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MICROCLIMATE ASSESSMENT FOR A PLANNING APPLICATION FOR A RESIDENTIAL DEVELOPMENT ON A SITE AT SANDYFORD ROAD, DUBLIN 18

Report Prepared For

Midsal Homes Ltd
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EXECUTIVE SUMMARY

AWN were commissioned by Midsal Homes Ltd to undertake an assessment with regard to Microclimate Effects associated with the proposed residential development on a site at Sandyford, Dublin 18. 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/B4, which corresponds to gentle to moderate 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.

Document History

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Name	Fergal Callaghan	Elaine Neary
Title	Director	Associate
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CONTENTS

1.0 INTRODUCTION

AWN were commissioned by Midsal Homes Ltd to undertake an assessment with regard to Microclimate Effects associated with the proposed residential development on a site at Sandyford, Dublin 18. 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.

- 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 description of the development is as follows:

Midsal Homes Limited intend to apply to An Bord Pleanála for permission for a strategic housing development at this site of 0.829 Ha approx. comprised of the properties known as 'Karuna' and 'Glenina' at Sandyford Road, Dublin 18, D18 C2H6 and D18 X5T7 respectively. The site is generally bound by a residential development known as 'Coolkill' to the east, a detached dwelling known as 'The Pastures' to the south, Sandyford Road (R117) to the west and a residential development (which is under construction) known as 'Cul Cuille' to the north. Works are also proposed at Sandyford Road, which include the removal of a wall and the creation of a new pedestrian connection to the existing cul-de-sac adjacent to 'Cul Cuille' to the north (0.016 Ha approx.) and at the footpath at Sandyford Road to provide a new multi-modal entrance, pedestrian/cycle entrances and landscaping (0.015 Ha approx.). In addition, works are proposed for water services (0.05 Ha approx.): water supply to be sourced by way of a new connection to the existing 250 mm diameter water main across from the proposed main entrance at Sandyford Road; surface water drainage network to discharge to the existing 525 mm diameter surface water sewer located to the north of the site at Sandyford Road via a new 150 mm surface water sewer; and foul water to discharge to the 225 mm diameter foul sewer under construction at Sandyford Road. An additional 0.01 ha has been assigned for Dún Laoghaire-Rathdown County Council to undertake road works to upgrade Sandyford Road. The residential development site, pedestrian connection, entrance works, water services and road works area will provide a total application site area of 0.92 Ha.

The proposed development principally consists of the demolition of the existing dwelling and ancillary buildings known as ‘Glenina’, the existing dwelling known as ‘Karuna’ and the existing boundary wall fronting Sandyford Road, and the construction of a residential development principally comprising 137 No. apartments (32 No. 1-bed units, 78 No. 2-bed units and 27 No. 3-bed units) in 4 No. blocks ranging in height from part-1 No. storey to part-6 No. storeys with a part-basement/part-undercroft level (at Blocks B, C and D).

The proposed development which has a gross floor space of 13,144 sq m (over a part-basement/part-undercroft level measuring 4,508 sq m, principally providing car and cycle parking and plant) also includes: internal communal amenities and support facilities (404 sq m); 137 No. car parking spaces, which include 127 No. spaces and 6 No. GoCar spaces located at basement level (accessed beneath Block B) and 4 No. set down spaces located at surface level adjacent to Block A; motorcycle parking spaces; cycle parking spaces; bin store; substation; switch room; meter rooms; plant rooms; new telecommunications infrastructure at rooftop level including microwave link dishes concealed in shrouds; hard and soft landscaping, including communal amenity space; private amenity space with balconies facing north, south, east and west; boundary treatments; and all associated works above and below ground..

The site location is shown in Figure 1.1 below.

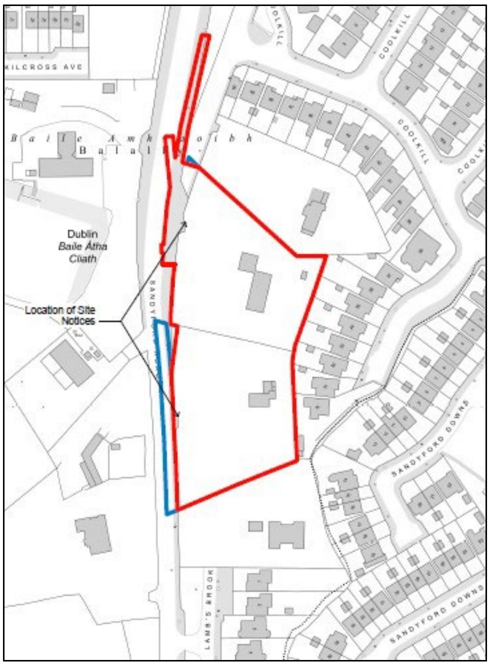

Figure 1.1 Site Location

The proposed building layout and elevations are shown below.

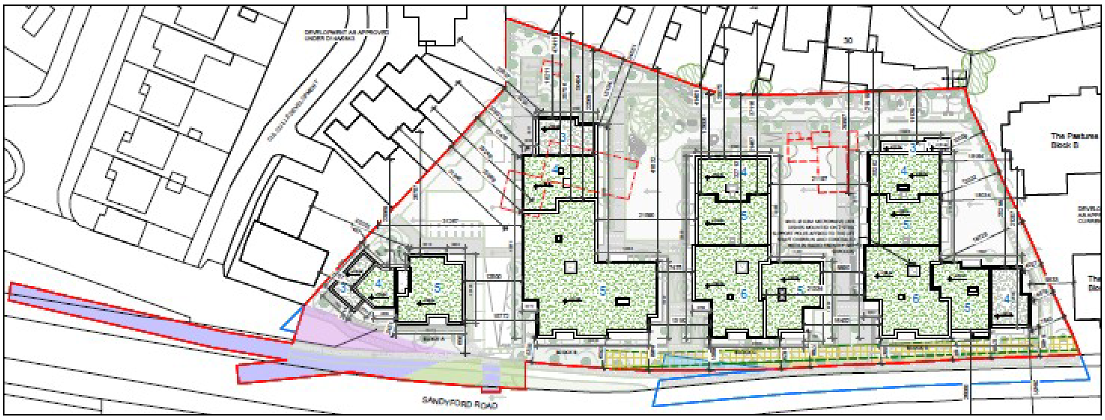

Figure 1.2 *Site Layout*

Figure 1.3 West Elevation

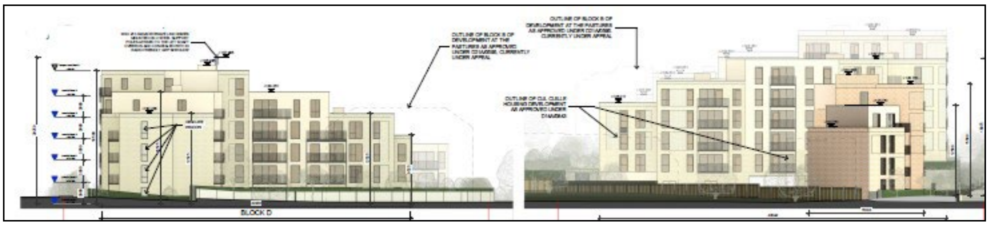

Figure 1.4 South and North Elevations

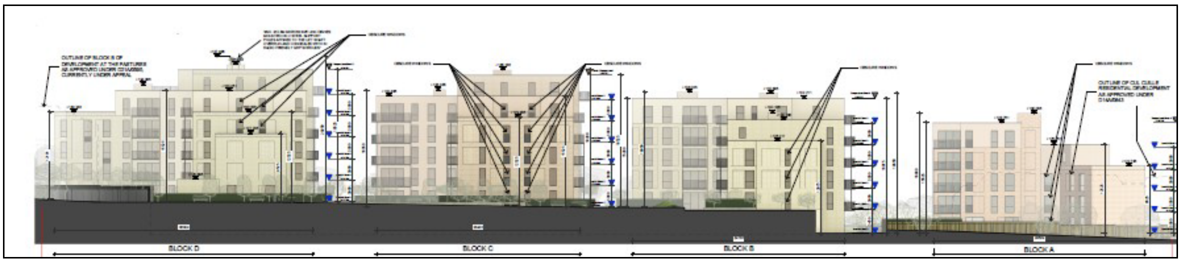

Figure 1.5 East Elevation

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 18km north of the site, the Airport site provides long term weather data records and for that reason is considered the most appropriate data source to be used. 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 a Beaufort 3/Beaufort 4 windspeed classification range, 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.

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/B4, which corresponds to gentle breeze on the Beaufort Scale.

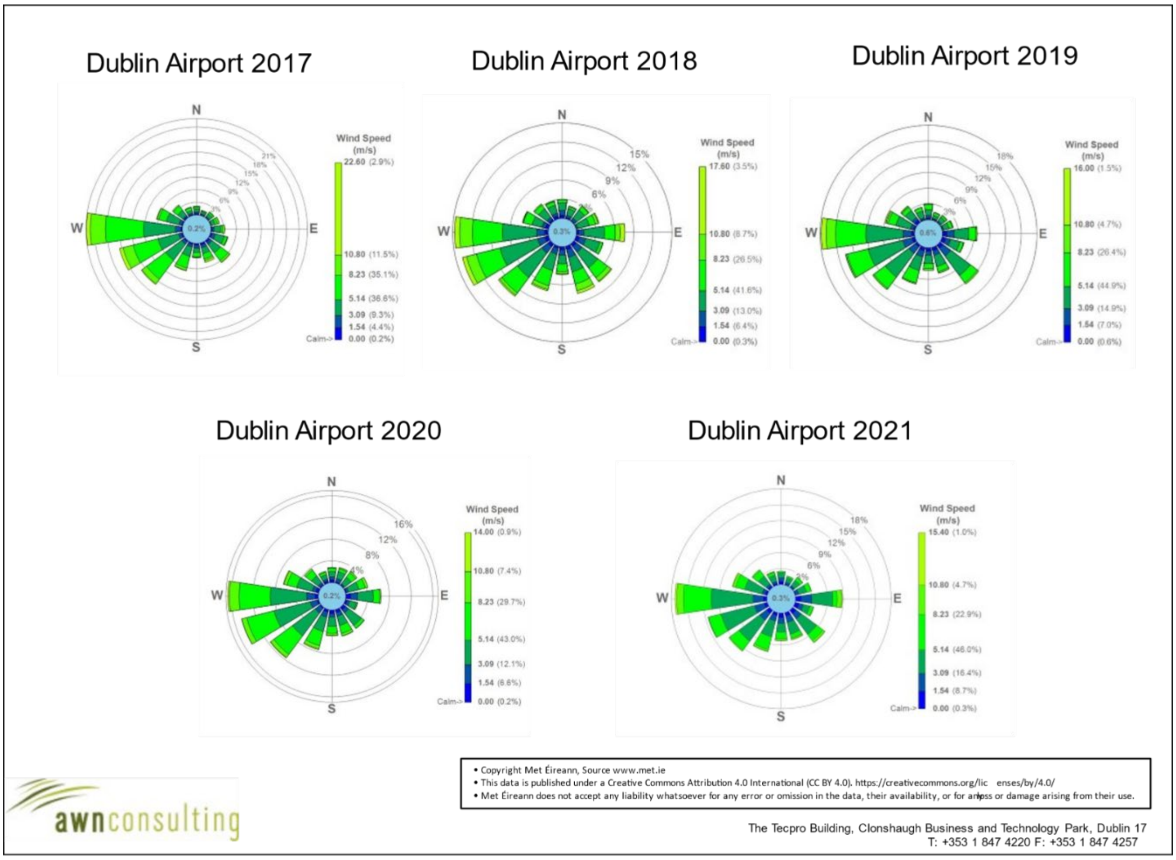

Figure 2.1 Wind-Rose Data

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 10 storeys high, "Sustainable Design and Construction, The London Plan Supplementary Planning Guidance, 2006, Mayor of London's Office". Section 2.4.5 notes that a wind environment assessment should be carried out for every tall building (e.g. a building over 10 storeys)". *Sustainable Design and Construction, Supplementary Planning Guidance, April 2014*" published by the Mayor of London's office provides further guidance in this regard.

The proposed development is principally 5 to 6 storeys in height at its tallest points and the proposed development therefore is not classed as a tall building so the likelihood of elevated windspeeds being generated for a development of this scale is very low. However it is still considered appropriate to examine the wind effects with regard to microclimate as a precautionary measure.

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.

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 area immediately downwind of the proposed development is dominated two storey residential developments. It is noted that the boundary of these developments is circa 18 metres from the eastern façade of the proposed development and that the proposed building heights vary from 15 to 18 metres above ground, so the H to W ratio is (15/18) = 0.83m which is well above the 0.65 threshold.

The wind-rose data points are measured wind-speeds at 10m above ground at Dublin Airport. The proposed building height is up to 18m above ground. Windspeed is known to increase as one travels vertically from 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 circa. 3.5 to 5.5 m/second at circa. 16.5m above ground – the approximate height above ground of the top floor balcony. This corresponds to Beaufort B3/B4 (Moderate Wind Speed, will raise dust and papers and move small branches on trees) – 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 use.

Based on the fact that the proposed buildings are not classed as tall, the absence of other tall structures and the generally open nature of the area upwind, it can be expected that the skimming regime will dominate, with little in the way of wind flow down to street level and therefore the proposed development is not expected to lead to elevated windspeeds at street level.

4.0 CONCLUSION

It was concluded that:

The existing environment experiences B3/B4 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.

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END OF REPORT