

11 Wind Microclimate

11.1 Introduction

- 11.1.1 This chapter was prepared by BMT and assesses the likely significant effects of the Development on the local wind microclimate within and around the Site. In particular, it considers the potential effects of wind upon pedestrian comfort as well as the potential for occasional strong winds to be generated. The assessment is based upon the findings of wind tunnel assessments undertaken by BMT.
- 11.1.2 This chapter is supported by Appendix 13.1: Pentavia Retail Park London, UK – Wind Microclimate Study (March 2019).

Competence

- 11.1.3 The principal author for this chapter is Dr David Hankin (Meng ACGI PhD MRAeS) with 5 years of experience of development across the UK. The technical approver for this chapter is Dr Robin Stanfield (BEng MSc EngD) with 11 years' experience of development across the UK. Together they represent a combined experience on hundreds of schemes, many of which are of similar size to the Development, such as East Village Stratford, the Wembley Masterplan and the Strand East Masterplan (Sugar House Lane).

11.2 Legislation, Planning Policy and Guidance

Legislation Context

- 11.2.1 There is no national legislation directly relating to wind microclimate issues relevant to the Development.

Planning Policy Context

National

- 11.2.2 The following national planning policy is relevant to the Development:

- The National Planning Policy Framework (NPPF)¹ (updated February 2019)².

- 11.2.3 There are no national planning policies directly relating to wind microclimate issues. However, the benefits of a high-quality built environment are emphasised in the NPPF. An example of this is presented at 127. D:

“establish or maintain a strong sense of place, using the arrangement of streets, spaces, building types and materials to create attractive, welcoming and distinctive places to live, work and visit;”

Regional

- 11.2.4 The following regional planning policy is relevant to the Development:

- The London Plan (2016)³; and,
- Draft London Plan showing minor suggested changes (2018)⁴.

- 11.2.5 The London Plan places importance on the creation and maintenance of a high-quality environment for London. Policy 5.3 ‘Sustainable Design and Construction’ states:

“Major development proposals should meet the minimum standards outlined in the Mayor’s supplementary planning guidance... ensuring that developments are comfortable and secure for users, including avoiding the creation of adverse local climatic conditions”.

11.2.6 Policy 7.6B ‘Architecture’ states:

“...buildings and structures should:

- Be of the highest architectural quality;*
- Be of a proportion, composition, scale and orientation that enhances, activates and appropriately encloses the public realm;*
- Not cause unacceptable harm to the amenity of surrounding land and buildings, particularly residential buildings, in relation to privacy, overshadowing, wind and microclimate;*
- Incorporate best practice in resource management and climate change mitigation and adaptation;*
- Provide high quality indoor and outdoor spaces and integrate well with the surrounding streets and open spaces; and*
- Be adaptable to different activities and land uses, particularly at ground level.”*

11.2.7 In addition, Policy 7.7 ‘Location and Design of Tall and Large Buildings’ states that tall buildings:

- “Tall and large buildings should be part of a plan-led approach to changing or developing an area by the identification of appropriate, sensitive and inappropriate locations. Tall and large buildings should not have an unacceptably harmful impact on their surroundings;*
- Applications for tall or large buildings should include an urban design analysis that demonstrates the proposal is part of a strategy that will meet the criteria below. This is particularly important if the site is not identified as a location for tall or large buildings in the borough’s LDF;*
- Tall and Large Buildings should: ... b) only be considered in areas whose character would not be affected adversely by the scale, mass or bulk of a tall or large building; f) have ground floor activities that provide a positive relationship to the surrounding streets;*
- Tall buildings should not affect their surroundings adversely in terms of microclimate, wind turbulence...”*

11.2.8 The draft London Plan Policy D.1 ‘London’s form and characteristics’ states:

- “Development design should...achieve comfortable and inviting environments both inside and outside buildings;*
- Creating a comfortable pedestrian environment with regard to levels of sunlight, shade, wind, and shelter from precipitation is important.”*

11.2.9 Policy D.8 ‘Tall buildings’ states:

- “Wind, daylight, sunlight penetration and temperature conditions around the building(s) and neighbourhood must be carefully considered and not compromise comfort and the enjoyment of open spaces, including water spaces, around the building”.*
- The base of the tall building is its lower storeys. The function of the base should be to frame the public realm and streetscape, articulate entrances, and help create an attractive and*

lively public realm which provides a safe, inclusive, interesting, and comfortable pedestrian experience.”

11.2.10 Wind microclimate is therefore an important consideration in determining the acceptability of development proposals.

Local

11.2.11 The following local planning policy is relevant to the Development:

- Barnet’s Local Plan – Core Strategy⁵;
- Barnet’s Local Plan - Development Management Policies⁶;
- Sustainable Design and Construction Supplementary Planning Document⁷ (SPD) - Section 2.5 “Microclimate – Wind and Thermal Conditions”; and,
- LB Barnet Planning Brief for Pentavia Retail Park⁸ (the ‘Planning Brief’).

11.2.12 There are no policies directly relating to wind microclimate issues in the LB Barnet Local Plan⁹, the LB Barnet Residential Design Guidance¹⁰ or the Planning Brief.

Guidance

11.2.13 The following guidance is relevant to the Development:

- Planning Practice Guidance¹¹; and,
- Sustainable Design and Construction, Supplementary Planning Guidance (2014)¹² (‘Sustainable Design & Construction SPG’).

11.2.14 The Sustainable Design & Construction SPG discusses the assessment of wind microclimate within the urban environment under section 2.3.7: ‘Micro-climate’.

11.3 Assessment Methodology

Consultation

11.3.1 As set out in Chapter 2: EIA Methodology, a scoping note was submitted to the GLA (Appendix 2.6), which confirmed topics that would be assessed during the EIA process. The scope and approach for this assessment was informed by an earlier scoping study (Appendix 2.3), subsequent 2016 ES and 2017 ES Addendum. LB Barnet and the GLA did not raised any additional potential effects for consideration during the EIA process and therefore the proposed scope was considered to be acceptable for the Development.

Study Area and Scope

11.3.2 The assessment of environmental wind flows in the built environment lies outside the scope of internationally recognised wind codes, which focus on wind loading issues. In addition, there are no handbooks or engineering methods from which reliable assessments of the complex environmental wind flows that shape the pedestrian level wind conditions can be derived and numerical/computational methods such as computational fluid dynamics do not readily apply to turbulent wind flows in the built environment.

11.3.3 A purposely-designed boundary layer wind tunnel study is the most well-established and robust means of assessing the pedestrian wind microclimate. It enables the wind conditions at the Site to be quantified and classified in accordance with the widely accepted Lawson Criteria for comfort and safety. The wind tunnel test results deliver a detailed assessment of the mean and gust wind

conditions around the existing Site and the Development for all wind directions in terms of pedestrian comfort and safety at ground level, rooftop terraces and balconies.

11.3.4 The model of the Development was constructed based on drawing information supplied by the project architects. A 1:300 scale model of the existing and future buildings at and surrounding the Site within a 450m radius of the centre of the Site was constructed (shown in Figure 11.1). The plan view of the Development is shown in Figure 11.2.

11.3.5 A model scale of 1:300 was adopted. At this scale the model is large enough to allow a good representation of the details that are likely to affect the local and overall wind flows at full scale. In addition, this scale enables a good simulation of the turbulence properties of the wind to be achieved.

Figure 11.1: Scale model of Development + Cumulative Schemes in the wind tunnel, viewed from south-east

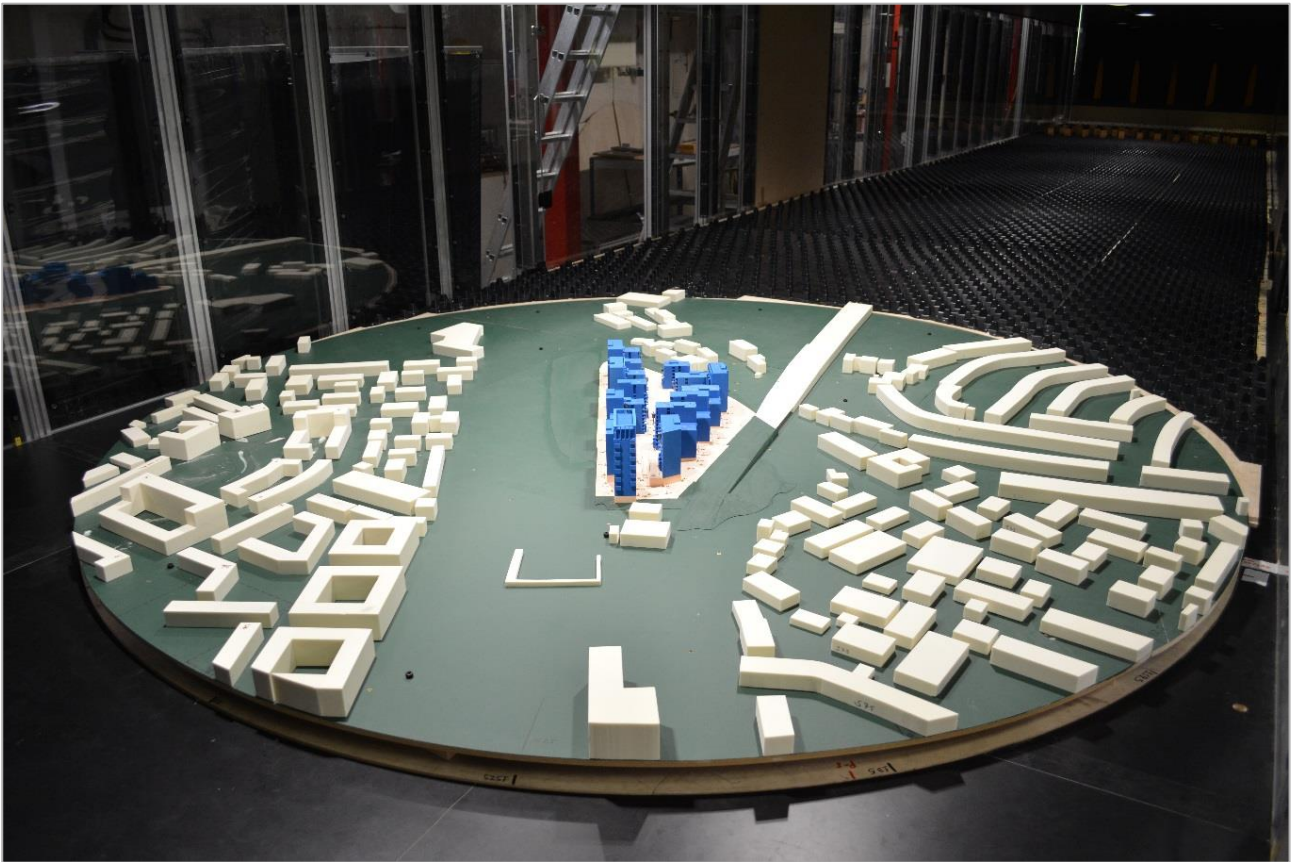
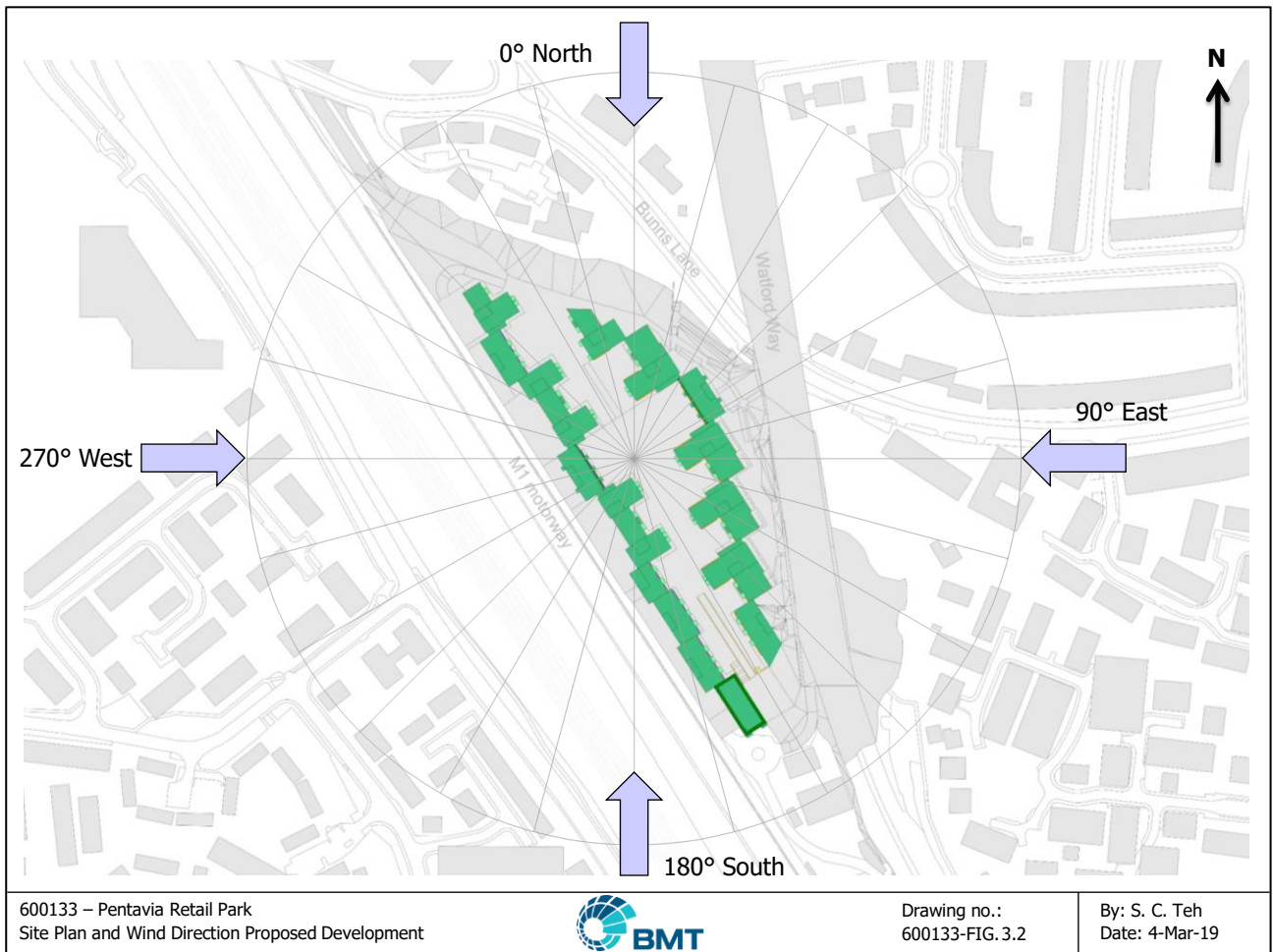


Figure 11.2: Plan view of the Development



Identifying Likely Significant Effects

Construction Establishing Baseline Conditions

11.3.6 Wind tunnel testing was undertaken to assess the pedestrian wind microclimate with the Development in place. This method is a well-established and robust means of assessing pedestrian wind microclimate effects. It enables the wind conditions at the Site to be quantified and classified in accordance with the widely-accepted Lawson Comfort Criteria (LCC).

11.3.7 The methodology for quantifying the pedestrian level wind environment of the existing Site and the Development is outlined below:

- Step 1: Measure the building-induced wind speeds at pedestrian level in the wind tunnel;
- Step 2: Adjust standard meteorological data to account for conditions at the Site;
- Step 3: Combine these to obtain the expected frequency and magnitude of wind speeds at pedestrian level; and
- Step 4: Compare the results with the Lawson Criteria to 'grade' conditions around the Site by reference to the planned/desired pedestrian activities.

Simulation of Atmospheric Winds

11.3.8 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 geographical location), a

series of posts, barrier and floor roughness elements were employed in the wind tunnel to create a boundary layer that is representative of urban or open country conditions, as is appropriate.

Meteorological Data

- 11.3.9 Wind microclimate studies require that wind speed data obtained from a measurement station be transposed to the site of interest. The wind speed history, provided by weather centres such as London Heathrow, was 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.
- 11.3.10 A mathematical model (the Weibull cumulative distribution) was used to determine the probability that, for a given wind direction, a particular wind speed will be exceeded.
- 11.3.11 The resulting weather centre wind data was transposed to open country terrain at sea-level, accounting for upwind terrain, topography and altitude for the weather centre, before being transposed to reference height of the Development, accounting for upwind terrain, topography and altitude for the Site. The resulting annual and seasonal directional and wind speed probability distributions at the Site, at a reference height of 36m above ground are given under 'Baseline Conditions' (Figure 11.3 and Figure 11.4), respectively.

Measurement Technique and Data Analysis

- 11.3.12 Wind speed measurements at assessment locations were made using 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 109 locations located at the ground level and 48 locations located at elevated levels, at a height corresponding to 1.5m above ground level at full scale. The main locations such as pedestrian access routes, entrances, recreational spaces including terraces and balconies were captured.
- 11.3.13 Measurements were taken for a full range of wind directions in increments of 22.5° (0° coinciding with OS grid north) (Figure 11.2). Recordings were taken for a sufficient length of time to determine the mean and gust wind speeds.
- 11.3.14 For each location, measured wind speeds were combined with long-term wind frequency statistics to assess the wind environment for exceedances of wind speed thresholds for safety and comfort for intended activities. Wind frequency statistics, covering a period of 10 years, were obtained from the London Heathrow weather centre and transposed, accounting for variations in terrain between the Site and the weather centre, to apply directly to the Site.

Cumulative effects

- 11.3.15 The cumulative assessment was based on the cumulative scheme list as defined within Chapter 2: EIA Methodology and Appendix 2.8. Proposed building structures of cumulative developments outside of the 450m radius were not modelled but were taken account of in the terrain analysis.
- 11.3.16 The Barnet Southgate College development (Ref: H/03551/14) was modelled as part of the 'existing surrounding conditions' (i.e. existing baseline). The Barnet Southgate College development will be fully complete and occupied prior to the Development being completed. Phase 1A and 2A of the Barnet Southgate College development is currently operational and the remaining phases are under construction. In addition, there was significant information available for the Barnet Southgate College development to allow detailed modelling to be undertaken. Therefore, effects associated with this development are inherent within both Completed Development and Cumulative Assessment Scenario assessment of effects.

Determining Effect Significance

11.3.17 In the wind tunnel assessment, the following configurations were assessed:

- Configuration 1: Existing Site with Existing Surrounding Buildings (the 'Baseline Scenario');
- Configuration 2: Development + Baseline Scenario (the 'Completed Development Scenario');
- Configuration 3: Development + Baseline Scenario + Proposed Soft Landscaping; and,
- Configuration 4: Development + Baseline Scenario + Cumulative Schemes (the 'Cumulative Assessment' Scenario).

Safety Criteria

11.3.18 At each area investigated, the suitability of the pedestrian level wind environment was assessed for receptor safety based on the Lawson criteria¹³. Safety is determined for the 'able-bodied' and for the 'general public'. For the general public a wind speed of 15 metres-per-second occurring once per year is rated as unsafe, with the potential to de-stabilise the less able members of the public including the elderly, cyclists and children. Able-bodied users are more likely to be capable of defending themselves against extreme pedestrian level winds and thus experience distress at a higher threshold wind speed of 20 metres-per-second, once per year.

11.3.19 Details of the safety criteria are presented in Table 11.1 and are based on the exceedance of the threshold wind speeds, based on the mean hourly value and on the gust equivalent mean value, occurring once per annum.

Table 11.1: The Lawson Safety Criteria

Threshold mean-hourly wind speed exceeded once per annum	Safety rating		Qualifying comments
> 15 m/s	S1	Unsuitable for general public	Less able and cyclists find conditions physically difficult.
> 20 m/s	S2	Unsuitable for able-bodied	Able-bodied persons find conditions difficult. Physically impossible to remain standing during gusts.

Comfort Criteria

11.3.20 The assessment of wind conditions requires a 'standard' against which to benchmark the microclimate. The Lawson Comfort Criteria (LCC) has been established for around thirty years and is widely used on building developments across the UK.

11.3.21 Lawson devised a scale for assessing the suitability of wind conditions in the built environment. The LCC defines a range of pedestrian activities from sitting through to more transient activities such as crossing the road. For each activity a threshold wind speed and frequency of occurrence is defined. If the wind conditions exceed the threshold then the conditions are unacceptable for the stated activity. If the wind conditions are below the threshold then they are described as tolerable (or suitable) for the stated activity. The wind speeds and activities are described in Table 11.2.

11.3.22 The criteria reflect the fact that sedentary activity, such as sitting, requires a low wind speed for a reasonable level of comfort, whereas for more transient activity, such as walking, would tolerate stronger winds.

Table 11.2: The Lawson Comfort Criteria

Threshold mean-hourly wind speed exceeded < 5% of the time	Threshold mean-hourly wind speed exceeded < 5% of the time		Threshold mean-hourly wind speed exceeded < 5% of the time
4 m/s	C4	Long-term sitting	Reading a newspaper and eating and drinking.
6 m/s	C3	Short periods of standing / sitting	Appropriate for bus stops, window shopping and building entrances.
8 m/s	C2	Strolling	General areas of walking and sightseeing.
10 m/s	C1	Pedestrian transit (A-B)	Local areas around tall buildings where people are not likely to linger.
>10 m/s	C0	Uncomfortable for all users	Uncomfortable for all pedestrian activities.

11.3.23 The assessment takes full account of seasonal variations in wind conditions and pedestrian activities. For example, conditions for recreational activities focus on summer, but also consider spring and autumn, whilst conditions for pedestrian thoroughfare, access or waiting (e.g. bus stops) consider all seasons, with winter usually being the critical season. The pedestrian level wind environment assessment is summarised in terms of suitability for various activities.

11.3.24 The activities considered and their relation to the LCC are summarised in Table 11.3.

Table 11.3: Suitability Assessment

Suitability	Lawson Comfort Criteria
For long periods of sitting such as for an outdoor café.	'Long-term sitting' in summer.
For pedestrian ingress/egress at a building entrance, or short periods of sitting or standing such as at a bus stop, taxi rank, meeting point, etc.	'Standing or short-term sitting' in all seasons.
For leisure uses excluding long periods of outdoor sitting such as a park, children's play area, etc.	'Standing or short-term sitting' from spring to autumn.
For access to and passage through the development and surrounding area.	'Pedestrian Transit' / 'Walking or strolling' in all seasons.

Sensitivity of Receptor

11.3.25 The criteria used in the assessment of effects was based on the relationship between the desired activity (as defined by the LCC) and the measured wind conditions at a particular receptor location with the Development in place. This allows for the assessment to take into account any changes in receptor activity that might result from the Development.

11.3.26 The sensitivity for all receptors was defined as high. The sensitivity of receptors is related to the intended activity at each location; there is no separate definition 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.

Magnitude of Impact

11.3.27 The assessment criteria for the LCC (Table 11.2) comprise an increasing scale to reflect increasing wind speeds. The minor, moderate and major impact magnitude categories indicate the severity of the difference between the desired microclimate and the expected wind conditions in the presence of the Development.

Assessing Significance

11.3.28 The significance of the wind microclimate effects of the Development is based on the suitability of wind conditions at each receptor location against either the current or planned receptor activities (as appropriate) using the LCC. As such, the locations and activities beyond the Site boundary (i.e. pedestrian footpaths) that would remain unchanged post development would be assessed against current activities; and where the introduction of the Development would alter the existing activities and built form, the associated locations would be assessed against planned / desired activity.

11.3.29 In summary, the following criteria were used to assess likely wind conditions as a result of the Development:

- Major Beneficial: Any effect on wind conditions which potentially improves receptor safety (such as an improvement in conditions from being considered unsafe to being considered safe).
- Moderate Beneficial: Any effect on wind conditions that improves receptor comfort from unsuitable to suitable for planned activities.
- Minor Beneficial: Any effect on wind conditions which improves receptor comfort from unsuitable to marginal/tolerable for planned activities, or from marginal/tolerable to suitable for planned activities.
- Negligible: Any effect that does not alter the suitability of existing wind conditions with respect to planned activities.
- Minor Adverse: Any effect on wind conditions which worsens receptor comfort from suitable to marginal/tolerable for planned activities, or from marginal/tolerable to unsuitable for planned activities.
- Moderate Adverse: Any effect on wind conditions that worsens receptor comfort from suitable to unsuitable for planned activities.
- Major Adverse: Any effect adversely affecting receptor safety.

Evidence Assumptions and Limitations

11.3.30 The conditions for the Site during construction were not assessed by the wind tunnel tests. Instead, professional judgement was used to assess conditions during construction.

11.3.31 The wind tunnel ground model was largely built as flat except for the significant topography around the Development. Therefore, the shelter afforded by adjacent road embankments and the proposed acoustic barrier/green walls was not assessed by the wind tunnel tests. Instead, professional judgement was used to assess the wind effects of these elements, where appropriate.

11.3.32 The wind tunnel model included the proposed soft landscaping (Configuration 3) with trees represented in winter (i.e. in a bare format) and of a deciduous variety to obtain conservative results.

It was assumed that trees planted as part of the Development will be a robust species that offers a worthwhile degree of alleviation of accelerated winds, i.e. the trees retain a substantial level of solidity during winter (lots of twigs and branches).

11.4 Baseline Conditions

Wind Direction and Speed

11.4.1 Annual and seasonal directional and wind speed probability distributions at the Site, at a reference height of 36m above ground are shown in Figure 11.3 and Figure 11.4, respectively. These figures illustrate the most frequent winds and the strongest winds at the Site blow from South-West (225° E of N). These winds are the most common cause of problematic wind comfort conditions due to strong ground level wind acceleration around buildings.

11.4.2 North-easterly winds are common during spring. South-easterly winds are generally light, rarely occurring and usually do not cause adverse impacts on pedestrian level.

Figure 11.3: Annual and Seasonal Wind Directional Probability Distribution at Site

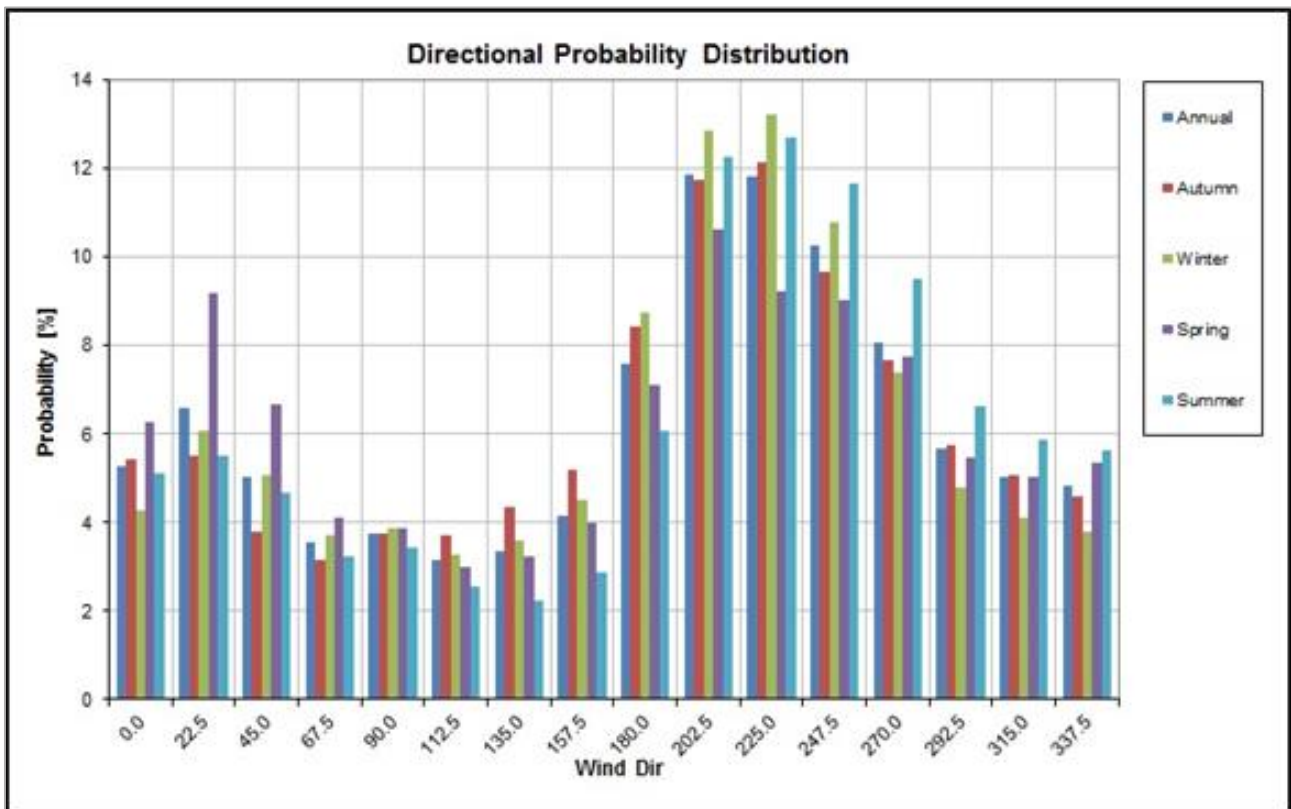
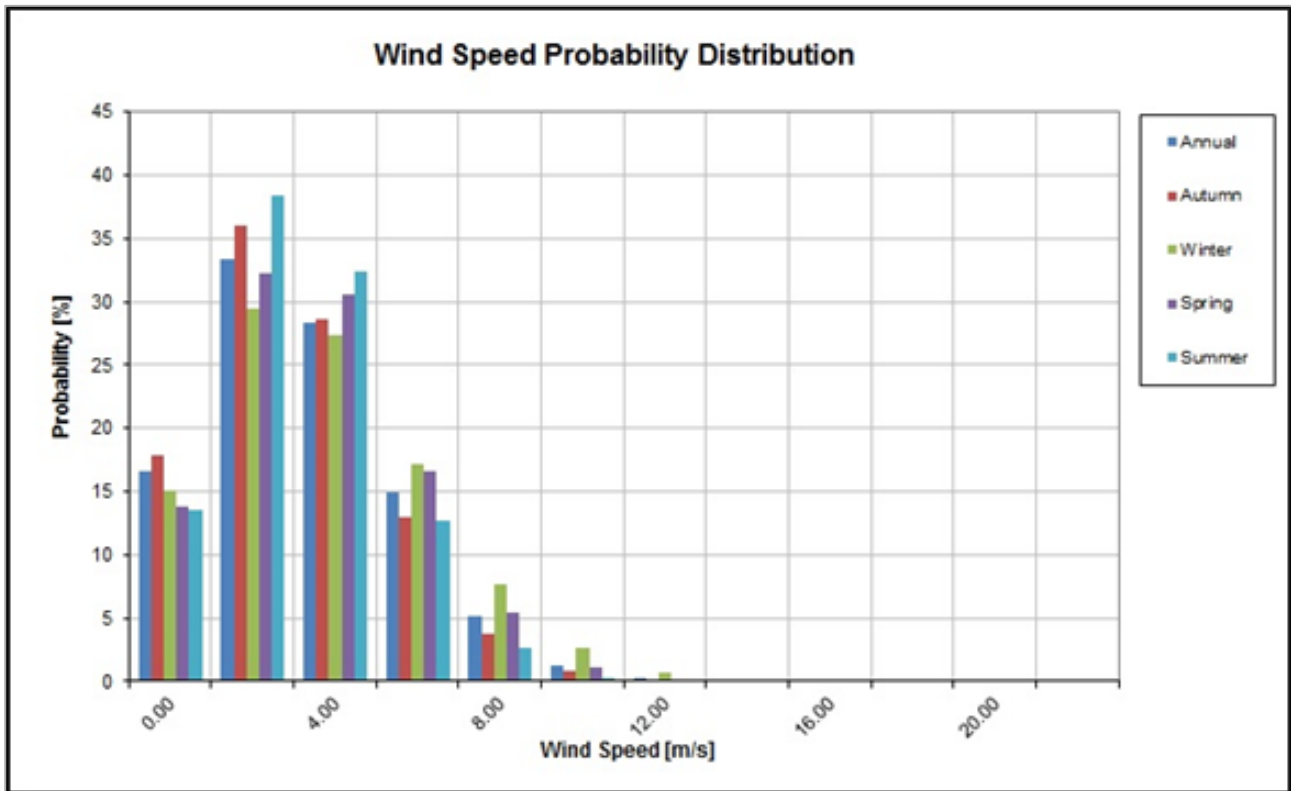


Figure 11.4: Annual and Seasonal Wind Speed Probability Distribution at Site



11.4.3 The results of the Baseline Scenario wind tunnel test (i.e. without the Development) are presented in graphical format in Figure 11.5 and discussed below.

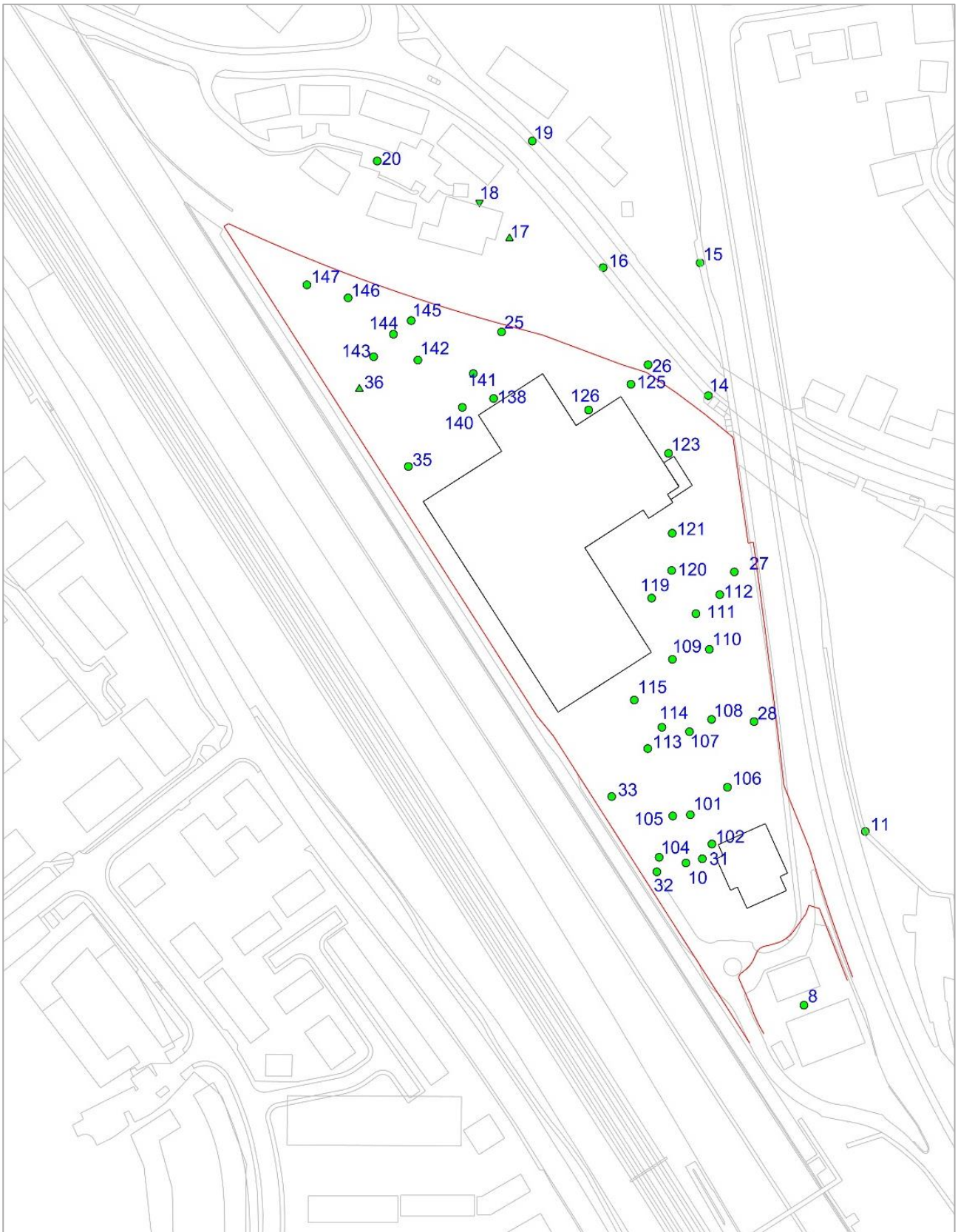
Safety

11.4.4 Within the context of existing Site, wind conditions at all of the assessed locations are rated as suitable, in terms of safety, for use by the general public.

Comfort

11.4.5 Within the context of existing Site, wind conditions for thoroughfares, entrances, recreational spaces and surrounding areas are rated as suitable, in terms of pedestrian comfort, for intended use throughout the year.

Figure 11.5: Baseline Wind Conditions (Without Development)



<p>Suitability</p> <ul style="list-style-type: none"> ● Suitable for Intended Use ● Unsuitable for Intended Use - Further Mitigation Required 	<p>Intended Use</p> <ul style="list-style-type: none"> ● Thoroughfare (A-B) Leisure Thoroughfare ▲ Recreational Space ▼ Entrance / Shop Front / Waiting Area ◆ Outdoor Seating 	<p>North [0°] West [270°] East [90°] Prevailing Sector South [180°]</p>	
<p>600133 Pentavia Retail Park - Existing Site - Ground Summary</p>		<p>Drawing No: 600133/WE/8</p>	<p>Prep: M. Syafrin Date: 27 Feb 2019</p>



Future Baseline

- 11.4.6 Effects of the future baseline were not directly assessed by a wind tunnel test. However, as previously outlined, the Barnet Southgate College development was included as part of the Baseline Scenario wind tunnel test (Configuration 1). Therefore, in the event that the Development and the Grahame Park Estate (Ref: W/01731JS/04) are not built out, the future baseline in the absence of these developments would be as presented above for Configuration 1.
- 11.4.7 Professional judgement was used to determine the effects on the local wind microclimate in the event that the Grahame Park Estate is built out and the Development is not. The commentary provided on this future baseline scenario was informed by the Baseline Scenario wind tunnel test (Configuration 1) and the wind tunnel test of the Cumulative Assessment scenario (Configuration 3). The Grahame Park Estate is located to the west and south west of the Site. The majority of the Grahame Park Estate development site falls outside of the spatial scope of the assessment (i.e. 450m). Those buildings that fall within the spatial scope of the Site are low to mid-rise buildings and are not anticipated to contribute to the wind environment at the Site. Therefore, in the event that the Development is not built out, wind conditions at the Site would be expected to be as presented above for Configuration 1.

Summary of Receptors and Sensitivity

- 11.4.8 Receptors in the baseline and completed Development scenarios were identified and located at thoroughfares, entrances, roof amenity spaces, and balconies, as necessary, for the wind tunnel test.
- 11.4.9 The sensitivity of receptors is related to the intended pedestrian usage at each location. The sensitivity for all receptors were defined as high.

11.5 Scheme Design and Management

Construction

- 11.5.1 The wind tunnel test was not undertaken with hoarding in place. No specific inherent design measures were considered necessary to mitigate wind effects during demolition or construction.

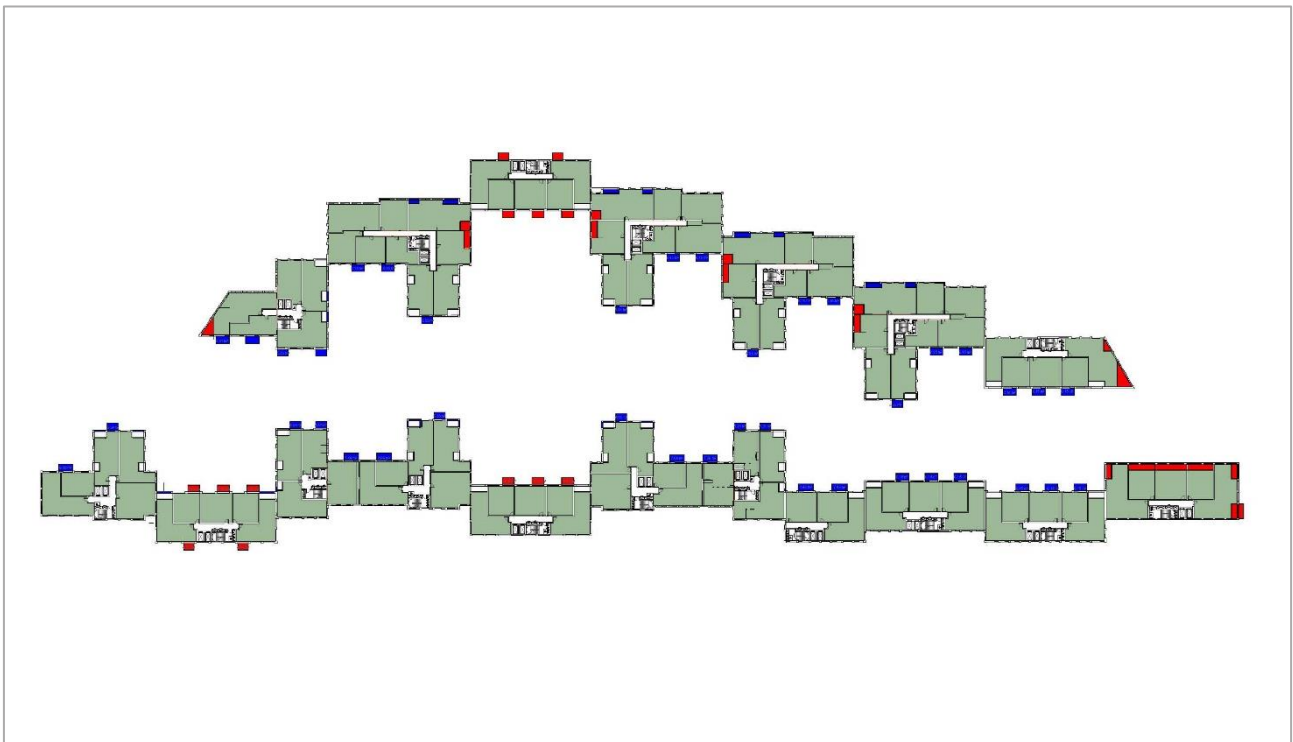
Operational Development

- 11.5.2 The design of the Development considered the likely wind environment for pedestrians. The Development includes a comprehensive landscape strategy which would act as inherent mitigation and provide shelter for pedestrians. As discussed in Section 11.3.18, the wind tunnel model for the Development was tested with the proposed landscaping (i.e. Configuration 3), which is presented in graphical format in Figure 11.6. See Section 11.7 for further details.
- 11.5.3 Additionally, the Development provides winter gardens, the locations of which are shown in Figure 11.7. Winter gardens will shelter private amenity areas within from any oncoming wind and will mitigate any adverse wind effects, as a result the significant of any effects on these balconies from wind would be negligible.

Figure 11.6: Soft Landscaping Proposal



Figure 11.7: Winter Garden and Balcony Location Plan. Balconies are shown in blue and winter gardens in red



11.6 Demolition and Construction

Assessment of Effects

- 11.6.1 During the construction works, demolition would occur and there would be potential for wind to blow into and across any open areas of the Site. Pedestrian activities within the Site and the immediate surrounds will also be different during construction and will include restrictions on pedestrian movements in some areas for safety reasons. Pedestrian perception of conditions both within the Site and in the surrounding area is also likely to be affected by expectations of conditions around a building site, with pedestrians more likely to tolerate adverse conditions as they can appreciate it as a temporary situation. On this basis there are not expected to be any potential significant effects resulting from construction works. This represents a negligible effect.
- 11.6.2 As construction of the Development progresses, the wind environment would gradually adjust to those of the completed Development described below.

Mitigation and Residual Effects

- 11.6.3 No mitigation is required and the residual effect would be Negligible, as stated above.

11.7 Completed Development

Assessment of Effects

Configuration 2: Development + Baseline Scenario

- 11.7.1 Full details of the suitability assessment for the Development in the context of the existing surrounds are presented in graphical format in Figures 11.8 to 11.11. Full results are also presented in Appendix 11.1.

Safety

- 11.7.2 Within the introduction of the Development in the context of existing surrounds, wind conditions at all locations are rated as suitable, in terms of safety, for use by the general public. This represents a negligible effect.

Comfort – Thoroughfares

- 11.7.3 With the introduction of the Development, wind conditions at all thoroughfare locations are rated as suitable, in terms of pedestrian comfort, for intended use. This represents a negligible effect.

Comfort – Entrances/Waiting Areas

- 11.7.4 Wind conditions at entrances in and around the Development are rated as suitable, in terms of pedestrian comfort, for intended use. This represents a negligible effect.

- 11.7.5 Wind conditions at waiting areas, i.e. bus stops, around the Development are rated as suitable, in terms of pedestrian comfort, for intended use. This represents a negligible effect.

Comfort – Recreational Spaces

- 11.7.6 Wind conditions at recreational and amenity spaces within the Development are rated as suitable, in terms of pedestrian comfort, for intended use. This represents a negligible effect.

Comfort –Balconies

- 11.7.7 Wind conditions at the balconies of the Development are rated as suitable, in terms of pedestrian comfort, for seating. This represents a negligible effect.

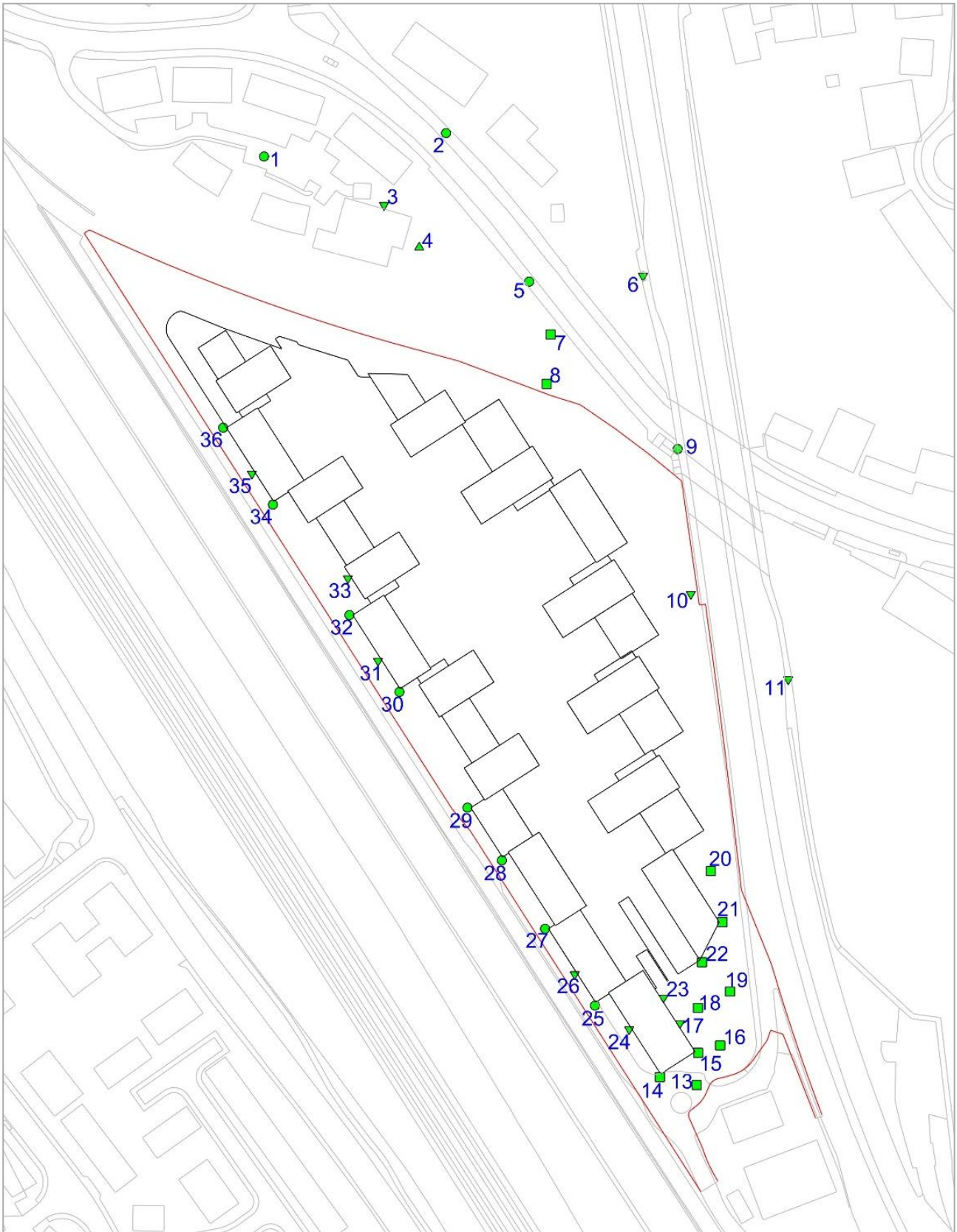
Comfort – Rooftop Terraces


- 11.7.8 Wind conditions at rooftop terraces of the Development are rated as suitable, in terms of pedestrian comfort, for general recreational uses, such as a viewing platform. This represents a negligible effect.

Summary

- 11.7.9 The assessed locations are considered suitable, both in terms of comfort and safety, for the intended use by the general public and future residential users.

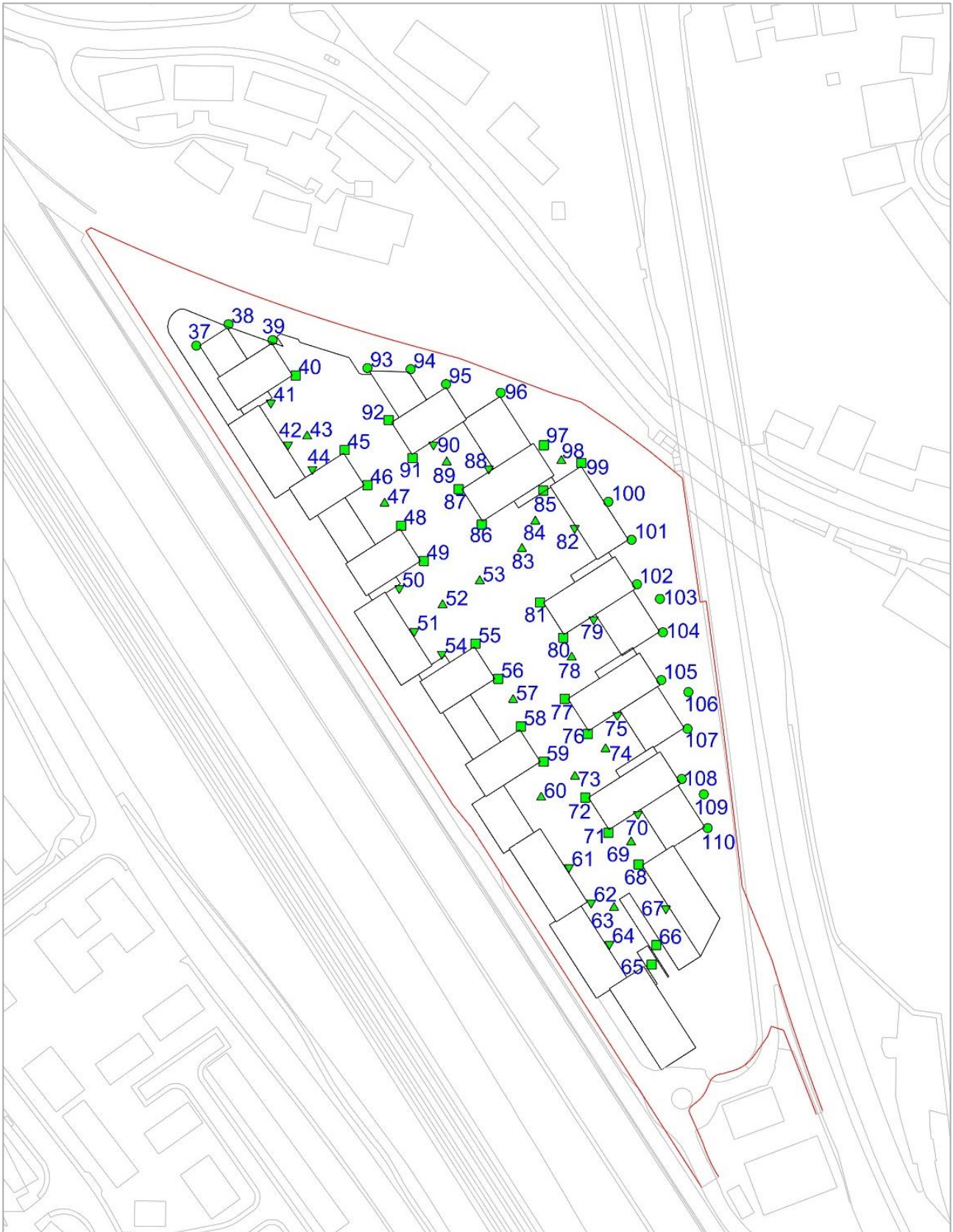
Figure 11.8: Wind Microclimate Development + Existing Surrounds – Lower Ground Level



<p>Suitability</p> <ul style="list-style-type: none"> ● Suitable for Intended Use ● Unsuitable for Intended Use - Further Mitigation Required 	<p>Intended Use</p> <ul style="list-style-type: none"> ● Thoroughfare (A-B) ■ Leisure Thoroughfare ▲ Recreational Space ▼ Entrance / Shop Front / Waiting Area ◆ Outdoor Seating 	<p>North [0°] West [270°] East [90°] Prevailing Sector South [180°]</p> 
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<p>600133 Pentavia Retail Park - Proposed in Existing - Lower Ground Summary</p>	<p>Drawing No: 600133/WE/8</p>	<p>Prep: M. Syafrain Date: 27 Feb 2019</p>
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Figure 11.9: Wind Microclimate Development + Existing Surrounds – Upper Ground Level



- | | |
|--|--|
| Suitability | Intended Use |
| ● Suitable for Intended Use | ● Thoroughfare (A-B) |
| ● Unsuitable for Intended Use
- Further Mitigation Required | ■ Leisure Thoroughfare |
| | ▲ Recreational Space |
| | ▼ Entrance / Shop Front / Waiting Area |
| | ◆ Outdoor Seating |

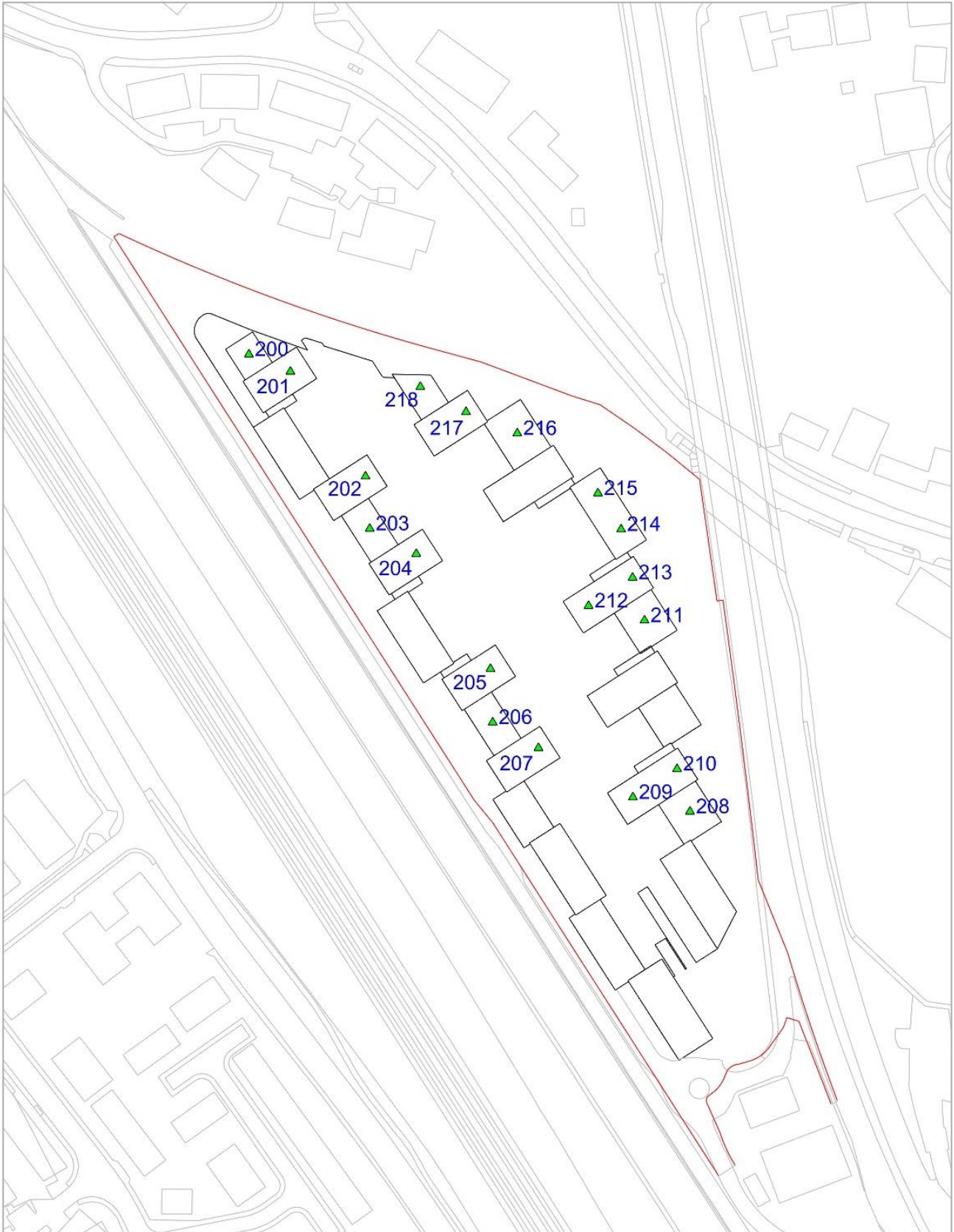


600133 Pentavia Retail Park - Proposed in Existing - Upper Ground Summary

Drawing No:
600133/WE/8

Prep: M. Syafrein
Date: 27 Feb 2019

Figure 11.10: Wind Microclimate Development + Existing Surrounds – Terraces




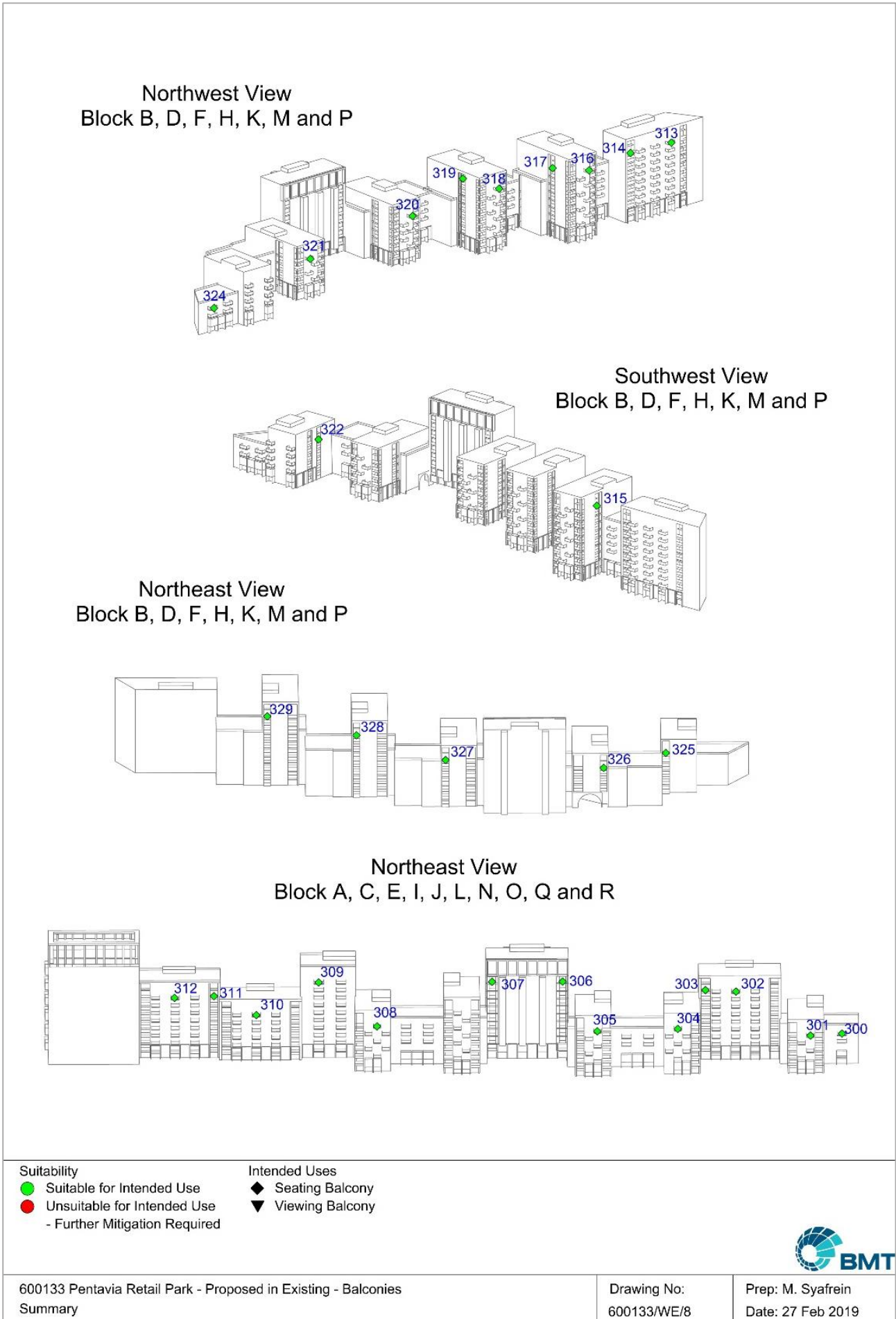
<p>Suitability</p> <ul style="list-style-type: none"> ● Suitable for Intended Use ● Unsuitable for Intended Use - Further Mitigation Required 	<p>Intended Use</p> <ul style="list-style-type: none"> ● Thoroughfare (A-B) ■ Leisure Thoroughfare ▲ Recreational Space ▼ Entrance / Shop Front / Waiting Area ◆ Outdoor Seating 	<p>North [0°] West [270°] East [90°] Prevailing Sector South [180°]</p> 
<p>600133 Pentavia Retail Park - Proposed in Existing - Terraces Summary</p>	<p>Drawing No: 600133/WE/8</p>	<p>Prep: M. Syafrein Date: 27 Feb 2019</p>

Figure 11.11: Wind Microclimate Development + Existing Surrounds – Balconies



Mitigation and Residual Effects

Mitigation Measures

- 11.7.10 The assessment presented below was undertaken for Configuration 3: Development + Baseline Scenario + Proposed Soft Landscaping.
- 11.7.11 As outlined within the ‘Scheme Design and Management’ section of this chapter, the Development includes a comprehensive landscape strategy which will act as inherent mitigation and provide shelter for pedestrians (Figure 11.6). Full details of the suitability assessment for the Development in the context of the existing surrounds with current soft landscaping proposals are presented in graphical format in Figures 11.12 to 11.15. Full results are also presented in Appendix 11.1.
- 11.7.12 In addition to the comprehensive landscape strategy, where outdoor seating is required within the rooftop terraces provided by the Development a number of mitigation options were tested to demonstrate that suitable shelter can be provided that meets the more stringent long-term sitting criteria in summer. The following mitigation options were tested and all options provide suitable shelter in the event that outdoor sitting is required on the rooftop terraces:
- 1.8m high 50% porous parapets around the perimeter of the roof;
 - 1.8m high solid parapets around the perimeter of the roof; and,
 - 1.0m high, 1m wide hedging around the perimeter of the roof.
- 11.7.13 The results of the rooftop terrace mitigation options are presented within Appendix D of Appendix 11.1 for the Development in existing surrounds with soft landscaping, and include the 50% porous parapets around the perimeter of the rooftop terraces. However, the results are similar for any of the options presented above and critically are suitable for long term sitting in summer at all rooftop terraces.

Residual Effects

Safety

- 11.7.14 Within the introduction of the proposed soft landscaping, wind conditions at all locations are rated as suitable, in terms of safety, for use by the general public. This represents a negligible residual effect.

Comfort – Thoroughfares

- 11.7.15 With the introduction of the proposed soft landscaping, wind conditions at all thoroughfare locations are rated as suitable, in terms of pedestrian comfort, for intended use. This represents a negligible residual effect.

Comfort – Entrances/Waiting Area

- 11.7.16 With the introduction of the proposed soft landscaping, wind conditions at all entrances are rated as suitable, in terms of pedestrian comfort, for intended use. This represents a negligible residual effect.
- 11.7.17 Wind conditions at waiting areas, i.e. bus stops, around the Development are rated as suitable, in terms of pedestrian comfort, for intended use. This represents a negligible residual effect.

Comfort – Recreational Spaces

- 11.7.18 Wind conditions at recreational and amenity spaces within the Development are rated as suitable, in terms of pedestrian comfort, for intended use. This represents a negligible residual effect.

Comfort –Balconies

11.7.19 Wind conditions at the balconies of the Development are rated as suitable, in terms of pedestrian comfort, for seating. This represents a negligible residual effect.

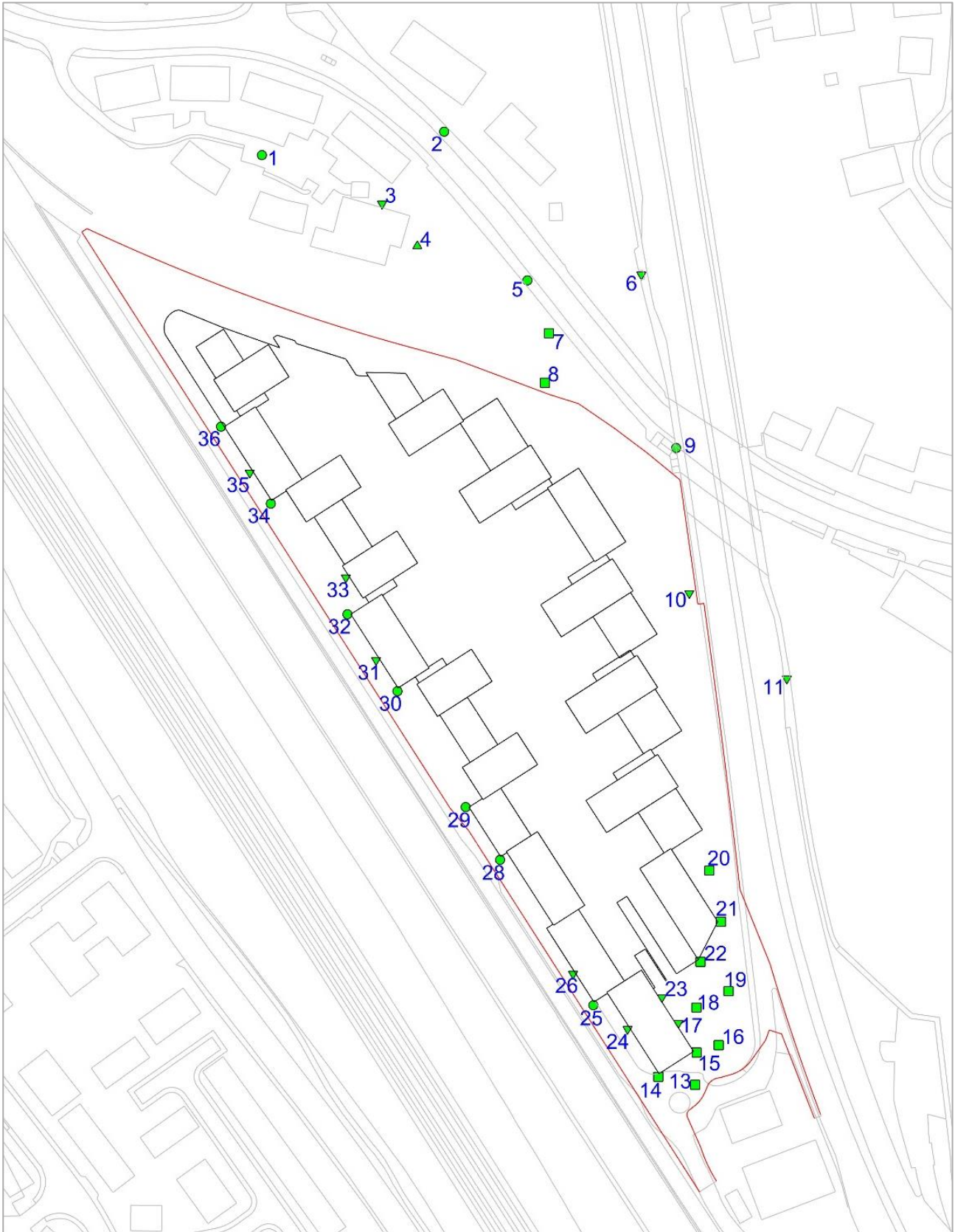
Comfort – Rooftop Terraces


11.7.20 With the introduction of the proposed mitigation options, wind conditions at rooftop terraces of the Development are rated as suitable, in terms of pedestrian comfort, for general recreational uses, such as a viewing platform and outdoor sitting. This represents a negligible residual effect.

Summary

11.7.21 With the introduction of the proposed soft landscaping and rooftop terrace mitigation options, wind conditions are suitable, both in term of pedestrian safety and comfort, within the Development and in the wider surrounding area.

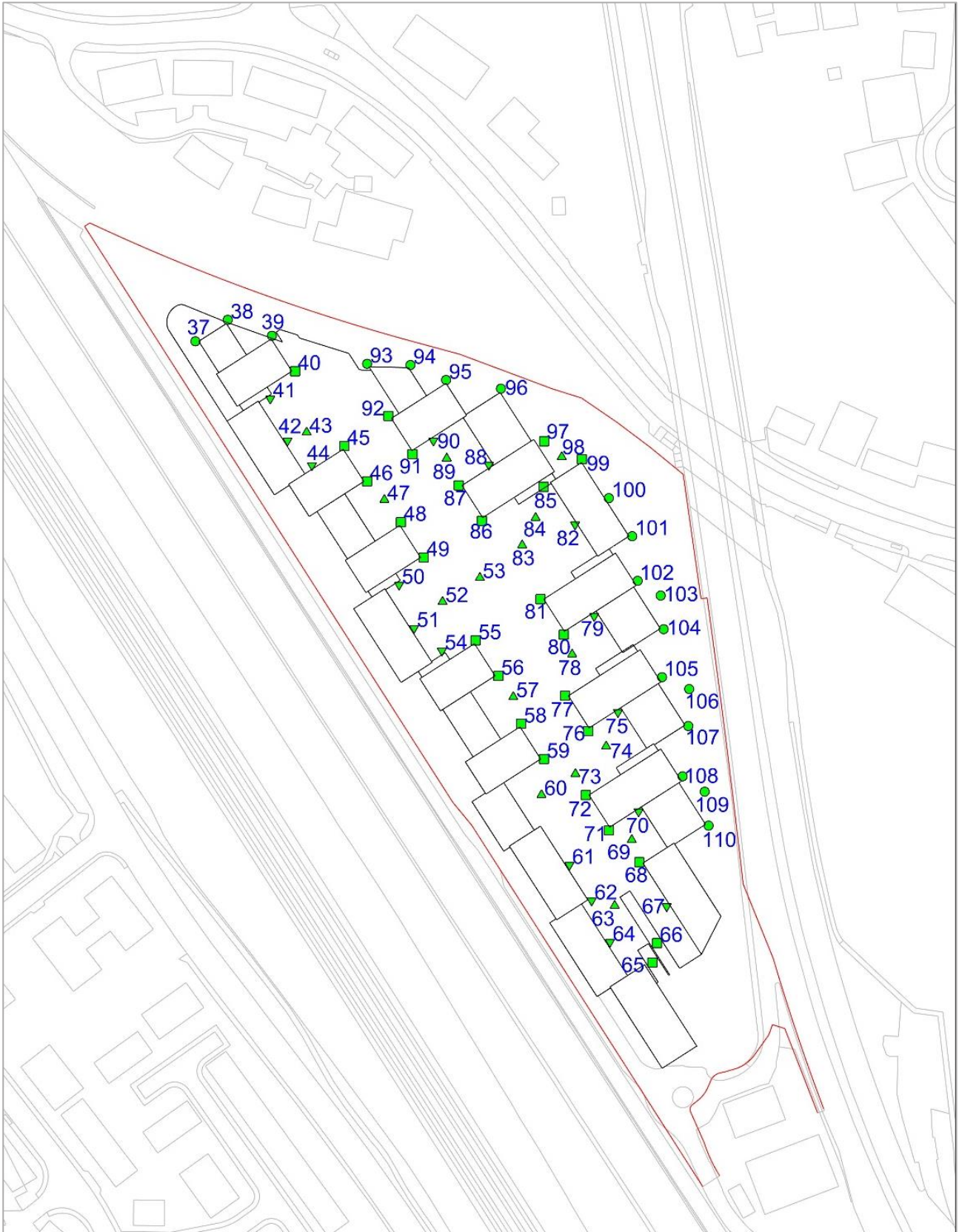
Figure 11.12: Wind Microclimate Development + Existing Surrounds with Soft Landscaping – Lower Ground Level




<p>Suitability</p> <ul style="list-style-type: none"> ● Suitable for Intended Use ● Unsuitable for Intended Use - Further Mitigation Required 	<p>Intended Use</p> <ul style="list-style-type: none"> ● Thoroughfare (A-B) ■ Leisure Thoroughfare ▲ Recreational Space ▼ Entrance / Shop Front / Waiting Area ◆ Outdoor Seating 	<p>North [0°] West [270°] East [90°] Prevaling Sector South [180°]</p> 
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600133 Pentavia Retail Park - Proposed in Existing with Soft Landscaping - Lower Ground Summary	Drawing No: 600133/WE/8	Prep: M. Syafrin Date: 27 Feb 2019
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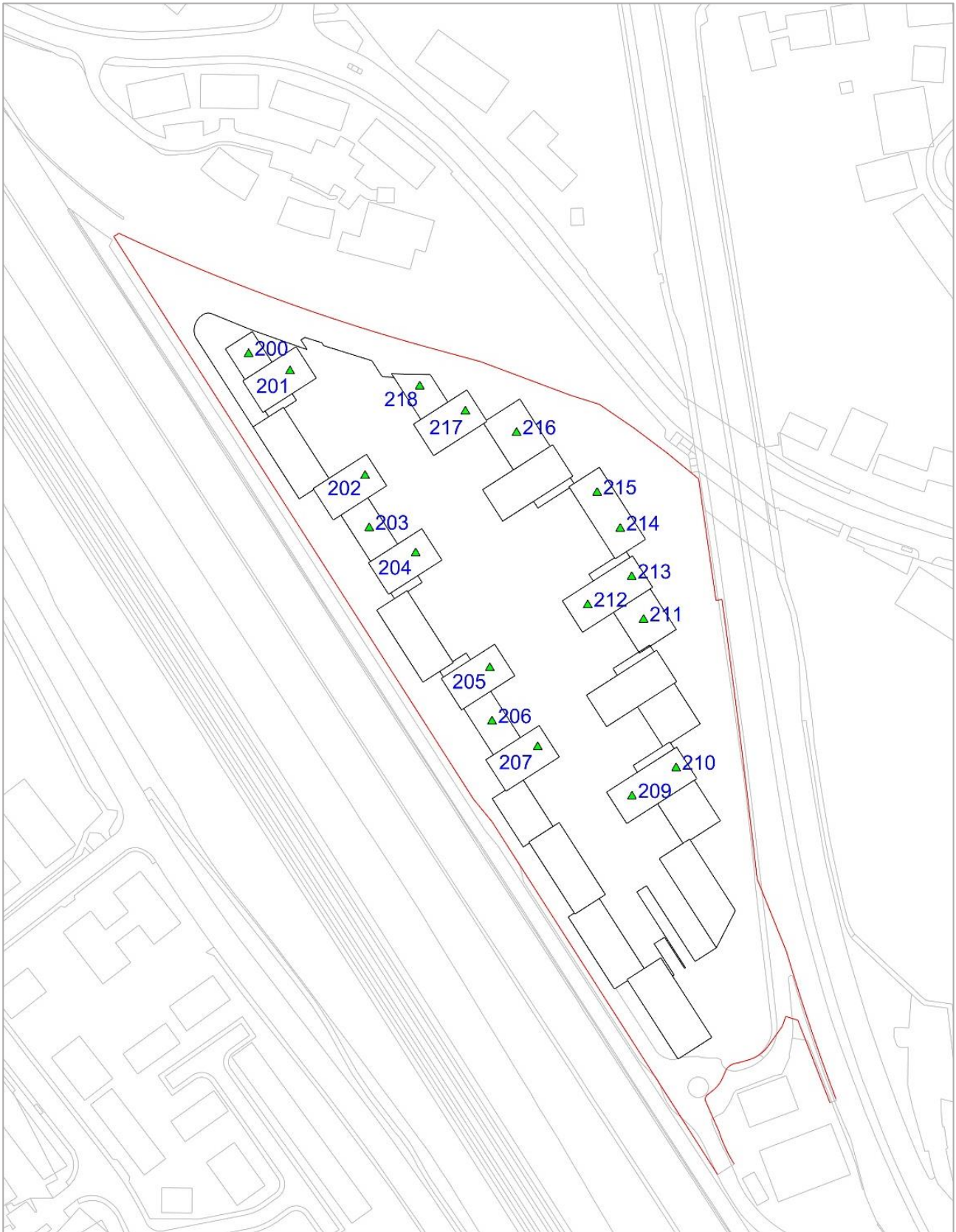
Figure 11.13: Wind Microclimate Development + Existing Surrounds with Soft Landscaping – Upper Ground Level




<p>Suitability</p> <ul style="list-style-type: none"> ● Suitable for Intended Use ● Unsuitable for Intended Use - Further Mitigation Required 	<p>Intended Use</p> <ul style="list-style-type: none"> ● Thoroughfare (A-B) ■ Leisure Thoroughfare ▲ Recreational Space ▼ Entrance / Shop Front / Waiting Area ◆ Outdoor Seating 	<p>North [0°]</p> <p>West [270°] East [90°]</p> <p>Prevailing Sector</p> <p>South [180°]</p> 
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600133 Pentavia Retail Park - Proposed in Existing with Soft Landscaping - Upper Ground Summary	Drawing No: 600133/WE/8	Prep: M. Syafrain Date: 27 Feb 2019
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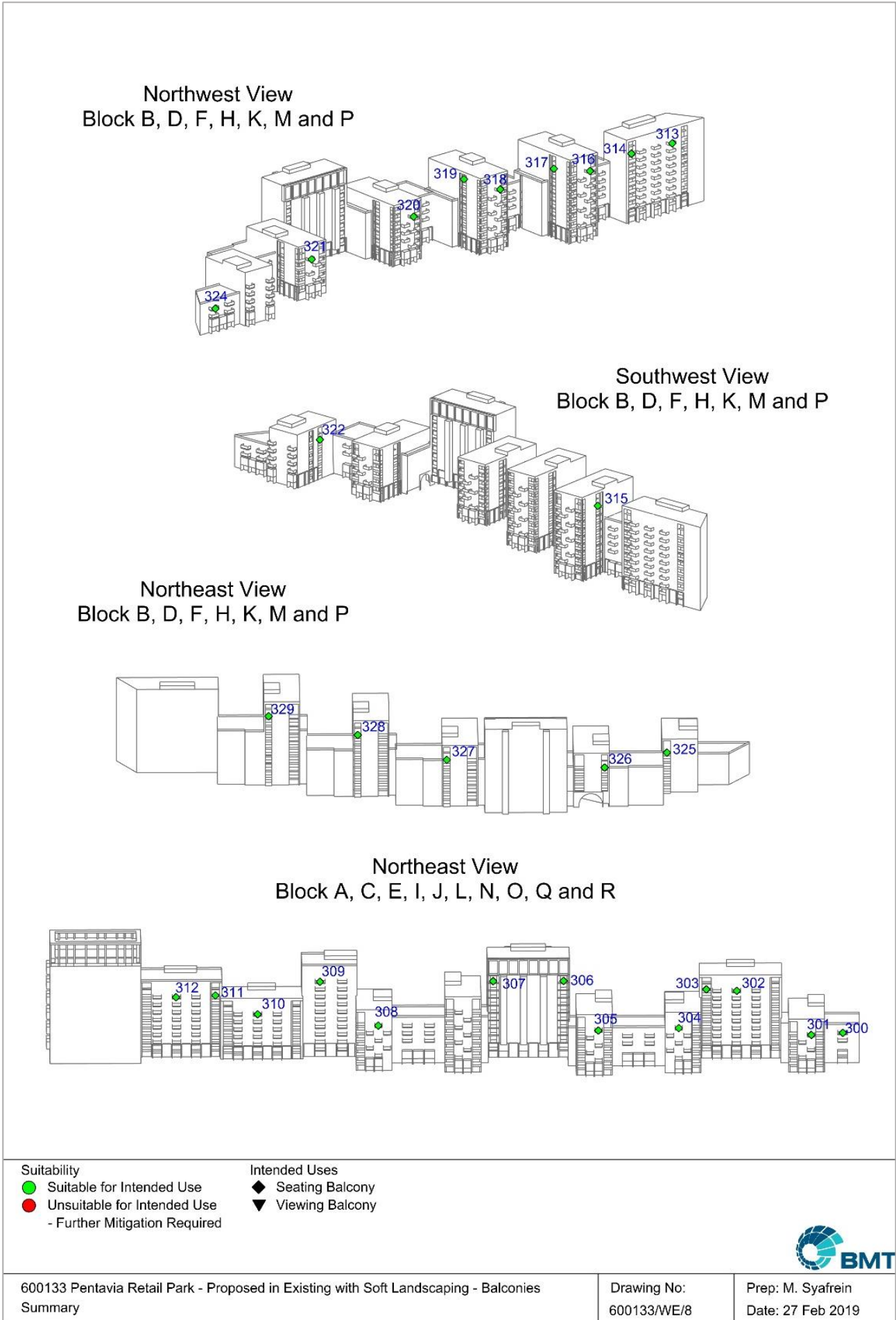
Figure 11.14: Wind Microclimate Development + Existing Surrounds with Soft Landscaping – Terraces



<p>Suitability</p> <ul style="list-style-type: none"> ● Suitable for Intended Use ● Unsuitable for Intended Use - Further Mitigation Required 	<p>Intended Use</p> <ul style="list-style-type: none"> ● Thoroughfare (A-B) ■ Leisure Thoroughfare ▲ Recreational Space ▼ Entrance / Shop Front / Waiting Area ◆ Outdoor Seating 	<p>North [0°] West [270°] East [90°] Prevailing Sector South [180°]</p>
		

<p>600133 Pentavia Retail Park - Proposed in Existing with Soft Landscaping - Terraces Summary</p>	<p>Drawing No: 600133/WE/8</p>	<p>Prep: M. Syafrain Date: 27 Feb 2019</p>
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Figure 11.15: Wind Microclimate Development + Existing Surrounds with Soft Landscaping – Balconies



11.8 Cumulative Effects

Completed Development

- 11.8.1 The assessment presented below was undertaken for Configuration 4: Development + Baseline Scenario + Cumulative Schemes. Full details of the suitability assessment for the Development in the context of cumulative surrounds which includes the cumulative schemes defined in Chapter 2: EIA Methodology are presented in graphical format in Figures 11.16 and 11.19 for the ground and elevated levels respectively.

Safety

- 11.8.2 No change from effects reported within the Completed Development Assessment.

Comfort – Thoroughfares

- 11.8.3 No change from effects reported within the Completed Development Assessment.

Comfort – Entrances/Waiting Area

- 11.8.4 No change from effects reported within the Completed Development Assessment.

Comfort – Recreational Spaces

- 11.8.5 No change from effects reported within the Completed Development Assessment.

Comfort – Balconies

- 11.8.6 No change from effects reported within the Completed Development Assessment.

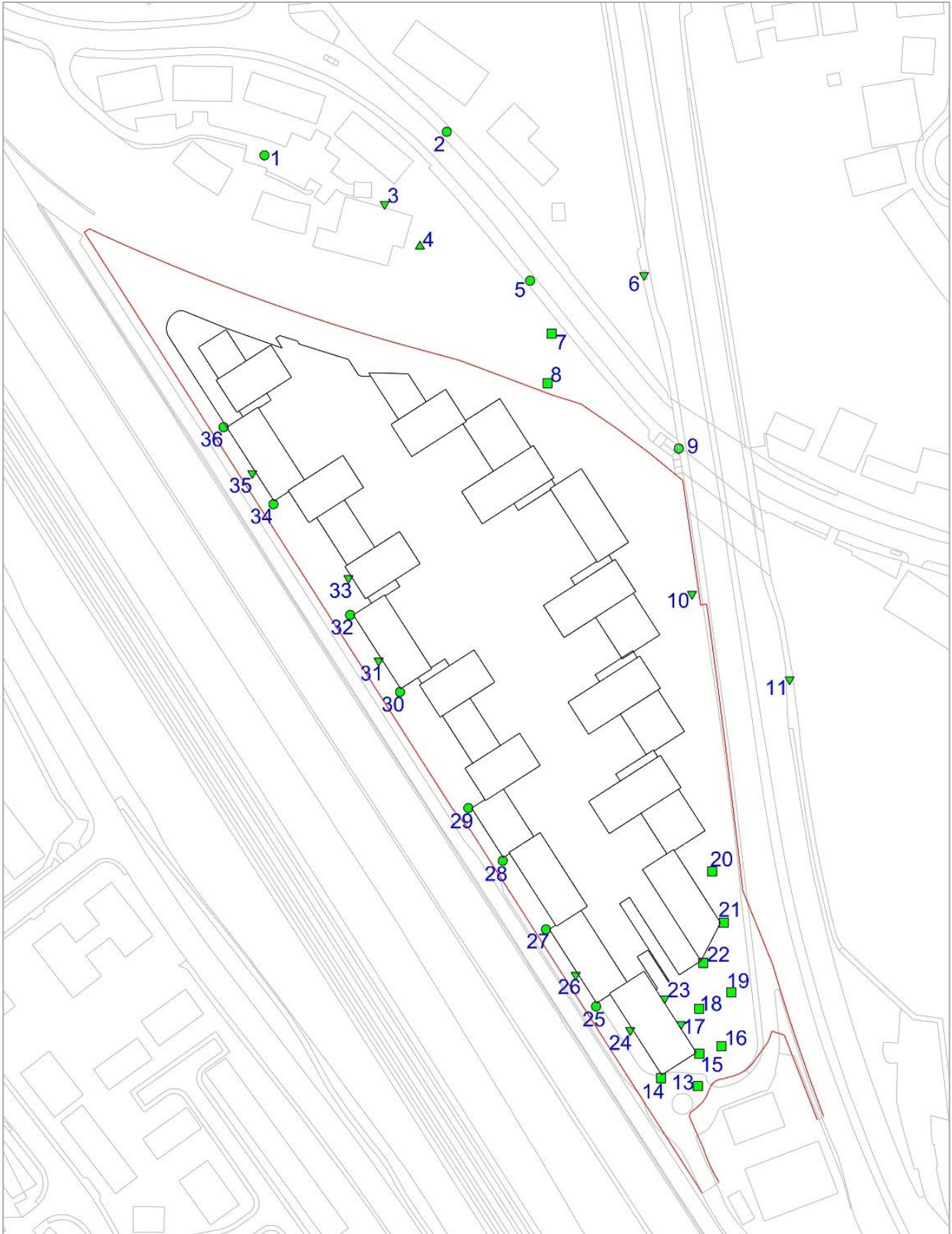
Comfort – Rooftop Terraces


- 11.8.7 No change from effects reported within the Completed Development Assessment.

Summary

- 11.8.8 Overall, inclusion of the cumulative schemes in the assessment was found not to result in any changes to the suitability of the assessed locations. No additional mitigation measures are required. The cumulative wind microclimate residual effects of the Development would therefore be unchanged from the residual effects outlined above for the Completed Development Assessment.

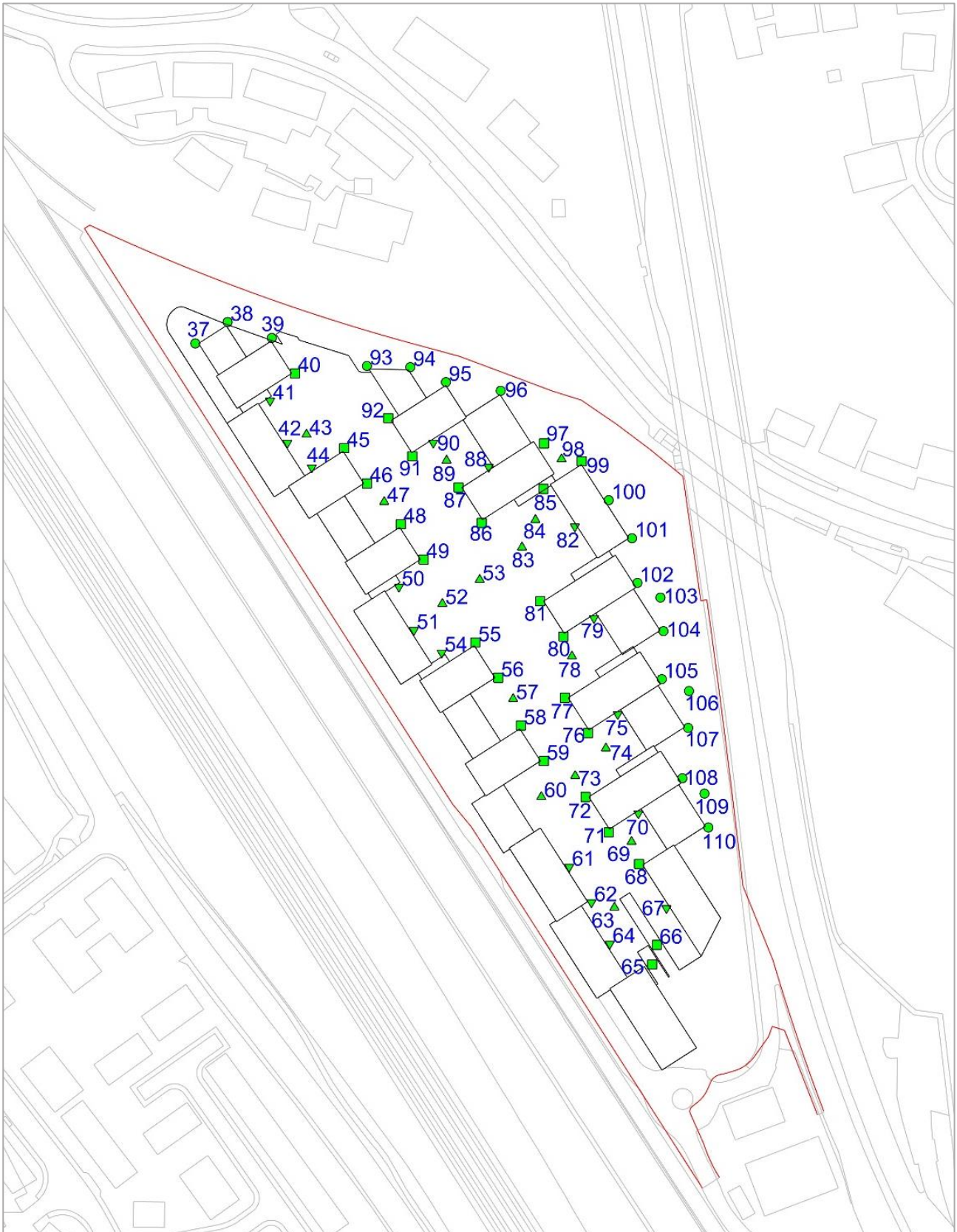
Figure 11.16: Development + Cumulative Schemes – Lower Ground Level



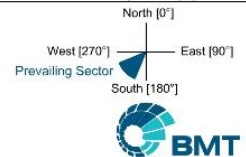
<p>Suitability</p> <ul style="list-style-type: none"> ● Suitable for Intended Use ● Unsuitable for Intended Use - Further Mitigation Required 	<p>Intended Use</p> <ul style="list-style-type: none"> ● Thoroughfare (A-B) ■ Leisure Thoroughfare ▲ Recreational Space ▼ Entrance / Shop Front / Waiting Area ◆ Outdoor Seating 	<p>North [0°]</p> <p>West [270°] East [90°]</p> <p>Prevailing Sector</p> <p>South [180°]</p> 
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600133 Pentavia Retail Park - Proposed in Cumulative - Lower Ground Summary	Drawing No: 600133/WE/8	Prep: M. Syafrin Date: 27 Feb 2019
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Figure 11.17: Development + Cumulative Schemes – Upper Ground Level



- | | |
|--|--|
| Suitability | Intended Use |
| ● Suitable for Intended Use | ● Thoroughfare (A-B) |
| ● Unsuitable for Intended Use
- Further Mitigation Required | ■ Leisure Thoroughfare |
| | ▲ Recreational Space |
| | ▼ Entrance / Shop Front / Waiting Area |
| | ◆ Outdoor Seating |

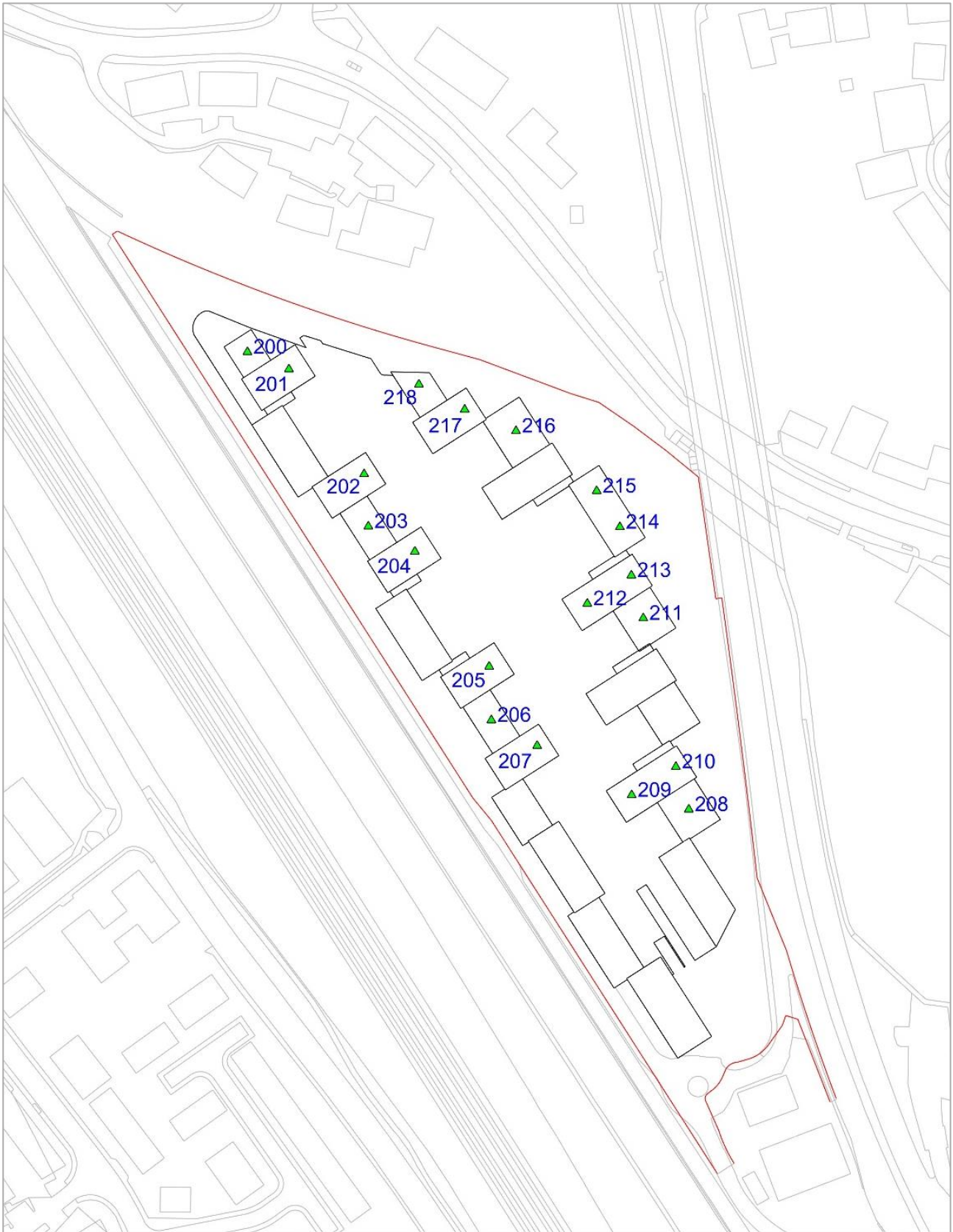



600133 Pentavia Retail Park - Proposed in Cumulative - Upper Ground Summary

Drawing No:
600133/WE/8

Prep: M. Syafrein
Date: 27 Feb 2019

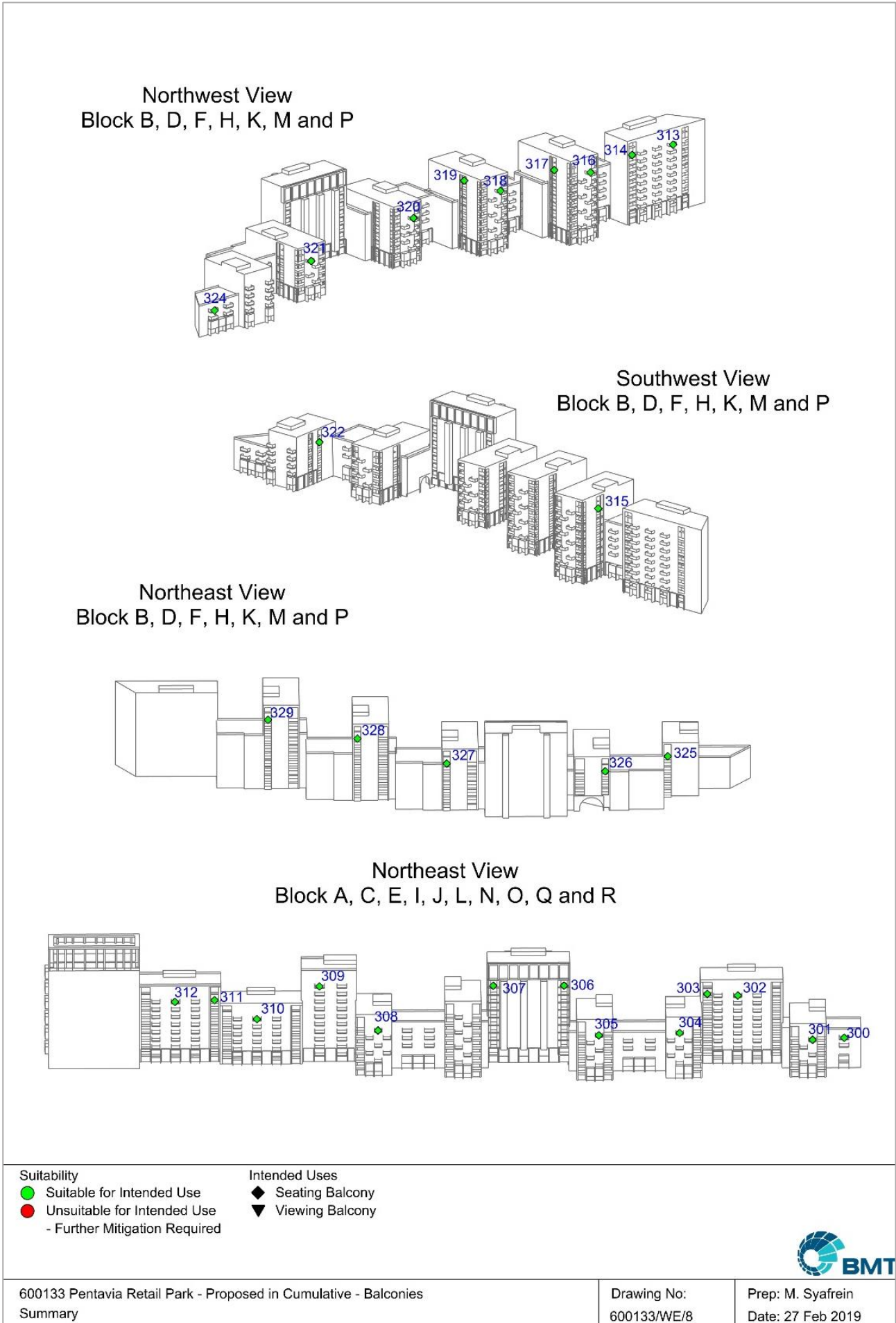
Figure 11.18: Development + Cumulative Schemes – Terraces



<p>Suitability</p> <ul style="list-style-type: none"> ● Suitable for Intended Use ● Unsuitable for Intended Use - Further Mitigation Required 	<p>Intended Use</p> <ul style="list-style-type: none"> ● Thoroughfare (A-B) ■ Leisure Thoroughfare ▲ Recreational Space ▼ Entrance / Shop Front / Waiting Area ◆ Outdoor Seating 	<p>North [0°]</p> <p>West [270°] East [90°]</p> <p>Prevailing Sector</p> <p>South [180°]</p> 
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600133 Pentavia Retail Park - Proposed in Cumulative - Terraces Summary	Drawing No: 600133/WE/8	Prep: M. Syaffrein Date: 27 Feb 2019
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Figure 11.19: Development + Cumulative Schemes – Balconies



11.9 Summary

11.9.1 Table 11.4 presents a summary of the identified effects, mitigation and residual effects in relation to wind microclimate.

Table 11.4: Summary of Effects of the Development

Effect	Receptor (Sensitivity)	Geographical Scale	Temporal Scale	Magnitude	Mitigation and Monitoring	Residual Effect
Construction						
Wind effect on construction site	High	Local	Temporary	Negligible	None required	Negligible
Completed Development						
Safety	High	Local	Permanent	Negligible	None required	Negligible
Comfort – Thoroughfares	High	Local	Permanent	Negligible	None required	Negligible
Comfort – Entrances/Waiting Areas	High	Local	Permanent	Negligible	None required	Negligible
Comfort – Recreational Spaces	High	Local	Permanent	Negligible	None required	Negligible
Comfort – Balconies	High	Local	Permanent	Negligible	None required	Negligible
Comfort – Rooftop Terraces	High	Local	Permanent	Negligible	None required	Negligible
Cumulative Effects						
Safety	High	Local	Permanent	As above	None required	As above
Comfort – Thoroughfares	High	Local	Permanent	As above	None required	As above
Comfort – Entrances/Waiting Areas	High	Local	Permanent	As above	None required	As above
Comfort – Recreational Spaces	High	Local	Permanent	As above	None required	As above
Comfort – Balconies	High	Local	Permanent	Negligible	None required	As above

Effect	Receptor (Sensitivity)	Geographical Scale	Temporal Scale	Magnitude	Mitigation and Monitoring	Residual Effect
Comfort – Rooftop Terraces	High	Local	Permanent	Negligible	None required	As above

REFERENCES

- ¹ Department for Communities and Local Government (2012). National Planning Policy Framework.
- ² Department for Communities and Local Government (updated 19 February 2019). National Planning Policy Framework.
- ³ GLA, 2016. The London Plan: The Spatial Development Strategy for London Consolidated with Alterations since 2011.
- ⁴ GLA (2018) Draft New London Plan showing Minor Suggested Changes.
- ⁵ Barnet Council, 2012. Barnet's Local Plan (Core Strategy) Development Plan Document, September 2012.
- ⁶ Barnet's Development Management Policies, 2012.
- ⁷ Barnet's Sustainable design and construction, 2016.
- ⁸ London Borough of Barnet, (2016). Pentavia Retail Park, Mill Hill: Draft Planning Brief, September 2016.
- ⁹ Barnet's Core Strategy, 2012.
- ¹⁰ Barnet's Residential Guidance, 2016.
- ¹¹ Department for Communities and Local Government, (2018); Planning Practice Guidance. HMSO, London.
- ¹² GLA, 2014. Sustainable Design & Construction, Supplementary Planning Guidance.
- ¹³ London Docklands Development Corporation, 1990. The Evaluation of the Windiness of a Building Complex before Construction, T V Lawson.