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MICROCLIMATE ASSESSMENT IN SUPPORT OF A PLANNING APPLICATION FOR A MIXED-USE DEVELOPMENT ON A SITE AT NO.158A RICHMOND ROAD, DUBLIN

Report Prepared For

Malkey Ltd

Technical Report Prepared By

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EXECUTIVE SUMMARY

AWN were commissioned by Malkey Limited to undertake an assessment with regard to Microclimate Effects associated with a proposed mixed-use development on a site at Leydens Wholesalers and Distributors,158A Richmond Road in Dublin. The aim of the assessment was to determine if there was considered to be potential microclimate effects with a particular focus on wind-speed impacts.

The site of the proposed development was characterised as a site which experiences average wind speeds of B3, which corresponds to gentle breeze on the Beaufort Scale.

Based on the analysis conducted it was concluded the proposed development would have no significant effects with regard to microclimate, either on amenity spaces in the vicinity of the development or within the development, or on podium level or roof garden areas.

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Signature	[illegible]	Elaine Neary
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Title	Director	Associate
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1.0 INTRODUCTION

AWN were commissioned by Malkey Limited to undertake an assessment with regard to Microclimate Effects associated with a proposed mixed-use development on a site at 158A Richmond Road in Dublin.

Malkey Limited intend to apply for permission for development (Large-scale Residential Development (LRD)) at this c. 0.55 hectare site at the former Leydens Wholesalers & Distributors, No. 158A Richmond Road, Dublin 3, D03 YK12. The site is bounded to the north-east by Richmond Road, to the west/south-west by No. 146A and Nos. 148-148A Richmond Road (pending application ABP Reg. Ref. TA29N.312352), to the south/south-west by a residential and commercial development (Distillery Lofts) and to the east/south-east by the Former Distillery Warehouse (derelict brick and stone building). Improvement works to Richmond Road are also proposed including carriageway widening up to c. 6 metres in width, the addition of a c. 1.5 metre wide one-way cycle track/lane in both directions, the widening of the northern footpath on Richmond Road to a minimum of c. 1.8 metres and the widening of the southern footpath along the site frontage which varies from c. 2.2 metres to c. 7.87 metres, in addition to a new signal controlled pedestrian crossing facility, all on an area of c. 0.28 hectares. The development site area and road works area will provide a total application site area of c. 0.83 hectares.

The proposed development will principally consist of: a Large-scale Residential Development (LRD) comprising the demolition of existing industrial structures on site (c. 3,359 sq m) and the construction of a mixed-use development including artist studios (c. 749 sq m), a creche (c. 156 sq m), a retail unit (c. 335 sq m), and a gym (c. 262 sq m), and 133 No. residential units (65 No. one bed apartments and 68 No. two bed apartments). The development will be provided in 3 No. blocks ranging in height from part 1 No. to part 10 No. storeys as follows: Block A will be part 1 No. storey to part 4 No. storeys in height, Block B will be part 1 No. storeys to part 10 No. storeys in height (including podium) and Block C will be part 1 No. storeys to part 9 No. storeys in height (including podium). The proposed development has a gross floor area of c. 14,590 sq m and a gross floor space of c. 13,715 sq m.

The development also proposes the construction of: a new c. 204 No. metre long flood wall along the western, southern and south-eastern boundaries of the proposed development with a top of wall level of c. 6.4 metres AOD to c. 7.15 metres AOD (typically c. 1.25 metres to c. 2.3 metres in height) if required; and new telecommunications infrastructure at roof level of Block B including shrouds, antennas and microwave link dishes (18 No. antennas enclosed in 9 No. shrouds and 6 No. transmission dishes, together with all associated equipment) if required. A flood wall and telecommunications infrastructure are also proposed in the adjoining Strategic Housing Development (SHD) application (pending decision ABP Reg. Ref. TA29N.312352) under the control of the Applicant. If that SHD application is granted and first implemented, no flood wall or telecommunications infrastructure will be required under this application for LRD permission (with soft landscaping provided instead of the flood wall). If the SHD application is refused permission or not first implemented, the proposed flood wall and telecommunications infrastructure in the LRD application will be constructed.

The proposed development also provides ancillary residential amenities and facilities; 25 No. car parking spaces including 13 No. electric vehicle parking spaces, 2 No. mobility impaired spaces and 3 No. car share spaces; 2 No. loading bays; bicycle parking spaces; motorcycle parking spaces; electric scooter storage; balconies and terraces facing all directions; public and communal open space; hard and soft landscaping; roof gardens; green roofs; boundary treatments; lighting; ESB substation; switchroom; meter room; comms rooms; generator; stores; plant; lift overruns; and all associated works above and below ground. The aim of the assessment was to determine if there was considered to be potential microclimate effects with a focus on wind-speed impacts. The assessment comprised:

- Determination from available data of the baseline (current) classification of the site with respect to The Beaufort Scale for Wind on Land.

- Examination of the proposed development and the potential for wind-speed amplification factors.

- Assessment of the impacts with regard to Microclimate

The site location is shown in Figure 1.1 below.

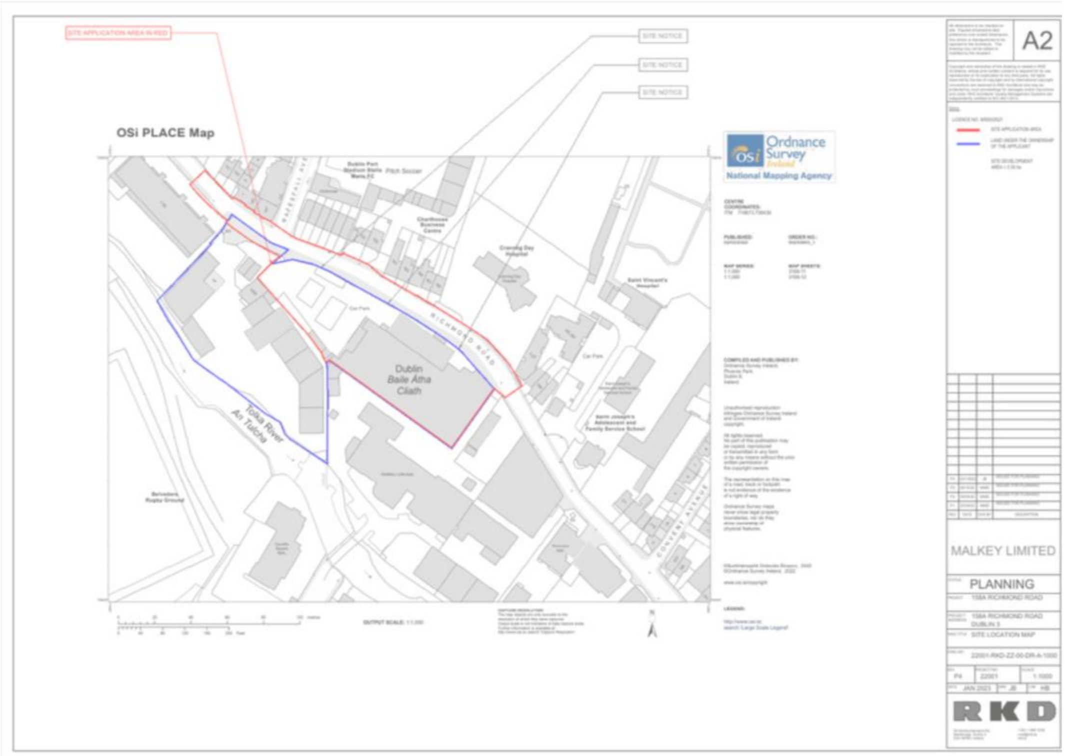

Figure 1.1 Site Location (red line boundary)

The site plan and elevations are shown in Figures 1.2 to 1.7.

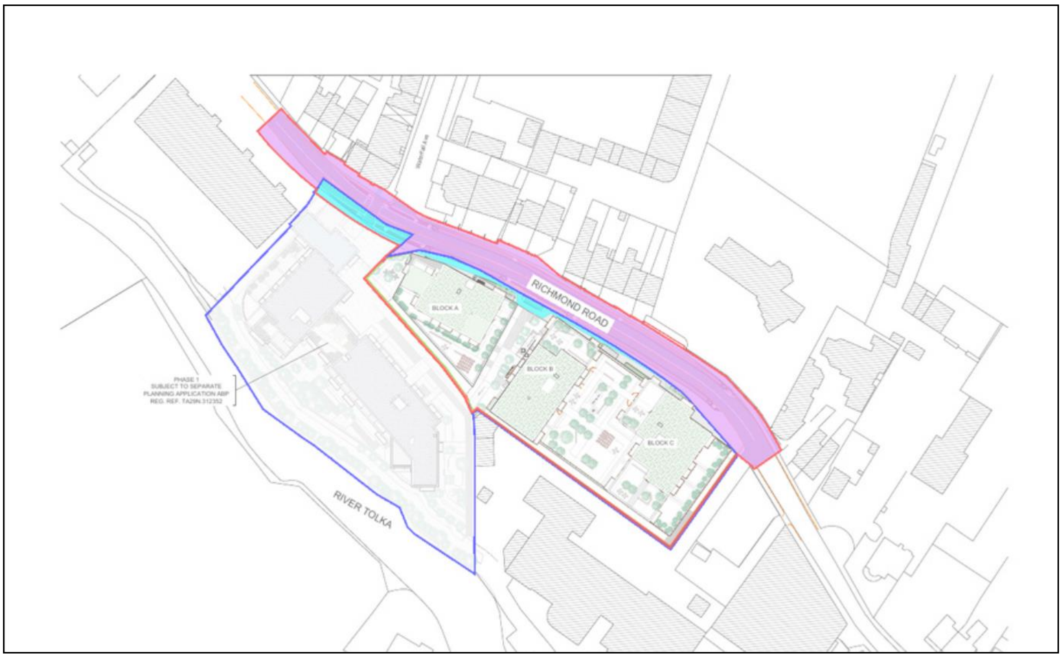

Figure 1.2 Site Plan

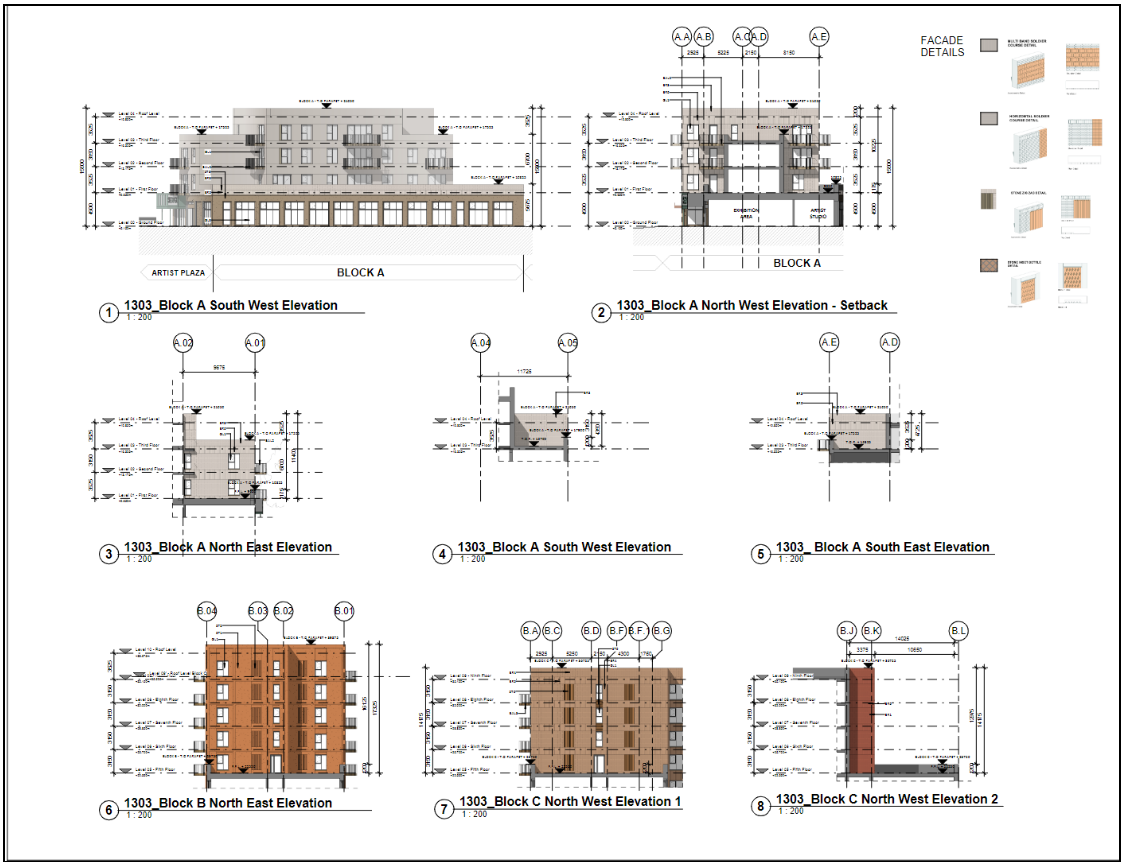

Figure 1.3 Elevations

Figure 1.4 Elevations

2.0 CHARACTERISATION OF THE SITE

The Beaufort Scale for Wind on Land is used to express the wind speed velocity recorded as a value which can be related to possible wind related impacts such as tree movement or building damage.

The nearest representative weather station collating detailed weather records is Dublin Airport, which is located approximately 6.8km north of the site. Dublin Airport met data has been examined to identify the prevailing wind direction and average wind speeds over a five-year period (see Figure 2.1 below). For data collated during five representative years (2017-2021), the predominant wind direction is south-westerly with an average wind speed of approximately 3-5 m/s, measured at a height of 10m above ground.

The Beaufort scale and its relationship to wind speed in metres/second is shown in Table 2.1 below. It can be seen that the site typically experiences Beaufort 3 (B3) wind conditions for much of the time.

Beaufort Scale	Wind speed(m/s)
0	<0.3
1	0.3-1.5
2	1.6-3.3
3	3.4-5.4
4	5.5-7.9
5	8.0-10.7
6	10.8-13.8
7	13.9-17.1
8	17.2-20.7
9	20.8-24.4
10	24.5-28.4
11	28.5-32.6
12	>32.7

Table 2.1 Beaufort Scale and Wind speed

The site of the proposed development can therefore be characterised as a site which experiences average wind speeds of B3, which corresponds to gentle breeze on the Beaufort Scale.

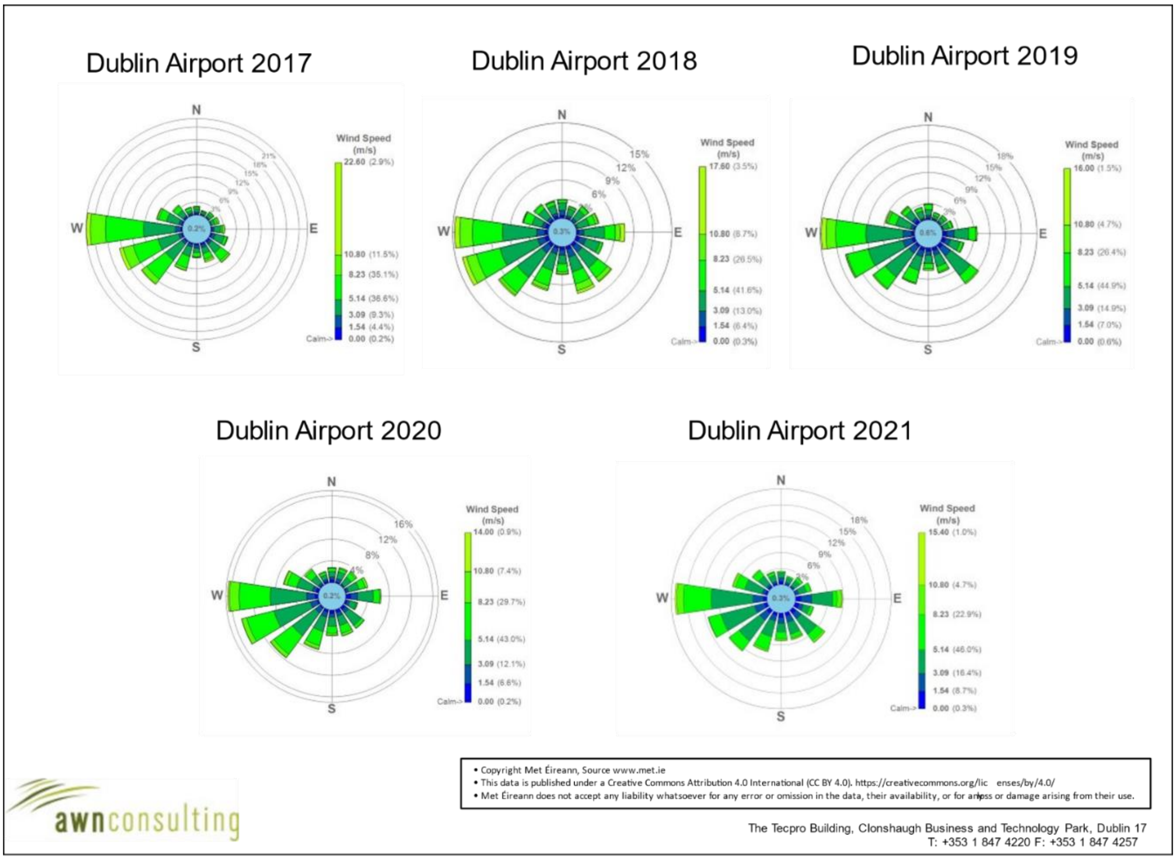

Figure 2.1 Wind-Rose Data

3.0 THE PROPOSED DEVELOPMENT AND MICROCLIMATE IMPACTS

Wind is normally described by its speed, either as a mean or gust speed. However, people sense the effect of the wind force, which is what we can feel, see and hear during windy conditions. Wind force is proportional to wind speed squared, therefore a relatively small increase in the wind speed can have a large effect on pedestrian comfort.

All buildings obstruct the free flow of the wind, causing it to be deflected and accelerated, resulting in very complex flow patterns. When the wind strikes the front face of a building, it will produce positive pressures that reach a maximum value at a point between about two thirds and three-quarters of the building height.

Below this height the wind will tend to be deflected down the front face towards the ground, often called 'downwash', and accelerated around the corners at ground level potentially producing areas of high wind speed and strong negative pressure. Above this height the wind will be deflected upwards and accelerated over the roof, again causing areas of high wind speed and increased turbulence. This can be a concern for roof gardens and roof terraces. A significant proportion of the wind will also spill around the side faces. Downwind, the flows around the building will recombine into a region of negative pressure known as the 'wake'.

Wind speed increases with height above ground; it follows, therefore, that the taller a building the higher the wind speeds acting on it. However, not all tall (where tall is greater than 10 storeys) buildings cause wind problems; what is important is the relative height of the building compared with that of neighbouring buildings.

A tall building in a group of tall buildings might not cause problems whereas a mid-rise building can cause unacceptable conditions if it is adjacent to an open area or has features or openings at ground level which can accelerate wind speed. When the wind strikes a building, it will generate positive pressures on the windward face and suction on the side, roof and leeward faces.

The wind will flow in the direction of decreasing pressure gradient, that is, from areas of high pressure to areas of lower pressure. As noted above, this causes wind flow down the front face, which brings high-speed wind from higher levels down to ground level. This can significantly increase ground-level wind speeds. The downwash on the windward face will tend to 'roll up' in front of a building, creating a windward vortex. The highest wind speed-up will occur near the centre of the face a short distance in front of the building, where the wind speed-up factor, S, can vary between about 1.2 and 2.0 depending on the building height. The flow then accelerates around the sides towards the low-pressure area in the wake. The S factor can reach 2.0 to 2.5 close to the corners of tall buildings, although values closer to 1.5 are likely for mid-rise buildings.

In general, tall, rectangular, sharp-edged buildings will generate the highest local ground-level wind speeds and the largest 'footprint' area of unpleasant wind speeds.

The UK Buildings Research Establishment (BRE DG 520: Wind Microclimate Around Buildings) has noted that wind speeds in the vortex between a tall building and a lower building (this occurs in the space in front of a tall building behind the lower building) can be up to 1.5 times the free wind speed (free wind speed being that measured in an open area with no buildings).

Wind speeds in the corner streams around either side of a tall building can be up to 2.5 times the free wind speed.

A useful document on wind speeds and tall buildings notes that tall buildings are generally taken to mean buildings more than 25m high, "Wind Microclimate Guidelines for Developments in the City of London (August 2019)".

The development will be provided in 3 No. blocks ranging in height from part 1 No. to part 10 No. storeys (to circa 35m above ground) as follows: Block A will be part 1 No. storey to part 4 No. storeys in height, Block B will be part 1 No. storeys to part 10 No. storeys in height (including podium) and Block C will be part 1 No. storeys to part 9 No. storeys in height (including podium).

It is acknowledged that the construction of new buildings can lead to changes to the local wind environment around the building. Generally elevated wind speeds around tall buildings are generated at three main points, either at ground level in the space behind a lower building and in front of a tall building, at an opening within the building envelope at ground level such as a tunnel or mall through the building or at building corners. Elevated wind speed can also be generated where a street runs between two tall buildings, leading to a "canyon effect".

T.V. Lawson in Building Aerodynamics, Imperial College London, Imperial College Press, 2001, has noted that when wind approaches a built-up area it is displaced upwards to roof level and generally flows across landscape at roof level, with gusts down to street level that are a function of the relative height to width of the street canyon.

It will be noted from the windrose presented as Figure 2.1 that as the predominant wind directions are from the west and from the south west, wind striking the proposed development will therefore already have travelled across the built-up landscape of the environs of Dublin City and therefore wind-flow across the landscape will be tend to be predominantly at 2-storey roof level.

Oke (T.R. Oke, Boundary Layer Climates, Routledge, 1987) has noted when the Height to Width Ratio is greater than 0.7, the Skimming Flow Regime tends to predominate, with little in the way of wind flow down to street level.

When the H to W ratio drops to 0.4 or less, the wind speed at ground level tends to increase and the street behaves more as if it were in open country, with much more of the wind now gusting down into the street.

Similarly, the BRE DG 520 document notes that H to W ratio of > 0.65 should be a target to minimise any wind related impacts.

The proposed building height is up to 35 metres above ground. The predominant wind directions are from the west and south west so the predominant downwind direction will be east and north east of the development. The area east and north east of the development comprises low rise, circa 2-storey buildings and Richmond Road, with a distance of circa 16 metres from the building façade to the opposite facades on Richmond Road. The H to W ratio is therefore up to (35/16) = 2.2 which is greater than 0.4 so wind will not expected to gust down to street level. The ratio is greater than 0.65 and therefore the skimming regime will tend to predominate with little in the way of elevated windspeed at street level and therefore the proposed development is not expected to lead to elevated windspeeds at street level.

In cumulative terms, when assessed in aggregate with Phase 1 of the proposed development, building heights are similar in both developments and no cumulative impacts are predicted.

A Microclimate assessment accompanying an application should address the safety and comfort of communal residential amenity spaces, including podium level and roof gardens and balconies, both within the site and on adjoining lands. Any required mitigation or other design measures arising from such assessment should be clearly detailed in the application.

Communal Residential Amenity Spaces – on Adjoining Lands

There are no community residential amenity spaces immediately adjacent and downwind of the proposed development – there is a proposed space in a proposed development to the west (Phase 1) however this is upwind of the proposed development and in addition as has been noted above, the skimming regime will be expected to dominate with little excess wind at ground level. The focus for microclimate assessments is on ground-level windspeed which people might experience. There are amenity areas to the east of the site, but there are buildings between the site and the amenity which will provide shelter from wind, and in addition the assessment noted above has determined that the proposed development is not expected to lead to elevated windspeeds at street level down wind of the proposed development.

Communal Residential Amenity Spaces – within the development

As has been noted above, a skimming regime is expected to predominate for the proposed development so elevated windspeeds are not expected at ground level in amenity areas within the development.

Podium, Roof Terrace and Balcony Areas

Windspeed above ground will be higher compared to a measured value closer to the ground. The Danish Wind Industry Association Online windspeed calculator http://xn--drmstrre-64ad.dk/wp-content/wind/miller/windpower%20web/en/ indicates that for a Roughness Class 3 landscape (a landscape defined by low rise buildings as opposed to a city scape defined by tall buildings) a windspeed range of 3-5 m/sec at 10m above ground will be a windspeed of 3.7 to 6.01 m/second at circa. 25 to 34m above ground – the approximate height above ground of the roof garden.

This corresponds to Beaufort B4 (Moderate Wind Speed, will raise dust and papers and move small branches on trees) which is only one windspeed class above that experienced at ground level. It is therefore considered that this is a relatively minor increase in wind-speed likely to be experienced and it is considered to be acceptable with regard to the proposed balcony, podium or roof garden uses.

4.0 CONCLUSION

It was concluded that:

The existing environment experiences B3 conditions for much of the time which correspond to a gentle breeze.

Based on the analysis conducted, it was concluded the proposed development would have no significant effects with regard to microclimate, either on amenity spaces in the vicinity of the development or within the development, or on podium, balcony or roof garden areas.

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