PEDESTRIAN WIND ENVIRONMENT STATEMENT

PEMULWUY PRECINCT 3, 83-123 EVELEIGH STREET, REDFERN

WB028-04F02(REV0)- WS REPORT

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Prepared for:

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DOCUMENT CONTROL

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EXECUTIVE SUMMARY

This report is in relation to the proposed development known as Pemulwuy Precinct 3, located at 83-123 Eveleigh Street, Redfern, and presents an opinion on the likely impact of the proposed design on the local wind environment at the critical outdoor areas within and around the subject development. The effect of wind activity is examined for the three principal wind directions for the Sydney region; the north-easterly, southerly and westerly winds. The analysis of the wind effects relating to the proposed development 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, received in May 2017. No wind tunnel testing has 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 acceptable wind conditions are generally expected around the site due to the shielding effects provided by the massing and orientation of the subject development, and also the arrangement of the building to minimise potential downwash effects at street level. Some recommendations have been made to ensure that wind conditions for key areas within and around the site are acceptable, and these recommendations are outlined within this report.

Wind tunnel testing is currently being undertaken for the subject development. This will provide a quantitative analysis of the wind conditions and determine the requirement for treatments, including the size and extent of these treatments to ensure suitable wind conditions are achieved at all outdoor pedestrian accessible locations within and around the development.

1 DESCRIPTION OF THE DEVELOPMENT AND SURROUNDINGS

The development site is known as Pemulwuy Precinct 3, and is located at 83-123 Eveleigh Street, Redfern. The site is located directly to the west of the heavy rail corridor and north of Redfern Station. Adjacent to the site to the north are several low-rise residential buildings, with open grassland across Eveleigh Street to the west. Pemulwuy Precincts 1 and 2 are proposed for development in these open areas which will consist of low-rise buildings. Further to the north and east are low and mid-rise residential and commercial buildings in the suburbs of Chippendale and Redfern. To the south, adjacent to Redfern Station is a cluster of high-rise buildings, with low and mid-rise residential and commercial buildings extending towards Green Square and Alexandria. Low-rise residential terraces extend to the west away from the site towards The University of Sydney.

A survey of the local land topography indicates that there is a downwards slope from south to north across the site. An aerial image of the subject site and the local surroundings is shown in Figure 1.

The proposed development is set on a roughly triangular lot and includes student housing apartments arranged in three adjoining, internally connected blocks. The southern block is 18 storeys high, while the northern block is 9 storeys high. The central block is the tallest at 24 storeys above ground. All blocks are rectangular in plan, with the northern and southern blocks having smaller floorplates than the larger central block. The critical trafficable areas associated with the proposed development, which are the focus of this assessment with regards to wind effects, are detailed as follows:

- The ground level pedestrian areas along Eveleigh Street and around the site.
- The landscaped courtyard at the northern end of the Lower Ground Level.
- The roof terrace on Level 21 of the development.

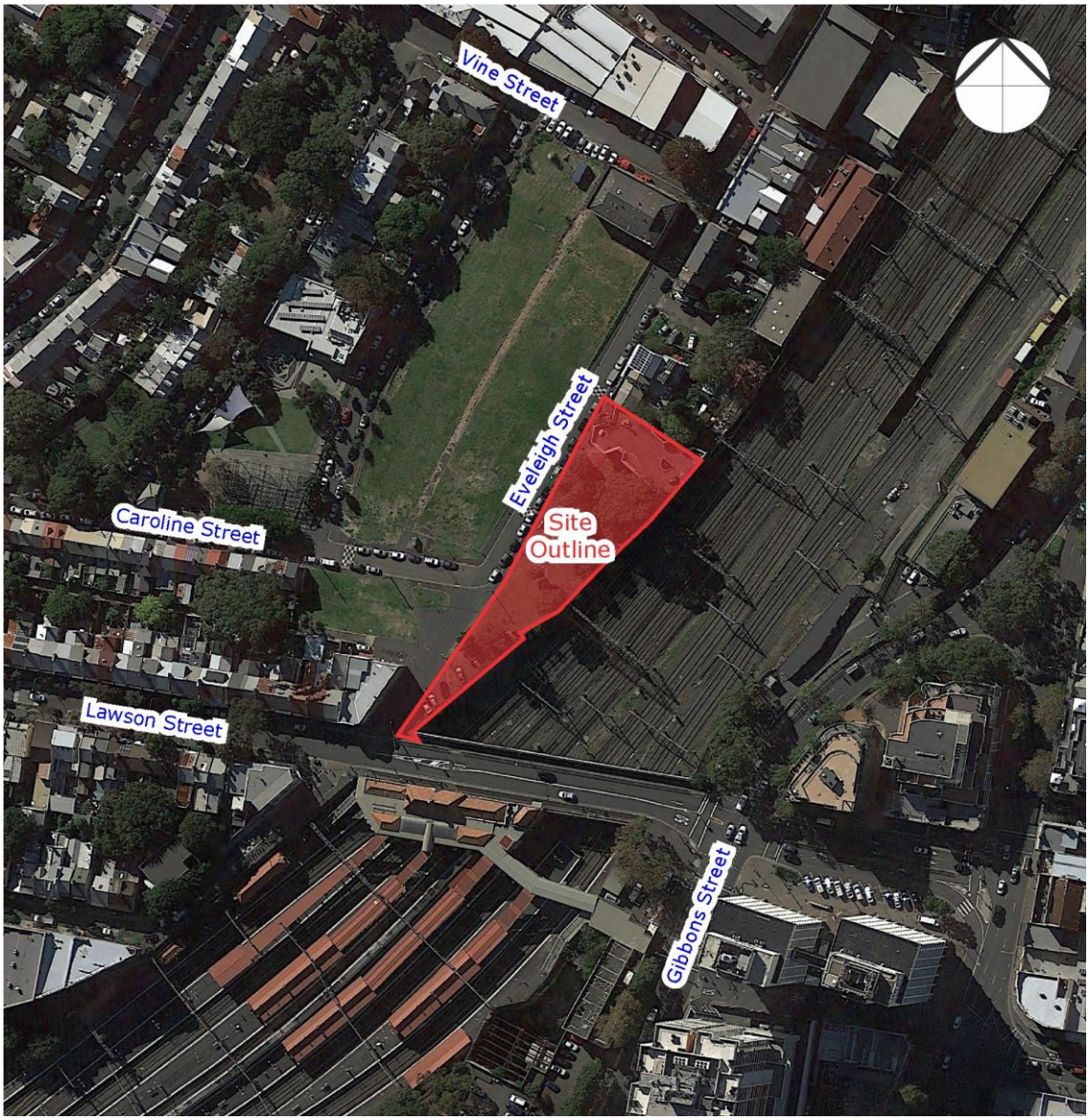

Figure 1: Aerial Image of the Site Location

2 WIND CLIMATE OF THE SYDNEY REGION

The Sydney region is governed by three principal 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 1995 to 2016). 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: Principal 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	

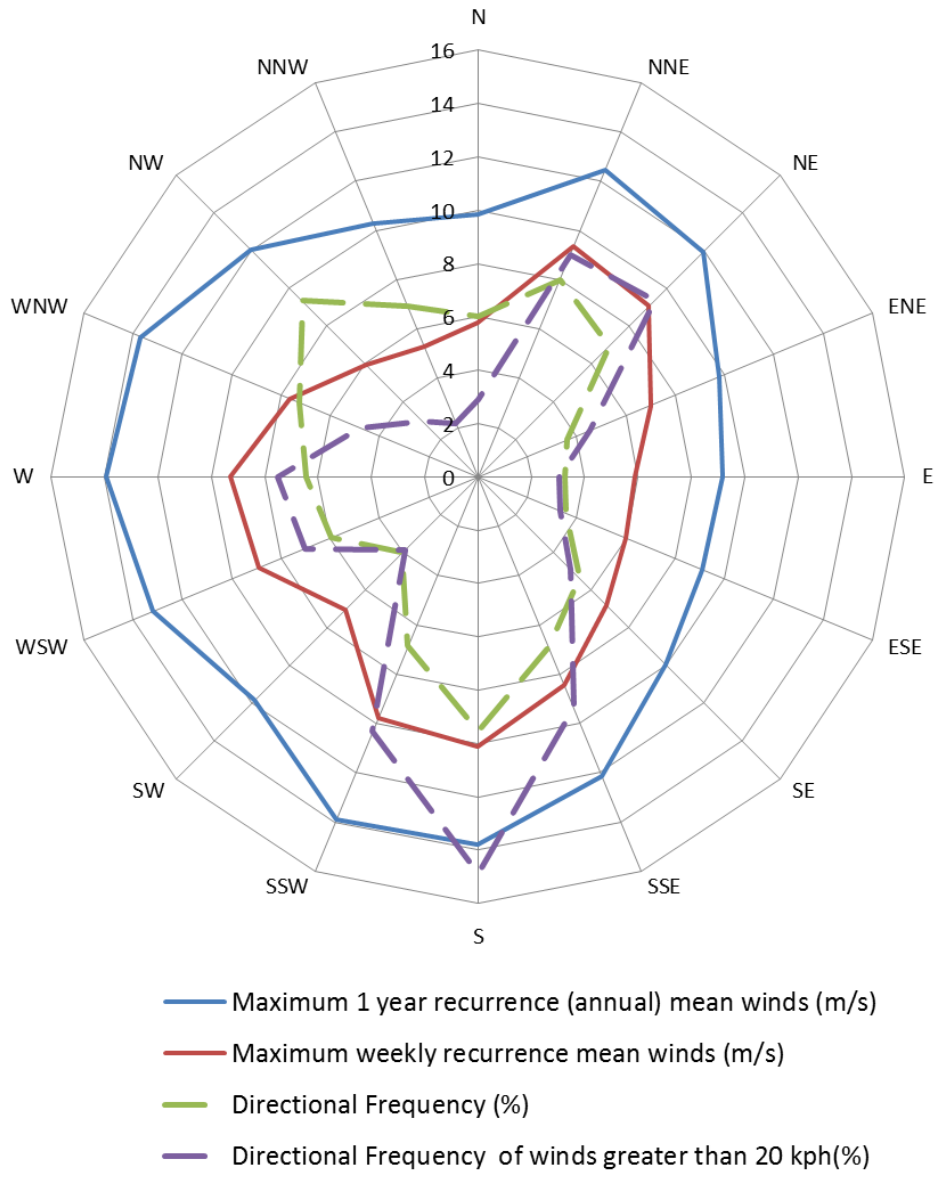

Figure 2: Annual and Weekly Recurrence Mean Wind Speeds, and Frequencies of Occurrence, for the Sydney Region (based on 10-minute mean observations from Kingsford Smith Airport from 1995 to 2016, corrected to open terrain at 10m)

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 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	Mean Wind 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 principal wind directions for the Sydney region. The interaction between the wind and the building morphology in the area is considered and important features taken into account including the distances between the surrounding buildings and the proposed building form, their overall heights and bulk, as well as the surrounding landform. Note that only the potentially critical wind effects are discussed in this report.

4.1 Ground Level Pedestrian Accessible Areas around the Site

The massing and orientation of the proposed development is expected to provide shielding of the southerly and north-easterly winds for the Eveleigh Street pedestrian footpath. The staggered form of the three blocks along with the setback of the central and northern blocks from the low-rise lobby and communal areas below are expected to reduce the potential for the westerly winds to downwash off the façade of the development and impact the Eveleigh Street frontage. Southerly winds have the potential to accelerate around the southern corner of the development, and may cause uncomfortable wind conditions within the nearby areas. It is recommended that the proposed tree planting at this corner be retained in the final design of the development, as indicated in Figure 3a. Note that to be effective in wind mitigation, trees should be evergreen and densely foliating, with interlocking canopies where possible.

Wind tunnel testing is being undertaken for the subject development to provide a quantitative analysis of the wind conditions at ground level and to determine the requirement for and extent of any required treatments.

4.2 Lower Ground Level Landscaped Courtyard

The landscaped courtyard on Ground Level is generally well shielded from most wind directions. There may be, however, potential for the westerly winds to downwash off the main façade of the central and northern blocks and redirected into the communal courtyard area. To mitigate this potential wind effect, it is recommended that proposed tree planting be retained in the final design of the development, as shown in Figure 3b, which will act to stagnate this flow path. Note that to be effective in wind mitigation, trees should be evergreen and densely foliating, with interlocking canopies where possible.

Wind tunnel testing is being undertaken for the subject development to provide a quantitative analysis of the wind conditions and to determine the requirement for and extent of any required treatments within the courtyard area.

4.3 Roof Terrace

The roof terrace on Level 21 of the proposed development is expected to benefit from shielding of the north-easterly and southerly winds provided by the building massing and form. However, the terrace is potentially exposed to the direct impact of the westerly winds, and also to the southerly winds being upwashed over the roof and recirculating into the terrace area. The following treatments are recommended to mitigate these potential wind effects, and are shown in Figure 3c:

- Retain the proposed 1.8m high impermeable perimeter screen.
- Retain tree planting as proposed at the northern corner of the roof terrace.

Note that to be effective in wind mitigation, trees should be evergreen and densely foliating, with interlocking canopies where possible.

Wind tunnel testing is being undertaken for the subject development to provide a quantitative analysis of the wind conditions and to determine the requirement for and extent of any required treatments within the roof terrace area.

Recommended Treatment

Retain tree as proposed. Tree should be densely foliating and evergreen, with interlocking canopies where possible.

Figure 3a: Recommended Treatments – Upper Ground Level Plan

Recommended Treatment

Retain tree as proposed. Tree should be densely foliating and evergreen, with interlocking canopies where possible.

Figure 3b: Recommended Treatments – Lower Ground Level Plan

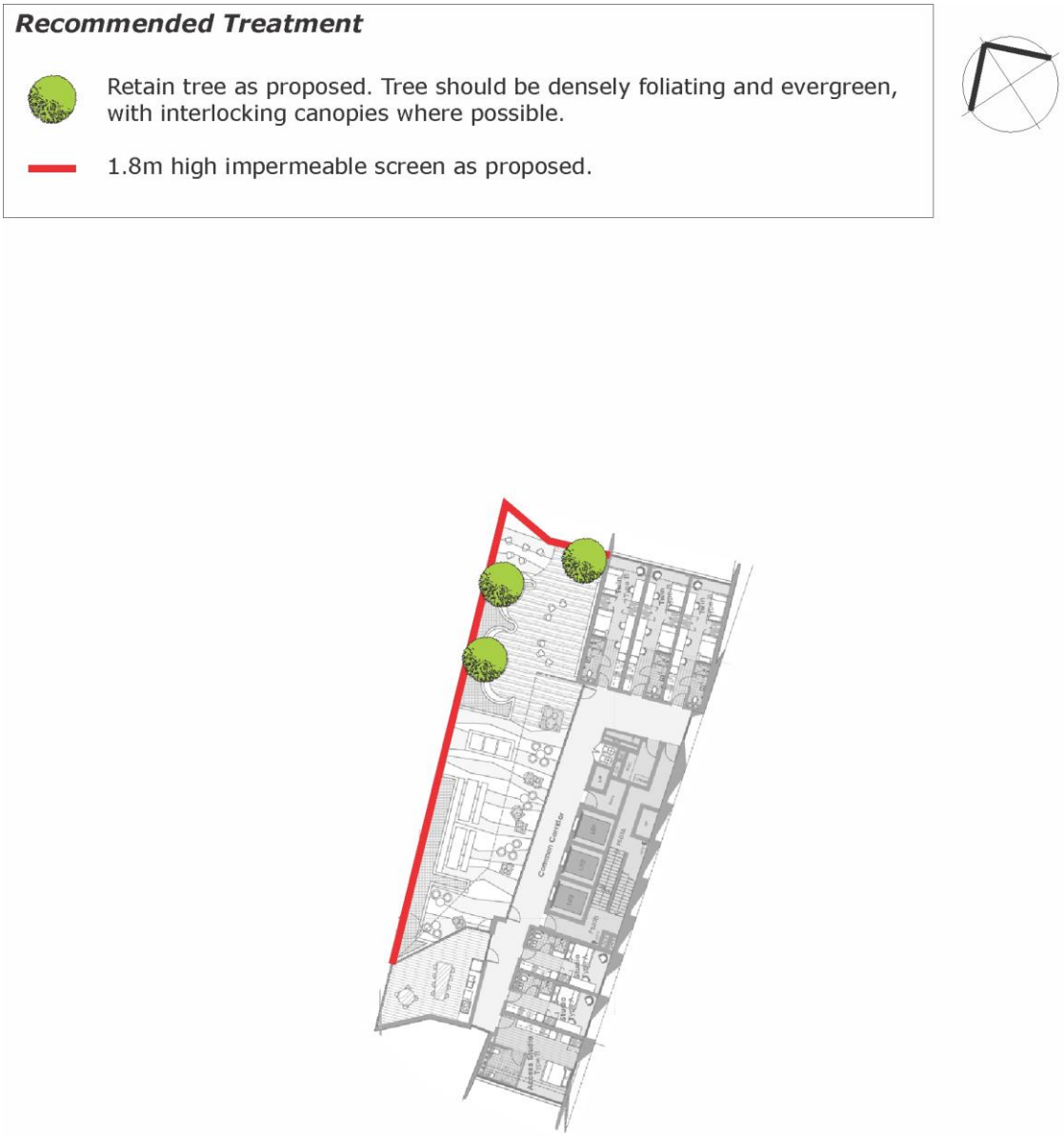

Figure 3c: Recommended Treatments – Level 21 Plan