

CAVERSHAM ROAD

READING, UK

PEDESTRIAN LEVEL WIND TUNNEL ASSESSMENT

RWDI #1900850 REV B

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SUBMITTED TO

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VERSION HISTORY

RWDI Project #1900850 Caversham Road Reading, UK		
Report	Releases	Dated
Reports	Rev A	May 19, 2020
	Rev B	May 22, 2020
Project Team	Matthew Rodwell	Project Engineer
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1. INTRODUCTION

RWDI was retained by Chartplan to conduct a desk-based microclimate assessment for the proposed mixed-use Caversham Road development (hereafter referred to as the Proposed Development) in Reading, due to post submission alterations in the design of the scheme and additional cumulative schemes.

The objective of this assessment was to analyse the impact of the revised Caversham Road development on ground, podium and roof terrace level wind environment, in support of an outline planning application. Also, this study evaluates the impact of several additional cumulative schemes have been identified in the surrounding area since the original planning submission in 2018.

Previously wind tunnel tests were conducted in support of the original planning application (ref: 182252) to quantify the pedestrian comfort and safety conditions across the site. The wind tunnel tests highlighted two key areas of concern; one at the southeast corner of Tower A as a result of winds downdrafting from this high-rise block, and the other along the exposed western edge of the Site as a result of prevailing south-westerly winds. Wind mitigation measures and landscape features were strategically designed and tested to verify their effectiveness for improving the wind conditions around the original scheme.

Since the submission of the scheme several design changes have occurred as follows:

- Tower A has been reduced in height by 9m above ordnance datum (AOD)
- The tower of Block C has been reduced in height by 1m AOD.
- The massing between Tower A and Block C (previously unlabelled) has increased in height by 4m AOD.
- There have been minor changes to the footprint of Block C with the southern façade extended outwards into the courtyard space to be parallel with the western end of the Block; and
- There has also been an alteration to the massing of Block B to make a clean cut with the office of Block C.

The revised scheme has a lower Tower A, which would in-turn create slightly reduced windiness around the south-eastern part of the Site. The massing of buildings on the western edge of the Site has remained largely the same, indicating that wind conditions to the west of the site would remain similar to those measured in the previous wind tunnel tests.

Therefore, in RWDI's professional opinion, the wind conditions around the revised scheme would be similar to those presented in the original wind microclimate assessment conducted by RWDI on 1st May 2019 (ref: 182252). **As such the same mitigation measures and landscaping scheme would be necessary to achieve a suitable wind microclimate around the Proposed Development. It is recommended that further wind tunnel studies are carried out in detailed design stages of each phase of the site to optimise the wind mitigation measures in response to detailed building designs.** This also allows the wind mitigation strategy to respond to the precise location of amenity areas and building entrances, which can change during detailed design.



Since the original submission six new cumulative schemes have been identified in the wider area around the site. Four of these cumulative schemes are over 360m away from the centre of the Proposed Development and as such are not expected to have cumulative wind microclimate effects with the revised scheme. The cumulative impacts arising from the two other cumulative schemes, namely 55 Vastern Road and Vastern Court, on the wind microclimate have been qualitatively assessed in Section 5 'Cumulative Effects' of this technical addendum. Based on RWDI's professional judgement, no adverse cumulative wind microclimate interactions would be expected to occur between the revised Caversham Road scheme and these cumulative schemes.

2. BACKGROUND AND APPROACH

Wind tunnel tests were conducted on a 1:300 scale model of the Submitted Scheme, located on Caversham Road (referred to as the “Site” hereafter in this report), in Reading, UK on the 1st May 2019 (ref: 182252). The assessment quantified the wind conditions within and around the Site, by comparing the measured wind speed and frequency of occurrence with the widely used Lawson Criteria at 240 measurement locations, including possible main entrance locations, pedestrian routes within and around the Site, as well as at rooftop and podium terraces. It is noted that the precise locations of entrances and amenity areas could change depending on the detailed design, so at this stage the most likely amenity and entrance locations have been considered.

Four configurations of the wind tunnel model were previously tested, as follows:

- Configuration 1: Existing Site with Existing Surrounding Buildings;
- Configuration 2: Proposed Development with Existing Surrounding Buildings;
- Mitigation: Proposed Development with landscaping, wind mitigation and existing surrounding buildings; and
- Configuration 3: Proposed Development with landscaping, wind mitigation and Cumulative Surrounding Buildings.

In order to assess the wind microclimate around the revised scheme, initially a review of floor plans and elevations was conducted and compared to the submitted scheme’s floor plans and elevations. A qualitative review was then conducted to evaluate the impact of the proposed amendments to the scheme on the wind microclimate at the Proposed Development and surrounding area.

2.1 Proposed Amendments

Subsequent to the submission of the scheme, the following design amendments have been made:

- Tower A has been reduced in height by 9m above ordnance datum (AOD);
- The tower of Block C has been reduced in height by 1m AOD;
- The massing between Tower A and Block C (previously unlabelled) has increased in height by 4m AOD; and
- There have also been minor changes to the footprint of Block C with the southern façade extended outwards into the courtyard space to be parallel with the western end of the Block; and
- There has also been an alteration to the massing of Block B to make a clean cut with the office of Block C.

As a result of these design amendments Tower A of the Proposed Development would now be 24 storeys in height, 23 of which would be residential floors and one of which will be a retail space. This is down from 25 storeys in the submitted scheme. Building C would become 8 storeys tall, 7 office floors and one retail floor, down from 11 storeys in the submitted scheme. An additional floor is to be added to the massing between Tower A and Block C increasing this element of the scheme from 7 storeys in height (in the submitted scheme) to 8 storeys in height (in the revised scheme).

The southern façade of Block C (southern façade of the community centre and a residential entrance in the submitted scheme) has been extended into the courtyard space to be parallel with the southern façade at the western end of this block. The massing of Block B has also been slightly been altered to create a clean separation with the office of Block C.

3. METHODOLOGY AND ASSESSMENT CRITERIA

The methodology of the previous assessment is discussed within the pedestrian level wind microclimate assessment conducted by RWDI on 1st May 2019 (ref: 182252). The assessment criteria have been re-iterated below for the readers benefit.

3.1 Pedestrian Comfort

The assessment of the wind conditions requires a standard against which the measurements can be compared. This report uses the Lawson Comfort Criteria, 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 Lawson Criteria sets 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 pedestrian are more likely to take on a leisurely pace, with the intention of taking time to move through the area, whereas in the walking scenario pedestrians are intending to move through the area quickly and are therefore expected to be more tolerant of stronger winds.

The Criteria are derived for open air conditions and assume that pedestrians will be suitably dressed for the season. Thermal comfort is discussed with reference to acceptable wind environments but not evaluated as part of the assessment.

The coloured key in Table 1 corresponds to the presentation of wind tunnel test results described later in this report.

Table 1: Lawson Comfort Criteria

Key	Comfort Category	Threshold	Description
	Sitting	0-4 m/s	Light breezes desired for outdoor restaurants and seating areas where one can read a paper or comfortably sit for long periods
	Standing	4-6 m/s	Gentle breezes acceptable for main building entrances, pick-up/drop-off points and bus stops
	Strolling	6-8 m/s	Moderate breezes that would be appropriate for 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

Key	Comfort Category	Threshold	Description
	Uncomfortable	>10 m/s	Winds of this magnitude are considered a nuisance for most activities, and wind mitigation is typically recommended

3.2 Strong Winds

Lawson¹ also specified a lower limit strong wind threshold when winds exceed 15m/s for more than 0.025% of the time (approximately 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 on the windiest day of the year.

Wind Speeds that exceed 20m/s for more than approximately 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.

If the wind speed exceeds 15m/s for more than 2 hours of the year in a proposed external seating area or outside an entrance, these conditions would be unacceptable and would require mitigation. However, in such cases the area is likely to be classified as acceptable for walking or as uncomfortable and so would require mitigation to satisfy the Criteria in any case.

¹ Lawson T.V. (April 2001), Building Aerodynamics, Imperial College Press

4. POST SUBMISSION DESIGN ALTERATION EFFECTS

This discussion outlines the expected effect that the post submission design alterations are expected to have on the wind conditions around the Proposed Development.

Subsequent to the submission of the scheme, several design changes have occurred relating to Blocks A, B, and C at the eastern side of the scheme:

- Tower A has been reduced in height by 9m above ordnance datum (AOD)
- The tower of Block C has been reduced in height by 1m AOD.
- The massing between Tower A and Block C (previously unlabelled) has increased in height by 4m AOD.
- There have also been minor changes to the footprint of Block C with the southern façade extended outwards into the courtyard space to be parallel with the western end of the Block; and
- There has also been an alteration to the massing of Block B to make a clean cut with the office of Block C.

Using the elevations and ground floor plans for both the submitted and revised schemes, presented in Figures 1-6 of this technical addendum for the readers consideration, as well as the results of the previous wind microclimate assessment conducted by RWDI on 1st May 2019 (ref: 182252), RWDI have conducted a qualitative review of the wind microclimate around the Proposed Development.

In RWDI's experienced professional opinion, it is not expected that the above design alterations to the scheme would materially alter the wind microclimate that would occur around the Proposed Development.

As such, wind conditions identified around the submitted scheme in the previous assessment would be expected to occur around the revised scheme in the absence of the landscaping and mitigation measures that were developed as part of the wind microclimate assessment for the submitted scheme. As such the same mitigation measures and landscaping scheme would continue to be necessary to achieve a suitable wind microclimate around the Proposed Development.

5. CUMULATIVE EFFECTS

Subsequent to the planning submission of the Caversham Road scheme in December 2018 (ref: 182252), six other nearby schemes have been submitted for planning, with two being approved planning permission. These schemes are:

Submitted:

- 55 Vastern Road (ref: 200188)
- Vastern Court (ref: 200328)
- Broad Street Mall (ref: 182137)
- Gas Holder Site Alexander Turner Close (ref: 190627)

Approved:

- 29-35 Station Road (ref: 181930)
- Clarendon House 59-75 Queens Road (ref: 180909)

Four of these schemes; 29-35 Station Road, Board Street Mall, Gas Holder Site Alexander Turner Close, and Clarendon House 59-75 Queens Road are over 360m away from the centre of the Proposed Development and as such are not expected to have cumulative wind microclimate effects with the revised scheme.

In RWDI's professional opinion, the revised Caversham Road scheme is not expected to have cumulative wind microclimate interactions with the 55 Vastern Road scheme due to the presence of the Vastern Court scheme in between the two sites.

The revised Caversham Road scheme is expected to have beneficial cumulative wind microclimate interactions with the Vaster Court scheme. It is expected that the revised Caversham Road scheme would provide shelter to the Vastern Court scheme from the prevailing winds, reducing the windiness around the Vastern Court site. This is evidenced in Wind Microclimate Technical Appendix 9.1 by Xi Engineering submitted for the Vastern Court scheme in which the wind microclimate around the Vastern Court scheme is calmer with the consented Caversham Road scheme in place. These results also suggest that the introduction of the Vastern Court scheme would not materially affect wind conditions around the consented Caversham Road scheme, and by extension the revised Caversham Road scheme.

6. CONCLUDING REMARKS

1. A wind microclimate assessment was conducted by RWDI on 1st May 2019 to accompany the planning submission for Caversham Road development in Reading (ref: 182252). Wind tunnel tests were utilised to quantify the wind conditions around the site and develop a suitable wind mitigation strategy to achieve the desired pedestrian comfort and safety conditions.
2. Subsequently several design changes have been made to the scheme as follows:
 - Tower A has been reduced in height by 9m above ordnance datum (AOD)
 - The tower of Block C has been reduced in height by 1m AOD.
 - The massing between Tower A and Block C (previously unlabelled) has increased in height by 4m AOD.
 - There have also been minor changes to the footprint of Block C with the southern façade extended outwards into the courtyard space to be parallel with the western end of the Block;
 - There has also been an alteration to the massing of Block B to create a separation with the office of Block C.
3. To evaluate the wind microclimate conditions around the revised scheme, a qualitative desk-based study was conducted by comparing the latest building massing with that of the original and combining this information with the results of the previous wind tunnel test results.
4. In RWDI's professional opinion, the alterations to the scheme would not be expected to significantly alter the wind microclimate around the Proposed Development. As such, the wind conditions presented for the Proposed Development in the original planning submission (ref: 182252) are considered to be representative for the revised scheme.
5. As such, the wind mitigation measures and landscaping scheme developed previously would continue to be necessary to achieve a suitable wind microclimate around the Proposed Development. It is recommended that further wind tunnel testing is carried out at the detailed design stages to optimise the wind mitigation strategy, considering the precise location of building entrances and amenity spaces.
6. There have also been six new cumulative schemes identified, two of which are consented, since the original planning application. Only two of these new cumulative schemes are near the Site, namely 55 Vastern Road and Vastern Court, and their impact on the wind microclimate around the revised Caversham Road scheme has also been qualitatively assessed. In RWDI's professional opinion, no adverse cumulative wind microclimate interactions are expected between the revised Caversham Road scheme and the new cumulative schemes.



7. REFERENCES

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

APPENDIX A



APPENDIX A: CONSENTED SCHEME AND REVISED SCHEME ELEVATIONS AND PLANS



Figure 1: Consented Scheme – Northern Elevation



Figure 2: Consented Scheme – Southern Elevation



Figure 3: Consented Scheme – Ground Floor Plan



Figure 4: Revised Scheme – Northern Elevation



Figure 5: Revised Scheme – Southern Elevation



Figure 6: Revised Scheme – Ground Floor Plan