FINAL REPORT

ROYAL BRUNSWICH PARK

LONDON, UK

PEDESTRIAN LEVEL WIND MICROCLIMATE ASSESSMENT

RWDI #2102824 – REV B

25TH OCTOBER 2021

SUBMITTED TO

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VERSION HISTORY

RWDI Project #2102824	**Royal Brunswich Park London, UK**	
Report	**Releases**	**Dated**
Reports	Rev B	21 October 2021
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EXECUTIVE SUMMARY

RWDI was retained to conduct a pedestrian level wind assessment of the proposed Royal Brunswich Park development (hereafter referred to as the 'Proposed Development') in London, UK. This report presents a description of the methodology used and the results of two configurations tested using Computational Fluid Dynamics (CFD) simulations, namely:

- Configuration 1: Existing Site with Existing Surrounding Buildings and Existing Landscaping; and
- Configuration 2: Proposed Development with Existing Surrounding Buildings and Proposed Landscaping.

The meteorological data for the Site indicates prevailing winds from the south-west quadrant throughout the year with secondary winds from the north-east direction which are more prevalent during the spring months.

The baseline scenario (i.e. Configuration 1) indicates that the Site and the majority of nearby surrounding area has conditions ranging from suitable for sitting to walking use, with the windiest conditions to the north of Ariana Banqueting Hall and at building corners within and around the Site. During the summer season, wind conditions would generally be one category calmer and would thus range from suitable for sitting to strolling use. Strong winds are expected to occur to the north of Ariana Banqueting Hall.

With the Proposed Development built out, wind conditions within and immediately surrounding the Site would differ substantially compared to the baseline due to the reduction of open space and the introduction of large building massing. As a result, windy areas would occur around the corners of the outline buildings at the western side of the masterplan as well as at potential entrances. During the summer season, wind conditions would be generally one category calmer and all the ground and elevated level amenity spaces would be suitable for sitting to standing use, appropriate for amenity use, provided that designated seating is located in areas suitable for sitting use.

Strong winds exceeding the safety threshold would occur at thoroughfare areas around the sharp corners of the outline elements discussed above alongside strong wind exceedances which would have the potential to be a safety concern to cyclists and more vulnerable pedestrians.

Wind conditions within and around the detailed elements of the Proposed Development would be suitable for the intended use and there would be no strong winds with the potential to be a safety concern to cyclists and more vulnerable pedestrians expected. As such no mitigation measures would be required around the detailed elements of the Proposed Development.

Wind mitigation measures and improvements to the proposed landscaping scheme for the outline elements of the masterplan have been suggested in Section 6 of this report which would be expected to improve conditions at the windy areas around these buildings. **Due to the expected potential safety concerns around the outline elements of the Proposed Development, wind conditions should be re-assessed and appropriate mitigation measures developed in conjunction with an experienced wind engineer at the detail design stage.**

1 INTRODUCTION

RWDI was retained by Opecprime Development Limited to conduct a pedestrian level microclimate assessment for the proposed Royal Brunswich Park development in London, UK. This report presents the background and objectives from RWDI's assessment. A summary of the overall recommendations from the study are presented in Section 7 "Conclusions".

2 BACKGROUND AND APPROACH

Computational Fluid Dynamics (CFD) simulations were conducted on the proposed Royal Brunswich Park development in London, UK. 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 the wider London area has been analysed and adjusted to the Site conditions by modelling the effect of terrain roughness in the computational domain.

Two configurations were simulated, as follows:

- Configuration 1: Existing Site with Existing Surrounding Buildings and Existing Landscaping; and
- Configuration 2: Proposed Development with Existing Surrounding Buildings and Proposed Landscaping.

Mitigation measures that would improve wind conditions within and around the Site are discussed in Section 6 of this report.

2.1 Site Description and Surroundings

The Site is located in the London Borough of Barnet, approximately 600m to the south-west of Brunswick Park. The Site is bound by a railway line connecting New Southgate to Oakleigh Park to the west, Brunswick Park Road to the east, and low-rise houses to the north and south. The Ordnance Survey Landranger grid reference is TQ279934.

The surrounding buildings are generally low-rise development. This topology results in a relatively higher mean wind speed and lower turbulent environment compared to a more built up suburban or urban area where the mean wind speeds are lower with higher turbulence levels. An aerial view of the approximate location of the Site 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

Hybrid planning application for the phased comprehensive redevelopment of the North London Business Park to deliver a residential-led mixed use development. The detailed element comprises up to 466 residential units in five blocks reaching 9 storeys, the provision of a 5 form entry secondary school, a gymnasium, a multi-use sports pitch and associated changing facilities and improvements to open space and transport infrastructure, including improvements to the access from Brunswick Park Road and; the outline element comprises up to 1,951 additional residential units in buildings ranging from three to twelve storeys, up to 7,148 sqm of non-residential floor space (use Class E) and 20,250sqm of open space. Associated site preparation/enabling work, transport infrastructure and junction work, landscaping and car parking.

A 3D model of the Proposed Development devoid of landscaping is shown in Figure 2 below.

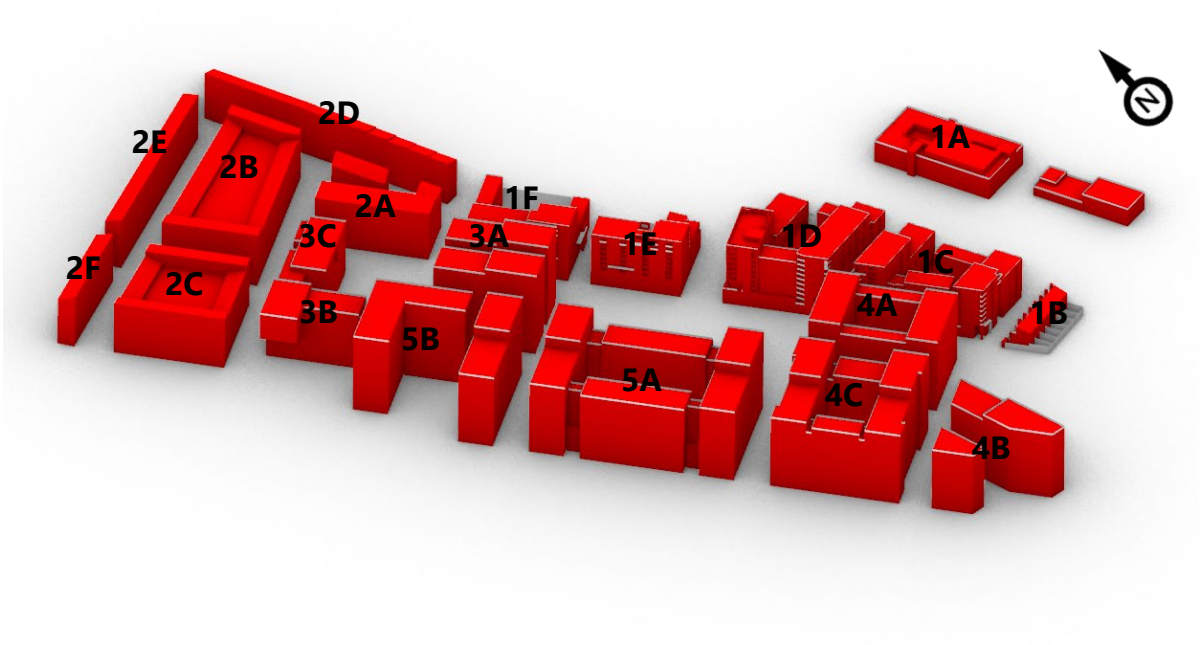


Figure 2: 3D model of the Proposed Development used for CFD simulations (view from the south-west)

3 METHODOLOGY AND ASSESSMENT CRITERIA

The three-dimensional model of the Proposed Development used for CFD simulations of Configuration 2 is shown in Figure 2. Additional images of the 3D model in are presented in Appendix A. In each of the two 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 Comfort Criteria described below in 3.2 '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 (equal 20 degrees intervals). Although the strongest winds originate from the south-westerly sector, this quantity of wind angles will provide sufficient coverage of all aerodynamic interactions from winds from all angles.

The individual cases of the Proposed Development were solved using 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-state 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 help 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 20 million hexahedral cells with refinement close to the areas of expected high pressure gradients.

All configurations were simulated with the existing and proposed landscaping scheme included. The landscaping scheme is provided in Appendix B.

3.1 Meteorological Data

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

Approximately 30 years of meteorological data for London was used in this report, presented in the seasonal wind roses (Figure 3). The radial axis indicates the percentage time per season that the wind speed exceeds the particular wind speed range. 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-westerly winds, especially during the spring.

Figure 3: Seasonal Wind Roses for London Heathrow (in km/hr) (Radial axis indicates the percentage of time the stated wind speed is exceeded)

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 Criteria[1] 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 wind tunnel test 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

3.3 Strong Winds

Lawson[1] also specified a lower limit strong wind threshold when winds exceed 15m/s for more than 0.025% of the time (approximately 2.2 hours per year). When winds exceed this threshold remedial measures or a careful assessment of the expected use of that location would be required; 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 approximately 2.2 hours per year represent a safety issue for all members of the population, which would require mitigation to provide an appropriate wind environment.

Strong winds are generally associated with areas which would be classified as acceptable for walking or as uncomfortable. In a mixed-use urban development scheme, walking and uncomfortable conditions would not usually form part of the 'target' wind environment and would usually require mitigation due to pedestrian comfort considerations. This mitigation would also reduce the frequency of, or even eliminate, any strong winds.

It should be noted that the CFD simulations will provide an average expected wind speed for the windiest (typically the winter months - December to February) and summer season in regard to pedestrian comfort. Areas which would have wind conditions suitable for walking use would be likely to have instances of strong winds. As such, 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.

4 RESULTS

4.1 Details of Analysis

To account for the difference in height and terrain roughness between meteorological conditions at the airports and the Site a roughness factor was used to adjust the meteorological data to the relatively built up suburban nature (compared to the airport site) of the area surrounding the Proposed Development Site, which is taken into account during the CFD simulations.

4.2 Desired Pedestrian Activity around the Proposed Development

Generally, for the Proposed Development, the target conditions are:

- Strolling during the windiest season on pedestrian thoroughfares;
- Standing conditions at main entrances and bus stops throughout the year; and
- Sitting and standing conditions at outdoor seating and amenity areas 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.

Achieving a sitting classification in the summer usually means that the same receptor would be acceptable for standing in the windiest season because winds are stronger at this time.

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 windiest season.

It should be noted that a mixture of sitting use and standing use is acceptable for larger amenity spaces, provided designated seating is not located at the windier locations suitable for standing use.

4.3 Performance against the Lawson Comfort Criteria

The results of the assessment for each configuration against Lawson Comfort Criteria are described below and presented graphically in Figures 4 to 9.

4.3.1 Configuration 1 – Existing Site with Existing Surrounding Buildings and Existing Landscaping

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).

Wind conditions in Configuration 1 were assessed with the existing landscaping at both sides of the railway line.

4.3.2 Configuration 2 – Proposed Development with Existing Surrounding Buildings, Retained and Proposed Landscaping

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); and
- Figures 8 and 9: Summer Season (Elevated Levels).

Wind conditions in Configuration 2 were assessed with the retained existing landscaping and proposed landscaping.

5 DISCUSSION

This discussion compares the measured wind conditions (shown in the contour plots in Figure 4 – 9) 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. Areas that are windier than suitable for the intended pedestrian use would require mitigation.

Existing landscaping either side of the railway line was included in all the tested configurations.

5.1 Configuration 1: Existing Site with Existing Surrounding Buildings and Existing Landscaping

The following discussion of the wind microclimate is based on the results shown in Figures 4 and 5 for the windiest and summer seasons for the ground level respectively.

5.1.1 Pedestrian Comfort

The existing buildings in the baseline scenario (i.e. Configuration 1) are generally low-rise and provide no shelter against the oncoming wind, which results in windy areas in large open spaces compared to more built up areas. Therefore, the Site and the majority of nearby surrounding area has conditions ranging from suitable for sitting to strolling use, with localised areas suitable for walking use during the windiest season. Generally during the summer season, wind conditions are one category calmer, and a larger area of the Site fulfils the standing criteria.

There are walking use wind conditions during the windiest season at thoroughfare areas to north-west of the existing Ariana Banqueting Hall and at the corners of several houses surrounding the Site. All other throughfare areas have strolling use or calmer wind conditions. There are strolling use wind conditions during the windiest season at houses to the west of Howard Close. All other entrances have standing use wind conditions or calmer. The bus stops on Brunswick Park Road have strolling use wind conditions during the windiest season.

Existing amenity spaces at the central courtyard of the College of Animal Welfare and to the east and west of the St Andrew the Apostle Greek Orthodox School would range from suitable for sitting to standing use during the summer season.

5.1.2 Strong Winds

There is one area where strong winds would be expected to occur in the context of the existing Site. This would be at the open space to the north of Ariana Banqueting Hall. This area has wind conditions suitable for walking use which are often associated with strong winds and would have the potential to be a safety concern to cyclists and more vulnerable pedestrians. No other areas within or around the existing Site are expected to have strong winds with the potential to be a safety concern.

5.2 Configuration 2: Proposed Development with Existing Surrounding Buildings and Proposed Landscaping

The following discussion of the wind microclimate is based on the results shown in Figures 6 and 7 during the windiest and summer seasons for ground level respectively. Figures 8 and 9 show the results for the elevated levels during the summer season.

5.2.1 Pedestrian Comfort

With the Proposed Development built out, wind conditions within and immediately surrounding the Site would differ substantially compared to the baseline due to the reduction of open space and the introduction of massing. As a result, windy areas would occur around the outline elements to the west of the Proposed Development. Wind conditions would generally range from suitable for sitting to strolling use with localised areas suitable for walking use during the windiest season. During the summer season, wind conditions would generally be one category calmer.

The change in wind conditions around the Site would be due to the introduction of the Proposed Development, which directs flow from the south-west around the massing providing an area of shelter to the cluster of houses to the north-east, but increasing windiness to the south around corners and between the buildings.

Thoroughfares (Figure 6)

Wind conditions at thoroughfares to the north-east of the Proposed Development (around the cluster of houses) would improve compared to the baseline scenario as well as within the Site due to the provided shelter by the built environment from the prevailing south-westerly winds.

Wind conditions at the majority of thoroughfares would range from sitting to strolling use during the windiest season, suitable for the intended use.

Walking use wind conditions would occur at the following areas within the Proposed Development Site:

- The thoroughfare separating the north-eastern and southern blocks of Building 5B;
- Between Buildings 5B and 5A;
- Between Buildings 5A and 4C; and
- The southern corner of Building 4B.

Entrances (Figure 6)

The wind conditions at the existing entrances to the houses to the west of Howard Close would improve to be suitable for standing use during the windiest season, appropriate for entrances and a material improvement from the baseline wind conditions. All other off-Site entrances would continue to have similar wind conditions to the baseline scenario.

The entrances to the Detailed Phase One, of the Proposed Development, would have wind conditions suitable for sitting to standing use during the windiest season and would not require mitigation measures.

There would be areas of the outline components of the Proposed Development that would have strolling use wind conditions during the windiest season, one category windier than suitable for entrances, these would be:

- The southern corner of Building 5B;
- In the gap between the northern and southern blocks of Building 5B;
- The southern corner of Building 5A; and
- The southern elevation of Building 4B.

Entrances located at these elevations would require wind mitigation measures as specified in Section 6.

Bus Stops (Figure 6)

Wind conditions at bus stops on Brunswick Park Road would be suitable for standing use during the windiest season. These wind conditions would be acceptable for bus stops and a material improvement compared to the baseline scenario. As such, no mitigation measures would be required.

Pedestrian Crossings (Figure 6)

Wind conditions at pedestrian crossings on Brunswick Park Road would be similar to the baseline scenario and would be suitable for strolling use during the windiest season. These wind conditions would be suitable for a pedestrian crossing and no mitigation measures would be required.

Amenity Spaces – Ground Level (Figure 7)

The Proposed Development would have several mixed-use amenity spaces between Phases One and Five, to the west of the school (1A) , between 3A and 3C and in the form of central courtyards at several buildings including 1B-1E, 4A-4C, 5A, 5B and 3B. These amenity spaces would have wind conditions ranging from sitting to standing use during the summer season, suitable for the intended use and mitigation measures would not be required.

Any potential designated seating would be required to be located in areas with wind conditions suitable for sitting use during the summer season. Any designated seating which is located in areas with standing use wind conditions during the summer season would require additional localised mitigation measures.

Amenity Spaces – Balconies (Figures 8 and 9)

Private amenity spaces in the form of balconies would be provided on the detailed components of the Proposed Development (i.e. Phase one). Wind conditions at balconies would range from suitable for sitting to standing use during the summer season at the accessible parts of the balcony. These wind conditions would be appropriate for balconies and mitigation measures would not be required.

Amenity Spaces – Terraces (Figure 7)

An accessible roof terrace would be provided on Building 1E as part of the detailed components of the Proposed Development. This roof terrace would have wind conditions ranging from suitable for sitting to standing use during the summer season. These conditions are appropriate for roof terraces provided that designated seating is located in areas with wind conditions suitable for sitting use during the summer season.

5.2.2 Strong Winds

There would be strong winds that would have the potential to be a safety concern to cyclists and more vulnerable pedestrians expected in the following ground level areas:

- The thoroughfare separating the north-eastern and southern blocks of Building 5B;
- Southern corner of Building 5B;
- Southern corner of Building 5A; and
- South-eastern corner of Building 4B.

As such, these areas would require wind mitigation measures as discussed in Section 6.

6 MITIGATION MEASURES

This section discusses the measures recommended by RWDI for the Proposed Development. The mitigation measures discussed below would be expected to improve wind conditions around the outline elements of the Proposed Development and compliment the proposed landscaping (shown in Appendix B) on Site. The effectiveness of any wind mitigation measures that are incorporated into the design of the scheme would, however, need to be tested at detail design stages of the outline components to ensure that they provide adequate shelter to achieve a safe and suitable wind environment.

Any areas around the outline elements of the Proposed Development where additional wind mitigation measures would be required should be identified at the detailed stage.

Configuration 2 concluded that wind conditions would be windier than suitable at the following areas of the outline component of the scheme:

- The thoroughfare separating the north-eastern and southern blocks of Building 5B;
- Between Buildings 5B and 5A;
- Between Buildings 5A and 4C;
- The southern corner of Building 4B;

wind mitigation measures, in addition to the proposed landscaping scheme, would be expected to improve wind conditions at the above windier than suitable locations:

- **Thoroughfares:** Deciduous trees 6m tall planted in a line between the buildings, with the first tree directly at the windy corner. Alternatively, the use of solid screens or 50% porous screens of similar scale to the trees to breakdown the winds.
- **Entrances:** If entrances would be located along the elevations that would likely be too windy, recessing these entrances by 1.5m would provide adequate shelter. Alternatively, the use of dense planting on either side of the entrances 1.5m wide, 2m in height would also be sufficient.

The report also notes that designated seating areas within amenity spaces would need to be located within areas with sitting use wind conditions during the summer season, otherwise additional localised mitigation measures would be required. The following localised mitigation measures would be expected to improve wind conditions at any potential designated seating areas:

- **Designated Seating:** Additional localised shelter in the form of screening (solid or up to 50% porous) or dense planting of at least 1.5m in height on the upwind (south-west) side of the seating location. Alternatively providing seating with solid backs and sides of at least 1.5m in height would be expected to provide pedestrians using the seating with adequate shelter.

7 CONCLUSIONS

In conclusion:

1. The meteorological data for the Site indicates prevailing winds from the south-west quadrant throughout the year with secondary winds from the north-east direction which are more prevalent during the spring months.

2. The baseline scenario (i.e. Configuration 1) indicates that the Site and the majority of nearby surrounding area has conditions ranging from suitable for sitting to walking use, with the windiest conditions to the north of Ariana Banqueting Hall and at building corners within and around the Site. During the summer season, wind conditions would generally be one category calmer and would thus range from suitable for sitting to strolling use. Strong winds are expected to occur to the north of Ariana Banqueting Hall.

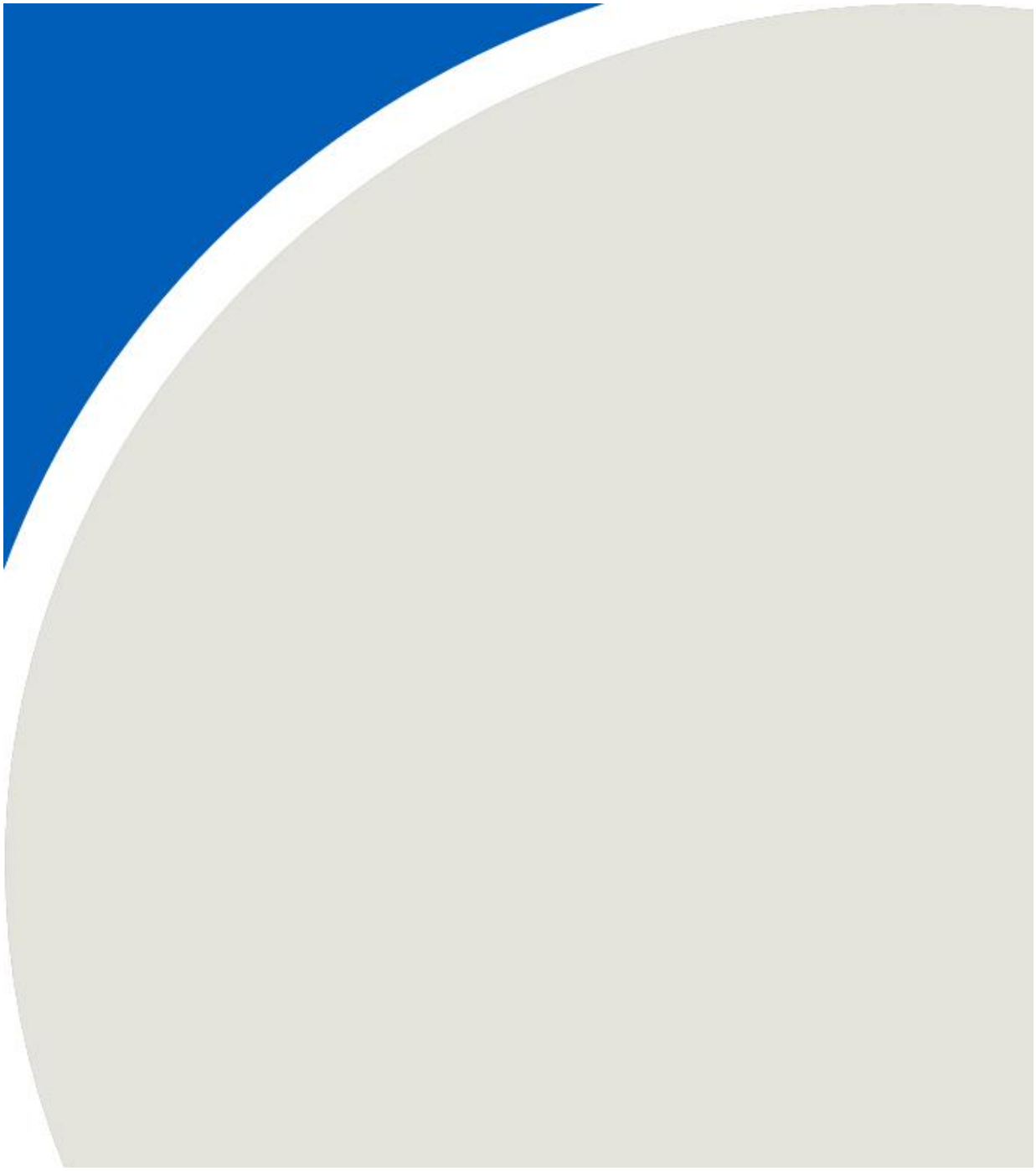
3. With the Proposed Development built out, wind conditions within and immediately surrounding the Site would differ substantially compared to the baseline due to the reduction of open space and the introduction of large building massing. As a result, windy areas would occur around the corners of the outline buildings at the western side of the masterplan as well as at potential entrances. During the summer season, wind conditions would be generally one category calmer and all the ground and elevated level amenity spaces would be suitable for sitting to standing use, appropriate for amenity use, provided that designated seating is located in areas suitable for sitting use.

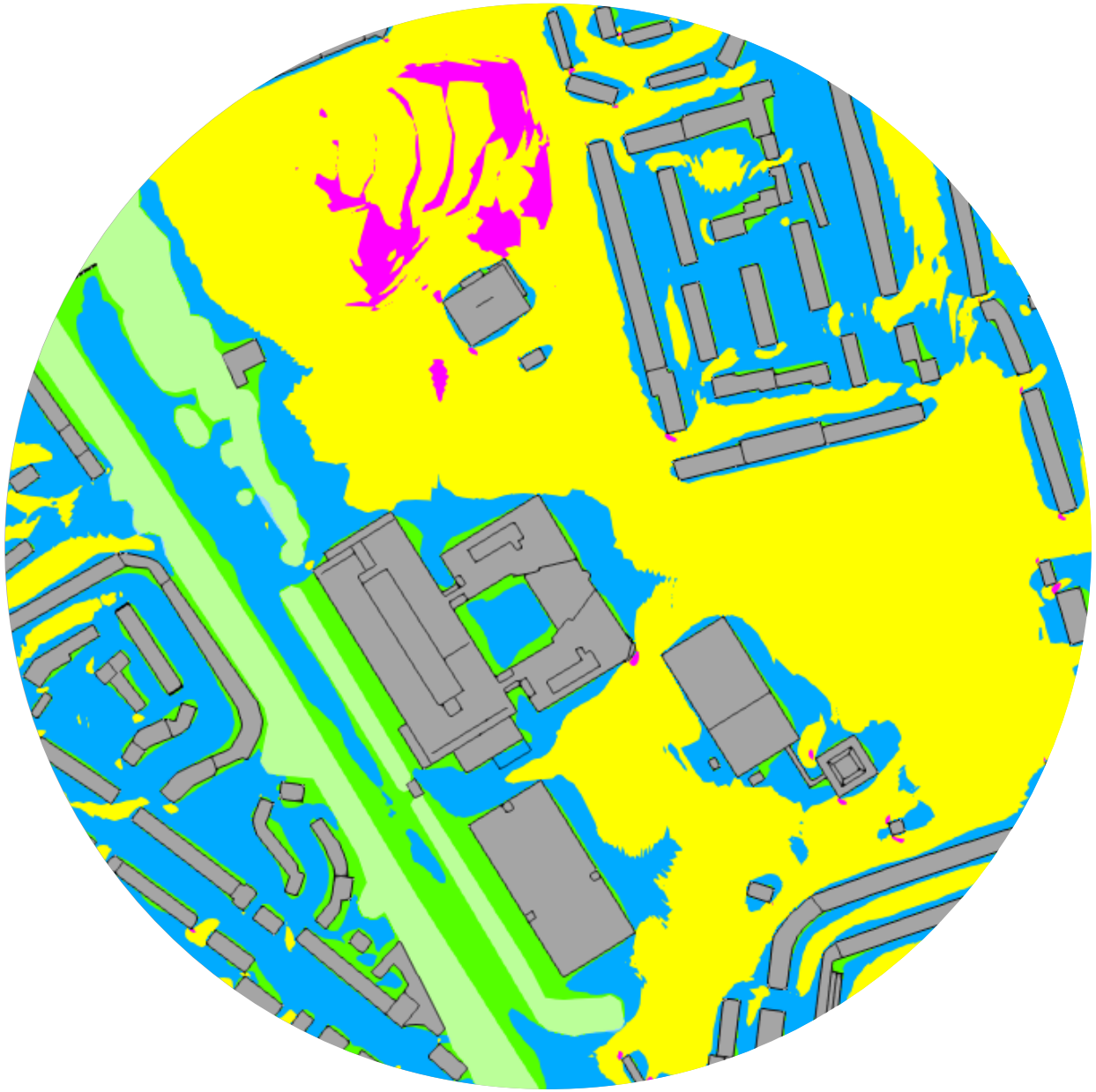
4. Strong winds exceeding the safety threshold would occur at thoroughfare areas around the sharp corners of the outline elements discussed above alongside strong wind exceedances which would have the potential to be a safety concern to cyclists and more vulnerable pedestrians.

5. **Wind conditions within and around the detailed elements of the Proposed Development would be suitable for the intended use and there would be no strong winds with the potential to be a safety concern to cyclists and more vulnerable pedestrians expected. As such no mitigation measures would be required around the detailed elements of the Proposed Development.**

6. Wind mitigation measures and improvements to the proposed landscaping scheme for the outline elements of the masterplan have been suggested in Section 6 of this report which would be expected to improve conditions at the windy areas around these buildings. **Due to the expected potential safety concerns around the outline elements of the Proposed Development, wind conditions should be re-assessed and appropriate mitigation measures developed in conjunction with an experienced wind engineer at the detail design stage.**

FIGURES





LEGEND:

LDDC COMFORT CATEGORIES:

- Sitting
- Standing
- Strolling
- Walking
- Uncomfortable

Pedestrian Wind Comfort Conditions – Ground Floor

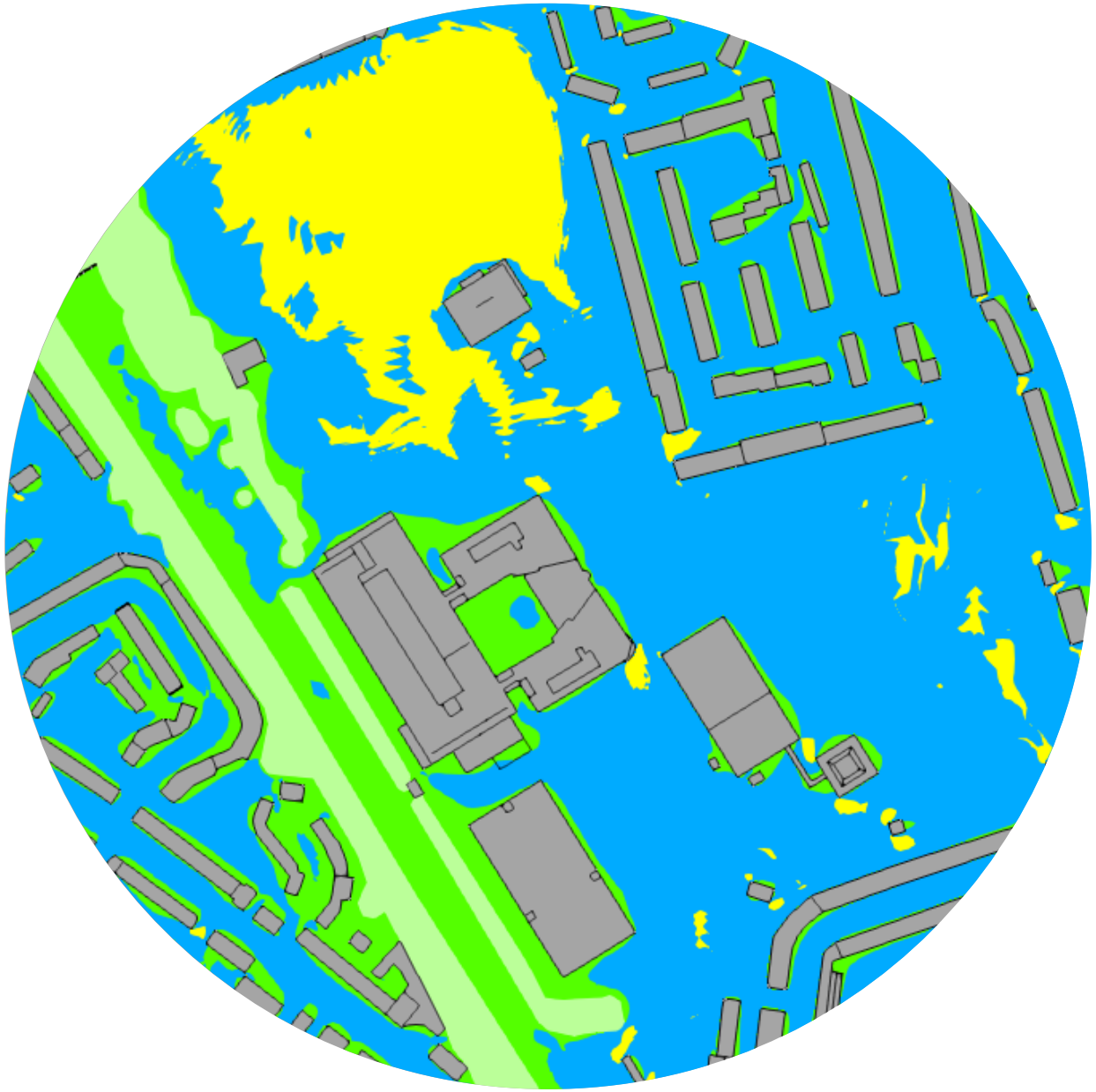
Configuration 1: Existing Site with Existing Surrounding Buildings and Existing Landscaping
Windiest Season

North London Business Park – London, United Kingdom

Project #2102824

Drawn By: HME

Figure: 4



LEGEND:

LDDC COMFORT CATEGORIES:

- Sitting
- Standing
- Strolling
- Walking
- Uncomfortable

Pedestrian Wind Comfort Conditions – Ground Floor

Configuration 1: Existing Site with Existing Surrounding Buildings and Existing Landscaping

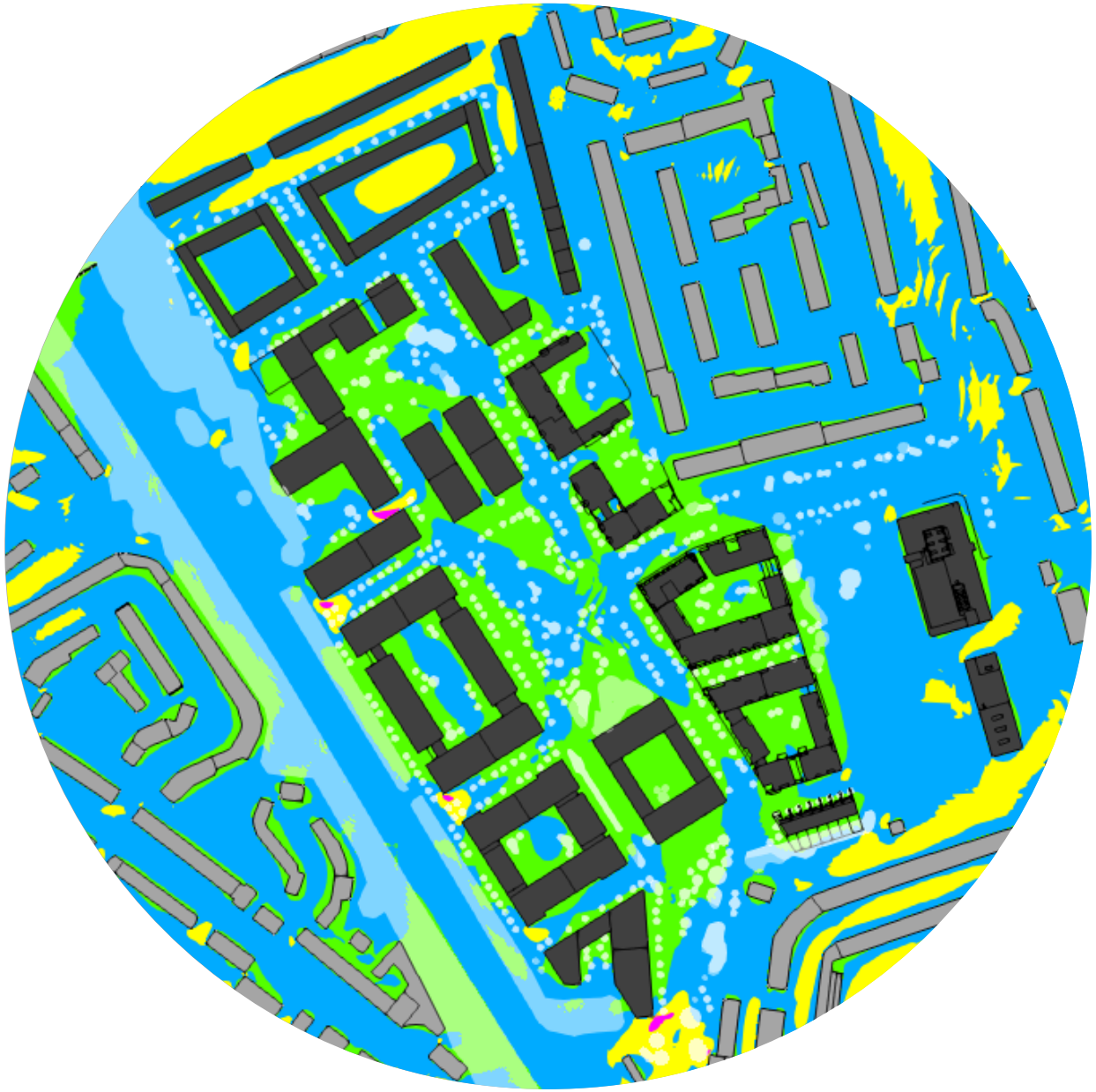
Summer Season

North London Business Park – London, United Kingdom

Project #2102824

Drawn By: HME

Figure: 5



LEGEND:

LDDC COMFORT CATEGORIES:

- Sitting
- Standing
- Strolling
- Walking
- Uncomfortable

Pedestrian Wind Comfort Conditions – Ground Floor

Configuration 2: Proposed Development with Existing Surrounding Buildings, Existing and Proposed Landscaping

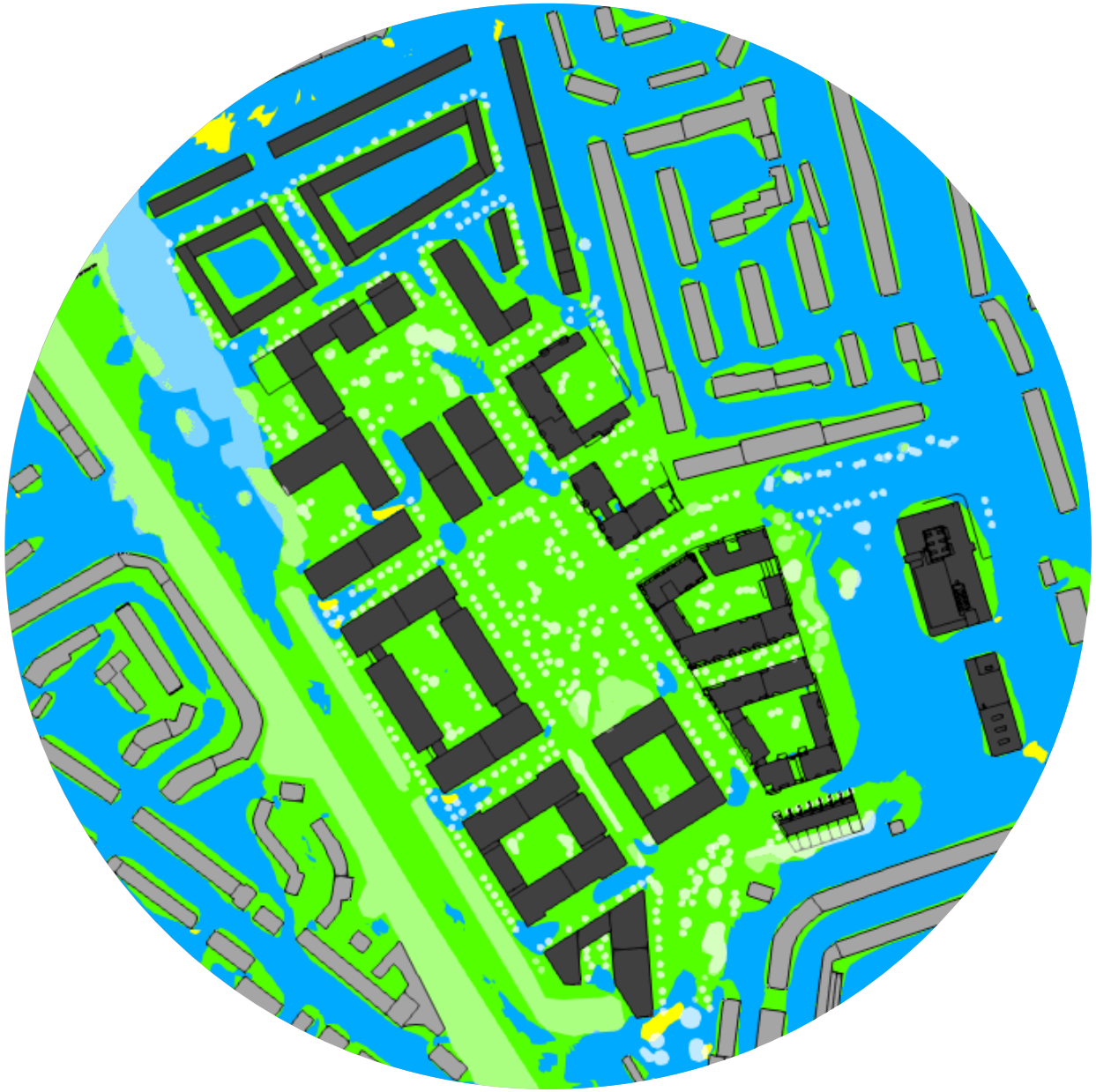
Windiest Season

North London Business Park – London, United Kingdom

Project #2102824

Drawn By: HME

Figure: 6



LEGEND:

LDDC COMFORT CATEGORIES:

- Sitting
- Standing
- Strolling
- Walking
- Uncomfortable

Pedestrian Wind Comfort Conditions – Ground Floor

Configuration 2: Proposed Development with Existing Surrounding Buildings, Existing and Proposed Landscaping

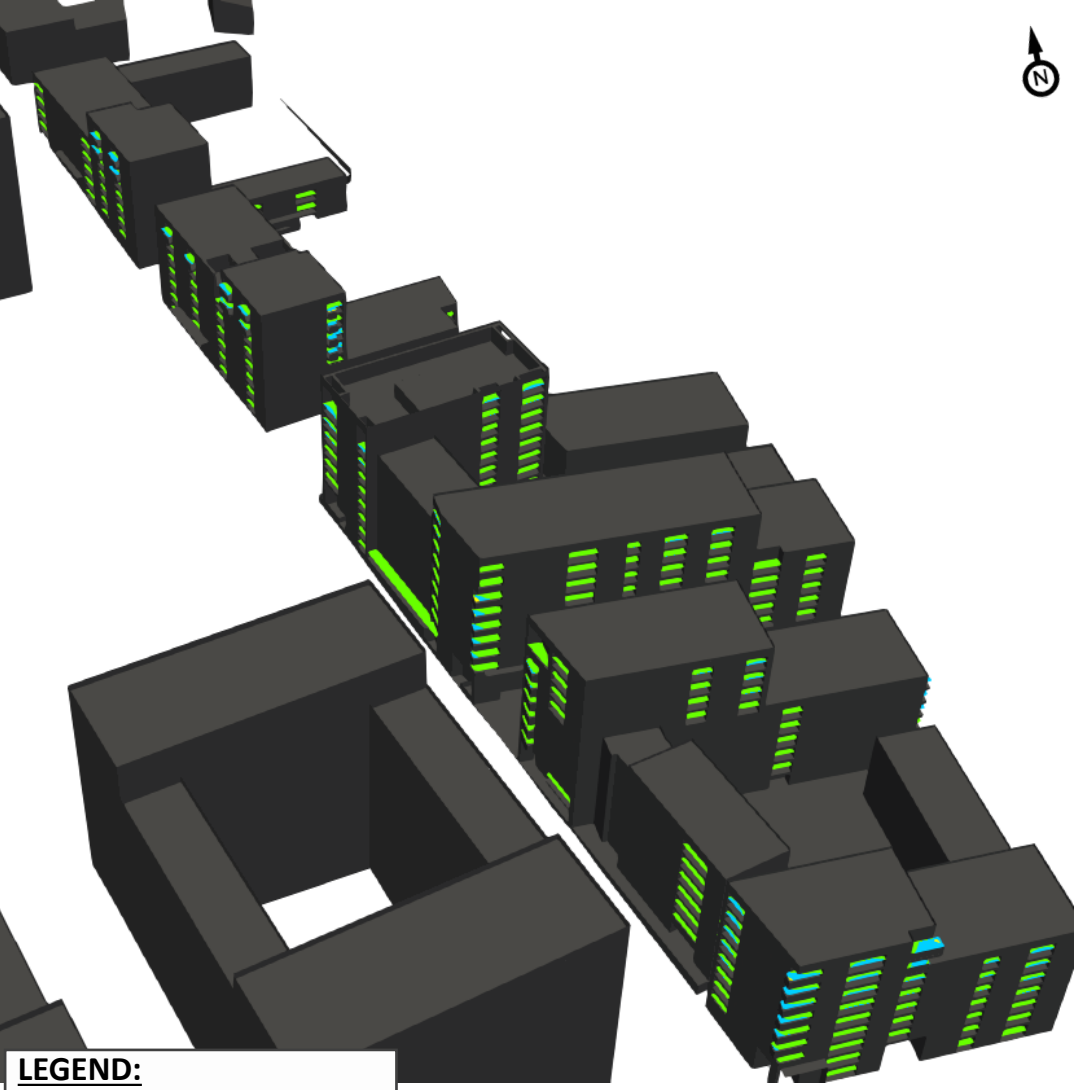
Summer Season

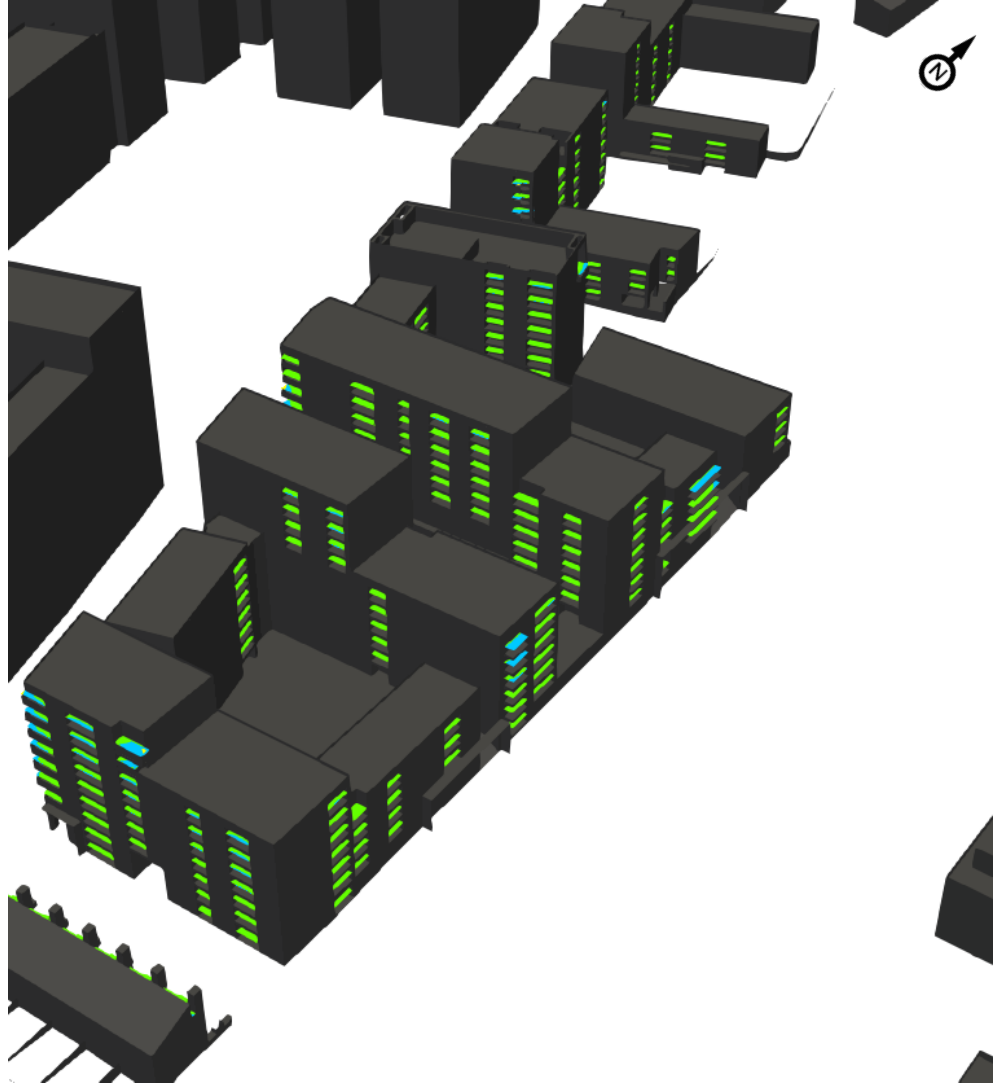
North London Business Park – London, United Kingdom

Project #2102824

Drawn By: HME

Figure: 7





LEGEND:

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- Sitting
- Standing
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- Walking
- Uncomfortable

Pedestrian Wind Comfort Conditions – Ground Floor

Configuration 2: Proposed Development with Existing Surrounding Buildings and Existing Landscaping

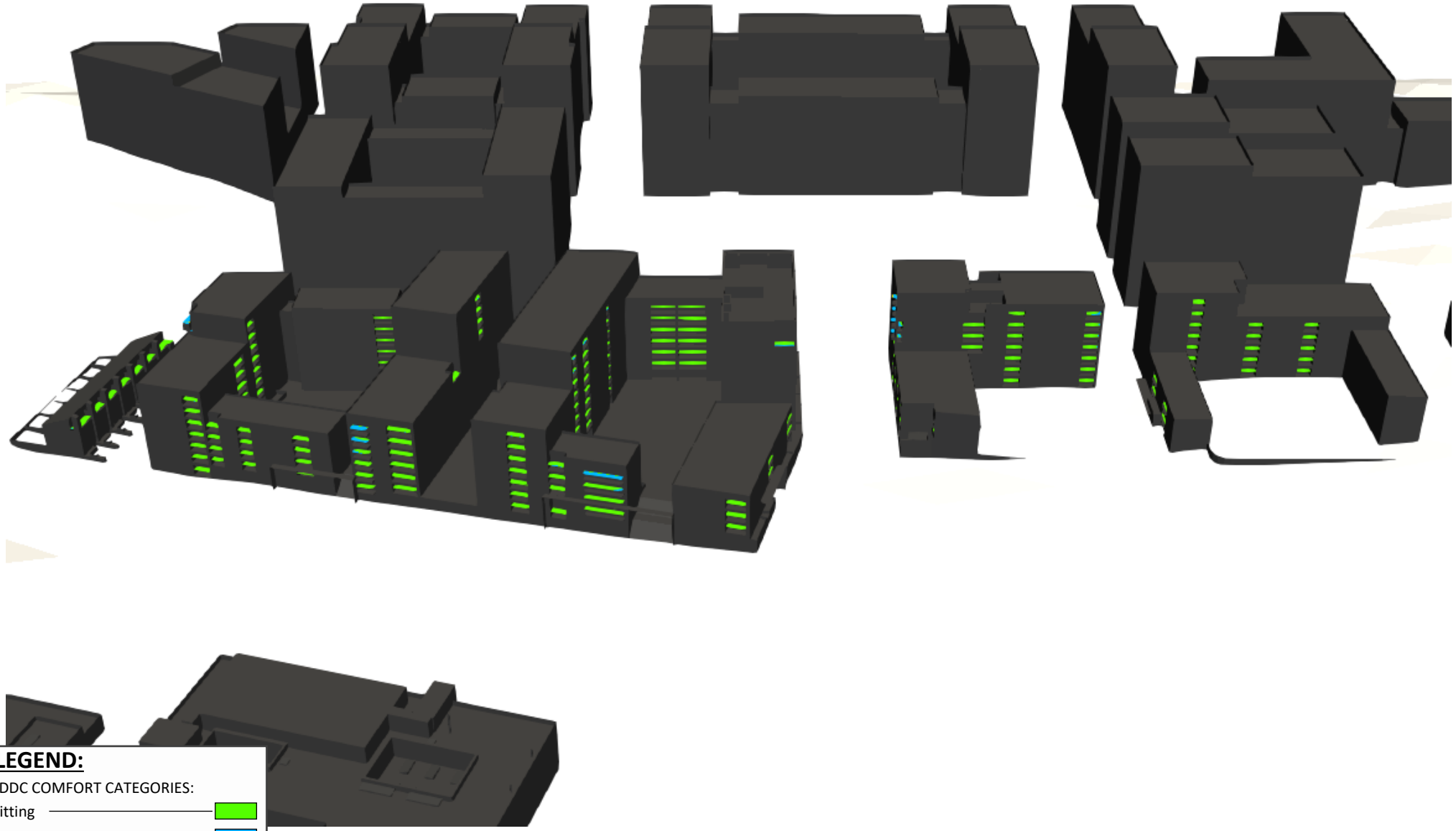
Summer Season

North London Business Park – London, United Kingdom

Project #2102824

Drawn By: HME

Figure: 8



LEGEND:

LDDC COMFORT CATEGORIES:

- Sitting
- Standing
- Strolling
- Walking
- Uncomfortable

Pedestrian Wind Comfort Conditions – Elevated Levels

Configuration 2: Proposed Development with Existing Surrounding Buildings, Existing and Proposed Landscaping

Summer Season

North London Business Park – London, United Kingdom

Project #2102824

Drawn By: HME

Figure: 9

APPENDIX A

APPENDIX A: 3D MODEL IMAGES

Figure 10 - Existing Site with Existing Surrounding Buildings and Existing Landscaping (Configuration 1) – View of 3D model (from the south-west)

Figure 11 – Proposed Development with Existing Surrounding Buildings and Proposed Landscaping (Configuration 2) – View of 3D model (from the south-west)

APPENDIX B

APPENDIX B: PROPOSED LANDSCAPING

APPENDIX C

APPENDIX C: MITIGATION MEASURES

Figure 13 – Trees planted in line between two buildings to mitigate windy conditions

Figure 14 – Copse of trees planted to mitigate windy conditions near building corners

APPENDIX D

APPENDIX D: USAGE PLOT

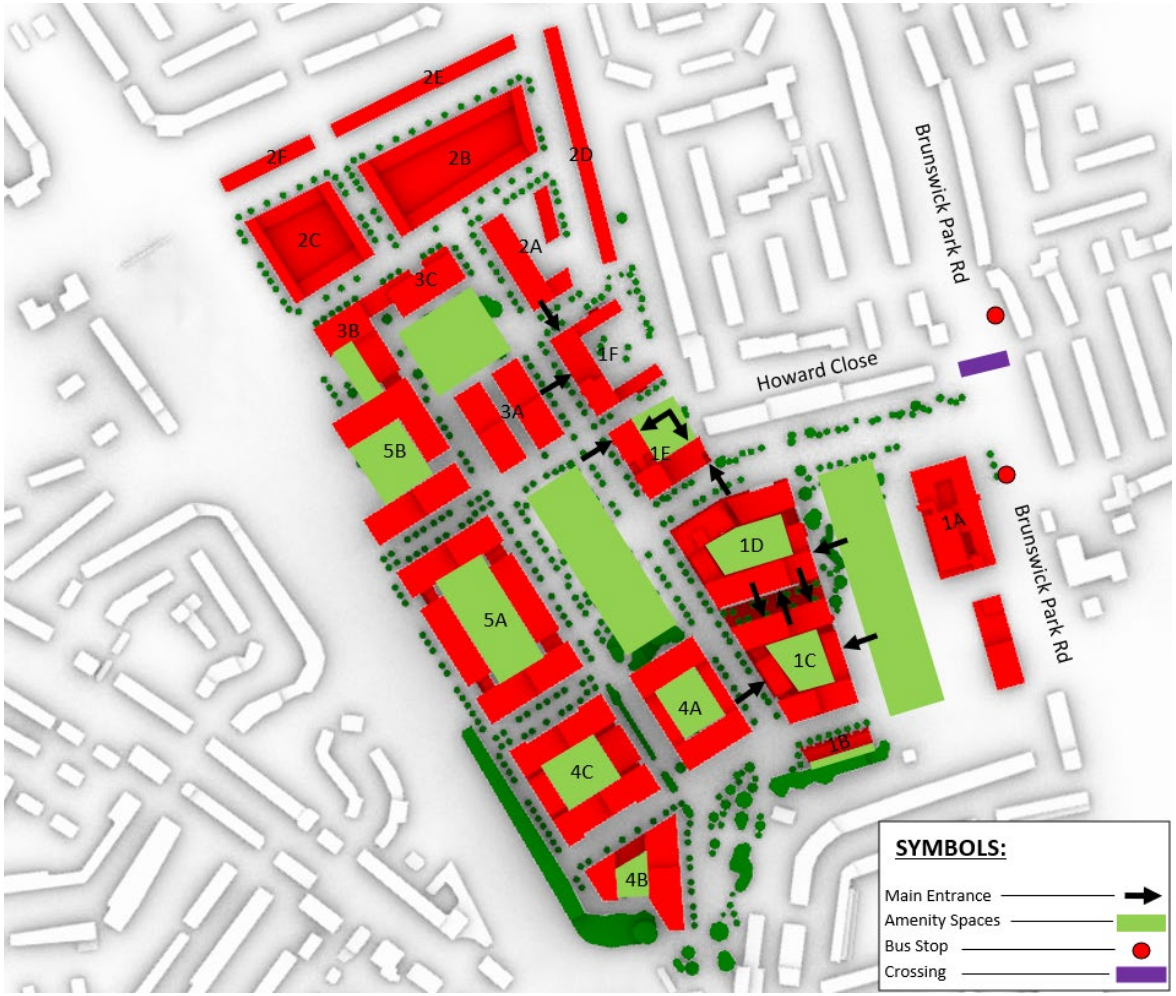


Figure 15 – Usage Plot