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CHARTERED SURVEYORS

DESKTOP WIND MICROCLIMATE STUDY

Land bound by John Dalton Street,
Ridgefield, Bow Street and South
King Street

14 April 2021

GIA No: 1122

PROJECT DATA:

Client **Island Site (General Partner) Limited**
Project Title **Land bound by John Dalton Street, Ridgefield, Bow Street and South King Street**
Project Number **1122**

REPORT DATA:

Report Title **Desktop Wind Microclimate Study**
GIA Department **Wind & Microclimate**
Dated **14 April 2021**
Report Number **1122**
Prepared by **JW**
Checked by **SW**
Type **Client Issue**

Revisions	No:	Date:	Notes:	Signed:

SOURCES OF INFORMATION:

Site Photos **GIA**
3D models **VERTEX & VUCITY**
OS Data **FIND Maps**



CONTENTS

1 SUMMARY	2
2 GUIDANCE	3
3 METHOD	4
3.1 ASSESSMENT METHODOLOGY	4
3.2 SITE GEOMETRY	4
3.3 WIND DATA ANALYSIS	4
3.4 TARGET CONDITIONS	9
3.5 LIMITATIONS AND ASSUMPTIONS	9
4 RESULTS	11
4.1 SOUTH-SOUTH-WESTERLY WINDS (DOMINANT WIND ANGLE)	11
4.2 WEST-NORTH-WESTERLY WINDS (SECOND DOMINANT WIND ANGLE)	11
4.3 NORTH-EASTERLY WINDS (DOMINANT SPRING WIND ANGLE)	12
4.4 ROOF TERRACE CONDITIONS	12
5 CONCLUSIONS	15

1 SUMMARY

This report outlines the results of a desktop-based wind microclimate analysis of the proposed development on Land bound by John Dalton Street, Ridgefield, Bow Street and South King Street, in Manchester.

Potential wind effects were assessed at the Land bound by John Dalton Street, Ridgefield, Bow Street and South King Street, in Manchester.

Various potential risk factors for raised wind speeds were considered, but in each case there are sufficient mitigating factors that no significant adverse wind effects are expected.

Conditions are expected to be suitable for all building entrances.

Conditions are expected to be suitable for the rooftop terrace amenity space, as there is a significant perimeter screen included within the terrace design.

It is recommended that any seating design on the terrace includes localised elements to provide further obstruction to the wind, due to the more stringent wind requirements to be suitable for sitting.

Conditions are expected to be suitable for all intended uses.

2 GUIDANCE

The assessment was performed with reference to the LDDC variant of the Lawson Comfort Criteria. The Lawson Criteria are well-established in the UK for quantifying wind conditions in relation to build developments and, although not a UK 'standard', the criteria are recognised by local authorities as a suitable benchmark for wind assessments.

Planning Practice Guidance 6th March 2014. The Department for Communities and Local Government (DCLG) web-based Planning Practice Guidance resource includes a section on design and sets out how a building's size and shape can affect the wind microclimate. The section addressing Design - How should buildings and the spaces between them be considered? 'Consider scale' Paragraph O26, states that: "Account should be taken of local climatic conditions, including daylight and sunlight, wind, temperature and frost pockets."

3 METHOD

3.1 ASSESSMENT METHODOLOGY

The assessment was performed as a desktop study, combining analysis of wind data from a local weather station with qualified assessment of any likely effects that the development may have on local wind conditions.

The assessment was performed by an experienced wind engineer with 8 years specific experience of performing wind microclimate studies.

The most common effects that a development could have on local wind conditions are as follows:

- Downwash:
 - High speed airflow from higher in the earth boundary layer being directed down to ground level by a building face.
- Corner flows:
 - Acceleration of the airflow due to the large pressure gradients around sharp corners.
- Channelling:
 - Acceleration of the airflow due to the flow paths being constrained between multiple buildings.

3.2 SITE GEOMETRY

A 3D CAD model of the proposed development was used for the analysis, which is shown in Figure 4.

The surrounding area consists of dense urban buildings on all sides. This is shown in Figure 5.

3.3 WIND DATA ANALYSIS

30 years of wind data were obtained for Manchester International Airport. The location of the site relative to the airport is shown in Figure 6. The site is located 14km from the airport.

Seasonal wind roses were created for the weather station. These are shown in Figure 7.

The dominant wind direction is south-south-westerly.

There is also a secondary dominant wind direction from the west-north-west, and from the north east during the spring.

The dominant wind direction for high wind speeds (hourly wind speeds >8m/s at 10m height at the airport) is 190°, stronger winds are most likely to occur in winter.

There are also significant high wind speeds from 280°.

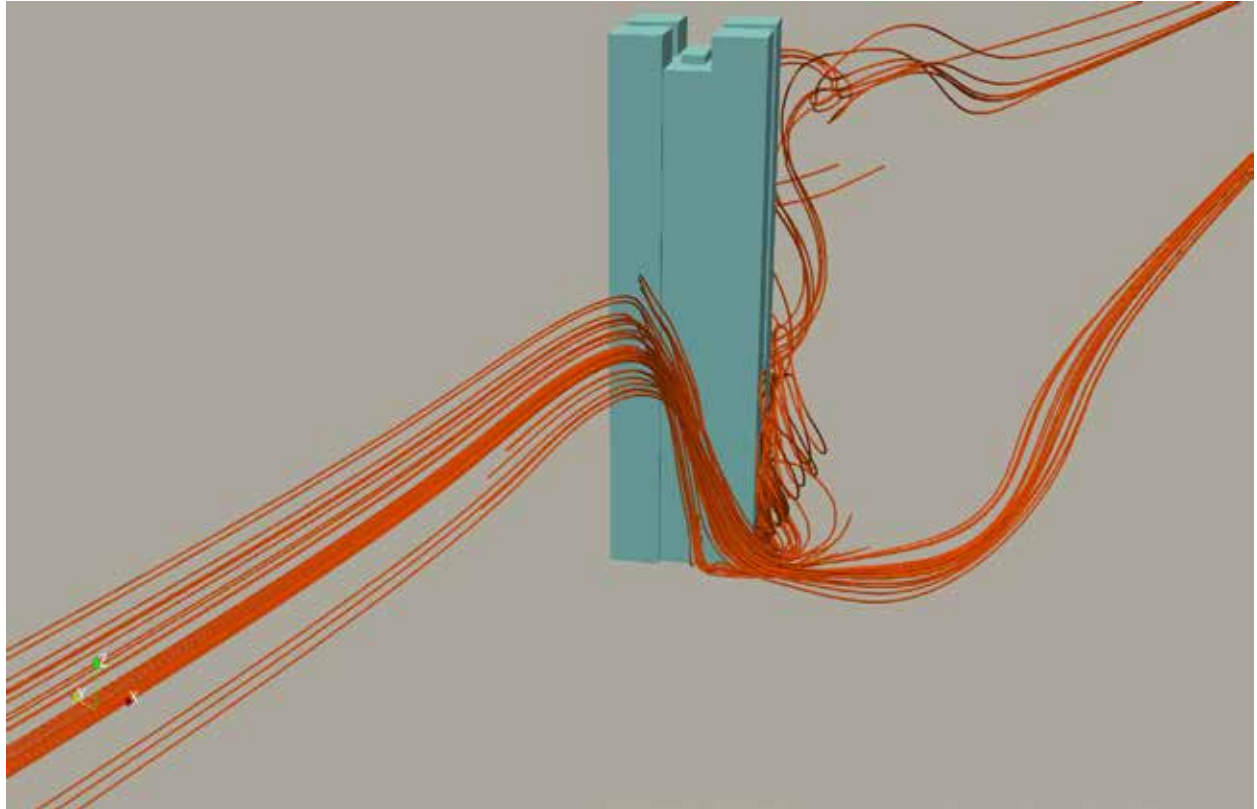


Fig. 01: Downwash

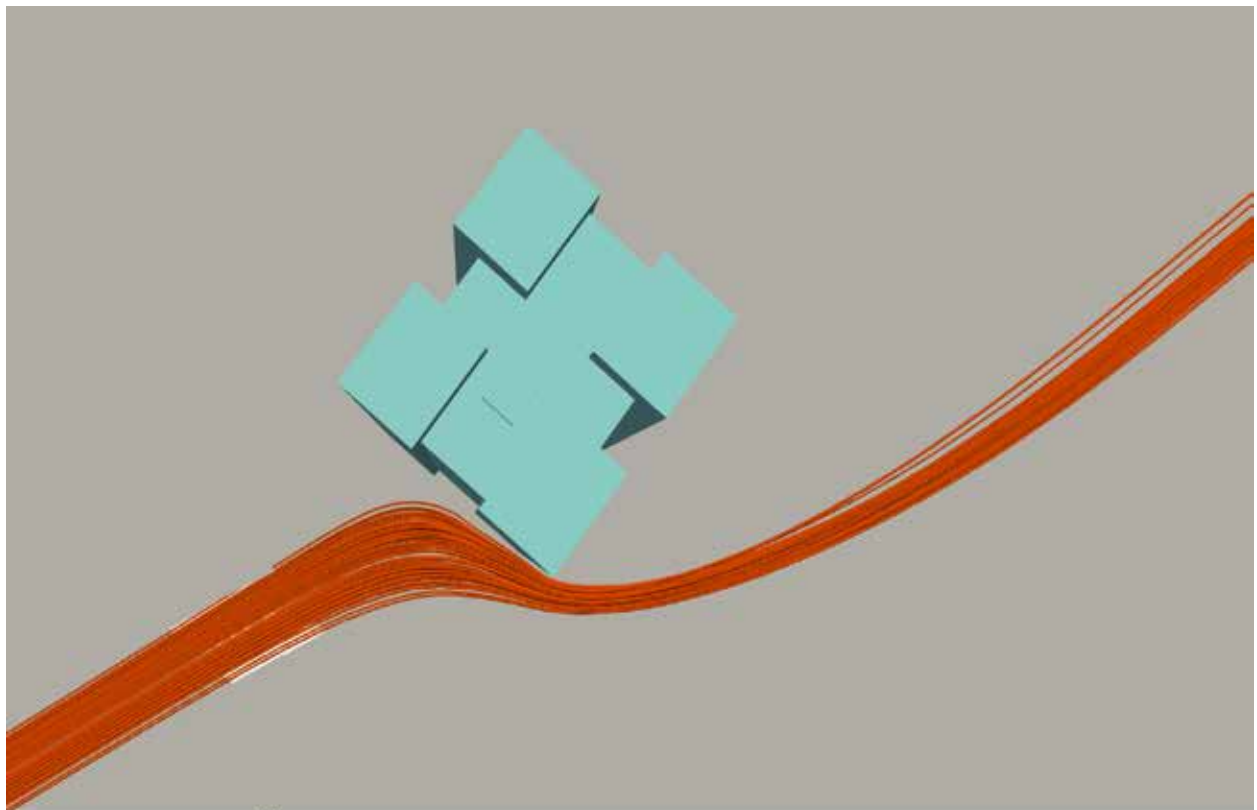


Fig. 02: Corner Flows

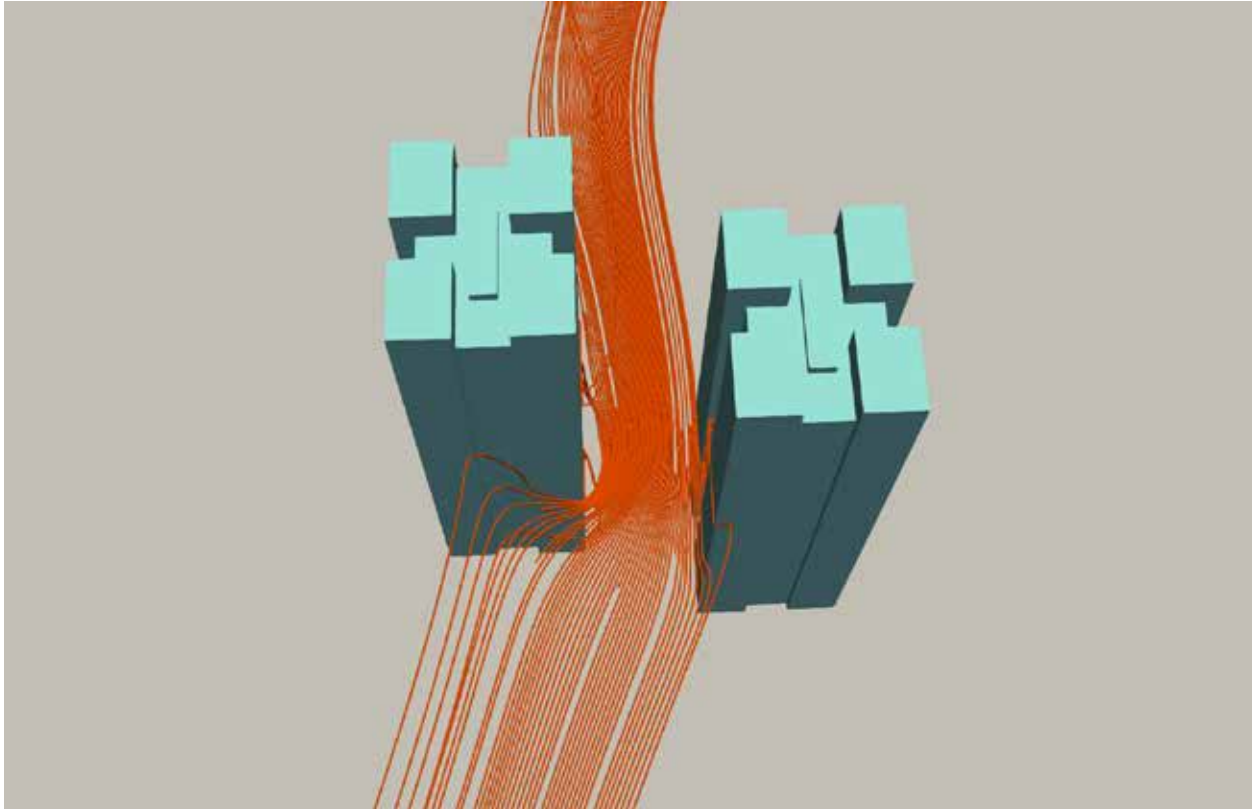


Fig. 03: Channelling

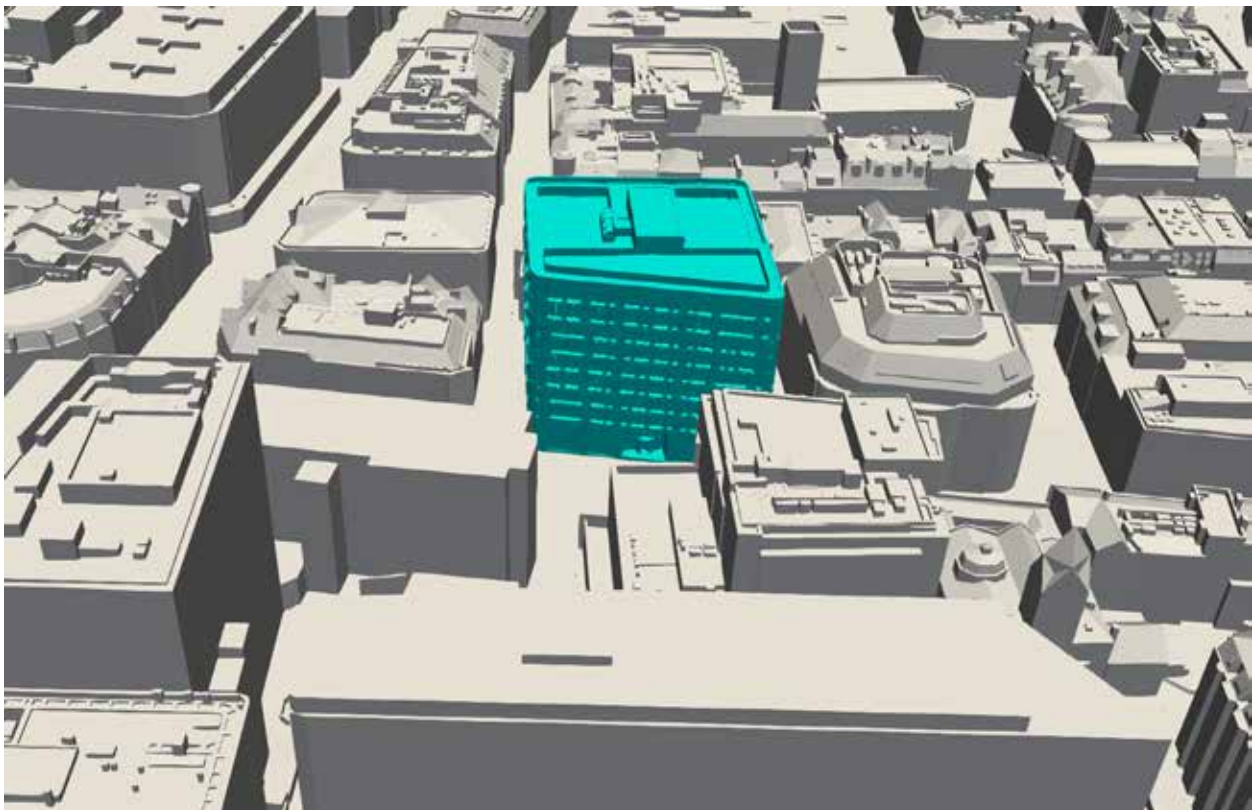


Fig. 04: The Proposed Development

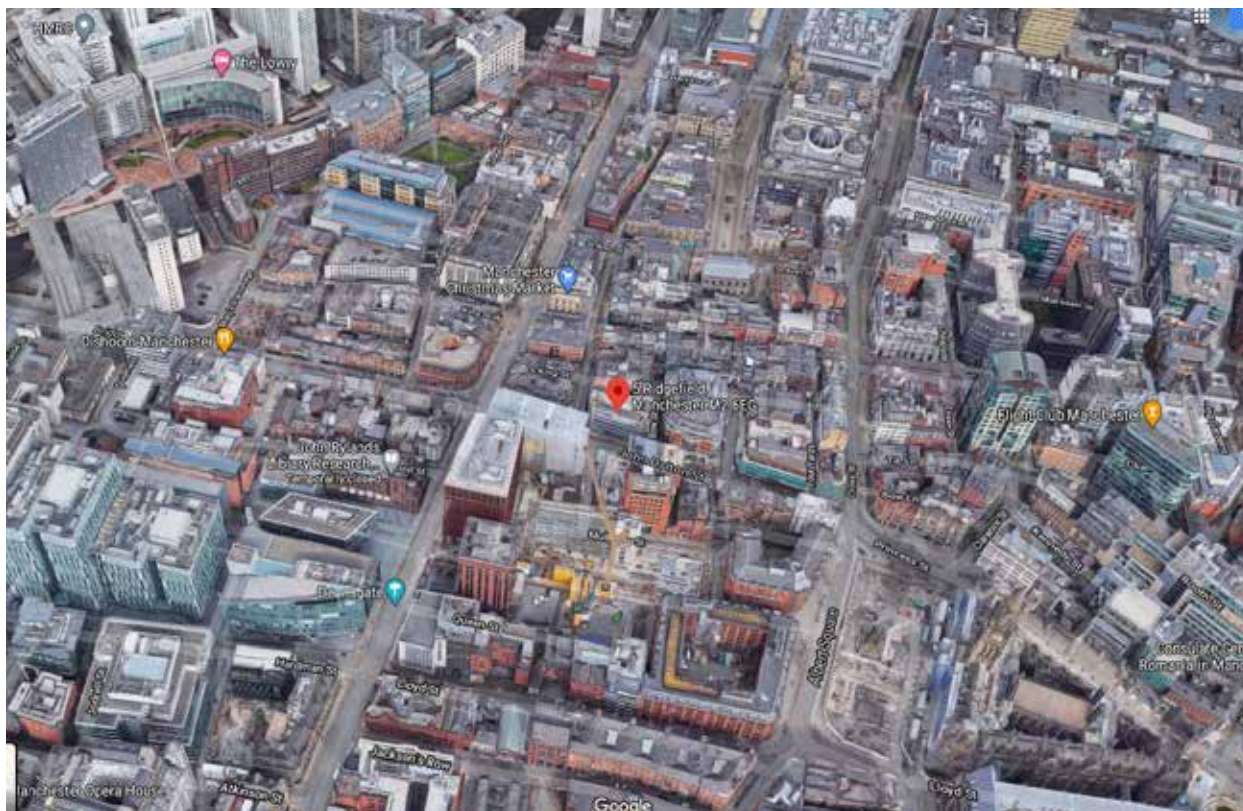


Fig. 05: The Surrounding Area

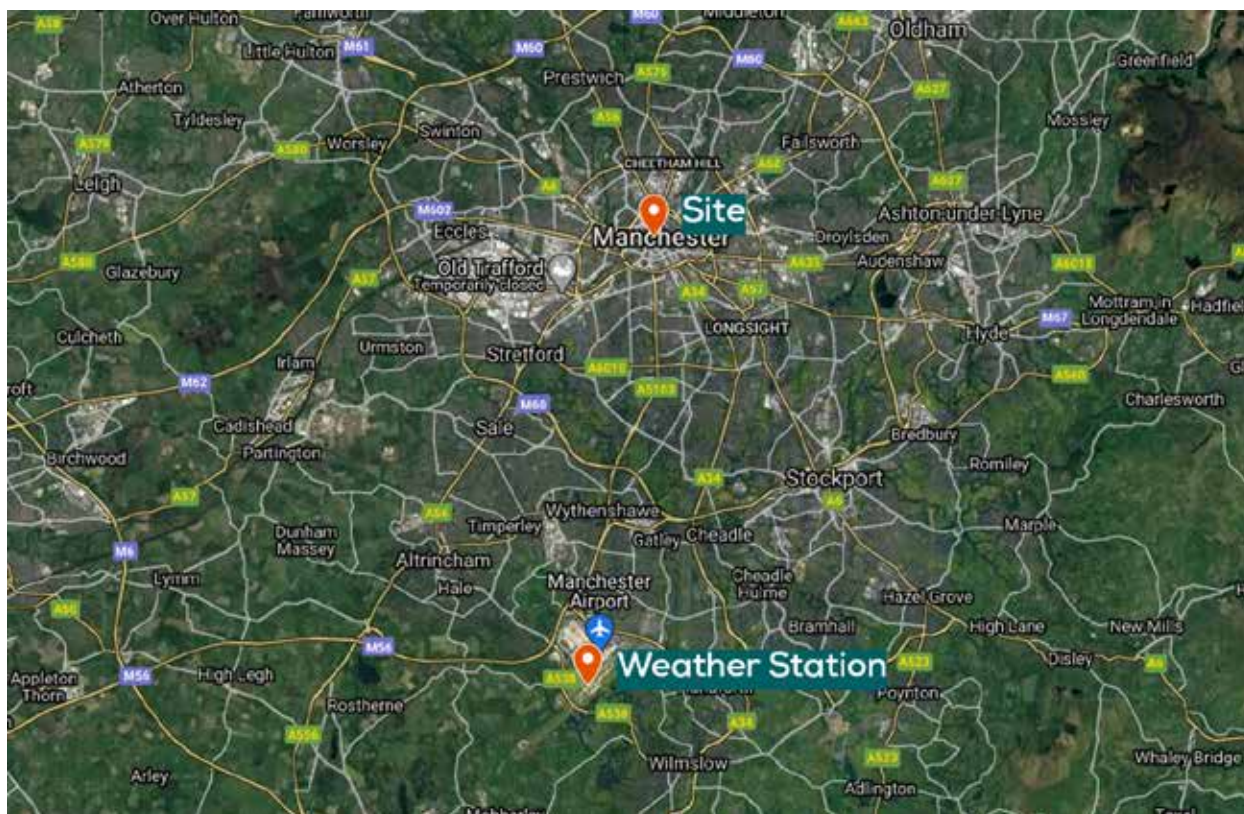


Fig. 06: Relative Locations of Site and Weather Station

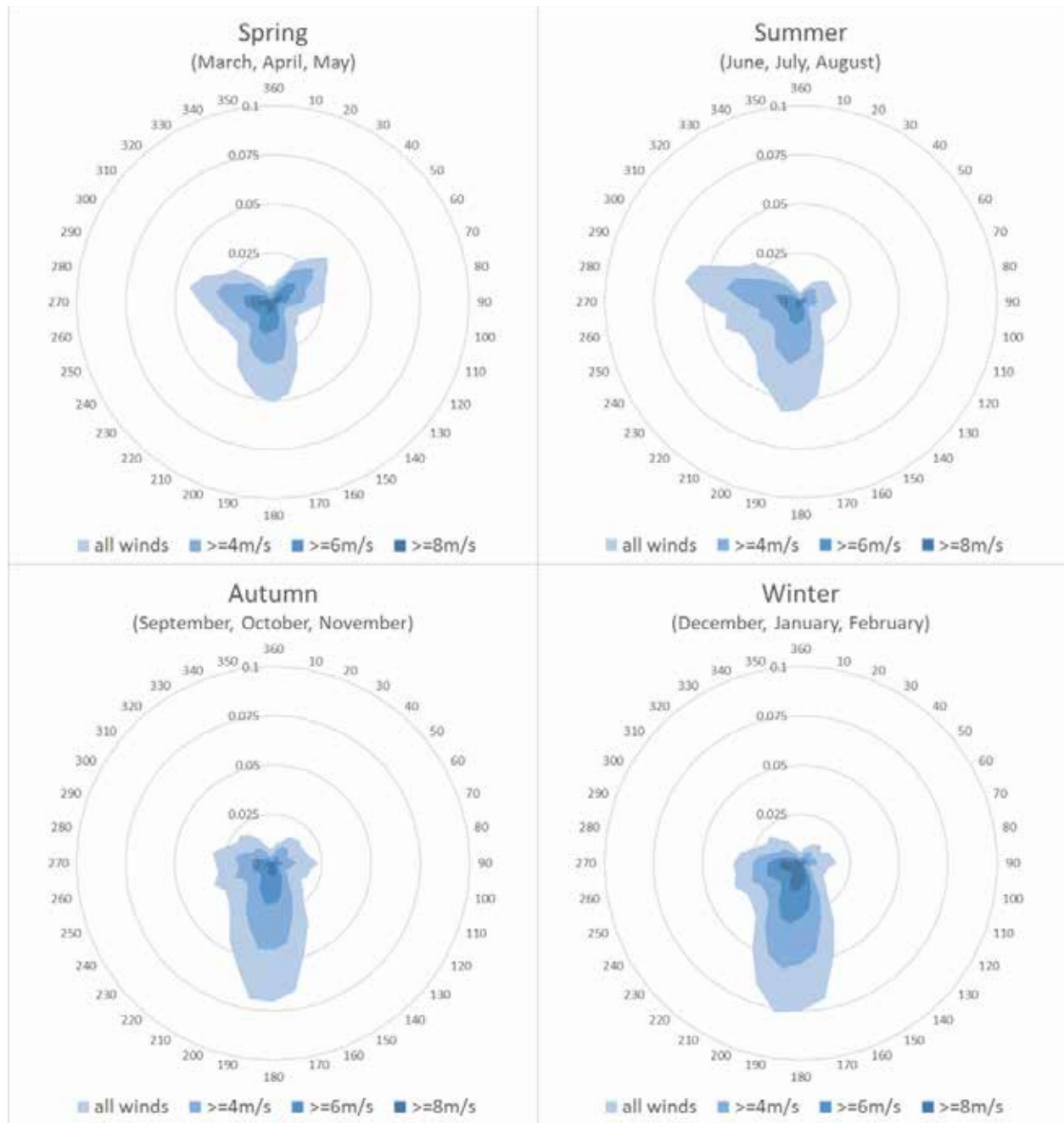


Fig. 07: Wind Roses for Manchester International Airport (1990-2020)

3.4 TARGET CONDITIONS

For a mixed-use urban area within which the Site is located, the desired wind microclimate would typically need to have areas acceptable for sitting, standing (including at entrances of buildings) and walking use. A description of the comfort categories to classify wind conditions in accordance with is given below.

Any areas which are predicted to be unsafe (annually) or uncomfortable (for winter) will require mitigation, unless they are in locations where pedestrian access can be controlled in the event of strong winds. This applies to all thoroughfares (for pedestrians) and roads (for cyclists) around the Development.

Any amenity spaces should be suitable for leisure walking in the winter, and for a mixture of sitting and standing in the summer.

The areas immediately outside any building entrances should be suitable for standing use during winter to provide a “buffer” between the still conditions in interior spaces and the general thoroughfare.

3.5 LIMITATIONS AND ASSUMPTIONS

This study is a desktop study. This means it does not include any modelling of the actual airflow around the site. Hence any atypical local microclimatic features will not be captured.

The nature of a desktop study means that all results and conclusions are qualitative, and it is not possible to draw quantitative conclusions.

3 METHOD (Continued)

Table 01: Lawson Comfort Criteria (LDDC variant)

KEY	COMFORT CATEGORY	MEAN WIND SPEED (5% EXCEEDANCE)	DESCRIPTION
	Sitting	4 m/s	Acceptable for outdoor sitting use (e.g. cafés, benches, balconies)
	Standing	6 m/s	Acceptable for main building entrances, pick-up / drop-off points and bus stops
	Walking (leisure)	8 m/s	Acceptable for strolling
	Walking (business)	10 m/s	Acceptable for external pavements, walking purposefully without lingering
	Uncomfortable	>10 m/s	Not comfortable for regular pedestrian access

Table 02: Lawson Safety Criteria (LDDC variant)

KEY	SAFETY CATEGORY	MEAN WIND SPEED (0.022% EXCEEDANCE)	DESCRIPTION
	No Safety Exceedance	<15 m/s	
	S15 (Distress)	>15 m/s	Unsafe for frail individuals, or cyclists
	S20 (Safety)	>20m/s	Wind conditions considered unsafe for all users

4 RESULTS

4.1 SOUTH-SOUTH-WESTERLY WINDS (DOMINANT WIND ANGLE)

Figure 8 shows the proposed development when viewed from the dominant wind angle (190°).

It is apparent that the proposed development is not significantly exposed to the wind from this angle, with the majority of the façade shielded by the surrounding buildings and only the top 2-3 storeys without upwind obstruction.

This means that the risk of downwash is low. The risk is further reduced as the corners of the proposed development are rounded, meaning there is also a low risk of corner accelerations.

Bow Street and Ridgefield are both relatively narrow and are aligned with this wind direction, which may infer a risk of channelling. There is, however, a lack of a clear route into either street for the wind from this direction so this risk is not considered to be significant.

The main entrance to the building faces the wind from this direction, however it is also set back from the façade with a revolving door, providing additional mitigation against wind risk as well as the factors outlined above. Therefore, no significant adverse wind effects are expected for this entrance.

4.2 WEST-NORTH-WESTERLY WINDS (SECOND DOMINANT WIND ANGLE)

Figure 9 shows the proposed development when viewed from the second-dominant wind angle (280°).

It is apparent that the proposed development is not significantly exposed to the wind from this angle, with the majority of the façade shielded by the surrounding buildings and only the top 3-4 storeys without upwind obstruction. This is marginally greater than for the dominant wind direction, but will be offset by the lower likelihood of wind coming from this direction.

This means that the risk of downwash is low. The risk is further reduced as the corners of the proposed development are rounded, meaning there is also a low risk of corner accelerations.

The Ridgefield entrances to the building face the wind from this direction, however these are located away from the building corners, which combined with the factors outlined above means that no significant adverse wind effects are expected for these entrances.

4.3 NORTH-EASTERLY WINDS (DOMINANT SPRING WIND ANGLE)

Figure 9 shows the proposed development when viewed from the dominant wind angle during spring conditions (50°).

From this wind angle, not only is the building shielded by its surrounds, but also none of the building façades are aligned perpendicular to the wind, meaning the risk of downwash and hence adverse wind effects is very low.

4.4 ROOF TERRACE CONDITIONS

Figure 10 shows the roof of the proposed development.

There is intended to be a roof terrace across the southern portion of the roof.

The roof terrace is relatively exposed to the wind, as it is above the roofline of the surrounding buildings. This suggests a risk of raised wind speeds from wind flowing unopposed onto the terrace.

This risk is not heightened by a significant additional upwash risk, for the same reasons that there is not a significant downwash risk at ground level.

There is a proposed 1.5m solid screen around the perimeter of the terrace, which is expected to provide sufficient obstruction to the wind for there not to be a significant risk of safety concerns at terrace level due to strong winds.

As conditions for seating will require calmer conditions than for other activities, it is recommended that any seating design for the terrace incorporates localised mitigation measures to provide further shelter directly adjacent to the seating areas (such as pergolas, screens, planting, canopies, etc.).

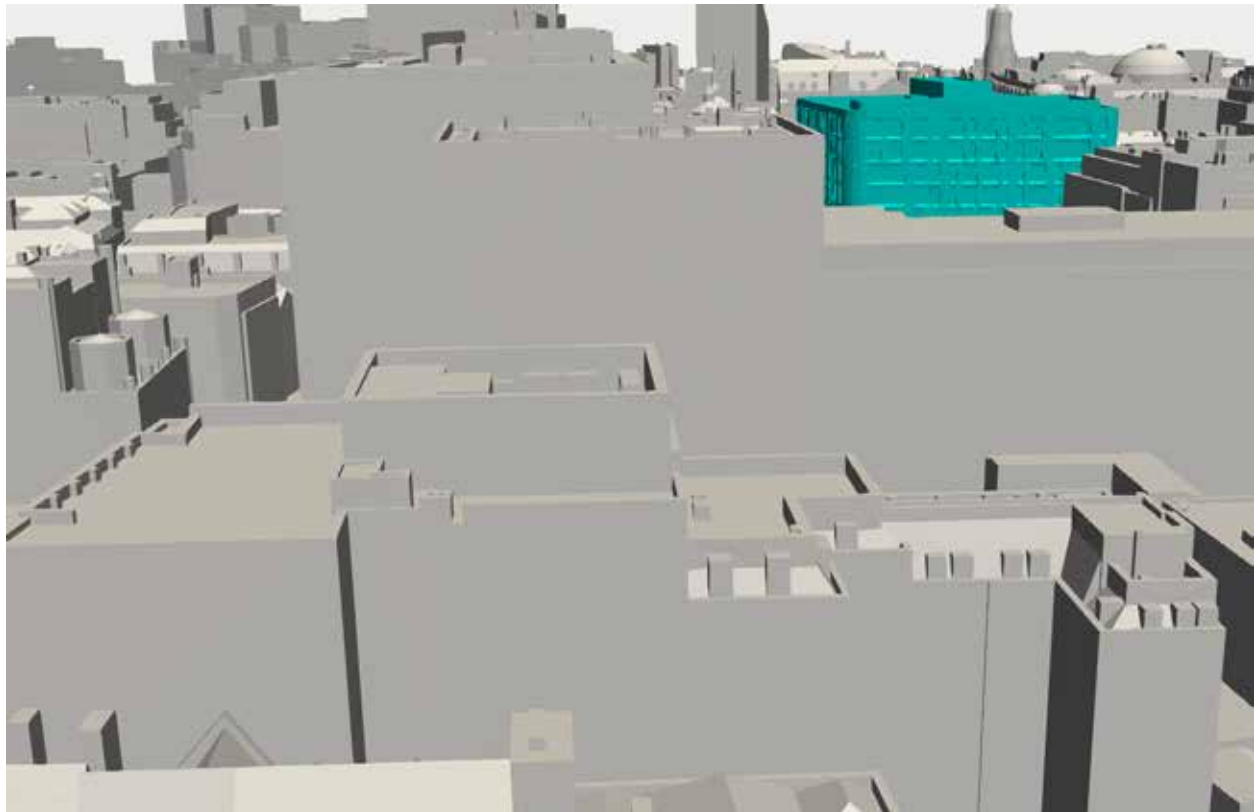


Fig. 08: Proposed Development Viewed From 190deg



Fig. 09: Proposed Development Viewed From 280deg



Fig. 10: Proposed Development Viewed From 50deg

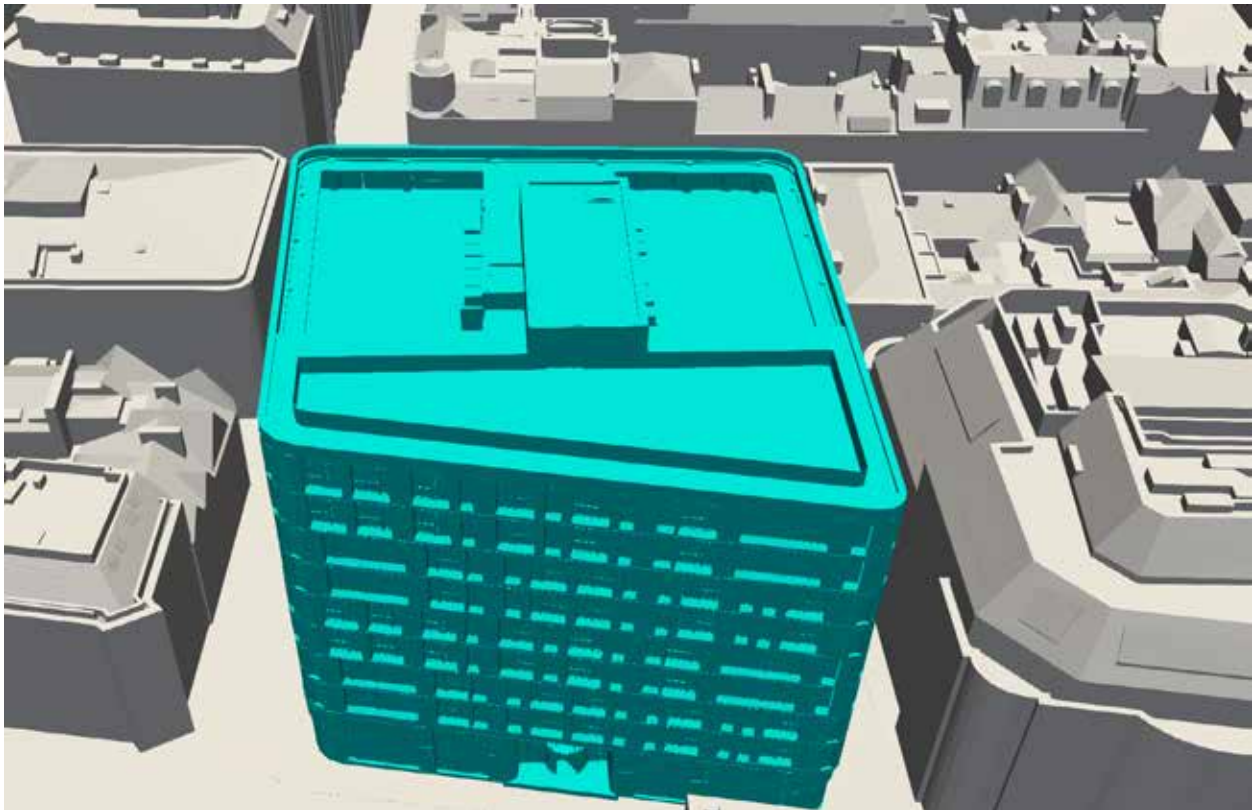


Fig. 11: Roof Terrace Area

5 CONCLUSIONS

Potential wind effects were assessed at Land bound by John Dalton Street, Ridgefield, Bow Street and South King Street, in Manchester.

Various potential risk factors for raised wind speeds were considered, but in each case there are sufficient mitigating factors that no significant adverse wind effects are expected.

Conditions are expected to be suitable for all building entrances.

Conditions are expected to be suitable for the rooftop terrace amenity space, as there is a significant perimeter screen included within the terrace design.

It is recommended that any seating design on the terrace includes localised elements to provide further obstruction to the wind, due to the more stringent wind requirements to be suitable for sitting.

Conditions are expected to be suitable for all intended uses.

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