

CO-LIVING SCHEME AT 20-30 GREYFRIARS ROAD

READING, UK

PEDESTRIAN LEVEL WIND MICROCLIMATE ASSESSMENT

RWDI #2407814 – REV C

10TH DECEMBER 2024

SUBMITTED TO

Elder Developments (Greyfriars) Ltd

SUBMITTED BY

RWDI

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VERSION HISTORY

RWDI Project #2407814	Co-Living at 20-30 Greyfriars Road Reading, UK	
Report	Releases	Dated
Reports	Rev A	8 th November 2024
	Rev B	28 th November 2024
	Rev C	10 th December 2024
Project Team	JM JLL RW	

EXECUTIVE SUMMARY

The objective of this study was to determine the ground and upper level wind environment within and around the proposed Co-Living Scheme at 20-30 Greyfriars Road development (hereafter referred to as the “Proposed Development” in Reading, UK.

This report presents a description of the methodology used and the results of the configurations tested using Computational Fluid Dynamics (CFD) simulations, namely:

- Configuration 1: Existing Site with the Existing Surrounding Buildings;
- Configuration 2: Proposed Development with the Existing Surrounding Buildings; and
- Configuration 3: Proposed Development with the Cumulative Surrounding Buildings.

The majority of areas have suitable wind conditions for the intended uses. Furthermore, potential safety concerns would not be anticipated.

With respects to the outdoor amenity spaces, the ground level amenity would have sitting use wind conditions during both the windiest and summer season, suitable for the intended use. On the Level 7 and Level 12 rooftop terraces, a mix of sitting and standing wind conditions is predicted during the summer months.

If seating is planned in areas with standing wind conditions, it is recommended to provide additional localised shelter as outlined in this report. However, there will also be periods during the summer with calmer wind speeds that would be suitable for seating.

Wind mitigations measures to improve wind conditions have been incorporated within the scheme in the form of balustrading, tall planting and landscaping structures. Further mitigation measures have been recommended on the Level 7 and Level 12 rooftop terraces which may further reduce the wind conditions suitable for their intended seating use. However, given the additional measures already incorporated within the terraces, these may compromise the design aspects and proposed functionality of the terrace spaces.

If additional landscaping measures are to be incorporated, these should be reviewed by an experienced wind engineer to provide professional judgement on whether added measures would be sufficient in achieving suitable wind conditions.

1. INTRODUCTION

RWDI was appointed by Elder Developments (Greyfriars) Ltd to conduct a pedestrian level wind microclimate (PLW) assessment for the proposed Co-Living Scheme at 20-30 Greyfriars Road development (referred to as the “Proposed Development” hereafter in this report) in Reading, UK. This report presents the background, objectives, methodology, results and discussion from RWDI’s assessment. A summary of the overall recommendations from the investigation are presented in Section 7 “Conclusions”.

2. BACKGROUND AND APPROACH

2.1 Site Description and Surroundings

The Proposed Development is located in Reading. The Site is bounded by Gerrard Street to the north, existing buildings to the east and south, and Greyfriars Road to the west. The OS Landranger reference grid for the Site is SU712736.

The Site is currently occupied by the existing 20-30 Greyfriars Road building. The surrounding area is predominantly low to mid-rise buildings, with taller high rise buildings to the south-west Site and immediately to the east. This type of terrain would result in wind speeds approaching the Site having a lower mean wind speeds and higher turbulence (i.e. more ‘gusty’), compared to a Site located in a more open environment. An aerial view of the approximate Site location is highlighted in yellow with its surroundings in Figure 1.



Figure 1: Aerial view of the existing Site (approximate extent of the Site highlighted in yellow)

2.2 The Proposed Development

The Proposed Development comprise the demolition of the existing building and the erection of a part-7, part-13 storey building comprising 266 co-living units (Sui Generis) and associated communal amenity facilities, refuse storage, cycle parking and plant equipment.

The Proposed Development will provide 3 external communal amenities spaces, located at ground, Level 7 and Level 12.

A 3D model of the Proposed Development used in the assessment is shown in Figure 2 below.

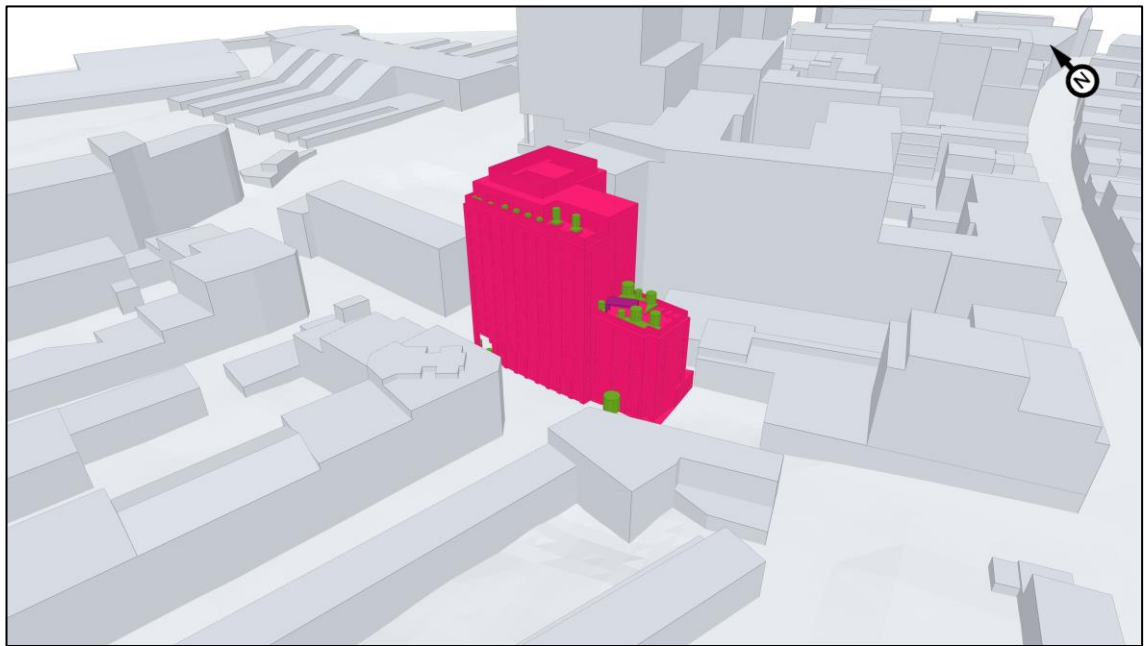


Figure 2: 3D model of the Proposed Development (pink) with Existing Surrounding Buildings (grey) (View from south-west)

3. METHODOLOGY AND ASSESSMENT CRITERIA

The 3D model of the Proposed Development in the context of the existing surrounding buildings used for CFD simulations of Configuration 2 is shown in Figure 2. Additional images of the 3D model in all configurations are presented in Appendix A. In each of the assessed scenarios surrounding buildings within a 400m radius of the centre of the Site were included.

The 'Results' section, shows the windiest season (typically winter) and the summer season (June to August) comfort plots. The comfort results are assessed at a height of 1.5m above the ground or building surface to represent conditions around people. The colours correspond to the Lawson Criteria described below in Section 4.2 'Pedestrian Comfort'.

CFD is a computer modelling technique for numerically simulating wind flow in complex environments. For this study, computational modelling was undertaken using OpenFOAM version 4.1 with 18 wind angles tested for each scenario, equally spaced out around the compass (using 20-degree intervals). This quantity of wind angles will provide sufficient aerodynamic interactions from all wind directions to achieve convergence.

The individual cases of the Proposed Development were solved using a RANS approach with an RNG k- ϵ turbulence model. The steady state RANS type model with the RNG k- ϵ turbulence model is chosen over other turbulence models or transient type schemes for wind microclimate studies by RWDI for its ability to approximate highly complex flows within urban environments to a high level of accuracy against a practical computational time. The statistically steady solution obtained by RANS simulations does not have the ability to predict the fluctuating or gusty nature of wind. As comfort is a function of average conditions, this model is more suited to analyse this.

The potential for strong winds leading to potential safety issues is assessed using informed engineering judgement.

The computational model was discretised into approximately 16.7 million cells with refinement close to the areas of expected high velocity gradients.

3.1 Meteorological Data

Approximately 30 years' worth of meteorological data were obtained from the meteorological station at London Heathrow Airport which was used in this report and is presented in Appendix B as wind roses by season (Figure 17). The radial axis indicates the directional distribution of winds. The seasons are defined as spring (March, April and May), summer (June, July and August), autumn (September, October and November) and winter (December, January and February).

The meteorological data indicates that the prevailing wind direction throughout the year is from the south-west and a secondary peak from north-easterly winds during the spring.

The wind data derived from the meteorological stations has been corrected to standard conditions of 10m above open flat level country terrain, over which pedestrian level wind speeds are greatest. The meteorological station data are then adjusted to the Site conditions using the methodology implemented in the ESDU software package¹.

The combination of meteorological data and velocity ratios permits the percentage of time that wind speeds are exceeded on the Site to be evaluated. The locations can then be assessed using the Lawson Comfort Criteria, as described below.

¹ ESDU International, 2001. Computer program for wind speeds and turbulence properties: flat or hilly sites in terrain with roughness changes, ESDU 01008, 2001 01008.

3.2 Pedestrian Comfort

The assessment of the wind conditions requires a standard against which the measurements can be compared. This report uses the Lawson Comfort Criteria², which have been established for over thirty years. The Criteria, which seek to define the reaction of an average pedestrian to the wind, are described in Table 1. If the measured wind conditions exceed the threshold wind speed for more than 5% of the time, then they are unacceptable for the stated pedestrian activity and the expectation is that there may be complaints of nuisance or people will not use the area for its intended purpose.

The Criteria sets out four pedestrian activities and reflect the fact that less active pursuits require more benign wind conditions. The four categories are sitting, standing, strolling and walking, in ascending order of activity level, with a fifth category for conditions that are uncomfortable for all uses. In other words, the wind conditions in an area for sitting need to be calmer than a location that people merely walk past.

The distinction between strolling and walking is that in the strolling scenario pedestrians are more likely to take on a leisurely pace, with the intention of taking time to move through the area, whereas in the walking scenario pedestrians are intending to move through the area quickly and are therefore expected to be more tolerant of stronger winds.

The Criteria are derived for open air conditions and assume that pedestrians will be suitably dressed for the season. Thermal comfort is discussed with reference to acceptable wind environments but not evaluated as part of the assessment.

The coloured key in Table 1 corresponds to the presentation of simulation results described in the results section of this report.

Table 1: Lawson Comfort Criteria

Key	Comfort Category	Threshold	Description
	Sitting	0-4 m/s	Light breezes desired for outdoor restaurants and seating areas where one can read a paper or comfortably sit for long periods
	Standing	4-6 m/s	Gentle breezes acceptable for main building entrances, pick-up/drop-off points and bus stops
	Strolling	6-8 m/s	Moderate breezes that would be appropriate for strolling along a city/town street, plaza or park
	Walking	8-10 m/s	Relatively high speeds that can be tolerated if one's objective is to walk, run or cycle without lingering
	Uncomfortable	>10 m/s	Winds of this magnitude are considered a nuisance for most activities, and wind mitigation is typically recommended

² Lawson T.V. (April 2001), Building Aerodynamics, Imperial College Press

3.3 Strong Winds

Lawson also specified a lower limit strong wind threshold when winds exceed 15m/s for more than 2.2 hours of the year. Exceedance of this threshold may indicate a need for remedial measures or a careful assessment of the expected use of that location; e.g. is it reasonable to expect elderly or very young pedestrians to be present at the location on the windiest day of the year?

Wind speeds that exceed 20m/s for more than 2.2 hours of the year represent a safety issue for all members of the population, which would require mitigation to provide an appropriate wind environment.

In the UK, strong winds are associated with areas which would be classified as uncomfortable for pedestrian use. Strong winds could also be associated with areas with walking use wind conditions, that are relatively close to the uncomfortable threshold. Professional judgement incorporating RWDI's experience of a large number of similar projects both within the UK and internationally has been applied, informed by the CFD results to identify areas of the Proposed Development likely to have instances of strong winds. Mitigation applied to improve pedestrian comfort would also reduce the frequency of, or even eliminate, any strong winds.

4. RESULTS

4.1 Details of Analysis

To account for the difference in ground height and terrain roughness between the meteorological station and the Site and the effect this will have on meteorological conditions, a terrain roughness assessment was undertaken to adjust the meteorological data from the relatively open surrounds of the airport to the suburban surroundings of the Site.

4.2 Desired Pedestrian Activity around the Development

Generally, for a mixed-use development, the target conditions are:

1. Strolling during the windiest season on pedestrian thoroughfares;
2. Standing conditions at main entrances throughout the year;
3. Standing use conditions at private amenity spaces such as balconies or larger amenity areas where seating is not intended; and
4. Sitting conditions at outdoor seating during the summer season when these areas are more likely to be frequently used by pedestrians.

The walking and uncomfortable classifications are usually avoided because of their association with occasional strong winds, unless they are on a minor pedestrian route or a route where pedestrian access could be controlled in the event of strong winds. Walking use wind conditions are also acceptable at crossings as pedestrians do not linger, however wind conditions must be safe.

Achieving a sitting classification in the summer usually means that the same location would be acceptable for standing in the windiest season because winds are stronger at this time of year. This is considered an acceptable occurrence for the majority of external amenity spaces because other factors such as air temperature and precipitation influence people's perceptions about the 'need' to use seating in the middle of winter.

Standing use wind conditions are the target conditions for main entrances, however strolling use wind conditions are considered acceptable at secondary entrances and fire exits.

It should be noted that a mixture of sitting and standing uses is acceptable for large terrace spaces, provided that any desired seating areas are situated in areas having sitting wind conditions. In addition, standing use conditions are also considered tolerable at private amenity areas (such as balconies) where the occupant has control over the use of the space.

4.3 Performance against the Lawson Comfort Criteria

The wind microclimate within and around the Site has been assessed and classified using the Lawson Comfort Criteria defined in Table 1. The results of the assessment for each configuration are described below and presented graphically in Figures 3 to 12.

4.3.1 Configuration 1: Existing Site with the Existing Surrounding Buildings

The wind microclimate results for Configuration 1 are shown in the following figures:

- Figure 3: Windiest Season (Ground Level); and
- Figure 4: Summer Season (Ground Level).

4.3.2 Configuration 2: Proposed Development with the Existing Surrounding Buildings

The wind microclimate results for Configuration 2 are shown in the following figures:

- Figure 5: Windiest Season (Ground Level);
- Figure 6: Summer Season (Ground Level);
- Figure 7: Windiest Season (Elevated Terraces); and
- Figure 8: Summer Season (Elevated Terraces).

4.3.3 Configuration 3: Proposed Development with the Cumulative Surrounding Buildings

The wind microclimate results for Configuration 3 are shown in the following figures:

- Figure 9: Windiest Season (Ground Level);
- Figure 10: Summer Season (Ground Level);
- Figure 11: Windiest Season (Elevated Terraces); and
- Figure 12: Summer Season (Elevated Terraces).

The following future schemes would be within the 400m radius and have been considered for the cumulative assessment:

- Station Hill Phase 2, Plots A to D (Planning Reference: 192032);
- 35-39 Friar Street (Planning Reference: 220933); and
- Broad Street Mall (Planning Reference: 182137).

5. DISCUSSION

This discussion compares the measured wind conditions (shown in the contour plots) to the anticipated use of the Site, to provide an assessment of whether the conditions would be suitable or too windy for the intended use.

Any areas not specifically mentioned would be suitable, or calmer than required, for the desired pedestrian use. Mitigation has been identified for areas where windier than suitable conditions for the intended pedestrian use, save for pre-existing wind conditions which are also identified in Configuration 1.

5.1 Configuration 1: Existing Site with Existing Surrounding Buildings

Wind conditions at and surrounding the Existing Site have been assessed in the context of the existing surrounding buildings (Configuration 1). Wind conditions during the windiest and summer seasons at ground level are presented in Figures 3 and 4, respectively.

5.1.1 Pedestrian Comfort

The Site is currently occupied by the existing 20-30 Greyfriars Road building, which is similar in height to the surrounding buildings. As such wind conditions are relatively calm. During the windiest season, wind conditions would largely be a mixture of sitting and standing use, with localised strolling use wind conditions. During the summer season, wind conditions are calmer, due to the lower wind speeds and frequency associated with this period of the year.

5.1.2 Strong Winds

Strong winds with the potential to be a safety concern for cyclists and more vulnerable pedestrians are anticipated to occur in areas with walking or uncomfortable wind conditions during the windiest season.

Therefore, potential safety concerns are not anticipated.

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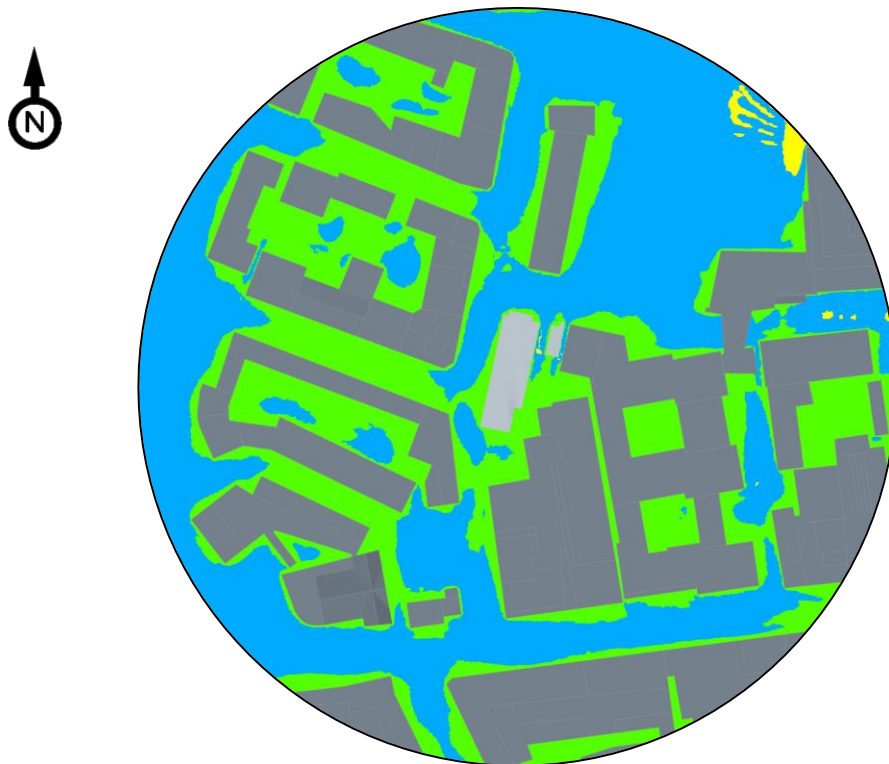


Figure 3: Configuration 1 – Existing Site with Existing Surrounding Buildings – Ground Level, Windiest Season

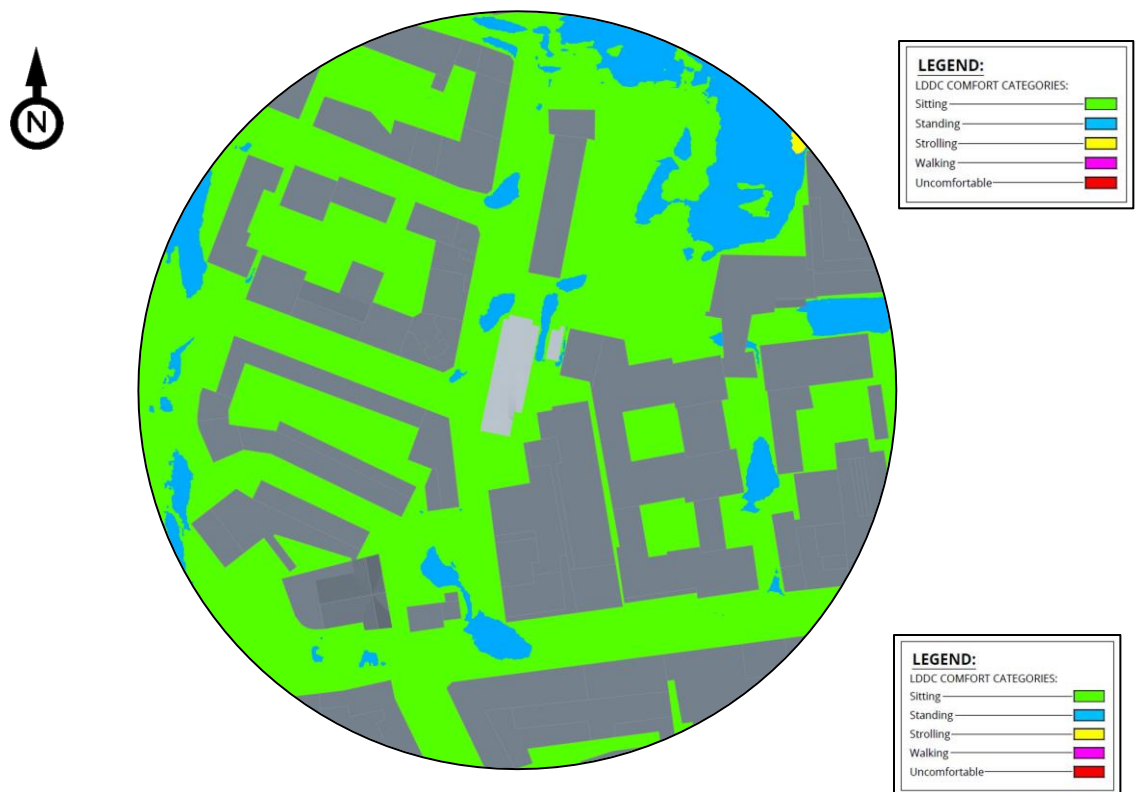


Figure 4: Configuration 1 – Existing Site with Existing Surrounding Buildings– Ground Level, Summer Season

5.2 Configuration 2: Proposed Development with Existing Surrounding Buildings

Wind conditions at and surrounding the Proposed Development, in the context of the existing surrounding buildings have been assessed in Configuration 2. The discussion of the wind microclimate in Configuration 2 is based on the results shown in Figures 5-8. Wind conditions during the windiest and summer seasons at ground level are presented in Figures 5 and 6, respectively. Wind conditions during the windiest and summer seasons at upper levels are presented in Figures 7 and 8, respectively.

5.2.1 Pedestrian Comfort

The Proposed Development would be taller than the existing site and as such, stronger, higher-level winds would interact with the exposed massing, be drawn downwards causing an increase in windiness. However, it should be noted that the Proposed Development would not be taller than that of the existing buildings to the east of the Site. As such, wind conditions in the surrounding area largely remain the same as the existing site.

During the windiest season, wind conditions would largely be a mixture of sitting and standing use, with localised strolling use wind conditions at the north-western corner of the Site. During the summer season, wind conditions would largely be a mixture of sitting and standing use.

Thoroughfares (Figure 5)

Pedestrian thoroughfares would mostly have a mixture of sitting and standing use wind conditions during the windiest season, with localised strolling use wind conditions at the north-western corner of the Site, suitable for the intended use.

Crossings (Figure 5)

Pedestrian crossings would have standing use wind conditions during the windiest season, suitable for the intended use.

Entrances (Figure 5)

Entrances would have a mixture of sitting and standing use wind conditions during the windiest season.

It should be noted that there would be a small area of strolling use wind conditions outside the north-western entrance to the Proposed Development. However, this would be situated far enough away from the entrance that pedestrians would have time to adjust to the windier conditions. Furthermore, the extent of area with these conditions is relatively small.

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Bus Stops (Figure 5)

Bus stops would have a mixture of sitting and standing use wind conditions during the windiest season, suitable for the intended use.

Ground Level Amenity (Figure 6)

Ground level amenity would have sitting use wind conditions during the summer season, suitable for the intended use.

Rooftop Level Amenity (Figure 8)

Rooftop level amenity would have a mixture of sitting and standing use wind conditions during the summer season. Sitting use wind conditions would be suitable at seating areas. Standing use wind conditions would be suitable in other areas.

The Level 7 and Level 12 terraces would have standing use wind conditions on some of the seating areas. These conditions would be one category windier than desired. Therefore, mitigation measures would be required to improve conditions, which can be found in Section 6 “Mitigation Measures”.

However it should be noted that although standing use wind conditions would occur, there would be times throughout the summer which calmer wind speeds that would be suitable for sitting use. Furthermore, it is expected that both the Level 7 and Level 12 terraces would have a relatively high amount of solar exposure during the summer season. As such, winds with a greater speed could be favourable to cool pedestrians during this warmer time of the year.

As the cumulative schemes come forward conditions would improve, notably on the level 12 terrace, as discussed in Section 5.3.

5.2.2 Strong Winds

Strong winds with the potential to be a safety concern for cyclists and more vulnerable pedestrians are anticipated to occur in areas with walking or uncomfortable wind conditions during the windiest season.

Therefore, potential safety concerns would not be anticipated.

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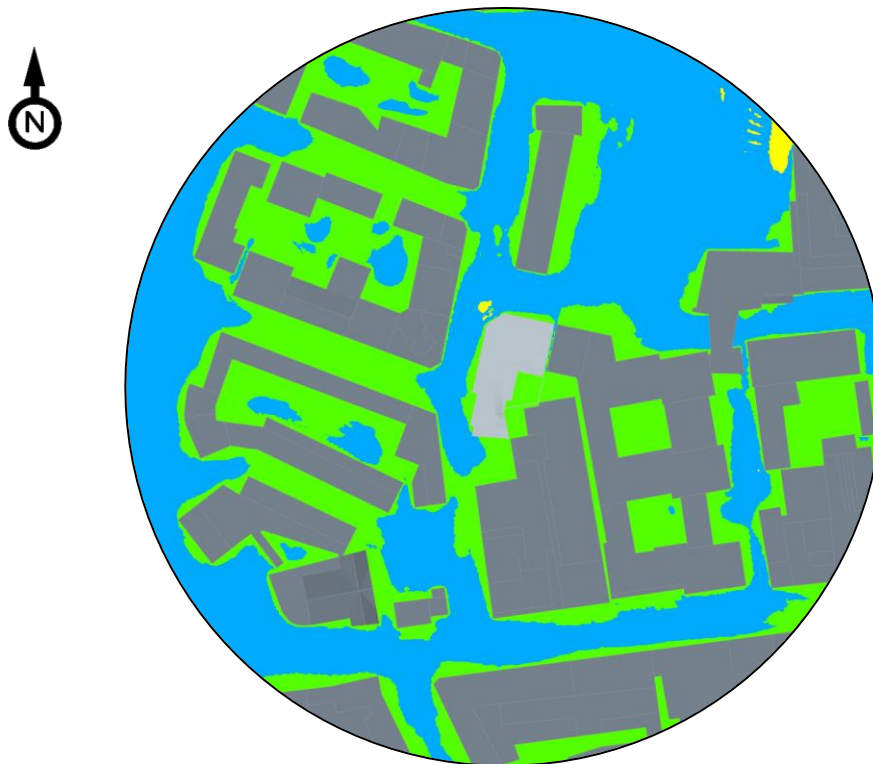


Figure 5: Configuration 2 – Proposed Development with Existing Surrounding Buildings – Ground Level, Windiest Season

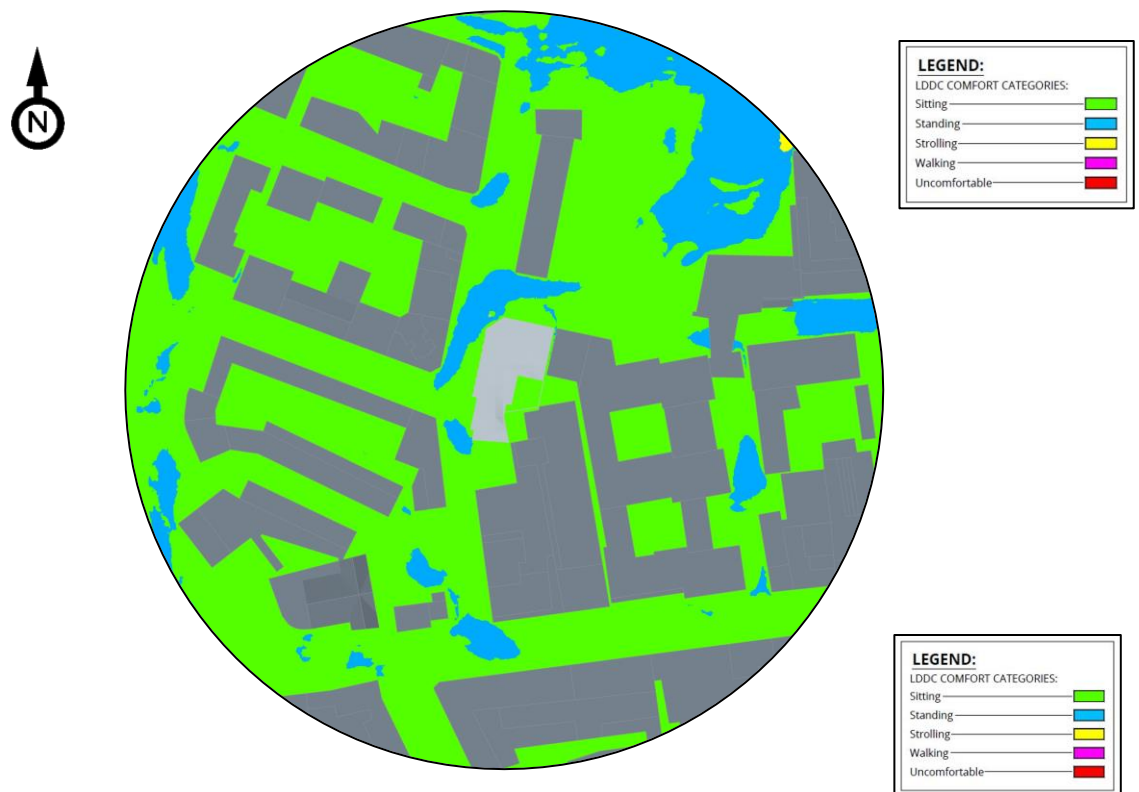


Figure 6: Configuration 2 – Proposed Development with Existing Surrounding Buildings – Ground Level, Summer Season

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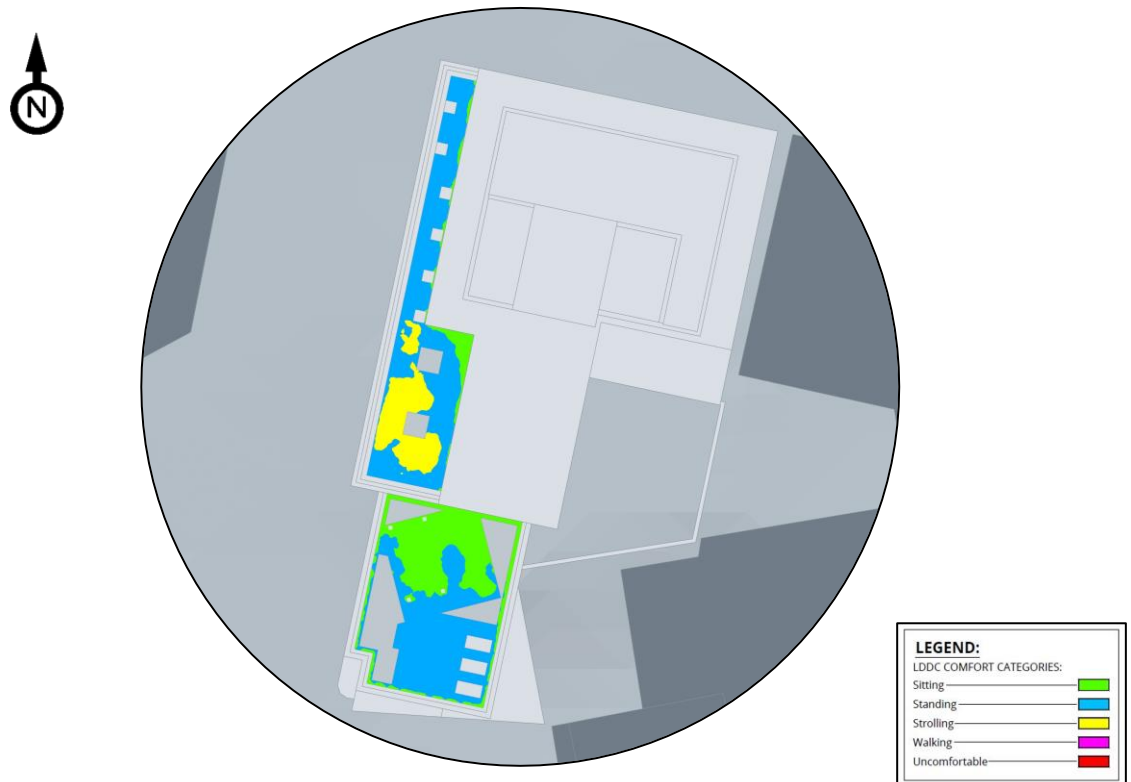


Figure 7: Configuration 2 – Proposed Development with Existing Surrounding Buildings – Elevated Terraces, Windiest Season

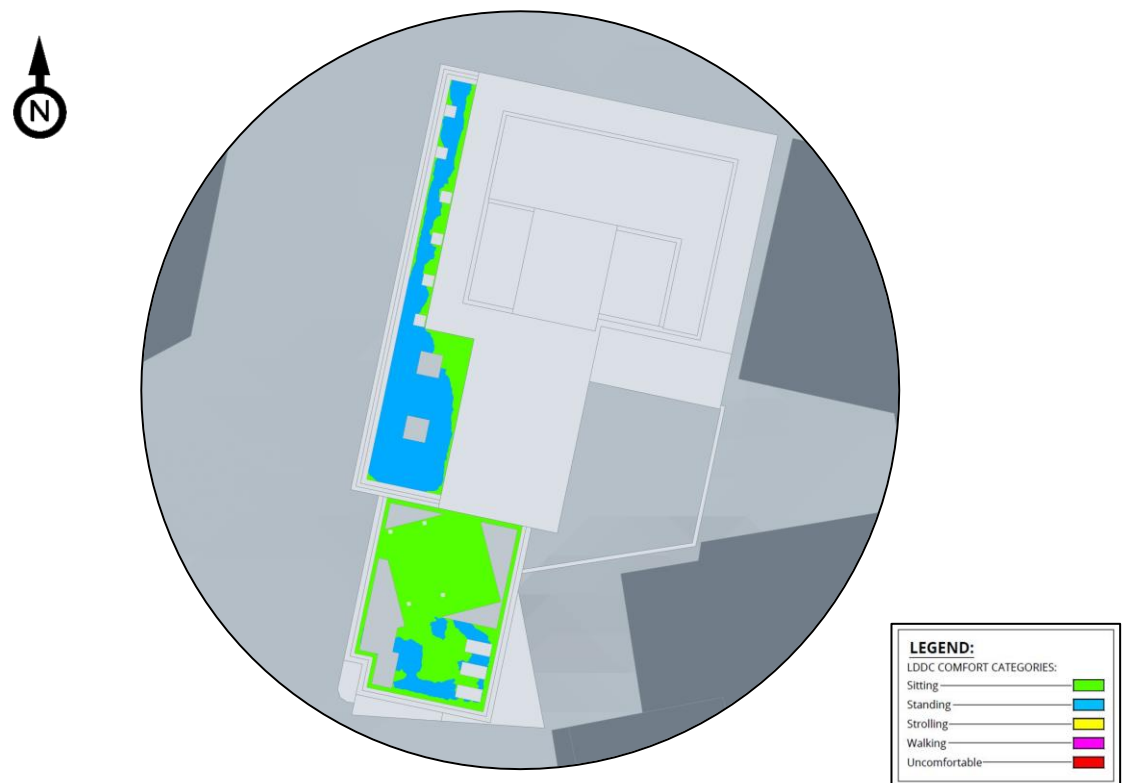


Figure 8: Configuration 2 – Proposed Development with Existing Surrounding Buildings – Elevated Terraces, Summer Season

5.3 Configuration 3: Proposed Development with the Cumulative Surrounding Buildings

Wind conditions at and surrounding the Proposed Development with the inclusion of nearby cumulative surrounding buildings have been measured in Configuration 3. The discussion of the wind microclimate in Configuration 3 is based on the results shown in Figures 9-12. Wind conditions during the windiest and summer seasons at ground level are presented in Figures 9 and 10, respectively. Wind conditions during the windiest and summer seasons at upper levels are presented in Figures 11 and 12, respectively.

5.3.1 Pedestrian Comfort

The most notable cumulative scheme is Station Hill Phase 2, Plots A to D (Planning Reference: 192032) which would be substantially taller than the Proposed Development and the surrounding area. As such, the change in wind conditions on-Site and in the surrounding area would largely be a result of this scheme and not the Proposed Development.

During the windiest season, wind conditions would range from sitting to strolling, with localised walking use wind conditions at the north-western corner of the Station Hill Phase 2 cumulative scheme. During the summer season, wind conditions would largely be a mixture of sitting and standing use, with localised strolling use wind conditions.

The majority of the surrounding area and the Proposed Development would have suitable wind conditions for the intended uses. However, windier than desired conditions would persist on the Level 7 and Level 12 terrace of the Proposed Development. It should be noted that conditions do improve compared to that with the existing surrounds in situ.

Walking use wind conditions at the north-western corner of the Station Hill Phase 2 cumulative scheme would be unsuitable for thoroughfares and entrance use. Furthermore, strolling use wind conditions would be unsuitable for entrance uses. It would be expected that these conditions would largely be a result of the cumulative massing and not because of the Proposed Development.

5.3.2 Strong Winds

Strong winds with the potential to be a safety concern for cyclists and more vulnerable pedestrians are anticipated to occur in areas with walking or uncomfortable wind conditions during the windiest season.

Therefore, strong winds with the potential to be safety concern would be anticipated at the north-western corner of the Station Hill Phase 2 cumulative scheme. As discussed above, it is not expected that these conditions are due to the Proposed Development and are caused by the cumulative massing.

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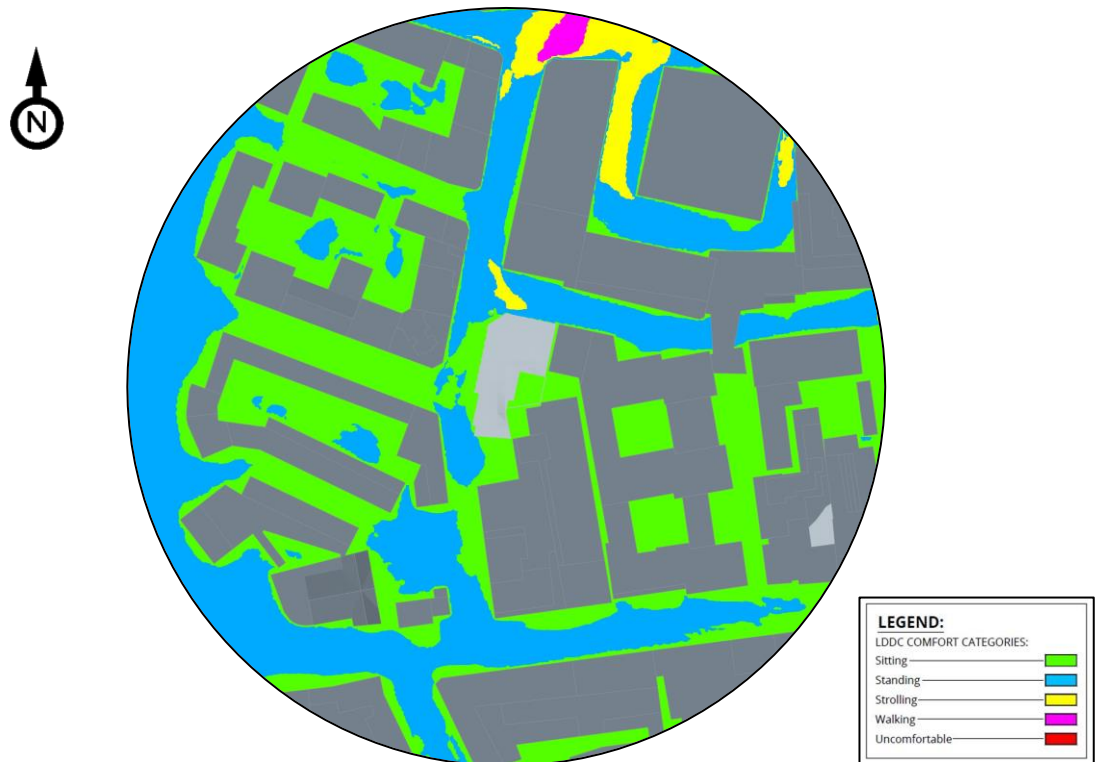


Figure 9: Configuration 3 – Proposed Development with Cumulative Surrounding Buildings – Ground Level, Windiest Season

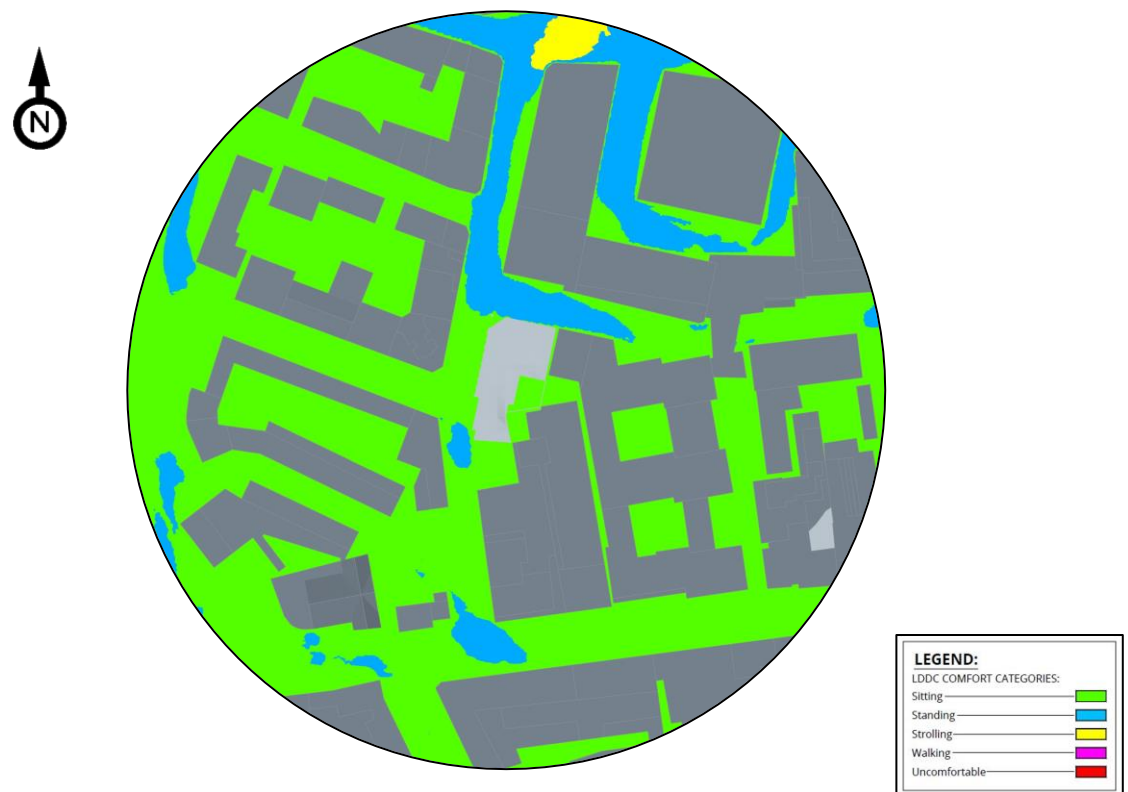


Figure 10: Configuration 3 – Proposed Development with Cumulative Surrounding Buildings – Ground Level, Summer Season

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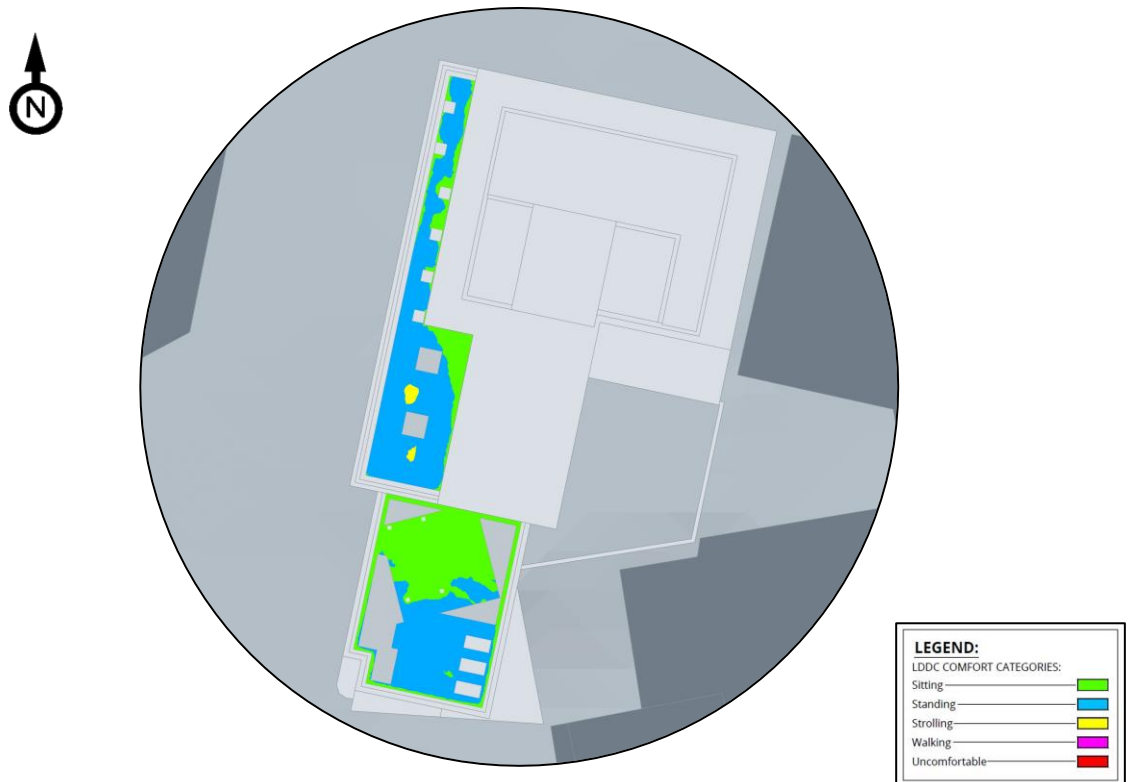


Figure 11: Configuration 3 – Proposed Development with Cumulative Surrounding Buildings
– Elevated Terraces, Windiest Season

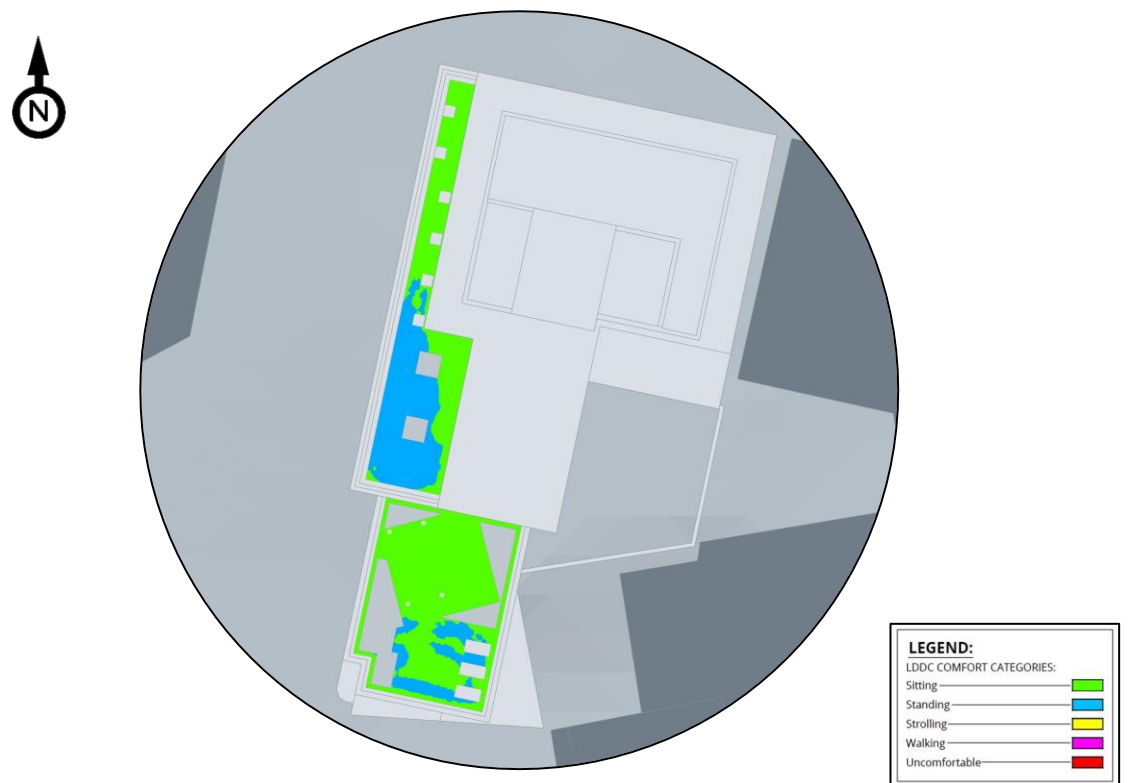


Figure 12: Configuration 3 – Proposed Development with Cumulative Surrounding Buildings
– Elevated Terraces, Summer Season

6. MITIGATION MEASURES

An initial wind assessment for the scheme was undertaken using RWDI's proprietary AI wind modelling software. This identified conditions on the Level 7 and Level 12 rooftop terraces of the Proposed Development were windier than for intended use, including potential safety concerns. As a result, a scheme of mitigation was developed and implemented to reduce the wind conditions. Mitigation measures including the addition of solid 1.5m and 1.8m balustrading to the perimeter of the Level 7 and Level 12 rooftop terraces (respectively), incorporation of > 1.5m tall planters/shrubs and rearrangement of the seating to areas likely to benefit from calmer wind conditions.

When incorporating the wind mitigation measures and the proposed landscaping into the scheme, the CFD simulations of the Proposed Development identified that the majority of areas have suitable wind conditions for the intended uses. Furthermore, potential safety concerns would not be anticipated.

The simulations predict there would be windier than desired conditions on the Level 7 and Level 12 rooftop terraces of the Proposed Development. It should be noted that as the cumulative schemes come forward conditions would improve, notably on the level 12 terrace.

Examples of potential further wind mitigation measures for terrace amenity could be in the form of:

- Solid or ~50% porous, screening surrounding seating areas (1.5m tall);
- Planters with planting (1.5m tall) surrounding seating areas; or
- Deciduous/evergreen trees (at least 2m tall).

Although these measures would further reduce wind speeds, It is noted that additional mitigations measures to those already incorporated may unduly compromise the design-aspects and functionality of the terrace levels.

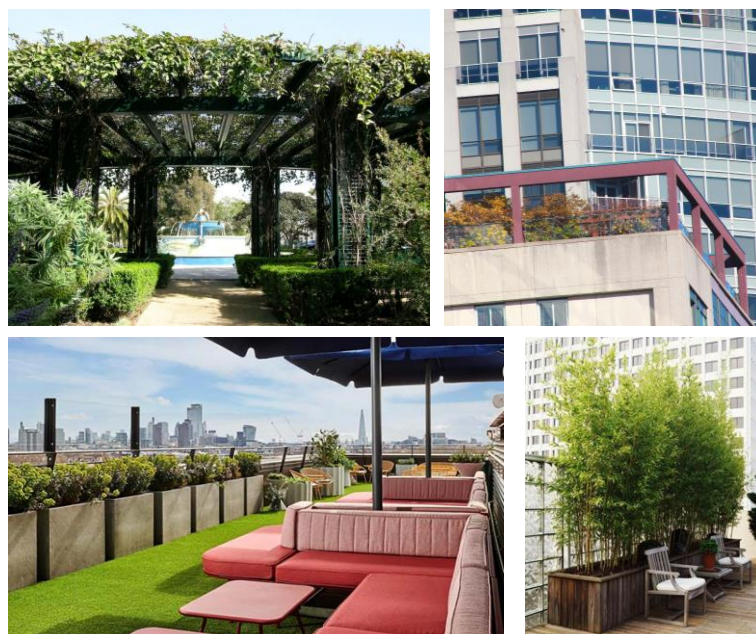


Figure 13: Example mitigation measures for upper level amenity



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If additional landscaping measures are to be incorporated, these should be reviewed by an experienced wind engineer to provide professional judgement on whether added measures would be sufficient in achieving suitable wind conditions.

7. CONCLUDING REMARKS

1. The Proposed Development would be taller than the existing site but would not be taller than that of the existing buildings to the east of the Site. As such, wind conditions in the surrounding area largely remain the same as the existing site.
2. The majority of areas have suitable wind conditions for the intended uses. Furthermore, potential safety concerns would not be anticipated.
3. With respects to the outdoor amenity spaces, the ground level amenity would have sitting use wind conditions during both the windiest and summer season, suitable for the intended use. On the Level 7 and Level 12 rooftop terraces, a mix of sitting and standing wind conditions is predicted during the summer months. If seating is planned in areas with standing wind conditions, it is recommended to provide additional localised shelter as outlined in this report. However, there will also be periods during the summer with calmer wind speeds that would be suitable for seating.
4. When the cumulative schemes come forward, conditions would improve at the Site, notably on the level 12 terrace.
5. Wind mitigations measures to improve wind conditions have been incorporated within the scheme in the form of balustrading, tall planting and landscaping structures.
6. Additional mitigation measures have been suggest, however these may unduly compromise the design-aspects and functionality of the terrace levels
7. Any additional landscaping measures should be reviewed by an experienced wind engineer to provide professional judgement on whether added measures would be sufficient in achieving suitable wind conditions.

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STATEMENT OF LIMITATIONS

This report entitled Pedestrian Level Wind Microclimate Assessment dated 27th November 2024, was prepared by RWDI Anemos Ltd. ("RWDI") for Elder Developments (Greyfriars) Ltd ("Client"). The findings and conclusions presented in this report have been prepared for the Client and are specific to the development described herein ("Project"). The conclusions and recommendations contained in this report are based on the information available to RWDI when this report was prepared. Because the contents of this report may not reflect the final design of the Project or subsequent changes made after the date of this report, RWDI recommends that it be retained by Client during the final design stage to verify that the results and recommendations provided in this report have been correctly interpreted in the final design of the Project.

The conclusions and recommendations contained in this report have also been made for the specific purpose(s) set out herein. Should the Client or any other third party utilise the report and/or implement the conclusions and recommendations contained therein for any other purpose or project without the involvement of RWDI, the Client or such third party assumes any and all risk of any and all consequences arising from such use and RWDI accepts no responsibility for any liability, loss, or damage of any kind suffered by Client or any other third party arising therefrom.

Finally, it is imperative that the Client and/or any party relying on the conclusions and recommendations in this report carefully review the stated assumptions contained herein and to understand the different factors which may impact the conclusions and recommendations provided.

ASSUMPTIONS AND LIMITATIONS

The findings included in this report are based on the following information ("Project Data") disclosed to RWDI:

- 'GFR-DAA-ZA-ZZ-M3-A-Building_A (1).rvt' – received 23th October 2024; and
- '20-30 Greyfriars Road Landscape Design Strategy November 2024.pdf' – received 1st November 2024.

The recommendations and conclusions are based on the following assumptions:

- The Project Data is accurate and complete;
- The Proposed Development, when built, does not deviate substantially from the information listed above. "Substantially" in this case means any change to the exterior form of the buildings that would change the wind flow around it, in a way that would impact pedestrian comfort or safety.
- Sensitive areas of the Site (such as amenity spaces) are expected to be used in line with the temporal specifications set out in the report body.

Any change in the Project Data or Project Specific Conditions not reflected in this report can impact and/or alter the recommendations and conclusions in this report. Therefore, it is incumbent for the Client and/or any other third party relying on the recommendations and conclusions in this report to contact RWDI in the event of any change in the Project Data and Project Specific Conditions in order to determine whether any such change(s) may impact the assumptions upon which the recommendations and conclusions were made.



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Finally, the recommendations and conclusions in this report are partially based on historical data and can be affected by a number of external factors, including but not limited to Project design, quality of materials and construction, site conditions, meteorological events, and climate change. As such, the conclusions and recommendations contained in this report do not list every possible outcome.

APPENDIX A



APPENDIX A: COMPUTATIONAL MODELS

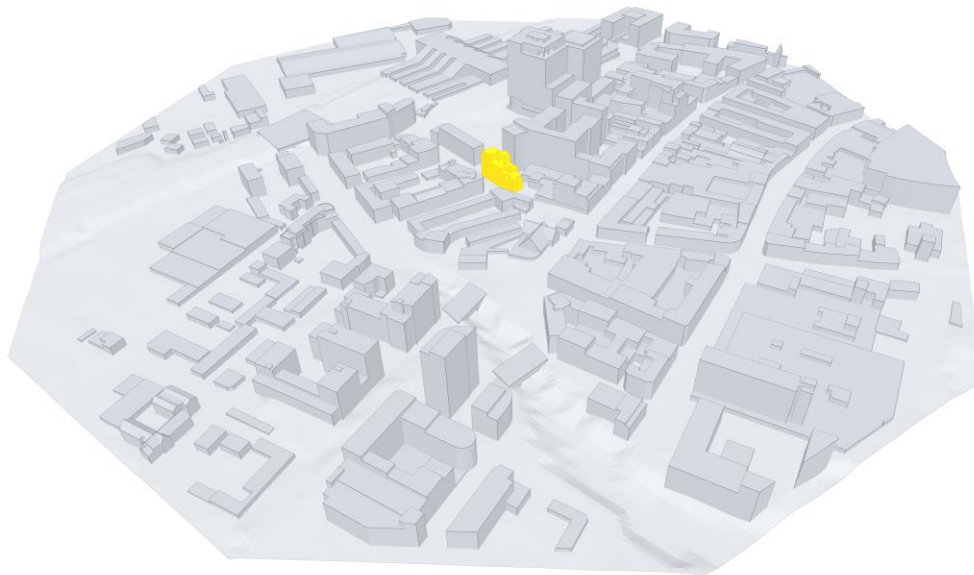


Figure 14: Existing Site (yellow) with Existing Surrounding Buildings (grey) 3D model used for Computational Fluid Dynamic simulations (view from the south-west)

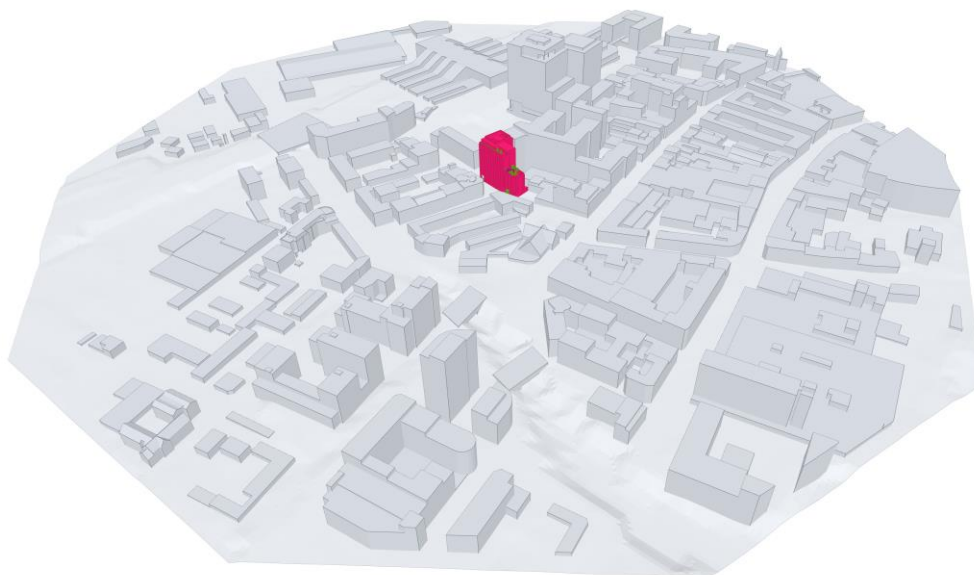


Figure 15: Proposed Development (pink) with Existing Surrounding Buildings (grey) 3D model used for Computational Fluid Dynamic simulations (view from the south-west)

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Figure 16: Proposed Development (pink) with Cumulative Surrounding Buildings (blue) 3D model used for Computational Fluid Dynamic simulations (view from the south-west)

APPENDIX B



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APPENDIX B: METEOROLOGICAL DATA

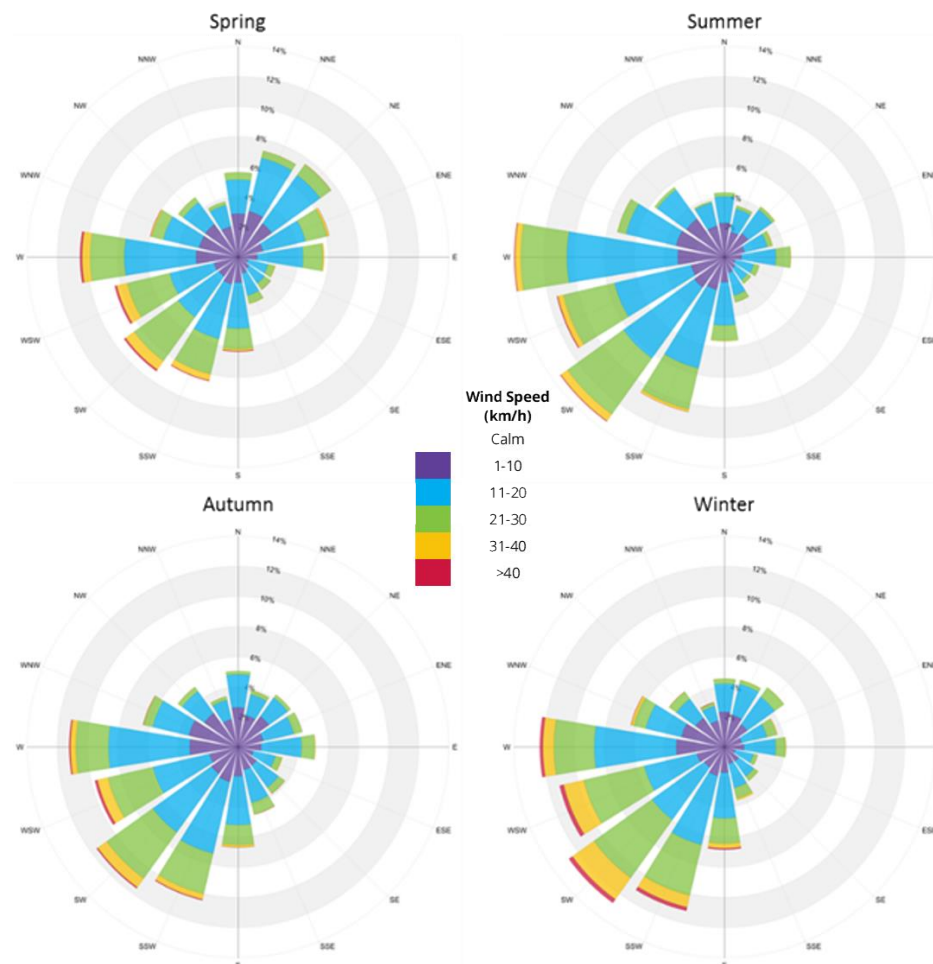


Figure 17: Seasonal wind roses from London Heathrow Airport (m/s) (Radial axis indicates the percentage of time for which the stated threshold is exceeded)

APPENDIX C



APPENDIX C: PROPOSED LANDSCAPING

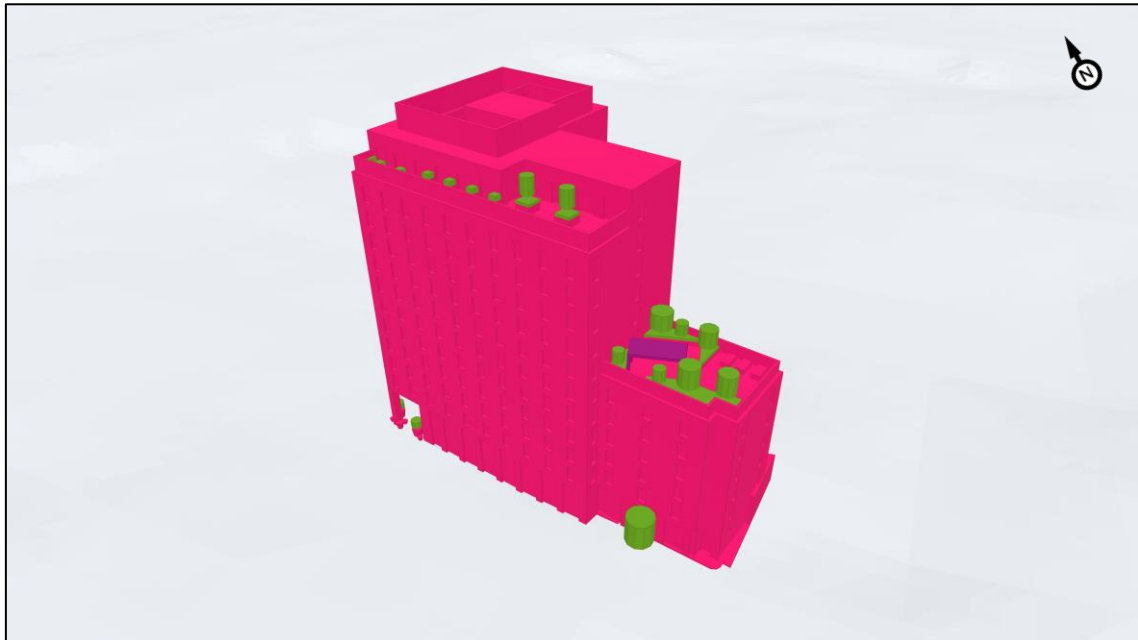


Figure 18: Proposed landscaping – view from south-west

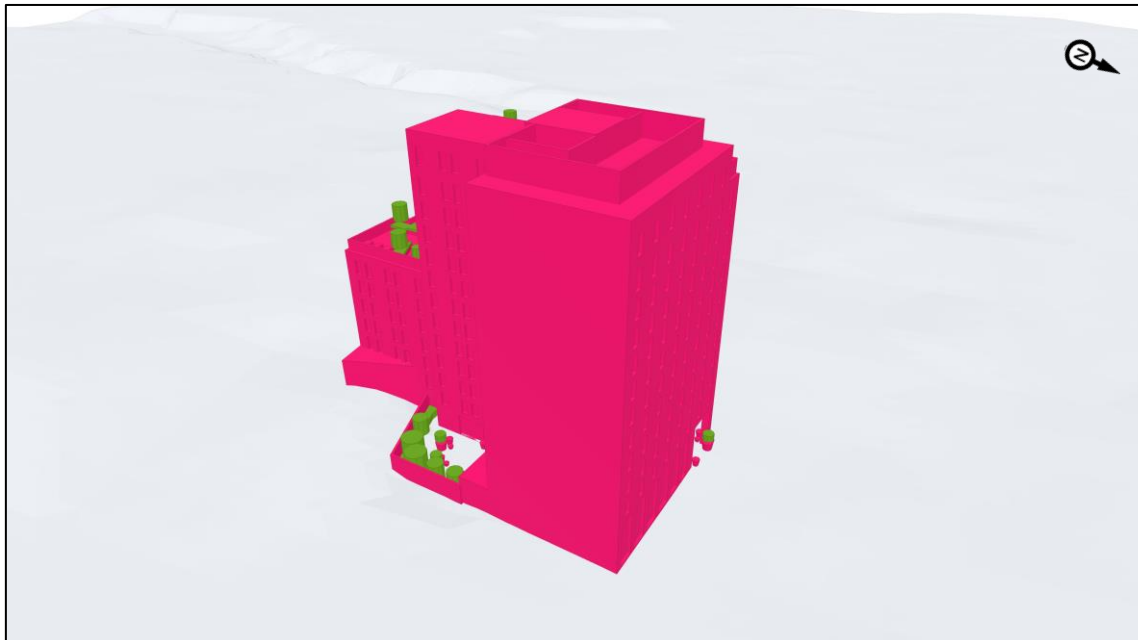


Figure 19: Proposed landscaping – view from north-east