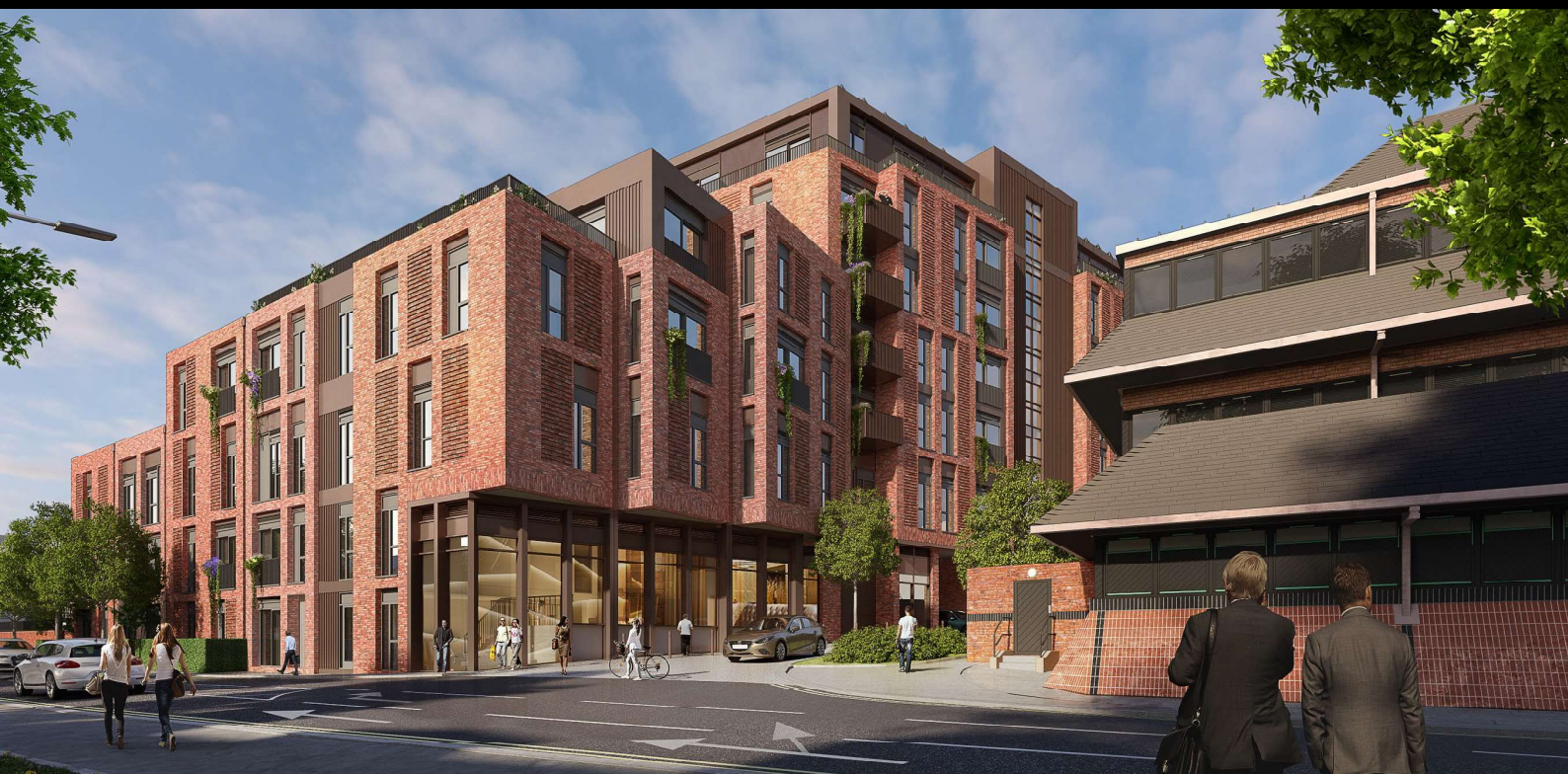
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Wind Microclimate Assessment

SEPTEMBER 2020

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HAREFIELD ROAD, UXBRIDGE

Wind Microclimate Assessment



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Wind Microclimate Assessment

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1 INTRODUCTION

1.1.1. This Wind Microclimate Assessment Report has been prepared by WSP to accompany an application for full planning permission being submitted by the Applicant, Senior Living Urban (Uxbridge) Limited (Guild Living), to the London Borough of Hillingdon (LBH). This report presents the results and recommendations from the study.

1.1.2. The proposal is for a comprehensive redevelopment of the site comprising demolition of existing buildings to provide residential care accommodation (C2), café (E), nursery (E), car parking, landscaping and associated works.

1.1.3. General Site description

1.1.4. The site is located to the east of Harefield Road and north of Warwick Place within Uxbridge Town Centre. It is bound by the rear gardens of the residential properties of Harefield Road and Lancaster Road to the north; Warwick Place and Beasley Court to the south; Penfield Estate to the east; and Harefield Road to the west (Figure 1.2).

1.1.5. The site comprises two low density attached retail warehouse buildings (Use Class A1), currently occupied by Wickes (Unit 1) and Halfords (Unit 2). The buildings are set back within the site which includes a large car park situated in front of the buildings. The site benefits from existing landscaping which is generally limited to eastern and northern boundaries. The site is currently raised above Harefield Road which is fronted by a retaining wall to the car park. The site benefits from existing vehicular and pedestrian access from Harefield Road, with a separate access to a loading bay off Warwick Place.

1.1.6. The surrounding area is characterised by a mix of uses, services and facilities including residential, retail, civic and commercial uses.

Figure 1-1– Proposed Development – North-west view

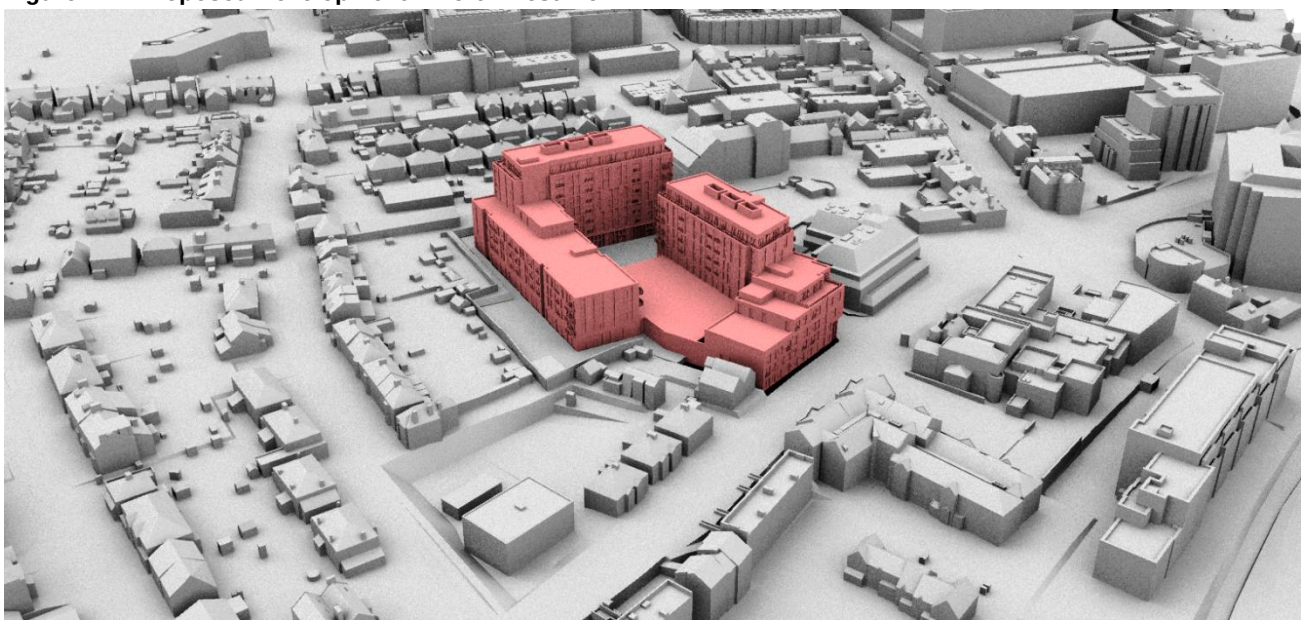


Figure 1-2 – Harefield Road Site Location



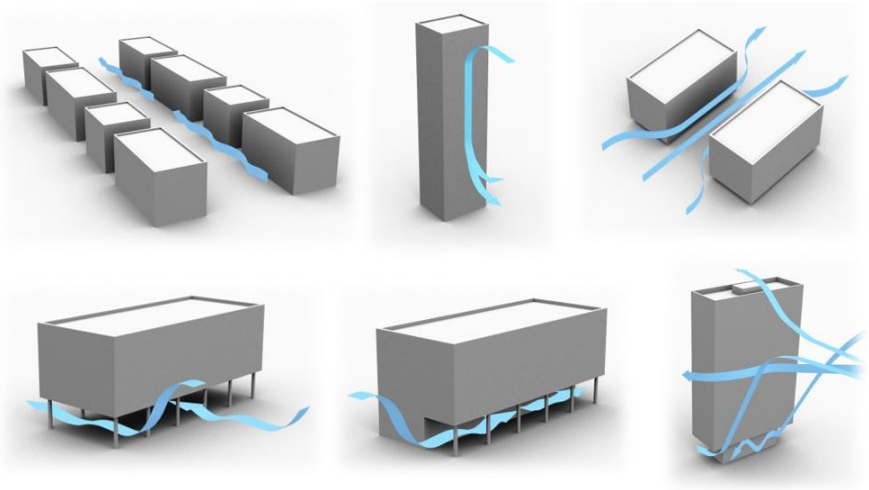
2 GUIDANCE

2.1.1. The Lawson Criteria (Ref. 1) are well-established in the UK for quantifying wind conditions in relation to built developments. The criteria are widely recognised by local authorities as a suitable benchmark for wind assessments. The Lawson Criteria have been adopted for this assessment.

2.2 GENERIC WIND EFFECTS

2.2.1. Buildings affect the speed and direction of wind flows as illustrated in Figure 2.1 below. The effect buildings have on the wind environment at pedestrian level, and the anticipation of the likely wind conditions resulting from the proposed developments are important considerations in the context of pedestrian comfort and the safe use of the public realm. While it is not always practical to design out all the risks associated with the wind environment, it is possible to provide local mitigation to minimise risk or discomfort where required.

Figure 2-1 – Wind Effects Around Buildings



3 METHODOLOGY

3.1 ASSESSMENT METHODOLOGY

3.1.1. The assessment has been based on a qualitative analysis of the site and the likely effects of the proposed development on the local wind environment. The desktop assessment includes a review of the design proposals, the site context and surroundings. The analysis is based on the drawings (Ref: "UXB001-MPI-ZZ-00-DR-A-200", dated 9th September 2020) and 3D model (Ref: "3DView-{3D-jleachJUBQV}", dated 1st August 2020) provided by Marchese Partners in August 2020, available satellite views of the site and its surroundings and WSP's experience in the field of wind engineering, having carried out a number of numerical assessments both via boundary layer wind tunnel and Computational analysis of similar projects in the UK.

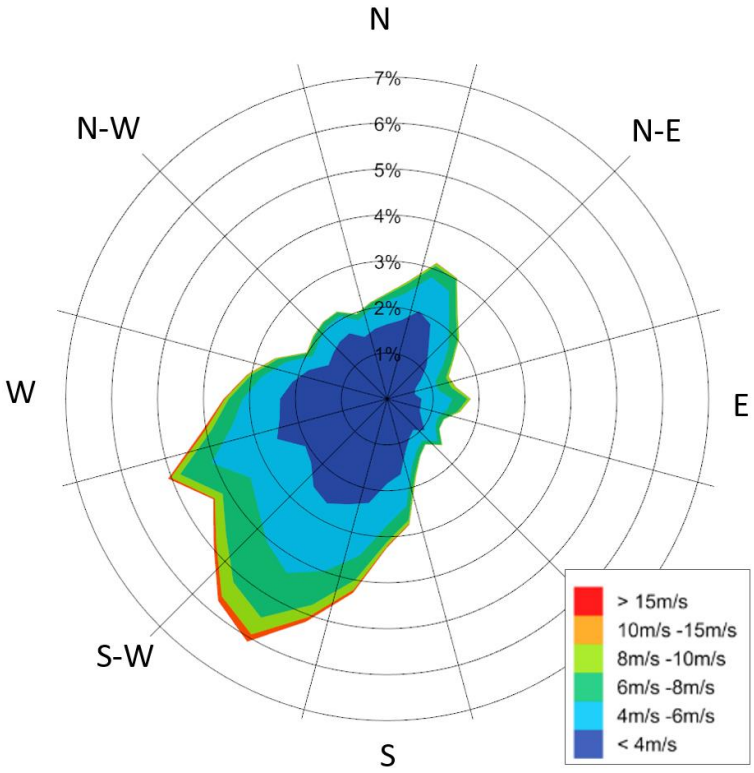
3.1.2. The potential wind effects of the proposed development on the local microclimate are discussed with reference to best practice guidelines for pedestrian comfort and safety (Lawson Criteria) and based upon analysis of meteorological conditions for London Heathrow Airport, adjusted to the site. Where appropriate, the report also identifies potential areas of wind acceleration where mitigation measures might be to prevent, minimise or control likely adverse effects arising from the proposed development.

3.2 WIND CLIMATE ANALYSIS

3.2.1. Twenty-year hourly wind data records from Heathrow Airport met Weather Station have been used to assess the local wind conditions surrounding the site, which is approximately 9.5Km south of the site. The data was discretised into 36 bins, representing 10° sectors. The nomenclature adopted in this report assigns 0° to winds coming from north and increases clockwise such that 90° refers to winds blowing from east, 180° from south and 270° from west.

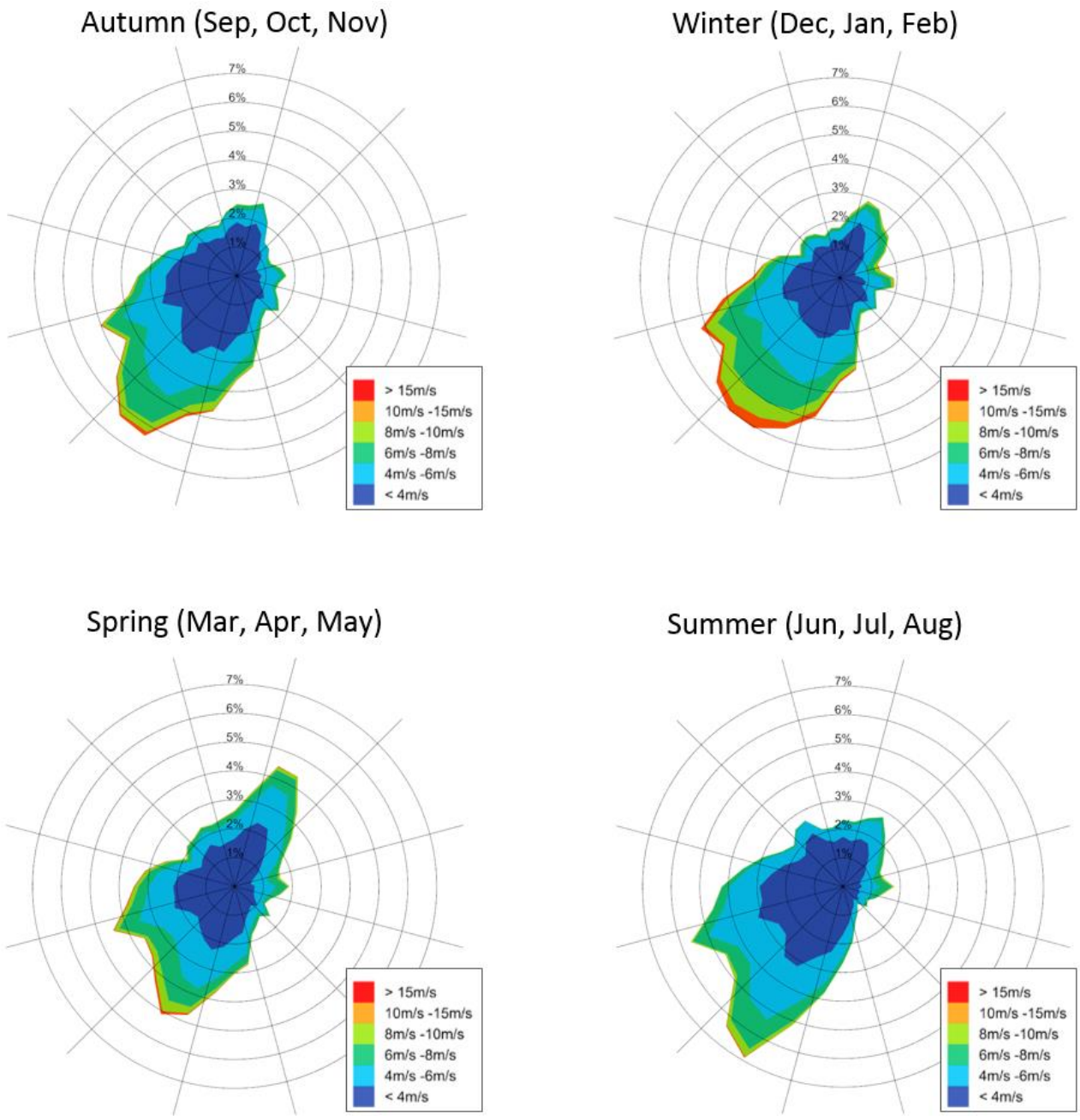
3.2.2. Figure 3-1 shows a summary of the wind data for Heathrow Airport for the whole year in the form of a wind rose. Wind direction is shown on the angular axes, with percentage of hours on the radial axes. For this region, the most frequent wind directions are the south-southwest and close to west quadrant blowing with the highest frequency and representing the largest proportion of higher wind speeds. Wind speeds from the north and north-east quadrant can reach 8-10m/s however, they are relatively infrequent.

Figure 3-1 - Annual Wind Rose for the Met Station



3.2.3. Figure 3-2 shows similar wind roses split into four-month seasons. It shows some variation in directionality, with spring showing an increase in north-easterly winds. The winter months are windier than other months, which is heavily weighted to the southerly winds.

Figure 3-2 - Wind Roses for each season



3.2.4. Figure 3-3 shows the upwind and topographical features surrounding the site and table 3-1 shows the transposition factors resulted from the terrain analysis. The transposition factors are calculated to account for the differences in terrain surrounding the meteorological weather station and the site, following the wind model proposed by ESDU, an engineering advisory organisation based in the UK (ESDU 2010) (Ref 2). This method assigns transposition factors to the Weibull probability distribution of the wind data at the meteorological site, based on upwind roughness factors of the terrain type. In this way, the meteorological station data is first corrected to standards of 10 m above open flat level country terrain and then adjusted to the site conditions for a precise analysis.

Figure 3-3 – Categorisation of the terrain surrounding the site.

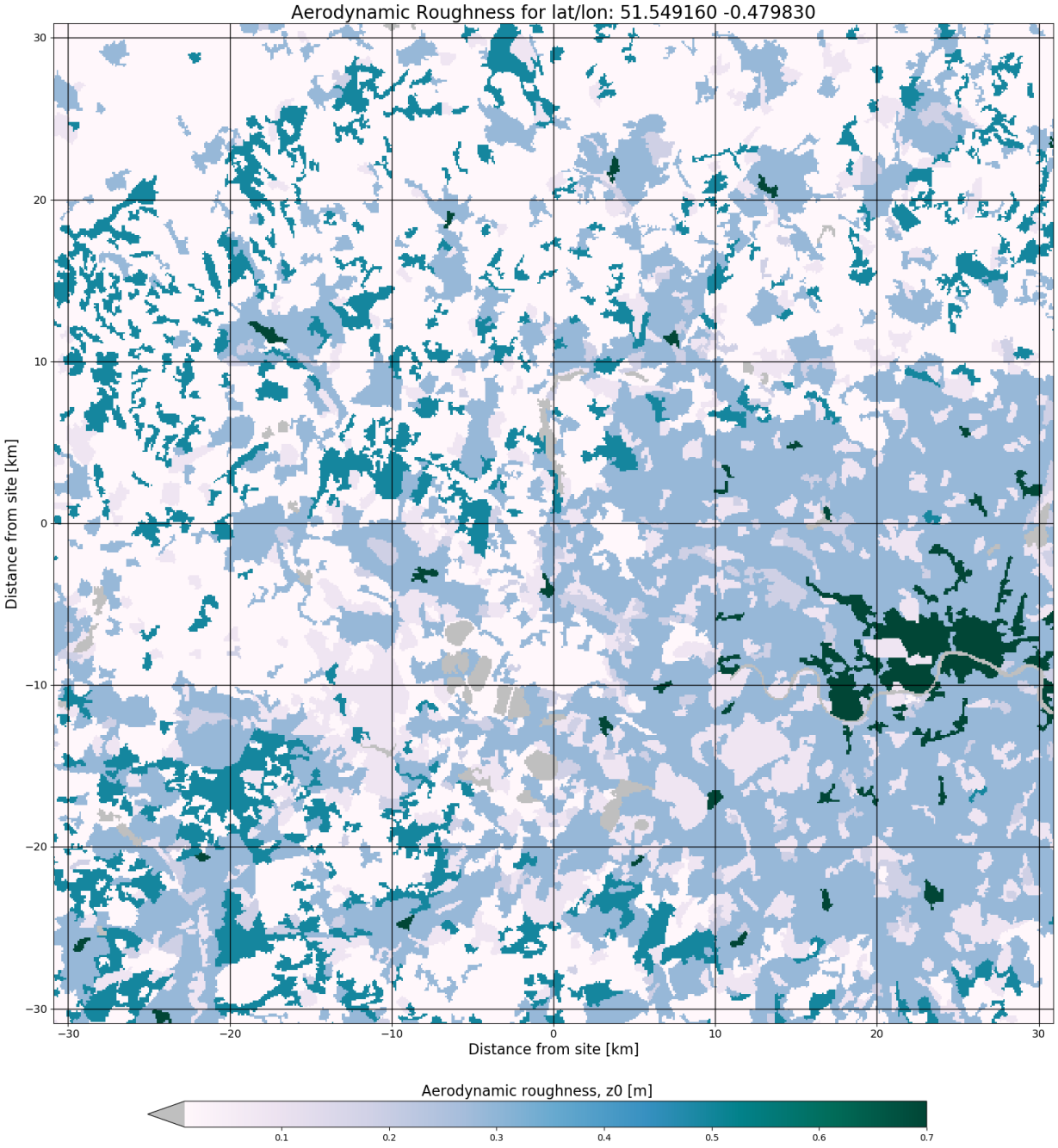


Table 3-1 – Transposition factors from 10m open country to reference height at the project site (30m)

0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
1.02	1.03	0.97	1.00	1.00	0.98	0.98	1.05	1.07	1.05	1.08	1.03

3.3 CRITERIA FOR PEDESTRIAN SAFETY AND COMFORT

3.3.1. The criteria used in this study were developed by T.V. Lawson (2001) (Ref. 1) and have been reproduced in Table 3-2. Like most criteria used in assessments of pedestrian wind conditions, they relate a threshold wind speed and a threshold frequency to the suitability of an activity.

3.3.2. The frequency threshold for each criterion is 5% - or about three weeks per year. It is also useful to assess frequency on a seasonal basis. For example, an outdoor seating area may require wind conditions suitable for sitting or standing in summer, but not in winter when the seating is unlikely to be used. For season-specific results, the criteria are based on 5% of hours across the months in that season.

Table 3-2 – Comfort criteria used in this study.

Criteria	Suitability	Threshold mean wind for 5% of hours [m/s]
Pedestrian sitting	Outdoor seating and areas one can occupy comfortably for long periods	4
Pedestrian standing	Main building entrances, pickup/drop-off points	6
Pedestrian walking	Appropriate for strolling	8
Business Walking	Can be tolerated if one's objective is to walk, run or cycle without lingering	10
Unsuitable	Nuisance for most pedestrian activities	>10

3.3.3. Additionally, criteria for safety have been defined based on 2.2 hours' exceedance per year. These are areas where someone could find walking difficult or even lose their footing. These criteria are reproduced in Table 3-3.

Table 3-3 – Safety criteria used in this study.

Criteria	Description	Threshold mean wind speed for 2hr/year [m/s]
S15	Unsuitable for frail persons, cyclists etc	15
S20	Unsuitable for all pedestrians	20

3.4 GENERAL TARGET WIND CONDITIONS

3.4.1. The wind assessment for each of these criteria has been tested taking into account the season and expected activity on the site based on the following general target wind conditions:

- Thoroughfares: Business / Leisure walking during windiest season;
- Pedestrian Walkways: Leisure walking during windiest season;
- Building entrances, bus stops, drop off areas: Standing throughout the year; and
- Outdoor amenity and seating areas: Sitting during the summer season.

4 EXISTING CONDITIONS

4.1.1. The site is located in Uxbridge, to the north-west of Hillingdon and it is bound by Uxbridge police station on Warwick Place to the southwest, and the back of the Penfield Estate to the southeast. The B467 Harefield road and back gardens of Lancaster Road housing boarder the north-west and east sides. The site currently houses the commercial units Wickes and Halfords auto parts store.

4.1.2. In terms of the existing context, the wind environment is expected to be suitable and safe for the existing pedestrian activities including pedestrian circulation, leisure walking and standing for accessing buildings or waiting at bus stops. Gardens of dwellings, to the north of the site, are surrounded by boundary fences and are generally expected to enjoy amenable conditions for associated recreational activities.

5 ASSESSMENT OF WIND EFFECTS AT THE PROPOSED DEVELOPMENT AND ITS SURROUNDINGS

5.1 PEDESTRIAN COMFORT

Thoroughfares

5.1.1. Prevailing incoming wind reach the site from the south-west creating pockets of wind acceleration; however, the severity of these effects is limited by the height of the proposed development. Wind conditions along thoroughfares within and around the proposed development at ground level are generally expected to remain suitable for standing to leisure walking during the windiest season (Figures 5-1 and 5-2).

5.1.2. Localised windiness is likely to occur at building corner locations, such as the south-east and south-west corners of the site bounding with Penfield Estate and Harefield Road respectively, or between blocks within the proposed development at the entrance of the middle courtyard. This is due to potential for minor downdraughts of the prevailing wind from the south-west façade to reach pedestrian level and subsequently channel along and between the blocks and around corners. Similar wind conditions are likely to be observed at thoroughfares along Harefield Road and along the south-east façade of the proposed development. However, the wind effects on these pedestrian areas are not expected to be substantial and are likely to remain suitable for the intended and existing use.

5.1.3. Some wind acceleration is also expected at the south-east corner of Laburnum Court building to the west of the site on Harefield Road, since the proposed development could cause this corner to experience flow separation. Nevertheless, this building's entrances over Harefield Road are at a lower level than the street and therefore, protected from this wind effect.

5.1.4. Overall, all thoroughfares within and around the site are generally expected to be within the recommended criteria.

Figure 5-1 – Wind conditions around the site – Top view

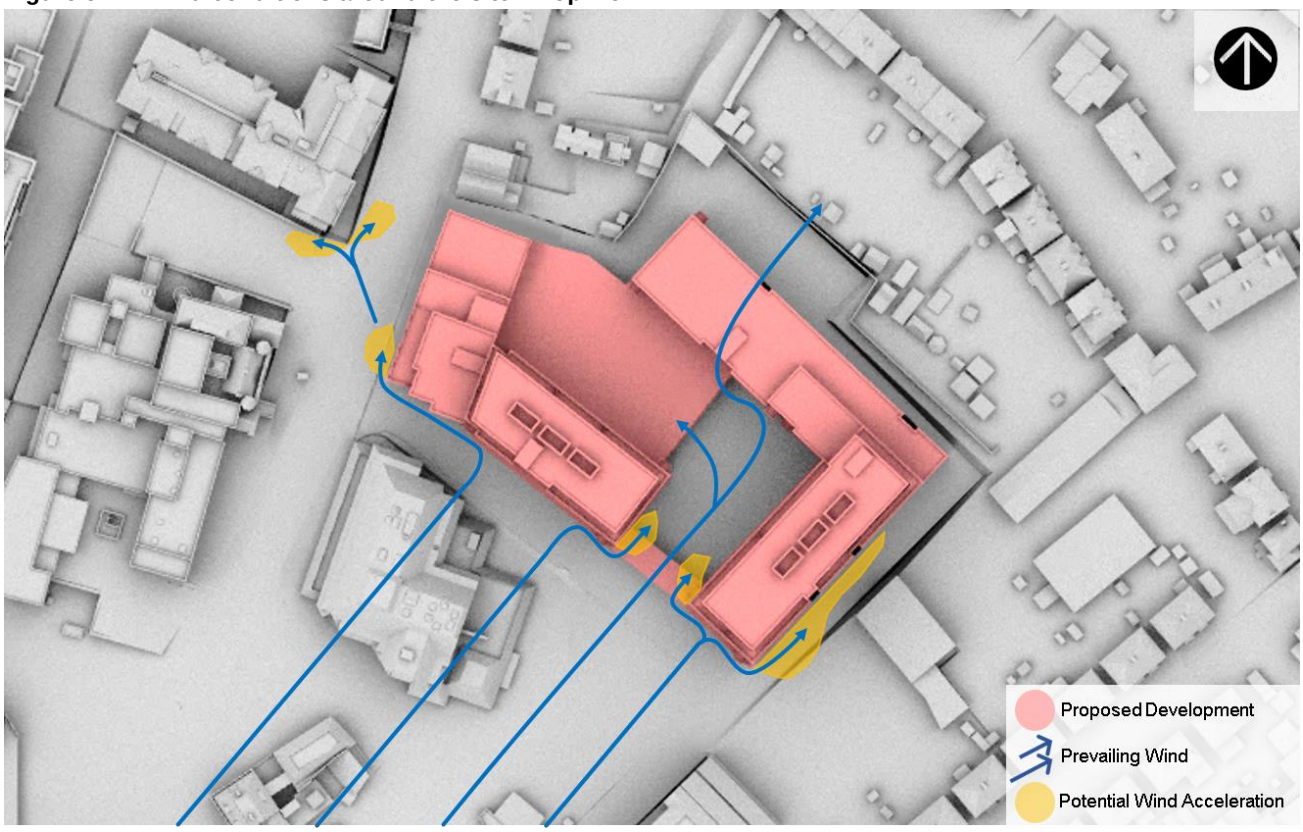
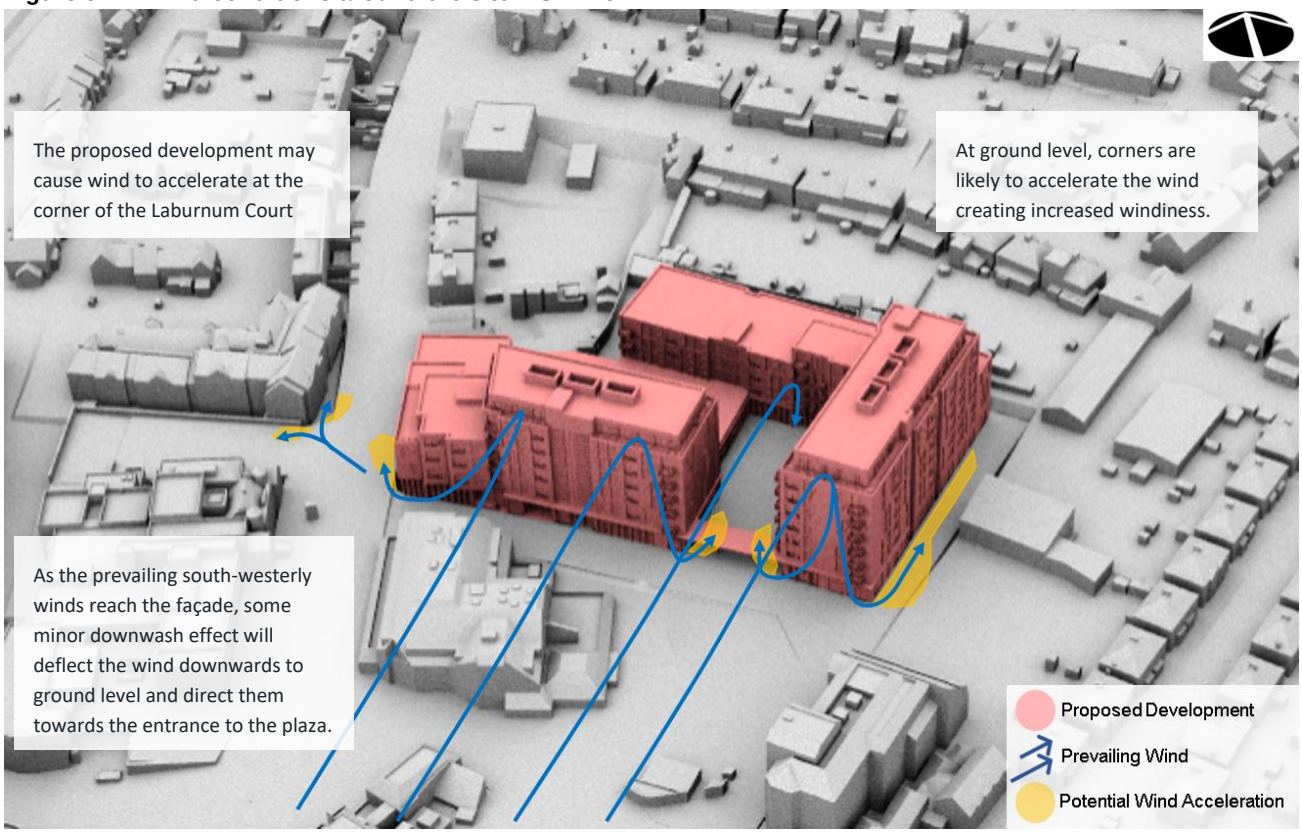


Figure 5-2 – Wind conditions around the site – SW view



Entrances

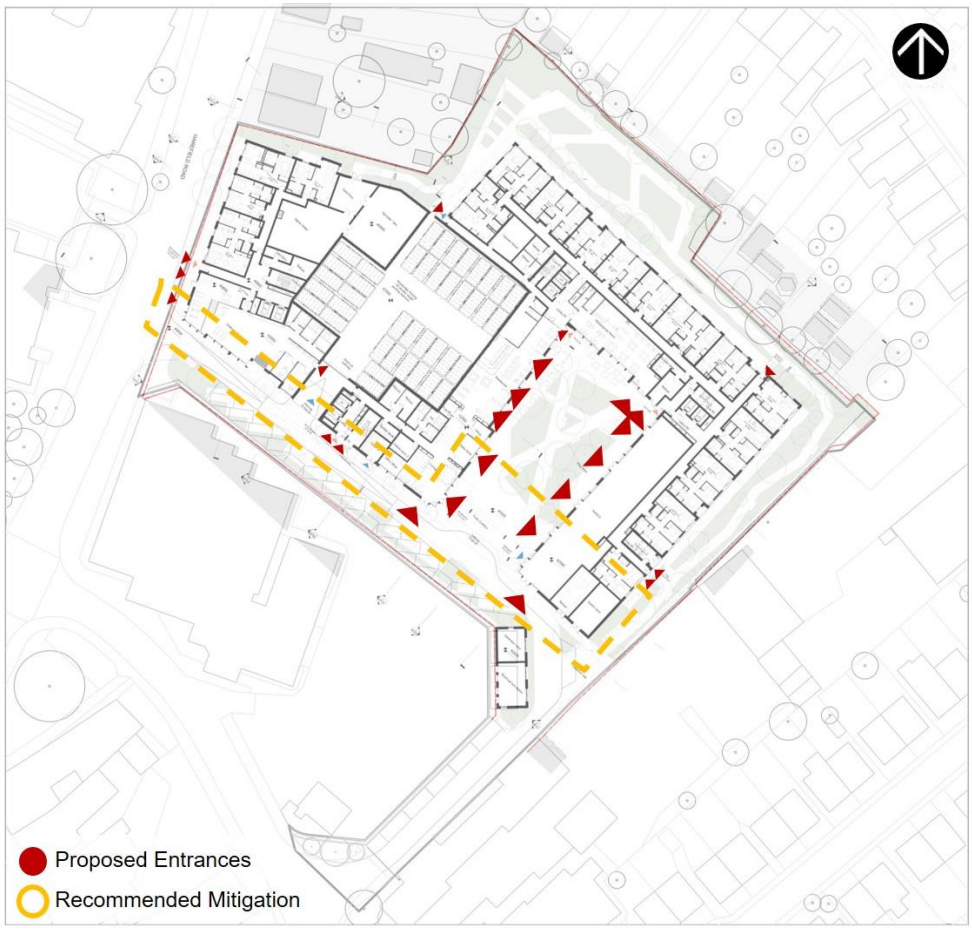
5.1.5. The wind environment at the majority of the entrance locations is likely to be suitable, at worst, for standing during the windiest season, the target wind condition for these areas.

5.1.6. The entrances along the areas around the south access to the site and to the courtyard, identified in Figure 5-3, are likely to experience some windiness. As mentioned, the façades facing the prevailing south-west wind directions are likely to generate a downwash flow, which could deflect the incoming wind downwards to the ground level creating localised wind acceleration. However, this effect is expected to be minor.

5.1.7. Some of these entrances are either protected by overhangs and columns along the ground floor glazed facades or recessed, such as the entrance to the south-west core. However, although these measures are likely to improve the wind conditions around the entrances by providing localised shelter, some further mitigation is recommended to ensure these areas are suitable for the intended uses. Section 6 below outlines possible mitigation options.

5.1.8. The rest of the entrances are generally expected to achieve standing wind conditions during the windiest season.

Figure 5-3 – Entrances location and potential entrances in need of mitigation



Open Spaces and Terraces

5.1.9. The proposed development includes a number of balconies, terraces and open spaces. Even though roof terraces are typically windier spaces than ground level spaces, the proposed development's balconies are generally expected to be suitable for their intended uses.

5.1.10. Figure 5-4 shows the landscape proposal which identifies the areas of trees, soft landscaping and outdoor seating at ground level. These proposed landscape measures are likely to promote improved wind conditions around the open spaces by providing localised shelter, especially at the south, east and west parts of the building. Also, at the centre, north and east area of the courtyard which allocates the seating arrangements. These are expected to experience sitting wind conditions, suitable for the intended use.

5.1.11. As mentioned, the entrance to the courtyard is likely to experience some wind acceleration and therefore, conditions are generally expected to be windier than within the courtyard. Provided that no seating arrangements are allocated within the identified zone, the wind environment is expected to be suitable for the intended use.

5.1.12. The east side of communal garden at podium level could potentially receive the deflected winds from the courtyard and therefore, could benefit from mitigation (Figure 5-5 & Section 6). However, the vast majority of this area is generally expected to experience suitable wind conditions since the building's massing and orientation is likely to help protecting the garden from most prevailing wind directions.

5.1.13. In general, during summer months the winds tend to be milder and therefore, by taking all the proposed landscape measures and mitigation recommendations into consideration, the terraces and open spaces are likely to be suitable for the intended uses.

Figure 5-4 – Proposed Landscape - Ground level

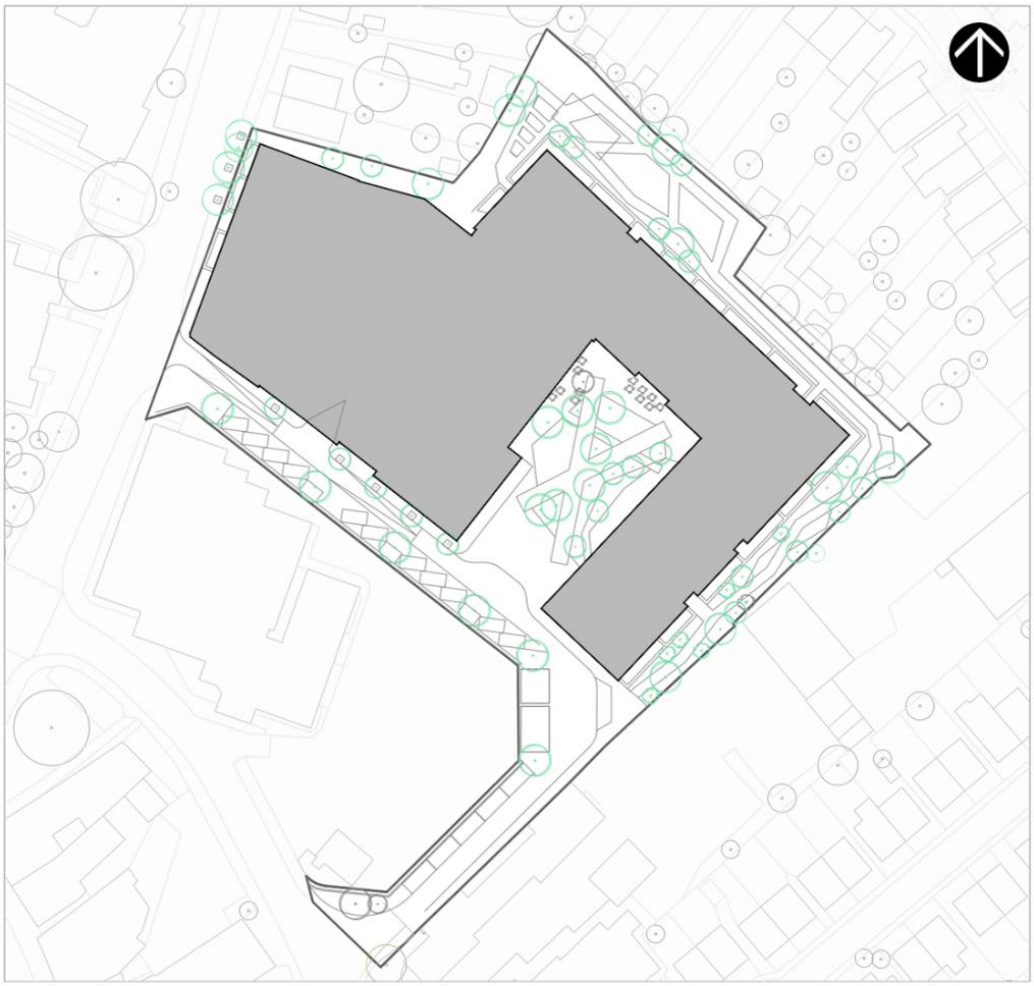
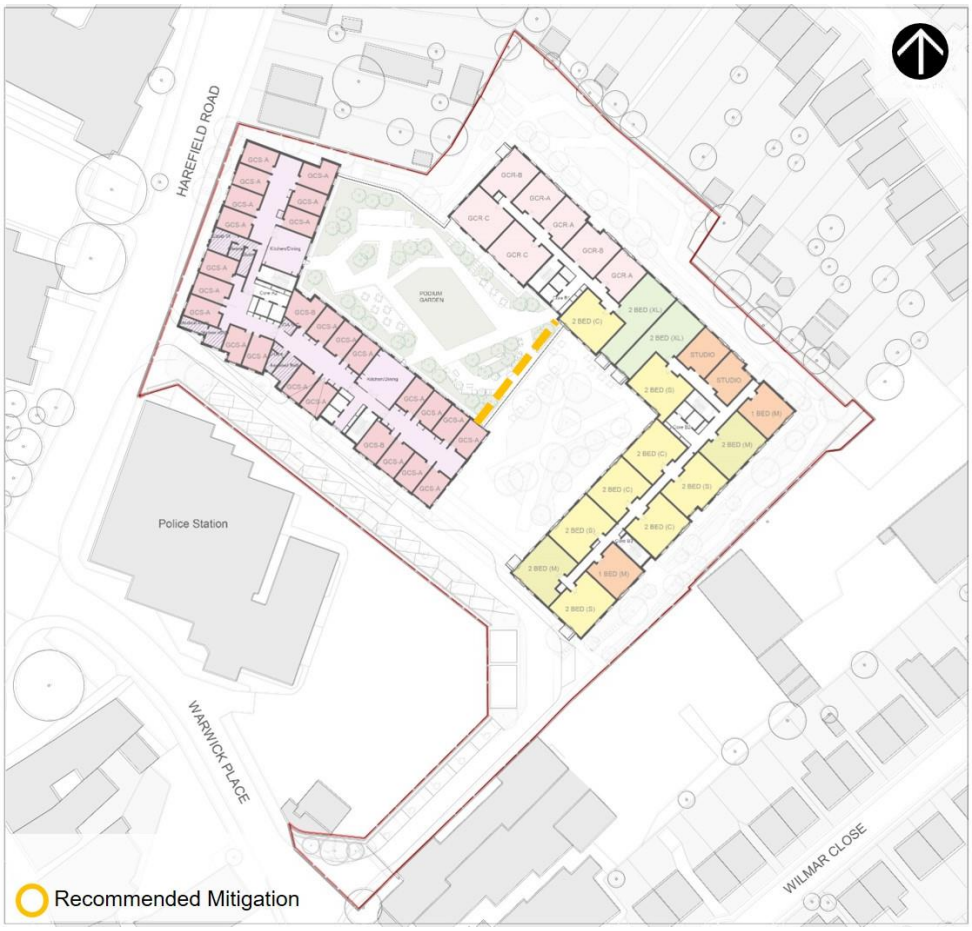


Figure 5-5 –Potential area in communal garden at podium level in need of mitigation



5.2 PEDESTRIAN SAFETY

5.2.1. Based on the qualitative assessment described above, the occurrence of winds in excess of 15 m/s for more than two hours per year are not expected. Therefore, all areas of the site and its close proximity are likely to be safe for all pedestrians.

6 MITIGATION

6.1.1. The assessment identified some entrances along the south-west façade and in close proximity to the entrance of the courtyard which could benefit from mitigation. The proposed landscape, overhangs and columns along the ground floor glazing facades will contribute as a mitigation strategy. This could be further enhanced if wind screens were to be incorporated.

6.1.2. The assessment identified the east side of the communal garden at podium level as a likely area to be subject to the courtyard's deflected wind and will therefore, benefit from local mitigation. Further planting / screening at roof level can generally be helpful to mitigate wind speeds and improve the wind conditions of this area of the garden.

6.1.3. Generally, trees in the surrounding area and the proposed landscaping within the site will contribute to provide a suitable wind environment, as they filter the incoming wind reducing the speeds locally, especially during periods when trees are in full foliage. Where possible, trees of evergreen species should be considered to provide wind shelter to pedestrians throughout the year.

6.1.4. Overall, it is expected that the wind microclimate at the proposed development and its surroundings will likely be suitable for the existing and intended pedestrian usages. Any localised windy conditions can be improved mainly through the implementation of landscaping and porous screens.

7 CONCLUSION

7.1.1. This report provides an assessment of the potential impact and likely suitability of wind conditions at pedestrian level within and around the proposed development at Harefield Road, Uxbridge, based on the industry standard Lawson criteria for pedestrian comfort and safety.

7.1.2. The qualitative analysis is based on the drawings and models provided, available satellite views of the site and its surroundings, exposure in conjunction with long-term wind climate statistics applicable to the site and WSP's experience in the field of wind engineering, having carried out a number of numerical assessments both via boundary layer wind tunnel and Computational analysis of similar projects in the UK.

7.1.3. The meteorological data for the Site indicates prevailing winds from the west-southwest and south-southwest quadrants throughout the year.

7.1.4. Based on the qualitative assessment carried out the outcome can be summarised as follows:

Conditions at the surrounding areas of the site:

7.1.5. In terms of existing context, it is generally expected that the wind conditions of the site and its surroundings will be suitable for the existing pedestrian activities including pedestrian circulation, leisure walking and standing for accessing buildings or waiting at bus stops. Although some wind acceleration is likely to be observed on the south-east corner of Laburnum Court building to the west of the site and on thoroughfares along Harefield Road, these wind effects are not generally expected to be substantial, and will therefore, remain within the targeted thresholds of pedestrian comfort and safety.

Conditions at the site

7.1.6. Regarding the site, prevailing incoming wind reaches the proposed development from the south-west creating pockets of wind acceleration, especially at building corner locations such as the south-east and south-west corners of the site bounding with Penfield Estate and Harefield Road respectively and at the entrance of the ground level courtyard due to the channelling effect between blocks. Similar winds are likely to be observed on thoroughfares along Harefield Road and along the south-east façade of the proposed development.

7.1.7. The proposed landscaping is likely to promote improved wind conditions around the proposed development, especially along the south-west and south-east facades of the building, by providing localised shelter and making thoroughfares around the proposed development suitable for the intended uses throughout the year.

7.1.8. Entrances along the south-west façade and at proximity to the entrance to the courtyard are likely to have occasional windy conditions. The addition of further planting/screening was recommended as mitigation measures alongside the proposed landscape, overhangs and columns to ensure the suitability of the intended pedestrian uses.

7.1.9. With regards to amenity spaces, the entrance to the courtyard is generally expected to have conditions windier than suitable for amenity use during the summer season. Moreover, the east side of the communal garden at podium level could receive the deflected winds from the courtyard. Taking the proposed landscape and the recommendations regarding the placement of seating arrangements as well as the implementation of porous screens into consideration, the terraces and open spaces are likely to remain suitable for the intended occupant uses.

7.1.10. In summary, the wind environment of the site as well as its immediate surroundings, is generally expected to remain safe and suitable for the existing and intended uses. Although some localised areas of increased windiness can be expected, these are likely to be minor and can be further mitigated with the implementation of the proposed landscaping and porous screens.

7.1.11. WSP recommends a quantitative analysis in later stages of the design to help redefine landscape strategies and seating areas with more precision.

8 REFERENCES

1. Lawson, T., 2001. Building aerodynamics, Imperial College Press [ISBN 1-86094-187-7]
2. ESDU 2010 Item 01008 ‘Computer program for wind speeds and turbulent properties: flat or hilly sites in terrain with roughness changes’



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