

VIEW 34

Photography



01. TRIPPOD POSITIONED AT 1.0M



02. CAMERA LOCATION

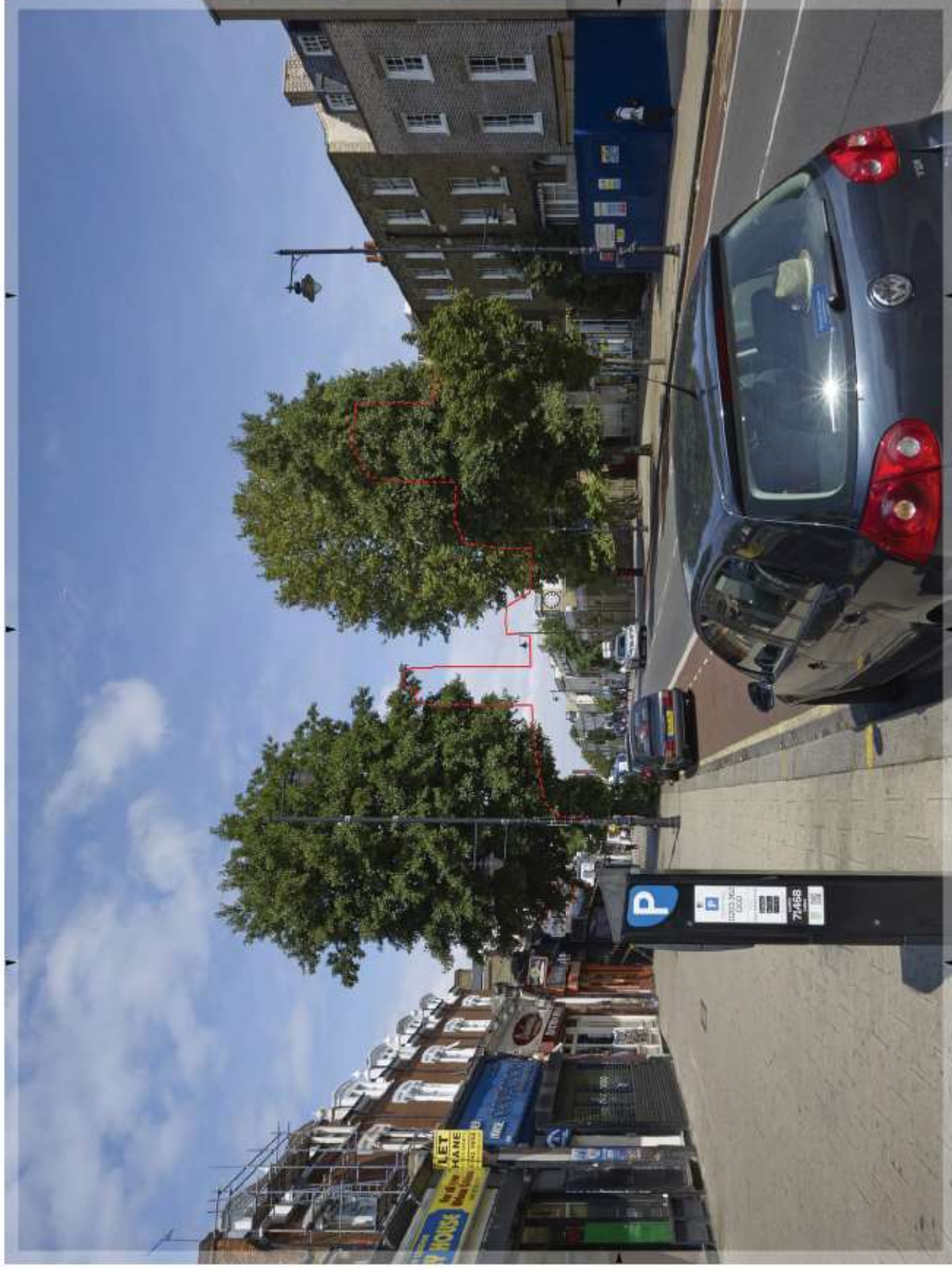
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Height AOD: 10.806m
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Format: Medium
Format Digital: 4:3



03. EXISTING VIEW

VIEW 34

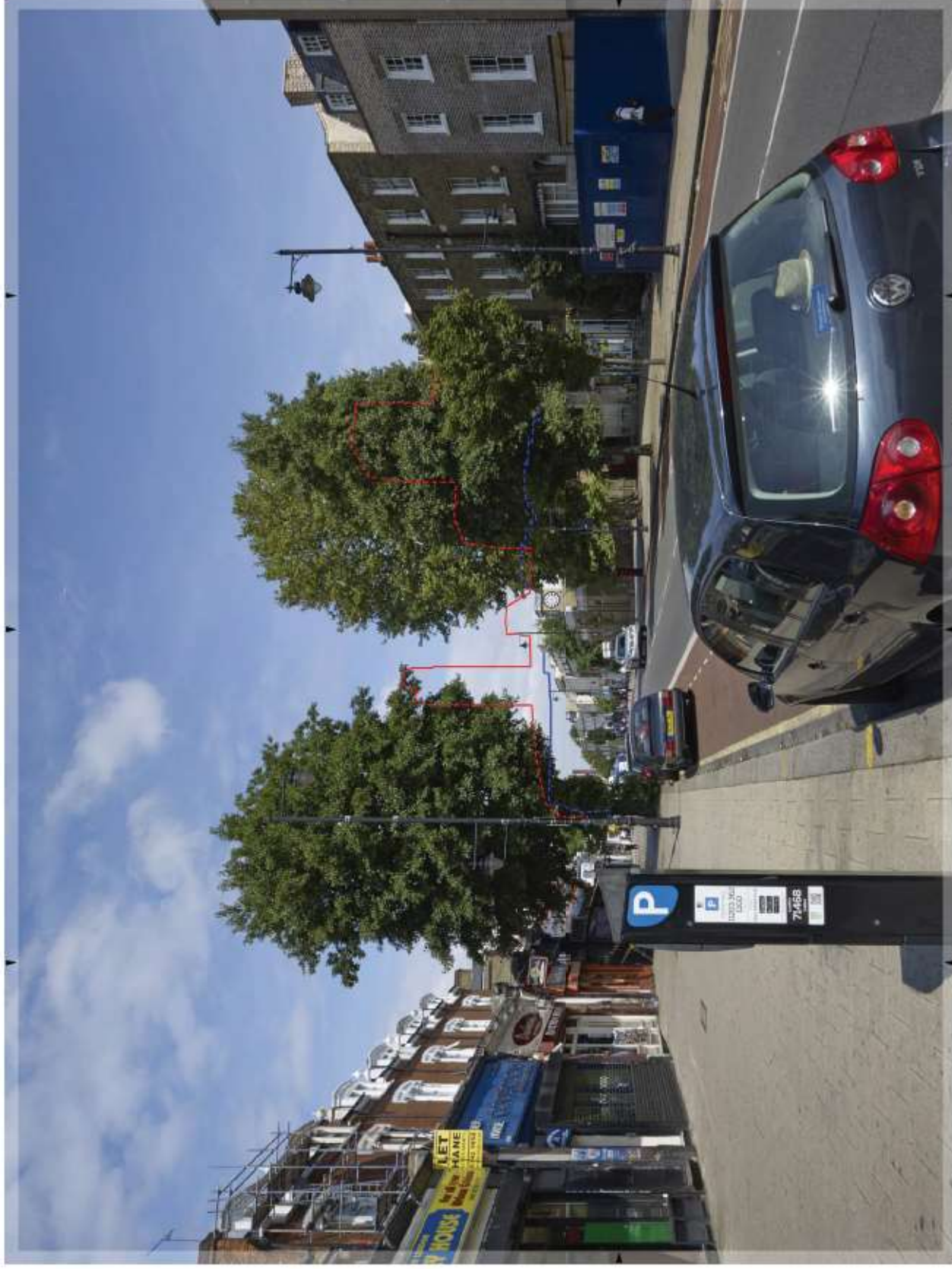
AVR



01. PROPOSED AVR VIEW

VIEW 34

AVR



01. OVERLAY AVR VIEW

VIEW 35

Photography



01. TRIPOD POSITIONED AT 1.6M



02. CAMERA LOCATION

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Time: 11:20am
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Height m: 1.6m
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Format Digital: 4:3



03. EXISTING VIEW

VIEW 35

AVR



01. PROPOSED AVR VIEW

VIEW 35

AVR



01. OVERLAY AIR VIEW

VIEW 36

Photography



01. TRIPPOO POSITIONED AT 1.0M



02. CAMERA LOCATION

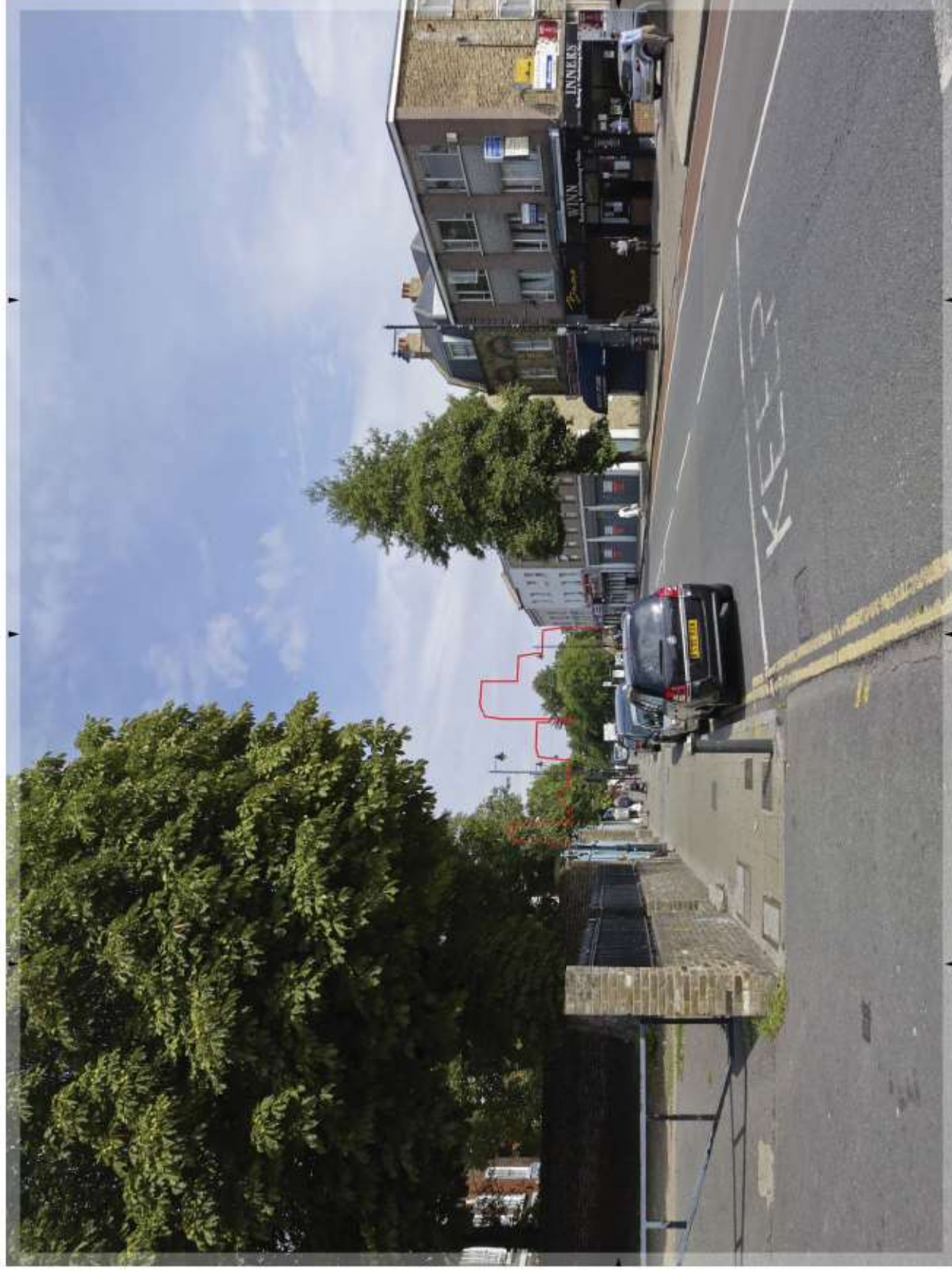
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03. EXISTING VIEW

VIEW 36

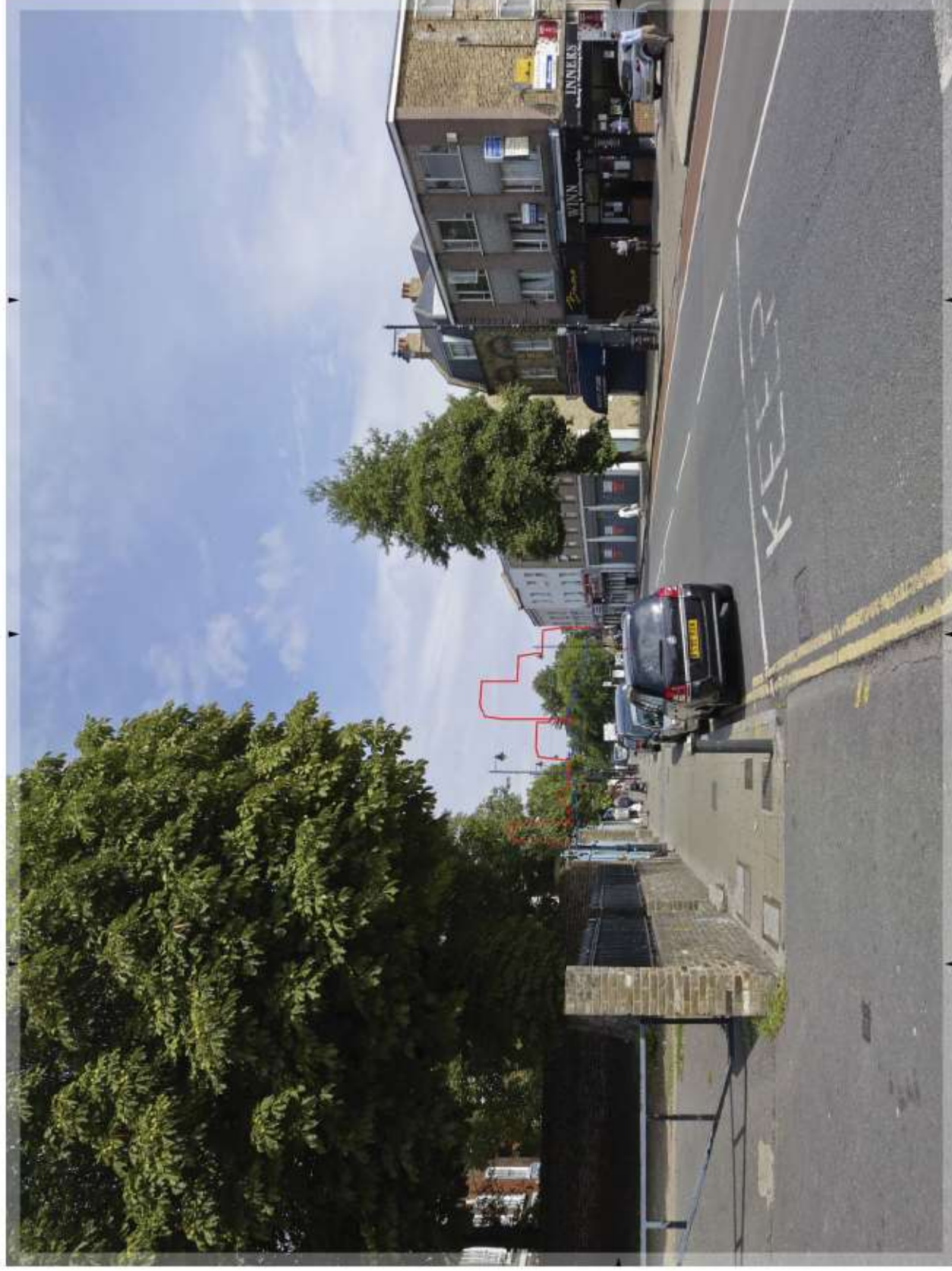
AVR



01. PROPOSED AVR VIEW

VIEW 36

AVR



01. OVERLAY AVR VIEW

VIEW 37

Photography



01. TRIPOD POSITIONED AT 1.0M



02. CAMERA LOCATION

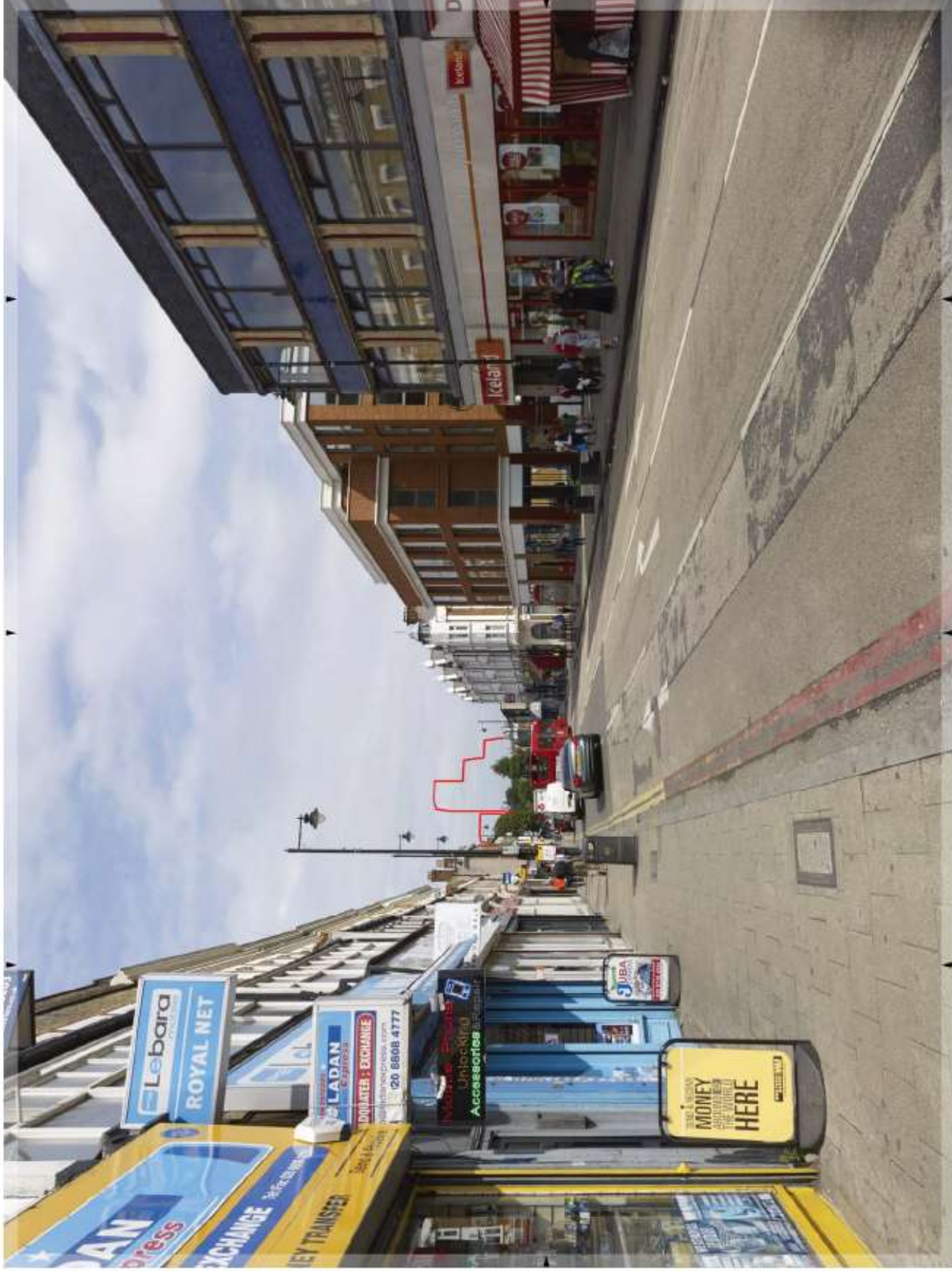
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Format: Medium
Format Digital: 4:3



03. EXISTING VIEW

VIEW 37

AVR



01. PROPOSED AVR VIEW

VIEW 37

AVR



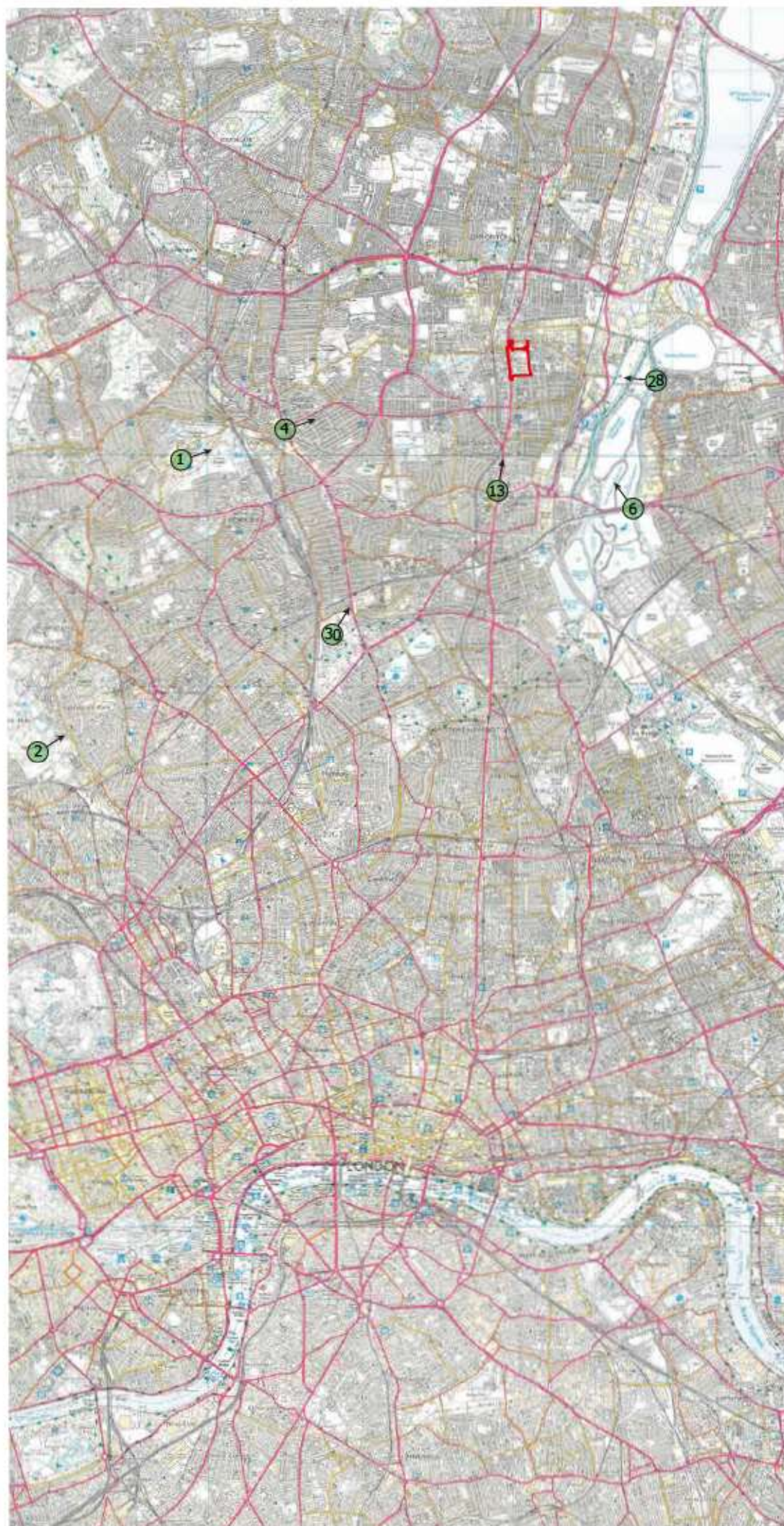
01. OVERLAY AVR VIEW



WEAREINK LTD 2nd FLOOR 122-128 ARLINGTON ROAD LONDON NW1 7HP
E.HELLO@WORTHINK.CO.UK T. 020 7193 5300
COMPANY REG NO. 9473109 VAT NO. GB9851916 77

Appendix 12.6: Summary Table of Effects

Location	Sensitivity		Magnitude (Construction)				Significance of Effect (Construction)		Magnitude (Year 1 - Winter)				Significance of Effect (Year 1 - Winter)		Magnitude (Year 15 - Summer)				Significance of Effect (Year 15 - Summer)					
	Value	Susceptibility	Overall Sensitivity	Size / Scale of Change	Geographical Influence	Duration and Reversibility	Overall Magnitude	Effect	Size / Scale of Change	Geographical Influence	Duration and Reversibility	Overall Magnitude	Effect	Size / Scale of Change	Geographical Influence	Duration and Reversibility	Overall Magnitude	Effect	Size / Scale of Change	Geographical Influence	Duration and Reversibility	Overall Magnitude	Significance of Effect (Year 15 - Summer)	
Effects on Townscape Site Features																								
Landform	Low	Medium	Low	Negligible	Medium	High	Low	Minor Adverse	Negligible	Medium	High	Low	Minor Adverse	Negligible	Medium	High	Low	Minor Adverse	Negligible	Medium	High	Low	Minor Adverse	Low
Vegetation	Medium	Medium	Medium	Low	Medium	High	Low	Minor Adverse	Low	Medium	High	Low	Minor Adverse	Low	Medium	High	Low	Minor Adverse	Medium	Medium	High	Medium	Beneficial	Moderate
Built Form	Medium	High	Medium	Very High	Very High	High	Very High Adverse	Major Adverse	Very High	Very High	High	High	Major Beneficial	Very High	Very High	High	High	Major Beneficial	Very High	Very High	High	Major Beneficial	Major	
Free Standing Built Structures	Medium	Medium	Medium	Low	Low	High	Low Adverse	Minor Adverse	Low	Low	High	Low	Minor Adverse	Low	Low	High	Low	Minor Adverse	Low	Low	High	Low	Minor Beneficial	Minor
Land Use	Medium	High	Medium	Medium	High	High	Medium Adverse	Moderate Adverse	Medium	High	High	Medium	Moderate Beneficial	Medium	High	High	Medium	Moderate Beneficial	Medium	High	High	Medium	Beneficial	Moderate
Public Access	Medium	High	Medium	Medium	High	High	Medium Adverse	Moderate Adverse	Medium	High	High	Medium	Moderate Beneficial	Medium	High	High	Medium	Moderate Beneficial	Medium	High	High	Medium	Beneficial	Moderate
Effects on Townscape Character Areas																								
1: THFC Stadium	Low	Low	Very Low	Very High	Very High	Low	Very High Neutral	Moderate Neutral	Very High	Very High	High	Very High Beneficial	Moderate Beneficial	Very High	Very High	High	Very High Beneficial	Moderate Beneficial	Very High	Very High	High	Very High Beneficial	Very High	Moderate Beneficial
2: Tottenham High Road	High	High	High	High	High	Low	High Adverse	Major Adverse	High	High	High	High Beneficial	Major Beneficial	High	High	High	High Beneficial	Major Beneficial	High	High	High	Major Beneficial	High	High
3: North Tottenham Low Level Industrial Estates	Low	Low	Very Low	Medium	Low	Low	Medium Adverse	Minor Adverse	Medium	Low	High	Medium Beneficial	Minor Beneficial	Medium	Low	High	Medium Beneficial	Minor Beneficial	Medium	Low	High	Medium Beneficial	Minor	Minor
4: East Tottenham Large Scale Residential	Medium	Low	Low	High	High	Low	High Adverse	Moderate Adverse	High	High	High	High Beneficial	Moderate Beneficial	High	High	High	High Beneficial	Moderate Beneficial	High	High	High	High	High	Moderate
5: East Tottenham Linear Residential	Medium	Medium	Medium	Medium	Low	Low	Medium Adverse	Moderate Adverse	Medium	Low	High	Medium Beneficial	Moderate Beneficial	Medium	Low	High	Medium Beneficial	Moderate Beneficial	Medium	Low	High	Medium	Beneficial	Moderate
6: East Tottenham Mixed Linear Residential	Medium	Medium	Medium	Medium	Medium	Low	Medium Adverse	Moderate Adverse	Medium	Medium	High	Medium Neutral	Moderate Neutral	Medium	Medium	High	Medium Neutral	Moderate Neutral	Medium	Medium	High	Medium	Neutral	Moderate
7: Northumberland Park Discordant Residential	Low	Medium	Low	Medium	Medium	Low	Medium Adverse	Minor Adverse	Medium	Medium	High	Medium Beneficial	Minor Beneficial	Medium	Medium	High	Medium Beneficial	Minor Beneficial	Medium	Medium	High	Medium	Beneficial	Minor
8: Bruce Castle Mixed Open Space	High	Very High	High	Medium	Low	Low	Medium Adverse	Moderate Adverse	Medium	Low	High	Medium Adverse	Moderate Adverse	Medium	Low	High	Medium Adverse	Moderate Adverse	Medium	Low	High	Medium	Adverse	Moderate
9: Lee Valley Large Scale Industrial	Low	Low	Very Low	Very Low	Low	Low	Very Low Adverse	Negligible Adverse	Very Low	Low	High	Very Low Beneficial	Negligible Beneficial	Very Low	Low	High	Very Low Beneficial	Negligible Beneficial	Very Low	Low	High	Very Low Beneficial	Very Low	Negligible
10: West Tottenham Large Scale Mixed Development	Low	Medium	Low	Very Low	Very Low	Low	Very Low Adverse	Negligible Adverse	Very Low	Very Low	High	Very Low Beneficial	Negligible Beneficial	Very Low	Very Low	High	Very Low Beneficial	Negligible Beneficial	Very Low	Very Low	High	Very Low Beneficial	Very Low	Negligible
Effects on Views																								
1. Alexandra Palace	High	High	High	Medium	Low	Low	Medium Adverse	Moderate Adverse	Medium	Low	High	Medium Beneficial	Moderate Beneficial	Medium	Low	High	Medium Beneficial	Moderate Beneficial	Medium	Low	High	Medium Beneficial	Medium	Moderate
2. Parliament Hill	High	High	High	Very Low	Very Low	Low	No Change	No Change	Very Low	Very Low	High	Very Low Neutral	Minor Neutral	No Change	No Change	High	No Change	No Change	No Change	No Change	High	No Change	No Change	No Change
3. Royal Observatory, Greenwich Park	High	High	High	No Change	No Change	Low	No Change	No Change	No Change	No Change	High	No Change	No Change	No Change	No Change	High	No Change	No Change	No Change	No Change	High	No Change	No Change	No Change
4. Intersection of Lordship Lane and High Road, Wood Green	Medium	High	High	No Change	No Change	Low	No Change	No Change	No Change	No Change	High	No Change	No Change	No Change	No Change	High	No Change	No Change	No Change	No Change	High	No Change	No Change	No Change
5. Western edge of Lordship Recreation Ground	Medium	High	High	Low	Low	Low	Low Adverse	Moderate Adverse	Low	Low	High	Low Neutral	Moderate Neutral	Low	Low	High	Low Neutral	Moderate Neutral	Low	Low	High	Low Neutral	Low	Moderate Neutral
6. Forest Lane Bridge Crossing of River Lea	Low	Medium	Low	Low	Low	Low	Low Adverse	Minor Adverse	Low	Low	High	Low	Minor Neutral	No Change	No Change	High	No Change	Minor Neutral	No Change	No Change	High	No Change	No Change	No Change
7. Public Footpath, Tottenham Marshes	Medium	High	High	Medium	Medium	Low	Medium Adverse	Moderate Adverse	Medium	Medium	High	Medium Neutral	Moderate Neutral	Medium	Medium	High	Medium Neutral	Moderate Neutral	Medium	Medium	High	Medium Neutral	Medium	Moderate Neutral



Key

 Application Boundary

 Viewpoint

SCALE BAR

0 500m 1km 1.5km 2km 3km

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Project Northberland Development Project

Drawing Extensive Context - Viewpoints

Dwg No Figure 12.1

Scale 1: 50,000 @A3

Date August 2015

Drawn CR Checked GF

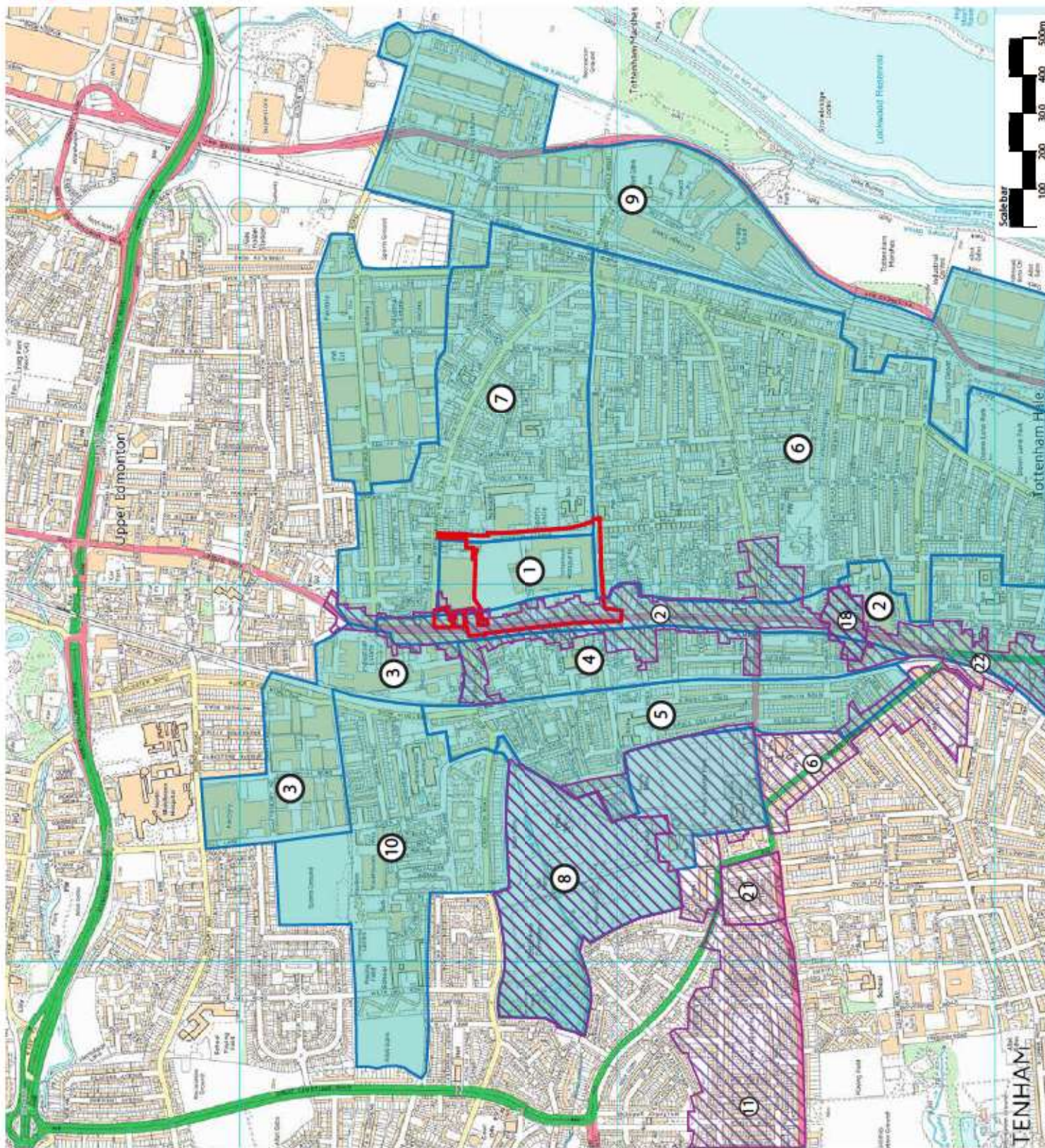


Bedford 01234 261315
Woodbridge 01394 380509
London 0207 252 0002
Horwich 01603 230777



Do not scale off drawing. All dimensions & levels are to be checked on site. Any discrepancies must be reported to the Landscape architect immediately. © The Landscape Partnership Ltd.

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Key

Application Boundary



Conservation Area



Townscape Character Areas



1. THFC Stadium
2. Tottenham High Road
3. North Tottenham Low Level Industrial Estates
 - a) East
 - b) West
4. West Tottenham Large Scale Residential
5. West Tottenham Linear Residential
6. East Tottenham Mixed Linear Residential
7. Northumberland Park Disordered Residential
8. Bruce Castle Mixed Open Space
9. Lee Valley Large Scale Industrial
10. East Tottenham Large Scale Mixed Development

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Project Northumberland Development Project

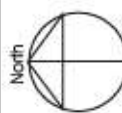
Drawing Townscape Character Areas

Dwg No. Figure 12.4

Scale 1:10 000 @A3

Date August 2015

Drawn AR Checked GF



Bedford	01234 261315
Woodbridge	01394 380509
London	0207 252 0002
Norwich	01603 230777

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TENHAM

Appendix 13.1 Glossary of Technical Terms

A-Weighting: The human ear is not equally sensitive to all frequencies of sound. It is relatively much less sensitive to very low frequencies such as 'mains hum', and to very high frequencies such as the call of a bat, than to the 'mid-frequencies' important for human voice communication. In order to make sound level meters, which would otherwise be indiscriminate in registering sound pressures, respond in a way which reflects human perception of sound, they usually are fitted with a set of filters to progressively filter out the high and low frequency energy. The filters are made to an internationally standardised specification and the filtered noise level is said to be 'A-weighted'. Sometimes A-weighted decibel levels are denoted 'dB(A)', but the correct, internationally standardised format for reporting requires the 'A' to be appended to the noise descriptor e.g. $L_{Aeq,T}$, L_{Amax} , etc.

Airborne Sound: Sound transmitted through the air rather than through the structure of a building or the ground.

Ambient Noise: This is the totally encompassing sound at the measurement position over a specified time interval and usually comprises sound from many different sources both near and far.

Attenuation: A general term used to indicate the reduction of noise or vibration, or the amount (in decibels) by which it is reduced.

Averaging: In the absence of a dominant steady source, the sound level at a point, indoors or outdoors, varies continuously. For example, the variation may be over a few dB about an average value in a quiet room, or over 10dB or more in a noisy outdoor environment. In order to define a level to represent the noisiness of the space it is necessary to define that average value. The most common averaging methods are energy averaging (L_{Aeq}) and statistical averaging (L_{AN} where N is a percentage between 1 and 100).

Background Noise Level, $L_{A90,T}$: Background noise level is a term used to describe that level to which the noise falls during quiet spells, when there is lull in passing traffic for example. It is quantified by the $L_{A90,T}$ which is the noise level that is exceeded for 90% of the measurement time interval, T.

Decibels: Noise conventionally is measured in decibels (dB). The decibel is a logarithmic unit and decibel levels do not add and subtract arithmetically. An increase or decrease of 3dB in the level of a steady noise is about the smallest that is noticeable. It represents a doubling or halving of noise energy. An increase or decrease of 10dB represents a ten-fold change in noise energy, and is perceived as a doubling or halving of loudness.

The threshold of hearing for a typical young, healthy adult is 0dB A-weighted sound pressure level. A noise level of 140dB(A) can cause physical pain. Most people listen to their televisions at about 60 to 65dB(A). Alongside a busy main road the ambient noise level may be in the 70 to 80dB(A) range; on a quiet day in the country it might be as low as 30dB, in town 40 to 50dB(A).

Decibel Addition: If two similar noise sources operate together their combined noise level at an observer's position some distance away is 3dB higher than the noise level generated by just one of them. If two further machines are switched on the noise level generated by all four at the observer's position is 3dB higher than the level generated by the two. If the number of machines is again doubled, to eight, the noise level increases by another 3 dB, and so on.

Equivalent Continuous A-Weighted Sound Pressure Level, $L_{Aeq,T}$: The 'equivalent continuous A-weighted sound pressure level' is an average of the fluctuating sound energy in a space. It is the value of the A-weighted sound pressure level of a continuous, steady sound that, over the specified time period, T seconds, has the same root mean square sound pressure as the varying sound. It can be likened to the mean petrol consumption of a car over a specific journey during which the

instantaneous consumption peaked during periods of acceleration and fell during periods of coasting or braking.

Façade Sound Level: Road and railway traffic noise levels often are specified in terms of the sound level at a position 1m in front of the most exposed façade of potentially noise sensitive premises. Such levels are assumed to be 3dB(A) higher than sound levels measured at an equivalent position away from the reflections from the building and any other surfaces (excluding the ground).

Free-field Sound Level: The free-field refers to sound level measurement positions in an open area well away from any buildings or other sound reflecting surfaces other than the ground. Generally the minimum distance from building facades for free-field measurements is taken to be 3.5m.

Frequency: The number of cycles per second that the sound pressure fluctuates about the ambient static air pressure. High frequency noises are often described as having a high pitch and low frequency noises as having a low pitch. Frequency is measured in Hertz (Hz). The frequency limit of human hearing ranges from 20 Hz to 20 kHz.

Frequency Spectrum: The complete range of frequencies.

Insertion Loss: The difference in sound power level at a particular frequency band of a noise source, measured at the receiver, with and without the sound attenuator in the transmission path between the source and receiver.

Minimum sound Level, L_{Amin} : This is the minimum instantaneous sound level occurring during the measurement period. Because of the standardised response time characteristics of the sound level meter a L_{Amin} level measured on Slow response normally will be a higher value than the same noise measured using Fast response.

Octave Band: The frequency spectrum is measured using an internationally standardised set of octave and one-third octave bands. These bands are identified by their nominal centre frequency specified in Hz (one hertz [Hz] is one cycle per second).

Pure tone: A single frequency tone with no harmonic component and generally considered to be more disturbing than a complex sound at the same level. In cases where the sound level in a single 1/3 octave band is at least 5 dB higher than the level in the frequency band on either side of it, this may be an indication of tonal character in a noise (clause 4.1.3 of BS7445:Part 2:1991).

Rating level, $L_{Ar,Tr}$: The term used in BS4142:1997 to describe the specific noise level plus any adjustment for the characteristic features of the noise.

Residual Noise: The ambient noise remaining at a given position in a given situation when the specific noise is suppressed to a degree such that it does not contribute to the ambient noise.

Resonance: The response of a system (e.g. a thin panel) to an incident sound wave that is close to its natural vibration frequency.

Reverberation: The decay of sound in an enclosed space after the noise source has stopped. Spaces bounded by acoustically hard surfaces (e.g. concrete) will be highly reverberant with the sound taking a long time to fade away due to echoes. Spaces with significant sound absorbent surfaces, such as a room with carpet, curtains and soft furnishings, sound will decay very rapidly and the space will sound much more "dead".

Specific Noise: The noise of the particular source under investigation.

Vibration: Vibration is an oscillatory motion. The magnitude of vibration can be defined in terms of displacement (how far something moves from the equilibrium position), velocity (how fast something moves), or acceleration (the rate of change of velocity). When describing vibration, one must specify whether peak values (i.e. the maximum displacement or maximum velocity) or rms/rmq values (effectively an average value) are used. Standards for the assessment of building damage are usually

given in terms of peak velocity (usually referred to as Peak Particle Velocity, or ppv), whilst human response to vibration is often described in terms of rms or rms acceleration.

Vibration Dose Value: This is a measure of the amount of vibration that is experienced over a specified period, and has been defined so as to quantify the human response to vibration in terms of comfort and annoyance. The Vibration Dose Value (VDV) is used to assess the likely levels of adverse comment about vibration, and is defined mathematically as the fourth root of the time integral.

Appendix 13.2 Planning Policy and Guidance Documents

The local and national planning guidance is summarised in the noise and vibration chapter.

The British Standards and guidance documents used in the assessment are set out below.

Construction Noise and Vibration

BS5228: 2009+A1:2014 Code of practice for Noise and vibration control on construction and open sites. Part 1: Noise

This British Standard comprises two parts but this particular one gives recommendations for basic methods of noise control where there is a need for the protection of persons living and working in the vicinity of, and those working on, construction and open sites.

"It recommends procedures for noise and vibration control in respect of construction operations and aims to assist architects, contractors and site operatives, designers, developers, engineers, local authority environmental health officers and planners."

In the Annexes to the code of practice there is included information on:

- the relevant legislation;
- typical noise sources and advice on mitigating them;
- sound level data for use in the prediction methods described in the standard;
- assessing the significance of noise effects;
- the estimation of noise levels, and;
- how to implement noise monitoring.

Annex E of the BS deals with the significance of noise effects. This approach addresses the need and methods for assessment of the significance of construction noise impacts when undertaking an Environmental Impact Assessment (EIA) for example.

Clause E.2 sets out two methods of assessment. Firstly it describes the "*older and more simplistic*" approach based on the advice in AL 72, noting that the original advice "*has been expanded over time to include a suite of noise levels covering the whole day/week period taking into account the varying sensitivities through these periods.*" Table 3 below (Table E.2 in sub-clause E.4 of the BS) illustrates the approach.

Table A13. 1: Examples of time periods, averaging times and noise levels associated with the determination of eligibility for noise insulation

Time	Relevant time period	Averaging time, T	Noise insulation trigger level dB L _{Aeq,T} A)
Monday to Friday	07.00 – 08.00	1 h	70
	08.00 – 18.00	10 h	75
	18.00 – 19.00	1 h	70
	19.00 – 22.00	3 h	65
	22.00 – 07.00	1 h	55
Saturday 07.00 – 08.00	07.00 – 08.00	1 h	70
	08.00 – 13.00	5 h	75
	13.00 – 14.00	1 h	70
	14.00 – 22.00	3 h	65
	22.00 – 07.00	1 h	55
Sunday and Public Holidays	07.00 – 21.00	1 h	65
	21.00 – 07.00	1 h	55
A) All noise levels are predicted or measured at a point 1 m in front of the most exposed of any windows and doors in any façade of any eligible dwelling.			

In sub-clause E.3 an alternative approach based on considering the change in the ambient noise level that the construction noise causes. This approach is used commonly in EIA. Two methods are described.

The first is the ABC method an example of which is set out in Table 4 below (Table E.1 in the BS). Three categories, A, B and C are described in terms of threshold noise levels for a daytime (07.00 to 19.00 weekdays, 07.00 to 13.00 Saturday), evening and weekend, and finally a night time period (23.00 to 07.00). If the combined ambient noise and construction noise exceed the relevant threshold level this is deemed a “significant effect”.

Table A13. 2: Example threshold of significant effect at dwellings

Assessment category and threshold value period (L _{Aeq})	Threshold value, in decibels (dB)		
	Category A ^{a)}	Category B ^{b)}	Category C ^{c)}
Night-time (23.00–07.00)	45	50	55
Evenings and weekends D)	55	60	65
Daytime (07.00–19.00) and Saturdays (07.00–13.00)	65	70	75
NOTE 1 A significant effect has been deemed to occur if the total LAeq noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level.			
NOTE 2 If the ambient noise level exceeds the threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total LAeq noise level for the period increases by more than 3 dB due to construction activity.			
NOTE 3 Applied to residential receptors only.			
^{a)} Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.			
^{b)} Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.			
^{c)} Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.			
^{d)} 19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays.			

In effect the appropriate Category is assessed using the following ambient noise level ranges:

Table A13. 3: Relevant ambient noise level ranges for the ABC approach

Assessment category and threshold value period	Ambient noise level, in decibels (dB)		
	Category A	Category B	Category C
Night-time (23.00–07.00)	≤42.4	42.5 to 47.4	≥47.5
Evenings and weekends D)	≤52.4	52.5 to 57.4	≥57.5
Daytime (07.00–19.00) and Saturdays (07.00–13.00)	≤62.4	62.5 to 67.4	≥67.5

The second method suggests that “Noise levels generated by construction activities are deemed to be significant if the total noise (pre-construction ambient plus construction noise) exceeds the pre-construction ambient noise by 5 dB or more, subject to lower cut off values of 65 dB, 55 dB and 45 dB $L_{Aeq,Period}$ from construction noise alone, for the daytime, evening and night-time periods, respectively; and a duration of one month or more, unless works of a shorter duration are likely to result in significant impact.”

BS5228: 2009+A1:2014 Code of practice for Noise and vibration control on construction and open sites. Part 2: Vibration

The threshold of perception for vibration depends on the frequency. The human body is most sensitive to vibration in the frequency range 1-80 Hz. The threshold of perception is typically taken to be 0.15 mm/s and 0.3 mm/s peak particle velocity (ppv) at frequencies between 8 Hz and 80 Hz.

BS5228-2:2009+A1:2014 provides guidance on the effects of vibration from construction activities in terms of the peak particle velocity (PPV) and the table below reproduces Table B.1 of Annex B to the standard.

Table A13. 4: Guidance on effects of vibration levels

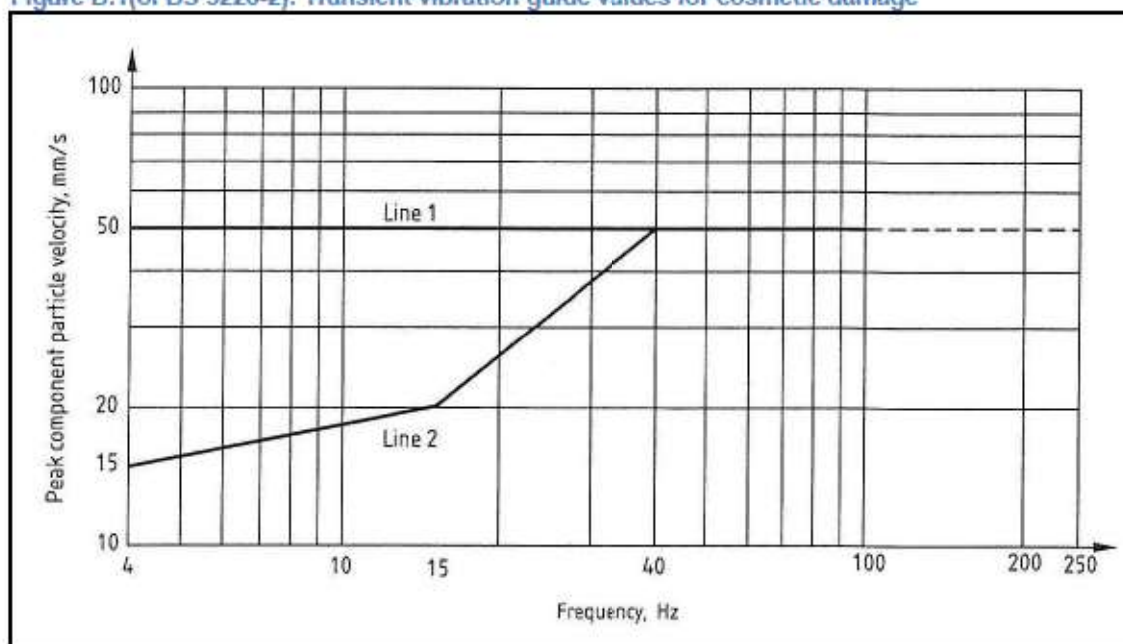
Vibration level	Effect
0.14 mm·s ⁻¹	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mm·s ⁻¹	Vibration might be just perceptible in residential environments.
1.0 mm·s ⁻¹	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10 mm·s ⁻¹	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

Guide values for cosmetic damage to buildings are given in Table B.2 of the standard and is as set out below, together with Figure B.1 to which it refers:

Table A13. 5: Transient vibration guide values for cosmetic damage

Line (see Figure B.1)	Type of building	Peak component particle velocity in frequency range of predominant pulse	
		4 Hz to 15 Hz	15 Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm·s ⁻¹ at 4 Hz and above	50 mm·s ⁻¹ at 4 Hz and above
2	Unreinforced or light framed structures Residential or light commercial buildings	15 mm·s ⁻¹ at 4 Hz increasing to 20 mm·s ⁻¹ at 15 Hz	20 mm·s ⁻¹ at 15 Hz increasing to 50 mm·s ⁻¹ at 40 Hz and above
NOTE 1 Values referred to are at the base of the building. NOTE 2 For line 2, at frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.			

Figure B.1(of BS 5228-2): Transient vibration guide values for cosmetic damage



Considerate Constructors Scheme

The Considerate Constructors Scheme, details of which can be found at the following web address, www.considerateconstructorscheme.org.uk, is a scheme under which sites registered with the scheme are monitored by an experienced industry professional to assess their performance against the eight point Code of Considerate Practice which includes the categories Considerate, Environment, Cleanliness, Good Neighbour, Respectful, Safe, Responsible and Accountable. It is recommended that the main contractor be required to register the site under this scheme.

Operational Road Traffic Noise

The noise from a traffic stream is not constant but varies from moment to moment and for assessment purposes it is necessary to use an index to arrive at a single-figure estimate of the overall noise level. The index adopted by the government to assess road traffic noise is the $L_{A10,18\text{hour}}$, which is the noise level exceeded for 10% of the 18-hour period (06:00 to 24:00 hours). This parameter has been used to assess traffic noise for some time because of its good correlation with subjective response.

The former Department of Transport and Welsh Office memorandum *Calculation of Road Traffic Noise* (CRTN), published in 1988, sets out the UK standard methods for predicting and measuring road traffic noise using the L_{A10} over an 18 hour period, from 06:00 hours to 24:00 hours. UK legislation relating to compensation and insulation against road traffic noise from new or altered public highways uses this noise index.

The Design Manual for Road and Bridges (DMRB), Volume 11, Part 3 Section 7 HD213/11 Revision 1, *Noise and Vibration*, gives advice on the appraisal of noise and vibration impacts due to changes in road traffic noise and vibration for trunk roads. The DMRB identifies various stages of assessment, with each stage becoming increasingly detailed.

The objective of the DMRB noise assessment is to establish the magnitude of the significance of noise changes for areas where existing traffic is likely to at least increase by 25% or reduce by 20%. The DMRB advises that these changes are equivalent to a change in noise level of 1 dB(A), which is the minimum change that can be detected by the human ear in the short term (e.g. on opening of a development or scheme). The DMRB assessment methodology dictates that all properties experiencing changes in noise greater than 1 dB(A) should be assessed. Properties experiencing a change in noise of less than 1 dB(A) do not need to be considered, the inference being that such a slight change in the level of noise is so small as to be negligible.

A doubling or halving of the total flow of traffic would cause the noise level to change by 3 dB(A) which is considered the minimum perceptible change under normal conditions. A change in the noise level of 1 dB(A) is generally only perceptible under controlled conditions. However, the DMRB indicates that those subjected to a sudden change in noise level as low as 1 dB(A), such as that which accompanies the opening of a road scheme, may just perceive the change and experience either a benefit or disbenefit.

Industrial/Commercial Noise

BS 4142:2014 *Methods for rating and assessing industrial and commercial sound* describes methods for rating and assessing the following:

- sound from industrial and manufacturing processes;
- sound from fixed installations which comprise mechanical and electrical plant and equipment;
- sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
- sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

The methods use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

Sound from any plant associated with the proposed development in its entirety should be considered in accordance with the requirements of BS 4142:2014 and for both existing and proposed noise-sensitive receptors.

The Standard effectively compares and rates the difference between the specific sound level of the source ($L_{Aeq,T}$) and the typical background sound level ($L_{A90,T}$) in the absence of the specific sound. If appropriate, the specific sound level is corrected, by the application of one or more corrections, for acoustic features such as tonal qualities and/or distinct impulses, to give a 'rating' level ($L_{Ar,Tr}$).

The Standard advises that the time interval ('T') of the background sound measurement should be sufficient to obtain a representative or typical value of the background sound level.

Comparing the rating level with the background sound level, BS 4142 states:

"Typically, the greater this difference, the greater the magnitude of impact

A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context

A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context

The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."

Code of Practice on Environmental Noise Control at Concerts

The Code of Practice is aimed specifically at "large music events involving high powered amplification held in sporting stadia, arenas, open air sites and within lightweight buildings". It defines a music event as "a concert or similar event where live or recorded music is performed by a solo or group of artists before an audience". For events held between 09:00 and 23:00 hours it provides guideline Music Noise Levels (the L_{Aeq} of the music noise measured at a particular location) 1 metre from the facade of any noise sensitive premises that are set out in Table 1 to the code of Practice.

Table A13. 6: The Noise Council guidelines for environmental noise control at concerts

Concert days per calendar year, per venue	Venue Category	Guideline
1 to 3	Urban Stadia or Arenas	The MNL should not exceed 75 dB(A) over a 15 minute period
1 to 3	Other Urban and Rural Venues	The MNL should not exceed 65 dB(A) over a 15 minute period
4 to 12	All Venues	The MNL should not exceed the background noise level by more than 15 dB(A) over a 15 minute period

For events that continue beyond 23:00 hours the Code recommends that the music noise should not be audible within noise-sensitive premises with their windows open for ventilation.

Site Suitability

BS 8233: 2014 *Guidance on sound insulation and noise reduction for buildings* provides recommendations for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new buildings, or refurbished buildings undergoing a change of use, rather than to assess the effect of changes in the external noise climate.

The Standard suggests suitable internal noise levels within different types of buildings, including residential dwellings. For reasonable resting/sleeping conditions the standard suggests that an internal noise level of 30 dB $L_{Aeq,8hour}$ within bedrooms and 35 dB $L_{Aeq,16hour}$ is specified for living rooms.

BS 8233: 2014 states that *"regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$ depending on the character and number of events per night."*

The Standard also recommends that "it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments." The standard also states that these guideline values are not always achievable in all circumstances and therefore a compromise between elevated noise levels and the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.

The noise level criteria specified in BS 8233:2014 are broadly in line with those specified by the World Health Organisation (WHO) in its *Guidelines for Community Noise* as described below.

The WHO guidelines consolidate scientific knowledge on the health effects of community noise and provide guidance to environmental health authorities and professionals trying to protect people from the harmful effects of noise in non-industrial environments. The main sources of community noise are identified as road, rail and air traffic, industries, construction and public work and neighbours.

The effects of noise in dwellings are, typically, sleep disturbance, speech interference and annoyance. Relevant guideline values and the time base over which the individual guideline values apply are summarised in Table A13.6.

Table A13. 7: Guideline Values for Proposed Dwellings, dB

Specific Environment	Critical Health Effect	$L_{Aeq,T}$	Time Base, T (hours)*	L_{AFmax}
Outdoor living area	Serious annoyance, daytime and evening	55 dB	16	-
	Moderate annoyance, daytime and evening	50 dB		-
Dwellings indoors	Speech intelligibility and moderate annoyance, daytime and evening	35 dB	16	-
Inside bedrooms	Sleep disturbance, night-time	30 dB	8	45 dB
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45 dB		60 dB

*These periods are usually taken to be 07:00 to 23:00 hours (daytime) and 23:00 to 07:00 hours (night-time).

Appendix 13.3 Noise Measurement Locations

P1. Park Lane

The microphone was in the free-field on the flat roof of the single storey building at the south west corner of the stadium, immediately overlooking Park Lane and opposite the four storey residential block of flats, Concorde House. This was taken to be representative of the closest point of the proposed southern commercial and residential development to both Park Lane and High Road.

Sound level meter Solo 3 (see Appendix 13.4) was installed on Tuesday 11 November at 17:34 running on mains power and was removed at 09:08 on Monday 17 November 2008.

CRTN Measurement in Park Lane beneath Location P1

A measurement over three consecutive 1-hour periods between 14:00 and 17:00 on Wednesday 19 November 2008 was undertaken at this free-field position on the pavement on the opposite side of Park Lane from the front of Concord House and directly below measurement location P1, to provide road traffic noise data using the CRTN "shortened measurement procedure". The sound level meter used for this was SIP C.

P2. High Road

The microphone was situated 1 m in front of a first floor window and the façade of the Gate House, 748 High Road, immediately to the south of Bill Nicholson Way, the main entrance to the White Hart Lane ground.

Solo 7 commenced monitoring at 17:13 on Tuesday 11 November 2008 and the measurement ended at 08:51 on Monday 17 November 2008.

P3. Northumberland Park

The microphone was mounted at a height of 3.5m above the end of a storage container sited on the forecourt of Unit 9, 12-48 Northumberland Park, approximately opposite the house at 37 Northumberland Park, effectively a free-field situation.

Sound level meter SIP D (see Appendix 13.4) started monitoring at 16:15 on Tuesday 11 November 2008 and was stopped at 09:36 on Monday 17 November 2008. Whilst the meter calibrated satisfactorily at both the start and end of the monitoring subsequent analysis of the measurement data revealed that all data after 23:45 on the 11 November 2008 were unreliable. It appears that damage was caused to the microphone preamplifier cable at the time of installation. A repeat measurement was arranged for the same location commencing at 17:35 on Wednesday 19 November and continuing until 14:36 on Monday 24 November 2008 using SIP C.

P4. Worcester Avenue

The microphone was mounted 1 m in front of the front façade of 41 Worcester Avenue (the house at the southern end of the terrace on the east side of the road), suspended from a first floor window on a tripod.

Solo 6 was installed at 16:44 on Tuesday 11 November 2008 and stopped at 09:55 on Monday 17 November 2008.

P5. East of Worcester Avenue

The microphone was mounted at the rear of 17 Worcester Avenue 1m in front of the rear façade at a height of 3 m above the ground, suspended on a tripod from a window.

This location was selected so as to approximate to the level of noise at the rear of properties fronting north onto Northumberland Park, such as 50 and 52 Northumberland Park, and the service yard area of the proposed supermarket.

Solo 4 commenced measuring at 15:46 on Friday 14 November 2008 and the measurement was ended at 09:47 on Monday 17 November 2008.

S6. South west corner of the stands within the stadium

A camera position was used to mount the microphone in a free field situation at a height of 1.2 m above the camera platform floor.

The Solo 2 sound level meter was left logging data between 17:18 and 21:49 on 12 November 2008.

S7. West stand within the stadium

Another camera position, this time in approximately mid-tier in the centre of the west stand, was used to mount the microphone in a free-field situation at a height of 1.3 m above the camera platform floor.

The Solo 1 sound level meter was left logging data between 17:55 and 22:03 on 12 November 2008.

R8. Corner of Vicarage Road and Park Lane, 1.5m from kerb

Attended measurements on 12 November 2008 with Solo 4 sound level meter between 19:33 and 19:43, 22:30 and 22:40, and finally between 23:09 and 23:19.

R9. In front of 28 Bromley Road

Short attended measurement on 12 November 2008 with Solo 4 between 21:00 and 21:02.

R10. In front of 16 Bromley Road on corner with spur road

Short attended measurement on 12 November 2008 with Solo 4 between 21:04 and 21:06.

R11. In front of 30 Park Lane

Attended measurement on 12 November 2008 with Solo 4 between 20:53 and 20:58.

R12. In the mouth of Lancaster Close (5m and 2.5m from Park Lane kerb)

Attended measurement on 12 November 2008 with Solo 4 between 19:45 and 19:55 (5m from Park lane kerb) and with SIP C sound level meter between 20:33 and 20:43 (2.5m from Park Lane kerb).

R13. In front of Paxton Hall on Paxton Road

Attended measurement on 12 November 2008 with Solo 4 between 20:05 and 20:10.

R14. North side of Paxton Road opposite North Stand Gateways 17-20, 2m from kerb

Attended measurement on 12 November 2008 SIP C sound level meter between 20:05 and 20:15 and again between 21:04 and 21:14.

R15. North side of Paxton Road opposite centre of North Stand

Short attended measurement on 12 November 2008 with Solo 4 between 22:59 and 23:01.

R16. North side of Paxton Road opposite east end of North Stand by car and lorry park

Attended measurements on 12 November 2008 with Solo 4 sound level meter between 21:38 and 21:48, 21:51 and 22:01, and finally between 22:01 and 22:11.

R17. East side of Worcester Avenue on corner with Paxton Road

Attended measurement on 12 November 2008 SIP C sound level meter between 21:21 and 21:27.

R18. Worcester Avenue in centre of road, towards north end of East Stand

Attended measurement on 12 November 2008 with Solo 4 between 20:40 and 20:47.

R19. In front of 41 Worcester Avenue below long-term location P4

Attended measurement on 12 November 2008 with Solo 4 between 21:07 and 21:12.

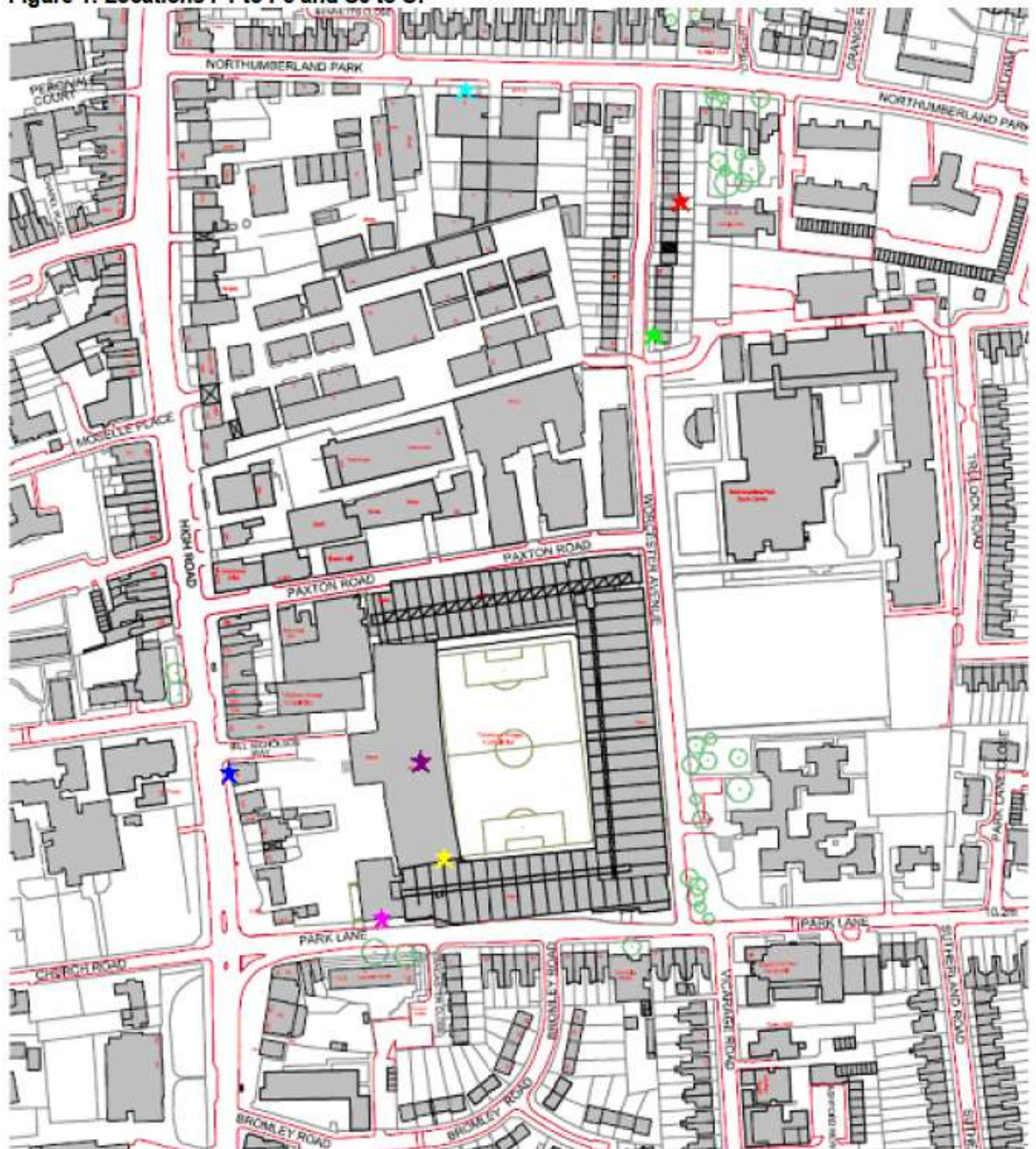
R20. In front of 5 Worcester Avenue

Attended measurement on 12 November 2008 with Solo 4 between 21:16 and 21:21.

R21. In centre of service yard of Stadium Business Park East

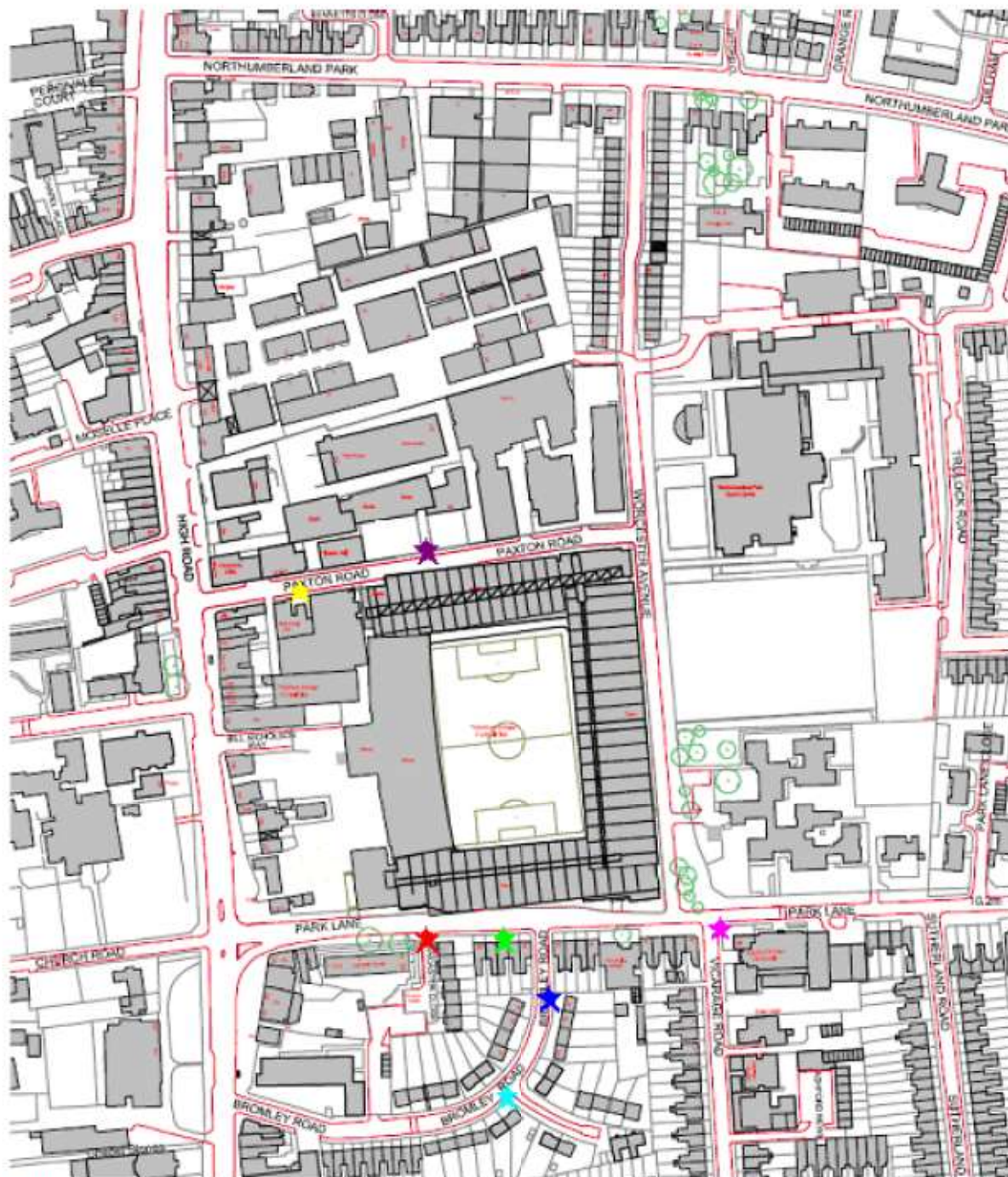
Attended measurements on 12 November 2008 with Solo 4 sound level meter between 21:22 and 21:27, 21:28 and 21:33, and finally between 23:25 and 23:45.

Figure 1: Locations P1 to P5 and S6 to S7



Key:

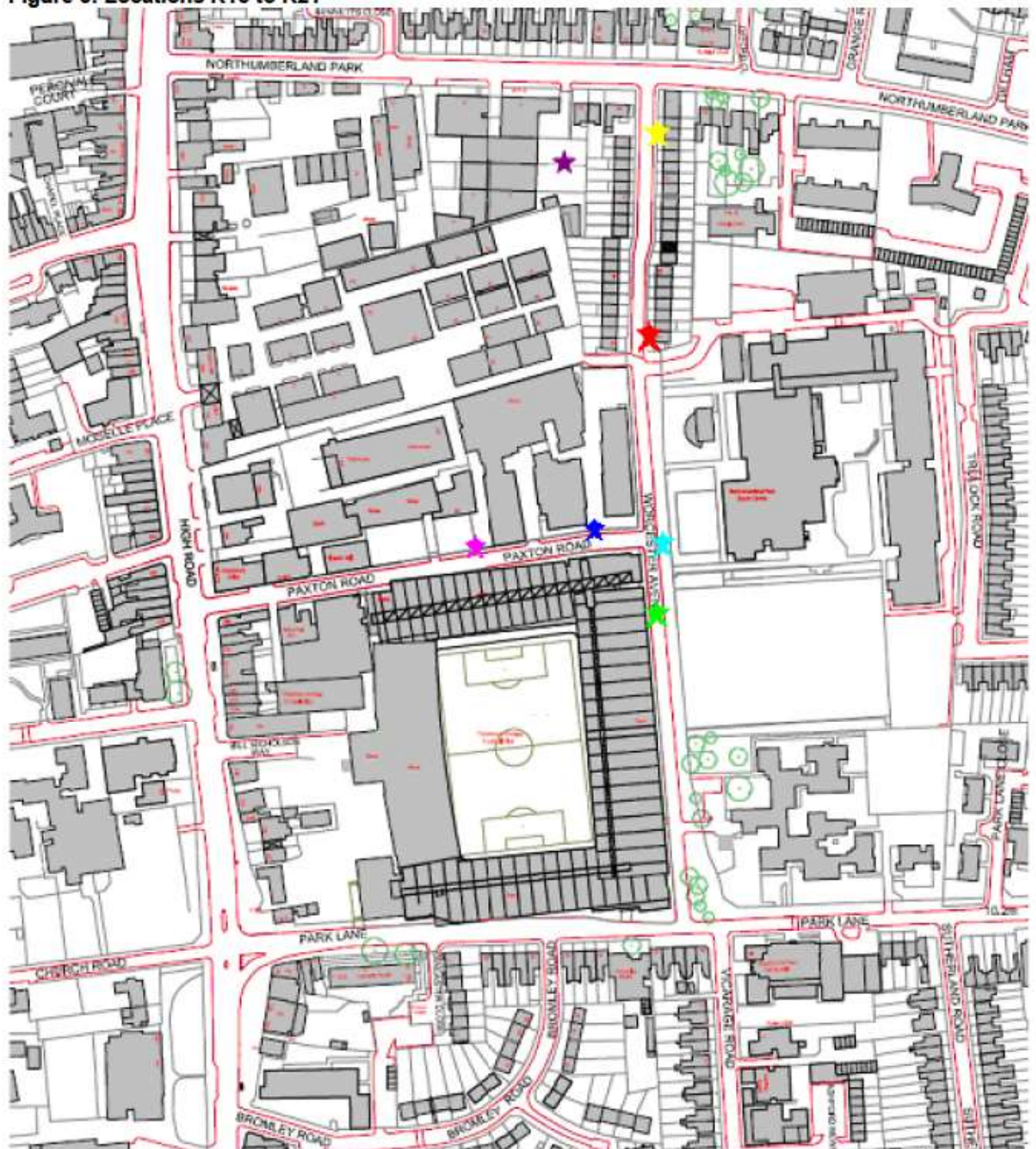
- ★ P1 - Flat roof of single storey room at White Hart Lane fronting Park Lane & High Road
- ★ P2 - The Gate House, 748 High Road
- ★ P3 - Northumberland Park
- ★ P4 - 41 Worcester Avenue 1m from the front building façade at first floor window height
- ★ P5 - 17 Worcester Avenue 1m from the rear building façade at first floor window height
- ★ S6 - South-west corner, lower stand of stadium
- ★ S7 - Mid section, upper tier of Western Stand



Key:

- ★ R8 - Corner of Vicarage Road and Park Lane, 1.5m from kerb
- ★ R9 - In front of 28 Bromley Road
- ★ R10 - In front of 16 Bromley Road on corner with spur road
- ★ R11 - In front of 30 Park Lane
- ★ R12 - In the mouth of Lancaster Close (2.5m from Park Lane kerb)
- ★ R13 - In front of Paxton Hall on Paxton Road
- ★ R14 - North side of Paxton Road opposite North Stand Gateways 17-20, 2m from kerb

Figure 3: Locations R15 to R21



Key:

- ★ R15 - North side of Paxton Road opposite centre of North Stand
- ★ R16 - North side of Paxton Road opposite east end of North Stand by car and lorry park
- ★ R17 - East side of Worcester Avenue on corner with Paxton Road
- ★ R18 - Worcester Avenue in centre of road, towards north end of East Stand
- ★ R19 - In front of 41 Worcester Avenue below long-term location P4
- ★ R20 - In front of 5 Worcester Avenue
- ★ R21 - In centre of service yard of Stadium Business Park East

Appendix 13.4 Schedule of Noise Measurement Equipment

Monitoring Site Location P1 (Solo 3)

01dB-Stell Solo integrating data logging sound level meter (Class 1) (calibrated to nationally traceable standards 11 December 2007)	10712
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Microtech Gefell GmbH MCE 212 ½" condenser microphone	51863
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01dB-Stell PRE21S preamplifier	11447
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Weather protected microphone enclosure, incorporating foam windshield and protective rain grid
All-weather protective case and battery power source

Noise Monitoring Site Location P2 (Solo 7)

01dB-Stell Solo integrating data logging sound level meter (Class 1) (calibrated to nationally traceable standards 27 May 2008)	11750
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Microtech Gefell GmbH MCE 212 ½" condenser microphone	61802
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01dB-Stell PRE21S preamplifier	12309
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Weather protected microphone enclosure, incorporating foam windshield and protective rain grid
All-weather protective case and battery power source

Noise Monitoring Site Location P3 (SIP D)

01dB-Stell SIP95 integrating data logging sound level meter (Class 1) (calibrated to nationally traceable standards 24 April 2007)	10565
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Microtech Gefell GmbH MCE 212 ½" condenser microphone	92308
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01dB-Stell PRE12N preamplifier	002557
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Weather protected microphone enclosure, incorporating foam windshield and protective rain grid
All-weather protective case and battery power source

Noise Monitoring Site Location P3 (second measurement) & attended measurements (SIP C)

01dB-Stell SIP95 integrating data logging sound level meter (Class 1) (calibrated to nationally traceable standards 25 July 2008)	10566
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Microtech Gefell GmbH MK 250 ½" condenser microphone	3738
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01dB-Stell PRE12N preamplifier	991313
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Weather protected microphone enclosure, incorporating foam windshield and protective rain grid
All-weather protective case and battery power source

Noise Monitoring Site Location P4 (Solo 6)

01dB-Stell Solo integrating data logging sound level meter (Class 1)
(calibrated to nationally traceable standards 02 October 2007) 10966

Microtech Gefell GmbH MCE 212 ½" condenser microphone 33525

01dB-Stell PRE21S preamplifier 11841

Weather protected microphone enclosure, incorporating foam windshield and protective rain grid
All-weather protective case and battery power source

Noise Monitoring Site Location P5 & attended measurements (Solo 4)

01dB-Stell Solo integrating data logging sound level meter (Class 1)
(calibrated to nationally traceable standards 17 December 2007) 10706

Microtech Gefell GmbH MCE 212 ½" condenser microphone 57606

01dB-Stell PRE21S preamplifier 11662

Weather protected microphone enclosure, incorporating foam windshield and protective rain grid
All-weather protective case and battery power source

Noise Monitoring Site Location S7 (Solo 1)

01dB-Stell Solo integrating data logging sound level meter (Class 1)
(calibrated to nationally traceable standards 11 October 2007) 10330

Microtech Gefell GmbH MCE 212 ½" condenser microphone 33494

01dB-Stell PRE21S preamplifier 10423

Weather protected microphone enclosure, incorporating foam windshield and protective rain grid
All-weather protective case and battery power source

Noise Monitoring Site Location S6 (Solo 2)

01dB-Stell Solo integrating data logging sound level meter (Class 1)
(calibrated to nationally traceable standards 14 March 2008) 10705

Microtech Gefell GmbH MCE 212 ½" condenser microphone 59725

01dB-Stell PRE21S preamplifier 11464

Weather protected microphone enclosure, incorporating foam windshield and protective rain grid
All-weather protective case and battery power source

Sound Level Calibrator

ACLAN Cal01 sound level calibrator (Class 1)

11332

(calibrated to nationally traceable standards by AV Calibration, 09 October 2008)

Appendix 13.5 Hourly Measurement Results for Continuous Monitoring

Table A13. 1: Hourly Data for Measurement Location P1 (Park Lane)

Period start	L _{Aeq,1h}	L _{Amin}	L _{AFmax}	L _{A90,1h}	L _{A50,1h}	L _{A10,1h}	L _{Aeq,T}	L _{Aeq,15h}
11/11/2008 18:00	62.4	56.7	82.1	57.8	60.0	64.5	61.5	61.7
11/11/2008 19:00	62.3	56.8	81.9	57.8	60.0	64.6		
11/11/2008 20:00	62.0	56.7	80.1	57.6	59.6	64.2		
11/11/2008 21:00	61.3	56.3	77.2	57.4	59.5	64.0		
11/11/2008 22:00	60.0	52.9	74.2	54.7	58.2	62.3		
11/11/2008 23:00	58.7	52.6	80.4	53.7	56.5	60.9	58.2	65.6
12/11/2008 00:00	59.8	52.1	80.3	52.8	55.4	61.0		
12/11/2008 01:00	56.4	51.6	74.0	52.2	53.6	58.9		
12/11/2008 02:00	58.5	51.3	84.4	51.9	53.3	58.5		
12/11/2008 03:00	57.2	51.3	79.5	52.0	52.9	57.8		
12/11/2008 04:00	56.7	51.5	75.8	52.1	53.4	59.1		
12/11/2008 05:00	57.5	52.3	77.2	53.2	55.2	60.0		
12/11/2008 06:00	59.4	53.8	73.7	55.4	57.8	61.6		
12/11/2008 07:00	63.3	54.7	88.3	56.7	59.9	64.5	64.0	
12/11/2008 08:00	62.9	55.0	79.2	57.8	60.8	65.7		
12/11/2008 09:00	62.3	54.5	80.6	56.7	60.0	65.1		
12/11/2008 10:00	65.6	54.2	85.0	58.2	61.7	68.5		
12/11/2008 11:00	62.5	54.4	87.3	57.1	60.1	64.8		
12/11/2008 12:00	64.8	55.5	91.2	59.7	62.5	66.3		
12/11/2008 13:00	63.3	57.6	88.3	59.2	61.0	65.5		
12/11/2008 14:00	64.8	57.6	88.2	59.1	61.2	66.1		
12/11/2008 15:00	63.4	57.5	81.2	59.1	61.3	66.2		
12/11/2008 16:00	63.5	57.6	83.9	59.4	61.5	66.0		
12/11/2008 17:00	65.7	58.0	85.7	59.7	62.1	68.3		
12/11/2008 18:00	64.4	58.9	85.5	60.3	62.3	66.2		
12/11/2008 19:00	71.4	60.4	90.4	63.8	67.8	73.2		
12/11/2008 20:00	64.8	57.7	90.1	59.0	60.7	65.5		
12/11/2008 21:00	69.1	57.7	90.8	59.2	62.6	71.9		
12/11/2008 22:00	64.9	58.2	90.1	59.5	61.8	67.2		
12/11/2008 23:00	63.8	57.1	88.0	58.1	60.1	65.5	61.2	
13/11/2008 00:00	64.1	56.5	87.5	57.0	58.9	66.4		
13/11/2008 01:00	58.9	56.2	74.1	56.6	57.3	60.4		
13/11/2008 02:00	58.6	56.3	82.5	56.6	57.0	59.3		
13/11/2008 03:00	59.2	56.4	82.4	56.7	57.2	60.2		
13/11/2008 04:00	58.8	56.5	74.5	56.8	57.3	60.3		
13/11/2008 05:00	60.8	56.2	87.3	56.8	57.9	61.1		
13/11/2008 06:00	61.1	56.9	79.0	57.8	59.4	62.6		
13/11/2008 07:00	62.5	57.6	79.1	58.5	60.5	64.5		
13/11/2008 08:00	64.3	58.3	82.7	59.6	61.8	66.4		
13/11/2008 09:00	64.4	57.7	88.8	59.1	60.9	66.4		
13/11/2008 10:00	65.7	58.0	84.7	59.8	62.3	69.0	64.1	63.7
13/11/2008 11:00	65.6	58.1	86.3	60.0	63.2	68.1		
13/11/2008 12:00	64.7	59.0	84.1	60.8	62.7	66.9		
13/11/2008 13:00	64.2	57.2	82.8	58.9	61.3	66.5		
13/11/2008 14:00	63.0	57.0	78.4	58.6	60.9	65.8		
13/11/2008 15:00	63.3	57.1	77.0	58.6	61.1	66.2		
13/11/2008 16:00	64.1	57.3	84.8	58.5	61.2	66.7		
13/11/2008 17:00	63.7	57.2	81.5	58.5	60.8	66.3		

Period start	L _{Aeq,1h}	L _{Amin}	L _{AFmax}	L _{A90,1h}	L _{A50,1h}	L _{A10,1h}	L _{Aeq,T}	L _{Aeq,16h}
13/11/2008 18:00	61.8	53.8	75.1	55.9	59.6	64.9	62.3	
13/11/2008 19:00	62.3	53.8	84.7	55.7	59.1	64.8		
13/11/2008 20:00	61.7	53.5	80.3	55.5	58.9	64.2		
13/11/2008 21:00	63.7	53.2	95.4	55.3	59.1	64.9		
13/11/2008 22:00	61.0	53.1	77.0	54.9	58.4	63.7		
13/11/2008 23:00	60.2	52.6	74.2	54.2	57.3	62.8	58.4	65.0
14/11/2008 00:00	58.7	52.5	74.0	53.3	56.0	61.2		
14/11/2008 01:00	58.2	52.1	74.9	52.8	54.6	60.4		
14/11/2008 02:00	56.8	52.2	76.5	52.6	53.9	58.9		
14/11/2008 03:00	57.5	52.1	80.8	52.5	53.7	59.0		
14/11/2008 04:00	57.4	52.2	88.0	52.6	53.6	58.7		
14/11/2008 05:00	57.7	52.5	78.5	53.2	55.4	60.4		
14/11/2008 06:00	59.3	52.8	81.3	54.0	57.0	61.5		
14/11/2008 07:00	61.8	53.7	76.6	55.3	59.4	65.3		
14/11/2008 08:00	67.0	64.3	78.6	65.3	66.2	68.5		
14/11/2008 09:00	66.9	64.5	79.9	65.3	66.1	68.1		
14/11/2008 10:00	67.9	64.7	84.8	65.4	66.2	69.7		
14/11/2008 11:00	66.5	64.5	80.1	65.1	65.8	67.4		
14/11/2008 12:00	67.1	64.8	80.4	65.6	66.4	68.2		
14/11/2008 13:00	66.8	64.4	87.0	65.2	66.0	67.7		
14/11/2008 14:00	65.6	58.4	86.2	61.4	65.4	67.4		
14/11/2008 15:00	63.9	57.4	85.8	58.9	61.4	66.0		
14/11/2008 16:00	62.6	57.5	81.5	58.5	60.8	64.9		
14/11/2008 17:00	62.7	53.5	85.1	57.6	60.1	64.7		
14/11/2008 18:00	62.3	53.7	79.7	55.6	59.1	65.5	62.2	
14/11/2008 19:00	61.4	53.5	79.9	55.7	59.1	64.5		
14/11/2008 20:00	63.3	53.9	89.6	55.5	58.9	63.7		
14/11/2008 21:00	62.7	54.2	89.4	55.7	58.9	63.6		
14/11/2008 22:00	61.2	54.5	87.0	56.3	58.8	63.1		
14/11/2008 23:00	62.2	54.3	88.8	56.4	58.9	63.2	61.3	
15/11/2008 00:00	61.7	54.6	84.5	57.0	59.5	63.6		
15/11/2008 01:00	61.5	53.7	87.2	56.1	58.2	62.7		
15/11/2008 02:00	64.9	53.8	92.7	55.7	58.3	64.3		
15/11/2008 03:00	60.1	52.3	84.0	53.5	56.2	61.5		
15/11/2008 04:00	57.9	52.1	76.6	53.0	55.3	60.6		
15/11/2008 05:00	59.5	51.8	85.9	52.9	55.5	60.4		
15/11/2008 06:00	57.9	52.4	73.3	53.3	56.0	60.6		
15/11/2008 07:00	58.6	52.5	75.7	53.8	56.5	61.1		
15/11/2008 08:00	59.8	53.1	77.8	54.5	57.4	62.5		
15/11/2008 09:00	60.9	53.3	77.7	56.1	58.9	63.2	61.1	
15/11/2008 10:00	61.6	54.6	81.1	56.8	59.8	64.1		
15/11/2008 11:00	61.8	54.1	83.6	56.0	59.1	64.2		
15/11/2008 12:00	61.7	54.4	86.7	56.4	59.7	64.3		
15/11/2008 13:00	61.6	54.4	85.2	56.4	59.5	63.7		
15/11/2008 14:00	62.2	54.3	86.7	56.5	59.6	63.9		
15/11/2008 15:00	60.7	53.6	78.0	55.7	58.7	63.3		
15/11/2008 16:00	60.5	54.2	80.8	55.7	58.6	63.2		
15/11/2008 17:00	61.2	54.0	81.1	55.8	58.7	64.0		
15/11/2008 18:00	60.9	53.7	78.4	55.4	58.5	63.5		
15/11/2008 19:00	62.5	53.7	84.3	55.5	59.0	64.9	62.1	
15/11/2008 20:00	61.2	53.3	79.9	55.4	58.8	64.3		
15/11/2008 21:00	61.4	53.2	86.1	55.5	58.8	64.3		
15/11/2008 22:00	63.0	54.3	89.5	56.0	59.4	64.3		

Period start	L _{Aeq,1h}	L _{Amin}	L _{AFmax}	L _{A90,1h}	L _{A50,1h}	L _{A10,1h}	L _{Aeq,T}	L _{Aeq,16h}
15/11/2008 23:00	61.9	53.6	86.5	55.7	58.9	64.1	59.8	63.0
16/11/2008 00:00	61.0	54.5	80.1	56.4	59.0	63.4		
16/11/2008 01:00	60.5	53.9	74.7	55.6	58.4	63.0		
16/11/2008 02:00	58.0	52.9	79.3	54.1	56.1	60.3		
16/11/2008 03:00	58.6	52.7	76.6	53.9	56.1	60.5		
16/11/2008 04:00	60.6	52.4	89.8	53.6	55.6	60.5		
16/11/2008 05:00	57.4	51.7	78.5	52.6	54.8	59.9		
16/11/2008 06:00	58.0	52.0	81.0	52.8	55.3	60.5		
16/11/2008 07:00	57.3	52.2	70.6	53.1	55.3	60.0	63.6	
16/11/2008 08:00	58.5	52.5	73.6	53.7	56.4	61.0		
16/11/2008 09:00	61.4	52.5	83.6	54.6	57.9	63.1		
16/11/2008 10:00	61.0	53.8	79.2	55.2	58.4	63.9		
16/11/2008 11:00	61.8	54.0	83.8	55.2	58.2	63.9		
16/11/2008 12:00	71.0	54.2	106.7	55.6	58.8	65.3		
16/11/2008 13:00	61.8	54.3	78.0	55.9	59.0	64.8		
16/11/2008 14:00	61.6	54.5	76.0	56.0	59.4	64.6		
16/11/2008 15:00	62.8	54.0	85.9	56.0	59.5	64.8		
16/11/2008 16:00	61.6	52.7	82.6	55.2	58.9	64.3		
16/11/2008 17:00	61.9	52.7	80.3	54.9	58.7	64.4		
16/11/2008 18:00	61.4	52.7	86.1	54.8	58.4	63.9		
16/11/2008 19:00	60.7	52.5	78.0	54.2	57.6	63.1	60.8	
16/11/2008 20:00	62.0	52.8	89.0	54.4	58.0	63.2		
16/11/2008 21:00	60.1	52.6	72.7	54.3	57.8	62.7		
16/11/2008 22:00	59.9	52.8	82.0	54.1	57.7	62.0		
16/11/2008 23:00	59.2	52.3	73.2	53.8	57.0	61.8	58.5	
17/11/2008 00:00	58.7	52.3	81.3	53.0	55.7	60.6		
17/11/2008 01:00	60.1	52.1	79.6	52.6	54.9	60.6		
17/11/2008 02:00	57.4	52.2	79.4	52.6	53.8	59.2		
17/11/2008 03:00	55.9	52.3	72.2	52.6	53.4	58.0		
17/11/2008 04:00	57.3	52.5	76.5	52.9	54.2	59.6		
17/11/2008 05:00	58.2	52.7	81.4	53.4	55.3	60.4		
17/11/2008 06:00	59.4	53.1	78.2	54.1	57.0	62.1		
17/11/2008 07:00	60.9	53.3	79.1	55.1	58.4	63.2	62.5	
17/11/2008 08:00	63.7	55.0	80.2	57.6	61.9	66.4		

Table A13. 2: Hourly Data for Measurement Location P2 (High Road)

Period start	L _{Aeq.1h}	L _{Amin}	L _{AFmax}	L _{A90.1h}	L _{A50.1h}	L _{A10.1h}	L _{Aeq.T}	L _{Aeq.16h}
11/11/2008 18:00	76.7	54.2	111.3	61.0	71.2	77.0	73.5	74.3
11/11/2008 19:00	74.3	52.0	102.0	62.3	71.5	77.0		
11/11/2008 20:00	73.3	53.4	93.5	60.1	69.9	76.9		
11/11/2008 21:00	73.2	49.6	92.9	60.5	70.4	76.8		
11/11/2008 22:00	72.9	51.5	88.5	58.2	69.5	77.0		
11/11/2008 23:00	72.8	48.7	100.7	56.7	68.3	76.5	70.7	75.8
12/11/2008 00:00	71.4	47.0	89.5	53.8	64.9	75.8		
12/11/2008 01:00	69.4	41.3	88.1	50.0	60.5	74.1		
12/11/2008 02:00	68.2	40.4	85.8	45.2	56.8	72.6		
12/11/2008 03:00	67.3	40.8	86.0	45.5	56.1	71.4		
12/11/2008 04:00	69.5	40.8	85.7	47.3	58.2	73.9	75.7	
12/11/2008 05:00	71.1	45.8	87.4	53.4	63.0	76.0		
12/11/2008 06:00	72.9	49.9	87.8	56.5	67.0	77.3		
12/11/2008 07:00	74.9	53.7	98.1	61.0	71.9	78.3		
12/11/2008 08:00	73.6	55.7	88.5	63.7	71.6	76.8		
12/11/2008 09:00	72.7	52.0	86.0	62.0	70.4	76.1		
12/11/2008 10:00	77.4	52.8	108.7	62.8	71.4	77.3		
12/11/2008 11:00	75.5	54.3	108.0	63.5	70.3	76.3		
12/11/2008 12:00	74.6	61.3	103.7	66.0	71.3	76.3		
12/11/2008 13:00	75.8	53.9	107.7	61.6	70.6	76.1		
12/11/2008 14:00	79.5	54.2	109.0	62.7	70.8	76.4		
12/11/2008 15:00	72.3	54.8	98.6	63.5	69.1	74.7		
12/11/2008 16:00	73.4	51.9	105.5	62.2	69.9	75.4		
12/11/2008 17:00	78.0	57.7	105.1	64.0	68.9	74.3		
12/11/2008 18:00	73.4	57.2	100.7	64.8	69.1	74.0		
12/11/2008 19:00	74.4	63.1	104.0	67.1	70.9	75.7	76.0	
12/11/2008 20:00	71.5	52.6	91.8	60.0	68.8	75.1		
12/11/2008 21:00	77.8	55.2	107.2	64.3	70.3	75.9		
12/11/2008 22:00	77.6	54.6	110.1	62.9	67.5	73.0		
12/11/2008 23:00	73.1	51.6	99.7	61.2	69.3	75.7		
13/11/2008 00:00	71.1	47.1	88.4	56.2	66.1	75.1	70.8	
13/11/2008 01:00	69.5	43.6	88.5	50.7	60.8	74.4		
13/11/2008 02:00	68.1	43.3	89.6	46.8	56.3	72.2		
13/11/2008 03:00	68.3	42.8	85.9	45.9	56.3	72.8		
13/11/2008 04:00	69.5	43.0	86.8	48.0	58.8	74.2		
13/11/2008 05:00	70.9	45.0	92.4	52.4	62.7	75.7		
13/11/2008 06:00	73.0	48.8	90.6	56.0	67.6	77.2		
13/11/2008 07:00	74.1	52.1	93.4	60.6	71.4	77.7		
13/11/2008 08:00	73.5	52.8	90.2	63.5	70.9	76.7		
13/11/2008 09:00	74.2	52.8	100.1	62.9	70.0	75.8	74.9	
13/11/2008 10:00	77.0	55.7	111.9	64.3	71.7	77.0		
13/11/2008 11:00	73.4	52.7	92.8	61.6	71.0	76.8		
13/11/2008 12:00	77.1	59.0	110.5	65.8	71.6	76.9		
13/11/2008 13:00	75.0	52.8	106.7	62.6	71.5	76.9		
13/11/2008 14:00	73.4	53.0	97.2	61.5	71.0	76.8		
13/11/2008 15:00	73.2	53.1	94.9	61.8	70.6	76.3		
13/11/2008 16:00	76.6	52.6	109.8	62.0	71.3	77.0		
13/11/2008 17:00	74.8	53.7	104.6	63.7	72.0	77.2		
13/11/2008 18:00	73.9	52.3	88.2	63.6	72.1	77.2		
13/11/2008 19:00	76.0	50.6	106.7	62.9	72.2	77.5	75.2	
13/11/2008 20:00	76.1	51.8	109.1	62.6	71.6	76.8		
13/11/2008 21:00	74.8	51.2	105.0	61.1	71.3	77.4		

Period start	L _{Aeq,1h}	L _{Amin}	L _{AFmax}	L _{A90,1h}	L _{A50,1h}	L _{A10,1h}	L _{Aeq,T}	L _{Aeq,16h}	
13/11/2008 22:00	73.2	52.2	92.3	58.8	70.6	77.1	71.2	74.0	
13/11/2008 23:00	72.7	47.7	87.9	57.1	68.0	76.8			
14/11/2008 00:00	71.6	45.5	90.4	53.8	65.2	76.2			
14/11/2008 01:00	70.5	42.8	89.8	50.3	61.5	75.0			
14/11/2008 02:00	70.0	42.1	99.1	48.1	59.2	73.9			
14/11/2008 03:00	68.9	42.1	87.4	47.5	58.1	73.6			
14/11/2008 04:00	69.4	42.6	91.3	47.9	57.6	73.3			
14/11/2008 05:00	71.2	45.2	90.1	53.4	63.3	76.0			
14/11/2008 06:00	73.1	47.6	90.0	56.0	66.9	77.4	74.1		
14/11/2008 07:00	74.0	53.2	93.3	60.7	71.4	77.6			
14/11/2008 08:00	73.9	53.1	91.2	63.7	71.4	77.2			
14/11/2008 09:00	73.5	55.5	93.6	62.4	70.9	77.0			
14/11/2008 10:00	74.6	54.4	101.6	63.7	71.5	77.2			
14/11/2008 11:00	73.1	53.0	90.9	62.0	71.0	76.5			
14/11/2008 12:00	73.8	58.8	91.4	65.9	71.8	76.8			
14/11/2008 13:00	74.3	57.1	99.8	63.3	71.4	77.0			
14/11/2008 14:00	75.7	56.6	96.3	65.3	73.3	79.7			
14/11/2008 15:00	73.7	55.1	101.6	63.3	70.6	76.2			
14/11/2008 16:00	72.4	52.3	91.8	61.9	70.2	75.6			
14/11/2008 17:00	75.3	52.9	108.0	61.2	70.3	76.0			
14/11/2008 18:00	73.3	52.7	91.0	62.0	71.2	76.7			
14/11/2008 19:00	73.6	53.1	88.9	61.9	71.5	77.0			73.9
14/11/2008 20:00	73.5	52.0	93.6	60.6	71.1	76.8			
14/11/2008 21:00	73.8	52.6	99.1	62.7	71.0	76.2			
14/11/2008 22:00	74.5	53.8	101.7	61.2	70.7	76.6			
14/11/2008 23:00	72.6	52.6	90.0	60.8	70.0	76.1	74.2	73.9	
15/11/2008 00:00	74.6	53.9	107.0	61.2	70.0	76.4			
15/11/2008 01:00	75.9	52.1	105.9	58.9	68.3	76.6			
15/11/2008 02:00	78.4	53.0	104.8	60.4	69.5	78.7			
15/11/2008 03:00	71.5	50.1	95.6	57.6	66.4	74.5			
15/11/2008 04:00	71.2	46.0	88.0	53.6	65.2	75.6			
15/11/2008 05:00	71.1	45.1	85.5	54.4	64.5	75.9			
15/11/2008 06:00	71.7	46.8	90.1	54.9	65.2	76.2			
15/11/2008 07:00	72.1	47.3	91.9	55.6	65.9	76.3			
15/11/2008 08:00	72.6	51.4	96.5	57.5	68.3	76.8			
15/11/2008 09:00	73.2	51.3	92.5	59.9	69.8	76.9			
15/11/2008 10:00	72.9	53.1	88.6	60.8	70.5	76.5			
15/11/2008 11:00	73.0	53.5	89.0	61.4	70.8	76.5			
15/11/2008 12:00	73.0	52.5	96.7	62.0	70.9	76.3			
15/11/2008 13:00	74.0	51.1	101.3	60.9	71.0	76.3			
15/11/2008 14:00	75.9	51.9	105.1	61.5	71.3	76.6			
15/11/2008 15:00	73.9	50.8	102.1	60.6	70.9	76.7	73.6		73.9
15/11/2008 16:00	72.4	52.0	87.2	60.5	70.0	75.9			
15/11/2008 17:00	75.5	51.9	106.2	61.7	71.2	76.3			
15/11/2008 18:00	72.6	53.4	88.9	62.0	70.3	76.1			
15/11/2008 19:00	74.5	50.6	104.2	61.0	71.1	76.3	74.6		
15/11/2008 20:00	73.1	51.5	91.7	60.7	70.9	76.8			
15/11/2008 21:00	75.9	53.0	109.4	61.0	70.6	76.5			
15/11/2008 22:00	74.5	54.9	102.1	61.7	70.9	77.0			
15/11/2008 23:00	75.9	53.0	107.1	60.7	70.8	76.3	73.0	74.5	
16/11/2008 00:00	73.9	52.8	101.7	59.4	70.1	76.5			
16/11/2008 01:00	72.8	50.4	94.2	60.6	69.8	76.4			
16/11/2008 02:00	71.4	50.8	88.2	57.5	66.8	75.6			

Period start	L _{Aeq,1h}	L _{Amin}	L _{AFmax}	L _{A90,1h}	L _{A50,1h}	L _{A10,1h}	L _{Aeq,T}	L _{Aeq,16h}
16/11/2008 03:00	71.8	49.8	88.8	56.5	66.7	76.1		
16/11/2008 04:00	72.0	49.6	91.2	57.2	66.6	76.2		
16/11/2008 05:00	71.4	46.2	90.6	54.3	65.0	76.0		
16/11/2008 06:00	72.7	44.7	104.2	53.4	63.9	75.8		
16/11/2008 07:00	70.8	46.1	86.0	54.3	63.7	75.5	74.1	
16/11/2008 08:00	71.6	47.6	92.5	55.4	65.9	75.9		
16/11/2008 09:00	72.5	47.0	102.3	58.5	67.9	75.7		
16/11/2008 10:00	72.2	51.5	88.9	60.1	69.5	75.9		
16/11/2008 11:00	72.9	51.3	98.9	61.2	69.9	75.7		
16/11/2008 12:00	78.2	52.0	110.1	61.2	70.5	76.3		
16/11/2008 13:00	73.6	50.6	94.3	61.6	71.4	77.0		
16/11/2008 14:00	73.2	53.1	87.4	61.7	71.5	76.5		
16/11/2008 15:00	77.1	52.5	107.3	62.4	71.8	77.3		
16/11/2008 16:00	73.4	49.6	85.9	59.9	71.7	77.0		
16/11/2008 17:00	73.7	49.2	87.2	62.0	72.0	77.2		
16/11/2008 18:00	73.9	51.8	89.6	61.6	72.1	77.1		
16/11/2008 19:00	78.0	48.7	109.9	61.1	71.3	77.2		
16/11/2008 20:00	75.3	50.4	104.4	60.6	71.3	77.5	75.5	
16/11/2008 21:00	73.5	50.6	92.0	58.7	70.3	77.4		
16/11/2008 22:00	73.8	49.3	93.1	59.0	70.9	77.7		
16/11/2008 23:00	73.1	46.3	87.4	56.2	68.7	77.4	71.5	
17/11/2008 00:00	72.2	46.1	92.3	54.6	66.6	76.6		
17/11/2008 01:00	71.4	42.7	89.2	52.5	63.0	76.1		
17/11/2008 02:00	69.9	43.2	88.4	48.5	59.8	74.6		
17/11/2008 03:00	68.3	42.7	89.1	45.7	56.7	72.7		
17/11/2008 04:00	70.0	43.2	89.4	48.7	59.0	74.4		
17/11/2008 05:00	71.6	44.4	89.8	52.3	62.7	76.3		
17/11/2008 06:00	73.5	46.9	91.2	55.3	67.1	78.0		
17/11/2008 07:00	74.2	52.4	87.0	59.3	71.5	78.0	74.8	
17/11/2008 08:00	75.4	53.2	104.9	63.3	72.4	77.9		

Table A13. 3: Hourly Data for Measurement Location P3 (Northumberland Park)

Period start	L _{Aeq,1h}	L _{Amin}	L _{AFmax}	L _{A90,1h}	L _{A50,1h}	L _{A10,1h}	L _{Aeq,T}	L _{Aeq,16h}
11/11/2008 17:00	69.0	48.8	83.5	56.3	64.6	71.9	66.9	67.7
11/11/2008 18:00	68.9	48.9	88.7	53.8	64.1	71.7		
11/11/2008 19:00	67.2	49.1	83.5	53.7	62.6	71.1		
11/11/2008 20:00	67.5	51.1	88.5	53.8	60.5	70.7		
11/11/2008 21:00	66.2	45.9	85.6	51.6	59.6	69.8		
11/11/2008 22:00	66.6	50.8	86.3	52.4	59.7	70.7		

Table A13. 4: Hourly Data for Second Measurement at Location P3 (Northumberland Park)

Period start	L _{Aeq,1h}	L _{Amin}	L _{AFmax}	L _{A90,1h}	L _{A50,1h}	L _{A10,1h}	L _{Aeq,T}	L _{Aeq,16h}
19/11/2008 18:00	67.7	45.9	88.4	51.0	61.7	71.2	68.3	68.2
19/11/2008 19:00	71.8	47.4	102.7	50.3	61.2	71.5		
19/11/2008 20:00	66.6	46.7	85.1	49.9	58.2	70.7		
19/11/2008 21:00	66.1	43.6	83.5	47.9	56.3	70.2		
19/11/2008 22:00	65.5	43.8	85.2	47.7	57.0	69.8		
19/11/2008 23:00	63.8	43.2	80.2	45.6	52.5	68.0	62.6	
20/11/2008 00:00	62.9	42.0	80.6	44.4	49.8	66.1		
20/11/2008 01:00	62.0	40.8	84.4	43.5	48.6	64.4		
20/11/2008 02:00	60.8	39.7	88.2	41.7	44.6	59.8		
20/11/2008 03:00	58.0	38.9	83.2	41.2	43.6	56.7		
20/11/2008 04:00	58.6	39.1	77.9	41.6	44.6	59.5		
20/11/2008 05:00	62.5	42.3	80.3	44.2	49.2	65.6		
20/11/2008 06:00	66.3	47.0	82.9	49.7	56.1	70.4		
20/11/2008 07:00	69.4	46.8	94.9	50.1	59.8	71.9		
20/11/2008 08:00	68.8	47.0	92.1	50.9	62.3	72.2		
20/11/2008 09:00	68.0	45.7	88.0	51.9	62.8	71.1		
20/11/2008 10:00	66.2	46.7	82.1	50.6	60.5	70.1		
20/11/2008 11:00	66.5	46.8	83.8	51.3	60.4	70.1		
20/11/2008 12:00	66.8	47.4	80.5	52.5	62.5	70.6		
20/11/2008 13:00	66.5	47.0	83.4	51.8	61.8	70.2		
20/11/2008 14:00	65.6	45.3	80.6	50.6	60.8	69.4		
20/11/2008 15:00	68.5	46.6	94.7	52.6	61.8	70.1		
20/11/2008 16:00	65.3	47.6	80.6	51.4	60.8	69.1		
20/11/2008 17:00	66.0	47.2	85.9	51.6	62.0	69.2	64.4	
20/11/2008 18:00	64.3	43.2	80.0	49.7	58.9	68.1		
20/11/2008 19:00	64.6	47.3	87.4	51.6	59.8	67.7		
20/11/2008 20:00	63.4	45.7	85.1	49.2	57.0	67.2		
20/11/2008 21:00	63.0	45.4	81.7	48.9	56.2	66.9		
20/11/2008 22:00	66.1	43.2	94.2	46.1	54.0	67.6	62.1	
20/11/2008 23:00	63.8	41.2	87.6	44.6	52.0	67.6		
21/11/2008 00:00	63.0	41.2	85.4	44.3	50.9	65.9		
21/11/2008 01:00	63.4	38.6	87.4	41.2	47.6	66.7		
21/11/2008 02:00	59.0	37.2	82.0	40.1	43.7	59.4		
21/11/2008 03:00	57.0	38.7	76.1	42.6	45.5	55.0		
21/11/2008 04:00	60.5	41.8	81.8	44.2	48.1	60.7		
21/11/2008 05:00	61.6	43.7	79.3	46.6	50.6	65.4		
21/11/2008 06:00	63.9	47.8	81.6	50.0	55.1	68.3		
21/11/2008 07:00	66.2	47.3	81.2	52.0	60.7	70.5		
21/11/2008 08:00	66.9	50.7	87.5	53.7	62.8	70.7		
21/11/2008 09:00	66.7	49.5	81.0	53.0	61.8	70.8		
21/11/2008 10:00	66.3	49.0	82.1	52.2	61.2	70.2		
21/11/2008 11:00	66.6	49.2	84.6	52.9	61.8	70.4		
21/11/2008 12:00	66.3	48.9	84.8	53.0	61.3	70.4		
21/11/2008 13:00	68.9	49.4	84.7	54.5	62.4	72.5		
21/11/2008 14:00	69.9	47.6	94.5	53.4	63.1	73.6		
21/11/2008 15:00	66.3	50.8	80.9	55.5	62.6	70.0		
21/11/2008 16:00	65.4	48.2	84.8	53.1	61.3	69.4		
21/11/2008 17:00	66.7	49.6	90.5	54.1	62.2	69.4		

Period start	L _{Aeq,1h}	L _{Amin}	L _{AFmax}	L _{A50,1h}	L _{A50,1h}	L _{A10,1h}	L _{Aeq,T}	L _{Aeq,16h}
21/11/2008 18:00	71.1	48.1	100.3	52.2	62.0	70.5	67.6	67.3
21/11/2008 19:00	67.0	50.2	93.6	52.8	61.1	69.4	66.3	
21/11/2008 20:00	63.7	47.7	79.6	50.2	58.1	68.1		
21/11/2008 21:00	64.7	45.5	79.8	49.0	58.5	69.2		
21/11/2008 22:00	68.4	45.0	94.0	48.9	58.5	69.6		
21/11/2008 23:00	66.0	45.2	90.6	48.6	58.2	69.5		62.0
22/11/2008 00:00	63.4	43.6	80.8	46.5	54.8	67.8		
22/11/2008 01:00	60.5	39.5	78.8	43.2	50.2	63.1		
22/11/2008 02:00	60.1	39.4	79.2	42.0	47.5	63.3		
22/11/2008 03:00	59.0	40.3	78.5	42.8	46.1	60.7		
22/11/2008 04:00	60.2	40.3	80.6	42.4	46.4	62.3		
22/11/2008 05:00	61.3	40.8	79.0	43.6	47.9	64.7		
22/11/2008 06:00	61.2	42.9	78.5	45.4	50.2	64.8		
22/11/2008 07:00	62.4	43.2	78.6	45.8	50.8	66.9		
22/11/2008 08:00	63.9	42.9	78.5	46.1	54.7	68.6		
22/11/2008 09:00	66.0	43.3	91.4	48.9	58.1	68.7		
22/11/2008 10:00	65.5	47.0	92.1	50.7	59.4	68.8		
22/11/2008 11:00	64.8	47.0	85.6	50.6	60.1	68.4		
22/11/2008 12:00	65.5	47.1	88.1	52.1	60.8	68.9		
22/11/2008 13:00	65.0	48.1	83.0	51.5	59.9	68.9		
22/11/2008 14:00	65.4	46.1	87.3	50.9	60.3	68.7		
22/11/2008 15:00	64.9	46.2	81.5	50.9	59.8	68.7		
22/11/2008 16:00	66.3	46.3	93.6	50.2	59.2	68.4		
22/11/2008 17:00	64.1	44.4	81.8	48.8	58.9	68.4		
22/11/2008 18:00	64.2	46.1	85.2	49.5	59.2	68.1		
22/11/2008 19:00	65.2	43.4	87.9	49.3	58.9	68.8		
22/11/2008 20:00	64.0	43.9	79.9	47.7	58.2	68.3		
22/11/2008 21:00	64.6	43.7	79.7	47.1	57.7	69.1		
22/11/2008 22:00	64.5	42.4	84.4	46.2	55.4	68.8		
22/11/2008 23:00	64.5	43.6	82.0	46.7	56.8	68.8		
23/11/2008 00:00	64.0	41.1	80.2	45.1	55.2	68.5		
23/11/2008 01:00	60.7	37.4	80.8	41.1	46.8	64.3		
23/11/2008 02:00	59.7	34.9	77.8	38.8	44.3	62.7		
23/11/2008 03:00	60.4	34.7	81.0	37.8	42.3	61.8		
23/11/2008 04:00	59.8	31.7	80.9	36.3	43.5	61.6		
23/11/2008 05:00	60.3	33.1	79.7	37.1	43.9	63.4		
23/11/2008 06:00	61.1	33.7	85.2	39.5	45.9	62.4		
23/11/2008 07:00	61.8	36.9	86.2	42.4	47.6	64.9		
23/11/2008 08:00	63.6	40.4	83.6	44.3	52.1	67.9		
23/11/2008 09:00	65.0	41.9	87.6	46.3	55.1	69.0		
23/11/2008 10:00	67.4	46.1	88.5	52.6	62.4	71.1		
23/11/2008 11:00	66.8	48.8	85.3	54.3	62.9	70.8		
23/11/2008 12:00	64.9	49.4	82.8	53.3	60.7	68.8		
23/11/2008 13:00	64.4	50.9	83.2	54.0	60.0	68.2		
23/11/2008 14:00	64.4	50.9	83.8	54.6	60.9	67.6		
23/11/2008 15:00	64.8	48.6	87.9	54.0	60.6	67.9		
23/11/2008 16:00	65.6	48.9	94.7	55.8	59.7	66.3		
23/11/2008 17:00	65.5	47.9	82.5	52.2	61.1	69.6		
23/11/2008 18:00	64.7	48.5	81.5	51.3	59.6	69.1		
23/11/2008 19:00	64.5	48.3	77.9	50.9	59.0	68.9		
23/11/2008 20:00	65.8	47.4	90.9	50.6	58.7	69.0		
23/11/2008 21:00	63.2	47.2	79.6	49.9	55.5	68.0		
23/11/2008 22:00	61.9	45.7	74.3	48.2	53.6	66.9		
23/11/2008 23:00	61.7	45.4	77.2	47.6	51.9	66.3		
24/11/2008 00:00	60.1	41.4	82.5	45.1	48.7	63.2		
24/11/2008 01:00	58.7	39.0	78.1	42.3	46.6	61.0		
24/11/2008 02:00	57.8	36.9	77.8	40.1	43.6	59.7		
24/11/2008 03:00	58.8	37.4	81.2	40.1	43.1	60.0		
24/11/2008 04:00	58.0	37.0	78.9	40.9	45.8	60.8		
24/11/2008 05:00	61.8	40.3	84.1	43.3	48.6	64.9		

Period start	L _{Aeq,1h}	L _{Amin}	L _{AFmax}	L _{A50,1h}	L _{A50,1h}	L _{A10,1h}	L _{Aeq,T}	L _{Aeq,16h}
24/11/2008 06:00	64.1	45.0	85.4	47.3	53.2	68.3	66.6	
24/11/2008 07:00	65.6	47.7	83.4	50.6	59.1	69.5		
24/11/2008 08:00	67.2	50.0	82.8	55.2	64.3	71.0		
24/11/2008 09:00	66.9	51.6	79.8	54.8	63.7	70.8		
24/11/2008 10:00	67.2	51.5	86.3	53.8	62.1	70.7		
24/11/2008 11:00	65.9	51.5	82.0	53.8	61.2	70.2		
24/11/2008 12:00	66.7	49.6	86.0	52.5	60.9	70.7		
24/11/2008 13:00	66.4	50.8	79.7	53.4	61.9	70.5		

Table A13. 5: Hourly Data for Measurement Location P4 (Worcester Avenue)

Period start	L _{Aeq 1h}	L _{Amin}	L _{AFmax}	L _{A50 1h}	L _{A50 1h}	L _{A10 1h}	L _{Aeq T}	L _{Aeq 16h}	
11/11/2008 17:00	55.9	51.4	83.4	52.7	53.9	56.7	56.0	55.6	
11/11/2008 18:00	56.1	51.2	84.1	52.7	54.1	57.8			
11/11/2008 19:00	56.1	51.3	83.0	52.5	53.7	56.4	55.3		
11/11/2008 20:00	55.4	51.3	74.2	52.6	53.9	56.7			
11/11/2008 21:00	56.0	50.9	84.6	52.1	53.4	57.4			
11/11/2008 22:00	53.4	50.1	74.1	51.5	52.4	53.9			
11/11/2008 23:00	55.1	49.7	77.3	51.1	52.2	55.5	55.7	58.1	
12/11/2008 00:00	52.0	49.1	63.5	50.8	51.7	52.8			
12/11/2008 01:00	51.9	49.1	64.8	50.4	51.4	52.8			
12/11/2008 02:00	59.4	48.8	92.5	50.3	51.3	53.1			
12/11/2008 03:00	58.9	48.8	90.5	50.4	51.3	52.7			
12/11/2008 04:00	52.2	48.7	72.0	50.5	51.4	52.7			
12/11/2008 05:00	53.0	49.9	68.1	51.4	52.4	53.9			
12/11/2008 06:00	55.1	51.8	78.5	53.3	54.3	56.1			
12/11/2008 07:00	56.0	52.1	81.3	53.5	54.7	57.0			57.2
12/11/2008 08:00	58.0	52.9	79.1	54.4	55.9	60.1			
12/11/2008 09:00	56.2	52.0	75.4	53.4	54.7	57.9			
12/11/2008 10:00	56.4	51.6	82.3	53.4	55.2	57.8			
12/11/2008 11:00	56.8	51.5	72.5	53.1	55.2	59.2			
12/11/2008 12:00	56.5	51.4	84.5	52.7	54.1	58.0			
12/11/2008 13:00	57.4	50.6	81.5	52.8	55.2	59.4			
12/11/2008 14:00	58.2	51.7	82.5	53.0	55.1	60.3			
12/11/2008 15:00	58.6	50.7	84.4	53.6	56.2	60.4			
12/11/2008 16:00	56.8	53.0	80.9	54.2	55.6	58.2			
12/11/2008 17:00	58.1	52.8	80.6	54.1	55.9	60.0			
12/11/2008 18:00	56.6	52.6	78.4	54.2	55.5	58.0	59.9		
12/11/2008 19:00	58.8	53.9	77.5	55.4	57.5	61.3			
12/11/2008 20:00	58.3	52.0	74.9	53.8	55.8	60.5			
12/11/2008 21:00	62.6	53.6	82.6	54.9	57.5	65.9			
12/11/2008 22:00	58.2	52.5	79.5	54.2	56.0	59.4			
12/11/2008 23:00	55.7	51.2	79.5	52.3	53.5	57.6			
13/11/2008 00:00	59.9	50.2	86.0	50.9	51.7	55.7	56.1	57.8	
13/11/2008 01:00	51.2	49.6	59.1	50.4	50.9	51.7			
13/11/2008 02:00	51.3	49.8	63.5	50.5	50.9	51.7			
13/11/2008 03:00	51.4	49.7	63.2	50.4	51.0	51.9			
13/11/2008 04:00	52.3	49.4	70.7	50.4	51.1	52.4			
13/11/2008 05:00	60.0	50.0	92.7	51.1	52.2	53.6			
13/11/2008 06:00	55.1	51.2	80.5	52.4	53.5	56.2	57.5		
13/11/2008 07:00	54.3	51.9	71.3	52.7	53.6	55.4			
13/11/2008 08:00	58.3	52.0	83.6	53.4	55.7	60.7			
13/11/2008 09:00	56.9	51.9	78.7	53.5	55.2	58.9			
13/11/2008 10:00	58.5	50.1	88.4	52.3	54.4	58.6			
13/11/2008 11:00	56.8	51.4	75.1	53.1	54.9	58.8			

Period start	L _{Aeq,1h}	L _{Amin}	L _{AFmax}	L _{A90,1h}	L _{A50,1h}	L _{A10,1h}	L _{Aeq,T}	L _{Aeq,15h}	
13/11/2008 12:00	56.5	52.3	88.4	53.4	54.8	57.9			
13/11/2008 13:00	58.7	52.0	88.2	54.4	56.2	60.8			
13/11/2008 14:00	58.1	51.7	82.9	53.1	55.0	60.9			
13/11/2008 15:00	58.3	52.7	82.5	53.9	55.9	60.3			
13/11/2008 16:00	57.1	51.6	76.5	53.1	54.6	58.7			
13/11/2008 17:00	58.3	51.0	86.2	52.4	53.9	57.1			
13/11/2008 18:00	56.6	50.7	78.8	52.2	53.4	56.3			
13/11/2008 19:00	55.6	51.0	78.7	52.4	53.6	56.1	58.5		
13/11/2008 20:00	55.5	50.7	79.4	51.9	53.1	56.2			
13/11/2008 21:00	62.8	51.1	92.1	52.3	53.5	57.4			
13/11/2008 22:00	53.1	50.3	71.1	51.5	52.4	53.9			
13/11/2008 23:00	52.3	49.9	64.1	51.2	52.0	53.1	52.4	71.7	
14/11/2008 00:00	52.2	49.8	73.1	51.0	51.8	53.0			
14/11/2008 01:00	51.9	49.3	70.6	50.6	51.4	52.6			
14/11/2008 02:00	52.3	49.3	81.0	50.6	51.4	52.5			
14/11/2008 03:00	51.8	49.7	70.4	50.6	51.2	52.3			
14/11/2008 04:00	52.3	49.7	75.3	50.6	51.3	52.4			
14/11/2008 05:00	52.9	49.5	75.1	51.1	52.2	53.7			
14/11/2008 06:00	53.3	50.1	65.9	51.6	52.7	54.5	72.9		
14/11/2008 07:00	56.8	51.2	80.2	52.6	54.2	58.7			
14/11/2008 08:00	57.7	51.7	82.7	53.6	55.5	60.1			
14/11/2008 09:00	55.8	51.2	80.0	52.8	54.2	57.1			
14/11/2008 10:00	82.8	50.8	103.6	52.9	55.8	74.0			
14/11/2008 11:00	68.3	51.5	93.9	53.8	58.7	74.4			
14/11/2008 12:00	64.7	51.7	86.2	53.3	55.4	64.5			
14/11/2008 13:00	74.4	52.8	92.4	54.8	57.4	79.0			
14/11/2008 14:00	57.7	51.6	80.2	52.9	55.0	59.9			
14/11/2008 15:00	58.3	51.8	84.6	53.4	55.6	59.8			
14/11/2008 16:00	60.4	51.0	87.4	53.0	55.2	62.9			
14/11/2008 17:00	56.5	50.0	82.3	52.5	53.9	56.9			
14/11/2008 18:00	57.1	51.5	79.1	52.6	54.0	58.0			
14/11/2008 19:00	54.6	50.7	70.5	52.4	53.6	56.3	55.4		
14/11/2008 20:00	56.5	51.1	81.6	52.1	53.1	55.7			
14/11/2008 21:00	56.1	51.2	88.9	52.5	53.7	57.2			
14/11/2008 22:00	54.1	49.8	74.9	51.6	52.8	54.7			
14/11/2008 23:00	66.9	49.9	105.6	51.3	52.5	54.2			
15/11/2008 00:00	53.7	49.9	75.3	51.4	52.5	54.4			
15/11/2008 01:00	53.4	49.6	74.9	51.0	52.0	53.8			
15/11/2008 02:00	53.3	49.3	72.6	50.9	52.0	54.3			
15/11/2008 03:00	53.5	49.2	74.7	50.8	51.9	54.0	59.6	56.3	
15/11/2008 04:00	52.2	48.8	68.2	50.7	51.7	53.1			
15/11/2008 05:00	60.3	49.1	91.4	50.8	51.8	53.4			
15/11/2008 06:00	53.7	49.8	69.7	51.4	52.7	55.3			
15/11/2008 07:00	57.1	50.3	81.2	51.6	53.0	57.8	55.1		
15/11/2008 08:00	54.1	50.1	68.2	51.9	53.2	55.5			
15/11/2008 09:00	54.6	50.8	76.6	52.3	53.5	55.9			
15/11/2008 10:00	54.4	50.8	74.0	52.3	53.4	55.4			
15/11/2008 11:00	55.5	50.4	82.6	52.3	53.6	56.6			
15/11/2008 12:00	55.0	50.0	76.7	52.2	53.5	56.3			
15/11/2008 13:00	55.2	50.8	79.4	52.2	53.5	56.4			
15/11/2008 14:00	55.0	50.2	84.0	51.7	53.1	56.4			
15/11/2008 15:00	55.0	50.5	78.0	51.9	53.3	56.3			
15/11/2008 16:00	54.1	50.5	75.6	51.8	52.9	55.1			

Period start	L _{Aeq,1h}	L _{Amin}	L _{AFmax}	L _{A90,1h}	L _{A50,1h}	L _{A10,1h}	L _{Aeq,T}	L _{Aeq,16h}
15/11/2008 17:00	54.3	50.7	77.8	51.7	52.8	55.7	58.6	
15/11/2008 18:00	55.5	51.0	83.1	52.2	53.6	56.8		
15/11/2008 19:00	58.9	50.9	91.0	52.8	55.4	59.2		
15/11/2008 20:00	58.8	53.7	83.6	55.6	57.4	60.1		
15/11/2008 21:00	57.9	51.4	84.7	53.8	56.1	58.7		
15/11/2008 22:00	58.8	51.8	77.6	55.5	57.3	61.3		
15/11/2008 23:00	61.4	52.6	84.9	57.8	60.4	63.4	57.7	
16/11/2008 00:00	61.6	50.8	82.1	57.7	61.1	63.6		
16/11/2008 01:00	59.3	50.1	77.4	51.3	53.2	62.9		
16/11/2008 02:00	54.1	49.1	82.1	50.7	51.5	52.8		
16/11/2008 03:00	51.7	49.2	70.4	50.5	51.3	52.5		
16/11/2008 04:00	52.9	49.1	74.8	50.5	51.4	52.7		
16/11/2008 05:00	51.9	48.9	63.6	50.5	51.5	52.8		
16/11/2008 06:00	54.4	49.6	76.9	50.9	52.2	55.9		
16/11/2008 07:00	53.2	49.8	69.1	51.1	52.3	54.7		
16/11/2008 08:00	53.7	49.7	74.6	51.3	52.6	54.8		
16/11/2008 09:00	56.1	49.7	83.0	51.7	53.0	56.2		
16/11/2008 10:00	54.5	50.5	75.6	51.9	53.5	55.7		
16/11/2008 11:00	54.1	49.5	72.3	52.0	53.4	55.4	57.5	56.8
16/11/2008 12:00	63.0	51.0	90.0	53.5	61.3	63.2		
16/11/2008 13:00	56.2	50.4	72.2	52.6	54.6	58.6		
16/11/2008 14:00	55.4	50.1	74.7	52.1	53.9	57.7		
16/11/2008 15:00	54.9	50.5	73.5	51.7	52.9	56.1		
16/11/2008 16:00	62.4	50.4	103.9	51.5	52.5	55.0		
16/11/2008 17:00	55.7	49.4	78.6	51.0	52.2	54.8		
16/11/2008 18:00	54.1	49.8	78.5	50.8	51.9	53.9		
16/11/2008 19:00	53.7	49.7	79.4	51.0	52.1	54.3		
16/11/2008 20:00	54.0	50.7	80.7	51.2	52.0	54.8		
16/11/2008 21:00	53.3	50.8	80.8	51.5	52.2	53.7		
16/11/2008 22:00	52.9	51.1	73.7	51.7	52.4	53.5		
16/11/2008 23:00	53.0	50.9	65.6	51.7	52.4	53.4	53.1	
17/11/2008 00:00	52.8	50.5	70.8	51.1	51.6	52.7		
17/11/2008 01:00	51.9	50.0	72.1	50.6	51.1	51.9		
17/11/2008 02:00	51.2	49.6	65.2	50.3	50.8	51.5		
17/11/2008 03:00	52.3	50.2	62.3	50.7	51.3	54.2		
17/11/2008 04:00	52.9	50.4	69.3	50.9	51.5	54.8		
17/11/2008 05:00	54.3	50.7	78.2	51.7	52.8	54.4		
17/11/2008 06:00	55.0	51.7	68.3	52.7	53.9	56.8		
17/11/2008 07:00	55.0	51.8	72.7	52.6	53.4	56.3		56.8
17/11/2008 08:00	58.7	52.2	88.1	53.1	55.5	60.6		
17/11/2008 09:00	55.7	52.0	75.3	52.9	54.0	57.1		

Table A13. 6: Hourly Data for Measurement Location P5 (East of Worcester Avenue)

Period start	L _{Aeq,1h}	L _{Amin}	L _{AFmax}	L _{A90,1h}	L _{A50,1h}	L _{A10,1h}	L _{Aeq,T}	L _{Aeq,16h}
14/11/2008 16:00	48.4	41.3	74.2	44.2	46.6	50.6	48.5	48.7
14/11/2008 17:00	48.6	42.4	63.7	44.6	46.6	51.0		
14/11/2008 18:00	48.4	42.5	71.3	44.6	46.7	50.0		
14/11/2008 19:00	48.5	43.3	75.2	45.3	47.3	49.9	48.7	
14/11/2008 20:00	50.3	43.4	77.4	45.0	47.1	50.3		
14/11/2008 21:00	48.8	43.1	66.5	44.7	46.5	51.0		
14/11/2008 22:00	46.6	40.1	64.2	41.9	44.6	48.2		
14/11/2008 23:00	47.1	39.3	69.3	41.8	43.6	47.2	46.0	50.5
15/11/2008 00:00	47.8	39.3	70.7	41.2	43.4	48.6		

Period start	L _{Aeq,1h}	L _{Amin}	L _{AFmax}	L _{A90,1h}	L _{A50,1h}	L _{A10,1h}	L _{Aeq,T}	L _{Aeq,15h}	
15/11/2008 01:00	44.9	38.5	62.2	40.3	42.3	47.4	49.5		
15/11/2008 02:00	45.4	38.3	69.2	39.5	42.2	46.9			
15/11/2008 03:00	44.7	37.7	66.6	39.6	42.0	46.9			
15/11/2008 04:00	43.8	37.9	66.5	39.1	41.0	44.9			
15/11/2008 05:00	45.6	37.9	67.0	39.4	41.4	46.5			
15/11/2008 06:00	47.1	39.7	67.9	41.7	44.5	49.7			
15/11/2008 07:00	48.4	41.0	68.8	43.0	45.7	50.6			
15/11/2008 08:00	48.5	42.2	69.7	43.9	46.0	50.2			
15/11/2008 09:00	48.3	42.8	65.8	44.4	46.5	50.6			
15/11/2008 10:00	49.4	42.8	69.7	44.8	46.9	51.4			
15/11/2008 11:00	49.3	43.2	69.4	44.7	46.9	51.0			
15/11/2008 12:00	51.3	42.5	74.6	44.3	46.6	50.7			
15/11/2008 13:00	51.3	42.7	76.6	44.8	47.3	52.7			
15/11/2008 14:00	50.6	42.1	72.0	45.0	47.8	53.1			
15/11/2008 15:00	50.4	42.8	77.0	45.0	47.5	52.7			
15/11/2008 16:00	47.5	41.2	69.5	43.8	46.1	49.6			
15/11/2008 17:00	47.5	41.2	66.6	43.1	45.5	49.4			
15/11/2008 18:00	48.5	42.1	72.5	43.9	46.1	50.7			
15/11/2008 19:00	55.9	42.7	95.2	44.6	46.9	53.2	52.7		
15/11/2008 20:00	50.2	45.4	70.0	47.2	48.7	51.1			
15/11/2008 21:00	50.5	42.5	73.1	44.9	47.5	50.6			
15/11/2008 22:00	51.4	42.9	75.9	47.2	48.9	53.4			
15/11/2008 23:00	52.7	42.5	64.3	49.2	52.0	55.0			
16/11/2008 00:00	53.1	40.5	70.0	48.7	52.4	55.2			
16/11/2008 01:00	50.2	38.9	69.5	40.6	45.1	54.0			
16/11/2008 02:00	41.2	37.7	60.3	38.7	39.9	43.5			
16/11/2008 03:00	43.8	37.4	63.9	38.5	40.5	46.9			
16/11/2008 04:00	50.5	36.8	77.0	38.1	39.9	48.1			
16/11/2008 05:00	44.4	36.5	71.1	38.2	40.4	47.1			
16/11/2008 06:00	50.3	37.4	71.1	40.0	44.9	52.3			49.9
16/11/2008 07:00	46.6	38.6	73.2	40.9	44.0	48.4			
16/11/2008 08:00	46.7	39.8	64.0	41.6	44.2	49.0			
16/11/2008 09:00	51.8	40.3	76.7	43.6	47.0	51.7			
16/11/2008 10:00	52.9	41.7	74.3	44.8	50.4	56.0			
16/11/2008 11:00	52.0	40.7	74.0	44.5	50.0	55.6			
16/11/2008 12:00	54.7	41.6	89.4	47.2	53.1	55.4			
16/11/2008 13:00	53.6	47.7	75.7	49.6	51.7	55.5			
16/11/2008 14:00	50.7	44.2	71.6	46.6	49.3	53.0			
16/11/2008 15:00	51.8	41.6	75.2	44.2	47.0	52.0			
16/11/2008 16:00	48.2	39.6	79.5	41.8	44.9	48.9			
16/11/2008 17:00	53.2	41.0	77.9	44.4	49.1	52.6			
16/11/2008 18:00	50.5	46.3	74.5	48.0	49.6	51.8	51.7		
16/11/2008 19:00	49.7	44.2	73.1	46.6	48.7	51.4			
16/11/2008 20:00	49.3	43.5	72.4	45.1	47.2	50.6			
16/11/2008 21:00	48.9	44.1	63.6	45.7	47.7	50.4			
16/11/2008 22:00	51.1	47.1	62.3	48.9	50.5	52.7	49.8	48.7	
16/11/2008 23:00	50.0	44.1	65.4	46.2	48.9	52.0			
17/11/2008 00:00	51.1	43.3	71.8	45.9	48.2	51.0			
17/11/2008 01:00	44.7	39.9	64.2	41.5	44.0	46.8			
17/11/2008 02:00	44.0	39.7	59.4	41.5	43.1	45.8			
17/11/2008 03:00	44.8	40.2	62.3	41.9	43.8	46.7			
17/11/2008 04:00	45.8	39.9	58.5	41.8	44.3	48.7			
17/11/2008 05:00	49.1	42.6	63.3	44.5	48.1	51.3			

Period start	L _{Aeq,1h}	L _{Amin}	L _{AFmax}	L _{A90,1h}	L _{A50,1h}	L _{A10,1h}	L _{Aeq,T}	L _{Aeq,15h}
17/11/2008 06:00	52.0	46.4	65.0	48.3	51.4	53.8	53.6	
17/11/2008 07:00	52.2	47.7	67.2	49.4	51.5	53.9		
17/11/2008 08:00	52.5	46.7	68.7	48.7	50.6	53.9		
17/11/2008 09:00	55.4	46.8	92.4	48.1	49.7	53.1		

Appendix 13.6 Measured Noise Levels within the Stadium

Table A13. 1: Measured Noise Levels

Event	Start Time (hh:mm:ss)	End Time (hh:mm:ss)	Duration (Secs)	Location S6 SW		Location S7 Mid	
				L _{Aeq,T}	L _{AFmax}	L _{Aeq,T}	L _{AFmax}
Goal 1:0	20:23:04	20:23:43	39	102.8	111.1	101.6	113.0
Goal 2:0	20:26:39	20:27:14	35	102.6	111.1	103.0	112.4
Goal 3:0	20:29:59	20:30:34	35	102.9	111.8	103.4	113.8
Goal 3:1	20:50:52	20:51:22	30	103.7	112.7	94.7	103.4
Goal 4:1	20:54:28	20:54:58	30	101.9	112.2	102.5	114.5
Goal 4:2	21:05:35	21:06:05	30	100.7	110.2	92.9	102.5
Singing	19:34:05	19:35:07	62	92.4	102.7	83.5	90.8
Singing	19:37:28	19:38:04	36	89.3	94.7	84.4	88.9
Cheers for players running onto pitch	19:41:14	-	-	-	101.6	-	98.4
Chanting from Liverpool fans	19:41:48	19:41:56	8	102.5	106.6	92.1	95.8
PA announcement of Liverpool team	19:42:06	19:42:44	38	96.5	105.3	90.0	96.6
PA announcement of Spurs players,	19:42:56	19:43:30	34	98.7	104.8	93.1	101.3
Chanting from Liverpool fans	19:43:41	19:44:25	34	97.5	103.9	90.3	98.0
Singing & cheering from Liverpool fans	19:44:55	19:45:17	22	99.7	105.8	94.2	100.3
Kick off	19:45:56	-	-	-	99.5	-	97.7
Singing from Liverpool fans	19:47:15	19:47:29	14	99.6	105.5	90.4	96.4
Cheer for Spurs corner	19:48:54	-	-	-	105.5	-	91.8
Crowd anticipation pre-corner (hush)	19:49:08	-	-	77.7	-	76.7	-
Shouts for Spurs goal chance	19:49:15	-	-	-	101.3	-	87.6
Shouts for Spurs opportunity	19:50:54	-	-	-	102.3	-	101.4
Crowd applause	19:52:08	19:52:23	15	88.7	-	84.8	-
Shouts for Liverpool goal chance	19:53:08	-	-	-	101.9	-	92.2
Singing from Liverpool fans	19:53:20	19:53:43	23	98.0	104.0	89.5	95.7
Spurs fans cry for foul - northern half	19:54:55	-	-	-	101.6	-	97.2
Shouts for Spurs opportunity	19:55:55	-	-	-	105.6	-	108.6
Shouts for Spurs goal chance	19:58:07	-	-	-	106.6	-	98.0
Singing from Liverpool fans	19:59:30	20:00:34	64	97.4	106.2	87.4	93.3
Shouts for Spurs break/attack	20:04:21	-	-	-	104.7	-	106.7
Shouts for Liverpool counter attack	20:05:00	-	-	-	105.9	-	
Singing from Liverpool fans	20:07:28	20:07:38	10	94.2	101.4	85.4	
Shouts for Spurs opportunity	20:09:08	-	-	-	102.3	-	
Chanting from Liverpool fans	20:13:00	20:13:15	15	96.6	104.9	87.7	
Applause for Spurs goal attempt	20:14:12	20:14:15	3	90.0	-	87.3	
Shouts for Liverpool goal attempt	20:14:50	-	-	-	101.0	-	
Shouts for foul	20:24:22	-	-	-	107.4	-	
Cheers for award of yellow card	20:24:54	-	-	-	102.1	-	94.7
Shouts for foul	20:26:02	-	-	-	101.9	-	95.1
Cheers for award of yellow card	20:26:13	-	-	-	98.0	-	91.0
Chanting from Liverpool fans	20:27:28	20:27:44	16	95.8	99.2	92.4	94.7
Singing around the stadium	20:28:07	20:28:32	25	91.4	97.0	91.1	96.3
Shouts/roar regard Spurs break	20:29:03	-	-	-	102.1	-	101.0
Cheers for award of Spurs corner	20:29:19	-	-	-	100.8	-	97.9
Singing	20:29:31	20:29:46	15	98.1	104.6	96.3	104.8
Singing	20:31:21	20:31:55	34	96.3	-	94.6	103.3
Cheers for half time	20:31:39	-	-	-	104.9	-	103.3
Total Sound Energy First Half	19:45:56	20:31:39	2743	94.4	111.8	91.6	113.8
Total Sound Energy During Interval	20:32:00	20:46:12	852	94.2	110.0	88.7	103.9
Lull 1 during interval	20:32:03	20:35:49	229	79.1	86.9	79.9	95.1
Lull 2 during interval	20:44:07	20:46:13	126	79.7	83.1	79.6	84.4

Event	Start Time (hh:mm:ss)	End Time (hh:mm:ss)	Duration (Secs)	Location S6 SW		Location S7 Mid	
				L _{Aeq,T}	L _{AFmax}	L _{Aeq,T}	L _{AFmax}
Total Sound Energy Second Half	20:46:37	21:42:17	3340	92.8	112.7	90.6	114.5
Cheers for start of second half	20:46:37	-	-	-	104.9	-	92.3
Spurs shouts for goal opportunity	20:57:17	-	-	-	106.6	-	111.5
Spurs GK taken down	21:10:43	-	-	-	108.8	-	100.7
Chanting from Spurs fans	21:13:06	21:13:28	28	86.5	91.5	85.8	91.3
Singing from Liverpool fans	21:15:06	21:15:27	21	91.8	99.1	86.3	92.8
Cheering	21:18:00	21:18:45	45	87.2	97.6	86.9	97.4
Liverpool goal attempt	21:19:36	21:19:46	10	95.8	99.7	93.6	98.5
Shouts for a foul	21:20:30	-	-	-	99.4	-	100.5
Liverpool shouts for a penalty	21:23:41	23:23:50	9	104.1	109.2	97.2	101.0
Liverpool shot on goal	21:36:59	-	-	-	101.2	-	101.7
Chanting	21:40:29	21:40:53	24	93.8	100.7	88.7	95.2
Cheers for full time	21:42:12	21:42:24	12	98.6	105.6	99.1	106.2
Applause	21:42:59	21:43:09	10	91.4	93.7	90.9	94.2

Appendix 13.7 Measured Noise Levels outside the Stadium – Solo 4

Table A13. 1: Measured Noise Levels – Solo 4

ID	File	Position	Position Description	Start	End	Duration (mm:ss)	L _{Aeq,T}	L _{Amax}	L _{Aec,T}	L _{A16,T}	L _{Amax}	Notes
1	Solo 4 121108 (CW002.0)MG	R8	Corner of Vicarage Road & Park Lane	19:33:11	19:38:11	05:00	63.2	57.6	59.2	64.4	78.9	Supporters making their way to the stadium, distant generator noise, distant crowd noise shouting, occasional local traffic.
2	Solo 4 121108 (CW003.0)MG	R12	In the mouth of Lancaster Close (5m from Park Lane)	19:38:11	19:43:11	05:00	63.9	58.9	60.7	66.5	75.4	Noise (shouting etc) from Away supporters queuing, other supporters streaming passed, shouting from upper level of stadium, horses moving.
3	Solo 4 121108 (CW004.0)MG	R13	Paxton Hall, Paxton Road	19:45:52	19:50:52	05:00	69.0	59.5	62.6	72.3	84.2	10m from burger van with generator noise audible.
4	Solo 4 121108 (CW005.0)MG	R17	Along Worcester Avenue/Paxton Lane, adjacent to the north-east corner of the stadium	20:05:12	20:10:12	05:00	67.9	64.2	65.0	68.8	80.6	Genny noise from Police horse box vehicles, ventilation noise from the stadium, crowd noise from the upper level of the north stand. Two (home) goals, with cheering, banging of seats (?), PA etc.
5	Solo 4 121108 (CW006.0)MG	R18	Worcester Ave in centre of road opposite north end of East Stand	20:20:06	20:25:06	05:00	61.8	56.5	57.0	65.0	76.4	PA noise during half-time interviews (very clear), crowd noise 20:43:24 Police van passed.
6	Solo 4 121108 (CW007.0)MG	R11	In front of 30 Park Lane	20:25:06	20:30:06	05:00	63.0	57.3	57.8	65.3	76.2	Crowd noise (cheering, chanting, clapping, singing) - from Away fans at the beginning, then Home fans after a goal.
7	Solo 4 121108 (CW008.0)MG	R9	Along Bromley Road, outside No.28	20:53:37	20:58:37	05:00	70.0	56.0	61.0	72.4	85.4	Singing and clapping from Home fans - clear, but not as loud as along Park Lane.
8	Solo 4 121108 (CW009.0)MG	R10	On the corner of Bromley Road and its spur road	20:59:35	21:01:55	02:00	59.6	49.4	50.9	63.5	68.9	Aborted
9	Solo 4 121108 (CW010.0)MG	R10	On the corner of Bromley Road and its spur road	21:02:54	21:03:24	00:30	60.3	55.2	55.3	64.1	68.7	Singing, shouting etc. still clearly audible. Some local vehicle movements. 21:05:40 loud chanting.
10	Solo 4 121108 (CW011.0)MG	R19	In front of 41 Worcester Avenue below long-term location P4	21:03:43	21:08:03	02:20	58.4	47.5	48.1	62.5	70.0	Genny noise from Police horse box vehicles. Crowd and PA noise audible, including chanting. "Come on you Spurs." Police horses and riders gearing up.
11	Solo 4 121108 (CW012.0)MG	R20	In front of 5 Worcester Avenue	21:07:38	21:12:38	05:00	86.0	57.1	60.6	72.8	113.4	Crowd noise still audible, road traffic on Northumberland Park, 3No. cars on Worcester Avenue, including passing noise.
12	Solo 4 121108 (CW013.0)MG	R21	Within service yard of Stadium Business Park East behind dwellings in Worcester Avenue and Northumberland Park	21:16:17	21:21:17	05:00	55.9	52.2	52.9	58.0	63.8	Crowd noise clearly audible - chanting "Que sera, que sera...". PA not intelligible, aircraft overhead, road traffic on Northumberland Park.
13	Solo 4 121108 (CW014.0)MG	R21	Within service yard of Stadium Business Park East behind dwellings in Worcester Avenue and Northumberland Park	21:22:38	21:27:38	05:00	54.1	43.9	45.7	56.1	70.9	Supporters streaming past, making their way out of the area, crowd noise from within the stadium, including banging of seat (?) etc. 21:49 helicopter overhead.
14	Solo 4 121108 (CW015.0)MG	R16	North side of Paxton Road, opposite north stand and in front of car park	21:28:57	21:33:57	05:00	48.9	42.9	44.9	51.8	58.4	Supporters streaming past, making their way out of the area, crowd noise from within the stadium, including banging of seat (?) etc. 21:49 helicopter overhead.
15	Solo 4 121108 (CW016.0)MG	R16	North side of Paxton Road, opposite north stand and in front of car park	21:38:50	21:43:50	05:00	68.8	58.7	61.8	71.6	88.5	Supporters streaming past, making their way out of the area, crowd noise from within the stadium, including banging of seat (?) etc. 21:49 helicopter overhead.
16	Solo 4 121108 (CW017.0)MG	R16	North side of Paxton Road, opposite north stand and in front of car park	21:43:50	21:48:50	05:00	71.7	62.7	65.9	72.5	92.6	Supporters streaming past, making their way out of the area, crowd noise from within the stadium, including banging of seat (?) etc. 21:49 helicopter overhead.
17	Solo 4 121108 (CW018.0)MG	R8	Corner of Vicarage Road & Park Lane	21:51:21	21:56:21	05:00	72.0	60.5	62.4	70.9	95.7	Only a few supporters passing/ waiting now, cars starting to leave car park, camera equipment arriving back at vans/lorries.
18	Solo 4 121108 (CW019.0)MG	R12	In the mouth of Lancaster Close (5m from Park Lane)	21:56:21	22:01:21	05:00	63.7	56.5	57.4	66.1	80.2	A few local car movements (in and out of Vicarage Road/Paxton Road), genny noise from inside stadium via open side door.
19	Solo 4 121108 (CW020.0)MG	R15	North side of Paxton Road, opposite mid point of the north stand	22:01:36	22:06:36	05:00	63.5	57.5	58.6	65.6	80.4	A handful of cars and people passing along Park Lane.
20	Solo 4 121108 (CW021.0)MG	R8	Corner of Vicarage Road & Park Lane	22:30:20	22:35:20	05:00	59.8	53.6	54.8	62.1	73.0	Measurement of plant noise from one of the lorries in the side of the north stand. Crowd control fencing being moved (dragged) in the background.
21	Solo 4 121108 (CW022.0)MG	R21	Within service yard of Stadium Business Park East behind dwellings in Worcester Avenue and Northumberland Park	22:35:20	22:40:20	05:00	63.0	53.1	56.5	66.8	78.0	PA noise from eastern side of stadium, voices from nearest burger van(s) (gearing up) - NB burger vans being run on mains from local shop - some local car movements, pitch lights being manoeuvred back into the stadium (by golf buggy).
22	Solo 4 121108 (CW023.0)MG	R21	Within service yard of Stadium Business Park East behind dwellings in Worcester Avenue and Northumberland Park	22:42:13	22:47:13	05:00	64.6	49.0	51.0	68.5	78.1	Road traffic on Northumberland Park, helicopter overhead.
				22:47:13	22:52:13	05:00	65.7	48.4	51.0	68.5	86.5	Road traffic on Northumberland Park.
				22:59:41	23:01:11	01:30	72.1	68.8	69.9	73.3	83.3	
				23:09:20	23:14:20	05:00	55.5	49.9	50.9	57.9	70.0	
				23:14:20	23:19:20	05:00	53.4	48.5	49.8	55.5	71.2	
				23:25:21	23:30:21	05:00	57.6	40.2	41.8	68.7	70.9	
				23:30:21	23:35:21	05:00	47.9	40.4	41.8	51.1	63.9	
				23:35:21	23:40:21	05:00	47.5	39.9	41.2	51.4	62.7	
				23:40:21	23:45:21	05:00	48.4	40.1	41.1	62.9	64.7	

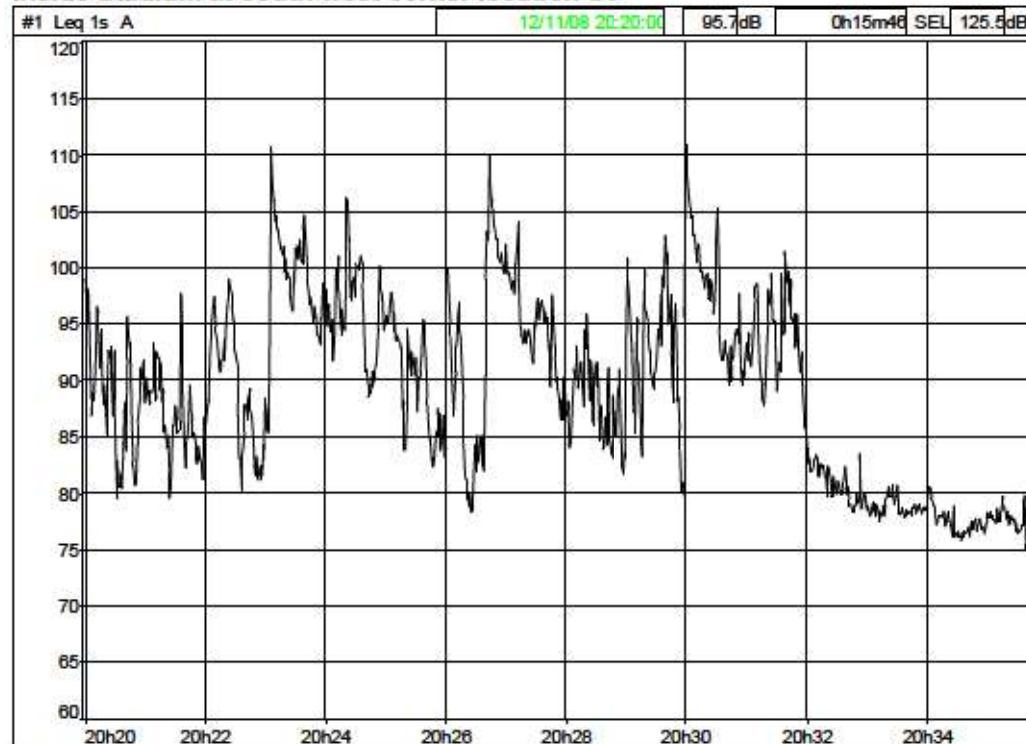
Appendix 13.8 Measured Noise Levels outside the Stadium - SIPC

Table A13. 1: Measured Noise Levels - SIPC

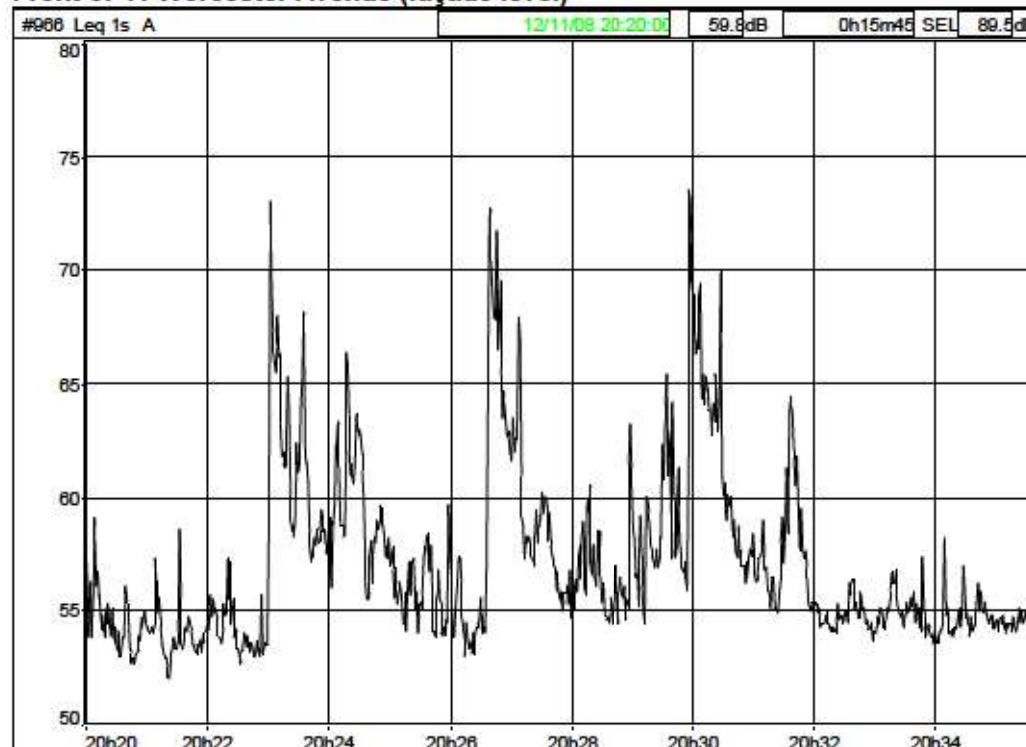
ID	File	Position	Position Description	Start	End	Duration (mm:ss)	L _{Aeq,T}	L _{Amin}	L _{Amax}	L _{A90,T}	Notes
1	SIPC_MG_002	R14	Paxton Road opposite North Stand Gateways 17-20, 2m from road kerb	20:05:12	20:10:12	05:00	62.9	57.8	70.1	65.5	Burger vans and souvenir shop behind measurement position. Baseline dominated by generator noise from burger van at NW corner of stadium. Clapping and cheering audible from inside stadium during first minute. 20:07 - Pedestrians arguing in street. 20:09 - Pedestrian whistling and shouting.
				20:10:12	20:15:12	05:00	62.7	57.1	75.9	64.5	20:12:50 - Pedestrians yelling and arguing. 20:14:16 - Van passby on Paxton Road. 20:14:40 - Crowd cheering in stadium, but not very loud. 20:14:55 - Crowd clapping in stadium.
2	SIPC_MG_003	R8	Corner Park Lane and Voarage Road, opposite stadium, 1.5m from kerb	20:33:14	20:38:14	05:00	59.3	52.8	70.8	61.8	Baseline dominated by generator on burger van with occasional vehicle passbys. Crowd cheering and PA system dominate when occurring. Measurement taken during half time with mostly PA noise and occasional crowd cheers from stadium. 20:36 - Police Van moving near microphone. 20:37 - PA announcement and vehicle passby.
				20:38:14	20:43:14	05:00	59.3	53.8	64.7	61.3	20:38 - Crowd chanting and PA announcements. 20:40 - Crowd cheering. PA is quite loud at this time. 20:41 - PA announcement and crowd chanting (sounds like crowd mostly at west end of stands).
3	SIPC_MG_004	R12	Corner Park Lane and Lancaster Close approx 2.5m back from Park Lane verge	20:46:53	20:51:53	05:00	67.4	50.6	82.1	71.6	Noise from stadium dominates noise levels. 20:46 - Crowd cheering and chanting, music from inside stadium also audible. 20:48:50 - Crowd chanting on grandstand. Referee whistle occasionally audible, but not very loud. 20:49:42 - Crowd chanting (west end of stands). 20:51 - Crowd chanting and cheering. Sounds like a goal (west end of stands).
				20:51:53	20:56:53	05:00	66.6	52.5	75.7	70.4	20:53:22 - Crowd chanting and banging on stands (west end of stands). 20:54:10 - Crowd chanting on stands (west end of stands). 20:54:47 - Crowd chanting and clapping (west end of stands). 20:55:30 - Crowd cheering (east end of stands). 20:55:37 - PA announces goal. 20:56 - Crowd chanting/chanting (east end of stands).
				20:56:53	20:59:54	03:01	61.6	51.4	75.3	63.1	20:57 - Pedestrian walks by and has a chat. 20:57 - Crowd chanting (east end of stands). 20:58:36 - PA announcement dominant from SW corner of stands. 20:59:40 - Van passby on Park Lane.
				21:04:00	21:09:00	05:00	61.7	57.1	70.8	64.2	Burger vans and souvenir shop behind measurement position. Baseline dominated by generator noise from burger van at NW corner of stadium. 21:04 - Chanting audible from stadium. 21:05:40 - Clapping from stadium. 21:06:45 - PA announcement. 21:08:25 - Small cheer from stadium. 21:08:48 - PA announcement for substitution clearly audible.
4	SIPC_MG_005	R14	Paxton Road opposite North Stand Gateways 17-20, 2m from road kerb	21:09:00	21:14:00	05:00	60.2	57.2	67.0	61.9	21:09:15 - Small cheer and ref whistle just audible. 21:11:28 - Clapping from stadium. 21:13:34 - Shouting from burger van behind measurement position. 21:13:57 - Chanting from stadium (not very loud).
				21:21:28	21:26:28	05:00	64.1	57.5	74.5	67.5	Noise during this measurement mostly dominated by vehicles, police horses and car park attendants preparing for the end of the game. 21:22:12 - Police horses pass by on road. 21:23:10 - Police horses pass by on road. 21:23:45 - Rubbish trolleys being pushed around paths, pedestrian talking on phone near mic. 21:24:27 - Small cheer from stadium barely audible. 21:24:27 - Small cheer from stadium barely audible. 21:24:40 - Car park barriers being moved around.
5	SIPC_MG_006	R17	Opposite stadium on corner Paxton Road and Worcester Avenue	21:26:28	21:27:55	01:27	62.8	60.2	66.1	65.0	21:26:28 - police van parked in front of mic and left idling. 21:27:41 - PA announcement and idling van. F finished measurement and moved on due to too much activity near mic.
				21:31:00	21:31:00	05:00	63.2	54.7	79.2	64.4	Police van idling nearby dominates baseline. Crowd just beginning to leave stadium a few at a time. Police preparing for crowd control, occasional noise from police radios. Car passby in 1st minute. 21:33:30 - Car passby. 21:34:14 - Car passby. 21:34:47 - Cheer from stadium. 21:35:00 - Pedestrian yelling.
6	SIPC_MG_007	R8	Corner Park Lane and Voarage Road, opposite stadium, 1.5m from kerb	21:35:00	21:41:00	05:00	61.1	54.7	71.8	63.5	21:35:21 - Car passby. 21:35:40 - Cheer from stadium and PA announcement. 21:37:18 - Cheer from stadium. 21:37:26 - Car passby. 21:38:55 - Car turned around in front of mic. 21:40:50 - Cheering and banging from stadium. 21:40:58 - Pedestrians chanting.
				21:41:00	21:42:39	01:39	64.7	58.3	73.2	69.3	21:41 - Police van moving around

Appendix 13.9 Analysis of Goal Noise Levels

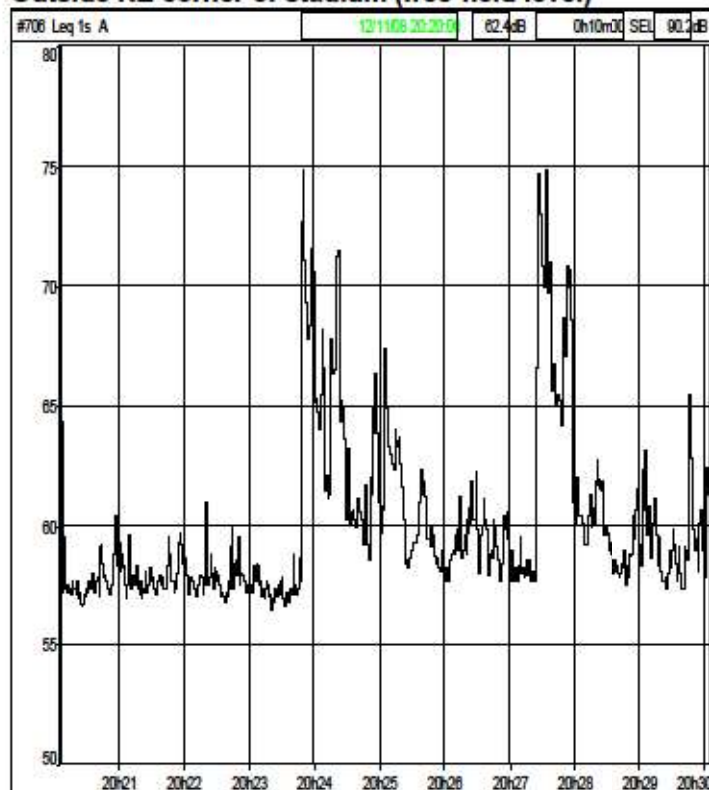
Inside Stadium at south west corner location S6



Front of 41 Worcester Avenue (façade level)



Outside NE corner of stadium (free-field level)



Home Team Goals

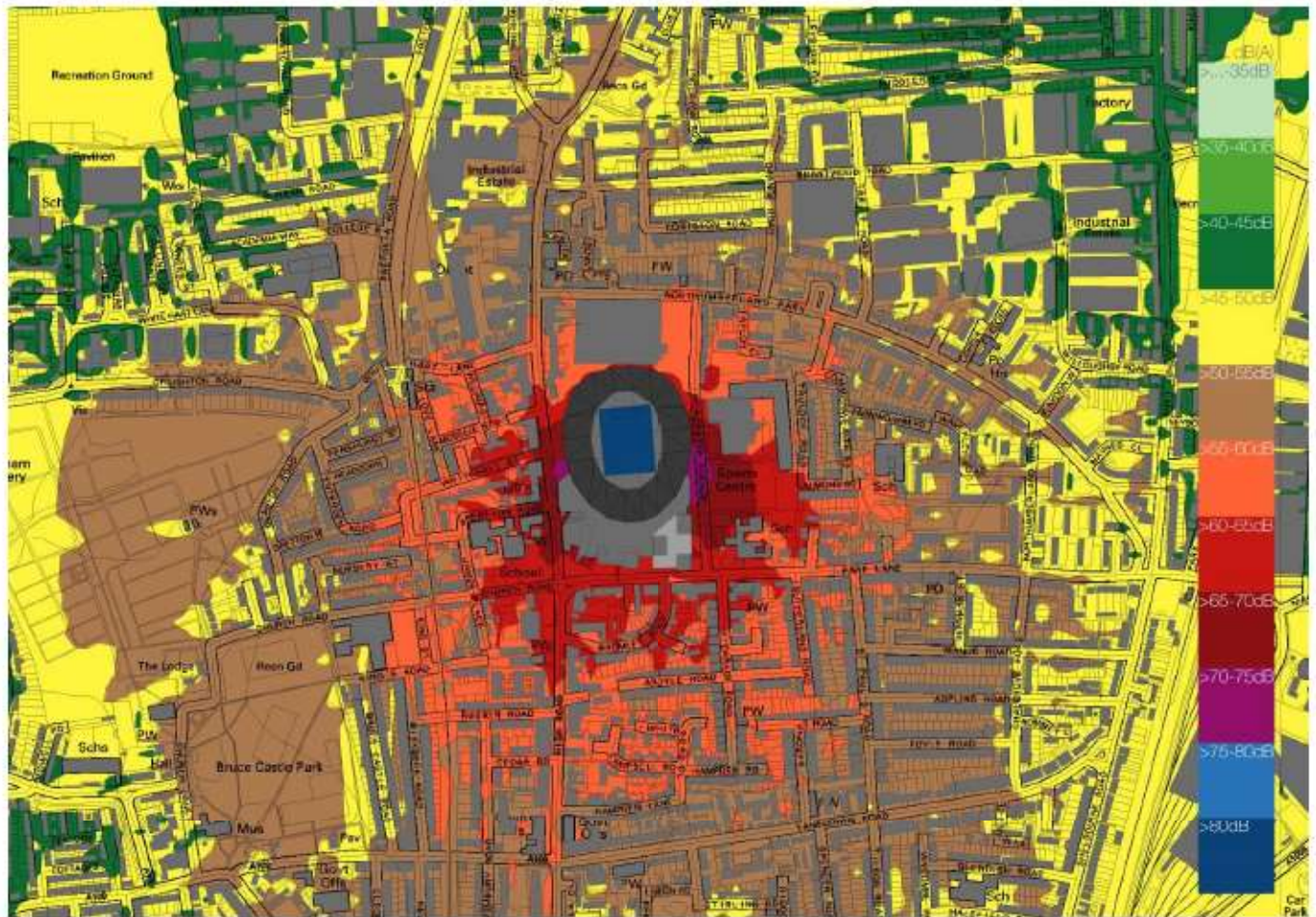
1 st goal at SW corner within stadium (location S6)	= 102.8 dB $L_{Aeq,30s}$
1 st goal at 41 Worcester Avenue (location P4)	= 65.2 dB $L_{Aeq,30s}$
1 st goal outside NE corner of stadium (location R17)	= 68.2 dB $L_{Aeq,30s}$
2 nd goal at SW corner within stadium (location S6)	= 102.6 dB $L_{Aeq,35s}$
2 nd goal at 41 Worcester Avenue (location P4)	= 66.9 dB $L_{Aeq,35s}$
2 nd goal outside NE corner of stadium (location R17)	= 69.7 dB $L_{Aeq,35s}$
3 rd goal at SW corner within stadium (location S6)	= 102.9 dB $L_{Aeq,35s}$
3 rd goal at 41 Worcester Avenue (location P4)	= 67.2 dB $L_{Aeq,35s}$
5 th goal at SW corner within stadium (location S6)	= 101.9dB $L_{Aeq,30s}$
5 th goal at 41 Worcester Avenue (location P4)	= 66.3 dB $L_{Aeq,30s}$
5 th goal at 30 Park Lane (location R11)	= 75.8 dB $L_{Aeq,30s}$
5 th goal at Lancaster Close junction with Park Lane (location R12)	= 68.4 dB $L_{Aeq,30s}$

Away Team Goals

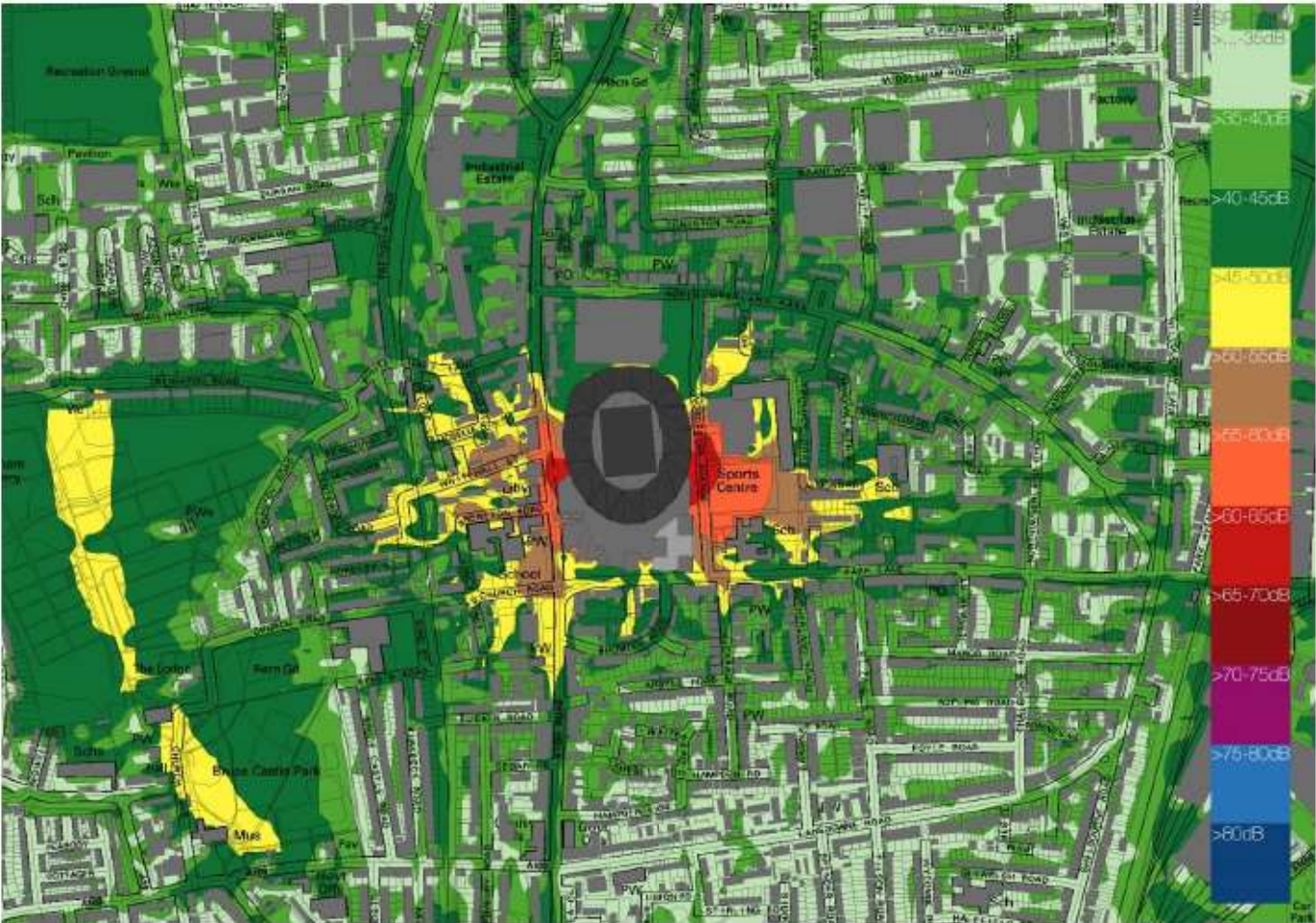
4 th goal at SW corner within stadium (location S6)	= 103.7 dB $L_{Aeq,30s}$
4 th goal at 41 Worcester Avenue (location P4)	= 61.8 dB $L_{Aeq,30s}$
4 th goal at Lancaster Close junction with Park Lane (location R12)	= 74.7 dB $L_{Aeq,30s}$
6 th goal at SW corner within stadium (location S6)	= 100.7 dB $L_{Aeq,25s}$
6 th goal at 41 Worcester Avenue (location P4)	= 59.7 dB $L_{Aeq,25s}$
6 th goal at Bromley Road (location R10)	= 58.3 dB $L_{Aeq,25s}$
6 th goal at north side of Paxton Road (location R14)	= 61.6 dB $L_{Aeq,25s}$

Appendix 13.10 Noise Contour Plots

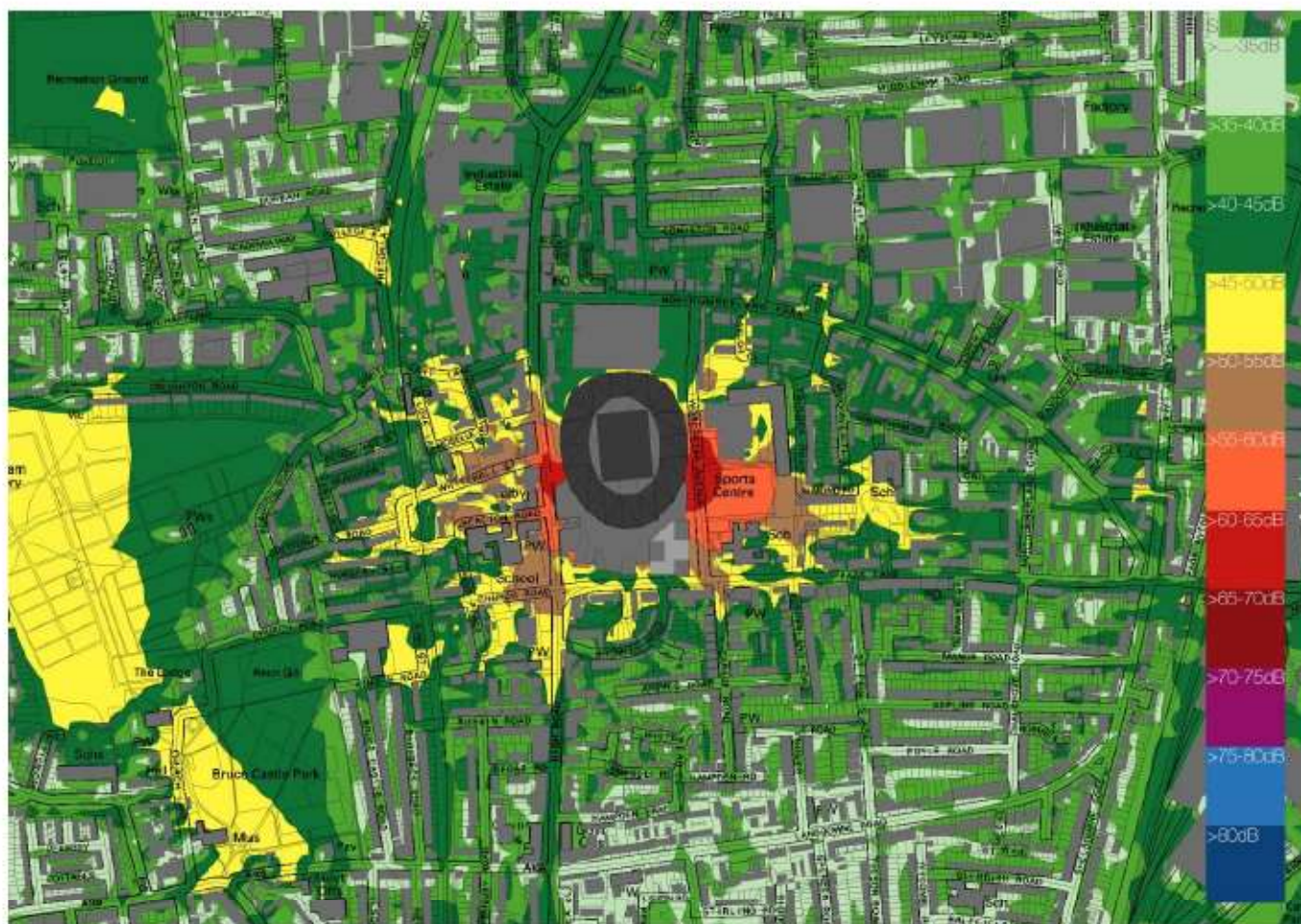
Concert Noise Levels



Football Match Noise Levels



NFL Noise Levels



TOTTENHAM HOTSPUR FOOTBALL CLUB

CONSTRUCTION COMPOUND NOISE IMPACT ASSESSMENT

Tottenham Hotspur Limited

SEPTEMBER 2015

TOTTENHAM HOTSPUR FOOTBALL CLUB

CONSTRUCTION COMPOUND NOISE IMPACT ASSESSMENT

Tottenham Hotspur Limited

Project no: 70009436-002
Date: September 2015

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TABLE OF CONTENTS

1	INTRODUCTION.....	1
2	SITE DESCRIPTION AND NOISE-SENSITIVE RECEPTORS.....	2
3	PROPOSED CONSTRUCTION ACTIVITIES	3
4	ASSESSMENT CRITERIA.....	5
5	ON-SITE ACTIVITY ASSESSMENT.....	6
6	TRAFFIC NOISE ASSESSMENT	8
7	SUMMARY.....	10

APPENDICES

APPENDIX A GLOSSARY OF TERMS

APPENDIX A-1 GLOSSARY OF TERMS

APPENDIX B FIGURES

APPENDIX B-1 FIGURE B-1: SITE & RECEPTOR LOCATION
PLAN

APPENDIX B-2 FIGURE B-2: INDICATIVE SITE LAYOUT PLAN

1 INTRODUCTION

1.1 PROJECT BRIEF

- 1.1.1 This report presents an assessment by WSP | Parsons Brinkerhoff (WSP | PB) of the noise associated with the use of The Goods Yard, 46-48 White Hart Lane, as a construction compound during the construction of the Northumberland Development Project (i.e. the proposed Tottenham Hotspur football stadium and associated development).
- 1.1.2 The compound is required for the siting of, in particular, a concrete batching plant, which will significantly reduce the amount of heavy vehicle movements on the road network associated with the Northumberland Development Project.
- 1.1.3 Haringey Council has requested that a noise assessment is submitted with the planning application for the compound.

1.2 ASSESSMENT SCOPE

- 1.2.1 Noise limits have been determined for key receptors, i.e. locations representative of the nearest dwellings to the site, based on guidance in the relevant British Standard, BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites Part 1: Noise*, and as presented in the 2015 Environmental Statement (ES) for the Northumberland Development Project.
- 1.2.2 Using the same Standard, together with details provided by the project team, the likely noise levels from the use of the compound have been determined at the key receptors. The comparison of these levels with the corresponding limits provides an indication of the likelihood of potential significant effects.
- 1.2.3 In addition to the assessment of the activities occurring on the site itself, consideration has been given to the noise effects associated with the use of the local roads by the vehicles associated with the operation of the compound, i.e. primarily the concrete mixers on route to and from the Northumberland Development Project site. This has been done by determining the likely change in existing road traffic noise levels, with the changes assessed against a standard significance scale relevant to road traffic noise.
- 1.2.4 No significant levels of vibration are anticipated from the proposed activities, nor was this raised by Haringey Council, and so vibration is not considered as part of the assessment.
- 1.2.5 This report is necessarily technical in nature, and, as such, a glossary of terminology is presented in Appendix A.

2

SITE DESCRIPTION AND NOISE-SENSITIVE RECEPTORS

2.1 SITE DESCRIPTION

- 2.1.1 The site of the proposed construction compound is shown in Figure B1 of Appendix B to this report. It is located at 46-48 White Hart Lane, approximately 0.5 km north-west of the Tottenham Hotspur stadium.
- 2.1.2 The site, which is located on the north side of White Hart Lane, is known as The Goods Yard, and is vacant. It is bounded to the west by the London Overground lines, and to the north and east by the corner of the Sainsbury's superstore and the western boundary of the Peacock Industrial Estate.
- 2.1.3 The southern-most part of the site, including the access off White Hart Lane, is narrow, but opens up to the widest point in the middle, before tapering down to a narrow point at the northern end, where the railway passes the superstore.

2.2 NOISE-SENSITIVE RECEPTORS

- 2.2.1 In the main, the noise-sensitive receptors are considered to be the nearest dwellings. The majority of which are separated from the site by either the railway lines and associated embankment, White Hart Lane, or the Industrial Estate. The exception to this is no.52 White Hart Lane, which is located to the west of the site access, and is understood to contain two or more residential flats. Furthermore, on the eastern side of the site access is the combination of The Grange Community Hub and Grange Day Care Centre. The Sainsbury's superstore is not considered to be noise-sensitive, especially since no windows overlook the site.
- 2.2.2 The next nearest dwellings are the flats in Charles House to the south of White Hart Lane, the houses in Pretoria Road to the west of the railway embankment, and the flats associated with the Rivers Apartments development, north of the Industrial Estate.
- 2.2.3 On this basis, the following key receptors have been adopted for the assessment:
- R1: The Grange Community Hub and Grange Day Centre (rear) – 2-2½ storey (M-F 8.30am to 5.15pm; Sat & Sun 9am to 3pm)
 - R2: 52 White Hart Lane (rear) – 2 storey (flats)
 - R3: Charles House, Love Lane – 10 storey
 - R4: Pretoria Road Houses (south, nos.1-17) – 2 storey
 - R5: Pretoria Road Houses (north, nos.35-45) – 2 storey
 - R6: Rivers Apartments Tower Block – 23 storey
- 2.2.4 These receptors are also shown in Figure B1 within Appendix B.
- 2.2.5 In addition to these receptors, the receptors in proximity to the roads used by the vehicles accessing the site have also been considered. The assessment, however, as described below, is based on a notional distance of 10 m from the road, and it is not necessary to list any receptors specifically in this regard.

3 PROPOSED CONSTRUCTION ACTIVITIES

3.1 ON-SITE ACTIVITIES

3.1.1 An indicative layout of the site is shown in Figure B2 of Appendix B. It can be seen that the office and welfare facilities are to be located at the southern end, nearest White Hart Lane; a materials storage area is to be located in the middle of the site; and the concrete batching plant is to be located at the northern end of the site. An aggregate washing plant will be located in the vicinity of the batching plant, but which is not shown in the figure.

3.1.2 The key activities would be as follows:

- The operation of the concrete batching plant
- The operation of the aggregate washing plant
- Shovel loaders associated with the above
- Lorry movements associated with the above

3.1.3 There would be no parking on site, and no requirement for combustion plant power provision.

3.1.4 The details of the plant assumed for the assessment are presented in section 5 of this report.

3.2 OFF-SITE ACTIVITIES

3.2.1 The main role of the site would be the production of concrete for the main site. The concrete would be delivered to the main site via mixer trucks, whilst additional lorry movements will be required to supply the raw materials to the batching plant.

3.3 HOURS OF OPERATION

3.3.1 It is proposed to operate the site between 08:00 and 18:00 hours, seven days a week. This represents an extension of what would be considered normal or core operational hours for a construction site, of 08:00 to 18:00 hours Monday to Friday and 08:00 to 13:00 hours Saturdays. The hours beyond these core hours are described as 'extended hours' in this report.

3.3.2 No evening or night-time working is proposed.

3.4 MITIGATION MEASURES

3.4.1 Several legislative safeguards exist to minimise the effects of construction noise and would be applicable during the construction of the proposed development. These safeguards include:

- the various EC Directives and UK Statutory Instruments that limit the noise emissions of a variety of construction plant; and
- the powers that exist for local authorities under Sections 60 of the Control of Pollution Act 1974 and Section 80 of the Environmental Protection Act 1990 to control noise (and vibration) on construction sites and statutory nuisance respectively.

3.4.2 The Considerate Constructors Scheme, details of which can be found at the web page www.considerateconstructorscheme.org.uk, is a scheme under which registered sites are monitored by an experienced industry professional to assess their performance against the eight point Code of Considerate Practice which includes the categories: 'Considerate', 'Environment',

'Cleanliness', 'Good Neighbour', 'Respectful', 'Safe', 'Responsible' and 'Accountable.' The main contractor will be required to register the site under this scheme.

3.4.3

Contract documents supplied to contractors will require that the effects of environmental noise are considered during the design and execution of the works. Such an assessment will require a noise control plan that provides a noise management system tailored to the specific needs of the construction works, the site and the surrounding area. As a minimum, any noise control plan will cover:

- procedures for ensuring compliance with statutory or other identified noise control limits;
- noise Action Levels (to be agreed with Haringey Council) above which consideration will be given to the use of alternative techniques and/or other means of reducing noise with the aim on ensuring that the Action Level (or below) is achieved. All practicable measures would be considered and implemented where appropriate together with additional consultation with the occupiers of potentially affected receptors;
- the review of the plant and mitigation measures, especially in response to breaches of the Action Level and/or complaints;
- procedures for ensuring that all works are carried out according to the principle of "Best Practicable Means" (BPM) as defined in the Control of Pollution Act 1974;
- general induction training for site operatives and specific training for staff having responsibility for particular aspects of controlling noise from the site;
- monitoring / auditing; and
- liaison with Haringey Council and the local business community.

3.4.4

The adoption of BPM is usually the most effective way of controlling noise from construction sites and will be enforced rigorously. In order to demonstrate the adoption of BPM to control noise emission from the site, the following conditions and measures would be imposed on the construction works:

- Local hoarding, screens or barriers will be erected as necessary to shield particularly noisy activities.
- Contractors will be required to bring to the site and employ on the works only the most environmentally acceptable and quietly operating plant and equipment compatible with the safe and efficient execution of the works.
- Noise emitted by any plant item will be required not to exceed the limits quoted in either the relevant EC Directive or UK Statutory Instrument and will be required to be no greater than the relevant values quoted in the current version of BS 5228.
- All plant items will be properly maintained and operated according to manufacturers' recommendations in such a manner as to avoid causing excessive noise.
- All plant will be sited so that the noise impact at nearby noise sensitive properties is minimised.
- All items of plant operating on the site in intermittent use will be shut down in the periods between use.
- Care will be taken when loading and unloading vehicles to minimise noise.
- No radios or music will be permitted to be played on the site.

3.4.5

As stated earlier, there would be no parking on site, and no requirement for combustion plant power provision.

4 ASSESSMENT CRITERIA

4.1 ON-SITE ACTIVITIES

- 4.1.1 As stated earlier, the activities on the compound site may be undertaken over a seven day period. As such, assessment criteria have been derived for both the typical construction working days (i.e. 08:00 to 18:00 hours Monday to Friday and 08:00 to 13:00 hours on Saturdays) and for the possible extended hours of 13:00 to 18:00 hours on Saturdays and 08:00 to 18:00 hours on Sundays.
- 4.1.2 The criteria for the extended hours are 5 dB lower than those for the typical construction working periods, which were established in the 2015 ES. A shorter assessment period of one hour also applies.
- 4.1.3 All receptors identified above are considered to be of high sensitivity to noise, whereby the following scales apply equally.

Table 1: Impact Significance Scale for Construction Noise – Core Working Hours, Façade

NOISE LEVEL FROM CONSTRUCTION WORKS	SCALE OF IMPACT SIGNIFICANCE	SIGNIFICANCE OF NOISE EFFECT
<65 dB $L_{Aeq,T}$	Negligible	Likely to be insignificant
66 to 70 dB $L_{Aeq,T}$	Minor negative	
71 to 75 dB $L_{Aeq,T}$	Moderate negative	Potentially significant
>76 dB $L_{Aeq,T}$	Major negative	

Where 'T' = 10 hours (08:00 to 18:00) Monday to Friday, or 5 hours (08:00 to 13:00) Saturdays

Table 2: Impact Significance Scale for Construction Noise – Extended Working Hours, Façade

NOISE LEVEL FROM CONSTRUCTION WORKS	SCALE OF IMPACT SIGNIFICANCE	SIGNIFICANCE OF NOISE EFFECT
<60 dB $L_{Aeq,T}$	Negligible	Likely to be insignificant
61 to 65 dB $L_{Aeq,T}$	Minor negative	
66 to 70 dB $L_{Aeq,T}$	Moderate negative	Potentially significant
>71 dB $L_{Aeq,T}$	Major negative	

Where 'T' = 1 hour

4.2 OFF-SITE ACTIVITIES

- 4.2.1 It is considered sufficient and appropriate to assess the significance of the off-site vehicle movements in terms of the likely resultant change in overall road traffic noise levels at the nearest receptors.
- 4.2.2 Since the potentially affected receptors (in proximity to the roads that would be used by the vehicles accessing the compound site) are currently exposed to a certain level of transportation noise, it is the difference or change in noise level as a result of the operation of the construction compound that is important when assessing the significance of potential effects.

- 4.2.3 HD 213/11 *revision 1. Noise and Vibration of the Design Manual for Roads and Bridges*(DMRB) identifies that a change in road traffic noise of 1 dB $L_{A10,18h}$ in the short term (e.g. when a scheme is first operational) is the smallest that is considered perceptible. The scale used in the assessment of off-site construction vehicle movements is taken directly from HD 213/11, as presented below.

Table 3: Scale for the Assessment of Changes in Road Traffic Noise due to Construction Traffic

NOISE CHANGE	SCALE OF IMPACT SIGNIFICANCE	SIGNIFICANCE OF NOISE EFFECT
0.1 – 0.9	Negligible	Likely to be insignificant
1.0 – 2.9	Minor	
3.0 – 4.9	Moderate	Potentially significant
≥ 5.0	Major	

5 ON-SITE ACTIVITY ASSESSMENT

5.1 PREDICTED CONSTRUCTION NOISE LEVELS

- 5.1.1 The prediction of the likely noise levels during the operation of the compound have been undertaken in accordance with the procedures described in BS 5228-1:2009+A1:2014. Accordingly, the predictions are in terms of the $L_{Aeq,T}$ noise levels for the relevant operational periods.
- 5.1.2 Table 4 below sets out the approximate programme for the stadium site considering a seven day working week.

Table4: Approximate Programme of Construction Works

PHASE	PERIOD	DURATION (MONTHS)
Enabling Works	Jan 15 – Dec 15	12
Demolition (existing Stadium)	Jan 17 – June 17	6
Piling and Foundations	Sep 15 – Feb 16, May 17 – Jul 17	6, 3
Structure	Jan 16 – Oct 17	15
Roof Structure & Cladding	Mar 17 – Apr 18	14
Envelope	Jan 17 – Jun 18	18
Fit-out and Facilities	Sept 16 – Jun 18	22
Commissioning	May 18 – Jul 18	3

- 5.1.3 The expected plant and associated sound power levels assumed for the predictions are given in the table below along with the reference to the origin of this source information from Annexes C and D of BS 5228-1:2009+A1:2014 or WSP | PB measurements.

Table 5: Construction Plant Noise Levels

PLANT	DATA SOURCE	L _{WA} (dB) (EACH ITEM)	% ON-TIME PER DAY / 1-HOUR
Concrete Batching Plant	BS 5228 – D6.10	106	80 / 100
Aggregate Washing Plant	WSP PB data ¹	107	80 / 100
Shovel Loaders x2	BS 5228 – C.6/32	103	20 / 60
Concrete Mixers ² (idling)	BS 5228 – C.4/19	99	40 / 80
Lorry Movements	BS 5228 – C.2/34	108	N/A ³

1 On Thursday 27th September 2015 WSP | PB undertook measurements of the aggregate washing plant operating on the Northumberland Project Development site. The level presented above represents the average of the measurements made at 10 m at several locations around the plant, corrected by +28 dB to determine the equivalent sound power level (L_{WA}).

2 The number of concrete mixers is accounted for in the percentage on-time.

3 The on-site lorry movements are predicted using the 'haul route' method given in BS 5228, which takes into account the predicted number of movements provided by the transport planner, and where the percentage on-time is not applicable. A worst case two-way hourly flow of 22 has been assumed.

- 5.1.4 For the purpose of these predictions, it is assumed that the intervening ground between the construction noise sources and the noise-sensitive properties will be acoustically hard such that there is no significant attenuation of sound due to ground absorption. Account is taken for any intervening screening, such as from the railway embankment and the proposed site hoarding.
- 5.1.5 All plant is assumed to be operating simultaneously (albeit subject to the percentage on-times presented in Table 5 above) as at the locations indicated on the site plan presented as Figure B2 of Appendix B. It is considered that the percentage on-times represent the likely worst case conditions.
- 5.1.6 Based on the activities and plant described above, the predicted noise levels are given in Table 6.

Table 6: Predicted Worst Case Construction Noise Levels – Façade L_{Aeq,T}, dB

RECEPTOR	PREDICTED NOISE LEVEL, dB L _{Aeq,T} ¹	
	Core Hours ²	Extended Hours ³
R1: The Grange Community Hub and Grange Day Centre	52	53
R2: 52 White Hart Lane (rear)	54	55
R3: Charles House, Love Lane	55	59
R4: Pretoria Road Houses (south, nos.1-17)	53	54
R5: Pretoria Road Houses (north, nos.35-45)	57	59
R6: Rivers Apartments Tower Block	61	63

1 Where 'T' is 10 hours Monday to Friday, 5 hours Saturdays and 1 hour at all other times

2 08:00 to 18:00 hours Monday to Friday and 08:00 to 13:00 hours on Saturdays

3 13:00 to 18:00 hours on Saturdays and 08:00 to 18:00 hours on Sundays

5.2 SIGNIFICANCE OF PREDICTED CONSTRUCTION NOISE LEVELS

5.2.1 Based on the impact significance scales presented in Tables 1 and 2, the effect of the predicted construction noise levels are considered to be as shown in Table 7.

Table 7: Significance of Predicted Worst Case Construction Noise Levels

RECEPTOR	LIKELY SIGNIFICANCE OF IMPACT	
	Core Hours	Extended Hours
R1: The Grange Community Hub and Grange Day Centre	Negligible	Negligible
R2: 52 White Hart Lane (rear)	Negligible	Negligible
R3: Charles House, Love Lane	Negligible	Negligible
R4: Pretoria Road Houses (south, nos.1-17)	Negligible	Negligible
R5: Pretoria Road Houses (north, nos.35-45)	Negligible	Negligible
R6: Rivers Apartments Tower	Negligible	Minor

5.2.2 Accordingly, based on the assumptions and data presented in this report, no potentially significant effects are anticipated as a result of the on-site construction activities. This is considered to take into account the likely worst case noise levels from the site.

6 TRAFFIC NOISE ASSESSMENT

6.1 PREDICTED CHANGE IN ROAD TRAFFIC NOISE LEVELS

6.1.1 The Calculation of Road Traffic Noise (CRTN) memorandum published by the Department of Transport and Welsh Office in 1988 describes procedures for predicting (and measuring) noise from road traffic in terms of the L_{A10} parameter – the level exceeded for 10% of the time.

6.1.2 The CRTN sets out a step-by-step method for predicting road traffic noise levels in terms of L_{A10} for both a 1-hour period and an 18-hour period (between 06:00 hours and midnight) at any distance up to 300 metres from a highway. The prediction method takes into account the following factors to generate a Basic Noise Level (BNL) at a notional distance from the kerb (i.e. 10 m): traffic flow, mean speed, the percentage of heavy vehicles, along with the road surface and gradient. The procedures also enable the noise level at specific receptors to be determined by taking the BNL and applying corrections for distance, the presence of screening (barriers, buildings and topography), the type of intervening ground cover between the road and receiver, the angle of view of the road and reflections from façades.

6.1.3 In order to assess the significance of the additional noise generated by any vehicle movements associated with the operation of the construction compound, it is necessary to determine the expected change in road traffic noise levels. To this end, BNL predictions have been determined in accordance with the CRTN and based on traffic data supplied by Tim Spencer & Co, together with the following assumptions:

- vehicle speeds are unchanged between the different scenarios;
- 50 kph vehicle speed on all roads;
- zero gradient on all roads for all scenarios; and
- standard bituminous, impervious surface (e.g. hot rolled asphalt) on all roads for all scenarios.

6.1.4 One benefit of the compound site and the associated concrete batching plant is the reduction in vehicles on the wider road network delivering concrete to the main site. The vast majority of the vehicle movements associated with the compound site, therefore, will be between the compound site and the main site. The roads associated with this route will be limited to the A1010 (High Road) and White Hart Lane (between the A1010 and the compound site).

6.1.5 The baseline flows for these two road sections are shown Table 8 below. The flows are in terms of the 24 hour annual average daily traffic (AADT) flows. Since this period doesn't relate to either the periods covered by the CRTN procedures or those applicable to the compound site's hours of operation, it has been necessary to make the following assumptions:

- As worst case, it is assumed that the 24 hour flows are equivalent to the 18 hour flows (06:00 to 00:00 hours). These are then divided by 18 to estimate the equivalent hourly flows for comparison with the hourly construction flows.

Table 8: Baseline Two Way Flows

ROAD/LINK	24 AADT BASELINE FLOW (%HGV)	18 HOUR BASELINE FLOW (%HGV) ¹	AVERAGE HOURLY BASELINE FLOW (%HGV) ²	SPEED (KM/H)
The A1010 High Road (South of White Hart Lane)	17970 (7)	17970 (7)	998 (7)	50
White Hart Lane (west of the A1010 High Road)	12238 (4)	12238 (4)	680 (4)	50

1 Assumed to be the same as the 24 hour flow

2 Estimated by dividing the 24/18 hour flow by 18

6.1.6 As a further worst case scenario, to account for potentially quieter traffic flows that may occur during the extend Saturday and Sunday working periods, for example, flows 50% of the average hourly flows have also been considered below.

6.1.7 Based on the data provided by Tim Spencer & Co. the highest average hourly trip rate during the construction programme is predicted to be 11 (trips per hour, based on an 8.5 hour day), which are all assumed to be by lorry (i.e. HGV).

6.1.8 The predicted change in road traffic noise levels are shown in Table 9.

Table 9: Predicted Change in Road Traffic Noise Levels with Construction Traffic

ROAD/LINK	PREDICTED CHANGE IN HOURLY NOISE LEVEL	
	Based on Ave. Hourly Baseline Flows (see Table 8)	Based on 50% of Ave. Hourly Baseline Flows (see para. 6.1.6)
The A1010 High Road (South of White Hart Lane)	0.3	0.6
White Hart Lane (west of the A1010 High Road)	0.5	1.0

6.2 SIGNIFICANCE OF PREDICTED CHANGE IN ROAD TRAFFIC NOISE LEVELS

6.2.1 Based on the impact significance scales presented in Table 3, the effect of the predicted change in road traffic noise levels as a result of the construction traffic is considered to be as follows:

Table 10: Significance of Predicted Worst Case Change in Road Traffic Noise Levels

RECEPTOR	LIKELY SIGNIFICANCE OF IMPACT	
	Based on Ave. Hourly Baseline Flows	Based on 50% of Ave. Hourly Baseline Flows
The A1010 High Road (South of White Hart Lane)	Negligible	Negligible
White Hart Lane (west of the A1010 High Road)	Negligible	Minor

6.2.2 Accordingly, based on the assumptions and data presented in this report, no potentially significant effects are anticipated as a result of the construction traffic on either White Hart Lane or the A1010 High Road. This is considered to take into account the likely worst case construction traffic flows.

7 SUMMARY

7.1 ON-SITE ACTIVITY ASSESSMENT

7.1.1 An assessment has been undertaken to determine the likely noise levels at the nearest receptors during the use of the site known as The Goods Yard on White Hart Lane as a compound site for the Northumberland Development Project main site. The compound site would primarily be used for the production of concrete, whereby the main sources of noise would be a batching plant, aggregate washing plant and associated lorry/concrete mixer movements.

7.1.2 It is proposed to operate the site during normal and extended working hours, including Saturday afternoons and Sundays. Criteria for determining the likely significance of the predicted noise levels, taking into account the proposed hours of operation, have been adopted based on those presented in the ES for the Northumberland Development Project.

7.1.3 The predictions have been undertaken based on the guidance in the relevant British Standard (BS 5228-1), using a combination of the source data contained therein and that obtained by WSP | PB for the benefit of this assessment.

7.1.4 The noise-sensitive receptors have been identified as follows:

- R1: The Grange Community Hub and Grange Day Centre (M-F 8.30am to 5.15pm; Sat & Sun 9am to 3pm)
- R2: 52 White Hart Lane (flats)
- R3: Charles House, Love Lane (flats)
- R4: Nos.1-17 Pretoria Road (houses)
- R5: Nos.34-45 Pretoria Road (houses)
- R6: Rivers Apartments Tower (flats)

- 7.1.5 In the main, the impact of the predicted construction noise levels is considered to be negligible. The exception being at the Rivers Apartments Tower where a minor impact has been predicted during extended hours working, but which is still considered to be insignificant.
- 7.1.6 Given the worst case nature of the assessment, it is considered that the noise levels during the majority of the time will be lower than those shown in this report.
- 7.1.7 It is taken that the mitigation measures listed in section 3.4 of this report will be adopted in order to keep noise levels to a minimum.

7.2 TRAFFIC NOISE ASSESSMENT

- 7.2.1 In addition to the assessment of the site-based activities, an assessment has also been undertaken of the likely change in road traffic noise levels as a result of the operation of the compound site. This assessment, therefore, considers the potential effect on receptors along the haul route between the compound site and the main site, as opposed to the receptors identified above.
- 7.2.2 The route between the two sites comprises White Hart Lane and the A1010 (High Road) only, and baseline and construction flow data for which have been provided by the transport planner, Tim Spencer & Co.
- 7.2.3 The assessment has been undertaken using the prediction procedures given in the CRTN and the example significance scale in the DMRB. It has been found that no more than minor changes in road traffic noise levels are anticipated, which are not considered to be significant.
- 7.2.4 Overall, therefore, it is considered that the use of The Goods Yard site will not result in significant effects on the neighbouring noise-sensitive receptors or those in the vicinity of the haul route.

Appendix A

GLOSSARY OF TERMS

APPENDIX A-1

GLOSSARY OF TERMS

Noise is defined as unwanted sound. Human hearing is able to respond to sound in the frequency range 20Hz (deep bass) to 20,000Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used, which reduces the importance of lower and higher frequencies in a similar manner to human hearing.

The weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq} , L_{A90} etc, according to the parameter being measured. The Glossary explains the acoustic terminology that is used in this Report.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

An indication of the range of sound levels found commonly in the environment is given in the table below.

Table A-1: Typical sound levels found in the environment

Sound Pressure Level, dB(A)	Location
0	Threshold of hearing
20 to 30	Quiet bedroom at night
30 to 40	Living room during the day
40 to 50	Typical office
50 to 60	Inside a car
60 to 70	Typical high street
70 to 90	Inside factory
100 to 110	Burglar alarm at 1m away
110 to 130	Jet aircraft on take off
140	Threshold of pain

The subjective response to a noise is dependent not only upon the sound pressure level and its frequency, but also its intermittency. Various indices have been developed to try and correlate annoyances with the noise level and its fluctuations.

- Sound Pressure: Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
- Sound Pressure Level (Sound Level): The sound level is the sound pressure relative to a standard reference pressure of 20 Pa (20×10^{-6} Pascals) on a decibel scale.
- Sound Power: The sound energy radiated per unit time by a sound source. Measured in Watts (W).
- Sound Power Level, L_w : Sound power measured on a decibel scale, relative to a reference value of 10-12 W.
- Decibel (dB): A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10} (s_1/s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20 Pa.
- A-weighting, dB(A): The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
- Noise Level Indices: Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
- $L_{eq,T}$: A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
- Free-Field: Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5 m away.
- Façade: At a distance of 1 m in front of a large sound reflecting object such as a building façade.

Appendix B

FIGURES

APPENDIX B-1

FIGURE B-1: SITE & RECEPTOR LOCATION PLAN

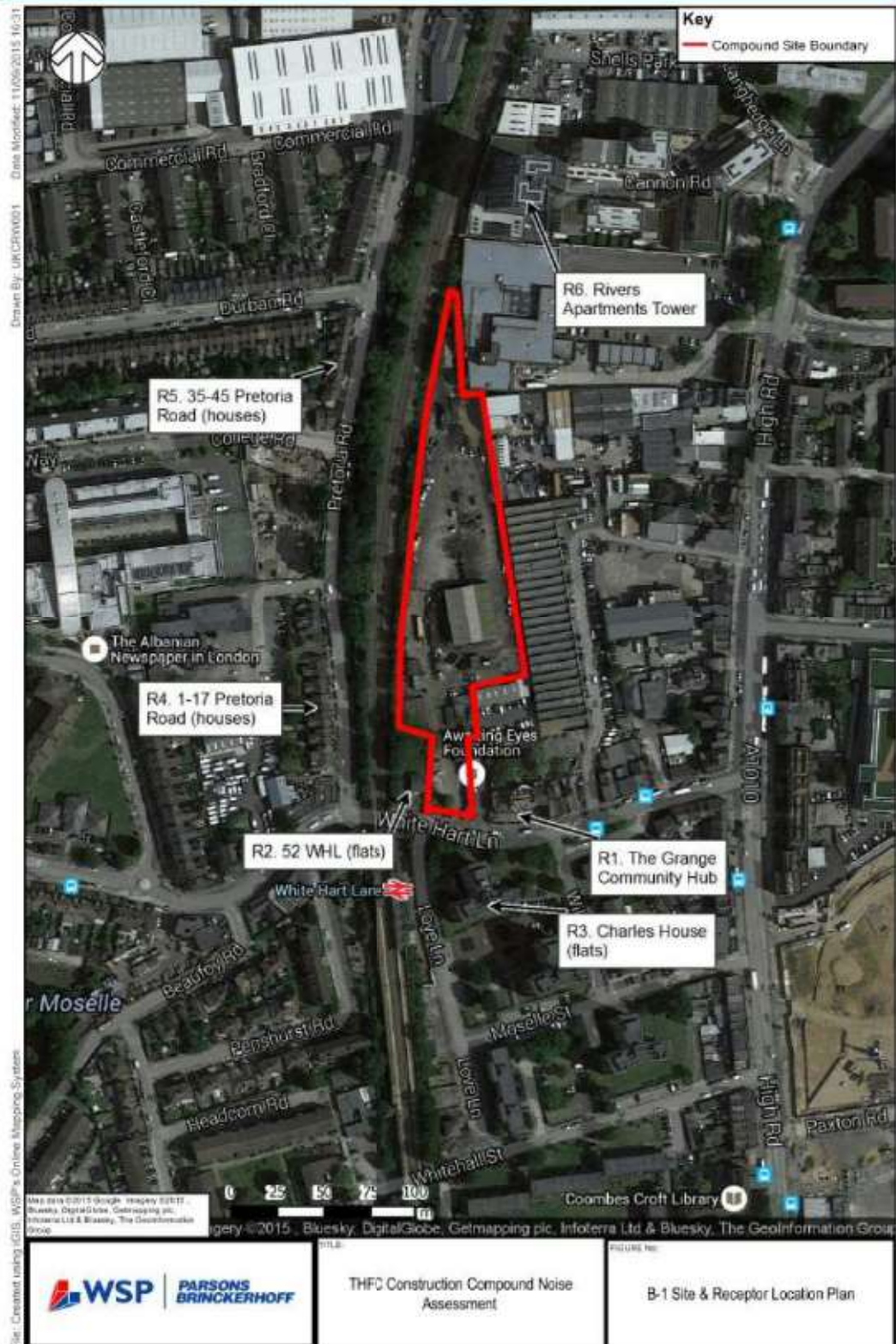
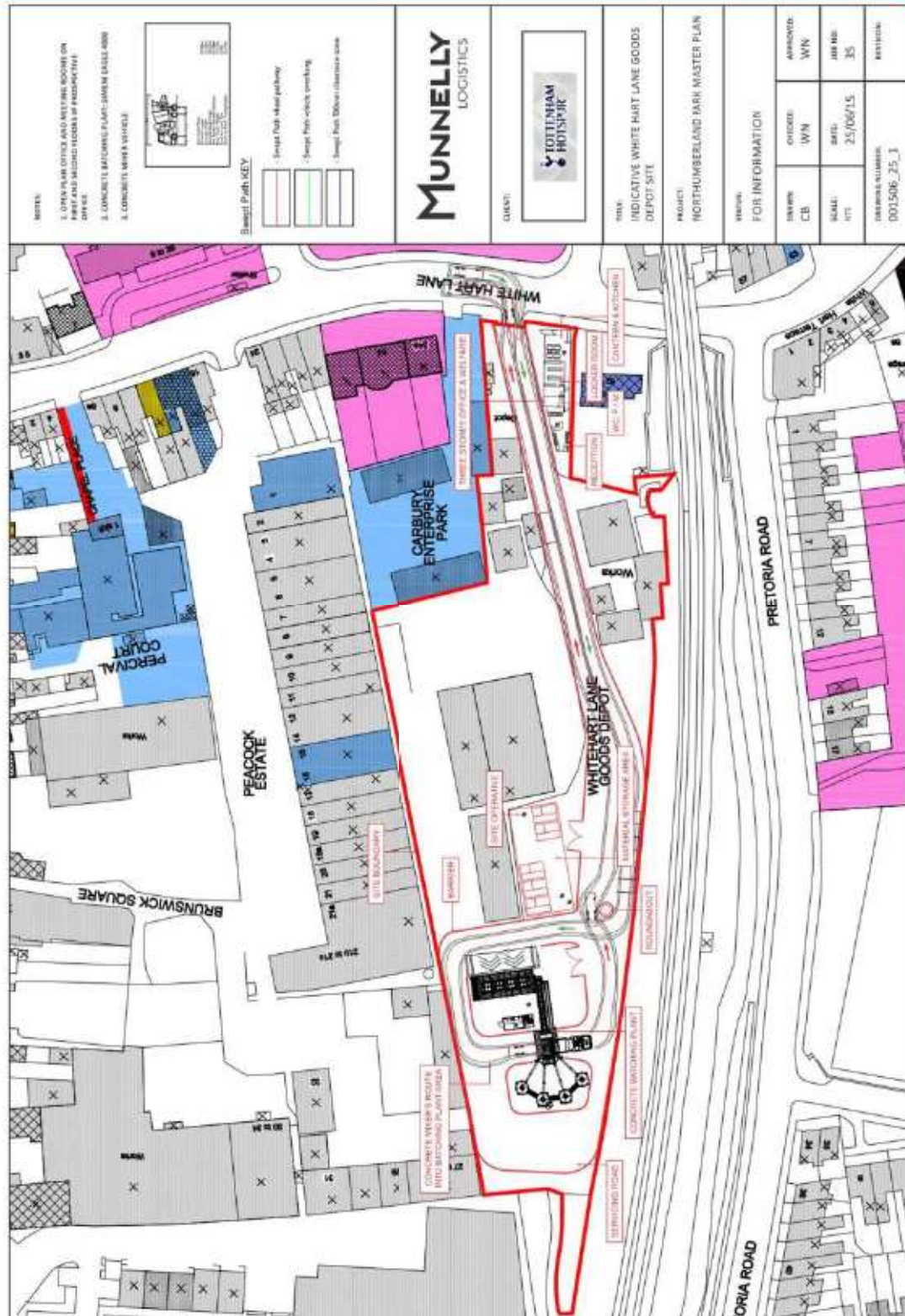


FIGURE B-2: INDICATIVE SITE LAYOUT PLAN



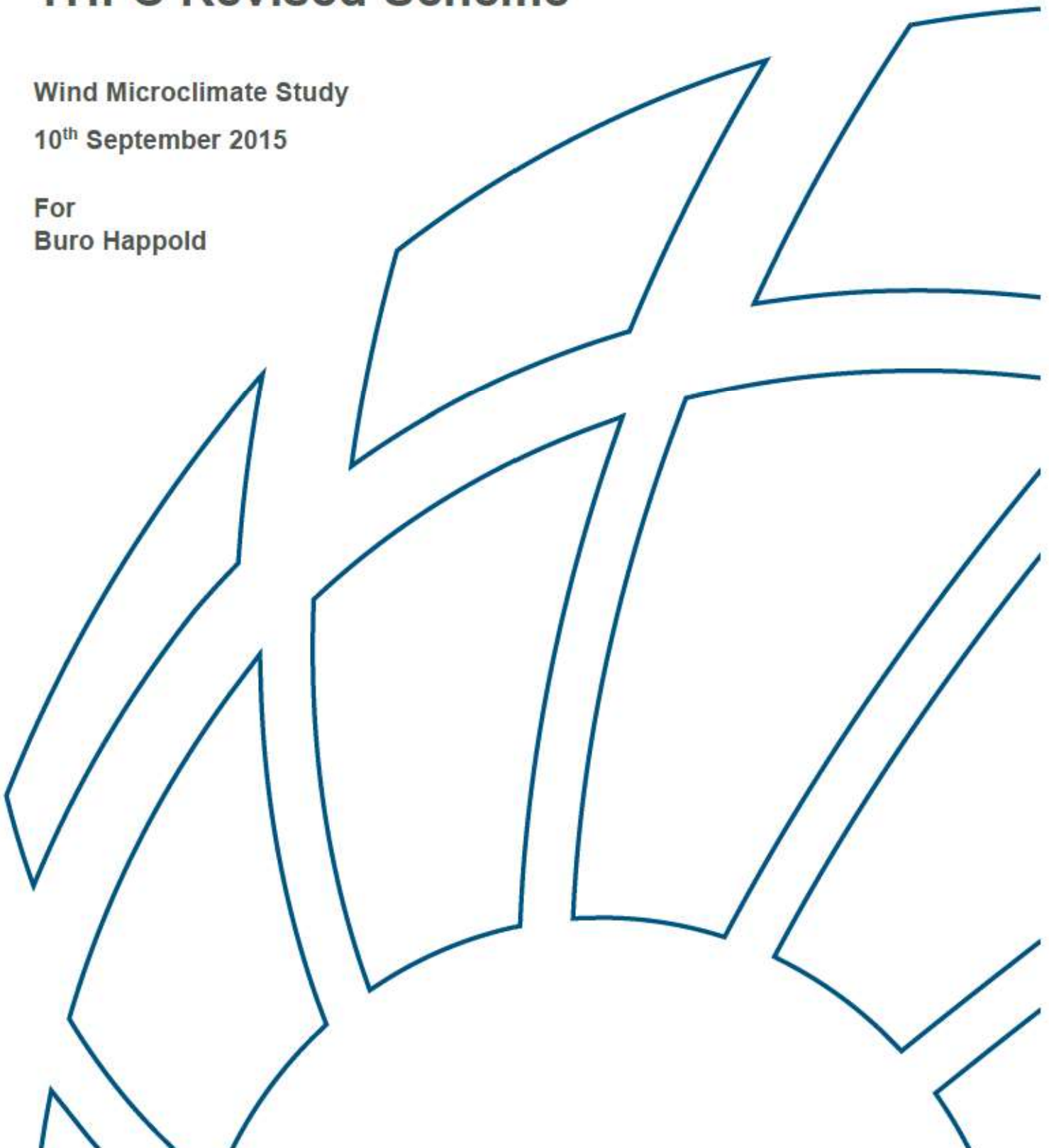
Project No. 431660

THFC Revised Scheme

Wind Microclimate Study

10th September 2015

**For
Buro Happold**



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THFC Revised Scheme Wind Microclimate Study

Contents

1. Introduction	5
2. The Assessment of Wind Microclimate	6
3. Study Area	7
4. Assessment Methodology	10
5. Results	12
6. Assessment	13
7. Recommendations for Further Mitigation	22
8. Conclusions	23
9. References	24
APPENDIX A. Wind Climate Analysis	44
APPENDIX B. Wind Tunnel & Model Details	53
APPENDIX C. Measurements and Analysis	59
APPENDIX D. Comfort and Safety Ratings	64

EXECUTIVE SUMMARY

Background

A boundary layer wind tunnel study has been carried out by BMT Fluid Mechanics Ltd. (BMT) to assess the wind microclimate for the proposed THFC development in London, UK.

The boundary layer wind tunnel study has enabled the pedestrian level wind environment at the site to be quantified and classified in terms of suitability for planned usage, based on the industry standard Lawson criteria for pedestrian comfort and safety.

The study combines measured pedestrian level wind speeds at key areas in and around the site with long-term wind frequency statistics to determine the probability of local wind speeds exceeding comfort and safety thresholds for a range of common pedestrian activities based on the industry standard Lawson criteria. This defines the type of activities for which the wind conditions would be safe and comfortable.

Conclusions

The boundary layer wind tunnel study has assessed the wind microclimate for the proposed development. On the basis of the wind tunnel modelling, the following conclusions have been drawn:

- In the absence of soft landscaping and wind mitigation measures, pedestrian wind conditions are generally considered suitable in terms of pedestrian comfort and/or safety for planned activities. However, several exceptions to this occur both in terms of pedestrian safety and comfort.
- With the introduction of proposed landscaping and wind mitigation, all locations in and around the site are considered suitable in terms of pedestrian safety, throughout the year and for all phases of construction.
- While the majority of locations are considered comfortable for the intended use with the introduction of proposed landscaping and wind mitigation, there are some areas that remain unsuitable in terms of pedestrian comfort during the various construction stages and for the completed masterplan

Mitigation measures that would be expected to address the remaining unwelcome wind conditions for the completed masterplan have been identified. It is recommended that the effectiveness of these solutions be verified via wind tunnel testing at an appropriate stage of the design process.