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WIND MICROCLIMATE ASSESSMENT REPORT

29 Newport Road

August 2026

GIA No: **24257**

PROJECT DATA:

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1 INTRODUCTION

This report outlines the results of a wind microclimate analysis for the Proposed Development at 29 Newport Road, Cardiff

1.1 SUMMARY

Wind microclimate conditions for the Proposed Development at 29 Newport Road, Cardiff were assessed using high resolution Computational Fluid Dynamics (CFD).

There are no wind safety risks associated with the Proposed Development at either ground level or elevated levels.

Long term wind comfort conditions will be suitable for the intended use (or consistent with baseline conditions) for all thoroughfares, existing building entrances, proposed building entrances, bus stops, church yards and the level 23 terraces.

The level 7 and 15 terraces have regions which are a category windier than the target. Care should be taken to ensure that seating on these terraces is offered local protection such as being set into raised planters.

Cumulative wind impacts would be negligible.

1.2 GUIDANCE

The assessment was performed using the London Docklands Development Corporation (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. The Lawson Criteria have been adopted for this assessment.

City of Cardiff Council Tall Buildings Supplementary Planning Guidance 2021

The City of Cardiff Council Tall Buildings Supplementary Planning Guidance 2021 states that:

'The proposal must demonstrate evidence of an acceptable level of impact in terms of microclimatic effects including wind tunnel effect [...] impact on building entrances, pedestrian strolling, public spaces, and seating areas.

2 METHOD

To identify the likely effect of the Proposed Development on the pedestrian level wind environment, a 3D CFD model of the development and surrounding site was created. This section describes the methodology for the creation of this model and the inputs used.

2.1 ASSESSMENT METHODOLOGY

The assessment was performed using GIA's high-resolution Computational Fluid Dynamics (CFD) modelling.

CFD is a digital modelling technique, which simulates the effect of wind for the built environment. The air is divided into hundreds of millions of "cells", within which the equations of motion are solved. GIA uses cloud computing from Amazon Web Services (AWS) to run the simulations, to ensure vast scalability and appropriate resource availability for any project.

A full description of the test methodology is included in Appendix O1.

2.2 ESTABLISHING MICROCLIMATE CONDITIONS

Microclimate conditions were established using a high resolution CFD model, extending 400m radius from the Site.

A model of the development was included within the CFD model and tested to determine the conditions at and around the Site. The model used is shown in Figures 1 to 4.

The model was run from 18 wind angles, spaced using 10° or 30° increments such that no sector contributes more than 10% of the annual wind.

Wind speeds were measured at 1.5m above any surfaces expected to be used for pedestrian activity.

On-site and local wind speeds were combined with wind statistics from 30 years of data recorded at Cardiff Airport, corrected for variations in terrain between the airport and the site, to obtain annual and seasonal frequency and magnitude of wind speeds across the model. This allows the 'grading' of the pedestrian level winds according to the Lawson Comfort Criteria, which are explained later in this report.

The wind microclimate effects are assessed

annually, for the winter months (December, January and February) and for the summer months (June, July, August). Winter conditions are reported as this is the season when the strongest winds are expected, summer conditions are reported as this is the season when pedestrian usage of outdoor spaces is expected to be highest.

2.3 LIMITATIONS AND ASSUMPTIONS

The accuracy of the results is dependent upon the accuracy of the CAD used to construct the model.

The assessment herein is valid to the design as supplied to GIA at the time of the assessment, and does not cover future variations in the design.

There is an inherent assumption that on-site wind speeds will scale linearly with the measured wind speeds at the airport (since all wind probabilities are based on data measured at airfield anemometers).

There is an inherent assumption that the wind speed statistics for the past 30 years will remain applicable for the foreseeable future.

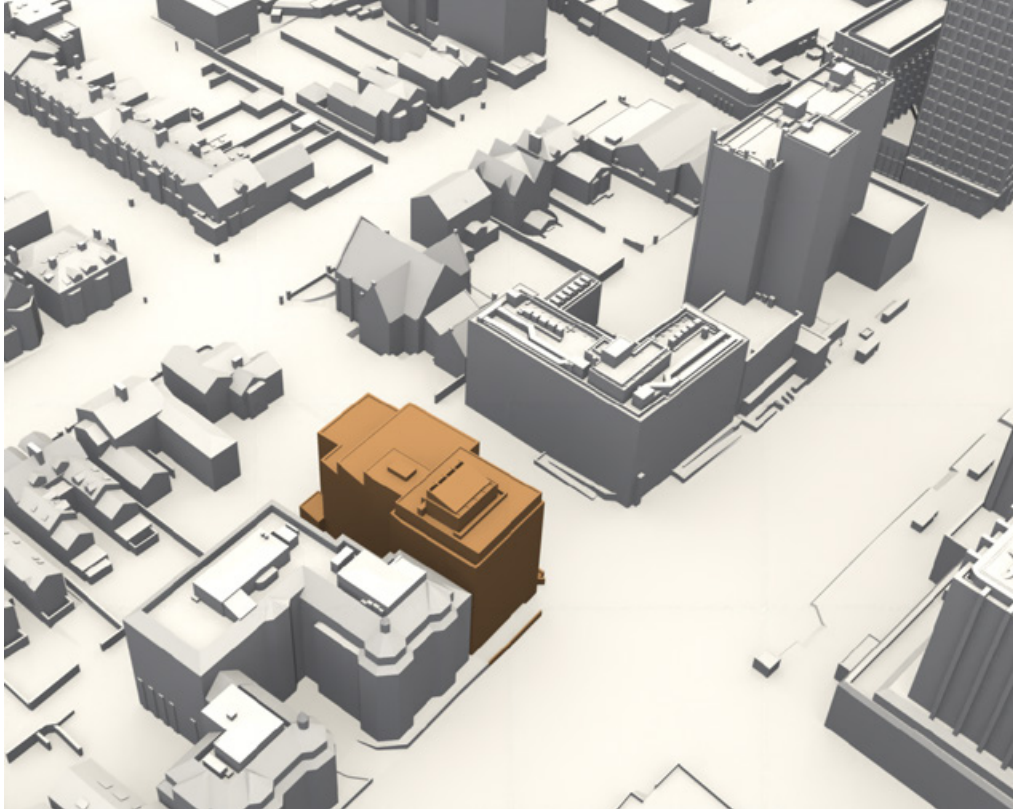


Fig. 01: 3D View of Existing Site

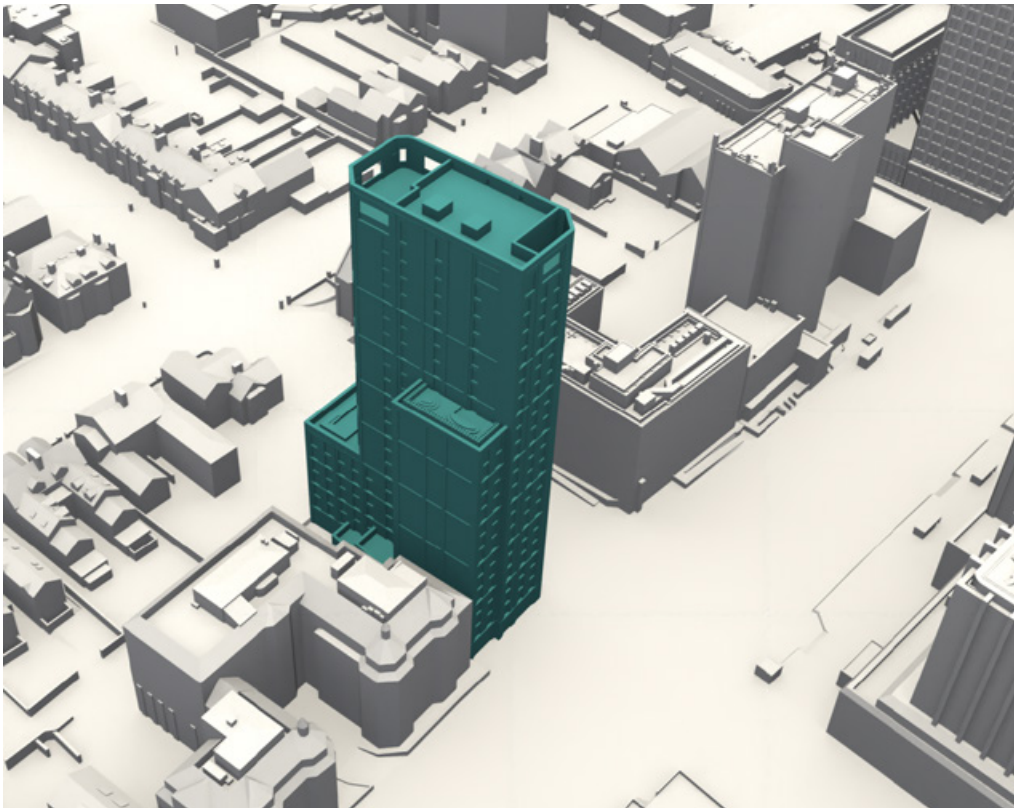


Fig. 02: 3D View of Proposed Development



Fig. 03: Proposed Development with Existing Surrounds



Fig. 04: Proposed Development with Cumulative Surrounds

2.4 LAWSON COMFORT AND SAFETY CRITERIA

The assessment was graded against the Lawson Comfort and Safety Criteria.

Table 1 and Table 2 show the banding of the various categories within the Lawson Comfort and Safety criteria, per the specifications of Appendix B2 of the Glasgow City Council Tall Buildings Design Guide.

Comfort categories are based on the level of wind speed exceedance for 5% of each season, and safety categories are based on the level of wind speed exceedance for 0.025% of the year.

Table 01: Lawson Comfort Criteria (LDDC variant)

KEY	COMFORT CATEGORY	MEAN WIND SPEED (5% EXCEEDANCE)	DESCRIPTION
	Long-term Sitting	4 m/s	Acceptable for all outdoor long-term sitting use (e.g. cafés, benches, balconies and terraces)
	Standing / Short-term Sitting	6 m/s	Acceptable for main building entrances, pick-up / drop-off points and bus stops, as well as occasional seating such as benches and balconies.
	Walking or Strolling	8 m/s	Acceptable for strolling
	Business Walking	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 (0.025% 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

2.5 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 used to classify wind conditions is given below.

Any areas which show up as either 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 Proposed Development.

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. The principal entrance to the Proposed Development are marked “E” on Figure 5, and principal off-site entrances are marked “O”.

There are bus stops on Newport Road (marked “B” in Figure 5) which are targeted to be suitable for standing / short-term sitting at worst.

There are mixed amenity spaces (which would be expected to be used for a mix of sedentary and active pursuits) in the form of the proposed terraces at levels 7, 15 and 23 (shown on Figure 6). These are targeted to be suitable for standing / short-term sitting in summer.

There is also the Church Yard of the Life Cardiff Church to the north east of the site, which is targeted to be suitable for standing / short-term sitting at worst.

The locations of sensitive receptors are shown in Figures 5 and 6

SCENARIOS

The purpose of these tests was to compare conditions with and without the Proposed Development.

The following scenarios were tested:

- 1 Baseline: The existing (previous) building on site, with the existing surrounds (including any planning consented schemes which are under construction at the time of writing);
- 2 Proposed Development with Existing Surrounds: The completed and operational development with the existing surrounds.
- 3 Proposed Development with Cumulative Surrounds: The completed and operational development with the existing surrounds plus local planning consented schemes.

The following consented schemes are sufficiently advanced to have been included in all of the above scenarios:

- 48-54 City Road (19/03194/MJR)
- Trafalgar House (24/00407/FUL)
- Knox Court (22/02604/FUL)
- Longcross Court (24/01238/FUL)

The following consented scheme was also considered as part of the cumulative surrounds in Scenario 3:

- Hallinans House (17/01063/MJR)



Fig. 05: Sensitive Wind Receptors



Fig. 06: Sensitive Wind Receptors

3 RESULTS

3.1 CONDITIONS FOR EXISTING SITE WITH EXISTING SURROUNDS (BASELINE)

Ground Level Conditions

Annual safety at ground level for the existing site with existing surrounds is shown in Figure 7. Winter comfort at ground level for the existing site with existing surrounds is shown in Figure 8. Summer comfort at ground level for the existing site with existing surrounds is shown in Figure 9.

There are no pre-existing exceedances of the wind safety criteria in the surrounding area.

Conditions range between suitable for long-term sitting, short-term sitting/standing and walking or strolling in all seasons.

All principal off-site entrances (marked "O" in results figures) are suitable for either long-term sitting or short-term sitting/standing in the windiest season (winter). This is suitable for the intended use.

The bus stops on Newport Road (marked "B" in results figures) are suitable for either long-term sitting or short-term sitting/standing in the windiest season (winter). This is suitable for the intended use.

The Church Yard around Life Cardiff Church is suitable for long-term sitting in all seasons. This is suitable for the intended use.



Fig. 07: Annual Safety at Ground Level, Existing Site with Existing Surrounds (Baseline)

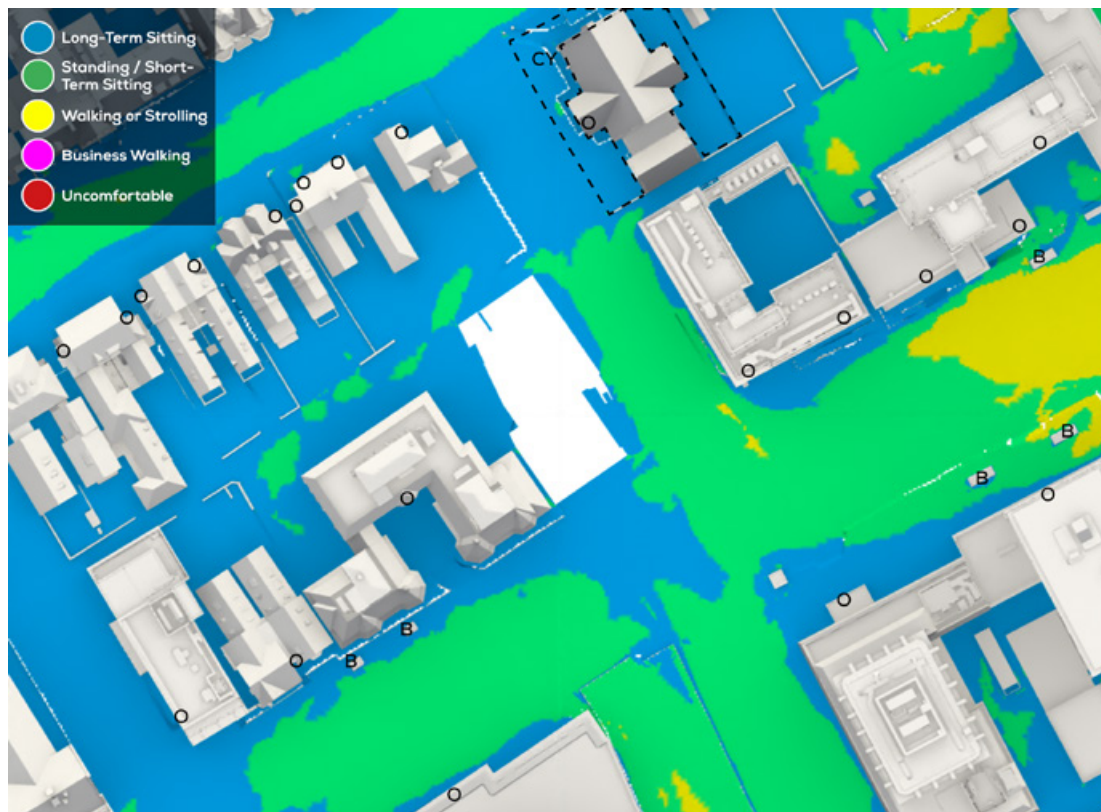


Fig. 08: Winter Comfort at Ground Level, Existing Site with Existing Surrounds (Baseline)

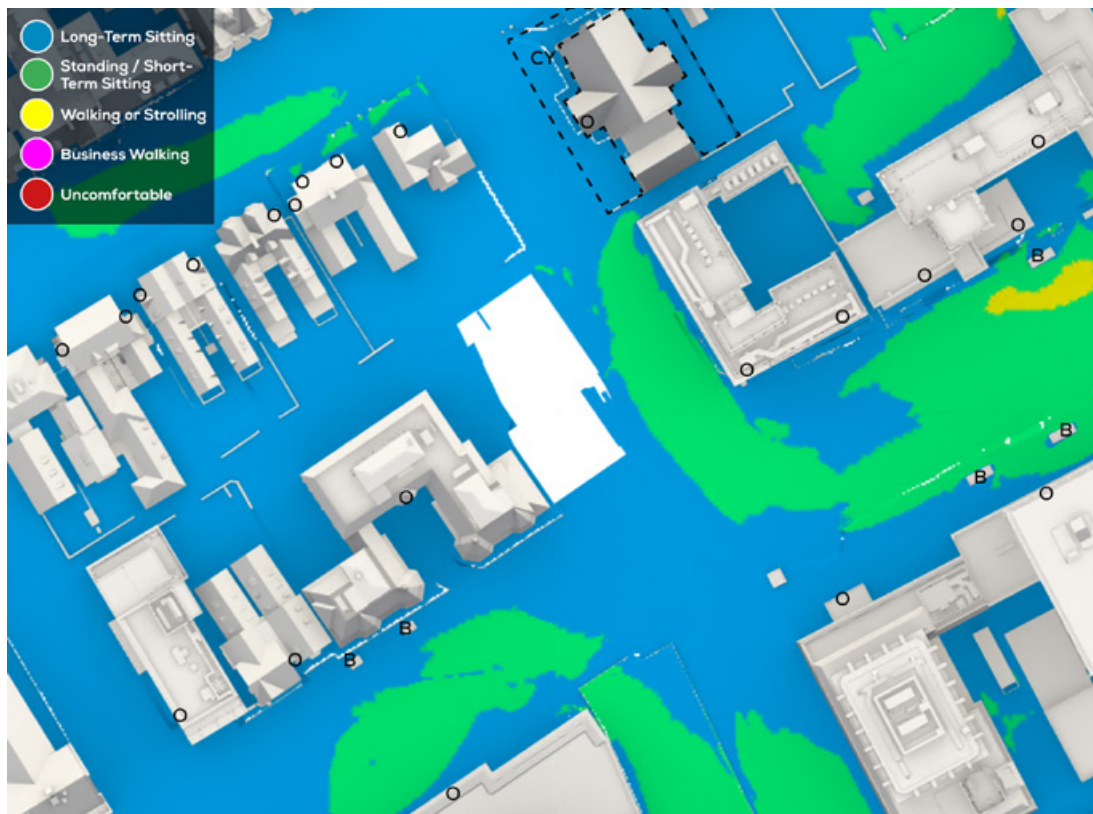


Fig. 09: Summer Comfort at Ground Level, Existing Site with Existing Surrounds (Baseline)

3.2 CONDITIONS FOR PROPOSED DEVELOPMENT WITH EXISTING SURROUNDS

Ground Level Conditions

Annual safety at ground level for the Proposed Development with existing surrounds is shown in Figure 10. Winter comfort at ground level for the Proposed Development with existing surrounds is shown in Figure 11. Summer comfort at ground level for the Proposed Development with existing surrounds is shown in Figure 12.

There are no exceedances of the wind safety criteria at ground level for the site or surrounding area.

Conditions range between suitable for long-term sitting, short-term sitting/standing, walking or strolling and business walking in winter, and between suitable for long-term sitting, short-term sitting/standing and walking or strolling in summer.

Localised regions which are suitable for business walking have been introduced at the north of the site. These predominantly fall within back-of-house regions or car parks, so conditions would be suitable for the intended use.

Conditions for the entrance to the Proposed Development (marked "E" in results figures) are suitable for short-term sitting/standing in the windiest season (winter). This is suitable for the intended use.

All principal off-site entrances (marked "O" in results figures) are suitable for either long-term sitting or short-term sitting/standing in the windiest season (winter). This is suitable for the intended use.

The bus stops on Newport Road (marked "B" in results figures) are suitable for either long-term sitting or short-term sitting/standing in the windiest season (winter). This is suitable for the intended use.

The Church Yard around Life Cardiff Church is suitable for a mix of long-term sitting and

short-term sitting/standing in all seasons. This is suitable for the intended use.

Elevated Level Conditions

Annual safety at elevated levels with the Proposed Development in existing surrounds is shown in Figure 13. Winter comfort at elevated levels with the Proposed Development with existing surrounds is shown in Figure 14. Summer comfort at elevated levels with the Proposed Development with existing surrounds is shown in Figure 15.

There are no regions of safety exceedance on any terrace which are sufficiently extensive to pose a safety risk to terrace users.

Conditions for the level 7 and 15 terraces are both suitable for a mix of short-term sitting/standing and walking or strolling in summer. This is up to one category windier than the target condition. It is recommended that any seating on these terraces is set into raised planters, to provide direct shelter for the seating itself.

Conditions for the level 23 terraces are mainly suitable for a mix of long-term sitting and short-term sitting/standing in summer. This is suitable for the intended use.



Fig. 10: Annual Safety at Ground Level, Proposed Development with Existing Surrounds

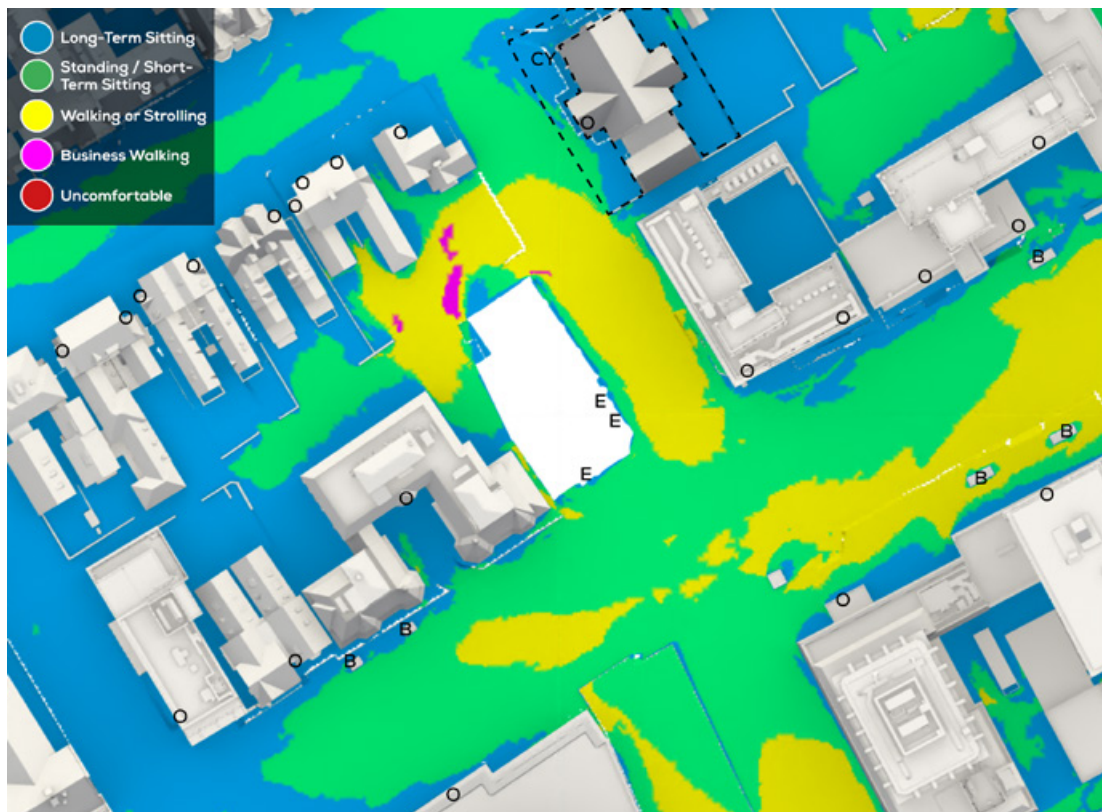


Fig. 11: Winter Comfort at Ground Level, Proposed Development with Existing Surrounds

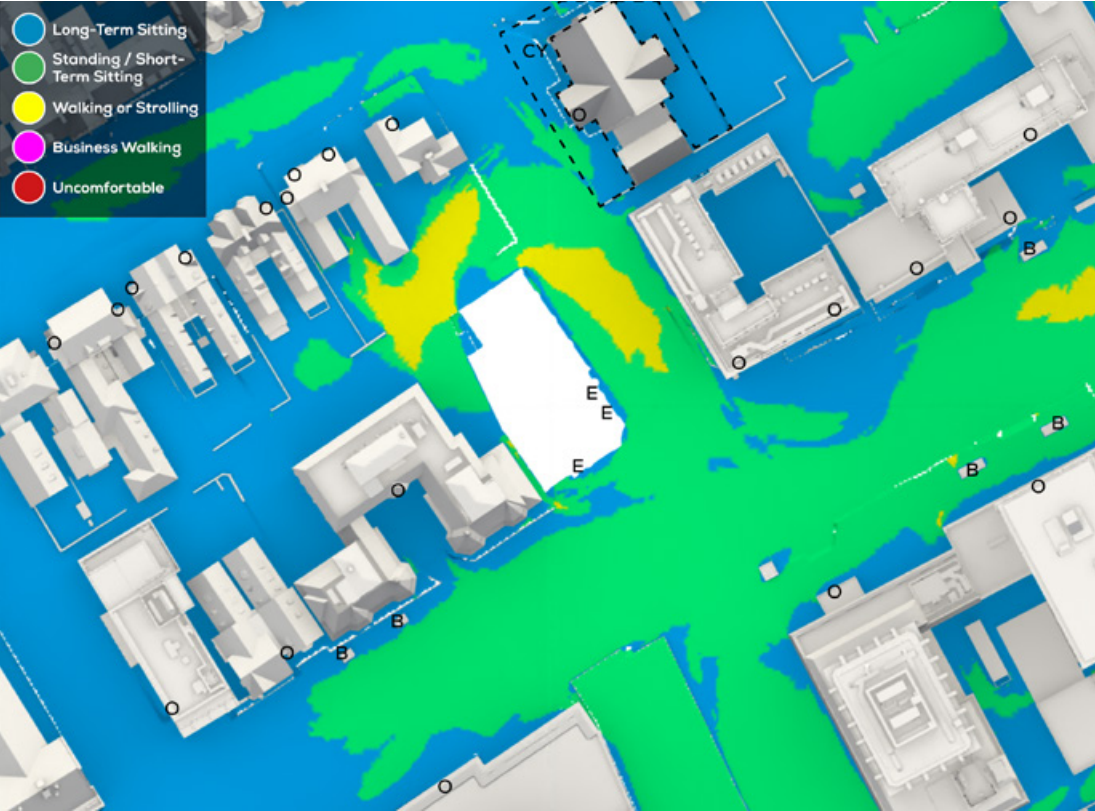


Fig. 12: Summer Comfort at Ground Level, Proposed Development with Existing Surrounds



Fig. 13: Annual Safety at Elevated Levels, Proposed Development with Existing Surrounds

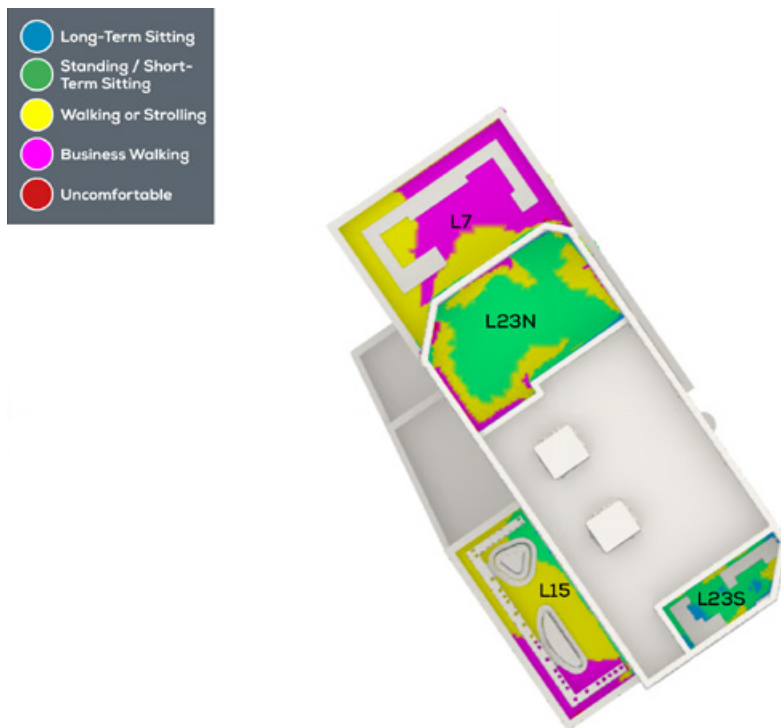


Fig. 14: Winter Comfort at Elevated Levels, Proposed Development with Existing Surrounds

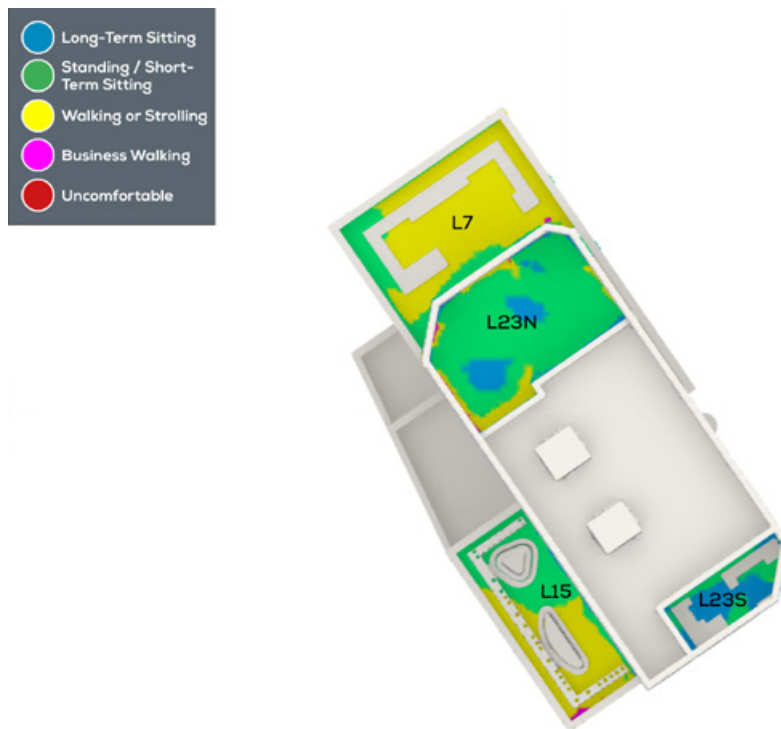


Fig. 15: Summer Comfort at Elevated Levels, Proposed Development with Existing Surrounds

3.3 CONDITIONS FOR PROPOSED DEVELOPMENT WITH CUMULATIVE SURROUNDS

Ground Level Conditions

Annual safety at ground level for the Proposed Development with cumulative surrounds is shown in Figure 16. Winter comfort at ground level for the Proposed Development with cumulative surrounds is shown in Figure 17. Summer comfort at ground level for the Proposed Development with cumulative surrounds is shown in Figure 18.

The inclusion of cumulative schemes has made conditions windier to the south west of the site.

A region of exceedance of the S15 (distress) criteria has been introduced adjacent to the Holland House hotel (marked "1" on Figure 16). Given the location of this exceedance away from the site to the south (upwind from key wind angles) this is not attributable to the proposed development and rather is attributable to the local cumulative schemes. As such there are no wind safety risks associated with the proposed development.

The entrance to the Holland House hotel (marked "O" and circled in Figure 17) is adjacent to a region which is suitable for walking or strolling, which is one category windier than the target condition. This entrance is, however, recessed which will provide a buffer region between internal and external conditions. So conditions will remain suitable for the intended use.

With the exception of the above, all other wind conditions would have the same suitability as those reported in Section 3.2 for the proposed development with existing surrounds.

Elevated Level Conditions

Annual safety at elevated levels with the Proposed Development in cumulative surrounds is shown in Figure 19. Winter comfort at elevated levels with the Proposed Development with cumulative surrounds is shown in Figure 20. Summer comfort at elevated levels with the Proposed Development with cumulative surrounds is shown in Figure 21.

Conditions are consistent with those for the scenario with existing surrounds, and there are no differences in suitability of conditions so the conditions reported in Section 3.2 still apply.



Fig. 16: Annual Safety at Ground Level, Proposed Development with Cumulative Surrounds

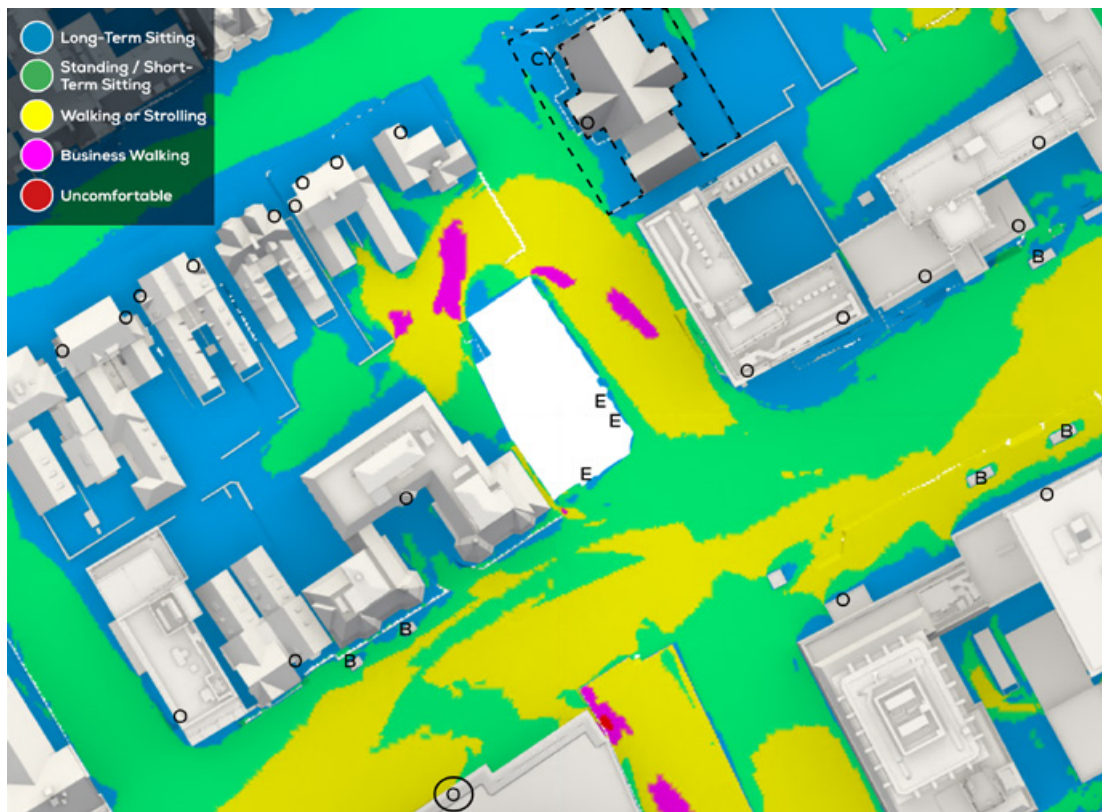


Fig. 17: Winter Comfort at Ground Level, Proposed Development with Cumulative Surrounds

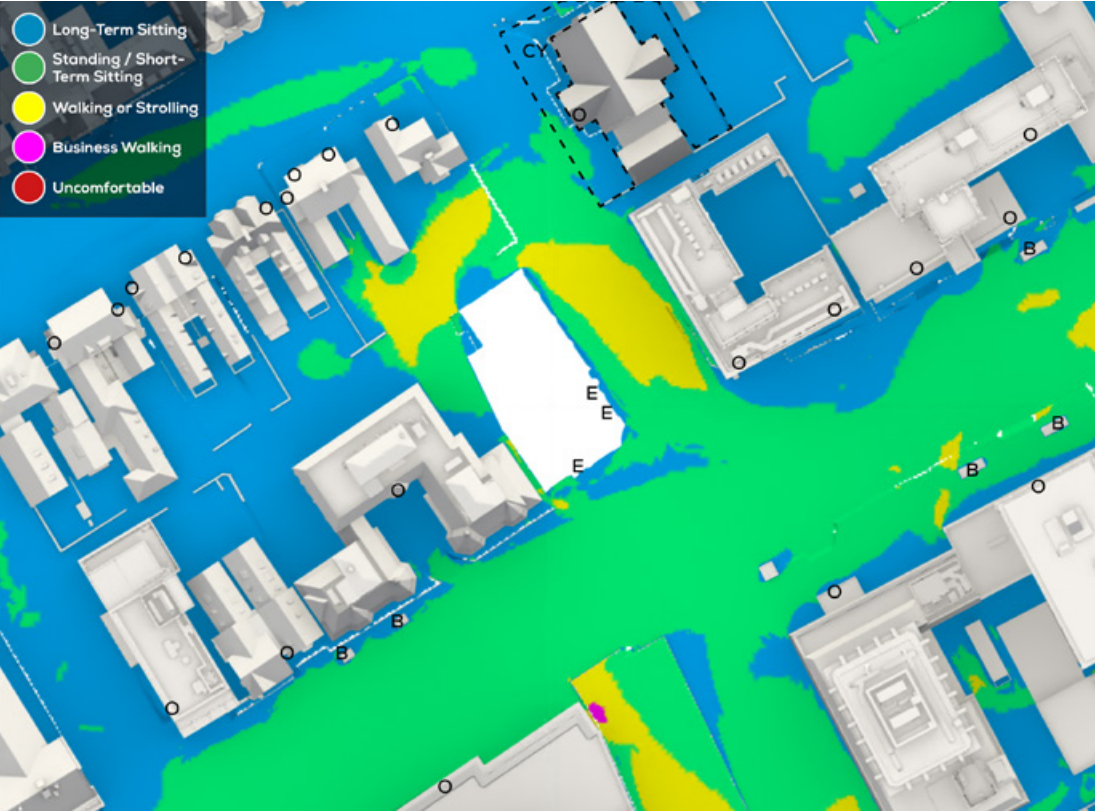


Fig. 18: Summer Comfort at Ground Level, Proposed Development with Cumulative Surrounds



Fig. 19: Annual Safety at Elevated Levels, Proposed Development with Cumulative Surrounds



Fig. 20: Winter Comfort at Elevated Levels, Proposed Development with Cumulative Surrounds



Fig. 21: Summer Comfort at Elevated Levels, Proposed Development with Cumulative Surrounds

4 CONCLUSIONS

Wind microclimate conditions for the Proposed Development at 29 Newport Road, Cardiff were assessed using high resolution Computational Fluid Dynamics (CFD).

There are no wind safety risks associated with the Proposed Development at either ground level or elevated levels.

Long term wind comfort conditions will be suitable for the intended use (or consistent with baseline conditions) for all thoroughfares, existing building entrances, proposed building entrances, bus stops, church yards and the level 23 terraces.

The level 7 and 15 terraces have regions which are a category windier than the target. Care should be taken to ensure that seating on these terraces is offered local protection such as being set into raised planters.

Wind impacts of the proposed development with respect to cumulative schemes would be negligible.

APPENDIX 01

DETAILED METHODOLOGY

CFD METHODOLOGY

The CFD was performed using OpenFOAM.

Meshed using a hybrid mesh of hexahedral, polyhedral, tetrahedral and prismatic elements:

- On site building edge length: 0.05m – 0.25m
- Surrounding context edge length: 0.25m – 1m

Prismatic cells were used in the boundary layer region, with 4 layers of cells growing with an expansion ratio of 1.15 and aspect ratios between 0.1 and 0.4.

The total mesh size was between 103 and 106 million cells. Mesh detail is shown in Figure 22 and Figure 23.

Buildings within 400m of the site were included.

The domain was 5000mx5000m, with a blockage ratio of 0.5%

The blockage ratio uses a “test section” of 600mx200m (within which detail is captured).

Run using the SST turbulence model with high Re wall functions to ensure mesh suitability.

The simulations were steady state and isothermal.

2nd order discretisation schemes were used.

Convergence was measured as the residuals of the continuity, x-velocity, y-velocity, z-velocity, k and omega equations all falling by at least 2 orders of magnitude, and by measured static pressure on the site buildings varying by less than 1% over the final 100 iterations.

The wind speed is corrected into a “gust-equivalent” mean. The gust-equivalent mean is calculated using an empirical relationship between the gust and mean ratios recorded at over 13,000 data points from wind tunnel tests. This method is found to give a significant correlation improvement over the more traditional methods based on the CFD turbulent kinetic energy field.

WIND CLIMATE METHODOLOGY

Seasonal wind roses for Cardiff Airport are shown in Figure 24.

Target wind profiles for the site, from each wind direction, were generated using sectoral analysis of the terrain surrounding the site and the local weather stations with ESDU 2010 Item01008 ‘Computer program for wind speeds and turbulent properties: flat or hilly sites in terrain with roughness changes’. The target wind profiles, compared to the wind speeds measured from the CFD model are shown in Figure 25.

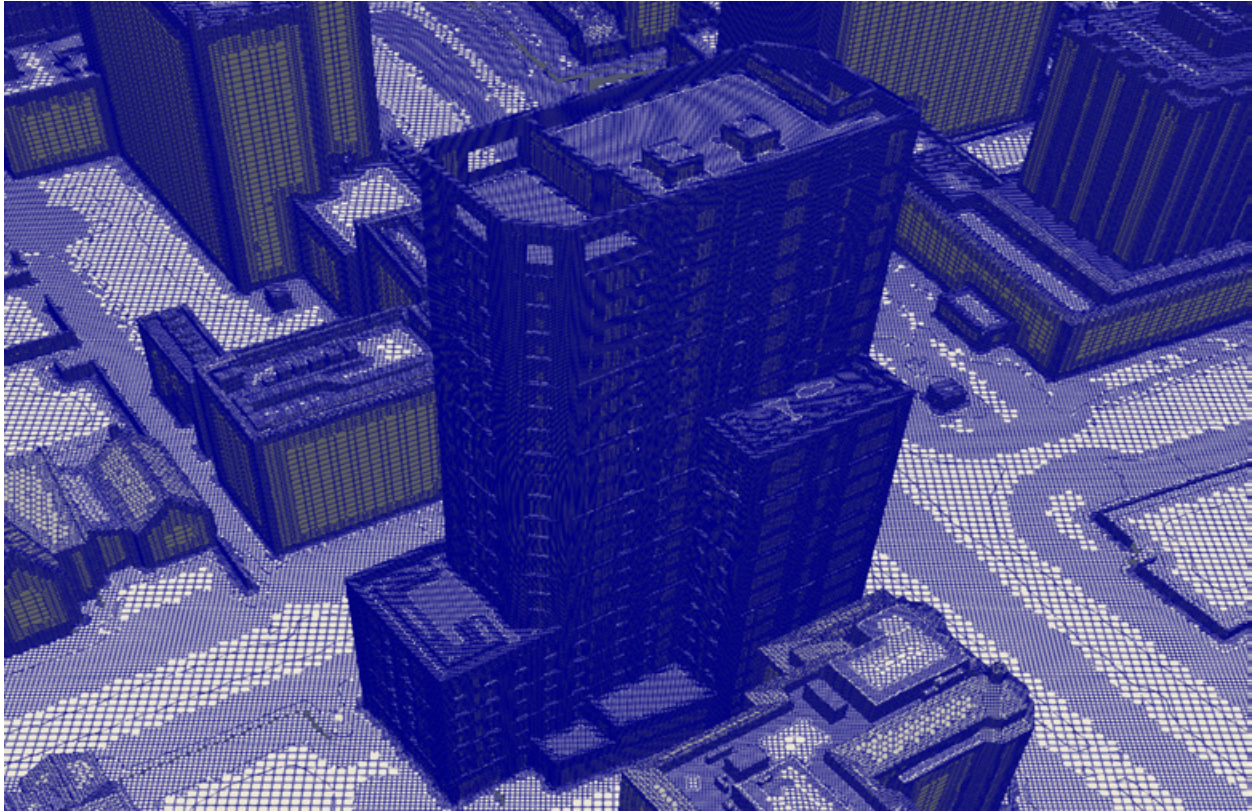


Fig. 22: Mesh Detail on Site Buildings

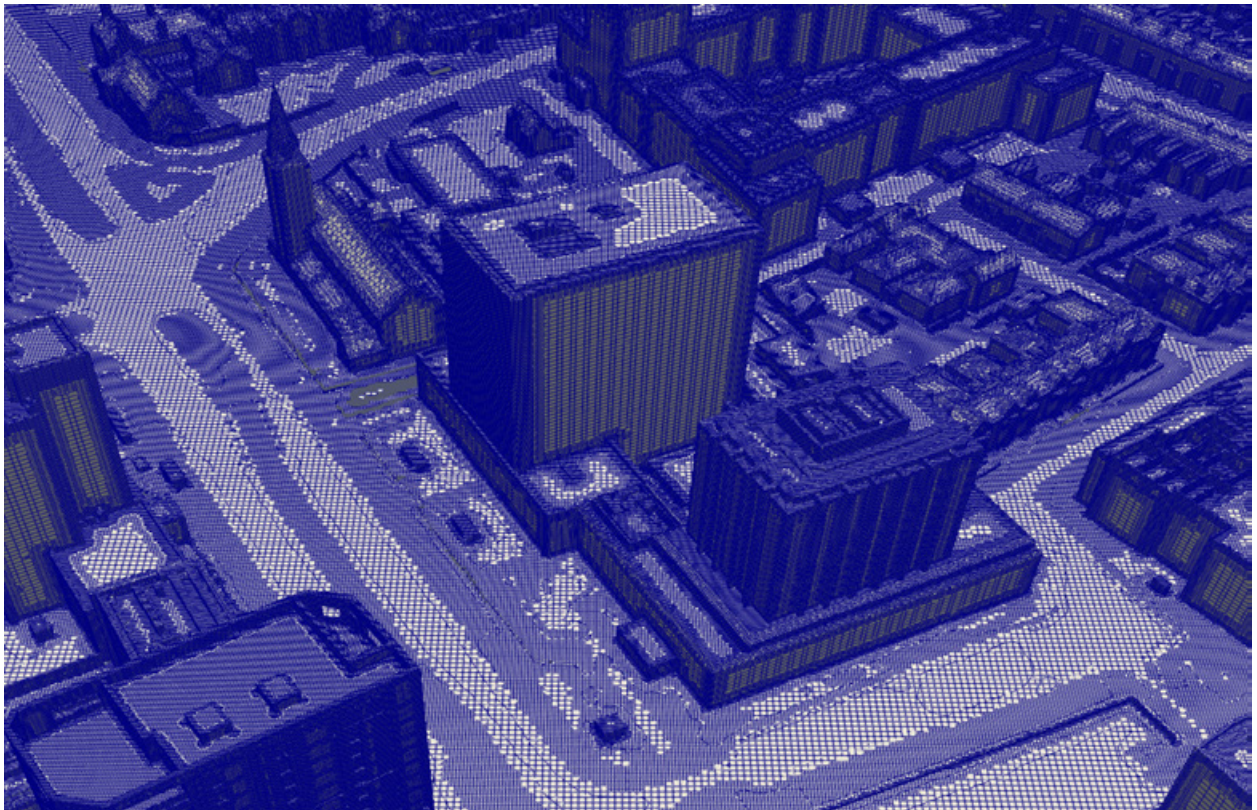


Fig. 23: Mesh Detail on Surrounds

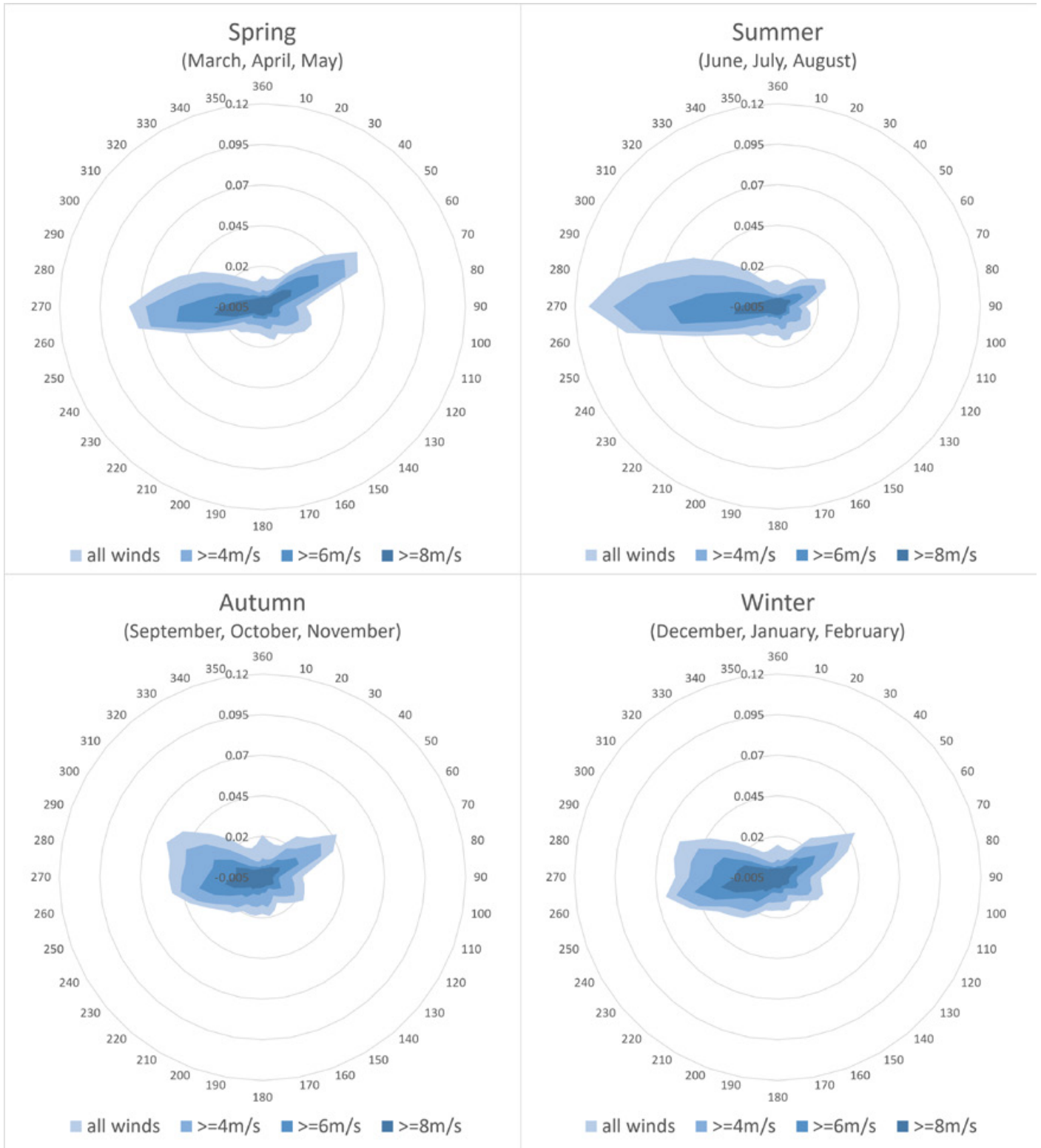


Fig. 24: Seasonal Wind Roses for Cardiff

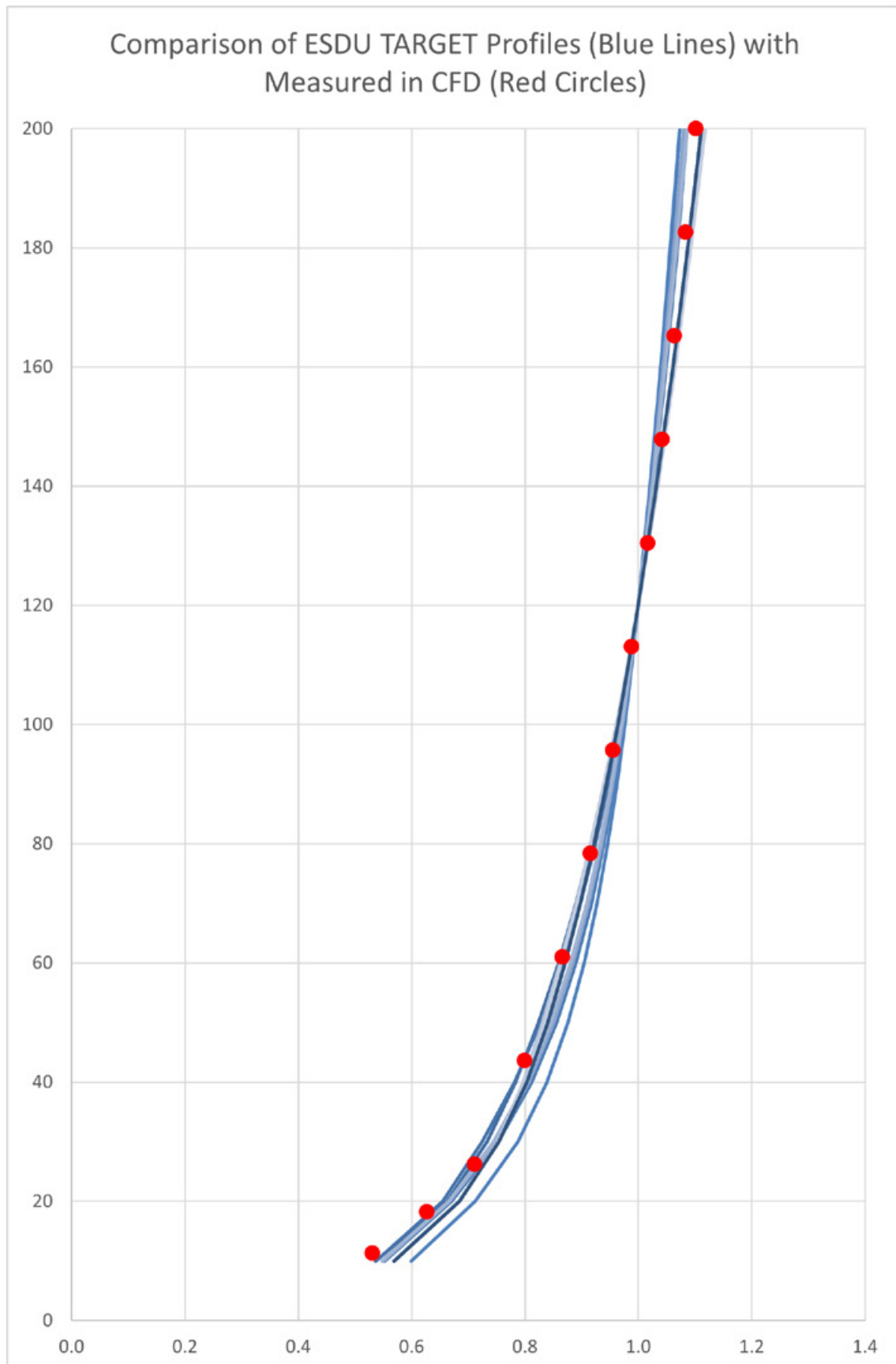


Fig. 25: Wind Profile for Cardiff



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