With development "as proposed", no vegetation or other treatments.	18%	22
Updated Proposed Masterplan design WD758-13 (rev1), Southern edge of Building C was rounded/chamfered and building setbacks of Buildings B and C were increased to 6m	13%	23
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 31			
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
— With development "as proposed", no vegetation or other treatments.		0%	15
— Existing site conditions		0%	17
— Updated Proposed Masterplan design WD758-13 (rev1), North-eastern aspect of Building D was set back from Level and up		12%	21
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WD758-13- Bays Market District, Blackwattle Bay		8/10/2020	

Results for Point 32		
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
With development "as proposed", no vegetation or other treatments.	6%	22
Existing site conditions	0%	17
Updated Proposed Masterplan design WD758-13 (rev1), North-eastern aspect of Building D was set back from Level and up	17%	23
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 33			
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
With development "as proposed", no vegetation or other treatments.		1%	15
Existing site conditions		0%	17
Updated Proposed Masterplan design WD758-13 (rev1), North-eastern aspect of Building D was set back from Level and up		10%	22
WD758-13- Bays Market District, Blackwattle Bay			8/10/2020

Results for Point 34			
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
— With development "as proposed", no vegetation or other treatments.		1%	15
— Existing site conditions		1%	20
— Updated Proposed Masterplan design WD758-13 (rev1), North-eastern aspect of Building D was set back from Level and up, Podium and tower form of Building E was largely changed with two podium cut-outs and rounded northern corner of the podium		21%	24
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WD758-13- Bays Market District, Blackwattle Bay			8/10/2020

Results for Point 35		
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
With development "as proposed", no vegetation or other treatments.	9%	21
Existing site conditions	4%	23
Updated Proposed Masterplan design WD758-13 (rev1), Southern edge of Building C and north-western edge of BuildingD was rounded/chamfered and building setbacks of Buildings B and C were increased to 6m	9%	20
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

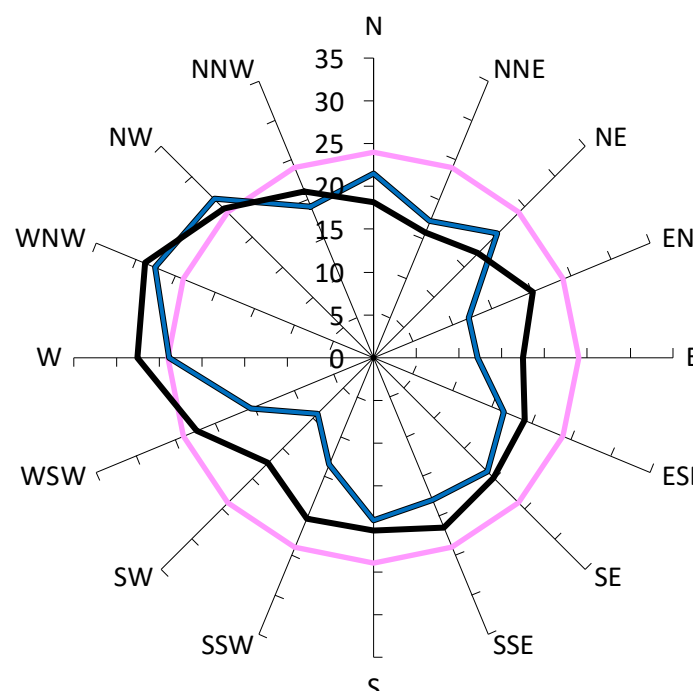








Results for Point 36		
Gust Equivalent Mean (m/s)	Maximum Gust (m/s)	
Comfort Criteria: 8m/s with 5% probability of exceedence	Safety Limit: 24m/s	
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
With development "as proposed", no vegetation or other treatments.	3%	23
Updated Proposed Masterplan design WD758-13 (rev1), North-western edge of Building D was rounded/chamfered and building setbacks of Buildings B and C were increased to 6m	2%	23
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

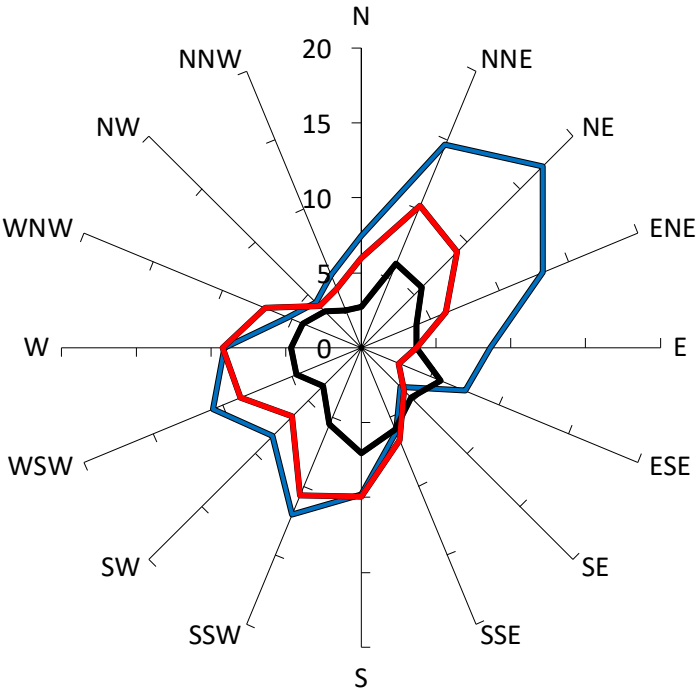
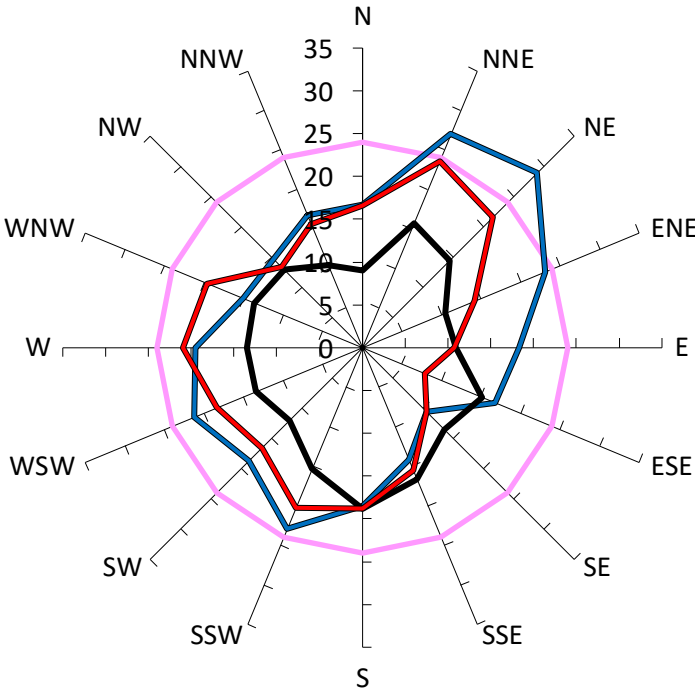
Results for Point 37		
Gust Equivalent Mean (m/s)	Maximum Gust (m/s)	
Comfort Criteria: 8m/s with 5% probability of exceedence	Safety Limit: 24m/s	
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
With development "as proposed", no vegetation or other treatments.	2%	21
Existing site conditions	2%	21
Updated Proposed Masterplan design WD758-13 (rev1), North-western edge of Building D was rounded/chamfered and building setbacks of Buildings B and C were increased to 6m	1%	20
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

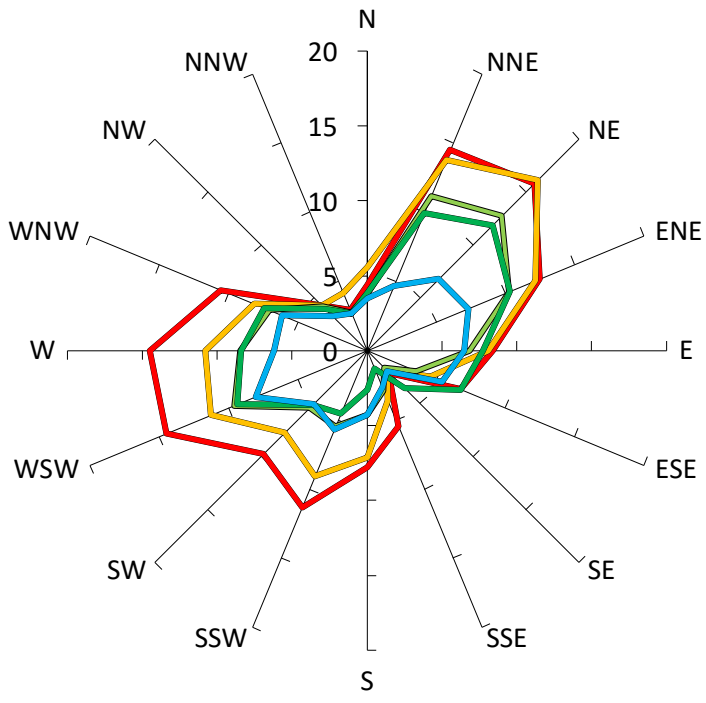
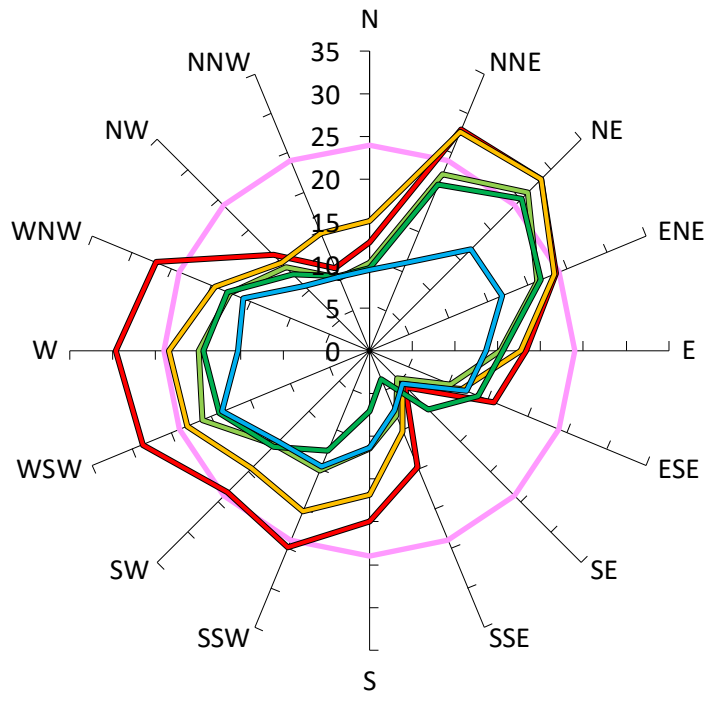









Results for Point 38		
Gust Equivalent Mean (m/s)		Maximum Gust (m/s)
		
Comfort Criteria: 8m/s with 5% probability of exceedence		Safety Limit: 24m/s
Description		GEM Prob of Exceed % Peak Gust m/s
 Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).		5% 24
 With development "as proposed", no vegetation or other treatments.		1% 18
		
 Updated Proposed Masterplan design WD758-13 (rev1), Podium and tower form of Building E was largely changed with two podium cut-outs and rounded northern corner of the podium and inclusion of a full-height podium cut out on Building D's eastern façade.		0% 16
		
		
		
		
		
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 39		
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
<div></div> <p>Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).</p>	5%	24
<div></div> <p>With development "as proposed", no vegetation or other treatments.</p>	26%	25
<div></div>		
<div></div> <p>Updated Proposed Masterplan design WD758-13 (rev1), Podium and tower form of Building E was largely changed with two podium cut-outs and rounded northern corner of the podium and inclusion of a full-height podium cut out on Building D's eastern façade.</p>	17%	24
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WD758-13- Bays Market District, Blackwattle Bay		
8/10/2020		

Results for Point 40		
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
With development "as proposed", no vegetation or other treatments.	3%	22
Existing site conditions	5%	23
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

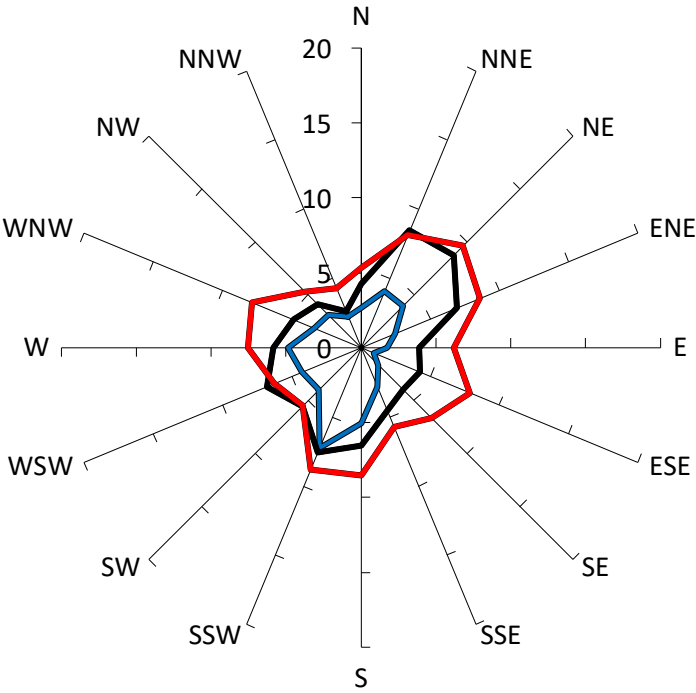
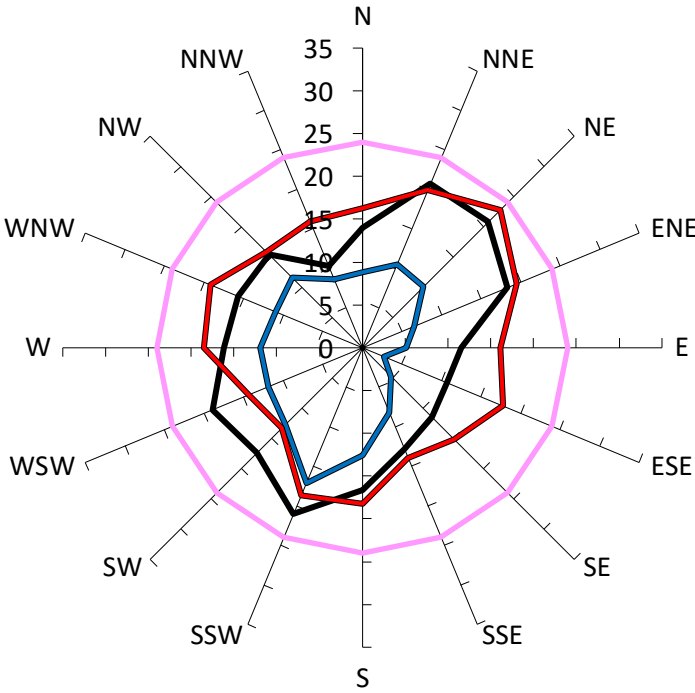









Results for Point 41		
Gust Equivalent Mean (m/s)	Maximum Gust (m/s)	
		
Comfort Criteria: 8m/s with 5% probability of exceedence	Safety Limit: 24m/s	
Description	GEM Prob of Exceed %	Peak Gust m/s
 Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
 With development "as proposed", no vegetation or other treatments.	10%	28
 Existing site conditions	21%	29
		
		
		
		
		
		
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 42			
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
— With development "as proposed", no vegetation or other treatments.		34%	29
— Existing site conditions		1%	19
— Updated Proposed Masterplan design WD758-13 (rev1), Podium and tower form of Building E was largely changed with two podium cut-outs and rounded northern corner of the podium and inclusion of a full-height podium cut out on Building D's eastern façade.		22%	24
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WD758-13- Bays Market District, Blackwattle Bay			8/10/2020

Results for Point 42a			
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
			
			
 Updated Proposed Masterplan design WD758-13 (rev1), Podium and tower form of building E was largely changed with two podium cut-outs and rounded northern corner of the podium and inclusion of a full-height podium cut out on Tower D's eastern façade.		34%	30
 With development "as updated proposed", with the inclusion of treatments stated in the red set of result above along with 3m wide impermeable awning spanning from the north-western to the north-eastern aspects of the Level 1 slab of Building E		29%	28
 With development "as updated proposed", with the inclusion of treatments stated in the red set of result above along with 3m wide impermeable awning spanning from the north-western to the north-eastern aspects of the Level 1 slab of Building E that meets up with the western distributor		20%	26
 With development "as updated proposed", with the inclusion of treatments stated in the red set of result above along with 3m wide impermeable awning spanning from the north-western to the north-eastern aspects of the Level 1 slab of Building E which meets up with the western distributor		20%	25
 With development "as updated proposed", with the inclusion of treatments stated in the red set of result above along with widened impermeable awning spanning from the north-western to the north-eastern aspects of the Level 1 slab of Building E that meets up with the western distributor and was extended to span the whole NE aspect of the Building E Podium as seen in Figure 7a		3%	19
			
WD758-13- Bays Market District, Blackwattle Bay			8/10/2020

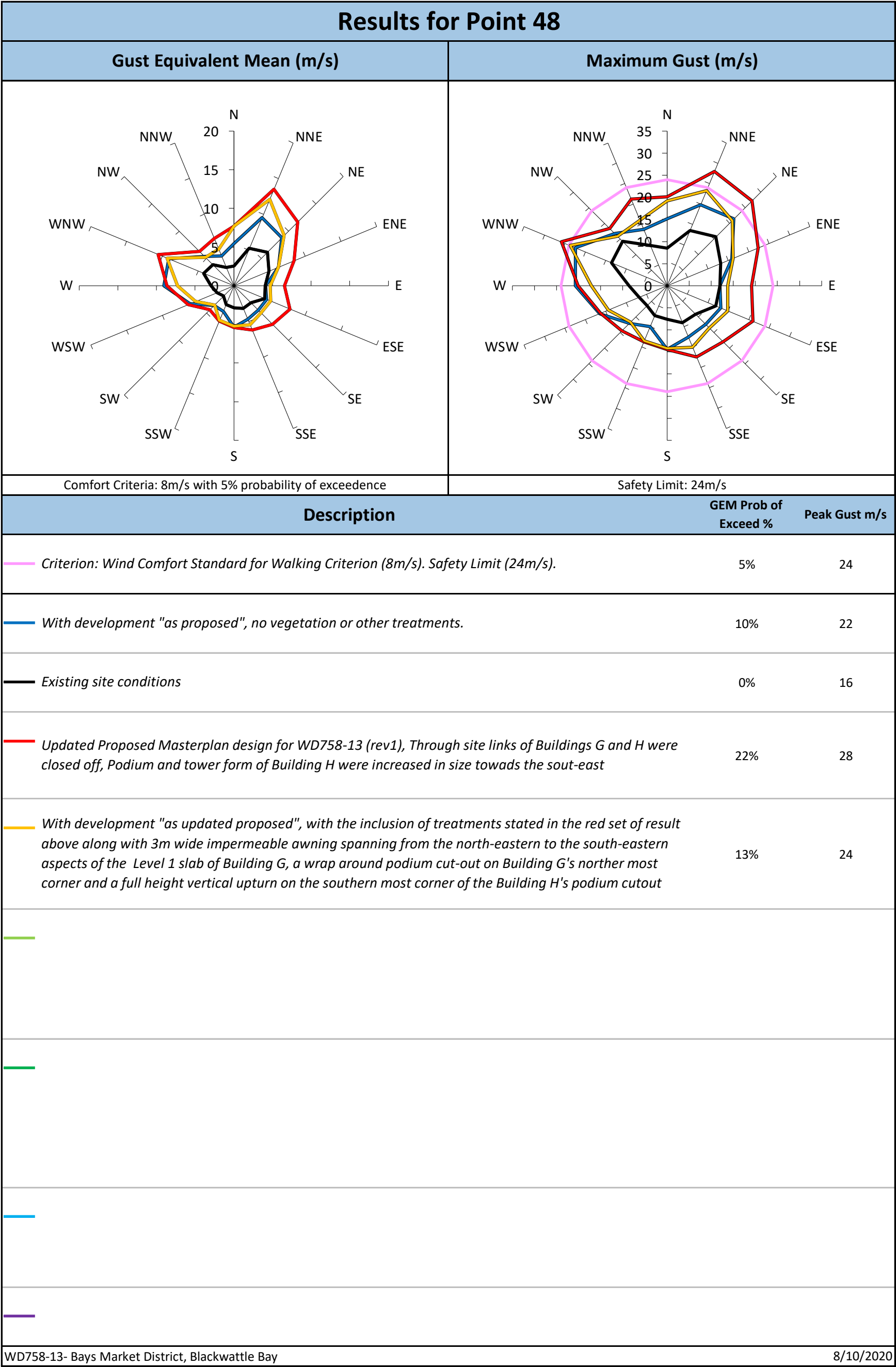
Results for Point 43		
Gust Equivalent Mean (m/s)	Maximum Gust (m/s)	
Comfort Criteria: 8m/s with 5% probability of exceedence	Safety Limit: 24m/s	
Description	GEM Prob of Exceed %	Peak Gust m/s
<div></div> <p>Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).</p>	5%	24
<div></div> <p>With development "as proposed", no vegetation or other treatments.</p>	29%	28
<div></div> <p>Updated Proposed Masterplan design WD758-13 (rev1), Podium and tower form of Building E was largely changed with two podium cut-outs and rounded northern corner of the podium and inclusion of a full-height podium cut out on Building D's eastern façade.</p>	2%	19
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WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

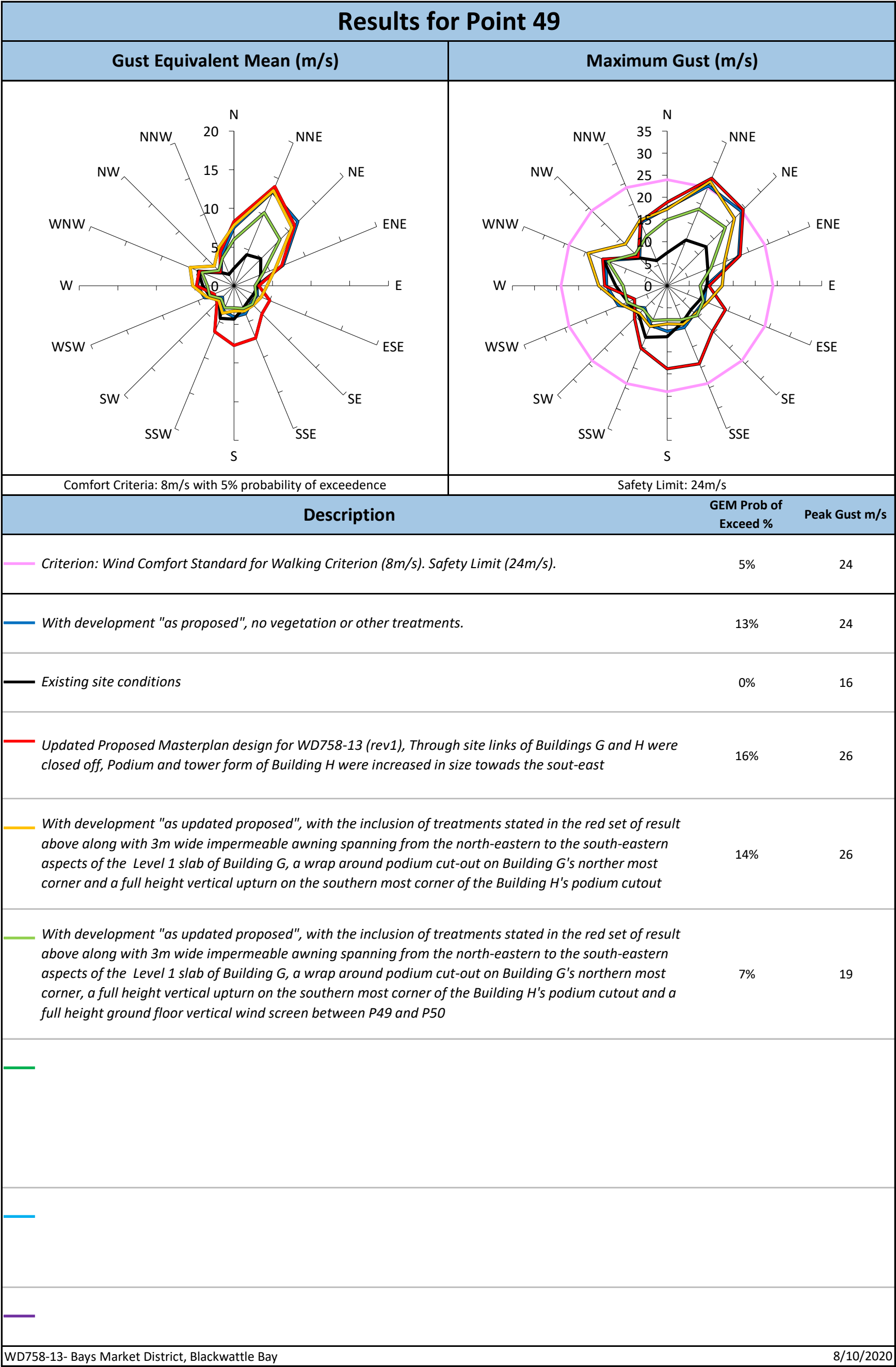
Results for Point 44		
Gust Equivalent Mean (m/s)	Maximum Gust (m/s)	
Comfort Criteria: 8m/s with 5% probability of exceedence	Safety Limit: 24m/s	
Description	GEM Prob of Exceed %	Peak Gust m/s
<div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
<div></div> With development "as proposed", no vegetation or other treatments.	1%	19
<div></div> Existing site conditions	1%	18
<div></div> Updated Proposed Masterplan design WD758-13 (rev1), Podium and tower form of Building E was largely changed with two podium cut-outs and rounded norhern corner of the podium.	2%	20
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WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

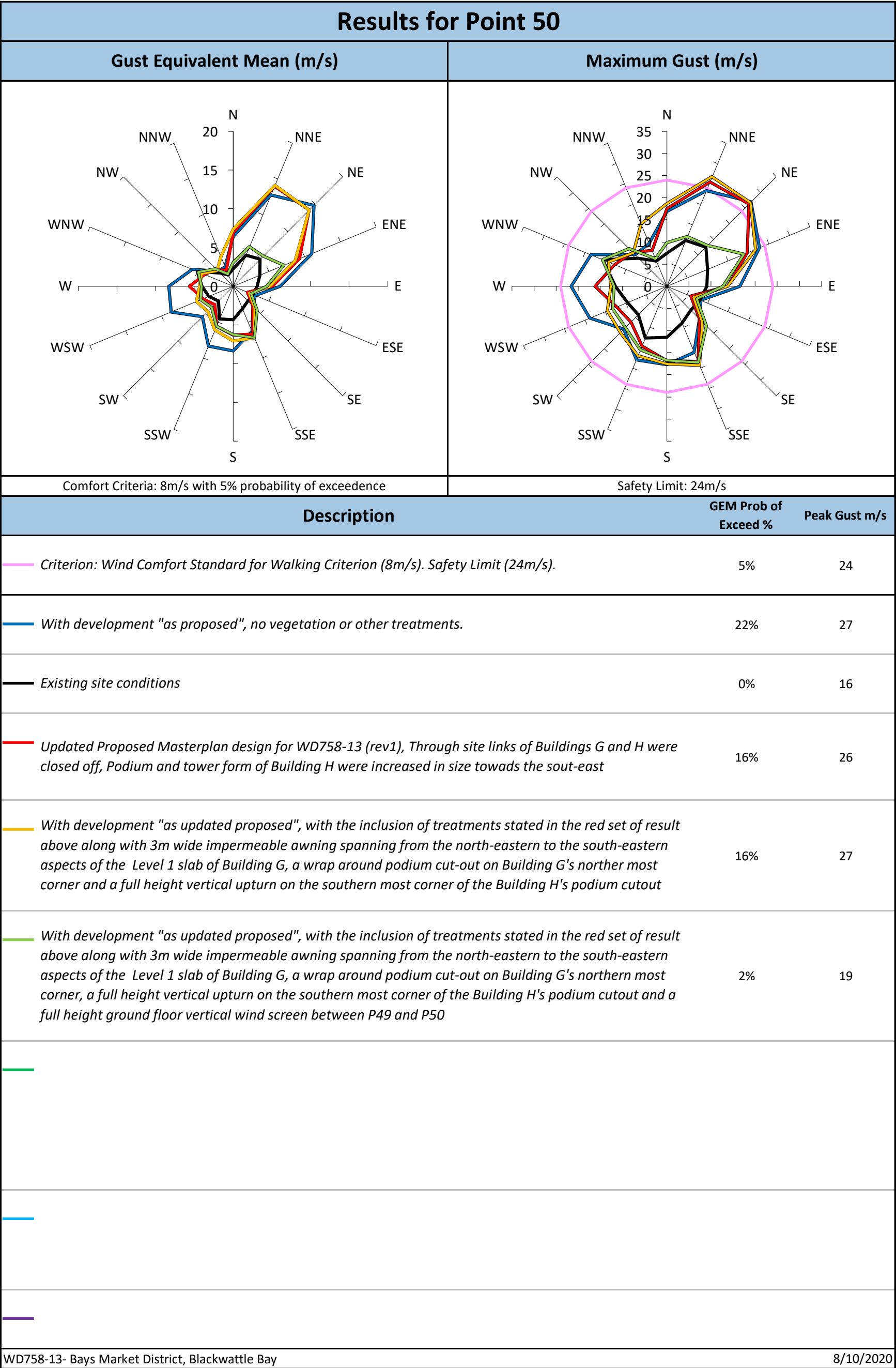
Results for Point 45			
Gust Equivalent Mean (m/s)		Maximum Gust (m/s)	
			
Comfort Criteria: 8m/s with 5% probability of exceedence		Safety Limit: 24m/s	
Description		GEM Prob of Exceed %	Peak Gust m/s
 Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).		5%	24
 With development "as proposed", no vegetation or other treatments.		1%	17
 Existing site conditions		6%	21
 Updated Proposed Masterplan design WD758-13 (rev1), Podium and tower form of Building E was largely changed with two podium cut-outs and rounded northern corner of the podium and through site walkway between Buildings E, G and F was increased		15%	23
			
			
			
			
			
WD758-13- Bays Market District, Blackwattle Bay			8/10/2020

Results for Point 46		
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
<div></div> <p>Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).</p>	5%	24
<div></div> <p>With development "as proposed", no vegetation or other treatments.</p>	1%	18
<div></div>		
<div></div> <p>Updated Proposed Masterplan design for WD758-13 (rev1), Through site links of Buildings G and H were closed off.</p>	3%	20
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WD758-13- Bays Market District, Blackwattle Bay		
8/10/2020		

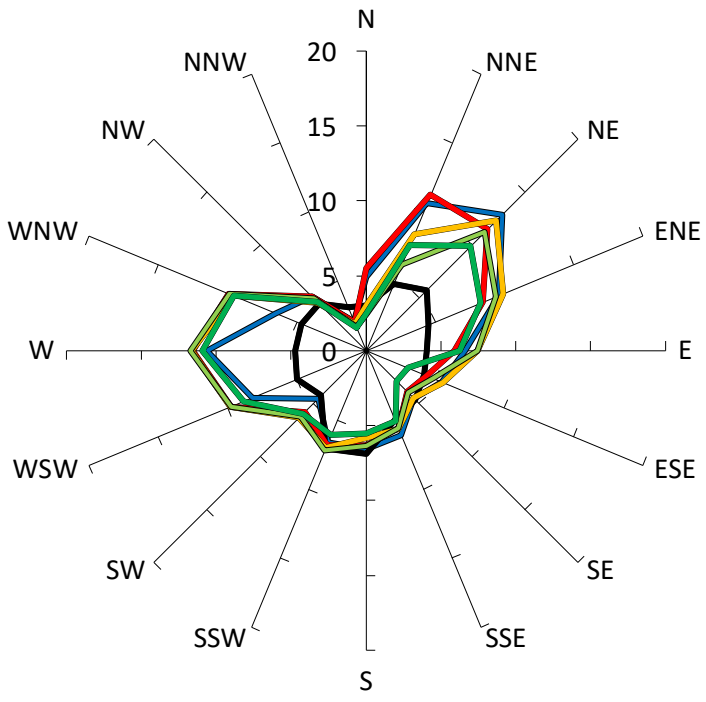
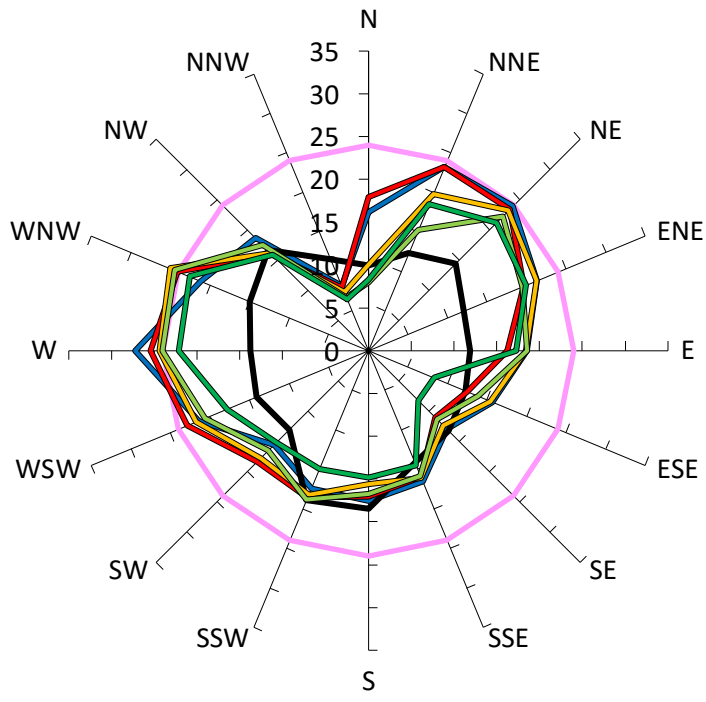









Results for Point 47			
Gust Equivalent Mean (m/s)		Maximum Gust (m/s)	
Comfort Criteria: 8m/s with 5% probability of exceedence		Safety Limit: 24m/s	
Description		GEM Prob of Exceed %	Peak Gust m/s
— Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).		5%	24
— With development "as proposed", no vegetation or other treatments.		13%	22
— Existing site conditions		2%	22
— Updated Proposed Masterplan design for WD758-13 (rev1), Through site links of Buildings G and H were closed off.		25%	24
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WD758-13- Bays Market District, Blackwattle Bay			8/10/2020







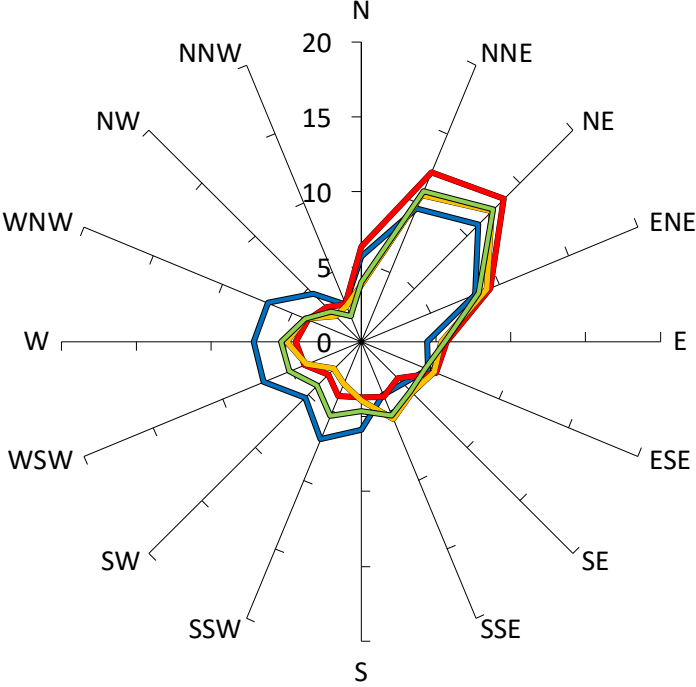
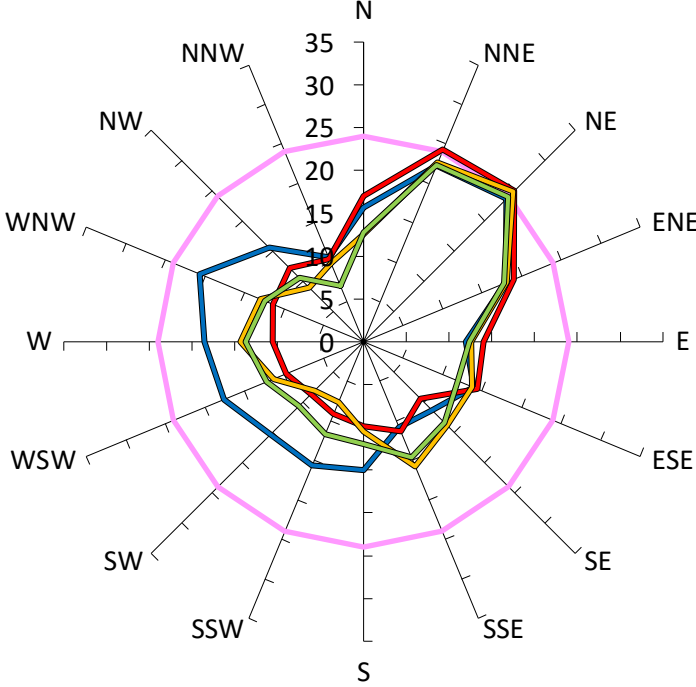









Results for Point 51		
Gust Equivalent Mean (m/s)	Maximum Gust (m/s)	
Comfort Criteria: 8m/s with 5% probability of exceedence	Safety Limit: 24m/s	
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
With development "as proposed", no vegetation or other treatments.	2%	17
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020




Results for Point 52		
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
 With development "as proposed", no vegetation or other treatments.	21%	27
 Existing site conditions	1%	19
 Updated Proposed Masterplan design for WD758-13 (rev1), Through site links of Buildings G and H were closed off, Podium and tower form of Building H were increased in size towards the south-east	23%	25
 With development "as updated proposed", with the inclusion of treatments stated in the red set of result above along with 3m wide impermeable awning spanning from the north-western and north-eastern aspects of the Level 1 slab of Building H, a wrap around podium cut-out on Building H's northern most corner and a full height vertical upturn on the southern most corner of the Building H's podium cutout	22%	25
 With development "as updated proposed", with the inclusion of treatments stated in the red set of result above along with 3m wide impermeable awning spanning from the north-eastern to the south-eastern aspects of the Level 1 slab of Building G, a wrap around podium cut-out on Building G's northern most corner, a full height vertical upturn on the southern most corner of the Building H's podium cutout and a full height ground floor vertical wind screen between P49 and P50	21%	25
 With development "as updated proposed", with the inclusion of treatments stated in the red set of result above along with 3m wide impermeable awning spanning from the north-eastern to the south-eastern aspects of the Level 1 slab of Building G, a wrap around podium cut-out on Building G's northern most corner, a full height vertical upturn on the southern most corner of the Building H's podium cutout, a full height ground floor vertical wind screen between P49 and P50 and a full height podium wind screen on the south-western aspect of Building H.	16%	23
		
		
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 53		
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
<div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
<div></div> With development "as proposed", no vegetation or other treatments.	14%	24
<div></div> Updated Proposed Masterplan design for WD758-13 (rev1), Podium and tower form of Building H were increased in size towards the sout-east and Building I has now merged to become one building	9%	20
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WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 54		
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
With development "as proposed", no vegetation or other treatments.	6%	19
Updated Proposed Masterplan design for WD758-13 (rev1), Podium and tower form of Building H were increased in size towards the south-east and Building I has now merged to become one building	11%	21
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

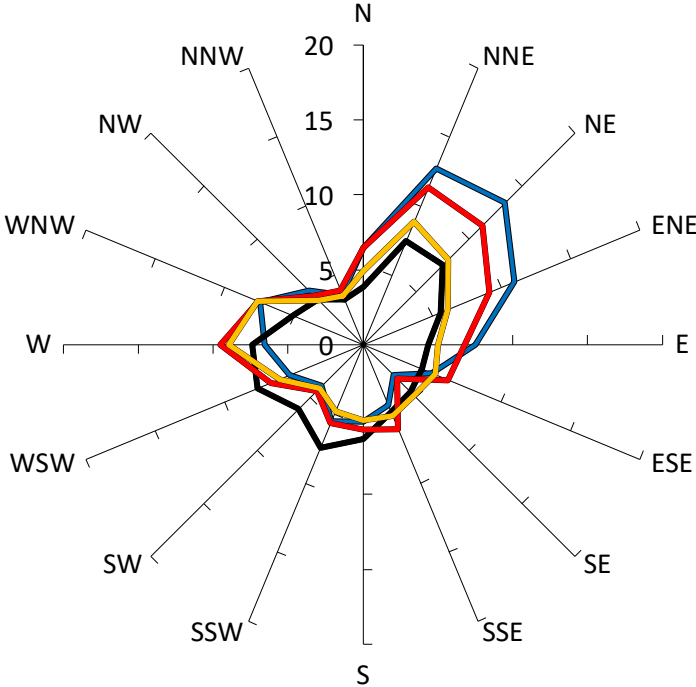
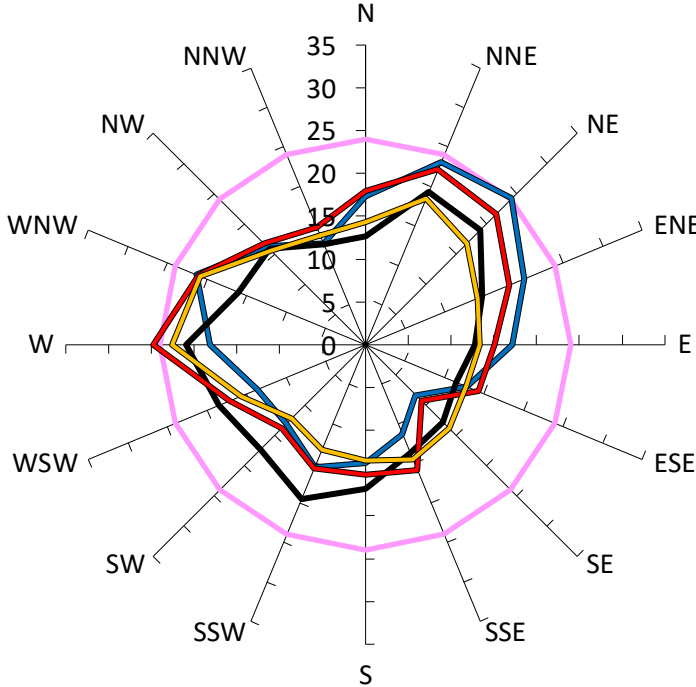
Results for Point 55		
Gust Equivalent Mean (m/s)	Maximum Gust (m/s)	
Comfort Criteria: 8m/s with 5% probability of exceedence	Safety Limit: 24m/s	
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
With development "as proposed", no vegetation or other treatments.	11%	22
Updated Proposed Masterplan design for WD758-13 (rev1), Building I has now merged to become one building, both the south-western and north-western corners of buildings F and I respectively were rounded	15%	23
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 56		
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
 With development "as proposed", no vegetation or other treatments.	14%	24
		
 Updated Proposed Masterplan design for WD758-13 (rev1), Building H's podium cross through link was closed off, Building I has now merged to become one building, both the south-western and north-western corners of buildings F and I respectively were rounded	15%	25
 With development "as updated proposed", with the inclusion of treatments stated in the red set of result above along with 3m wide impermeable wrap around awnings on Building G and H, and the wrap around podium cut-out on Building G and H.	14%	25
 With development "as updated proposed", with the inclusion of treatments stated in the red set of result above along with 3m wide impermeable awning spanning from the north-western and north-eastern aspects of the Level 1 slab of Building H, a wrap around podium cut-out on Building H's norther most ground floor corner a full height corner screen near P47 extending out to the NE	14%	24
		
		
		
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

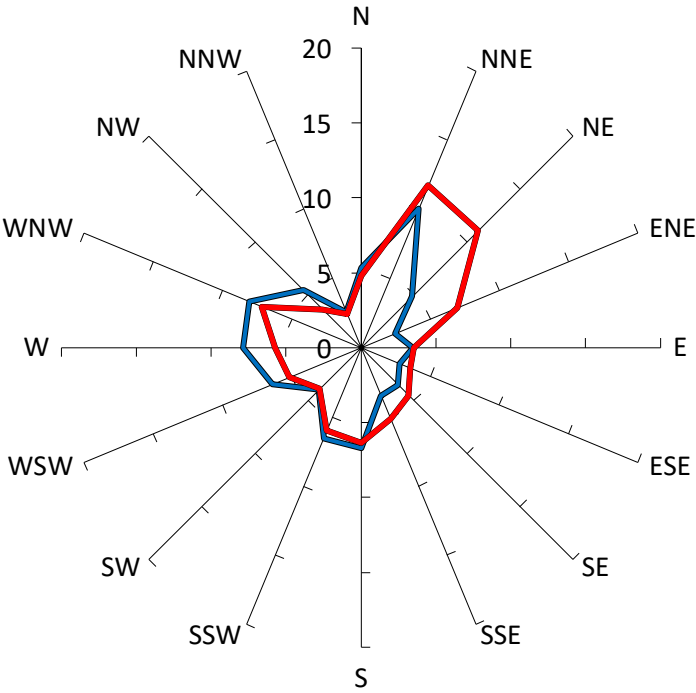
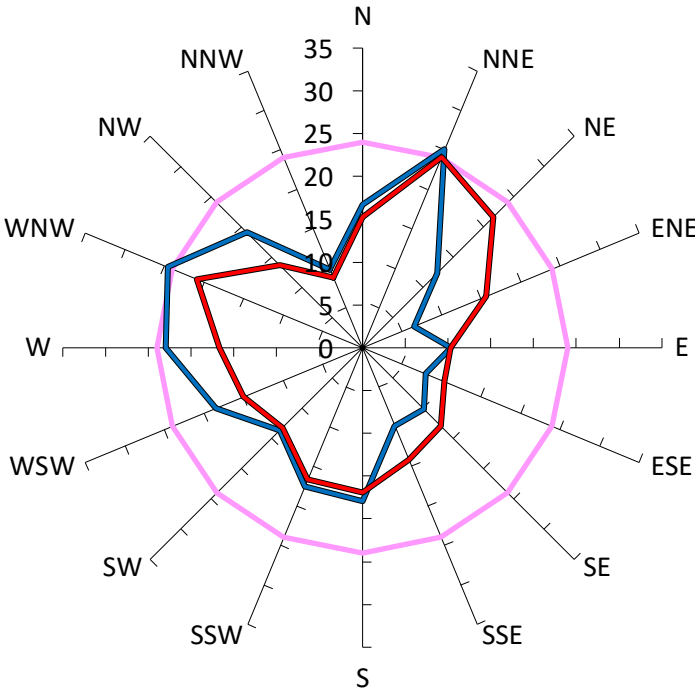









Results for Point 57		
Gust Equivalent Mean (m/s)	Maximum Gust (m/s)	
		
Comfort Criteria: 8m/s with 5% probability of exceedence	Safety Limit: 24m/s	
Description	GEM Prob of Exceed %	Peak Gust m/s
 Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
 With development "as proposed", no vegetation or other treatments.	12%	22
		
 Updated Proposed Masterplan design for WD758-13 (rev1), No changes were made around this point	3%	21
		
		
		
		
		
WD758-13- Bays Market District, Blackwattle Bay		
8/10/2020		

Results for Point 58		
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
With development "as proposed", no vegetation or other treatments.	27%	24
Existing site conditions	6%	21
Updated Proposed Masterplan design WD758-13 (rev1), Podium and tower form of Building E was largely changed with two podium cut-outs and rounded northern corner of the podium, through site walkway between Buildings E, G and F was increased and Building G's through site link has been closed off	27%	26
With development "as updated proposed", with the inclusion of treatments stated in the red set of result above along with the wrap around podium cut-out on Building G's northern most corner.	9%	19
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 59		
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
<div></div> <p>Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).</p>	5%	24
<div></div> <p>With development "as proposed", no vegetation or other treatments.</p>	21%	31
<div></div> <p>Updated Proposed Masterplan design WD758-13 (rev1), Podium and tower form of Building E was largely changed with two podium cut-outs and rounded northern corner of the podium and inclusion of a full-height podium cut out on Building D's eastern façade.</p>	15%	26
<div></div> <p>With development "as updated proposed", with the inclusion of treatments stated in the red set of result above along with a 3m wide awning spanning from the north-eastern to the north western aspects of the Building E's Level 1 slab.</p>	9%	23
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WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 60		
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
<div><div></div><div>Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).</div></div>	5%	24
<div><div></div><div>With development "as proposed", no vegetation or other treatments.</div></div>	18%	24
<div><div></div><div>Existing site conditions</div></div>	5%	21
<div><div></div><div>Updated Proposed Masterplan design WD758-13 (rev1), Podium and tower form of Building E was largely changed with two podium cut-outs and rounded northern corner of the podium, Inclusion of a full-height podium cut out on Building D's eastern façade and the through site walkway between Buildings E, F, G has widened</div></div>	19%	25
<div><div></div><div>With development "as updated proposed", with the inclusion of treatments stated in the red set of result above along with a 3m wide awning spanning from the north-eastern to the north western aspects of the Building E's Level 1 slab.</div></div>	7%	23
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WD758-13- Bays Market District, Blackwattle Bay		
8/10/2020		

Results for Point 61		
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
<div></div> <i>Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).</i>	5%	24
<div></div> <i>With development "as proposed", no vegetation or other treatments.</i>	13%	24
<div></div>		
<div></div> <i>Updated Proposed Masterplan design for WD758-13 (rev1), Bboth the south-western and north-western corners of buildings F and I respectively were rounded</i>	11%	24
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WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 62			
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
 With development "as proposed", no vegetation or other treatments.		8%	25
			
 Updated Proposed Masterplan design for WD758-13 (rev1), Bboth the south-western and north-western corners of buildings F and I respectively were rounded		13%	24
			
			
			
			
			
WD758-13- Bays Market District, Blackwattle Bay			8/10/2020

Results for Point 63		
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
<div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
<div></div> With development "as proposed", no vegetation or other treatments.	10%	24
<div></div> Updated Proposed Masterplan design for WD758-13 (rev1), Building I has now merged to become one building	8%	24
<div></div>		
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<div></div>		
WD758-13- Bays Market District, Blackwattle Bay		
8/10/2020		

Results for Point 64			
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
With development "as proposed", no vegetation or other treatments.		12%	25
Existing site conditions		1%	19
Updated Proposed Masterplan design for WD758-13 (rev1), Podium and tower form of Building H were increased in size towards the south and south-east, South-western corner of Tower I has been rounded		23%	26
With development "as updated proposed", with the inclusion of treatments stated in the red set of result above along with a 3m wide awning spanning from the south-eastern to the south-western aspects of the Building I's Level 1 slab.		12%	27
With development "as updated proposed", with the inclusion of treatments stated in the red set of result above along with a 3m wide awning spanning from the south-eastern to the south-western aspects of the Building I's Level 1 slab and a full height corner screen at the south-eastern corner of building I		8%	20
WD758-13- Bays Market District, Blackwattle Bay			8/10/2020

Results for Point 65		
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
With development "as proposed", no vegetation or other treatments.	2%	19
Existing site conditions	12%	25
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 66		
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
With development "as proposed", no vegetation or other treatments.	7%	21
Existing site conditions	12%	25
Updated Proposed Masterplan design WD758-13 (rev1), Throught site walkway between Buildings E, G and F was increased and Building G's through site link has been closed off	16%	27
With development "as updated proposed", with the inclusion of treatments stated in the red set of result above along with a 3m wide awning spanning from the north-eastern to the north western aspects of the Building E's Level 1 slab.	15%	25
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 67		
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
With development "as proposed", no vegetation or other treatments.	2%	21
Existing site conditions	3%	20
Updated Proposed Masterplan design for WD758-13 (rev1), No changes were made around this point	1%	19
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 68		
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
With development "as proposed", no vegetation or other treatments.	2%	20
Existing site conditions	3%	20
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

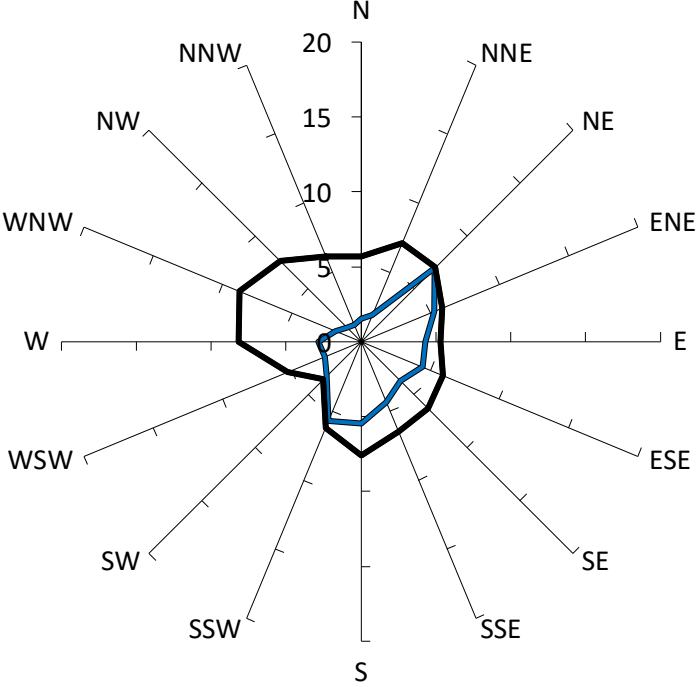
Results for Point 69		
Gust Equivalent Mean (m/s)	Maximum Gust (m/s)	
		
Comfort Criteria: 8m/s with 5% probability of exceedence	Safety Limit: 24m/s	
Description	GEM Prob of Exceed %	Peak Gust m/s
 <i>Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).</i>	5%	24
 <i>With development "as proposed", no vegetation or other treatments.</i>	3%	21
		
 <i>Updated Proposed Masterplan design for WD758-13 (rev1), No changes were made around this point</i>	7%	24
		
		
		
		
		
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 70		
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
With development "as proposed", no vegetation or other treatments.	2%	20
Existing site conditions	4%	22
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 71		
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
With development "as proposed", no vegetation or other treatments.	11%	23
Existing site conditions	10%	24
Updated Proposed Masterplan design for WD758-13 (rev1), Podium and tower form of Building H were increased in size towards the south and south-east, South-western corner of Tower I has been rounded	13%	24
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020



Results for Point 73		
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
With development "as proposed", no vegetation or other treatments.	1%	18
Existing site conditions	4%	20
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 74			
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
 With development "as proposed", no vegetation or other treatments.		1%	17
 Existing site conditions		8%	24
			
			
			
			
			
			
WD758-13- Bays Market District, Blackwattle Bay			8/10/2020



Results for Point 76		
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
With development "as proposed", no vegetation or other treatments.	3%	20
Existing site conditions	19%	23
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 77		
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
With development "as proposed", no vegetation or other treatments.	1%	18
Existing site conditions	5%	23
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 78		
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
With development "as proposed", no vegetation or other treatments.	1%	18
Existing site conditions	5%	23
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

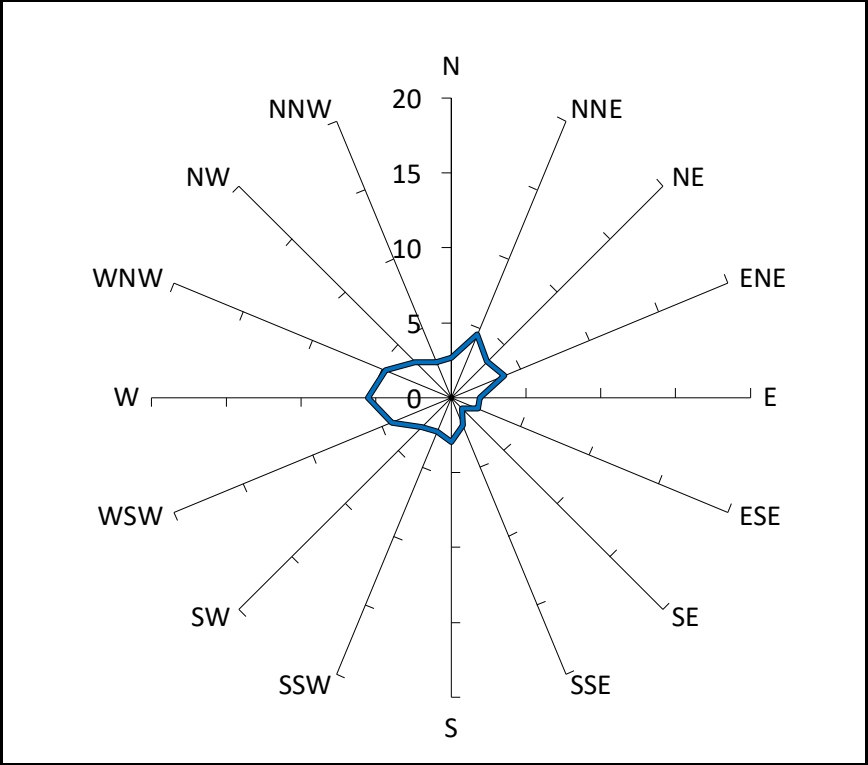
Results for Point 79		
Gust Equivalent Mean (m/s)	Maximum Gust (m/s)	
Comfort Criteria: 8m/s with 5% probability of exceedence	Safety Limit: 24m/s	
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
With development "as proposed", no vegetation or other treatments.	1%	18
Existing site conditions	5%	23
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 80		
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
With development "as proposed", no vegetation or other treatments.	1%	18
Existing site conditions	6%	25
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 81		
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
With development "as proposed", no vegetation or other treatments.	1%	18
Existing site conditions	10%	23
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

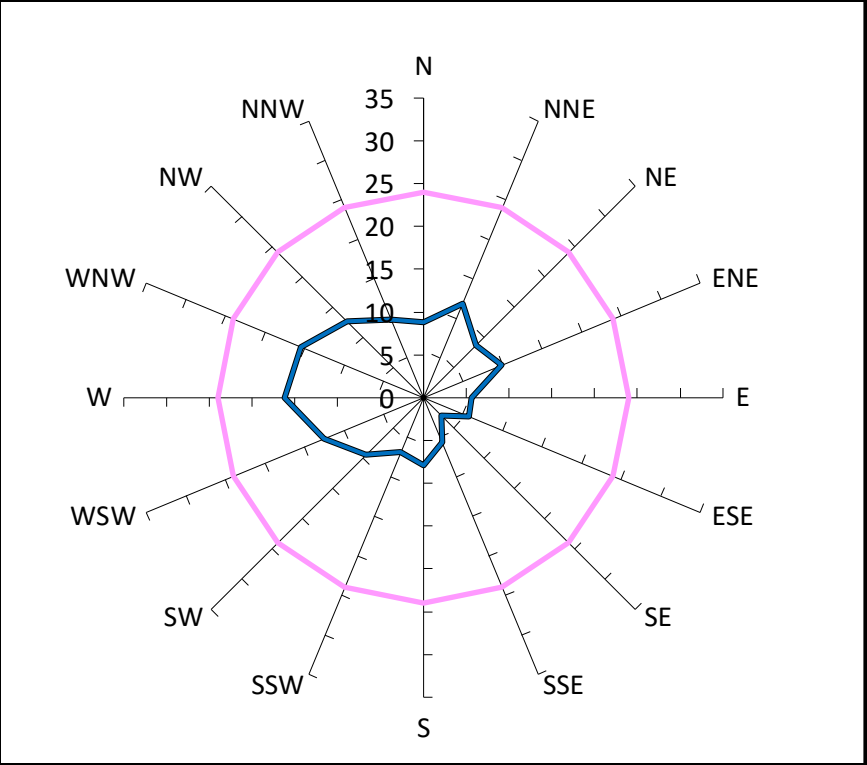
Results for Point 82

Gust Equivalent Mean (m/s)	
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Comfort Criteria: 8m/s with 5% probability of exceedence
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Maximum Gust (m/s)



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
	With development "as proposed", no vegetation or other treatments.	0%	16
			
			
			
			
			
			
			

Results for Point 83		
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
With development "as proposed", no vegetation or other treatments.	0%	16
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

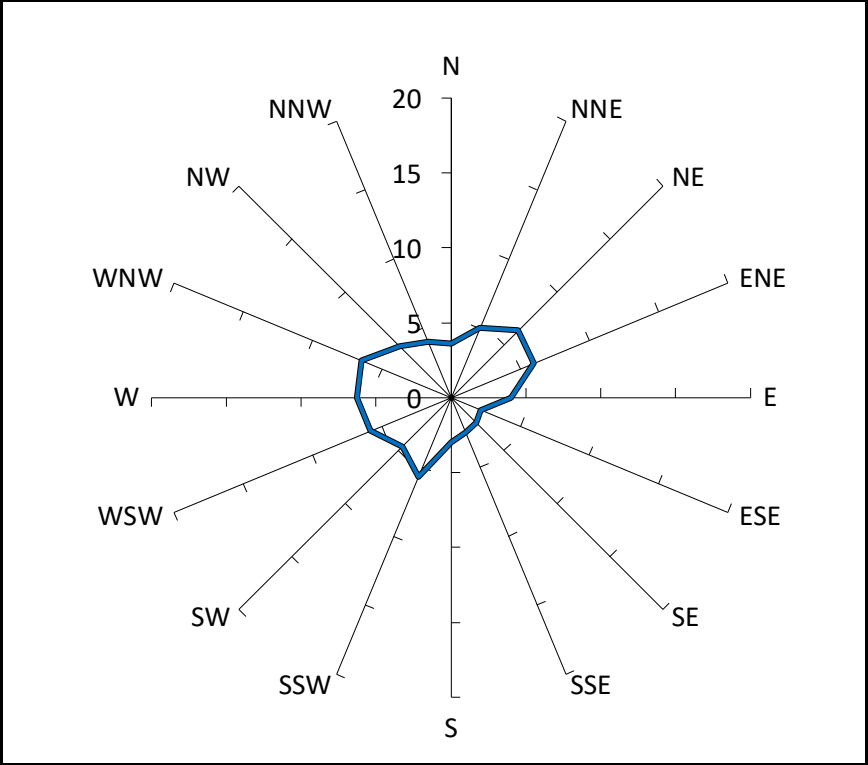
Results for Point 84		
Gust Equivalent Mean (m/s)	Maximum Gust (m/s)	
Comfort Criteria: 8m/s with 5% probability of exceedence	Safety Limit: 24m/s	
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
With development "as proposed", no vegetation or other treatments.	5%	20
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 85		
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
With development "as proposed", no vegetation or other treatments.	1%	17
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 86			
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
With development "as proposed", no vegetation or other treatments.		5%	23
Existing site conditions		8%	24
WD758-13- Bays Market District, Blackwattle Bay			8/10/2020

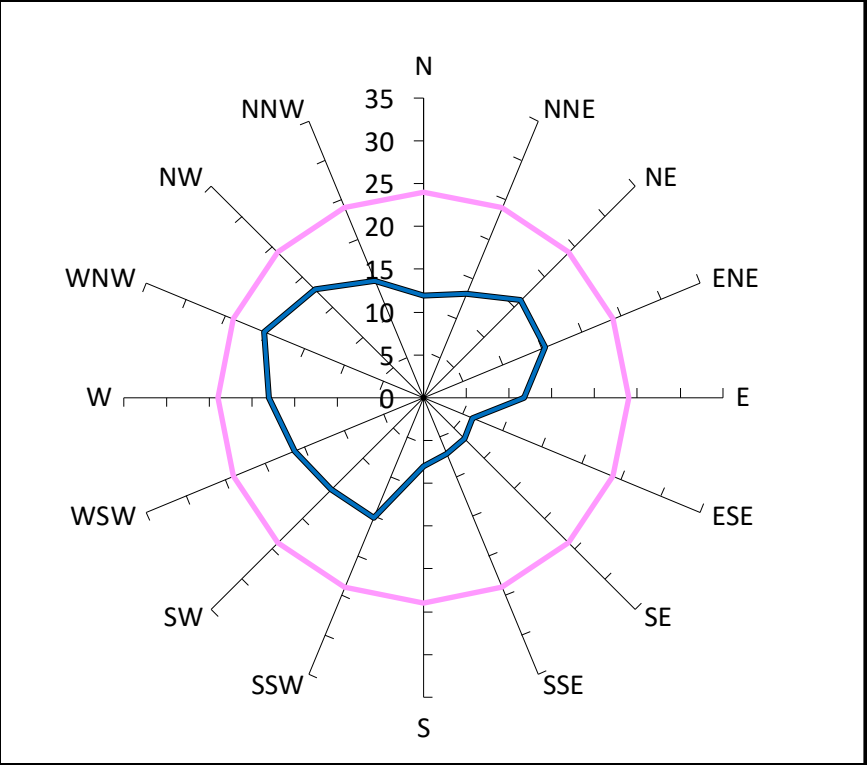
Results for Point 87

Gust Equivalent Mean (m/s)	
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Comfort Criteria: 8m/s with 5% probability of exceedence
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Maximum Gust (m/s)

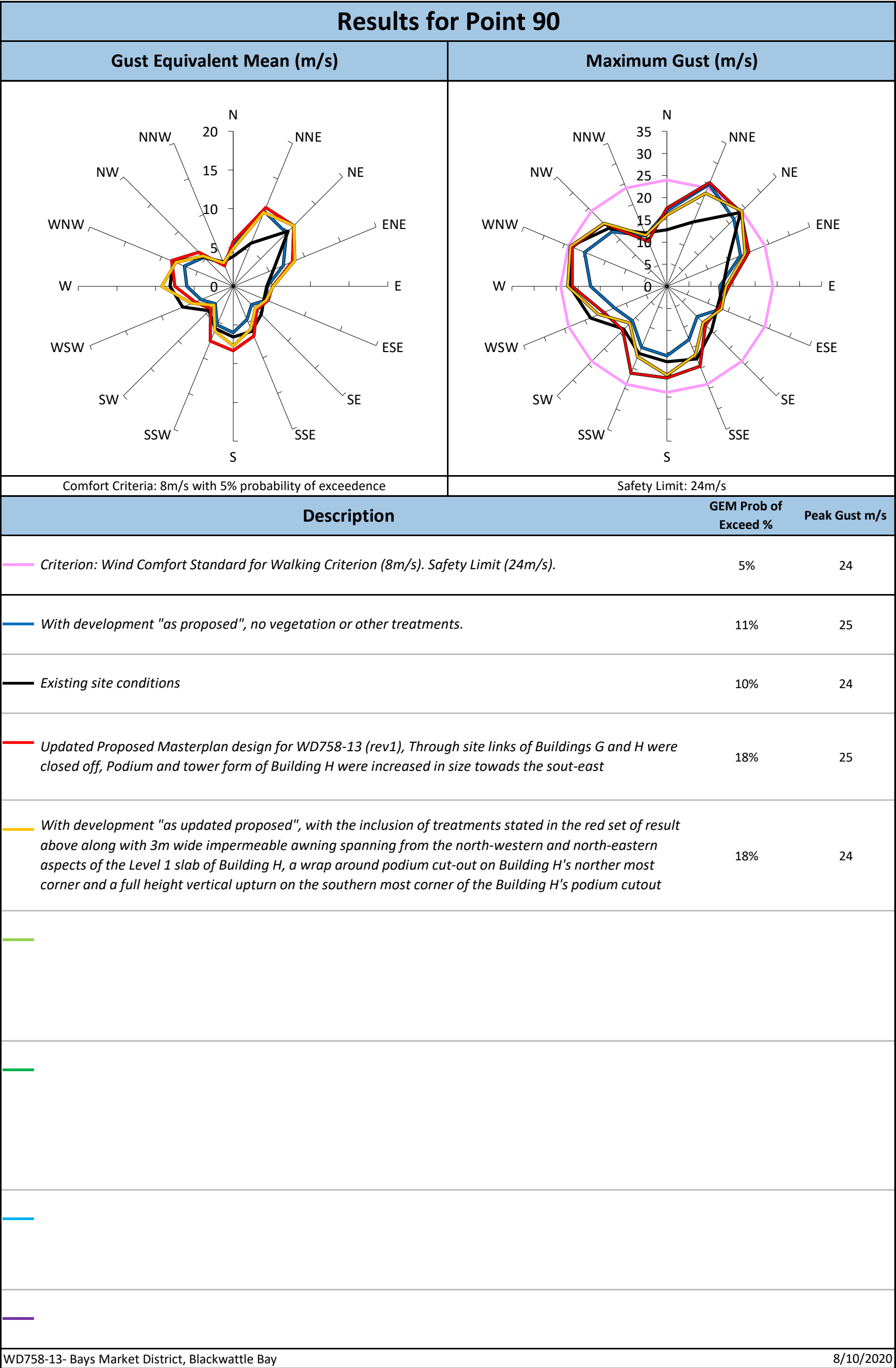


Safety Limit: 24m/s

Description		GEM Prob of Exceed %	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
	With development "as proposed", no vegetation or other treatments.	2%	20
			
			
			
			
			
			
			

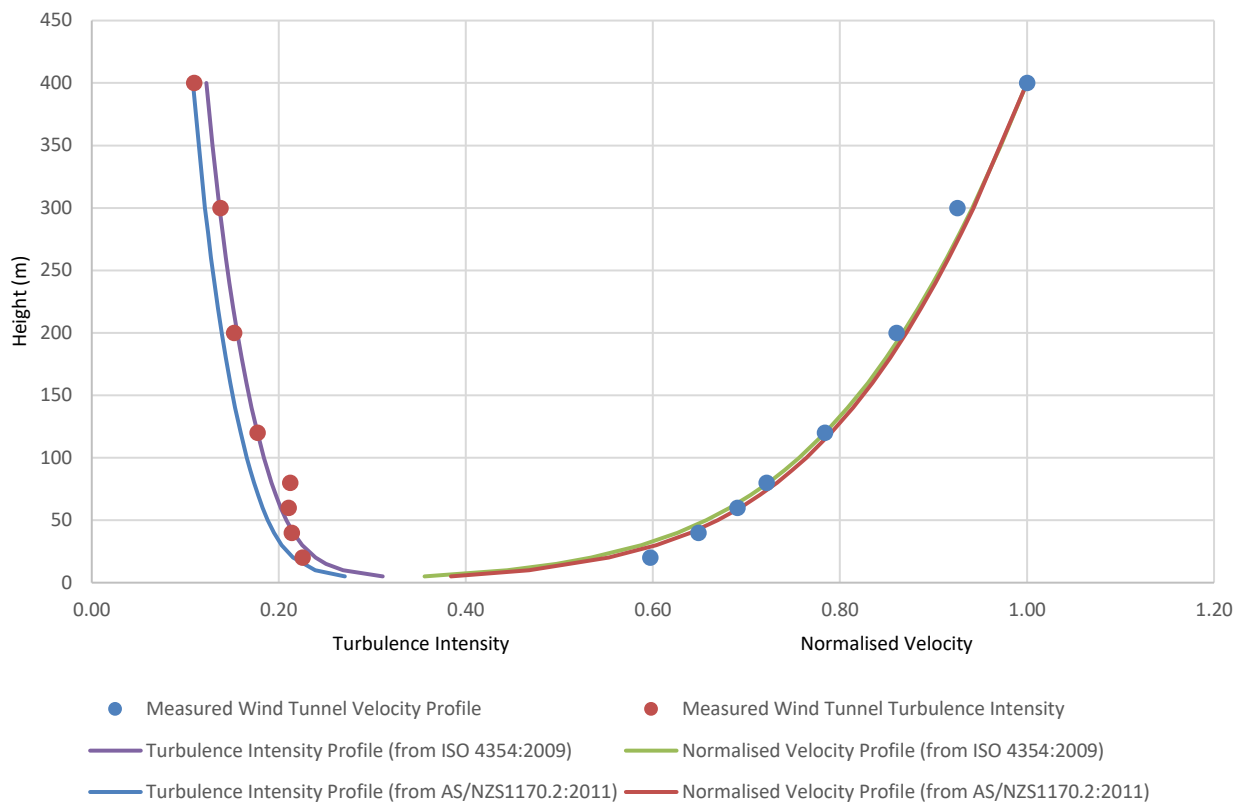
Results for Point 88		
Gust Equivalent Mean (m/s)	Maximum Gust (m/s)	
Comfort Criteria: 8m/s with 5% probability of exceedence	Safety Limit: 24m/s	
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	5%	24
With development "as proposed", no vegetation or other treatments.	4%	24
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

Results for Point 89		
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
With development "as proposed", no vegetation or other treatments.	1%	14
WD758-13- Bays Market District, Blackwattle Bay		8/10/2020

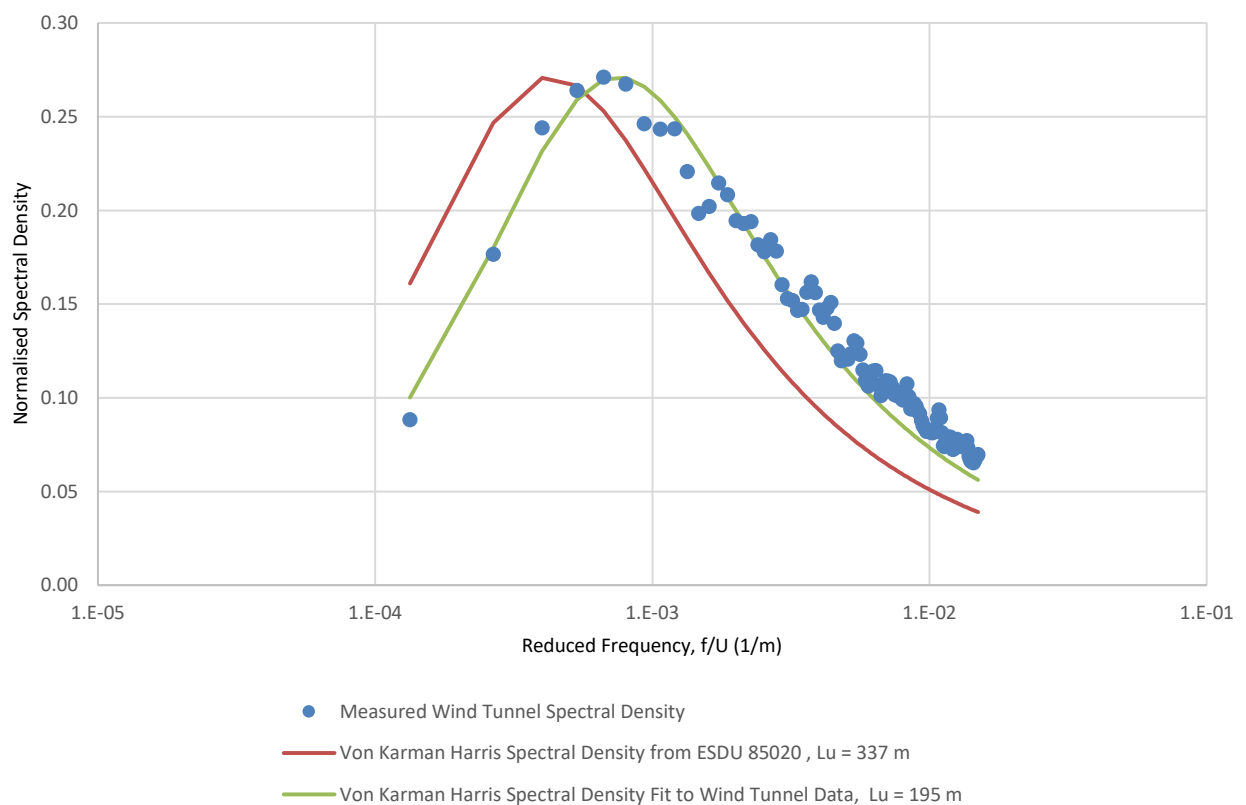


APPENDIX D VELOCITY AND TURBULENCE INTENSITY PROFILES

Mean Velocity and Turbulence Intensity for Suburban/Forest Terrain ($0.2\text{m} < z_0 < 0.3\text{m}$) (TC3) at a 1:400 Scale



Longitudinal Spectra Density for Suburban/Forest Terrain ($0.2\text{m} < z_0 < 0.3\text{m}$) (TC3) at a 1:400 Scale



APPENDIX E SEASONAL ANALYSIS



Date: February 19, 2021

Reference: WD758-13F03(rev0)- Seasonal Analysis Letter

Infrastructure NSW (INSW)

Level 15, Macquarie House,
165 Macquarie Street, NSW 2000

**RE: BLACKWATTLE BAY, SYDNEY
SEASONAL ANALYSIS**

Dear Mr Gerring,

This letter is in relation to the time of day and seasonal analysis undertaken for the Blackwattle Bay, Sydney project. Selected study point locations were analysed with respect to the Draft Sydney Development Control Plan 2012 - Central Sydney Planning Review Amendment. This was carried out for a monthly occurrence, and 3-hour interval time periods throughout a given day for the pre-treatment testing wind tunnel results (i.e. – those reflected in initial Pedestrian Wind Environment report ref: **WD758-14F02(rev1)- WE Report**). These calculations were based on a detailed statistical analysis of observed wind speed data obtained from the meteorological recording station located at Kingsford Smith Airport (Sydney Airport) as outlined in the above report.

In general, the result of the seasonal analysis show that the wind speeds are generally lower during the cooler months of the year at the various selected outdoor locations. The calmer winds during the cooler months of the year reduces the chill factor, presenting a more comfortable environment for outdoor activities. For these cooler months of the year, the morning periods consistently offer calmer wind conditions in comparison to that of the afternoon.

During the warmer months of the year, these winds are generally more welcomed as a cooling breeze. Similarly, to that of the cooler months of the year, the results show the winds during the morning periods consistently offer more suitable conditions for outdoor activities in comparison to those of the afternoon. However, while the conditions are better during the abovementioned cooler months, they are generally in exceedance of the designated target “walking” comfort criterion for a significant portion of a given day. As a result, a suitable mitigation strategy has been devised and tested in the wind tunnel, as seen in the

Pedestrian Wind Environment Study report **WD758-14F02(rev1)- WE Report**, in order to mitigate the wind conditions in these areas to achieve the desired criteria.

The complete results of the assessment are presented in Appendix A of this letter below.

Regards,

A handwritten signature in black ink, appearing to read 'N. Napier', with a long horizontal stroke extending to the left.

Nathan Napier
Project Engineer

APPENDIX A – SEASONAL ANALYSIS TABLES

Legend for Tables 1a to 12a

Abbreviation	Criteria	Wind Speed (m/s)
LE	Long Exposure	4 (at 5% exceedance)
SE	Short Exposure	6 (at 5% exceedance)
CW	Comfortable Walking	8 (at 5% exceedance)
EC(<2)	Exceeds CW Criteria (by < 2m/s)	
EC(>2)	Exceeds CW Criteria (by > 2m/s)	-

Table 1: Point 05 - Monthly and 3 Hourly Results

Time	Davenport Criteria Analysis (95%)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12am - 3am	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW
3am - 6am	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW
6am - 9am	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW	EC(<2)	CW
9am - 12pm	CW	CW	CW	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)
12pm - 3pm	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)
3pm - 6pm	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)
6pm - 9pm	EC(<2)	EC(<2)	EC(<2)	CW	CW	CW	CW	CW	CW	EC(<2)	EC(<2)	EC(<2)
9pm - 12am	EC(<2)	CW	CW	CW	CW	CW	CW	CW	CW	EC(<2)	EC(<2)	EC(<2)
All Year 6am to 10pm	EC(<2)											

Table 2: Point 08 - Monthly and 3 Hourly Results

Time	Davenport Criteria Analysis (95%)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12am - 3am	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW
3am - 6am	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW
6am - 9am	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW
9am - 12pm	CW	CW	CW	CW	CW	EC(<2)	EC(<2)	CW	EC(<2)	CW	EC(<2)	EC(<2)
12pm - 3pm	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)
3pm - 6pm	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	CW	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)
6pm - 9pm	EC(<2)	CW	CW	CW	CW	CW	CW	CW	CW	CW	EC(<2)	CW
9pm - 12am	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW	EC(<2)	EC(<2)
All Year 6am to 10pm	EC(<2)											

Table 3: Point 19 - Monthly and 3 Hourly Results

Time	Davenport Criteria Analysis (95%)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12am - 3am	EC(<2)	EC(<2)	EC(<2)	EC(<2)	CW	EC(<2)	CW	EC(<2)	CW	EC(<2)	EC(<2)	EC(<2)
3am - 6am	EC(<2)	EC(<2)	EC(<2)	EC(<2)	CW	EC(<2)	EC(<2)	CW	CW	EC(<2)	EC(<2)	EC(<2)
6am - 9am	EC(<2)	EC(<2)	EC(<2)	EC(<2)	CW	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)
9am - 12pm	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(<2)	EC(<2)	EC(<2)
12pm - 3pm	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
3pm - 6pm	EC(>2)	EC(<2)	EC(>2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
6pm - 9pm	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)
9pm - 12am	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)
All Year 6am to 10pm	EC(<2)											

Table 4: Point 34 - Monthly and 3 Hourly Results

Time	Davenport Criteria Analysis (95%)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12am - 3am	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)
3am - 6am	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)
6am - 9am	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)
9am - 12pm	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(<2)	EC(<2)
12pm - 3pm	EC(>2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
3pm - 6pm	EC(>2)	EC(>2)	EC(>2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
6pm - 9pm	EC(>2)	EC(>2)	EC(>2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
9pm - 12am	EC(>2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)
All Year 6am to 10pm	EC(>2)											

Table 5: Point 39 - Monthly and 3 Hourly Results

Time	Davenport Criteria Analysis (95%)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12am - 3am	EC(<2)	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW	EC(<2)
3am - 6am	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW
6am - 9am	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW
9am - 12pm	EC(<2)	EC(<2)	EC(<2)	CW	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)
12pm - 3pm	EC(>2)	EC(>2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
3pm - 6pm	EC(>2)	EC(>2)	EC(>2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
6pm - 9pm	EC(>2)	EC(>2)	EC(>2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
9pm - 12am	EC(>2)	EC(>2)	EC(<2)	CW	CW	EC(<2)	CW	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)
All Year 6am to 10pm	EC(>2)											

Table 6: Point 42 - Monthly and 3 Hourly Results

Time	Davenport Criteria Analysis (95%)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12am - 3am	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)
3am - 6am	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)
6am - 9am	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)
9am - 12pm	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(<2)
12pm - 3pm	EC(>2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
3pm - 6pm	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
6pm - 9pm	EC(>2)	EC(>2)	EC(>2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
9pm - 12am	EC(>2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)
All Year 6am to 10pm	EC(>2)											

Table 7: Point 48 - Monthly and 3 Hourly Results

Time	Davenport Criteria Analysis (95%)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12am - 3am	EC(<2)	EC(<2)	EC(<2)	CW	CW	EC(<2)	CW	EC(<2)	EC(<2)	CW	EC(<2)	EC(<2)
3am - 6am	EC(<2)	EC(<2)	CW	CW	CW	EC(<2)	CW	EC(<2)	EC(<2)	CW	CW	CW
6am - 9am	EC(<2)	EC(<2)	CW	CW	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)
9am - 12pm	EC(>2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
12pm - 3pm	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
3pm - 6pm	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
6pm - 9pm	EC(>2)	EC(>2)	EC(>2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
9pm - 12am	EC(>2)	EC(>2)	EC(>2)	EC(<2)	CW	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
All Year 6am to 10pm	EC(>2)											

Table 8: Point 49 - Monthly and 3 Hourly Results

Time	Davenport Criteria Analysis (95%)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12am - 3am	EC(<2)	EC(<2)	EC(<2)	CW	CW	CW	CW	CW	CW	CW	EC(<2)	EC(<2)
3am - 6am	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW
6am - 9am	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW	EC(<2)	CW
9am - 12pm	EC(>2)	EC(<2)	EC(<2)	CW	CW	CW	CW	CW	EC(<2)	EC(<2)	EC(<2)	EC(<2)
12pm - 3pm	EC(>2)	EC(>2)	EC(>2)	EC(<2)	EC(<2)	EC(<2)	CW	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
3pm - 6pm	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
6pm - 9pm	EC(>2)	EC(>2)	EC(>2)	EC(>2)	CW	CW	CW	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
9pm - 12am	EC(>2)	EC(>2)	EC(>2)	EC(<2)	CW	CW	CW	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
All Year 6am to 10pm	EC(>2)											

Table 9: Point 52 - Monthly and 3 Hourly Results

Time	Davenport Criteria Analysis (95%)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12am - 3am	EC(<2)	CW	CW	CW	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	CW	CW	EC(<2)
3am - 6am	CW	CW	CW	CW	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	CW	CW	CW
6am - 9am	CW	CW	CW	CW	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	CW	CW
9am - 12pm	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(<2)	EC(<2)
12pm - 3pm	EC(>2)	EC(>2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
3pm - 6pm	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
6pm - 9pm	EC(>2)	EC(>2)	EC(>2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
9pm - 12am	EC(>2)	EC(>2)	EC(<2)	CW	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)
All Year 6am to 10pm	EC(>2)											

Table 10: Point 55 - Monthly and 3 Hourly Results

Time	Davenport Criteria Analysis (95%)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12am - 3am	EC(<2)	CW	CW	SE	SE	SE	SE	SE	CW	CW	CW	EC(<2)
3am - 6am	CW	CW	SE	SE	SE	SE	SE	SE	SE	SE	CW	CW
6am - 9am	CW	CW	SE	SE	SE	SE	SE	SE	CW	CW	CW	CW
9am - 12pm	EC(<2)	EC(<2)	CW	CW	CW	CW	CW	CW	EC(<2)	EC(<2)	EC(<2)	EC(<2)
12pm - 3pm	EC(>2)	EC(>2)	EC(>2)	EC(<2)	CW	CW	CW	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
3pm - 6pm	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(<2)	CW	CW	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
6pm - 9pm	EC(>2)	EC(>2)	EC(>2)	EC(<2)	CW	CW	CW	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
9pm - 12am	EC(>2)	EC(>2)	EC(<2)	CW	SE	CW	SE	CW	EC(<2)	EC(<2)	EC(>2)	EC(>2)
All Year 6am to 10pm	EC(>2)											

Table 11: Point 56 - Monthly and 3 Hourly Results

Time	Davenport Criteria Analysis (95%)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12am - 3am	EC(<2)	EC(<2)	CW	SE	SE	SE	SE	SE	CW	CW	CW	EC(<2)
3am - 6am	CW	CW	SE	SE	SE	SE	SE	SE	SE	SE	CW	CW
6am - 9am	CW	CW	SE	SE	SE	SE	SE	SE	SE	CW	CW	CW
9am - 12pm	EC(>2)	EC(<2)	EC(<2)	SE	SE	SE	SE	SE	CW	EC(<2)	EC(<2)	EC(<2)
12pm - 3pm	EC(>2)	EC(>2)	EC(>2)	EC(<2)	CW	CW	CW	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
3pm - 6pm	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(<2)	CW	CW	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
6pm - 9pm	EC(>2)	EC(>2)	EC(>2)	EC(<2)	CW	CW	CW	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
9pm - 12am	EC(>2)	EC(>2)	EC(>2)	CW	SE	CW	SE	CW	EC(<2)	EC(<2)	EC(>2)	EC(>2)
All Year 6am to 10pm	EC(>2)											

Table 12: Point 59 - Monthly and 3 Hourly Results

Time	Davenport Criteria Analysis (95%)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12am - 3am	CW	CW	CW	SE	CW	CW	CW	CW	CW	SE	CW	CW
3am - 6am	SE	SE	SE	SE	CW	CW	CW	CW	CW	SE	SE	SE
6am - 9am	SE	SE	SE	SE	CW	CW	CW	CW	CW	CW	CW	SE
9am - 12pm	EC(<2)	CW	CW	CW	CW	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)
12pm - 3pm	EC(>2)	EC(>2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
3pm - 6pm	EC(>2)	EC(>2)	EC(>2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
6pm - 9pm	EC(>2)	EC(>2)	EC(>2)	EC(<2)	CW	CW	CW	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
9pm - 12am	EC(>2)	EC(>2)	EC(<2)	CW	CW	CW	CW	CW	EC(<2)	EC(<2)	EC(<2)	EC(>2)
All Year 6am to 10pm	EC(>2)											

Table 13: Point 60 - Monthly and 3 Hourly Results

Time	Davenport Criteria Analysis (95%)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12am - 3am	EC(<2)	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW	EC(<2)
3am - 6am	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW
6am - 9am	CW	CW	CW	CW	CW	CW	CW	CW	EC(<2)	CW	CW	CW
9am - 12pm	EC(<2)	EC(<2)	EC(<2)	CW	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)
12pm - 3pm	EC(>2)	EC(>2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
3pm - 6pm	EC(>2)	EC(>2)	EC(>2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
6pm - 9pm	EC(>2)	EC(>2)	EC(>2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
9pm - 12am	EC(>2)	EC(>2)	EC(<2)	CW	CW	EC(<2)	CW	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)
All Year 6am to 10pm	EC(>2)											

Table 14: Point 61 - Monthly and 3 Hourly Results

Time	Davenport Criteria Analysis (95%)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12am - 3am	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW
3am - 6am	SE	SE	CW	CW	CW	CW	CW	CW	CW	CW	CW	SE
6am - 9am	CW	CW	SE	CW	CW	CW	CW	CW	CW	CW	CW	CW
9am - 12pm	CW	CW	CW	CW	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	CW	CW
12pm - 3pm	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(<2)	EC(>2)	EC(>2)	EC(<2)	EC(<2)
3pm - 6pm	EC(>2)	EC(>2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
6pm - 9pm	EC(>2)	EC(<2)	EC(<2)	CW	CW	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)
9pm - 12am	EC(<2)	CW	CW	CW	CW	EC(<2)	CW	CW	CW	CW	CW	EC(<2)
All Year 6am to 10pm	EC(<2)											

Table 15: Point 62 - Monthly and 3 Hourly Results

Time	Davenport Criteria Analysis (95%)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12am - 3am	EC(<2)	CW	CW	SE	SE	SE	SE	CW	CW	CW	CW	CW
3am - 6am	CW	CW	SE	SE	SE	SE	SE	SE	SE	SE	CW	CW
6am - 9am	CW	CW	SE	SE	SE	SE	SE	SE	CW	CW	CW	CW
9am - 12pm	EC(<2)	CW	CW	CW	CW	CW	CW	CW	CW	EC(<2)	EC(<2)	EC(<2)
12pm - 3pm	EC(>2)	EC(>2)	EC(<2)	EC(<2)	CW	CW	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
3pm - 6pm	EC(>2)	EC(>2)	EC(>2)	EC(<2)	CW	CW	CW	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
6pm - 9pm	EC(>2)	EC(>2)	EC(>2)	EC(<2)	CW	CW	CW	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
9pm - 12am	EC(>2)	EC(>2)	EC(<2)	CW	SE	CW	SE	CW	EC(<2)	EC(<2)	EC(<2)	EC(>2)
All Year 6am to 10pm	EC(>2)											

Table 16: Point 63 - Monthly and 3 Hourly Results

Time	Davenport Criteria Analysis (95%)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12am - 3am	CW	CW	CW	CW	CW	EC(<2)	EC(<2)	EC(<2)	CW	CW	CW	CW
3am - 6am	SE	CW	CW	CW	CW	EC(<2)	EC(<2)	CW	CW	CW	CW	CW
6am - 9am	CW	CW	CW	CW	CW	EC(<2)	EC(<2)	CW	CW	CW	CW	CW
9am - 12pm	CW	CW	CW	CW	EC(<2)	EC(<2)	EC(>2)	EC(<2)	EC(<2)	EC(<2)	CW	CW
12pm - 3pm	CW	CW	CW	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(<2)	CW
3pm - 6pm	EC(<2)	CW	CW	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(<2)	EC(<2)	EC(<2)
6pm - 9pm	CW	CW	CW	CW	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	CW	EC(<2)
9pm - 12am	CW	CW	CW	CW	CW	EC(<2)	EC(<2)	EC(<2)	CW	CW	CW	CW
All Year 6am to 10pm	EC(<2)											

Table 17: Point 64 - Monthly and 3 Hourly Results

Time	Davenport Criteria Analysis (95%)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12am - 3am	EC(<2)	CW	CW	CW	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	CW	CW	CW
3am - 6am	CW	CW	CW	CW	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	CW	CW	CW
6am - 9am	CW	CW	CW	CW	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	CW	CW
9am - 12pm	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(<2)	EC(<2)
12pm - 3pm	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
3pm - 6pm	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
6pm - 9pm	EC(>2)	EC(>2)	EC(>2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
9pm - 12am	EC(>2)	EC(<2)	EC(<2)	CW	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)
All Year 6am to 10pm	EC(>2)											

Table 18: Point 66 - Monthly and 3 Hourly Results

Time	Davenport Criteria Analysis (95%)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12am - 3am	EC(<2)	EC(<2)	CW	SE	SE	CW	CW	CW	CW	CW	CW	EC(<2)
3am - 6am	CW	CW	CW	SE	SE	CW	CW	CW	CW	CW	CW	CW
6am - 9am	CW	CW	SE	SE	CW	CW	CW	CW	CW	CW	CW	CW
9am - 12pm	EC(<2)	EC(<2)	EC(<2)	CW	CW	CW	CW	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)
12pm - 3pm	EC(>2)	EC(>2)	EC(>2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
3pm - 6pm	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
6pm - 9pm	EC(>2)	EC(>2)	EC(>2)	EC(<2)	CW	CW	CW	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
9pm - 12am	EC(>2)	EC(>2)	EC(>2)	CW	CW	CW	CW	EC(<2)	EC(<2)	EC(<2)	EC(>2)	EC(>2)
All Year 6am to 10pm	EC(>2)											

Table 19: Point 69 - Monthly and 3 Hourly Results

Time	Davenport Criteria Analysis (95%)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12am - 3am	CW	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	CW
3am - 6am	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE
6am - 9am	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE
9am - 12pm	CW	CW	SE	SE	SE	SE	SE	SE	CW	CW	CW	CW
12pm - 3pm	EC(<2)	EC(<2)	CW	CW	CW	CW	CW	CW	EC(<2)	EC(<2)	EC(<2)	EC(<2)
3pm - 6pm	EC(>2)	EC(>2)	EC(<2)	CW	CW	CW	CW	CW	EC(<2)	EC(>2)	EC(>2)	EC(>2)
6pm - 9pm	EC(>2)	EC(>2)	EC(<2)	CW	SE	SE	SE	CW	EC(<2)	EC(<2)	EC(>2)	EC(>2)
9pm - 12am	EC(<2)	EC(<2)	CW	SE	SE	SE	SE	SE	CW	CW	EC(<2)	EC(<2)
All Year 6am to 10pm	EC(<2)											

Table 20: Point 71 - Monthly and 3 Hourly Results

Time	Davenport Criteria Analysis (95%)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12am - 3am	CW	CW	CW	SE	CW	CW	CW	CW	CW	CW	CW	CW
3am - 6am	CW	CW	SE	SE	SE	CW	SE	SE	CW	CW	SE	SE
6am - 9am	CW	CW	SE	SE	CW	CW	CW	CW	CW	CW	CW	CW
9am - 12pm	EC(<2)	CW	CW	CW	CW	CW	CW	CW	CW	CW	CW	EC(<2)
12pm - 3pm	EC(>2)	EC(>2)	EC(<2)	EC(<2)	CW	CW	CW	EC(<2)	EC(<2)	EC(>2)	EC(>2)	EC(>2)
3pm - 6pm	EC(>2)	EC(>2)	EC(>2)	EC(<2)	EC(<2)	CW	CW	EC(<2)	EC(>2)	EC(>2)	EC(>2)	EC(>2)
6pm - 9pm	EC(>2)	EC(>2)	EC(>2)	CW	CW	CW	CW	CW	EC(<2)	EC(>2)	EC(>2)	EC(>2)
9pm - 12am	EC(<2)	EC(<2)	CW	CW	CW	CW	CW	CW	CW	CW	EC(<2)	EC(<2)
All Year 6am to 10pm	EC(<2)											