

HIGH STREET, UXBRIDGE

LONDON, UK

PEDESTRIAN LEVEL WIND DESK-BASED ASSESSMENT

RWDI #2404017

27TH MARCH 2024

SUBMITTED TO

DNA Uxbridge Ltd

SUBMITTED BY

RWDI

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VERSION HISTORY

RWDI Project #2404017		High Street, Uxbridge, London	
Report	Releases	Dated	
Reports	Rev A	March 15 th , 2024	
	Rev B	March 27 th , 2024	
Project Team	Zain Khan	Project Engineer	
	Jeniffer Lowther	Senior Project Engineer	
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1 EXECUTIVE SUMMARY

This is a qualitative assessment of the likely wind conditions around the proposed Uxbridge High Street development in London, UK. The report outlines the overall methodology and the use of the Lawson Comfort Criteria to describe the expected on-Site wind conditions. The assessment is based upon analysis of meteorological conditions for London, adjusted to the Site, and a review of the scheme drawings in the context of the meteorological data and surrounding area in combination with RWDI's extensive experience in wind flow in the urban environment.

The meteorological data for the Site indicates prevailing winds predominantly from the south-west throughout the year, with secondary winds from the north-east. Winds from other directions do occur, and are considered within the assessment; however, their impact on the overall wind microclimate conditions tends to be low, due to being relatively infrequent (compared to the prevailing directions).

A review of the baseline meteorological data for the Site and the existing building and surrounding context indicates that wind conditions at the existing Site are expected to be acceptable for the current uses throughout the year with no safety exceedances.

With the Proposed Development situ, wind conditions at ground level would generally be expected to be suitable. Areas identified as likely to be windy are the ground level seating at the western corner, and the level 08 roof terrace. Mitigation in the form of the proposed landscaping has been reviewed and would be expected to provide shelter to the windy areas identified above.

Overall, with the implementation of recommended wind mitigation (proposed landscaping), we would expect wind conditions around the Proposed Development would be suitable for the intended uses of the scheme.

2 INTRODUCTION

RWDI was appointed by DNA Uxbridge Ltd to conduct a desk-based assessment of the proposed Uxbridge High Street development (hereafter referred to as the 'Proposed Development'), in London, UK. This report presents the background, objectives, results and recommendations from RWDI's assessment. A summary of the overall recommendations from the study are presented in Section 9, "Concluding Remarks".

In terms of relevant local policies, Policy DMHB 10 of the London Borough of Hillingdon Local Plan Part 2¹ states "Any proposal for a high building or structure [...] not adversely impact on the microclimate (i.e. wind conditions and natural light) of the site and that of the surrounding areas, with particular focus on maintaining useable and suitable comfort levels in public spaces".

This wind microclimate assessment assesses this, and the conclusions from the assessment confirm that the Proposed Development would not be expected to adversely impact on the local wind microclimate.

3 SITE DESCRIPTION

3.1 Site and Surroundings

The Site is located in the London Borough of Hillingdon. The Site is bounded by Belmont Road to the north, Bakers Road to the east, High Street to the west, and commercial buildings to the south. The terrain surrounding the Site is predominantly suburban in nature, with the surrounding area generally comprising low-rise buildings. Due to the dense suburban nature of the surrounding development, winds approaching the Site would have a relatively low mean wind speed with high turbulence, as opposed to a more open terrain which would have a higher mean wind speed and relatively lower turbulence.

Figure 1 below shows an aerial view of the existing Site and surrounding buildings.

¹ London Borough of Hillingdon Local Plan Part 2 Development Management Policies, January 2020



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

3.2 The Proposed Development

The Proposed Development comprise demolition of the existing buildings and comprehensive redevelopment of the Site to provide a mixed-use development with hotel (Class C2), co-Living (Class Sui Generis) and replacement of the commercial floorspace (Class E) alongside open space, landscaping and public realm improvements, basement parking and refuse storage.

The Proposed Development will range in height from 8-10 storeys. The scheme will feature a courtyard at ground level. The roof terrace at level 08 on the north-western side would be accessible to occupants.

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

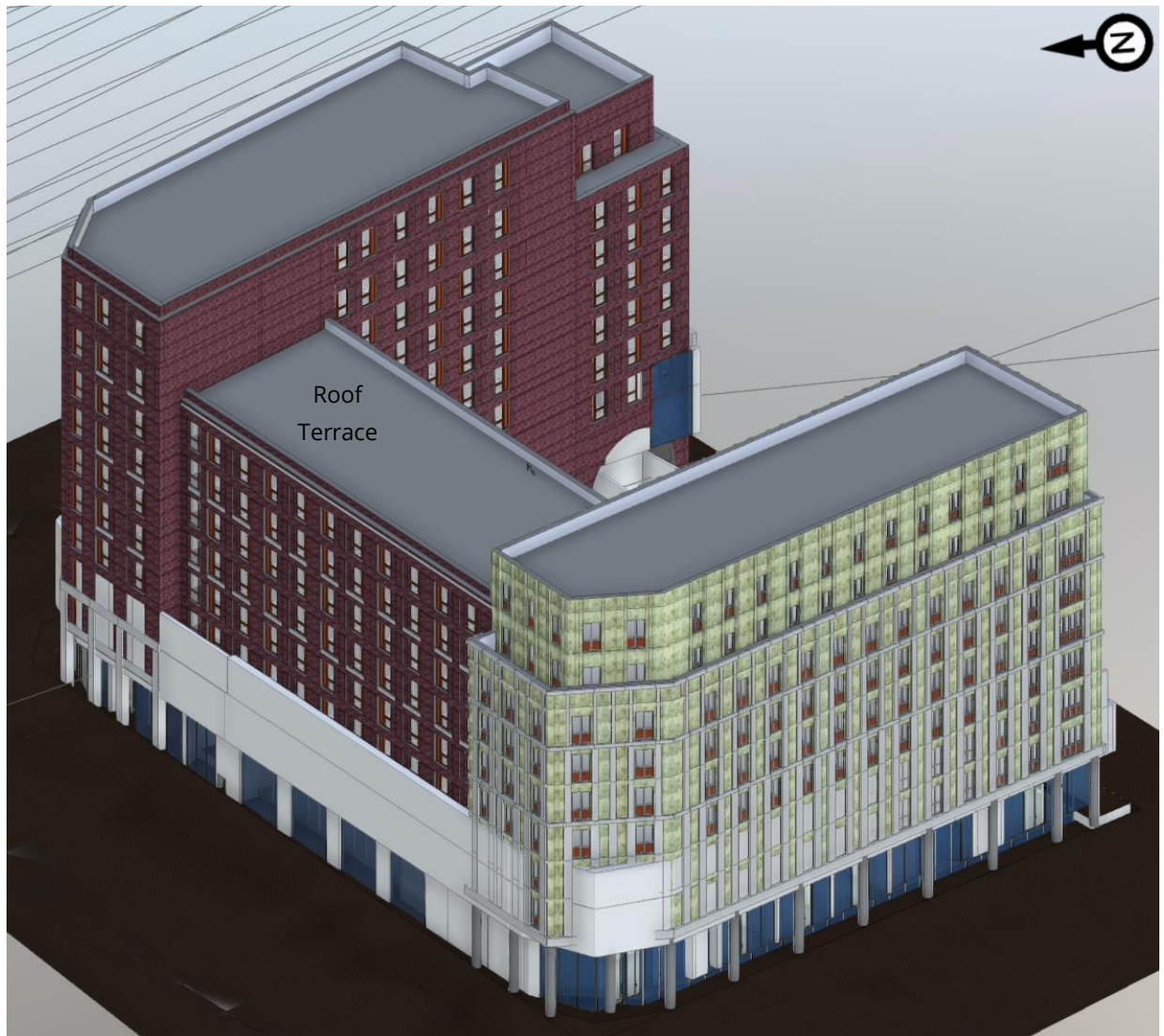


Figure 2: View of the Proposed Development from west

4 METHODOLOGY AND ASSESSMENT CRITERIA

The wind conditions at the Proposed Development have been qualitatively assessed based on the meteorological data for the area, a terrain assessment, and RWDI extensive experience of wind flow in the urban environment.

Knowledge of the prevailing wind direction focuses attention on the likely impact of these winds on the Site except where the proposed building massing/layout indicates that winds from other directions are likely to be important.

4.1 General Meteorological Data

Meteorological data derived from the meteorological stations at London City and Heathrow airports have been corrected to standard conditions of 10m above open flat level country terrain and is presented as wind roses by season in Figure 3. The assessment presented in this report focusses on winter, the windiest season, representing a 'worst-case' season for windy conditions between December and February and a summer season (representing a time of the year when amenity spaces are expected to be most usable between June and August). The radial axis indicates the percentage time per season that the wind speed exceeds the particular range of wind speeds.

The meteorological data indicate that the prevailing wind direction throughout the year are from the south-west. This is typical for many areas of southern England. There is a secondary peak from the north-east, especially during the spring which tends to have cold winds.

4.2 Terrain Roughness

Another consideration is the terrain roughness in each wind direction because wide, open spaces permit the wind to flow smoothly at ground level generating conditions similar to those of open countryside even within a built-up area. An assessment of the terrain roughness for the Site was conducted using the methodology implemented in ESDU 01008² which models the wind characteristics caused by changes in the terrain roughness.

Mean factors for the Site are presented in Appendix A Table 2, where the mean factor represents the ratio of wind speed on site, at the stated reference height, as a fraction of the wind speed in open, flat countryside at a height of 2m and 10m.

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

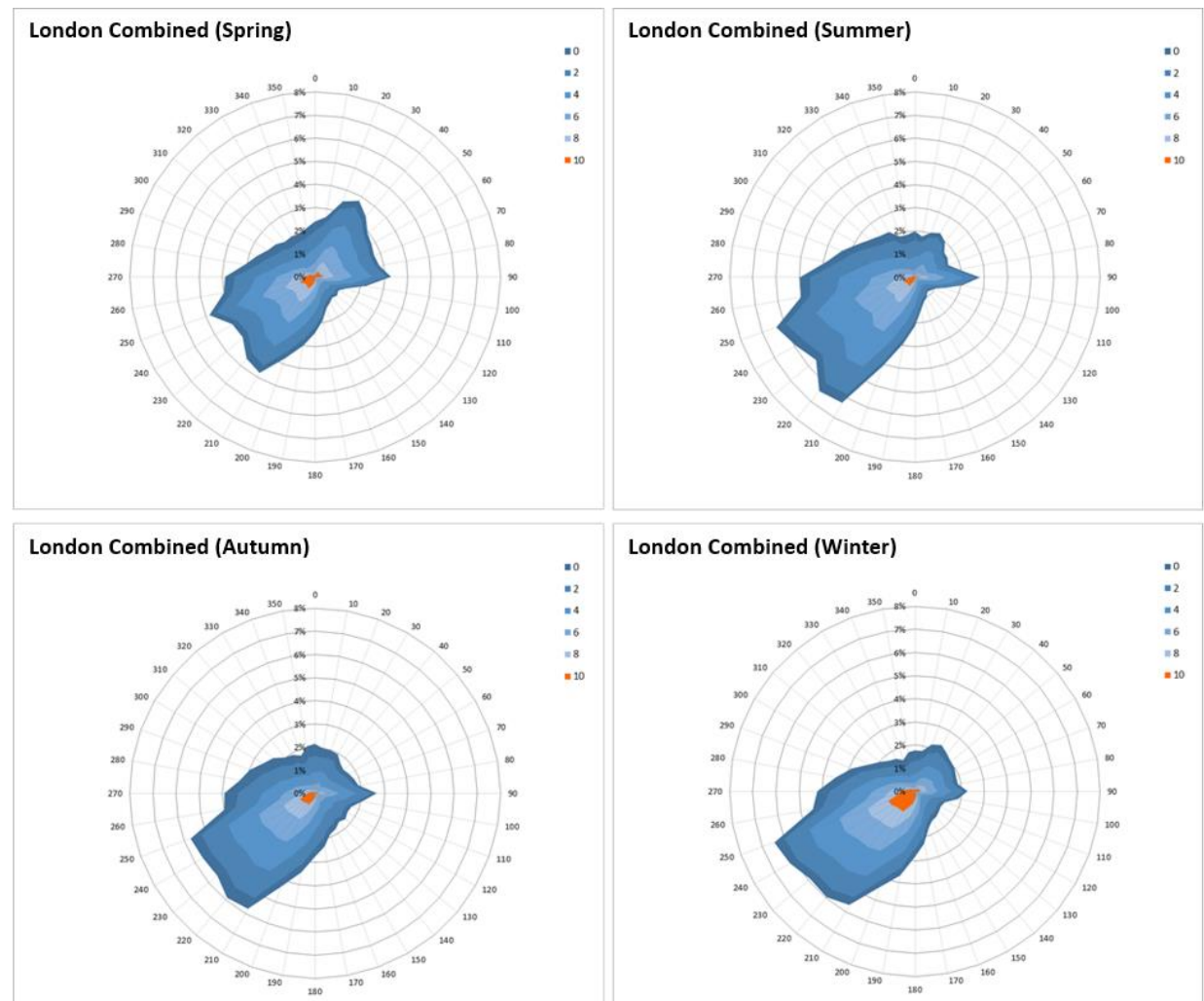


Figure 3: Seasonal Wind Roses for London City and Heathrow Airports combined (Radial axis indicates the percentage of time for which the stated wind speed (m/s) threshold is exceeded)






4.3 Comfort Criteria

The assessment of the wind conditions requires a standard against which the measurements can be compared. This report uses the Lawson Comfort Criteria, 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 set 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 more 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 windier conditions.

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.

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 window shopping and strolling along a city/town centre 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

Generally, the target conditions are:

- Strolling use during the windiest season on pedestrian thoroughfares (with walking conditions potentially being tolerated in areas where pedestrians would not linger);
- Standing conditions at entrances, drop off areas or taxi ranks, and bus stops throughout the year;
- Standing use at private amenity areas where seating is not designated (such as balconies) during the summer season; and
- Sitting use conditions at outdoor seating and amenity areas during the summer season when these areas are more likely to be frequently used by pedestrians. It is noted that in large mixed-use amenity spaces a mixture of sitting use and standing / entrance use can be considered acceptable as users can choose to sit in 'calmer' areas, with 'windier' areas acceptable for more active pursuits.

The wind conditions in an area for sitting need to be calmer than a location that people merely walk past, and this is reflected in the Comfort Criteria.

4.4 Strong Winds

Lawson³ also specified a lower limit strong wind threshold when winds exceed 15m/s for more than 2.2 hours of the year (or 0.025% of the time). 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 cyclists or 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 hours of the year represent 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.

4.5 Typical Wind – Building Interactions

The wind conditions at the Proposed Development are expected to be due to either one, or a combination of, two generalised flow behaviours.

Channelling (Figure 4a) of the wind occurs between buildings of similar height when in close proximity to each other. Windy conditions occur at pedestrian level since the flow accelerates as it is "squeezed" between the buildings.

Corner acceleration (Figure 4b) around building corners may occur due to the difference in pressure on the upwind and downwind façades (low pressure zones on the leeward side and zones of higher pressure on the windward side of the building). This effect is particularly pronounced around sharp corners which create localised windy areas in the vicinity of the corner where the flow is accelerated around the building.

Down-washing (Figure 4c) of the wind occurs when a building is taller than its surrounding buildings. The taller scheme forces high level winds to ground level where they create locally high wind speeds in the pedestrian realm.

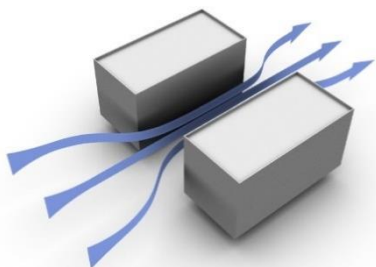


Figure 4a: Channelling

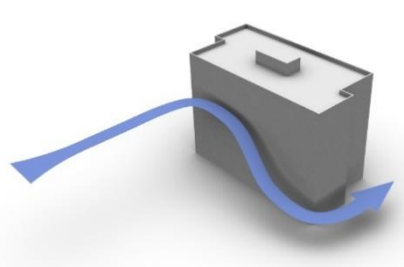


Figure 4b: Corner acceleration

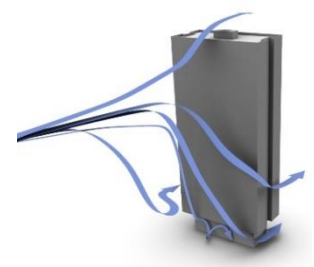


Figure 4c: Down-washing

³ Lawson T.V. (April 2001), Building Aerodynamics, Imperial College Press

5 EXISTING SITE WITH EXISTING SURROUNDING BUILDINGS

Often a new development will alter the pedestrian activity (i.e. intended use) on site. Occasionally, although wind conditions may not change after the Proposed Development is completed (e.g. stay suitable for strolling), mitigation would still be required if, on the new development, the location of interest is intended for a critical activity (e.g. a main entrance) for which the wind condition would be unsuitable. Assessment in terms of the desired pedestrian activity on, or around, a site takes into consideration any change of use, and this is where the comfort criteria are particularly helpful.

5.1 Pedestrian Comfort

Based on the terrain roughness analysis discussed in section 5.2, the baseline conditions at 2m above ground level at an idealised “empty” Site would be suitable for standing use throughout the year.

As the Site comprises a commercial building similar in height to the surrounding development, wind conditions within the existing Site are expected to be suitable for standing use during the windiest season, with the more sheltered areas suitable for sitting use.

5.2 Strong Winds

Strong winds in excess of 15m/s are often concurrent with areas with conditions suitable for walking use or windier. As no conditions suitable for walking use are likely to occur, strong winds are not expected to occur at the existing Site.

6 PROPOSED DEVELOPMENT WITH EXISTING SURROUNDING BUILDINGS

6.1 Pedestrian Comfort

The expected wind conditions at the Proposed Development are shown in Figures 6 and 7 at ground level for the windiest and summer seasons respectively. Figure 8 presents the expected wind conditions at roof level during the summer season, at potential spaces that could be used as terraces.

The expected wind conditions assume no landscaping is in place, to provide a worst case (i.e. relatively windy) scenario.

As the Proposed Development is taller in comparison to the nearby surrounding buildings, wind speeds would be expected to increase around the Site, as winds from higher levels are brought down to ground level.

Thoroughfares (Figure 6)

Wind conditions on pedestrian thoroughfares around the Proposed Development would be expected to range from suitable for standing and strolling use during the windiest season, acceptable conditions for the intended pedestrian use. Areas of strolling use would occur around building corners, and the covered passageways in the courtyard.

Entrances (Figure 6)

Standing conditions or calmer are the target wind conditions for entrances. During the windiest season, strolling conditions would be expected to occur at entrances situated within the covered passageways to the courtyard. This is due to prevailing south-westerly winds interacting with the courtyard façades and funnelling through these passageways. As these entrances are secondary (not main entrances, rather entrances for maintenance, storage, bins, etc) strolling conditions would be considered tolerable.

Off-Site, the introduction of the Proposed Development would not be expected to materially change wind conditions at off-Site entrances.

Ground Level Amenity (Figure 7)

The courtyard would feature seating and amenity. During the summer season, wind conditions within the courtyard would be expected to be suitable for sitting use, suitable conditions for amenity areas.

Seating situated at the western corner would be expected to have standing conditions, one category windier than suitable, requiring mitigation measures. This is discussed in Section 7.

Terraces (Figure 8)

The roof terrace at level 08 would be expected to be suitable for standing use during the summer season. As seating is placed on this terrace, standing conditions would be one category windier than suitable, requiring mitigation measures. This is discussed in Section 7.

6.2 Strong Winds

Strong winds in excess of 15m/s are often concurrent with areas with conditions suitable for walking use or windier. As no conditions suitable for walking use would be expected to occur, strong wind exceedances would also not be expected to occur.

7 LANDSCAPING AND MITIGATION

The assessment of the Proposed Development identified windier than suitable conditions at the following locations (in the absence of landscaping):

- Ground level seating at the western corner; and
- Level 08 roof terrace seating.

These areas have been highlighted in Figure 5 below.

The proposed landscaping (shown in the Appendix Figures 9-10) features trees at ground level. The tree at the corner would help provide some shelter to the identified windy seating, therefore expected to improve conditions such that they would be suitable (provided the tree is at least 3m tall).

The terrace landscaping shows planting/trees placed south of the seating; this would be beneficial as it would shelter the seating from the prevailing south-westerly winds which flow into the space. Therefore, the inclusion of the proposed landscaping would be expected to improve the terrace conditions such that they would be suitable (provided the planting is at least 1.5m tall, and trees are at least 3m tall).



Figure 5: Areas windier than suitable in the absence of landscaping/mitigation

8 CUMULATIVE EFFECTS

The following cumulative schemes have been considered for the wind microclimate cumulative assessment:

- Town Centre West ref: 585/APP/2016/4504
- 33-37 Belmont Road ref: 45222/APP/2015/4692
- Harefield Road ref: 16299/APP/2020/3313
- Vine Street ref: 41309/APP/2016/3391

The schemes are situated far enough from the Proposed Development that they would not be expected to influence the local wind microclimate. In addition, the cumulative schemes are situated to the north and south-east of the Proposed Development, as such would not be expected to influence the local wind microclimate around the Site as the prevailing winds approach from the south-west.

9 CONCLUDING REMARKS

In conclusion:

1. The Proposed Development has been qualitatively assessed based on meteorological data, terrain assessment and professional judgement/experience.
2. The meteorological data for the Site indicates prevailing winds from the south-west throughout the year, with secondary winds from the north-east.
3. For the existing Site, the wind microclimate at ground level is expected to be acceptable for the current use throughout the year with no safety exceedances.
4. With the Proposed Development situ, wind conditions at ground level would largely be expected to be suitable. Areas identified likely to be windy is seating at the western corner at ground level, and the level 08 roof terrace. Mitigation has been recommended in Section 7.
5. Wind conditions are not expected to exceed the safety threshold.
6. Overall, with the implementation of recommended wind mitigation, we would expect wind conditions around the Proposed Development would be made suitable for the intended uses of the scheme.

10 STATEMENT OF LIMITATIONS

This report entitled Pedestrian Level Wind Desk-Based Assessment dated March 26th, 2024, was prepared by RWDI for DNA Uxbridge 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.

11 ASSUMPTIONS AND LIMITATIONS

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

- Cumulative list – received 23rd February 2024;
- Revit models of the scheme – received 23rd February 2024;
- Plans and elevation drawings – received 6th March 2024; and
- Landscaping plans – received 26th 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.

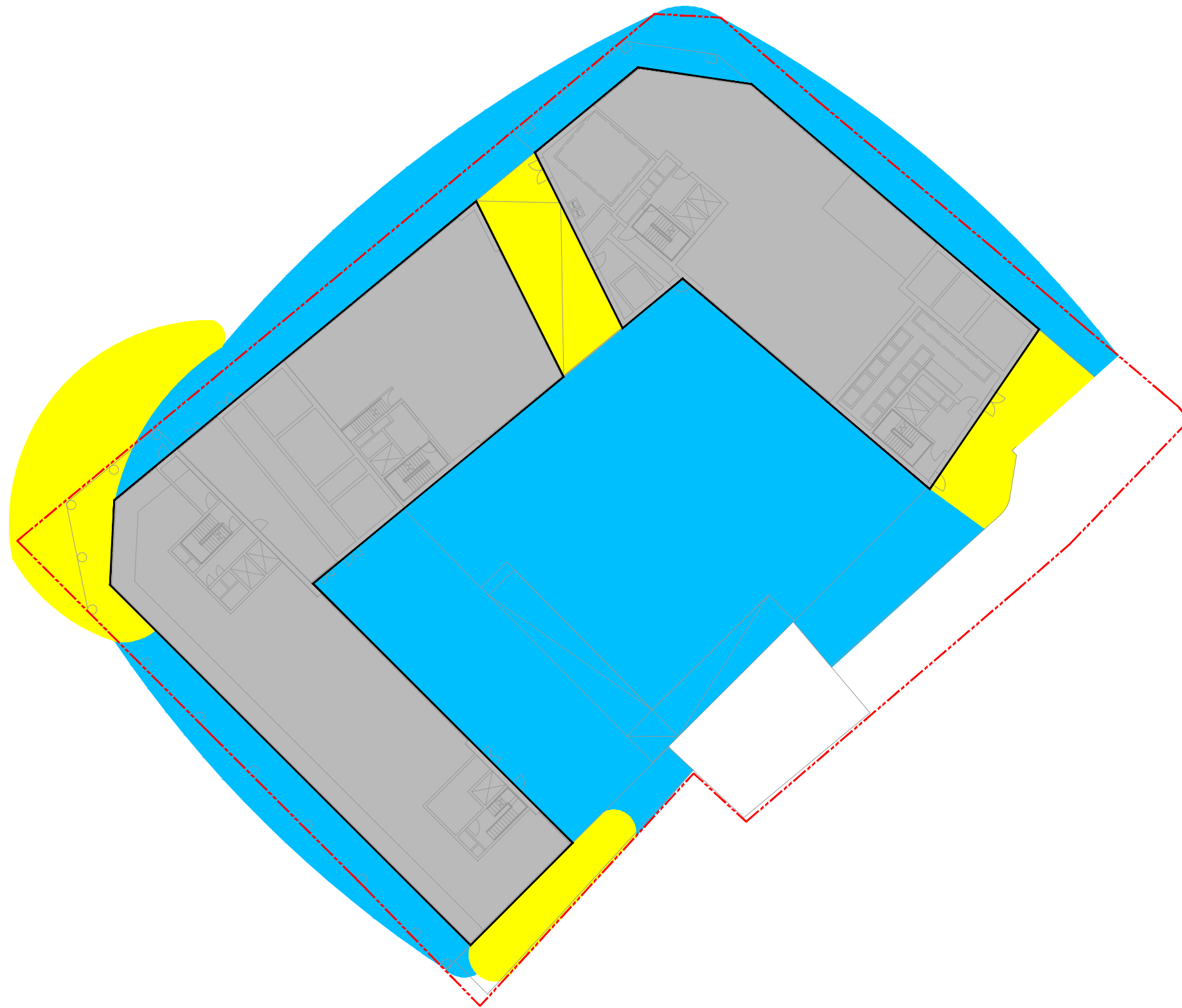
Finally, the recommendations and conclusions in this report are partially based on historical data and can be affected by a number of external factors, including but not limited to Project design, quality of materials and construction, site conditions, meteorological events, and climate change. As such,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

12 REFERENCES

1. London Borough of Hillingdon Local Plan Part 2 Development Management Policies, January 2020
2. 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. Lawson T.V. (April 2001), Building Aerodynamics, Imperial College Press

FIGURES





LDDC COMFORT CATEGORIES:

Sitting	
Standing	
Strolling	
Walking	
Uncomfortable	

Pedestrian Comfort Desk- Expected Wind Conditions - Ground Floor

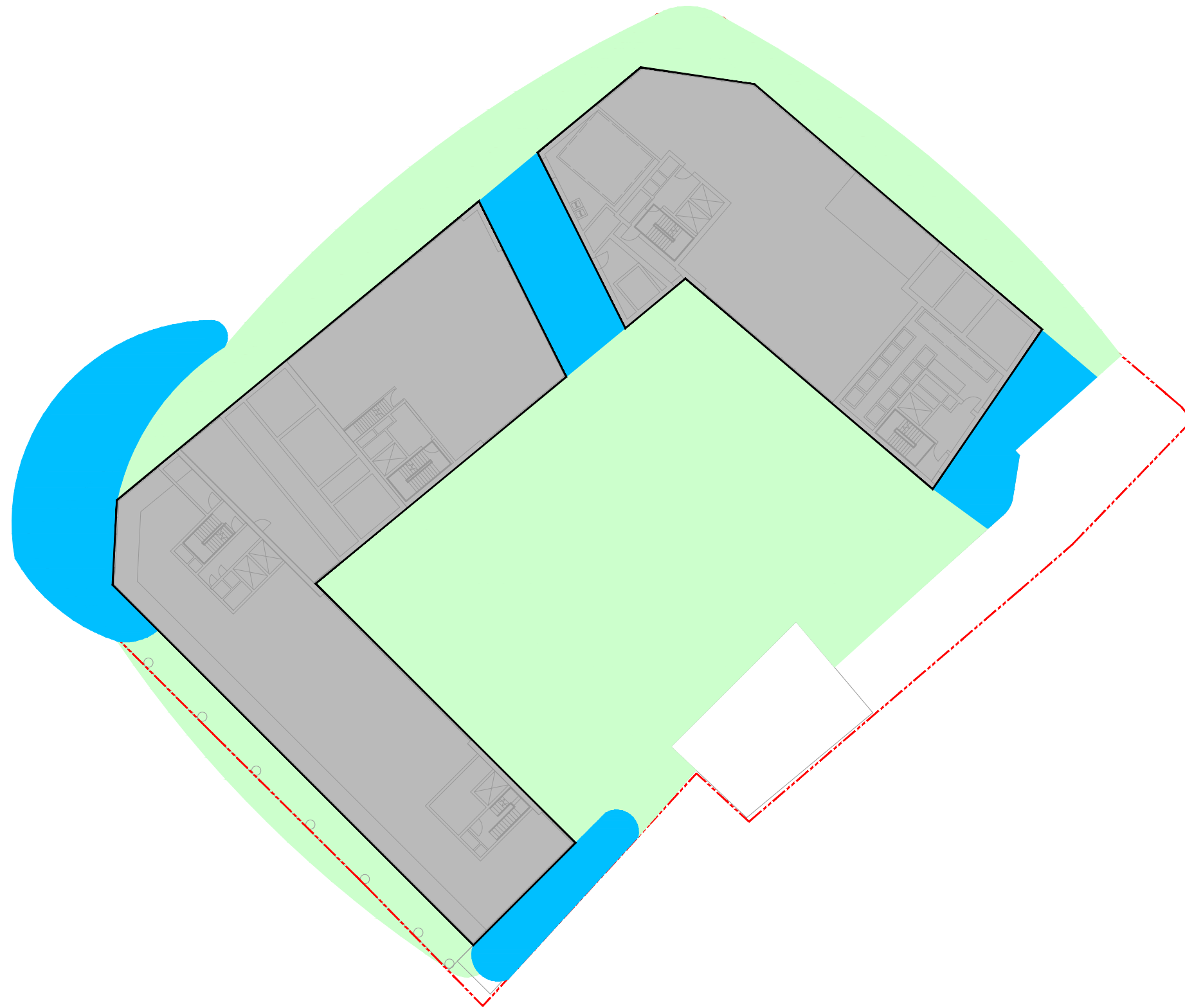
Proposed Development with Existing Surrounding Buildings

Windiest Season

2404017 Uxbridge High Street - London, UK



Figure: 6



LDDC COMFORT CATEGORIES:

Sitting	
Standing	
Strolling	
Walking	
Uncomfortable	

Pedestrian Comfort Desk- Expected Wind Conditions - Ground Floor

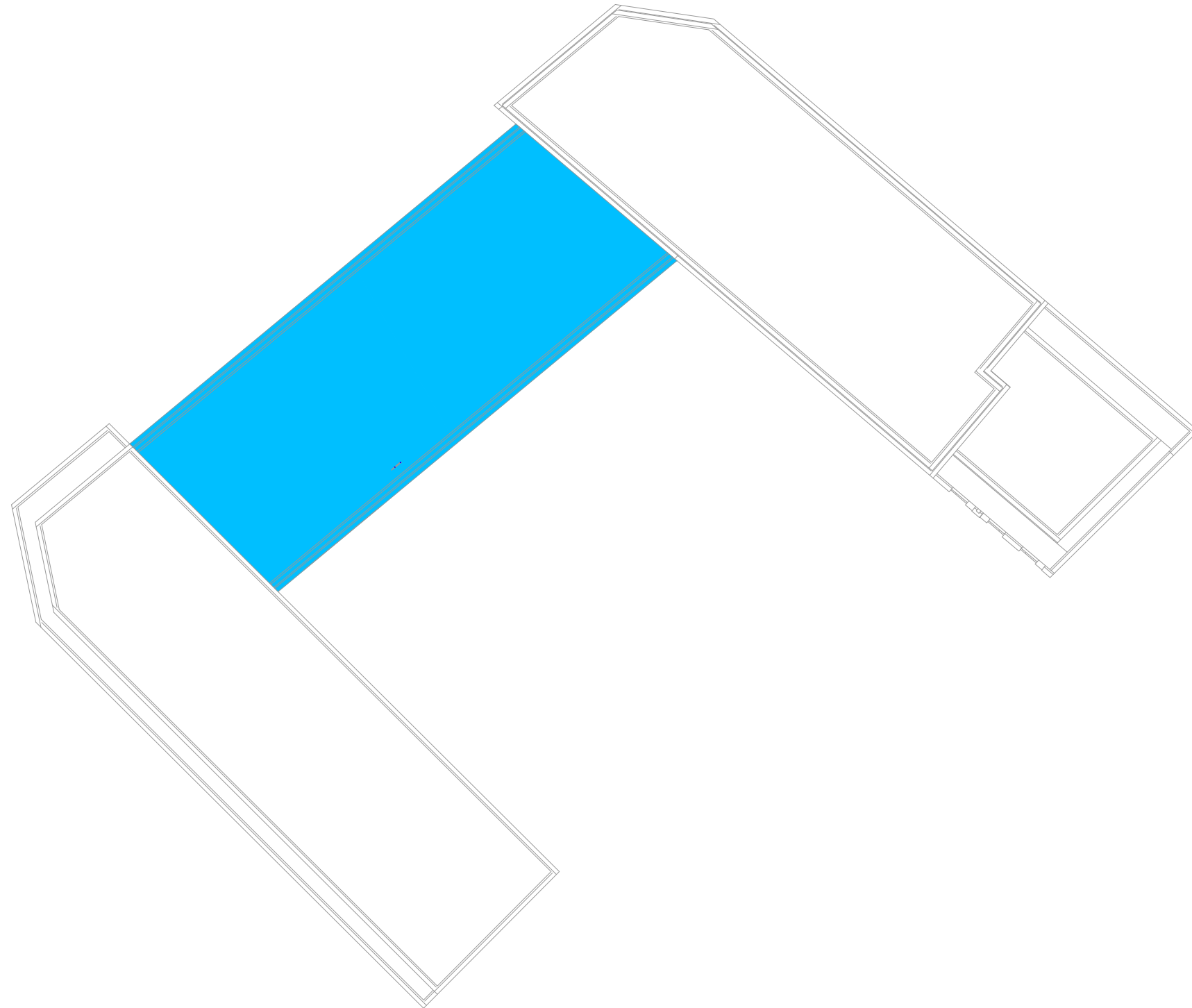
Proposed Development with Existing Surrounding Buildings

Summer Season






2404017 Uxbridge High Street - London, UK



Figure: 7



LDDC COMFORT CATEGORIES:

Sitting	
Standing	
Strolling	
Walking	
Uncomfortable	

Pedestrian Comfort Desk- Expected Wind Conditions - Roof Level

Proposed Development with Existing Surrounding Buildings

Summer Season

2404017 Uxbridge High Street - London, UK

Figure: 8



APPENDIX A





APPENDIX A: MEAN FACTORS

Table 2: ESDU Mean Factors at 2m and 10m above ground level

Wind Direction	0 °	10 °	20 °	30 °	40 °	50 °	60 °	70 °	80 °	90 °	100 °	110 °
Mean Factor at 2 m	0.45	0.45	0.34	0.34	0.37	0.37	0.34	0.34	0.34	0.34	0.34	0.32
Mean Factor at 10 m	0.77	0.77	0.69	0.69	0.68	0.68	0.67	0.67	0.67	0.67	0.67	0.65
Wind Direction	120 °	130 °	140 °	150 °	160 °	170 °	180 °	190 °	200 °	210 °	220 °	230 °
Mean Factor at 2 m	0.32	0.32	0.32	0.33	0.34	0.34	0.34	0.35	0.35	0.35	0.35	0.38
Mean Factor at 10 m	0.65	0.65	0.65	0.66	0.68	0.68	0.68	0.70	0.70	0.70	0.70	0.71
Wind Direction	240 °	250 °	260 °	270 °	280 °	290 °	300 °	310 °	320 °	330 °	340 °	350 °
Mean Factor at 2 m	0.38	0.38	0.53	0.53	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.54
Mean Factor at 10 m	0.71	0.71	0.81	0.82	0.83	0.83	0.82	0.82	0.82	0.83	0.83	0.83

APPENDIX B



PEDESTRIAN LEVEL WIND - DESK BASED ASSESSMENT
HIGH STREET, UXBRIDGE - LONDON, UK

RWDI #2404017
March 27th, 2024

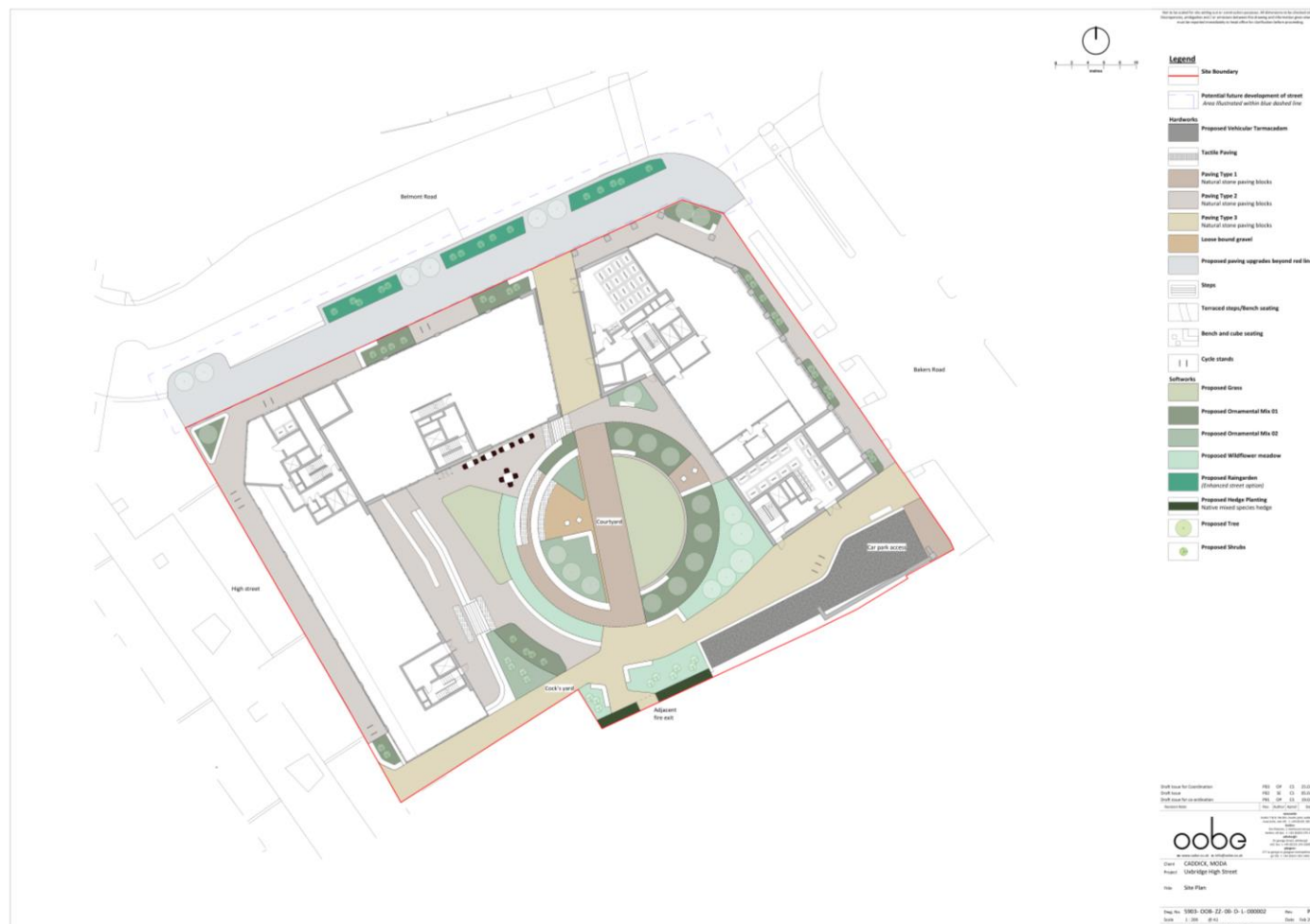


Figure 9: Proposed landscaping at ground level

PEDESTRIAN LEVEL WIND - DESK BASED ASSESSMENT
HIGH STREET, UXBRIDGE - LONDON, UK

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March 27th, 2024



Figure 10: Proposed landscaping at terrace level