

# Pedestrian Wind Environment Statement

for the proposed development at corner of  
Wentworth Street and South Steyne, Manly

May 05, 2011

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## Document Control

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0	19/04/2011	Initial	NT	TR
1	5/5/2011	Updated Drawings and Topographic	NT	TR

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## 1.0 Introduction

This report is in relation to the a proposed mixed use residential development located at the corner of Wentworth Street and South Steyne, Manly. It presents an opinion on the likely impact of the proposed design on the local wind environment of the critical outdoor areas within and around the development.

The effect of wind activity within and around the proposed development 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 conclusions of this report are drawn from our extensive experience in this field and are based on an examination of the architectural drawings which have been prepared by the project architect Architectus, received May 03 2011. No wind tunnel tests have been undertaken for the subject development. As such, 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.

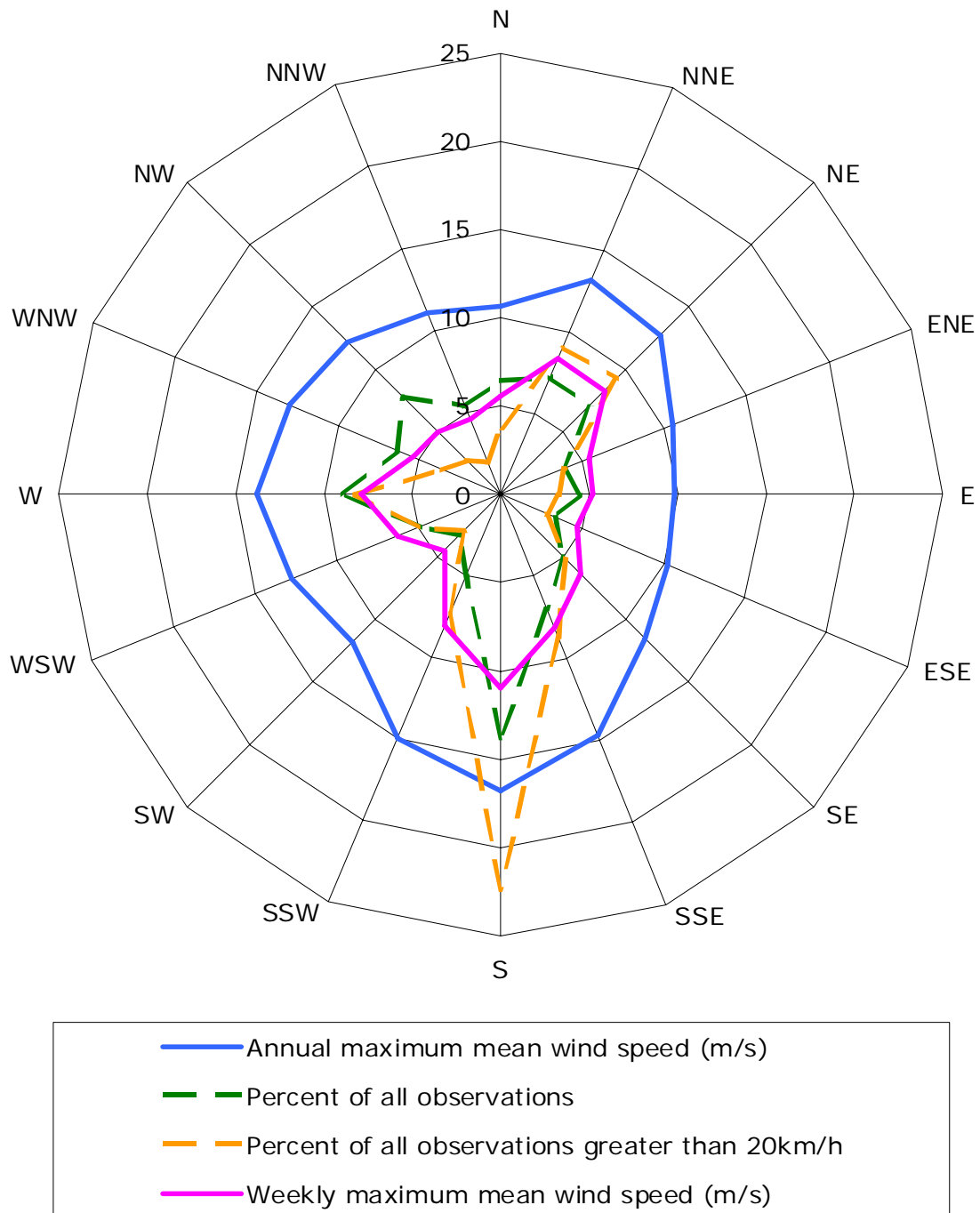
## 2.0 Regional Wind Climate for Sydney

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 an analysis of wind rose data obtained by the Bureau of Meteorology from Kingsford Smith Airport between 1939 and 2000. The wind roses are attached in the appendix of this report.

**Table 1: Principal Time of Occurrence of Winds for Sydney**

Month(s)	Prevailing Wind Direction		
	North-Easterly	Southerly	Westerly
January through to March	X	X	
April		X	X
May through to August			X
September		X	X
October through to December	X	X	

A directional plot of the annual and weekly recurrence winds for the Sydney region is shown in Figure 1 below. The frequency of occurrence of these winds is also shown in Figure 1. This plot has been produced based on an analysis of recorded wind speed data obtained from Kingsford Smith Airport from 1939 to 2008.



**Figure 1: 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)**

### 3.0 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.

The following table, developed by Penwarden (1975), 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 (after 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.

## 4.0 Description of the Site and Surrounds

The proposed development site is located in Manly, Sydney. The site is bound by South Styne to the East, Wentworth Street to the North and Victoria Parade to the South. There are three medium-rise buildings located on this site which will be demolished and two buildings that will be retained.

To the east of the site is Manly Beach. Immediately to the North, West and South of the site are several existing residential and commercial buildings between 2 and 8 levels in heights. Further away from the site there are existing residential and commercial buildings between 2 and 16 levels in heights.

The site is located on causeway between North Head and the centre of Manly and to the West and South-West is Sydney Harbour. An aerial image of the site is shown in Figure 2.

The impact of the North Head peninsular on wind conditions at the site has been considered. Due to the distance between the crest of the North Head peninsular and the site, it is expected that the southerly winds deflected by North Head will reattach nearby to the development site. Based on this assessment, no reduction in local wind speed as a result of North Head has been considered.



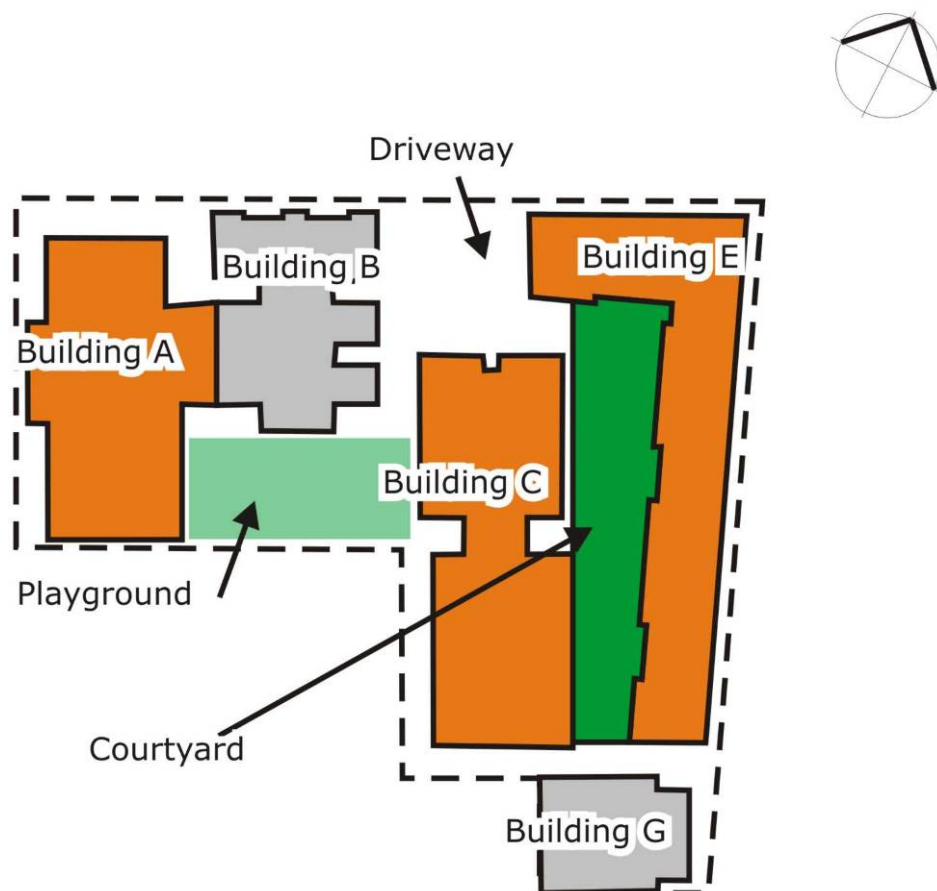
**Figure 2: Aerial Image of the Site Location**

## 5.0 Description of the Proposed Development

The proposed development consists of six buildings located within the development site. The residential and hotel buildings are located on the eastern side of the site and the Royal Far West buildings on the west side of the site. The proposed development site also contains retail on the ground level of the Eastern buildings. The various buildings of the development are summarized as follows:

- Building A – Proposed 8 Floor Building, Royal Far West
- Building B – Heritage 3 Floor Building, Royal Far West
- Building C – Proposed 9 Floor Building, Hotel
- Building E – Proposed 5 Floor Building, Residential
- Building B – Heritage 2 Floor Building, Residential

There are pedestrian footpaths around the northern and eastern edge of the site. There is a children's playground on the ground level and a courtyard on the podium. Private balconies are proposed for the residential buildings. The roofs of the buildings have been assumed not to be trafficable.



**Figure 3: Site Plan**



## **6.0 Results of the Analysis**

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. Important features taken into account include the distances between the proposed building forms, their overall heights and bulk, as well as the landform. Only the potentially critical wind effects are discussed in this report.

### **6.1 North-Easterly Winds**

North-easterly winds occur most frequently during the warmer months of the year for the Sydney region. They are typically not as strong as the southerly winds, and are usually welcomed within outdoor areas since they typically occur when it can be quite warm during the summer.

#### ***Areas on Ground Level within and around the site***

The pedestrian footpath along South Steyne and Wentworth Street are exposed to direct North-Easterly winds and winds deflected by the residential building. With the addition of an awning along the Northern and Eastern aspects of the residential development it is expected that wind conditions along these footpaths will be suitable for their intended use.

North-Easterly winds will be funneled into the alleyway between Buildings E and G. With the addition of strategic planting similar to that shown in Figure 4 it is expected that wind conditions in this alleyway will be suitable for its intended use. It is expected that the children's playground will be shield from the North-Easterly winds by the proposed buildings.

#### ***Trafficable Outdoor Areas within the site***

The residential courtyard may be subject to adverse North-Easterly winds deflected by the hotel building. However, with the addition of a screen on the Southern edge of the courtyard and an awning linking the hotel to the courtyard it is expected that wind conditions will be suitable for their intended use. The awning is not required if the courtyard meets the hotel building.

#### ***Balcony Levels***

Balconies on the northern and eastern aspect of Building E will be subject to North-Easterly winds. It is expected that with the retention of the blade walls between the private balconies and the addition of impermeable balustrades in the final design that the wind conditions will be acceptable for its intended use. Wind conditions on the balconies of Building G are expected to be similar to existing. However, they are currently expected not to be appropriate for frequent use.

## **6.2 Southerly Winds**

As shown in Figure 1 of this report, the southerly winds are by far the most frequent wind for the Sydney region, and are also the strongest for the shorter recurrence periods.

### ***Areas on Ground Level within and around the site***

The pedestrian footpath along South Steyne and Wentworth Street are partially shielded from Southerly winds by the existing and proposed buildings and wind conditions are expected to be similar to the existing conditions.

Adverse wind conditions may around the southern corners of Buildings A and C generated by the Southerly winds. With the addition of densely foliating trees nearby to these corners, as shown in Figure 4, it is expected that wind conditions will be suitable for their intended use.

### ***Trafficable Outdoor Areas within the site***

The residential courtyard may be subject to adverse Southerly winds funneled by the hotel building. However, with the addition of a screen on the Southern edge of the courtyard it is expected that wind conditions will be suitable for their intended use. Wind conditions in the Courtyard can be further enhanced with the inclusion of tree planting in the Courtyard.

### ***Balcony Levels***

Balconies on the Southern and Western aspect of Building E will be subject to Southerly winds. It is expected that with the retention of the blade walls between the private balconies and the addition of impermeable balustrades in the final design that the wind conditions will be acceptable for its intended use. Wind conditions on the balconies of Building G are expected to be similar to existing. However, they are currently expected not to be appropriate for frequent use.

## **6.3 Westerly Winds**

Westerly winds occur most frequently during the winter season for the Sydney region. 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.

### ***Areas on Ground Level within and around the site***

The pedestrian footpath along South Steyne and Wentworth Street are partially shielded from Westerly winds by the existing and proposed buildings and wind conditions are expected to be similar to the existing conditions.

Adverse wind conditions may around the northern corners of Buildings A and C generated by the Southerly winds. With the addition of densely foliating trees nearby to these corners, as shown in Figure 4, it is expected that wind conditions will be suitable for their intended use.

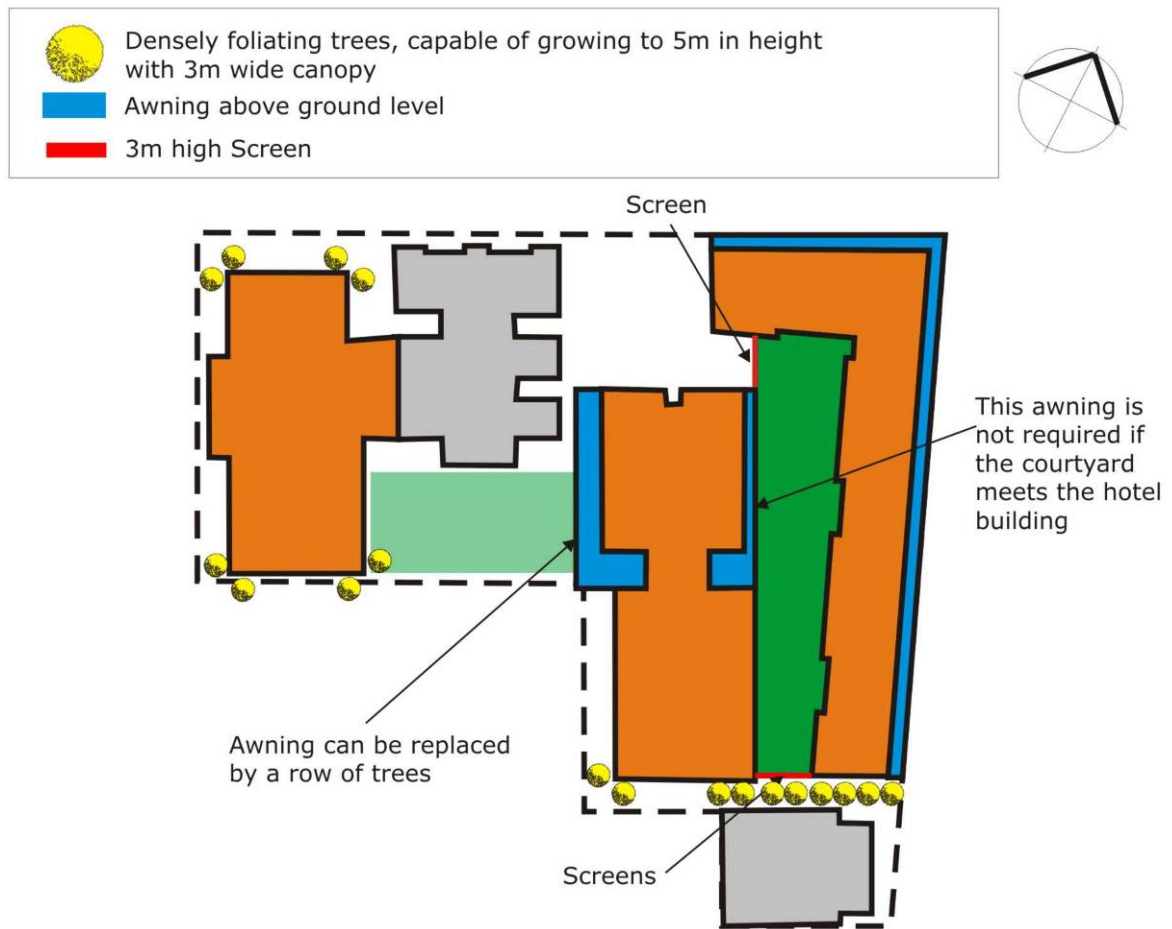
The children's playground and the walkway between Buildings B and C may be subject to westerly winds downwashed from Building C. With the addition of an awning along the Western aspects of the Hotel Building it is expected that wind conditions in these areas will be suitable for their intended use. Alternatively, a row of densely foliating trees may be used in place on the awning.

### ***Trafficable Outdoor Areas within the site***

The residential courtyard may be subject to adverse Westerly winds funneled between Building C and E. However, with the addition of a screen on the North-Western edge of the courtyard it is expected that wind conditions will be suitable for their intended use. Wind conditions in the courtyard can be further enhanced with the inclusion of tree planting in the Courtyard.

### ***Balcony Levels***

Balconies on the Northern and Western aspect of Building E will be subject to Southerly winds. It is expected that with the retention of the blade walls between the private balconies and the addition of impermeable balustrades in the final design that the wind conditions will be acceptable for its intended use.



**Figure 4: Proposed Ground and Podium Level Treatments**

## 7.0 Conclusions

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 Wentworth Street and South Steyne, Manly. The conclusions of this report are drawn from our extensive experience in this field and are based on an examination of the architectural drawings which have been prepared by the project architect Architectus, received May 03 2011. No wind tunnel tests have been undertaken for the subject development. As such, 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 study indicate that adequate wind conditions can be expected for all outdoor trafficable areas within and around the proposed development with the inclusion of the following:

- Strategic planting on the ground level on the site.
- Awnings along the North and Eastern edges of residential Building E, above Wentworth Street and South Steyne.
- Awnings along the Eastern and Western faces of the hotel Building C,
- 3m high screens along the Western and Southern edge of the courtyard
- Retain all wall blade walls on the private balconies.
- Impermeable balustrades on all private balconies.

Note that the awning around the eastern edge of the Hotel Building can be removed if the courtyard meets the hotel building and the awning around the western edge can be replaced by a row of trees.

Wind conditions in the court yard area can be further enhanced with the addition of planting.

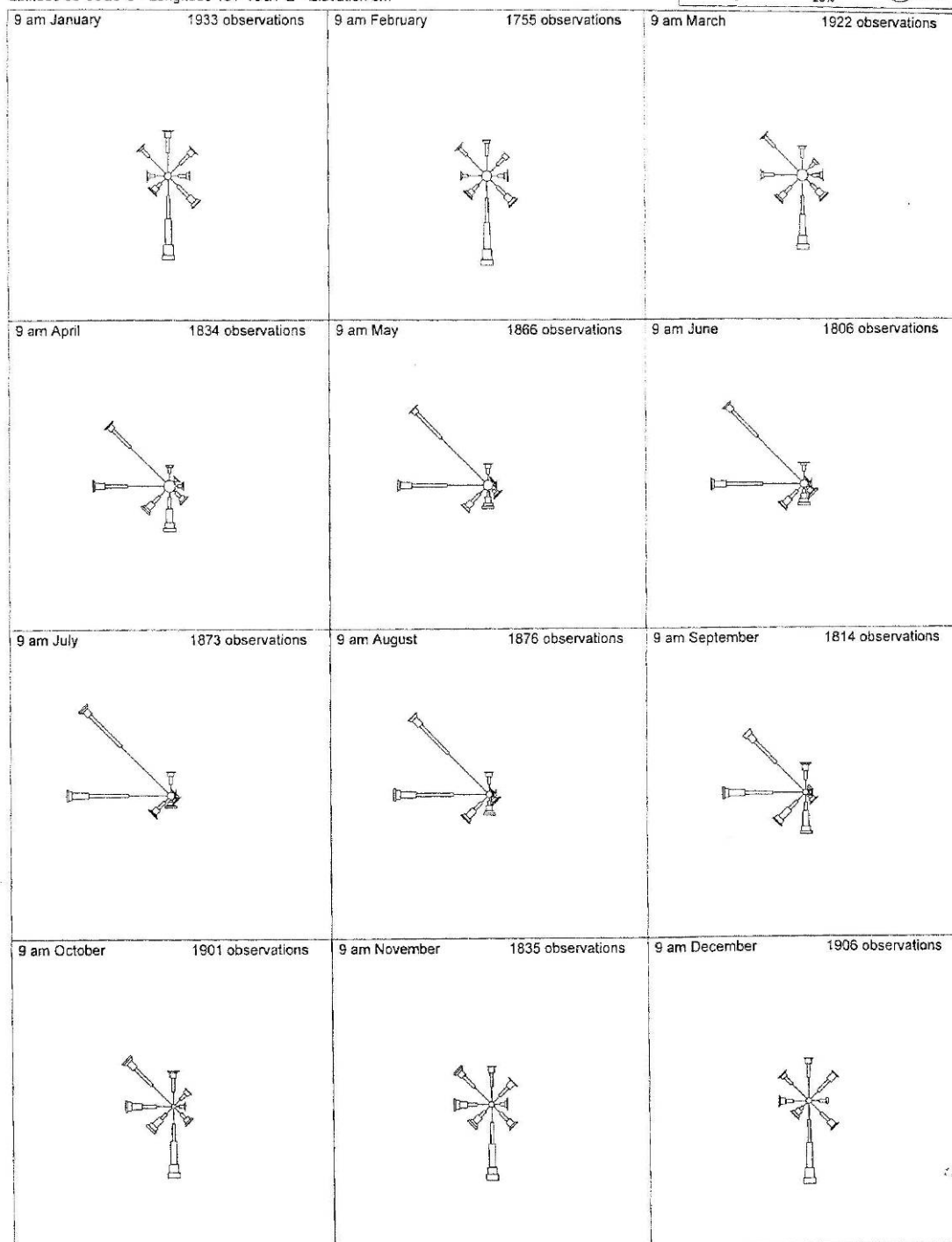
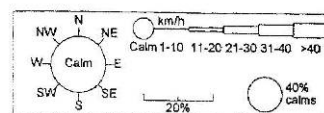
With the inclusion of the abovementioned recommendations, adequate wind conditions can be expected for all outdoor trafficable areas of the subject development. Note that for trees to be effective in wind mitigation they should be of a densely foliating variety.

# **Appendix**

## Wind Roses for the Sydney Region

# **Wind Roses using available data between 1939 and 2000 for SYDNEY AIRPORT AMO**

Site Number 066037 • Locality: SYDNEY AIRPORT • Opened Jan 1929 • Still Open  
Latitude 33°56'28"S • Longitude 151°10'21"E • Elevation 6m

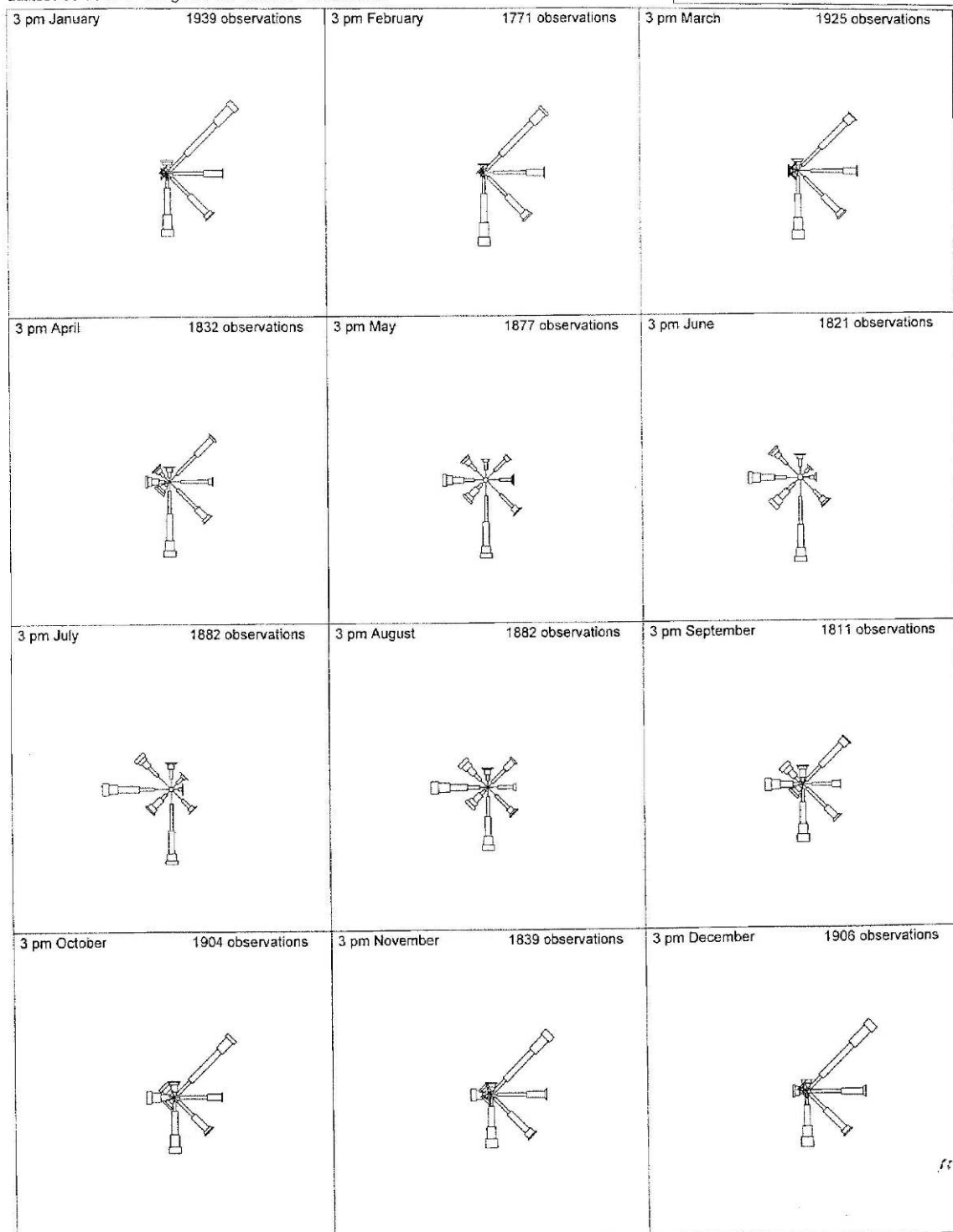
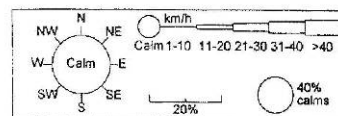


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