

Chapter 10: Wind Microclimate

WIND MICROCLIMATE	
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SUPPORTING APPENDIX	ES Volume 3: Appendix - Wind Microclimate: Annex 1: Legislative and Planning Policy Context; and Annex 2: Wind Microclimate Technical Report.
KEY CONSIDERATIONS	This chapter will assess the effects of the Proposed Development on the site and if the resulting changes in wind speeds would be suitable, in regard to comfort and safety, for the intended usage of sensitive locations in and around the site.
CONSULTATION	An EIA Scoping Report was prepared and submitted to the RBC in September 2018 requesting a formal Scoping Opinion from the RBC on the scope of the EIA. A copy of the EIA Scoping Report is provided in ES Volume 3: Appendix- EIA Scoping. A Scoping Opinion has not been received at the time of preparing this ES. The EIA has proceeded in the absence of a formal opinion received.

ASSESSMENT METHODOLOGY

Defining the Baseline

Current Baseline Conditions

- 10.1** The baseline conditions across the existing site and the surroundings have been defined using wind tunnel testing to provide a detailed, quantitative assessment.
- 10.2** Mean and peak wind speeds have been measured (for both the windiest season (normally winter) to show the worst case scenario, and summer season for amenity spaces (amenity spaces are assessed during the summer season as these areas are expected to be used most frequently during this period with an expectation of calmer conditions compared to other times of the year) at locations across the existing site and at other surrounding buildings, paths, roads and areas of open spaces for 36 wind directions in 10° increments within a 360m radius of the site which is considered a large enough scale to ensure all wind effects are captured. Details of the tunnel test methodology is presented in the section '*Wind Tunnel Test Methodology*' of this ES Chapter.
- 10.3** The results have been combined with long-term meteorological climate data appropriate for the local Reading area (London Heathrow Airport). The meteorological data used in this assessment is deemed to be representative of the local wind microclimate for the Reading area. The meteorological data used is presented within '*Baseline Condition – Meteorological Data*' section and shown in Figure 10.1.

Evolution of the Baseline

- 10.4** The evolution of the baseline condition (in the event that the Proposed Development does not come forward) has been considered using professional judgement informed by the results of the Baseline Scenario (test Configuration 1) and the wind tunnel results undertaken as part of the cumulative effects assessment (see section '*Assessment of Future Environment – Cumulative Effects Assessment*' of this ES Chapter).
- 10.5** The cumulative scenario provides information on the general changes, if any, in wind conditions around the site as a result of the cumulative developments. This cumulative effect assessment takes account of the other future schemes within the area surrounding the site (presented within **ES Chapter 2 – EIA Methodology (Volume 1)**).

Impact Assessment Methodology

Demolition and Construction

- 10.6** The potential microclimate impacts during demolition and construction works have not been directly assessed within the wind tunnel, as this is a temporary condition and would be highly variable as the remaining existing buildings are demolished and the Proposed Development is constructed. The potential impacts are assessed using the professional judgement of an experienced wind engineer, based on an assessment of the background wind climate at the site (the results of the tested configurations for the baseline and completed development scenarios) and an understanding of the likely effects based on RWDI's experience of assessing wind in the built environment.
- 10.7** This approach is taken assuming that the activity on-site during this time (i.e. construction activity) is less sensitive to wind conditions (due to protection from site hoarding, and site access being restricted to site

workers) than when the Proposed Development is completed and occupied (which would include new building entrances and outdoor seating with amenity spaces, for example). In addition, there would be appropriate health and safety measures implemented to ensure that the construction workers were adequately protected.

- 10.8** Windier conditions (in terms of pedestrian comfort) will be tolerable across the active demolition and construction site as this area is not for typical pedestrian use (see section '*Assumptions and Limitations*' below).

Assumptions and Limitations

- 10.9** It is assumed that there will be restricted access (i.e. not accessible to the general public) across the site during the demolition and construction works, and therefore windier conditions will be tolerable as the area is not for typical pedestrian use where the tolerable wind speed threshold would be lower.

Completed Development

- 10.10** To predict the local wind environment associated with the completed development, and the resulting pedestrian comfort within and surrounding the site, wind tunnel testing of the Proposed Development has been undertaken within the wind tunnel.
- 10.11** Wind tunnel testing allows the pedestrian level wind microclimate at and surrounding the site to be quantified and classified in accordance with the accepted criteria (refer to '*Assessment Criteria*' section of this ES Chapter).
- 10.12** Wind tunnel testing delivers a detailed assessment of the mean and gust wind conditions in and around the site for the tested wind directions in terms of pedestrian comfort and safety and provides a basis to assess the potential wind microclimate impacts and likely effects of the Proposed Development with regards to its intended use.
- 10.13** It is acknowledged that a direct comparison with the baseline conditions would be useful to understand changes from the existing (baseline) wind conditions across the site due to the Proposed Development. However, a comparison of the measured wind environment for the Proposed Development with the existing conditions does not take into account any change in pedestrian activity that would usually accompany development. Comparisons between the baseline scenario and 'completed development' scenario have therefore been made where possible.

Wind Tunnel Testing Methodology

- 10.14** The methodology for quantifying the pedestrian level wind environment is outlined below within four steps. Further details of the assessment methodology is presented within **ES Volume 3: Appendix - Wind Microclimate**.
- Step 1: The site's induced wind speeds are measured for the appropriate configuration(s) at the appropriate pedestrian level(s) in the wind tunnel;
 - Step 2: Standard meteorological data is adjusted to account for conditions at a subject site (for this assessment, meteorological data has been derived from the meteorological station of London Heathrow Airport);
 - Step 3: Data from Step 1 and Step 2 is combined to obtain the expected frequency and magnitude of wind speed for the appropriate configuration(s) and at the appropriate pedestrian level(s); and
 - Step 4: The results of Step 3 are compared with the Lawson Comfort Criteria (and where relevant, the change in the wind microclimate conditions between appropriate test configuration(s)) to 'grade / score' the conditions within and around the site.
- 10.15** To produce the results within the wind tunnel, a 1:300 scale model comprising the site and the surrounding area (including relevant existing buildings and other topographical features) was constructed on a 2.4m diameter disc allowing for the surrounding area within a 360 metre (m) radius of the centre of the site of the Proposed Development to be modelled (the radius is determined based on the scale model and due to the physical constraints of the modelling in the wind tunnel). This radius is considered a large enough scale to ensure all likely wind effects are captured.
- 10.16** Wind is unsteady, or gusty, and this 'gustiness' or turbulence, varies depending upon the site. In order to model the likely effects of gustiness or turbulence (which depends on the geographical location), a combination of spires and floor roughness elements have been employed in the wind tunnel in order to create a 'boundary layer' that is representative of the urban location of the site. The detailed wind tunnel model around the

Proposed Development is used to fine-tune the flow and create conditions similar to those expected at full scale.

- 10.17** Other developments outside the 360m radius of the site would not individually be expected to modify the wind approaching the site and as such have been included within the analysis of the surrounding terrain.
- 10.18** To test the impact of the Proposed Development, a scale model of the buildings comprising the completed Proposed Development has been constructed (*Configuration 2: Proposed Development with Existing Surrounding Buildings*).
- 10.19** Wind speed measurements within and around the site for the tested configurations were established using 'Irwin probes'. These sensors are able to measure the mean and gust wind speeds at a full-scale height of approximately 1.5 m above the surface upon which the probe is located.
- 10.20** The wind speed was measured at up to 171 locations under the configurations for all wind directions in equal increments, with 0° representing wind blowing from the north and 90° wind from the east and so on.

Model Configurations Assessed

- 10.21** The assessment of the wind microclimate is based on the results from a series of tests of physical models within the wind tunnel to provide a detailed, quantitative assessment. The existing landscaping to the south of the site was included in order to provide an accurate representation of the environmental context and the wind microclimate across the site. The Proposed Development with Existing Surrounding Buildings was initially assessed devoid of landscaping associated with the Proposed Development, in order to consider a worst-case scenario.
- 10.22** Configurations tested within the wind tunnel include:
- Configuration 1: Existing Site with Existing Surrounding Buildings;
 - Configuration 2: Proposed Development with Existing Surrounding Buildings;
 - Configuration 3: Proposed Development with Existing Surrounding Buildings and Proposed Landscaping Scheme; and
 - Configuration 4: Proposed Development with Cumulative Surrounding Buildings.
- 10.23** Cumulative developments identified within the 360m radius of the site assessed in the wind tunnel model are:
- Chatham Street (Application Reference: 170326);
 - 20 Hosier Street (Application Reference: 182054);
 - 52 – 55 Friar Street (Application Reference: 162210);
 - Plot E & Telecom House Land Friar Street/ Garrard Street Station Hill (Application Reference: 151426); and
 - Station Hill (Application Reference: 151427).

Assessment Criteria

Lawson Comfort Criteria

- 10.24** The assessment of the wind conditions requires a standard against which the measurements can be compared. This assessment of the wind tunnel results presented in this ES Chapter adopts the Lawson Comfort Criteria ('the Lawson Criteria')¹, which have been established for over 30 years.
- 10.25** The Lawson Criteria described in Table 10.1 is presented to define the reaction of an average pedestrian to the wind. 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.
- 10.26** The Lawson Criteria set out four pedestrian activities (comfort categories) 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 required 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.

- 10.27** The coloured key in Table 10.1 corresponds to the presentation of wind tunnel test results.

Table 10.1 Lawson Comfort Criteria

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.
	Walking	8-10 m/s	Relatively high speeds that can be tolerated if the objective is to walk, run or cycle without lingering.
	Strolling ²	6-8 m/s	Moderate breezes that would be appropriate for strolling along a city/town centre street, plaza or park.
	Standing	4-6 m/s	Gentle breezes suitable for main building entrances, pick-up/drop-off points and bus stops.
	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.

Target Wind Conditions

- 10.28** For a mixed-use urban environment, such as the site and surrounding area, the desired wind microclimate for the Proposed Development would typically need to have areas suitable for sitting, standing/entrance use and strolling (Table 10.1).
- 10.29** The walking and uncomfortable classifications may be acceptable in isolated areas, but these classifications are also associated with occasional strong winds (which are described below) and so the aim has been to avoid conditions falling into these categories.

Amenity Areas

- 10.30** The target condition for seating in amenity areas is a wind microclimate that is suitable for sitting during the summer season. This is because these areas are more likely to be frequently used during the summer when pedestrians would expect to be able to sit comfortably. If an area is classified as suitable for sitting in the summer, the windier conditions that occur during the winter season usually mean that the area would be classified as suitable for standing in the windiest season, unless additional shelter was provided.
- 10.31** Large upper level terraces and large amenity spaces (mixed use amenity) are assessed on the basis that are intended for good-weather use only (and is therefore also assessed during the summer season). A mix of sitting and standing conditions during the summer would be acceptable provided that any desired seating areas are situated in areas having sitting use wind conditions.

Entrances

- 10.32** Areas in proximity of building entrances, a wind environment suitable for standing or calmer is desired, as pedestrians will transition from the calm indoors to the windier outdoors throughout the year. The assessment for building entrances therefore focuses on the windiest season result.
- 10.33** An entrance which is recessed, then the recessed zone provides a transition area for pedestrians existing the building. If strolling conditions are observed on the pavement outside a recessed entrance, acceptable standing conditions would be expected at the recessed entrance.

¹ Building Aerodynamics, (2001); Lawson T.

Secondary Entrances

- 10.34** Considered as entry points to a building which are not primary entrances and used for alternative purposes, like fire entrances or emergency exits, a wind environment for strolling or calmer is desired. The assessment focuses on the windiest season.

Thoroughfares

- 10.35** A pedestrian thoroughfare should be suitable for strolling during the windiest season. The assessment for pedestrian thoroughfares therefore focuses on the windiest season result.
- 10.36** Localised occurrence of walking conditions may be acceptable in areas with limited footfall, or service areas, as long as the strong wind criteria (see section 'Strong Winds') is not exceeded.

Bus stops

- 10.37** Bus stops should be suitable for standing during the windiest season.

Crossings

- 10.38** Crossings should be suitable for walking during the windiest season.

Car Park

- 10.39** Car Park should be suitable for walking during the windiest season.

Roadways

- 10.40** The Lawson Criteria does not specify criteria for acceptable wind conditions for cyclists; however, the occurrence of winds exceeding the strong winds threshold (as described below) would be considered unsuitable for cyclists.

Off-Site Locations

- 10.41** Wind conditions at off-site locations will only be considered beneficial if they are unsuitable for the intended use in the existing scenario and are improved by the Proposed Development to be calmer than required for the intended use. Wind conditions which are suitable for the intended use in the existing scenario, and remain suitable or calmer than required for the intended use after construction of the Proposed Development will be negligible since the usability of the location is not affected.
- 10.42** Wind conditions off-site will only be classified as beneficial if wind conditions were not suitable for the intended use in the baseline scenario, and are improved to be calmer than required for the intended use with the Proposed Development completed. Should an off-site location be windier than required in the baseline scenario, and does not change with the Proposed Development completed, the wind conditions would be negligible as the Proposed Development has not made the wind conditions worse than the existing scenario.
- 10.43** It is acknowledged that a direct comparison between the baseline conditions and the Proposed Development would be useful to understand the changes in wind conditions across the site caused by the presence of the Proposed Development. However, the comparison of the wind environment does not take into account any change in pedestrian activity during the development. For example, pedestrian thoroughfares of an existing site may change to entrances of the Proposed Development, changing the acceptable comfort criteria.

Strong Winds

- 10.44** The Lawson Criteria also specifies a strong wind threshold when winds exceed 15m/s for more than 0.025% of the time (approximately 2.2 hours of the year) would have the potential to cause distress to pedestrians and cyclists. 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 older adults or young children to be present at the location on the windiest day of the year?
- 10.45** Wind Speeds that exceed 20m/s for more than 0.025% of the time (approximately 2.2 hours of the year) represent safety issue for all members of the population, which would require mitigation to provide an appropriate wind microclimate environment.
- 10.46** Strong winds are generally associated with areas which would be classified as acceptable for walking or conditions considered 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 have the impact of reducing the frequency of, or even eliminate, any strong winds.

Assumptions

- 10.47** This assessment is based on worst-case wind speeds, expected to be encountered during the winter season (December, January and February) in the UK. Additional consideration has been made for summer wind conditions due to the presence of ground floor public amenity space. This complies with the standard methodology set out by Lawson for wind-microclimate assessments.
- 10.48** It is expected that use of outdoor amenity spaces and rooftop terraces for sitting will be limited to the summer season. During the winter, it would be expected that these spaces would increase a criteria level to standing or strolling use.

Methodology for Defining Effects

Receptors and Receptor Sensitivity

- 10.49** The sensitivity of receptors is related to the intended pedestrian usage at each location; there are no definitions for sensitivity, as the important consideration is whether the wind conditions experienced at a particular receptor location are suitable for the intended use (in terms of comfort and strong winds) at that particular location. All receptors are considered to be highly sensitive to the local wind microclimate conditions and are given an equal weighting.

Defining Effect Classification

- 10.50** The assessment of the potential effects is based on the desired pedestrian uses (as defined by the Lawson Criteria) in relation to the wind conditions measured at a particular probe location with the Proposed Development in place. This allows for the assessment to take into account any changes in pedestrian activity that might accompany the Proposed Development.
- 10.51** The assessment criteria for the modelled wind microclimate, as shown in Table 10.2, comprise a stepped scale to reflect the change in magnitude of impact.
- 10.52** In line with Lawson's overall methodology, any strong winds (i.e. affecting pedestrian safety) would be unsuitable, and therefore as any strong wind exceedance is inherently 'significant'. The occurrence of strong winds is reported as a separate category from the Lawson Criteria assessment. Where strong winds are identified, mitigation is required (as per adverse effects related to pedestrian comfort).

Table 10.2 Effect Classification Criteria

Modelled Wind Microclimate Criteria	Effect Classification
Wind Conditions are 3-steps calmer / windier than desired.	Major
Wind Conditions are 2-steps calmer / windier than desired	Moderate
Wind Conditions are 1-step calmer / windier than desired	Minor
Wind Conditions are similar to those desired.	Negligible

- 10.53** The minor, moderate and major categories indicate the severity of the change in wind condition between the desired wind microclimate and the wind microclimate presented in the modelled results. As an example, if the desired wind conditions at a location are required to be suitable for 'Standing', but the predicted wind conditions are suitable for 'Strolling', the difference between the desired and predicted wind condition is one category windier than desired. In this case, the scale of the effect would be identified as 'minor adverse'.
- 10.54** The effect classification criteria must also account for comparison against the Baseline conditions and the predicted (modelled) wind conditions for the Proposed Development. Where predicted wind conditions are windier than the Baseline conditions, yet remain calmer than required, these would be identified as negligible effect (rather than minor beneficial effect). Additionally, if wind conditions remain suitable for the intended use, these would also be classified as negligible effect (i.e. if a thoroughfare location in the baseline condition has standing wind conditions but increase to a strolling condition when the Proposed Development is in situ, although windier than the baseline scenario, these wind conditions would remain suitable for the intended use and therefore represent a negligible effect).
- 10.55** An adverse effect implies that a location has a wind environment that is windier than the desired conditions and mitigation should therefore be considered. Where potential adverse effects are identified, consideration is provided in the 'Mitigation and Monitoring Measures' section of this ES Chapter to discuss the remedial measures required to mitigate the potential impact and the resultant residual effects are then presented.

- 10.56
- In light of the above, any adverse effect or residual adverse effect are considered to be 'significant'. Any beneficial effects are considered to not be significant as they are calmer than the desired condition.
- 10.57
- Strong winds (affecting pedestrian safety) are not assigned a scale of effect and so overall significance but, are reported separately. This is due to the fact that any strong wind exceedance is considered to be significant.
- 10.58
- Effects once the Proposed Development is completed are direct, local and long-term (permanent) and irreversible unless there is a change in the Proposed Development's massing on-site or the local wind microclimate.

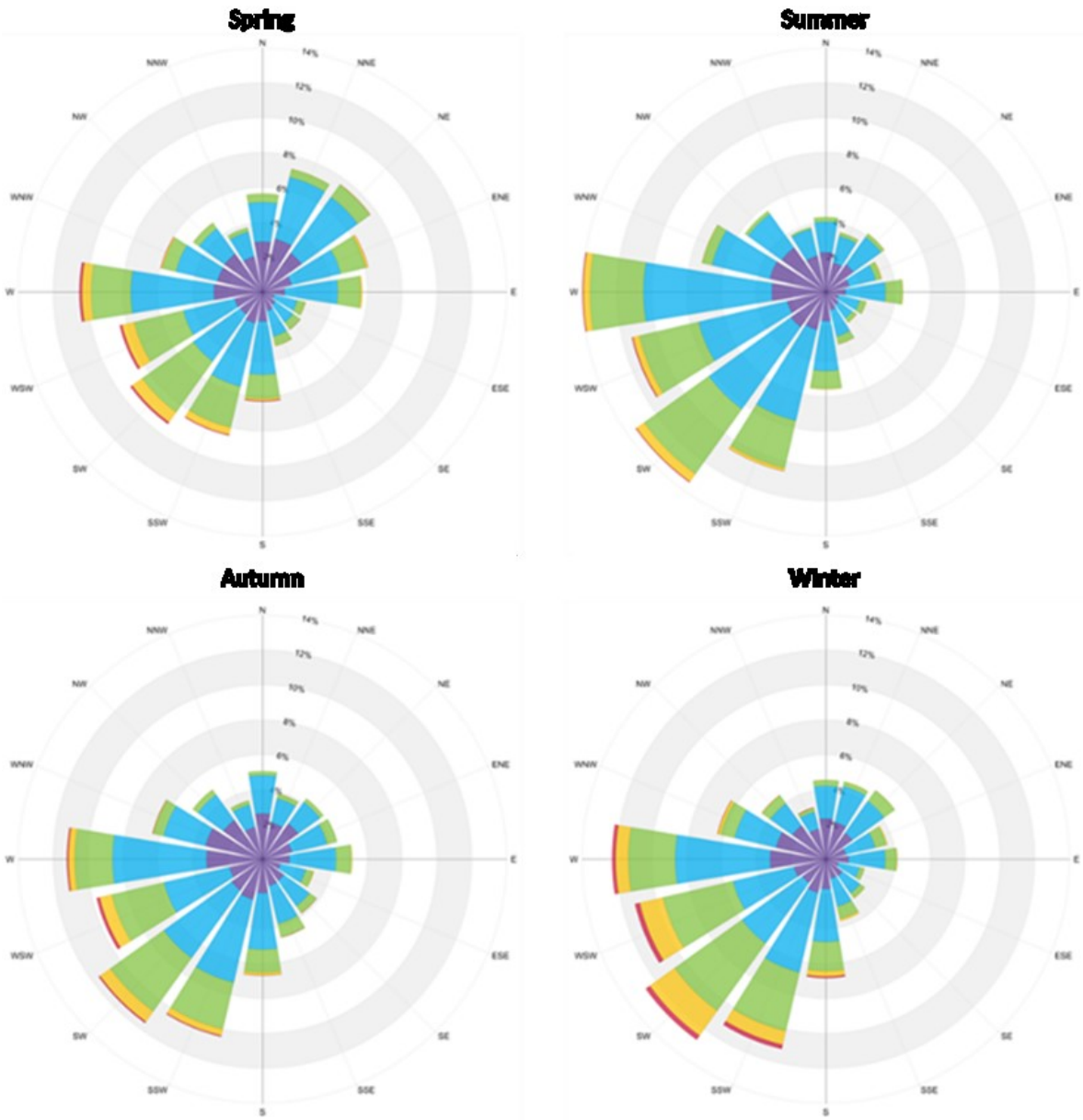
BASELINE CONDITIONS

Baseline Conditions

Meteorological Data

- 10.59
- The UK Meteorological Office supplies records of the number of hours that wind occurs for ranges of wind speed (using the Beaufort Scale) and by direction. Meteorological data for London Heathrow Airport is shown in Figure 10.1 and provides a representation of the local wind microclimate for the Reading area.

Figure 10.1 Seasonal Wind Roses for London Heathrow Airport



- 10.60
- The meteorological data for the London Heathrow area indicates that the prevailing wind throughout the year is from the south-west (i.e. 210 to 240 degrees on the compass). This is typical for many areas of southern England. There is a secondary peak from the north-east during the late spring and early summer. The winds from the north-east are not as strong as the prevailing winds from the south-west, although the winds are colder.
- 10.61
- The meteorological data was corrected to standard conditions of 10 m above open flat level country terrain to remove the influence of terrain surrounding the meteorological station. The meteorological model was then adjusted to the site conditions taking account of the terrain roughness (see section 'Wind Tunnel Testing Methodology') using the BREVe3 software package which models the wind characteristics caused by changes in the terrain roughness at the stated reference height of 120 m above the surface. The results are shown in Table 10.3.

Table 10.3 Site Meteorological Data Adjustment

Direction ('N)	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
Mean Factor	1.41	1.42	1.44	1.43	1.39	1.45	1.46	1.51	1.46	1.41	1.41	1.39

Configuration 1: Existing Site with Existing Surrounding Buildings

- 10.62
- Wind conditions for Configuration 1 (baseline scenario) are presented in Figures 10.2 and 10.3 for the windiest season, while Figures 10.4 and 10.5 depict the wind condition at the site during the windiest season. Figures 10.6 and 10.7 report the strong winds exceedances for Configuration 1.

Pedestrian Comfort

- 10.63
- Within the baseline scenario, wind conditions at the site and within the surrounding area are suitable for 'sitting' use to 'strolling' use during the windiest season, with only one instance of 'walking' use wind conditions at measurement location 6 along Queens Walk (Figures 10.2 and 10.3).
- 10.64
- During the summer season (Figures 10.4 and 10.5), wind conditions at the site and the surrounding area are generally one category calmer, ranging from suitable for 'sitting' use to 'strolling' use.

Strong Winds

- 10.65
- Strong winds exceeding 15m/s for approximately 3.3 hours per year would occur at measurement location 6 along Queen's Walk (Figures 10.6 and 10.7).

Figure 10.2 Configuration 1: Existing Site with Existing Surrounding Buildings – Ground Level – Windiest Season

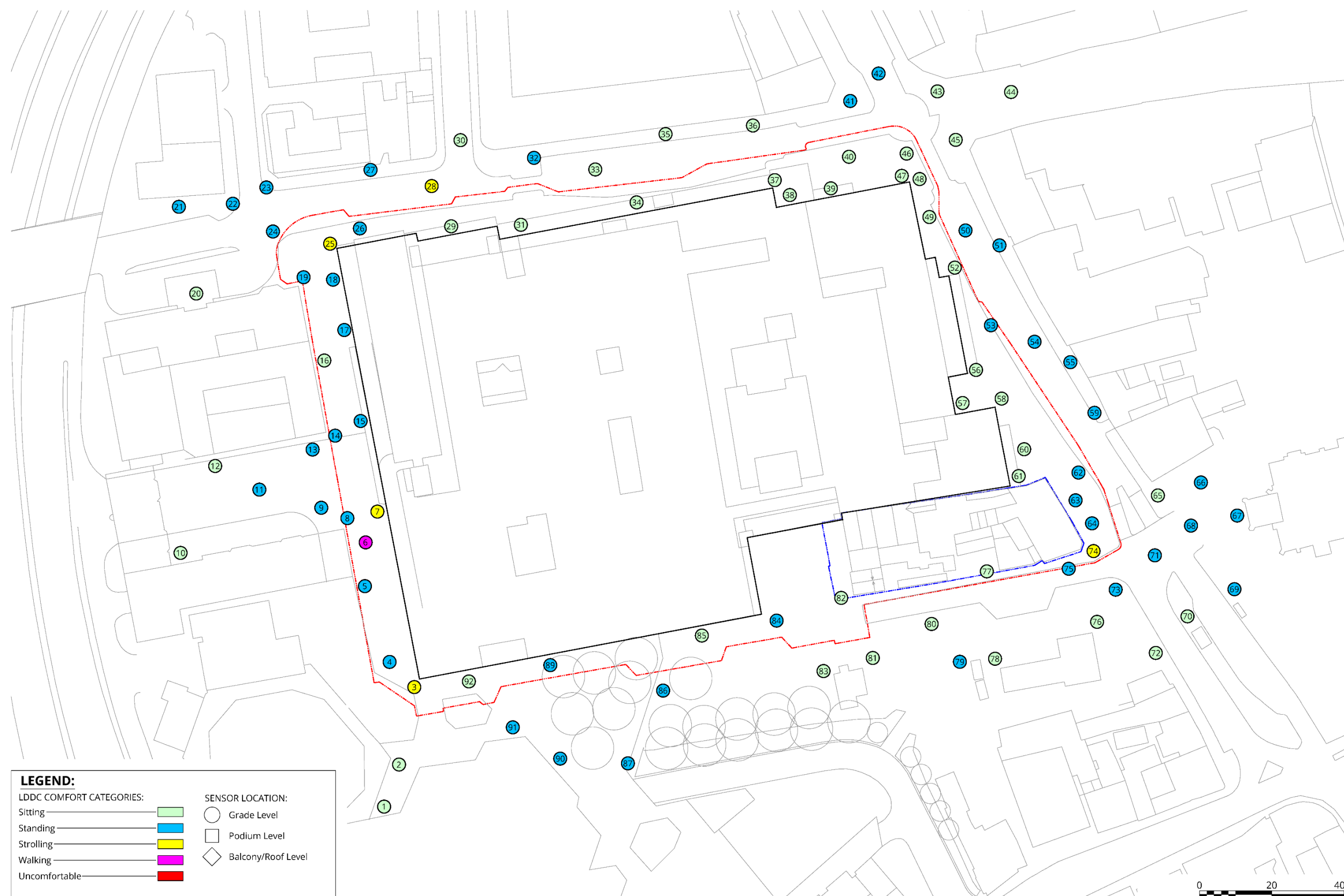


Figure 10.3 Configuration 1: Existing Site with Existing Surrounding Buildings – Roof Level – Windiest Season

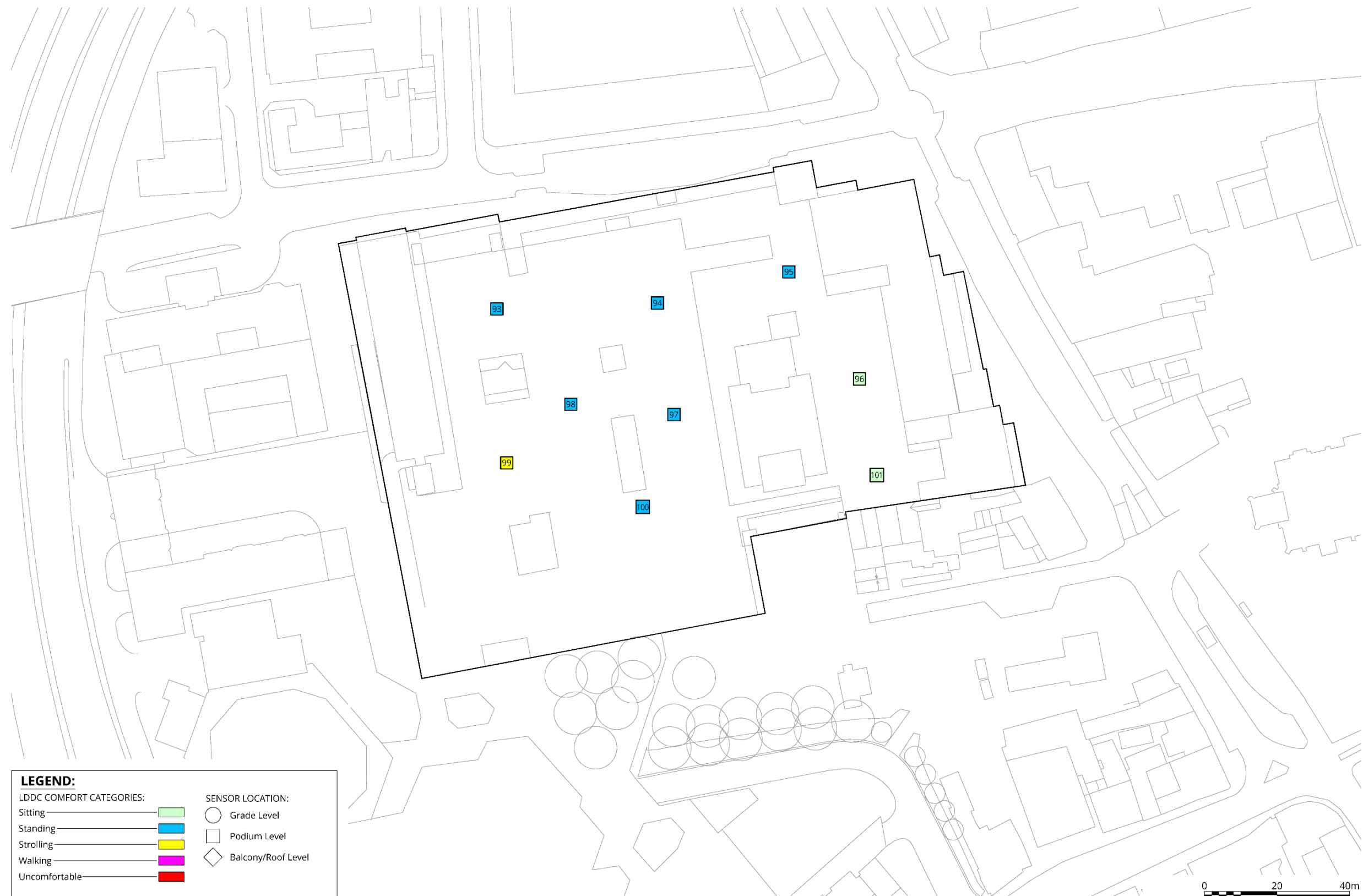


Figure 10.4 Configuration 1: Existing Site with Existing Surrounding Buildings – Ground Level – Summer Season

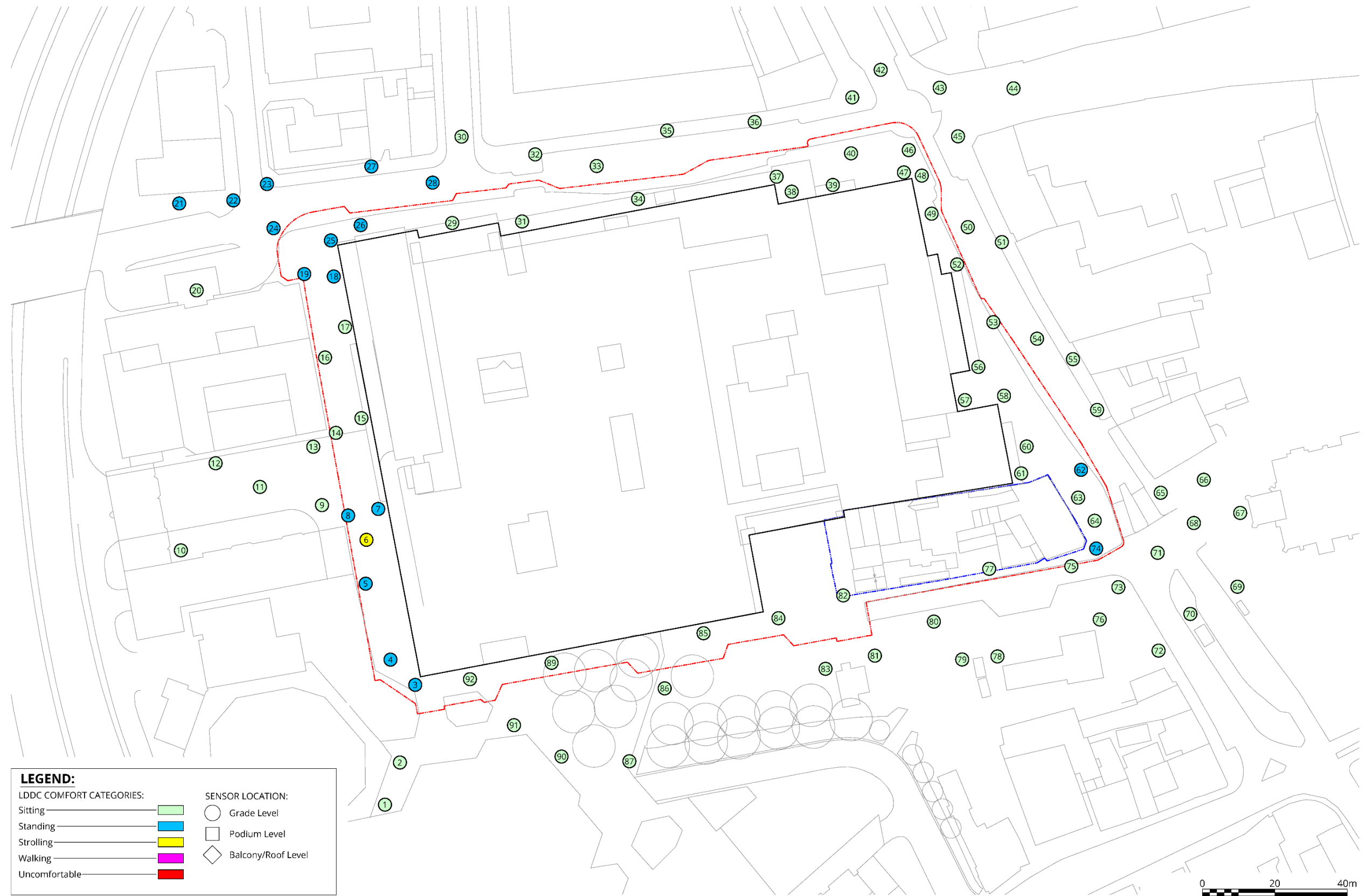


Figure 10.5 Configuration 1: Existing Site with Existing Surrounding Buildings – Roof Level – Summer Season

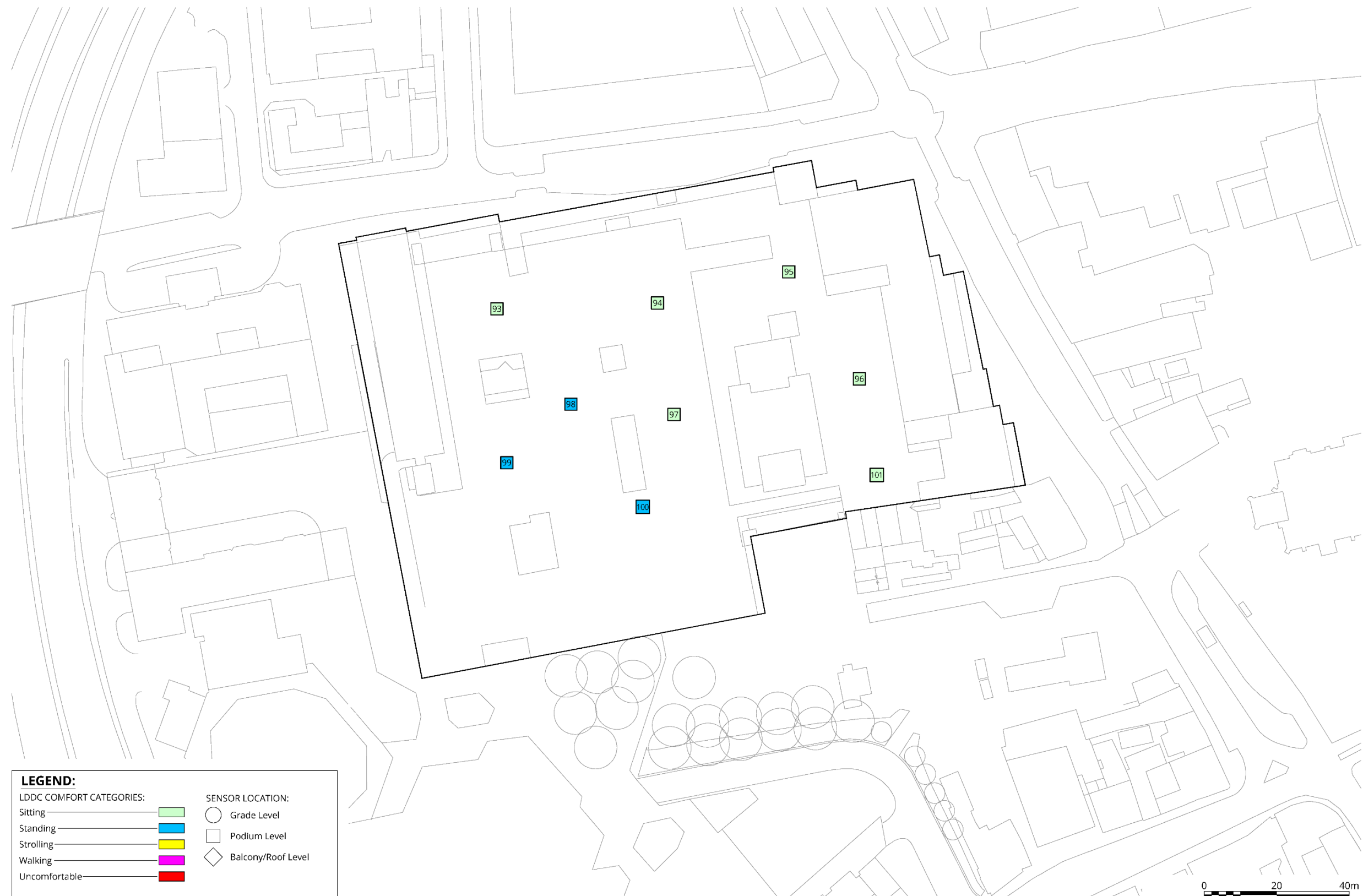


Figure 10.6 Configuration 1: Existing Site with Existing Surrounding Buildings – Ground Level – Safety

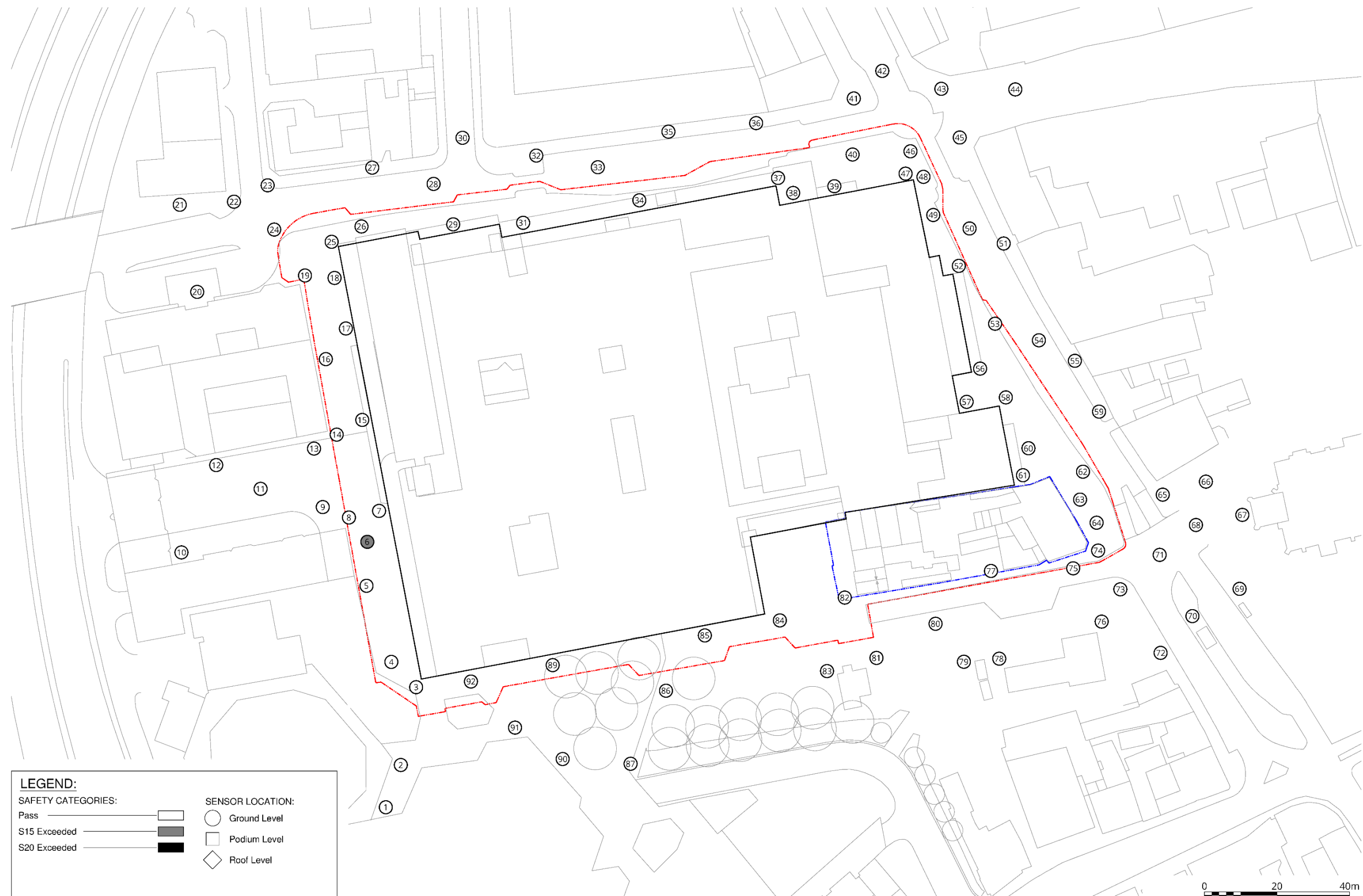


Figure 10.7 Configuration 1: Existing Site with Existing Surrounding Buildings – Roof Level – Safety



RECEPTORS AND RECEPTOR SENSITIVITY

- 10.66** In assessing the wind microclimate there are no definitions for the sensitivity of receptors, with each receptor being highly sensitive to changes to the local wind microclimate conditions. Receptors likely to be affected by the Proposed Development include all pedestrians using/visiting the Proposed Development and the surrounding areas, as well as pedestrians and cyclists on surrounding thoroughfares, entrances to the Proposed Development and those of surrounding buildings and surrounding amenity spaces, including areas with outdoor seating.
- 10.67** There is an overall total of 171 measurement locations (refer to Table 10.4) across the site and surrounding area, which have been assessed. The locations of the probes are fixed and have been subjectively determined based on examination of architectural drawings, reflecting the expected use of the Proposed Development. The only exception to this is represented by measurement location 100, which represents a car park location in Configuration 1 while it located on the amenity podium in Configurations 2, 3, and 4.
- 10.68** The following description of receptor categories for the site and the approach taken to the allocation of the probe locations to the categories is as follows:
- On-Site:
 - Pedestrian Thoroughfares: includes areas that are immediately adjacent to the Proposed Development. This also includes thoroughfares within the Proposed Development;
 - Entrances: includes entrances at ground level;
 - Bus stops;
 - Amenity areas: ground floor and roof terrace (includes terraces located on the upper levels of the buildings);
 - Car Park;
 - Roadways; and
 - Off-Site locations: includes all receptors falling outside the definition of the boundary of the site, such as along roadways, surrounding building entrances and amenity areas.

Table 10.4 Likely Resource / Receptor

Receptor Type (Season)	Receptor Reference (Measurement location numbers; Orientation within the site)
On-Site	
Thoroughfares	3,4, 8, 14, 16, 17, 19, 25, 26, 37, 40, 46, 47, 48, 49, 52, 53, 56, 57, 58, 60, 61, 62, 63, 88, 92, 142, 143, 145, 146, 147, 148, 150, 151, 152, 153, 154, 157, and 159
Entrances	7, 15, 18, 29, 31, 34, 38, 39, 57, 84, 85, 89, 92, 103, 109, 115, and 155
Bus Stops	156
Car Park	93, 94, 95, 96, 97, 98, 99, 101, 106, 108, 116 117, 119, 126, 138, 139, 140, and 141
Amenity Areas Ground Level	5, 6, 144, 64, and 74
Amenity Areas Upper Levels	100, 102, 104, 105, 110, 112, 113, 114,, 118, 120, 121, 122, 123, 127, 128, 129,133, and 134
Off-Site	
Thoroughfares	1, 2,13, 22, 23, 24, 35, 36, 41, 43, 44, 45, 51, 55, 59, 65, 66, 68, 70,72,73, 75, 76, 77, 78, 79, 80, 81, 82, 83, 86, 87, 90, 91, 149, 158, and 160
Entrances	10, 12, 20, 21, 27, and 67
Bus Stops	69
Amenity Areas Ground Level	9, 11, and 12
Road	25, 28, 30, 32, 33, 42, 50, 54 and 71

POTENTIAL EFFECTS

Demolition and Construction

- 10.69** Wind conditions during the demolition and construction works would be expected to gradually adjust from those of the Baseline Scenario (Configuration 1) to the likely wind conditions identified for the Completed Development (Configuration 2).
- 10.70** The demolition phase is not expected to alter wind conditions from the Baseline Scenario presented in Configuration 1. Therefore, the likely effect is expected to be **negligible**.
- 10.71** It is expected that the wind conditions during the period of construction works will gradually transition from the Baseline Scenario (existing site wind microclimate - Configuration 1) to the completed Proposed Development wind microclimate (Configuration 2) (as described on 'Potential Effects – Completed Development').

Assumptions

- 10.72** It assumed that there will be restricted access (i.e. not accessible to the general public) to the site during demolition and construction, and therefore windier conditions will be tolerable as the area is not for typical pedestrian use where the tolerable wind speed threshold would be lower.

Completed Development

Configuration 2: Proposed Development with the Existing Surrounding Buildings

- 10.73** The discussion of wind conditions at the Proposed Development with the existing surrounding buildings is based on the results presented in Figures 10.8 and 10.9 for the windiest season at ground and elevated levels respectively; and in Figures 10.10 and 10.11 for the summer season at ground and elevated levels respectively. Figures 10.12 and 10.13 represent the safety exceedances for ground and elevated levels respectively.
- 10.74** Wind conditions were initially assessed devoid of landscaping in order to assess a worst-case (i.e. windiest) scenario at the Proposed Development.

Pedestrian Comfort

- 10.75** Wind conditions at the Proposed Development would be suitable for 'sitting' use to 'strolling' use during the windiest season.
- 10.76** During the summer season, wind conditions would be generally one category calmer, with all locations suitable for 'sitting' to 'standing' use.

Thoroughfares

On-site

- 10.77** Thoroughfare locations within the site would have wind conditions ranging from suitable for 'sitting' use (2 categories calmer than desired) to 'strolling' use (target condition) during the windiest season (Figure 10.8). This would represent a **moderate beneficial** (not significant) (particularly along Oxford Road and St. Mary's Butts) to **negligible** (not significant) effect.

Off-site

- 10.78** Off-site thoroughfare locations would have wind conditions ranging from suitable for 'sitting' use to 'strolling' use (target conditions) during the windiest season (Figure 10.8). This is a **negligible** (not significant) effect.

Road

Off-site

Wind conditions at all road locations (target as 'walking' use wind conditions) would be suitable for 'strolling' use or calmer during the windiest season, representing a **negligible** (not significant) effect (Figure 10.8).

Entrances

On-site

- 10.79** Most of the entrance locations to the Proposed Development would have wind conditions ranging from a 'sitting' use to 'standing' use (target conditions) classification representing a **minor beneficial** (not significant) to **negligible** (not significant) effect (Figures 10.8 and 10.9).

- 10.80** Entrance location 109 (Building B) at podium level would have ‘strolling’ use wind conditions during the windiest season (Figure 10.9), representing a **minor adverse** (significant) effect. This location would require localised wind mitigation measures.

Off-site

- 10.81** Off-site entrances to the surrounding buildings would have wind conditions ranging from suitable for ‘sitting’ use to ‘standing’ use (target conditions) during the windiest season (Figure 10.8), representing a **negligible** (not significant) effect.

Bus Stops

- 10.82** All bus stop locations would have ‘standing’ use (target conditions) or calmer use wind conditions during the windiest season (Figure 10.8), representing a **negligible** (not significant) effect.

Car park

- 10.83** All car park locations (target as ‘walking’ use wind conditions) would have ‘strolling’ use or calmer use wind conditions during the windiest season (Figure 10.8), representing a **negligible** (not significant) effect.

Ground Level Amenity Areas

On-site

- 10.84** Wind conditions at ground floor amenity spaces along Queen’s Walk and at the corner of Hosier St and St Mary’s Butts (measurement locations 5, 6, 144, 64, and 74) would have wind conditions ranging from ‘sitting’ use (target conditions) to ‘standing’ use during the summer season. If seating is intended at locations 5, 6, 144 wind mitigation would be required to provide localised shelter (Figure 10.10).

- 10.85** Measurement locations 64 and 74 represent the outdoor seating areas of an existing pub, and ‘sitting’ use (target conditions) wind conditions would be desired at these locations. Measurement locations 64 and 74 would have respectively ‘sitting’ use and ‘standing’ use wind conditions during the summer season (Figure 11.10). However, ‘sitting’ use at measurement location 64 and ‘standing’ use at measurement location 74 would occur also in the baseline scenario (Configuration 1), therefore wind conditions at these locations would remain the same with the inclusion of the Proposed Development. This represents a **negligible** (not significant) effect.

Off-site

- 10.86** Wind conditions at Off-Site amenity locations 9, 11, and 12 to the west of Queen’s Walk would be suitable for ‘sitting’ use (target conditions) during the summer season, representing a **negligible** effect (Figure 10.10).

Upper Level Amenity Spaces

- 10.87** Wind conditions at podium level amenity spaces would range from suitable for ‘sitting’ use (target conditions) to ‘strolling’ use during the summer season (Figure 10.11). Measurement locations 102, 110, 112, 114, 127, 133, 162, 163, and 166 at podium level would have ‘strolling’ use wind conditions, representing a **moderate adverse** (significant) effect. Wind mitigation would be required at podium level to provide shelter at these locations.

Strong Winds

- 10.88** Strong winds exceeding 15 m/s for more than 2.2 hours per year would occur at podium level (Figures 10.12 and 10.13). Instances of strong winds would occur at measurement locations 102, 110, 112, 114, 127, 133, 162, 163, and 166 at podium level, car park location 116, and at terrace location 118. This represents a safety concern for those using the terrace, therefore wind mitigation measures would be required at these locations.

Figure 10.8 Configuration 2: Proposed Development with Existing Surrounding Buildings– Ground Level - Windiest Season

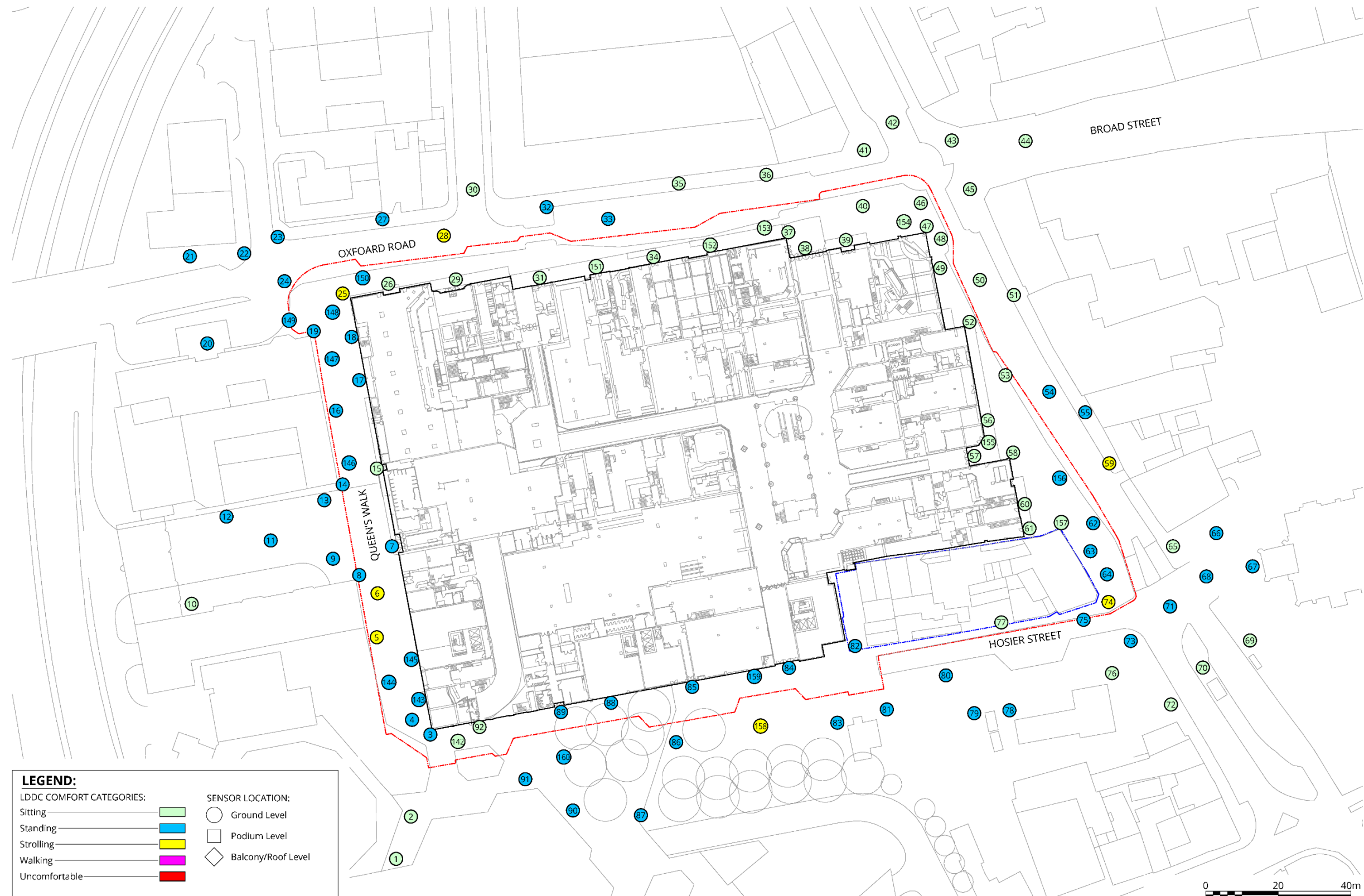


Figure 10.9 Configuration 2: Proposed Development with Existing Surrounding Buildings – Podium and Roof Levels – Windiest Season



Figure 10.10 Configuration 2: Proposed Development with Existing Surrounding Buildings – Ground Level – Summer Season

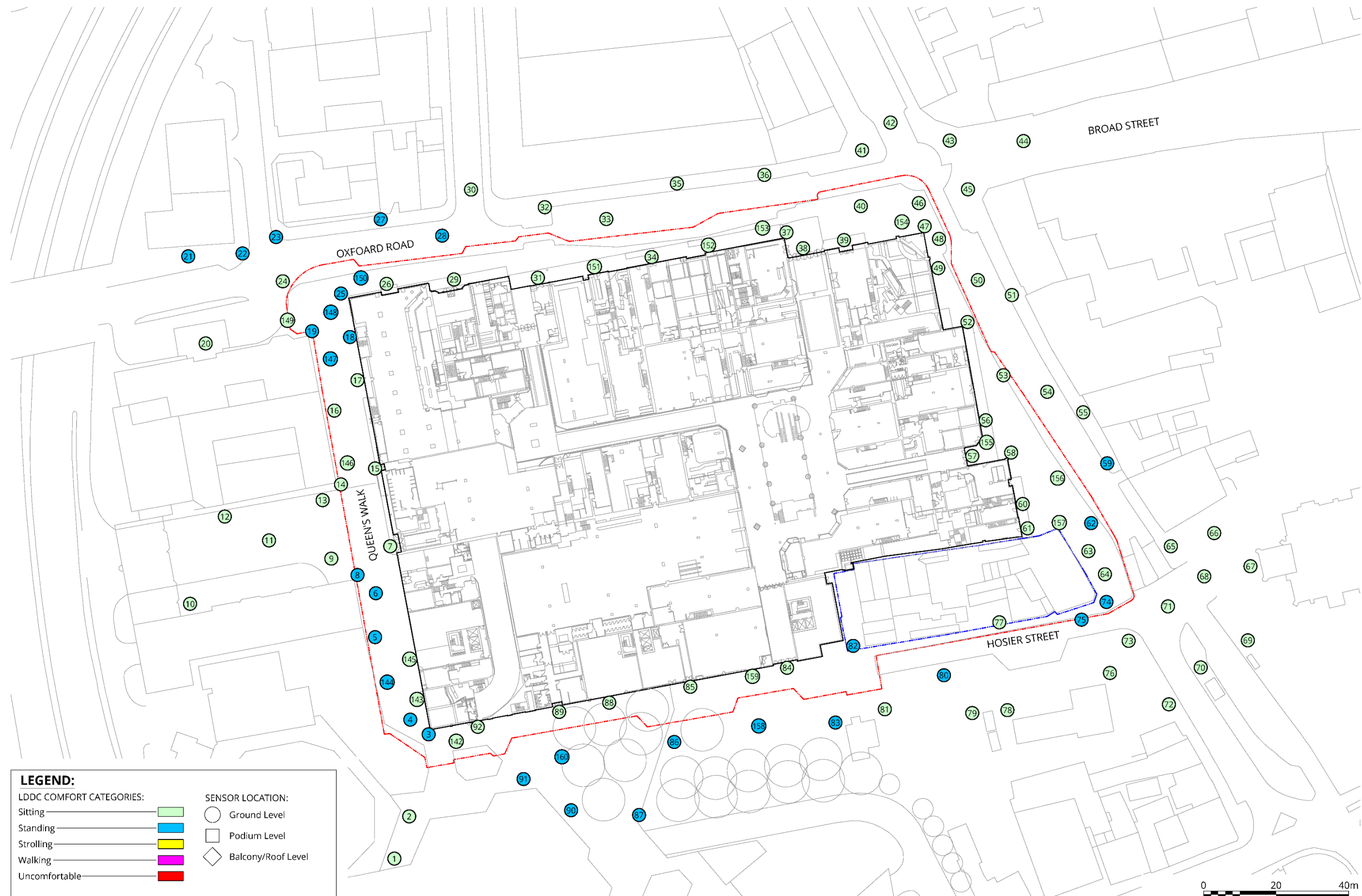


Figure 10.11 Configuration 2: Proposed Development with Existing Surrounding Buildings – Podium and Roof Levels – Summer Season



Figure 10.12 Configuration 2: Proposed Development with Existing Surrounding Buildings – Ground Level – Safety

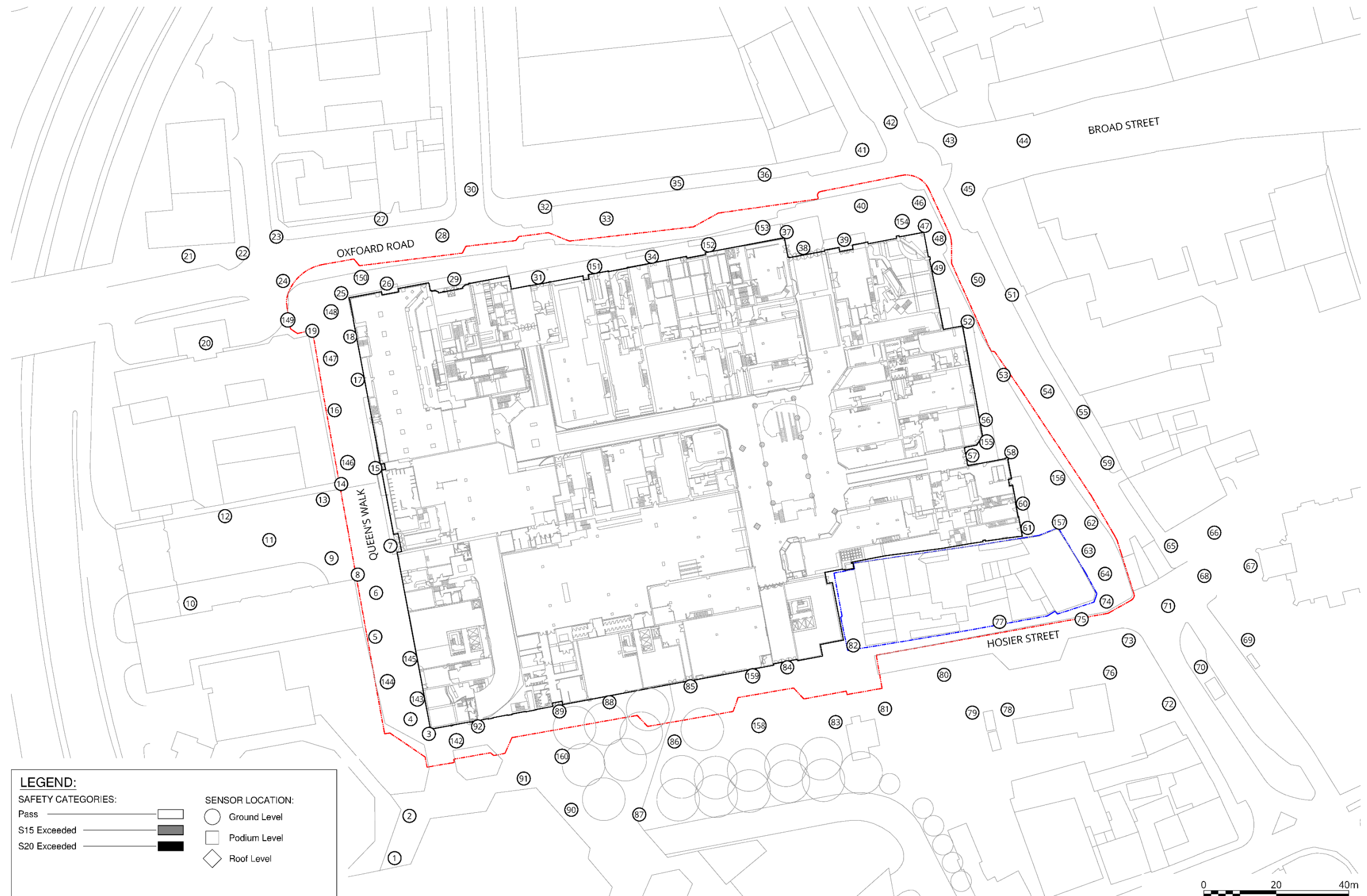
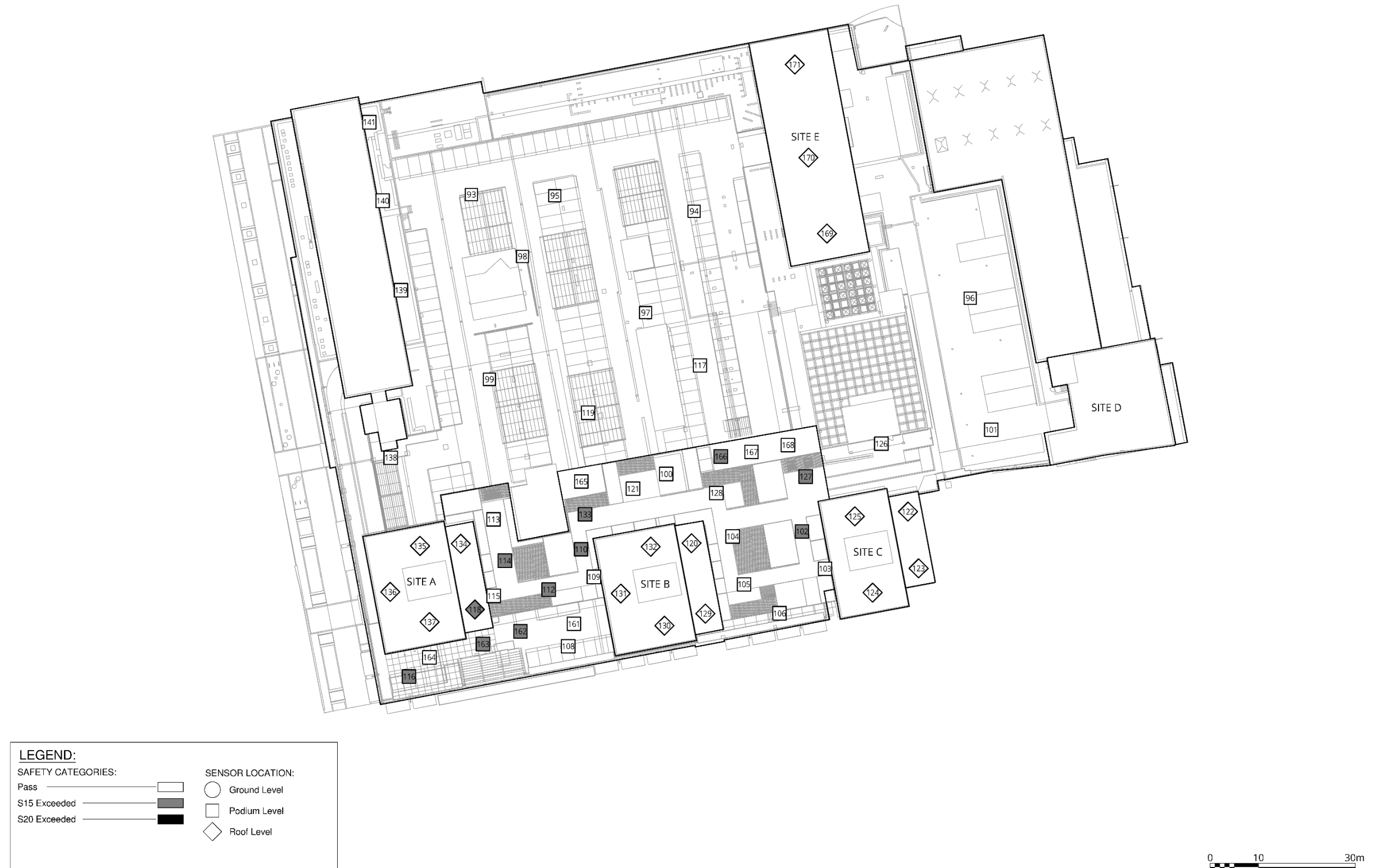


Figure 10.13 Configuration 2: Proposed Development with Existing Surrounding Buildings – Podium and Roof Levels – Safety



Configuration 3: Proposed Development with Existing Surrounding Buildings and Landscaping Scheme

- 10.89** Discussion of the tested wind conditions for the complete and operational Development with the proposed landscaping scheme (refer to Figures 10.35 and 10.36 of Annex 2) is based on the results presented in Figures 10.14 and 10.15 for the windiest season at ground and upper levels respectively. Figures 10.16 and 10.17 present the wind conditions for the summer season at ground and upper levels respectively. Safety exceedances at ground and upper levels are shown in Figures 10.18 and 10.19.

Pedestrian Comfort

- 10.90** Wind conditions at the Proposed Development with the inclusion of the proposed landscaping scheme would be suitable for 'sitting' use to 'strolling' use during the windiest season. The majority of ground level locations within and around the Site would have similar wind conditions to Configuration 2, with the exception of measurement locations 5, 9, 11, 12, 60, and 76 that would be one category calmer and locations 75, 80, and 82 one category windier (Figure 10.16). Calmer wind conditions would also occur at podium level during the summer season, namely at measurement locations 100, 102, 109, 112, 113, 114, 115, 121, 133 (Figure 10.17)
- 10.91** During the summer season, wind conditions would generally be calmer with all locations ranging from suitable for 'sitting' use to 'standing' use.

Thoroughfares

On-site

- 10.92** All thoroughfare locations within the site would have wind conditions ranging from 'sitting' use to 'strolling' use (target conditions) during the windiest season (Figure 10.14). This represents a **moderate beneficial** (not significant) (particularly along Oxford Road and St. Mary's Butts) to **negligible** (not significant) effect.

Off-site

- 10.93** Off-site thoroughfare locations would have wind conditions suitable for 'strolling' use (target conditions) or calmer during the windiest season, representing a **negligible** (not significant) effect (Figure 10.14).

Road

Off-site

- 10.94** Off-site road locations (target as 'walking' use wind conditions) would have wind conditions suitable for 'strolling' use or calmer during the windiest season, representing a **negligible** (not significant) effect (Figure 10.14).

Entrances

On-site

- 10.95** On-site entrance locations would have 'standing' use (target conditions) wind conditions at worse during the windiest season, representing a **minor beneficial** (not significant) (at measurement locations 15, 29, 31, 34, 38, 39, 57, 92, and 155) to **negligible** (not significant) effect (Figures 10.14 and 10.15).
- 10.96** All entrance locations to the Proposed Development located at podium level would have the requires 'standing' use (target conditions) wind conditions during the windiest season, representing a **negligible** (not significant) effect (Figure 10.15).

Off-site

- 10.97** Off-site entrances would have 'standing' use (target conditions) wind conditions at worse during the windiest season, representing a **negligible** (not significant) effect (Figure 10.14).

Bus Stops

- 10.98** All bus stop locations would have 'standing' use (target conditions) or calmer use wind conditions during the windiest season (Figure 10.14), representing a **negligible** (not significant) effect.

Car park

- 10.99** Car park locations (target as 'walking' use wind conditions) would have 'strolling' use or calmer use wind conditions during the windiest season (Figure 10.14), representing a **negligible** (not significant) effect.

Ground Level Amenity Areas

On-site

- 10.100** Wind conditions at ground floor amenity spaces along Queen's Walk and at the corner between Hosier Street and St. Mary's Butts (measurement locations 5, 6, 144, 64, and 74) would have wind conditions ranging from 'sitting' use (target conditions) to 'standing' use during the summer season (Figure 10.16). The results are considered acceptable for this large amenity area, therefore no additional wind mitigation measures would be required. This represents a **negligible** (not significant) effect.

Off-site

- 10.101** Wind conditions at Off-Site amenity locations 9, 11, and 12 to the west of Queen's Walk would be suitable for 'sitting' use (target conditions) during the summer season, representing a **negligible** effect (Figure 10.16).

Upper Level Amenity Spaces

- 10.102** The inclusion of the proposed landscaping scheme at podium level would generally provide beneficial shelter at podium level.

- 10.103** However, measurement locations 110, 127, 162, 163, and 166 at podium level would have 'strolling' use wind conditions during the summer season (Figure 10.17). This represents a **moderate adverse** (significant) effect. Wind mitigation measures would be required at these locations to provide calmer wind conditions at these amenity areas.

Strong Winds

- 10.104** Strong winds exceeding the 15 m/s safety threshold for more than 2.2 hours yearly would occur at podium level at measurement locations 110,, 127, 162, 163, 166, and 167, at car park location 116, and at terrace location 118 (Figures 10.18 and 10.19). Wind mitigation measures would be required at these locations, as this represents a safety concern for pedestrians.

MITIGATION AND MONITORING MEASURES

Demolition and Construction

- 10.105** During construction works, the areas under construction will be hoarded off until the point where the building becomes occupied.
- 10.106** No further mitigation is required during the demolition and construction of the Proposed Development.

Completed Development

- 10.107** The Proposed Development incorporates landscaping details which have been tested and form part of the results presented for Configuration 3. Further localised mitigation measures would be required at measurement locations 110, 116, 118, 127, 162, 163, 166, and 167 (located to the west of the amenity deck between blocks A and B, to the north east of the amenity deck near Block C, and private terrace on Block A) to mitigate strong winds and to provide calmer wind conditions during the summer season and safe wind conditions. Wind mitigation measures at these locations could be in the form of additional soft landscaping elements and/or additional trellises/canopies which would provide shelter at the seating areas. Further wind tunnel testing would be required to verify the effectiveness of additional measures at these locations.
- 10.108** It should be noted that mitigation measures required for the completed development would need to be installed during construction prior to completion.

Figure 10.14 Configuration 3: Proposed Development with Existing Surrounding Buildings and Landscaping Scheme – Ground Level – Windiest Season

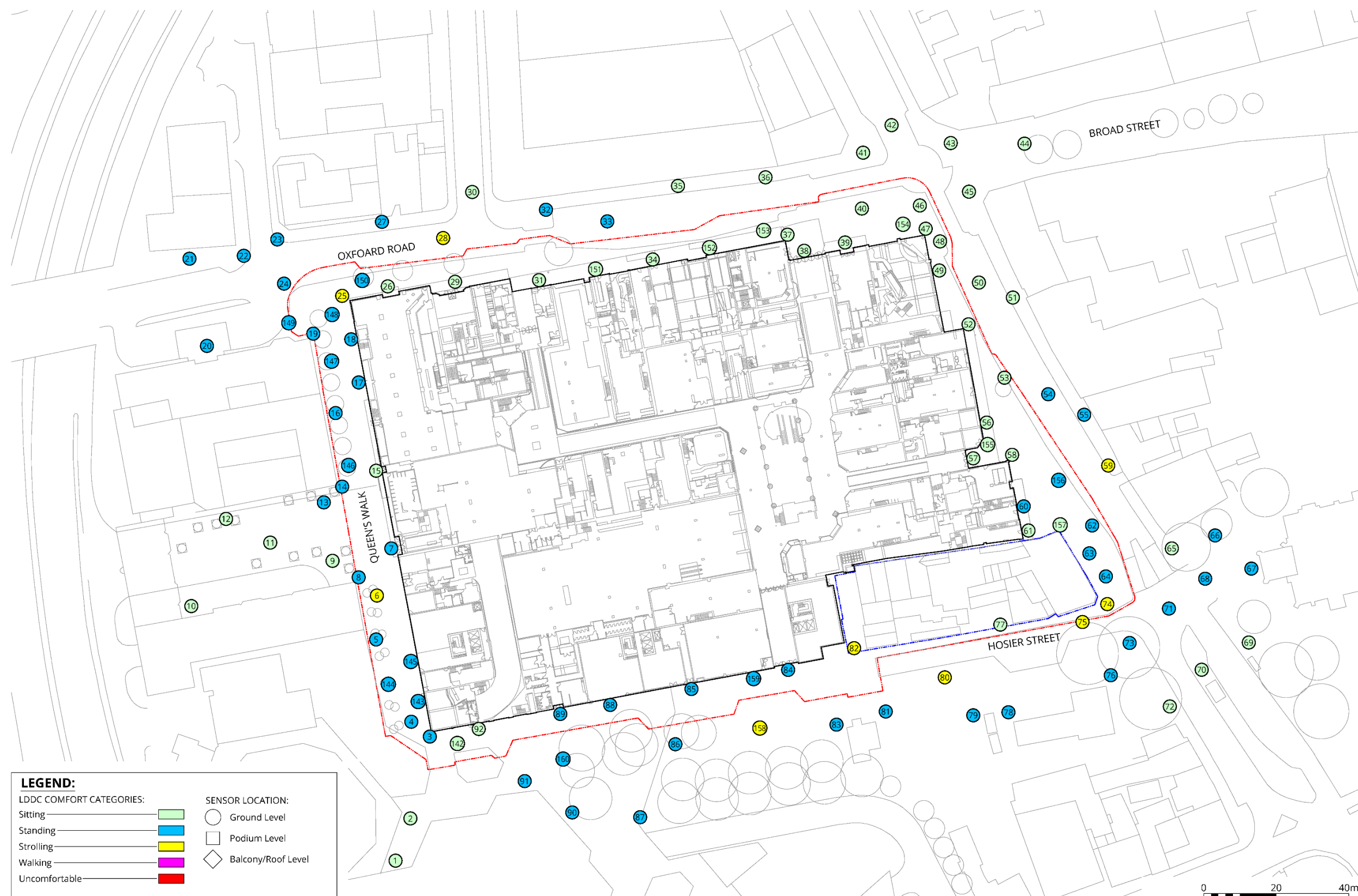


Figure 10.15 Configuration 3: Proposed Development with Existing Surrounding Buildings and Landscaping Scheme – Podium and Roof Levels – Windiest Season

