# Heuston South Quarter
# Residential Development

St John's Road West
Dublin 8

## Microclimate Wind Analysis

IN2 Project No. D2026
17/09/2021
REV02

# Revision History

| Date | Revision | Description |
|---|---|---|
| 02/07/2021 | 00 | Initial issue for client review |
| 21/06/2021 | 01 | Revised issue for updated scheme |
| 17/09/2021 | 02 | Issued for planning |



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# 1.0 Executive Summary

This report summarises the Microclimate Wind Analysis undertaken for the proposed residential development at Heuston South Quarter, St John's Road West, Dublin 8.

The analysis utilises Computational Fluid Dynamics (CFD) modelling software to simulate the wind profiles for each of the twelve cardinal wind directions for the proposed development.

The results of the modelling are evaluated using the Lawson Criteria, a best practice methodology for assessing acceptable wind velocities and microclimate effects.

The results of the Heuston South Quarter SHD residential development analysis indicate no unacceptable wind effects. The analysis confirms a small degree of wind acceleration below the bridge between blocks A & C however the Lawson Criteria confirms the area remains suitable for pedestrians. As there is no seating proposed for this area there is no remediation required.

The roof terraces of each block were assessed and in each case found to be suitable for sitting and pedestrian comfort however significant improvements were achieved by raising the parapet height on the West and South sides of the roof gardens. The increased parapet height has been included for each roof garden ensuring all achieve very good microclimate results.

## 2.0 Development Description

The proposed development will consist of a residential development of 399 no. 'Build To Rent' residential units and all ancillary and associated uses, development and works, and a retail unit of 120 sq m, on a site of 1.08 ha. The proposed development consists of:

- Site clearance and localised demolitions to remove part of the podium and Basement Level -1 reinforced concrete slabs at the interface of the proposed Blocks A and B, together with the incorporation of part of the existing double basement level structure extending to approximately 7,613 sq.m over two levels (excluding an area of 3,318 sq.m that will be backfilled at Basement Level -1) within the proposed development.
- The construction of 5 no. buildings (Blocks A to E) ranging in height between 3- to 18-storeys over double basement level / podium level to provide a residential / mixed use development to provide 399 Specific BTR (Build to Rent) units with a total gross floor area of 29,391 sq.m, comprising 46 no. studios, 250 no. one bedroom units, 90 no. 2 bedroom / 4 person units and 13 no. 2 bedroom / 3 person units; internal communal ancillary residential services / amenities to include a shared co-working area / lounge (178 sq.m) and gym (102 sq.m) at lower ground floor level, and lounges on either side of a residential foyer at ground floor / podium level within Block A (196 sq.m), and a TV Room / lounge (57 sq.m) at ground floor / podium level within Block C.
- An independent retail unit (120 sq.m) is proposed at ground floor / podium level within Block B.
- A double basement is provided that will be integrated within the existing basement levels serving the wider HSQ development and will be accessed from the existing vehicular ramped accesses/egresses onto/off St. John's Road West and Military Road to the north and east, respectively. Basement level -1 provides: a refuse store; 80 no. car parking spaces (including 4 no. disabled spaces and 8 car club spaces); 4 no. motorcycle parking spaces; and, secure bicycle parking / storage in the form of 251 no. double stacked cycle parking spaces providing capacity for 502 no. secure bicycle storage spaces for residents. An additional 49 no. Sheffield type bicycle stands are provided at basement level -1 to provide 98 no. visitor cycle spaces (inclusive of 8 no. designated cargo bike spaces, that will also be available for the shared use with residents of the scheme) and a further 55 no. Sheffield type bicycle stands are provided at podium level to provide 110 no. cycle parking spaces (108 no. visitor cycle parking spaces (inclusive of 6 no. designated cargo bike spaces) and 2 no. cycle parking spaces in connection with the retail unit). All bicycle parking at basement level is accessed via a dedicated cycle lift from podium to basement level -1 that is situated to the south of Block B.
- Works proposed along the St John's Road West frontage include the omission of the existing left-turn filter lane to the vehicular ramped access to the HSQ development and re-configuration of the pedestrian crossings at the existing junction together with the re-configuration of the existing pedestrian crossing over the westbound lanes of St. John's Road West leading to an existing pedestrian refuge island. Re-alignment of the existing footpath along the site frontage onto St John's Road West to tie into the reconfigured junction arrangement and provision of a link to a new lift to provide wheelchair access from St John's Road West to the HSQ podium.
- Communal Outdoor Amenity space is provided for residents in the form of rooftop terraces (totalling 1,179sqm), and lower-level communal courtyards between blocks (totalling 960sqm).
- Hard and soft landscaping works are proposed at podium level which includes the extension and completion of the public plaza to the east of Block A; the provision of footpaths; a MUGA (Multi Use Games Area) and informal play areas for children (totalling 1,670sqm).
- A double ESB substation/switch room at ground / podium level within Block A, and a single substation/switch room at ground / podium level within Block B together with associated site development works, which includes the realignment / reprofiling of an existing vehicular access ramp at the southern end of the site between basement levels -1 and -2 and the closure / removal of a second vehicular access ramp between the subject site at basement level -1 and the raised basement level -1 under the Telford building.

# 3.0 Methodology

## 3.1 Wind Analysis

The predicted wind patterns around the proposed development were determined using Computational Fluid Dynamics (CFD) software (SimScale). This enabled an assessment of the site wind conditions highlighting zones of high pressure, negative pressure, and air movement for varying wind conditions.

An initial 3D representational model of the existing buildings and their immediate surroundings was created, and simulations undertaken for 12 cardinal wind directions.

Wind Climate Data was taken from the Global Wind Atlas. This utilises a microscale modelling system, enabling localised wind data to be obtained for high resolution (250m grid) topography, such as hills, ridges, and land use, including urban environments.

Fig 1.1.1 illustrates Global Wind Atlas data for the general Dublin area, indicating average wind speed at 10m height. The relative sheltering of the Urban area can be seen, in contrast to Dublin Airport to the North, and Dublin/ Wicklow mountains to the South, and exposed coastal locations.

Recorded wind speeds for Dublin Airport are relatively high- in what is one of Europe's windier meteorological weather station locations. However, the particular site location at HSQ2 identified in Fig 1.1.1, is an area relatively sheltered on a macro level, within the Dublin City area.

The CFD simulations utilised wind profiles accounting for terrain effects. Allowing for the nature of the site and location, a surface roughness layer profile representative of "Urban Terrain" (z0=0.4m height)" was utilised, derived from GIS survey analysis1[1].

Figures 1.1.2 and 1.1.3 indicates the long-term annual "Wind Rose" obtained from the Global Wind Atlas for the site at Heuston South Quarter, Dublin 8. The rose diagrams illustrate the frequency that wind will be from a certain direction and at what speed. It can be seen how the prevailing Westerly/ South Westerly winds entirely predominate due to the Atlantic gulf stream, with only lower occurrence from other directions.

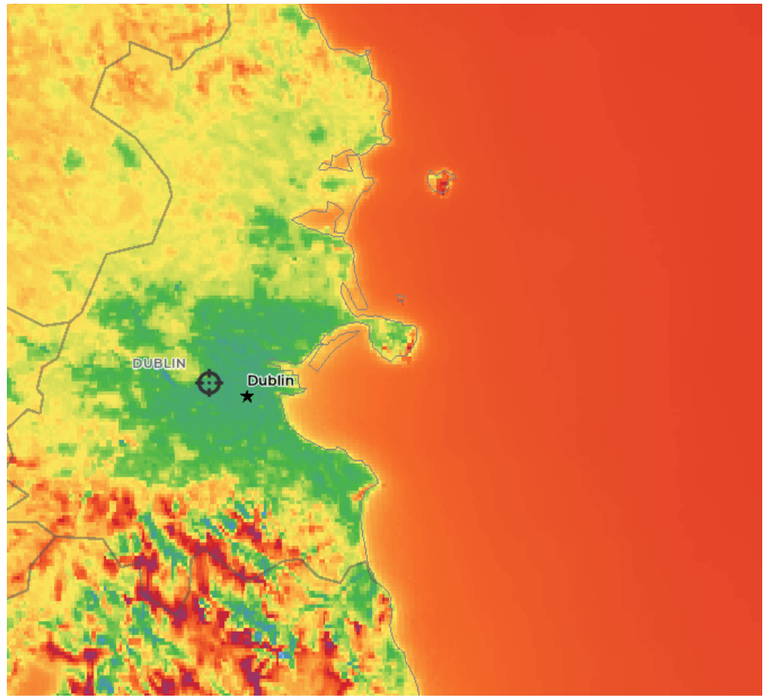


Fig 1.1.1 – Mean Wind Speeds across Dublin – Global Wind Atlas

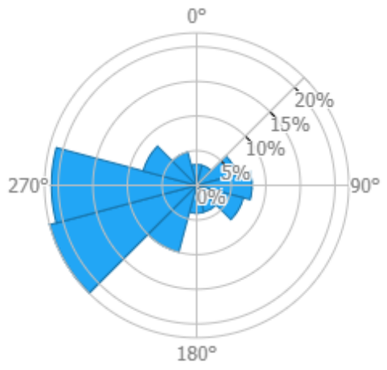


Fig 1.1.2 – Wind Frequency Rose for HSQ – Global Wind Atlas

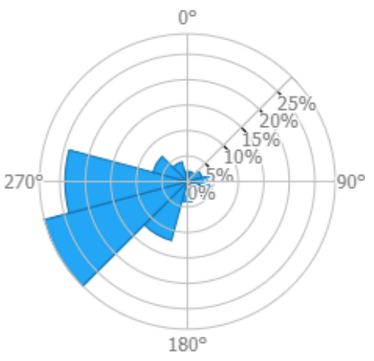


Fig 1.1.3 – Wind Speed Rose for HSQ – Global Wind Atlas

[1] European Space Agency's Climate Change Initiative Land Cover (CCI-LC) dataset v2.0.7.

Fig 1.1.4 outlines the 3D representational model of the proposed development and its surroundings that was created based on current architectural modelling information, and simulations were undertaken for 12 cardinal wind directions.

Fig 1.1.5 shows the CFD simulation results which form the basis of the Pedestrian Wind Comfort Analysis undertaken, which is described in detail in Section 1.2 below.

The methodology calculates predicted airflow patterns around buildings for all wind orientations and calculates average velocity applying weighting based on probability of occurrence throughout the year. It should be noted that wind effects around buildings for prevailing SW wind conditions are deemed to have more of a potential impact to pedestrian discomfort, as these will occur on a more regular occurrence.

However, it should be noted that the methodology assesses averaged (hourly) wind conditions for the purposes of general pedestrian comfort and does not intend to predict gusting, abnormal nor potential future climate change conditions.

Nevertheless, the Lawson Criteria methodology basis, as described in detail below, has been proven to be a robust means of analysing Pedestrian Comfort and its basis has been successfully adapted and implemented in both National Standards (Netherlands NEN.8100) and Design Guidelines (City of London – Wind Microclimate Guidelines (2019)).

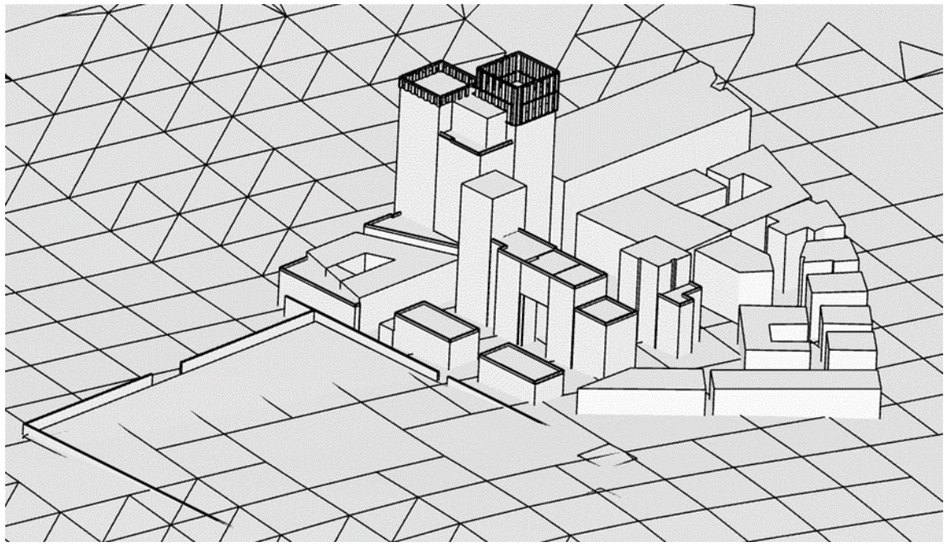

Fig 1.1.4 – 3D Representational Model of Proposed HSQ2 Development

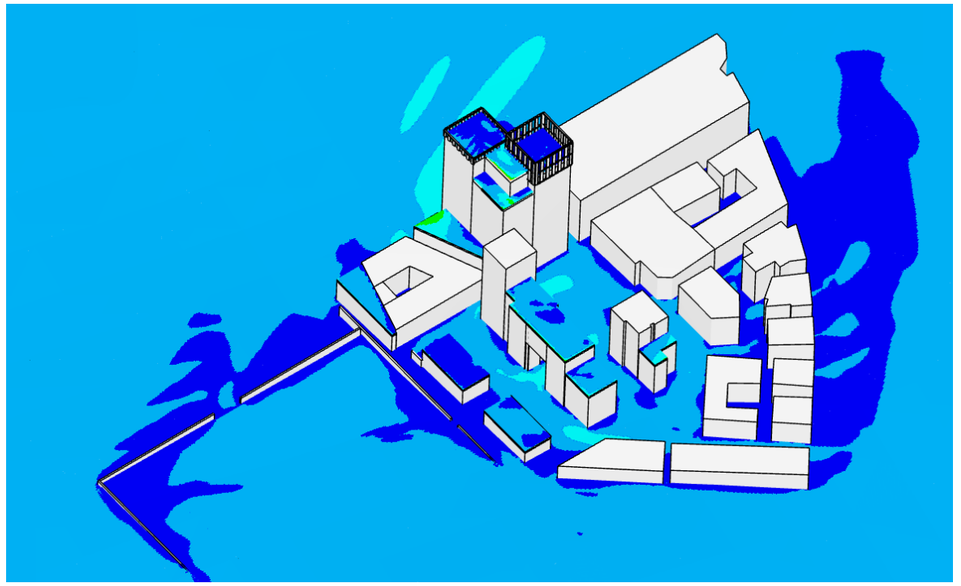

Fig 1.1.5 – Pedestrian Wind Comfort Analysis of Proposed HSQ2 Development

## 3.2 Pedestrian Comfort

Pedestrian Wind Comfort was assessed utilising the “Lawson Criteria” scale, which has been developed as a means of assessing the long term suitability of urban areas for walking or sitting, accounting for both microclimatic wind effects (i.e. site location and prevailing winds) and microclimatic air movement associated with wind forces influenced by the localised built environment forms and landscaping effects.

The original Lawson Criteria (as described in Building Aerodynamics, Tom Lawson, Imperial College Press, 2001) assesses probability of wind discomfort based on the Beaufort Scale as referenced in Figure 1.2.1.

Figure 1.2.2 illustrates the Lawson Criteria scale, as utilised and assessed within the report, which ranges from areas deemed suitable for long term sitting through to regions uncomfortable for pedestrian comfort. “Pedestrian Walking” areas, for example, are defined as areas that would not experience wind velocities in excess of 8m/s for more than 5% of the year, whereas uncomfortable areas would experience averaged wind velocities greater than 10m/s for more than 5% of the year.

The assessment identifies area where potential wind occurrence, based on probability of wind direction and speed, would either be mitigated (Outdoor Dining/ Pedestrian Sitting and Standing) or exacerbated (Business Walking/ Uncomfortable) due to proposed massing from potential developments.

However, it should be noted that in terms of pedestrian comfort, the Lawson Criteria assesses solely for wind/associated air velocity effects. Therefore, other environmental aspects that may influence a space’s microclimate, such as exposure to sunlight and envisaged temperature variation throughout the year are not accounted for within this methodology.

| Beaufort Force | Hourly-Average Windspeed m/s | Description of Wind | Noticable Effect of Wind |
|---|---|---|---|
| 0 | <0.45 | Calm | Smoke rises vertically |
| 1 | 0.45 - 1.55 | Light | Direction shown by Smoke drift but not by vanes |
| 2 | 1.55 - 3.35 | Light | Wind felt on faces: leaves rustle: wind vane moves |
| 3 | 3.35 - 5.60 | Light | Leaves and twigs in motion: wind extends a flag |
| 4 | 5.60 - 8.25 | Moderate | Raises dust and loose paper: small branches move |
| 5 | 8.25 - 10.95 | Fresh | Small trees in leaf sway |
| 6 | 10.95 - 14.10 | Strong | Large branches begin to move: telephone wires whistle |
| 7 | 14.10 - 17.20 | Strong | Whole trees in motion |

Fig 1.2.1 Beaufort Scale

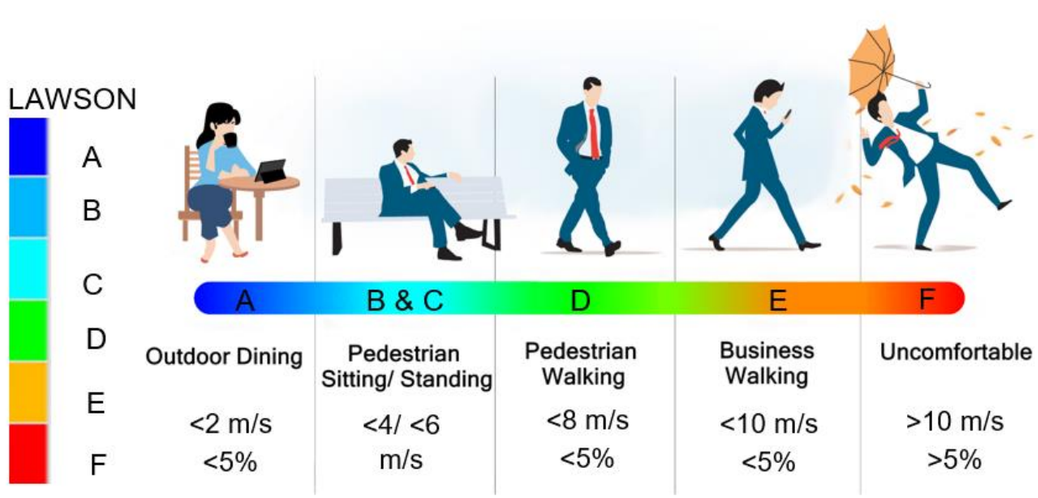


Fig 1.2.2 Lawson Scale

# 4.0 Lawson Criteria Results

Figure 2.0 outlines the Lawson Criteria Scale utilised to assess Pedestrian Comfort across the proposed Heuston South Quarter SHD development. Blue contours illustrate the most sheltered regions, areas deemed “Suitable for Outdoor Dining”. Light Blue/Cyan contours indicate regions “Suitable for Pedestrian Sitting” and “Pedestrian Standing” respectively. Green contours indicate areas “Suitable for Pedestrian Walking”, with orange illustrative of being “Suitable for Business Walking”. Red areas highlight zones as “Uncomfortable”.

## 4.1 Ground Level Results

Fig 2.1 illustrates the Pedestrian Comfort results for 1.5m above the ground level of the development. The conditions have been determined to be predominantly suitable for “Outdoor Dining” and “Pedestrian Sitting”, as illustrated by dark/light blue contours.

As highlighted in Fig 2.1, Fig 2.2 illustrates slight acceleration of winds through the undercroft of the buildings, with wind conditions suited to “Pedestrian Standing”, as indicated by cyan contours.

| | | | | |
|---|---|---|---|---|
| A | 2 m/s | < 5% | Outdoor Dining |
| B | 4 m/s | < 5% | Pedestrian Sitting |
| C | 6 m/s | < 5% | Pedestrian Standing |
| D | 8 m/s | < 5% | Pedestrian Walking |
| E | 10 m/s | < 5% | Business Walking |
| U | 10 m/s | > 5% | Uncomfortable |

Fig 2.0 – Lawson Criteria Scale

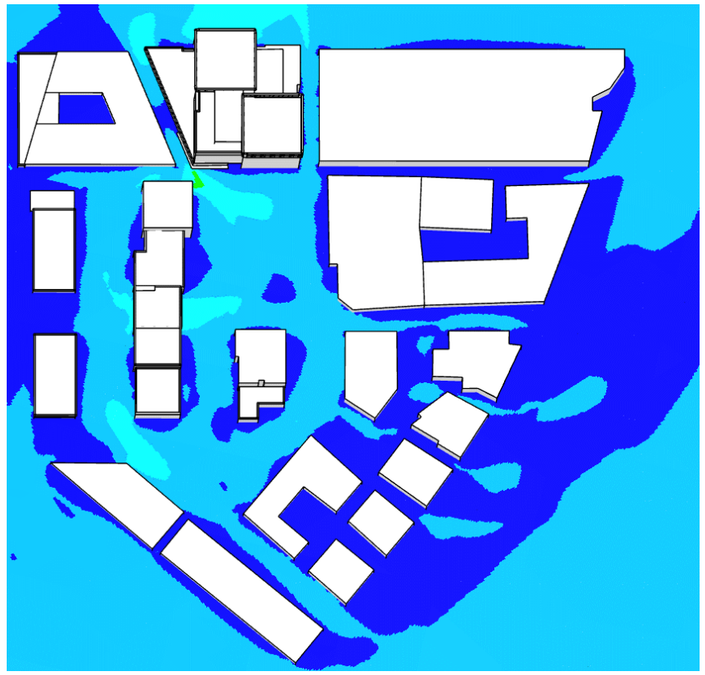

Fig 2.1 – Lawson Criteria Results at 1.5m above Ground Level across Proposed HSQ2 Development.

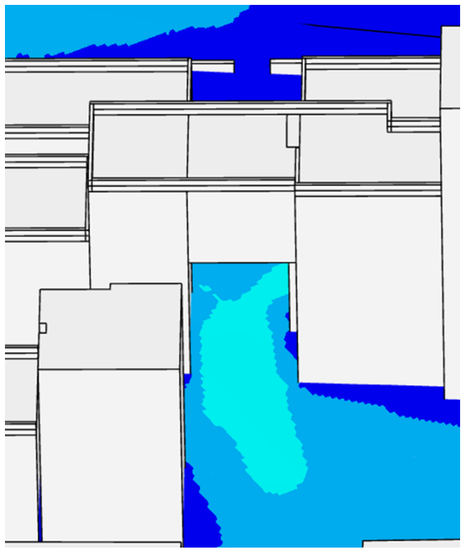

Fig 2.2 – Acceleration through Undercroft

## 4.2 Roof Terrace

Figure 2.6 illustrates results of pedestrian comfort results at the initial roof terrace level amenity modelled with a one-metre-high balustrade surrounding the terraces. The space as analysed is determined by the Lawson methodology utilised to be predominantly suitable for “Outdoor Dining/Pedestrian Sitting” with a small area of block B suitable for “Pedestrian Standing”.

The height of the parapets to the South and West of each terrace were increased to 1.8m high to further improve the microclimate to these amenity areas.

| | | | | |
|---|---|---|---|---|
| A | 2 m/s | < 5% | Outdoor Dining |
| B | 4 m/s | < 5% | Pedestrian Sitting |
| C | 6 m/s | < 5% | Pedestrian Standing |
| D | 8 m/s | < 5% | Pedestrian Walking |
| E | 10 m/s | < 5% | Business Walking |
| U | 10 m/s | > 5% | Uncomfortable |

Fig 2.0 – Lawson Criteria Scale

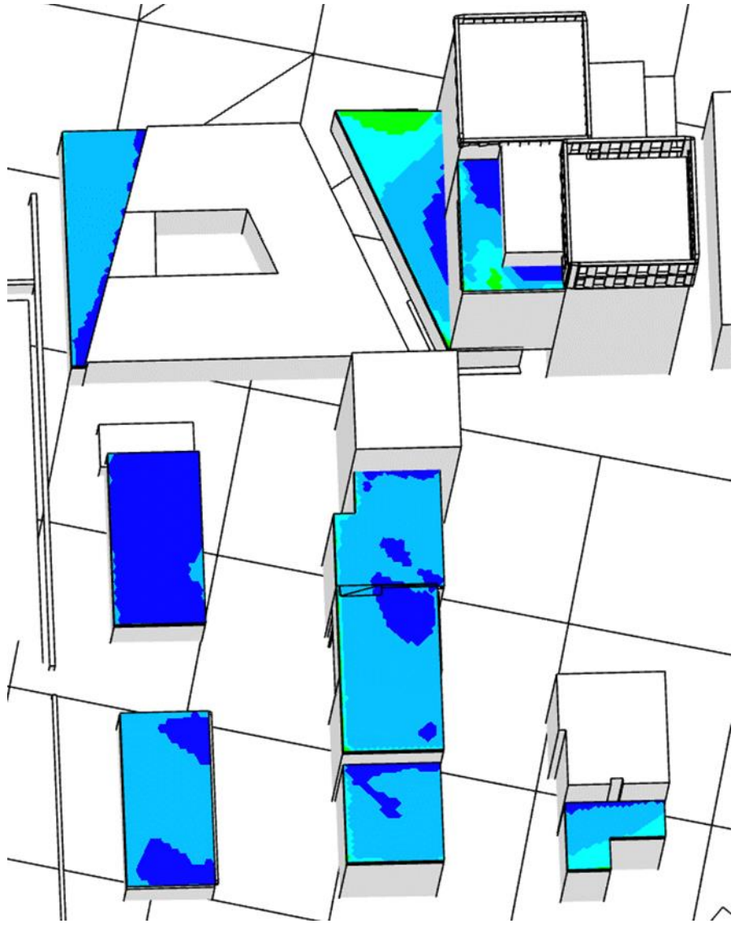

Fig 3.3 – Initial Lawson Criteria Results for Roof Terraces with 1m high balustrade.

Figure 3.3 illustrates roof terrace results with a 1.8m high balustrade to the West and South parapets. These results indicate an increase in areas suited to “Outdoor Dining”. Results for all roof terraces with the Block B terrace now achieving “Outdoor Dining” standards across the full footprint.

| | | | | |
|---|---|---|---|---|
| A | 2 m/s | < 5% | Outdoor Dining |
| B | 4 m/s | < 5% | Pedestrian Sitting |
| C | 6 m/s | < 5% | Pedestrian Standing |
| D | 8 m/s | < 5% | Pedestrian Walking |
| E | 10 m/s | < 5% | Business Walking |
| U | 10 m/s | > 5% | Uncomfortable |

Fig 2.0 – Lawson Criteria Scale

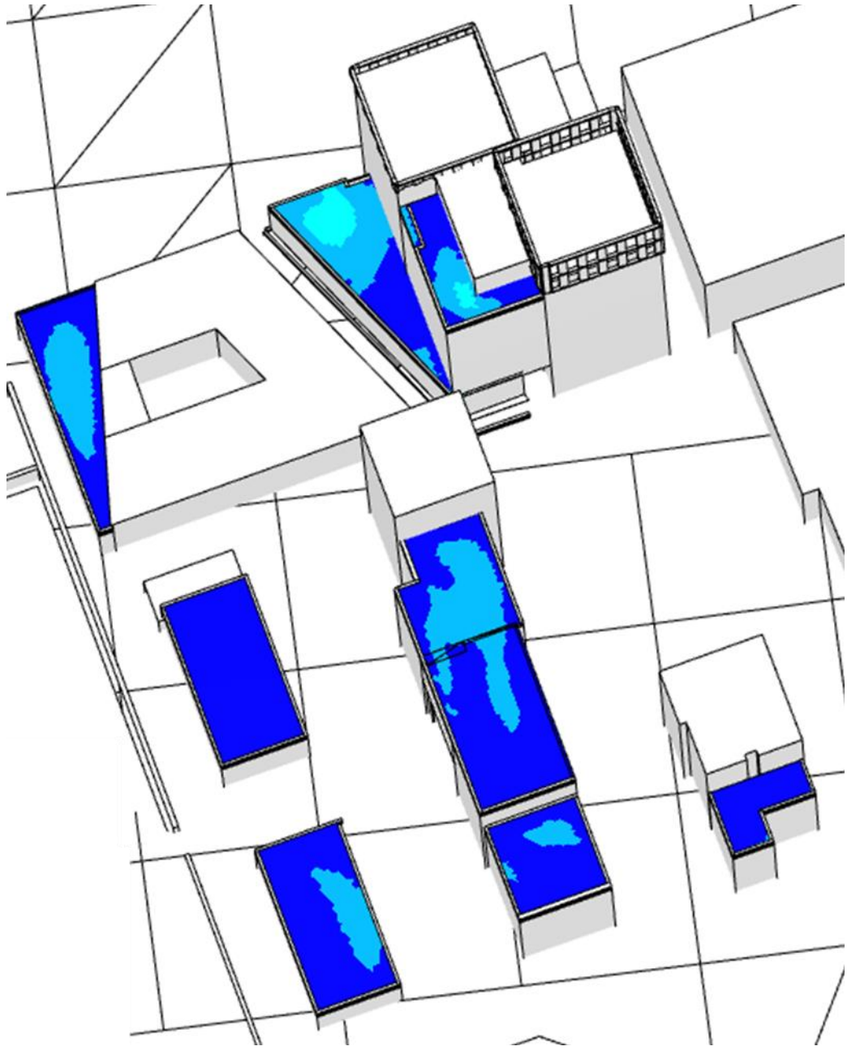

Fig 3.3 – Lawson Criteria Results for Roof Terraces with 1.8m high balustrade.

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