

Chapter 11: Wind Microclimate

WIND MICROCLIMATE	
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SUPPORTING APPENDIX	ES Volume 3: Appendix: Wind Microclimate: Annex 1: Legislation, Policy and Guidance; Annex 2: Computational Fluid Dynamics Methodology; and Annex 3: Wind Climate Methodology.
KEY CONSIDERATIONS	This ES chapter presents an assessment of the likely wind microclimate effects of the Proposed Development, in terms of pedestrian level wind comfort and safety. The key wind microclimate considerations are: - The Proposed Development causing a risk to pedestrian safety due to strong winds either on-site or in the surrounding area during construction works and once completed; - The Proposed Development causing unsuitable comfort conditions due to high wind speeds on-site, in terms of conditions for thoroughfares, building entrances and amenity spaces during construction works and once completed; and - The Proposed Development causing unsuitable comfort conditions due to high wind speeds within the local area off site, in terms of conditions for thoroughfares, building entrances and bus stops during construction works and once completed.
CONSULTATION	An EIA Scoping Report was prepared and submitted to Gravesham Borough Council (GBC) on the 11 th August 2022 requesting a Scoping Opinion from GBC. A copy of the EIA Scoping Report is provided in ES Volume 3, Appendix: EIA Methodology – Annex 1 . A Scoping Opinion was received on 16 th September 2022, as provided in ES Volume 3, Appendix: EIA Methodology – Annex 2 . The Scoping Opinion noted: “Given that part of the development will be on the riverfront, the LPA would also ask that consideration be given to the effects of microclimate on the river itself close to the shore, where wind effects may impact on the manoeuvring of small craft – including sailing vessels.” Conditions directly above the surface of the River Thames have therefore also been considered within this ES chapter as relevant, to ensure the manoeuvrability of small crafts are not impacted by the Proposed Development.

ASSESSMENT METHODOLOGY

Initial Design Review

- 11.1** Prior to the wind assessment discussed within this ES chapter, GIA conducted an initial wind analysis study of the Proposed Development design to provide the design team with initial insight into the expected wind conditions at the site during the initial design phase. The guidance provided by GIA to improve wind conditions within and around the Proposed Development was taken into consideration during the design process (including the illustrative landscaping scheme) and was captured in the wind assessment. GIA will continue to provide advice to the design team in relation to wind microclimate at the RMA stage in order to ensure that wind effects are considered and any necessary mitigation measures are implemented as the design evolves.

Defining the Baseline

- 11.2** Baseline conditions have been established using a 3D model, extending 600m radius from the site, tested using high resolution Computational Fluid Dynamics (CFD).
- 11.3** The existing baseline conditions are defined as the current site conditions at the time of the planning submission (September 2022) plus current surrounding properties and those schemes with planning permission that are currently under substantial construction. As such, it is considered reasonable that these schemes are assumed to be fully built out for the purposes of the baseline scenario.
- 11.4** CFD is a digital modelling technique, which simulates the effect of wind for the built environment. The air is divided into hundreds of millions of “cells”, within which the equations of motion are solved. GIA uses cloud computing from Amazon Web Services (AWS) to run the simulations, to ensure vast scalability and appropriate resource availability for any project.
- 11.5** CFD was chosen as a method for this study as physical limitations on the number of probes associated with wind tunnel testing would significantly restrict the potential coverage due to the large lateral scale of the site. GIA’s high resolution CFD was used to ensure that accurate and conservative results were obtained.
- 11.6** GIA’s CFD methods have been extensively correlated to physical data to ensure accuracy, and also allows for a greater level of detail (such as terrain undulations and fine building details) to be captured by the model, as well as allowing the ability to test at full scale.

- 11.7** Wind speeds on and around the site were measured at 1.5m above any surfaces expected to be used for pedestrian activity, to determine the conditions at and around the site. The model was run at full scale from 18 wind angles, spaced using 10° or 30° increments such that no sector contributes more than 10% of the annual wind.

- 11.8** Wind speeds were also measured at a 2m normal offset from all building walls, to assess the potential for protruding balconies.

- 11.9** On-site and local wind speeds (both mean and peak gust speeds) were combined with 30 years-worth of weather data for Biggin Hill Airport, corrected for terrain local to the airports and the site, to obtain annual and seasonal frequency and magnitude of wind speeds across the model. This allows the ‘grading’ of the pedestrian level winds according to the Lawson Comfort Criteria, which are explained later in this ES chapter.

- 11.10** The wind microclimate effects are assessed annually and seasonally. The windiest season (typically the winter months of December, January and February) are reported as this is when the strongest winds are expected, summer conditions (June, July, August) are reported as this is the season when pedestrian usage of outdoor spaces is expected to be highest.

Evolution of the Baseline

- 11.11** The evolved baseline condition is a scenario in which the site and the surrounding area naturally evolve in the absence of the Proposed Development.

- 11.12** The evolved baseline conditions have not been measured directly in the wind tunnel but have rather been assessed through professional judgement and comparison of the existing baseline conditions and the cumulative assessment.

Impact Assessment Methodology

Demolition and Construction

- 11.13** Demolition and construction effects have not been measured directly in CFD, due to the constantly changing building form during the construction process. Rather, they have been assessed through professional judgement and comparison of the baseline conditions with those for the completed Proposed Development. It should be noted that the qualitative assessment of demolition and construction does not take account of phasing as a result of the changing building form during the construction process.

Phasing

- 11.14** Indicative operational phasing, in line with that set out in **ES Volume 1, Chapter 2: EIA Methodology**, has been considered via the assessment of an additional scenario, representative of the completion of Phase 1 of the Proposed Development, in advance of Phase 2 coming forward, as well as a scenario assessing the fully complete Proposed Development

Completed Development

CFD Testing

- 11.15** A 3D model of the Proposed Development was included in the CFD model and wind speeds were measured on and around the site to determine the strength and frequency of pedestrian level wind speeds.
- 11.16** A suitable atmospheric boundary layer (to accurately capture the effect of local buildings and terrain on atmospheric wind speeds and turbulence) was generated.
- 11.17** The Proposed Development was modelled using the maximum parameters sought for approval (as set out in **ES Volume 1, Chapter 4: The Proposed Development**), to represent a worst-case scenario and capture the maximum potential level of wind effects.

Target Conditions

- 11.18** The desired wind microclimate would typically need to have areas acceptable for sitting, standing (including at entrances of buildings) and walking use. **Table 11.1** and **Table 11.2** set out the description of the comfort categories to classify wind conditions.
- 11.19** Any areas which show up as either subject to strong winds (defined as when there is either a distress exceedance or a safety exceedance in accordance with **Table 11.2**) or uncomfortable (during the windiest season) will require mitigation, unless they are in locations where pedestrian access can be controlled in the event of strong winds. This applies to all thoroughfares (for pedestrians) and roads (for cyclists) around the Proposed Development.

- 11.20** The target is for the majority of thoroughfares to be suitable for leisure walking. Localised regions of business walking can be tolerated as a transitory pedestrian will pass through them relatively quickly, but an extensive region of business walking is not acceptable.
- 11.21** Within roadways, business walking is acceptable as these areas will only be used by people undertaking high energy activities such as cycling or brisk walking to cross the road.

Table 11.1 Lawson Comfort Criteria (LDDC variant)

Key	Comfort Category	Mean Wind Speed (5% exceedance)	Description
	Sitting	0-4m/s	Acceptable for outdoor sitting use (e.g. cafes, benches)
	Standing	4-6m/s	Acceptable for main building entrances, pick-up / drop-off points and bus stops
	Leisure Walking	6-8m/s	Acceptable for strolling
	Business Walking	8-10m/s	Acceptable for external pavements, walking purposefully without lingering
	Uncomfortable	>10m/s	Not comfortable for regular pedestrian access

Table 11.2 Lawson Safety Criteria (LDDC variant)

Key	Category	Mean Wind Speed (0.022% exceedance)	Description
	Safe	<15m/s	An acceptable level of wind safety risk
	Distress Exceedance (S15)	15m/s	Presents a safety risk to more vulnerable members of the public and cyclists
	Safety Exceedance (S20)	20m/s	Presents a safety risk to all members of the public

- 11.22** Bus stops are targeted to be suitable for standing, as pedestrians would be expected to dwell in these spaces for a longer duration than a general thoroughfare. There are existing off-site bus stops on Taunton Road.
- 11.23** There are also proposed updated on-site bus stops for the Ebbsfleet United Stadium. The exact location of these bus stops is as yet undetermined, so the windiest conditions on general thoroughfares around the site will be reported as the conditions for these bus stops as a worst case for the purposes of assessment.
- 11.24** The Ebbsfleet United Football Stadium is located within the site and is proposed to be redeveloped as part of the Proposed Development. Consideration has been given to both the comfort of spectators in the stands and also the potential impact on playing conditions. Conditions within the stadium are required to be suitable for standing in the windiest season.
- 11.25** There are existing off-site amenity spaces in the form of Swanscombe Marshes and also a playground on Black Eagle Drive. These are targeted to be suitable for a mixture of standing and sitting in summer conditions.
- 11.26** There is also proposed amenity within the Proposed Development in the form of the Power Park, Riverwalk Gardens and the Market Place (as set out in **ES Volume 1, Chapter 4: The Proposed Development**) at ground level, and also roof terraces. These are targeted to be suitable for a mixture of standing and sitting in summer conditions.
- 11.27** Balconies will be designed within the detailed design of the Proposed Development. Although these have not been modelled explicitly, conditions at 2m from the walls of all buildings have been used as a proxy for worst case balcony conditions in any given area, and to identify areas suitable for protruding balconies and areas where mitigation measures will need to be considered, designed and tested as appropriate at the detailed design stage. These are required to be suitable for sitting or standing in summer conditions.
- 11.28** The areas immediately outside any building entrances should be suitable for standing use during the windiest season to provide a “buffer” between the still conditions in interior spaces and the general thoroughfare. It should be noted that Part M of the Building Regulations stipulate that communal building entrances and

entrances for wheelchair users require the need for a covered area, minimum depth/width 1.2m - i.e., recessed or a canopy – this will be detailed at the detailed design stage.

- 11.29** Conditions directly above the surface of the River Thames have also been considered, to ensure the manoeuvrability of small crafts are not impacted. The target condition for the river surface is to be suitable for leisure walking in all seasons.

Test Scenarios

- 11.30** The purpose of these tests was to ensure that target conditions could be achieved when the Proposed Development is complete and in use with its current surroundings.

- 11.31** The following five configurations were tested:

- Configuration 1: The Existing Site with the Existing Surrounding Buildings (assessed in the ‘*Baseline Conditions*’ section of this ES chapter);
- Configuration 2: The Intermediate Phase (Phase 1 complete, with the Phase 2 site area as existing) with the Existing Surrounding Buildings (**Figure 11.1**) (assessed in the ‘*Potential Effects*’ section of this ES chapter);
- Configuration 3: The Proposed Development (Maximum Parameters, with no landscaping) with the Existing Surrounding Buildings (**Figure 11.2**) (assessed in the ‘*Potential Effects*’ section of this ES chapter);
- Configuration 4: The Proposed Development (Maximum Parameters) with the Final Illustrative Landscaping (Including Mitigation) and the Existing Surrounding Buildings (assessed in the ‘*Mitigation, Monitoring and Residual Effects*’ section of this ES chapter); and
- Configuration 5: The Proposed Development (Maximum Parameters, with no landscaping) with the Cumulative Surrounding Buildings (assessed in the ‘*Assessment of the Future Environment*’ section of this ES chapter).

- 11.32** The ‘Intermediate Phase’, as tested in Configuration 2, is shown in **Figure 11.1**. The Proposed Development (Maximum Parameters), as tested in Configurations 3, 4 and 5, is shown in **Figure 11.2**.

- 11.33** The existing surrounding buildings, as tested in Configurations 1, 2 3 and 4, is shown in **Figure 11.3**. The cumulative surrounding buildings, as tested in Configuration 5, are shown in **Figure 11.4**.

- 11.34** Trees and soft landscaping were not initially included in the model (Configurations 1, 2, 3 and 5), to ensure that a reasonable worst-case scenario was captured.

- 11.35** The illustrative landscaping (included in Configuration 4) consisted of the illustrative trees and relevant hard landscaping features (for example terrace screens) and retained trees within the site. All proposed illustrative trees were modelled at the installation size, and all trees were modelled as deciduous and bare leafed to ensure the effects captured were conservative (apart from where specified as required for mitigation purposes).

- 11.36** An initial illustrative landscaping masterplan was tested although not reported in this ES chapter. This round of testing identified where further measures (e.g. additional planting) were required within the final illustrative landscaping, or to be secured by the Design Code, in order to achieve suitable conditions, as discussed in the ‘*Mitigation, Monitoring and Residual Effects*’ section of this ES chapter.

- 11.37** Following a wind mitigation workshop discussing the results of the initial illustrative landscaping testing (as discussed in the ‘*Mitigation, Monitoring and Residual Effects*’ section of this ES chapter), the illustrative landscaping design evolved to include a number of measures recommended by GIA in order to resolve exceedances of comfort/safety thresholds identified by the initial testing. The final Illustrative Landscaping Masterplan, as presented in **ES Volume 1, Chapter 4: The Proposed Development** and **Figure 11.5**, has been established as a result, and is subsequently tested (Configuration 4) and set out later in this ES chapter.

Cumulative Assessment

- 11.38** Of the cumulative schemes identified in **ES Volume 1, Chapter 2: EIA Methodology**, the majority are outside of the study area (600m radius of the site), so were scoped out on the grounds of proximity.

- 11.39** There is one Tier 1 cumulative scheme within the 600m radius study area: Land North of Hive Lane Northfleet Embankment West (EDC/21/0081). This scheme has been included within Configuration 5 as a Tier 1 cumulative scheme for assessment.

11.40 The following Tier 2 cumulative schemes are within the 600m radius study area: Land Adj To Northfleet Harbour (EDC/21/0102) and The London Resort scheme (BC080001). The effect of these schemes has been assessed qualitatively.

Assumptions and Limitations

- 11.41** The accuracy of the results is dependent upon the accuracy of the architectural CAD used to construct the model.
- 11.42** There is an inherent assumption that on-site wind speeds will scale linearly with the measured wind speeds at the airports.
- 11.43** It is assumed that, during the construction process, wind conditions will gradually change from the baseline conditions to the conditions for the completed Proposed Development.
- 11.44** It is assumed that on-site activity during construction (i.e. construction workers) will be able to withstand a higher category of pedestrian comfort level than for the completed Proposed Development.
- 11.45** The location of bus stops within the Proposed Development is based upon the Illustrative Masterplan, as presented in **ES Volume 1, Chapter 4: The Proposed Development**.
- 11.46** While the configurations tested utilise maximum parameters (and hence represent a worse-case scenario), it should be noted that the final buildings and landscaping will be subject to detailed design at the Reserved Matters Application (RMA) stage, and therefore further wind assessment will be undertaken (as necessary) to ensure the wind conditions on- and off-site are appropriate for the intended use. The wind microclimate assessment team have worked with the project design team to ensure that mitigation measures have been integrated into the design of the Proposed Development as relevant. The detailed design of the Proposed Development will need to conform with the controls set within the Design Code. This includes mandatory measures (for example with regards to balcony design at specific locations) that have been prepared in coordination between the project design team and the wind microclimate specialists. These measures are set out within the 'Mitigation, Monitoring and Residual Effects' section of this ES chapter.

Methodology for Defining Effects

Receptors and Receptor Sensitivity

- 11.47** Receptors are identified according to the expected pedestrian activities for different areas in the site and surrounding area. All receptors are considered of high sensitivity to strong winds, as these can pose a risk to the safety of pedestrians, cyclists and canal users.
- 11.48** General thoroughfares are of medium sensitivity to pedestrian comfort, as users are not expected to dwell for significant periods in the region of an individual probe. Bus stops, building entrances, public realm and amenity spaces are of high sensitivity to pedestrian comfort.

Magnitude of Impact

- 11.49** All impacts will be of high magnitude, as any exceedance of the required wind comfort or safety levels has the potential to hinder the usability of a pedestrian area if not mitigated.

Defining the Effect

- 11.50** **Beneficial** effects are those where conditions are calmer than required for the intended use. **Adverse** effects are those where conditions are windier than required for the intended use, or there is a risk to safety due to strong winds.
- 11.51** The scale of wind effects is defined as set out below:
- **Major Beneficial:** wind conditions are three categories calmer than required;
 - **Moderate Beneficial:** wind conditions are two categories calmer than required;
 - **Minor Beneficial:** wind conditions are one category calmer than required;
 - **Negligible / No Effect:** wind conditions are those required;
 - **Minor Adverse:** wind conditions are one category windier than required;
 - **Moderate Adverse:** wind conditions are two categories windier than required; and
 - **Major Adverse:** wind conditions are three categories windier than required.

11.52 Additionally, any risk to pedestrian safety due to strong winds is classified as a **Major Adverse** effect.

11.53 All wind effects will be either site or local effects. For the purposes of this study, a site effect is classified as one which is measured anywhere within the site boundary, a local effect is one which is measured elsewhere in the study area across Northfleet Harbour, Northfleet Industrial Estate, Lower Road, Galley Hill Road and Stonebridge Road.

11.54 All effects for the completed and operational Proposed Development will be **permanent** effects, any effects during construction will be temporary effects. All wind effects are direct effects resulting from the impact of the Proposed Development on the local wind environment.

Categorising Likely Significant Effects

11.55 Notwithstanding minor effects being generally classified as 'non-significant' for the purposes of this ES, in this chapter, any adverse effects (for strong winds and comfort) are categorised as significant, as these will require mitigation in order to achieve suitable comfort and safety conditions. Any negligible or beneficial effects will have suitable conditions for the intended use without mitigation, so are not classed as significant.

BASELINE CONDITIONS

Current Baseline Conditions

Meteorological Data

- 11.56** The UK Meteorological Office supplies records of the number of hours that wind occurs for ranges of wind speed) and by direction. Meteorological data from the Biggin Hill Airport weather station have been reviewed to develop a statistical model of wind speed and direction, representative of the local wind conditions for the Greater London area.
- 11.57** Approximately 30 years of meteorological data were used in the assessment, corrected for meteorological data standard conditions of 10m above open, flat, level country terrain. The data was corrected to account for the terrain roughness at the site, using ESDU 2010 Item01008 'Computer program for wind speeds and turbulent properties: flat or hilly sites in terrain with roughness changes'.
- 11.58** Seasonal wind roses for the airport are shown in **Figure 11.6**. The dominant wind direction is from the south-west. The correction factors between the airport (measured 10m above ground) and the site (at a reference height of 120m) are shown in **Table 11.3**; it should be noted that the terrain analysis has been performed using sectors of 30°.

Table 11.3 Site Wind Correction Factors

Wind Angle (°N)	0	30	60	90	120	150	180	210	240	270	300	330
Correction Factor	1.57	1.57	1.49	1.55	1.39	1.42	1.44	1.44	1.42	1.40	1.38	1.39

Figure 11.1 CFD Model as Tested (Intermediate Phase, tested in Configuration 2)

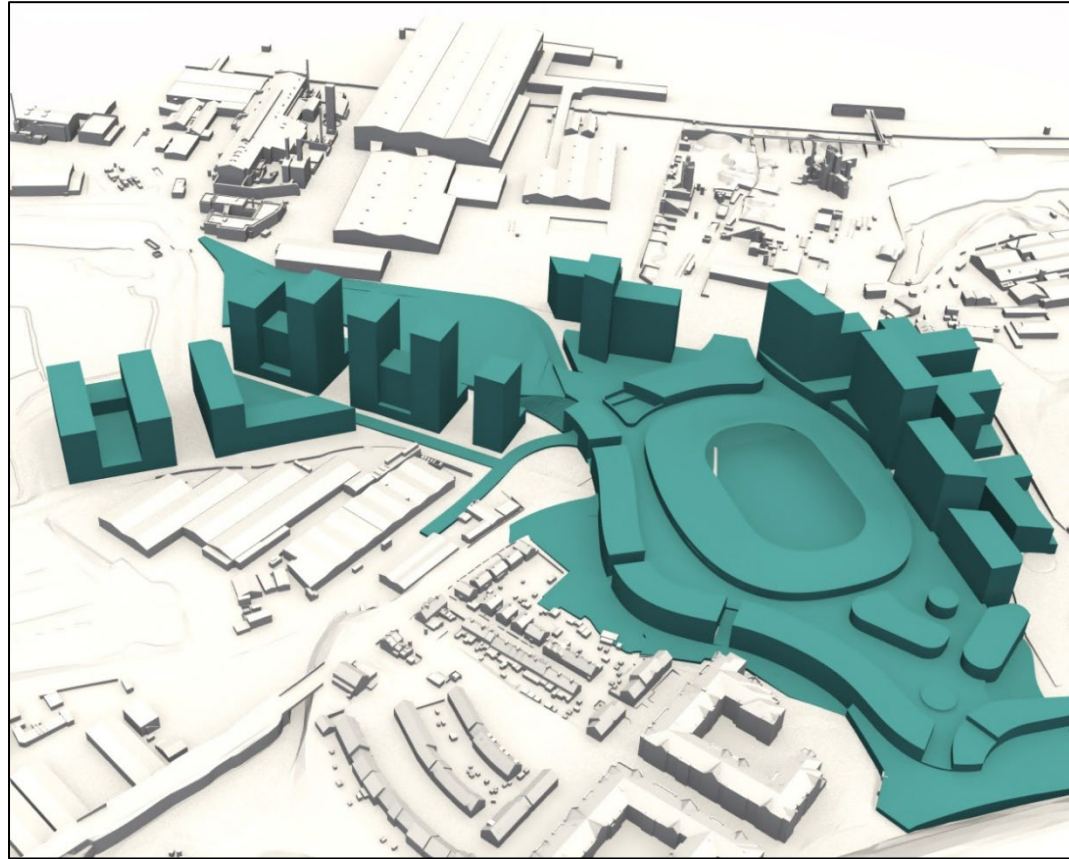


Figure 11.2 CFD Model as Tested (Proposed Development, Max Parameters, tested in Configurations 3, 4 and 5)

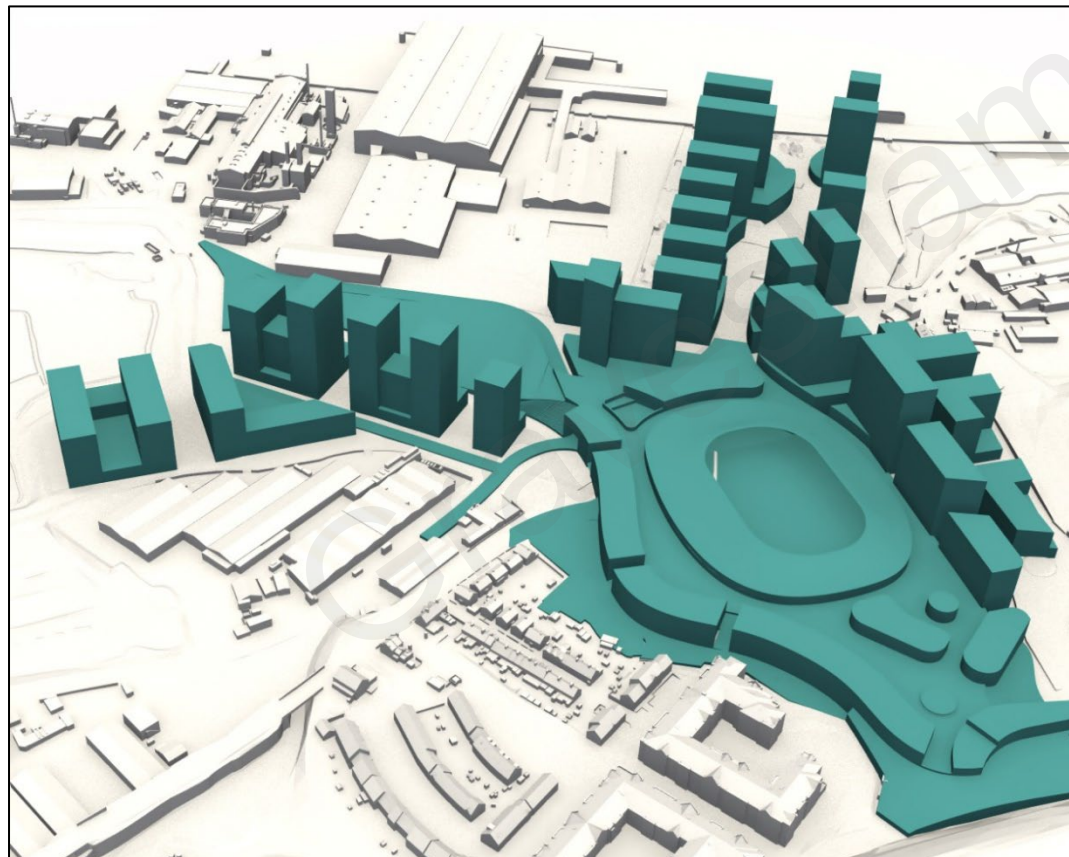


Figure 11.3 Surrounding Context (Existing), as tested in Configurations 1, 2, 3 and 4 (shown with Proposed Development from Configurations 3 and 4)

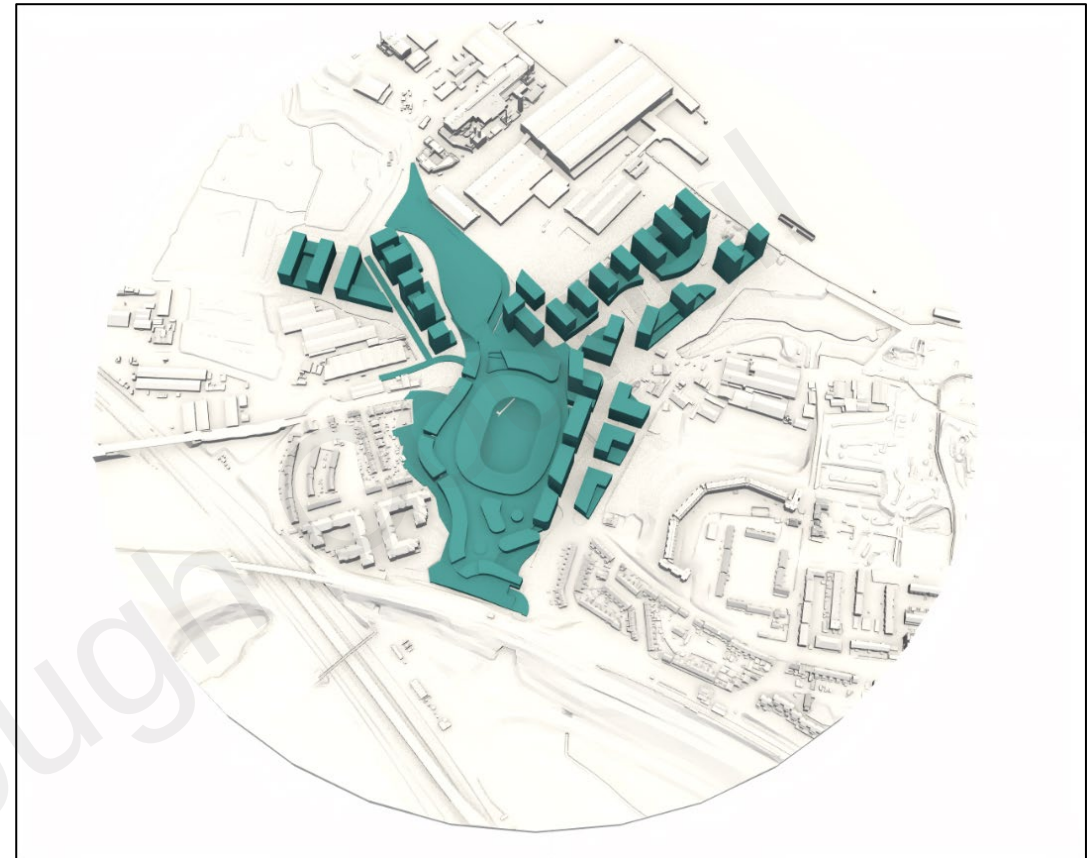


Figure 11.4 Surrounding Context (Cumulative), as tested in Configuration 5.

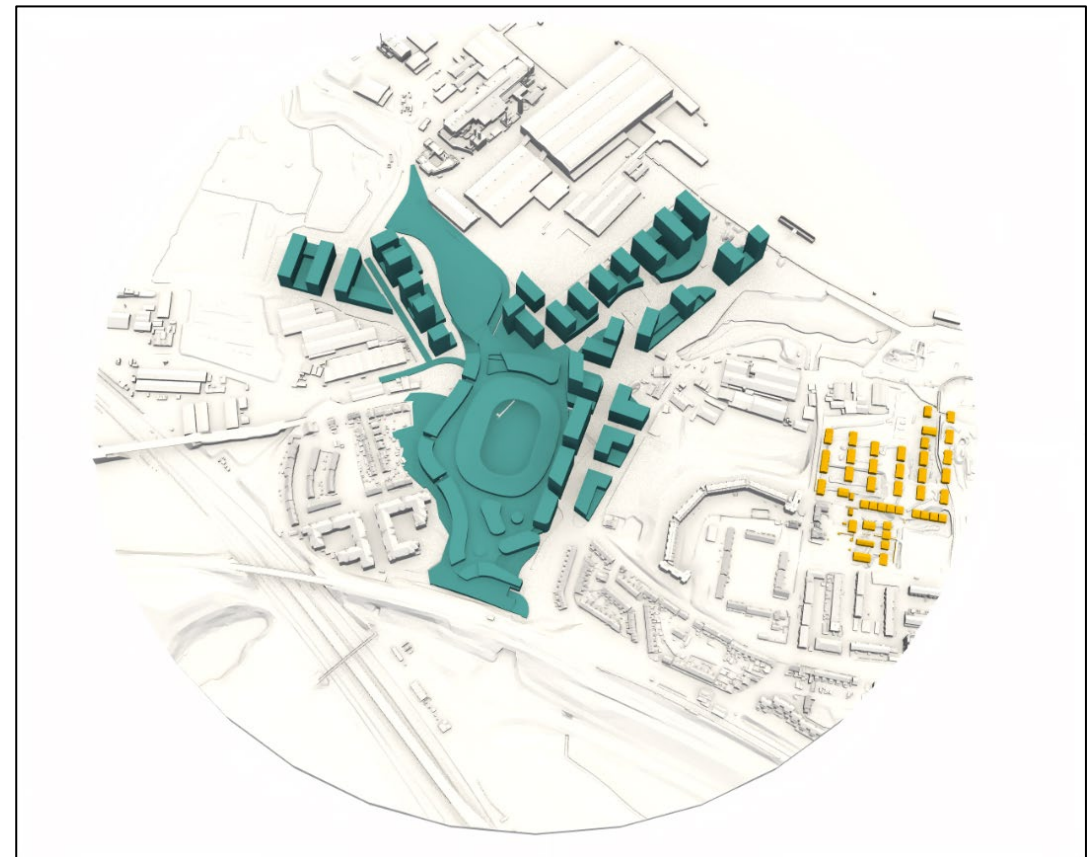
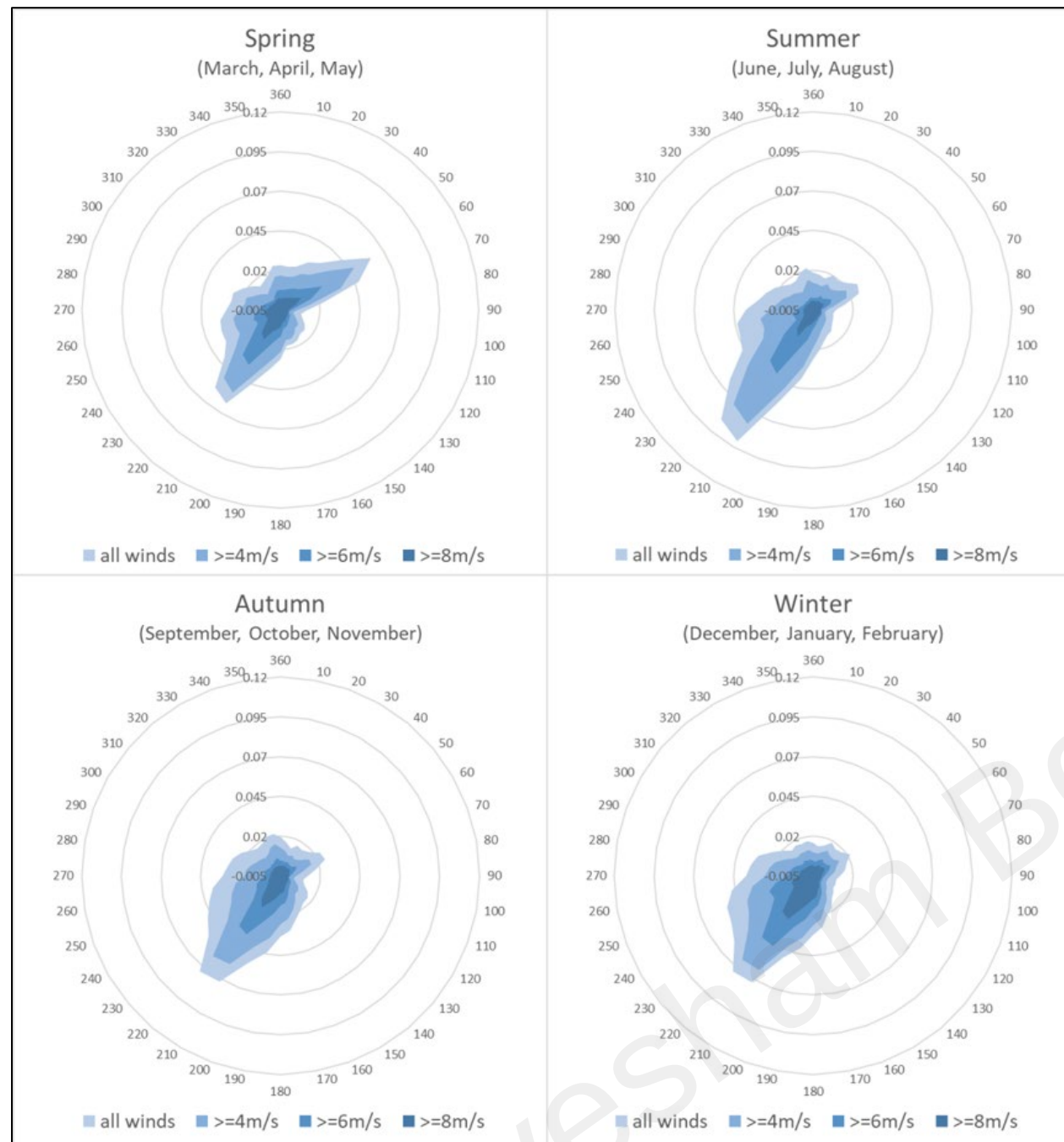


Figure 11.5 Final Illustrative Tree Planting as Tested in Configuration 4



Figure 11.6 Seasonal Wind Roses for Biggin Hill (1990-2021)



Configuration 1: Existing Site with Existing Surrounds

- Windiest season conditions at ground level for the existing site with existing surrounds are shown in **Figure 11.7**.
- Summer conditions at ground level for the existing site with existing surrounds are shown in **Figure 11.8**.
- Strong winds at ground level for the existing site with existing surrounds are shown in **Figure 11.9**.

Pedestrian Comfort

- 11.59** Windiest season conditions range between suitable for sitting, standing, leisure walking, business walking and uncomfortable. Summer conditions range between suitable for sitting, standing, leisure walking and business walking.
- 11.60** Conditions for all off-site entrances are suitable for either range between sitting, standing and leisure walking in the windiest season and between sitting and standing in summer. Those which are suitable for leisure walking in the windiest season are a category windier than required for the intended use.
- 11.61** The locations of bus stops, public realm, and amenity spaces are shown in **Figure 11.10**.
- 11.62** Conditions for the Taunton Road bus stops (marked B1 and B2) are suitable for standing in all seasons. This is suitable for the intended use.
- 11.63** Conditions for the Ebbsfleet United Football Stadium are suitable for a mixture of standing and leisure walking in the windiest season and for a mixture of sitting and standing in summer. This is a category windier than required for the intended use.
- 11.64** Conditions for Swanscombe Marshes are suitable for a mixture of leisure walking and business walking in the windiest season and for a mixture of standing and leisure walking in summer. This is a category windier than required for the intended use.
- 11.65** Conditions for the off-site Black Eagle Drive play area (marked A1) are suitable for leisure walking in the windiest season and for a mixture of standing and leisure walking in summer. This is a category windier than required for the intended use.
- 11.66** Conditions for the surface of the River Thames are suitable for a mixture of standing and leisure walking in the windiest season and for standing in summer. This is suitable for the intended use.

Strong Winds

- 11.67** There are four accessible locations which show a risk of strong winds (exceeding 15m/s for 0.022% of the year) within the surrounding area. These are located within Swanscombe Marshes (marked 1 and 2 in **Figure 11.9**), on Galley Hill Road (marked 3) and in Wallis Park (marked 4). In the absence of mitigation these pose a risk to the safety of pedestrians and cyclists within these areas.
- 11.68** There are also two locations which show a risk of strong winds (exceeding 15m/s for 0.022% of the year) within the railway lines to the south of the study area (marked 5 and 6 in **Figure 11.9**). These will not be accessible to the general public, so do not pose an unacceptable risk to the safety of pedestrians or cyclists.

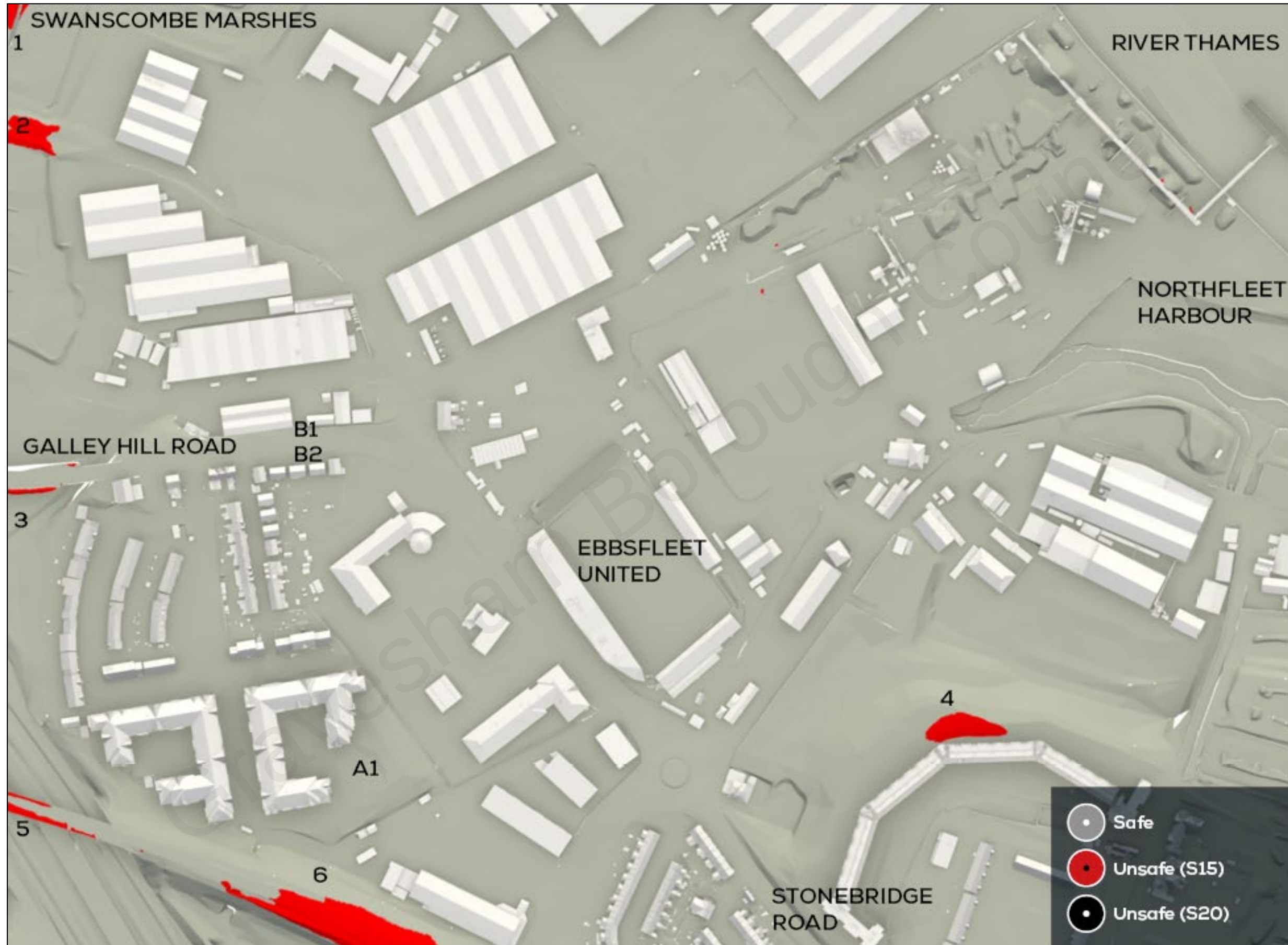
Figure 11.7 Configuration 1: Existing Site with Existing Surrounds, Ground, Windiest Season (Annotated as described in Table 11.4)



Figure 11.8 Configuration 1: Existing Site with Existing Surrounds, Ground, Summer (Annotated as described in Table 11.4)



Figure 11.9 Configuration 1: Existing Site with Existing Surrounds, Ground, Strong Winds (Annotated as described in Table 11.4)



RECEPTORS AND RECEPTOR SENSITIVITY

Existing

- 11.69** The existing sensitive receptors include thoroughfares around the site, off-site entrances to buildings within the study area, the bus stops on Galley Hill Road, the Ebbsfleet United FC Stadium, the play area on Black Eagle Drive and Swanscombe Marshes.
- 11.70** The locations for these receptors are shown in **Table 11.4** and are also marked in **Figure 11.10**.

Introduced

- 11.71** New sensitive receptors will be introduced by the Proposed Development, including the entrances to the buildings of the Proposed Development, on-site bus stops, amenity spaces in the form of Power Park, Riverwalk Gardens and the Market Place, the resident amenity roof terraces and potential balconies within the Proposed Development. The locations for these receptors are shown in **Table 11.4**.

Table 11.4 Sensitive Receptors

Receptor Type (Relevant Assessment Season)	Receptor Reference
On-Site	
Thoroughfares (Windiest)	Spaces away from direct building proximity within red line
Entrances (Windiest)	Immediately adjacent to buildings within red line
Bus Stops (Windiest)	New on-site bus stops
Ebbsfleet United FC (Windiest)	Ebbsfleet United FC stadium
Ground Level Amenity (Summer)	Power Park Riverwalk Gardens The Market Place
Roof Level Terrace (Summer)	Resident Amenity Roof terraces (marked purple in Figure 11.10)
Balconies (Summer)	Potential balcony locations
Off-Site	
Thoroughfares (Windiest)	Spaces away from direct building proximity outside red line
Entrances (Windiest)	Immediately adjacent to buildings outside red line
Bus Stops (Windiest)	Taunton Road bus stops (marked "B1" and "B2" in Figure 11.10)
Ground Level Amenity (Summer)	Swanscombe Marshes Black Eagle Drive play area (marked "A1" in Figure 11.10)
River Surface (Windiest)	Conditions directly above the surface of the River Thames

POTENTIAL EFFECTS

Demolition and Construction

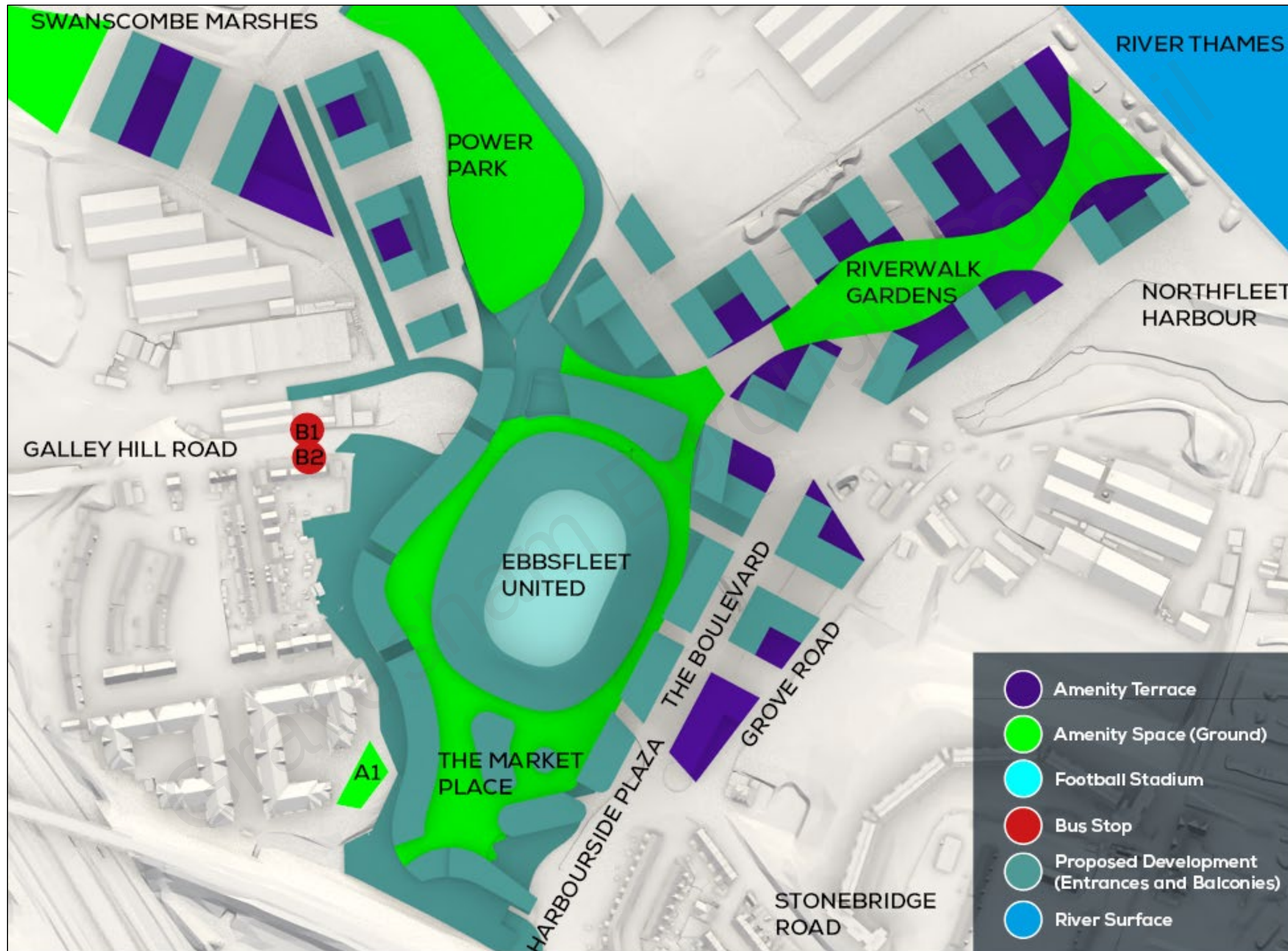
- 11.72** During the demolition and construction of the Proposed Development, it is expected that conditions will gradually change from those measured for the Existing Site with Existing Surrounds (Configuration 1) to those measured for the Proposed Development with Existing Surrounds (Configuration 3). As such (in accordance with industry best practice for wind microclimate assessments), demolition and construction effects can be inferred from completed development effects.

- 11.73** All pedestrian comfort related completed development effects are either negligible or relate to receptors which are only relevant once the Proposed Development is completed and in use (conditions at proposed amenity spaces or entrances). Therefore, all demolition and construction effects on thoroughfares, entrances, bus stops or amenity spaces are **Negligible** (not significant).
- 11.74** There are various effects related to strong winds for the Proposed Development, both within the bounds of the site and also off-site in the Northfleet Industrial Estate and Northfleet Harbour.
- 11.75** For the on-site issues, the level of exceedance is such that it would pose a risk to frail individuals or cyclists, but not to able bodied construction workers. As such this will not pose a safety risk during construction and is a **Negligible** effect (not significant).
- 11.76** The off-site issues identified are associated with the Phase 2 buildings within the site, and are resolved by the inclusion of landscaping, as presented in Configuration 4 later in this ES chapter. It is the perimeter planting that is pertinent for these issues. Until such a time as this planting is in place, there will be perimeter hoarding in the same locations, which will similarly restrict the airflow and hence resolve these issues. The effect will therefore be **Negligible** (not significant).
- 11.77** In addition to general demolition and construction effects, the phasing of the development has also been taken into consideration, to assess the likelihood of temporary effects occurring once Phase 1 of the Proposed Development is completed and operational, but prior to the commencement of Phase 2, as presented below in 'Configuration 2'.

Configuration 2: Intermediate Phase with Existing Surrounds

- 11.78** Configuration 2 represents Phase 1 of the Proposed Development complete, with the Phase 2 site area as existing, including existing surrounds. It should be noted that this configuration does not include any landscaping. The following figures are presented with regards to the testing of this configuration:
- Windiest season conditions at ground level for the Intermediate Phase with Existing Surrounds are shown in **Figure 11.11**;
 - Summer conditions at ground level for the Intermediate Phase with Existing Surrounds are shown in **Figure 11.12**;
 - Strong winds at ground level for the Intermediate Phase with Existing Surrounds are shown in **Figure 11.13**;
 - Windiest season conditions at the proposed resident amenity roofs for the Intermediate Phase with Existing Surrounds are shown in **Figure 11.14**;
 - Summer conditions at the proposed resident amenity roofs for the Intermediate Phase with Existing Surrounds are shown in **Figure 11.15**;
 - Strong winds at the proposed resident amenity roofs for the Intermediate Phase with Existing Surrounds are shown in **Figure 11.16**;
 - Windiest season conditions at potential balcony locations for the Intermediate Phase with Existing Surrounds are shown in **Figure 11.17**;
 - Summer conditions at potential balcony locations for the Intermediate Phase with Existing Surrounds are shown in **Figure 11.18**;
 - Strong winds at potential balcony locations for the Intermediate Phase with Existing Surrounds are shown in **Figure 11.19**; and
 - Sensitive receptor locations are shown in **Figure 11.10**.

Figure 11.10 Sensitive Receptor Locations



Pedestrian Comfort

- 11.79** Windiest season conditions range between suitable for sitting, standing, leisure walking, business walking and uncomfortable. Summer conditions range between suitable for sitting, standing, leisure walking and business walking.

Thoroughfares

On-Site

- 11.80** Conditions for all on-site thoroughfares range between sitting, standing and leisure walking and business walking in the windiest season and between sitting, standing and leisure walking in summer. The regions of business walking are too extensive to be considered localised are a category windier than required for the intended use. This is either suitable for the intended use or one category too windy, so thoroughfare wind effects range from **Negligible** (not significant) to **Minor Adverse** (significant).

Off-Site

- 11.81** Conditions for all off-site thoroughfares range between sitting, standing and leisure walking and business walking in the windiest season and between sitting, standing and leisure walking in summer. The regions of business walking are too extensive to be considered localised are a category windier than required for the intended use but are consistent with baseline conditions so represent a **Negligible** wind effect (not significant).

Entrances

On-Site

- 11.82** Conditions immediately adjacent to buildings within the Proposed Development range between suitable for sitting, standing, leisure walking and business walking in the windiest season and summer conditions range between suitable for sitting, standing, leisure walking and business walking. This ranges between suitable for the intended use, one category too windy and two categories too windy for the intended use, so on-site entrance wind effects range from **Negligible** (not significant) to **Moderate Adverse** (significant).

Off-Site

- 11.83** Conditions for all off-site entrances are suitable for either range between sitting, standing and leisure walking in the windiest season and between sitting and standing in summer. Those which are suitable for leisure walking in the windiest season are a category windier than required for the intended use but are consistent with baseline conditions so represent a **Negligible** wind effect (not significant).

Bus Stops

On Site

- 11.84** Conditions for potential bus stop locations range between suitable for sitting, standing, leisure walking and business walking in the windiest season and summer conditions range between suitable for sitting, standing, leisure walking and business walking. This ranges between suitable for the intended use, one category too windy and two categories too windy for the intended use, so on-site entrance wind effects range from **Negligible** (not significant) to **Moderate Adverse** (significant).

Off-Site

- 11.85** Conditions for the Taunton Road bus stops (marked B1 and B2) are suitable for standing in all seasons. This is suitable for the intended use. This is suitable for the intended use and represents a **Negligible** wind effect (not significant).

Ebbsfleet United FC

- 11.86** Conditions for the Ebbsfleet United FC stadium are suitable for a mixture of sitting and standing in all seasons. This was unsuitable for the intended use in the baseline but is now suitable for the intended use and represents a **Minor Beneficial** wind effect (not significant).

Amenity

On-Site

- 11.87** Conditions for Power Park are suitable for a mixture of leisure walking and business walking in the windiest season and for a mixture of standing and leisure walking in summer. This is a category windier than required for the intended use and is a **Minor Adverse** wind effect (significant).

- 11.88** Conditions for the Market Place are suitable for a mixture of standing and leisure walking in all seasons. This is a category windier than required for the intended use and is a **Minor Adverse** wind effect (significant).

- 11.89** Conditions for the proposed terraces range between suitable for standing, leisure walking and business walking in the windiest season, and between suitable for sitting, standing and leisure walking in summer. This is either suitable for the intended use or one category too windy, so terrace wind effects range from **Negligible** (not significant) to **Minor Adverse** (significant).

- 11.90** Conditions for potential balcony locations range between suitable for sitting, standing, leisure walking, business walking and uncomfortable in the windiest season and summer conditions range between suitable for sitting, standing, leisure walking and business walking. This ranges between suitable for the intended use, one category too windy and two categories too windy for the intended use, so balcony wind effects range from **Negligible** (not significant) to **Moderate Adverse** (significant).

Off-Site

- 11.91** Conditions for Swanscombe Marshes are suitable for a mixture of leisure walking and business walking in the windiest season and for a mixture of standing and leisure walking in summer. This is a category windier than required for the intended use but is consistent with the baseline conditions so is a **Negligible** wind effect (not significant).

- 11.92** Conditions for the off-site Black Eagle Drive play area (marked A1) are suitable for leisure walking in the windiest season and for standing in summer. This was unsuitable for the intended use in the baseline (Configuration 1) but is now suitable for the intended use and represents a **Minor Beneficial** wind effect (not significant).

River Surface

- 11.93** Conditions for the surface of the River Thames are suitable for a mixture of standing and leisure walking in the windiest season and for standing in summer. This is suitable for the intended use and represents a **Negligible** wind effect (not significant).

Strong Winds

On-Site

- 11.94** There are seven locations within the site which show a risk of strong winds (exceeding 15m/s for 0.022% of the year). These are located by the residential units to the north east of the site (marked 7, 8 and 9 in **Figure 11.13**), in Power Park (marked 10) and in the Market Place (marked 11). These pose a risk to the safety of pedestrians and cyclists and are a **Major Adverse** wind effect (significant).

- 11.95** There are residential amenity roof terraces proposed within the Proposed Development (as demonstrated by the Illustrative Masterplan) which are subject to a risk of strong winds (exceeding 15m/s for 0.022% of the year), markedly those within the residential buildings to the north west of the site. These pose a risk to the safety of terrace uses and are a **Major Adverse** wind effect (significant).

- 11.96** There are potential balcony locations within the Proposed Development which are subject to a risk of strong winds (exceeding 15m/s for 0.022% of the year), markedly those within the residential buildings to the north west of the site. These pose a risk to the safety of balcony users and are a **Major Adverse** wind effect (significant).

Off-Site

- 11.97** There are five locations which show a risk of strong winds (exceeding 15m/s for 0.022% of the year), located in Swanscombe Marshes (marked 2 in **Figure 11.13**), on Galley Hill Road (marked 3), in Wallis Park (marked 4) and within the Railway Lines (marked 5 and 6). These pose a risk to the safety of pedestrians and cyclists but were also present in the baseline conditions. As these have not been introduced by the Proposed Development, they represent a **Negligible** wind effect (not significant).

- 11.98** There is one location in Swanscombe Marshes (marked 1 in **Figure 11.13**) which does not carry a risk of strong winds (exceeding 15m/s for 0.022% of the year) but did in the baseline conditions. There is no longer a risk to the safety of pedestrians and cyclists in this region, which represents a **Major Beneficial** wind effect (not significant).

Figure 11.11 Configuration 2: Intermediate Phase with Existing Surrounds, Ground, Windiest Season (Annotated as described in Table 11.4)

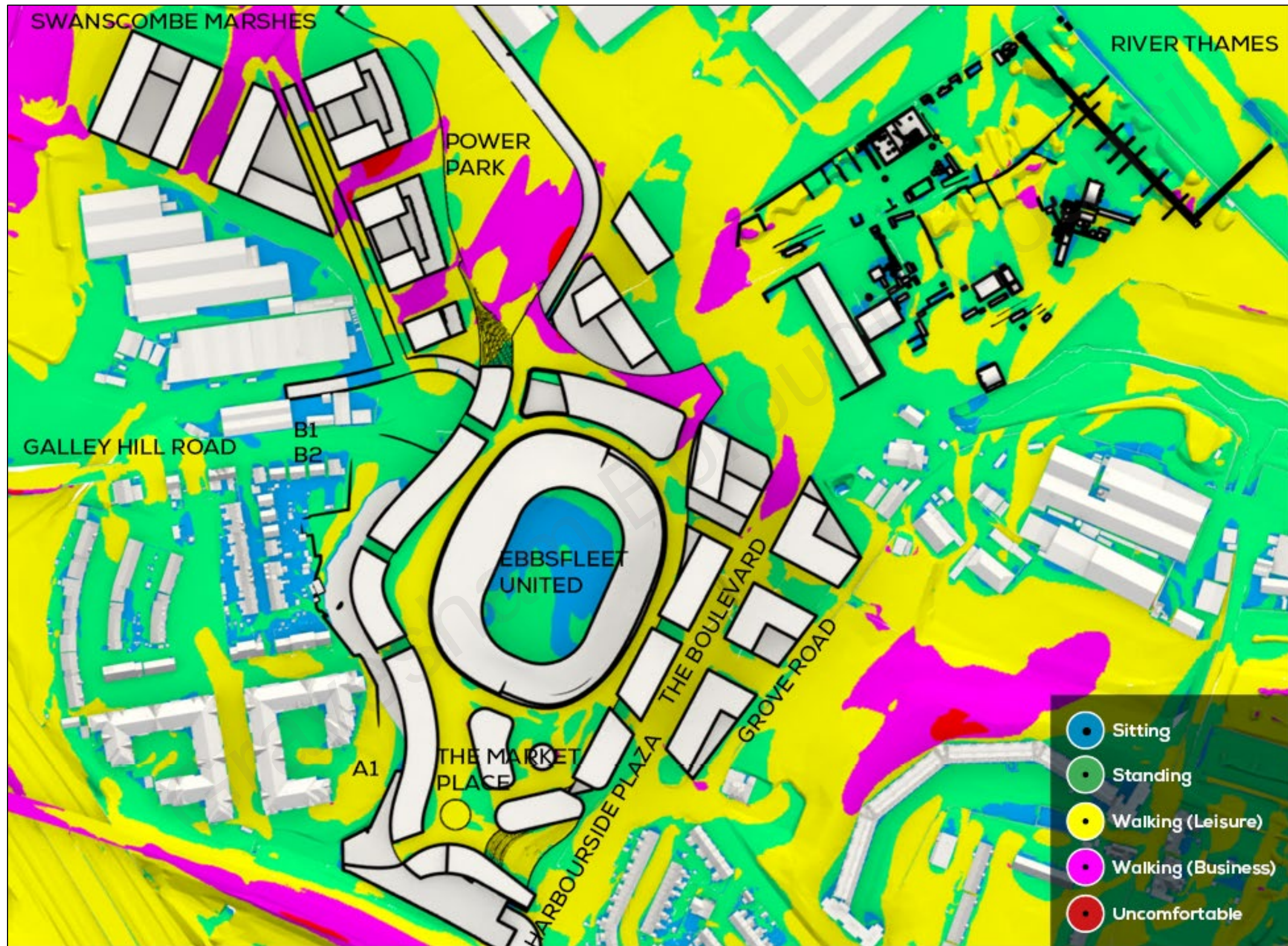


Figure 11.12 Configuration 2: Intermediate Phase with Existing Surrounds, Ground, Summer (Annotated as described in Table 11.4)

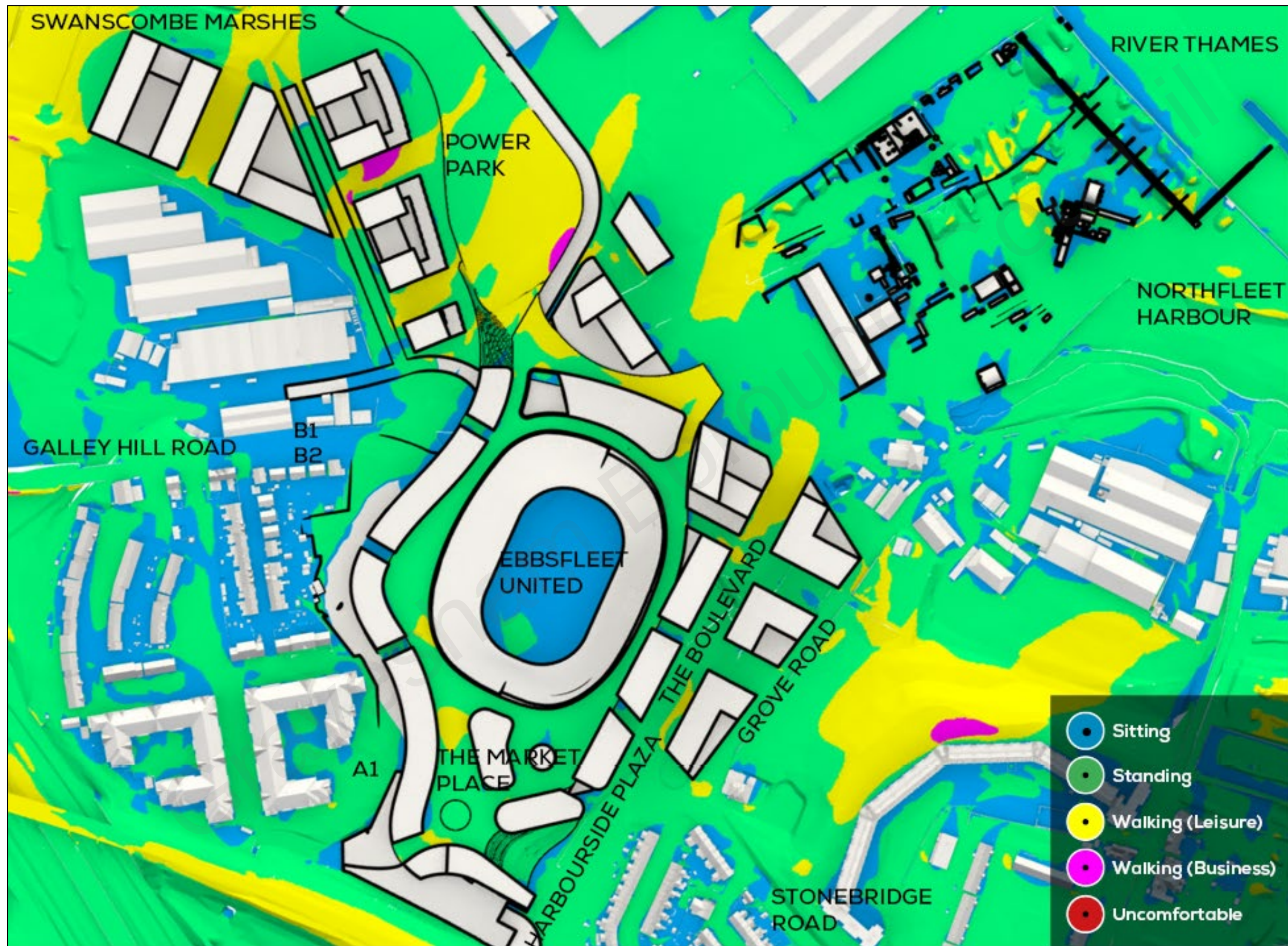


Figure 11.13 Configuration 2: Intermediate Phase with Existing Surrounds, Ground, Strong Winds (Annotated as described in Table 11.4)

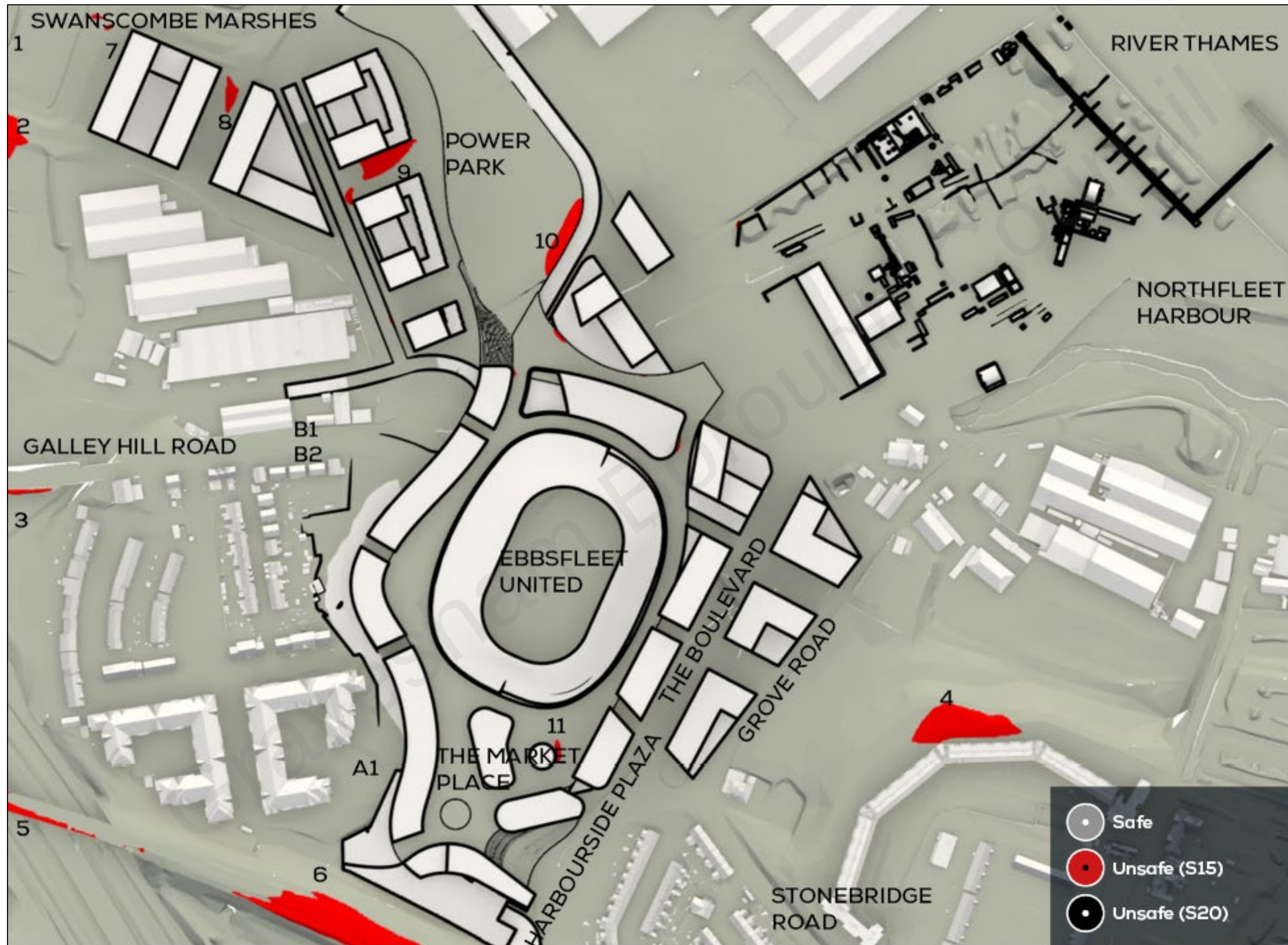


Figure 11.14 Configuration 2: Intermediate Phase with Existing Surrounds, Proposed Resident Amenity Roofs, Windiest Season

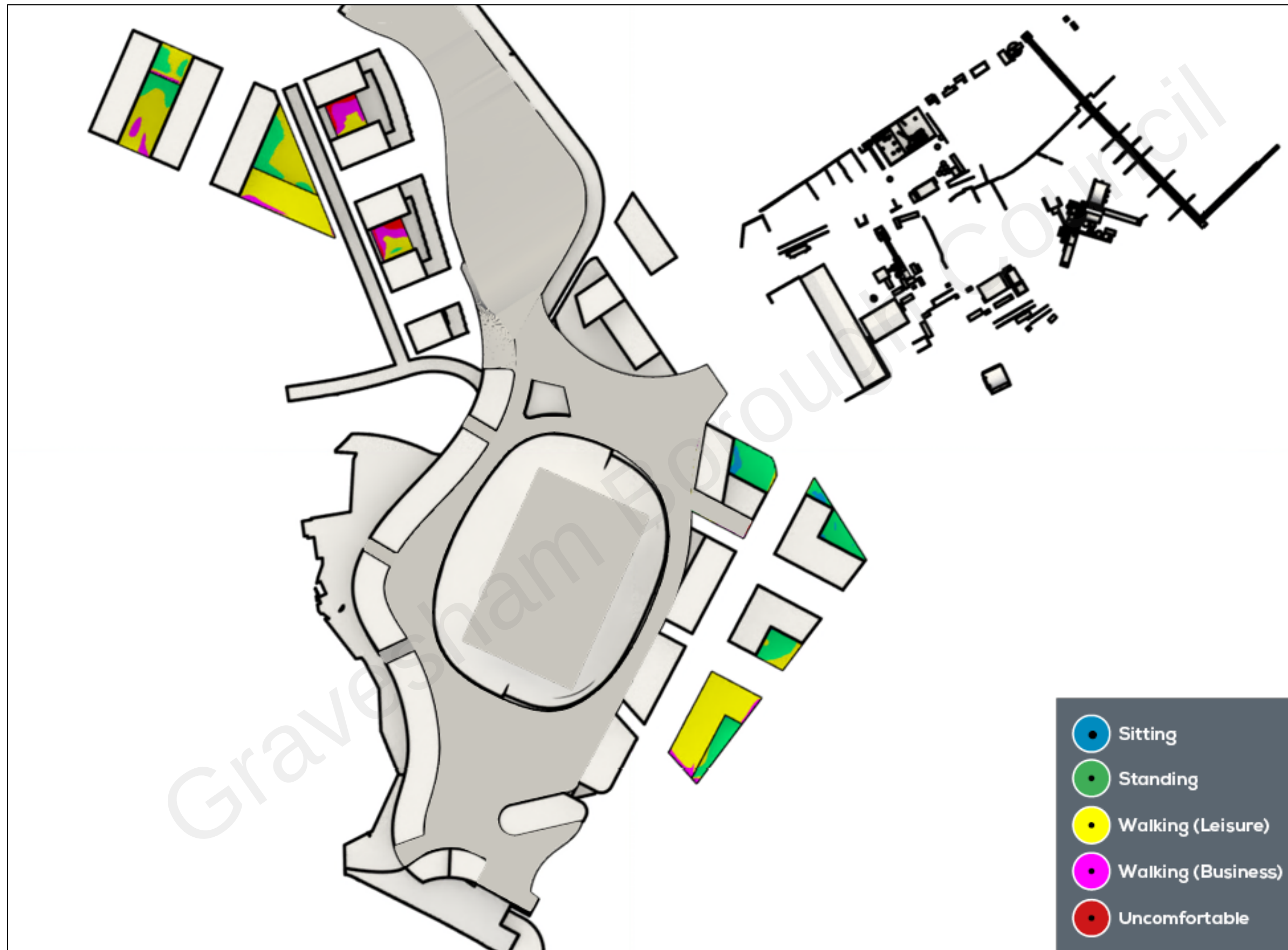


Figure 11.15 Configuration 2: Intermediate Phase with Existing Surrounds, Proposed Resident Amenity Roofs, Summer

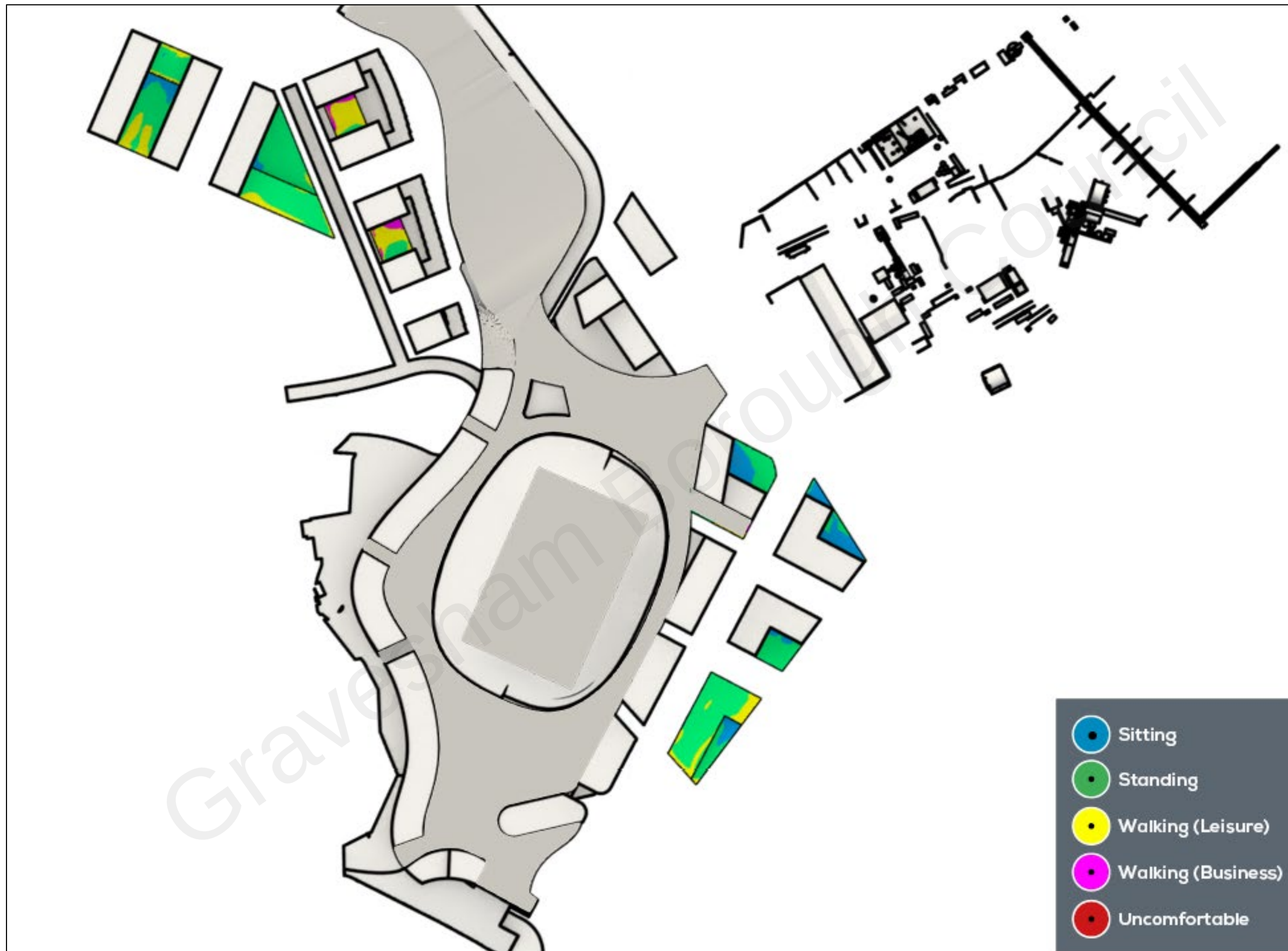


Figure 11.16 Configuration 2: Intermediate Phase with Existing Surrounds, Proposed Resident Amenity Roofs, Strong Winds

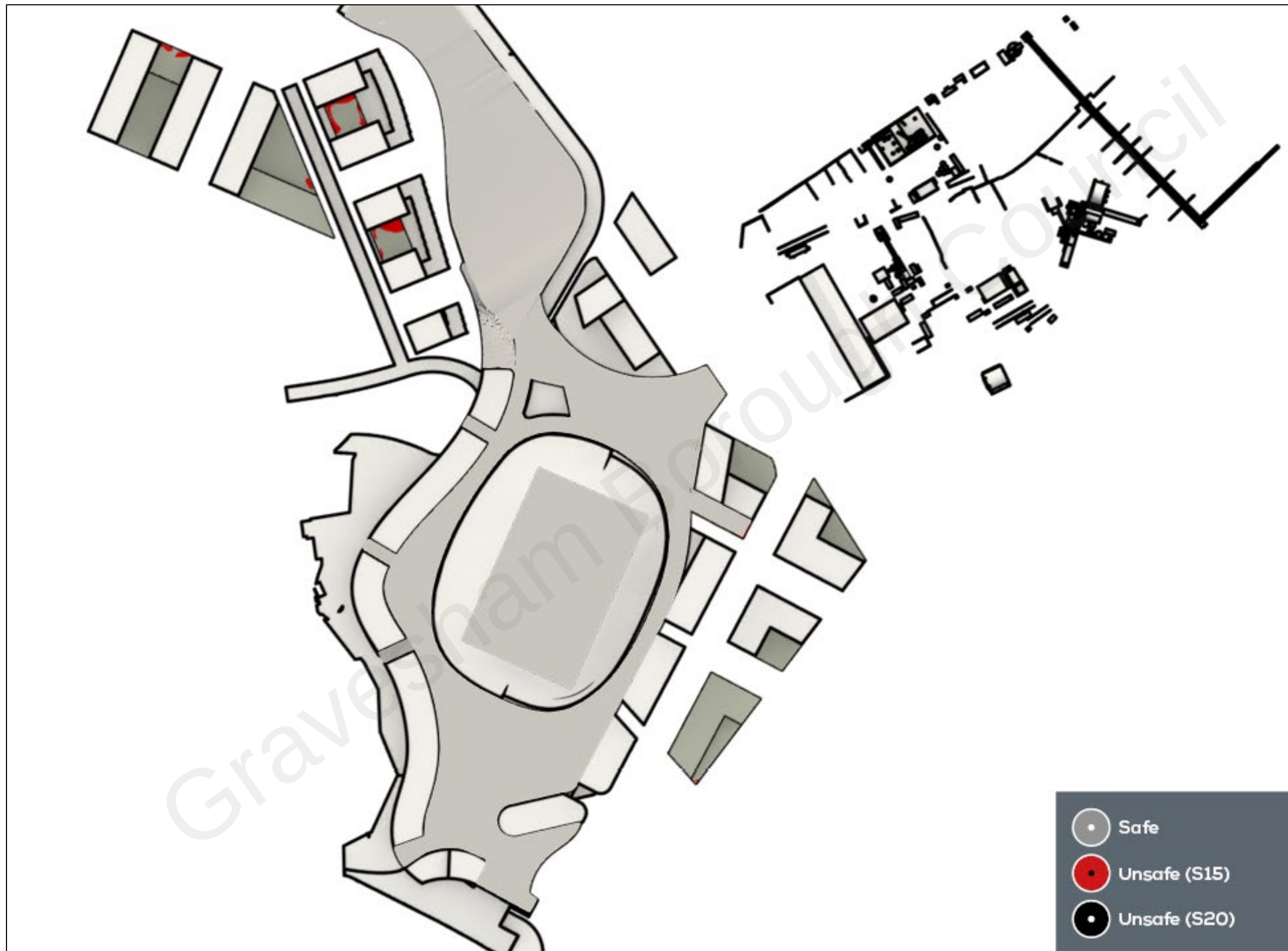


Figure 11.17 Configuration 2: Intermediate Phase with Existing Surrounds, Potential Balcony Locations, Windiest Season

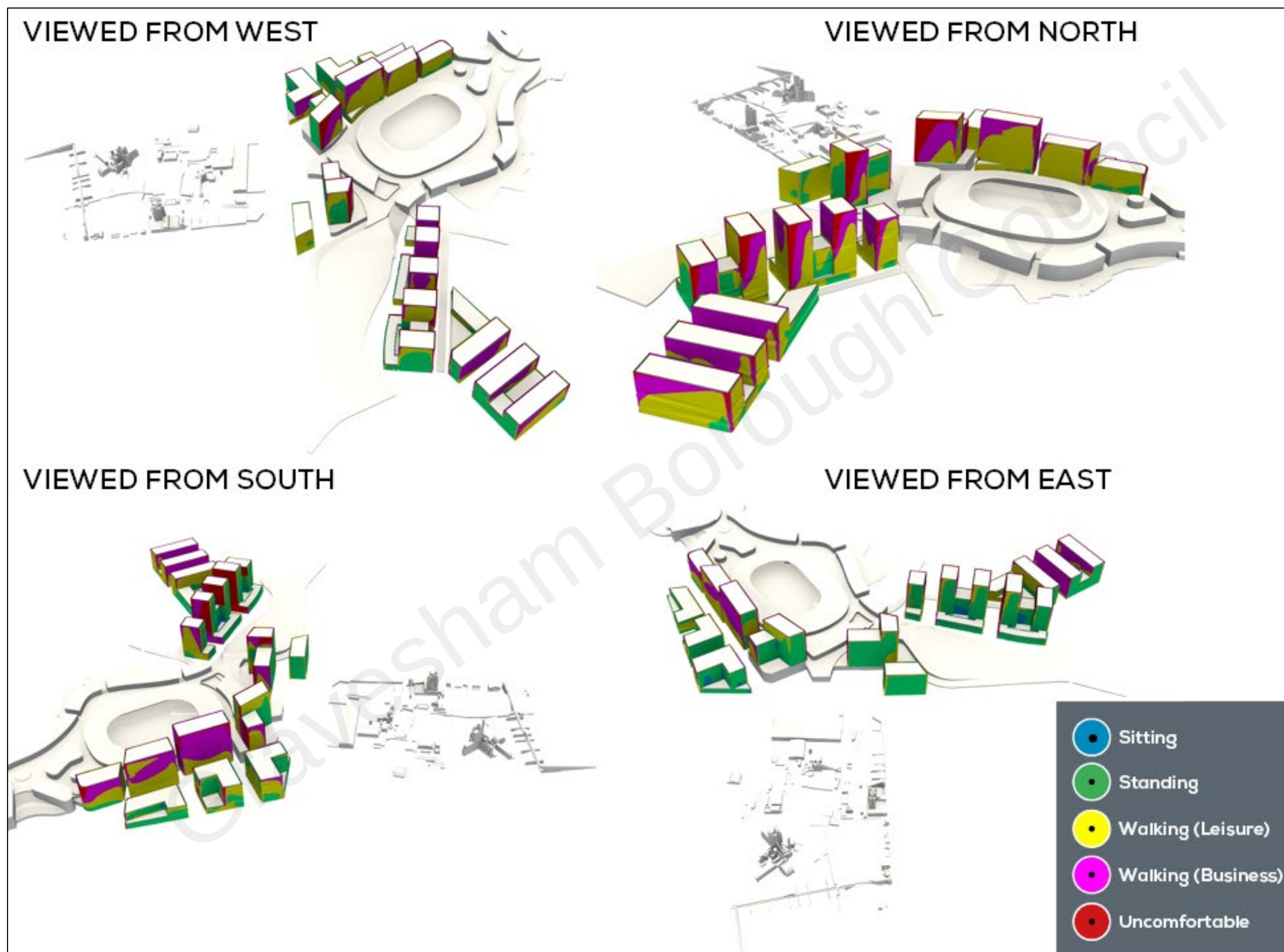


Figure 11.18 Configuration 2: Intermediate Phase with Existing Surrounds, Potential Balcony Locations, Summer

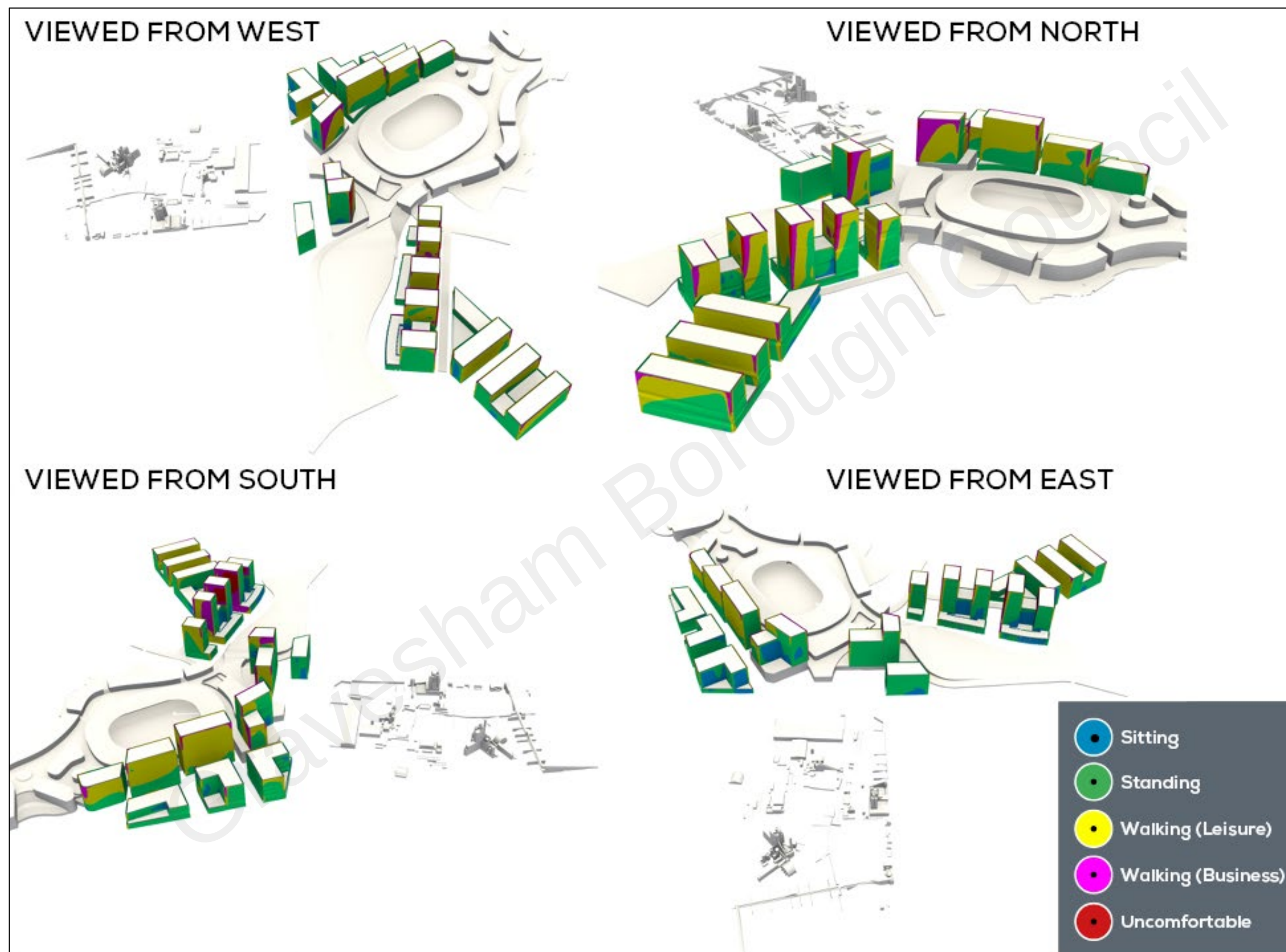
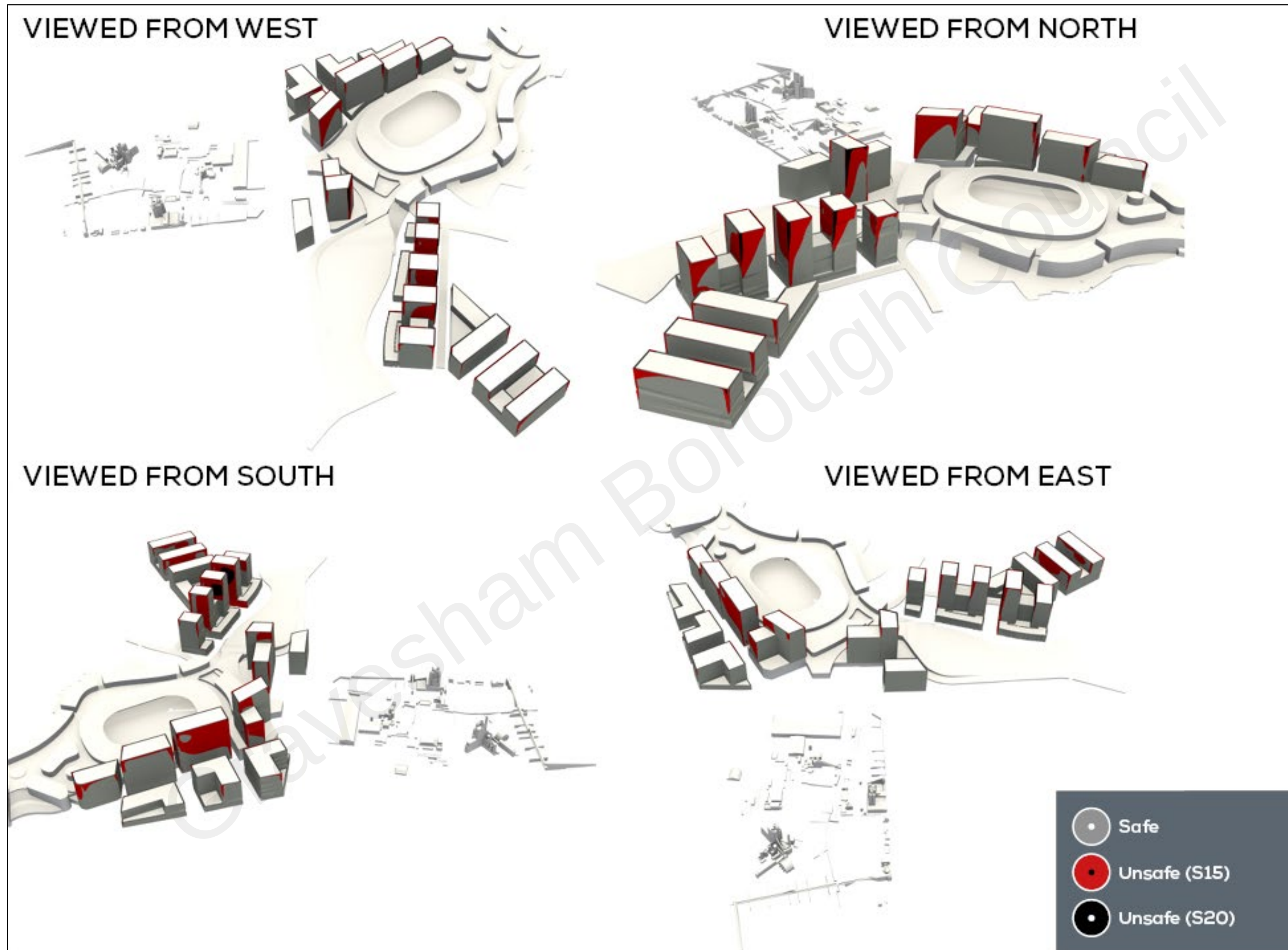


Figure 11.19 Configuration 2: Intermediate Phase with Existing Surrounds, Potential Balcony Locations, Strong Winds



Completed Development

Configuration 3: Proposed Development (Maximum Parameters) with Existing Surrounds

- 11.99** Configuration 3 represents the completed Proposed Development (tested on the basis of maximum parameters), including existing surrounds. It should be noted that this configuration does not include any landscaping. The following figures are presented with regards to the testing of this configuration:
- Windiest season conditions at ground level for the Proposed Development (Maximum Parameters) with Existing Surrounds are shown in **Figure 11.20**;
 - Summer conditions at ground level for the Proposed Development (Maximum Parameters) with Existing Surrounds are shown in **Figure 11.21**;
 - Strong winds at ground level for the Proposed Development (Maximum Parameters) with Existing Surrounds are shown in **Figure 11.22**;
 - Windiest season conditions at the proposed resident amenity roofs for the Proposed Development (Maximum Parameters) with Existing Surrounds are shown in **Figure 11.23**;
 - Summer conditions at the proposed resident amenity roofs for the Proposed Development (Maximum Parameters) with Existing Surrounds are shown in **Figure 11.24**;
 - Strong winds at the proposed resident amenity roofs for the Proposed Development (Maximum Parameters) with Existing Surrounds are shown in **Figure 11.25**;
 - Windiest season conditions at potential balcony locations for the Proposed Development (Maximum Parameters) with Existing Surrounds are shown in **Figure 11.26**;
 - Summer conditions at potential balcony locations for the Proposed Development (Maximum Parameters) with Existing Surrounds are shown in **Figure 11.27**;
 - Strong winds at potential balcony locations for the Proposed Development (Maximum Parameters) with Existing Surrounds are shown in **Figure 11.28**; and
 - Sensitive receptor locations are shown in **Figure 11.10**.

Pedestrian Comfort

- 11.100** Windiest season conditions range between suitable for sitting, standing, leisure walking, business walking and uncomfortable. Summer conditions range between suitable for sitting, standing, leisure walking and business walking.

Thoroughfares

On-Site

- 11.101** Conditions for all on-site thoroughfares range between sitting, standing and leisure walking and business walking in the windiest season and between sitting, standing and leisure walking in summer. The regions of business walking are too extensive to be considered localised are a category windier than required for the intended use. This is either suitable for the intended use or one category too windy, so thoroughfare wind effects range from **Negligible** (not significant) to **Minor Adverse** (significant).

Off-Site

- 11.102** Conditions for all off-site thoroughfares range between sitting, standing and leisure walking and business walking in the windiest season and between sitting, standing and leisure walking in summer. The regions of business walking are too extensive to be considered localised are a category windier than required for the intended use but are consistent with baseline conditions so represent a **Negligible** wind effect (not significant).

Entrances

On-Site

- 11.103** Conditions immediately adjacent to buildings within the Proposed Development range between suitable for sitting, standing, leisure walking and business walking in the windiest season and summer conditions range

between suitable for sitting, standing, leisure walking and business walking. This ranges between suitable for the intended use, one category too windy and two categories too windy for the intended use, so on-site entrance wind effects range from **Negligible** (not significant) to **Moderate Adverse** (significant).

Off-Site

- 11.104** Conditions for all off-site entrances are suitable for either range between sitting, standing and leisure walking in the windiest season and between sitting and standing in summer. Those which are suitable for leisure walking in the windiest season are a category windier than required for the intended use but are consistent with baseline conditions so represent a **Negligible** wind effect (not significant).

Bus Stops

On Site

- 11.105** Conditions for potential bus stop locations range between suitable for sitting, standing, leisure walking and business walking in the windiest season and summer conditions range between suitable for sitting, standing, leisure walking and business walking. This ranges between suitable for the intended use, one category too windy and two categories too windy for the intended use, so on-site entrance wind effects range from **Negligible** (not significant) to **Moderate Adverse** (significant).

Off-Site

- 11.106** Conditions for the Taunton Road bus stops (marked B1 and B2) are suitable for standing in all seasons. This is suitable for the intended use. This is suitable for the intended use and represents a **Negligible** wind effect (not significant).

Ebbsfleet United FC

- 11.107** Conditions for the Ebbsfleet United Football Stadium are suitable for a mixture of sitting and standing in all seasons. This was unsuitable for the intended use in the baseline (Configuration 1) but is now suitable for the intended use and represents a **Minor Beneficial** wind effect (not significant).

Amenity

On-Site

- 11.108** Conditions for Power Park are suitable for a mixture of leisure walking and business walking in the windiest season and for a mixture of standing and leisure walking in summer. This is a category windier than required for the intended use and is a **Minor Adverse** wind effect (significant).

- 11.109** Conditions for the Market Place are suitable for a mixture of standing and leisure walking in all seasons. This is a category windier than required for the intended use and is a **Minor Adverse** wind effect (significant).

- 11.110** Conditions for Riverwalk Gardens are suitable for a mixture of leisure walking and business walking in the windiest season and for a mixture of standing and leisure walking in summer. This is a category windier than required for the intended use and is a **Minor Adverse** wind effect (significant).

- 11.111** Conditions for the proposed terraces range between suitable for standing, leisure walking and business walking in the windiest season, and between suitable for sitting, standing and leisure walking in summer. This is either suitable for the intended use or one category too windy, so terrace wind effects range from **Negligible** (not significant) to **Minor Adverse** (significant).

- 11.112** Conditions for potential balcony locations range between suitable for sitting, standing, leisure walking, business walking and uncomfortable in the windiest season and summer conditions range between suitable for sitting, standing, leisure walking and business walking. This ranges between suitable for the intended use, one category too windy and two categories too windy for the intended use, so balcony wind effects range from **Negligible** (not significant) to **Moderate Adverse** (significant).

Off-Site

- 11.113** Conditions for Swanscombe Marshes are suitable for a mixture of leisure walking and business walking in the windiest season and for a mixture of standing and leisure walking in summer. This is a category windier than required for the intended use but is consistent with the baseline conditions so is a **Negligible** wind effect (not significant).

- 11.114** Conditions for the off-site Black Eagle Drive play area (marked A1) are suitable for leisure walking in the windiest season and for standing in summer. This was unsuitable for the intended use in the Baseline but is now suitable for the intended use and represents a **Minor Beneficial** wind effect (not significant).

River Surface

- 11.115** Conditions for the surface of the River Thames are suitable for a mixture of standing and leisure walking in the windiest season and for standing in summer. This is suitable for the intended use and represents a **Negligible** wind effect (not significant).

Strong Winds

On-Site

- 11.116** There are six locations within the site which show a risk of strong winds (exceeding 15m/s for 0.022% of the year). These are located by the residential units to the north east of the site (marked 7, 8 and 9 in **Figure 11.22**), in the Market place (marked 11) adjacent to the residential units at the north of the site (marked 12) and within Riverwalk Gardens (marked 13). These pose a risk to the safety of pedestrians and cyclists and are a **Major Adverse** wind effect (significant).
- 11.117** It should be noted that the region in Power Park (marked 10 in **Figure 11.22**) which was subject to risk of strong winds for the Intermediate Phase (Configuration 2) no longer poses this risk for the full Proposed Development.
- 11.118** There are residential amenity roof terraces within the Proposed Development which are subject to a risk of strong winds (exceeding 15m/s for 0.022% of the year), markedly those within the residential buildings to the north west of the site. These pose a risk to the safety of terrace uses and are a **Major Adverse** wind effect (significant).
- 11.119** There are potential balcony locations within the Proposed Development which are subject to a risk of strong winds (exceeding 15m/s for 0.022% of the year), markedly those within the residential buildings to the north west of the site. These pose a risk to the safety of balcony users and are a **Major Adverse** wind effect (significant).

Off-Site

- 11.120** There are two off-site locations which show a risk of strong winds (exceeding 15m/s for 0.022% of the year) but did not for the baseline conditions (Configuration 1). These are located near the River Thames, within Northfleet Industrial Estate (marked 14 in **Figure 11.22**) and in Northfleet Harbour (marked 16). These will pose a risk to the safety of pedestrians and cyclists and are a **Major Adverse** wind effect (significant).
- 11.121** There is another off-site location which show a risk of strong winds (exceeding 15m/s for 0.022% of the year) but did not for the baseline conditions (Configuration 1), which is also located in Northfleet Harbour (marked 15 in **Figure 11.22**). This would pose a risk to the safety of pedestrians and cyclists but is not accessible to the public once the Proposed Development is built-out so is considered a **Negligible** wind effect (not significant). Should the usage of this region of Northfleet Harbour change in future, this region will have to be addressed within the detailed design of the Proposed Development to ensure safe conditions, as discussed in the 'Mitigation, Monitoring and Residual Effects' section of this ES chapter.
- 11.122** There are five locations which show a risk of strong winds (exceeding 15m/s for 0.022% of the year), located in Swanscombe Marshes (marked 2 in **Figure 11.22**), on Galley Hill Road (marked 3), in Wallis Park (marked 4) and within the Railway Lines (marked 5 and 6). These pose a risk to the safety of pedestrians and cyclists but were also present in the baseline conditions. As these have not been introduced by the Proposed Development, they represent a **Negligible** wind effect (not significant).
- 11.123** There is one location in Swanscombe Marshes (marked 1 in **Figure 11.22**) which does not carry a risk of strong winds (exceeding 15m/s for 0.022% of the year) but did in the baseline conditions (Configuration 1). There is no longer a risk to the safety of pedestrians and cyclists in this region, which represents a **Major Beneficial** wind effect (not significant).

Figure 11.20 Configuration 3: Proposed Development (Maximum Parameters) with Existing Surrounds, Ground, Windiest Season (Annotated as described in Table 11.4)

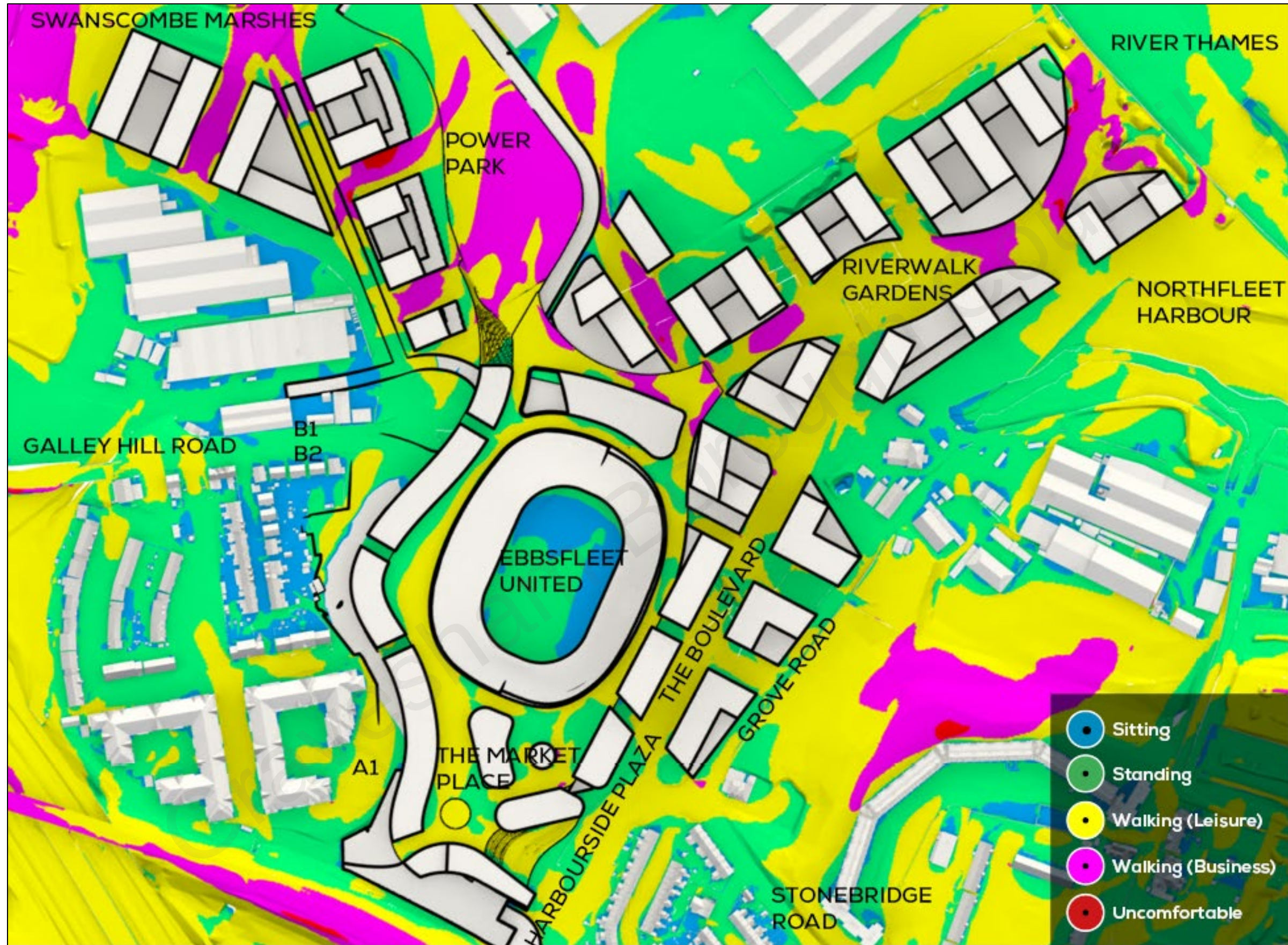


Figure 11.21 Configuration 3: Proposed Development (Maximum Parameters) with Existing Surrounds, Ground, Summer (Annotated as described in Table 11.4)

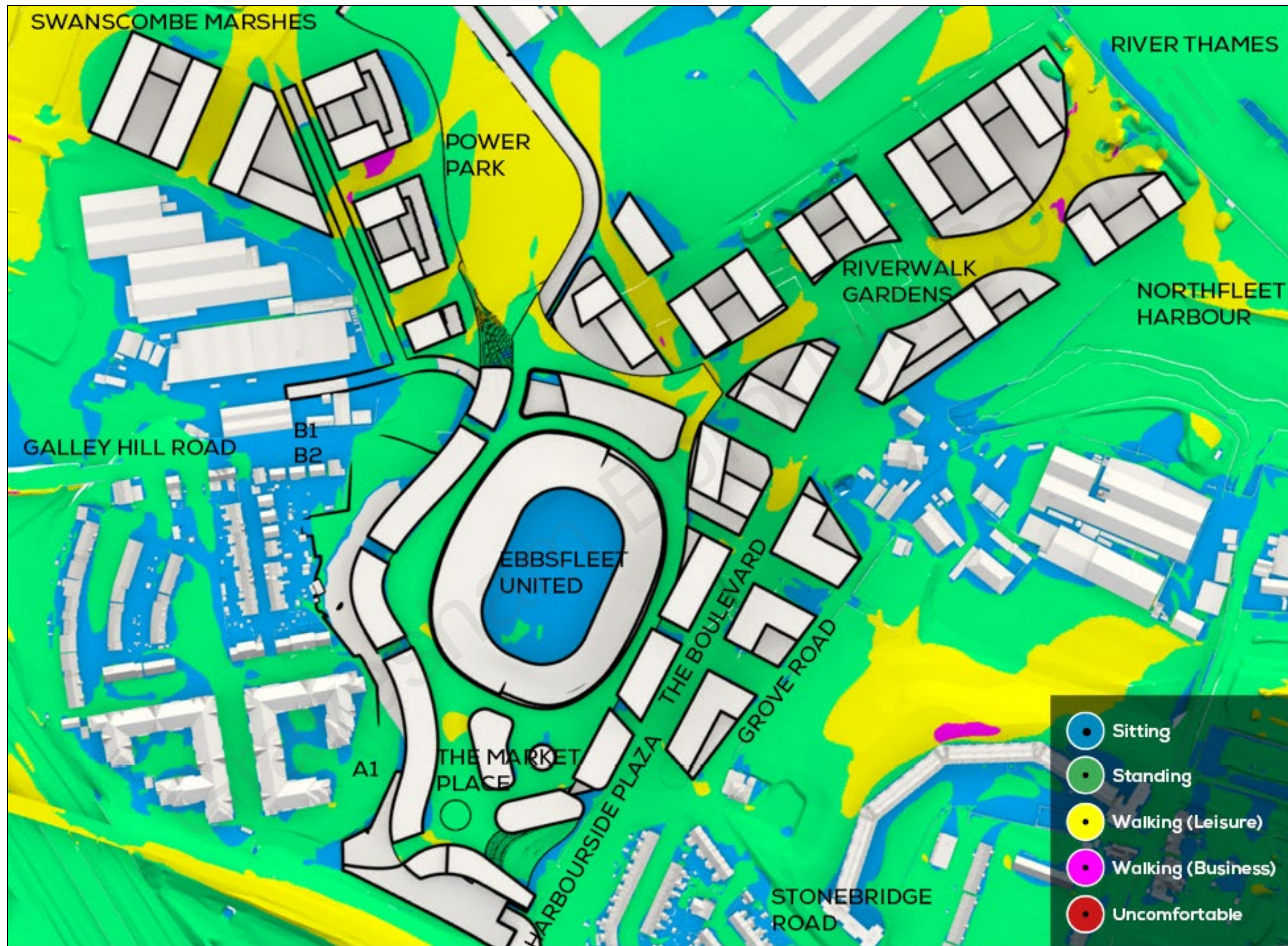


Figure 11.22 Configuration 3: Proposed Development (Maximum Parameters) with Existing Surrounds, Ground, Strong Winds (Annotated as described in Table 11.4)



Figure 11.23 Configuration 3: Proposed Development (Maximum Parameters) with Existing Surrounds, Proposed Resident Amenity Roofs, Windiest Season

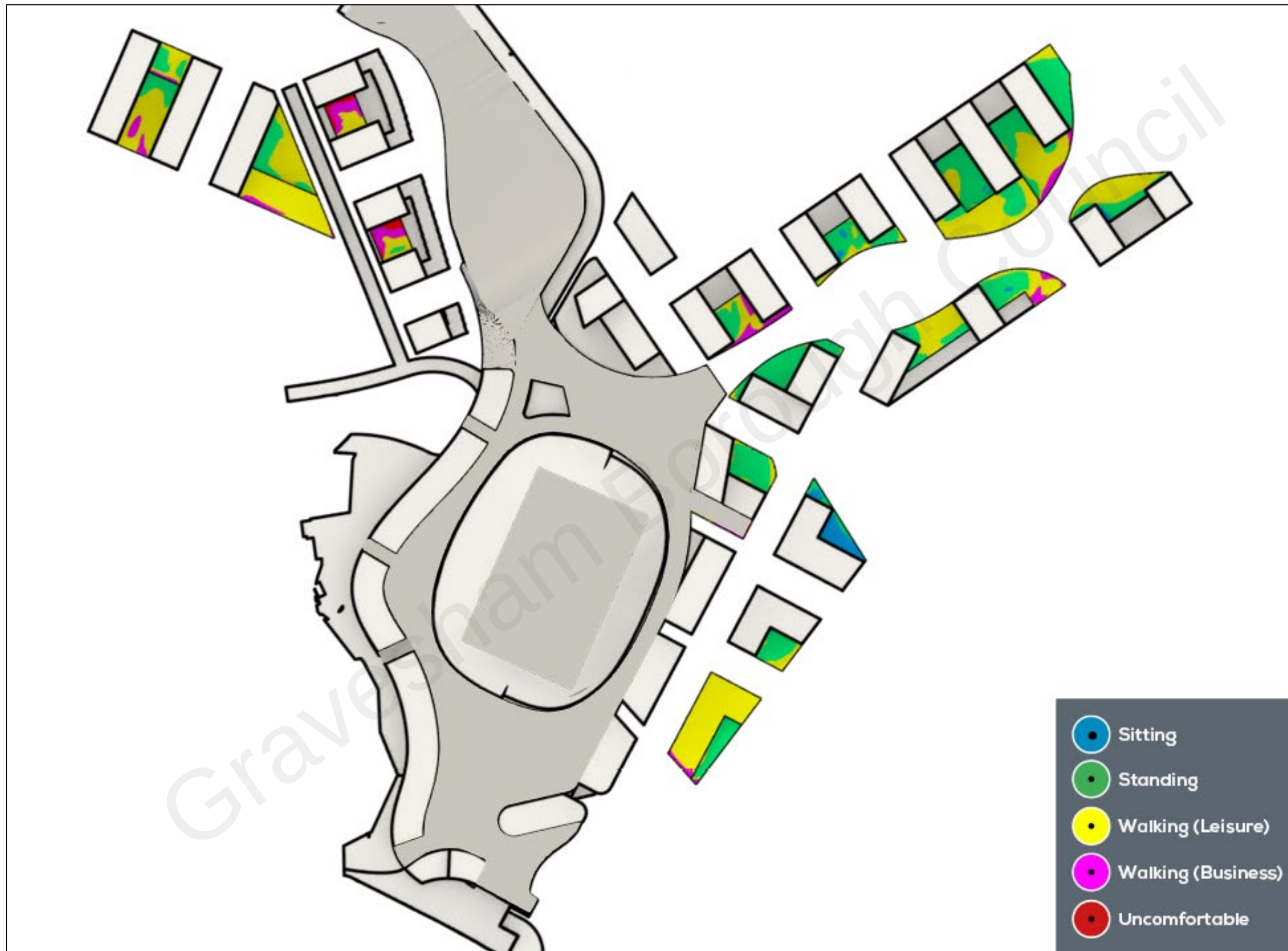


Figure 11.24 Configuration 3: Proposed Development (Maximum Parameters) with Existing Surrounds, Proposed Resident Amenity Roofs, Summer

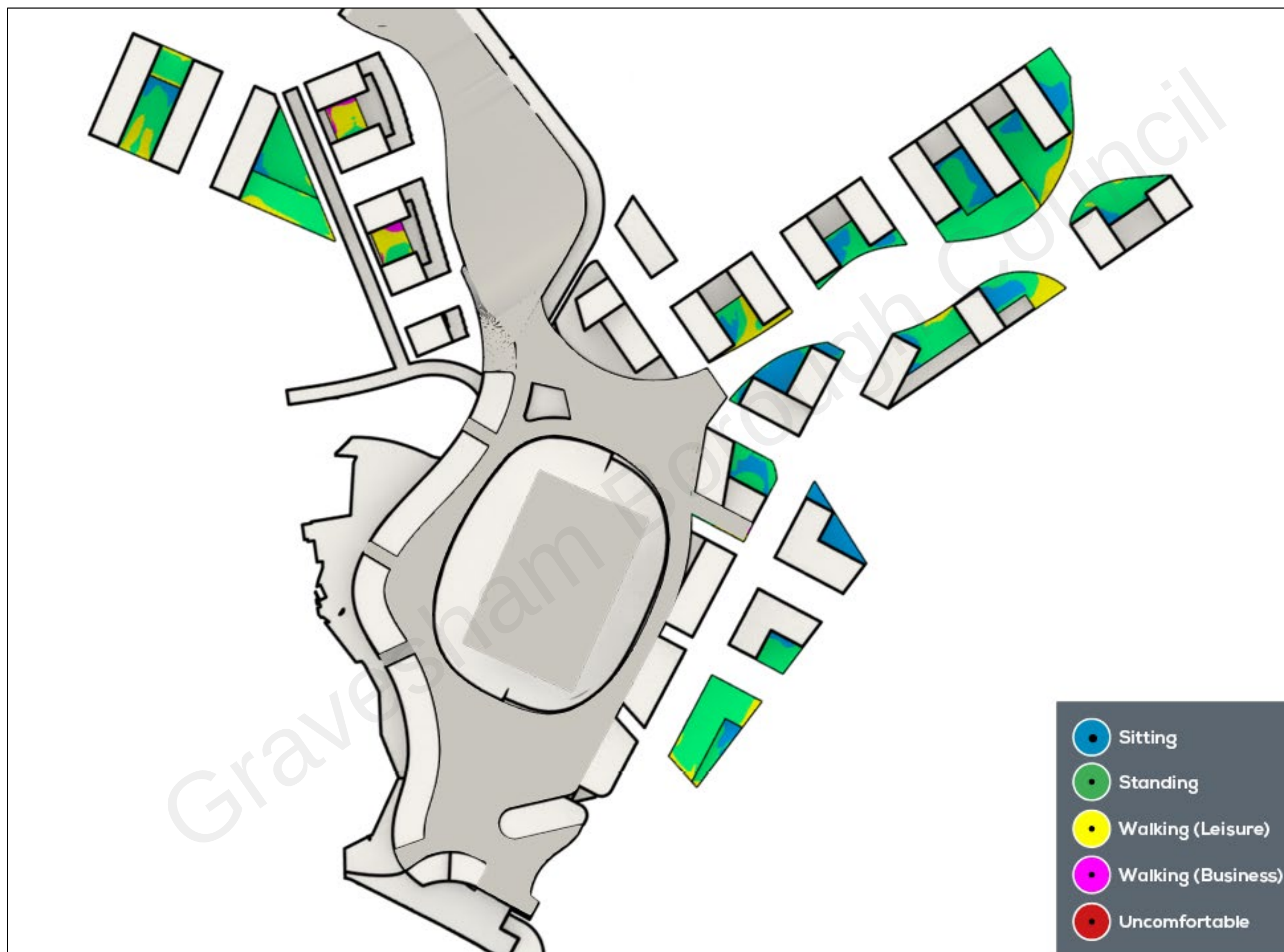


Figure 11.25 Configuration 3: Proposed Development (Maximum Parameters) with Existing Surrounds, Proposed Resident Amenity Roofs, Strong Winds

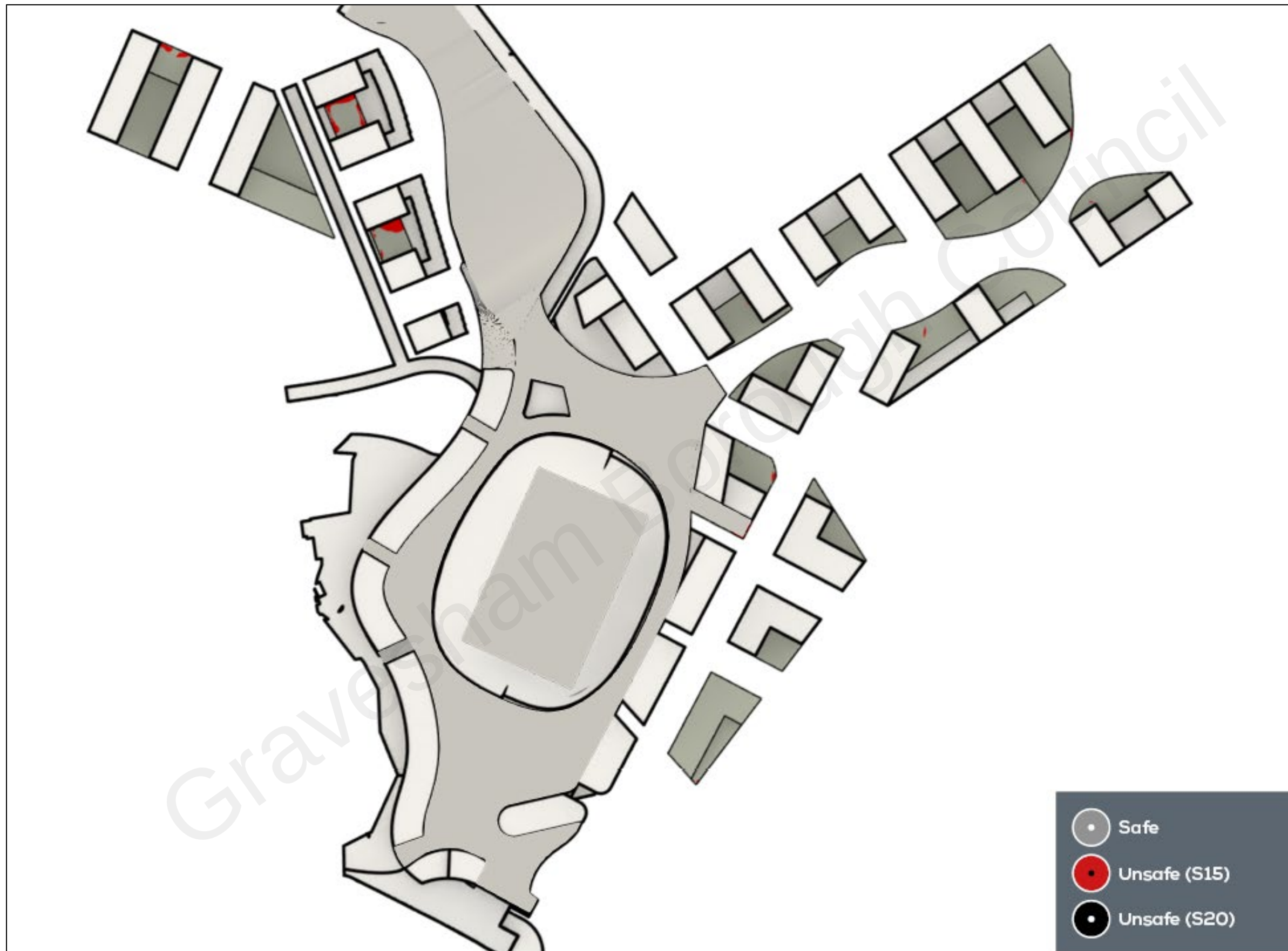


Figure 11.26 Configuration 3: Proposed Development (Maximum Parameters) with Existing Surrounds, Potential Balcony Locations, Windiest Season

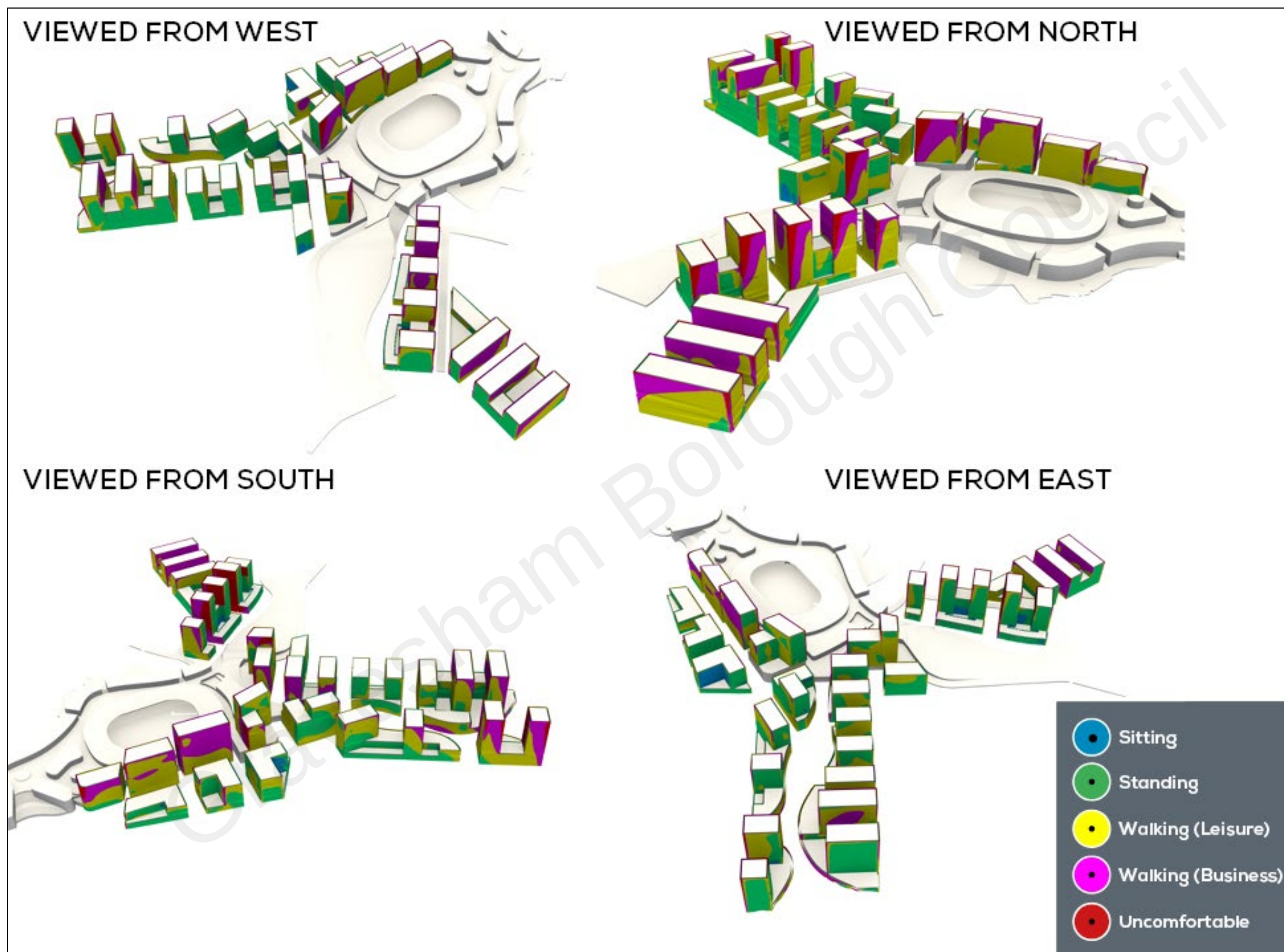
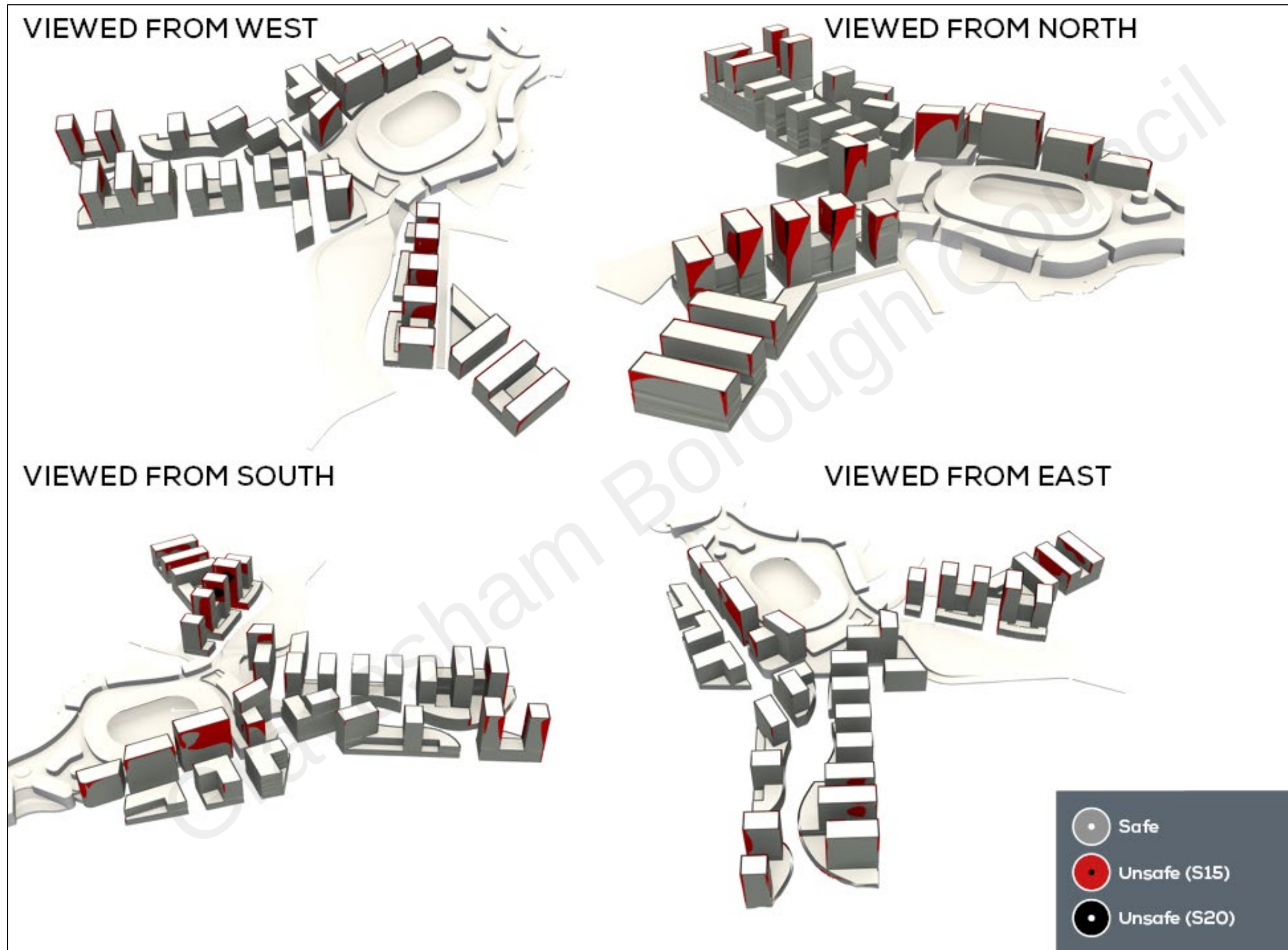


Figure 11.27 Configuration 3: Proposed Development (Maximum Parameters) with Existing Surrounds, Potential Balcony Locations, Summer



Figure 11.28 Configuration 3: Proposed Development (Maximum Parameters) with Existing Surrounds, Potential Balcony Locations, Strong Winds



MITIGATION, MONITORING AND RESIDUAL EFFECTS

Demolition and Construction Mitigation

- 11.124** As all general demolition and construction wind effects will be negligible (not significant), no specific wind mitigation measures will be required.
- 11.125** There are adverse effects associated with the Intermediate Phase (Configuration 2). The majority of these are in locations of the Phase 1 site area which are also subject to adverse effects for the completed Proposed Development (Configuration 3). Therefore, these will be resolved by the inclusion of the measures outlined below (Configuration 4) for the completed Proposed Development, and the residual effects will be **Negligible** (not significant).
- 11.126** There is one major adverse wind effect associated with the Intermediate Phase (Configuration 2) which is not also present for the completed Proposed Development (Configuration 3). This is the incidence of strong winds located in Power Park (marked 10 in **Figure 11.13**). From a comparison of this region with the illustrative landscaping (**Figure 11.5** – as assessed in Configuration 4) it is apparent that this incidence of strong winds will be entirely located within a cluster of proposed trees, and inaccessible to pedestrians. As such, the residual effect in this area will be **Negligible** (not significant).

Completed Development Mitigation

- 11.127** Mitigation principles are discussed below in relation to the maximum parameter Proposed Development tested and assessed within the ES chapter and the way in which they are expected to apply, i.e. ways in which adverse effects could be mitigated. Further review and wind testing/assessment will be undertaken where necessary at RMA stage(s) in relation to the detailed scheme geometry that would ultimately come forward and as part of this verification of the effectiveness of any wind mitigation measures required.
- 11.128** As noted previously, an initial illustrative landscaping masterplan was tested, although not reported as a separate configuration test within this ES chapter, in order to identify where further measures (e.g. additional planting) were required within the final illustrative landscaping (as tested by Configuration 4, and presented in **ES Volume 1, Chapter 4: The Proposed Development** and **Figure 11.5**), or to be secured by the Design Code, in order to achieve suitable wind conditions.
- 11.129** **Figure 11.29** shows the key areas identified with unsuitable conditions by this interim illustrative landscaping testing.

General Thoroughfares and Ground Level Amenity

- 11.130** Eight locations of major adverse (significant) wind effects due to strong winds were identified within Configuration 3 which require mitigation. The locations of these significant adverse effects are:
- Three locations around the residential units to the north east of the site;
 - Within the Market Place;
 - Adjacent to the residential units at the north of the site;
 - Within Riverwalk Gardens;
 - Off-site in Northfleet Industrial Estate; and
 - Off-site in Northfleet Harbour.
- 11.131** In addition to the above, minor adverse (significant) wind effects were identified within general thoroughfares and the proposed amenity in Power Park, Riverside Walk and the Market Place.

Figure 11.29 Interim Illustrative Landscaping Testing¹



- 11.132** **Figure 11.30** demonstrates the resultant changes made to the illustrative landscaping (as included within the final illustrative landscaping tested within Configuration 4) to resolve the issues identified within Configuration 3. The trees of the final illustrative landscaping plan were included in the model tested in Configuration 4, with all trees sized according to their expected sizes at planting and assumed deciduous (except for the regions indicated under **Figure 11.30**), to ensure conservative results.

¹ Note, colour coded by severity (red requires most intervention, green least).

Figure 11.30 Mitigation Implemented within Final Illustrative Landscaping



- A.** Ground level screening to boundary edge. With hedgerows and additional tree planting to form a continuous green buffer along southern boundary.
- B.** Enhanced green infrastructure providing structural planted buffer adjacent to boundary. To include densely planting edge of evergreen pine trees.
- C.** Enhanced entrance features to residential street, with feature screens extending from buildings, including hedge planting and trees along with decorative panelled fence screens.
- D.** A larger planted structural embankment spanning the podium level transition. Including a copse of both evergreen and deciduous trees.
- E.** A larger planted structural embankment spanning the podium level transition. Including a copse of both evergreen and deciduous trees.
- F.** A larger pocket park at edge of site boundary. To include densely planting edge of evergreen pine trees.
- G.** A structurally arranged group of street trees providing a canopy across the public space.
- H.** Ground level screening to boundary edge. With hedgerows and additional tree planting to form a continuous green buffer along south-east boundary.

11.133 As noted above, further testing of the detailed design (landscaping and buildings) will be undertaken as appropriate at the RMA stage(s). This detailed design may not necessarily include the exact mitigation measures included within the final illustrative landscaping, however testing/assessment will be required to demonstrate how suitable conditions will be achieved at the site. The Design Code includes a number of mandatory controls with regards to building entrances, roof terraces, bus stops and balconies, as set out below, in order to ensure that the detailed design considers and implements specific measures to mitigate the occurrence of potentially adverse wind effects.

Building Entrances

11.134 Significant wind effects ranging from minor to moderate adverse were identified for building entrances within the Proposed Development (Configuration 3) - see **Figure 11.20**. In order to mitigate this, the Design Code includes a mandatory control that any entrances which are located in unsuitable regions (leisure walking or windier conditions) are recessed by at least 1.5m (or similarly protected) to ensure pockets of calms conditions immediately adjacent to the entrances. However, if non-recessed entrances are considered within these areas at the detailed design stage, further wind testing of the detailed designs will need to be undertaken, with the testing and implementation of appropriate mitigation measures (such as localised screening or planting adjacent to the entrance location) in order to ensure that the required wind conditions are achieved. As entrances within areas with leisure walking or windier conditions may currently be unsuitable for use without the testing and implementation of further measures, the assessment of appropriate measures by an experienced wind engineer, if required, should be secured through an appropriately worded planning condition.

11.135 Taking into account this mandatory control, this will ensure that all residual on-site entrance effects are **negligible** (not significant).

Residents Amenity Terraces

11.136 Significant wind effects ranging from minor to major adverse were identified at residential amenity terraces (Configuration 3), such as the potential roof terraces on the residential units at the north-west of the site (see **Figure 11.24**). These residential amenity terrace locations would not be suitable for use when considering the maximum parameters assessed. In order to mitigate this, the Design Code includes a mandatory control that solid perimeter screening (2m high) should be utilised at these locations within the detailed design to establish habitable conditions relevant to the roof terrace use. However, if less significant screening is required at the detailed design stage, further wind testing of the detailed designs will need to be undertaken, with the testing of appropriate mitigation measures (such as localised screening or planting adjacent to seating areas) in order to ensure that the required wind conditions are achieved. As the terraces in these locations may currently be unsuitable for use without the testing and implementation of further measures, the assessment of appropriate measures by an experienced wind engineer should be secured through an appropriately worded planning condition.

11.137 Taking into account this mandatory control, this will ensure that all residual on-site roof terrace effects are **negligible** (not significant).

Balconies

11.138 Significant wind effects ranging from minor to major adverse were identified for potential balcony locations. In order to mitigate this, the Design Code includes controls with regards to the detailed design to specify regions where mitigation and further testing are required if protruding balconies are proposed. With reference to **Figure 11.27**, this includes:

- Any protruding balconies within green or blue regions (sitting and standing conditions) would be expected to be suitable for use with standard balustrades (e.g. 1.1m high railings, metal balustrades, solid glass balustrades or a combination);
- Any protruding balconies within yellow regions (leisure walking conditions) would require measures such as solid glazed balustrades or raised height (e.g. 1.5m) porous balustrades. Further wind testing of the detailed design would confirm the suitability of protruding balconies at these locations with the inclusion of relevant measures (such as glazed or raised height balustrades). As wind conditions at protruding balconies in these locations would be unsuitable for use without the implementation of these measures, the implementation of these measures or assessment of alternatives by an experienced wind engineer should be secured through an appropriately worded planning condition; and
- Based on the current parameters tested, protruding balconies in magenta or red regions (business walking and uncomfortable conditions) would not be suitable for use. Alternative options to protruding

balconies (e.g. winter gardens) should be explored at these locations within the detailed design. However, if protruding balconies are considered within these areas at the detailed design stage, further wind testing of the detailed designs will need to be undertaken, with the testing of appropriate mitigation measures (such as 2m high solid side panels or fully enclosed spaces with openable fenestrations) in order to ensure that the required wind conditions are achieved. As protruding balconies in these locations would currently be unsuitable for use without the testing and implementation of further measures, the assessment of appropriate measures by an experienced wind engineer should be secured through an appropriately worded planning condition.

- 11.139** Taking into account these mandatory controls, this will ensure that all residual balcony effects are **negligible** (not significant).

Bus Stops

- 11.140** The final location of on-site bus stops will be determined during the detailed design of the Proposed Development. Any proposed bus stops above podium level located within regions suitable for leisure walking or windier (see **Figure 11.20**) would not be suitable for use. In order to mitigate this, the Design Code includes a mandatory control that bus shelters with solid side panels should be explored at these locations as necessary within the detailed design. As bus stops at podium level in these locations would be unsuitable for use without the testing and implementation of further measures, the assessment of appropriate measures by an experienced wind engineer, if required, should be secured through an appropriately worded planning condition.

- 11.141** Taking into account these mandatory controls, this will ensure that all residual bus stop effects are **negligible** (not significant).

Configuration 4: Proposed Development (Maximum Parameters) with Final Illustrative Landscaping and Existing Surrounds

- 11.142** Configuration 4 represents the completed Proposed Development (maximum parameters), including existing surrounds. It should be noted that, in contrast to Configuration 3, this configuration includes the final illustrative landscaping (as per **Figure 11.5**). The following figures are presented with regards to the testing of this configuration:

- Windiest season conditions at ground level for the Proposed Development (Maximum Parameters) with Final Illustrative Landscaping (Including Mitigation) and Existing Surrounds are shown in **Figure 11.1**.
- Summer conditions at ground level for the Proposed Development (Maximum Parameters) with Final Illustrative Landscaping (Including Mitigation) and Existing Surrounds are shown in **Figure 11.32**.
- Strong winds at ground level for the Proposed Development (Maximum Parameters) with Final Illustrative Landscaping (Including Mitigation) and Existing Surrounds are shown in **Figure 11.33**.
- Windiest season conditions at the proposed resident amenity roofs for the Proposed Development (Maximum Parameters) with Final Illustrative Landscaping (Including Mitigation) and Existing Surrounds are shown in **Figure 11.34**.
- Summer conditions at the proposed resident amenity roofs for the Proposed Development (Maximum Parameters) with Final Illustrative Landscaping (Including Mitigation) and Existing Surrounds are shown in **Figure 11.35**.
- Strong winds at the proposed resident amenity roofs for the Proposed Development (Maximum Parameters) with Final Illustrative Landscaping (Including Mitigation) and Existing Surrounds are shown in **Figure 11.36**.
- Windiest season conditions at potential balcony locations for the Proposed Development (Maximum Parameters) with Final Illustrative Landscaping (Including Mitigation) and Existing Surrounds are shown in **Figure 11.37**.
- Summer conditions potential balcony locations for the Proposed Development (Maximum Parameters) with Final Illustrative Landscaping (Including Mitigation) and Existing Surrounds are shown in **Figure 11.38**.
- Strong winds at potential balcony locations for the Proposed Development (Maximum Parameters) with Final Illustrative Landscaping (Including Mitigation) and Existing Surrounds are shown in **Figure 11.39**.

- Sensitive receptor locations are shown in **Figure 11.10**.

Pedestrian Comfort

- 11.143** All of the regions which were suitable for Configuration 3 remained suitable for Configuration 4. Conditions for those regions which were subject to adverse effects are reported below.

Thoroughfares

On-Site

- 11.144** Conditions for all on-site thoroughfares are range between sitting, standing and leisure walking and business walking in the windiest season and between sitting, standing and leisure walking in summer. The regions of business walking are now either located within the proposed roadway or restricted to localised regions within the footpaths. This is now suitable for the intended use and the residual effect is **Negligible** (not significant).

Entrances

On-Site

- 11.145** The mandatory controls included in the Design Code, as outlined above, will ensure that all on-site entrance conditions will be suitable and residual effects will be **Negligible** (not significant).

Bus Stops

On-Site

- 11.146** The mandatory controls included in the Design Code, as outlined above, will ensure that all on-site bus stop conditions will be suitable and residual effects will be **Negligible** (not significant).

Amenity

On-Site

- 11.147** Conditions for Power Park are suitable for mixture of standing and leisure walking in all seasons. Conditions are significantly calmer than in Configuration 3, but do not contain any regions which would be suitable for seating (without further mitigation) and conditions are therefore a category windier than required for the intended use and is a **Minor Adverse** residual wind effect (significant).

- 11.148** Conditions for Riverwalk Gardens are suitable for a mixture of standing, leisure walking and business walking in the windiest season and for a mixture of sitting, standing and leisure walking in summer. Conditions are significantly calmer than in Configuration 3, but there are still regions which are suitable for leisure walking in summer which is therefore a category windier than required for the intended use and is a **Minor Adverse** residual wind effect (significant).

- 11.149** It should be noted that following the testing of Configuration 4, additional mandatory controls with regards to the ground level amenity space on-site have been added to the Design Code to ensure that these significant adverse effects are resolved as part of the detailed design. This includes the following measures:

- Any dwelling spaces (e.g. a standing or sitting space) which are located within regions which are suitable for leisure walking conditions (or windier) would not be suitable for use when considering the maximum parameters assessed. These regions should be designated within the design of the amenity spaces to be transitory spaces rather than dwell spaces, to ensure suitable conditions. However, if dwelling spaces within these regions are considered at the detailed design stage, further wind testing of the detailed designs will need to be undertaken, with the testing of appropriate mitigation measures (such as localised screening or planting) in order to ensure that the required wind conditions are achieved. As the amenity spaces in these locations may be unsuitable for use without the testing and implementation of further measures, the assessment of appropriate measures by an experienced wind engineer, if required, should be secured through an appropriately worded planning condition; and
- Any seating areas within amenity spaces which are located within regions which are suitable for standing conditions (or windier) would not be suitable for use when considering the maximum parameters assessed. Seating areas should not be included in these areas without appropriate mitigation to ensure suitable conditions. If seating areas within these regions are considered at the detailed design stage, further wind testing of the detailed designs will need to be undertaken, with the testing of appropriate mitigation measures (such as localised screening or planting immediately adjacent to the proposed seating areas) in order to ensure that the required wind conditions are achieved. As the amenity spaces

in these locations may be unsuitable for use without the testing and implementation of further measures, the assessment of appropriate measures by an experienced wind engineer, if required, should be secured through an appropriately worded planning condition.

- 11.150** Conditions for the Market Place are suitable for a mixture of standing and leisure walking in the windiest season and for a mixture of sitting and standing summer. This is now suitable for the intended use and the residual effect is **Negligible** (not significant).
- 11.151** Conditions for the proposed terraces range between suitable for sitting, standing and leisure walking in the windiest season, and between suitable for sitting and standing in summer. This is now suitable for the intended use and the residual effect is **Negligible** (not significant).
- 11.152** The mandatory controls included in the Design Code, as outlined above, will ensure that all balcony conditions will be suitable and residual effects will be **Negligible** (not significant).

Strong Winds

On-Site

- 11.153** The six locations within the site which showed a risk of strong winds (exceeding 15m/s for 0.022% of the year) when tested for Configuration 3 (located by the residential units to the north east of the site (marked 7, 8 and 9 in **Figure 11.22**), in the Market place (marked 11) adjacent to the residential units at the north of the site (marked 12) and within Riverwalk Gardens (marked 13)) have been eradicated, and the only extremely localised on-site risks of strong winds lie in regions which the illustrative landscaping show as inaccessible to pedestrians. There is no longer a significant risk to the safety of pedestrians or cyclists due to strong winds and residual effects are **Negligible** (not significant).
- 11.154** There are no longer any regions which show a risk of strong winds (exceeding 15m/s for 0.022% of the year) on any of the residential amenity roof terraces. There is no longer a significant risk to the safety of terrace users and residual effects are **Negligible** (not significant).
- 11.155** The mandatory controls included in the Design Code, as outlined above, will ensure that there will be no significant risks of strong winds at balcony level, and residual effects will be **Negligible** (not significant).

Off-Site

- 11.156** The two off-site instances of strong winds, which had been attributable to the Proposed Development and were located within Northfleet Industrial Estate (marked 14 in **Figure 11.22**) and in Northfleet Harbour (marked 16), have been eradicated. There is no longer a significant risk to the safety of pedestrians or cyclists due to strong winds in these regions and residual effects are **Negligible** (not significant).
- 11.157** The off-site location also located in Northfleet Harbour (marked 15 in **Figure 11.33**) still shows a risk of strong winds (exceeding 15m/s for 0.022% of the year). However, this has reduced significantly since the testing in Configuration 3, demonstrating the beneficial effect that final illustrative landscaping has had on the wind conditions at this location. As previous, this would still pose a risk to the safety of pedestrians and cyclists but is not accessible to the public once the Proposed Development is built-out so is considered a **Negligible** wind effect (not significant). Should the usage of this region of Northfleet Harbour change in future, this region will have to be addressed within the detailed design of the Proposed Development to ensure safe conditions. Therefore, the following mandatory control has been included within the Design Code:
- If in the future access is proposed within the area to the immediate east of the site (to the north of Robin's Creek²), the detailed landscaping design of the north-eastern extent of the site will need to consider additional mitigation in order to resolve a localised area of off-site wind safety risk. This location is also currently inaccessible to the public and in part comprises bare ground used by the existing on-site aggregates works (which will be displaced to allow for the Proposed Development to come forward). When considering the implementation of the illustrative landscaping, the area of wind safety risk is reduced to be extremely localised, therefore demonstrating that the implementation of additional measures on the north-east corner of the site would likely resolve this issue. The assessment of appropriate measures by an experienced wind engineer should be secured through an appropriately worded planning condition if access at this location is envisaged in the future to ensure that this localised area of off-site wind safety risk is resolved within the detailed design.

² Note, ownership of this area of land associated with Robin's Creek is with a local land owner and does not form part of the planning application.

Figure 11.31 Configuration 4: Proposed Development (Maximum Parameters) with Final Illustrative Landscaping (Including Mitigation) and Existing Surrounds, Ground, Windiest Season (Annotated as described in Table 11.4)

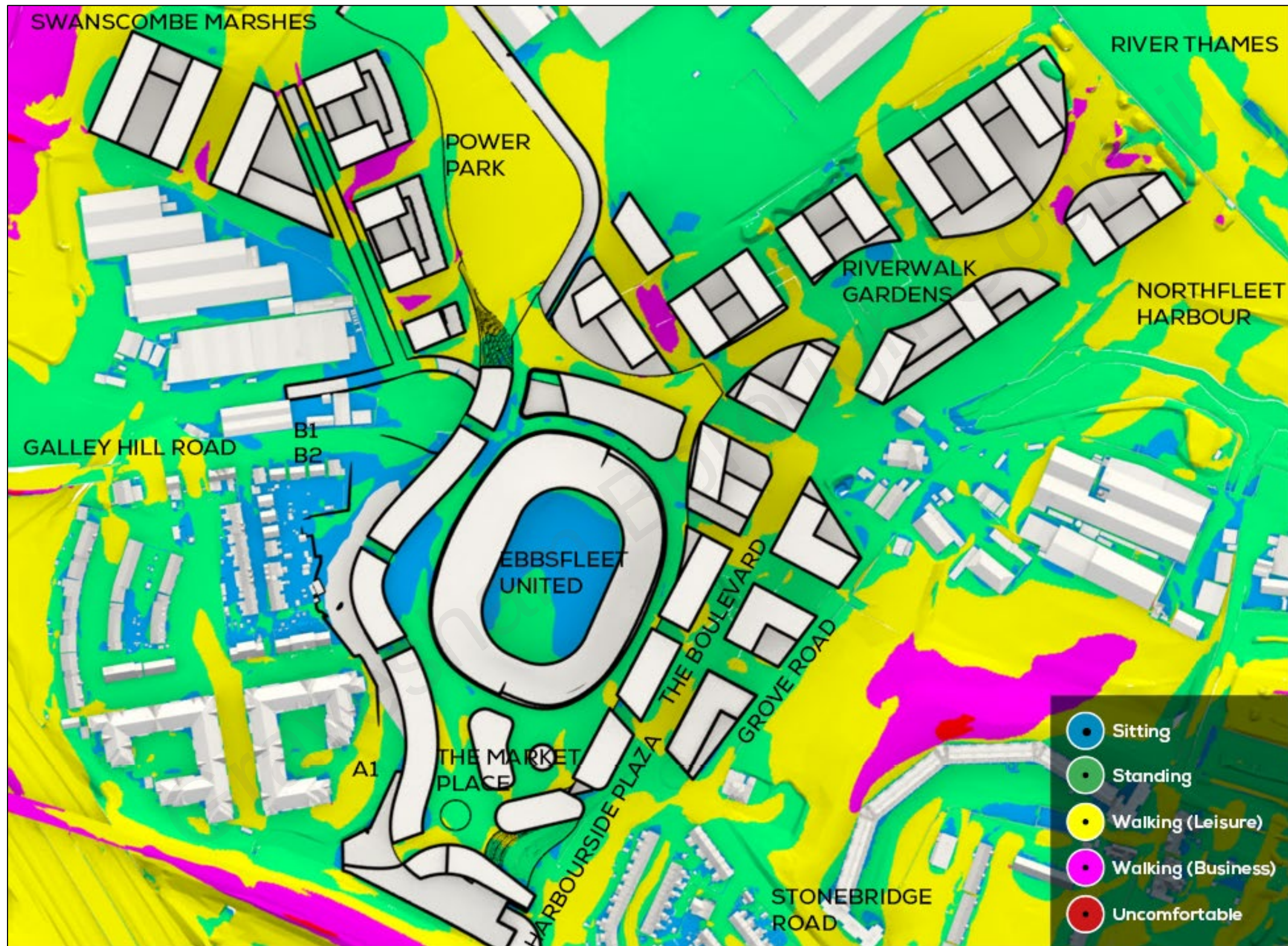


Figure 11.32 Configuration 4: Proposed Development (Maximum Parameters) with Final Illustrative Landscaping (Including Mitigation) and Existing Surrounds, Ground, Summer (Annotated as described in Table 11.4)



Figure 11.33 Configuration 4: Proposed Development (Maximum Parameters) with Final Illustrative Landscaping (Including Mitigation) and Existing Surrounds, Ground, Strong Winds (Annotated as described in Table 11.4)

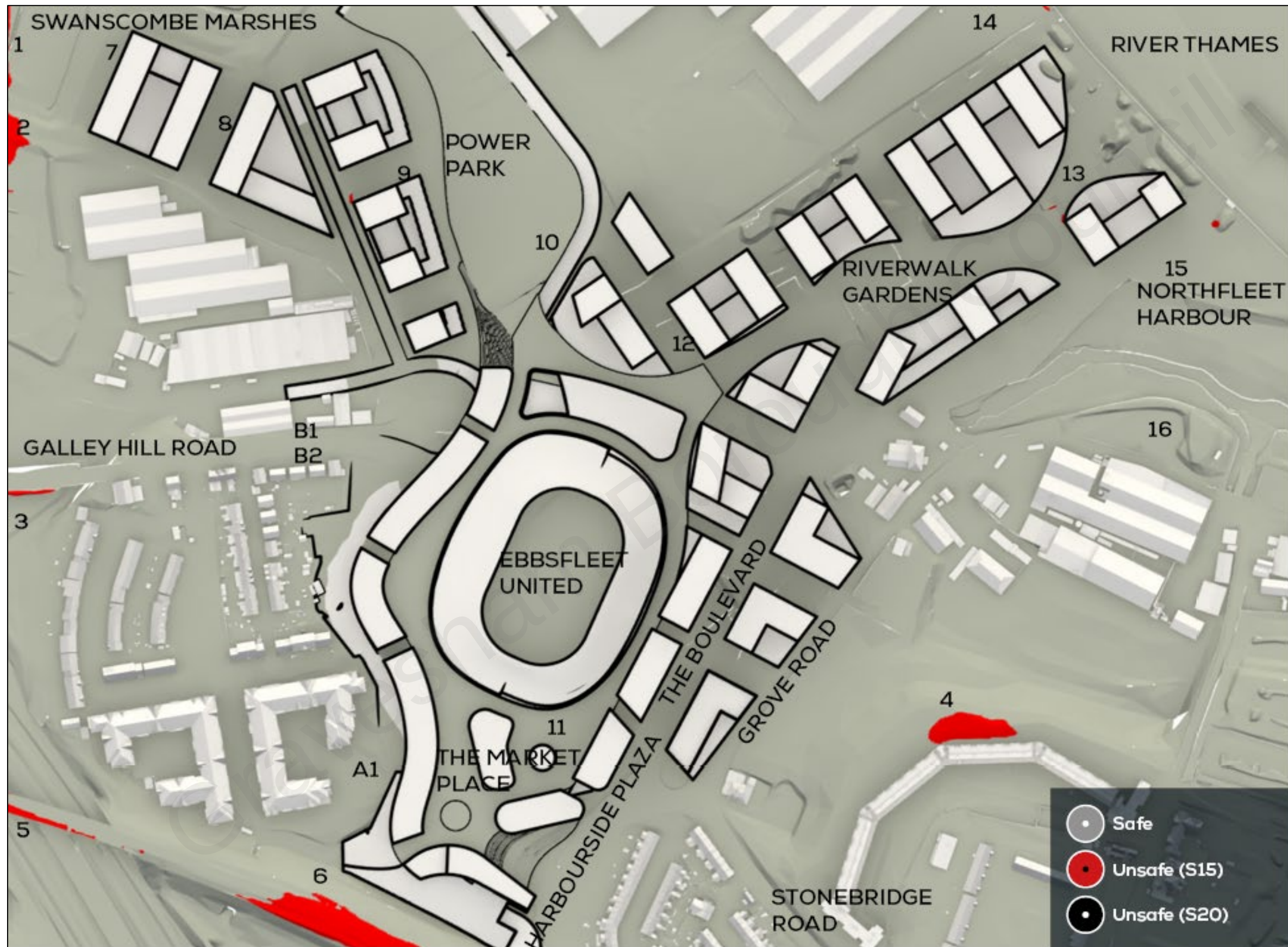


Figure 11.34 Configuration 4: Proposed Development (Maximum Parameters) with Final Illustrative Landscaping (Including Mitigation) and Existing Surrounds, Proposed Resident Amenity Roofs, Windiest Season

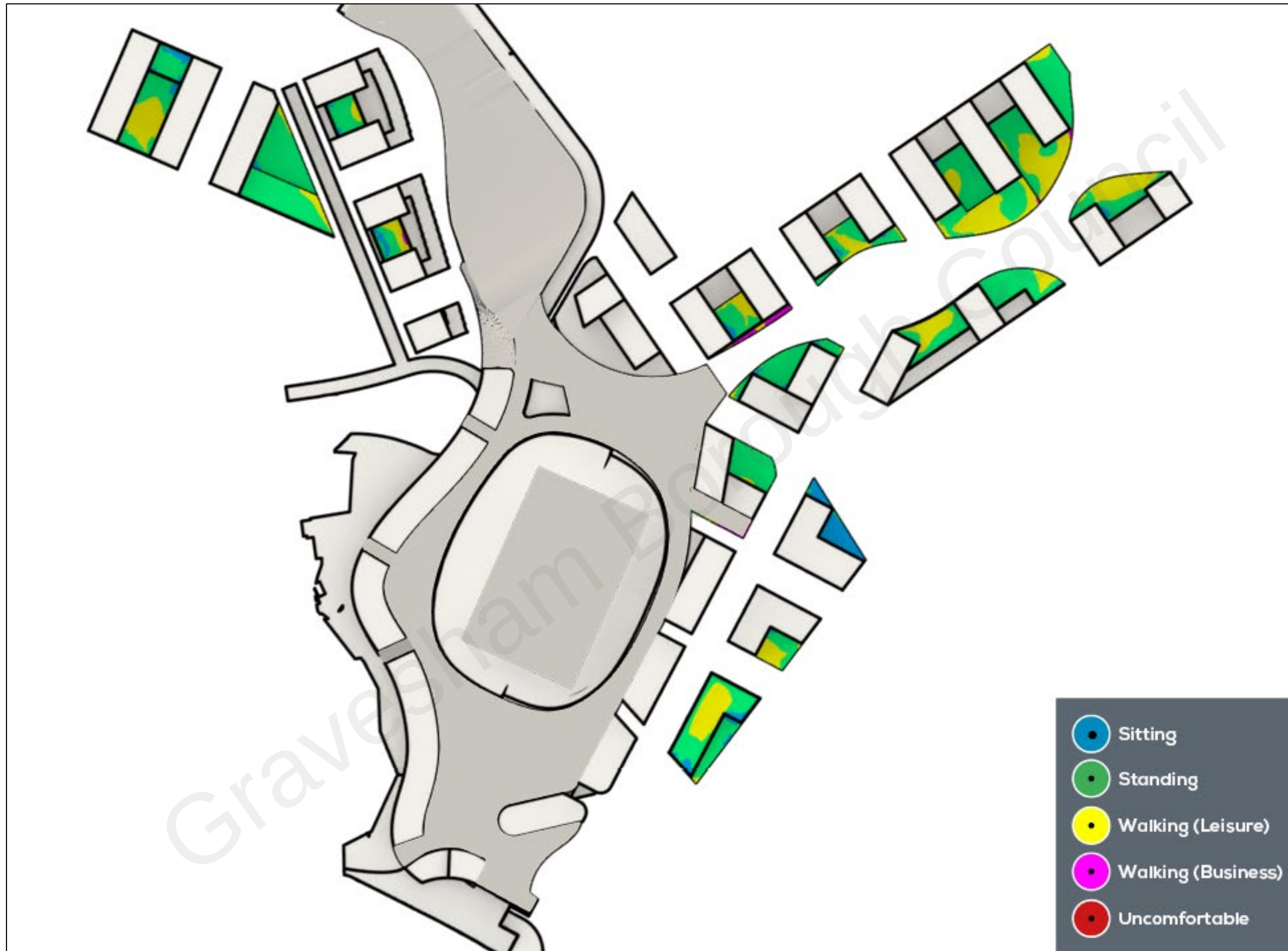


Figure 11.35 Configuration 4: Proposed Development (Maximum Parameters) with Final Illustrative Landscaping (Including Mitigation) and Existing Surrounds, Proposed Resident Amenity Roofs, Summer

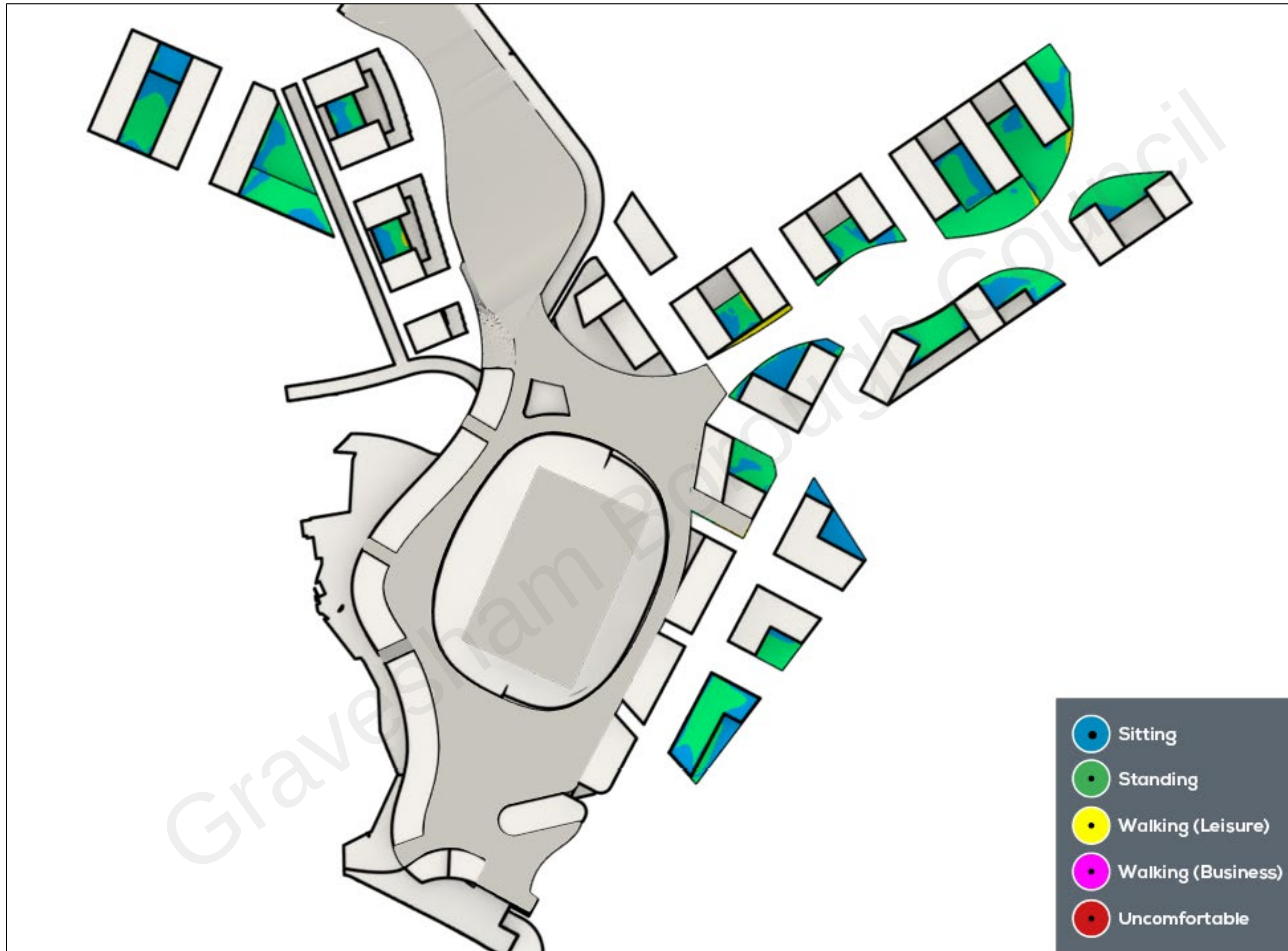


Figure 11.36 Configuration 4: Proposed Development (Maximum Parameters) with Final Illustrative Landscaping (Including Mitigation) and Existing Surrounds, Proposed Resident Amenity Roofs, Strong Winds

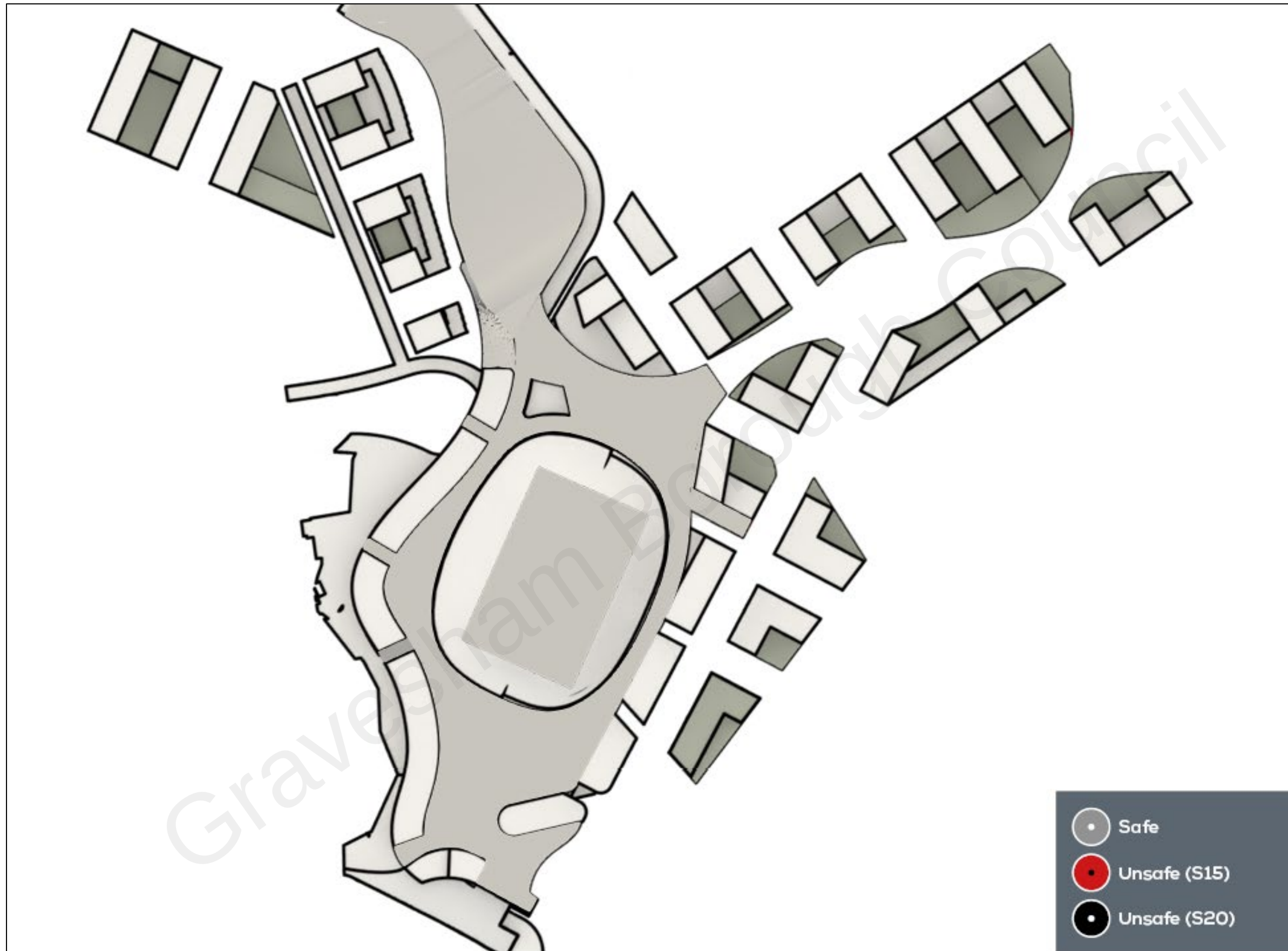


Figure 11.37 Configuration 4: Proposed Development (Maximum Parameters) with Final Illustrative Landscaping (Including Mitigation) and Existing Surrounds, Potential Balcony Locations, Windiest Season

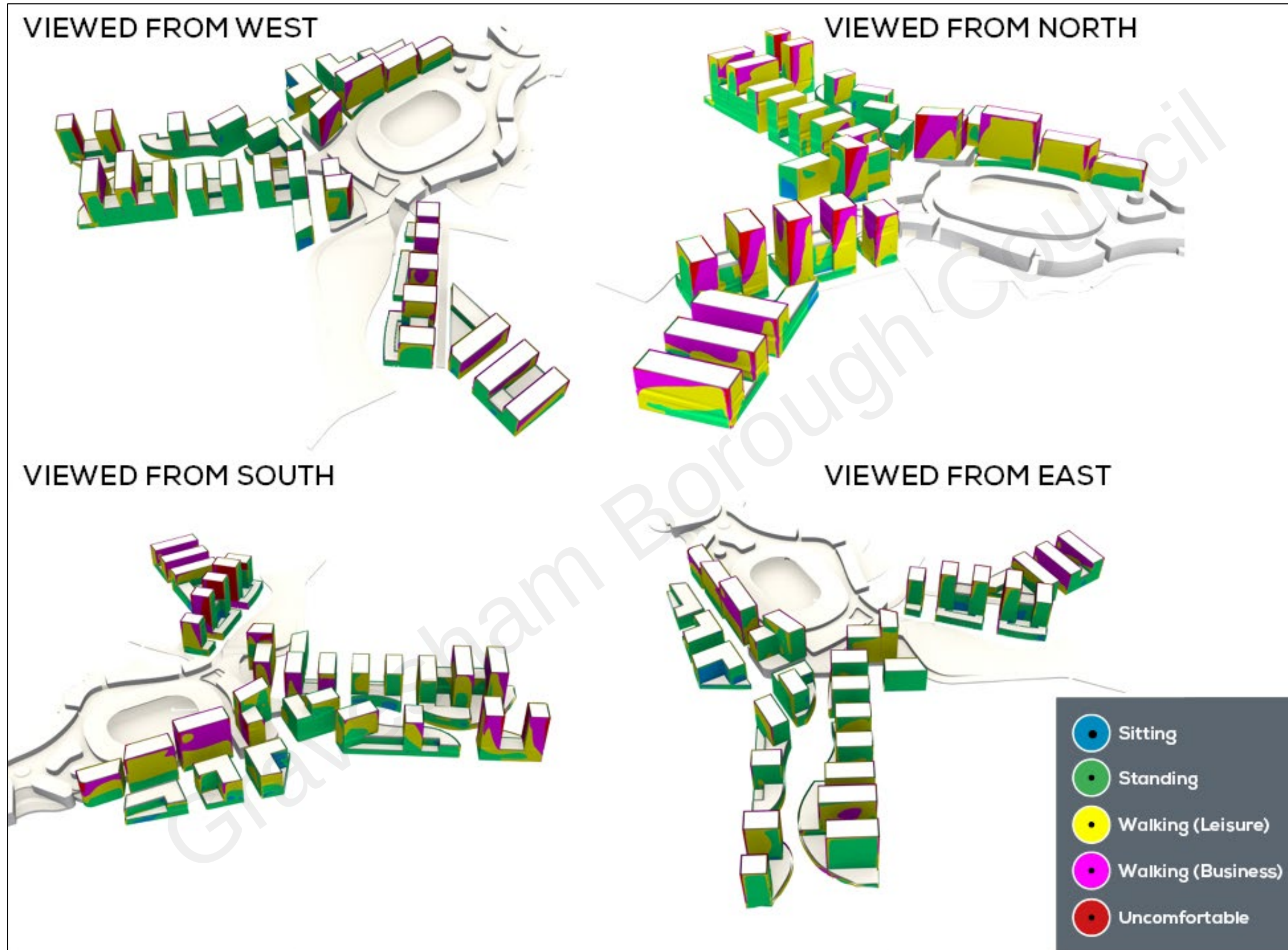


Figure 11.38 Configuration 4: Proposed Development (Maximum Parameters) with Final Illustrative Landscaping (Including Mitigation) and Existing Surrounds, Potential Balcony Locations, Summer

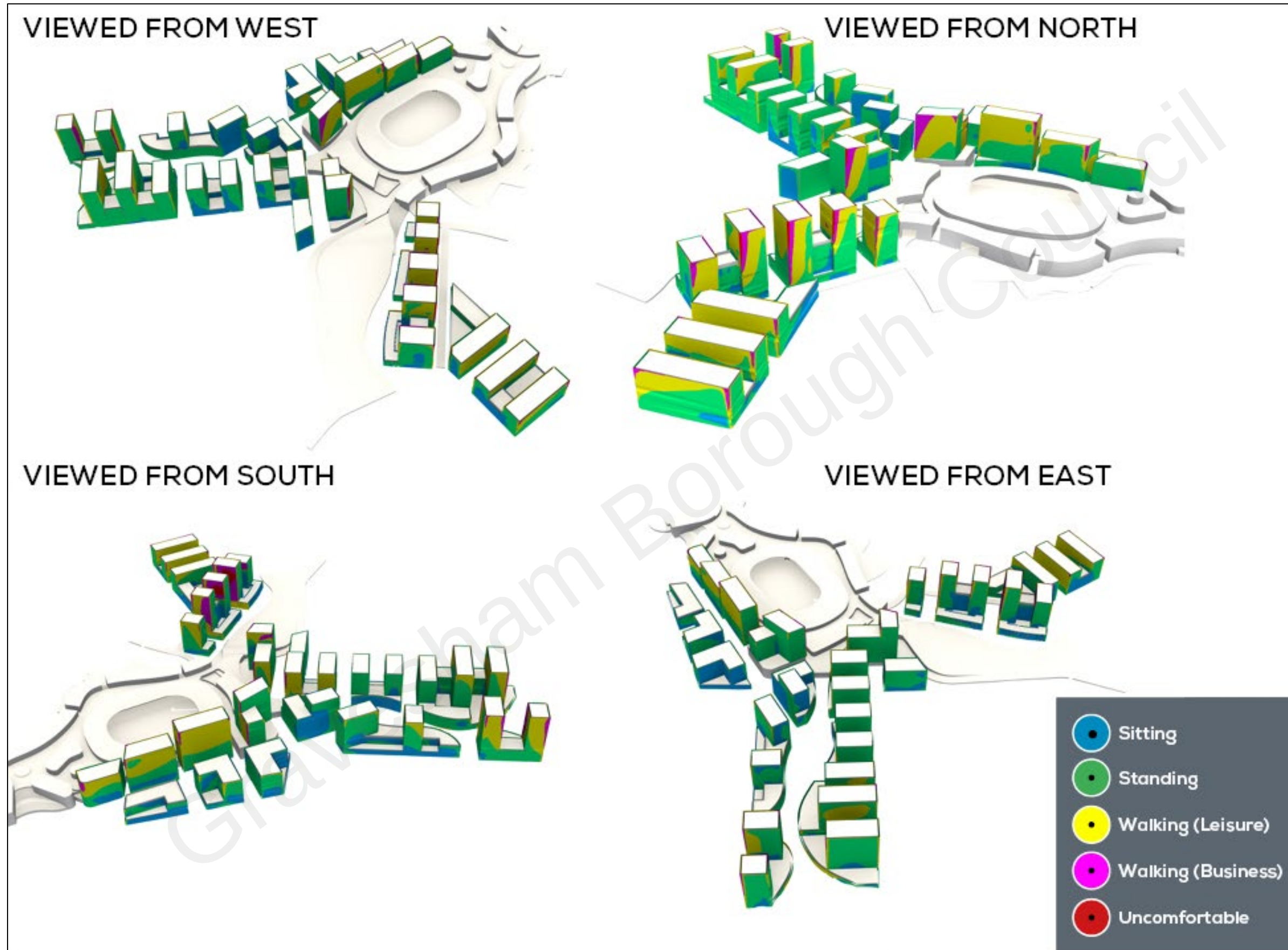
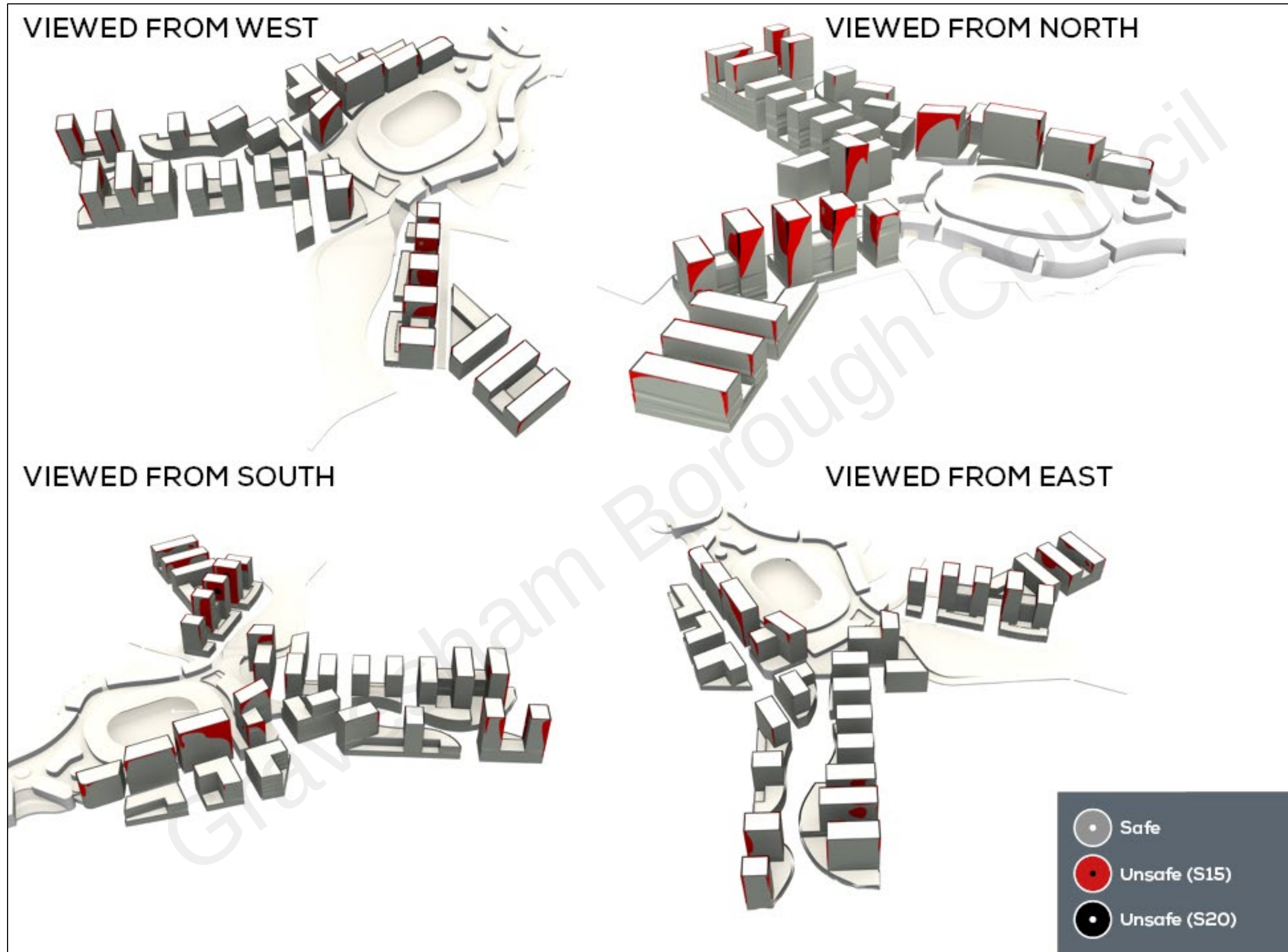


Figure 11.39 Configuration 4: Proposed Development (Maximum Parameters) with Final Illustrative Landscaping (Including Mitigation) and Existing Surrounds, Potential Balcony Locations, Strong Winds



Residual Effects

11.158 All of the residual effects resulting from the Proposed Development, are presented in **Table 11.5** identifying whether the effect is significant or not.

Table 11.5 Residual Effects

Receptor	Description of the Residual Effect	Scale and Nature	Significant / Not Significant	Geo	D I	P T	St Mt Lt
Demolition and Construction							
On-site pedestrian users and occupants	Thoroughfares	Negligible	Not Significant	L	D	T	St
	Strong Winds			L	D	T	St
Off-Site pedestrian users and occupants	Thoroughfares			L	D	T	St
	Entrances			L	D	T	St
	Bus Stops			L	D	T	St
	Ground Level Amenity			L	D	T	St
	Strong Winds			L	D	T	St
Interim Phase							
On-site pedestrian users and occupants	Thoroughfares	Negligible	Not Significant	L	D	T	St
	Entrances			L	D	T	St
	Bus Stops	Negligible	Not Significant	L	D	T	St
	Ebbsfleet United FC	Minor Beneficial	Not Significant	L	D	T	St
	Ground Level Amenity	Negligible to Minor Adverse	Significant	L	D	T	St
	Amenity Terraces	Negligible	Not Significant	L	D	T	St
	Balconies			L	D	T	St
	Strong Winds			L	D	T	St
Off-Site pedestrian users and occupants	Thoroughfares					L	D
	Entrances			L	D	T	St
	Bus Stops			L	D	T	St
	Ground Level Amenity	Negligible to Minor Beneficial	Not Significant	L	D	T	St
	Strong Winds	Negligible	Not Significant	L	D	T	St
Off-Site small river craft	River Surface	Negligible	Not Significant	L	D	T	St
	Strong Winds			L	D	T	St
Completed Development (Maximum Parameters) – Including Final Illustrative Landscaping and Design Code Measures							
On-site pedestrian users and occupants	Thoroughfares	Negligible	Not Significant	L	D	P	Lt
	Entrances			L	D	P	Lt
	Bus Stops			L	D	T	St
	Ebbsfleet United FC	Minor Beneficial	Not Significant	L	D	P	Lt
	Ground Level Amenity	Negligible to Minor Adverse	Significant	L	D	P	Lt
	Amenity Terraces	Negligible	Not Significant	L	D	P	Lt
	Balconies			L	D	P	Lt
	Strong Winds			L	D	P	Lt
Thoroughfares	L			D	P	Lt	

Receptor	Description of the Residual Effect	Scale and Nature	Significant / Not Significant	Geo	D I	P T	St Mt Lt
Off-Site pedestrian users and occupants	Entrances			L	D	P	Lt
	Bus Stops			L	D	P	Lt
	Ground Level Amenity	Negligible to Minor Beneficial	Not Significant	L	D	P	Lt
	Strong Winds	Negligible	Not Significant	L	D	P	Lt
Off-Site small river craft	River Surface	Negligible	Not Significant	L	D	T	St
	Strong Winds			L	D	T	St
Notes: Residual Effect - Scale = Negligible / Minor / Moderate / Major - Nature = Beneficial or Adverse Geo (Geographic Extent) = Local (L), Borough (B), Regional (R), National (N) D = Direct / I = Indirect P = Permanent / T = Temporary St = Short Term / Mt = Medium Term / Lt = Long Term N/A = not applicable / not assessed							

ASSESSMENT OF THE FUTURE ENVIRONMENT

Evolution of the Baseline Scenario

- 11.159** The baseline scenario (Configuration 1) is suitable for a mixture of standing, leisure walking and business walking localised regions of uncomfortable or unsafe conditions, in the windiest season.
- 11.160** As the cumulative schemes are brought forward, the baseline is expected to evolve in a similar way as moving from the Configuration 3 (Proposed Development with Existing Surrounds) to Configuration 5 (Proposed Development the Cumulative Surroundings). This change saw no difference in wind strength, with identical conditions for both options for surrounding context.
- 11.161** It is therefore expected that the Evolved Baseline will be suitable for a mixture of standing, leisure walking and business walking with localised regions of uncomfortable or unsafe conditions, in the windiest season.

Cumulative Effects Assessment

- 11.162** As set out in **ES Volume 1, Chapter 2: EIA Methodology**, the cumulative effects assessment considers the potential for cumulative effects to arise as a result of the Proposed Development in-combination with the defined 'Tier 1' (schemes which meet the defined criteria with regards to scale and distance from the site and have full planning consent, a resolution to grant consent, or have been submitted but not yet consented where considered appropriate) and 'Tier 2' (major planning applications and decisions which have not yet been submitted for approval, and are at varying stages in the pre-application stage) cumulative schemes within 1km of the site.

Tier 1 Cumulative Assessment: Configuration 5: Proposed Development (Maximum Parameters) with Cumulative Surrounds

- 11.163** The following Tier 1 Cumulative Scheme has been identified as sufficiently local to the site (within the 600m radius study area) to be considered within the wind assessment: Land North of Hive Lane Northfleet Embankment West (EDC/21/0081).
- 11.164** This was tested as an additional configuration in CFD (Configuration 5).
- Windiest season conditions at ground level for the Proposed Development (Maximum Parameters) with Cumulative Surrounds are shown in **Figure 11.40**.
 - Summer conditions at ground level for the Proposed Development (Maximum Parameters) with Cumulative Surrounds are shown in **Figure 11.41**.

- Strong winds at ground level for the Proposed Development (Maximum Parameters) with Cumulative Surrounds are shown in **Figure 11.42**.
- Windiest season conditions at the proposed resident amenity roofs for the Proposed Development (Maximum Parameters) with Cumulative Surrounds are shown in **Figure 11.43**.
- Summer conditions at the proposed resident amenity roofs for the Proposed Development (Maximum Parameters) with Cumulative Surrounds are shown in **Figure 11.44**.
- Strong winds at the proposed resident amenity roofs for the Proposed Development (Maximum Parameters) with Cumulative Surrounds are shown in **Figure 11.45**.
- Windiest season conditions at potential balcony locations for the Proposed Development (Maximum Parameters) with Cumulative Surrounds are shown in **Figure 11.46**.
- Summer conditions at potential balcony locations for the Proposed Development (Maximum Parameters) with Cumulative Surrounds are shown in **Figure 11.47**.
- Strong winds at potential balcony locations for the Proposed Development (Maximum Parameters) with Cumulative Surrounds are shown in **Figure 11.48**.
- Sensitive receptor locations are shown in **Figure 11.10**.

11.165 All wind conditions (both pedestrian comfort and strong winds) are not materially different to the conditions recorded for Configuration 3 (Proposed Development with Existing Surrounds). All wind conditions will be in the same locations and of the same significance as those for Configuration 3 and will be resolved by the same mitigation measures deployed for the Proposed Development (Configuration 4).

Strong Winds

On-Site

11.166 All strong winds are in the same locations, and of the same strength as the conditions recorded for Configuration 3 (Proposed Development with Existing Surrounds). As above, these adverse effects will be resolved by the same mitigation measures deployed for the Proposed Development (Configuration 4).

Tier 2 Cumulative Assessment

11.167 The following Tier 2 Cumulative Schemes are within the 600m radius study area:

- Land Adj To Northfleet Harbour (EDC/21/0102); and
- The London Resort scheme.

11.168 All other Tier 2 Cumulative Schemes are scoped out due to proximity.

11.169 'Land aj. To Northfleet Harbour' (EDC/21/0102) is located adjacent to the Tier 1 Cumulative Scheme 'Land North of Hive Lane Northfleet Embankment West' (EDC/21/0081), but further away from the Proposed Development, so it is reasonable to expect that it will have a lesser impact on the Proposed Development than the Tier 1 Cumulative Scheme.

11.170 The London Resort scheme is located to the west and north-west of the site, with the London Resort Scheme's "Gate 1" region (as per the Parameter Plans from the withdrawn planning application) coming up to the site boundary adjacent to the residential units at the north west of the Proposed Development. The expected cumulative impacts of the London Resort Scheme and the Proposed Development would be twofold:

- This section of the London Resort Scheme would be expected to provide shelter to the Proposed Development from key south westerly winds, and hence reduce the expected wind speeds across the northern end of the Site; and
- In turn, the Proposed Development would be expected to provide a "back pressure" downwind of the London Resort Scheme. This would reduce wind speeds within the "Gate 1" region of the London Resort Scheme.

11.171 As such, wind conditions would be expected to be identical to, or slightly calmer than, Configuration 5, and therefore all wind conditions will be in the same locations and of the same (or lesser) significance as those for Configuration 3 and will be resolved by the same mitigation measures deployed for the Proposed Development (Configuration 4).

Figure 11.40 Configuration 5: Proposed Development (Maximum Parameters) with Cumulative Surrounds, Ground, Windiest Season (Annotated as described in Table 11.4)

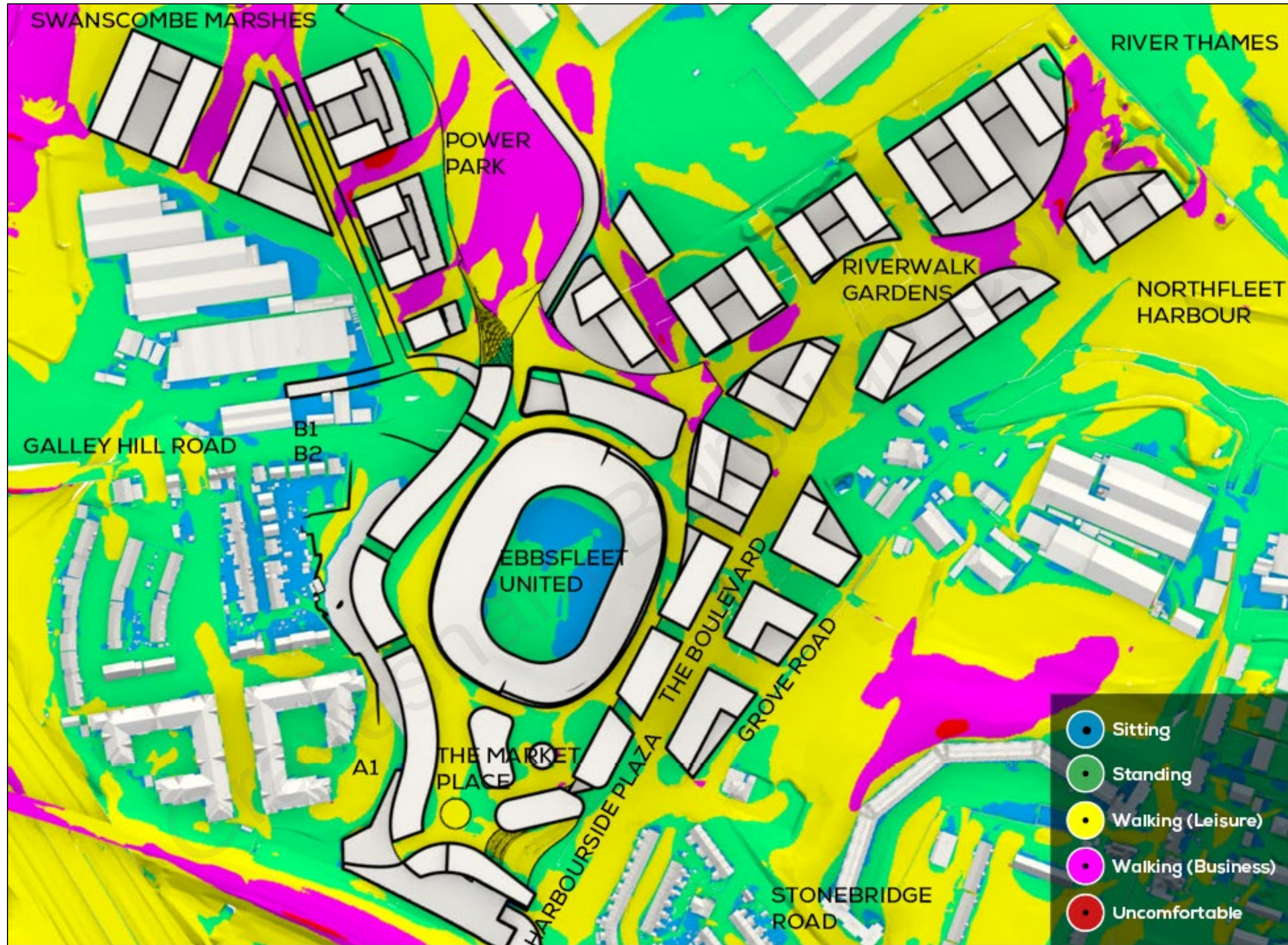


Figure 11.41 Configuration 5: Proposed Development (Maximum Parameters) with Cumulative Surrounds, Ground, Summer (Annotated as described in Table 11.4)



Figure 11.42 Configuration 5: Proposed Development (Maximum Parameters) with Cumulative Surrounds, Ground, Strong Winds (Annotated as described in Table 11.4)

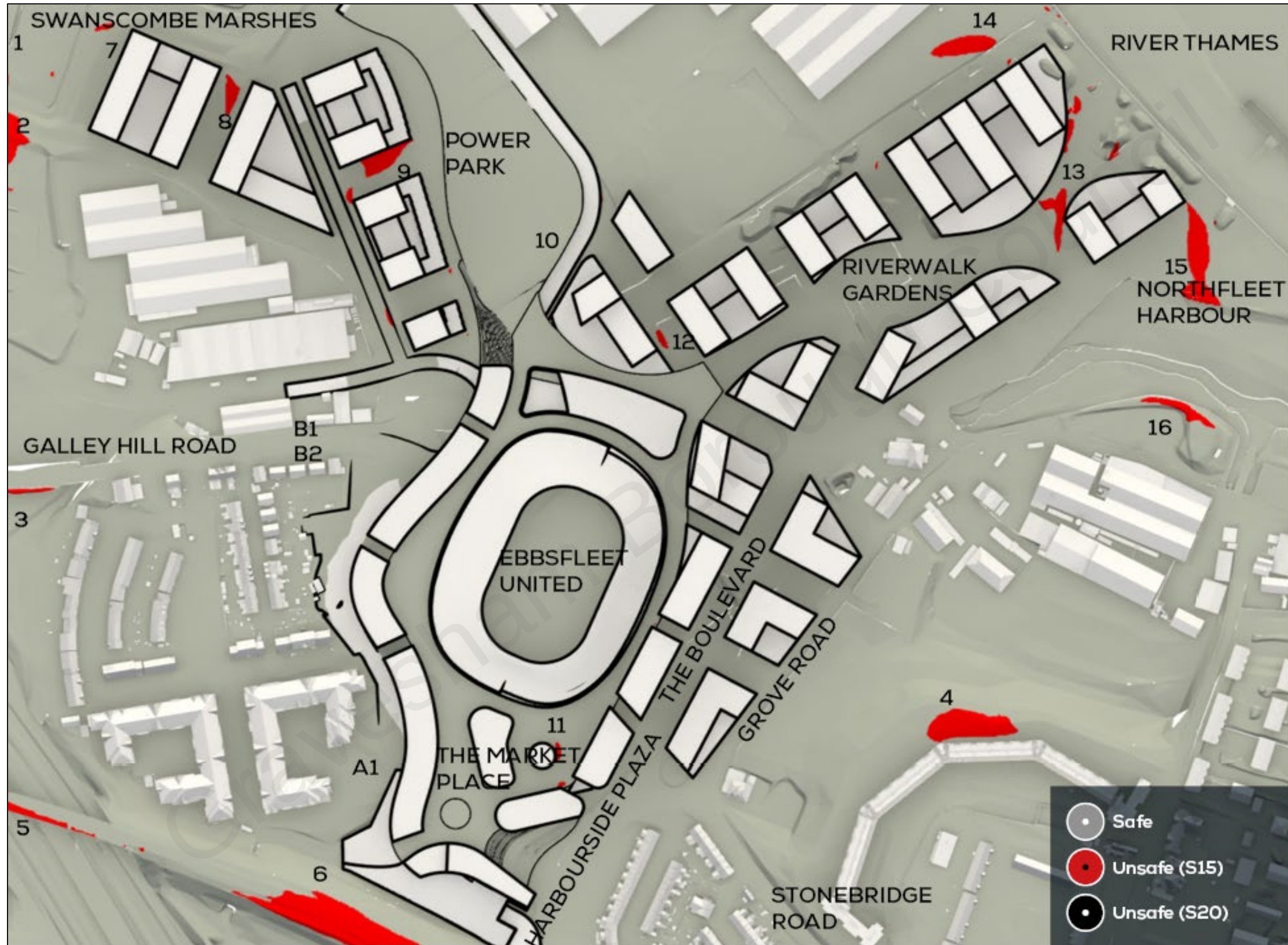


Figure 11.43 Configuration 5: Proposed Development (Maximum Parameters) with Cumulative Surrounds, Proposed Resident Amenity Roofs, Windiest Season

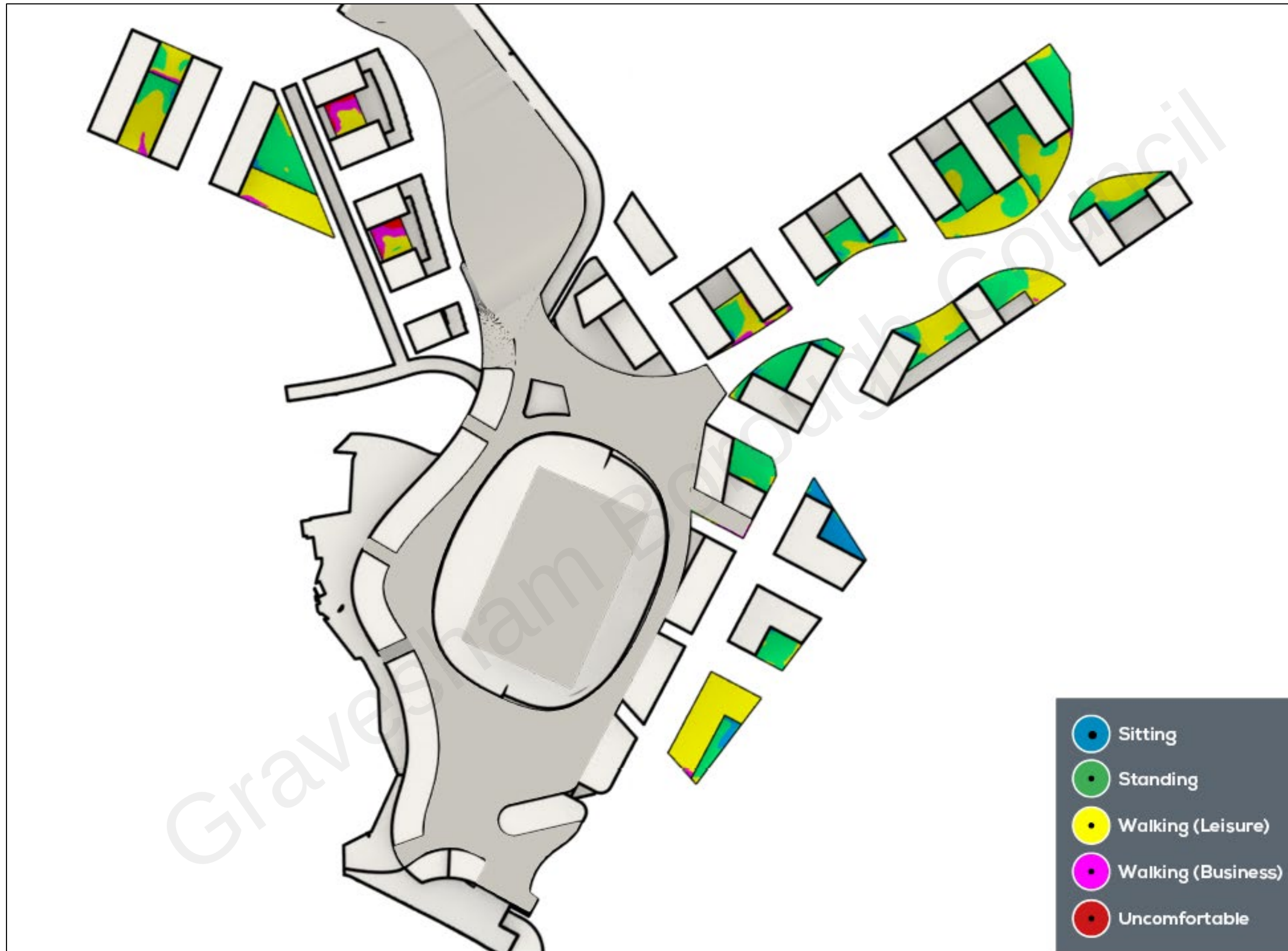


Figure 11.44 Configuration 5: Proposed Development (Maximum Parameters) with Cumulative Surrounds, Proposed Resident Amenity Roofs, Summer

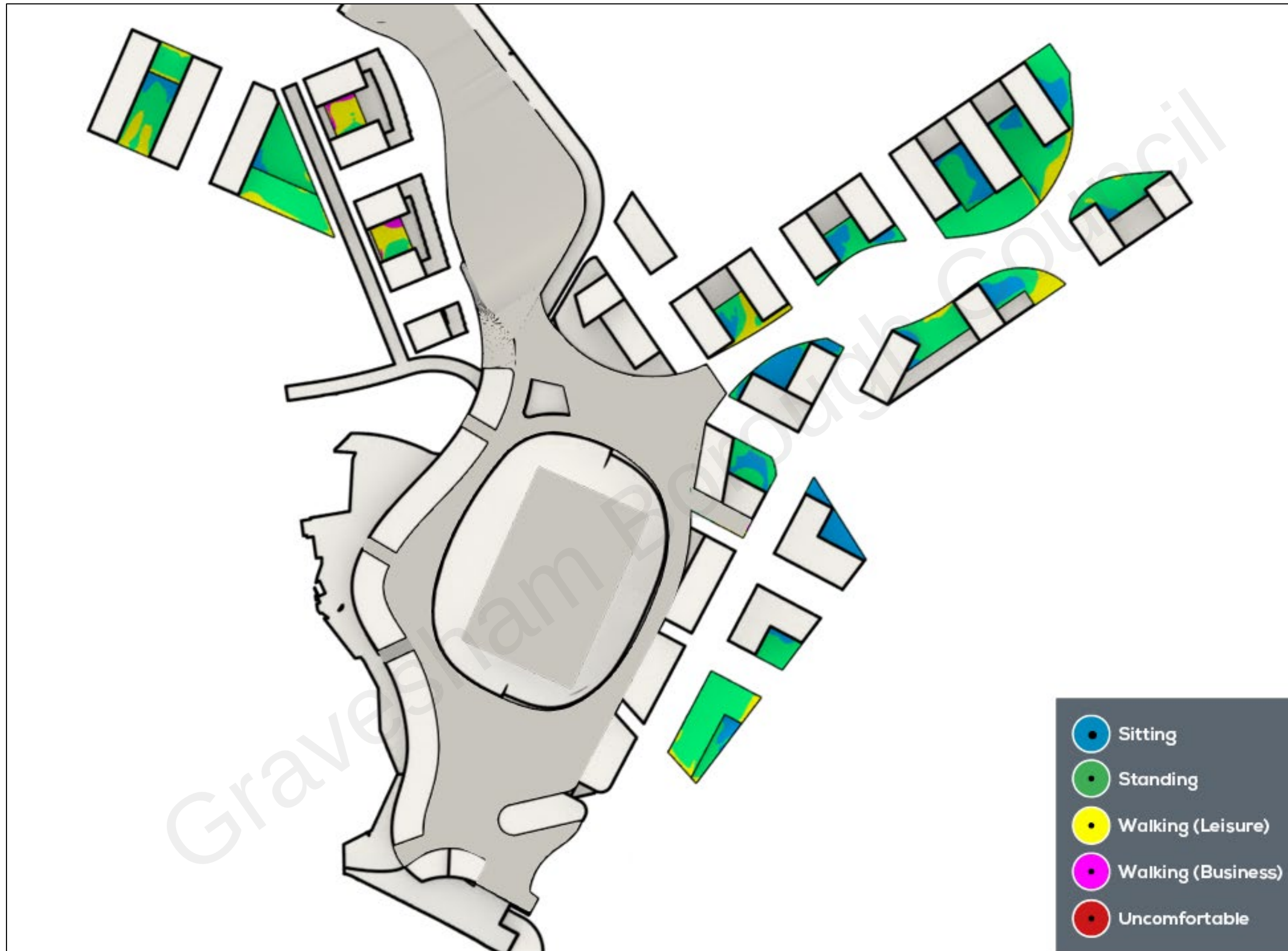


Figure 11.45 Configuration 5: Proposed Development (Maximum Parameters) with Cumulative Surrounds, Proposed Resident Amenity Roofs, Strong Winds

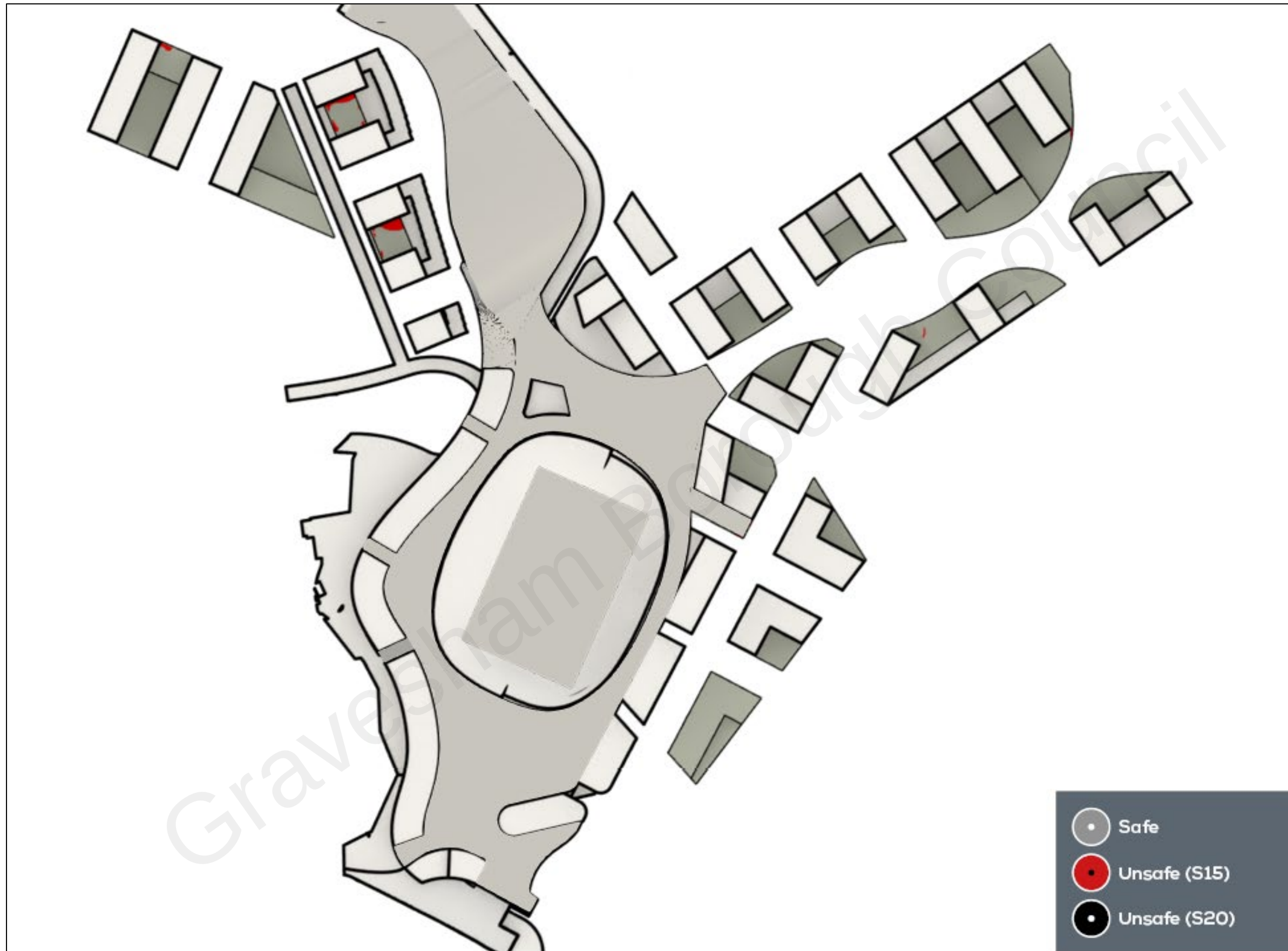


Figure 11.46 Configuration 5: Proposed Development (Maximum Parameters) with Cumulative Surrounds, Potential Balcony Locations, Windiest Season

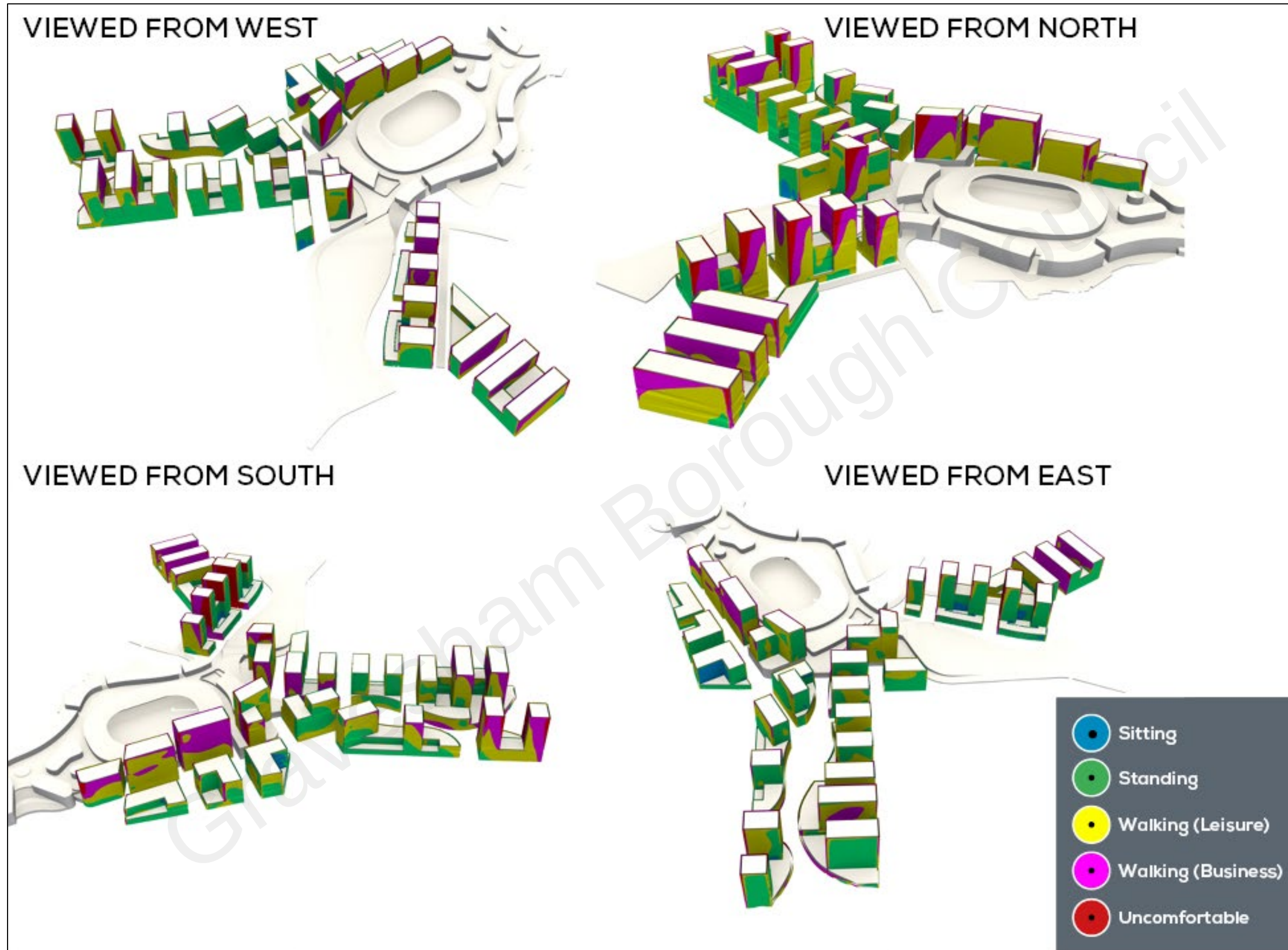
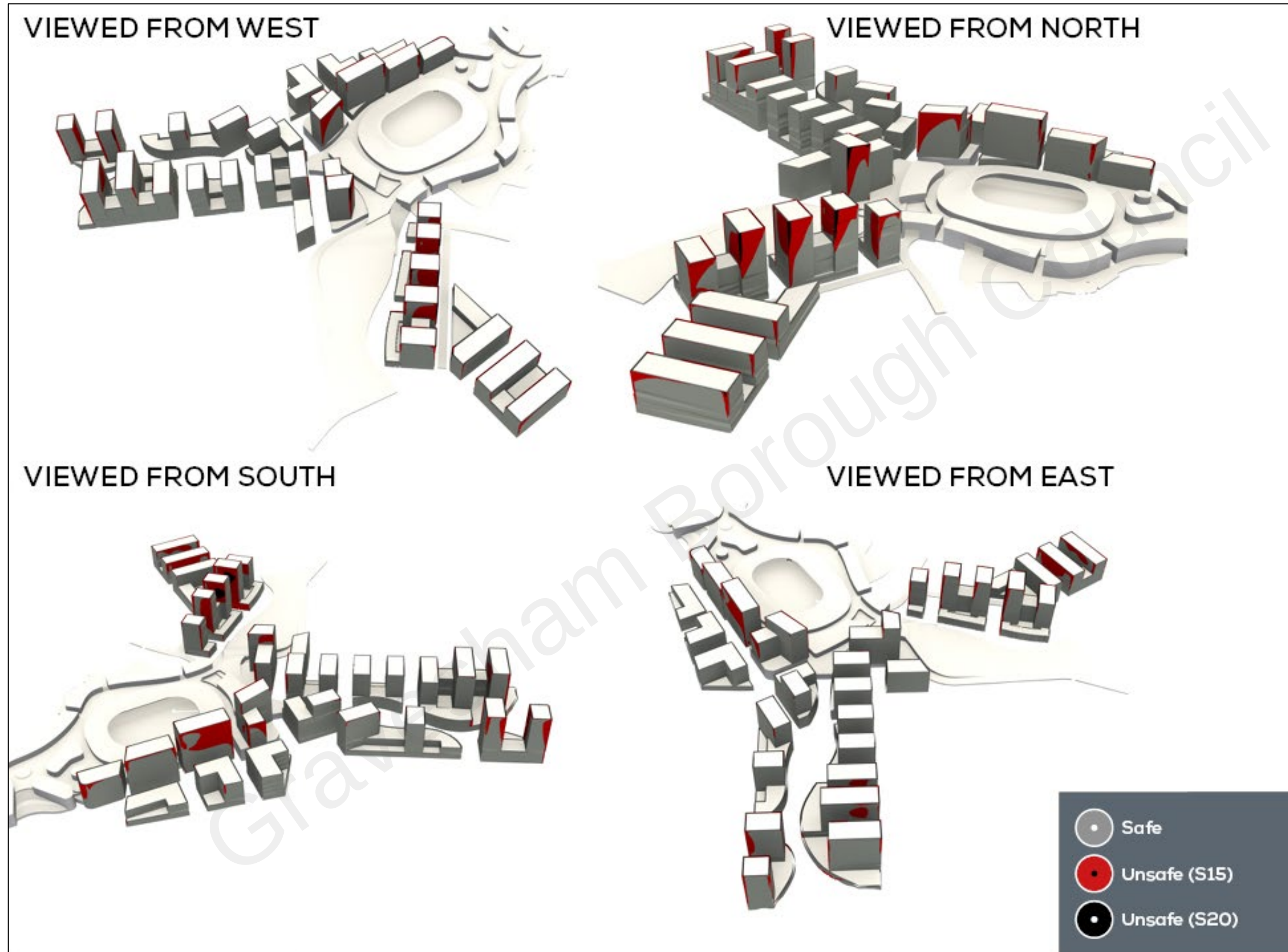


Figure 11.47 Configuration 5: Proposed Development (Maximum Parameters) with Cumulative Surrounds, Potential Balcony Locations, Summer



Figure 11.48 Configuration 5: Proposed Development (Maximum Parameters) with Cumulative Surrounds, Potential Balcony Locations, Strong Winds



LIKELY SIGNIFICANT EFFECTS

11.172 Taking into account the Final Illustrative Landscaping (as tested in Configuration 4), there are residual **Minor Adverse** effects (significant) for the proposed amenity in Power Park and Riverwalk Gardens. These will require further consideration at the detailed design stage. Although not tested at this stage, there is substantial scope for further mitigation and it is considered straightforward to achieve suitable conditions. Possible solutions could include (noting the below is not an exhaustive list):

- Localised screening immediately adjacent to any seating areas;
- Adjustments to the landscaping scheme to ensure more trees fall within the critical wind flow paths;
- The inclusion of more evergreen trees, or species with higher leaf densities, within the landscaping to provide greater resistance to the wind; and
- Appropriate zoning of the amenity spaces such that “dwell spaces” fall within regions which are suitable for sitting or standing, and any regions which are suitable for walking are specified as transitory zones.

11.173 It should be noted that mandatory controls have been written into the Design Code to ensure that these residual significant effects within the ground-level amenity are resolved at the detailed design stage.

11.174 There are no other likely significant effects with regards to wind microclimate during either the demolition and construction stage or the complete and operational stage of the Proposed Development when considering the mandatory controls secured via the Design Code and the mitigation implemented via the final illustrative landscaping, which has been developed as part of an extensive design review and testing process as discussed in this ES chapter. There are also no identified significant cumulative effects.

11.175 Further review and wind testing/assessment will be undertaken where necessary at RMA stage(s) in relation to the detailed scheme geometry that will ultimately come forward, and as part of this, verification of the effectiveness of any wind mitigation measures required. The assessment of appropriate wind microclimate mitigation measures at the detailed design stage by an experienced wind engineer, if required, should be secured through an appropriately worded planning condition.