

17A. Wind Microclimate

17A.1 Introduction

- 17A.1.1 This Chapter, which has been prepared by Waterman and BMT, provides further information with regard to the potential wind microclimate impacts arising from the Scheme with Phase 1B (North) in place (and having regard also to the detailed design previously approved in relation to Phase 1A (North)). The Chapter provides further environmental information pursuant to the s73 ES and other EIA Documentation (as defined in **Chapter 4: Approach to the ES Further Information Report**) in the light of the further detailed design information now being available in respect of Phase 1B (North), and presents the findings of the further wind tunnel testing and assessment which has been undertaken to identify whether the findings of the s73 ES and other EIA Documentation with respect to the likely significant effects, mitigation and residual impacts in relation to the wind environment remain valid.
- 17A.1.2 A review of relevant policy, legislation and guidance published since preparation of the s73 ES and other EIA Documentation has been carried out. A review of the detailed design for Phase 1B (North), as defined in **Chapter 2: Description of Phase 1B (North) RMA**, has then been undertaken, to identify elements of the Phase 1B (North) RMA detailed design of relevance to the wind microclimate assessment.
- 17A.1.3 The approach to this further information chapter is set out and a summary of relevant consultation is provided. A review of the baseline information presented in the s73 ES and other EIA Documentation has been undertaken and updates are presented where relevant. Commentary is then provided which confirms whether any new or different potential significant wind microclimate impacts arising from the Development (comprising the Scheme with the detailed design for both Phase 1A (North) and Phase 1B (North) in place) from those identified in the s73 ES and other EIA Documentation are likely. Likewise, any new or different mitigation measures from those identified in the s73 ES and other EIA Documentation are presented where considered necessary, and residual impacts following the application of mitigation are described.
- 17A.1.4 This Chapter is supported by **Appendix 17A.1: Brent Cross Cricklewood: Phase 1B (North) Wind Microclimate Study** which presents the detailed methodology and findings of the wind microclimate studies for Phase 1B (North).

17A.2 Policy, Legislation and Guidance

- 17A.2.1 There have since been no significant changes to policy, legislation or guidance since the s73 ES and other EIA Documentation were prepared, which would have a material effect on the approach to or the findings of the assessment of wind microclimate.

17A.3 Relevant Phase 1B (North) RMA Details

- 17A.3.1 Following a review of the Phase 1B (North) RMA, the following elements have been identified as being of relevance to the assessment of wind microclimate:
- Infrastructure: replacement Brent Cross Bus Station;
 - Open Spaces / Public Realm / Threshold Spaces;

- Areas of Public Realm and Open Space including Brent Cross Main Square, the Living Bridge Approach North, and the Threshold Spaces including - Fenwick Place, Tempelhof Circus and Layfield Place;
- The Eastern Brent Riverside Park and Western Brent Riverside Park to be provided adjacent to the realigned River Brent and including a riverside walkway, and River Brent Nature Park to be provided alongside the River Brent;
- Existing Sturgess Park to the north west of the Shopping Centre, to be retained and enhanced including new formal play facilities, seating areas, gardens, informal sports provision and nature areas; and
- Development Plots: those development plots to the south, west and east of the existing Brent Cross Shopping Centre, around High Street North and Brent Cross Main Square, comprising a mix of uses including retail, leisure, food and beverage, hotel, and community floorspace, in addition to an energy centre, residential development on plot 113 and multi-storey car parks.

17A.3.2 These elements were assessed as part of the assessment of the Scheme in outline in the s73 ES and other EIA Documentation, however further consideration is given within this Chapter to the detailed design of these elements to determine the likely wind conditions following their implementation, and whether significant effects are likely which were not identified in the s73 ES and other EIA Documentation.

17A.4 Assessment Methodology

17A.4.1 Further wind assessment has been undertaken by BMT to identify any likely significant environmental impacts arising from the detailed design of the Development with Phase 1B (North) in place, but also to address in part, Planning Condition 34.5 of the 2014 Permission which states:

“In order to alleviate adverse wind conditions in accordance with the mitigation proposed in the Environmental Statement all reserved matters applications for buildings and bridge structures must demonstrate that the following mitigation measures have been considered and will be provided where appropriate:

- a) *Recessing of entrances;*
- b) *Entrance screens;*
- c) *Softening sharp building corners;*
- d) *Canopies above entrances;*
- e) *Localised shelter to create pockets of areas suitable for long periods of outdoor sitting or general recreational activities as required.”*

Basis of the Assessment

17A.4.2 For the further wind tunnel testing, the following Development configurations have been assessed:

- **Configuration 1: Interim Surrounds** - Phase 1B (North) elements with the approved Phase 1A (North) elements in place, and with the existing surrounds, in the absence of further development, i.e. without the remainder of the Scheme built out;

- **Configuration 2: Illustrative Masterplan** - Phase 1B (North) elements with the approved Phase 1A (North) elements in place, and with the remainder of the BXC Scheme modelled as per the Revised Development Specification Framework (RDSF); and
- **Configuration 3: Maximum Height Parameters** - Phase 1 B (North) elements with the approved Phase 1A (North) elements in place, with the remainder of the BXC Scheme modelled using the maximum parameters (worst case scenario).

17A.4.3 A configuration was not tested to determine the effects having regard to any identified cumulative schemes, as it was agreed with London Borough of Barnet (LBB) through the scoping process that all cumulative schemes are located at too great a distance from the Development for there to be any potential for interaction between the wind effects associated with these schemes and the Development.

Scope and Methodology

17A.4.4 There have been no significant changes to planning policy, legislation or guidance which materially affect the approach to the wind microclimate assessment presented in the s73 ES and other EIA Documentation. The methodology and significance criteria previously presented therefore remain valid for the purposes of assessing the Phase 1B (North) RMA. A brief overview of the approach is set out below for completeness: for more information on assessment methodology please refer to **Appendix 17A.1**.

17A.4.5 Wind tunnel testing is the most well-established and robust means of assessing the pedestrian wind microclimate. It enables the wind conditions at the Site to be quantified and classified in accordance with the widely accepted Lawson Criteria for comfort and safety. Wind tunnel testing was previously used for the assessments of wind microclimate presented in the s73 ES and other EIA Documentation.

17A.4.6 This approach has enabled Waterman to identify whether the wind impacts presented in the s73 ES and the other EIA Documentation remain valid. The likely significant wind impacts arising from the Development have been considered in this Chapter, with particular reference to any changes to, or new, impacts associated with Phase 1B (North) or surrounding areas.

17A.4.7 The wind environment has been assessed for the proposed development with the approved soft landscaping for Phase 1A (North) in place, which includes trees and planting for the Central Riverside Park (and Nature Park 5), planting associated with 1A (North) infrastructure and planting on the Living Bridge. The following proposed soft landscaping for Phase 1B (North) has also been included as part of the assessment: Western and Eastern Riverside Parks and Nature Park 4. However, the proposed planting for threshold spaces was not included, except for landscaping that was required for the purpose of providing mitigation.

17A.4.8 All three configurations were tested within the wind tunnel and results are presented in full within **Appendix 17A.1**. This Chapter presents the outcomes of the wind tunnel test for all three configurations.

17A.4.9 The wind tunnel study was used to provide wind speed measurements of the pedestrian level wind environment within the following key areas within Phase 1B (North):

- Pedestrian access routes;
- Entrances;

- Outdoor Seating; and
- Recreational areas, including
 - Terraces; and
 - Balconies.

17A.4.10 Wind speed measurements were taken at 125 'locations' at a height corresponding to 1.5m at a full scale. These locations were consistent for each configuration and are shown in **Appendix 17A.1**.

17A.4.11 Two specific areas within Phase 1A (North) have also been considered within this assessment due to their proximity to, and intrinsic links to, Phase 1B (North):

- Living Bridge (location 112), and
- Tempelhof Bridge (location 117).

17A.4.12 Locations were considered in terms of pedestrian safety and comfort using Lawson Criteria for the mean and gust wind conditions for each of the configurations. Details of the proposed pedestrian activities assumed in the assessment area are provided in **Appendix 17A**.

Safety

17A.4.13 At each area investigated, the suitability of the pedestrian level wind environment in terms of safety was assessed based on the Lawson criteria for pedestrian safety. Safety is determined for the 'able-bodied' and for the 'general public'. For the general public, a wind speed of 15 metres-per-second occurring once per year is rated as unsafe, with the potential to de-stabilise the less able members of the public including the elderly, cyclists and children. Able-bodied users are more likely to be capable of defending themselves against extreme pedestrian level winds and thus experience distress at a higher threshold wind speed of 20 metres-per-second, once per year.

Comfort

17A.4.14 At each area investigated, the suitability of the pedestrian level wind environment in terms of comfort for various activities was assessed based on the Lawson criteria for pedestrian comfort (see **Appendix 17A.1**). The assessment takes full account of seasonal variations in wind conditions and pedestrian activities. For example, conditions for recreational activities focus on summer, but also consider autumn and spring, whilst conditions for pedestrian thoroughfare, access or waiting (example bus stops) consider all seasons, with winter usually being the critical season. The activities considered, and their relation to the Lawson comfort criteria, are summarised as follows:

Table 17A.1: Lawson Comfort Criteria

Suitability		Lawson Comfort Criteria
Outdoor Seating	For long periods of sitting such as for an outdoor café / bar, a private balcony	'Long-term sitting' in summer
Entrances, waiting areas, shop fronts	For pedestrian ingress / egress at a building entrance / shop front, window shopping, or short periods of sitting or standing such as at a bus stop, taxi rank, meeting point, etc.	'Short-term standing / sitting' in all seasons
Recreational Spaces	For outdoor leisure uses such as a park, children's play area, etc.	'Short-term standing / sitting' from spring to autumn
Leisure Thoroughfare / Strolling	For access to and passage through the development and surrounding area	'Leisure Thoroughfare / Strolling' in all seasons
Pedestrian Transit / Thoroughfare (A-B)	For access to and passage through the development and surrounding area	'Pedestrian Transit / Thoroughfare (A-B)' in all seasons

17A.4.15 Further information on the approach to the assessment, including significance criteria, is provided in Section 17A.4 of the Phase 1A (North) FIR. This approach remains unchanged.

Limitations or Constraints

17A.4.16 For the wind tunnel testing, Configuration 3 (Maximum Height Parameter Configuration) represents the detailed design for Phase 1A (North) and Phase 1B (North) alongside the consented maximum building height for the remainder of the Scheme. However, it should be noted that the width and length dimensions of the buildings within the Scheme (outside of Phase 1A (North) and Phase 1B (North)) are provided in line with the indicative layout plan (Parameter Plan 015 of the RDSF) as the maximum width and length parameters were unfeasible to model due to overlapping of maximum parameters in some areas. Heights however, remain as maximum parameter heights.

17A.5 Consultation

17A.5.1 The approach to the wind microclimate further information chapter was set out in the EIA Scoping Report (**Appendix 4.1**). The subsequent EIA Scoping Opinion is presented in **Appendix 4.2**.

17A.5.2 During the scoping process, confirmation was obtained from LBB that the baseline scenario previously tested was still considered to be applicable, and hence did not require updating.

17A.6 Baseline Conditions

17A.6.1 The wind baseline information presented in the Chapter 17: Microclimate of the s73 ES and confirmed as remaining unchanged in the subsequent other EIA Documentation has been reviewed and its validity is again confirmed as there have been no significant variations to the baseline conditions. The baseline conditions presented in the s73 ES was based on wind tunnel testing of the existing Site. As noted above, confirmation was obtained from LBB that the baseline scenario previously tested was still considered to be applicable, and hence did not require updating.

17A.7 Assessment and Mitigation

Construction

Potential Impacts

- 17A.7.1 Wind impacts related to the construction phase were not identified in the s73 ES and other EIA Documentation, and are generally not considered due to the temporary nature and insignificant wind impacts of construction activities and equipment which may alter wind speeds on Site such as hoardings and construction equipment. No significant construction impacts have been identified following a review of the Phase 1B (North) RMA and in accordance with the assessments from the s73 ES and other EIA Documentation. The Intermediate Years Assessment presented within the s73 ES and other EIA Documentation however considered the wind effects during interim stages of the Development, and this has been reviewed and updated by Waterman and the findings presented herein, and within **Chapter 20: Intermediate Years Assessment**.

Mitigation Measures and Residual Impacts

- 17A.7.2 For the reasons set out above, mitigation measures and residual impacts for the construction stage of the Phase 1B (North) RMA and Development have not been considered further.

Operation

Potential Impacts

- 17A.7.3 Further wind tunnel modelling has been undertaken of the Development with the detailed design of Phase 1B (North) RMA in place. Full details are provided in **Appendix 17A.1**.
- 17A.7.4 The results of all three assessment scenarios, as defined in Section 17A.4.2 of this Chapter, are summarised below, with full details provided in **Appendix 17A.1**. However, it should be noted that Configuration 2, in keeping with previous assessments (specifically the assessment carried out for Phase 1A (North) FIR), is the main scenario focused on for the purpose of this assessment.

Configuration 1: Interim Surrounds - Phase 1B (North) and Phase 1A (North) in place with the existing surrounds in the absence of further development

Pedestrian Safety

- 17A.7.5 Wind conditions in and around Phase 1B (North) are suitable, in terms of pedestrian safety, for the general public.
- 17A.7.6 One exception occurs in the surrounding area, on the replacement Tempelhof Bridge to the south of Phase 1B (North), which is within Phase 1A (North) [location 117], where conditions rate as unsuitable for general public, but as suitable for able bodied. This does not arise as a result of the introduction of Phase 1B (North).
- 17A.7.7 As reported previously in the s73 ES and other EIA Documentation (specifically when wind conditions were modelled for the Phase 1A (North) RMAs (as approved by LBB)), predicted wind conditions on the replacement Tempelhof Bridge exceeded the Lawson Safety Levels. This equates to wind speeds >15 m/s on more than one occurrence a year making the bridge

unsuitable, in terms of safety, for less abled pedestrians and cyclists. This has not changed with the detailed design for Phase 1B (North) in place. Despite the low frequency (or likelihood) of this event, as the Lawson Safety Criteria has been exceeded, the impact at Tempelhof Bridge in the Interim scenario for this location would be **major adverse** (location 117) in the absence of mitigation.

Pedestrian Comfort

- 17A.7.8 Wind conditions are generally suitable, in terms of pedestrian comfort, for pedestrian transit (strolling) or better, and are thus suitable for thoroughfares (leisure thoroughfares). Exceptions occur within the south-west of Phase 1B (North) [Locations 71, 78 and 83], where conditions are suitable for pedestrian transit only, and are therefore suitable for thoroughfares but not leisure thoroughfares. These are located around the proposed hotel and energy centre. Overall, wind conditions are generally suitable, in terms of pedestrian comfort, for short periods of standing / sitting, and these areas are therefore suitable for their intended use. Effects would therefore be **negligible** for thoroughfares and leisure thoroughfares in the absence of the rest of the Scheme in place.
- 17A.7.9 In the south of Phase 1B (North), in the vicinity of the Living Bridge Approach North, at locations 4 and 5 (marginal criteria exceedance) and location 112 (criteria exceeded throughout the year), conditions in the absence of mitigation were initially found to be suitable for thoroughfare only, and were therefore not suitable for entrances / waiting areas. Following the introduction of mitigation through design, for example providing planters/planting on the Living Bridge Approach North, all locations are now suitable for their intended use and therefore **negligible** for entrances /waiting areas.
- 17A.7.10 Wind conditions are generally suitable, in terms of pedestrian comfort, for areas intended for long-term sitting, and are therefore suitable for outdoor seating. One exception occurs at the front of the proposed community facilities (Plot 103) [Location 7], where conditions are suitable for short periods of standing / sitting only. However, with the introduction of mitigation through design, to increase the balustrade of the balcony, this location has become suitable for outdoor seating. Effects would therefore be **negligible** for long-term outdoor seating.
- 17A.7.11 Wind conditions on the balconies in Plot 113 (a selection of balconies were tested) are suitable, in terms of pedestrian comfort, for long-term sitting and are therefore suitable for seating balconies. Effects would therefore be **negligible** for long-term sitting on balconies.

Configuration 2: Illustrative Masterplan - Phase 1 B (North) and Phase 1A (North) in place with the Illustrative Masterplan for the remainder of the Scheme

Pedestrian Safety

- 17A.7.12 Wind conditions in and around the Development still rate as suitable, in terms of pedestrian safety, for general public with the illustrative masterplan in place. As per Configuration 1, on Tempelhof Bridge to the south of 1B (North), which is within Phase 1A (North) [location 117], conditions rate as unsuitable for use by the general public, but as suitable for able-bodied. Effects for this specific location would therefore be **major adverse** in the absence of mitigation.

Pedestrian Comfort

- 17A.7.13 Wind conditions in and around Phase 1B (North) are generally suitable, in terms of pedestrian comfort, for strolling or better, and are thus suitable for leisure thoroughfares. Overall, effects would therefore be **negligible** for thoroughfares and leisure thoroughfares.
- 17A.7.14 At the designated entrances, shop fronts and waiting areas, wind conditions are suitable, in terms of pedestrian comfort, for short periods of standing / sitting, and are therefore suitable for their intended use. As with Configuration 1, with design mitigation incorporated, all locations are suitable for their intended use and therefore the effects are **negligible**.
- 17A.7.15 At the designated outdoor seating areas, wind conditions are suitable, in terms of pedestrian comfort, and are therefore suitable for outdoor seating. Effects would therefore be **negligible** for long-term outdoor sitting.
- 17A.7.16 Wind conditions on the balconies in Plot 113, to the west of 1B (North) are still suitable, in terms of pedestrian comfort, for long-term sitting and are therefore suitable for seating balconies. Effects would therefore be **negligible** for sitting on balconies.
- 17A.7.17 Wind conditions at the surrounding area are rated as suitable, in terms of pedestrian comfort, for the intended uses. Conditions as the south of Tempelhof Bridge [Locations 116 and 117] are suitable for pedestrian transit, and thus suitable, in terms of comfort, for thoroughfares. Effects would therefore be **negligible** in the surrounding area.
- 17A.7.18 The results of the assessment of Phase 1 A (North) and Phase 1 B (North) with the illustrative masterplan are illustrated on **Figure 17A.1** (ground level) and **Figure 17A.2** (balcony level for the residential units at Plot 113) and presented in **Appendix 17A.1**.

Configuration 3: Maximum Height Parameters - Phase 1 B (North) and Phase 1A (North) in place with the Maximum Height Parameters for the remainder of the Scheme

Pedestrian Safety

- 17A.7.19 Wind conditions in and around the Development still rate as suitable, in terms of pedestrian safety, for general public. Exceptions occur in the surrounding area, on Tempelhof Bridge to the south of Phase 1B (North), with the number of locations recording unsuitable conditions for the general public (but suitable for able-bodied), increasing to three locations [locations 93, 116 and 117]. Effects for this location would therefore be **major adverse** for pedestrian safety.

Pedestrian Comfort

- 17A.7.20 Wind conditions are generally suitable, in terms of pedestrian comfort, for pedestrian transit (strolling), and are thus suitable for thoroughfares (leisure thoroughfares). One exception occurs at the northern corner of Plot 101 [Location 78], where conditions are suitable for pedestrian transit only in winter, and are therefore suitable for a thoroughfare but not a leisure thoroughfare. The location is intended as a thoroughfare and therefore acceptable. Effects would therefore be **negligible** to **minor adverse** for thoroughfares and leisure thoroughfares respectively.
- 17A.7.21 Wind conditions are suitable, in terms of pedestrian comfort, with the introduction of the maximum parameter masterplan for short periods of standing / sitting, and are therefore suitable for intended use. Effects would therefore be **negligible** for short-term sitting at entrances, shop fronts and waiting areas.

- 17A.7.22 Wind conditions are suitable, in terms of pedestrian comfort, with the introduction of the maximum parameter masterplan for long-term sitting, and are therefore suitable for outdoor seating. Effects would therefore be **negligible** for long-term outdoor sitting.
- 17A.7.23 Wind conditions on the balconies in Plot 113, to the west of 1B (North) are still suitable, in terms of pedestrian comfort, for long-term sitting and are therefore suitable for seating balconies. Effects would therefore be **negligible** for sitting on balconies.
- 17A.7.24 Wind conditions at the surrounding area are rated as suitable, in terms of pedestrian comfort, for the intended uses. One exception occurs to the south of Phase 1B (North) on Tempelhof Bridge [Location 117], where wind conditions are now uncomfortable for all uses. Effects would therefore be **negligible to major adverse**. It should be noted that these conditions would only result if the future development plots adjacent to the bridge to the south are built to their maximum consented heights. This is considered to be an unlikely scenario as the illustrative Masterplan is the most likely massing scenario for plot delivery, however this information can be considered further in the detailed design and RMAs for these buildings at the RMA stage for the relevant sub-phase.
- 17A.7.25 The results of the assessment of Phase 1A (North) and Phase 1B (North) with maximum parameters are presented in **Appendix 17A.1**.

Mitigation Measures

Pedestrian Safety

- 17A.7.26 Mitigation measures have not been recommended for Tempelhof Bridge at this stage, however as future development phases come forward for detailed design (RMAs), further wind modelling will be undertaken and depending on the final building heights and massing to the south of the bridge, the assessment of wind microclimate on the bridge will need to be updated. If adverse impacts and safety concerns were found to exist in the permanent, completed state, then design alterations or mitigation would need to be considered to reduce these to an acceptable microclimate for bridge users.

Pedestrian Comfort

- 17A.7.27 The wind mitigation measures were developed for Phase 1B (North) in conjunction with the architects for the Scheme during an interactive workshop session (with BMT and the project architects) to alleviate unwelcome winds. The mitigation measures outlined below are inherent mitigation measures, i.e. they are now part of the detailed design for Phase 1B (North), having also been taken into account in the preceding assessment of impacts, however they are described for information purposes. These comprise the following:
- 1.5m high planter and hedging around the potential seating area in front of the community facilities (Plot 103);
 - Trees beside the balustrade surrounding the stairs on the Living Bridge Approach North;
 - Glass balustrade around the Plot 101 outdoor seating area [Location 80] raised to ~1.6m in total height; and
 - ~0.5m deep ledge or similar at ~10m high along the western façade of the community facilities (Plot 103) opposite the stairs located within the Living Bridge Approach North.
- 17A.7.28 The wind mitigation measures are illustrated on **Figure 3.4** within **Appendix 17A.1**.

Residual Impacts

17A.7.29 With the introduction of the mitigation measures as described above, and within **Appendix 17A.1**, the Phase 1B (North) elements, in terms of safety and comfort, are considered suitable for their intended purpose. The residual impacts remain as reported in the Potential Impacts section, as all mitigation measures identified are inherent and therefore now form part of the detailed design for Phase 1B (North). The mitigation also addresses Planning Condition 34.5 of the 2014 Permission.

17A.7.30 Overall, the findings of the s73 ES and other EIA Documentation remain valid.

17A.7.31 A summary of the residual impacts associated with wind is included within **Chapter 22: Summary of Residuals Impacts and Mitigation**.

References

There are no references for this Chapter.