Redefining possible.

MANOR ROAD - RICHMOND

LONDON, UK

WIND MICROCLIMATE ASSESSMENT

May 2019

RWDI #1901113

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Introduction

Executive Summary

- RWDI was retained by GVA to carry out a wind microclimate design review of the proposed Manor Road development in the London Borough of Richmond upon Thames.
- This report will discuss potential impacts of the 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 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 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 proposed development is not expected to change the wind conditions around the existing residential buildings around the site.

Figure 1: Early-stage model of the Proposed Development in the surrounding context

Introduction

Legislation and Planning Policy Context

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.

Planning Practice Guidance (2014)

4. The Planning Practice Guidance (PPG) (Ref. 11-2) identifies the potential for a building's size and shape (particularly in the case of tall and large buildings) to affect the wind microclimate. Under the section addressing *'Design: How should buildings and the spaces between them be considered?'*, the PPG states in Paragraph 25 and 26 ('Consider Form' and 'Consider Scale' respectively) that:

   'Some forms pose specific design challenges, for example how taller buildings meet the ground and how they affect local wind […] patterns should be carefully.' And that: *'Account should be taken of local climatic conditions, including […] wind'.*

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. *Section 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. *Section 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."

Emerging London Plan

The draft London Plan notes in section D7-F 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.". Also, D8-3 notes that Environmental Impacts including wind should be carefully considered.

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."

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.

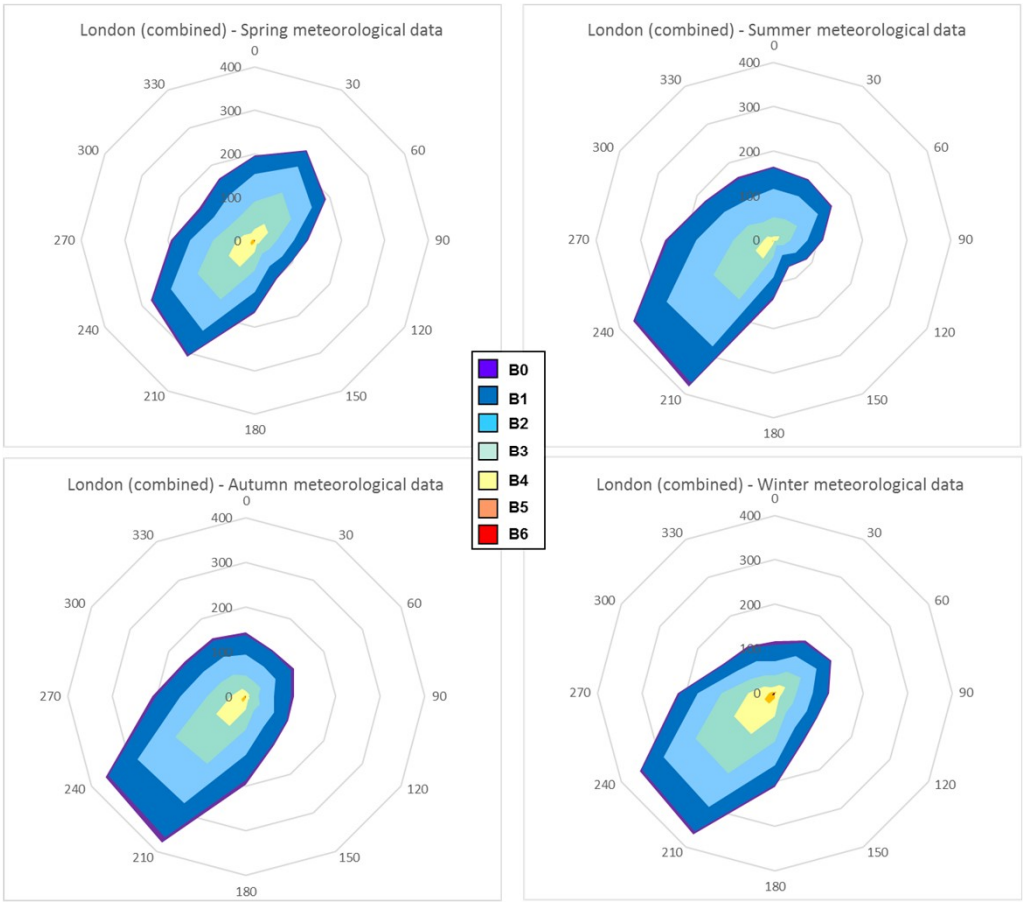


Figure 2: Wind rose for combined London airports (Gatwick, Heathrow and Stansted)

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 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.

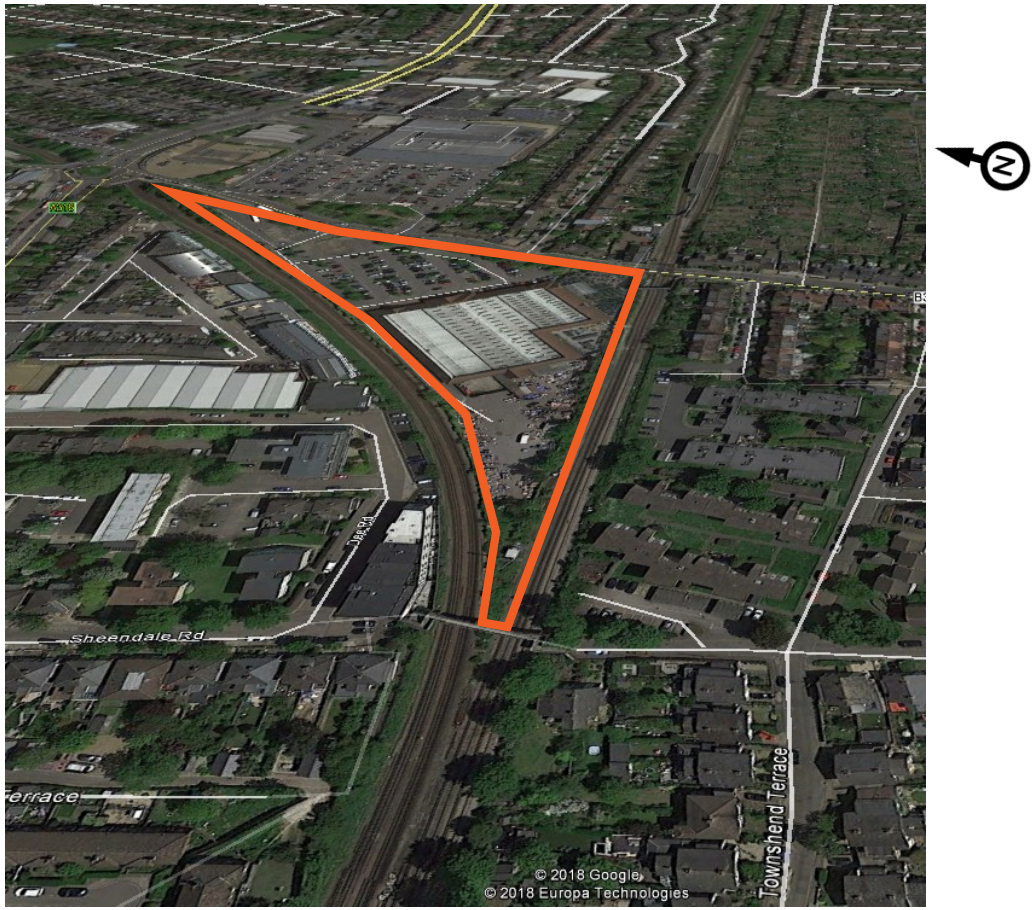


Figure 3: Aerial view of the Proposed Development location (site boundary highlighted red), viewed from the prevailing west-southwest winds.

Introduction

Proposed Development

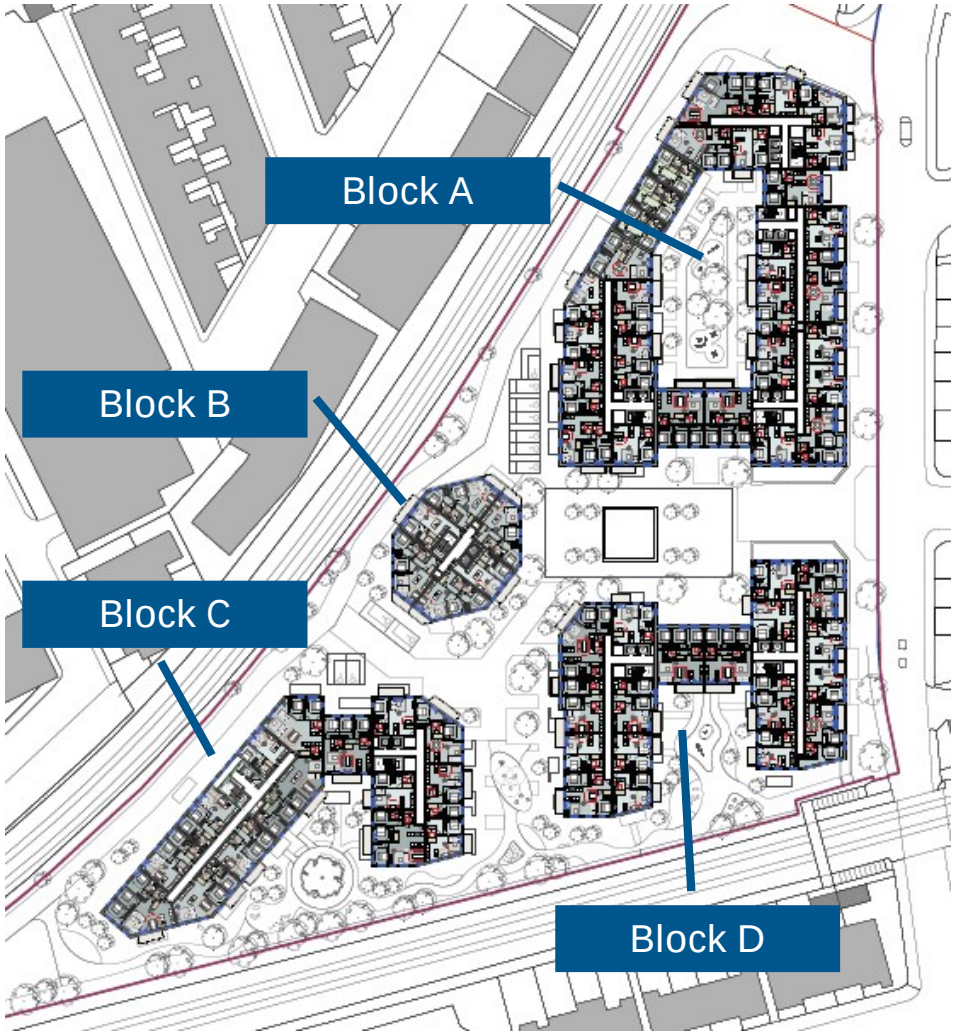
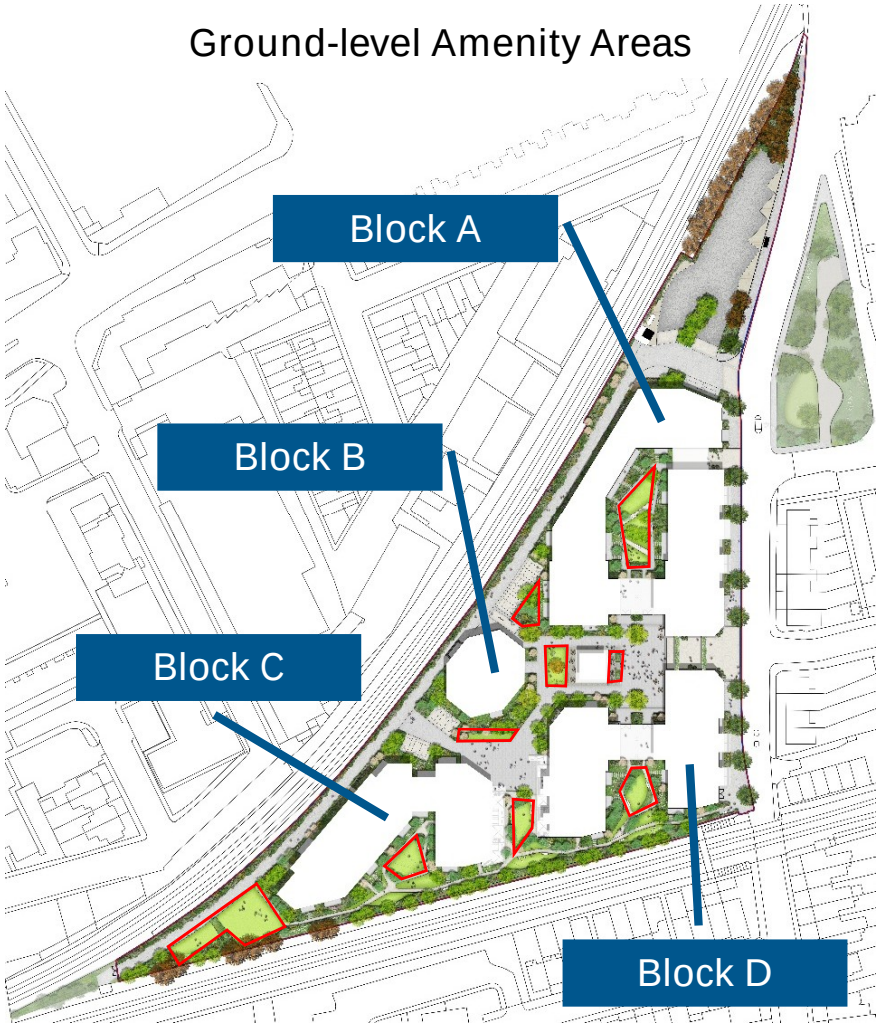


Figure 4: Plan view of the Proposed Development

- The Proposed Development comprises of four blocks as follows;
  - Block A is on the northeast side of the site and ranges from 1 to 9 storeys,
  - Block B is a stand-alone building of up to 9 storeys,
  - Block C is the most exposed building for prevailing southwest winds, and is up to 7 storeys, with terraces facing the prevailing winds.
  - Block D is located on the southeast side of the site and ranges in height from 3 to 9 storeys.
- The taller 9 storey 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 and play provision around a one-storey pavilion at the centre of the site.
- There are also pockets of usable green spaces at ground and terrace levels, as shown in the following slide.

Introduction

Proposed Development



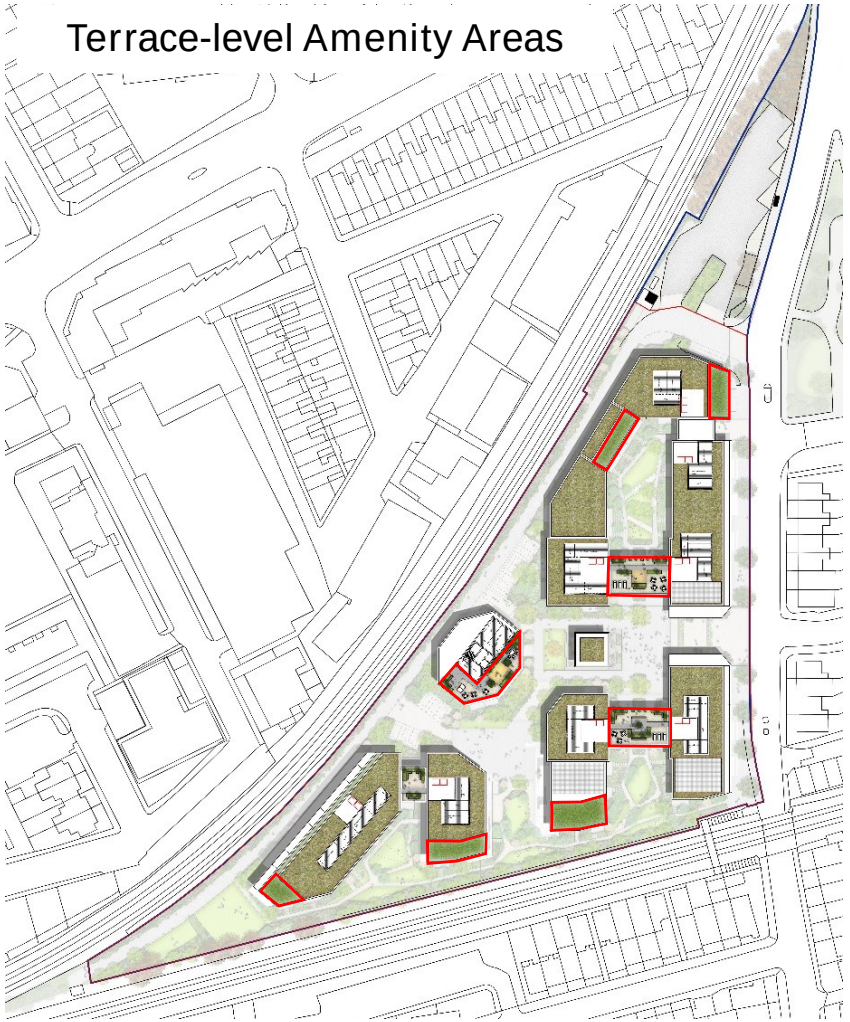


Figure 5: Plan view of the Proposed Development showing ground-level and terrace-level amenity areas.

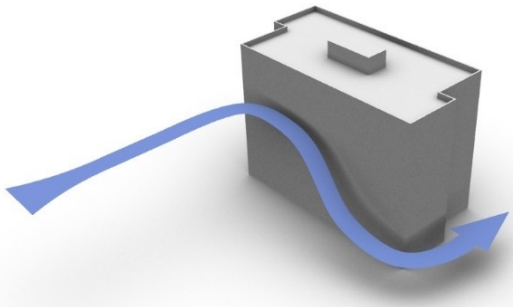
Expected Wind Microclimate

Expected Wind Microclimate

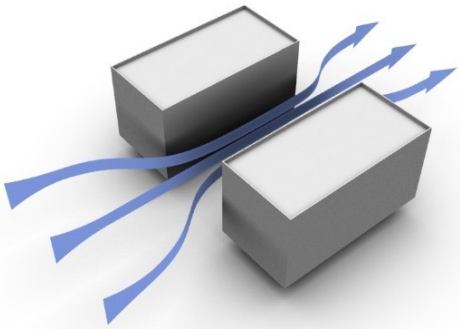
Wind Effects

- 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 'leisure walking' level winds, but this is acceptable for the walking access use.
- The northern edge of the site will also feature 'leisure walking' conditions as the sheltering effect of the existing industrial building reduces .
- The figure 6 shows a simplified plot of the worst season (typically 'winter) comfort conditions expected around the existing site according to Lawson comfort criteria. Streamlines of wind for different directions have been combined and simplified for graphical purposes.

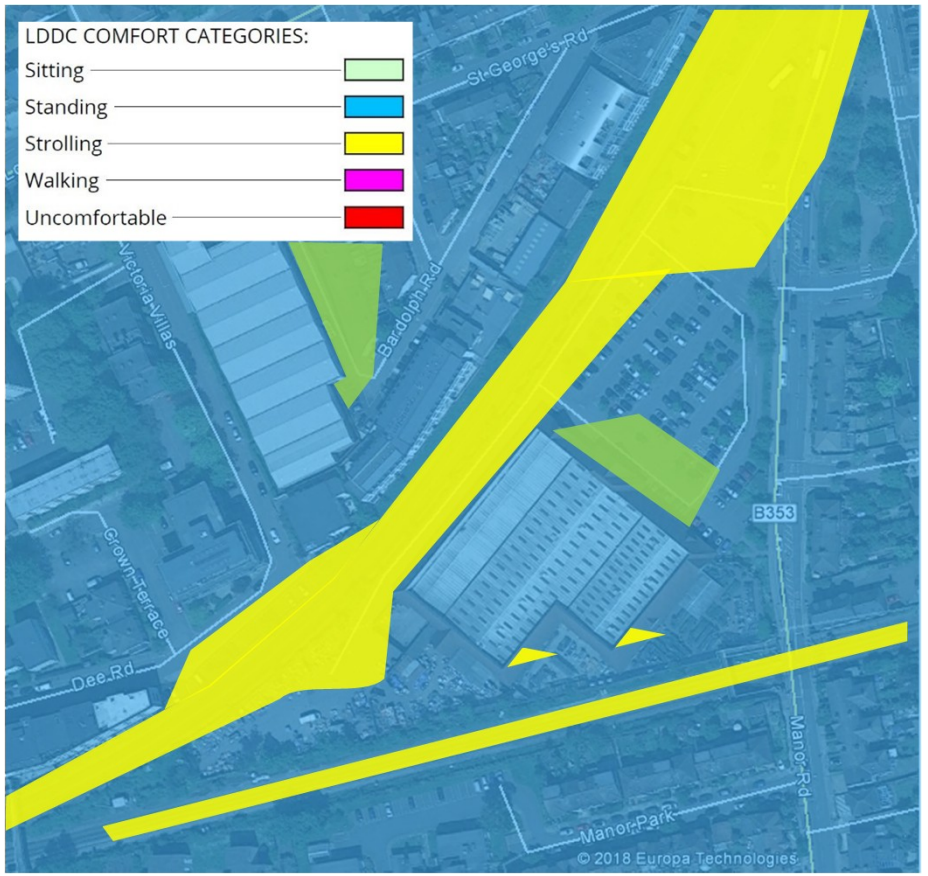


Figure 6: Aerial view of the existing site, with the expected wind conditions.

Expected Wind Microclimate

Proposed Site – Ground-Level Conditions

- The figure 7 shows a simplified plot of worst season (typically winter) wind conditions around the site without landscape features. The summer conditions would be one category lower in most areas.
- The proposed 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 C and D. 'Strolling' conditions are expected in these areas.
- 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 development, additional landscape features have been incorporated as part of the design (please see landscape plans on Page 18 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 semi-mature cluster of trees, and localized sheltering of amenity areas using hedging.
- The development is not expected to have any adverse wind effects on the existing residential properties around the site. 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

- The figure 8 shows the worst season (typically winter) wind conditions at upper-level terraces, with the assumption that there will be no landscaping at these terraces and porous balustrades will be used. Summer season conditions would be one category calmer.
- Block B features several upper-level terraces which will be exposed to the prevailing southwest winds. 'Strolling' level wind conditions are expected in these areas.
- Similarly, Blocks C and D have private amenity terraces facing the prevailing southwest winds, which will have 'Strolling' range and would benefit form mitigation.
- Mitigation measures have been incorporated into the design of these terraces, as described in the subsequent sections.

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

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 part 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.

- Localized 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.

- 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 9: 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, as shown beside.
- Most terraces within the site are intended as general amenity space for residents, mostly used on good weather days.
- To improve the usability and comfort of the terraces on Blocks B, C and D, glass balustrades of 1.5m high and small scale planting (that is safely secured) will be used to provide 'Standing' level conditions in the winter and 'Sitting' level conditions in the summer seasons.
- With these mitigation measures in place, the terraces are expected to acceptable conditions for occasional good weather use in warmer months of the year.

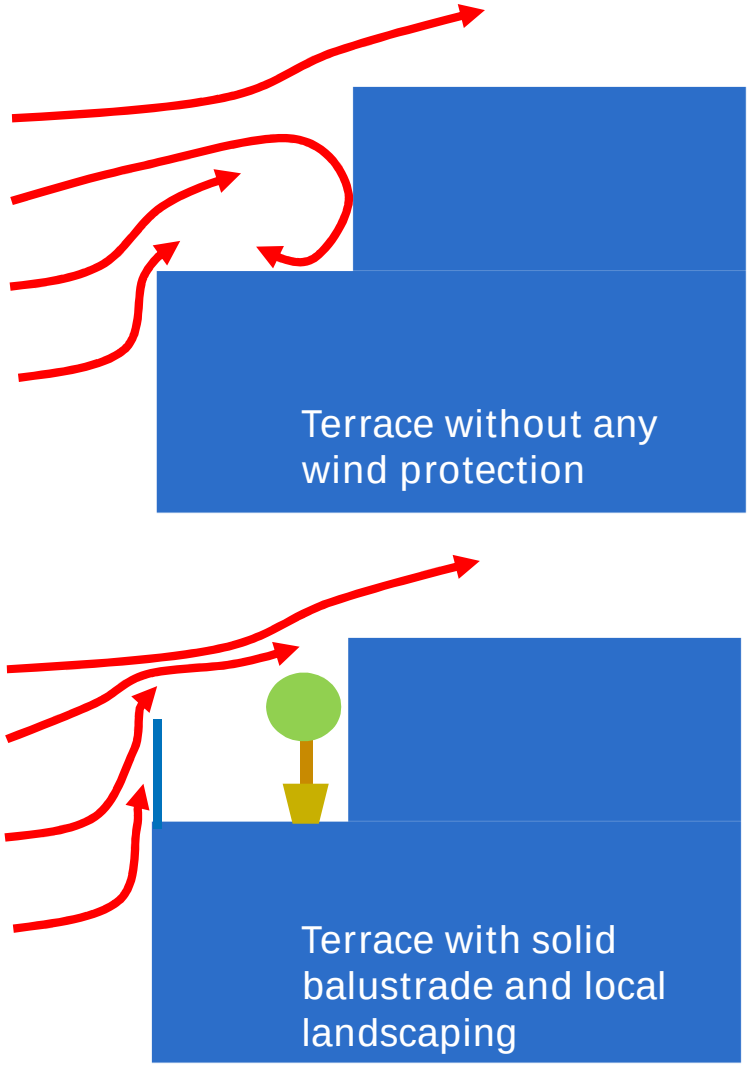


Figure 10: Sketch showing the effect of mitigation at terrace levels.

Conclusions and Recommendations

Conclusions and Recommendations

- A desk based review was carried out to identify likely windy areas around Manor Road development in Richmond, UK.
- The arrangement of the proposed buildings is highly beneficial, as the upwind blocks provide shelter to the rest of the site for 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.
- As part of the design development, increased density of hedging or landscaping has been incorporated to improve the pedestrian comfort around the residential amenity areas around Block B, C and D. These will be implemented through a phased programme of planting in association with the occupation of each phase to provide localized shelter to the amenity areas. Similarly, some of the windier terraces on Blocks B, C and D will feature 1.5m high glass balustrades and small-scale landscaping to achieve 'Standing' conditions during winter and 'Sitting' conditions during summer.
- With these localized mitigation measures in place, wind conditions across the entire site is expected to be suitable for the intended amenity and pedestrian activities.
- No adverse wind effects are expected for existing residential properties around the site, due to the orientation of the proposed scheme, presence of railways lines and the predicted calm wind conditions in the area.