DKPartnership Dublin Cork London
T : 01-813-1930 T : 064-664-1686
E : post@dkpartnership.com

6200 MICROCLIMATE IMPACT ASSESSMENT

Microclimate assessment report with focus on wind impacts

WYATTVILLE PARK BTR

Loughlinstown
Co. Dublin

Green Urban Living N11 Ltd

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ING Gerard (Craig) van Deventer CEng., BE(mech)., HDip CIOB, MCIBSE

M : [00] 353 (0)87 260 8080
E : gerard@dkpartnership.com

DKPartnership
70 Main Street, Applewood , Swords, Co. Dublin, Ireland
Reen Kenmare Co. Kerry

post@dkpartnership.com
www.dkpartnership.com

T : [00] 353 (0) 1813 1930
T : [00] 353 (0)64664 1686

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1 Introduction

1.1 Report purpose

The aim of the assessment is to determine if there are potential microclimate effects with a particular focus on wind impacts. This report determined the existing environment using available data from the Irish Meteorological Service (MET Eireann) and examined the potential for wind impacts on the proposed development.

1.2 Instruction

DKPartnership (DKP) have been commissioned by Green Urban Living N11 Ltd to carry out the analysis and report for the proposed development on lands associated with St. Laurence College, Wyattville Park, Loughlinstown, Co. Dublin.

1.3 Development description

The development will principally consist of the demolition of the existing AstroTurf and hardcourt area and the construction of: 256 no. Build-to-Rent apartments (105 no. 1-bed, 145 no. 2-bed and 6 no. 3-bed) in 4 no. blocks ranging in height from 1 to 8 no. storeys above ground level including and connected by single storey podiums with internal communal amenities and facilities; a crèche with outdoor play area; a café; communal and public open space and play facilities; a permanent multimodal access off Wyattville Park Road; a pedestrian/cycle link from the N11 to Wyattville Park; a temporary construction access off the N11; car, motorcycle and bicycle parking; and a set down area. Furthermore, the school side development will consist of: the provision of a new AstroTurf pitch and associated floodlighting; a bin store/vehicle shed; and a new vehicular and pedestrian entrance off Wyattville Park Road. The development will also include all ancillary site services and works to facilitate the development.

2 Executive summary

2.1 Analysis conducted

This report undertakes an assessment with regard to microclimate effects associated with the proposed development at Loughlinstown. The aim of the assessment is to determine if there are potential microclimate effects with a particular focus on wind impacts. This report determined the existing environment using available data from the Irish Meteorological Service (MET Eireann) and examined the potential for wind impacts on the proposed development.

2.2 Guideline's overview

There are no national planning policies directly related to wind microclimate however the following guidance documents were reviewed:

- BRE DG 520 Wind microclimate around buildings. Brings together the latest information on wind environment around buildings. The general principles of wind flow around buildings and techniques for mitigating unacceptable wind speeds are discussed and advice is given on the methods and criteria for assessing pedestrian wind comfort.
- Sustainable Design and Construction, The London Plan Supplementary Planning Guidance. Document on wind speeds and tall buildings.
- Building Aerodynamics, Imperial College London, Imperial College Press, 2001. shows practicing architects and engineers the information which wind engineers can present to ensure that the effects of wind are considered in building design.

2.3 Microclimate summary

The assessment focused firstly on identifying the existing baseline levels in the region of the proposed development by an evaluation of MET Eireann historical monitoring data. A desk-based assessment was used to determine any significant effects on the wind microclimate. In summary;

- The wind profile around the proposed development was established using meteorological data collected at Dublin Airport, the dominant wind direction for the site is identified as south-west, with an average of 18km/h wind speed.
- This corresponds to average wind speeds of Beaufort scale 3, which is described as a 'gentle breeze'. Conditions around the site during the summer season are expected to be calmer compared to the windiest season, because winds are lighter in the summer.
- Wind comfort is in line with guidelines and given the configuration and orientation of the amenity spaces it is predicted the exposure of the amenity space to be relatively sheltered and there is no significant wind speed impact down to the open areas between the blocks.
- The podium and public amenity space are shielded when the wind is blowing from the dominant south-west direction. The wind less frequently blows from the ESE and WNW quadrants and although more exposed in those directions, very little impact is predicted (frequency of wind condition 6% and 9%).

In conclusion, based on the examination conducted the proposed development would have no significant adverse impacts with regard to microclimate.

2.4 Recommendations / mitigation measures

Construction phase: No mitigation measures required however the site would be enclosed by high hoarding as part of a construction management plan which would assist in mitigating wind speeds around the perimeter.

Operational phase: The impact of the proposed development on microclimate will be unnoticeable in regard to baseline conditions, therefore no specific mitigation measures are required.

3 Geographical overview

3.1 Project overview

Image 3.1, the (google maps) site map below is a basic overview of the site with proposed development approximately outlined in the area site map.

Image 3.1 Approximate proposed development site

4 Approach and methodology

4.1 Ireland's wind climate

In Ireland the prevailing wind direction is between south and west. Wind blows most frequently from the south and west for open sites while winds from the northeast or north occur least often. In January the southerly and south-easterly winds are more prominent than in July, which has a high frequency of westerly winds. Easterly winds occur most often between February and May and are commonly accompanied by dry weather. Average annual wind speeds range from 10.8km/h to 28.8km/h. The wind at a particular location can be influenced by a number of factors such as obstruction by buildings or trees, the nature of the terrain and deflection by nearby mountains or hills. A series of monitoring stations are located across the country, these stations collect wind data for public information.

4.2 Beaufort scale

The Beaufort scale is a way of estimating the wind strength according to the appearance of the sea (or on land).

		wind speed		
Scale	*Description*	*km/h*	*knots*	*Effects*
0	Calm	<1	<1	No noticeable wind, smoke rises vertically
1	Light air	1-5	1-3	Direction of wind shown by smoke drift but not wind vanes
2	Light breeze	6-11	4-6	Wind felt on face, leaves rustle
3	Gentle breeze	12-19	7-10	Wind extends light flag, leaves in constant motion
4	Moderate breeze	20-28	11-16	Raises dust and loose paper; hair disarranged, clothing flaps
5	Fresh breeze	29-38	17-21	Small trees in leaf begin to sway; limit of agreeable wind on land
6	Strong breeze	39-49	22-27	Umbrellas used with difficulty; force of the wind felt on the body; wind noisy, frequent blinking
7	Near gale	50-61	28-33	Inconvenience felt when walking; difficult to walk steadily; hair blown straight
8	Gale	62-74	34-40	Generally impedes progress; walking difficult to control; great difficulty with balance in gusts
9	Strong gale	75-88	41-47	People blown over by gusts; slight structural damage
10	Storm	89-102	48-55	Seldom experienced inland; trees uprooted, significant structural damage
11	Violent storm	103-117	56-63	Very rarely experienced; accompanied by widespread structural damage
12	Hurricane	>117	>64	Countryside devastated; winds of this force only occur in hurricanes and tornadoes

Table 4.1: Beaufort scale and wind speed

4.3 Receiving environment at Loughlinstown

The nearest weather station collating detailed weather records is Dublin Airport which is located approximately 24km away. The meteorological data has been examined to identify the prevailing wind direction and average wind speeds. Table 4.2 -4.4 shows the averages over 30 year periods and Image 4.5 the wind data over 1 year.

wind (knots)	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*
Mean monthly speed	12.5	12.0	11.6	9.9	9.2	8.6	8.7	8.7	9.2	10.4	11.0	11.3
Max gust	80	73	66	59	58	53	54	56	59	69	66	76
Max mean 10-minute speed	53	49	45	39	39	38	36	37	36	51	43	55
Mean no. of days with gales	2.3	1.5	1.1	0.1	0.1	0.1	0.1	0.1	0.2	0.5	0.8	1.3

Table 4.2: Wind data at Dublin airport 1981-2010 – 30 year average

wind (knots)	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*
Mean monthly speed	12.4	11.9	11.6	9.7	8.7	8.2	8.3	8.1	9.0	10.1	10.8	11.8
Max gust	75	73	66	59	58	53	54	56	59	69	66	76
Max mean 10-minute speed	48	49	45	41	39	38	34	37	36	51	43	55
Mean no. of days with gales	2.4	1.2	1.2	0.1	0.3	0.1	0.0	0.2	0.2	0.5	0.8	1.6

Table 4.3: Wind data at Dublin airport 1971-2000 – 30 year average

wind (knots)	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*
Mean monthly speed	12.2	11.7	11.6	9.7	8.7	8.0	8.1	8.0	8.9	9.9	10.8	11.8
Max gust	75	73	61	60	58	55	54	56	64	73	64	71
Max mean 10-minute speed	48	49	42	41	39	36	34	41	35	45	43	47
Mean no. of days with gales	2.1	1.1	1.2	0.3	0.3	0.1	0.0	0.3	0.2	0.5	0.7	1.4

Table 4.4: Wind data at Dublin airport 1961-1990 – 30 year average

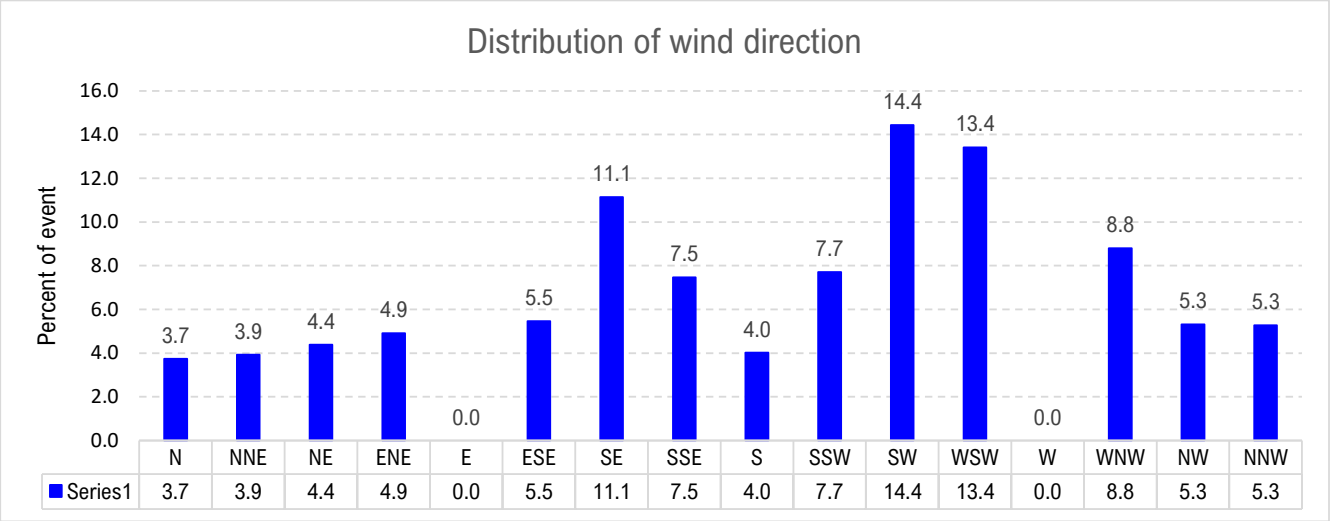


Image 4.5: Wind direction data (year 1944-2021)

4.4 Significance of data assessed

The data recorded from Met Eireann's historical data during the past shows the predominant wind direction is south-westerly with an average wind speed of approximately 9.5 knots or 17.7 km/h. there is a secondary dominant wind from the west south-west direction, it is observed other wind directions such as northern winds are infrequent. These conditions are considered to be representative of conditions at the site given the close proximity. The site of the proposed development can be characterised as a site which experiences average wind speeds of Beaufort scale 3, which is described as a 'gentle breeze'. Conditions around the existing site during the summer season are expected to be calmer compared to the windiest season, because winds are lighter in the summer.

Image 4.6: Predominant wind direction SW directional arrows.

5 Microclimate impact

5.1 Potential impact of the proposed development

Construction phase:
The effects on the wind microclimate at the site during the construction phase is difficult to qualitatively analyse however a professional judgement has been used to assess the likely conditions during this stage of development. Once the proposed development begins construction, localised wind conditions felt at ground level have the potential to vary on a temporary basis. However, as construction of the proposed development proceeds, the wind conditions on the site and surroundings would gradually adjust to those of the completed development. There are no construction microclimate impacts of significance.

Operational phase:
In general the construction of new buildings can lead to changes to the local wind environment around the building. The following effects of buildings have been analysed:

Building height: Wind speed increases with height above ground therefore the taller a building the higher the wind speeds acting on it. Tall buildings are generally taken to mean buildings more than 10 storeys high. The proposed residential development at Wyattville is less than 10 storeys and is not classed as a high building. BRE suggest tall buildings where possible, be orientated with their narrow face into the prevailing wind. The proposed blocks do not directly face the prevailing wind direction. It can be predicted that the proposed development height will not lead to significant acceleration of wind-speeds.

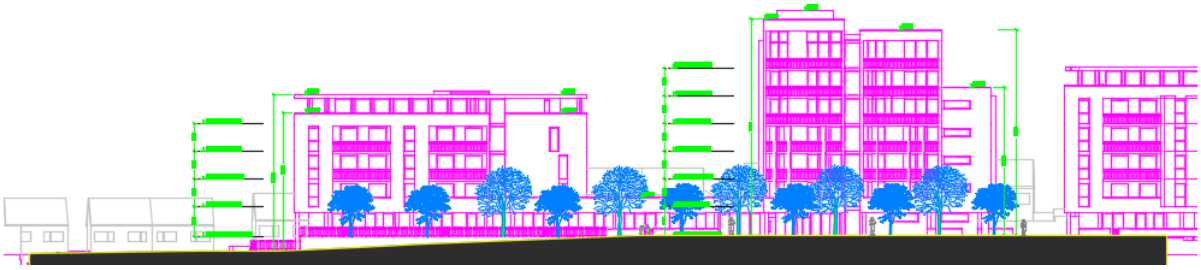
Using BRE guidelines a check has been carried out to determine if the buildings present a high risk due to height differential. Blocks A, B, C and D all pass this check. The height-to-width (h/w) ratio of the proposed blocks presents itself in the guideline of 'good'. Wind will go up and over the development, rather than being directed down to street level. The BRE DG 520 document notes that H to W ratio of > 0.65 should be an 'optimum' target to minimise any wind related impacts. To illustrate the height to width ratio of the proposed development blocks see images 5.1, the elevations of the proposed. Block A *h/w* =0.44, Block B *h/w* = 0.46, Block C *h/w* = 0.45 and Block D *h/w* = 0.53

Images 5.1:

South west elevation:

South east elevation:

North west elevation:



North east elevation:

Downwash: When the wind strikes the front face of a building, it will produce wind pressures that reach maximum speeds 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, called downwash, and accelerated around the corners at ground level and can produce areas of high wind speed. Above this height the wind will be deflected upwards and accelerated over the roof. Block D has a building front that could potentially present a downwash during high instances of south westerly wind conditions, however, these are generally during summer months when wind speeds are less.

Building wake: Downwind the wind flows around the building and recombines into a region of negative pressure known as the wake. This will continue for between about six and 10 times the building height before the original flow patterns are re-established. The larger the building, the larger the volume of air that must be displaced, and the larger the potential ground-level wind speeds. Tall, isolated slab-sided buildings adjacent to large open spaces and wide streets will tend to produce high wind speeds at pedestrian level. Blocks A, B, C and D while being larger than their neighbours are not sufficiently isolated or of different scale to present a high risk in terms of wake flow.

Canyon effect:
Elevated wind speed can also be generated where an opening runs between two tall buildings leading to a “canyon effect”.

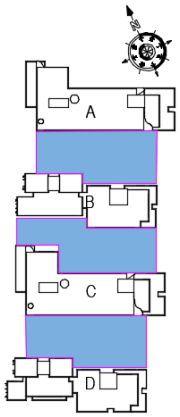


Image 5.2: potential canyon effect - Wyattville development

The optimum height-to-width ratio for ideal wind comfort is >0.65. As height-to-width ratio increases, the ground level wind speeds are likely to reduce. At the other extreme very wide streets with height-to-width ratio < 0.3 will not benefit from wind shelter and are likely to be quite exposed.
Canyon A-B H to W ratio 0.71-optimum wind comfort
Canyon B-C H to W ratio 0.79-optimum wind comfort
Canyon C-D H to W ratio 0.73-optimum wind comfort

	Street canyon height-to-width ratio		
Aspect of design	Optimum	Good	Undesirable
Wind comfort	>0.65	>0.4	<0.3
Sense of enclosure	0.4-0.5	0.33-0.67	<0.3->1.0

Table 5.3: BRE design summary guidelines

Wind comfort is in line with guidelines summarized in table 5.3. Amenity areas: It is noted that as the national predominant wind direction are from the south and locally the predominant wind direction is south westerly. Given the configuration and orientation of the blocks in the proposed development, it is predicted the exposure of the amenity space to be relatively sheltered. The location of the amenity areas means there is no significant wind speed impact down to the open areas between the blocks.

The podium and public amenity space are shielded when the wind is blowing from the dominant south-west direction. The wind less frequently blows from the ESE and WNW quadrants and although more exposed in those directions, very little impact is predicted (frequency of wind condition 6% and 9%).

6 Conclusion

6.1 Remedial and reductive measures

Construction phase: No mitigation measures required however the site would be enclosed by high hoarding as part of a construction management plan which would assist in mitigating wind speeds around the perimeter.
Operational phase: The impact of the proposed development on microclimate will be unnoticeable in regards to baseline conditions, therefore no specific mitigation measures are required.

6.2 Monitoring

It is recommended that the local weather conditions should be reviewed routinely, particularly for construction works carried out at a height. It is not necessary to monitor any wind speed and direction on site during the construction or operational phases.

6.3 Wind impact summary

The assessment focused firstly on identifying the existing baseline levels in the region of the proposed development by an evaluation of MET Eireann historical monitoring data. A desk-based assessment was used to determine any significant effects on the wind microclimate. In summary;

- The wind profile around the proposed development was established using meteorological data collected at Dublin Airport, the dominant wind direction for the site is identified as south-west, with an average of 18km/h wind speed.
- This corresponds to average wind speeds of Beaufort scale 3, which is described as a 'gentle breeze'. Conditions around the site during the summer season are expected to be calmer compared to the windiest season, because winds are lighter in the summer.
- Wind comfort is in line with guidelines, given the configuration and orientation of the amenity spaces it is predicted the exposure of the amenity space to be relatively sheltered and there is no significant wind speed impact down to the open areas between the blocks.
- The podium and public amenity space are shielded when the wind is blowing from the dominant south-west direction. The wind less frequently blows from the ESE and WNW quadrants and although more exposed in those directions, very little impact is predicted (frequency of wind condition 6% and 9%).

In conclusion, based on the examination conducted the proposed development would have no significant adverse impacts with regard to microclimate.