



Plot 9A, First Street

For

First Street Developments
Ltd

Wind Microclimate Report

0850073rep3v4

21 December 2021

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Issue History

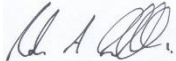
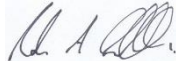
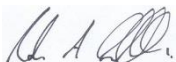
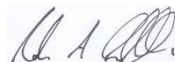
	Previous Issue			Current Issue
Comment				
Issue	3	2	1	4
Date	8 th December 2021	27 th September 2021	27 th September 2021	21 st December 2021
Prepared by	A. Turpitt	R. Stanfield	R. Stanfield	A. Turpitt
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Prepared by	R. Stanfield	A. Turpitt	A. Turpitt	R. Stanfield
Signature				
Report Number	0850073rep3v3	0850073rep3v2	0850073rep3v1	0850073rep3v4

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Executive Summary

Background

An experience based desktop study has been carried out by Architectural Aerodynamics Ltd. (ArcAero) to assess the pedestrian and terrace level wind microclimate for the proposed Plot 9A, First Street scheme in Manchester, UK.

The study is based on our experience of quantitative assessments using wind tunnel testing and computational methods of many similar developments across the UK, and further draws on our knowledge of aerodynamic principles and the site-specific wind climate of the Plot 9A, First Street site, including previous studies at the site and immediate surrounds (including but not limited to CFD and wind tunnel testing for sites including Plot 9, Premier Inn, Plot 11, Parkway Gate and One City Road).

Conclusions

The conclusions of the study are as follows:

- Wind conditions within the existing site and surrounds are expected to be safe and comfortable for all users.
- Upon introduction of the proposed development wind conditions are expected to meet the safety criteria for pedestrians.
- Wind conditions at the ground level within and around the proposed development are expected to be suitable for planned pedestrian activities.
- Wind conditions at the elevated terrace are generally expected to be acceptable for proposed recreational activities.

1 Introduction

This report summarises experience based desktop study of wind conditions in and around the proposed Plot 9A, First Street development in Manchester, UK.

2 The Project

2.1 Site Location and Surrounding Area

The Plot 9A development is part of a major project to regenerate the area surrounding Medlock Street, which bounds the site to the west. Hulme Street runs adjacent to the south of the site beyond a temporary lawn, both of which providing separation from the consented high-rise development on Plot 11. Completed mid-rise developments are to the north of the site, while an empty site (for which aspirational plans exist) lies to the east.

Further afield the immediate surrounding area is largely characterised by a relative mixture of building types, with several mid- and high-rise developments nearby, but also a number of open plots and car parks, as well as conventional residential housing to the south of Mancunian Way. Manchester city centre lies to the north.

2.2 The Proposed Development

The proposed development is a 9-storey building with basement comprising office accommodation (Use Class E(c)), car parking, cycle parking and associated facilities, landscaping and associated works. The development features accessible open roof terrace spaces at the ninth floor.

2.3 Surrounding Contexts

The wind microclimate assessment considers the proposed development within the contexts of both existing and cumulative surrounding conditions. Consented developments that have been considered within the cumulative surrounds scenario are listed in Table 2 1.

Table 2-1 – Cumulative Schemes

Development Name	Planning Reference
One City Road	128002/FO/2020
Plot 11, First Street	125573/FO/2019
1 Alpha Place	120113/FO/2018
Great Jackson Street Plot E	116850/FO/2017
10-12 Whitworth Street	111003/FO/2016/C1
Hotspur House	120635/FO/2018
MMU Science and Engineering Building	125799/FO/2019

2.4 Drawing Information

The findings of this report are based on the following set of drawing information, received by ArcAero in December 2021:

- 05662_B1_02_2199.pdf
- 05662_B1_02_2201.pdf
- 05662_B1_02_2203.pdf
- 05662_B1_02_2209.pdf
- 05662_B1_04_2200.pdf
- 05662_B1_04_2202.pdf
- 05662_B1_02_2200.pdf
- 05662_B1_02_2202.pdf
- 05662_B1_02_2208.pdf

2.5 Soft Landscaping

The wind microclimate has been assessed for the proposed development with proposed soft landscaping proposals in place, these are presented in Figure 2.3 which replicates PL1471.1-PLA-XX-00-DR-L-0001Landscape GA.pdf, also received by ArcAero in December 2021.

3 Typical Assessment Methodology

3.1 The Assessment of Wind Microclimate

A microclimate can often be described as the distinctive climate of a small-scale area. The weather variables in a microclimate, such as wind, may be different to the conditions prevailing over the wider area.

This assessment considers the wind conditions that would result upon the introduction of the proposed development into the existing space.

The assessment predicts the proportion of time an area will experience wind speeds in excess of threshold values associated with safe and comfortable use by pedestrians and occupants once the development is introduced. It can therefore be shown within the various parts of a new development proposal and the adjacent developments, whether wind conditions are suitable or unsuitable, and whether design adjustment or mitigation measures are required.

The assessment of wind microclimate in the urban environment is not covered by internationally recognised wind codes – which tend to focus on wind loading issues. As such, a typical wind microclimate study will involve one-of or a mixture of an experience-based desk study, a computation fluid dynamics assessment (CFD) and boundary layer wind tunnel studies.

3.2 Experience-Based Desk Study

An experienced wind engineer will be able to draw upon results from hundreds of previous wind tunnel and CFD studies, and along with accurate site wind analyses and robust wind frequency data, is able to draw conclusions about the likely wind conditions on site and provide meaningful feedback regarding changes to the design or landscaping implementation to create suitable wind conditions across the site and surrounds. The current assessment adopts this approach.

3.3 Wind Climate Analysis

Details of the wind climate relevant to the site are provided in Appendix A of this report.

3.4 The LDDC Lawson Criteria

The industry standard criteria for such assessments are commonly referred to as the Lawson criteria. Architectural Aerodynamics use the London Docklands Development Corporation variant of the Lawson Criteria (1).

The LDDC variant of the Lawson criteria applies a single percentage probability of exceedance of a range of wind speeds related to different pedestrian uses. The current study predicts wind conditions qualitatively and employs the LDDC Lawson criteria to interpret and present expected wind conditions.

3.4.1 Safety

A wind speed of 15 metres-per-second occurring once per year is rated as unsafe, with the potential to de-stabilise the less able members of the public including the elderly, cyclists and children.

3.4.2 Comfort

The LDDC variant of the Lawson criteria prescribes that wind conditions are suitable for a given activity when the threshold is exceeded no more than 5% of the time.

The value of 5% has been established as giving a reasonable allowance for extreme and relatively infrequent winds that are tolerable within each category. Where certain activities are year-round, such as walking, entrance use or for waiting areas, comfort ratings are required to be met in all seasons. For more seasonal activities, such as outdoor recreation or for sitting spaces, the assessment focuses on relevant seasons where the expectation will exist for conditions to be suitable. The LDDC comfort threshold wind speed values are presented in Table 3 1.

Table 3-1 – LDDC Wind Comfort Thresholds

Threshold Wind Speed [m/s]	Comfort Rating / Activity	
4	C4	Long term sitting
6	C3	Standing / short term sitting
8	C2	Strolling
10	C1	Walking
> 10	C0	Uncomfortable

4 Expected Wind Conditions

4.1 Existing Site

Wind conditions within the existing site and immediate surrounds are expected to meet the criteria for pedestrian safety, be suitable for at least strolling and (where they exist) for comfortable ingress / egress at building entrances.

4.2 Proposed Development

The proposed development represents a modest obstruction to wind, is somewhat sheltered from commonly occurring westerly winds but relatively exposed to southerly winds.

The predicted suitability of wind conditions within a combination of existing and cumulative surrounds is presented within Figure 4.1 and Figure 4.2.

4.2.1 Safety

All areas within and immediately around the proposed development are expected to meet the pedestrian safety criteria.

4.2.2 Comfort

4.2.2.1 *Thoroughfares*

Wind conditions at all thoroughfares within the site are generally expected to be suitable for at least leisurely strolling throughout the year and thus for comfortable pedestrian access to and passage through the site. An isolated spot has the potential to be windier, suitable for fast walking, at the north-western corner of the proposed development. With current landscaping proposals showing trees concentrated on this corner, however, this region is expected to be confined to the building corner and to fall within a planted region beyond which the pedestrian footpath will be routed. Pedestrians would therefore experience conditions suitable for strolling and thus for comfortable pedestrian passage.

4.2.2.2 *Entrances*

The main entrance to the development is located within a region at the north-eastern corner that is well sheltered from prevailing westerly and southerly winds. Correspondingly wind conditions are expected to be suitable for at least short-term standing and thus for ingress / egress to and from the building.

4.2.2.3 *Level 9 Terrace*

The level 9 terrace is largely sheltered from prevailing southerly winds, but is exposed to less prevailing westerly winds. The space directly adjacent to the western corner is likely to be suitable only for strolling, but with the remainder of the terrace suitable for at least short periods of sitting conditions are suitable overall. Furthermore, conditions against the building façade are likely to be largely suitable for long periods of sitting in at least the summer months.

4.2.2.4 *Surrounding Area*

Wind conditions within the immediate surrounding areas are expected to remain substantially suitable for at least leisurely strolling along thoroughfares and for short periods of standing at entrances, following the introduction of the proposed development. Areas where conditions

are marginally windy for strolling, suitable for walking, during winter, have the potential to occur more commonly within the context of cumulative surrounding developments further to the north-west of the site. Where this occurs, conditions are expected to be acceptable for thoroughfare along Medlock Street.

5 Conclusions

The conclusions of the study are as follows:

- Wind conditions within the existing site and surrounds are expected to be safe and comfortable for all users.
- Upon introduction of the proposed development wind conditions are expected to meet the safety criteria for pedestrians.
- Wind conditions at the ground level within and around the proposed development are expected to be suitable for planned pedestrian activities.
- Wind conditions at the elevated terrace are generally expected to be acceptable for proposed recreational activities.

6 References

1. **Lawson, T.V.** *The determination of the wind environment of a building complex before construction*. Bristol : University of Bristol, Department of Aeronautical Engineering, 1990.
2. **ESDU (Engineering Science Data Unit)**. *Item 01008. Computer Program for wind speeds and turbulence properties: flat or hilly sites in terrain with roughness*. 2001.

7 Figures

Figure 2.3 – Soft landscaping proposals

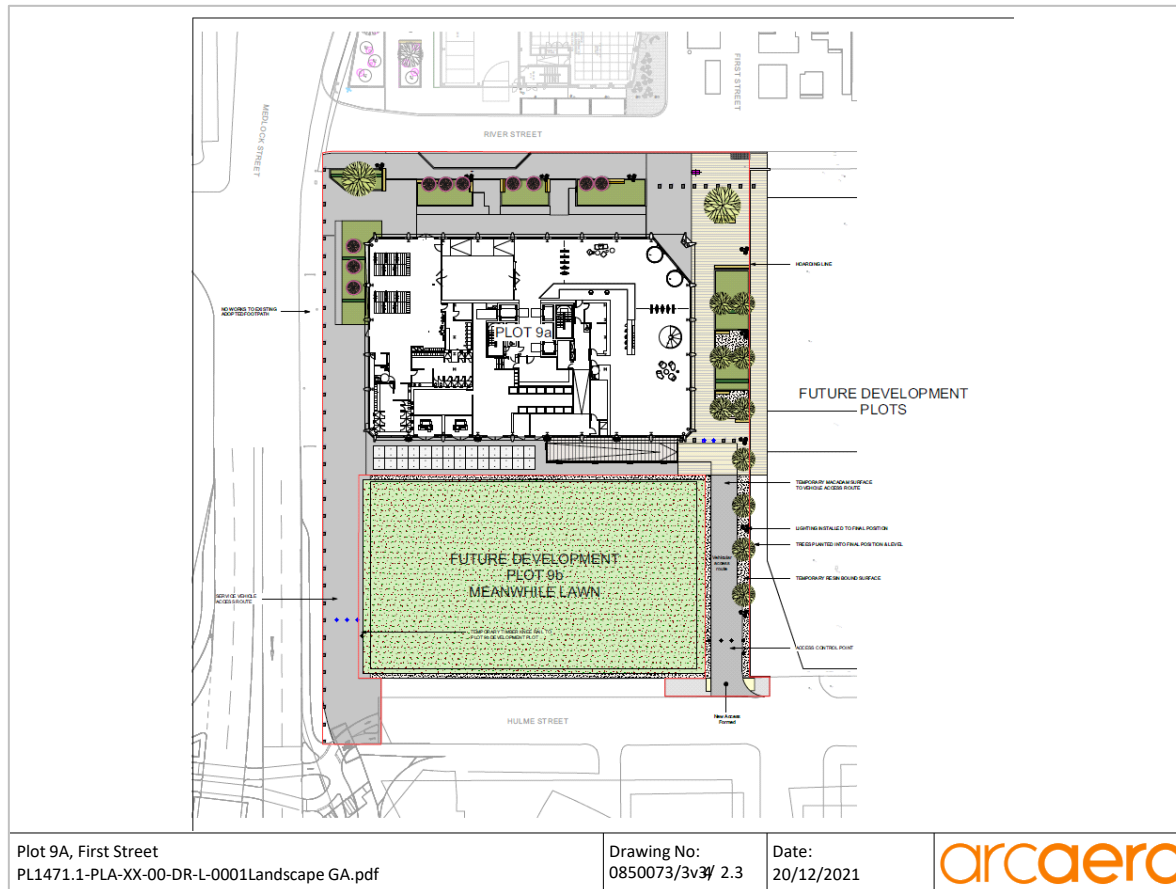
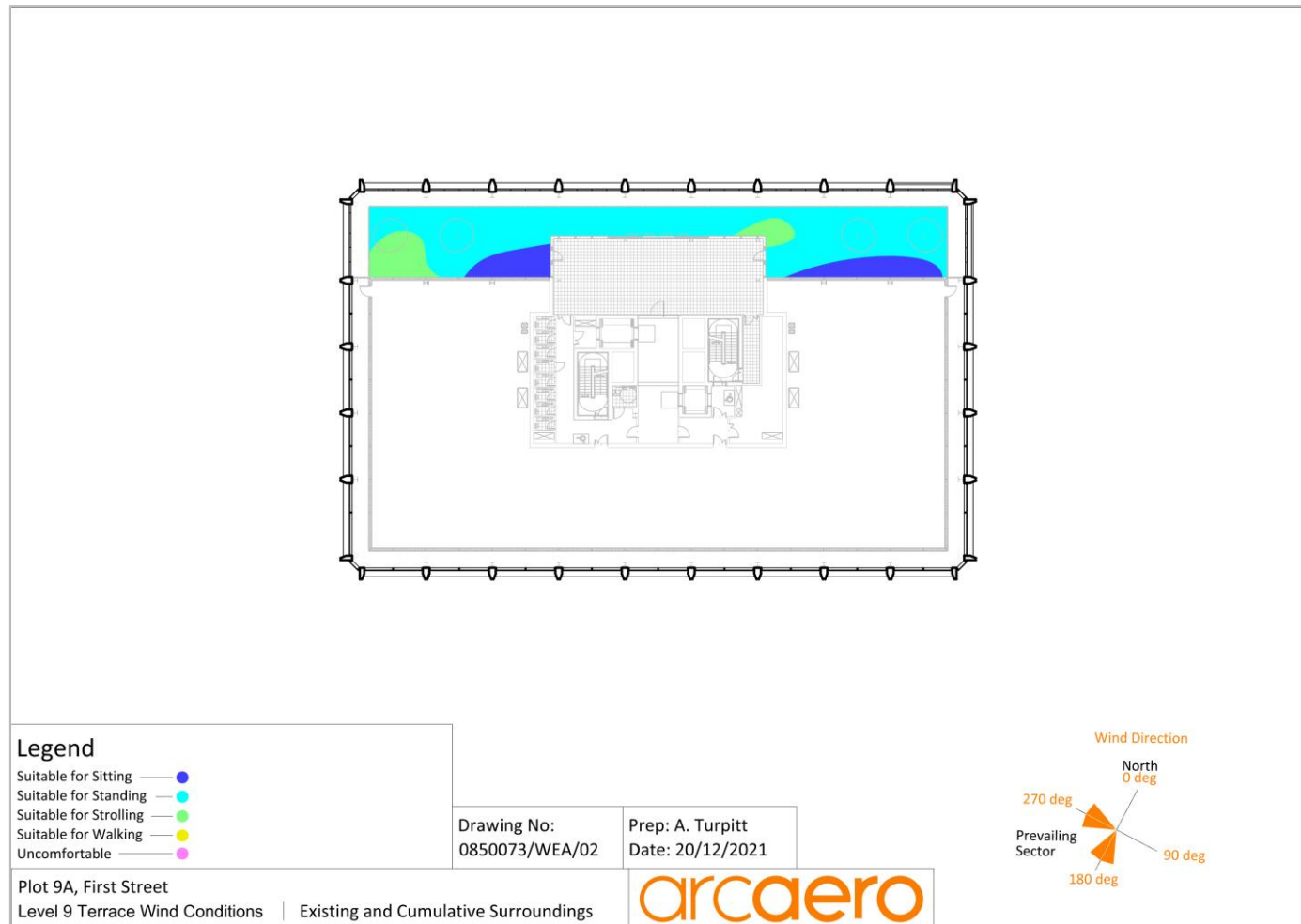


Figure 4.1 – Wind Assessment, Ground Level



Figure 4.2 – Wind Assessment, Level 9 Terrace



Appendix A Wind Climate Analysis

A.1 Site Wind Analysis

A detailed analysis, based on the widely accepted Deaves and Harris model of the atmospheric boundary layer (ABL), as defined in ESDU Item 01008 (2), has been carried out to determine the wind properties at the site.

A.2 Wind Properties at the Site

A.2.1 Wind Frequency Data

Wind microclimate studies require that meteorological data is transposed from a nearby weather station with enough wind data to produce accurate wind frequency statistics. The current study uses data from Manchester Airport.

The wind climate data, transposed to reference height at site, is presented graphically in Figure A.1 to Figure A.5.

Figure A.1 - Annual Probability of exceedance at reference height

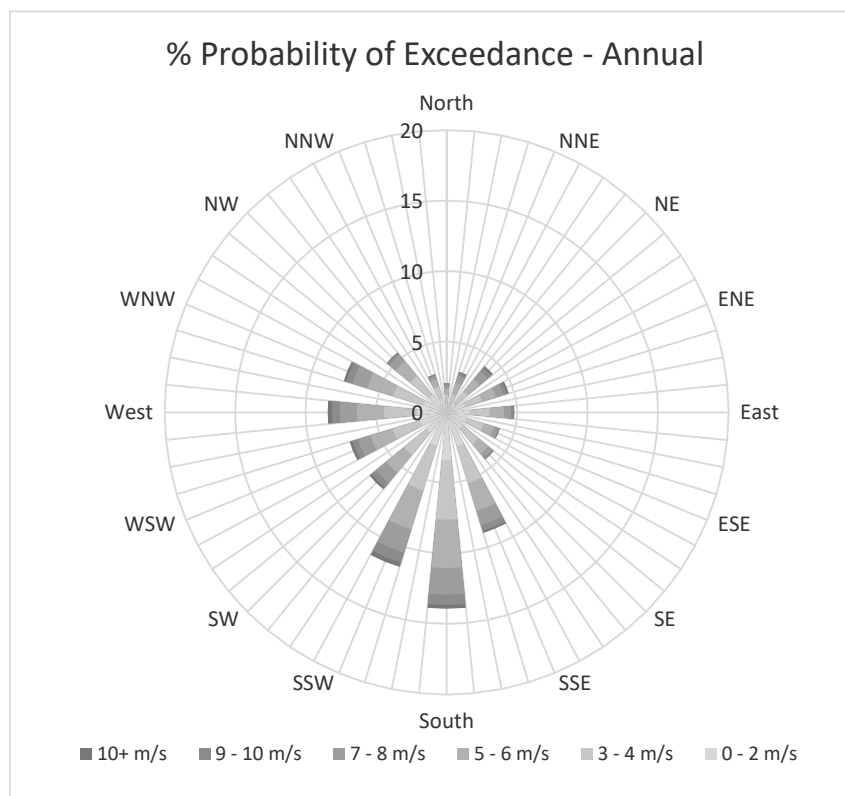


Figure A.2 - Spring Probability of exceedance at reference height

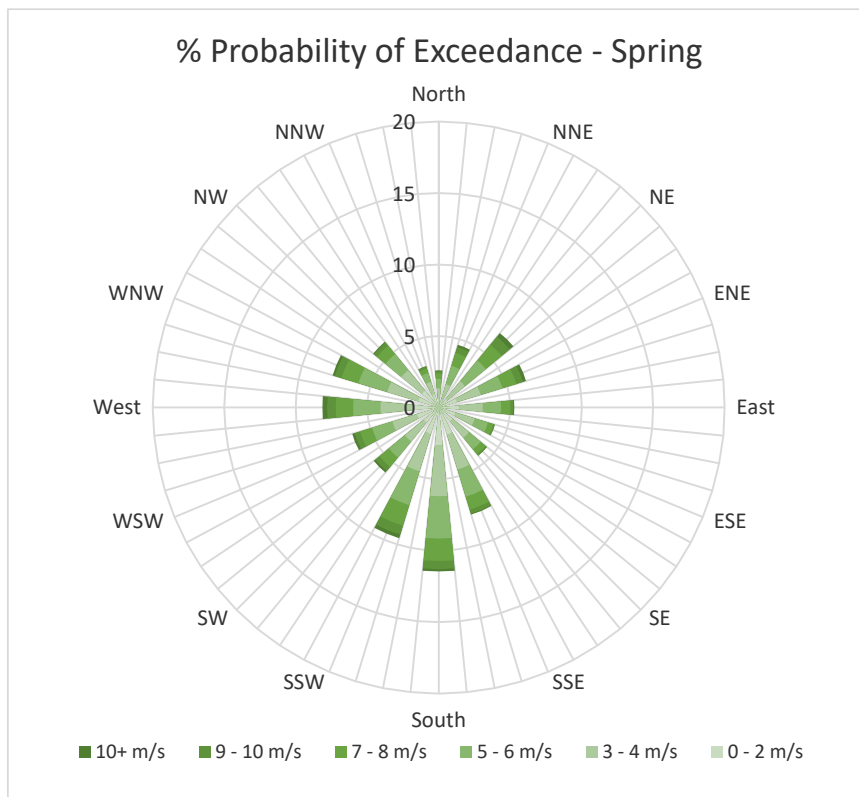


Figure A.3 - Summer Probability of exceedance at reference height

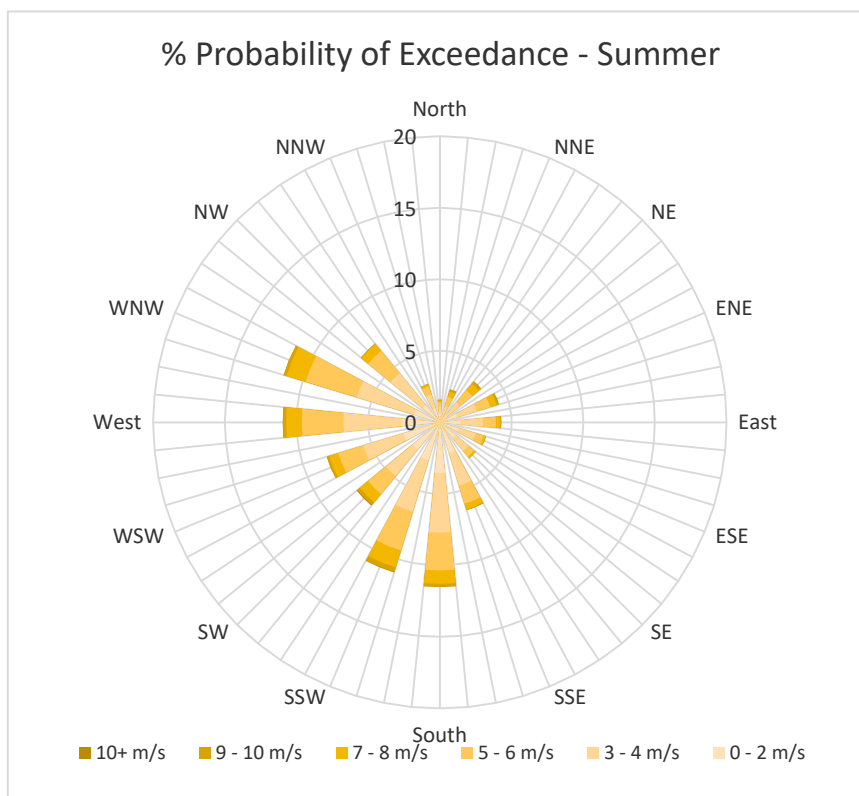


Figure A.4 - Autumn Probability of exceedance at reference height

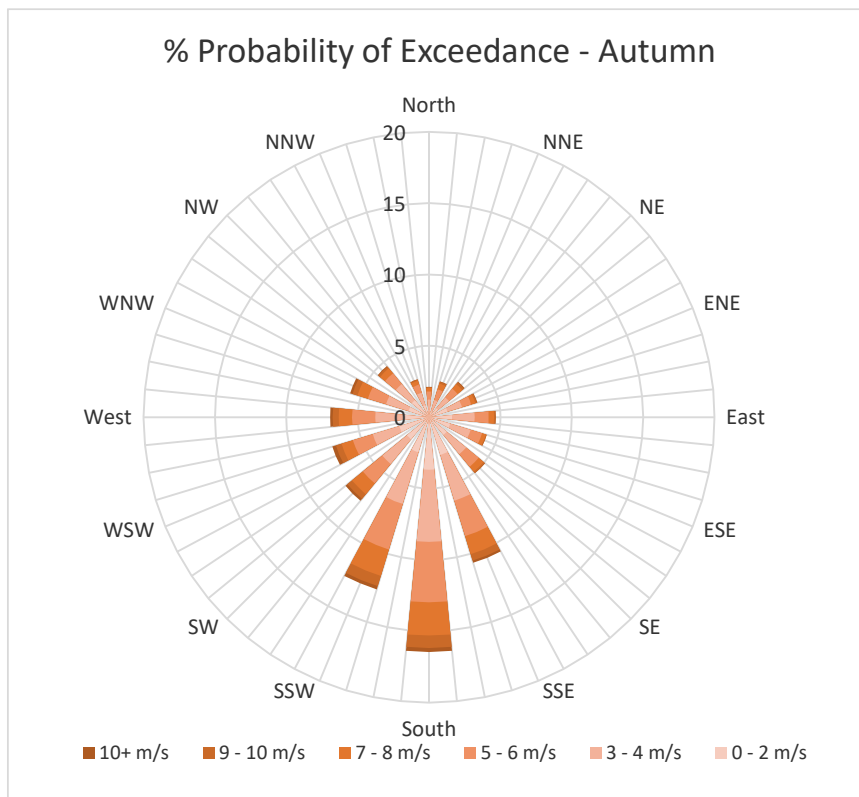


Figure A.5 - Winter Probability of exceedance at reference height

