PEDESTRIAN WIND ENVIRONMENT STATEMENT

IGLU, 60-78 REGENT STREET, REDFERN

WC246-01F02(REV3)- WS REPORT

5 NOVEMBER 2014

Prepared for:

Iglu Pty Limited

Level 21, Deutsche Bank Place

126 Phillip Street

Sydney NSW 2000

Attention: Mr Timothy Farrell

WINDTECH Consultants Pty Ltd ABN 72 050 574 037
Head Office: 19 Willis Street Wolli Creek NSW 2205 Australia
P +61 2 9567 0722 **E** reception@windtech.com.au **W** www.windtech.com.au
Sydney | Singapore | New York | Shanghai | London | Mumbai | Melbourne | Abu Dhabi

DOCUMENT CONTROL

Date	Revision History	Non-Issued Revision	Issued Revision	Prepared By (initials)	Instructed By (initials)	Reviewed & Authorised by (initials)
30/10/2014	Initial.	-	0	JC	AB	KP
05/11/2014	Update for comments	-	1	JC	TR	TR
05/11/2014	Update for comments	-	2	JC	TR	TR
05/11/2014	Update for comments	-	3	JC	TR	TR

EXECUTIVE SUMMARY

This report is in relation to the proposed development located at 60-78 Regent Street, Redfern, and presents an analysis on the likely impact of the proposed design on the local wind environment to the critical outdoor areas within and around the subject development. The effect of wind activity is examined for the three predominant wind directions for the Sydney region; north-easterly, southerly and westerly winds. The analysis of the wind effects relating to the proposal was carried out in the context of the local wind climate, building morphology and land topography. The assessment presented in this report for the Development Application Phase will be verified through wind tunnel testing to be undertaken as part of the Detailed Design Phase.

The conclusions of this report are drawn from our extensive experience in this field (including two wind environment assessments on 7-9 Gibbons Street Redfern and 157 Redfern Street Redfern) and are based on an examination of the architectural drawings which have been prepared by the project architect Bates Smart Architects, dated 27th October 2014. No wind tunnel tests have been undertaken for the subject development, and hence this report addresses only the general wind effects and any localised effects that are identifiable by visual inspection. Any recommendations in this report are made only in-principle and are based on our extensive experience in the study of wind environment effects.

The results of this assessment indicate that adequate wind conditions are expected to be achieved for majority outdoor trafficable areas within and around the subject development site with the inclusion of the proposed development. The site benefits from the shielding provided by the many surrounding buildings, while the northern entrance, accessible from Redfern Street, benefits from the effective use of wind mitigating devices such as the recessed building entrance.

There are areas within and around the site that may potentially be exposed to adverse wind conditions. To ensure tolerable wind conditions are achieved for all trafficable outdoor areas within and around the site, treatments in the form of inclusion of canopy and optional wind screens have been recommended for the Podium Level 1 to be incorporated into the final design. The two directly opposite pedestrian entrances on Regent Street and William Lane respectively may cause a pressure driven wind entry effect if these gates are opened simultaneously. Wind conditions in this part of the laneway may be acceptable for pedestrian activity. It is recommended to join the proposed awnings along Regent Street and the inclusion of full height impermeable screen connecting to the slab above. These recommendations need to be verified though wind tunnel testing in the Detailed Design Phase.

The inclusion of the proposed landscape within and around terraces areas is expected to further enhance the wind conditions, therefore, should be retained in the final design of the development. Note that the proposed trees should be capable of growing to a high of 3-4 m with 4m canopy, and are of an evergreen species to ensure their effectiveness in the wind mitigation throughout the entire year.

1 DESCRIPTION OF THE PROPOSED DEVELOPMENT AND SURROUNDS

The subject development site is located at 60-78 Regent Street, Redfern. The site is bounded by the neighbouring buildings to the west and south, Regent Street to the east and William Lane to the west. Further to the north is Redfern Street with GCA twin towers and Redfern Railway Station towards the north-west. Further to the south is Marian Street and low to medium rise buildings dominating the remaining boundaries. A survey of the local land topography indicates a general rise towards the northeast of the site. An aerial image of the site and the surroundings is shown in Figure 1.

The proposal is for a mixed-use building with an overall height of 18 storeys above ground. The total height of the proposed building is approximately 61m above the ground. Retail tenancies are proposed on the Ground Floor, and student accommodations are proposed for all other levels. Communal Courtyard is located at the south western aspect on Level 1 and the communal terrace is around the northern aspect on Level 1. There is no private balconies proposed in the development.

The critical trafficable outdoor areas associated with the proposed development, which are the focus for pedestrian wind effects in this assessment, are detailed as follows:

- The pedestrian footpath along the Regent Street frontage of the site.
- The pedestrian entrances at the eastern, northern and western aspect of the development on Regent Street, Redfern Street and William Lane respectively.
- The communal terrace area located around the northern aspect on the Level 1 Podium.
- The communal courtyard area located at the southern aspect on the Level 1 Podium.

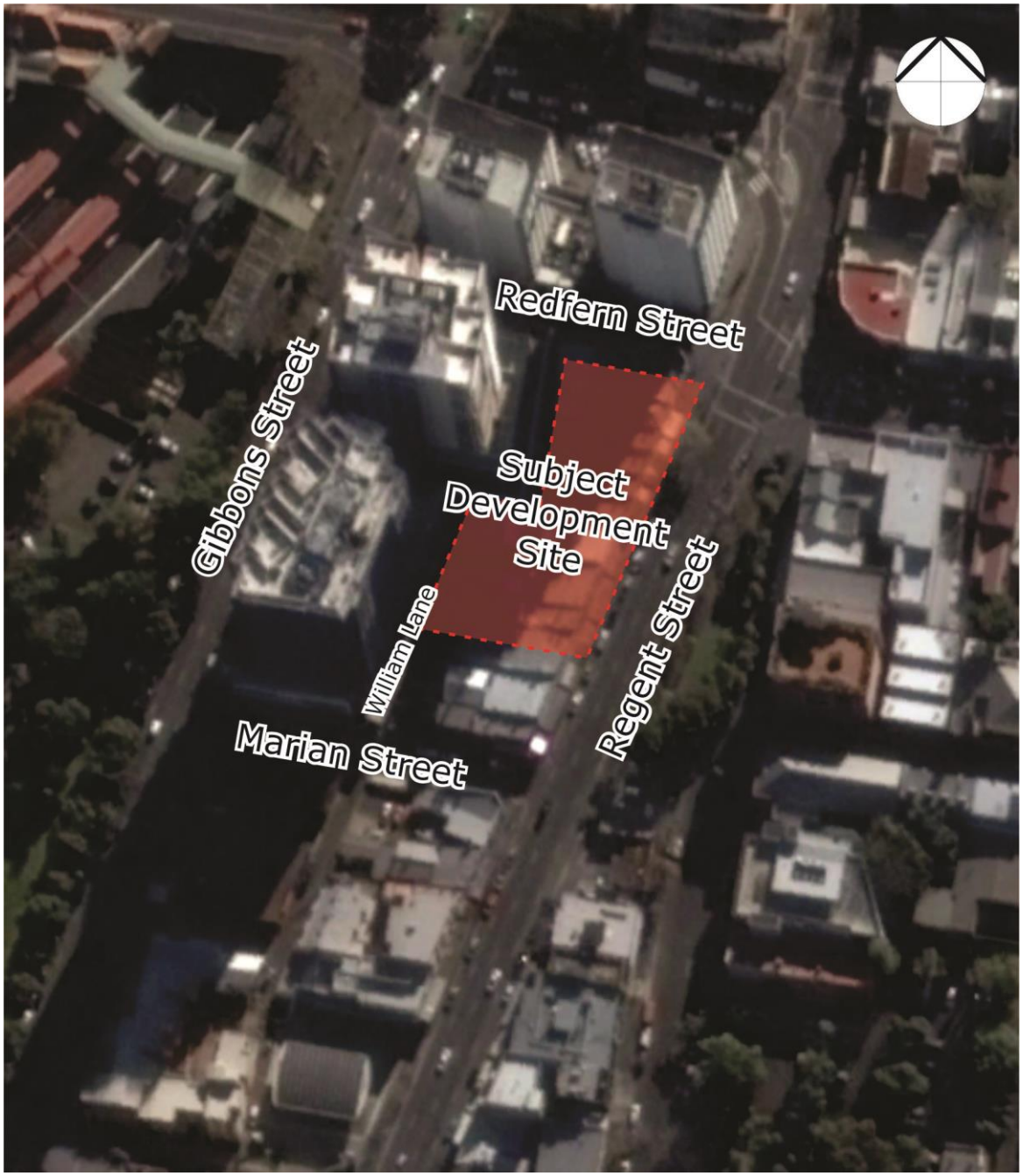

Figure 1: Aerial Plan Image of the Site Location

2 WIND CLIMATE OF THE SYDNEY REGION

The Sydney region is governed by three principle wind directions, and these can potentially affect the subject development. These winds prevail from the north-east, south and west. A summary of the principal time of occurrence of these winds throughout the year is presented in Table 1 below. This summary is based on a detailed analysis undertaken by Windtech Consultants of recorded directional wind speeds obtained at the meteorological station located at Kingsford Smith Airport by the Bureau of Meteorology (recorded from 1939 to 2008). From this analysis, a directional plot of the annual and weekly recurrence winds for the Sydney region is also determined, as shown in Figure 2. The frequency of occurrence of these winds is also shown in Figure 2.

As shown in Figure 2, the southerly winds are by far the most frequent wind 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 since they occur during the winter and hence can be a cause for discomfort for outdoor areas. North-easterly winds occur most frequently 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.

Table 1: Principle Time of Occurrence of Winds for Sydney

Month	Wind Direction		
	North-Easterly	Southerly	Westerly
January	X	X	
February	X	X	
March	X	X	
April		X	X
May			X
June			X
July			X
August			X
September		X	X
October	X	X	
November	X	X	
December	X	X	

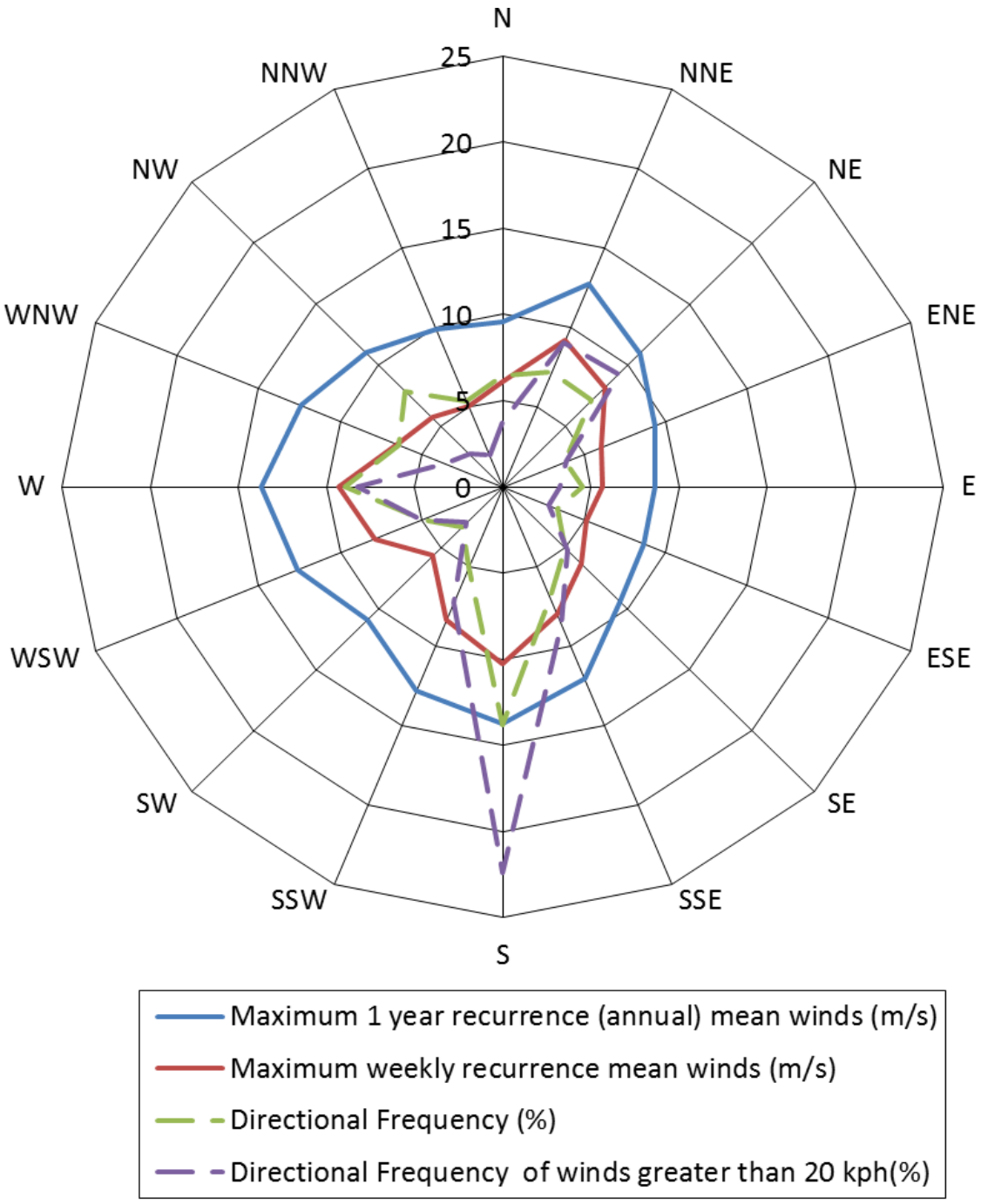

Figure 2: Annual and Weekly Recurrence Mean Wind Speeds, and Frequencies of Occurrence, for the Sydney Region (based on 10-minute mean observations from Kingsford Smith Airport from 1939 to 2008, corrected to open terrain at 10m)

3 WIND EFFECTS ON PEOPLE

The acceptability of wind in any area is dependent upon its use. For example, people walking or window-shopping will tolerate higher wind speeds than those seated at an outdoor restaurant. Various other researchers, such as Davenport, Lawson, Melbourne, Penwarden, etc, have published criteria for pedestrian comfort for pedestrians in outdoor spaces for various types of activities. Some Councils and Local Government Authorities have also adopted elements of some of these into their planning control requirements in Australia. The following table is an example, which was developed by Penwarden in 1975, and describes the effects of various wind intensities on people. Note that the applicability column relates to the indicated wind conditions occurring frequently (exceeded approximately once per week on average). Higher ranges of wind speeds can be tolerated for rarer events.

Table 2: Summary of Wind Effects on People (Penwarden, 1975)

Type of Winds	Gust Speed (m/s)	Effects	Applicability
Calm, light air	0 - 1.5	Calm, no noticeable wind.	Generally acceptable for Stationary, long exposure activities such as in outdoor restaurants, landscaped gardens and open air theatres.
Light breeze	1.6 - 3.3	Wind felt on face.	
Gentle breeze	3.4 - 5.4	Hair is disturbed, Clothing flaps.	
Moderate breeze	5.5 - 7.9	Raises dust, dry soil and loose paper. Hair disarranged.	Generally acceptable for walking & stationary, short exposure activities such as window shopping, standing or sitting in plazas.
Fresh breeze	8.0 - 10.7	Force of wind felt on body.	Acceptable as a main pedestrian thoroughfare
Strong breeze	10.8 - 13.8	Umbrellas used with difficulty, Hair blown straight, Difficult to walk steadily, Wind noise on ears unpleasant.	Acceptable for areas where there is little pedestrian activity or for fast walking.
Near gale	13.9 - 17.1	Inconvenience felt when walking.	
Gale	17.2 -20.7	Generally impedes progress, Great difficulty with balance.	Unacceptable as a public accessway.
Strong gale	20.8 - 24.4	People blown over by gusts.	Completely unacceptable.

It should be noted that wind speeds can only be accurately quantified with a wind tunnel study. This assessment addresses only the general wind effects and any localised effects that are identifiable by visual inspection, and the acceptability of the conditions for outdoor areas are determined based on their intended use (rather than referencing specific wind speeds). Any recommendations in this report are made only in-principle and are based on our extensive experience in the study of wind environment effects.

4 RESULTS AND DISCUSSION

The expected wind conditions are discussed in the following sub-sections of this report for the various outdoor areas within and around the subject development for each of the three predominant wind directions for the Sydney region. The interaction between the wind and the building morphology in the area was considered, and important features taken into account include the distances between the proposed building form, their overall heights and bulk, as well as the landform. Note that only the potentially critical wind effects are discussed in this report.

4.1 Ground Level Areas around the Site

Wind conditions for the pedestrian footpath and entrance along Regent Street is expected to be acceptable for pedestrian activity with the addition of the proposed development due to the shielding provided from the neighbouring low buildings to the east and south of the subject development and the effective use of wind mitigating devices such as the proposed awnings along Regent Street.

Wind conditions for the pedestrian entrance accessible from Redfern Street are expected to be acceptable for pedestrians due to the recessed building entrance away from the street.

William Lane is closed at the north end with the 19 storeys Redfern RSL building at the north end of the lane. Wind conditions are expected to remain suitable for pedestrian activity within the inclusion of the proposed development as the pedestrian entrance is very well shielded by adjacent buildings.

The two directly opposite pedestrian entrances on Regent Street and William Lane respectively may cause a pressure driven wind entry effect if these gates are opened simultaneously. Wind conditions in this part of the laneway may be acceptable for pedestrian activity. It is recommended to join the proposed awnings along Regent Street and the inclusion of full height impermeable screen connecting to the slab above.

These recommendations need to be verified though wind tunnel testing in the Detailed Design Phase and as shown in Figure 3.

4.2 Communal Terrace and Courtyard on the Level 1 Podium

The Level 1 Podium Courtyard at the southern aspect of the development is potentially exposed to the direct southerly winds down-washing and side-streaming around the corner of the tower section of the development to the courtyard below. With the proposed 3.5m high brick screen along the southern edge of the Level 1 Podium, it is recommended to include a 3m deep awning along the northern edge of the courtyard to mitigate any potential downwashed winds from the tower above. The recommended treatment is shown in Figure 4.

Furthermore, north-easterly and westerly winds may impact occupant comfort around the outdoor terrace at the northern part of Level 1 Podium due to side-stream effects and the lack

of shielding from the neighbouring buildings to the south and east of the subject development. In addition, the same winds may potentially generate uncomfortable turbulence around the proposed BBQ area. With the proposed 3.5m high brick screen along the northern edge of the Level 1 Podium adjoining the neighbouring property wall and 5m existing brick façade along the eastern aspect, it is recommended as an option to include two screens of full height and 3m high respectively at the middle section of the northern aspect on the Level 1 Podium. These recommendation need to be verified though wind tunnel testing in the Detailed Design Phase.

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Recommended extension of awnings.
The need of this treatment is to be verified through wind tunnel testing.

Recommended inclusion of full height impermeable screen from the awning to meet the slab above. The need of this treatment is to be verified through wind tunnel testing.

Figure 3: Recommended Treatments – Ground Floor

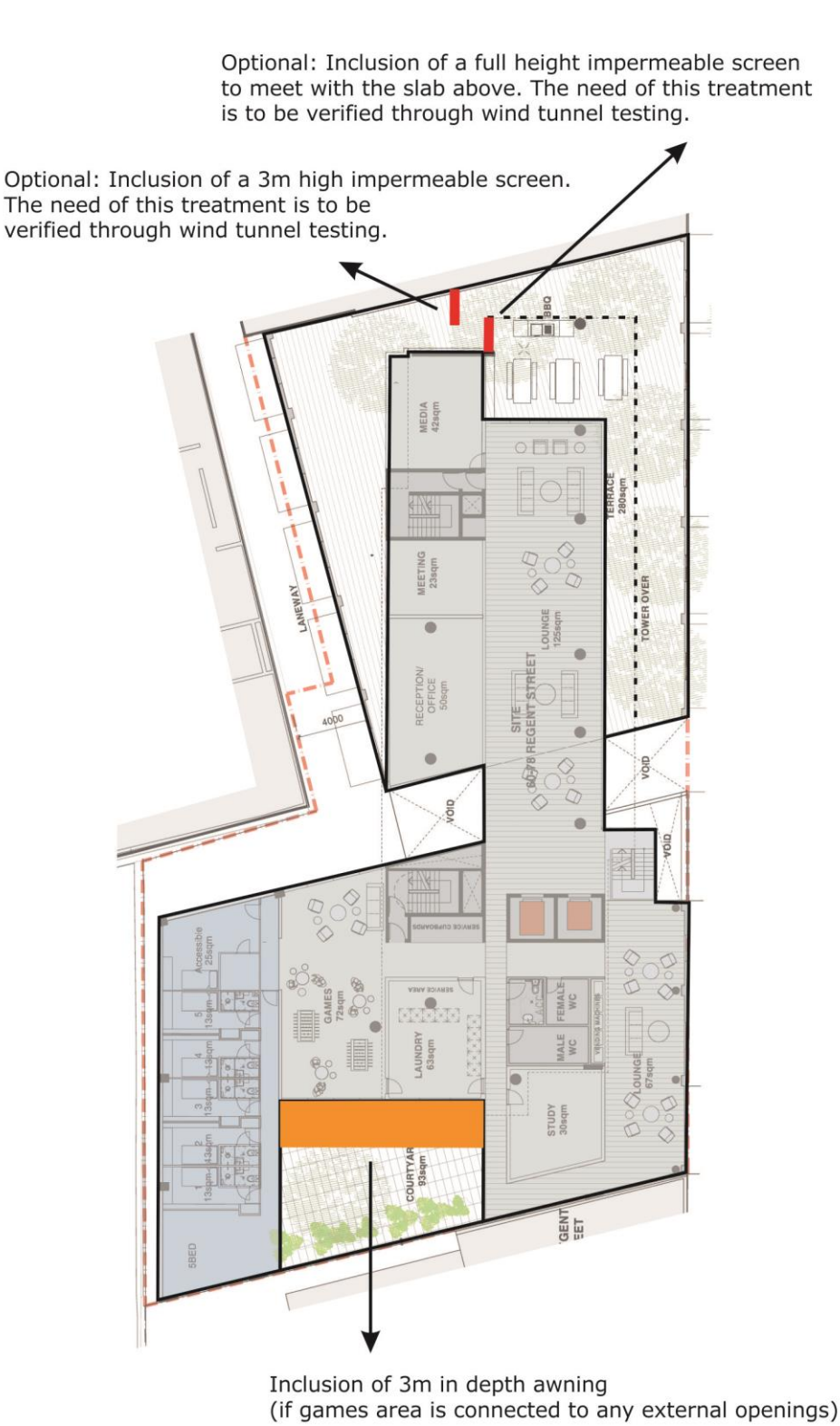

Figure 4: Recommended Treatments – Podium Level 1

5 CONCLUSION

An analysis of the wind environment impact with respect to the three principal wind directions for the Sydney region has been completed for the proposed development located at 60-78 Regent Street, Redfern. The conclusions of this report are drawn from our extensive experience in this field (including two wind environment assessments on 7-9 Gibbons Street Redfern and 157 Redfern Street Redfern) and are based on an examination of the architectural drawings which have been prepared by the project architect Bates Smart Architects, dated 27th October 2014. No wind tunnel tests have been undertaken for the subject development, and hence this report addresses only the general wind effects and any localised effects that are identifiable by visual inspection. Any recommendations in this report are made only in-principle and are based on our extensive experience in the study of wind environment effects.

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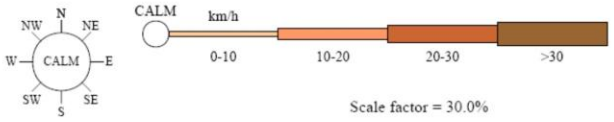
The assessment presented in this report for the Development Application Phase will be verified through wind tunnel testing to be undertaken as part of the Detailed Design Phase.

6 APPENDIX – SYDNEY WIND ROSES

WIND FREQUENCY ANALYSIS (in km/h)

SYDNEY AIRPORT AMO STATION NUMBER 066037

Latitude: -33.94 ° Longitude: 151.17 °



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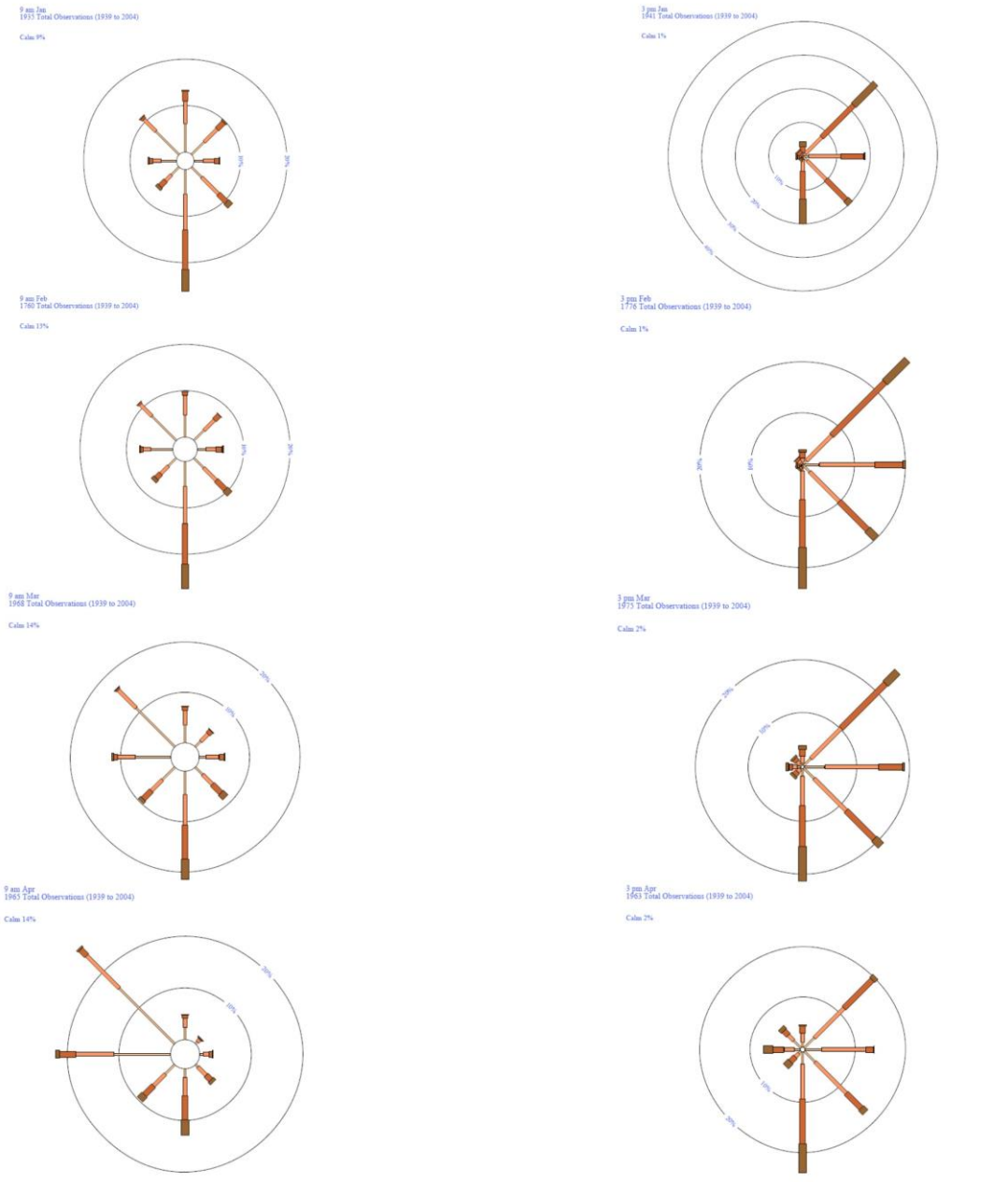

Wind directions are divided into eight compass directions. Calm has no direction.
An asterisk (*) indicates that calm is less than 1% .
An observed wind speed which falls precisely on the boundary between two divisions (eg 10km/h) will be included in the lower range (eg 1-10 km/h). Only quality controlled data have been used.

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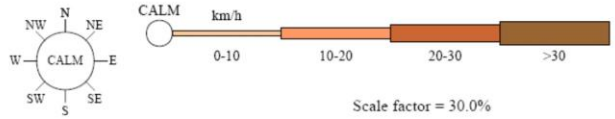

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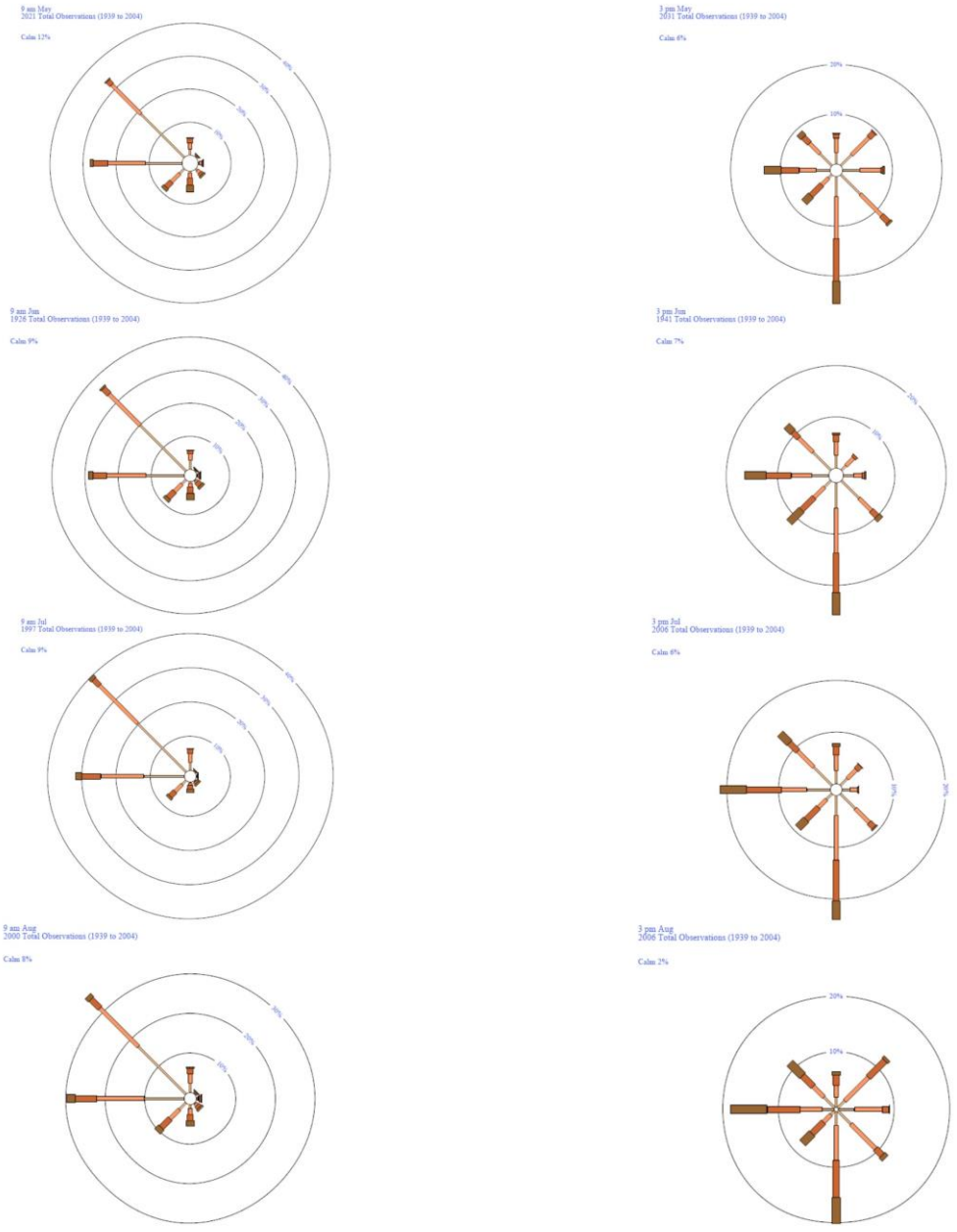

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Australian Government
Bureau of Meteorology

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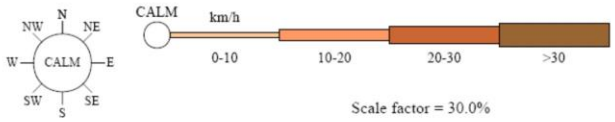

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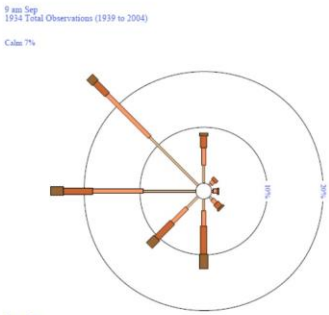

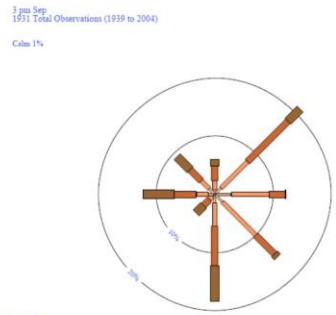

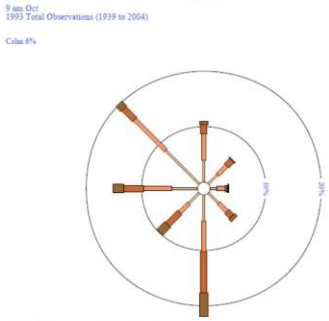

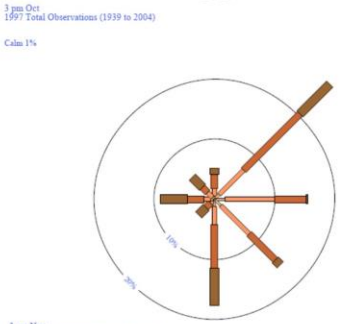

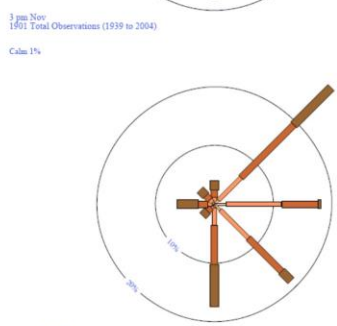

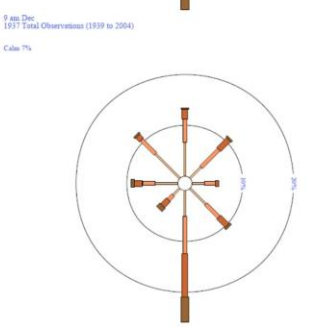

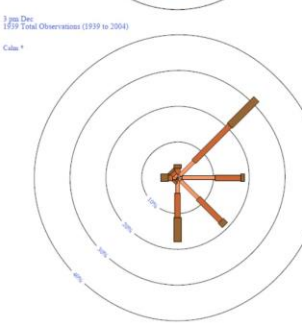

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