Pedestrian Wind Environment Statement

for the Stage 1 development application of

Bay Park, Lot 3 & 22, 23 Bennelong Parkway, Homebush Bay

June 29, 2009

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Document Control

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0	25/06/2009	Initial	JA	AB	TR
1	29/06/2009	Updated project title	AB	-	TR

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1.0 Introduction

This report is in relation to the Stage 1 development application of Bay Park, located at Lot 3 & 22, 23 Bennelong Parkway, Homebush Bay, and presents an opinion on the likely impact of proposed design on the wind environment within and around the site.

The effect of wind activity within and around the site of the proposed development is examined for the three predominant wind directions for the Sydney region; i.e. north-east, south and west. 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 prepared by Turner + Associates, dated December June 19, 2009. 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 Local Wind Climate

Three principal wind directions potentially affect the development. These winds prevail from the north-east, south and west. Table 1 is a summary of the principal time of occurrence of these winds. This summary is based on data obtained by the Bureau of Meteorology between 1939 and 2000 at Kingsford Smith Airport, Sydney. The wind rose plots of this data are shown in the attached appendix to this report. Table 1 presents a summary of the principal time of occurrence of these winds. Figure 1 presents a plot of recorded wind data from Kingsford Smith Airport, obtained from 1939 to 2008.

Table 1: Principal Time of Occurrence of Winds for the Sydney Region

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	

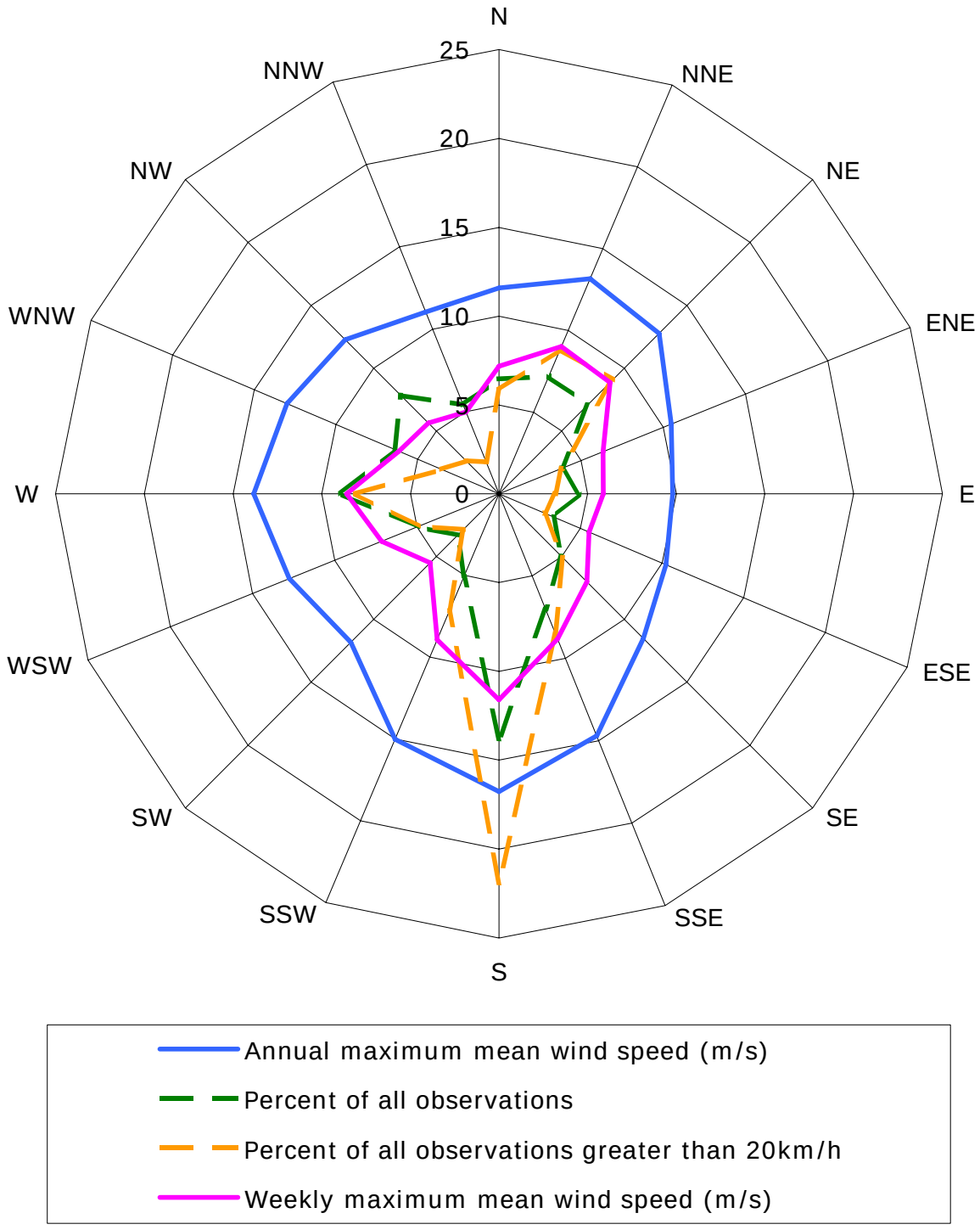


Figure 1: Reference Wind Speed Data for the Sydney, 1939-2008 (based on 10 minute mean wind speed observations at Kingsford Smith Airport, corrected for open terrain at 10m height)

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), is a modified version of the Beaufort Scale, and describes the effects of various wind intensities on people. Note that the applicability column related to 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	Beaufort Number	Gust Speed (m/s)	Effects	Applicability
Calm, light air	1	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	2	1.6 - 3.3	Wind felt on face	
Gentle breeze	3	3.4 - 5.4	Hair is disturbed, Clothing flaps	
Moderate breeze	4	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	5	8.0 - 10.7	Force of wind felt on body	Acceptable as a main pedestrian thoroughfare
Strong breeze	6	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	7	13.9 - 17.1	Inconvenience felt when walking.	
Gale	8	17.2 -20.7	Generally impedes progress, Great difficulty with balance.	Unacceptable as a public accessway.
Strong gale	9	20.8 - 24.4	People blown over by gusts.	Completely unacceptable.

4.0 Site Description

The proposed development site is located in the Homebush Bay district, at Lot 3 & 22, 23 Bennelong Parkway. The site is bounded by Bennelong Road from the south-west to the north-west, Stromboli Straight to the north-east and The Piazza to the south-east. In addition, Amalfi Drive cuts through the site, thus separating it into two sections.

The local land topography is relatively flat around the site, although Bennelong Road is one storey lower than the Amalfi Drive ground level. Directly adjacent to the north-east through to the south-east of the proposed site are typical residential buildings that vary in height from 3 to 8 stories. The north-west through to south-west directions upstream of the site are generally open field areas, with the closet suburban area being at least 1km away. An aerial photograph of the local precinct is given in Figure 2, below.

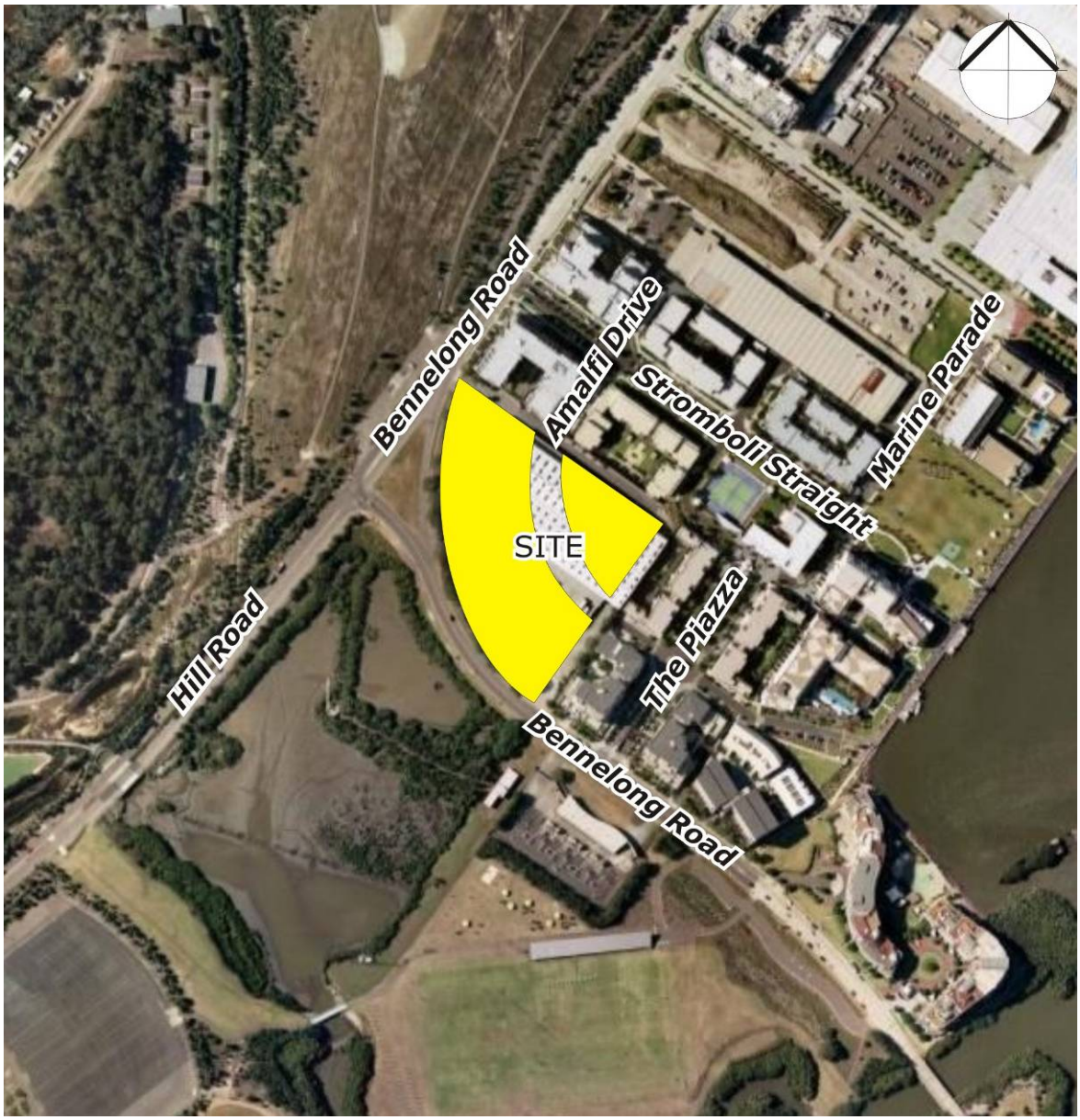


Figure 2: Aerial Image of the Site Location

5.0 Description of the Proposed Development

The proposed development is known as Bay Park, and consists of 3 residential building components, named Building A, B and C. A site layout of the various buildings is shown below in Figure 3 below.

Figure 3: Site Layout

Building A, located at the eastern corner of the site, is a 5 storey residential building with private balconies on the north-western aspect, and at the north-eastern corner. Buildings B and C are both residential buildings and are each 8 stories high, each enclosing their own communal central landscaped courtyard. Both are located between Amalfi Drive and Bennelong Road, with Building B at the southern end and Building C at the northern end. Private balcony areas are proposed on all outward-facing aspects of Building B, and on the northern, southern and western outward-facing aspects of Building C.

A trafficable passage is proposed at ground level between Buildings B and C, providing a pedestrian link between Bennelong Road and Amalfi Drive. The ground level area on the north-western side of Building A is accessible by pedestrians and the general public, and is likely to be used as open grassland.

6.0 Wind Conditions Within and Around the Site

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

The ground level areas of the proposed development are generally well shielded from the north-easterly winds by the neighbouring buildings to the north-east. This includes the pedestrian pathways along Amalfi Drive, and the open area on the north-western side of Building A. Buildings B and C of the proposed development are expected to provide effective shielding from the north-easterly winds to the pedestrian footpath along Bennelong Road, and also to the central courtyard areas of Buildings B and C. The gap between Buildings B and C may be exposed to potential funneling of north-easterly winds. If this area is to be trafficable, it is recommended that this area only be used as a pedestrian thoroughfare, and that several densely foliating trees be included along this area to assist in ameliorating the potentially adverse wind effects at ground level (in a layout similar to that indicated in Figure 4).

The ground level area at the north-eastern end of Building A may also be exposed to adverse north-easterly winds being directed around Building A. To ameliorate this effect it is recommended that densely foliating trees be added in a similar layout to that indicated in Figure 4.

Note that for trees to be effective in wind mitigation throughout all seasons, they should be a densely foliating and evergreen species.

Note that if, at a later design stage, outdoor seating areas are proposed, such as in the case of outdoor seating for cafés or other similar retail tenancy type uses, additional localised ameliorative devices may be required depending on the location.

The use of vertical privacy screens and building setbacks are expected to assist in providing adequate wind conditions to most of the private residential balconies of the development. However, some of the private balconies are located on the corner of a building and may be exposed to stronger side-streaming effects. It is recommended that 1.2m high impermeable balustrades be used on all corner balconies of the development. Wind conditions for the remaining private balconies are expected to be further enhanced if impermeable balustrades are also used for those areas.

The roof areas of all three buildings of the proposed development are exposed to north-easterly winds. If these areas are to be trafficable for occupants of the development, it is expected that strategically placed ameliorative devices such as screens, impermeable balustrades, canopies or densely foliating vegetation would be necessary to provide adequate wind conditions.

With the addition of the trees indicated in Figure 4, it is not expected that the proposed development will have any adverse effects to the wind conditions in the local surrounding streetscapes and pedestrian footpaths. Wind conditions to the various ground level areas within and around the site are expected to be acceptable for the intended uses.

6.2 Southerly Winds

The Bennelong Road frontage of the development is exposed to direct southerly winds. The varying shape of the façade of Buildings B and C are expected to assist in breaking-up potentially adverse attached side-stream flows. However, it is recommended to include densely foliating trees along the pedestrian footpath of Bennelong Road (see Figure 4) to provide amelioration to this area.

The ground level area on the north-western side of Building A is well shielded from southerly winds by Buildings A and B of the proposed development, and by the neighbouring buildings to the south-east of the site. The gap between Buildings B and C, and also the central courtyard areas of Buildings B and C, are well shielded from the southerly winds.

Note that if, at a later design stage, outdoor seating areas are proposed, such as in the case of outdoor seating for cafés or other similar retail tenancy type uses, additional localised ameliorative devices may be required depending on the location.

Note that for trees to be effective in wind mitigation throughout all seasons, they should be a densely foliating and evergreen species.

The use of vertical privacy screens and building setbacks are expected to assist in providing adequate wind conditions to most of the private residential balconies of the development. However, some of the private balconies are located on the corner of a building and may be exposed to stronger side-streaming effects. It is recommended that 1.2m high impermeable balustrades be used on all corner balconies of the development. Wind conditions for the remaining private balconies are expected to be further enhanced if impermeable balustrades are also used for those areas.

The roof areas of all three buildings of the proposed development are exposed to southerly winds. If these areas are to be trafficable for occupants of the development, it is expected that strategically placed ameliorative devices such as screens, impermeable balustrades, canopies or densely foliating vegetation would be necessary to provide adequate wind conditions.

With the addition of the trees indicated in Figure 4, it is not expected that the proposed development will have any adverse effects to the wind conditions in the local surrounding streetscapes and pedestrian footpaths. Wind conditions to the various ground level areas within and around the site are expected to be acceptable for the intended uses.

6.3 Westerly Winds

The Bennelong Road frontage of the development is exposed to direct westerly winds. The varying shape of the façade of Buildings B and C are expected to assist in breaking-up potentially adverse attached side-stream flows. However, it is recommended to include densely foliating trees along the pedestrian footpath of Bennelong Road (see Figure 4) to provide amelioration to this area.

The gap between Buildings B and C is directly exposed to westerly winds being funneled through this gap. If this area is to be trafficable, it is recommended that this area only be used as a pedestrian thoroughfare, and that several densely foliating trees be included along this area to assist in ameliorating the potentially adverse wind effects at ground level (in a layout similar to that indicated in Figure 4).

The ground level area on the north-western side of Building A is mostly well shielded from westerly winds by Buildings B and C of the proposed development. With the recommended trees along the gap area between Buildings B and C as indicated in Figure 4 it is expected that the potential for westerly winds to be directed to this open area on the north-western side of Building A will be ameliorated at ground level. The central courtyard areas of Buildings B and C are well shielded from the westerly winds.

Note that if, at a later design stage, outdoor seating areas are proposed, such as in the case of outdoor seating for cafés or other similar retail tenancy type uses, additional localised ameliorative devices may be required depending on the location.

Note that for trees to be effective in wind mitigation throughout all seasons, they should be a densely foliating and evergreen species. It should be noted that westerly winds tend to occur during the winter months for the Sydney region, which is when a deciduous tree would provide no protection from adverse winds.

The use of vertical privacy screens and building setbacks are expected to assist in providing adequate wind conditions to most of the private residential balconies of the development. However, some of the private balconies are located on the corner of a building and may be exposed to stronger side-streaming effects. It is recommended that 1.2m high impermeable balustrades be used on all corner balconies of the

development. Wind conditions for the remaining private balconies are expected to be further enhanced if impermeable balustrades are also used for those areas.

The roof areas of all three buildings of the proposed development are exposed to westerly winds. If these areas are to be trafficable for occupants of the development, it is expected that strategically placed ameliorative devices such as screens, impermeable balustrades, canopies or densely foliating vegetation would be necessary to provide adequate wind conditions.

With the addition of the trees indicated in Figure 4, it is not expected that the proposed development will have any adverse effects to the wind conditions in the local surrounding streetscapes and pedestrian footpaths. Wind conditions to the various ground level areas within and around the site are expected to be acceptable for the intended uses.

Figure 4: Recommend Treatments – Ground Level

7.0 Conclusions & Recommendations

An analysis of the wind environment impact with respect to the principal wind directions for the Sydney region has been completed for the Stage 1 development application of Bay Park, located at Lot 3 & 22, 23 Bennelong Parkway, Homebush Bay.

The conclusions of this report are drawn from our extensive experience in this field and are based on an examination of the architectural drawings prepared by Turner + Associates, dated December June 19, 2009. 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 effect.

The results of this study indicate that wind conditions within and around the various outdoor areas of the site will be acceptable for their intended uses with the following recommendations incorporated into the design:

- Inclusion of several densely foliating evergreen trees along the Bennelong Road pedestrian footpath frontage of the site.
- Inclusion of several densely foliating evergreen trees through the gap area between Buildings B and C of the proposed development.
- Inclusion of a densely foliating evergreen tree either side of Building A, at the north-eastern end.
- Implementation of 1.2m high impermeable balustrades around the perimeter all corner balconies of the proposed development.

Note that for trees to be effective in wind mitigation throughout all seasons, they should be a densely foliating and evergreen species. It should be noted that westerly winds tend to occur during the winter months for the Sydney region, which is when a deciduous tree would provide no protection from adverse winds.

The roof areas of all three buildings of the proposed development are exposed to the three critical wind directions for the Sydney region. If these areas are to be trafficable for occupants of the development, it is expected that strategically placed ameliorative devices such as screens, impermeable balustrades, canopies or densely foliating vegetation would be necessary to provide adequate wind conditions. Additionally, if at a later design stage outdoor ground level seating areas are proposed, such as in the case of outdoor seating for cafés or other similar retail tenancy type uses, additional localised ameliorative devices may also be required, depending on the location.

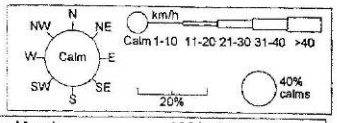
With the above treatments incorporated into the design, it is not expected that the proposed development will cause any adverse effect to the wind conditions to the local surrounding streets and other outdoor areas around the site.

Appendix

Wind Roses for Sydney Airport
1939-2000

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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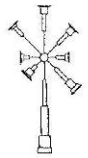		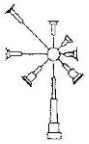
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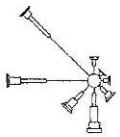	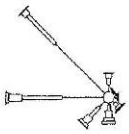	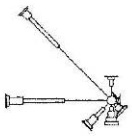
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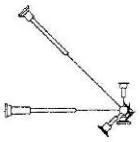	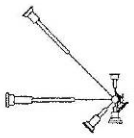	
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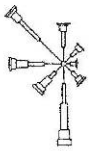	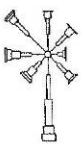	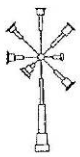

Wind Roses using available data between 1939 and 2000 for SYDNEY AIRPORT AMO

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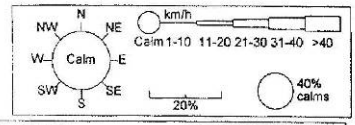
Latitude 33°56'28"S • Longitude 151°10'21"E • Elevation 6m



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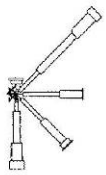	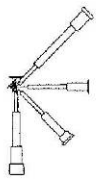	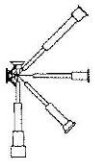
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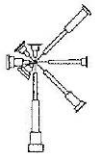	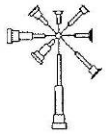	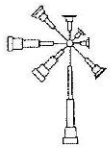
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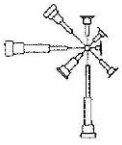	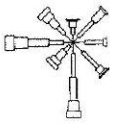	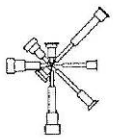
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