

Pedestrian Wind Environment Statement

for the Stage 2 development located at
2 Herb Elliot Avenue, Sydney
Olympic Park

March 26, 2013

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Document Control

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1.0 Introduction

This report is in relation to the proposed Stage 2 commercial development located at 2 Herb Elliot Avenue, Sydney Olympic Park, and presents an opinion on the likely impact of the proposed design on the local wind environment to 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 Sydney, dated 15th March, 2013. 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.

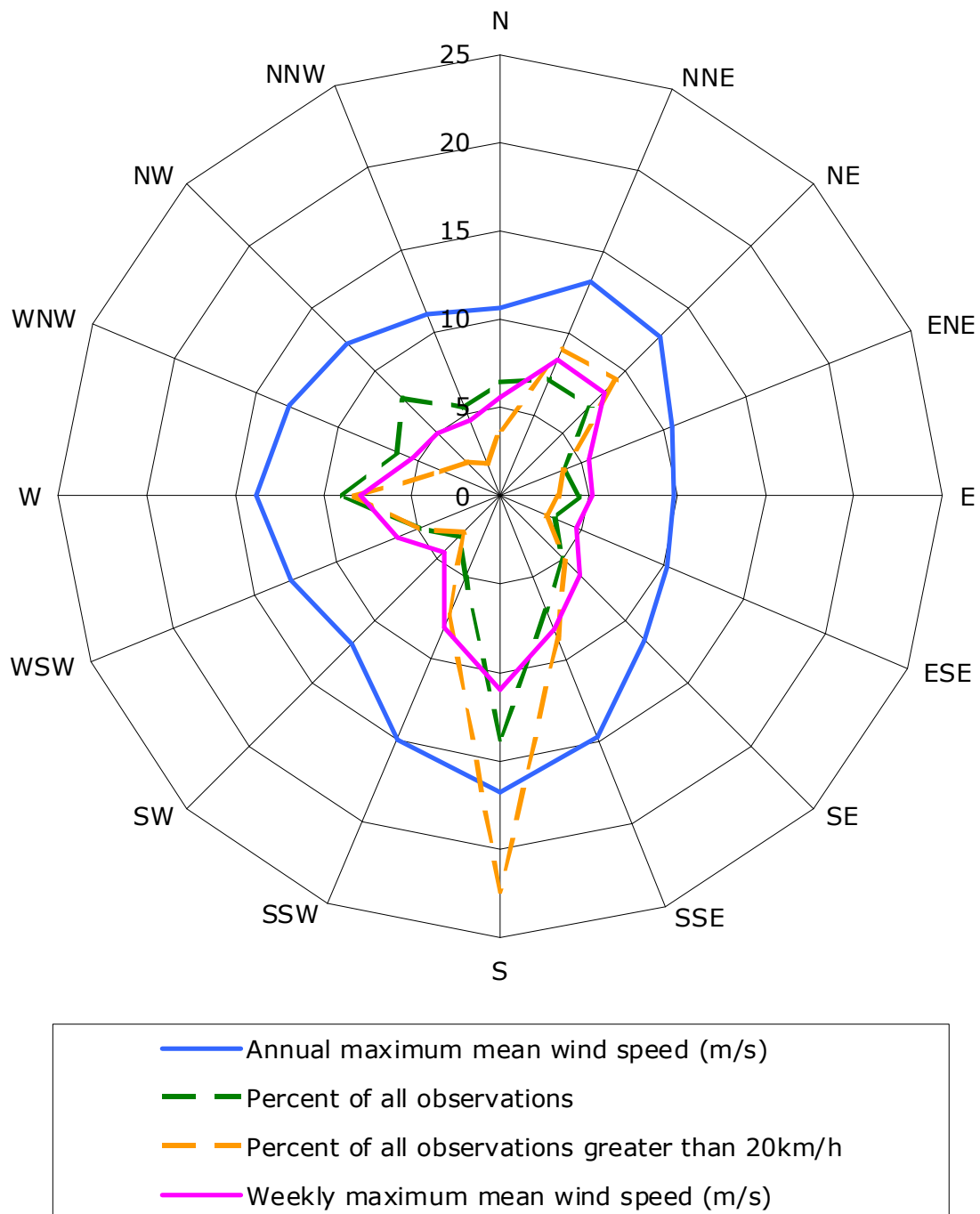


Figure 1: Annual and Weekly Recurrence Mean Wind Speeds, and Frequencies of Occurrence, for the Sydney Region (based on 10 minute mean observations from Kingsford Smith Airport from 1939 to 2008, corrected to open terrain at 10m)

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 on the south-western side of the intersection of Australia Avenue and Herb Elliott Avenue in Homebush Bay. To the far east of the site are the Australia Towers that are approximately 30-storeys above ground. To the north-east of the site is a medium-rise building of approximately 11-storey above ground. Surrounding the site to the south and west are low-rise buildings of approximately 3-storey high. The proposed development site comprises of a three stage development; Stage 1/1A located along the eastern boundary and Stage 2 located along the western boundary of the site and is indicated in Figure 2a below. The landform in the local vicinity of the site is relatively flat. An aerial image of the site is shown in Figure 2b.

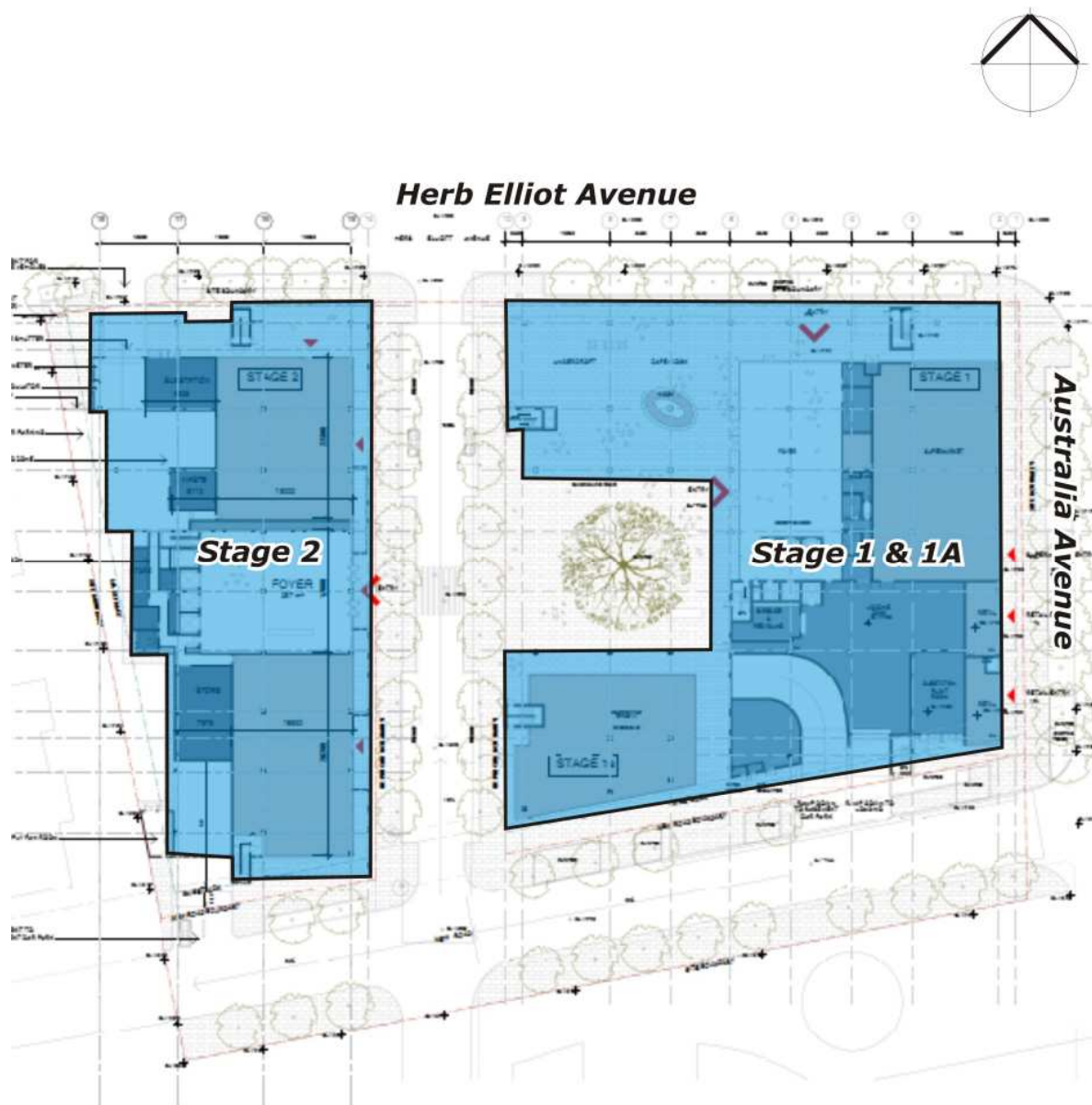


Figure 2a: Site Plan of the Subject Development



Figure 2b: Aerial Image of the Site Location

5.0 Description of the Proposed Development

The proposed development is a mixed-use building with 8 storeys consisting of office commercial space and a roof mounted plant above. Retail tenancies are proposed for the Ground Level, and commercial tenancies are proposed on the remaining levels above ground. Two basement levels are also proposed, which will be used for car parking.

The various outdoor trafficable areas of the development are summarised as follows:

- Pedestrian footpaths along the Herb Elliott Avenue frontage of the site.
- Pedestrian footpaths along the proposed new roads between the Stage 1 and 2 components of the development and along the southern boundary of the site.
- The loading zone thoroughfare along the western boundary of the site.

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.

Pedestrian Footpaths within and around the Site

The wind conditions along the pedestrian footpath along Herb Elliott Avenue frontage and the proposed road along the southern boundary of the site are exposed to the north-easterly winds. This is due to road alignments with the predominant wind direction. It is noted that the architectural drawings include existing and proposed densely trees along Herb Elliott Avenue and the southern boundary. It is recommended that these trees be retained in the final design. These trees are expected to be effective in mitigating the north-easterly winds and hence the wind conditions will be acceptable for its intended uses.

The wind conditions within along the new road between the Stage 1, 1a and 2 development of the site are shielded from the north-easterly winds by the adjacent Stage 1 development. The inclusion of the proposed densely foliating trees along the road will further enhance the wind conditions.

Similarly, the loading zone thoroughfare along the western boundary is shielded from the north-easterly winds by the proposed development

itself. The north-eastern corner may be susceptible to wind accelerations around corner; hence it is recommended the proposed densely foliating trees are retained to mitigate the potentially adverse wind conditions.

With the abovementioned recommendations incorporated and indicated in Figure 3 into the final design, it is not expected that there will be any adverse wind effects caused by north-easterly winds to the various outdoor areas within and around the proposed development.

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.

Pedestrian Footpaths within and around the Site

The pedestrian footpath along Herb Elliott Avenue frontage of the site is well shielded from the southerly winds by the proposed development itself. The inclusion of the proposed densely foliating trees along the frontage is expected to further enhance the wind conditions within these areas.

The wind conditions along the new road between the Stage 1, 1a and 2 development of the site are potentially exposed to the southerly winds accelerating around the corner of the Stage 2 development. Similarly the new road along the southern boundary is exposed to the southerly winds travelling over the adjacent open car park. It is recommended the densely foliating trees along both the proposed roads are included in the final design of the development to mitigate these potential adverse wind effects. Hence they are expected to be acceptable for its intended uses.

The loading zone thoroughfare along the western boundary of the site is shielded from the southerly winds by the surrounding developments and existing densely foliating trees to the west and south.

With the abovementioned treatments incorporated and indicated in Figure 3 into the final design, it is not expected that there will be any adverse wind effects caused by southerly winds to the various outdoor areas within and around the proposed development.

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.

Pedestrian Footpaths around the Site

The pedestrian footpath along Herb Elliott Avenue frontage of the site is potentially exposed to the westerly winds travelling through the open park area directly west of the site. It is noted that the architectural drawings include existing and proposed densely trees along Herb Elliott Avenue. These densely foliating trees are recommended to be retained in the final design to mitigate these adverse wind effects.

The wind conditions along western corner of the new road between the Stage 1, 1a and 2 are exposed to the westerly winds accelerating around the north-eastern corner of the proposed development while providing a shielding effect to the remaining pedestrian footpath. It is recommended the proposed densely foliating trees around the corner of the development are retained in the final design of the development to mitigate these adverse wind conditions.

The wind conditions along the new road on the southern boundary of the site of the site are shielded from the westerly winds by the proposed development and the neighboring developments. The inclusion of the proposed densely foliating trees along the road is expected to further enhance the wind conditions within these areas.

The entrance to the loading zone thoroughfare off Herb Elliot Avenue is exposed to the westerly winds travelling through the open park area directly west of the site. The proposed densely foliating trees at the north-western corner of the site and the existing trees on the adjacent development are expected to be effective in mitigating the westerly winds within these areas. As the remaining areas of the loading dock are primarily used for vehicular access and infrequent pedestrian traffic, it is expected the wind conditions within these areas will be acceptable for its intended uses.

With the abovementioned recommendations incorporated and indicated in Figure 3 into the final design, it is not expected that there will be any adverse wind effects caused by westerly winds to the various outdoor areas within and around the proposed development. Note that for the densely foliating trees to be effective throughout the year, they are recommended to be of an evergreen variety.

 Densely Foliating Trees recommended to be retained in the final design of the development.
The densely foliating trees are to be of an evergreen variety.

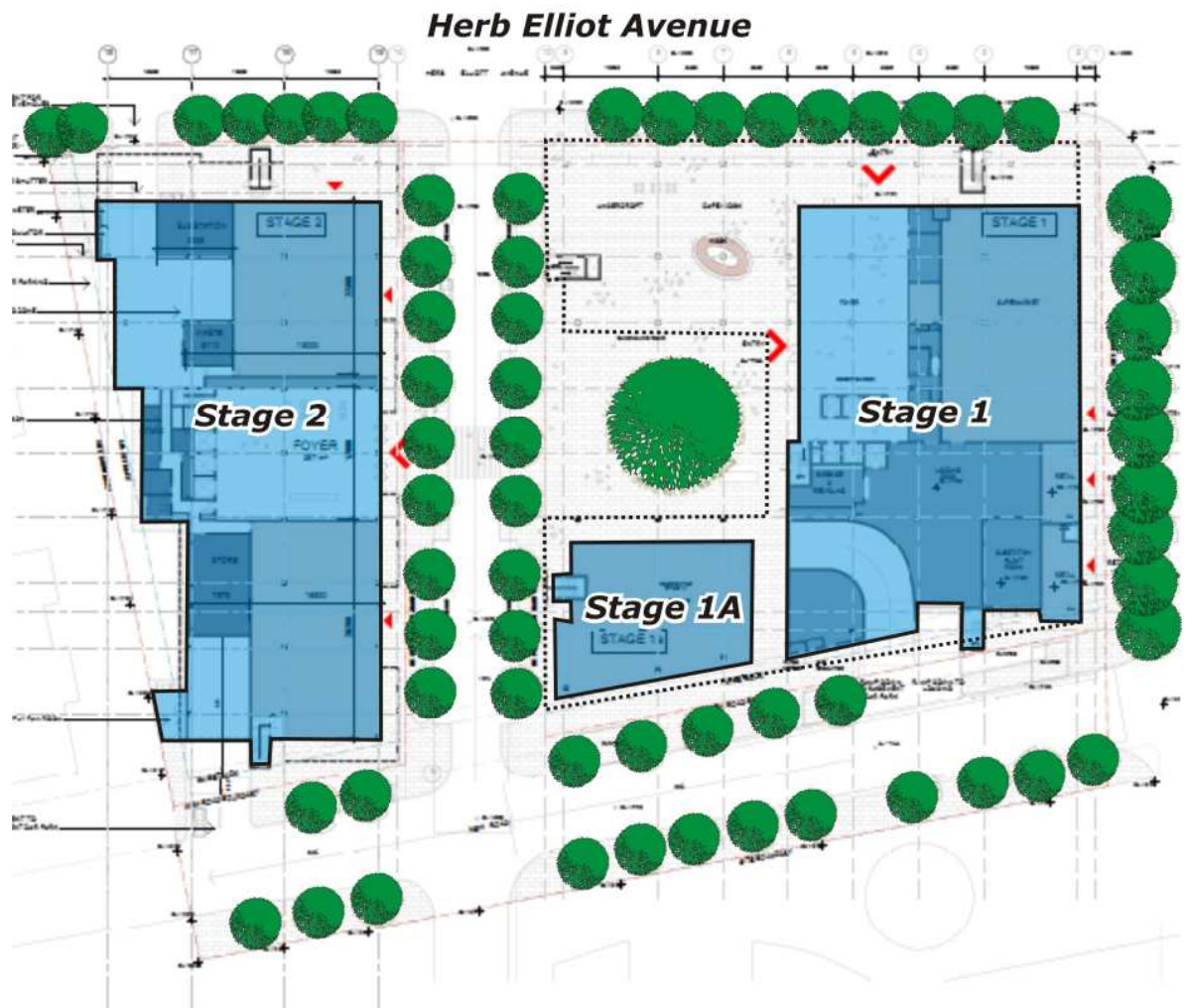


Figure 3: Recommended Treatments to Ground Level

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 Stage 2 development located at 2 Herb Elliot Avenue, Sydney Olympic Park. 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 Sydney, dated 15th March, 2013. 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 there were several ground level areas within and around the site that are potentially exposed to the adverse wind conditions due to a number of factors such as the orientation/alignment of the roads and potential accelerations around the corner sites of the development. To ensure adequate wind conditions are achieved for all trafficable outdoor areas with and around the site, it is recommended the proposed vegetation scheme of densely foliating trees within and around the site is retained in the final design of the development and hence wind conditions are expected to be acceptable for its intended uses.

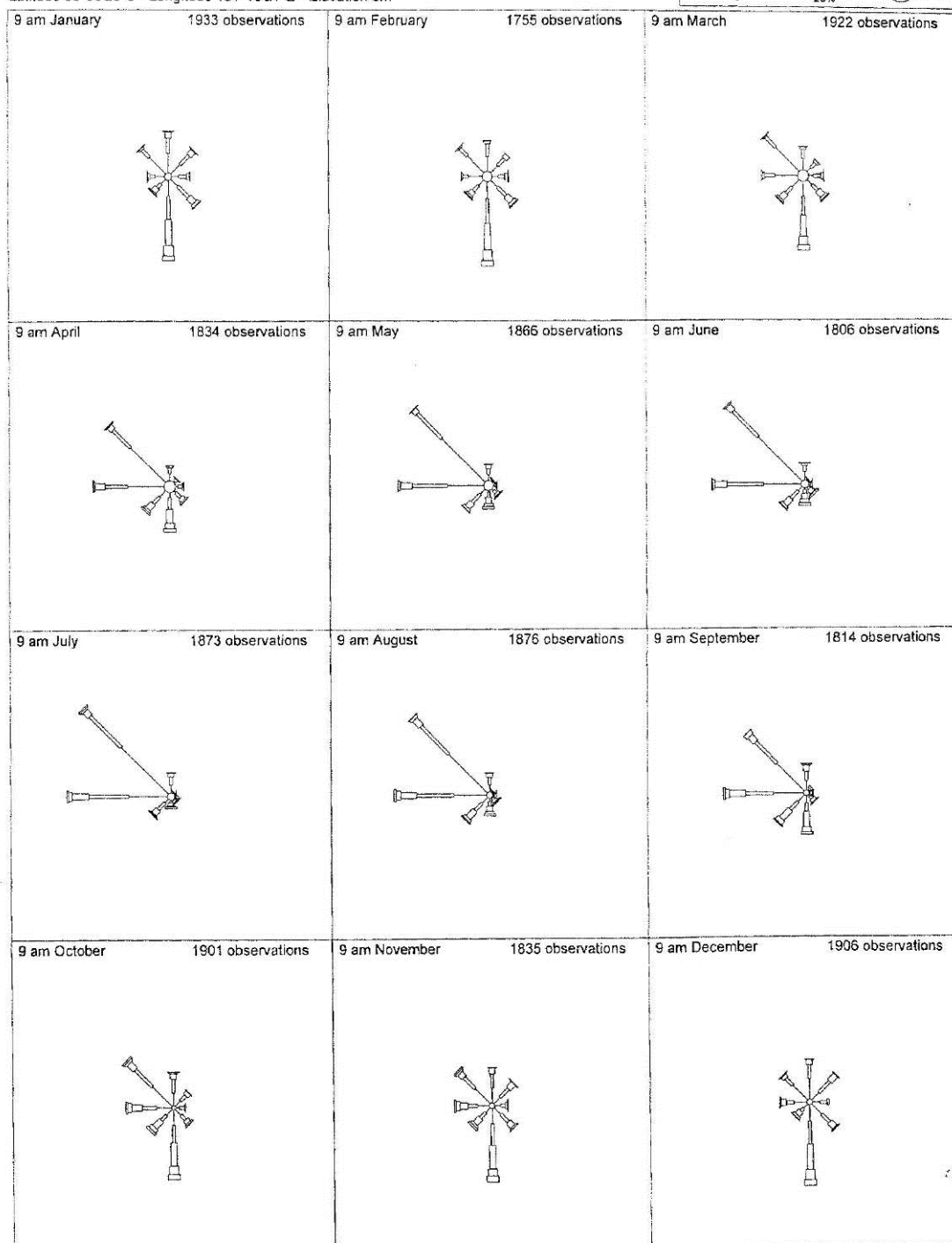
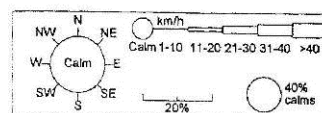
Note that to ensure the densely foliating trees are effective in wind mitigation throughout the year, they are recommended to be of an evergreen species.

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

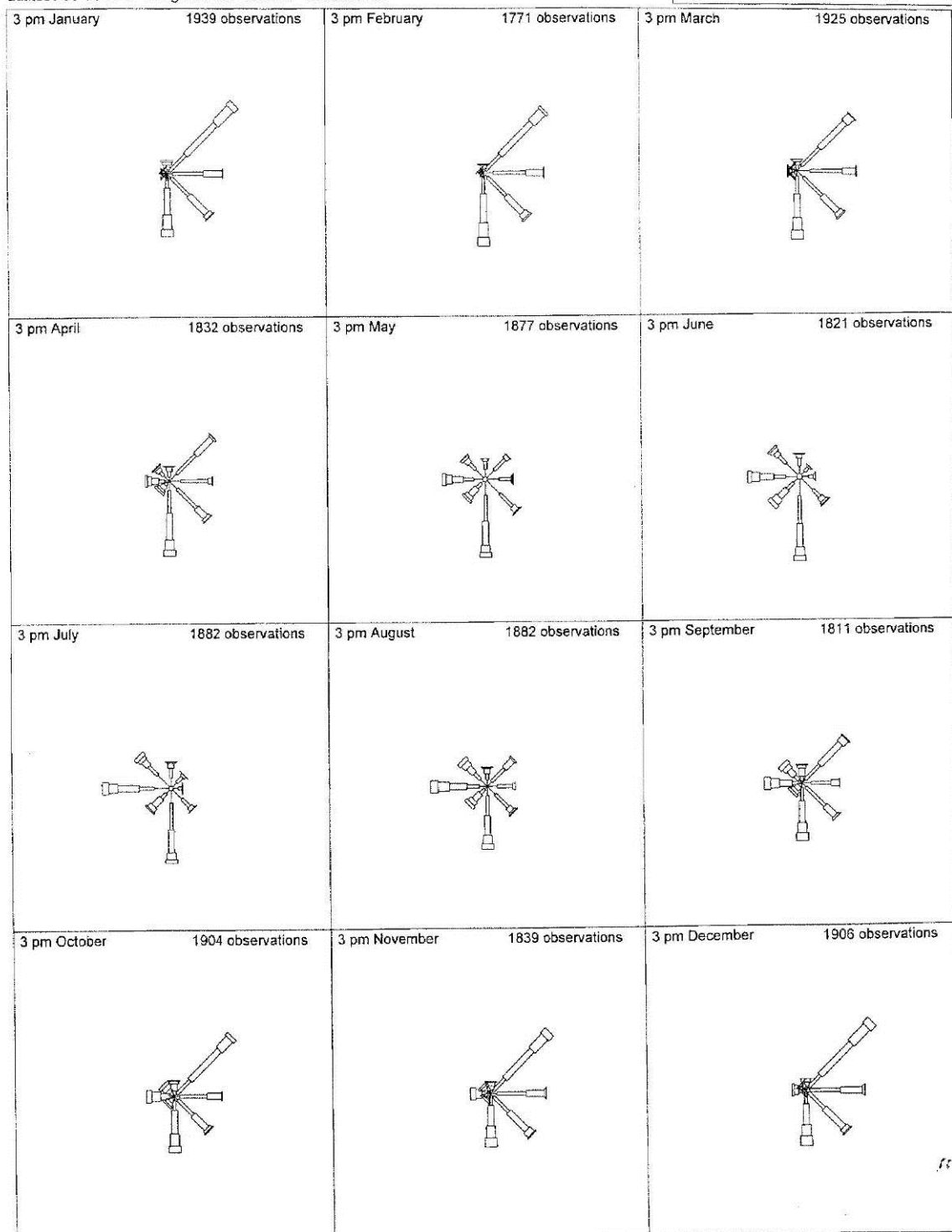
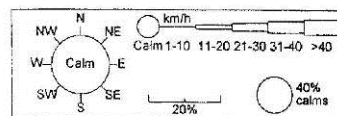


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