# Former Sipson Garden Centre

## Pedestrian Wind Microclimate Assessment

Virtus Data Centres

5th October 2026

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## Quality information

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# 1. Executive Summary

1.1 AECOM have been appointed to undertake a pedestrian comfort microclimate assessment. This report presents an overview of this work.

1.2 AECOM performed a CFD microclimate study using the Lawson method.

1.3 All areas around the proposed development met the desired comfort levels in the model.

1.4 All areas around the proposed development met the required distress levels in the model.

1.5 A single model was assessed:

- **Proposed** scenario and surroundings with no trees.

1.6 The wind microclimate around the site was assessed for this model. The assessment was undertaken through computational wind engineering (CWE) which uses CFD techniques to simulate wind conditions around the site. This report contains the methodology and results from these simulations.

1.7 Lawson comfort plots were produced for the site and its nearby surroundings. These plots allow identification of the level of comfort achieved over the site and enable comparison to the pedestrian uses intended for the site. Turbulence has also been accounted for in the Lawson analysis.

1.8 The aim of the simulations was to reproduce the macro level wind regime around the buildings. A total of 36 wind directions (every 10° around the compass) were simulated with a representative high wind applied to a full 3D model of the development within the local built environment.

1.9 Further analysis was also undertaken to assess compliance with the Lawson criteria for comfort and distress. Interpolating steady-state CFD simulations of the site allows the frequencies with which wind speeds occur across the site to be calculated. This analysis used 20 years of historic weather data from London Heathrow to calculate the prediction.

# 2. Introduction

## Outline of the Proposed Development

### Site Description

2.1 The site is irregular in shape and comprises the former Sipson Garden Centre and associated land. The northern part of the site contains the former garden centre buildings, areas of hardstanding, a car park, and external areas previously used for the display and storage of goods associated with the garden centre use. The southern part of the site comprises an undeveloped field.

2.2 The site is bounded to the east by a section of the M4 motorway in the vicinity of Heathrow Airport. A further section of the M4 motorway runs immediately to the north of the site. The western boundary is formed by the A408, from which the site gains vehicular access. A small number of residential properties are located to the south-west of the site, fronting the A408.

2.3 The Holiday Inn Hotel, which is currently being refurbished, is situated immediately north of the site, while The Plough public house occupies the north-western corner of the site boundary. The Plough is designated as a locally listed building. To the south of the site are residential properties forming part of the settlement of Sipson.

### Proposed Development

2.4 Outline planning application (with all matters reserved except for access) for the redevelopment of the former Sipson Garden Centre site to provide a data centre facility, including associated energy infrastructure, security measures, landscaping, and access arrangements.

2.5 The proposed development comprises the demolition of existing structures and the construction of a new data centre facility with an anticipated operational capacity of approximately 54MW. The development would provide approximately up to 54,000 sqm of gross internal floorspace, including data halls, administration block, plant, and associated ancillary infrastructure.

### Planning History

2.6 Full planning permission was granted on 7 March 2025 (LPA Ref. 67666/APP/2023/3721) for the redevelopment of the site to provide a Centre of Excellence for the servicing and repair of Airside Support Vehicles (Use Class B2). The approved scheme comprises a service building containing seven service bays and one storage bay, an ancillary two-storey office building, together with associated hardstanding, parking, and other supporting infrastructure.

2.7 This planning application was approved following a resolution to grant planning permission at Planning Committee in June 2024.

# Views of the site

2.8 Figure 1 provides an overview of the Site location in plan. Figure 2 provides a conceptual illustration of the architecture and landscape proposals.




*Source: extract of drawing PGF-ACM-00-XX-DR-AR-100000 - Site Location Plan rev P1*

**Figure 1: Site Plan**



*Source: AECOM Architectural Render, July 2026*

**Figure 2: Site Illustration**

2.9 AECOM have been appointed to undertake a pedestrian comfort microclimate assessment. This report presents an overview of this work.

# Scope of the Computational Fluid Dynamics (CFD) Study

2.10 A single model was assessed:

- **Proposed** scenario and surroundings with no trees.

2.11 The wind microclimate around the site was assessed for this model. The assessment was undertaken through computational wind engineering (CWE) which uses CFD techniques to simulate wind conditions around the site. This report contains the methodology and results from these simulations.

2.12 Lawson comfort plots were produced for the site and its nearby surroundings. These plots allow identification of the level of comfort achieved over the site and enable comparison to the pedestrian uses intended for the site. Turbulence has also been accounted for in the Lawson analysis.

2.13 The aim of the simulations was to reproduce the macro level wind regime around the buildings. A total of 36 wind directions (every 10° around the compass) were simulated with a representative high wind applied to a full 3D model of the development within the local built environment.

2.14 Further analysis was also undertaken to assess compliance with the Lawson criteria for comfort and distress. Interpolating steady-state CFD simulations of the site allows the frequencies with which wind speeds occur across the site to be calculated. This analysis used 20 years of historic weather data from London Heathrow to calculate the prediction.

# Limitations of Modelling

2.15 The results of modelling physical phenomena have uncertainty compared with real life performance. All modelling techniques fail to predict reality with perfect precision due to necessary assumptions, unpredictable boundary conditions, or other simplifications. The two main methods used to model wind flow are CFD (used in this study) and wind tunnel testing using a scaled physical 3D model.

2.16 CFD simulation presents an efficient and comprehensive solution to predicting pedestrian comfort. Since the domain is divided into millions of separate cells, results can be reported in high resolution throughout the full 3D domain. This allows all features of the simulation to be accounted for in the analysis.

2.17 Methods that require physical measuring equipment, such as wind tunnel testing can provide a useful approach to corroborating results but only provide data at much reduced number of locations throughout the domain. For example, the CFD results presented in this report use tens of thousands of data points combined into an image displaying pedestrian wind comfort throughout the whole area of concern. A wind tunnel approach would use typically ~10s to ~100s of data points and as such may miss important flow features that CFD analysis may have reported.

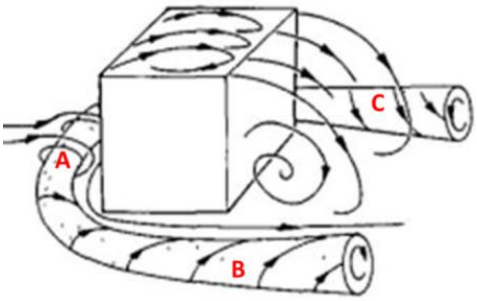



**Figure 3: Schematic of turbulent airflow around a building block**

2.18 This study employs the Reynolds-averaged Navier Stokes (RANS) equations to model time-averaged fluid flow. This method uses an analytical closure model to account for turbulence rather than resolving turbulent eddies explicitly. Calculating the precise eddy size created by more complex turbulent behaviour requires transient simulation methods which require much greater computational resources making them impractical for studies of this kind. The simulated turbulence kinetic energy is incorporated into the Lawson calculation using an approximation to make a more conservative estimate (for typical buildings) of the Lawson result over the site.

2.19 Figure 3 shows an idealised diagram of airflow around a building block. The depicted flow features, amongst others, introduce turbulence into the flow field, both as it is simulated and as it presents in reality.

2.20 This report is suitable for Lawson Comfort and Distress and is not intended to be used for any other purposes e.g. structural loading, façade pressures, sports, particle transport, fire safety, etc.

# 3. Methodology

3.1 To identify the likely effect of the proposed development on the pedestrian level wind environment, 3D CFD models of the development and surrounding site were created. This section describes the methodology for the creation of this model and the inputs used.

## Computational Fluid Dynamics (CFD)

3.2 Digital 3D model geometry of the site and surroundings is created using *Rhinoceros3D* (industry standard 3D CAD software). The extents of the surrounding geometry around the site are limited to the regions of influence and dependence of the geometry at the site.

3.3 The resulting geometry is a volume representing the fluid around the buildings. This volume is decomposed into a computational mesh of discrete finite volumes using *ANSYS ICEM CFD* (industry standard meshing software).

3.4 Computational Fluid Dynamics (CFD) is used to evaluate the flow state (including vectors and scalars) across the entire domain represented by the computational mesh. The simulation is performed using *ANSYS CFX* (industry standard CFD software).

3.5 The following state variables are evaluated at each cell in the mesh:

- Velocities in the three co-ordinate directions (U, V, W)
- Pressure (P)
- Turbulence Transport Properties: Kinetic Energy (k); Dissipation Rate (ε); Specific Dissipation (ω)

3.6 To enhance the resolution of the results, the cell sizes of the mesh can be reduced in the areas of greatest interest (at pedestrian level around the proposed development) and where any significant small-scale flow features are likely to occur. This ensures greater accuracy of the variables under investigation.

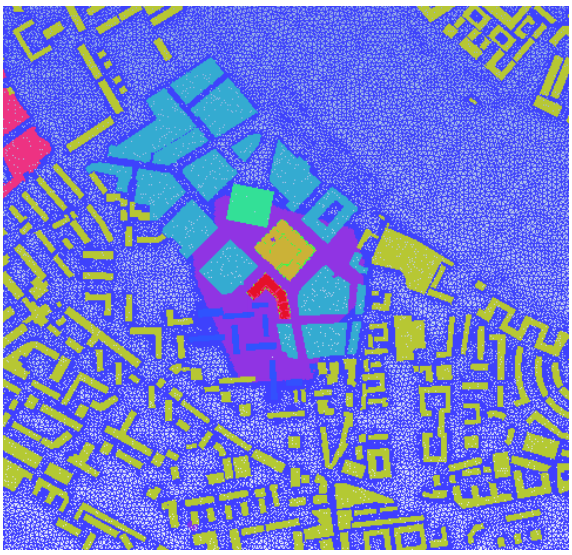


**Figure 4: Example of typical mesh**

# Boundary Conditions

3.7 A cylindrical computational domain was used for the analysis as shown in Figure 5. Around the perimeter of the domain, a profile for the velocity and turbulence parameters was specified to take into account how the wind speed varies with height from the ground. Profiles for the fractional turbulence intensity and eddy length scale have also been prescribed at the inlet boundaries to better mimic the Atmospheric Boundary Layer entering the domain.

3.8 Surfaces within the model were specified as having 'no slip'. This condition ensures that flow moving parallel to a surface is brought to rest at the point where it meets the surface. Furthermore, a sand-grain roughness is applied to each surface as described in Table 3

# Wind Boundary Layer Profile

3.9 Accurate specification of the boundary layer wind profile is crucial in correctly simulating the urban wind environment. For this reason, a "neutral" atmospheric boundary layer was applied for the upstream velocity profile. This profile is for a wind in the highest decile of measured wind speeds and is representative of typical strong winds**.**

# Lawson Criteria

3.10 The pedestrian comfort criteria use the LDDC method, as set out in Building Aerodynamics, [Imperial College Press (2001)]. These criteria are shown in Table 1.

**Table 1: Lawson comfort criteria**

| Category | Comfort Category | Threshold Wind Velocity (m/s) | Colour Scale | Percentage of Exceedance |
|---|---|---|---|---|
| 0 | | <2.5 | | 5% |
| I | Pedestrian Sitting | 4 | | 5% |
| II | Pedestrian Standing | 6 | | 5% |
| III | Pedestrian Walking | 8 | | 5% |
| IV | Business Walking/Cycling | 10 | | 5% |
| V | Unacceptable for Pedestrian Use | >10 | | >5% |

3.11 Lawson comfort conditions are evaluated 1.5m above floor level for all public pedestrian areas and rooftop terraces. If a colour shown in Table 1 is seen in a Lawson plot, then it means it is acceptable for the corresponding activity and all those with higher wind velocity thresholds. For example, if an area is coloured with the yellow shown for "category III" then it will be acceptable for Pedestrian Walking (III) and Business Walking/Cycling (IV) but not acceptable for Sitting and Standing (I, II).

3.12 The distress criteria used will use the Lawson LDDC method, as set out in Building Aerodynamics, [Imperial College Press (2001)]. These state that, for elderly or infirm pedestrians, the hourly mean wind speed should exceed 15 m/s for less than 0.025% of a typical year (approximately 2 hours). For able-bodied pedestrians, the hourly mean wind speed limit should exceed 20 m/s for less than 0.025% of a typical year. Should these be exceeded for more than 0.025% of the year, this informs the wind engineer to consider if 'the location [is] on a major route through the complex, and are there suitable alternate routes which are not 'distressful'?'

# 4. Policy

The section below is a policy summary included for completeness. While the detailed wording of policy has varied in time, and across planning authorities – the methodology and thresholds of these assessments have remained constant (apart from the City of London which explicitly sets slightly tighter thresholds).

## Statutory Context and National Planning Policy Framework

4.1 The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and is a material consideration in the determination of planning applications. The NPPF was adopted in August 2026.

*4.2* The NPPF DP3(2.f) states: *"Public Space: include spaces that are safe, secure, inclusive, and accessible for all ages and abilities, including for groups such as women and girls; and which facilitate and encourage social interaction, play and healthy lifestyles (for example by providing high quality, clear and legible pedestrian and cycle routes, a variety of recreational spaces and places to meet, integrating lighting and making building entrances and windows face onto streets and other public spaces to provide natural surveillance); and"*

4.3 These principles are relevant to pedestrian wind conditions where the scale, height and massing of a proposed development have the potential to alter wind flows at pedestrian level. Potential effects can include increased wind speeds, localised wind acceleration, funnelling and downdraughts around building corners and within open spaces.

4.4 The Pedestrian Wind Assessment provides a technical assessment of these effects and considers whether the resulting wind conditions are appropriate for the intended use of pedestrian areas and surrounding public realm.

## Regional Policy: The London Plan 2021

4.5 The site is located within Greater London, where the strategic development framework is provided by the adopted London Plan 2021.

**GG1 - Building strong and inclusive communities**

4.6 GG1 F states: *"Good growth is inclusive growth. To build on the city's tradition of openness, diversity and equality, and help deliver strong and inclusive communities, those involved in planning and development must: ensure that streets and public spaces are consistently planned for people to move around and spend time in comfort and safety, creating places where everyone is welcome, which foster a sense of belonging, which encourage community buy-in, and where communities can develop and thrive."*

**Policy D8 – Public Realm**

4.7 Policy D8 G states: *"ensure buildings are of a design that activates and defines the public realm, and provides natural surveillance. Consideration should also be given to the local microclimate created by buildings, and the impact of service entrances and facades on the public realm"*

**Policy D9 – Tall Buildings**

4.8 Policy D9 3 a states: *"wind, daylight, sunlight penetration and temperature conditions around the building(s) and neighbourhood must be carefully considered and not compromise comfort and the enjoyment of open spaces, including water spaces, around the building"*

# Local Planning Policy: London Borough of Hillingdon

4.9 The adopted development plan for the site comprises the Hillingdon Local Plan: Part 1 – Strategic Policies (2012) and the Hillingdon Local Plan: Part 2 – Development Management Policies (2020).

**Hillingdon Local Plan: Part 1 – Strategic Policies (2012)**

4.10 Policy BE1 (Built Environment): Seeks a high standard of design and requires development to contribute positively to the character, appearance, and quality of the built environment. The policy is relevant to pedestrian wind conditions as far as building scale, massing, height and layout can influence the environmental quality and usability of surrounding streets and spaces.

**Hillingdon Local Plan: Part 2 – Development Management Policies (2020)**

4.11 Policy DMHB 11 (Design of New Development): Requires development to achieve a high standard of design and respond appropriately to its context, including matters such as scale, height, massing, street enclosure and the relationship between buildings and surrounding spaces. These considerations are relevant to pedestrian wind conditions because changes in building form and massing can influence wind flow around buildings and at pedestrian level.

4.12 Policy DMHB 12 (Streets and Public Realm): Relevant to the design and quality of streets and public spaces. The Pedestrian Wind Assessment therefore considers the effect of the proposed development on wind conditions experienced by pedestrians using surrounding footways, entrances, pedestrian routes and other relevant areas of the public realm.

**Emerging Hillingdon Local Plan**

4.13 Hillingdon Council is progressing a new Local Plan. Adopted local policies remain the primary statutory basis for determination under Section 38(6) of the PCPA 2004 until replacement plans are formally adopted.

# Assessment Methodology and Wind Comfort Criteria

4.14 Neither the NPPF nor London Plan nor local planning policy prescribe a single statutory CFD or wind-tunnel methodology for assessing pedestrian wind conditions. The assessment methodology should therefore be proportionate to, and appropriate for, the scale, form and context of the development and the nature of the pedestrian environment.

4.15 Computational Fluid Dynamics (CFD) modelling has been undertaken to predict pedestrian-level wind velocities and the resulting wind conditions around the proposed development.

# 5. Inputs

## Geometry

5.1 A single model was assessed:

- **Proposed** scenario and surroundings with no trees.



**Figure 5: Plan view of the proposed scenario**

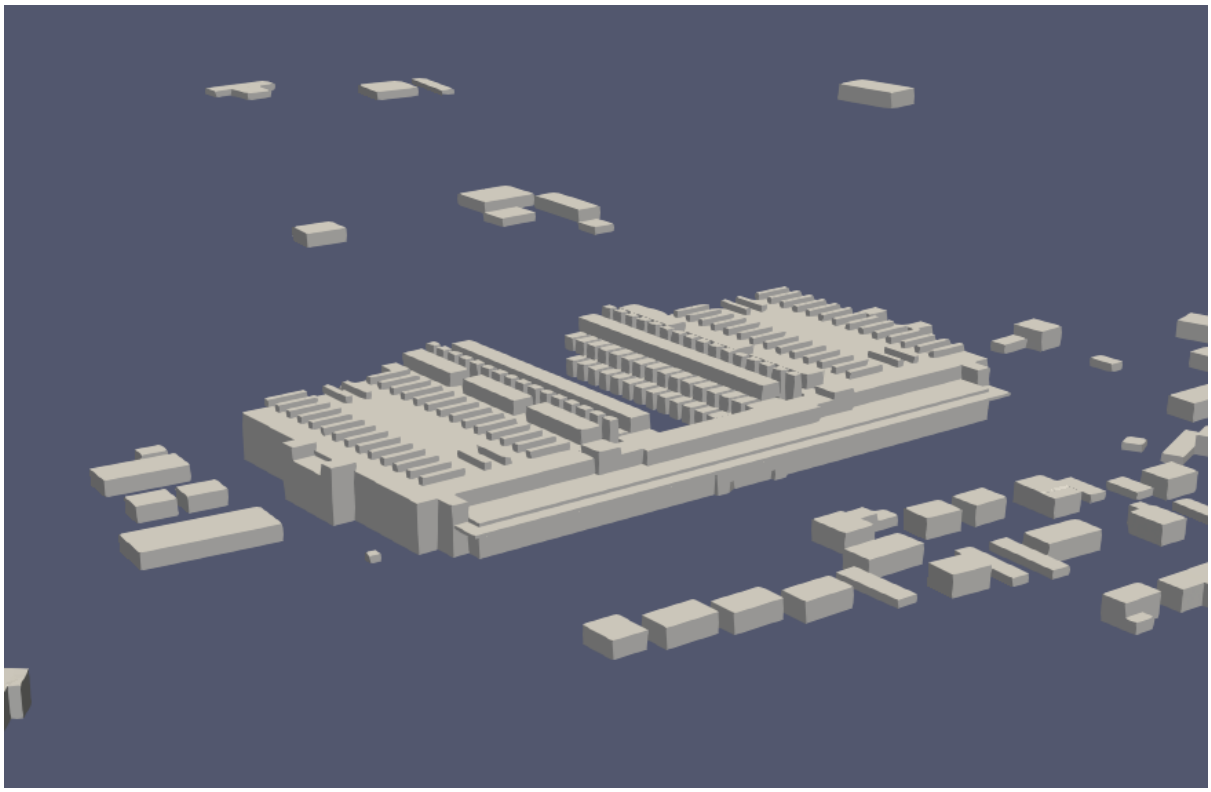


**Figure 6: Perspective view of the proposed scenario**

# Wind Data Analysis

5.2 The wind data used for the analysis was from Heathrow Airport. It is in the form of hourly-averaged wind velocities, measured at 10m above ground. A wind rose for Heathrow Airport is shown in Figure 7, which indicates that the prevailing wind direction is south-westerly (mode direction is 210° from north).

5.3 Average wind speed increases with distance from the ground and this, along with turbulence effects, has a significant impact on the resulting wind profiles around the buildings. When assessing pedestrian level wind speeds, wind data is modified to consider terrain roughness around the data source location and the resulting wind velocity profile.

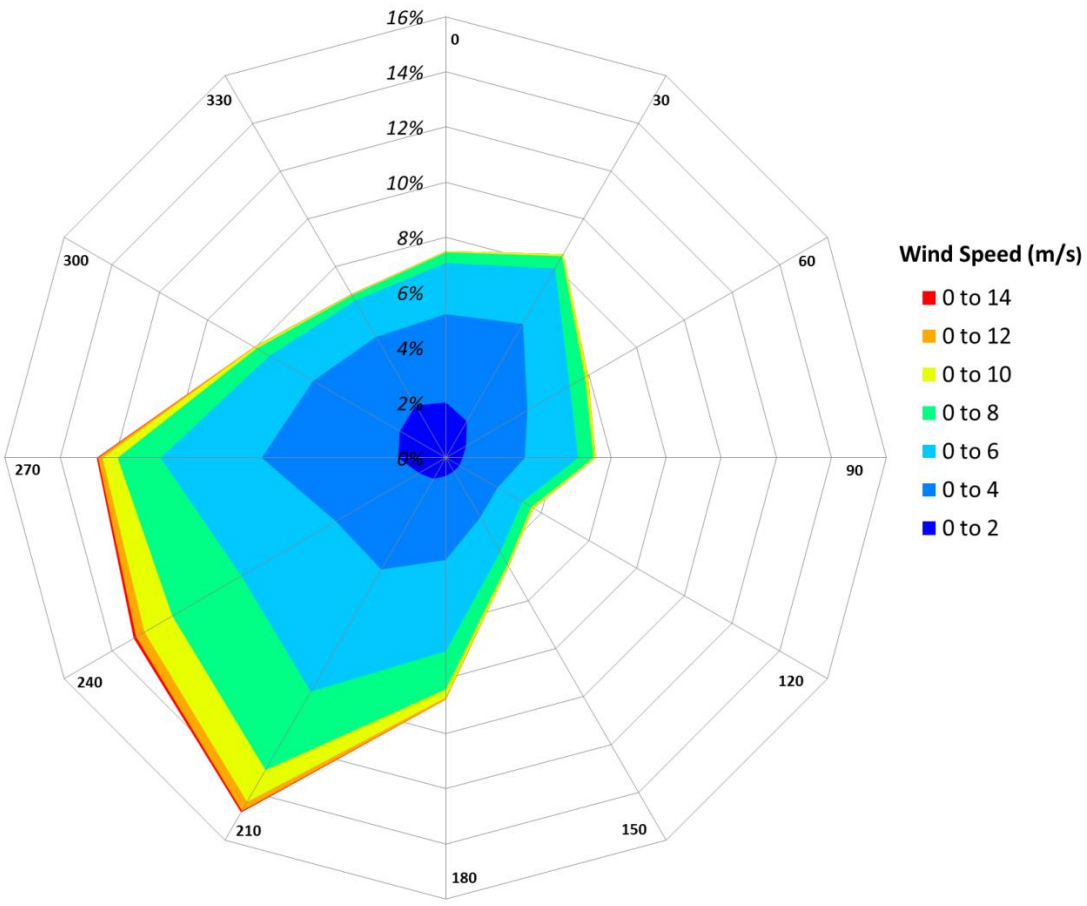



**Figure 7: Wind Rose for Heathrow Airport**

# Terrain Roughness Approaching Site

5.4 The roughness of the upwind ground surface is important in the formulation of the atmospheric boundary layer and as a result will affect the wind velocity felt at pedestrian level on the site. Table 2 indicates the roughness $z_0$ appropriate for various terrains surrounding a site. An approaching terrain roughness is chosen, according to the method described in (EN 1991-1-1-4:2005+A1:2010 (E)).

5.5 Figure 8 shows the wider site. The roughness's were as follows:

- 80 degrees to 270 degrees inclusive – Category II
- 280 degrees to 70 degrees inclusive – Category III

**Table 2: Terrain categories and related parameters**

| Terrain category | | $z_0$ m | $z_{min}$ m |
|---|---|---|---|
| 0 | Sea or coastal area exposed to the open sea | 0,003 | 1 |
| I | Lakes or flat and horizontal area with negligible vegetation and without obstacles | 0,01 | 1 |
| II | Area with low vegetation such as grass and isolated obstacles (trees, buildings) with separations of at least 20 obstacle heights | 0,05 | 2 |
| III | Area with regular cover of vegetation or buildings or with isolated obstacles with separations of maximum 20 obstacle heights (such as villages, suburban terrain, permanent forest) | 0,3 | 5 |
| IV | Area in which at least 15 % of the surface is covered with buildings and their average height exceeds 15 m | 1,0 | 10 |



**Figure 8: Satellite image indicating approaching terrain to the site**

# Trees and Vegetation

5.6 Trees were not modelled. As wind flows though trees it slows down. Not modelling trees makes on-Site winds faster, and is likely the worst case for this study.

# Model Surface Roughness

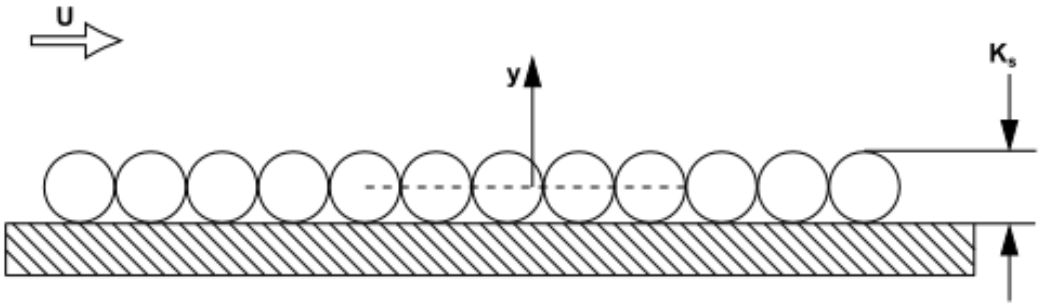



**Figure 9: Diagram with value of sand-grain roughness labelled as $K_s$**

5.7 A sand-grain roughness is applied to each surface in the model to represent likely features on a surface. Figure 9 indicates the theory behind the value.

**Table 3: Summary of sand-grain roughness of surfaces within CFD model**

| **Surface** | **$K_s$, Sand-grain Roughness (m)** |
|---|---|
| Ground | 0.1 |
| All buildings | 0.01 |

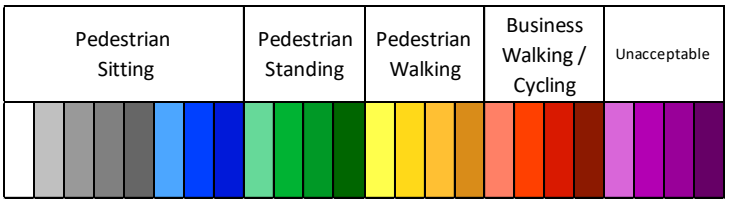
# 6. Results

## Pedestrian Comfort

6.1 The results for each simulated scenario are presented as a Lawson plot at 1.5m above the ground, showing colours that correspond to the categories set out in Table 1. The wind microclimate will be acceptable for an activity if the Lawson plot shows the colour of the corresponding category or lower, as shown in Table 1.

6.2 Increased detail in results will be shown by breaking colours down into shades within each category, as seen in the table below. This allows the reader to see if the space is towards the calm or windy end of each category.

**Table 4: Results Colours**



6.3 The results for the Lawson pedestrian comfort analysis for the proposed scenario at ground level is shown in Figure 10.

6.4 The results show that the pedestrian wind microclimate in the model is suitable for pedestrian walking everywhere on or nearby the site. Entrances and thoroughfares are suitable for standing or more comfortable. As such, these conditions are acceptable according to the Lawson criteria.

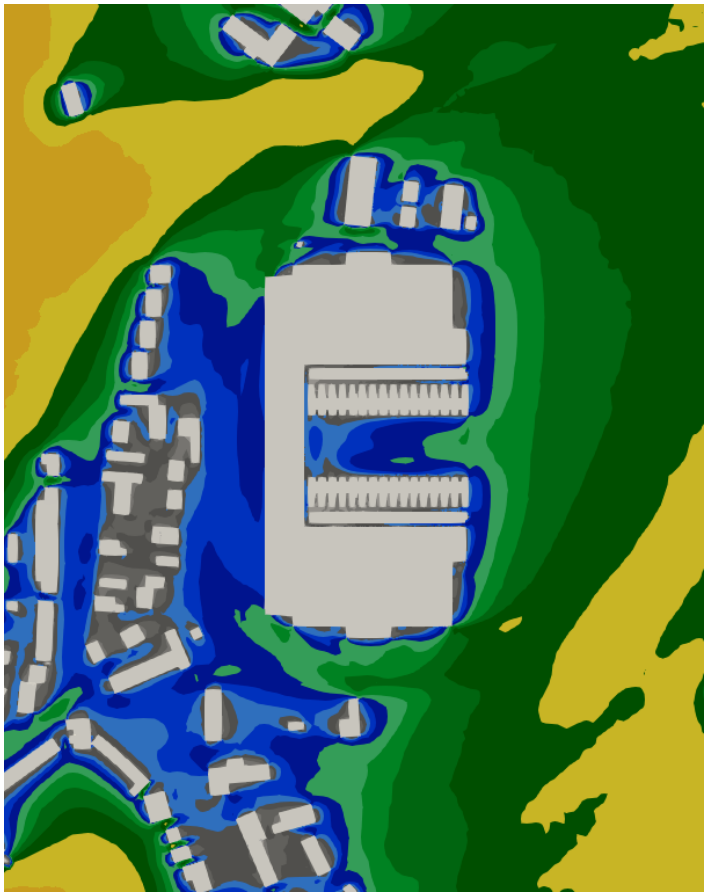


**Figure 10: Lawson pedestrian comfort results**

| | | |
|---|---|---|
| 0 | <2.5 | |
| I | Pedestrian Sitting | 4 |
| II | Pedestrian Standing | 6 |
| III | Pedestrian Walking | 8 |
| IV | Business Walking/Cycling | 10 |
| V | Unacceptable for Pedestrian Use | >10 |




**Figure 11: Lawson comfort – desired uses**

| | | | |
|---|---|---|---|
| 0 | | <2.5 | |
| I | Pedestrian Sitting | 4 | |
| II | Pedestrian Standing | 6 | |
| III | Pedestrian Walking | 8 | |
| IV | Business Walking/Cycling | 10 | |
| V | Unacceptable for Pedestrian Use | >10 | |

6.5 Figure 11 shows the Lawson pedestrian comfort desired / intended uses for each space. It can be seen that at every point in the model the actual wind conditions are at a suitable level or calmer than the desired uses.

# Distress Criteria

6.6 Ground level distress results for the proposed is shown in Figure 12.

6.7 No distress with a 15 m/s threshold around the proposed development is indicated in the model.

6.8 No distress with a 20m/s threshold around the proposed development is indicated in the model.

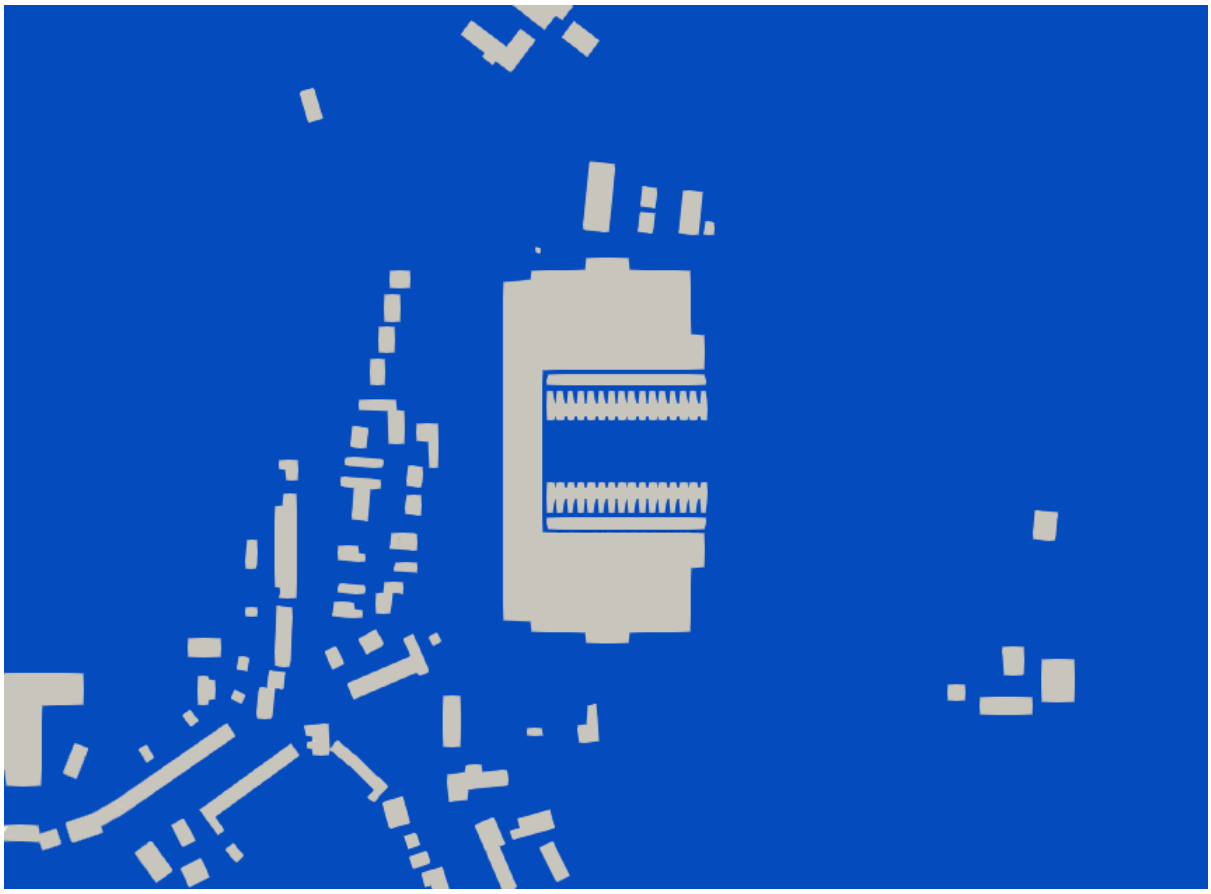


**Figure 12: Lawson distress (15m/s and 20m/s) results for proposed**



# 7. Conclusion

7.1 AECOM have been appointed to undertake a pedestrian comfort microclimate assessment. This report presents an overview of this work. AECOM performed a CFD microclimate study using the Lawson method. All areas around the proposed development met the desired comfort levels in the model. All areas around the proposed development met the required distress levels in the model.

7.2 A single model was assessed:

- **Proposed** scenario and surroundings with no trees.

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