PEDESTRIAN WIND ENVIRONMENT STATEMENT

WESTFIELD PARRAMATTA REDEVELOPMENT

WB400-01F03(REV3)- WS REPORT

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Prepared for:

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DOCUMENT CONTROL

Date	Revision History	Non-Issued Revision	Issued Revision	Prepared By (initials)	Instructed By (initials)	Reviewed & Authorised by (initials)
26/07/2012	Initial	-	0	AB	TR	AB
30/07/2012	Reference to latest drawings.	-	1	AB	TR	AB
31/07/2012	Reference to latest drawings.	-	2	AB	TR	AB
16/08/2012	Updated the maximum height reference of the Stage 1 component.	-	3	AB	TR	AB

EXECUTIVE SUMMARY

This report is in relation to the proposed redevelopment of Westfield Parramatta, and presents an opinion on the likely impact of the proposed design on the wind environment in 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 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 Westfield, dated July 27, 2012. 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 around buildings.

The results of the analysis indicate that, compared to the existing conditions, the construction of the Stage 1 component of the redevelopment is expected to have a negligible impact onto the wind conditions affecting pedestrians in the local surrounding area. The Stage 2 tower component of the redevelopment is also expected to have a minimal impact onto the wind conditions to the street level areas around it, due to the effective use of building setbacks on the lower levels. However, it should be noted that wind mitigation strategies may be necessary for any outdoor terraces atop the podium stepped-setbacks on Levels 5 and 8, for any balconies located on or near the corners of the tower, or for the rooftop of the tower if it is to be made trafficable. The typical wind mitigation strategies would be in the form of strategically-placed screens, balustrades, awnings, etc, and can be investigated further during the wind tunnel testing at a more detailed design stage of the project.

1 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 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: Principle Time of Occurrence of Winds for Sydney

Month(s)	Prevailing 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	

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 directional wind speeds obtained from Sydney Airport between 1939 and 2008.

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. 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. North-easterly winds are also typically not as strong as the southerly or westerly winds.

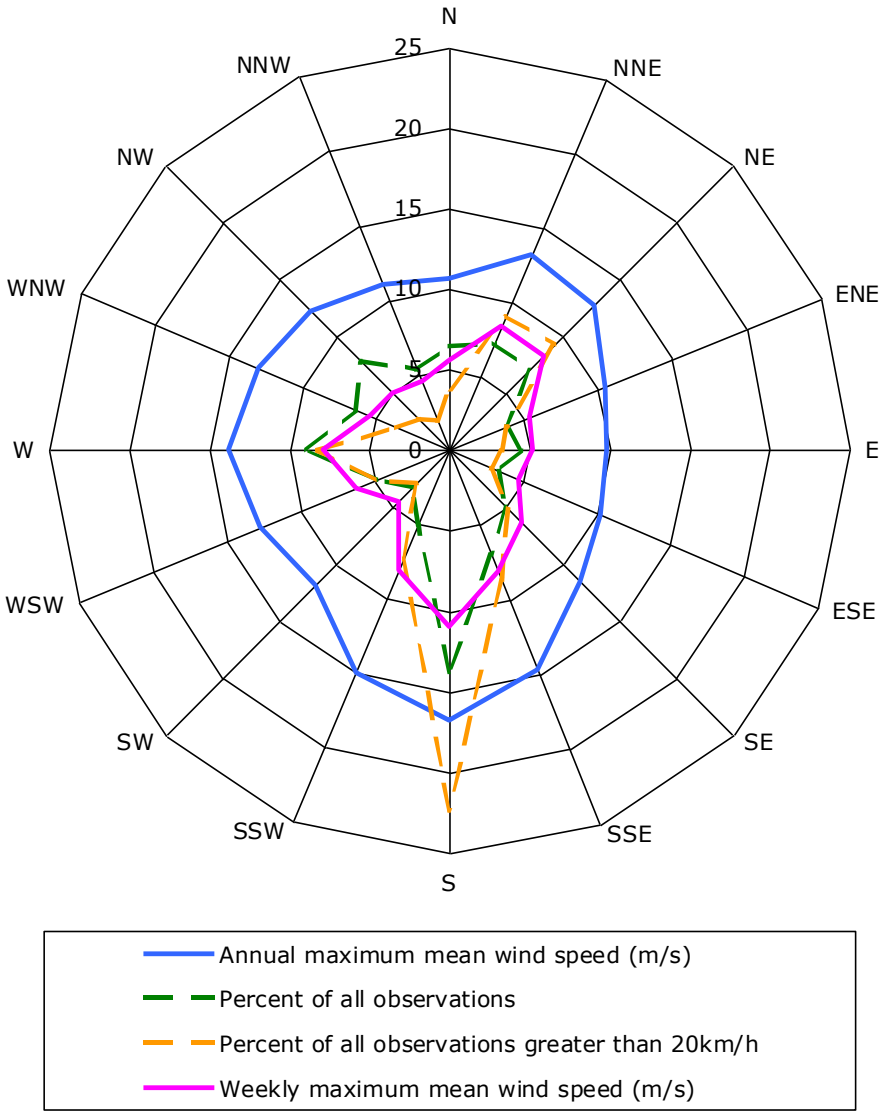

Figure 1: Annual and Weekly Recurrence Mean Wind Speeds, and Frequencies of Occurrence, for the Sydney Region (based on directional wind speed observations from Kingsford Smith Airport between 1939 to 2008, at 10m height in open terrain)

2 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.

3 DESCRIPTION OF THE PROPOSED REDEVELOPMENT AND SURROUNDS

The proposed development comprises of two stages. Stage 1 is for the construction of an additional retail level to parts of the existing shopping mall, and additional car parking. The maximum building height of the Stage 1 component is 34.14m above ground. Stage 2 is for a high-rise commercial office tower at the north-eastern corner the existing shopping centre (overlooking the intersection of Argyle Street and Church Street), and an upgrade of the existing Argyle Street ground level façade. The tower will sit atop the existing shopping mall on Level 5, and will have a height of approximately 20 stories above Level 5 of the existing shopping mall.

It should be noted that the architectural design of the Stage 2 office tower has not yet been finalised, and hence this report assesses only a basic massing representation of the proposed tower. An update to this assessment should be undertaken at a more detailed design stage, and should include wind tunnel testing.

Westfield Parramatta is surrounded by buildings of various heights. To the south and south-west are generally low-rise residential houses, and to the west and north-west are open parklands. Surrounding the site from the north through to the south-east is the Parramatta CBD which includes towers of various heights. To the north, on the northern side of Argyle Street, is the Western Railway Line, which is elevated approximately one storey above the street level. There is a gentle rise in the local land topography across the site, with the Argyle Street level along the northern end of the site being approximately one storey lower than the Campbell Street level along the southern end of the site.

Perspective views of the proposed development are shown in Figures 2a to 2c. It should be noted that, as mentioned above, the shape of the office tower shown in Figures 2a to 2c is preliminary only and is subject to refinement at a later design stage. An aerial view of the existing site is shown in Figure 3.

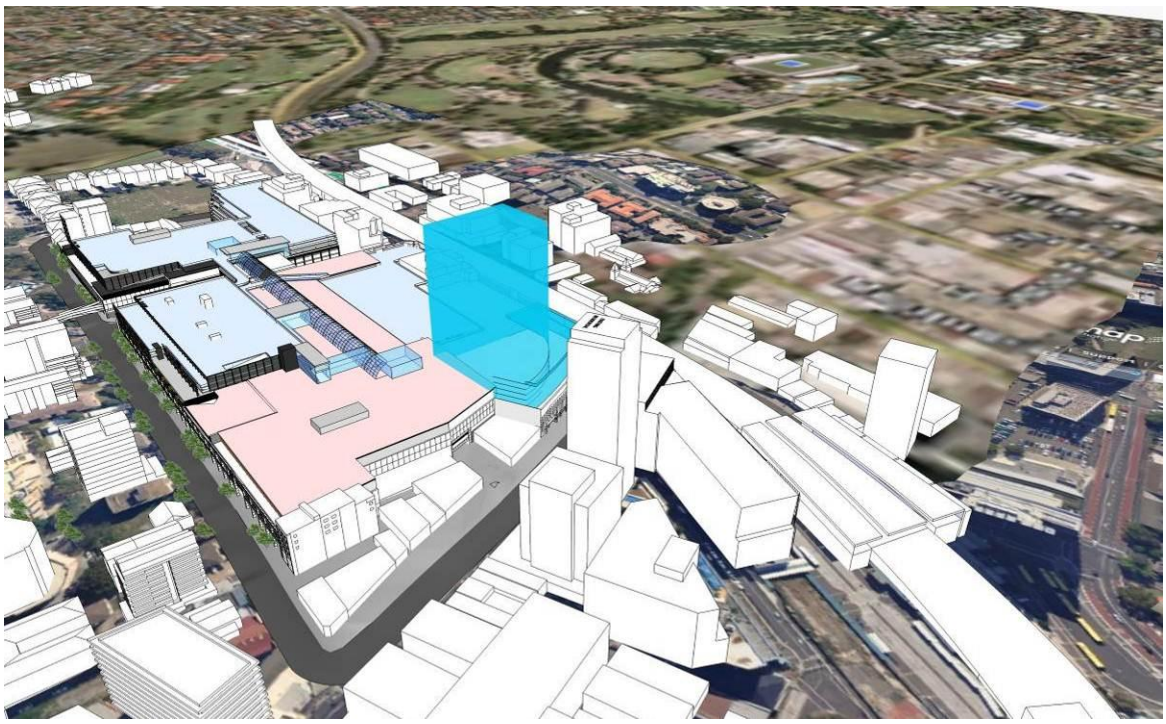

Figure 2a: Perspective View of the Redevelopment
(view from the south-east, facing north-west)

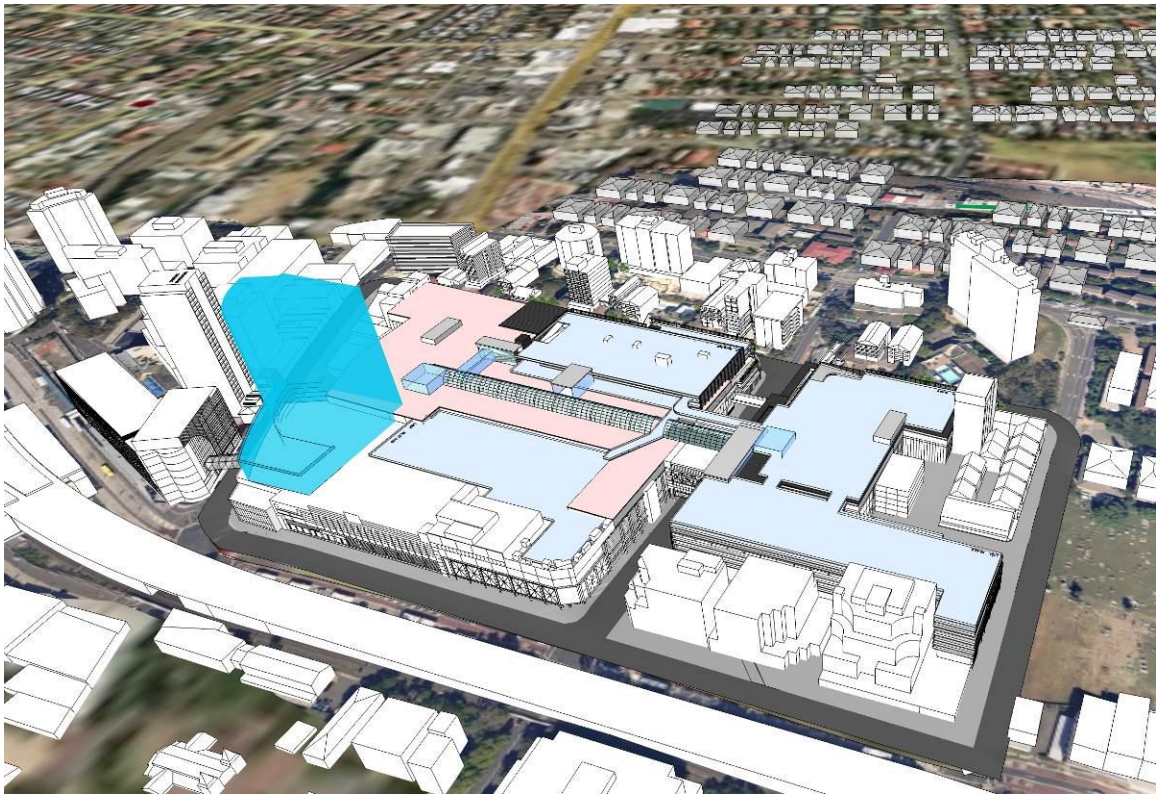

Figure 2b: Perspective View of the Redevelopment
(view from the north, facing south)

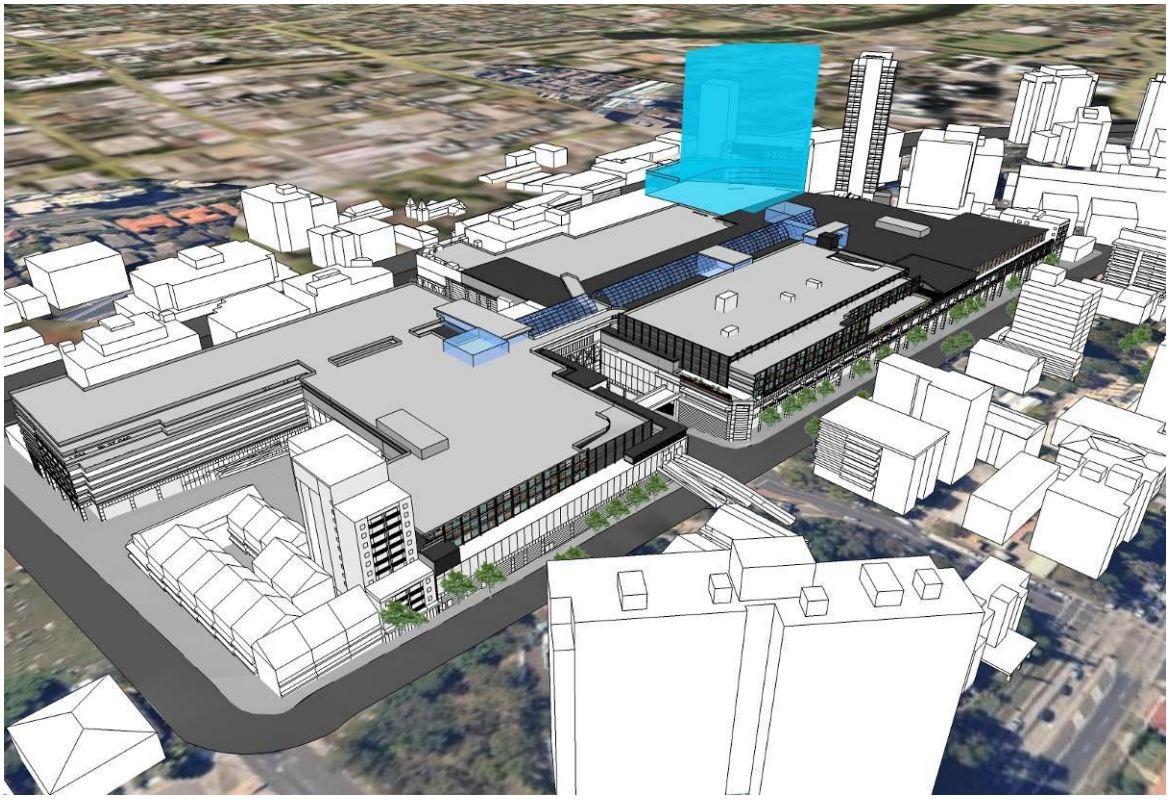

Figure 2c: Perspective View of the Redevelopment
(view from the south-west, facing north-east)

Figure 3: Aerial Perspective of the Existing Site
(view from the north, facing south)

4 RESULTS AND DISCUSSION

The expected wind conditions for the various outdoor areas within and around the subject development are discussed in this section of the report with respect to each of the three predominant wind directions for the Sydney region. The interaction between the prevailing 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.

Compared to the existing conditions, the construction of the Stage 1 component of the redevelopment is expected to have a negligible impact onto the wind conditions affecting pedestrians in the local surrounding area.

The latest building massing design of the Stage 2 office tower, as shown in the architectural plans dated July 27, 2012, indicates that the tower will have two distinct stepped-setbacks in the overall shape for the podium levels. These changes occur on Level 5 and Level 8, and these will be effective in breaking-up attached wind flow and downwashed winds to the street level below. Hence, with the construction of the Stage 2 office tower, at street level (on Church Street and Argyle Street) it is expected that wind conditions will remain similar to the existing conditions.

It should be noted that if outdoor terraces are to be located atop the Level 5 or Level stepped-setbacks of the Stage 2 tower, then these areas may be exposed to adverse wind conditions due to side-streaming and/or downwashing effects. However, these types of effects can be mitigated with the use of strategically-placed screens, balustrades, awnings, etc. These effects can be investigated further during the wind tunnel testing at a more detailed design stage of the project.

Since the subject Stage 2 tower is for commercial use, it is not expected that there will be any balconies on the tower. However, if there are any balconies on or near the corners of the tower then it may be necessary to use impermeable balustrades or screens to ensure adequate wind conditions are achieved. Similarly, if the rooftop of the tower is to be trafficable, it is expected that wind mitigation strategies will be necessary due to the exposure of the rooftop of the tower to the prevailing winds. If applicable, these effects can be investigated further during the wind tunnel testing at a more detailed design stage of the project.

5 CONCLUSION

An analysis of the wind environment impact with respect to the three principal wind directions for the Sydney region has been undertaken for the proposed redevelopment of Westfield Parramatta. The conclusions of this report are drawn from our extensive experience in this field and are based on an examination of the architectural drawings by Westfield, dated July 27, 2012. 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.

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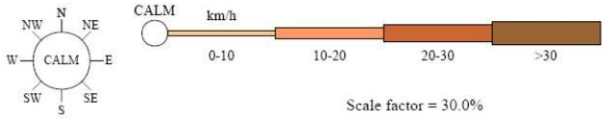
APPENDIX A - WIND ROSES FOR THE SYDNEY REGION

WIND FREQUENCY ANALYSIS (in km/h)

SYDNEY AIRPORT AMO STATION NUMBER 066037

Latitude: -33.94 ° Longitude: 151.17 °



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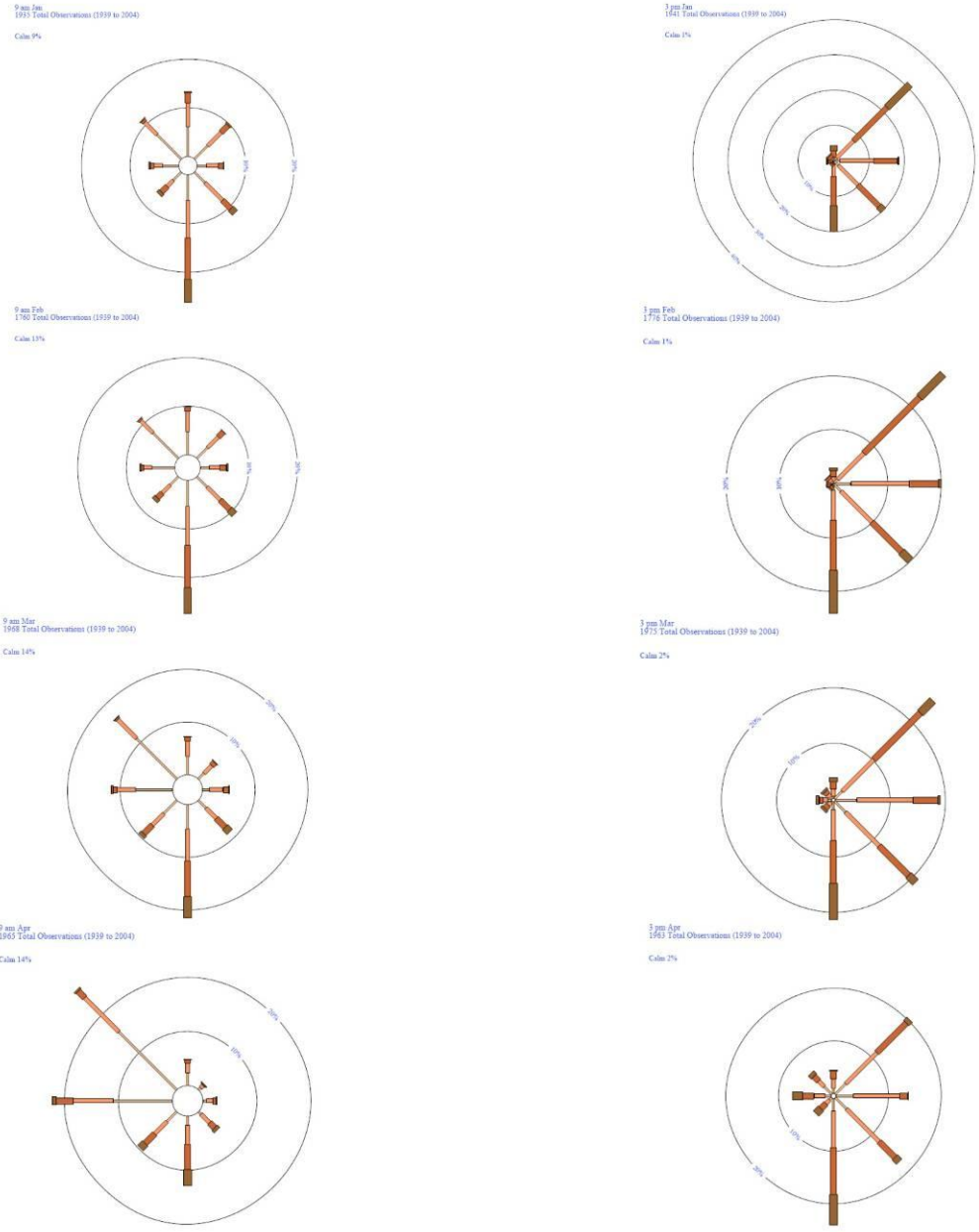

Wind directions are divided into eight compass directions. Calm has no direction.
An asterisk (*) indicates that calm is less than 1% .
An observed wind speed which falls precisely on the boundary between two divisions (eg 10km/h) will be included in the lower range (eg 1-10 km/h). Only quality controlled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

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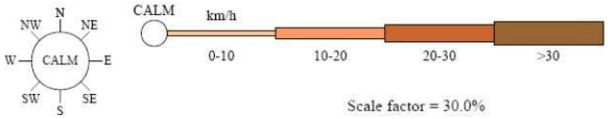

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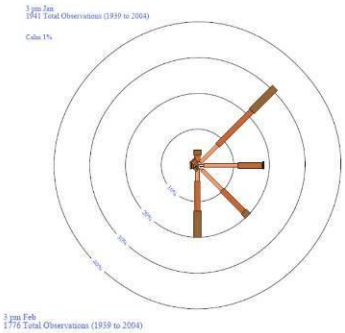

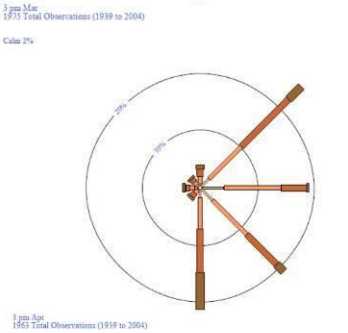

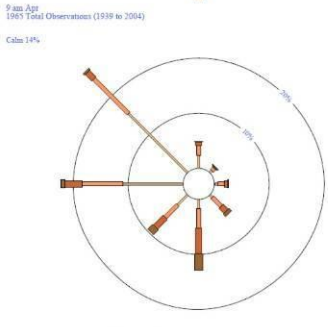

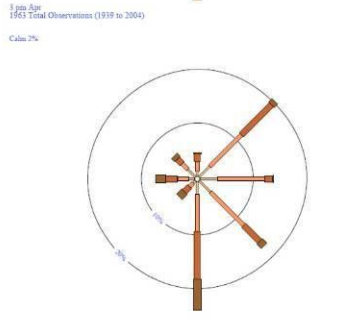

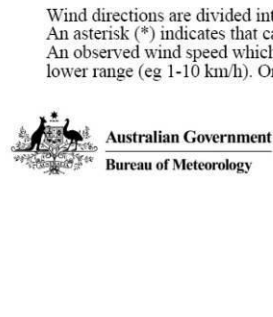

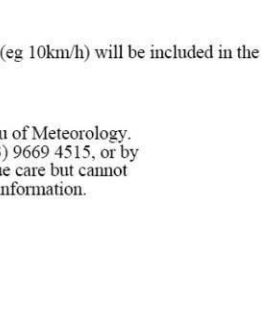

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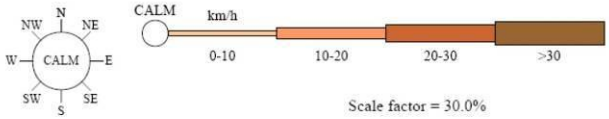

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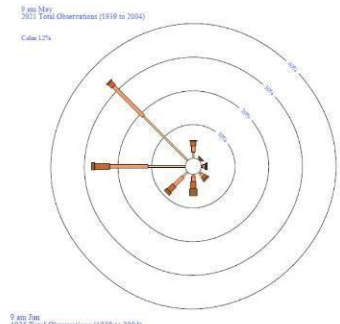

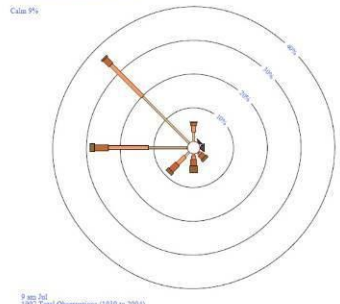

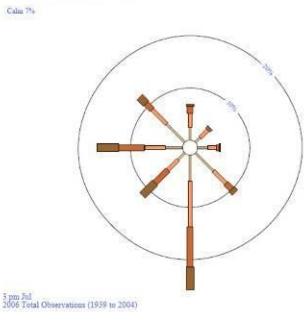

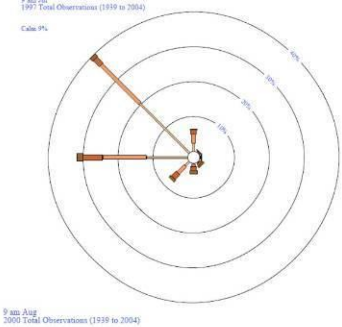

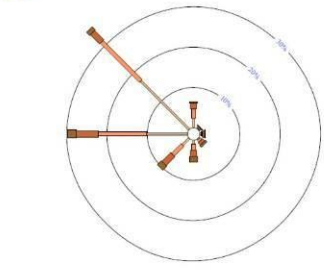

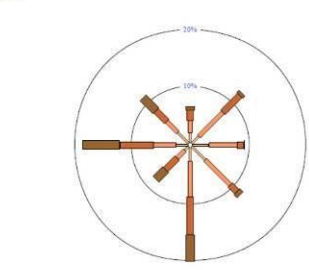

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