



PEDESTRIAN WIND ENVIRONMENT STATEMENT

TAFE MEADOWBANK, EDUCATION PRECINCT  
COMBINED MULTI TRADES AND  
DIGITAL TECHNOLOGY HUB

WF019-01F02(REV3)- WS REPORT

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## DOCUMENT CONTROL

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## EXECUTIVE SUMMARY

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This report presents an opinion on the likely impact of the proposed Meadowbank TAFE Education Precinct development located at Meadowbank, on the local wind environment at the critical outdoor areas within the subject development boundary outline. The effect of wind activity is examined for the three predominant wind directions for the Bankstown region; namely the north-easterly, south to south-easterly 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 latest architectural drawings. No wind tunnel testing was 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 the subject development is relatively exposed to the three prevailing wind directions affecting the site. As a result, there is a possible impact on the wind comfort within the various outdoor workshop areas and pedestrian spaces. It is expected that the wind effects identified in the report can be ameliorated with the consideration of the following treatment strategies into the design of the development:

### Ground Level Thoroughfare

- Retention of existing and proposed densely foliating evergreen tree planting.
- Inclusion of additional densely foliating evergreen tree planting at various critical locations along the site.

### Outdoor Workshop Areas on Level 3 and the External Loading Yard

- Retention of the proposed 1.5m high impermeable balustrade on the western aspect of the southern outdoor workshop.
- Retention of the proposed 1.5 m high impermeable screen around the northern and western aspects of the northern outdoor workshop.
- Retention of existing and proposed densely foliating evergreen tree planting.

### Pedestrian Footpaths along See Street and the Entrance to the Subject Development on the Eastern Aspect on Level 4

- Inclusion of densely foliating evergreen hedge planting or bushes along the eastern aspect adjacent to the Level 4 entrance and at the north-eastern corner before the Level 4 entrance. These should be at least 1m high.

#### Outdoor Workshop Area on the Roof Level

- Retention of the proposed 2m high impermeable screen along the eastern, southern and of the outdoor workshop.
- Inclusion of 2m high impermeable screen on the western aspect between the mechanical vents and the building.
- Retention of the proposed standard height impermeable balustrade adjacent to the south-western mechanical vents.

#### The Atrium through the Centre of the Subject Development

- Retain the proposed airlock at the Level 4 entrance.

## CONTENTS

1	Introduction	1
2	Description of the Development and Surroundings	2
3	Regional Wind	4
4	Wind Effects on People	5
5	Planning Secretary's Environmental Assessment Requirements	6
6	Results and Discussion	7
6.1	Ground Level Thoroughfare	7
6.2	Outdoor Workshop Areas on Level 3 and the External Loading Yard	8
6.3	Pedestrian Footpaths along See Street and the Entrance to the Subject Development on the Eastern Aspect on Level 4	8
6.4	Outdoor Workshop Area on the Roof Level	9
6.5	The Atrium through the Centre of the Subject Development	9
7	References	13

# 1 INTRODUCTION

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An opinion on the likely impact of the proposed design on the local wind environment affecting pedestrians within the critical outdoor areas within and around the subject development is presented in this report. The analysis of wind effects relating to the proposed development was carried out in the context of the predominant wind directions for the region, building morphology of the development and nearby buildings, and local land topography. The conclusions of this report are drawn from our extensive experience in the field of wind engineering and studies of wind environment effects.

No wind tunnel testing was undertaken for this assessment. Hence this report addresses only the general wind effects and any localised effects that are identifiable by visual inspection, and any recommendations in this report are made only in-principle.

## 2 DESCRIPTION OF THE DEVELOPMENT AND SURROUNDINGS

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The development site is bounded by See Street to the south-east, McPherson Street to the north-east and low to mid rise buildings abutting the site on the western boundary that are a part of the TAFE complex. Surrounding the site are predominantly low rise retail/residential buildings to the east and west of the site. Furthermore, there are low to mid-rise industrial buildings to the south and north of the site. A survey of the land topography indicates no major elevation changes in the region surrounding the site from the south-west to the north-east. However, there is a major elevation change in the region surrounding the site from the west to the east. An aerial image of the subject site and the local surroundings is shown in Figure 1.

The proposed development includes an outdoor workshop and pedestrian thoroughfare on the Ground Level, with classrooms, seminar rooms and workshops on the levels above. The overall height of the development is 6 storeys above ground. The trafficable areas which have been assessed with regards to wind effects, are detailed as follows:

- The Pedestrian thoroughfare and outdoor workshop between the proposed development and Building P on the Ground Level.
- The outdoor workshop on the southern aspect of the subject development on Level 3.
- The outdoor workshop and the Loading Yard on the northern aspect of the subject development on Level 3.
- The pedestrian footpaths on See Street and the entrance to the Subject Development on the Eastern aspect of the development on Level 4.
- The outdoor workshop on the Roof of the subject development.
- The atrium through the centre of the subject development.



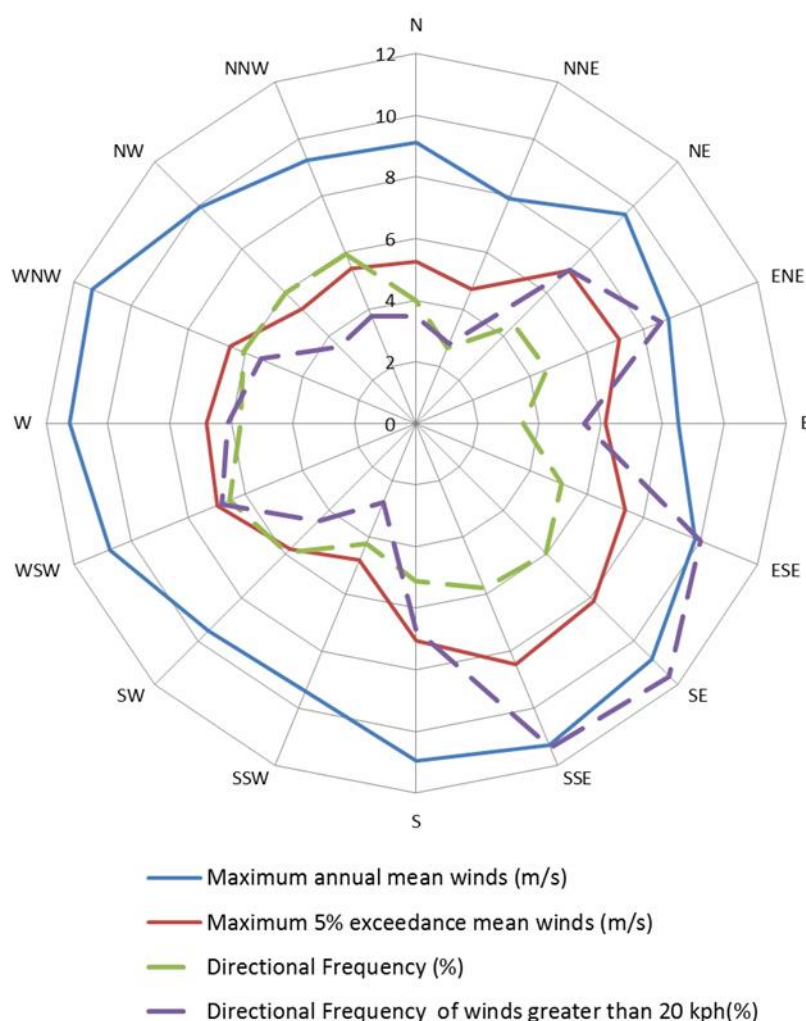


**Figure 1: Aerial Image of the Site Location**



### 3 REGIONAL WIND

The Meadowbank region is governed by three principal wind directions, and these can potentially affect the subject development. These winds prevail from the north-east, south to south-east and west. These wind directions were determined from an analysis undertaken by Windtech Consultants of recorded directional wind speeds obtained at the meteorological station located at Bankstown Airport by the Bureau of Meteorology. The data has been collected from this station from 1993 to 2016 and corrected so that it represents winds over standard open terrain at a height of 10m above ground level. Figure 2 shows a summary of this analysis in the form of, a directional plot of the annual and 5% exceedance mean winds for the Bankstown region is also determined. The frequency of occurrence of these winds is also shown in Figure 2.



**Figure 2: Annual and 5% Exceedance Hourly Mean Wind Speeds, and Frequencies of Occurrence, for the Meadowbank Region (referenced to 10m above ground in standard open terrain)**

## 4 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 A.G. Davenport, T.V. Lawson, W.H. Melbourne, and A.D. Penwarden, 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.

For example, A.D. Penwarden (1973) developed a modified version of the Beaufort scale which describes the effects of various wind intensities on people. Table 1 presents the modified Beaufort scale. Note that the effects listed in this table refers to wind conditions occurring frequently over the averaging time (a probability of occurrence exceeding 5%). Higher ranges of wind speeds can be tolerated for rarer events.

**Table 1: Summary of Wind Effects on People (A.D. Penwarden, 1973)**

Type of Winds	Beaufort Number	Mean Wind Speed (m/s)	Effects
Calm	0	Less than 0.3	Negligible.
Calm, light air	1	0.3 – 1.6	No noticeable wind.
Light breeze	2	1.6 – 3.4	Wind felt on face.
Gentle breeze	3	3.4 – 5.5	Hair is disturbed, clothing flaps, newspapers difficult to read.
Moderate breeze	4	5.5 – 8.0	Raises dust, dry soil and loose paper, hair disarranged.
Fresh breeze	5	8.0 – 10.8	Force of wind felt on body, danger of stumbling
Strong breeze	6	10.8 – 13.9	Umbrellas used with difficulty, hair blown straight, difficult to walk steadily, wind noise on ears unpleasant.
Near gale	7	13.9 – 17.2	Inconvenience felt when walking.
Gale	8	17.2 – 20.8	Generally impedes progress, difficulty balancing in gusts.
Strong gale	9	Greater than 20.8	People blown over.

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. Any recommendations in this report are made only in-principle and are based on our extensive experience in the study of wind environment effects.

## **5 PLANNING SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS**

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In addition to assessing the wind impact of the proposed design on the local wind environment to the critical outdoor areas, the subject development will also be assessed against the Planning Secretary's Environmental Assessment Requirements (SEAR's). The requirements are as follows:

### **5. Environmental Amenity**

- Detail amenity impacts including solar access, acoustic impacts, visual privacy, view loss, overshadowing and wind impacts. A high level of environmental amenity for any surrounding residential land uses must be demonstrated.

The following section details the wind impacts the subject development is expected to have on the pedestrian trafficable areas within the boundary outline of the subject development.

## 6 RESULTS AND DISCUSSION

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The expected wind conditions are discussed in the following sub-sections of this report for the various outdoor areas within the subject development boundary outline. 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, as well as the surrounding landform. Note that only the potentially critical wind effects are discussed in this report.

The Ground Level will be used primarily for circulation. However there are also outdoor workshop areas throughout the development that will be subject to a more stringent criteria. The recommended criterion for wind conditions for the circulation area is 7.5m/s with a 5% probability of exceedance, whereas the proposed outdoor workshop areas will need to satisfy a more stringent comfort criterion of 5.5m/s with a 5% probability of exceedance. Although this assessment is of a qualitative nature, the abovementioned criteria are considered when assessing the wind environment impacts.

### 6.1 Ground Level Thoroughfare

The subject development is situated along a significant rise in Ground Level terrain from the west to the east, with the potential for north-easterly and southerly winds to funnel through buildings along the main pedestrian thoroughfare situated within between Building P and The subject development. While the westerly winds may also intermittently impact the Ground Level thoroughfare, these are expected to be somewhat mitigated with the retention of the existing densely foliating evergreen landscaping/tree planting to the west of the Main Civic Plaza along the Campus Green and beyond (noted in the landscape design of the campus masterplan).

The retention of existing and already proposed densely foliating evergreen landscaping/tree planting along the Northern Entry Plazas and Main Civic Plaza areas (noted in the landscape design of the campus masterplan) is expected to aid in mitigating adverse winds potentially affecting the Ground Level thoroughfare due to the prevailing wind directions. The retention of the proposed landscaping through the Ground level thoroughfare in the final design of the development is expected to help mitigate the direct southerly winds and the prevailing north-easterly winds impact this area.

Furthermore, it is recommended that the proposed trees at the southern aspect of Building P and the existing trees between Buildings F and G be retained in the final design of the development in order to shield the pedestrian thoroughfare between Building P and the subject development from the prevailing westerly winds. Already proposed densely foliating evergreen landscaping/tree planting within the remainder of the campus masterplan is also recommended to be retained to further enhance wind conditions.

Furthermore, additional trees are also recommended at the northern most corner of the carpark at Level 1 (as indicated by Figure 3) to mitigate potential north-easterly winds accelerating around this corner and impacting the Ground Level entrance and outdoor workshop area on the western aspect of the development.

It should be noted that a landscape design has been developed for the remainder of the campus which is subject to a separate development application (alternative planning pathway), which will include the abovementioned tree planting. This is expected to have a positive impact on the ground level thoroughfare between the subject development and Building P in regards to ameliorating wind conditions.

This outdoor workshop area is expected to benefit from the shielding provided by the abovementioned additional trees ameliorating the direct and sidestreaming prevailing winds. As noted, all recommended landscaping should be densely foliating and of an evergreen species to effectively aid in mitigating adverse wind conditions affecting the site throughout the year.

## **6.2 Outdoor Workshop Areas on Level 3 and the External Loading Yard**

The outdoor workshop area on the southern aspect benefits from shielding from the prevailing winds from the south and north-east due to the topography at the site. However, the workshop area at the southern aspect of the development on Level 3 is susceptible to the direct impact of prevailing winds from the west. Furthermore, it is expected that these winds will accelerate around the south-west corner of the workshop and funnel between Building G and the subject development. In order to mitigate these adverse wind conditions, it is recommended that the proposed impermeable balustrade that is at least 1.5m high on the western aspect of the Outdoor Workshop be retained in the final design of the development, as indicated by Figure 3. Furthermore, it is also recommended that the existing and proposed evergreen tree planting throughout the site be retained in the final design of the masterplan development.

The outdoor workshop area and external loading yard area on the northern aspect benefits from shielding from the south and partial shielding from winds from the north-east due to the subject development and the zone substation to the north. However, the external loading yard is susceptible to the north-easterly winds flowing over the zone substation and reattaching at the loading yard. It is expected that these reattached winds will stagnate at the external loading yard. The external loading yard and the outdoor yard are susceptible to the westerly winds accelerating around the north-western corner of the development and directly impacting these areas. In order to mitigate these adverse wind conditions, it is recommended that the proposed 1.5m high impermeable balustrade around the northern and western aspects of the outdoor workshop be retained in the final design of the development, as indicated by Figure 3.

## **6.3 Pedestrian Footpaths along See Street and the Entrance to the Subject Development on the Eastern Aspect on Level 4**

The pedestrian footpath areas along See Street adjacent to the subject development are exposed to the prevailing north-easterly and southerly winds due to the orientation of See

Street. However, it is expected that with the inclusion of the subject development the wind conditions along the pedestrian footpaths on See Street will be similar to the existing site conditions and suitable for its intended use.

The entrance to the subject development on Level 4 benefits from shielding from the prevailing westerly winds due to the orientation of the subject development. However, it is expected that the Level 4 entrance is susceptible to the southerly winds accelerating around the south-eastern corner of the development and sidestreaming along the eastern aspect impacting the entrance area. Furthermore, it is expected that the prevailing north-easterly winds will accelerate around the north-eastern corner and impact the Level 4 entrance. In order to mitigate these adverse wind conditions, it is recommended that a row of densely foliating evergreen hedges or bushes along the eastern aspect before the Level 4 entrance and at the north-eastern corner before the Level 4 entrance be included in the final design of the development. These should be at least 1m high. The trees would essentially be along either side of the Level 4 entrance.

#### **6.4 Outdoor Workshop Area on the Roof Level**

The outdoor workshop area on the Roof level is exposed to the prevailing southerly, westerly and north-easterly winds. It is expected that the prevailing westerly and southerly winds will directly impact this area. It is also expected that the prevailing north-easterly winds will accelerate around the north-eastern corner of the development and impact the outdoor workshop area. In order to mitigate these adverse wind conditions, it is recommended that the proposed 2m high impermeable screens along the eastern, and southern aspects of the outdoor workshop area be retained in the final design of the development. It is also recommended that a 2m high impermeable screen on the western aspect between the mechanical vents and the building be included in the final design of the development. Furthermore, it is also recommended that the proposed standard height impermeable balustrade along the eastern and southern aspects of the outdoor workshop that meet the mechanical vents at the south-western corner of the floor be retained in the design of the development.

#### **6.5 The Atrium through the Centre of the Subject Development**

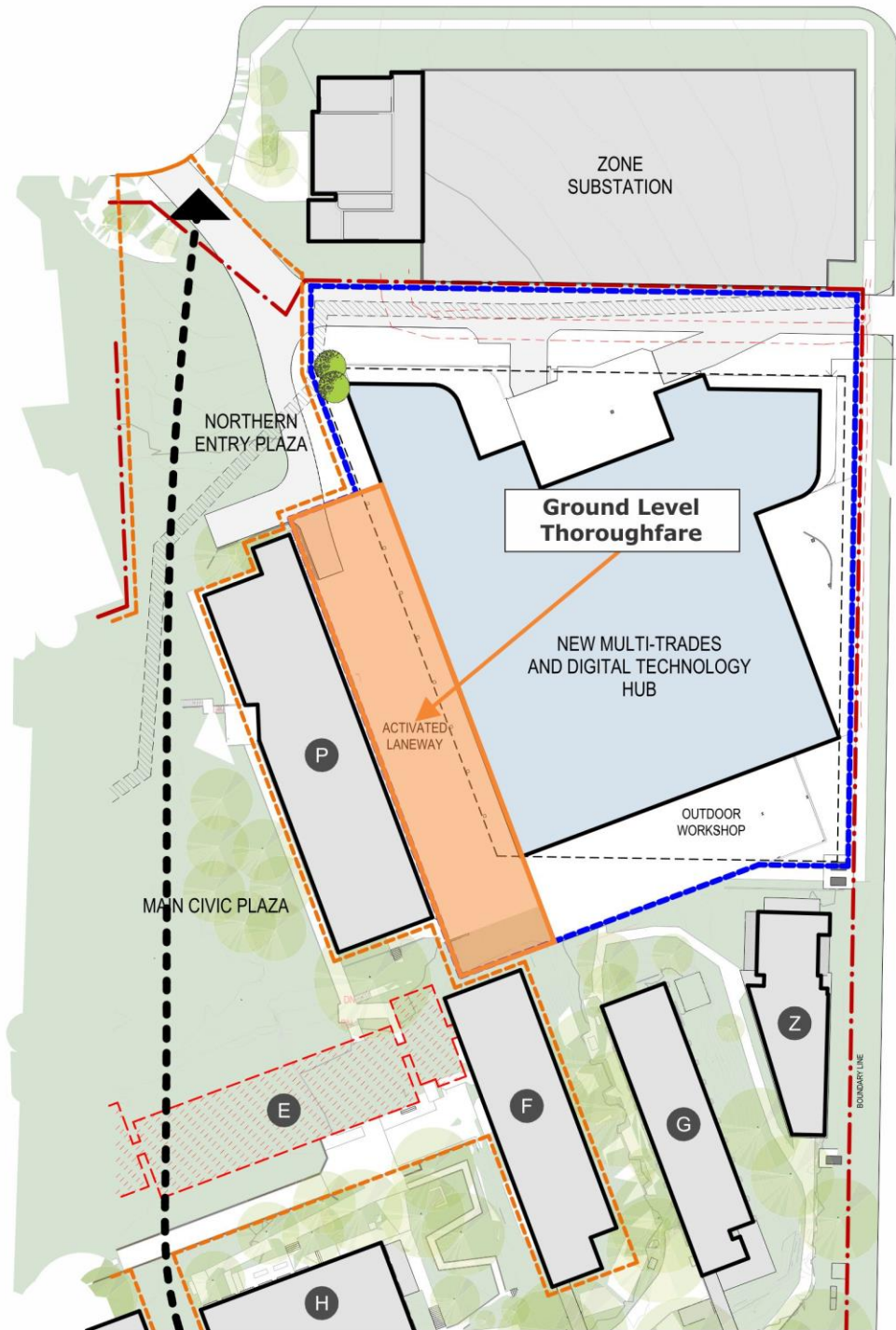
The open atrium through the centre of the subject development is susceptible to pressure driven flow from the Ground Level entrance to the Level 4 entrance and vice versa. It is expected that the prevailing westerly winds will flow through the Building P pedestrian through link and positively pressurise the Ground level entrance whilst the Level 4 entrance is negatively pressurised. This potential difference in pressure is expected to drive the wind flow through the subject development, making wind conditions potentially uncomfortable. Similarly, it is expected that the prevailing north-easterly winds accelerating around the north-eastern corner will positively pressurise the Level 4 entrance whilst the Ground Level entrance is negatively pressurised.



With the inclusion of the proposed airlock at the Level 4 entry and the proposed double leaf sliding door at the Level 1 entry, the wind conditions at the Level 1 entry, the Level 4 entry and throughout the atrium through the centre of the subject development are expected to be suitable for their intended uses. With the inclusion of the airlock at the Level 4 entry, it is expected that the pressure driven flow through the development will be mitigated. It should be noted that for the airlock to be most effective in mitigating the pressure driven flow, the internal door should be perpendicular to the external door.

### Legend

-  Recommended additional densely foliating evergreen tree planting.



**Figure 3a: Ground Floor Thoroughfare Plan**

### Legend

— Retain the proposed 1.5m high impermeable balustrade.



**Figure 3b: Outdoor Workshop and External Loading Yard Plan**

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