



FORMER JOHN LEWIS DEPOT, LETCOMBE STREET, READING
(ALSO KNOWN AS JLP MILL LANE)

WIND & MICROCLIMATE ASSESSMENT

AUGUST 2024

AECOM

FORMER JOHN LEWIS DEPOT, LETCOMBE STREET, READING (ALSO KNOWN AS JLP MILL LANE)

PEDESTRIAN LEVEL WIND MICROCLIMATE ASSESSMENT
RWDI #2401982
MAY 22ND, 2024

SUBMITTED TO

AECOM

SUBMITTED BY

RWDI Anemos Ltd



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VERSION HISTORY

RWDI Project #2401982		Former John Lewis Depot, Letcombe Street, Reading (also known as JLP Mill Lane)
Report	Releases	Dated
Reports	Rev A	April 5 th , 2024
	Rev B	April 29 th , 2024
	Rev C	May 15 th , 2024
	Rev D	May 22 nd , 2024
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1 EXECUTIVE SUMMARY

RWDI was appointed by AECOM to conduct a pedestrian level wind assessment of the Former John Lewis Depot, Letcombe Street, Reading (also known as JLP Mill Lane) (referred to as the “Proposed Development” hereafter in this report). This report presents a description of the methodology used and the results of five configurations tested using Computational Fluid Dynamics (CFD) simulations, namely:

- Configuration 1: Existing Site with Existing Surrounding Buildings;
- Configuration 2: Proposed Development with Existing Surrounding Buildings;
- Configuration 3: Proposed Development with Cumulative Surrounding Buildings;
- Configuration 4: Proposed Development with Wind Mitigation Measures and Existing Surrounding Buildings; and
- Configuration 5: Proposed Development with Wind Mitigation Measures and Cumulative Surrounding Buildings.

The meteorological data for the Site indicates prevailing winds blowing from the south-west throughout the year. There is a secondary wind from the north-east most common during the late spring season.

In the baseline scenario (Configuration 1), the majority of the Site and surrounding area has suitable wind conditions for the current uses.

With the introduction of the Proposed Development with mitigation measures incorporated (Configuration 4), wind conditions at ground level remain materially the same as in the baseline. On-Site conditions around the Proposed Development would be suitable for the intended uses. The inclusion of the cumulative schemes (Configurations 3 and 5) would result in similar conditions to those reported in Configuration 2.

Overall, all the areas at the Proposed Development and the majority of the areas surrounding the Proposed Development would be safe and suitable for the intended use. Off-site areas with windier conditions would be similar to that of the baseline scenario and would not be adversely affected by the Proposed Development.

2 INTRODUCTION

RWDI was appointed by AECOM to conduct a pedestrian level wind microclimate assessment using CFD simulations for the Proposed Development in Reading. This report presents the background and objectives from RWDI's assessment. A summary of the overall recommendations from the study are presented in Section 8 "Concluding Remarks".

3 BACKGROUND AND APPROACH

Computational Fluid Dynamics (CFD) simulations were conducted on the Proposed Development in Reading. The assessment quantifies the wind conditions within and around the Site by comparing the measured wind speed and frequency of occurrence with the Lawson Comfort Criteria. Meteorological data for Reading has been analysed and adjusted to the Site conditions by modelling the effect of terrain roughness in the computational domain.

Five configurations were assessed, as follows:

- Configuration 1: Existing Site with Existing Surrounding Buildings;
- Configuration 2: Proposed Development with Existing Surrounding Buildings;
- Configuration 3: Proposed Development with Cumulative Surrounding Buildings;
- Configuration 4: Proposed Development with Wind Mitigation Measures and Existing Surrounding Buildings; and
- Configuration 5: Proposed Development with Wind Mitigation Measures and Cumulative Surrounding Buildings.

3.1 Site Description and Surroundings

The site is located on the edge of the town centre in Central Reading within close proximity of key local services and facilities including The Oracle shopping centre opposite, the Premier Inn hotel adjacent to the west and Reading railway station located approximately 1km to the north.

The site itself is bound by Mill Lane and the A329 to the north, Letcombe Street to the south-west and Crossland Road to the south-east, from which the Site is accessed. The site currently comprises the existing JLP warehouse building with associated car parking and servicing areas to the north-east and south-west of the building.

Figure 1 below shows an aerial view of the Site and surroundings, with the approximate Site location highlighted in yellow.



Figure 1: Aerial view of the Existing Site (Approximate extent of the Site highlighted in yellow)

3.2 The Proposed Development

Demolition of the existing building and redevelopment of the site comprising erection of a new building for up to 215 build to rent residential dwellings (Use Class C3) together with flexible commercial / community space (Use Class E/F1/F2), residents' facilities, landscaping, public realm, amenity space, cycle parking and disabled car parking.

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

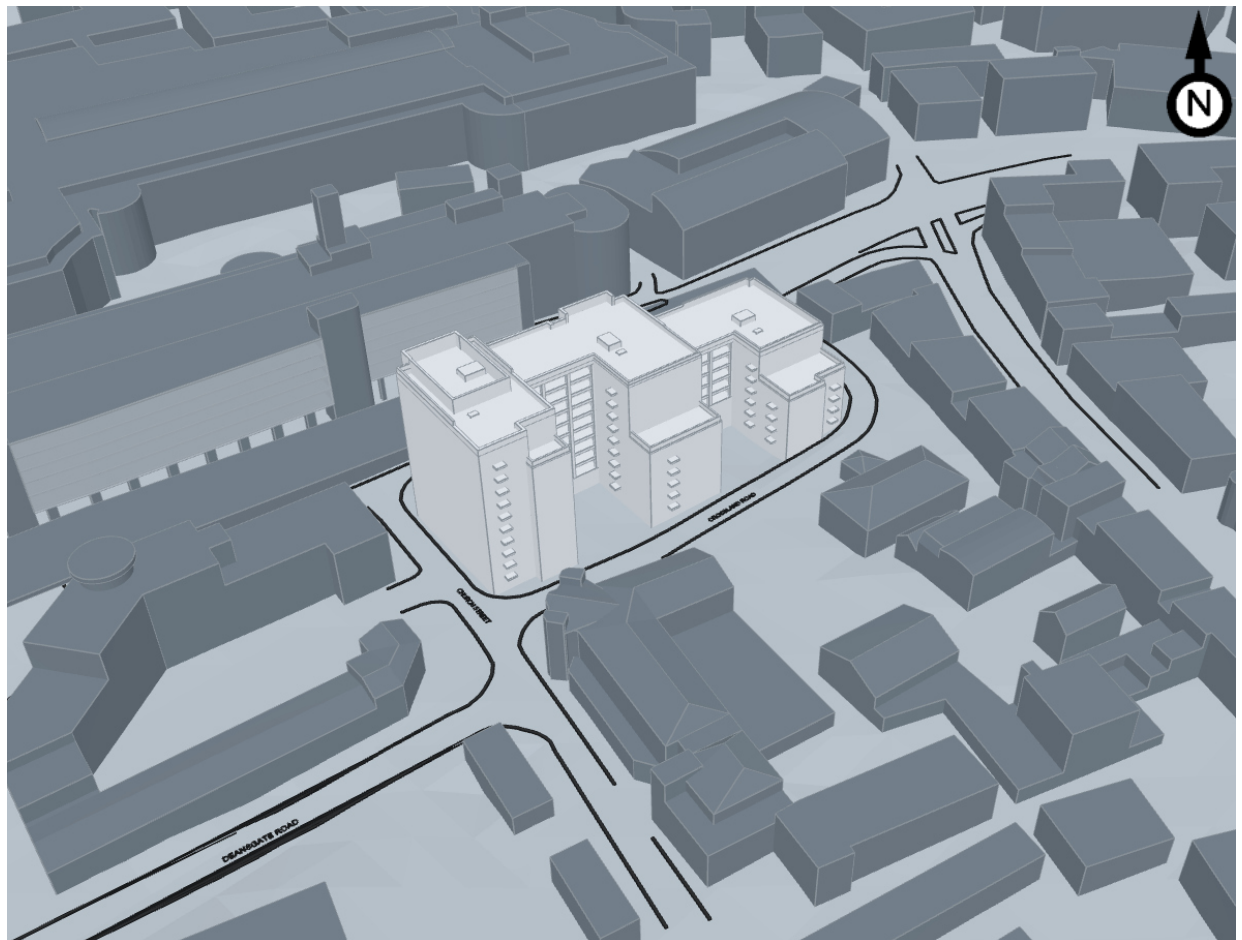


Figure 2: 3D model of the Proposed Development in the context of the existing surrounding buildings, used for CFD simulations (view from the south)

4 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 for 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.

4.1 Meteorological Data

Figure 3 shows the seasonal wind roses (meteorological data) for Reading, which are based on data obtained from the meteorological station at London Heathrow airport. 0 Degrees represents wind blowing from the north and 90 degrees represents wind blowing from the east.

Approximately 30 years of meteorological data for London Heathrow was used in this report, presented in the seasonal wind roses with the wind speed divided into wind speed thresholds (Figure 3). The radial axis indicates the cumulative number of hours per season that the wind speed exceeds the wind speed threshold as a percentage. 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 indicate that the prevailing wind direction throughout the year is from the south-west. This is typical for many areas of southern England. There is a secondary peak from the north-easterly winds, especially during the spring; however, these tend to be colder winds.

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 'comfort criteria', as described below.

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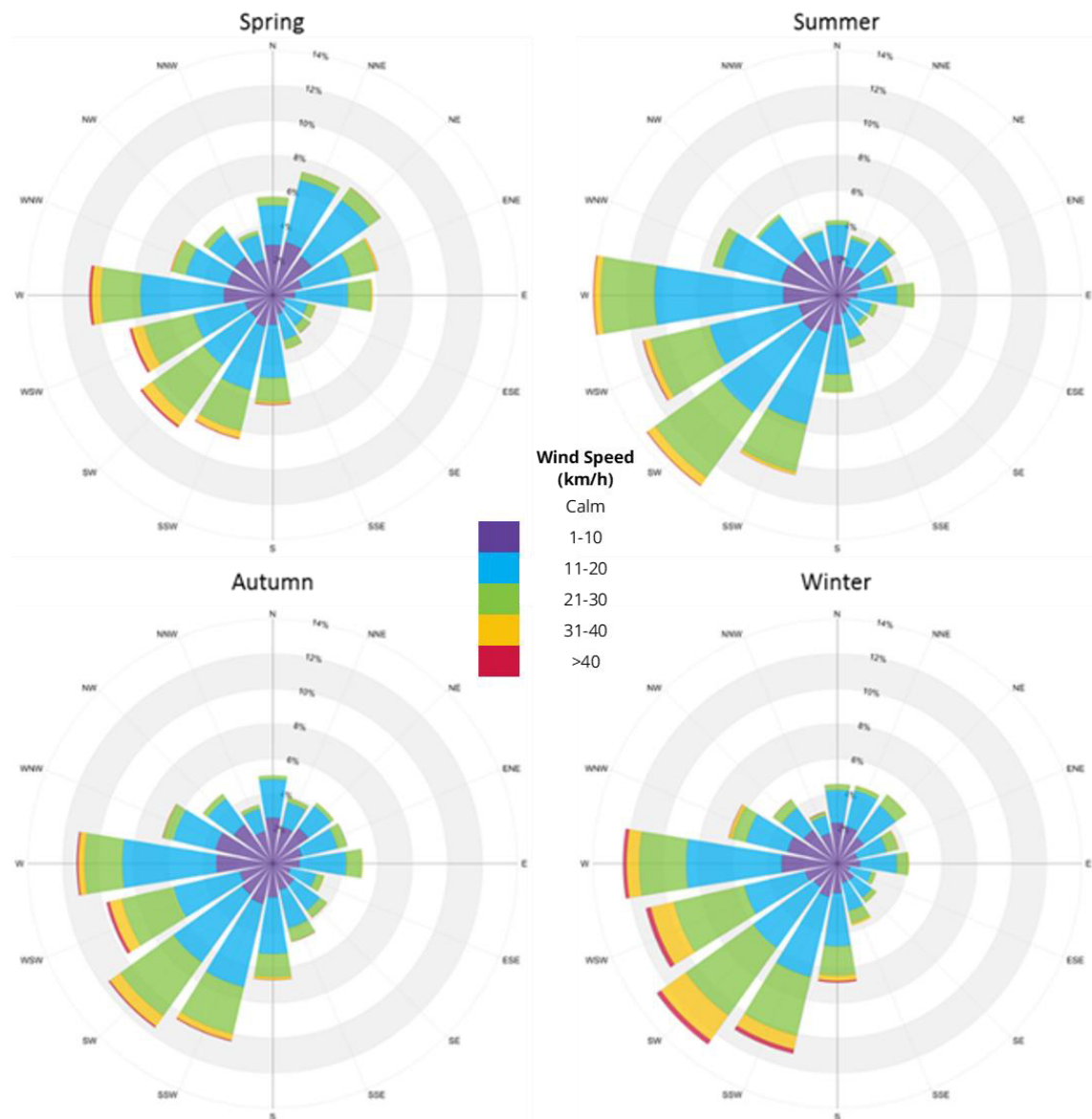


Figure 3: Seasonal Wind Roses for London Heathrow Airport (Radial axis indicates the percentage of time for which the stated wind speed threshold is exceeded)

4.2 Pedestrian Comfort

The assessment of the wind conditions requires a standard against which the measurements can be compared. This report uses the Lawson Comfort Criteria¹ that have been established for over thirty years and have been widely used on building developments across the United Kingdom. The comfort criteria seek to define the reaction of an average pedestrian to the wind as described in Table 1. If the measured wind conditions exceed the threshold wind velocity for more than 5% of the time, then they are deemed unacceptable for the intended pedestrian activity. 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 categories are sitting, standing, strolling and walking, in ascending order of activity level, with a fifth category for conditions that are uncomfortable for all pedestrian 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.

The coloured key in Table 1 corresponds to the presentation of 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

¹ Lawson T.V. (April 2001), Building Aerodynamics, Imperial College Press

4.3 Strong Winds

In addition, the criteria stipulate two strong wind threshold limits; when winds exceed 15m/s or 20m/s for more than 0.025% of the time (approximately 2 hours of the year). The lower limit, 15m/s, if exceeded may require remedial measures depending on the sensitivity of the location i.e. is it reasonable to expect an elderly or very young pedestrian to be present at the location? Wind speeds that exceed the 20m/s threshold for more than approximately 2 hours per year would represent a safety risk for all members of the population and would therefore 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, and potentially eliminate, strong winds.

5 RESULTS

5.1 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. Adjustment (mean) factors were computed and applied to all assessed wind directions using the methodology set out in ESDU 01008² and applied to the CFD data.

5.2 Desired Pedestrian Activity around the Development

Generally, for a residential development such as the Proposed Development, the target conditions are:

- Strolling during the windiest season on pedestrian thoroughfares;
- Standing conditions at main entrances, drop off areas, and bus stops throughout the year;
- Sitting conditions at outdoor seating during the summer season when these areas are more likely to be frequently used by pedestrians; and
- Sitting or standing use conditions during the summer season on private amenity spaces.

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.

² ESDU International, Computer program for wind speeds and turbulence properties: flat or hilly sites in terrain with roughness changes, ESDU 01008, 2001 01008

Achieving a sitting classification in the summer usually means that the same measurement location would be suitable for standing in the windiest season because winds are stronger during this period. 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.

5.3 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 4–29. Results of the assessment are discussed in Section 6.

5.3.1 Configuration 1 – Existing Site with Existing Surrounding Buildings

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

- Figure 4: Windiest Season: Ground Level; and
- Figure 5: Summer Season: Ground Level.

5.3.2 Configuration 2 – Proposed Development with Existing Surrounding Buildings

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

- Figure 6: Windiest Season: Ground Level;
- Figure 7: Summer Season: Ground Level;
- Figure 8: Windiest Season: roof spaces;
- Figure 9: Summer Season: roof spaces;
- Figure 10: Windiest Season: Balconies; and
- Figure 11: Summer Season: Balconies.

5.3.3 Configuration 3 – Proposed Development with Cumulative Surrounding Buildings

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

- Figure 12: Windiest Season: Ground Level;
- Figure 13: Summer Season: Ground Level;
- Figure 14: Windiest Season: roof spaces;
- Figure 15: Summer Season: roof spaces;
- Figure 16: Windiest Season: Balconies; and
- Figure 17: Summer Season: Balconies.

The following cumulative schemes were included:

- 221364 Central Club; and
- 221916 and 221917 Yield Hall Place.

5.3.4 Configuration 4: Proposed Development with Wind Mitigation Measures and Existing Surrounding Buildings

The wind microclimate results for Configuration 4 are shown in the following figures:

- Figure 18: Windiest Season: Ground Level;
- Figure 19: Summer Season: Ground Level;
- Figure 20: Windiest Season: roof spaces;
- Figure 21: Summer Season: roof spaces;
- Figure 22: Windiest Season: Balconies; and
- Figure 23: Summer Season: Balconies.

5.3.5 Configuration 5: Proposed Development with Wind Mitigation Measures and Cumulative Surrounding Buildings

The wind microclimate results for Configuration 5 are shown in the following figures:

- Figure 24: Windiest Season: Ground Level;
- Figure 25: Summer Season: Ground Level;
- Figure 26: Windiest Season: roof spaces;
- Figure 27: Summer Season: roof spaces;
- Figure 28: Windiest Season: Balconies; and
- Figure 29: Summer Season: Balconies.

6 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.

6.1 Configuration 1: Existing Site with Existing Surrounding Buildings

Results for Configuration 1 are presented in Figure 4 and Figure 5 for ground level during the windiest and summer seasons respectively.

6.1.1 Pedestrian Comfort

Wind conditions around the Site range from suitable for sitting to strolling use during the windiest season, with a localised area of walking conditions north-west of the assessed area.

6.1.1.1 Thoroughfares (Figure 4)

Pedestrian thoroughfares around the Site and in the surrounding area mainly range from suitable for sitting to strolling use during the windiest season. There is a localised area of walking conditions to the north along the footpath on Bridge Street nearby The Oracle.

6.1.1.2 Entrances (Figure 4)

Entrances to the majority of nearby surrounding buildings have wind conditions suitable for sitting and standing use during the windiest season. There are strolling conditions at the entrance to the Premier Inn Hotel on Mill Lane.

6.1.1.3 Bus Stops (Figure 4)

Bus stops to the east along London Street would be suitable for sitting and standing use during the windiest season.

6.1.2 Strong Winds

Strong winds with the potential to be a safety concern for cyclists and more vulnerable pedestrians would be anticipated to occur when wind conditions are suitable for walking or uncomfortable for all intended uses during the windiest season. Professional judgement has been applied, informed by the CFD results, to identify areas likely to have instances of strong winds.

As walking conditions occur on Bridge Street nearby The Oracle, strong wind exceedances would also be anticipated to occur.

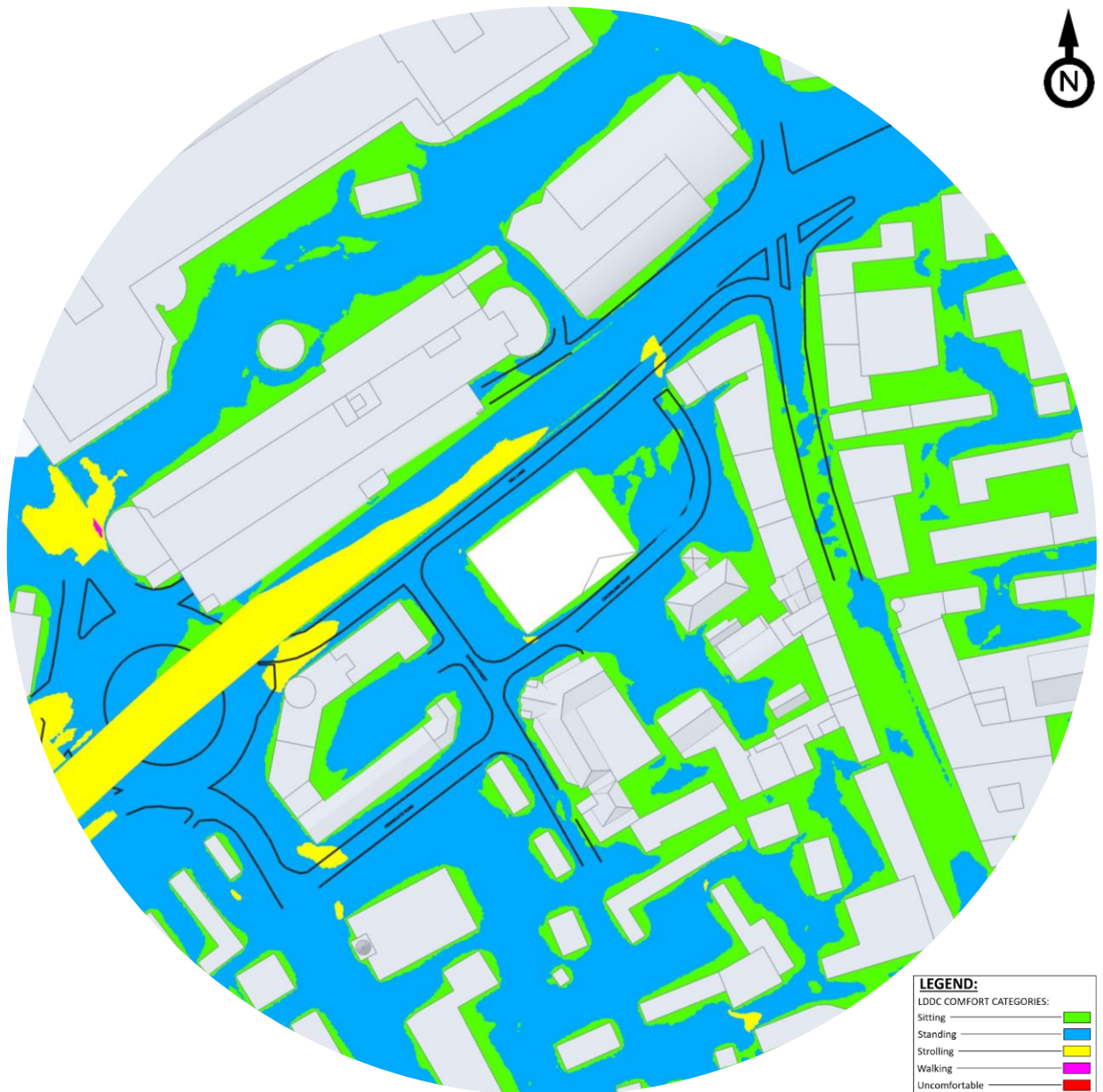


Figure 4: Configuration 1 – Existing Site with Existing Surrounding Buildings – Ground Level, Windiest Season

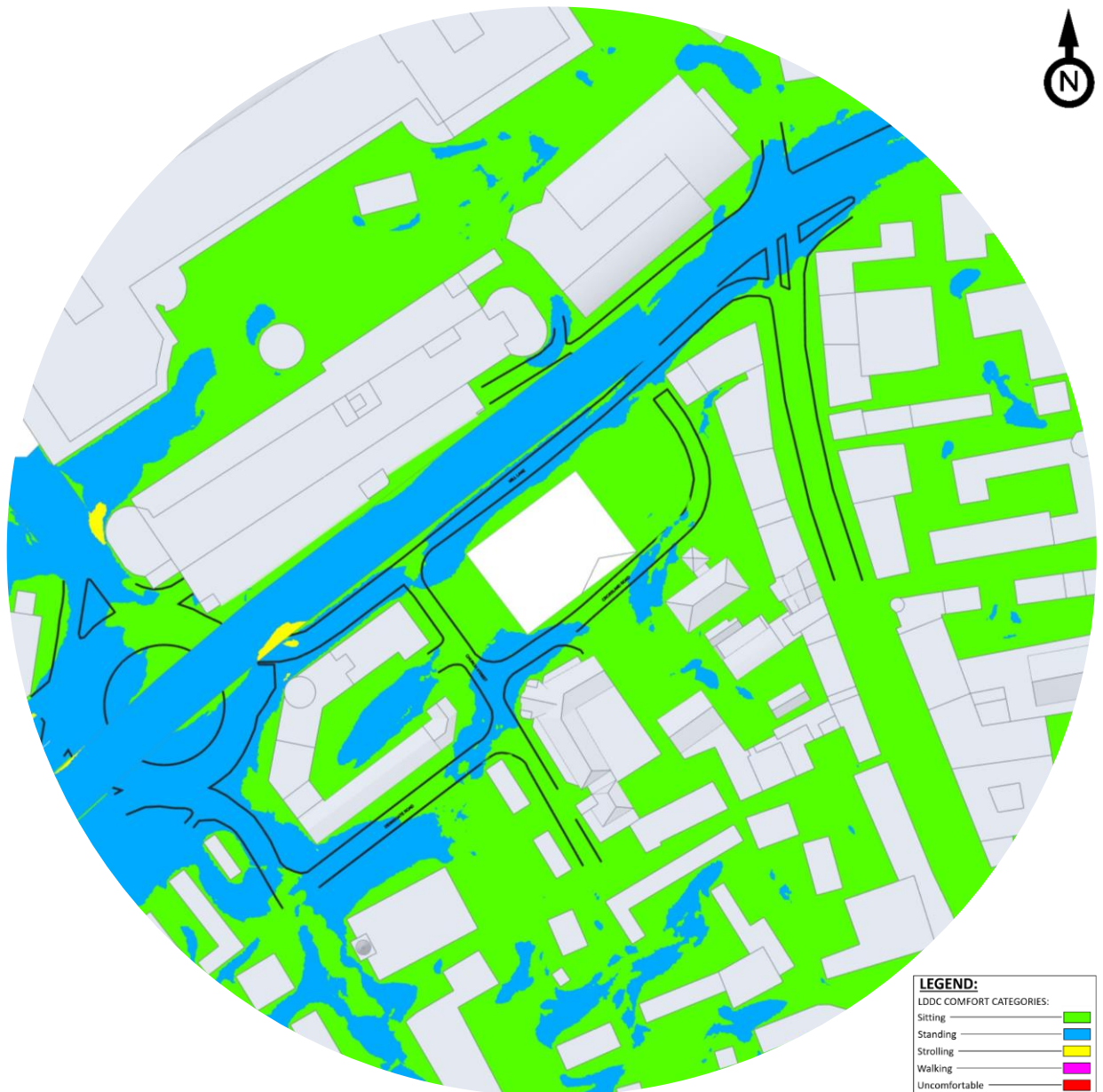


Figure 5: Configuration 1 – Existing Site with Existing Surrounding Buildings – Ground Level, Summer Season

6.2 Configuration 2: Proposed Development with Existing Surrounding Buildings

Results for Configuration 2 are presented in Figure 6 and Figure 7 for ground level during the windiest and summer seasons respectively. Figures 8 and 9 present the results at roof spaces during the windiest and summer seasons respectively. Figures 10 and 11 present the results at balconies during the windiest and summer seasons respectively.

6.2.1 Pedestrian Comfort

The introduction of the Proposed Development would slightly increase the windiness along Mill Lane, and locally around the north-western and south-western corners. This is due to localised building corner accelerations and prevailing south-westerly winds being channelled between the Proposed Development and The Oracle.

6.2.1.1 Thoroughfares (Figure 6)

Pedestrian thoroughfares around the Proposed Development and surrounding area would range from suitable for sitting to walking use during the windiest season. Walking conditions would occur to the north along the footpath on Bridge Street nearby The Oracle. Whilst this would be considered one category too windy for a thoroughfare, as these conditions occur in the baseline and the area is not significantly increased with the Proposed Development introduced, no mitigation measures would be required. Wind conditions at thoroughfares elsewhere would be suitable for the intended pedestrian use.

6.2.1.2 Entrances (Figure 6)

Entrances to the Proposed Development would be suitable for sitting and standing use during the windiest season, acceptable conditions for the intended use.

Entrances to surrounding buildings would be similar to those reported in Configuration 1. There are strolling conditions at the entrance to the Premier Inn Hotel on Mill Lane; however, as this occurs in the baseline and the area is not significantly increased with the Proposed Development introduced, no mitigation measures would be required. Wind conditions at entrances elsewhere would be suitable for the intended pedestrian use.

6.2.1.3 Bus Stops (Figure 6)

Bus stops along London Street would have similar conditions to those reported in Configuration 1, suitable for standing use during the windiest season, acceptable for the intended use.

6.2.1.4 Ground Level Amenity Spaces (Figure 7)

The courtyard spaces on-Site would be suitable for sitting use during the summer season, acceptable conditions for the intended use.

6.2.1.5 Roof Spaces (Figure 9)

As the roof spaces are not accessible by the residents in the current design, there is no requirement for mitigation at present. If this changes and they do become accessible, amenity spaces should be situated in areas suitable for sitting and standing use during the summer season, with seating allocated in areas suitable for sitting use.

6.2.1.6 Balconies (Figure 11)

The majority of balconies would be suitable for sitting and standing use during the summer season, acceptable conditions for private balconies. There would however be balconies situated next to the south-western corner (the upper five balconies) which would have strolling conditions during the summer season, one category windier than suitable. Suitable wind mitigation measures for these balconies have been assessed and discussed in Configuration 4.

6.2.2 Strong Winds (Figures 6, 8, 10)

Strong winds with the potential to be a safety concern for cyclists and more vulnerable pedestrians would be anticipated to occur when wind conditions are suitable for walking or uncomfortable for all intended uses during the windiest season. Professional judgement has been applied, informed by the CFD results, to identify areas likely to have instances of strong winds.

As walking conditions occur on Bridge Street nearby The Oracle, strong wind exceedances would also be anticipated to occur. As this occurs in the baseline and the area is not significantly increased with the Proposed Development introduced, no mitigation measures would be required.

At elevated levels, the roof spaces (as shown in Figure 8), and the upper three balconies next to the south-western corner (as shown in Figure 10) would have walking conditions during the windiest season, therefore strong wind exceedances would also be anticipated to occur. Suitable wind mitigation measures for these balconies have been assessed and discussed in Configuration 4. No mitigation would be required at the roof spaces as this would be accessed for maintenance purposes and not accessible to occupants.

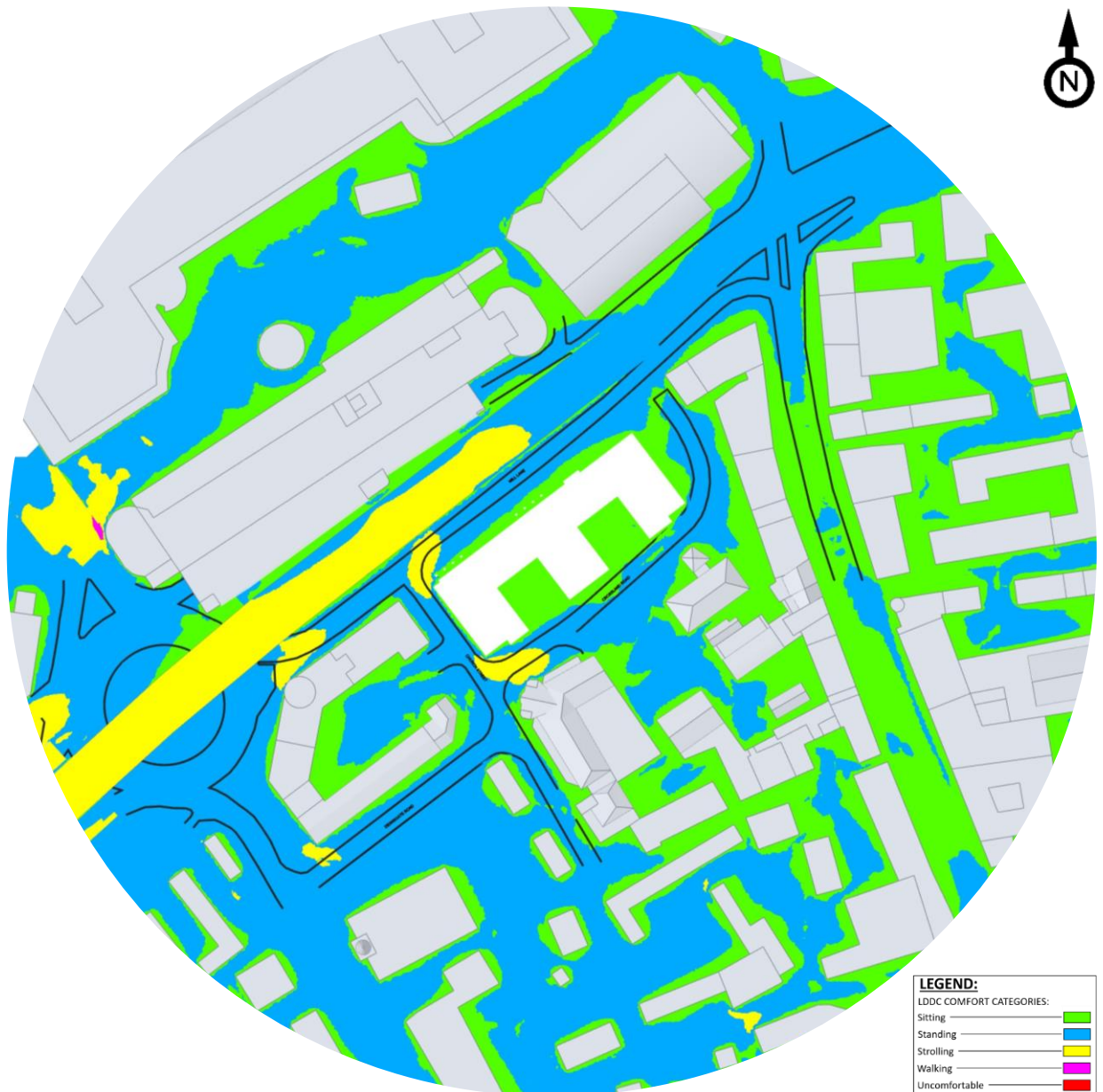


Figure 6: Configuration 2 – Proposed Development with Existing Surrounding Buildings – Ground Level, Windiest Season

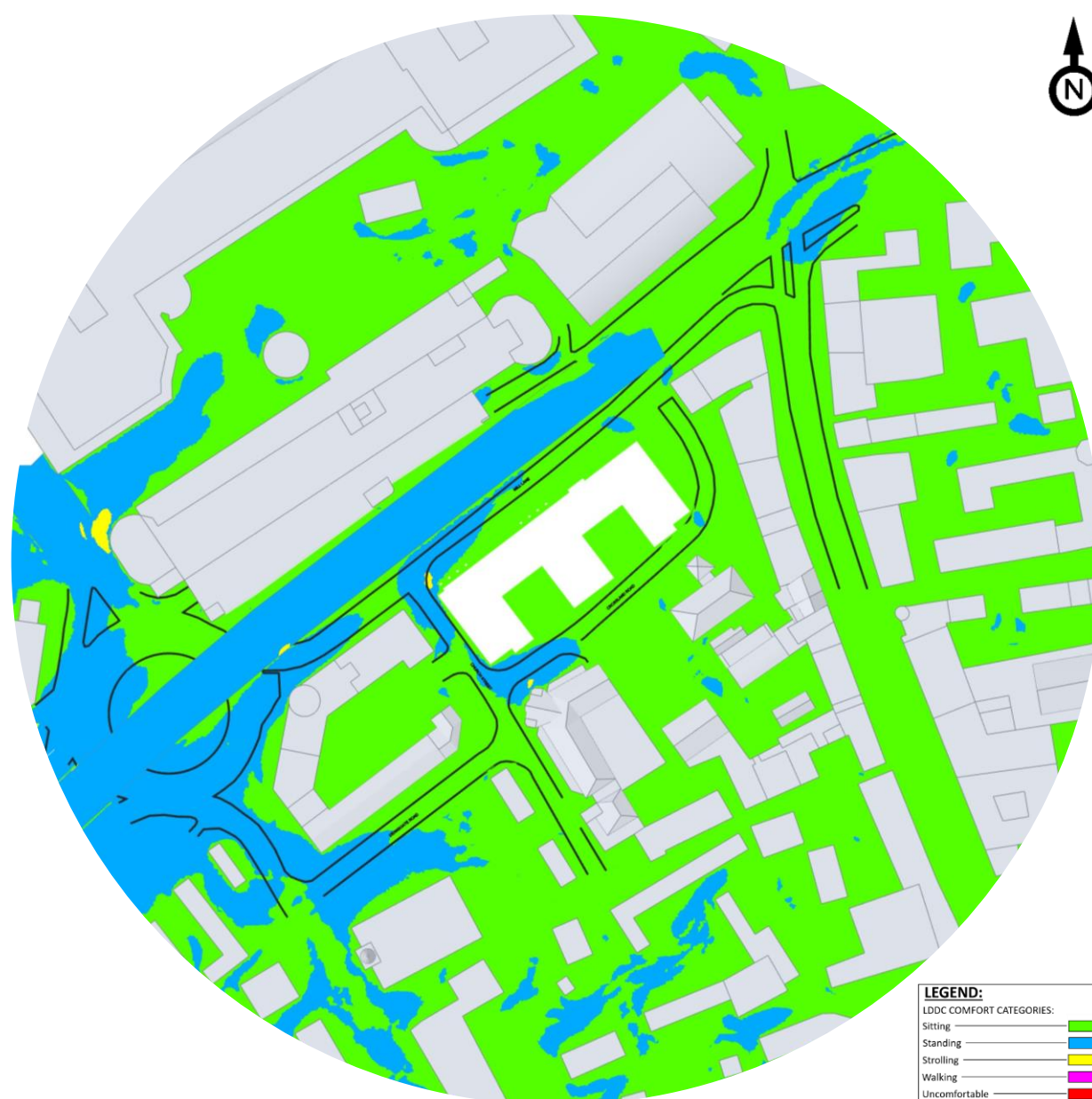


**Figure 7: Configuration 2 – Proposed Development with Existing Surrounding Buildings –
Ground Level, Summer Season**

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Figure 8: Configuration 2 – Proposed Development with Existing Surrounding Buildings –
Roof Spaces, Windiest Season

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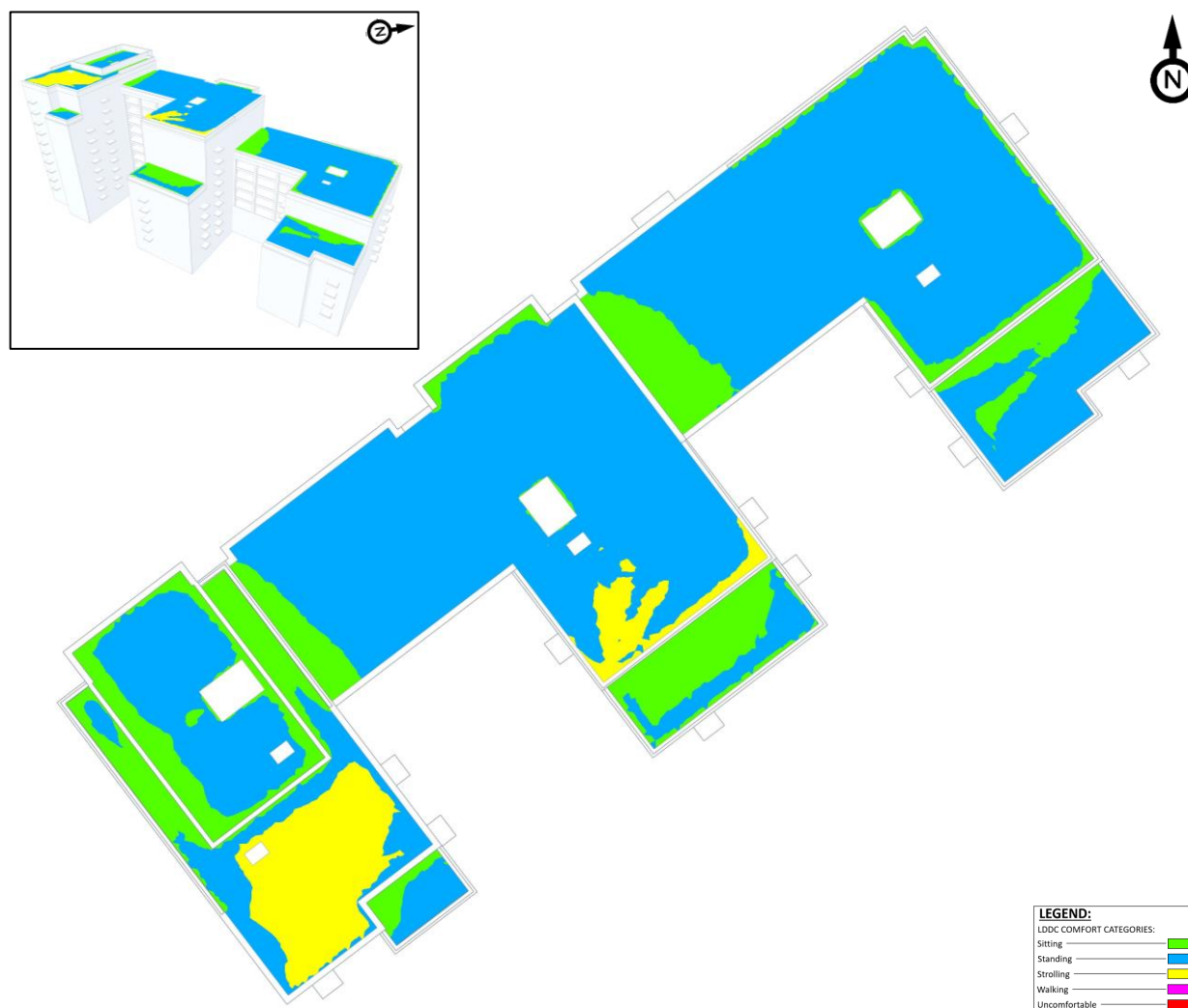


Figure 9: Configuration 2 – Proposed Development with Existing Surrounding Buildings –
Roof Spaces, Summer Season

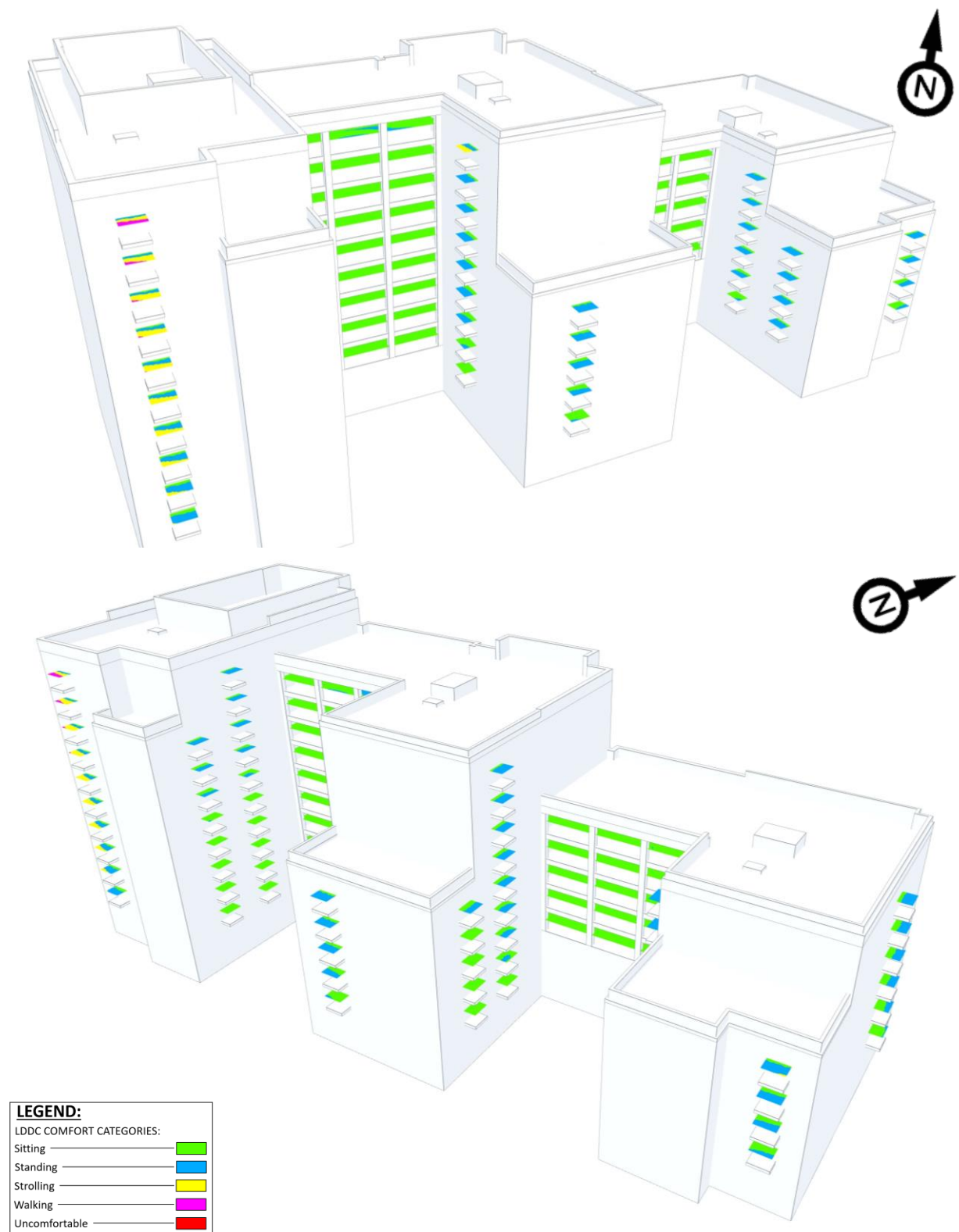


Figure 10: Configuration 2 – Proposed Development with Existing Surrounding Buildings – Balconies, Windiest Season

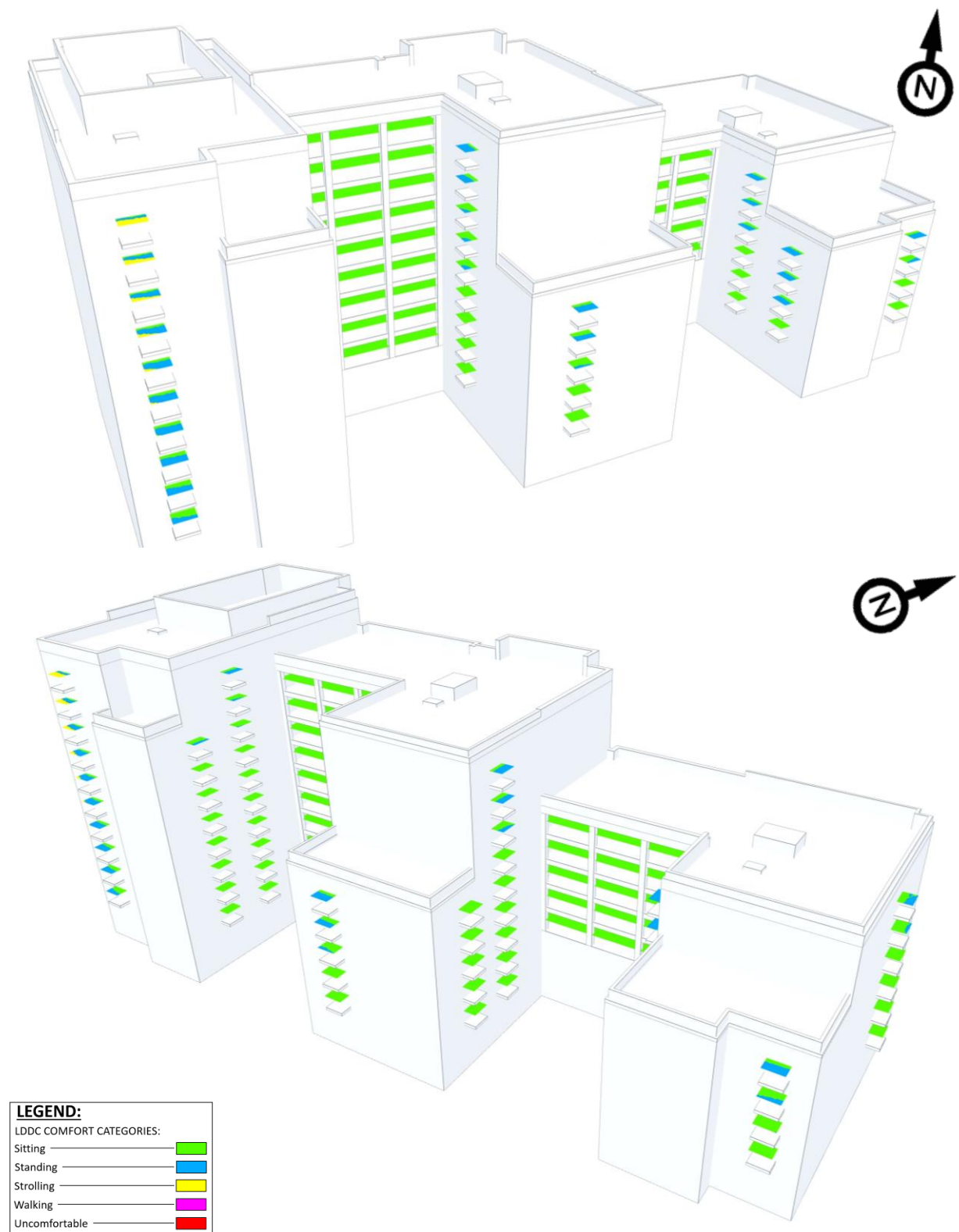


Figure 11: Configuration 2 – Proposed Development with Existing Surrounding Buildings – Balconies, Summer Season

6.3 Configuration 3: Proposed Development with Cumulative Surrounding Buildings

Results for Configuration 3 are presented in Figure 12 and Figure 13 for ground level during the windiest and summer seasons respectively. Figures 14 and 15 present the results at roof spaces during the windiest and summer seasons respectively. Figures 16 and 17 present the results at balconies during the windiest and summer seasons respectively.

The Yield Hall Place cumulative scheme (221916 and 221917) is not consented currently. This scheme has been included in the cumulative surrounds assessment to represent a worst-case scenario. However, as this scheme is located in a non-prevailing wind direction, the removal of this scheme would not be expected to adversely affect the wind conditions discussed in the sections below.

6.3.1 Pedestrian Comfort

With the inclusion of nearby cumulative schemes, wind conditions to the north along The Oracle and Bridge Street would be slightly calmer in comparison to Configuration 2, as the cumulative schemes provide a form of 'back-pressure'. This would eliminate the walking conditions situated along Bridge Street identified in Configurations 1 and 2. Conditions around the corners of the Yield Hall Place scheme would be windier with strolling conditions, likely due to localised corner acceleration. Wind conditions at ground level would be suitable for the intended pedestrian uses, with the exception of the off-Site entrance to the Premier Inn Hotel on Mill Lane; however, as this occurs in the baseline and the area is not significantly increased with the Proposed Development introduced, no mitigation measures would be required.

Wind conditions at balconies would remain materially the same as those reported in Configuration 2. Suitable wind mitigation measures for these balconies have been assessed and discussed in Configuration 5.

6.3.2 Strong Winds

Strong winds with the potential to be a safety concern for cyclists and more vulnerable pedestrians would be anticipated to occur when wind conditions are suitable for walking or uncomfortable for all intended uses during the windiest season. Professional judgement has been applied, informed by the CFD results, to identify areas likely to have instances of strong winds.

Strong wind exceedances would be anticipated to occur at the same balcony levels as reported in Configuration 2, as the results are materially the same. Suitable wind mitigation measures for these balconies have been assessed and discussed in Configuration 5.

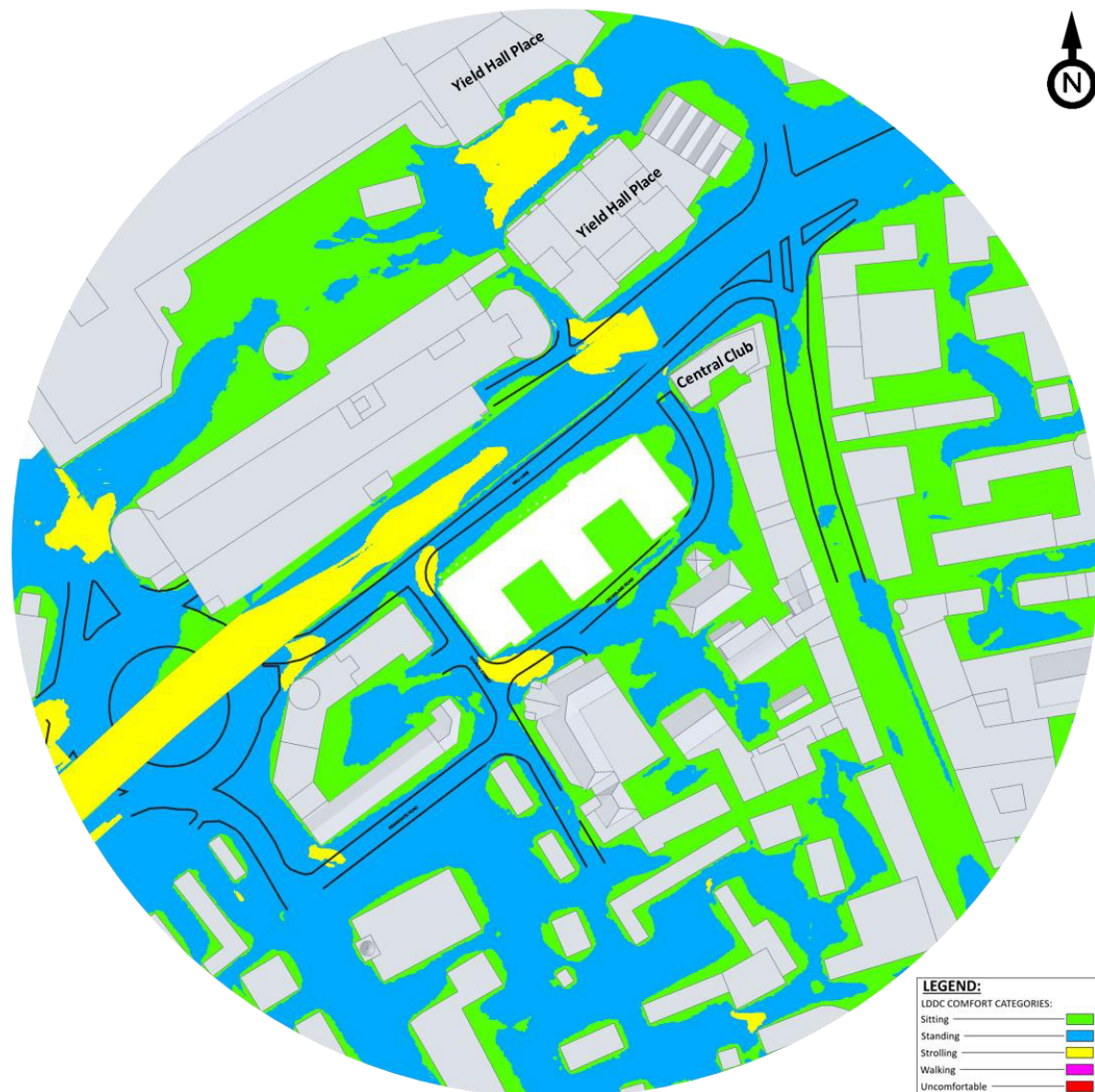


Figure 12: Configuration 3 – Proposed Development with Cumulative Surrounding Buildings
– Ground Level, Windiest Season

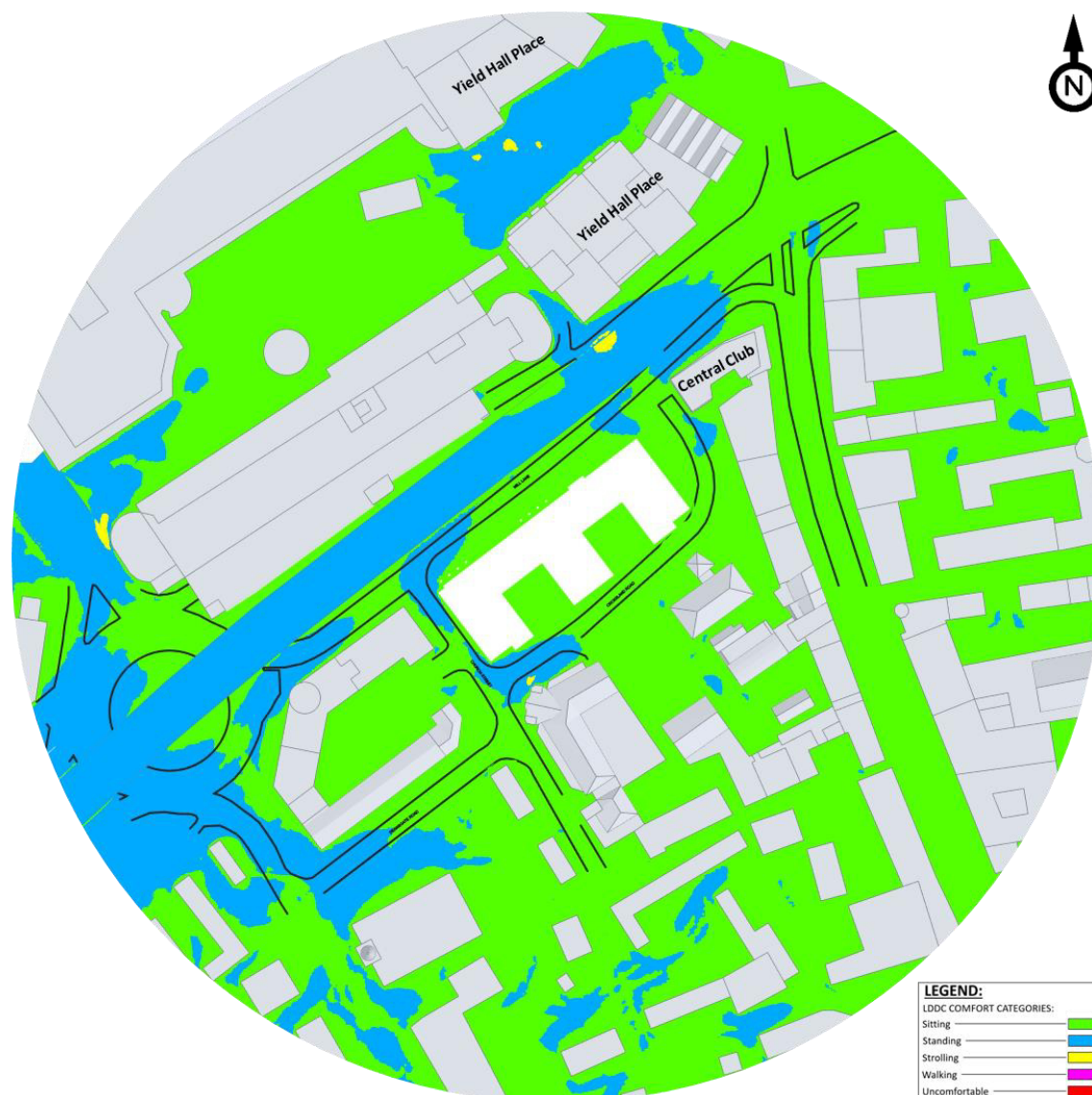


**Figure 13: Configuration 3 – Proposed Development with Cumulative Surrounding Buildings
– Ground Level, Summer Season**

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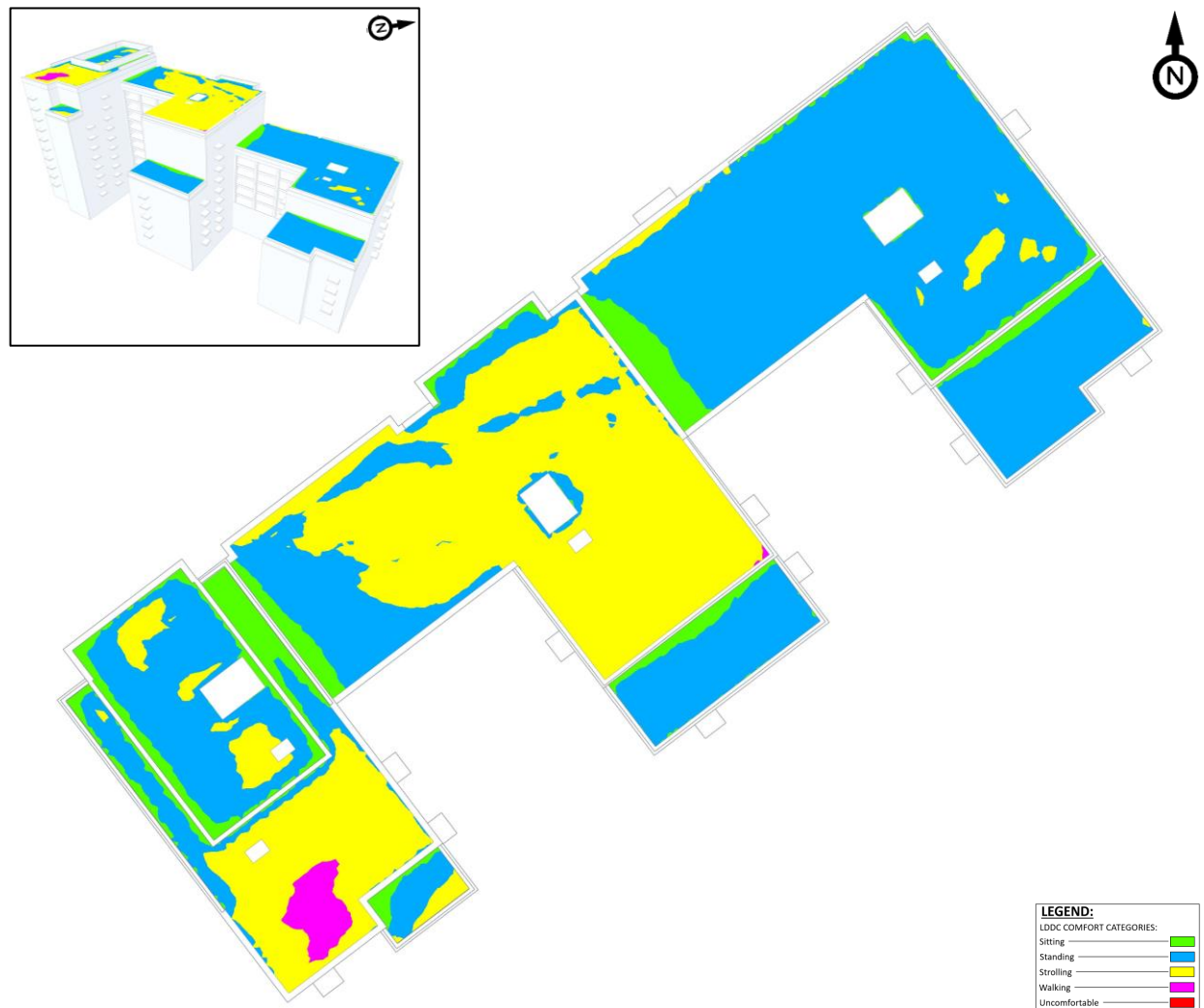


**Figure 14: Configuration 3 – Proposed Development with Cumulative Surrounding Buildings
– Roof Spaces, Windiest Season**

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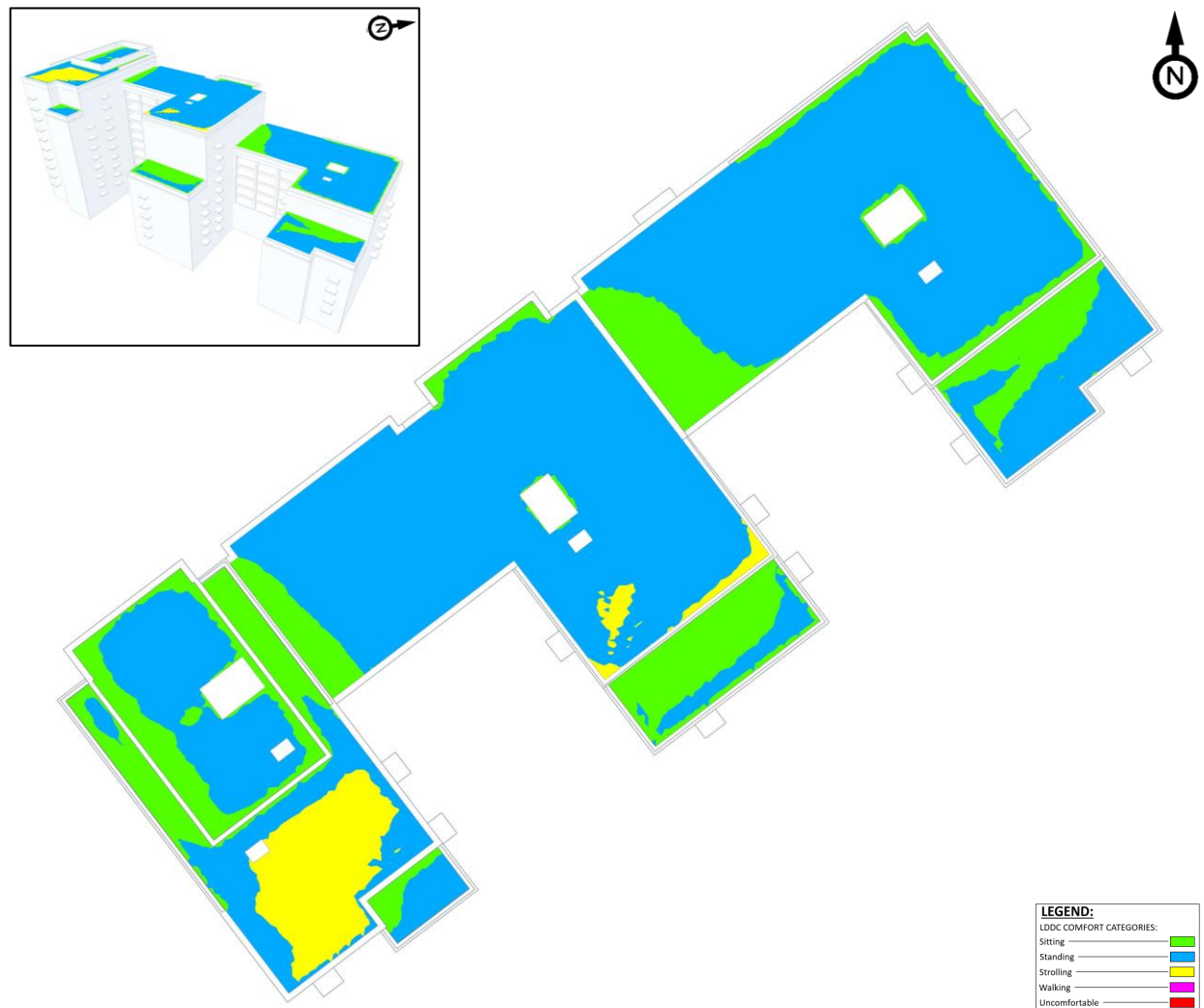


**Figure 15: Configuration 3 – Proposed Development with Cumulative Surrounding Buildings
– Roof Spaces, Summer Season**

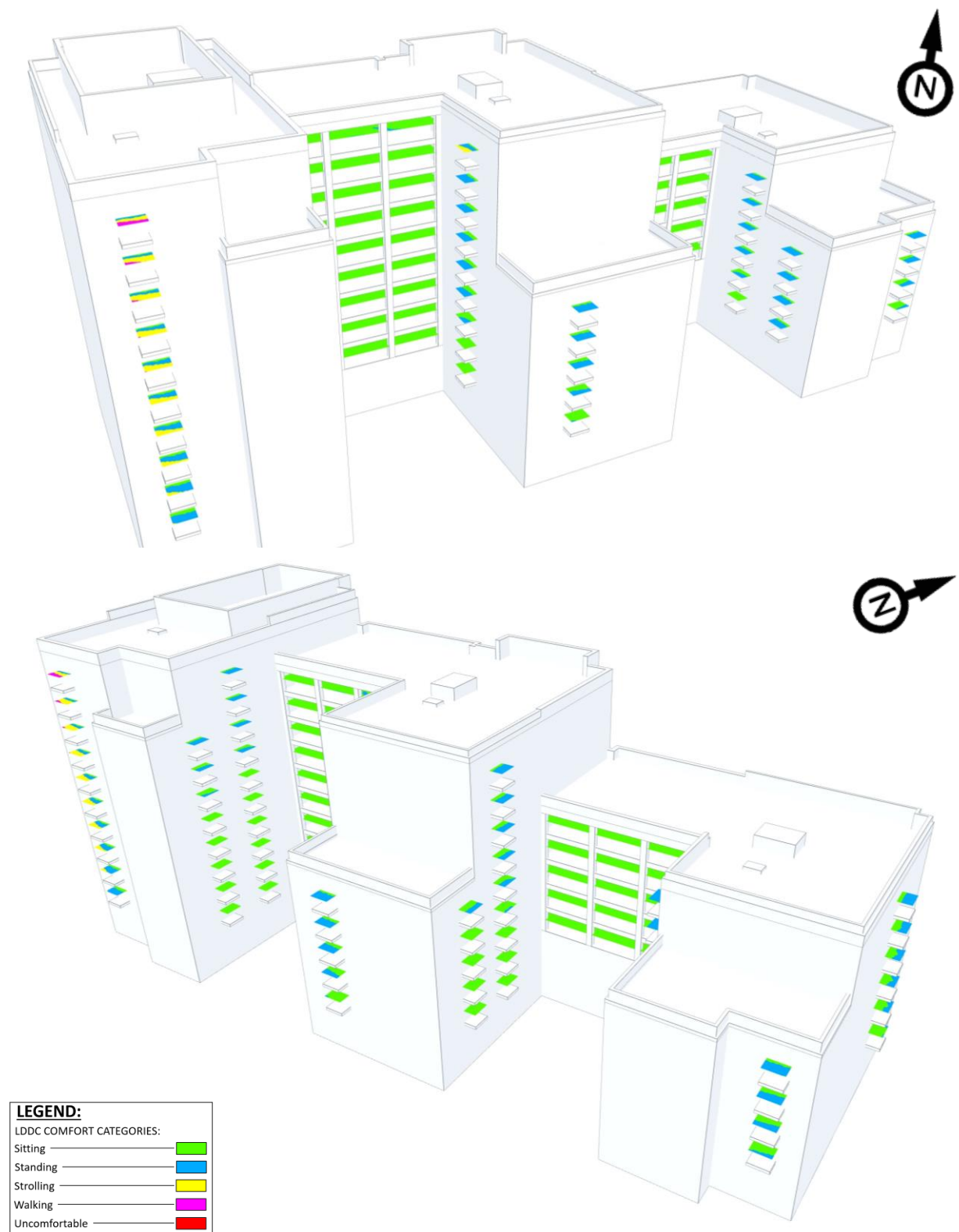


**Figure 16: Configuration 3 – Proposed Development with Cumulative Surrounding Buildings
– Balconies, Windiest Season**



**Figure 17: Configuration 3 – Proposed Development with Cumulative Surrounding Buildings
– Balconies, Summer Season**

7 MITIGATION MEASURES

The assessment has identified the following areas that would be windier than suitable, and therefore require mitigation measures:

- Upper five balconies nearby the south-western corner, which would have strolling conditions during the summer season, and anticipated strong wind exceedances posing safety concerns.

Configurations 4 and 5 assesses the effectiveness of 1.5m high solid balustrade around the perimeter of the balconies with unsuitable conditions identified above. These measures have been agreed with the design team and implemented into the Proposed Development. As discussed in the below sections, with these measures in place the balconies would have suitable wind environment for the occupants. A markup of the wind mitigation measures is presented in the Appendix Figure 35.

Based on the current design in which the roof spaces are inaccessible to residents, no mitigation measures would be required. As the roof spaces with walking conditions during the windiest season are anticipated to have strong winds exceeding the safety threshold, it is recommended that access to this roof spaces for maintenance is restricted during the windiest times of the year.

7.1 Configuration 4: Proposed Development with Wind Mitigation Measures and Existing Surrounding Buildings

Results for Configuration 4 are presented in Figure 18 and Figure 19 for ground level during the windiest and summer seasons respectively. Figures 20 and 21 present the results at roof spaces during the windiest and summer seasons respectively. Figures 22 and 23 present the results at balconies during the windiest and summer seasons respectively.

7.1.1 Pedestrian Comfort

Inclusion of the 1.5m high solid balustrade along the perimeter of the five uppermost balconies near the south-western corner would provide beneficial shelter from the prevailing winds accelerating around the western corner; as such these balcony spaces would have sitting conditions during the summer season, suitable conditions for the intended amenity use.

Wind conditions at all other areas at and around the Proposed Development would be consistent with Configuration 2.

7.1.2 Strong Winds

Strong winds with the potential to be a safety concern for cyclists and more vulnerable pedestrians would be anticipated to occur when wind conditions are suitable for walking or uncomfortable for all intended uses during the windiest season. Professional judgement has been applied, informed by the CFD results, to identify areas likely to have instances of strong winds.

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As such, no instances of strong winds are anticipated in pedestrian accessible areas of the Proposed Development.

Strong winds expected at the roof spaces would be tolerable as this area would only be accessible for maintenance use only and mitigation measures would not be required.

Strong wind exceedances anticipated along Bridge Street nearby The Oracle would be similar to that in the baseline scenario. As such, no mitigation measures would be required.

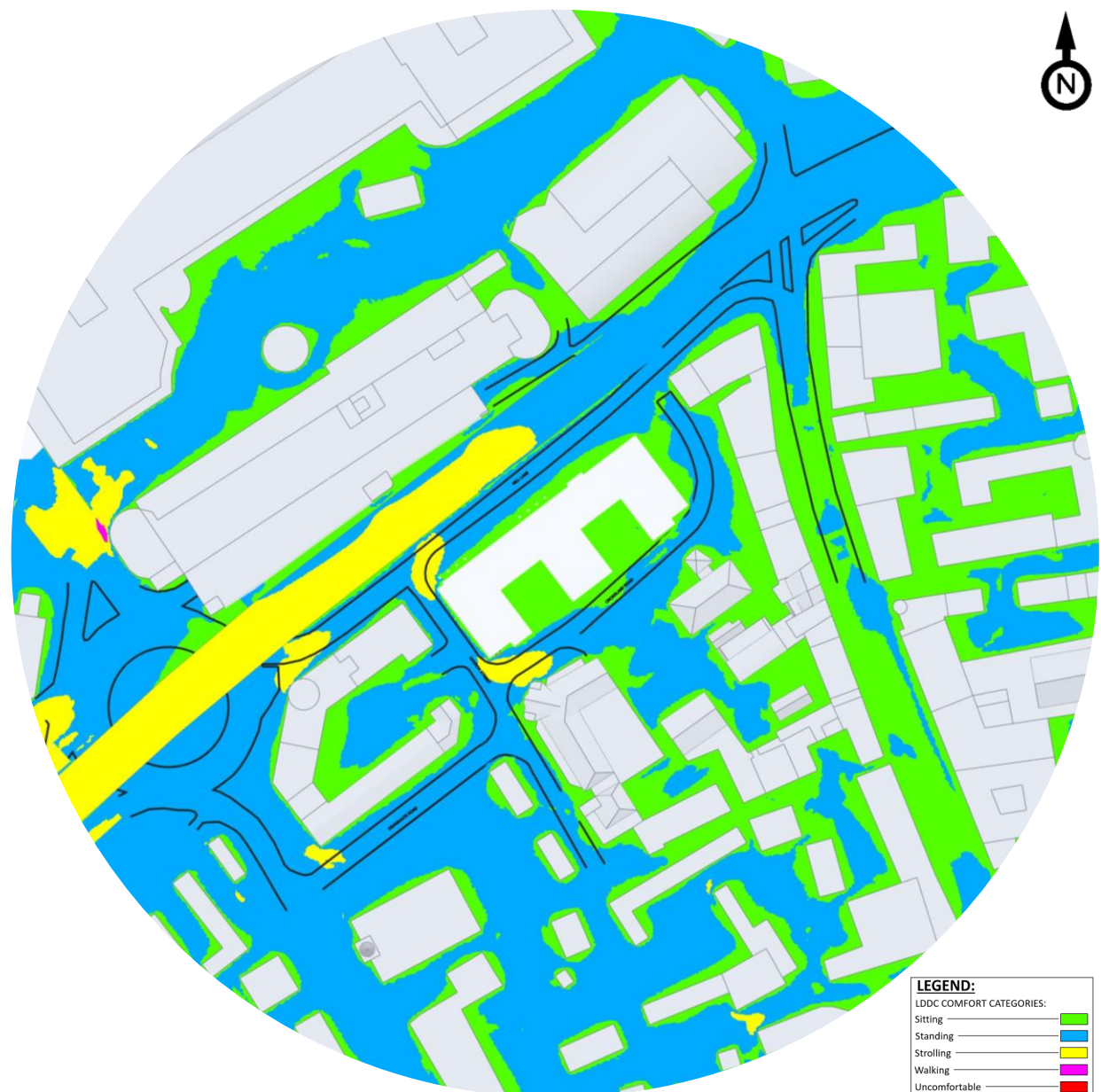


Figure 18: Configuration 4 – Proposed Development with Wind Mitigation Measures and Existing Surrounding Buildings – Ground Level, Windiest Season



Figure 19: Configuration 4 – Proposed Development with Wind Mitigation Measures and Existing Surrounding Buildings – Ground Level, Summer Season

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Figure 20: Configuration 4 - Proposed Development with Wind Mitigation and Existing Surrounding Buildings - Roof Spaces, Windiest Season

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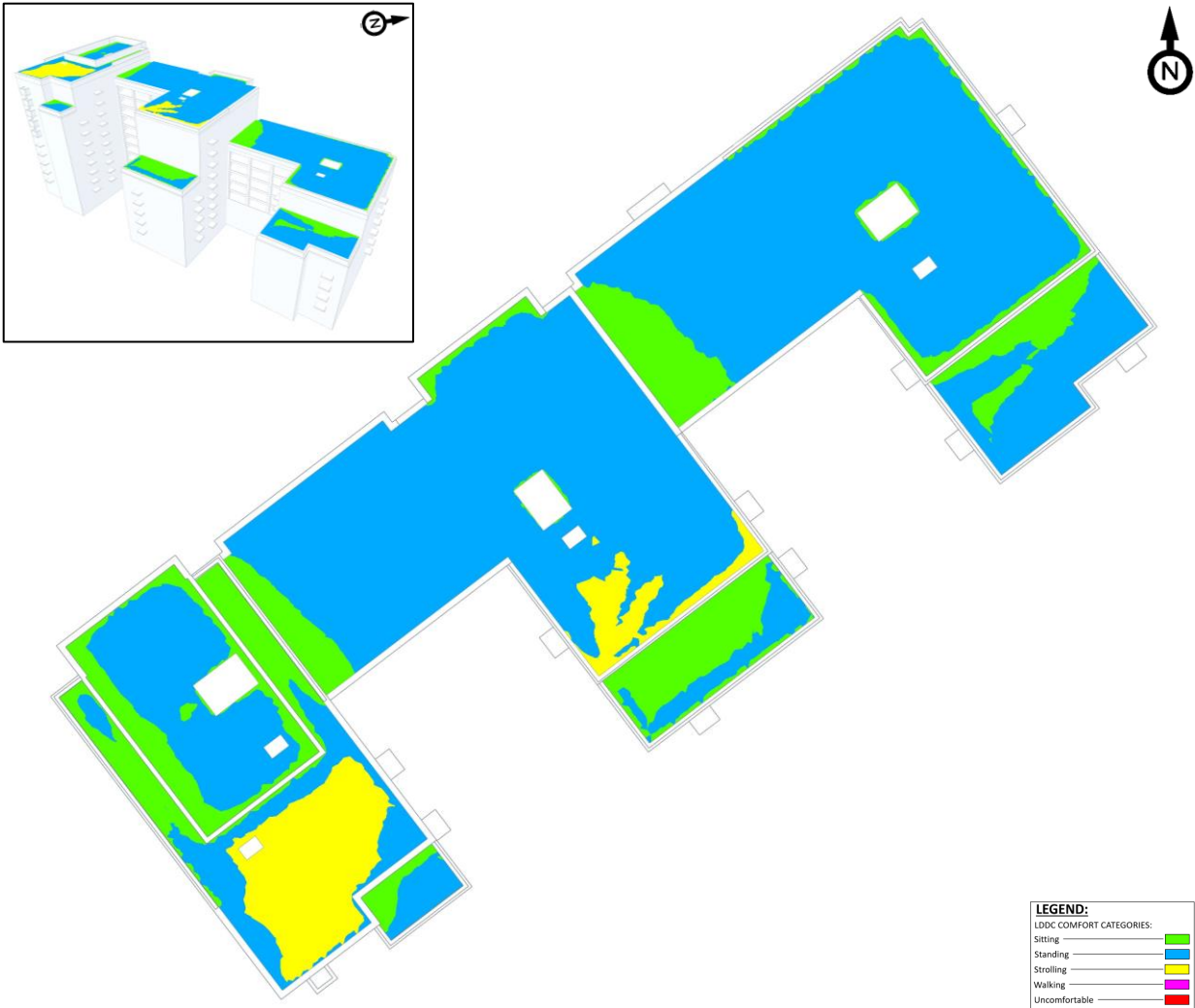


Figure 21: Configuration 4 – Proposed Development with Wind Mitigation and Existing Surrounding Buildings – Roof Spaces, Summer Season

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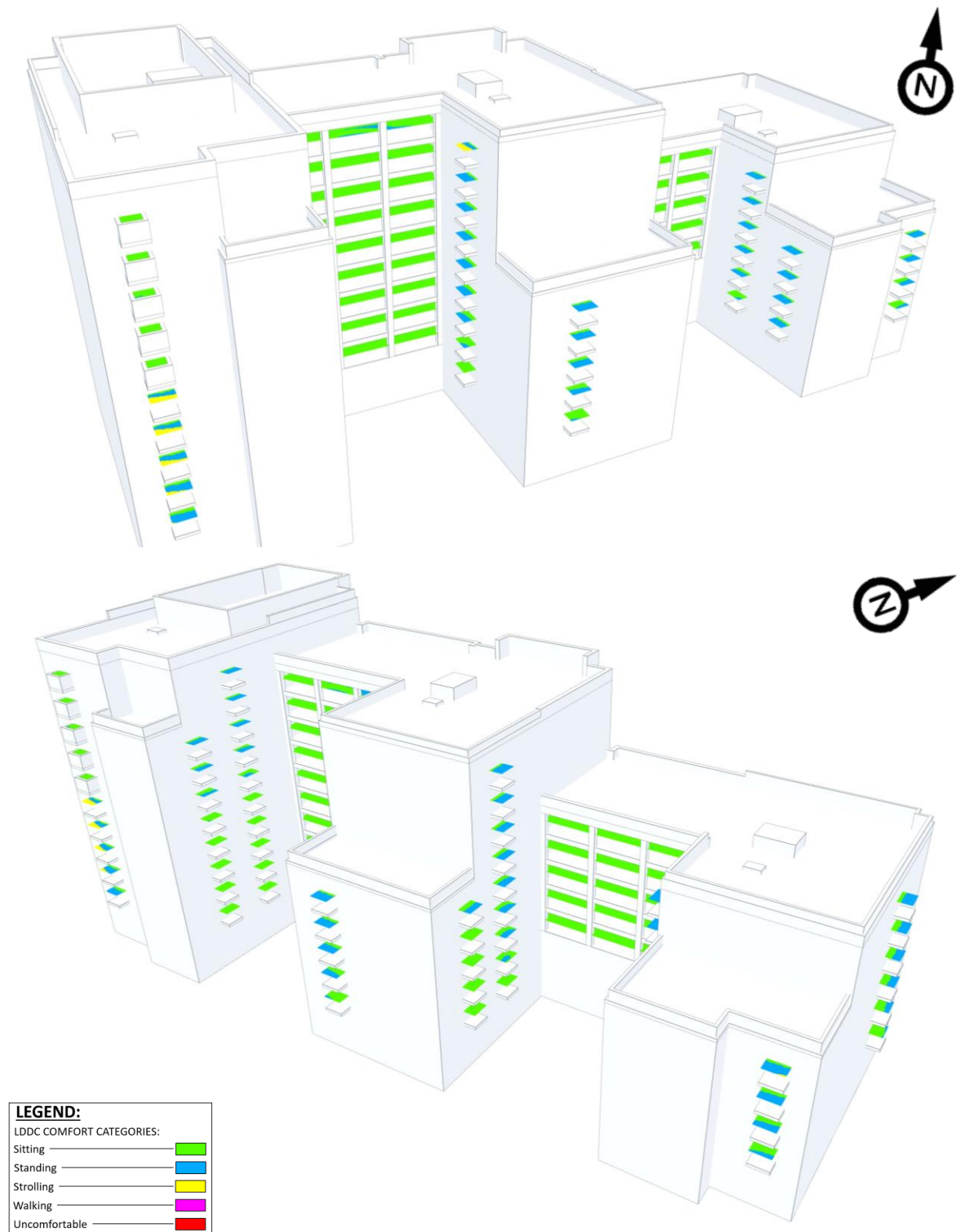


Figure 22: Configuration 4 – Proposed Development with Wind Mitigation Measures and Existing Surrounding Buildings – Balconies, Windiest Season

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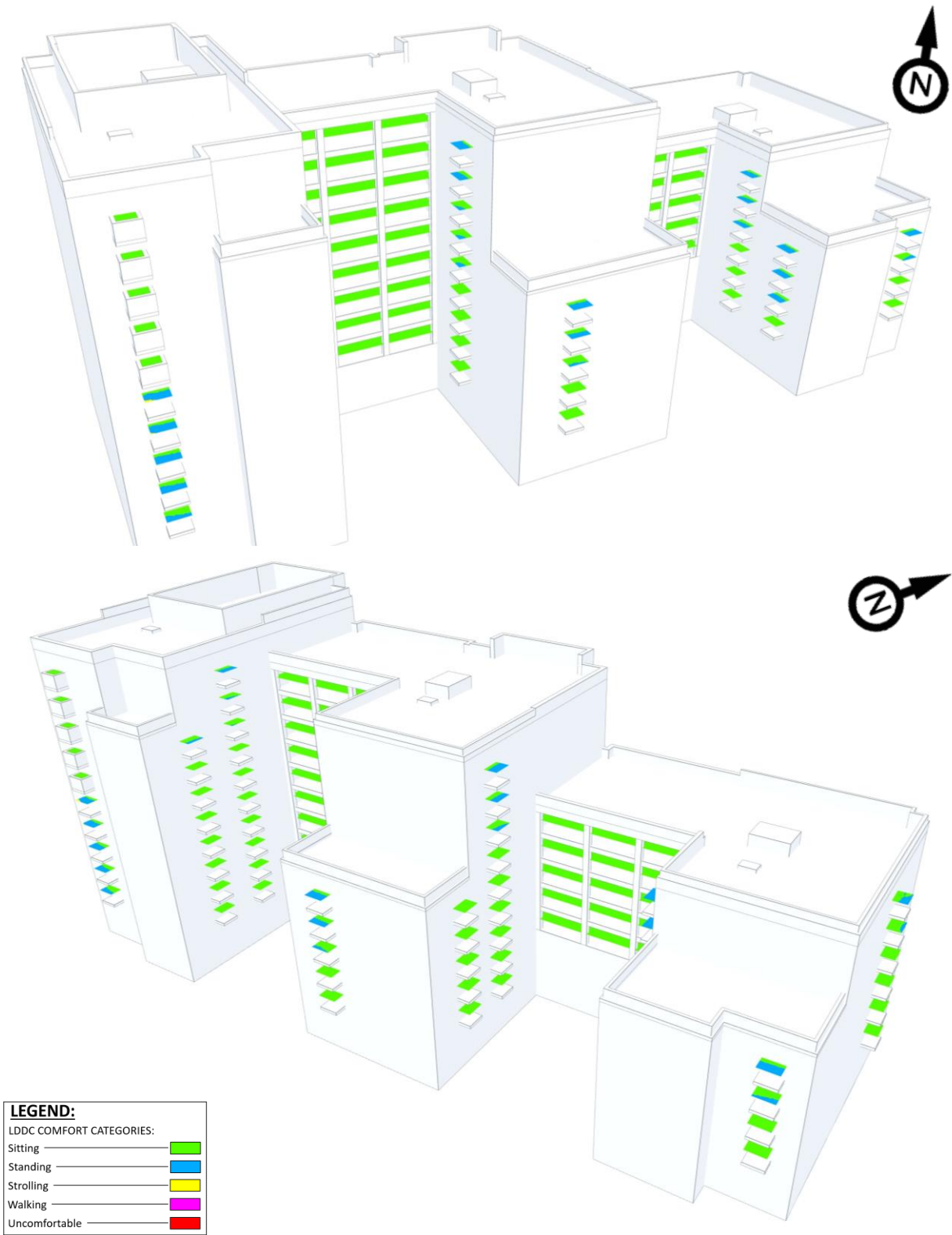


Figure 23: Configuration 4 – Proposed Development with Wind Mitigation Measures and Cumulative Surrounding Buildings – Balconies, Summer Season

7.2 Configuration 5: Proposed Development with Wind Mitigation Measures and Cumulative Surrounding Buildings

Results for Configuration 5 are presented in Figure 24 and Figure 25 for ground level during the windiest and summer seasons respectively. Figures 26 and 27 present the results at roof spaces during the windiest and summer seasons respectively. Figures 28 and 29 present the results at balconies during the windiest and summer seasons respectively.

7.2.1 Pedestrian Comfort

With the inclusion of the 1.5m high solid balustrade along the perimeter of the five uppermost balconies near the south-western corner these balconies would have suitable sitting use conditions during the summer season, in the context of the cumulative surrounds.

Wind conditions at all other areas at and around the Proposed Development would be consistent with Configuration 3.

7.2.2 Strong Winds

Strong winds with the potential to be a safety concern for cyclists and more vulnerable pedestrians would be anticipated to occur when wind conditions are suitable for walking or uncomfortable for all intended uses during the windiest season. Professional judgement has been applied, informed by the CFD results, to identify areas likely to have instances of strong winds.

As such, no instances of strong winds are anticipated in pedestrian accessible areas of the Proposed Development.

Strong winds expected at the roof spaces would be tolerable as this area would only be accessible for maintenance use only and mitigation measures would not be required.

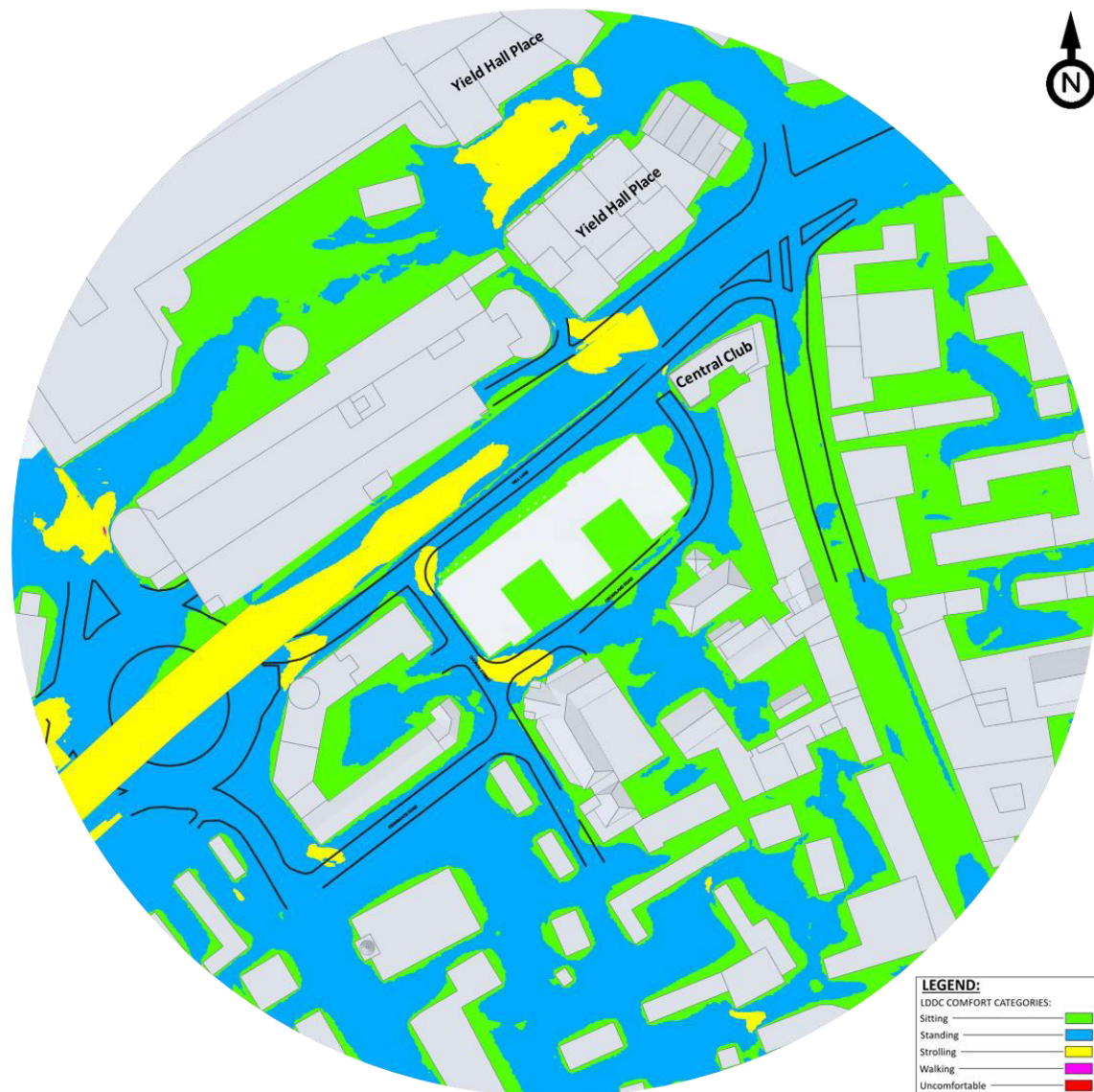


Figure 24: Configuration 5 – Proposed Development with Wind Mitigation Measures and Cumulative Surrounding Buildings – Ground Level, Windiest Season

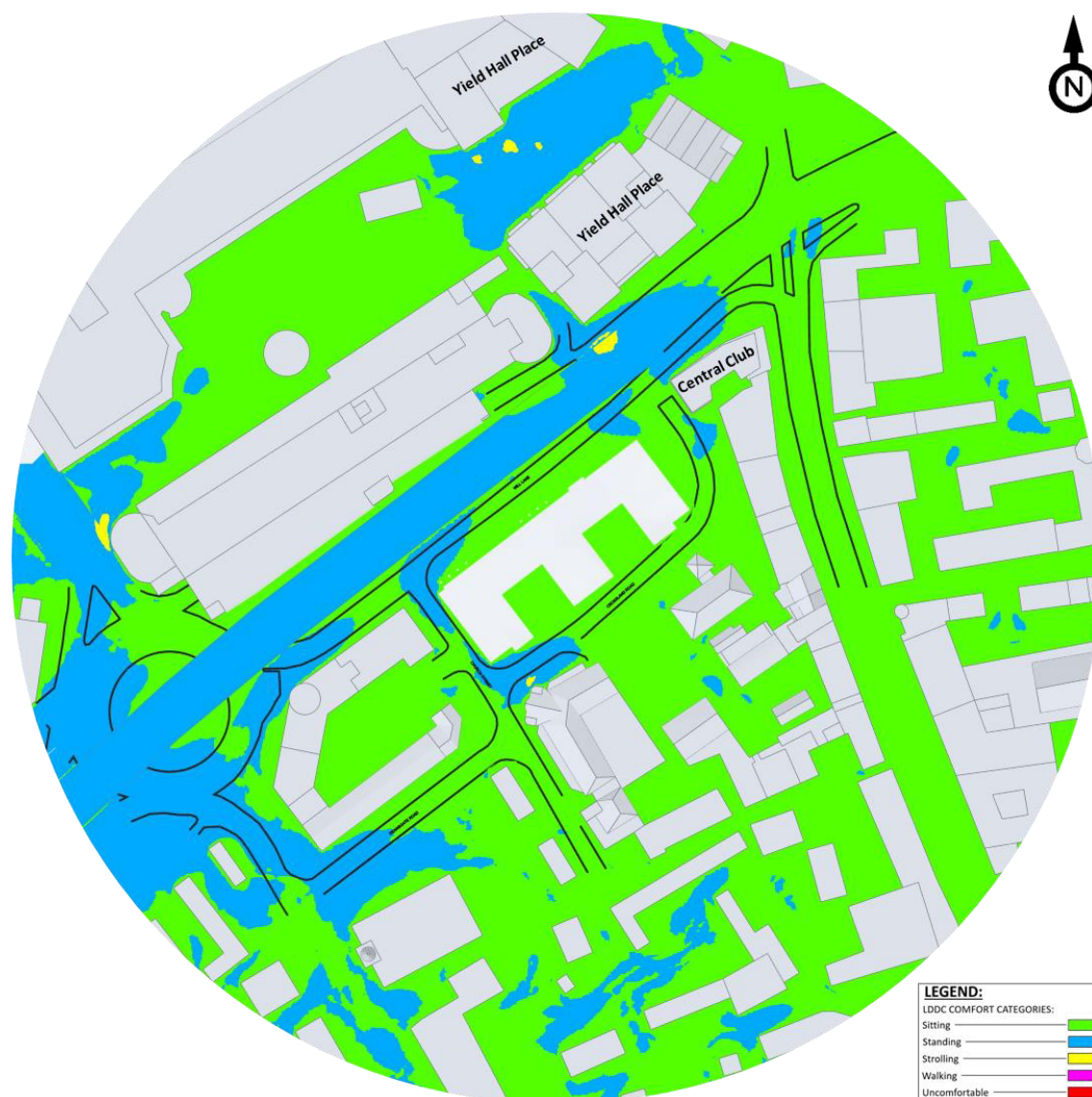


Figure 25: Configuration 5 – Proposed Development with Wind Mitigation Measures and Cumulative Surrounding Buildings – Ground Level, Summer Season

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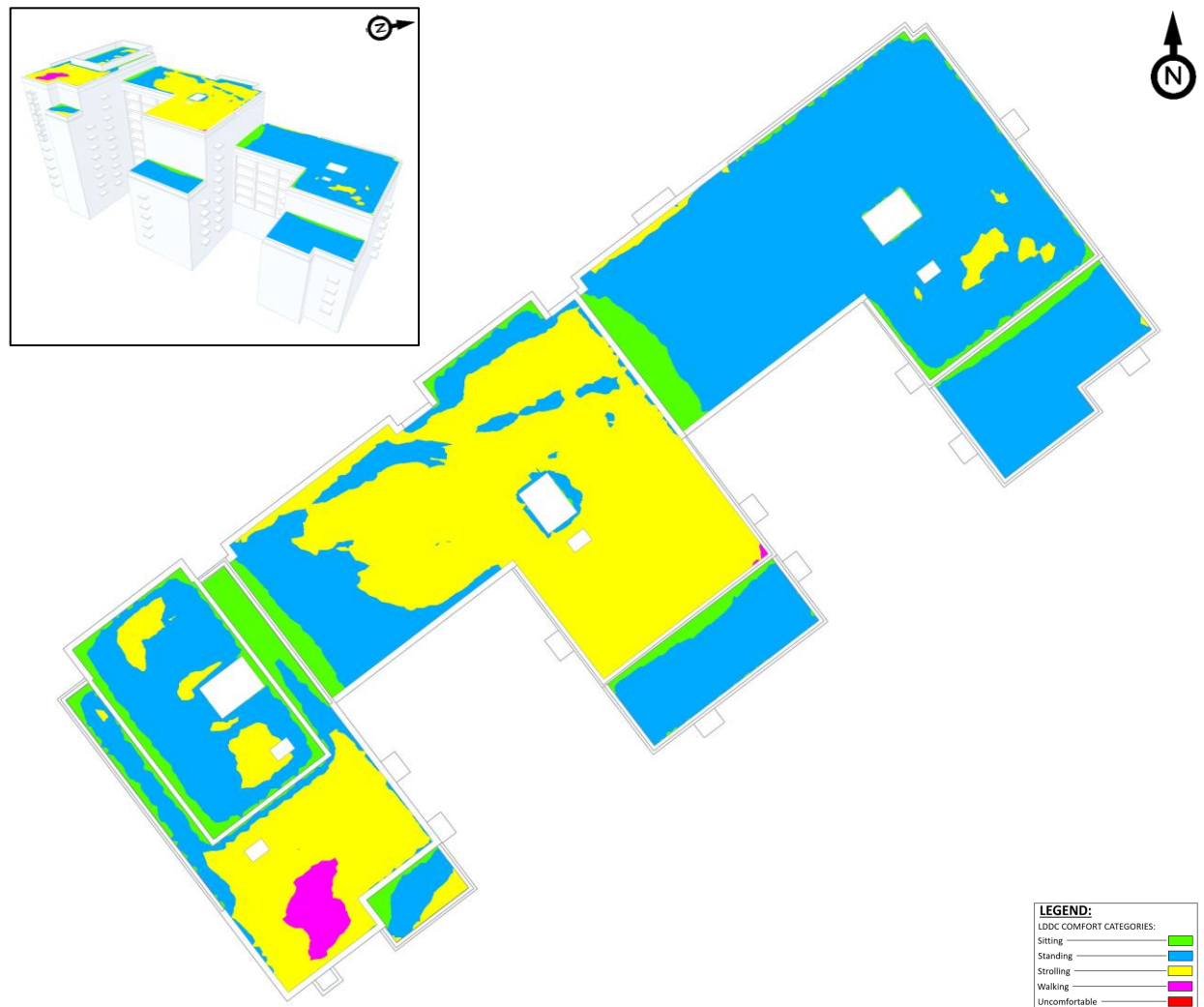


Figure 26: Configuration 5 – Proposed Development with Wind Mitigation and Cumulative Surrounding Buildings – Roof Spaces, Windiest Season

RWDI #2401982
May 22nd, 2024

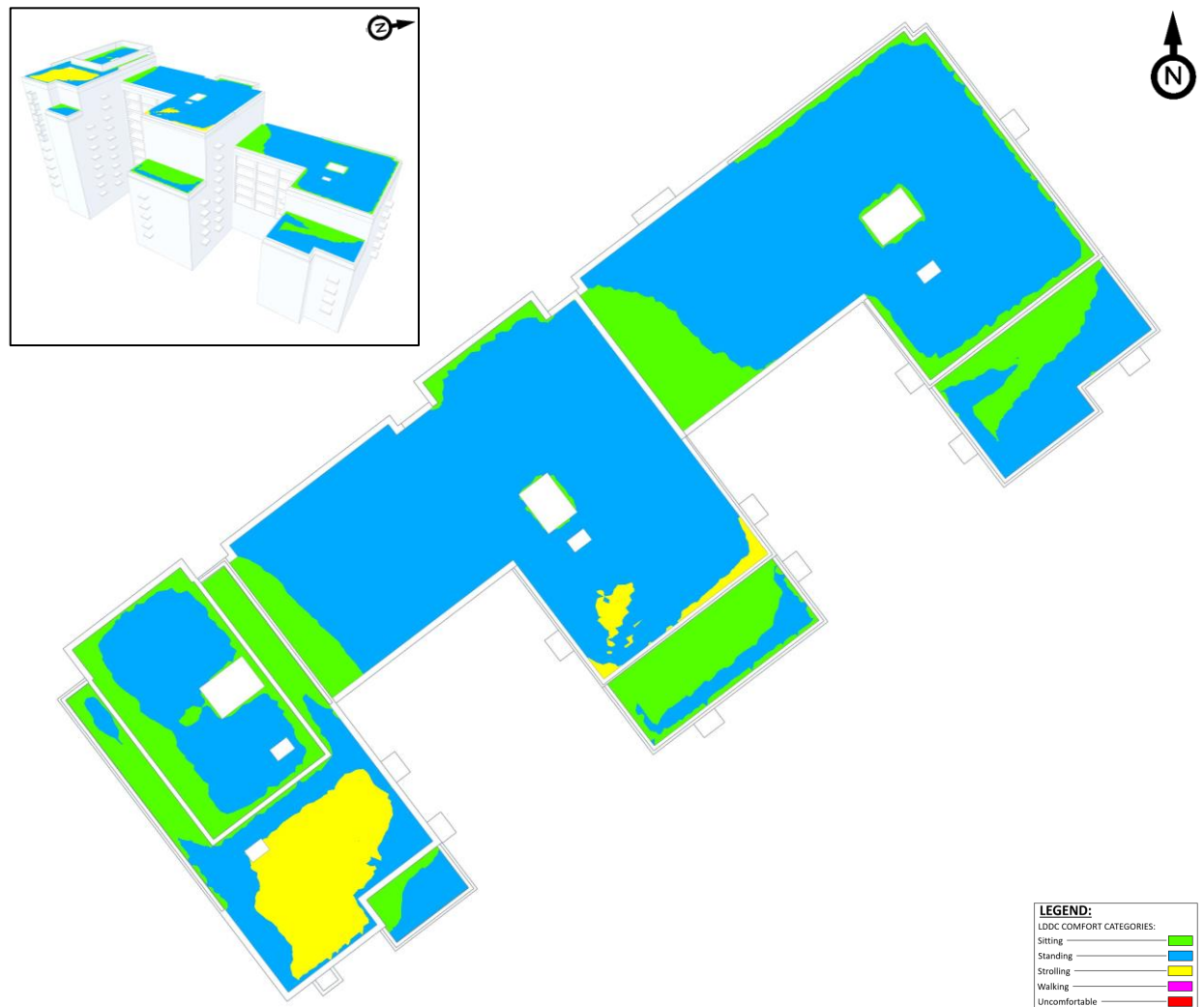


Figure 27: Configuration 5 – Proposed Development with Wind Mitigation and Cumulative Surrounding Buildings – Roof Spaces, Summer Season

RWDI #2401982
May 22nd, 2024

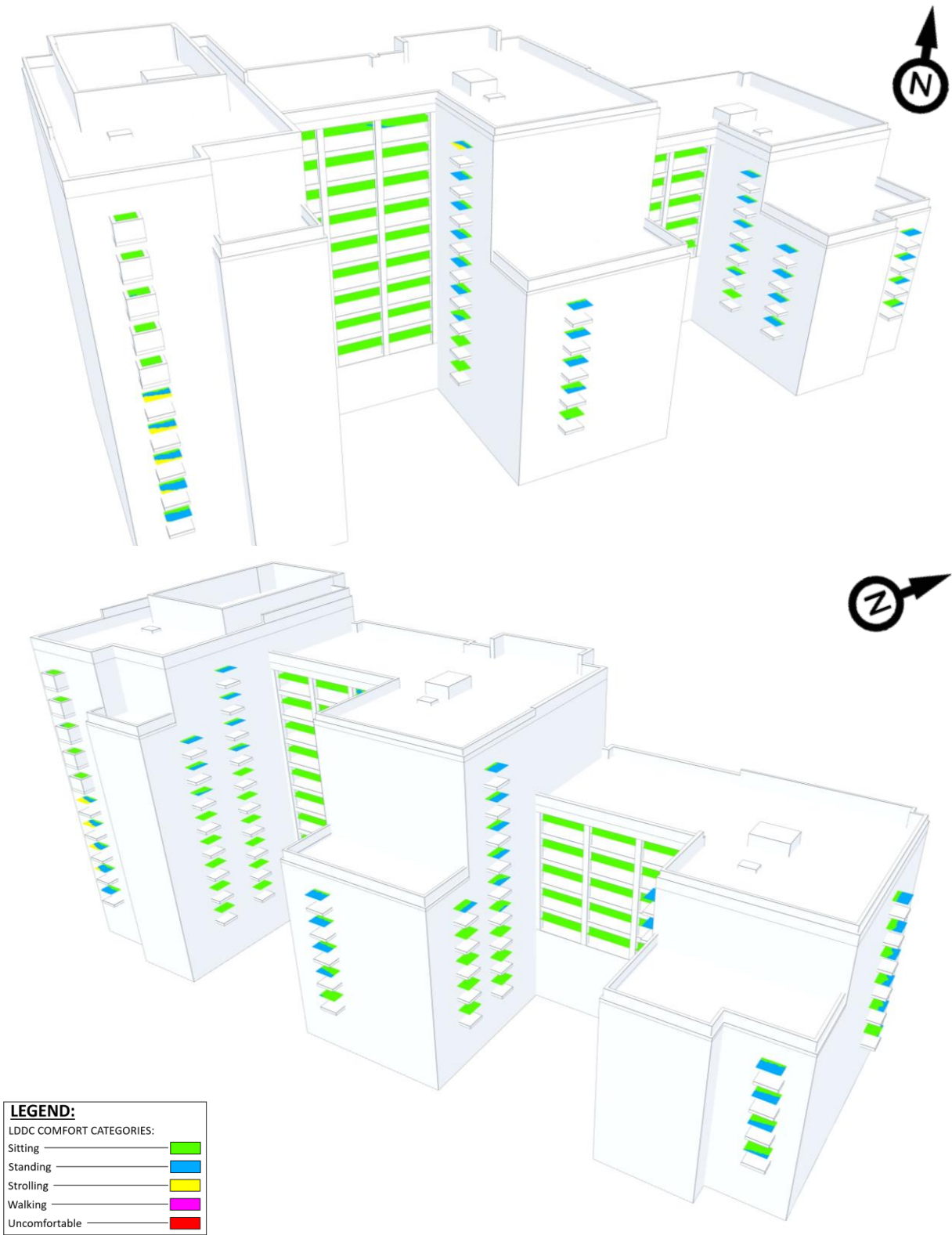


Figure 28: Configuration 5 – Proposed Development with Wind Mitigation Measures and Cumulative Surrounding Buildings – Balconies, Windiest Season

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Figure 29: Configuration 5 – Proposed Development with Wind Mitigation Measures and Cumulative Surrounding Buildings – Balconies, Summer Season

8 CONCLUDING REMARKS

This report has identified the wind microclimate effects on the Proposed Development and surrounding area, based on an assessment conducted using Computational Fluid Dynamics (CFD) simulations. The following is a summary of the key points described in the report:

- The meteorological data for the Site indicates prevailing winds blowing from the south-west throughout the year. There is a secondary wind from the north-east most common during the late spring season.
- Wind conditions for the baseline scenario (Configuration 1) show the majority of the existing Site has suitable conditions for the current uses, with the exception of one thoroughfare which is also anticipated to have strong winds posing safety concerns, and one entrance which has strolling conditions.
- With the introduction of the Proposed Development (Configuration 2), wind conditions at ground level materially remain the same as in the baseline. There would be upper-level balconies that would be windier than suitable and anticipated to have strong winds posing safety concerns. As discussed in Configuration 4, these adverse conditions have been resolved through the implementation of wind mitigation measures which are inherent in the design.
- The inclusion of the cumulative schemes (Configuration 3) would result in similar conditions to those reported in Configuration 2. As indicated in Configuration 5, with the inclusion of balcony wind mitigation measures inherent in the design these spaces would have suitable/safe wind conditions.
- For the off-site areas wind conditions would be no worse than the baseline environment (Configuration 1) and as such no further mitigation measures would be required.

9 STATEMENT OF LIMITATIONS

This report entitled Pedestrian Level Wind Microclimate Assessment dated May 22nd, 2024, was prepared by RWDI for AECOM ("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.

10 ASSUMPTIONS AND LIMITATIONS

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

- Cumulative list – received 13th March 2024;
- Revit model – received 18th March 2024;
- Plans and elevations – received 18th March 2024; and
- Landscaping information – received 19th March 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.

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.



11 REFERENCES

1. Lawson T.V. (April 2001), Building Aerodynamics, Imperial College Press
2. ESDU International, Computer program for wind speeds and turbulence properties: flat or hilly sites in terrain with roughness changes, ESDU 01008, 2001 01008

APPENDIX A: COMPUTATIONAL MODEL

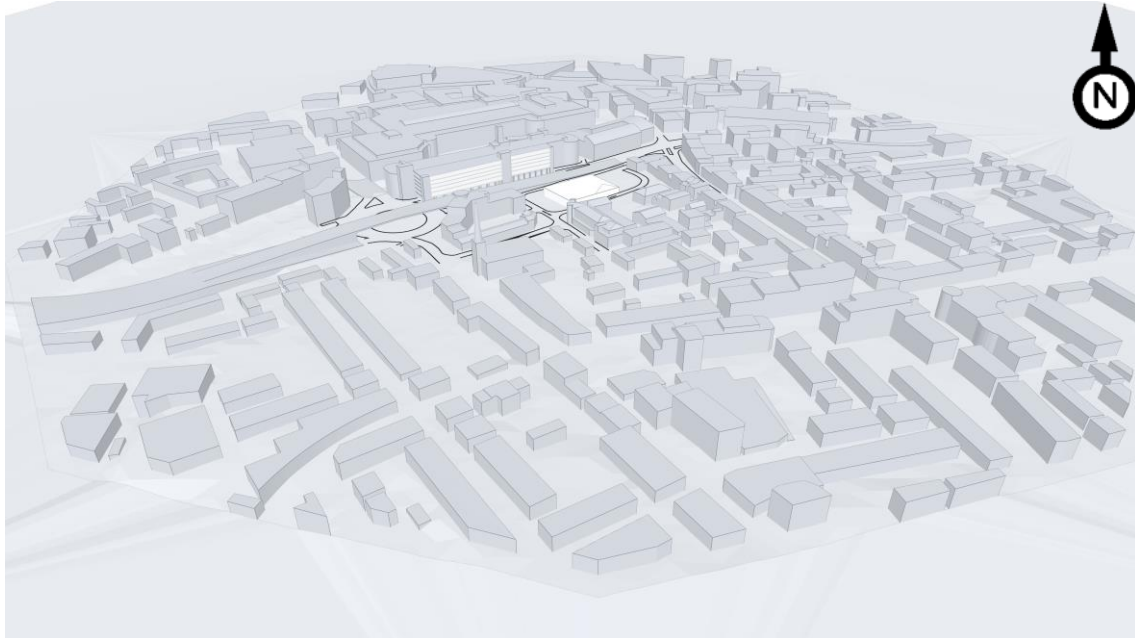


Figure 30 – Existing Site with Existing Surrounding Buildings 3D model used for Computational Fluid Dynamic simulations (view from the south)



Figure 31 – Proposed Development with Existing Surrounding Buildings 3D model used for Computational Fluid Dynamic simulations (view from the south)

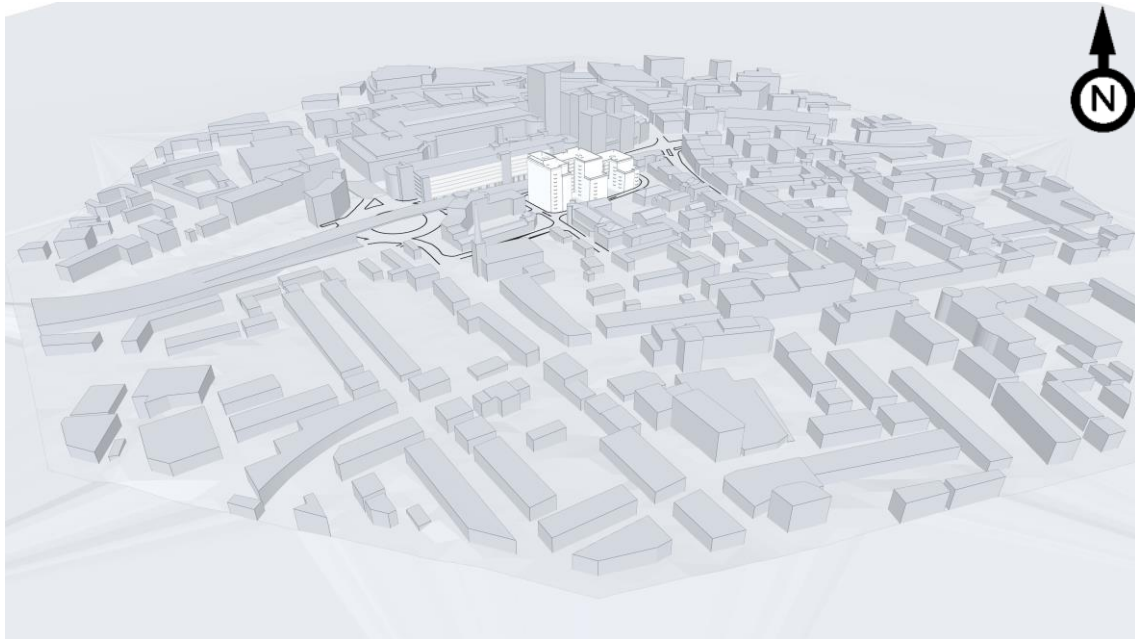


Figure 32 – Proposed Development with Cumulative Surrounding Buildings 3D model used for Computational Fluid Dynamic simulations (view from the south)



Figure 33 – Proposed Development with Wind Mitigation Measures and Existing Surrounding Buildings 3D model used for Computational Fluid Dynamic simulations (view from the south)

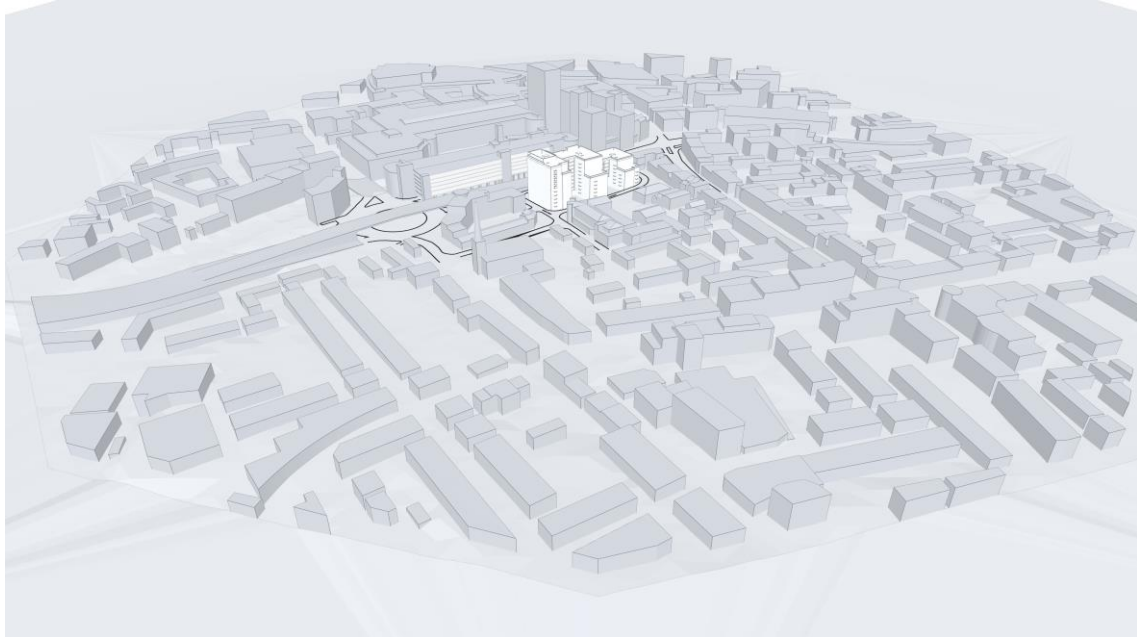


Figure 34 – Proposed Development with Wind Mitigation Measures and Cumulative Surrounding Buildings 3D model used for Computational Fluid Dynamic simulations (view from the south)

APPENDIX B: MITIGATION MEASURES

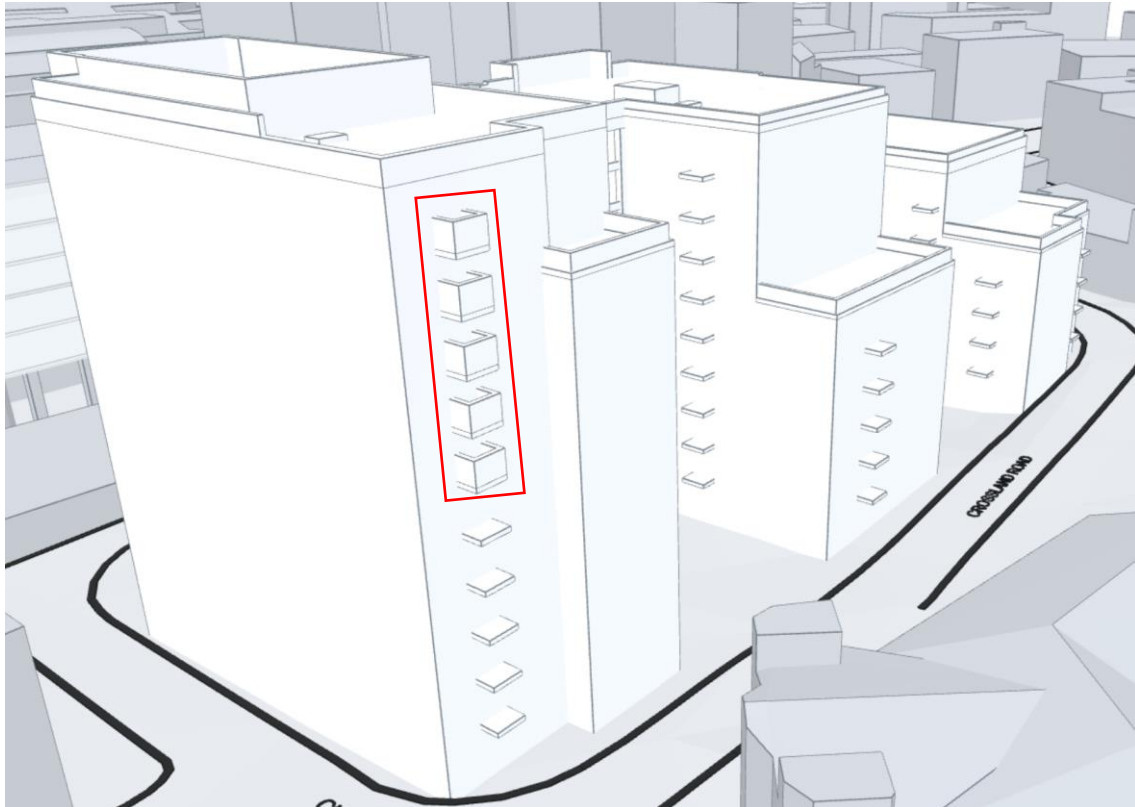


Figure 35 – 1.5m high solid balustrade along the perimeter of the balconies