PEDESTRIAN WIND ENVIRONMENT STATEMENT

36-52 WELLINGTON STREET, COLLINGWOOD

WE824-01F02(REV3)- 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 located at 36-52 Wellington Street, Collingwood and presents an opinion on the likely impact of the proposed design on the local wind environment on 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 Melbourne region; namely the northerly, 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 latest architectural drawings. 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 the development is relatively exposed to the prevailing southerly winds due to the minimal shielding provided by the upwind low-rise buildings, and is somewhat shielded from the northerly prevailing winds by the proposed development located directly to the north-east. The lower half of the development is expected to be somewhat shielded from the prevailing westerly winds due to the proposed development located to the west; however, the top half of the development is relatively exposed to the prevailing westerly winds. As a result, there is a possible slight impact on the wind comfort at ground level pedestrian footpaths and external terraces within the development, primarily due to the prevailing northerly, southerly and westerly winds.

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 Entrances and Pedestrian Footpaths:

- Inclusion of a 2m wide awning above Ground Level, along the Northumberland Street frontage.
- Inclusion of a 2m wide awning above Ground Level, along the Wellington Street frontage. Awning may be broken to allow room for the existing tree canopies.
- Inclusion of a wrap-around awning around the north-western corner, connecting the two recommended canopies along the Northumberland Street and Wellington Street frontages may be required, subject to further testing in the wind tunnel.
- Retention of existing trees along the Wellington Street frontage and inclusion of additional trees along Northumberland Street frontage may be required, subject to further testing in the wind tunnel.

Level 4 External Terrace:

- Inclusion of 1.5m to 2m high, up to 30% porous balustrades along the perimeter of the terrace.
- Inclusion of a 1.5m to 2m wide, 2m to 2.5m high, and 25% to 35% porous screen, located at the north-western corner of the terrace, abutting the building outline and facing north-south.
- Inclusion of a 2m to 2.5m wide, 2m to 2.5m high, and 25% to 35% porous screen, located at the south-western corner of the terrace, abutting the building outline and facing east-west.
- Inclusion of multiple 25% to 35% porous screens with a height of 2m to 2.5m between the western building outline and every pillar located on the western side of the terrace.

Level 14 External Terrace:

- Inclusion of at least 1.5m high impermeable balustrades along the perimeter of the terrace.
- Retention of vertical acoustic façade louvers along the external plant area to make the façade to be approximately 30% porous.

Wind tunnel testing is recommended to be undertaken at a later detailed design stage to verify the wind conditions and enable a more detailed feedback and design of the proposal and potential wind mitigation measures. This will provide a quantitative analysis of the wind conditions and determine the requirement for wind mitigation measures, including the optimum size and extent of treatments to ensure suitable conditions are provided for the trafficable areas throughout the development. Note that the inclusion of any additional landscaping or planting within and around the building is expected to be effective in improving local wind conditions. It is also recommended to retain all impermeable balustrades along all remaining terraces of the development.

CONTENTS

1 INTRODUCTION

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 has been 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 has been 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

The development site is bounded by Northumberland Street to the north, Wellington Street to the west, medium-rise buildings abutting to the east and some low rise buildings abutting the site on the southern boundary. To the west of the site, across Wellington Street is an approved proposed medium-rise development. Similarly, directly to the north-east of the site, across the Northumberland Street is another under-construction medium-rise development. Surrounding the site are predominantly low rise retail/residential buildings with scattered intermittent medium-rise buildings. A survey of the land topography indicates a slight rise in terrain to the far west of the surrounding area of the site; apart from that, the survey does not indicate any major elevation changes in the region surrounding the site. An aerial image of the subject site and the local surroundings is shown in Figure 1.

The proposed development includes a café and restaurants at the ground level, with offices above. The overall height of the development is fourteen storeys above ground. This assessment covers the various outdoor trafficable areas within and around the proposed development, namely the ground level pedestrian footpaths and external terraces.

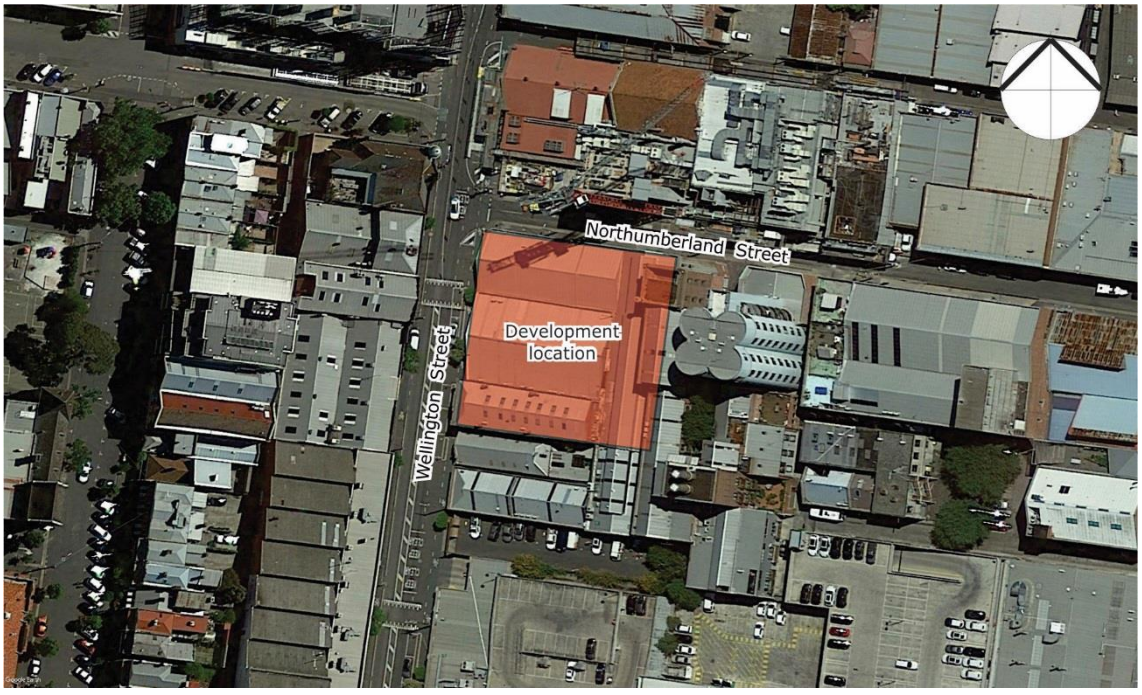

Figure 1: Aerial Image of the Site Location

3 REGIONAL WIND

The Melbourne region is governed by three principal wind directions, and these can potentially affect the subject development. These winds prevail from the north, 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 Melbourne Airport by the Bureau of Meteorology (recorded from 1970 to 2009). From this analysis, a directional plot of the annual, weekly recurrence and 20% (probability of exceedance) winds for the Melbourne 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 northerly winds are by far the most frequent wind for the Melbourne region, and are also the strongest. The southerly winds occur most frequently during the summer and colder months of the year. The far less frequent westerly winds are usually a cold wind since they occur during the spring and winter months and hence can be a cause for discomfort for outdoor areas. The northerly and southerly winds occur most frequently during the warmer months of the year for the Melbourne region, and hence are usually welcomed within outdoor areas.

Table 1: Principal Time of Occurrence of Winds for Melbourne

Month	Wind Direction		
	Northerly	Southerly	Westerly
January	X	X	
February	X	X	
March	X	X	
April	X	X	
May	X		X
June	X		X
July	X		X
August	X		X
September	X		X
October	X	X	X
November	X	X	X
December	X	X	

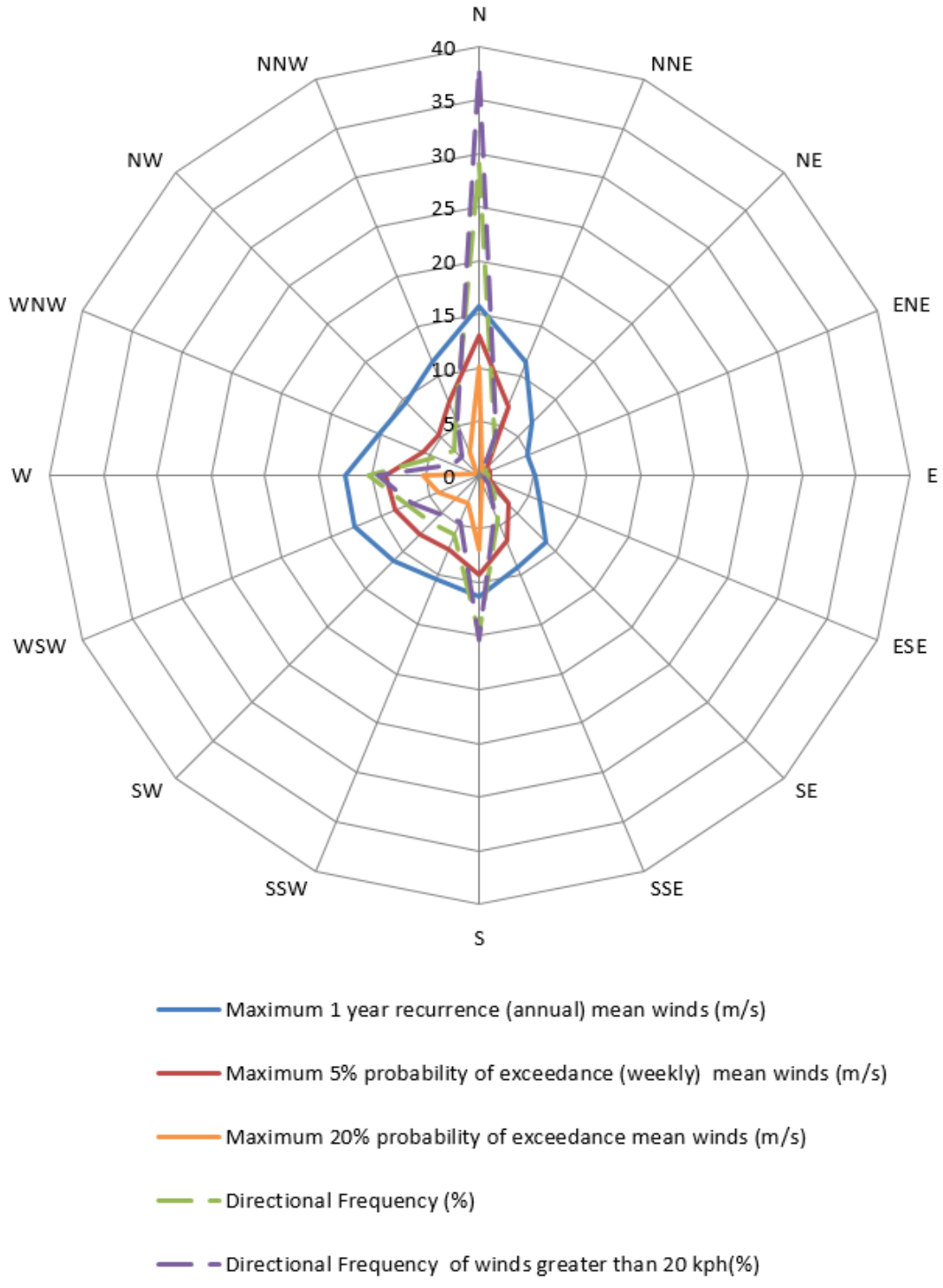

Figure 2: Annual, Weekly Recurrence and 20% (probability of exceedance) Mean Wind Speeds, and Frequencies of Occurrence, for the Melbourne Region (based on 10-minute mean observations from Melbourne Airport from 1970 to 2009, corrected to open terrain at 10m)

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 2 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 2: 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 (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.

5 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. 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. The recommended criterion for wind conditions for the circulation area is 7.5m/s with a 5% probability of exceedance. The elevated external terraces are private areas, hence the recommended criterion for wind conditions for these private external terraces is 7.5m/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.

5.1 Ground Level Entrances and Pedestrian Footpaths

Due to the east-west orientation of Northumberland Street and north-south orientation of Wellington Street, the footpaths and ground level areas will be exposed to the westerly winds along Northumberland Street and both the northerly and southerly winds along Wellington Street, although these are existing conditions at the site location.

Due to the low-rise nature of the surrounding buildings to the south and the location of the proposed neighbouring medium-rise development directly to the north-east, the development will be relatively exposed to prevailing northerly and southerly winds. It is therefore recommended to include a 2m wide awning above Ground Level, along the Northumberland Street frontage to mitigate any downwash due to the northerly winds. Additional trees along the Northumberland Street frontage are also recommended, subject to further testing in the wind tunnel. Similarly, it is recommended to retain existing trees and include a 2m wide awning above Ground Level, along the Wellington Street frontage to mitigate the potential adverse impact of the side-streaming prevailing northerly and southerly winds as well as any downwash due to the prevailing westerly winds. Inclusion of a wrap-around awning around the north-western corner, connecting the two recommended canopies along the Northumberland Street and Wellington Street frontages may be required, subject to further testing in the wind tunnel.

5.2 Level 4 External Terrace

It is recommended to include a 1.5m to 2m wide, 2m to 2.5m high, and 25% to 35% porous screen, located at the north-western corner of the terrace, abutting the building outline and facing north-south. This screen is expected to impede the side-streaming and corner

accelerations due to the westerly and northerly winds, and direct impact due to southerly winds. Hence, this is expected to assist in mitigating adverse wind conditions along the western and northern side of the terrace area.

It is recommended to include a 2m to 2.5m wide, 2m to 2.5m high, and 25% to 35% porous screen, located at the south-western corner of the terrace, abutting the building outline and facing east-west. This screen is expected to impede the side-streaming and corner accelerations due to the southerly and westerly winds. Hence, this is expected to assist in mitigating adverse wind conditions along the western and southern side of the terrace area.

To further reduce the adverse impact of the side-streaming winds along the western side of the terrace area, it is recommended to include multiple 25% to 35% porous screens with a height of 2m to 2.5m between the western building outline and every pillar located on the western side of the terrace.

It is also recommended to include 1.5m to 2m high, up to 30% porous balustrades along the perimeter of the terrace. These porous balustrades are expected to further assist in mitigating direct adverse winds impacting the terrace area.

5.3 Level 14 External Terrace

The Level 14 External Terrace is relatively exposed to the prevailing southerly and northerly winds and is expected to somewhat benefit from the prevailing westerly winds due to the built form of the development itself.

It is recommended to include at least 1.5m high impermeable balustrades along the perimeter of the terrace. These balustrades are expected to assist in impeding the direct impact of the prevailing winds and mitigating adverse wind conditions the terrace area.

It is also recommended to retain vertical acoustic façade louvers to the external plant area to make the façade to be approximately 30% porous. This porous façade is expected to absorb some of the impact of the direct prevailing winds and it is also expected to mitigate the reattached southerly and northerly winds and prevent them from side-streaming across the building façade and accelerating around the corner onto the eastern side of the terrace area.

Wind tunnel testing is recommended to be undertaken at a later detailed design stage to verify the wind conditions and enable a more detailed feedback and design of the proposal and potential wind mitigation measures. This will provide a quantitative analysis of the wind conditions and determine the requirement for wind mitigation measures, including the optimum size and extent of treatments to ensure suitable conditions are provided for the trafficable areas throughout the development. Note that the inclusion of any additional landscaping or planting within and around the building is expected to be effective in improving local wind conditions. It is also recommended to retain all impermeable balustrades along all remaining terraces of the development.

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