Manor Road / Richmond

Revised Wind Microclimate Assessment

RWDI

July 2020

Redefining possible.

MANOR ROAD - RICHMOND

LONDON, UK

REVISED WIND MICROCLIMATE ASSESSMENT – AMENDED PROPOSED DEVELOPMENT

30th July 2020

RWDI #1901113 – REV E

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Introduction

Executive Summary

- RWDI was retained by Avanton Richmond Development Ltd to carry out a revised wind microclimate desk based assessment for the Amended Proposed Development at Manor Road, London Borough of Richmond upon Thames. RWDI also conducted desk based assessments on previous designs of the Proposed Development, the latest of which was issued July 2020.
- This report will discuss potential impacts of the Amended Proposed Development on pedestrian comfort and safety at ground and terrace levels, **both within and around the site**. This study is based on our experience of wind tunnel testing many similar developments across the UK, and our knowledge of aerodynamic principles.
- The proposed massing and landscaping is expected to create acceptable wind conditions at ground level around the site. The orientation of the site with respect to prevailing west-southwest winds creates beneficial mutual shelter from buildings within the site. Specific landscape features have been incorporated into the design to improve windiness in various locations, as advised by the previous wind microclimate study.
- Also, the proposed landscaping will be planted in semi-mature form through a phased programme of planting in association with the occupation of each phase, to improve the shelter provided to amenity and play areas.
- The Amended Proposed Development is not expected to change the wind conditions around the existing residential buildings around the site.

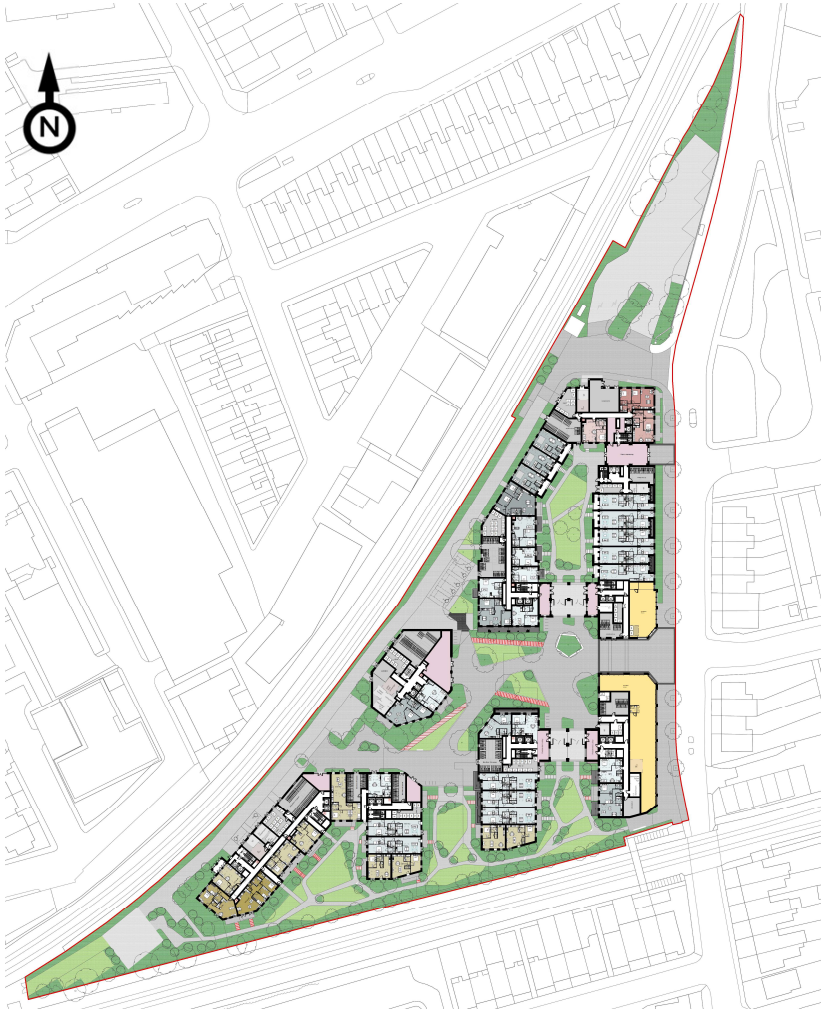


Figure 1: Ground Floor of the Amended Proposed Development

Introduction

This wind microclimate assessment has been prepared by RWDI on behalf of Avanton Richmond Development Ltd ('the Applicant') following further amendments to the proposed scheme for the redevelopment of the Homebase store at 84 Manor Road, North Sheen ('the Site').

A planning application for the redevelopment of the Site was submitted to London Borough of Richmond Upon Thames (LBRuT) in February 2019 (ref. 19/0510/FUL) (the 'Original Proposed Development'), and was considered at LBRuT Planning Committee on 3 July 2019.

The Planning Committee resolved that they were minded to refuse the Application, however on 29 July 2019 it was confirmed that the Mayor of London would act as the local planning authority for the purposes of determining the application.

Following review of LBRuT's reasons for refusal and discussions with Officers at the Greater London Authority (GLA) and Transport for London (TfL), the Applicant sought to review the scheme, with the principle aim of increasing the delivery of affordable housing through additional density and addressing other issues raised in the Mayor's Stage 2 Report. Initial scheme amendments were submitted in November 2019 ('the November 2019 Amendments') and increased the overall number of units by 48, primarily through the introduction of a new residential building known as Block E.

Following further discussions with TfL and the GLA, it was subsequently agreed that further revisions should be explored in order to deliver an improved scheme, without the need for this additional block.

As of the latest, July 202, proposed changes, the Amended Proposed Development would comprise the demolition of existing buildings and structures and comprehensive phased residential-led redevelopment to provide 453 residential units (of which 173 units will be affordable), flexible retail, community and office uses, provision of car and cycle parking, landscaping, public and private open spaces and all other necessary enabling works. As a result of the proposed changes, this document has been updated in order to assess the Amended Proposed Development.

This document will review the Amended Proposed Development and the effected wind microclimate in and around the site.

Introduction

Legislation and Planning Policy Context

This section highlights any current planning policies (national, regional and local) which provide guidance on the design of a new building in regard to wind microclimate.

National Legislation

1. There is no National Legislation directly relating to wind microclimate issues; however, there is general guidance on the effect of building design on local winds, and the importance of high quality built environment.

National Planning Policy

National Planning Policy Framework (2019)

2. The National Planning Policy Framework (NPPF) was adopted in March 2012 (Ref. 11-1) and updated in July 2018 and February 2019. NPPF sets out the Government's economic, environmental and social policies for England. These policies outline the Government's vision of sustainable development, which should be interpreted and applied locally to meet local and community aspirations.

3. The latest version of NPPF – published in February 2019 – does not include any policies pertaining to wind microclimate.

National Planning Practice Guidance (2019)

4. The NPPG was published in November 2016 to support the NPPF and was updated in October 2019. There is no guidance within the NPPG related to tall buildings and wind microclimate issues.

Introduction

Relevant Planning Policies

The London Plan – Spatial Development Strategy for Greater London (2016)

The London Plan (Ref. 12-4) places great importance on the creation and maintenance of high quality environment for London. The following policies apply specifically in relation to wind microclimate:

1. *Policy 7.6: Architecture*

   "Architecture should make a positive contribution to a coherent public realm, streetscape and wider cityscape. It should incorporate the highest quality materials and design appropriate to its context."

   "Buildings and structures should:

   a. Not cause unacceptable harm to the amenity of surrounding land and buildings, particularly residential buildings, in relation to privacy, overshadowing, wind and microclimate. This is particularly important for tall buildings."

2. *Policy 7.7: Location and Design of Tall and Large Buildings*

   "Tall and large buildings should be part of a plan-led approach to changing or developing an area by the identification of appropriate, sensitive and inappropriate locations. Tall and large buildings should not have an unacceptably harmful impact on their surroundings."

   "Applications for tall or large buildings should include an urban design analysis that demonstrates the proposal is part of a strategy that will meet the criteria below. This particularly important if the site is not identified as a location for tall or large buildings in the borough's LDF."

   "Tall buildings: (b) Should not affect their surroundings adversely in terms of microclimate, wind turbulence, overshadowing, noise, reflected glare, aviation and telecommunication interference."

Introduction

Relevant Planning Policies

Intend to Publish London Plan (2019)

This is a new London Plan (also known as a Replacement Plan). This London Plan replaces all previous versions. This document provides guidance for developments and is an integrated policy framework for local plans across London.

1. *Policy D3 Optimising site capacity through the design-led approach (Para 3.3.8), states that:*

   "Buildings [...] massing, scale and layout [...] should complement the existing streetscape and surrounding area. Particular attention should be paid to the design of the parts of a building or public realm that people most frequently see or interact with in terms of its legibility, use, detailing, materials and location of entrances. Creating a comfortable pedestrian environment with regard to levels of [...] wind".

2. *Policy D8 Public realm, Development Plans and development proposals should, states that:*

   "Consideration should also be given to the local microclimate created by buildings, and the impact of service entrances and facades on the public realm."

   "Ensure that appropriate shade, shelter, seating [...] with other microclimatic considerations, including temperature and wind, taken into account in order to encourage people to spend time in a place."

3. *Policy D9 Tall buildings: Environmental impact, states that:*

   "Wind [...] around the building(s) and neighbourhood must be carefully considered and not compromise comfort and the enjoyment of open spaces, including water spaces, around the building";

   "Air movement affected by the building(s) should [...] not adversely affect street-level conditions".

4. *Policy D9 Tall buildings: Cumulative impacts, states that:*

   "The cumulative visual, functional and environmental impacts of proposed, consented and planned tall buildings in an area must be considered when assessing tall building proposals and when developing plans for an area. Mitigation measures should be identified and designed into the building as integral features from the outset to avoid retro-fitting."

Introduction

Relevant Planning Policies

Sustainable Design & Construction Supplementary Planning Guidance (2014)

1. The Greater London Authority (GLA) Sustainable Design and Construction Supplementary Planning Guidance (SPG) (Ref. 11-6) states in section 2.3.7 that:

   'Large buildings have the ability to alter their local environment and affect the micro-climate. For example, not only can particularly tall buildings cast a long shadow effecting buildings several streets away, they can influence how wind travels across a site, potentially making it unpleasant at ground level or limiting the potential to naturally ventilate buildings. One way to assess the impact of a large building on the comfort of the street environment is the Lawson Comfort Criteria. This tool sets out a scale for assessing the suitability of wind conditions in the urban environment based upon threshold values of wind speed and frequency of occurrence. It sets out a range of pedestrian activities from sitting through to crossing the road and for each activity defines a wind speed and frequency of occurrence. Where a proposed development is significantly taller that it's surrounding environment, developers should carry out an assessment of its potential impact on the conditions at ground level, and ensure the resulting design of the development provides suitable conditions for the intended uses.'

Local Planning Policy - London Borough of Richmond Local Plan (2018)

2. Section 4.2 of the LBR Local Plan states the following:

   The Council will require new buildings, including extensions and redevelopment of existing buildings, to respect and strengthen the setting of the borough's valued townscapes and landscapes, through appropriate building heights, by the following means:

   (4) take account of climatic effects, including overshadowing, diversion of wind speeds, heat island and glare;

3. Section 4.1.11 states "Proposals should maximise the opportunities the site holds to generate a design, which will minimise its environmental impact and take account of micro-climates. Well informed design decisions at an early stage, such as the orientation of a building, can reduce energy consumption through responding positively to climatic conditions."

4. A new Local Plan is in development which will replace the current Local Plan and Twickenham Area Action Plan. However, this is not currently published.

Introduction

London Wind Climate

- The seasonal wind roses (meteorological data) for the London area are shown to the right. These are based on combined data from three London airports (Heathrow, Gatwick and Stansted). Although a site-specific wind climate analyses have not been carried out, the wind roses shown in this page are considered to be representative of the wind conditions around the site. 0 degrees represents wind blowing from the north and 90 degrees represents winds blowing from the east.
- The prevailing winds blow from the south-west (210 degrees through to 240 degrees) throughout the year. There is a secondary prevailing wind direction from the north-east (30 degrees) during the spring season.
- Majority of wind-related discomfort and safety concerns arise for winds from the prevailing southwest winds, due to the strength and high probability of occurrence of these winds.
- The windiest conditions occur during the winter months.

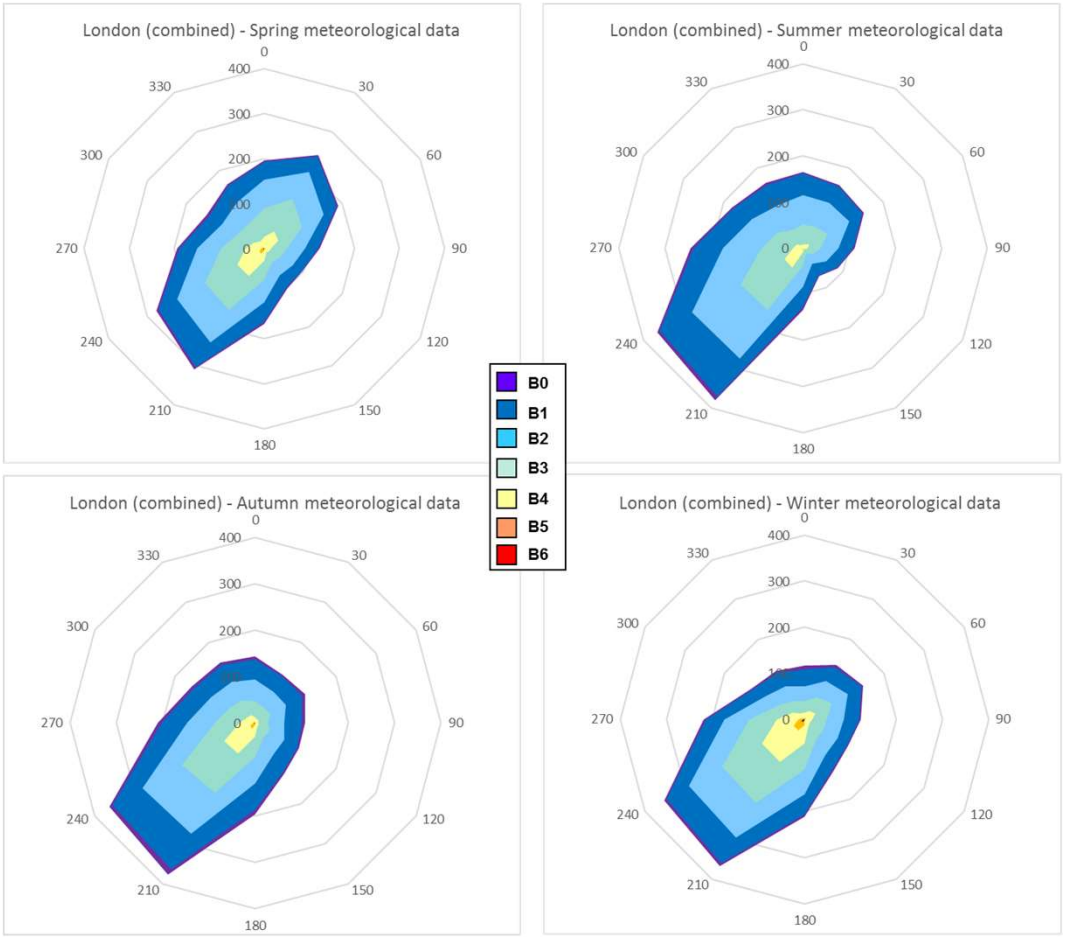


Figure 2: Wind rose for combined London airports (Gatwick, Heathrow and Stansted) radial axis show the cumulative hours each Beaufort category is exceeded.

Introduction

Lawson Comfort Criteria

- The most frequently used and widely accepted wind microclimate criteria in the UK is the Lawson Criteria. The table beside shows the five categories specified in the Lawson LDDC criteria in order of pedestrian activity level.
- The criteria set out various pedestrian activities and reflect the fact that less active pursuits require more benign wind conditions. In other words, the wind conditions in an area for sitting need to be calmer than a location that people merely walk past.

LDDC Comfort Categories		
Category	**5% exceedance wind speed**	**Colour Scheme**
Sitting	0-4m/s	
Standing	4-6m/s	
Strolling	6-8m/s	
Walking	8-10m/s	
Uncomfortable	> 10m/s	

- Please note that suitability of an area for amenity use is generally assessed for the summer season when prolonged use of external amenity spaces would be expected.
- Lawson also specified a safety criteria, to capture areas where pedestrians may be distressed or unbalanced by strong winds. Lawson criteria uses a safety threshold of 15 m/s occurring for more than 2.2 hours of the year. Exceedance of this threshold may indicate a need for remedial measures or a careful assessment of the expected use of that location; e.g. is it reasonable to expect elderly or very young pedestrians to be present at the location.

Introduction

Site Description

- The Site is located on Manor Road in Richmond, less than 50m from North Sheen train station.
- The orientation of the site is such that the southwest corner of the site is exposed to prevailing south-westerly winds, especially due to the train lines that increase the exposure in this direction.
- Currently the surrounding buildings are generally low-rise residential 2-3 storeys high units, with existing mature trees of up to 10-20m high on either sides of the railway line and around the site.
- The report will mainly focus on prevailing southwest winds, describe the wind conditions around the project in its existing surroundings. Other wind directions have been considered, but due to their lower rate of occurrence and lower wind speeds the primary wind issues are expected to be associated with the prevailing southwest winds.

Figure 3: Aerial view of the Amended Proposed Development location (site boundary highlighted red), viewed from the prevailing west-southwest winds.

Introduction

Amended Proposed Development

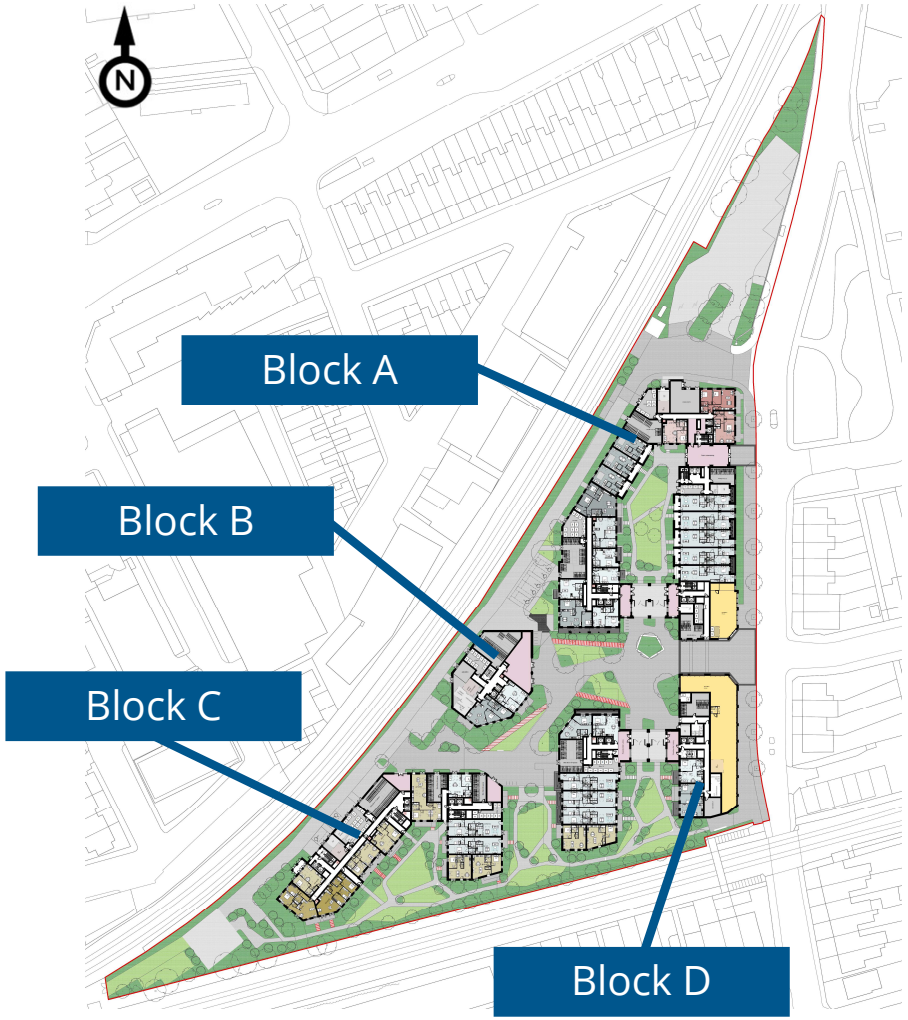


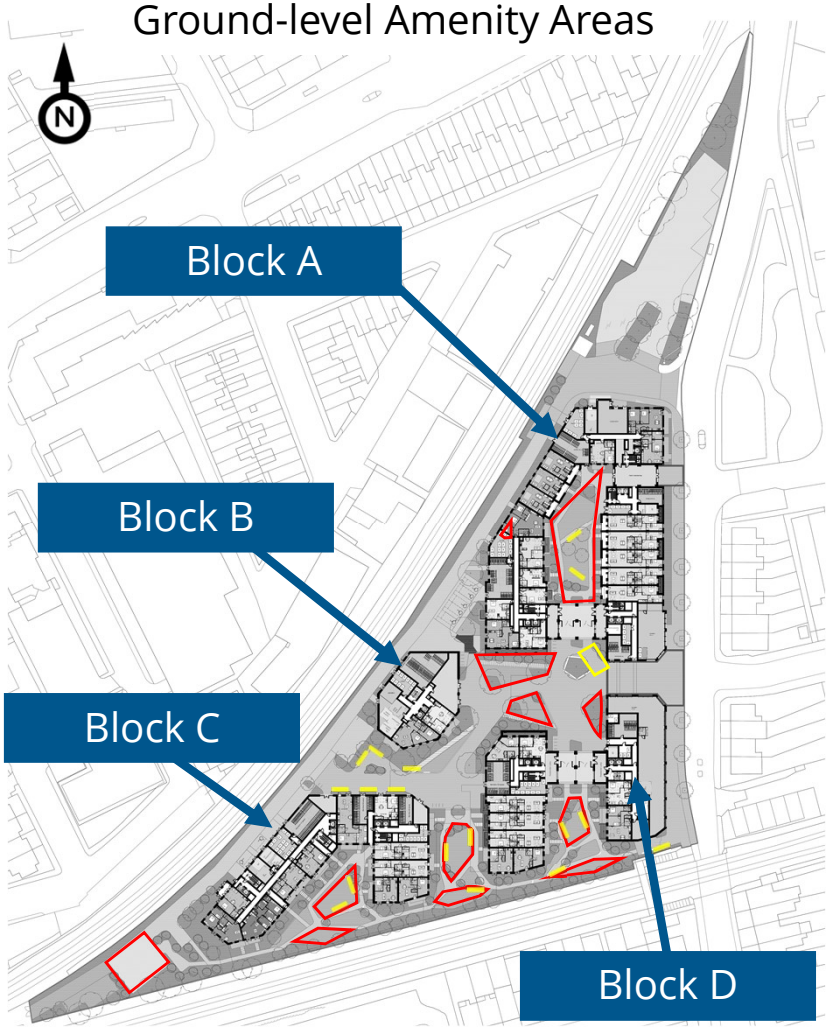
Figure 4: Plan view of the Amended Proposed Development

- The Amended Proposed Development comprises of four blocks as follows;
  - Block A is on the northeast side of the site and ranges from G+2 to G+7 storeys;
  - Block B is a stand-alone building of up to G+10 storeys;
  - Block C is the most exposed building for prevailing southwest winds, and is up to G+9 storeys, with terraces facing the prevailing winds;
  - Block D is located on the southeast side of the site and ranges in height from G+3 to G+7 storeys.
- The taller components are located near the centre of the site. Blocks C and D feature a stepped massing which will help reduce wind effects at ground-level, but exposes the terraces to strong winds.
- The spaces between buildings is mainly intended for walking use, with some good-weather amenity spaces.
- There are also pockets of usable green spaces at ground and terrace levels, as shown in the following slide.
- Balconies are located throughout the Amended Proposed Development.

Introduction

Amended Proposed Development

Ground-level Amenity Areas



Terrace-level Amenity Areas

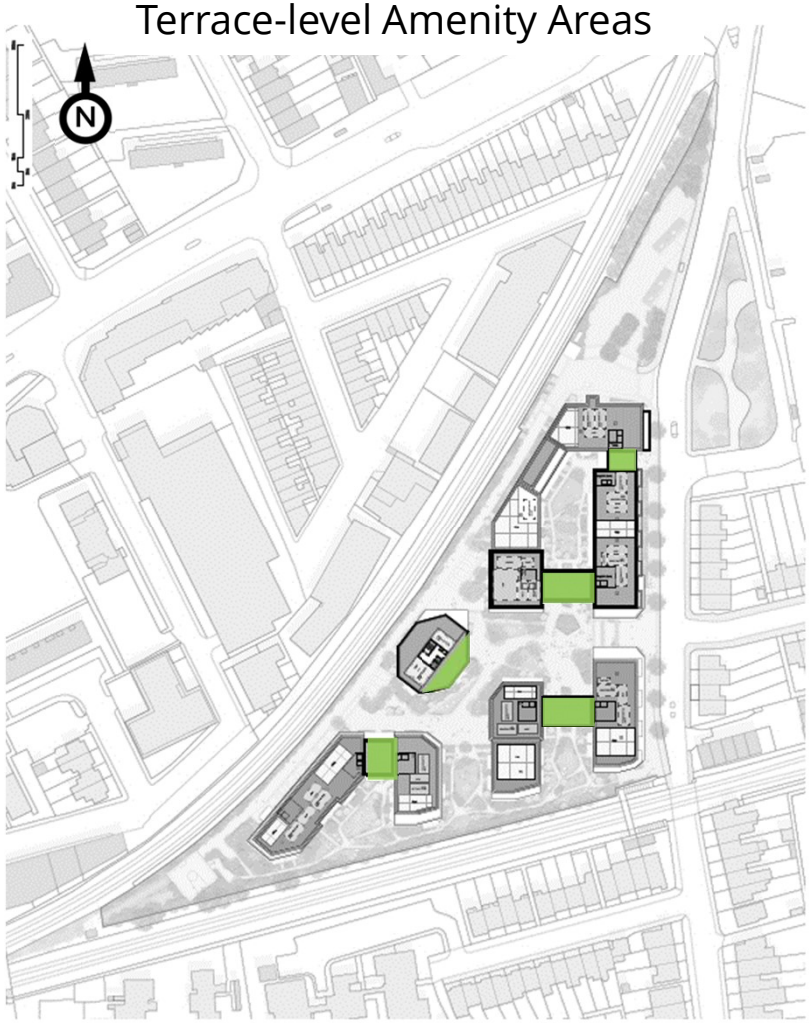


Figure 5: Plan view of the Amended Proposed Development showing ground-level and terrace-level amenity areas. Mixed use amenity is shown in red and seating is shown in yellow. Terrace levels shown in green.

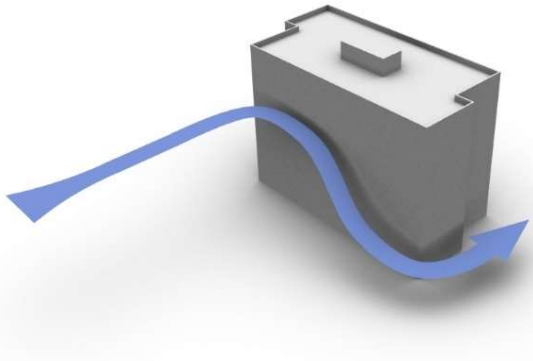
Expected Wind Microclimate

Expected Wind Microclimate

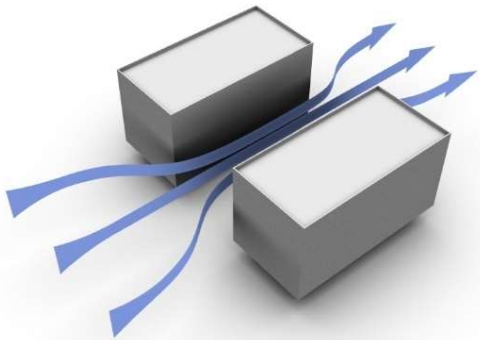
Wind Effects

- The introduction of taller buildings to areas of predominantly low rise development have the potential to introduce windier conditions, both on and off site, as a result fluid-building interactions, such as downdraughts, corner accelerations or flow channelling.
- **Downdraughts -** Buildings substantially taller than their surroundings, have the potential to create a windy microclimate at ground level as a result of the massing redirecting the wind flow from higher levels (where wind speeds are higher) to ground level.
- **Corner acceleration –** When a building corner is exposed to prevailing winds this creates a pressure drop downstream. The air is thus forced to gain speed around the corner, leading to increased wind speeds and less comfortable wind conditions.
- **Channelling –** Buildings in close proximity to each other, particularly where the area between is aligned with the prevailing wind direction, "squeezes" the wind through a smaller area resulting in wind acceleration.
- In the following pages the wind conditions are graphically displayed using various colours to indicate the comfort levels. These diagrams show the conditions resulting from all wind directions For winds from a particular wind direction, with streamlines of strong wind flow simplified for graphical purposes.

Example of downdraughts



Example of flow accelerating around a corner



Example of channelling

Expected Wind Microclimate

Existing Site Conditions

- The existing site contains a large surface car-park and a two-storey retail warehouse.
- As the existing building on the site is similar in height to neighbouring 2-3 storey residential units, and due to the shelter provided by mature existing trees along the southern edge of the site, conditions within the existing site are expected to be in the 'standing' range in most places.
- Corner acceleration – when a building corner is exposed to prevailing winds this creates a pressure drop and an acceleration of flow near the corner. Therefore some areas around the corners of the existing building will feature slightly higher 'strolling' level winds, but this is acceptable for the walking access use.
- The northern edge of the site will also feature 'strolling' conditions as the sheltering effect of the existing industrial building reduces .
- Figure 6 shows a simplified plot of the worst season (typically 'winter) comfort conditions expected around the existing site according to Lawson comfort criteria.

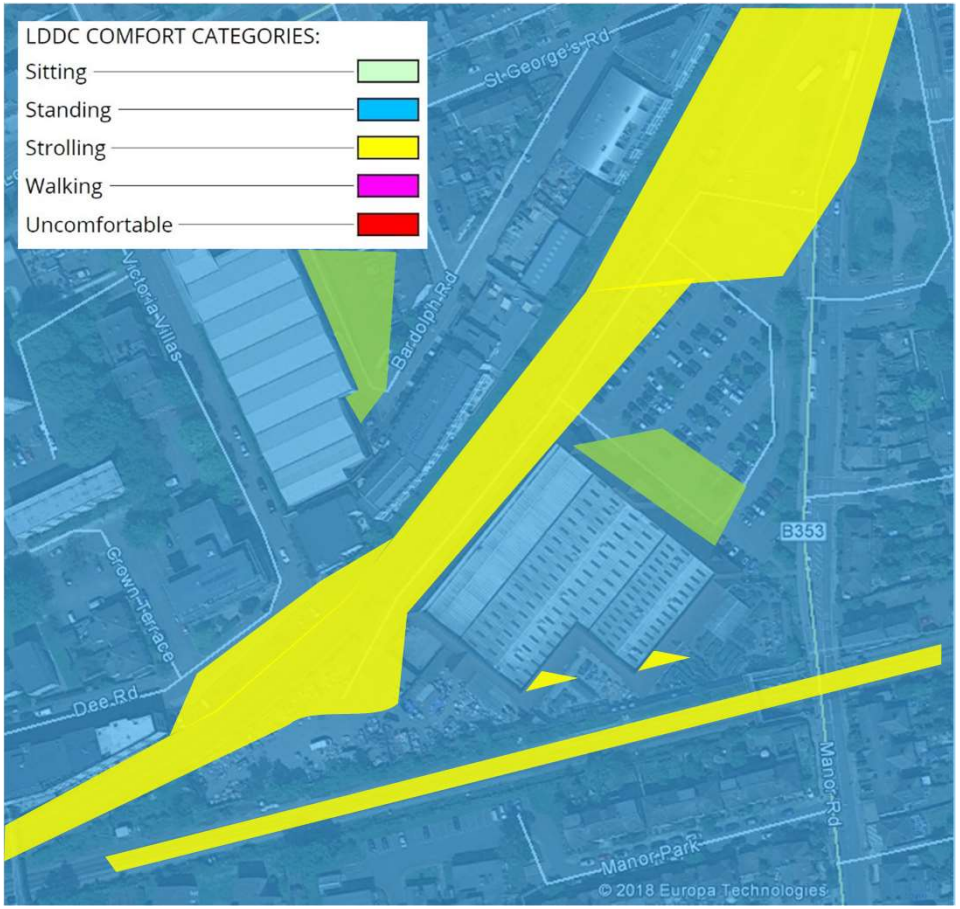


Figure 6: Aerial view of the existing site, with the expected wind conditions.

Expected Wind Microclimate

Proposed Site – Ground-Level Conditions

- Figure 7 shows a simplified plot of the worst season (typically winter) wind conditions around the site without landscape features. The summer conditions would be one comfort category lower in most areas.
- The Amended Proposed Development site benefits from the general arrangement of the buildings with respect to prevailing winds, which creates significant mutual shelter amongst proposed buildings.
- The most exposed part of the site is the southwest corners of Blocks B and C as well as the southern corners of Block D. 'Strolling' conditions are expected in these areas. Main entrances in these areas without landscaping would be windier than required for the intended use.
- Block B is exposed to westerly winds, and is expected to create 'Strolling' conditions to the north and south of this block.
- Conditions in all areas are considered to be within the safety criteria.
- Throughout the design of the Amended Proposed Development, additional landscape features have been incorporated as part of the design (please see Section 3 for further details) to improve the pedestrian comfort at the general private amenity areas around the corners of Blocks B, C and D. These take the form of clusters of semi-mature trees, and localised sheltering of amenity areas using hedging.
- The impact on railways lines is also expected to be minimal, although it is noted that no criteria exists with respect to wind effects on trains.

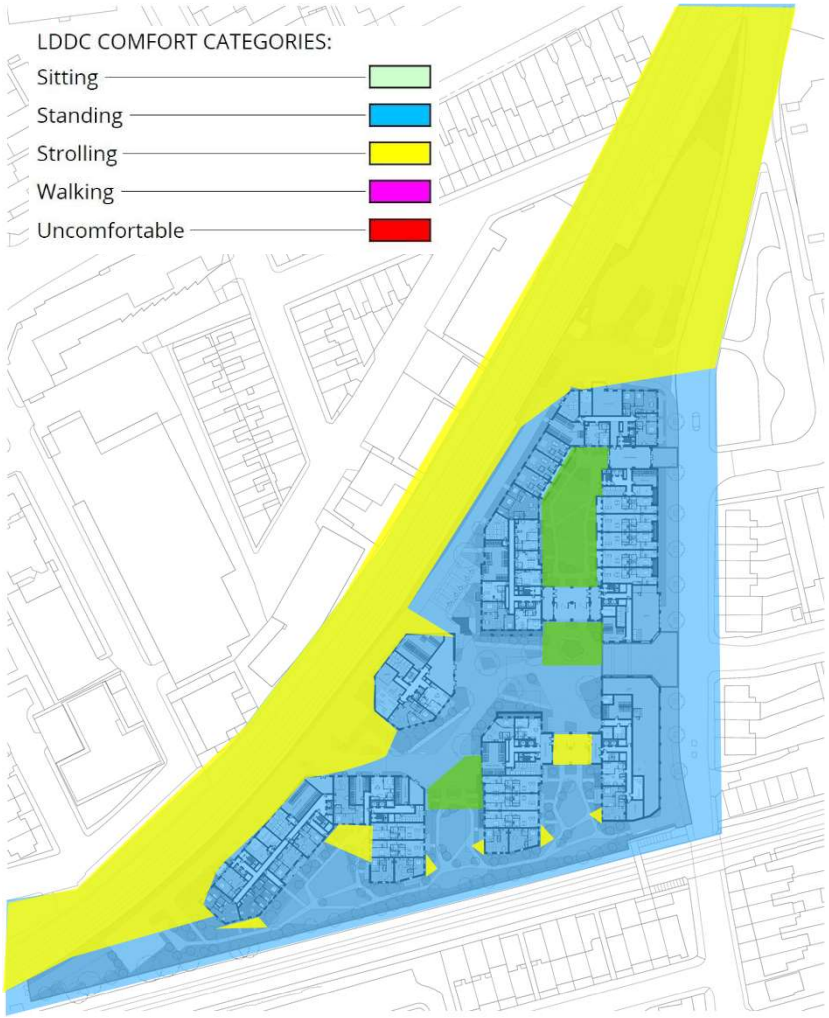


Figure 7: Plan view of the proposed site, with the expected wind conditions.

Expected Wind Microclimate

Proposed Site – Terrace-Level Conditions

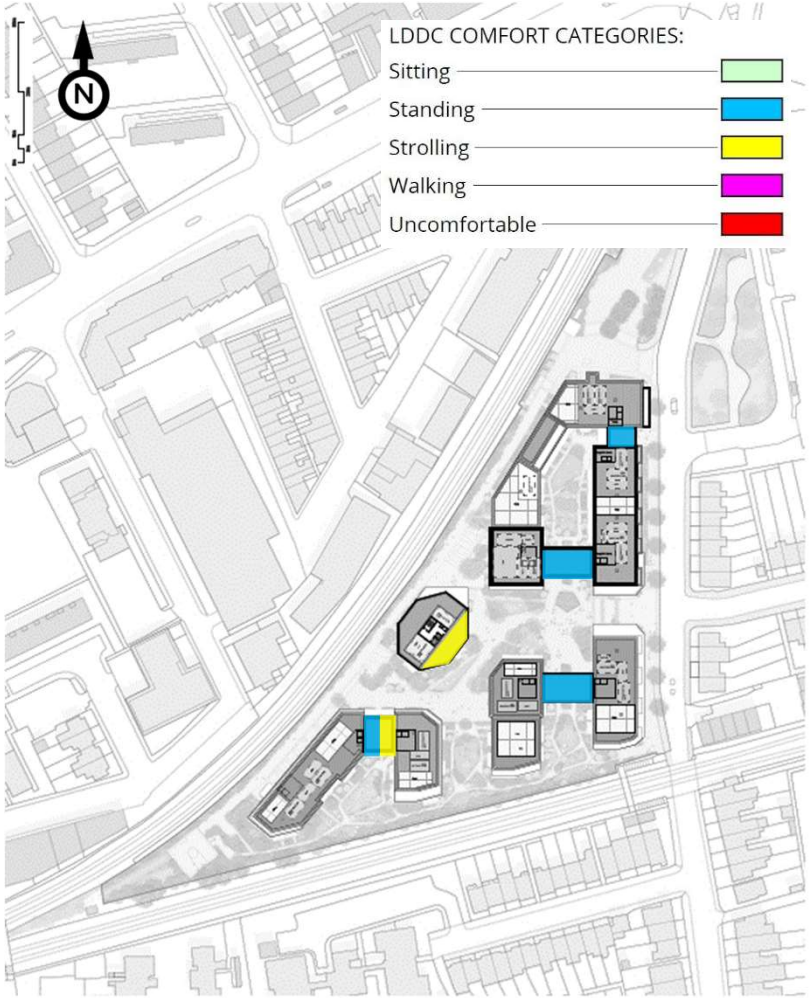


Figure 8: Plan view of the proposed terraces, with the expected wind conditions for the scenario without wind mitigation measures.

- Figure 8 shows the summer season wind conditions at upper-level terraces, with the assumption that there will be no landscaping at these terraces and porous balustrades will be used. Windiest season (winter) conditions would be one comfort category windier.
- Block A and Block D would have generally calm wind conditions suitable for standing use without landscaping in situ during the summer season. These wind conditions would be suitable for general amenity use however localised mitigation measures would be required at seating areas.
- Block B features an upper-level terrace which will be exposed to the prevailing southwest winds. 'Strolling' level wind conditions are expected in these areas. This would be windier than required for amenity use.
- Similarly, Block C has communal amenity terraces facing/exposed to the prevailing southwest winds, which will have 'Strolling' range and would require mitigation.
- Terraces with strolling use wind conditions during the summer season could also have unsafe wind conditions.
- Mitigation measures have been incorporated into the design of these terraces. The effectiveness of these measures is described in Section 3. Further mitigation measures that would be required are discussed in Section 4.

Expected Wind Microclimate

Proposed Site – Balcony Level Conditions

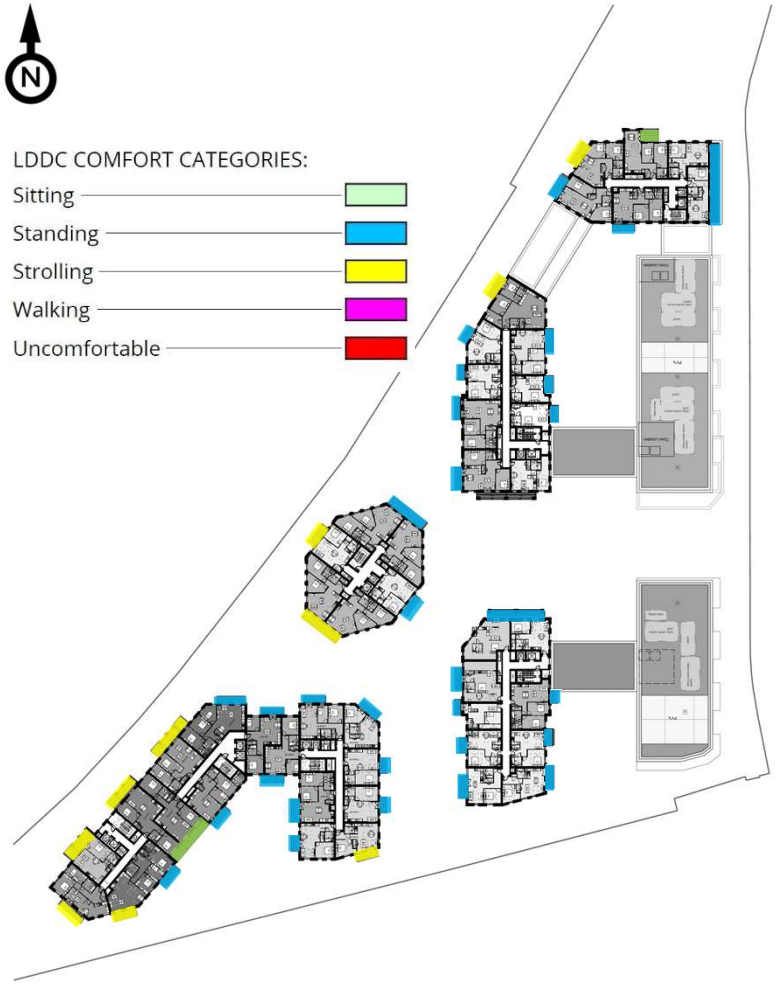


Figure 9: Plan view of the proposed balconies at the 6th floor, with the expected wind conditions for the scenario without wind mitigation measures.

- Figure 9 shows the summer season wind conditions at upper-level balconies representing the 6th floor and higher.
- The balconies all have railing balustrades which would not provide shelter against winds.
- The majority of balconies would be expected to be suitable for standing use or calmer during the summer season, as they are sheltered from the prevailing south-westerly winds.
- However, several balconies, particularly facing south-west and near westerly corners, would be expected to have windier conditions suitable for strolling use during the summer season.
- This is windier than required for private amenity use. Furthermore, unsafe wind conditions could also occur at these locations.
- Mitigation measures would be required at these balconies. This has been discussed further in Section 4.

6

Wind Improvement Measures Incorporated into the Design

Incorporated Mitigation Measures

Ground-Level Mitigations

- As part of the design development, specific landscape features have been incorporated into the design to improve the wind conditions in various parts of the site. These include the following;
  - The residential amenity spaces are to be sheltered with dense hedging and trees around Blocks B, C and D.
  - Localised hedging will be incorporated near the residential entrances on the south side of Block C and D, as well as on the south side of Block B.
  - Clusters of trees have been places the south-western corners of Blocks B and C
  - Dense line of mature trees are to be retained and reinforced along the south edge of the site, to reduce the impact of southerly and south-westerly winds on the general amenity spaces on the southern side of the site.
- With these features in place no further wind mitigation is considered necessary to achieve the required wind conditions at ground-level.
- Wind conditions around the existing residential properties around the site will also continue to be acceptable.

Figure 10: Landscape plan with elements incorporated for improving wind conditions around the blocks.

Incorporated Mitigation Measures

Terrace-Level Mitigations

- Page 16 of this report provides the wind conditions on terraces with no balustrades or landscaping. In this 'worst case' scenario upper-level terraces will be inherently subjected to stronger winds.
- Most terraces within the site are intended as general amenity space for residents, mostly used on good weather days. However, further mitigation around seating areas would be required, which would also improve the usability of the spaces.
- Terraces on Blocks B and C would have strolling use wind conditions which is windier than required for general amenity use and could also have associated unsafe winds.
- The balustrades at the terraces are 1.2m tall and solid. Balustrades of this height would not provide significant shelter to a person, and therefore would be unlikely to mitigate wind conditions.
- However, landscaping in the form planters have been included on the terraces around the site (see Figure 11). It is expected that the planters on the northern terrace on Block A would result in wind conditions which would be suitable for the intended use. The planters would need to be of 1.5m total height.
- The northern area of the Block B terrace is expected to benefit from the proposed landscaping. However, the southern area, which is most exposed to prevailing winds, would receive little shelter form the proposed landscaping and would require further mitigation measures, discussed in Section 4.
- The seating areas at the southern Block A terrace and Block D terrace, as well as the southern portion of the Block B terrace would require further mitigation measures to be suitable for the intended use. Potential mitigation measures are discussed in Section 4.
- The eastern half of the Block C terrace would benefit from the introduction of the proposed landscaping scheme and would not require further mitigation measures, provided planters are of a total height of 1.5m.
- The proposed landscaping at terraces, as well as recommended planter heights, is shown on the following page (Figure 11).

Incorporated Mitigation Measures

Terrace-Level Mitigations

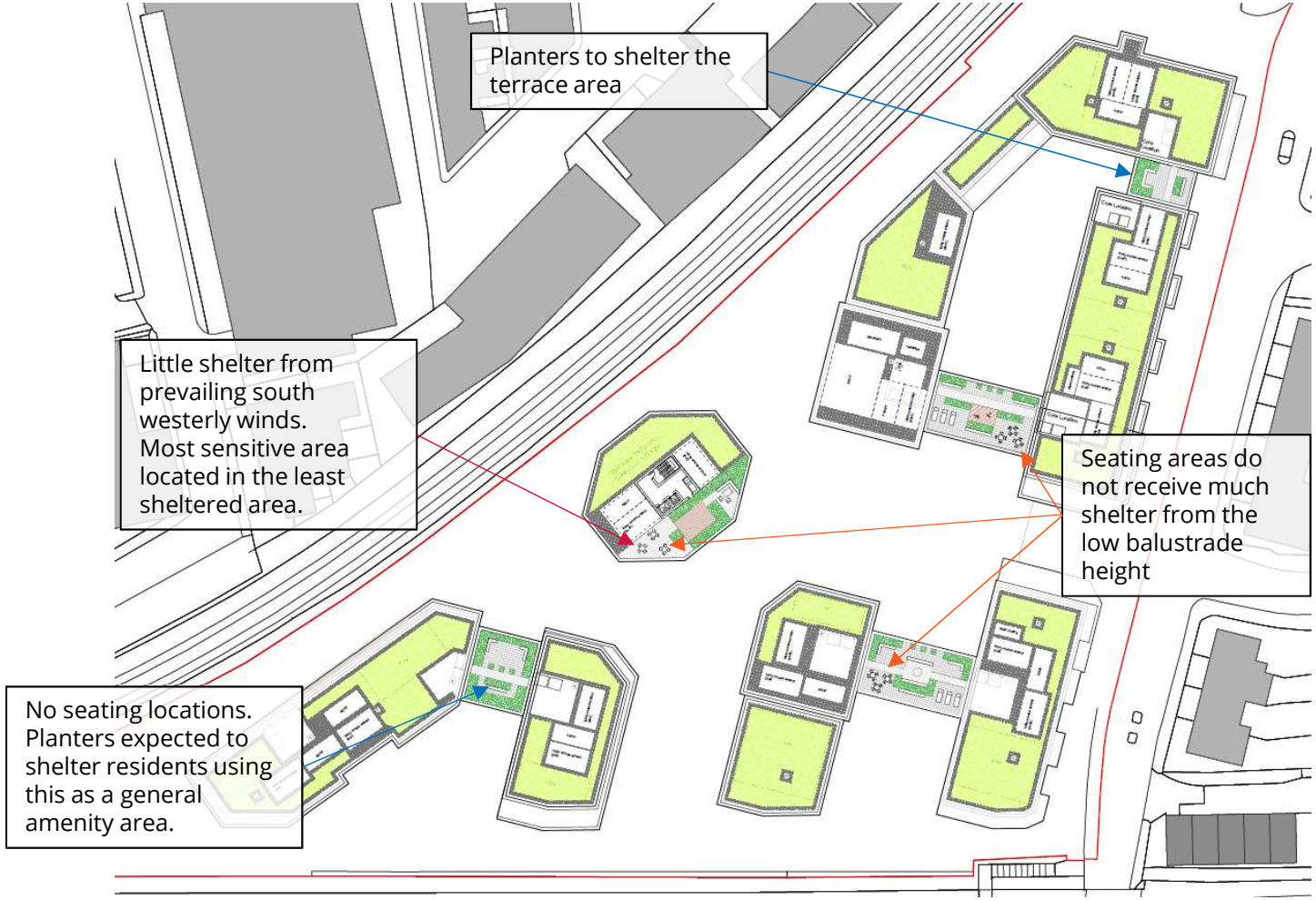


Figure 11: Proposed terrace mitigation.

All planters must be a total of 1.5m in height (planter and dense shrub) to disrupt the wind flow and provide shelter to seating areas.

Further mitigation measures would be required at the southern Block A terrace and at terraces on Blocks B and D.

These measures are discussed in Section 4 and should be secured via a planning condition.

Further Mitigation Measures

4

Further Mitigation Measures

Terrace-Level Mitigations

- The seating areas at the southern Block A terrace and the Block D terrace would not be expected to receive sufficient shelter to achieve the particularly calm conditions required to be comfortable. Increasing the southern balustrades to 1.5m solid options would provide more shelter to these areas. Alternatively, moving the seating to be immediately to the north-east of 1.5m planters would also provide shelter.
- The Block B terrace would receive little shelter from prevailing south-westerly winds with the current proposed landscaping scheme. Furthermore, this area is intended for seating use which requires much calmer conditions.
- It is recommended that the balustrade at the Block B terrace is increased to 1.5m (solid). Furthermore, additional planters (1.5m total height) and trees (at least 3m height) should be locates to the south and south-west of the seating areas to achieve suitable wind conditions.
- **These mitigation measures are to be developed at the detailed design stage in conjunction with an experienced wind engineer and should be secured through an appropriately worded planning condition.**

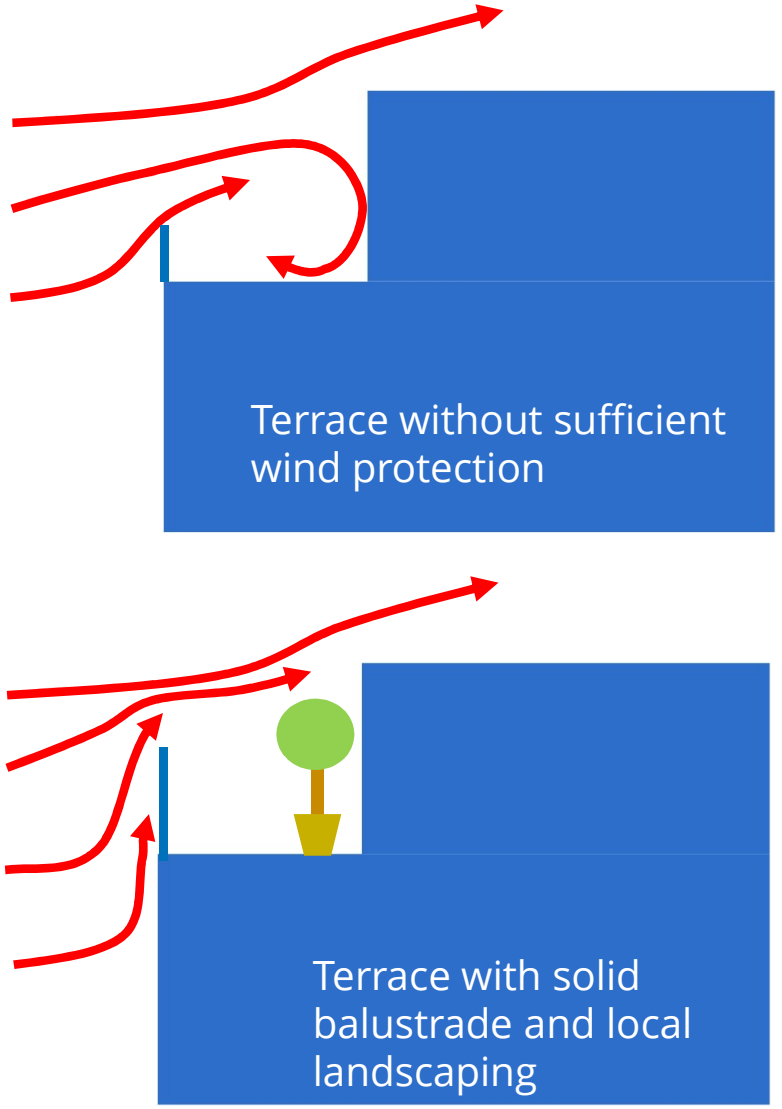


Figure 12: Sketch showing the effect of mitigation at terrace levels.

Further Mitigation Measures

Balcony-Level Mitigations

- Railing balustrades would provide no shelter against oncoming winds. Therefore the more exposed balconies or balconies subject to corner accelerations are expected to be too windy for the intended use and potentially unsafe.
- Replacing the railing balustrades at the noted balcony locations (on page 19) with a solid options of 1.5m height would provide more shelter and would therefore be expected to result in suitable wind conditions.
- Alternatively, a solid or (up to 50% porous) screen on one or both sides of the balcony would also provide shelter. These screens would need to be full height (i.e. to the floor plate of the balcony above).
- If one side screen is preferable, the screen would need to be located on the downwind side of the affected balcony as shown in Figure 13.
- **These mitigation measures are to be developed at the detailed design stage in conjunction with an experienced wind engineer and should be secured through an appropriately worded planning condition.**

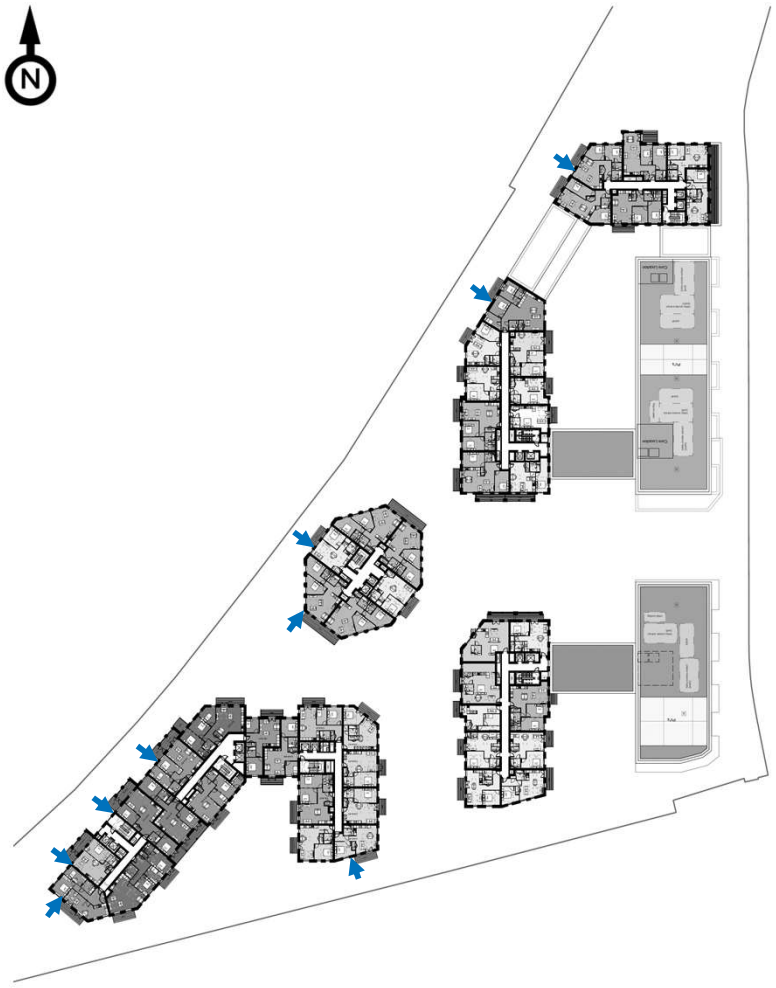


Figure 13: Mark-up of downwind screen locations for balcony mitigation.

Conclusions and Recommendations

Conclusions and Recommendations

- A revised wind microclimate desk based assessment has been undertaken to assess the Amended Proposed Development at Manor Road in the London Borough Richmond upon Thames.
- The arrangement of the proposed buildings is highly beneficial, as the upwind blocks provide shelter to the rest of the site from the prevailing south-westerly winds.
- Using the widely-accepted Lawson wind microclimate criteria, wind conditions in majority of the site are expected to be in the 'Standing' range during the worst season (typically winter). Summer conditions are expected to be one category calmer and in the 'Sitting' range around most of the site.
- These conditions would be acceptable for entrances, walking access, and general amenity spaces.
- The only exception are the areas near the southwest corners of Blocks B, C and D, which are more exposed to prevailing winds and will feature 'Strolling' level winds during worst season. 'Strolling' conditions would continue to be acceptable for walking access, but not acceptable in some of the amenity spaces or entrances.
- The roof terraces at Blocks A and D would have wind conditions suitable for general amenity use without landscaping in situ; however seating areas would be too windy for the intended use. Terraces at Blocks B and C would have wind conditions windier than required for general amenity use with potential associated unsafe winds without any landscaping in situ.
- Balconies would generally be suitable for the intended use. However the more exposed balconies or balconies subject to corner accelerations are expected to be too windy for the intended use and potentially unsafe; receiving little shelter from the railing balustrades.
- As part of the previous design development carried forward to the Amended Proposed Development, embedded mitigation in the form of landscaping has been included at ground level which would be expected to result in suitable wind conditions throughout the ground floor. The proposed landscaping would also be beneficial at the northern Block A terrace and the Block C terrace. With planters of 1.5m in total height (planter and dense shrub), no further mitigation would be required in these areas.

Conclusions and Recommendations

- Several areas have been noted which would be expected to require additional mitigation measures.
- Although the proposed landscaping may improve wind conditions in localised areas of the terrace, further measures would be required at the following terraces:
  - Block B terrace to alleviate unsuitable and potential unsafe wind conditions – 1.5m solid balustrades as well as additional 1.5m planters and 3m trees to the south and south-west.
  - Block D terrace to alleviate unsuitable wind conditions at seating areas – 1.5m solid balustrade to the south of the terrace or moving seating areas to the north-east of 1.5m tall planters.
- In addition to the noted terraces, balconies from the 6th floor upwards at the more exposed western façade of Block C, as well as several corner balconies on Blocks A, B, C and D would also require additional mitigation measures. One of the following recommendations would be expected to result in suitable wind conditions:
  - 1.5m solid balustrades
  - Full height solid or (up to 50%) porous side screens on both sides of the balcony
  - Full height solid or (up to 50%) side screen on the downwind side of the balcony.
- **These mitigation measures are to be developed at the detailed design stage in conjunction with an experienced wind engineer and should be secured through an appropriately worded planning condition.**
- With the above additional mitigation measures (secured through an appropriately word planning condition) in place, wind conditions around the Amended Proposed Development would be expected to be suitable for the intended use and safe. These wind conditions would also be an improvement to the Original Proposed Development.