



Appendix 16.1

WIND TECHNICAL REPORT



Northumberland Development Project Hotel S73 Application

For

Tottenham Hotspur
Property Company
Limited

Wind Microclimate Report

3090515rep1v3

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Submitted by:

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Executive Summary

Background

A study has been carried out by Architectural Aerodynamics Ltd. (ArcAero) to assess the wind microclimate for the proposed Northumberland Development Project Hotel S73 Application development in London, UK.

The study has adopted wind tunnel testing to predict the strength of winds. Then using the industry standard Lawson criteria, it has established the suitability of wind conditions and the impact on the surrounding area, following the introduction of the proposed development.

Conclusions

The following conclusions have been drawn:

- Following the introduction of the proposed development with wind mitigation measures, wind conditions in / around the immediate vicinity of Plot 3 (NDP Hotel) meet the criteria for pedestrian safety and are largely suitable for use in terms of comfort. There are no adverse impacts on wind conditions within the immediate or wider surrounds.
- Neither cumulative surrounds and nor 'Lendlease' cumulative surrounds create any material difference to the resulting wind microclimate.

1 Introduction

A microclimate is defined 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 area as a whole. Wind microclimate assessments consider the wind conditions that would result upon the introduction of a new development into an existing space.

Such assessments predict 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 proposal and neighbouring properties whether wind conditions are suitable or unsuitable, and whether design adjustment or mitigation measures are required. It is for this purpose that wind microclimate assessments are undertaken.

This report summarises the results wind tunnel studies commissioned by Tottenham Hotspur Property Company Limited, to assess the wind microclimate for the proposed Northumberland Development Project Hotel S73 Application development in London, UK.

2 The Proposed Development

2.1 Site Location and Surrounding Area

NDP Hotel development (Plot 3) is a part of the Northumberland Park Development Project (NDP) that was previously granted planning permission (LPA reference HGY/2015/3000). The Northumberland Development Project Hotel S73 Application development is bounded by Park Lane to the south Northumberland Park Road and London Academy of Excellence to north, High Road to the west, and Worcester Avenue to the east .

Further afield, the regions around the proposed development are fairly built up with surrounding medium to high rise developments. The development is in North London with the more built up City to the South.

The proposed development will comprise of a 30 storey building with 180 hotel rooms, and rises to a level of approximately of 117 metres above local ground.

2.2 Drawing Information Describing the Proposed Development

Assessment models have been constructed on the basis of the following drawings received from F3 Architects on 3rd July 2023:

- NDP Hotel - 3D Model (230703).dwg

The existing surrounding area was based upon information supplied by Ordnance Survey details for the area. Cumulative surrounds were based upon information contained within the LB of Haringey planning portal.

2.3 Soft Landscaping

The wind microclimate has been assessed for the proposed development with current soft landscaping proposals at ground level hotel terrace, 27888002-ARP-XX-R-L_002_Landscape Design Freeze.pdf as in Figure 2.1 on 9th of June 2023.

2.4 Wind Mitigation Measures

The completed development has been assessed with and without wind mitigation measures. These are:

- Within Plot 3 Ground Terrace as presented in Figure 2.2
 - 3 planters with hedging to the northeast of Plot 3 (1.6m by 1.2m by 1.0m)
 - 1.0m planter
- Elevated Terraces as presented in Figure 2.3
 - 1.8m tall parapets
 - Potentially moveable wind break (2.6m long, 1.5m tall)

- Planting (~1.5m tall)
- 1.8m tall privacy screens

2.5 Surrounding Contexts

The proposed development was assessed in three surrounding contexts, namely existing surrounds, cumulative surrounds and Lendlease cumulative schemes. Consented developments that have been considered within the cumulative surrounds and Lendlease cumulative scenario are listed in Table 2-1.

Table 2-1 – Cumulative Schemes

Development Name	Planning Reference
819-829 High Road, Tottenham	HGY/2021/2283 & HGY/2021/2284
The Goods Yard and The Depot	HGY/2022/0563
807 High Road, London	HGY/2021/0441
Lendlease Scheme	HGY/2021/3175

3 Assessment Methodology

3.1 Overview

Wind tunnel modelling was undertaken in the Imperial College 10x5 atmospheric boundary layer wind tunnel in London. The blockage ratio was within the 5% level recommended by the ASCE SEI (1) and AWES QAM (2) guidelines. Full details of the wind tunnel testing conducted for the study are presented in Appendix A of this report.

Modelling via wind tunnel testing has derived mean and gust equivalent mean wind speeds, in accordance with best industry practice. In doing so 36 wind directions were assessed, in 10.0° increments.

The industry standard criteria for wind microclimate assessments, the LDDC variant of the Lawson criteria (3), has been employed for the study.

3.2 Wind Climate Analysis

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

Full details of the wind climate relevant to the site, the wind properties approaching the site and the modelling of those wind properties in the wind tunnel models are provided in Appendix B of this report. All analysis of wind data and the atmospheric boundary layer has employed the methods of ESDU item 01008 (4), in accordance with best industry practice.

3.3 Assessment Scenarios

The wind tunnel model covered a radius of 600 metres from the site. All features which are likely to impact the wind flow within the study area have been replicated. The model was reviewed and approved by the design team prior to the study. The assessment considered a full range of directions in 10° intervals, and considered the following configurations:

1. Existing site, existing surrounding conditions
2. Completed Development, existing surrounding conditions
3. Completed Development, existing surrounding conditions with wind mitigation measures
4. Completed Development, cumulative surroundings
5. Completed Development, Lendlease cumulative surroundings

Details of the tunnel and model used for the wind tunnel study are presented in Appendix A of this report.

3.4 The LDDC Lawson Criteria

The industry standard criteria for wind microclimate assessments are commonly referred to in the UK as the Lawson criteria after one of their main authors. As with most other leading practitioners, ArcAero use the 'LDDC' variant of the Lawson Criteria (London Docklands Development Corporation (3)).

The LDDC variant applies a single percentage probability of exceedance of a range of wind speeds and associates different wind speeds to different types of usage. This offers a relatively simple and practical manner for the assessment of wind comfort and safety.

3.4.1 Safety

A wind speed of 15 m/s occurring once per year is rated as unsuitable, in terms of safety, 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 (3) 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	Short-term sitting / standing
8	C2	Strolling
10	C1	Walking
> 10	C0	Uncomfortable

3.5 Pedestrian / Occupant Uses

In using the Lawson criteria to consider the suitability of spaces, in terms of comfort, it is necessary to identify the anticipated usage of the various areas and assign that usage to an assessment receptor. Each measurement location is assigned a pedestrian / occupant use, for each assessment scenario. This is presented in Table C.1 in Appendix C.

4 Results

4.1 Existing Site within Existing Surrounds

The results for the existing site conditions are presented graphically within Figure 4.1 and Figure 4.2 for worst-seasonal and summer conditions respectively.

4.1.1 Safety

Wind conditions to the south and south-east of Tottenham Stadium on the podium (location 41 & 62) exceed the criteria for wind safety. Elsewhere, all locations within the existing site and immediate surrounds meet the safety criteria.

4.1.2 Comfort

Wind conditions at several locations within the site and immediate surrounds would be too windy for entrances, these include at the south, southeast and southwest of the Tottenham Hotspur Stadium (39, 42, 61, 63, 83, 109, 110), being suitable for standing for 83% on average. Elsewhere wind conditions at entrances are suitable for at least short-term standing and thus for comfortable pedestrian ingress egress.

Conditions on the podium close to the stadium (locations 38, 41, 60, 62, 64, 65 and 112) are generally too windy for comfortable thoroughfare use, particularly in the winter month. These areas would however be suitable for strolling on average 92% of the time.

Elsewhere, the existing conditions are expected to be suitable for existing uses.

4.2 Completed Development within Existing Surrounds

The results for the completed development within existing surrounds are presented graphically within Figure 4.3 and Figure 4.4 for worst-seasonal and Figure 4.5 and Figure 4.6 for summer conditions respectively.

4.2.1 Safety

Following the introduction of the completed development and without any mitigation measures, wind conditions on the podium improve such that locations 41 and 62 satisfy the safety criteria. There are several areas within the site and immediate surrounds which fail the wind criteria for safety however:

- Within the podium of Plot 5, The Residential Buildings and Flexible B1/D1 Space (location 31, 32 & 33). This area's safety was predicted and mitigated in the last ES reported in 2015.
- At the northwest corner of the Plot 3 (location 77)
- Plot 3, level 12 (location 203)
- Plot 3, level 26 (location 403)
- Plot 3, level 27 (location 406)

Elsewhere, all locations within the site and immediate surrounds meet the safety criteria.

4.2.2 Comfort

4.2.2.1 Thoroughfares

Several areas to the south of Tottenham Hotspur Stadium (location 60, 64, and 112) have now become suitable for the leisure thoroughfares with the introduction of the completed development. Several areas within the development site would be considered suitable only for fast walking in winter, including

- The area at the southern of the Tottenham Hotspur Stadium (location 38, 41, 62, 72) has shown wind comfort improvement from an average of 92% of the time suitable for strolling to 94%.
- level 12 of Plot 3 (location 203), being suitable for strolling 91% of the time.
- within or nearby Plot 5 (location 30,35,36,48,49).

Within the Plot 5 podium (location 33 and 32), the wind conditions are uncomfortable for use. At all other thoroughfares conditions are suitable for at least strolling throughout the year and thus for proposed pedestrian use.

4.2.2.2 Entrances

The northwestern corner of Plot 3 facade (location 77) is suitable for fast walking. However, this is a relatively inaccessible area to be used only for emergency exit purposes on rare occasions. The north Plot 3 terrace entrance (location 75) has exceeded the wind comfort criteria being suitable for standing for 83% of the time. The entrances to the south of the Tottenham Hotspur Stadium (location 39, 42, 61, 63, 109, 110) have showed an improvement with the introduction of completed development but remain suitable for comfortable pedestrian ingress / egress for an average of only 83% of the time. For location 83 to the south of Tottenham Stadium, conditions have become suitable for entrance use.

Elsewhere wind conditions at entrances are suitable for at least standing and thus for comfortable pedestrian ingress egress.

4.2.2.3 Recreational Spaces

From springs to autumn, there are several areas within the site and immediate surrounds which exceeds the comfort criteria for recreational spaces usage:

- Ground Terrace, Plot 3 (location 76 to 80) exceed the criteria for long term sitting in summer and would be considered too windy for comfortable use.
- Level 12 & 13, Plot 3 (location 201, 205, 302) modestly exceed the wind comfort criteria, being suitable for short-term standing on average 93% of the time in spring and being generally suitable for short periods of sitting in summer.
- Level 26 & 27, Plot 3 (location 401, 402, 403, 404 & 406) exceed the wind comfort criteria being suitable on average 90% of the time for short-term standing in spring and on average 93% of the time in summer.

- South of the Tottenham Hotspurs Stadium (location 65 & 66) have modestly exceeded the wind comfort which are suitable for short-term standing on average 93% of the time in spring and on average suitable for recreational use in summer.
- Plot 4, The Extreme Sports Building (location 70) is suitable only for fast walking. Effective wind mitigation has been designed for this location as part of the consented application. This has not been modelled within the current tests.
- Plot 5, The Residential Buildings and Flexible B1/D1 Space (location 31, 32 & 34) has similarly been resolved during earlier wind studies, these mitigation measures have not been modelled in the current study.

Elsewhere wind conditions for recreational spaces are suitable for at least short term of standing/seating and thus suitable for recreational activities.

4.2.2.4 *Balconies*

The balconies of the Plot 3 are part of the facade recess that are well protected to the extent that they will provide comfortable wind conditions. This has been confirmed via initial CFD modelling which demonstrated the wind conditions suitable at least short-term standing or better from spring to autumn.

4.2.2.5 *Surrounding Area*

Following the introduction of the completed development, conditions on surrounding thoroughfares are suitable for strolling or better with an exception at the southwest of Plot 5 where the wind is marginally exceeding with an average 93% of the time suitable for strolling at location 48 and 49. These locations have not been impacted by the presence of the Hotel development. The outdoor seating area (location 119) continues to be suitable for long-term sitting from spring to autumn and hence suitable for outdoor seating.

4.3 Completed Development within Existing Surrounds with Mitigation measures

The results for the completed development within existing surrounds are presented graphically within Figure 4.7 and Figure 4.8 for worst-seasonal and Figure 4.5 and Figure 4.10 for summer conditions respectively.

Mitigation measures have been designed to alleviate windy conditions within the Hotel site only, surrounding conditions on the podium and within the wider surrounds remain as per the configuration with no mitigation as discussed above.

4.3.1 *Safety*

With the introduction of mitigation measures, all locations within the Hotel site satisfy the safety criteria.

4.3.2 *Comfort*

4.3.2.1 *Thoroughfares*

With the introduction of wind mitigation measures, all thoroughfares within the Hotel site are suitable for at least strolling throughout the year.

4.3.2.2 Entrances

With the introduction of mitigation measures, all main entrances within the Hotel site are suitable for at least standing and thus for entrance use. The secondary / emergency exit at location 77 does experience windier conditions which are still considered suitable given the infrequent use of the space.

4.3.2.3 Recreational Spaces

With the introduction of mitigation measures, recreational spaces within the Hotel site are generally suitable for use with the exception of:

- A small area at the north of the podium level seating space (location 76) is too windy for comfortable long-term sitting. It is likely that the rest of the seating space, which is considered suitable, would be utilised on the days this limited area is too windy.
- In spring, localised areas of the upper terraces are marginally too windy for use. With these areas being suitable from spring to autumn and the rest of the spaces being suitable throughout the year, conditions on the terraces would be considered suitable, or at worst tolerable where conditions are marginally too windy in spring:
 - Within the pool on level 12 (location 205)
 - At the northeast corner on level 13 (location 302)
 - At the northern terrace of level 26 (location 401)

4.4 Completed Development within Cumulative Surrounds

The results for the completed development within cumulative surrounds are presented graphically within Figure 4.11 and Figure 4.12 for worst-seasonal and Figure 4.13 and Figure 4.14 for summer conditions respectively.

Following the introduction of cumulative surrounds, in combination with the completed development, wind conditions within the study area are materially the same, with regard to their comfort suitability for designated uses, and with regard to pedestrian safety. As such the proposed mitigation measures would be as effective for the cumulative scenario.

4.5 Completed Development within Lendlease Cumulative Surrounds

The results for the completed development within Lendlease cumulative surrounds are presented graphically within Figure 4.15 and Figure 4.16 for worst-seasonal and Figure 4.17 and Figure 4.18 for summer conditions respectively.

Following the introduction of Lendlease cumulative surrounds, in combination with the completed development, wind conditions within the study area are materially the same, with regard to their comfort suitability for designated uses, and with regard to pedestrian safety. As such the proposed mitigation measures would be as effective for the cumulative scenario.

5 Conclusions

The following conclusions have been drawn:

- Following the introduction of the proposed development with wind mitigation measures, wind conditions in / around the immediate vicinity of Plot 3 (NDP Hotel) meet the criteria for pedestrian safety and are largely suitable for use in terms of comfort. There are no adverse impacts on wind conditions within the immediate or wider surrounds.
- Neither cumulative surrounds and nor 'Lendlease' cumulative surrounds create any material difference to the resulting wind microclimate.

6 References

1. Quality Assurance Manual - Wind Engineering Studies of Buildings. 2001. AWES-QAM-1-2001.
2. The American Society of Civil Engineers (ASCE) Manual of Practice No.67 for Wind Tunnel Studies. ASCE SEI 49/12.
3. Lawson, T.V. *The determination of the wind environment of a building complex before construction*. Bristol : University of Bristol, Department of Aeronautical Engineering, 1990.
4. 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 2.1 - Proposed Landscaping (Ground)

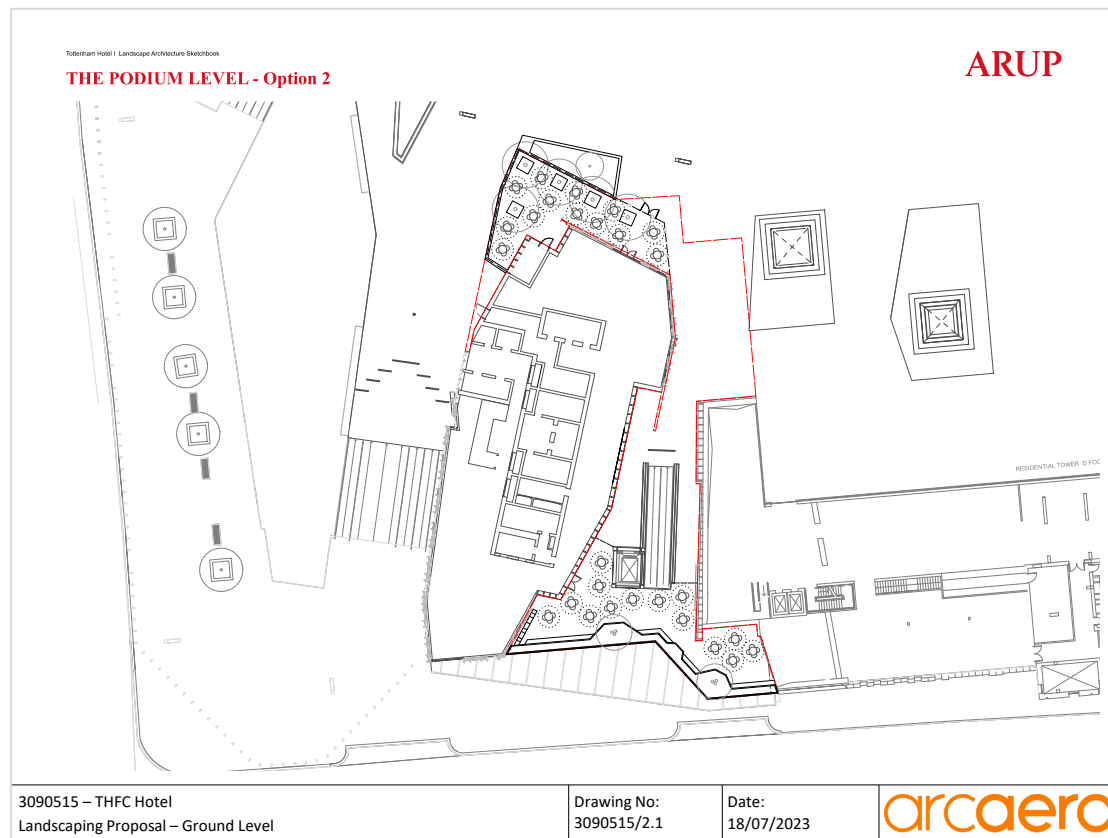


Figure 2.2 - Ground Level mitigations measures

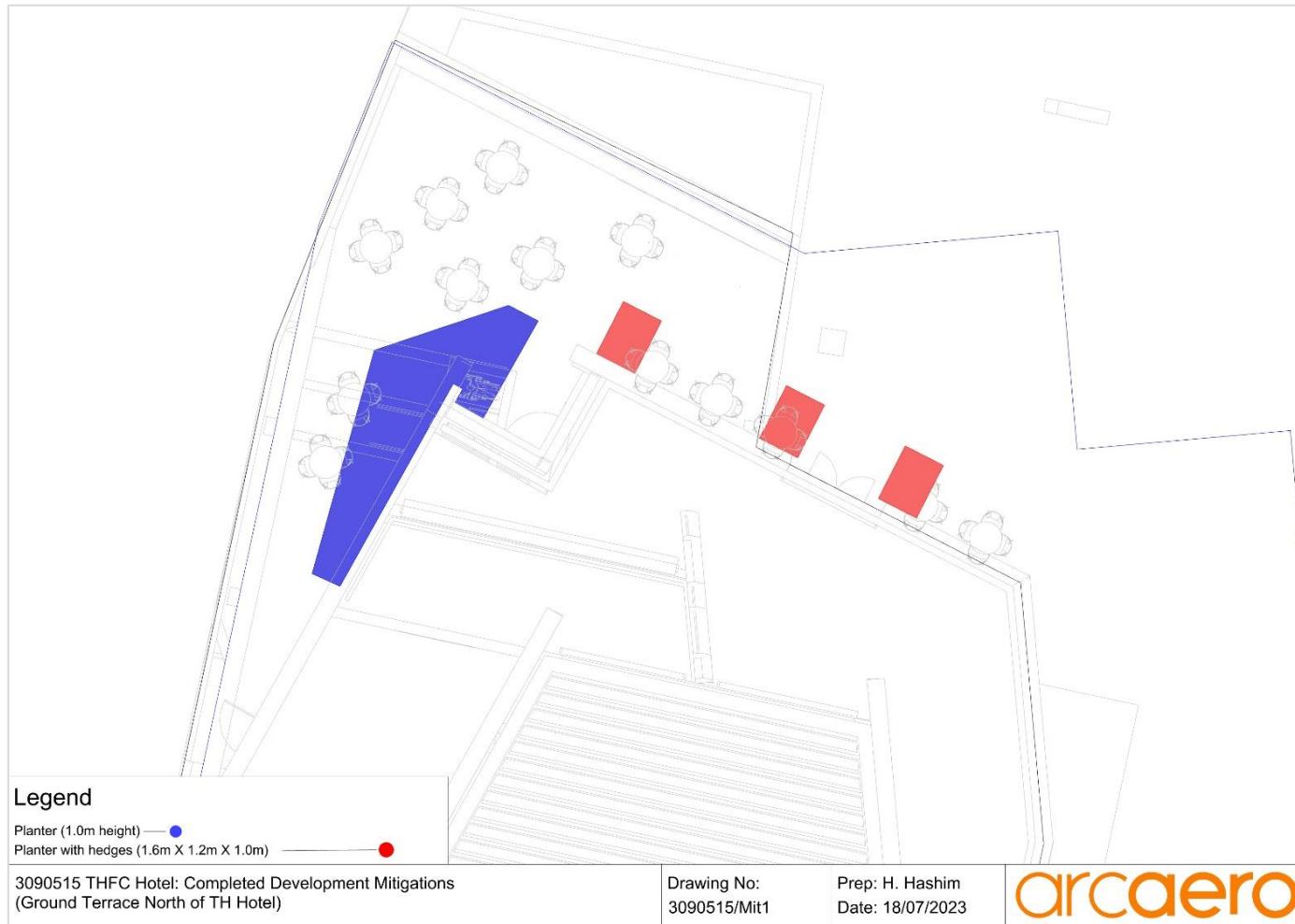


Figure 2.3 – Elevated terrace mitigation measures



Figure 4.1 - Pedestrian wind conditions, existing site within existing surrounds, 'worst' season

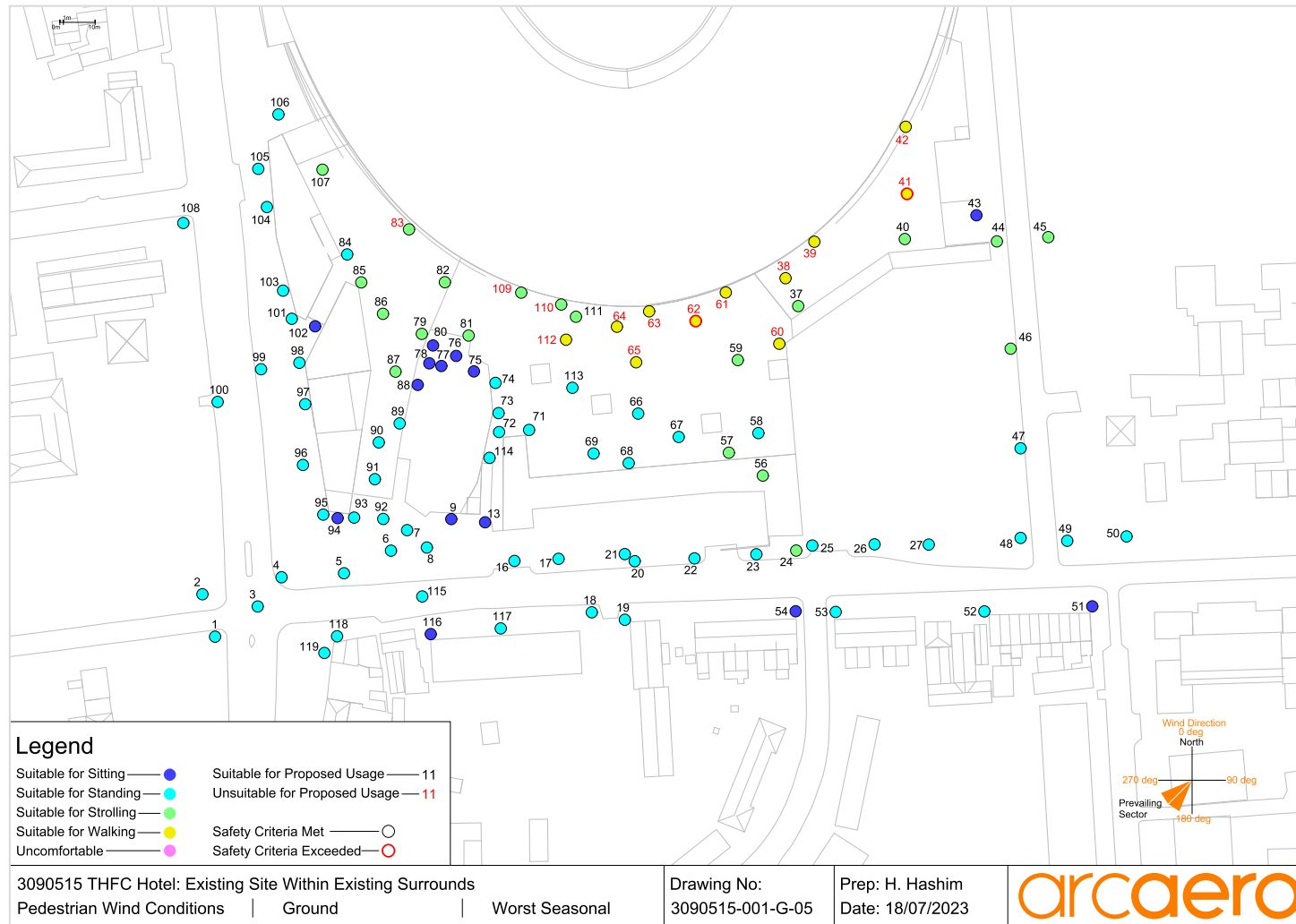


Figure 4.2 - Pedestrian wind conditions, existing site within existing surrounds, summer

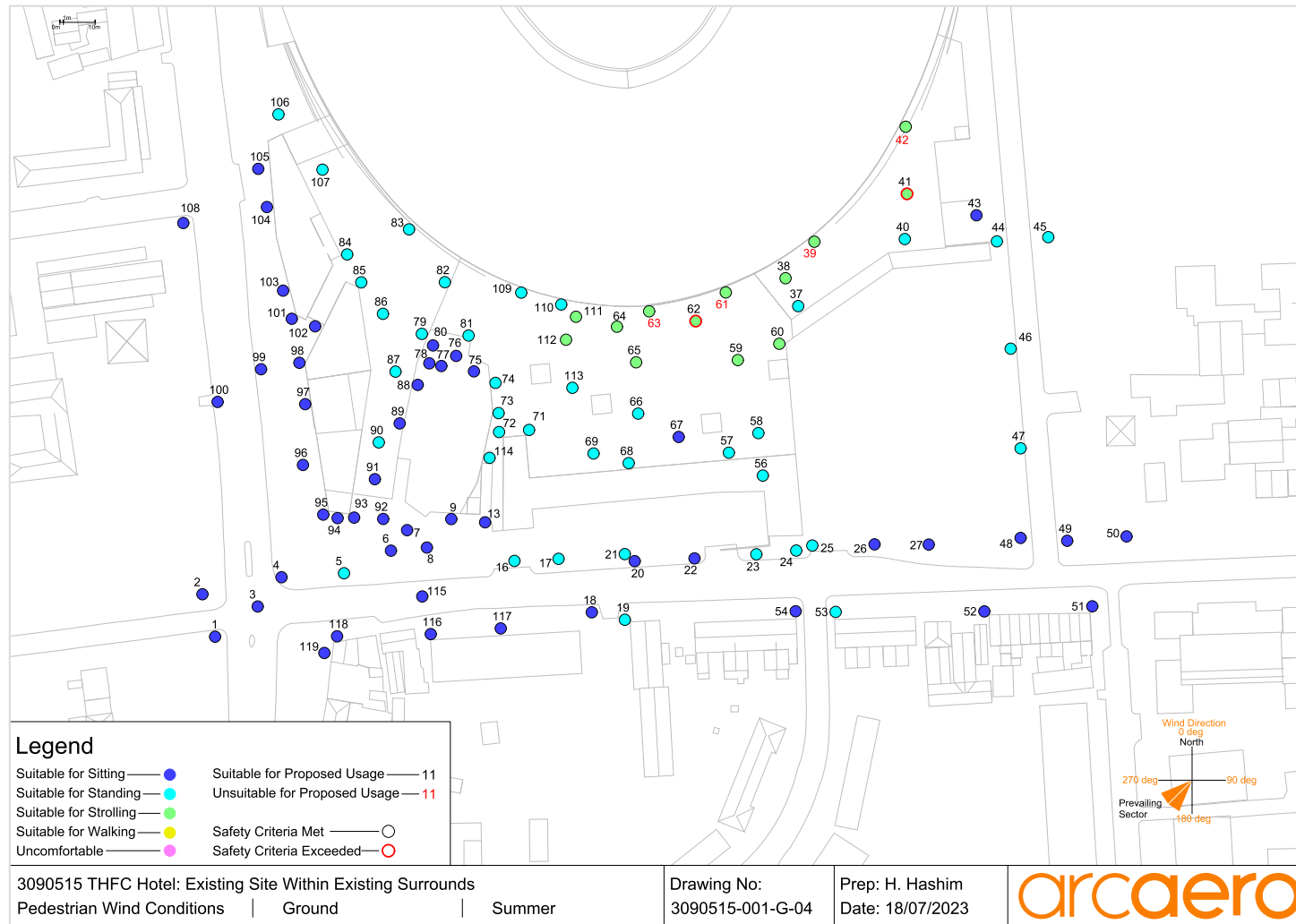


Figure 4.3 - Pedestrian wind conditions, completed development within existing surrounds, 'worst' season – ground level

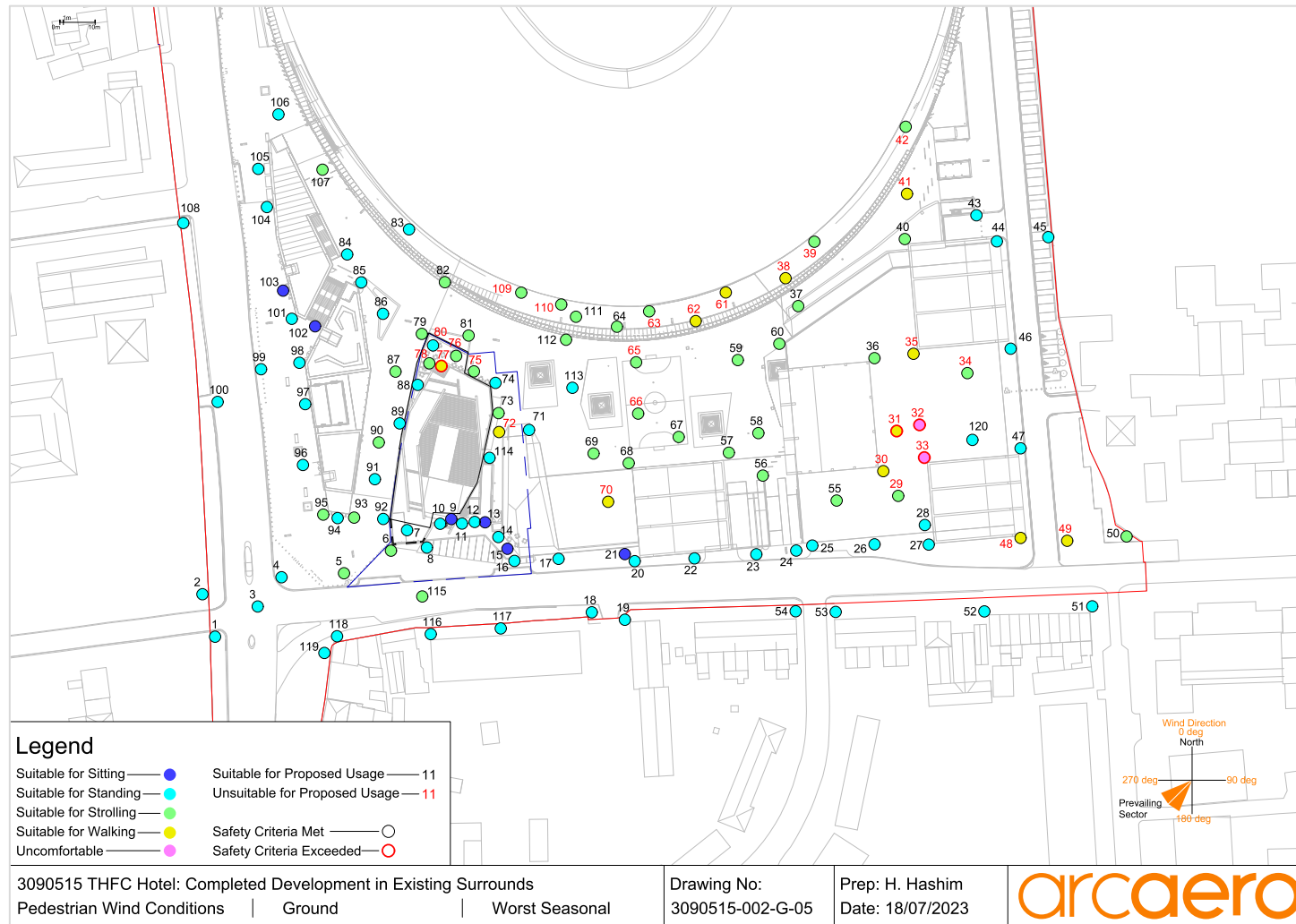


Figure 4.4 – Pedestrian wind conditions, completed development within existing surrounds, 'worst' season – elevated level

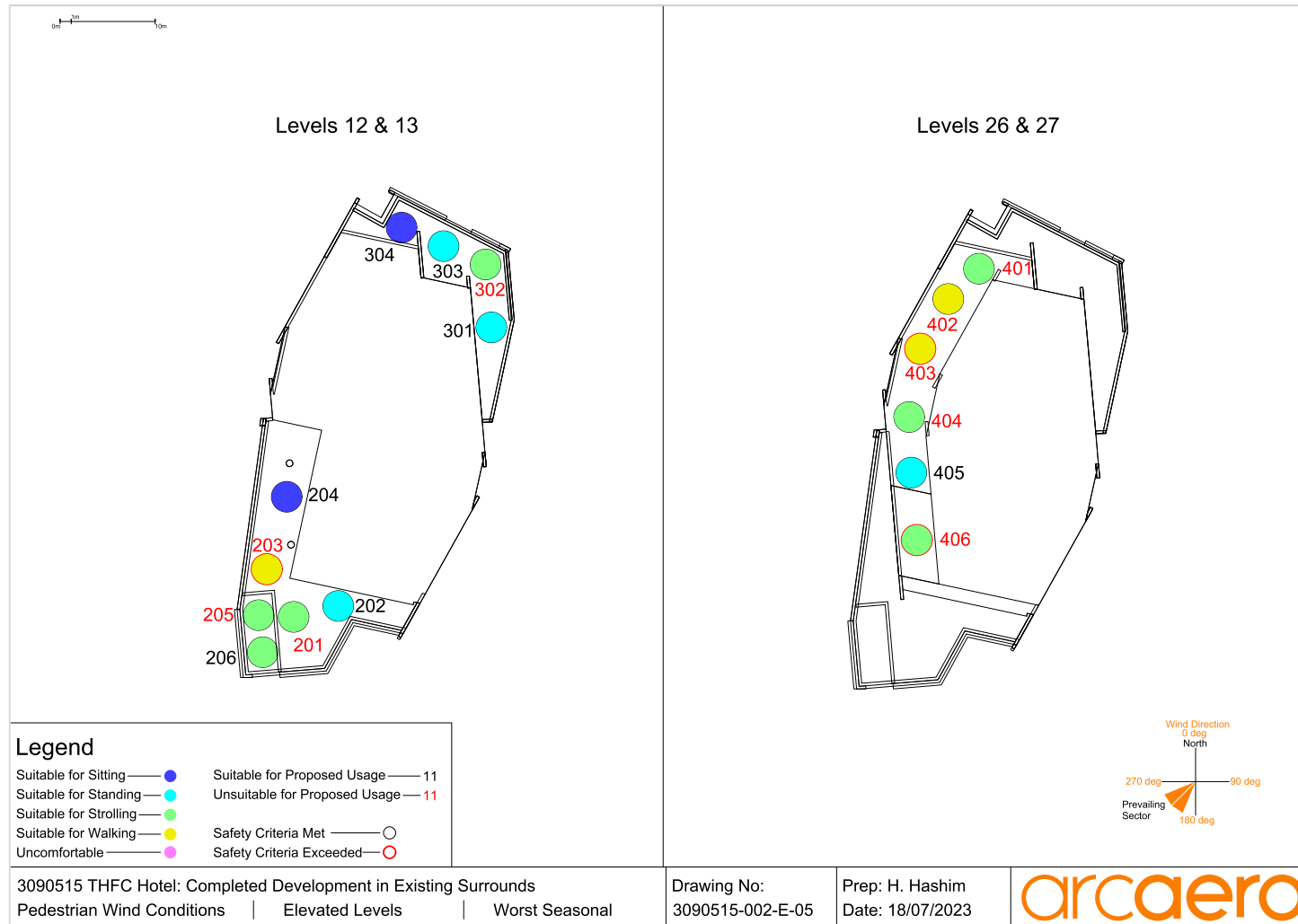


Figure 4.5 - Pedestrian wind conditions, completed development within existing surrounds, summer – ground level

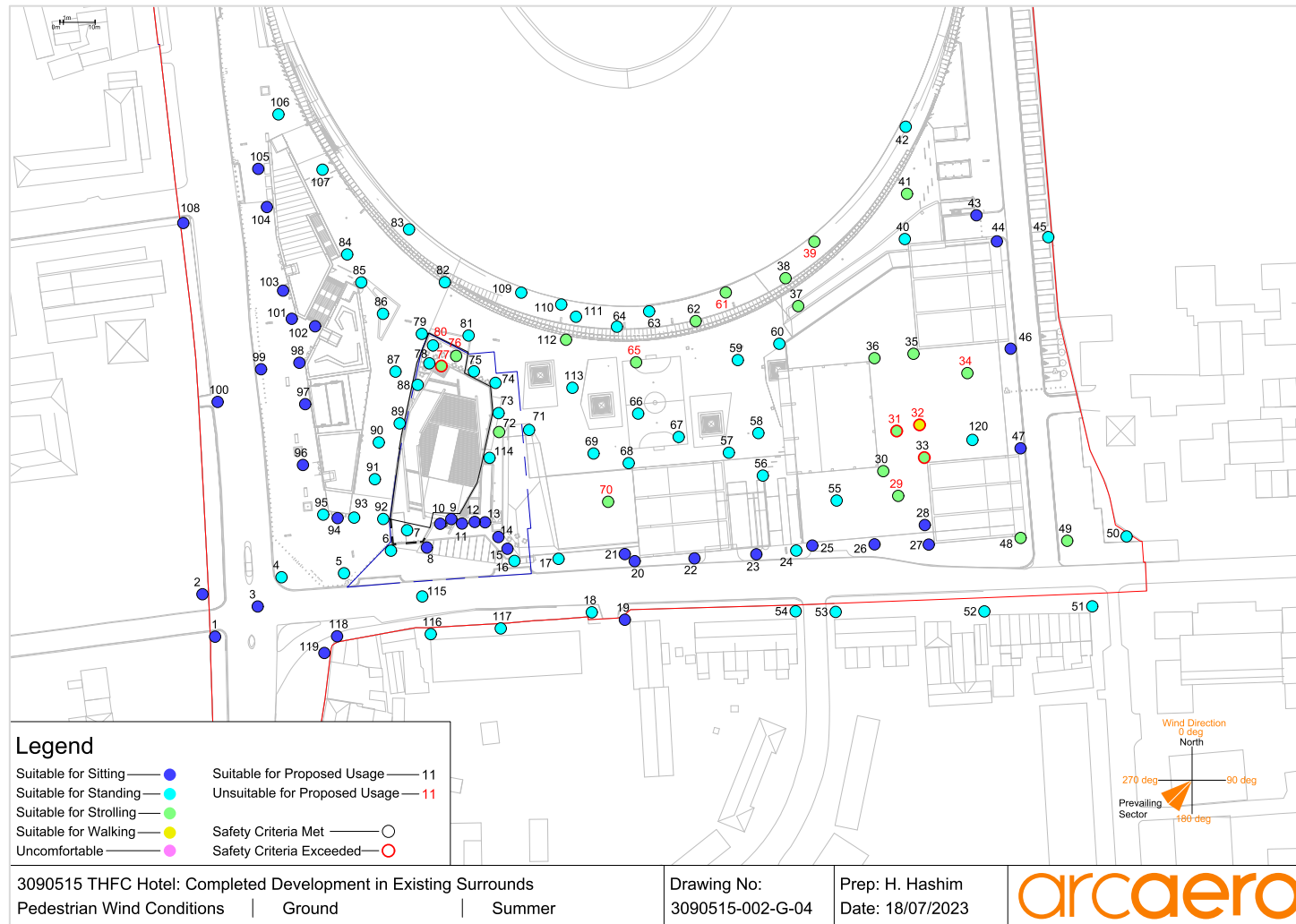


Figure 4.6 – Pedestrian wind conditions, completed development within existing surrounds, summer – elevated level

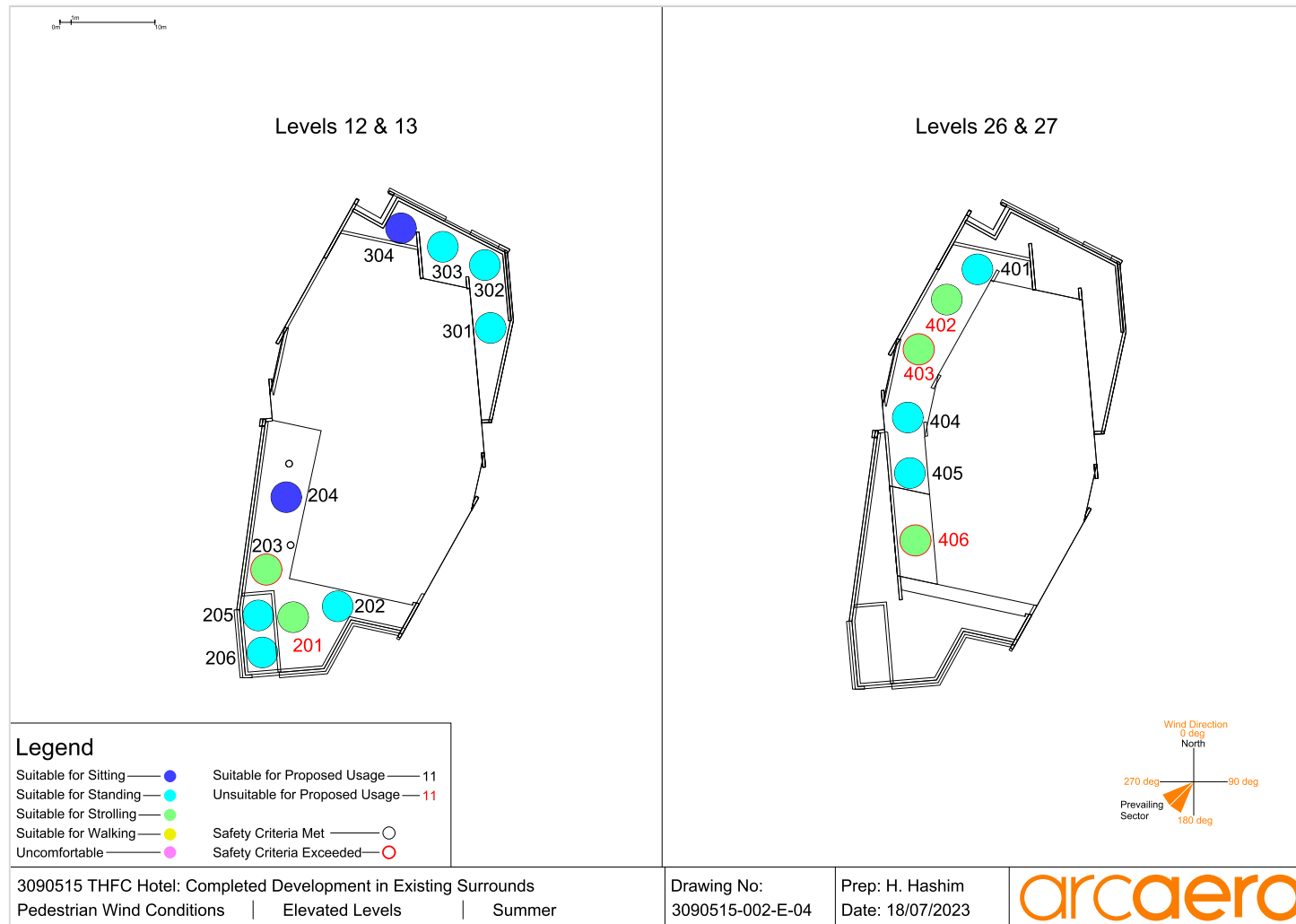


Figure 4.7 - Pedestrian wind conditions, completed development within existing surrounds with wind mitigation measures, 'worst' season – ground level

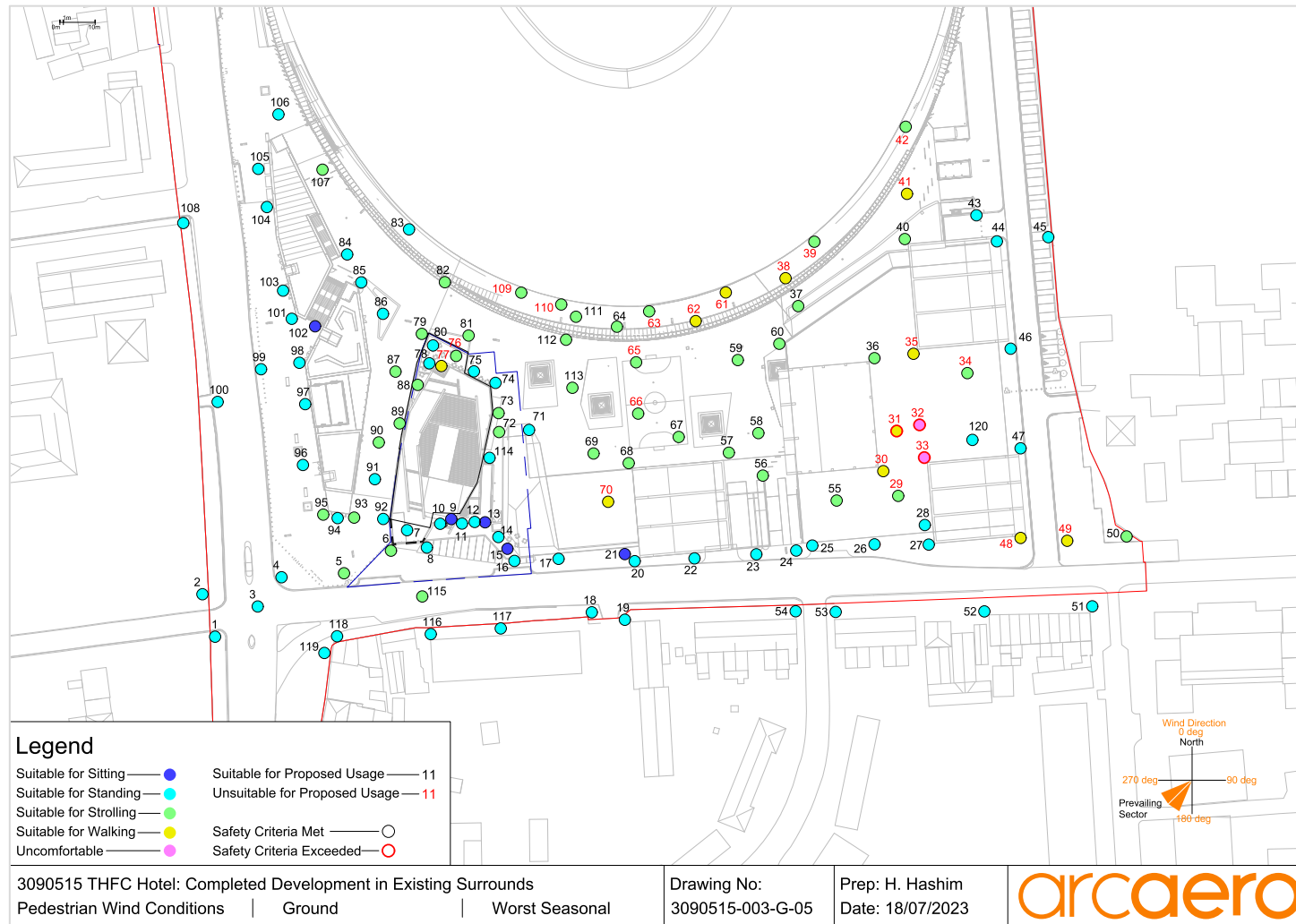


Figure 4.8 – Pedestrian wind conditions, completed development within existing surrounds with wind mitigation measures, – ‘worst season’ elevated level

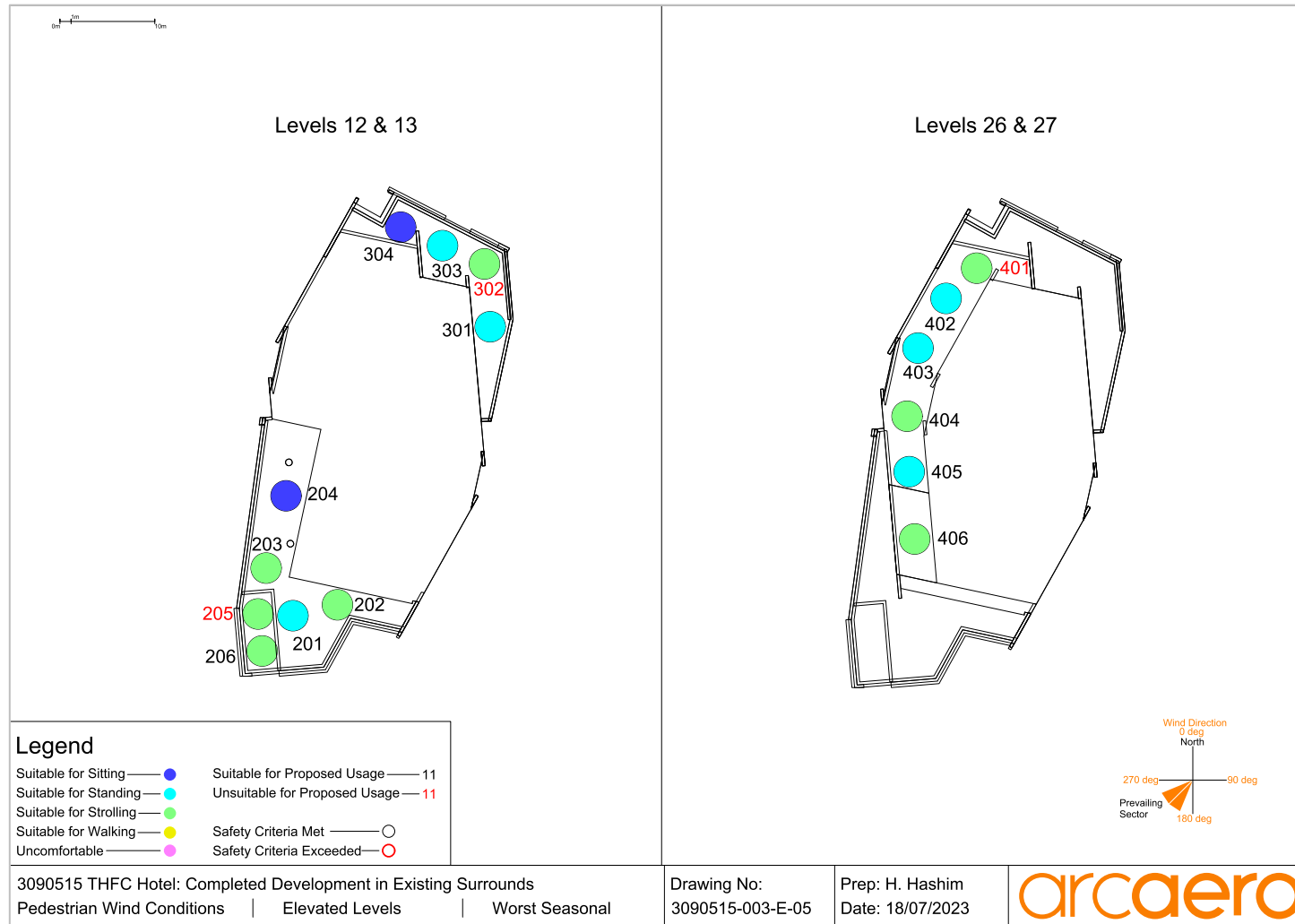


Figure 4.9 - Pedestrian wind conditions, completed development within existing surrounds with wind mitigation measures, summer – ground level

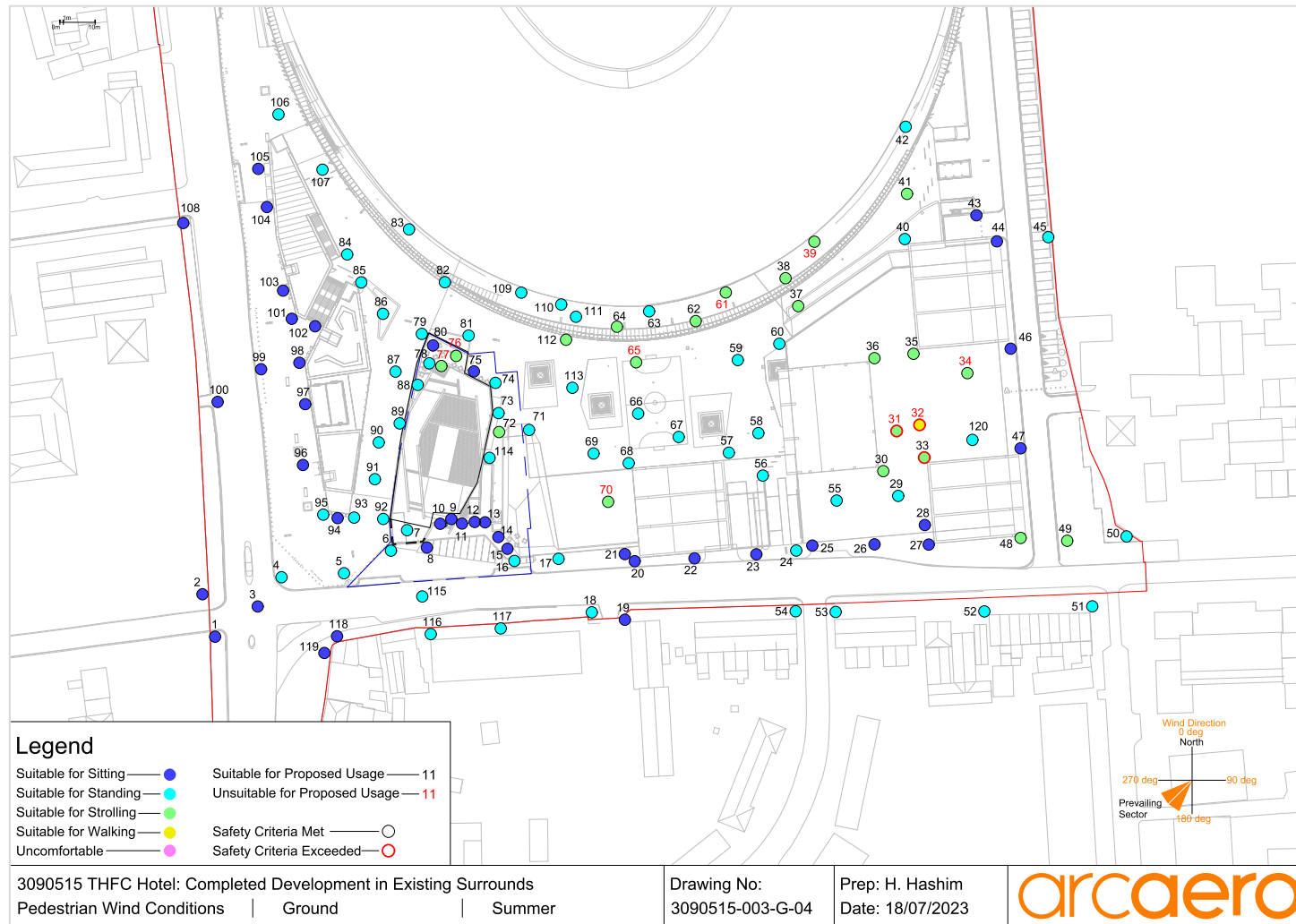


Figure 4.10 – Pedestrian wind conditions, completed development within existing surrounds with wind mitigation measures, summer – elevated level

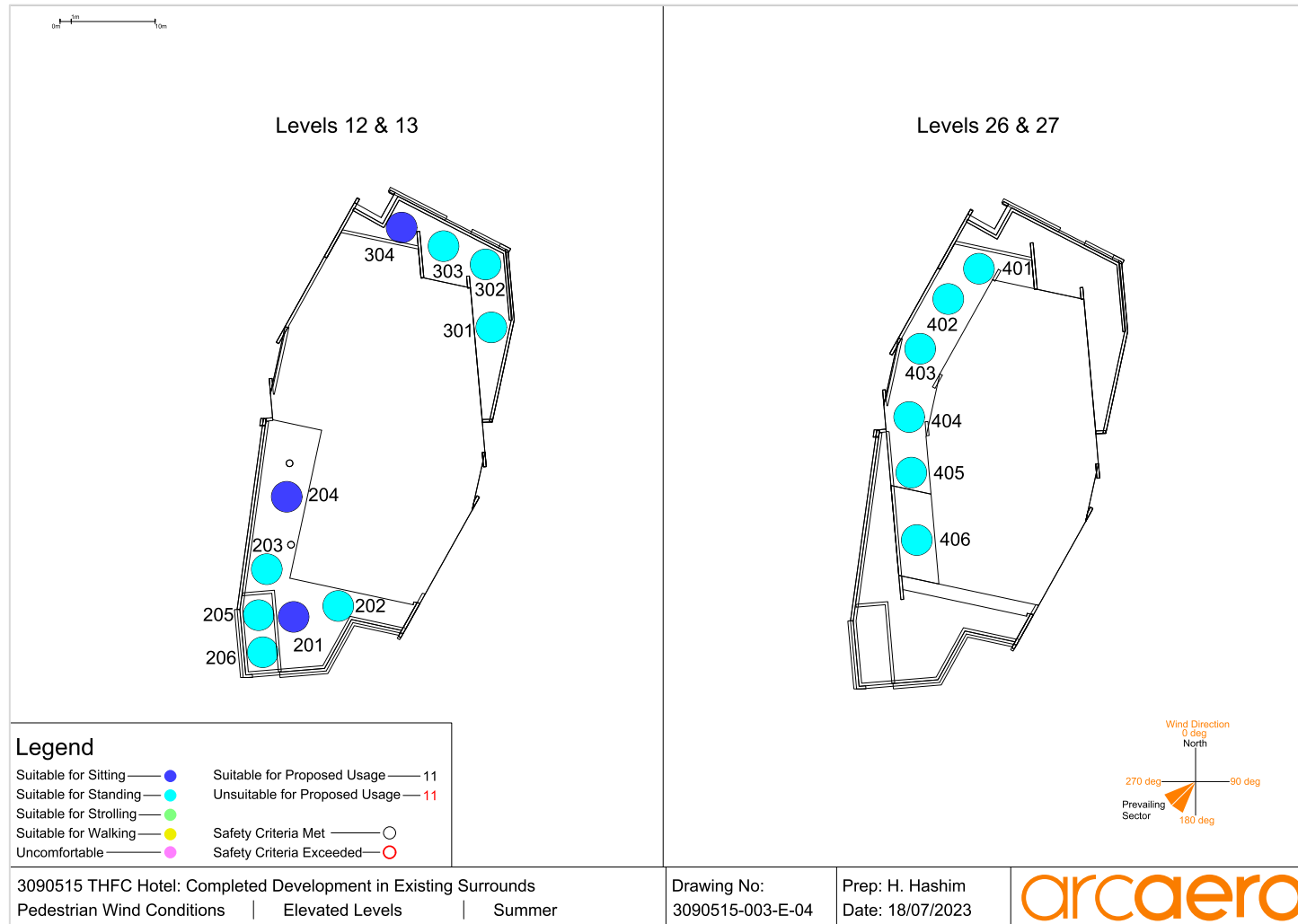


Figure 4.11 - Pedestrian wind conditions, completed development within cumulative surrounds, 'worst' season – ground level

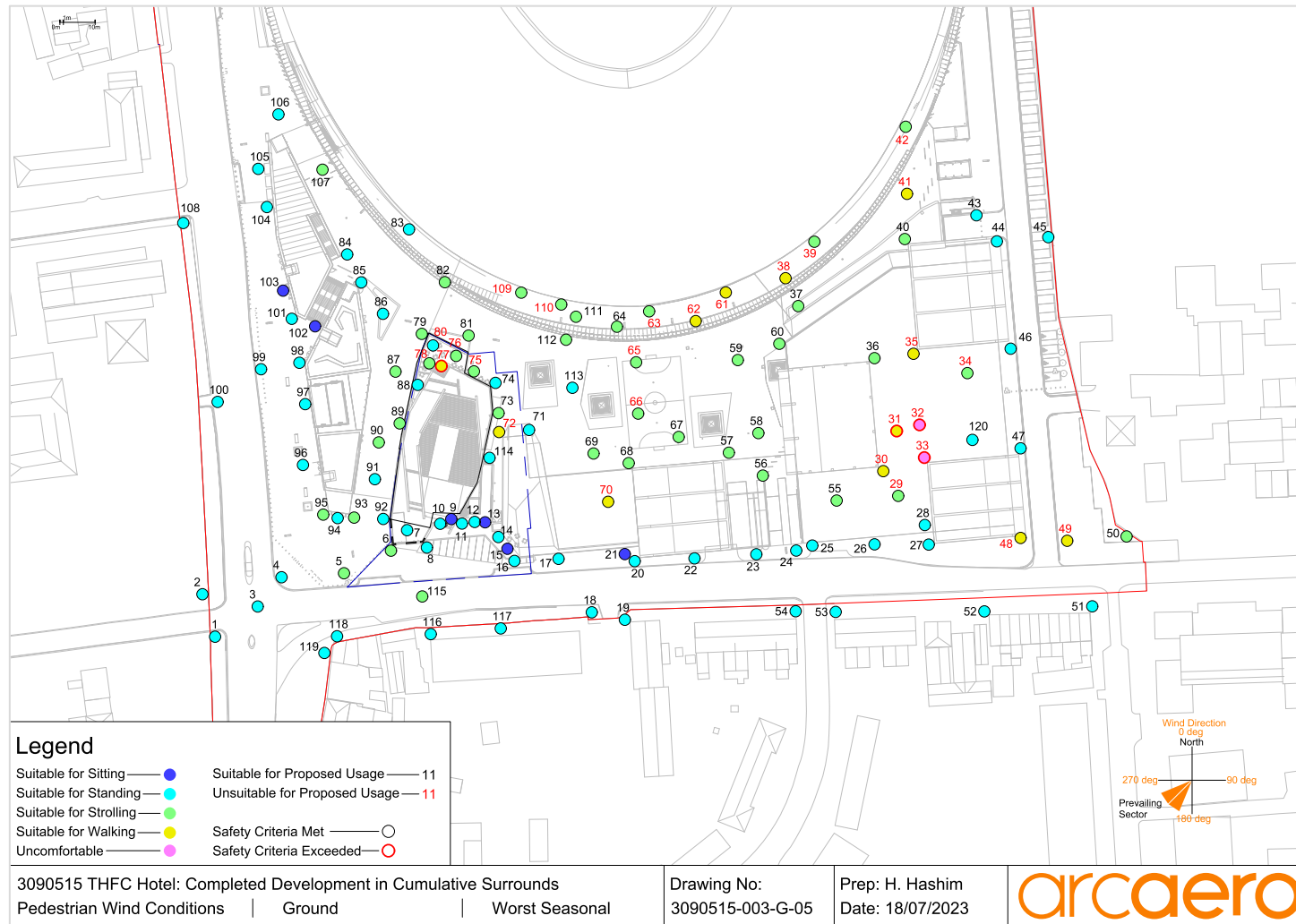


Figure 4.12– Pedestrian wind conditions, completed development within cumulative surrounds, 'worst' season – elevated level

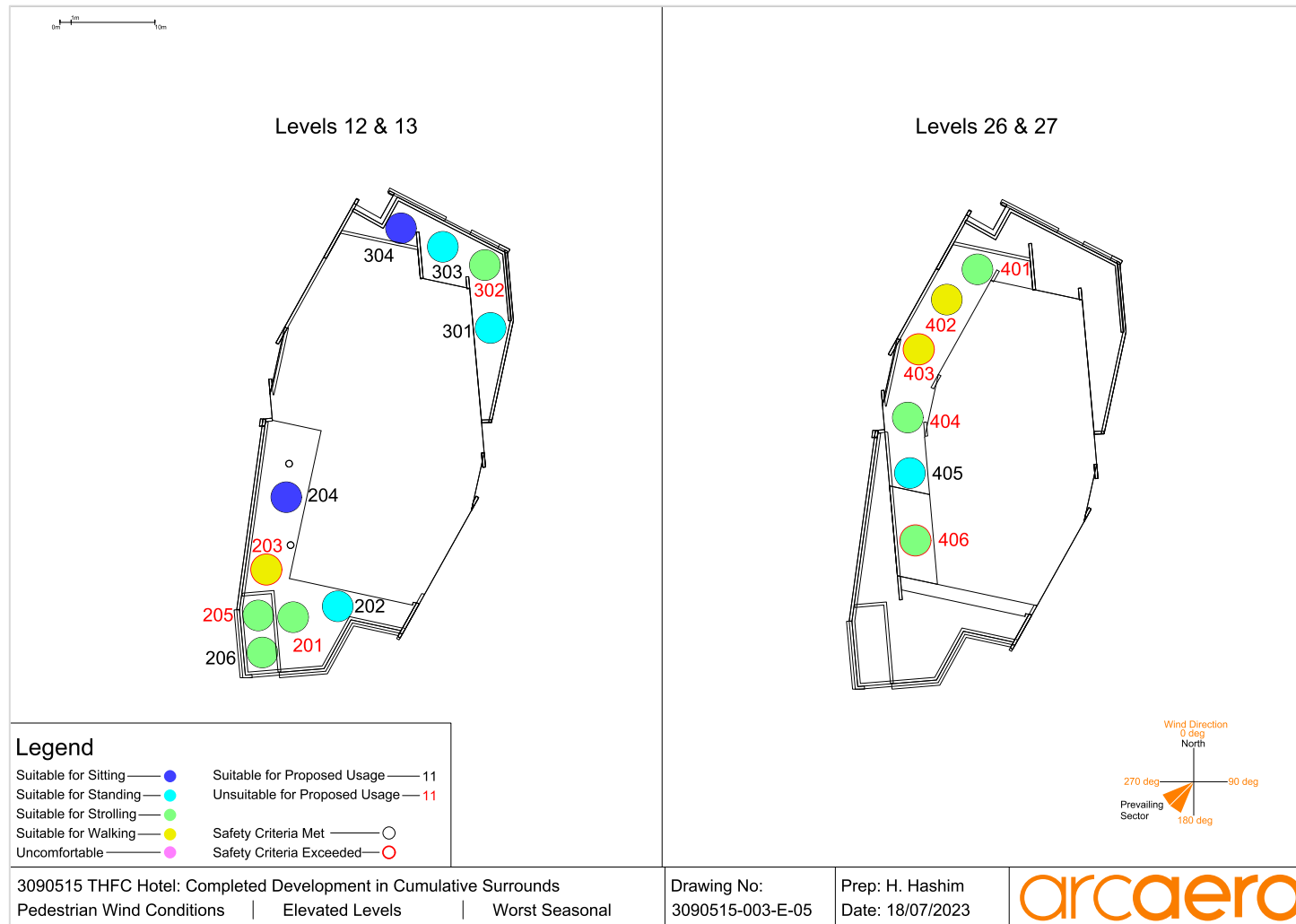


Figure 4.13– Pedestrian wind conditions, completed development within cumulative surrounds, summer – ground level

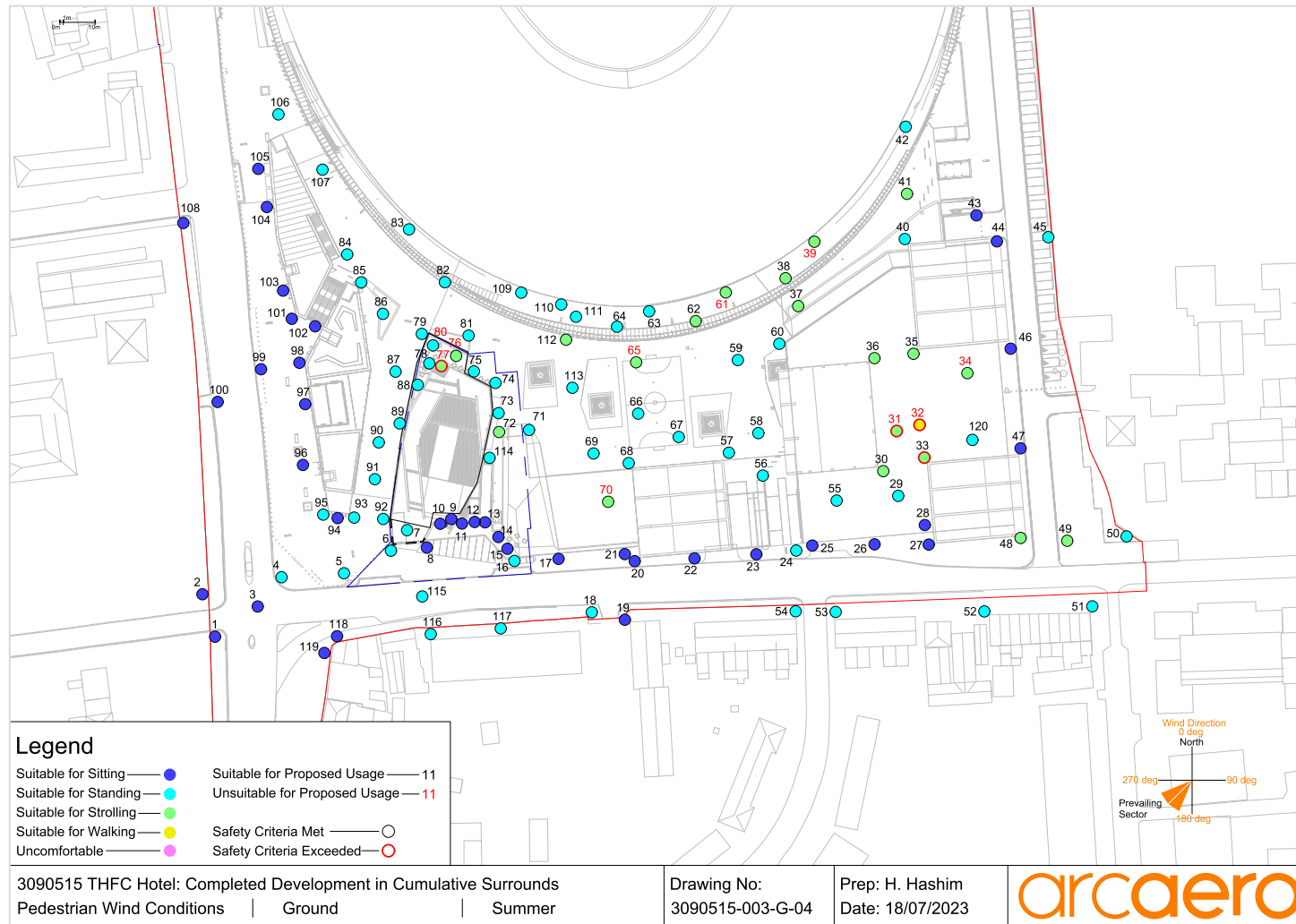


Figure 4.14— Pedestrian wind conditions, completed development within cumulative surrounds, summer – elevated level

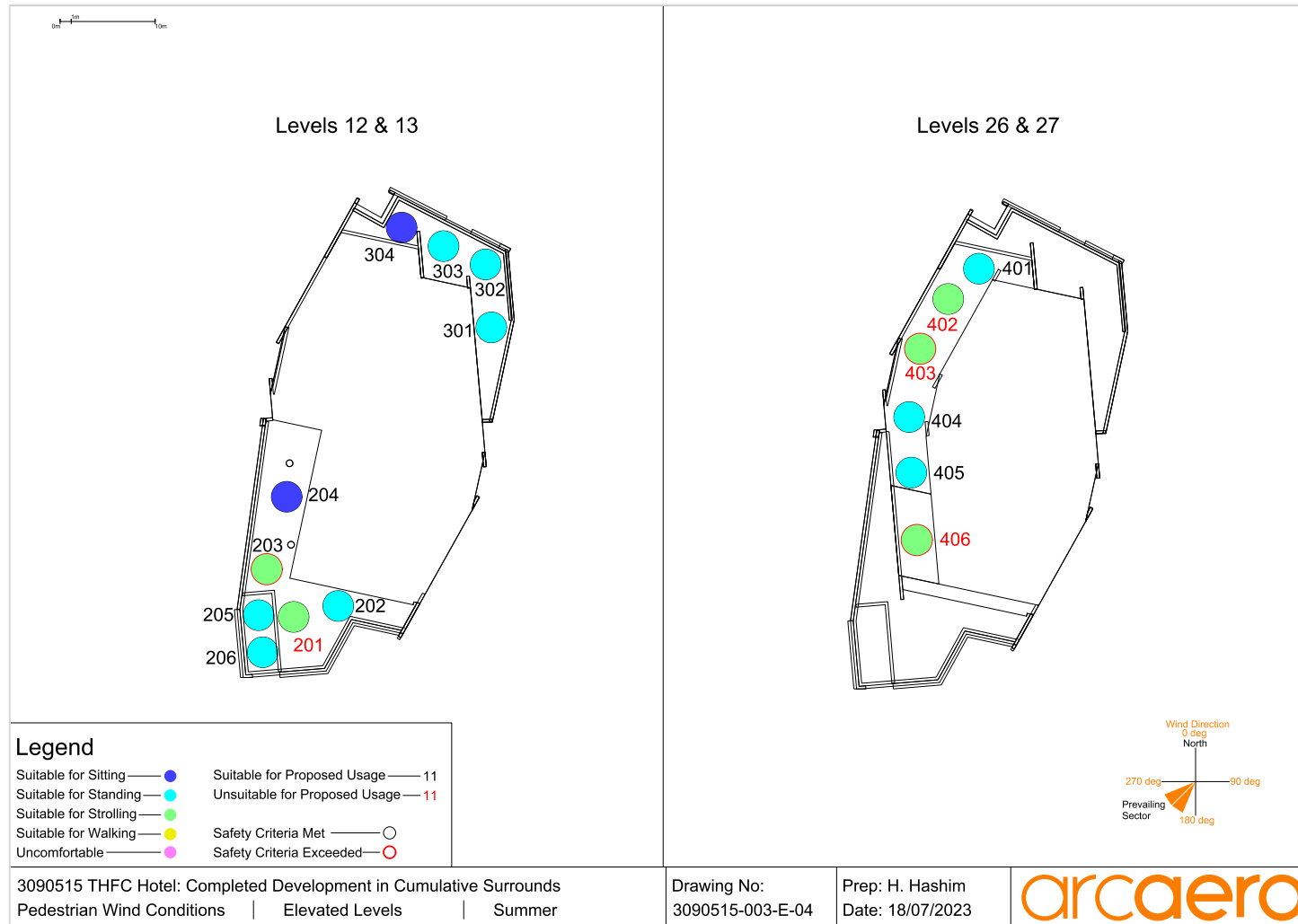


Figure 4.15– Pedestrian wind conditions, completed development within Lendlease cumulative surrounds, 'worst' season – ground level

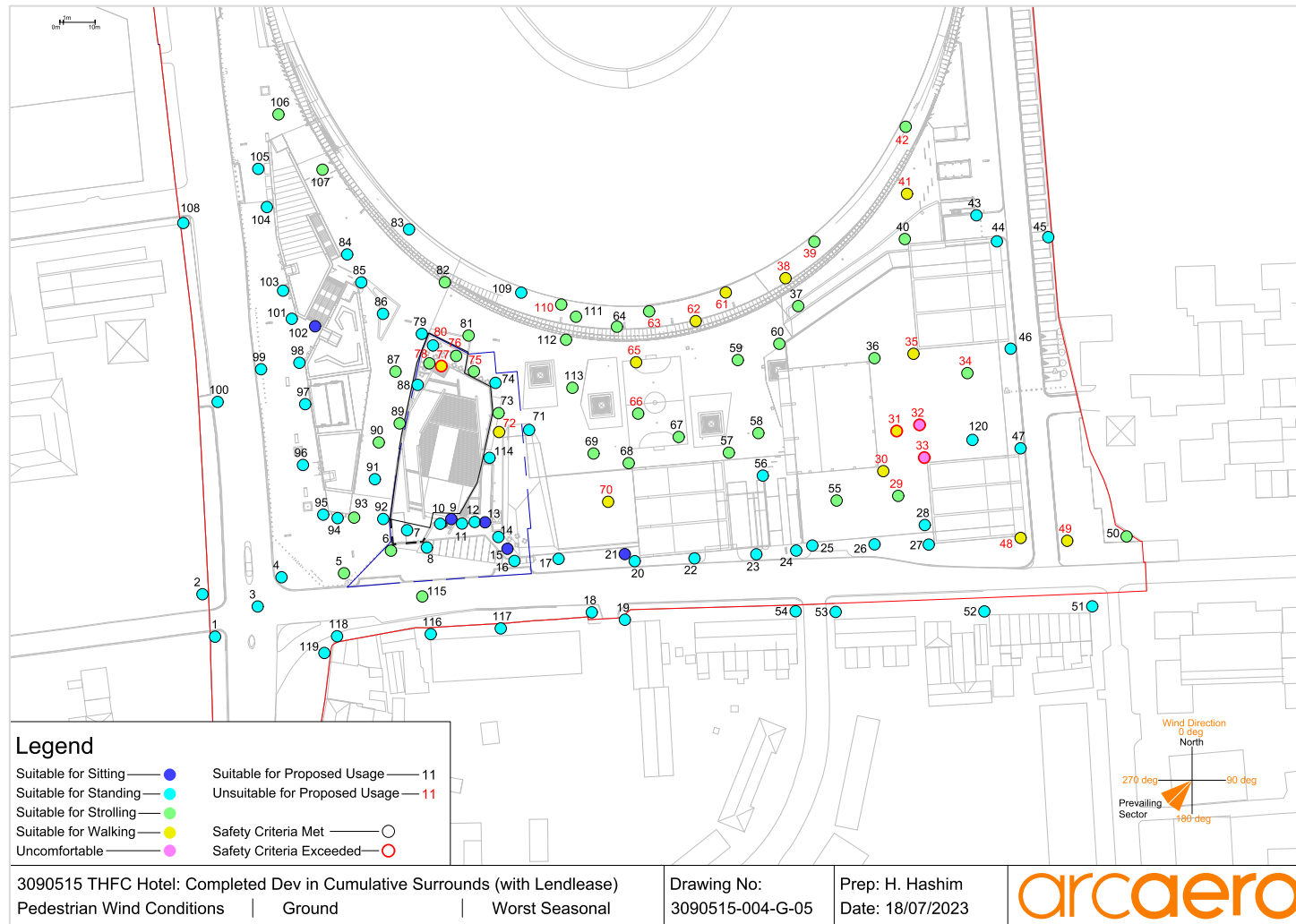


Figure 4.16— Pedestrian wind conditions, completed development within Lendlease cumulative surrounds, 'worst' season – elevated level

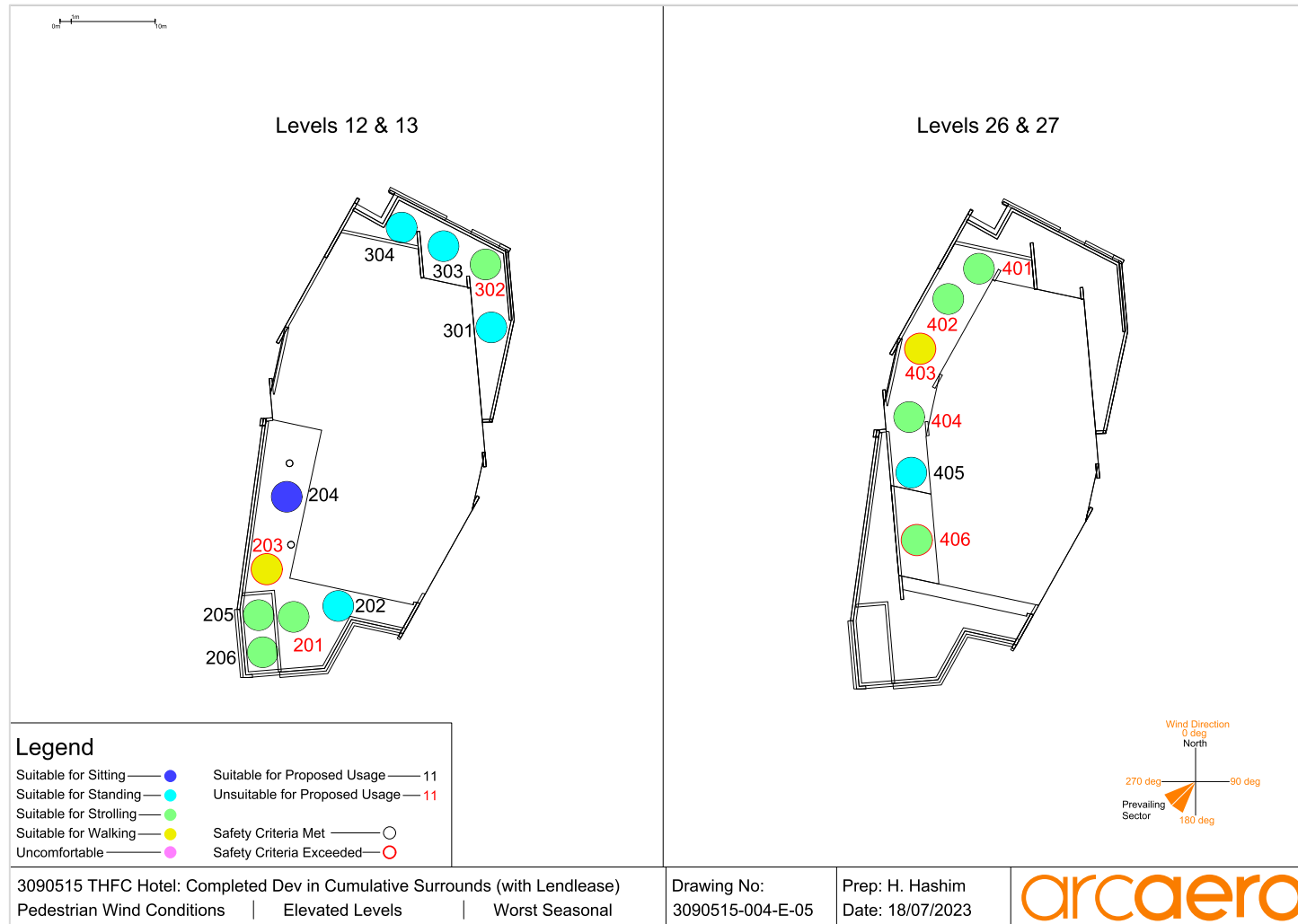


Figure 4.17– Pedestrian wind conditions, completed development within Lendlease cumulative surrounds, summer – ground level

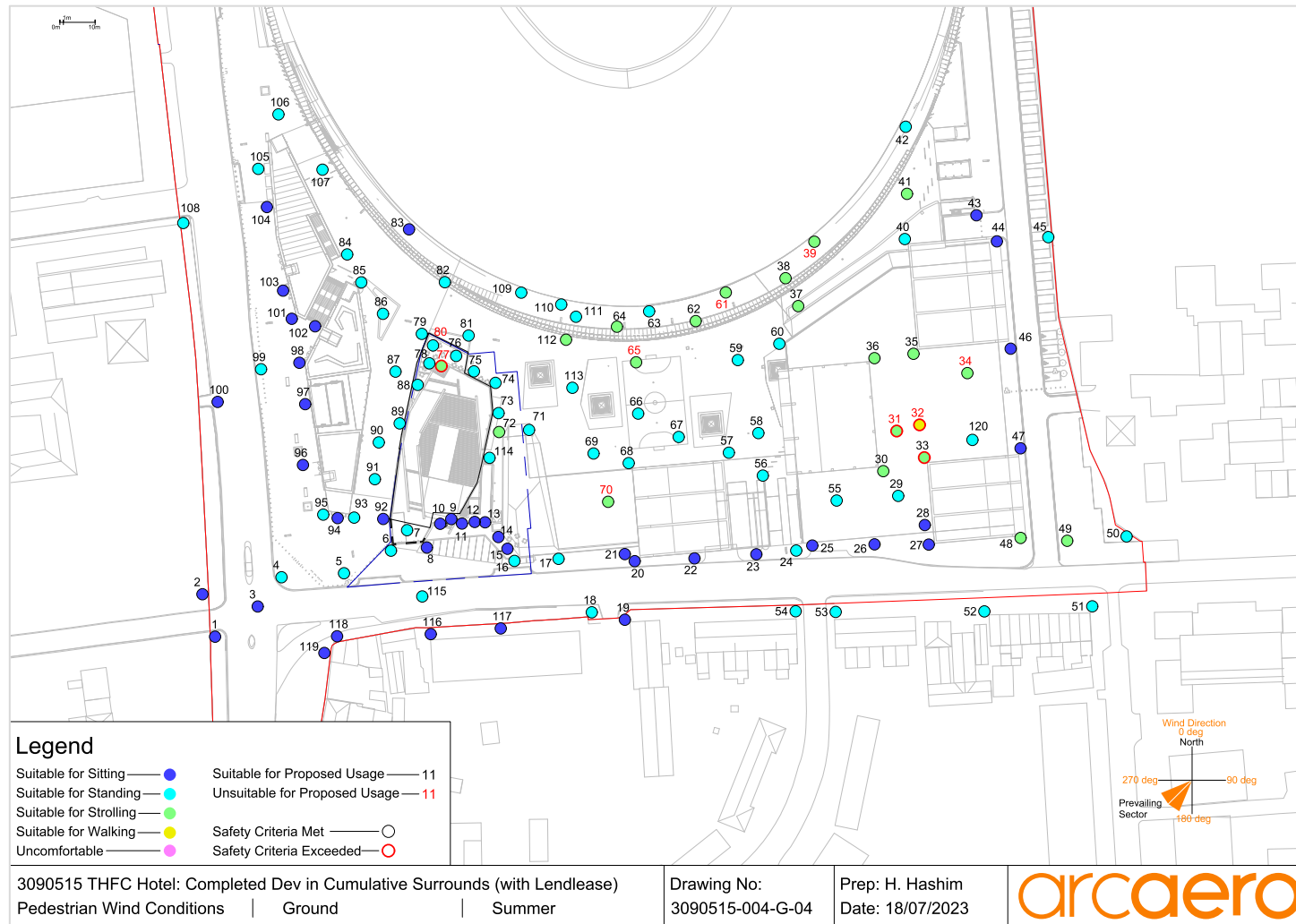
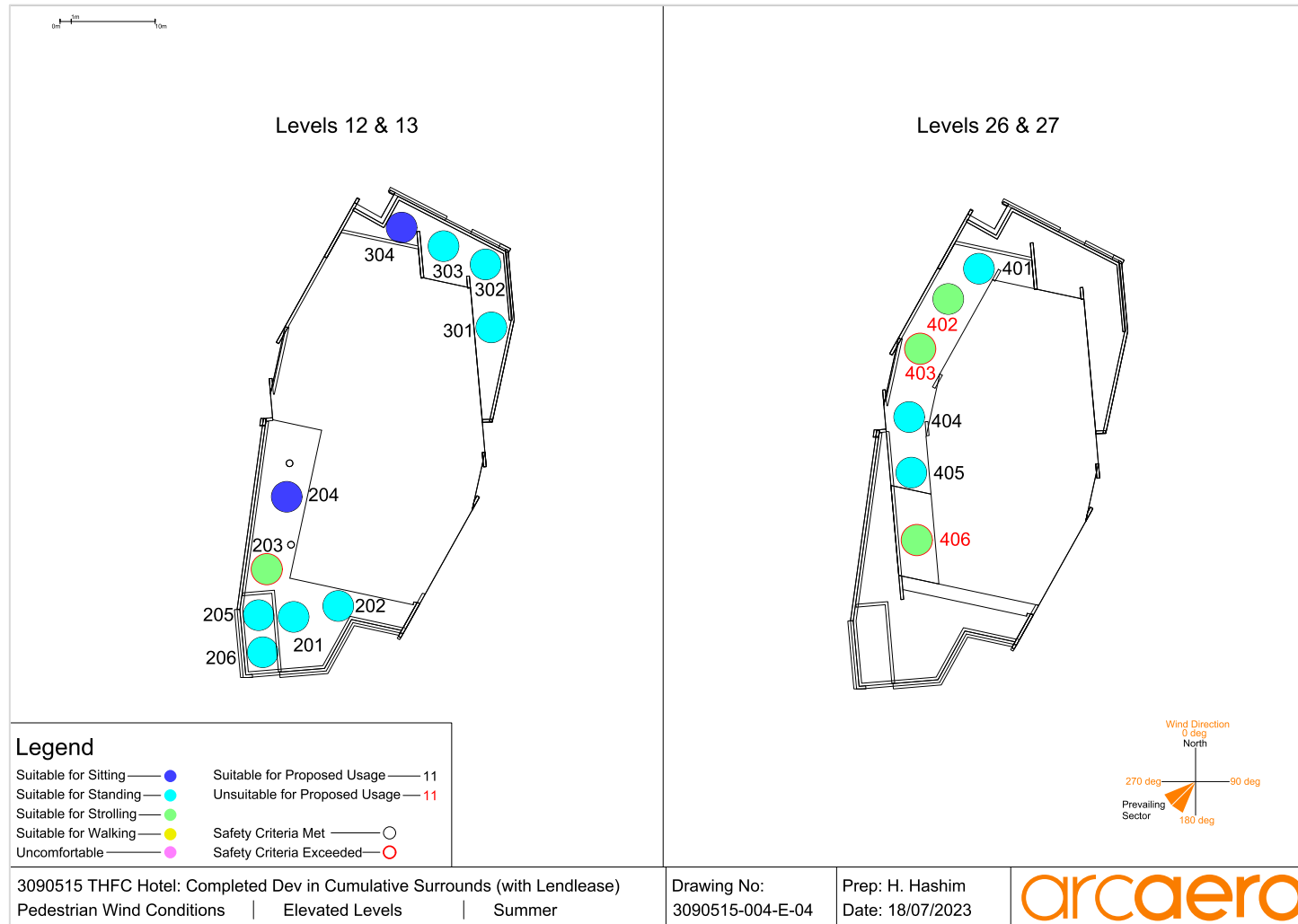


Figure 4.18– Pedestrian wind conditions, completed development within Lendlease cumulative surrounds, summer – elevated level



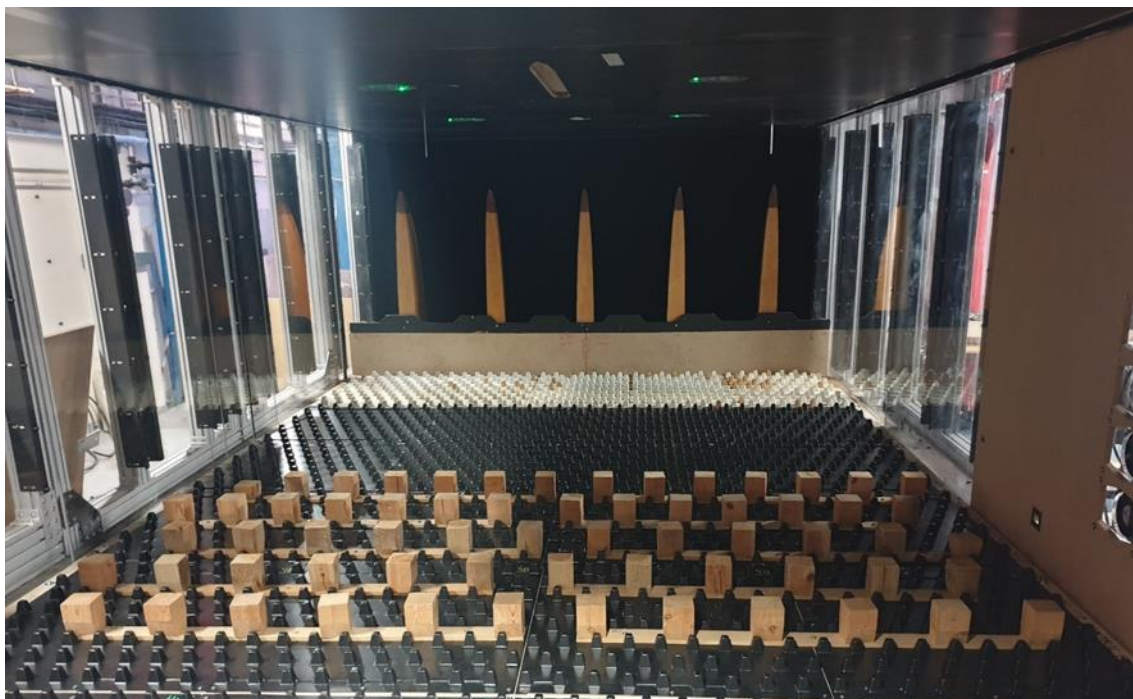
Appendix A Wind Tunnel and Model

A.1 Atmospheric Boundary Layer Modelling

The study was conducted at the Imperial College wind tunnel 10' x 5' in London. This closed-loop facility provides a 20 metre long boundary layer test section and a 3.0 metre x 1.5 metre test section. The wind speed operating range is 0-40 m/s.

'Roughness blocks', a 2D fence and 3D posts were used to replicate the boundary layer. These elements are presented Figure A.1.

Figure A.1 - Boundary layer creation, Imperial College boundary layer wind tunnel, London.



A.2 Wind Tunnel Models

A 1:400 scale wind tunnel was constructed from materials such as dense foam, wood and plastic. The wind microclimate was assessed at a total of 136 locations for the completed development.

Photos of the wind tunnel model are presented as follows:

- Figure A.2 and Figure A.3: existing site conditions
- Figure A.4 and Figure A.5: completed development within existing surrounds
- Figure A.6 and Figure A.7: completed development within cumulative surrounds
- Figure A.8 and Figure A.9: completed development within Lendlease cumulative surrounds

- Figure A.10 and Figure A.11: close-ups of completed development

Figure A.2 – Existing site conditions, viewed from southeast

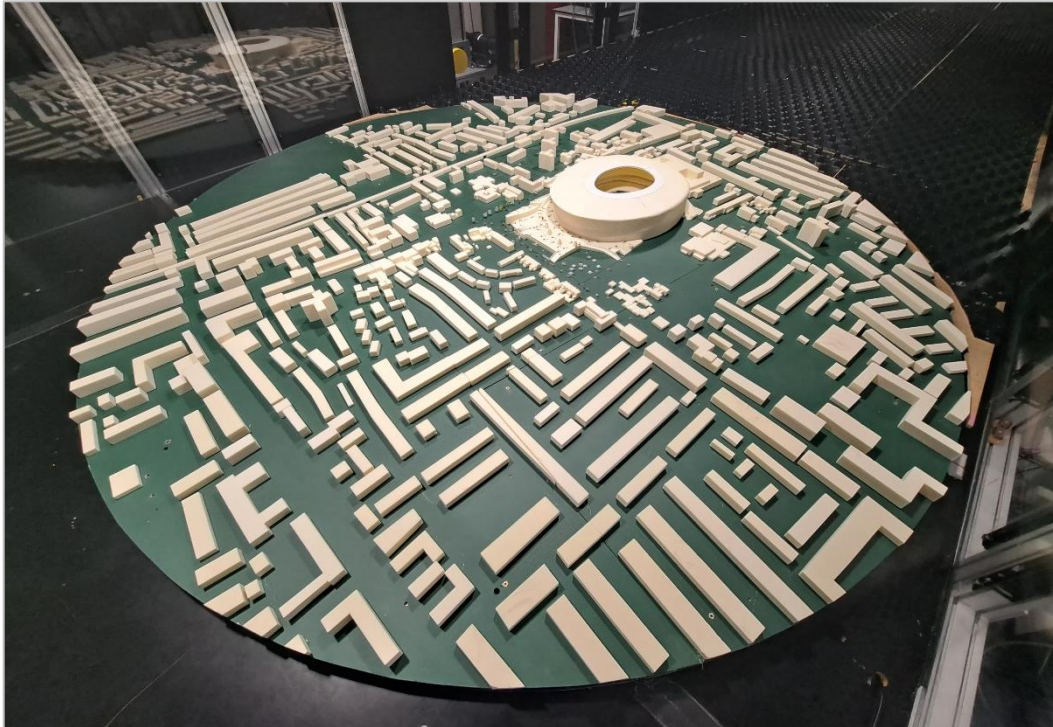


Figure A.3 - Existing site conditions, viewed from northwest

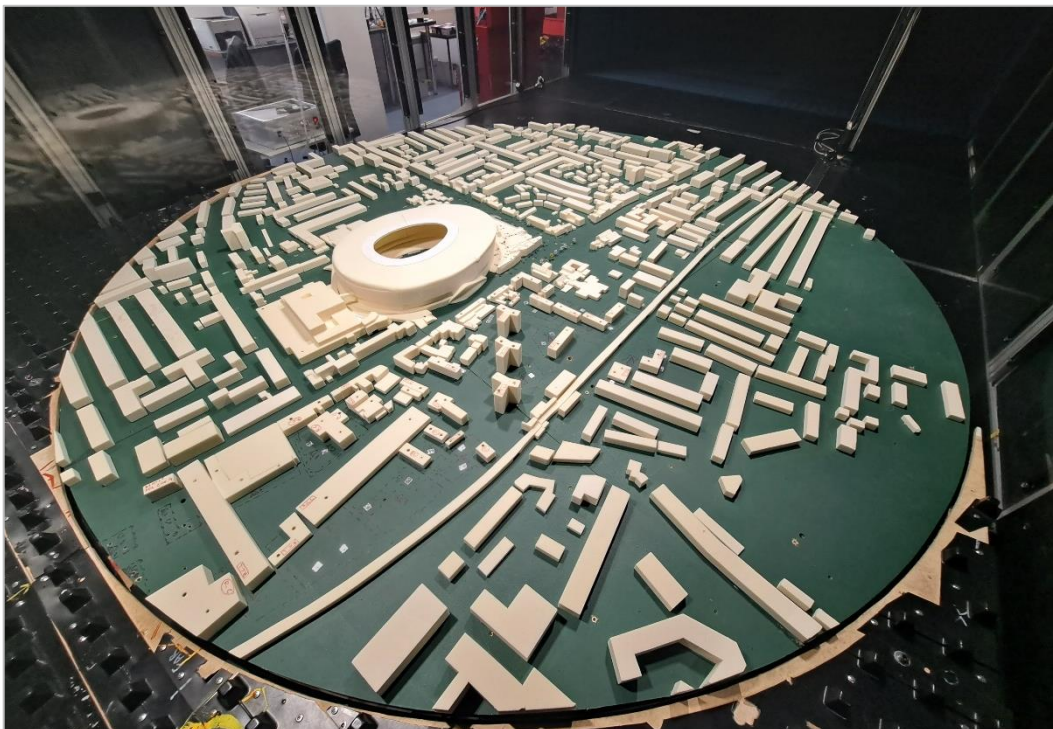


Figure A.4 - Proposed development within existing surrounds, viewed from southeast

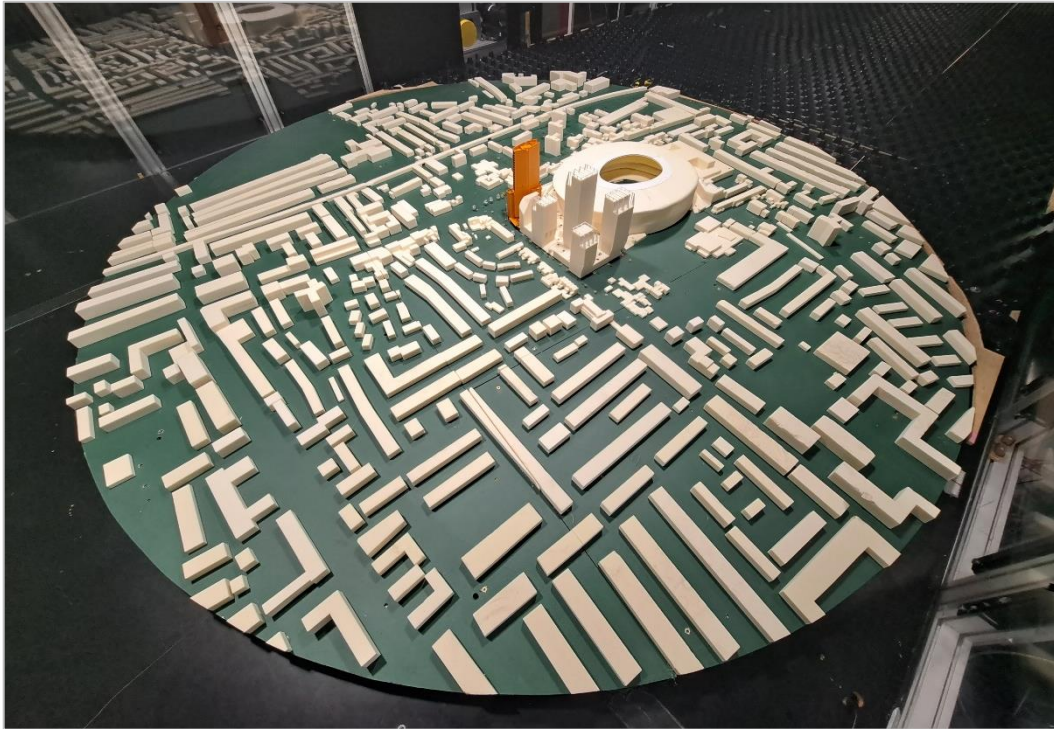


Figure A.5 - Proposed development within existing surrounds, viewed from northwest



Figure A.6 – Proposed development within cumulative surrounds, viewed from southeast

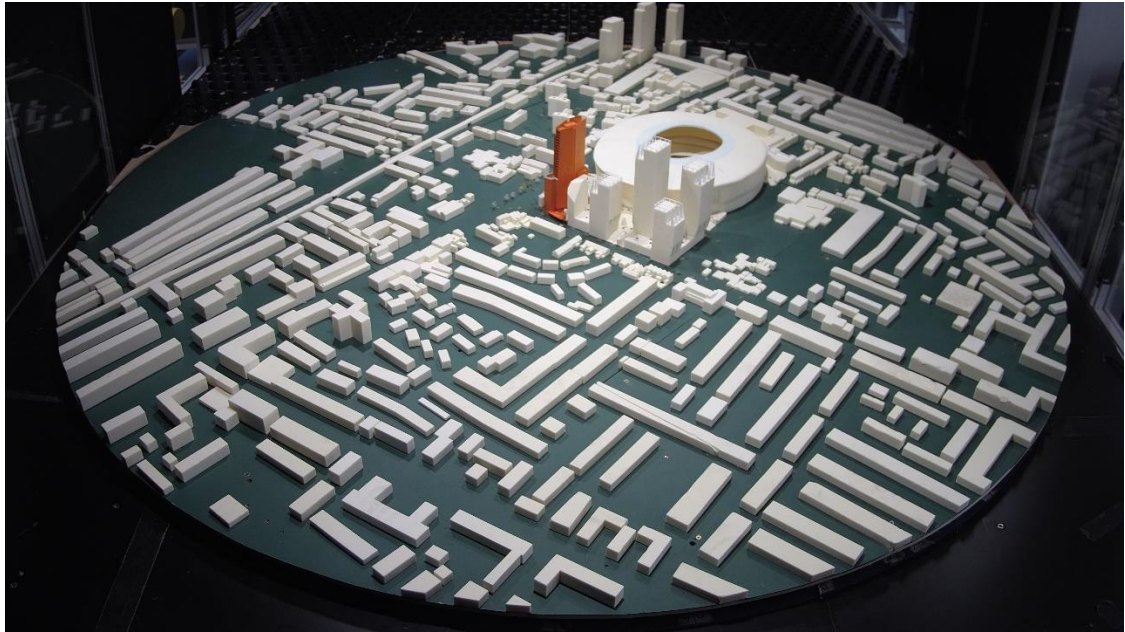


Figure A.7 – Proposed development within cumulative surrounds, viewed from west

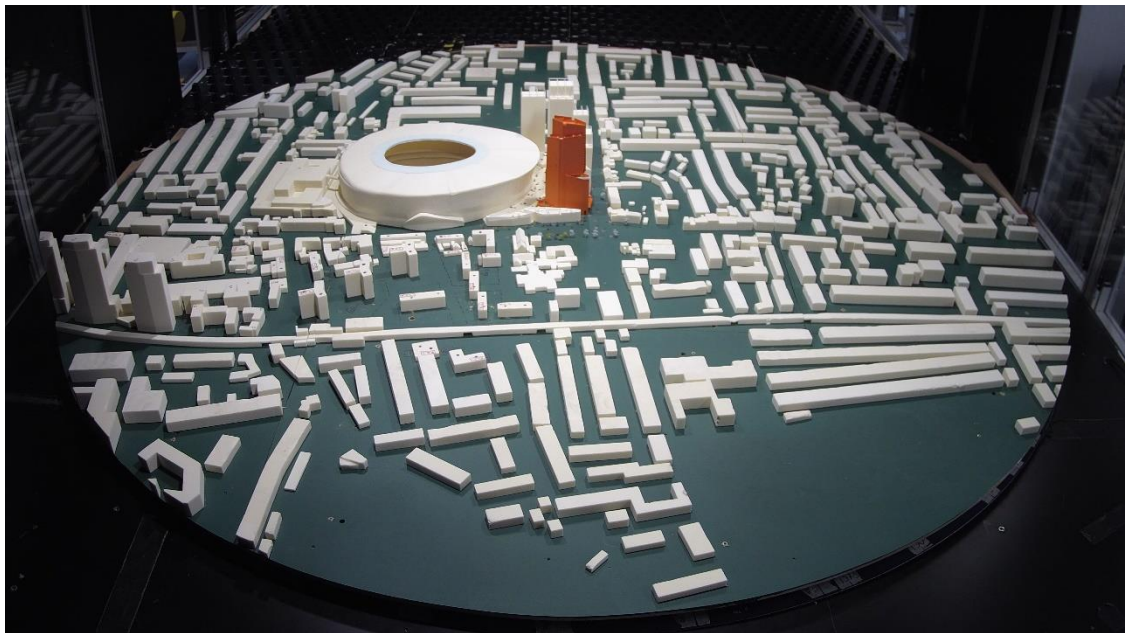


Figure A.8 – Completed development within Lendlease cumulative surrounds, viewed from southeast

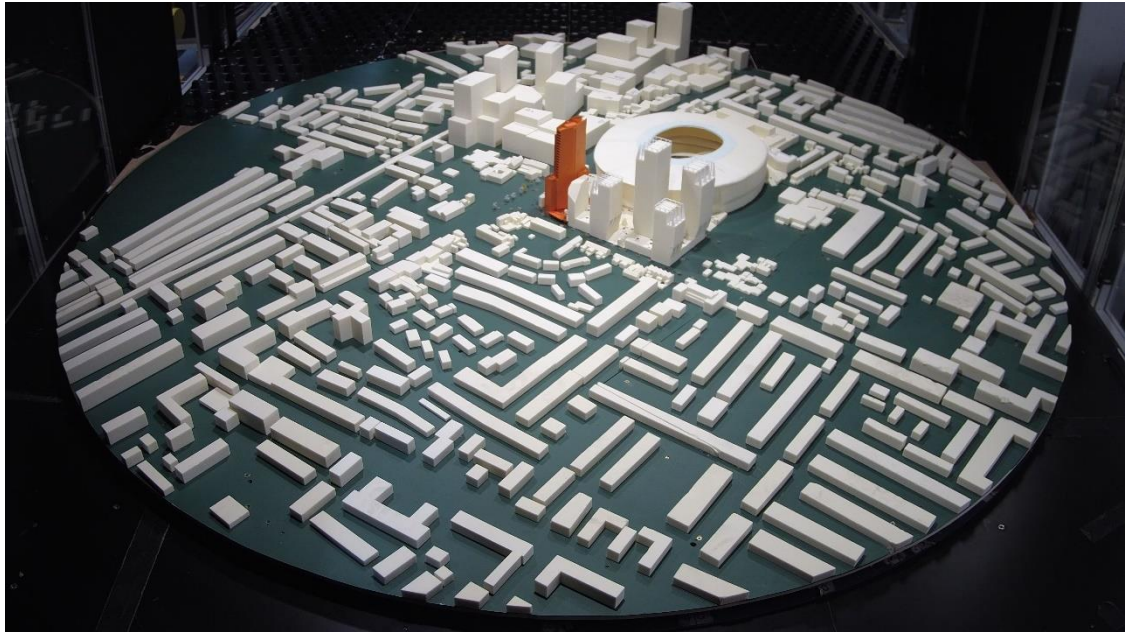


Figure A.9 – Completed development within Lendlease cumulative surrounds, viewed from northeast

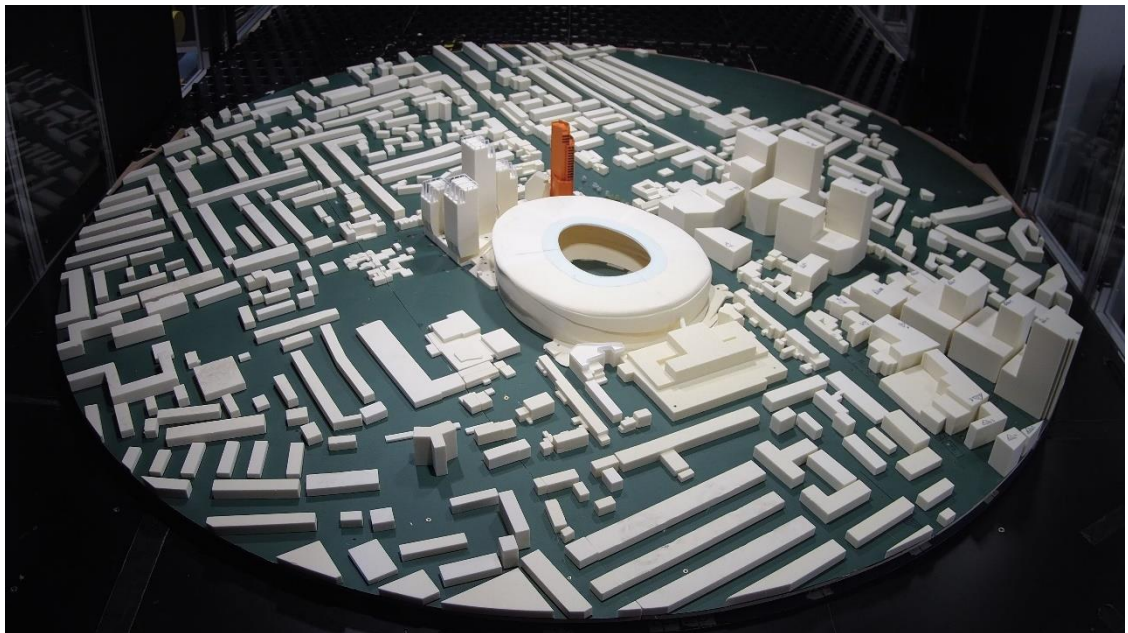


Figure A.9 – Close-up of the proposed development , viewed from southwest

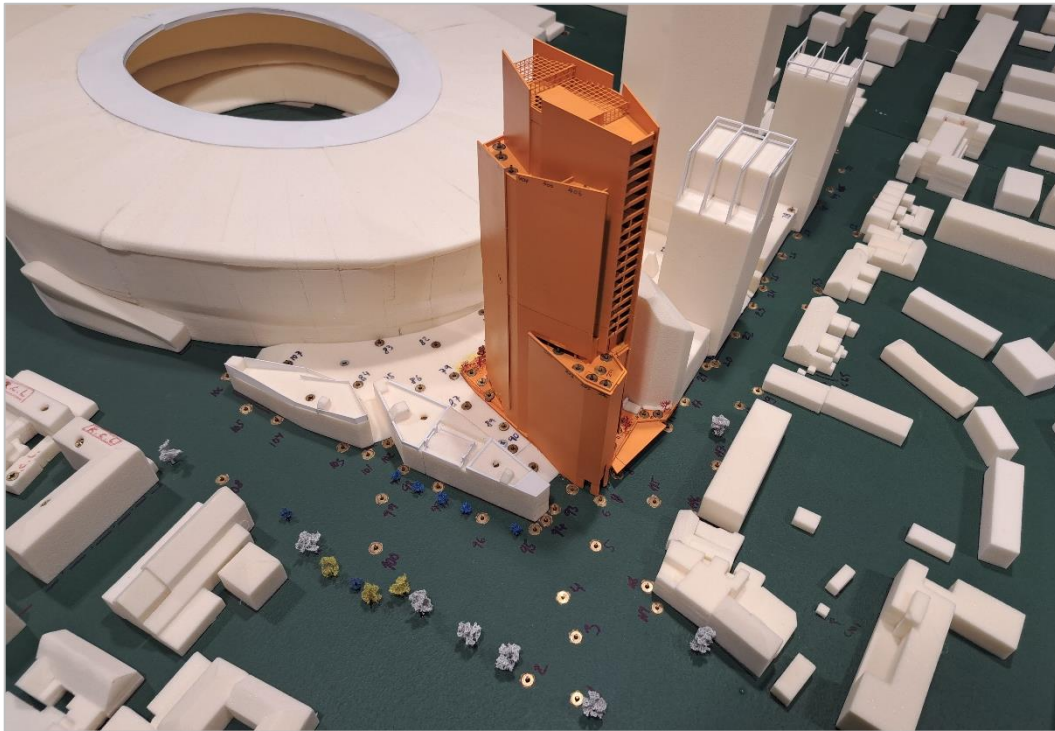


Figure A.10 – Close-up of the proposed development within cumulative surrounds, viewed from south



A.3 Data Acquisition

Wind speed measurements were made using ‘Irwin probes’, capable of measuring fluctuating pressure differences that are calibrated against wind speed. A system of probes running simultaneously was used to obtain results from approximately 136 locations at a height corresponding to 1.5m at full scale.

Data was recorded for a sufficient length of time to determine the mean and 3-second gust wind speeds.

The gust wind speed is translated to an equivalent mean wind speed, the Gust Equivalent Mean or GEM, according to the following equation:

$$U_{GEM} = \frac{U_{GUST}}{1.85}$$

The results at each location were combined with wind statistics transposed to the site to assess the exceedance of threshold wind speeds that relate to comfort and safety in accordance with the Lawson criteria.

Appendix B Wind Climate Analysis

B.1 Wind Frequency Data, London Heathrow Airport

Wind microclimate studies require that wind speed data obtained from a measurement station be transposed to the site of interest. The current study employs wind data from London Heathrow airport.

The wind speed history has been reformatted into the number of observations of mean-hourly wind speeds within each of several wind speed ranges, for each wind direction and for each month of the year. To facilitate the transposition of the wind data, the months are grouped into the seasons and a Weibull distribution is fitted to the wind speed distribution for each wind direction, for each season.

From the Weibull cumulative distribution, the probability that, for a given wind direction, a wind speed, V , will be exceeded is given by:

$$P(>V) = e^{-\left(\frac{V}{c}\right)^k}$$

where c is the dispersion parameter and k is the shape parameter.

To these parameters is further added the probability, p , of each wind direction occurring. Thus, for each month of the year the probability that a specified wind speed is exceeded for a specified wind direction may be calculated.

The resulting weather centre wind data is transposed to a standard reference terrain category, 'open country terrain', at sea-level, accounting for upwind terrain, topography and altitude for the weather centre. The open country wind data is then transposed to the reference height at the site of the proposed development, accounting for upwind terrain, topography and altitude for the target site.

For the transposition of wind speed data from the weather station to open country, and from open country to the site, the methods set out in ESDU item 01008 (4) (the industry standard) have been employed.

The resulting annual and seasonal directional and wind speed probability distributions at the reference height of 120m, at the proposed site, are given in Figures B.2 to B.6, respectively.

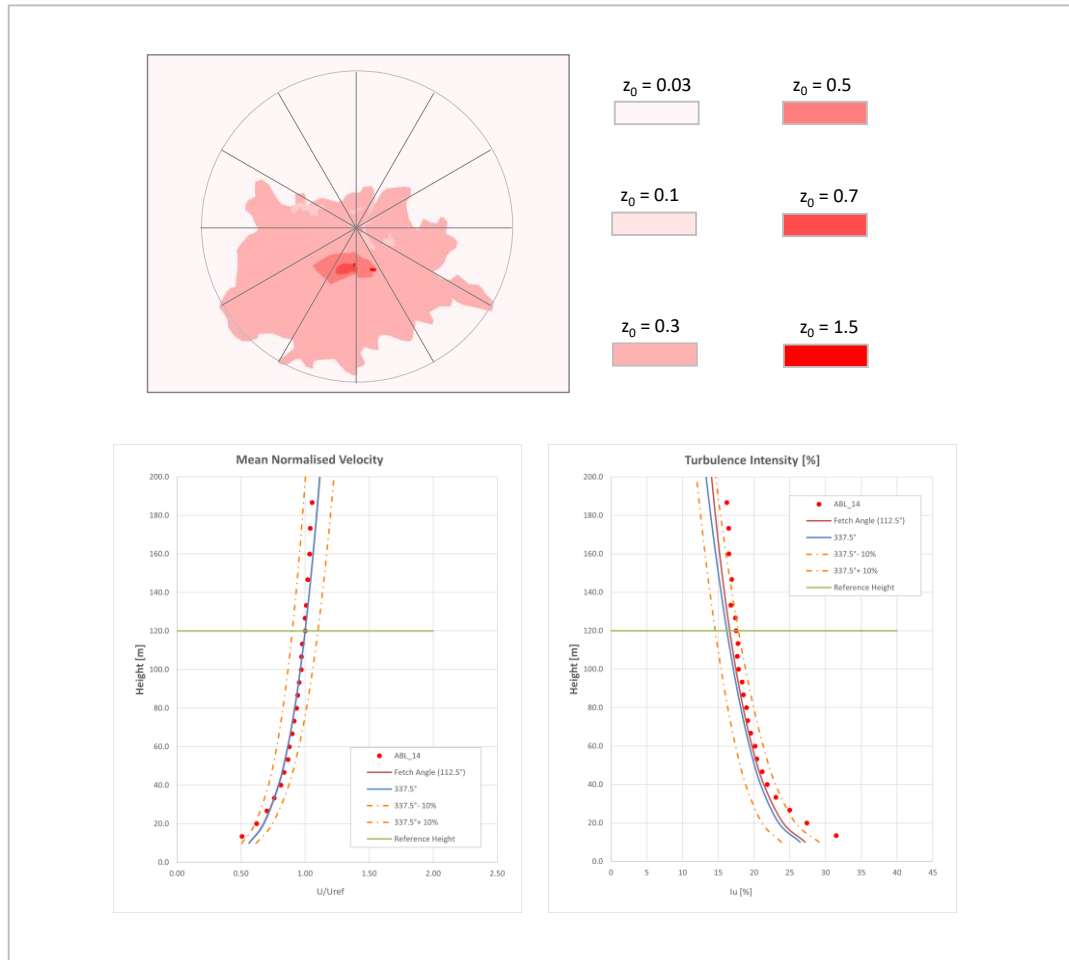
B.2 Wind Properties at the Site

A detailed analysis, based on the widely accepted Deaves and Harris model of the atmospheric boundary layer (ABL), as defined in ESDU Item 01008 (4), has been carried out to determine the wind properties at the site. From this analysis a representative profile was defined as a target for the ABL simulation in the wind tunnel.

Upon conducting the ESDU analysis, one wind profile was replicated in the wind tunnel to adequately account for wind blowing from all angles.

ArcAero's terrain analysis and resulting mean wind speed and turbulence intensity profiles are presented within Figure B.1.

Figure B.1 – Target mean wind speed and turbulence intensity profiles and wind tunnel profile



B.3 Wind Frequency Data

Wind microclimate studies require that meteorological data is transposed from a nearby weather station with sufficient wind data to produce accurate wind frequency statistics. The current study uses data from London Heathrow Airport. The cumulative wind speed probability distributions, transposed to building height at site are provided in Figure B.2 to **Error! Reference source not found.**

Figure B.2 – Cumulative wind speed probability distribution at site, annual

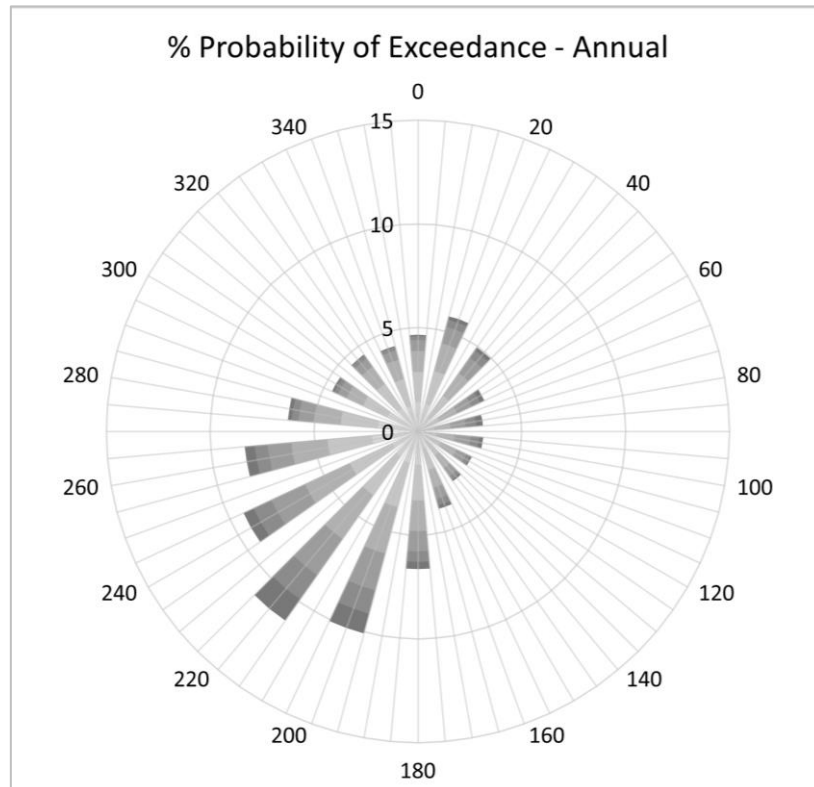


Figure B.3 – Cumulative wind speed probability distribution at site, spring

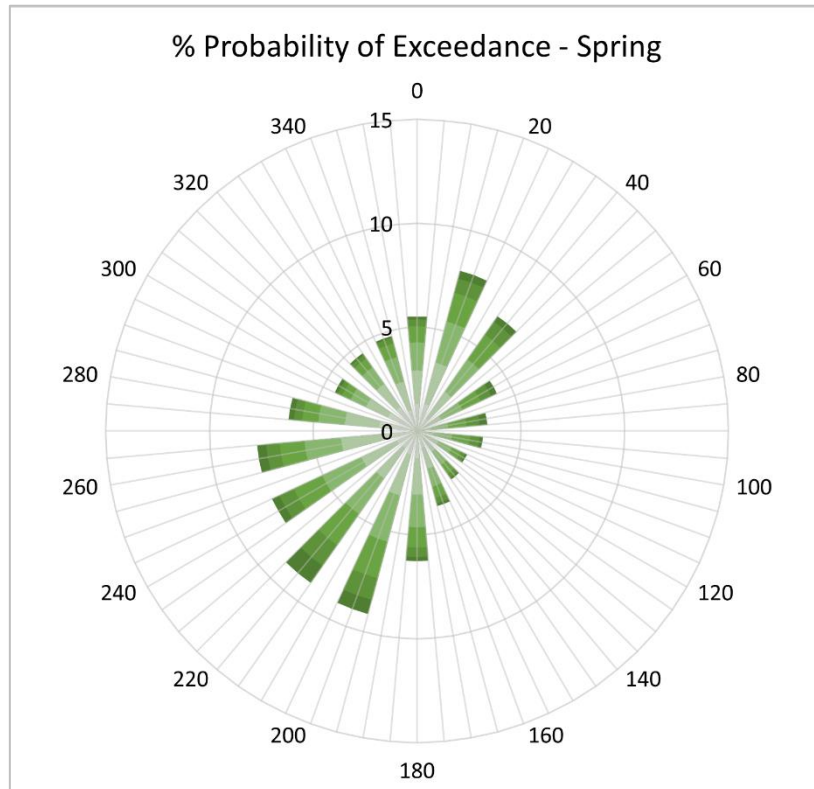


Figure B.4 – Cumulative wind speed probability distribution at site, summer

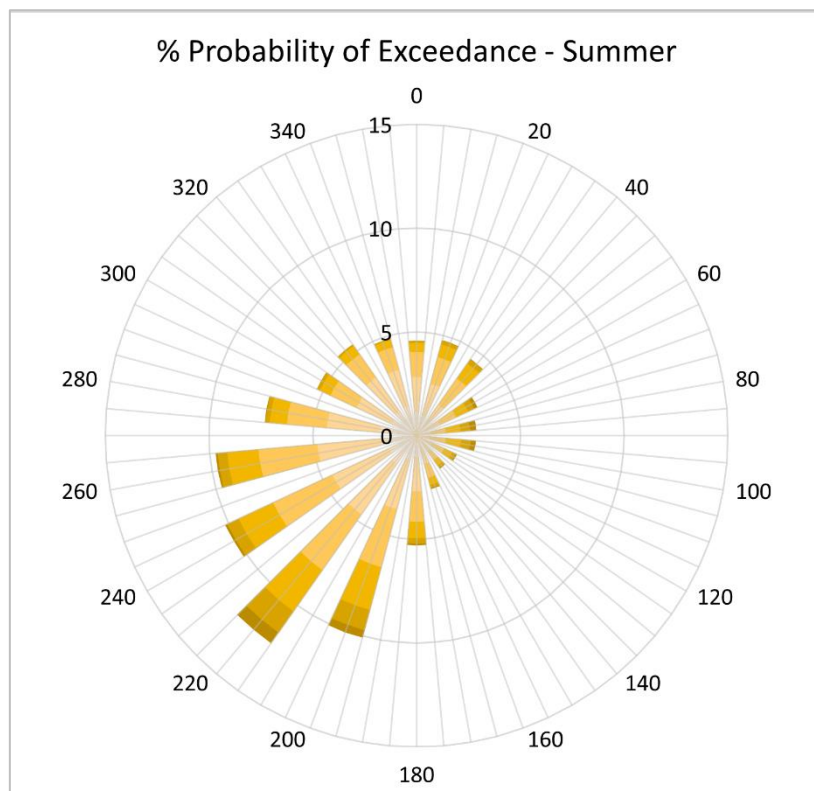


Figure B.5 – Cumulative wind speed probability distribution at site, autumn

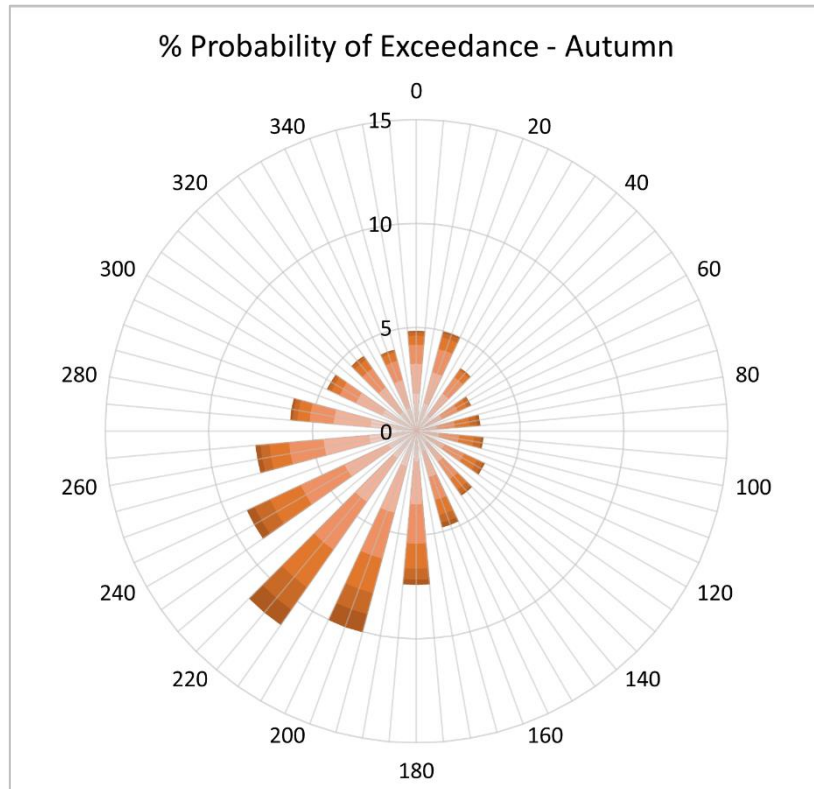
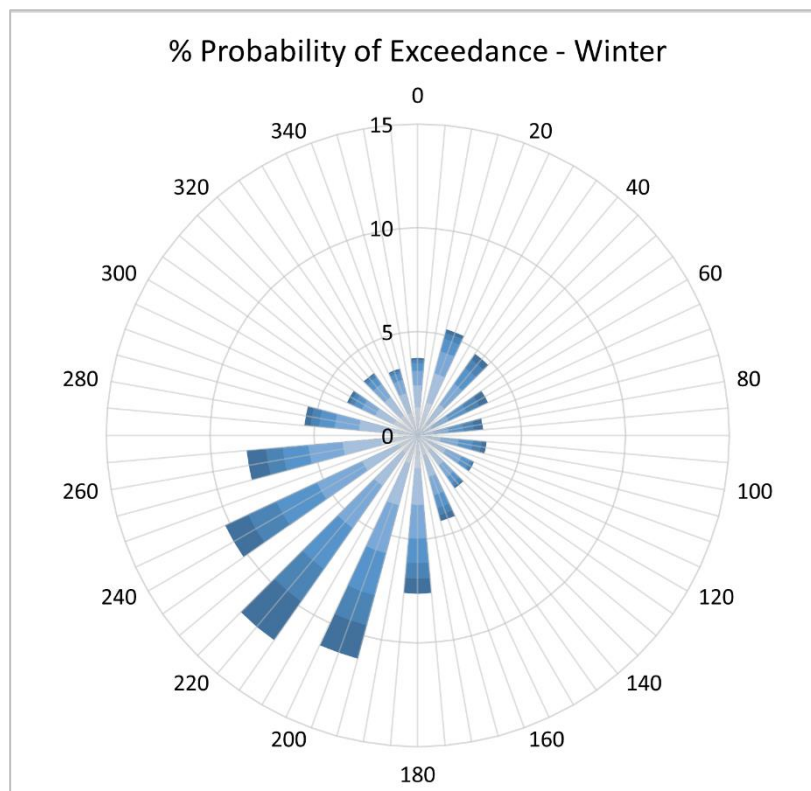


Figure B.6 – Cumulative wind speed probability distribution at site, winter



Appendix C Pedestrian / Occupant Uses

Figure C. 1- Pedestrian uses: existing site conditions

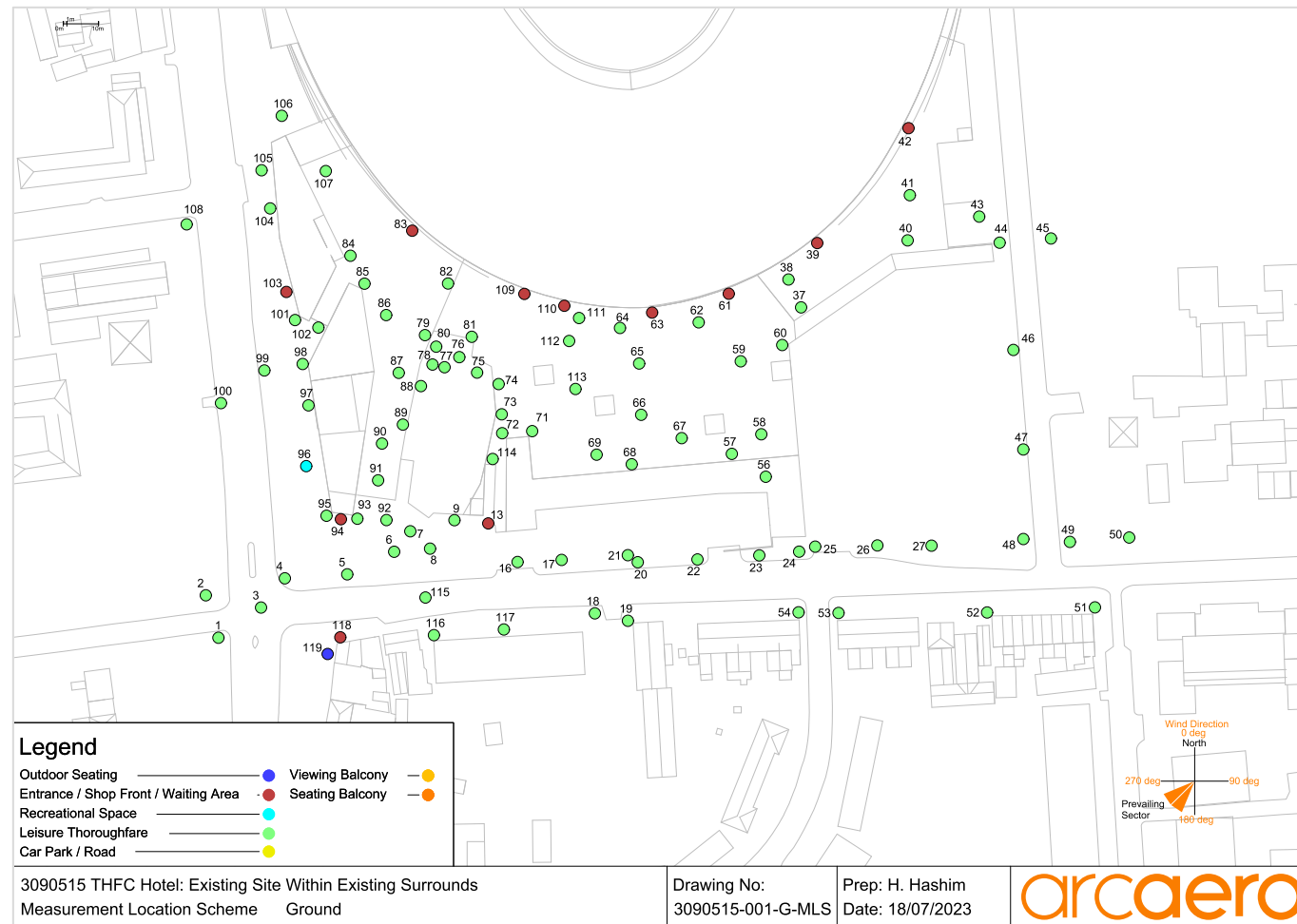


Figure C. 2 - Pedestrian uses: completed development within all configurations - ground level

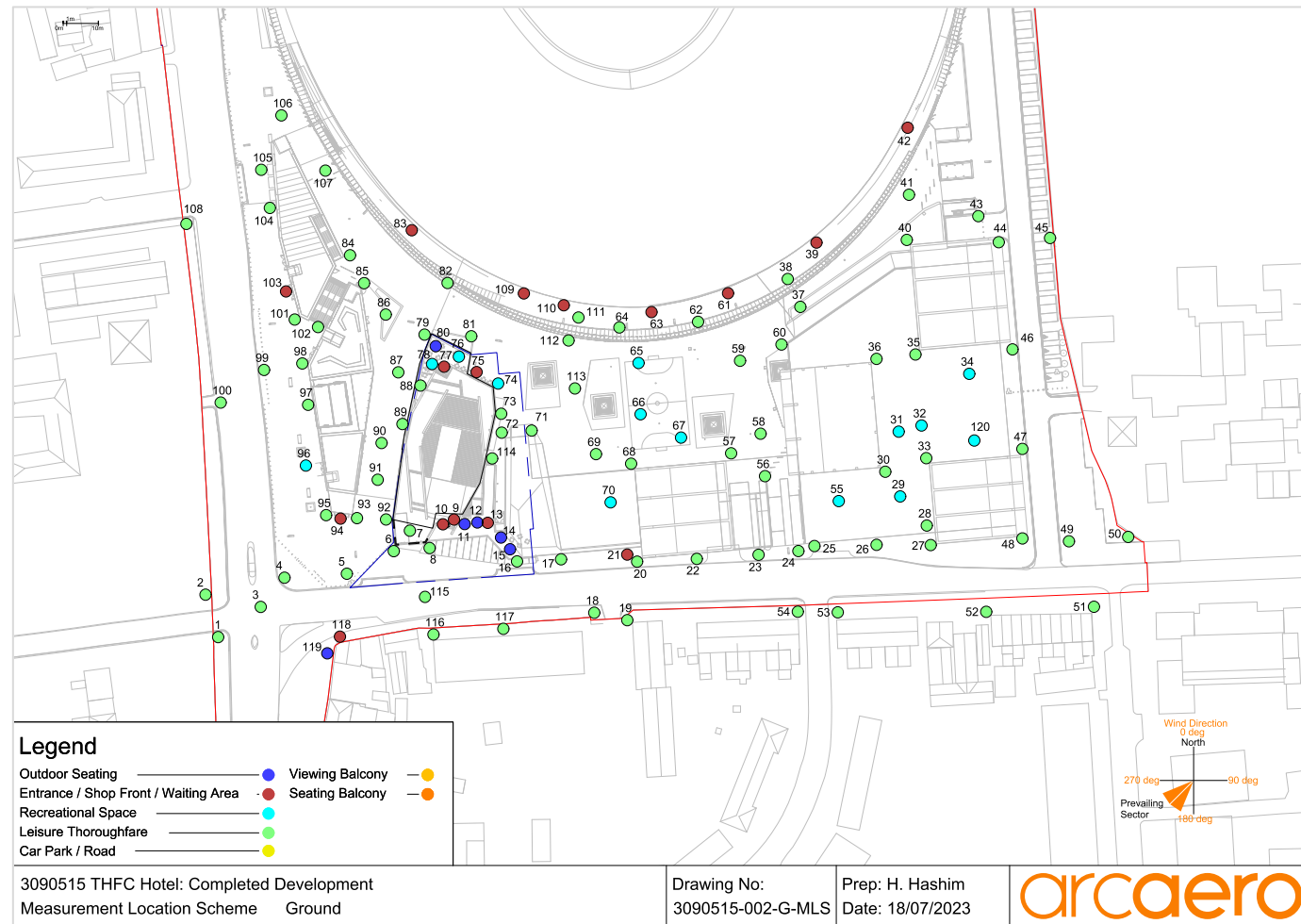


Figure C. 3 - Pedestrian uses: completed development within all configurations - elevated level

