125 Shaftesbury Avenue

Planning Noise Assessment

SEPTEMBER 2016

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This document has been prepared and checked in accordance with
Waterman Group's IMS (BS EN ISO 9001: 2008, BS EN ISO 14001: 2004 and BS OHSAS 18001:2007)

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Comments

Comments

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1. Introduction

1.1 The Brief

Waterman Infrastructure & Environment Limited ('Waterman IE') was commissioned by Almacantar Shaftesbury S.á.r.l (the 'Applicant') to undertake an assessment of environmental noise in order to determine the suitability of 125 Shaftesbury Avenue, London ('the Site') for flexible retail and office uses following proposed refurbishment and extension of the existing building (the 'Development'). The potential effect of the Development on sensitive receptors, from fixed external plant and building services, was also assessed.

This report presents the results of the baseline noise survey together with the established prevailing daytime and night-time noise levels across the Site determined through use of Cadna-A® noise modelling software. An assessment of the suitability for flexible retail and office Development is presented, having regard to relevant guidance on noise and the requirements of London Borough of Camden (LBC). Noise limits for plant are recommended to safeguard the existing amenity, again having regard to LBC's requirements.

A glossary of the acoustic terminology used throughout this report is presented as **Appendix A**.

1.2 Site Description

The Site, which comprises a nine storey building, provides 22,773.5m^2 Gross Internal Area (GIA) currently occupied by offices and shopping spaces across basement, ground floor and nine upper levels. The Site is bounded to the north by residential properties, to the east by Stacey Street, to the south by Shaftesbury Avenue and to the west by Charing Cross Road.

It is understood that the Northern Line runs under Charing Cross road located to the west of the Site and not directly underneath the Site.

The location of the Site and the planning application boundary are shown in **Figure 1**.

1.3 Proposed Development

The Development comprises the remodelling, refurbishment and extension of the existing building to provide flexible retail and office entrances on the ground floor, and office floor space on the upper storeys. The Development includes extending the height of the existing building by step storey, from ground plus nine to ground plus 11 storeys, albeit the eleventh storey is significantly smaller when compared to the 10th storey. The proposed basement would involve the reduction in existing ancillary retail space to include bike storage and changing facilities, a sub-station and building maintenance rooms for the office accommodation. Plant rooms would also be primarily located in the basement and seventh storey with additional air conditioning and roof plant above the seventh floor and on the roof on the eleventh storey. The Development would also provide improvements to the public realm, highways, servicing and landscaping.

2. Planning Policy and Guidance

2.1 National Planning Policy

2.1.1 National Planning Policy Framework, 2012

The *National Planning Policy Framework*[1] (NPPF) sets out the Government's planning policies for England and how these are expected to be applied. The NPPF must be taken into account in the preparation of Local and Neighbourhood Plans, and is a material consideration in planning decisions.

With regard to noise the NPPF paragraph 109 states that:

"The planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by, unacceptable levels of noise pollution."

Paragraph 123 states that:

"*Planning policies and decisions should aim to:*

a) avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;

b) mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;

c) recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and

d) identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."

Pollution, including noise, is defined as anything that affects the quality of land, air, water or soils, and which might lead to an adverse impact on human health, the natural environment or general amenity.

Annex 3 of the NPPF states that it replaces Planning Policy Guidance (PPG) 24: *Planning and Noise*[2], but falls short of providing any specific technical guidance for assessing noise levels and amenity.

Web-based guidance on the NPPF was issued with regard to noise[3], although it does not explicitly state acceptable absolute noise levels for safeguarding amenity.

2.2 Local Planning Policy

2.2.1 Camden Local Development Framework - Camden Core Strategy, 2010

LBC has certain legal responsibilities to prepare documents that control and regulate the use of land. The Local Development Framework (LDF) consists of the Core Strategy which was formally adopted by the Council in November 2010[4], and Candem's Development Policies (2010) replacing the Unitary Development Plan (UDP) as the main collection of planning policy documents for the Council. The core

[1] Communities and Local Government (2012). '*The National Policy Planning Framework'*. HMSO.
[2] DoE (1994). Planning Policy Guidance Note 24: '*Planning and Noise'*. HMSO.
[3] Department for Communities and Local Government (2014). Noise. Available from: http://planningguidance.planningportal.gov.uk/blog/guidance/noise/
[4] LBC (2010). Camden Local Development Framework, Camden Core Strategy, 2010-2025 Adopted November, 2010.

strategy is a strategic document that establishes the land use and planning framework for the borough and is the primary reference for all planning decisions.

The Adopted Core Strategy acknowledges Development Policy DP28 – *Noise and Vibration*. This document sets out detailed planning criteria that LBC use to determine applications for planning permission in the borough in contributing towards delivering the Council's Strategic Objectives.

Disturbance from noise and vibration is recognised as a particularly important issue in the borough on amenity and health and therefore quality of life due to Camden's high density and mixed-use nature.

Policy DP28 states that:

"*The Council will seek to ensure that noise and vibration is controlled and managed and will not grant planning permission for:*

a) development likely to generate noise pollution; or

b) development sensitive to noise in locations with noise pollution, unless appropriate attenuation measures are provided."

Policy DP28 states that "*Development that exceeds Camden's Noise and Vibration Thresholds will not be permitted.*" The threshold values for plant and machinery to which applications are assessed are outlined in **Table 1**.

Table 1: Noise Level from Plant and Machinery at which Planning Permission will not be Granted

Noise Description and Location of Measurement	Period	Time	Noise level
Noise at 1m external to a sensitive façade	Day, evening and night	00:00 - 24:00	5dB <LA90
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1m external to a sensitive façade.	Day, evening and night	00:00 - 24:00	10dB <LA90
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1m external to a sensitive façade.	Day, evening and night	00:00 - 24:00	10dB <LA90
Noise at 1m external to sensitive façade where L_{A90} >60dB	Day, evening and night	00:00 - 24:00	55dBLAeq

DP28 also states:

"*The Council will only grant permission for plant or machinery if it can be operated without causing harm to amenity and does not exceed our noise thresholds.*

The Council will seek to minimise the impact on local amenity from the demolition and construction phases of development. Where these phases are likely to cause harm, conditions and planning obligations may be used to minimise the impact."

2.2.2 Camden Planning Guidance 6 - Amenity, 2011

LBC's LDF also contains a number of other documents, notably Supplementary Planning Documents (SPD), which give detailed guidance on how the Council's planning strategy and policies will be implemented for specific topics, areas or sites. Although they do not form part of the statutory development plan for LBC, and do not therefore have the same weight in decision making, they play an important role in providing additional 'material consideration' in LBC's planning decisions.

Camden Planning Guidance 6: *Amenity* (CPG6)[5] is a formal SPD, which supports policy DP28, providing guidance on how to control and manage noise, so that growth and development is sustainably managed and harmful effects on the amenity of existing and future occupiers and to nearby properties is avoided.

Chapter 4 '*Noise and Vibration*' of CPG 6 states that LBC's commitments are to:

"*… ensure that noise and vibration is controlled and managed to:*

- *Limit the impact of existing noise and vibration sources on new development; and*
- *Limit noise and vibration emissions from new development.*"

CPG 6 further acknowledges noise and vibration can have an effect on amenity, health and people's quality of life. In this respect, Policy DP28 is referenced with regard to the control and management of noise and vibration. The document also highlights the key noise sources within LBC (namely road, rail, industrial, plant and mechanical equipment, entertainment uses and building sites), and outlines measures to minimise the effects of these sources of noise on new developments. In respect of controlling noise from development, the measures range from engineering (e.g. reducing the noise emitted at the point of generation), layout (e.g. exploiting distance and screening loss between source and noise sensitive areas) and administrative (e.g. specifying an acceptable noise limit).

CPG 6 goes on to state that detailed acoustic / noise and vibration information in the form of a report will be required for developments that include installation of plant, ventilation or air conditioning equipment that will create significant noise (e.g. new industry, nightclub); noise sensitive development in an area where existing noise sources are present; or will generate a significant volume of traffic.

[5] LBC (2011), Camden Planning Guidance 6 - Amenity. LBC.

3. Noise Assessment Criteria

When selecting the appropriate noise criteria for assessment purpose, consideration was given to relevant planning policy and regulations concerning the Development. The advice contained within the National Planning Policy Framework (NPPF)[6], *Noise Policy Statement For England*[7] and *Noise Planning Practice Guidance*[8] was also considered, although direct noise and vibration assessment criteria were not drawn from these documents.

With regard to acoustic design and noise control, the NPPF provides a set of overarching aims; broadly reflecting those already contained in the *Noise Policy Statement for England* (NPSE). They are directed towards the avoidance of significant adverse impacts and reduction of other health effects and quality of life; set within the context of the Government's policy on sustainable development.

3.1 Office Amenity

When considering the amenity of future occupants of the Development, the most relevant and credited guidance covering desirable levels of environmental noise for indoor environments is BS 8233:2014 *Guidance on sound insulation and Noise Reduction for Buildings* and specifically for offices the BCO 2014: *British Council for Offices Guide to Specification 2014*. A summary of these guidelines used in the assessment of offices amenity of the Site is provided below.

3.1.1 BS 8233: Guidance on Sound Insulation and Noise Reduction for Buildings, 2014

BS 8233:2014[9] provides guidelines for the control of noise in and around buildings. The guidelines recommend internal ambient noise criteria for a range of spaces. The criteria relevant to the proposed Development are presented as **Table 2**.

Table 2: BS 8233 Guideline Noise Levels for Offices

Room	$L_{Aeq,T}$ (dB)
Meeting Rooms	35 – 45
Executive Rooms	35 – 40
Cellular Offices	40 – 50
Open Plan Offices	45 – 50
Reception Rooms	40 – 45
Corridors, Toilets	45 – 55

In addition, maximum noise intrusion levels should not normally exceed 55dB L_{AFmax} in open plan / speculative offices or 50dB L_{AFmax} in cellular offices. When natural ventilation is possible it may be appropriate or necessary higher external noise intrusion levels than described above (e.g. +5dB(A) relaxation in maximum ventilation mode provided occupants have the choice).

There are no guidelines with regard to acceptable noise levels within external spaces to offices. On this basis, the BS 8233:2014 upper guideline value of 55dB $L_{Aeq,16h,}$ used for external residential amenity, were used as a benchmark. BS 8233:2014 advice, which advocates acceptance of higher noise levels at

[6] Communities and Local Government. (2012) The Planning Policy Planning Framework. Crown Copyright.
[7] Defra. (2010) *Noise Policy Statement for England.*· Crown copyright.
[8] http://planningguidance.communities.gov.uk/blog/guidance/noise/noise-guidance/ (March 2015)
[9] British Standards Institute, 2014, BS8233: Sound Insulation and Noise Reduction for Buildings, BSI.

city centre or urban locations, was also taken into account. External noise levels of 60dB $L_{Aeq,16h}$ should therefore be acceptable for external amenity spaces to the offices.

3.1.2 BCO 2014: British Council for Offices 'Guide to Specification 2014'

The *British Council for Offices Guide to Specification 2014*[10] recommends internal noise levels that will provide an acoustic environment which is conducive to uninterrupted speech, but considering an adequate level of confidentiality or privacy.

External noise intrusion levels generated by external sources such as roads, rail or aircraft sources should, after attenuation by the composite building envelope, should not exceed the acoustic design criteria presented in **Table 3**.

Table 3: BCO 2014 Recommended Rating Noise Levels

Room	External Noise Intrusion	Building Services Noise
Cellular Offices	NR 35	NR 35
Speculative Offices	NR 38	NR 38
Open Plan Offices	NR 40	NR 40
Entrance Lobbies	-	NR 40
Circulation Spaces	-	NR 40
Toilets	-	NR 45
Loading Bays	-	NR 55
Underground Car Parks	-	NR 55

3.2 Fixed External Plant & Building Services

The primary source of guidance in determining the significance of sound of an industrial and / or commercial nature, such as fixed external plant and building services, on sensitive receptors is provided in BS 4142:2014[11]. BS 4142 and specific Local Planning Authority guidance was used in assessing the significance of sound from potential mechanical plant.

The potential effect of fixed external plant is based on the noise level difference between the source, known as the 'specific noise' level ($L_{Aeq,T}$), compared with the 'background noise' level ($L_{A90,T}$) that exists in the absence of the source in question. Where the sound contains any acoustic characteristics such as tonality, impulsiveness and intermittency, the specific noise level is adjusted in-line with BS 4142 advice to determine the rating noise level ($L_{Ar,Tr}$).

Typically, the greater the difference between the rating noise level and the background noise level the greater the potential of an adverse impact. BS4142 provides the following guidance:

- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5dB is likely to be an indication of an adverse impact, depending on context.
- 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 context.

[10] British Council for Offices. 2014. Guide to Specification. BCO
[11] British Standard (BS) 2014, BS 4142:2014 '*Methods for rating and assessing industrial and commercial sound*', British Standards Institution (BSI).

Notwithstanding BS 4142 advice, the requirements of LBC are presented as **Table 1** within this report.

3.3 Consultation

The LBC's Environmental Health Department was consulted prior to the baseline survey to agree noise monitoring locations and the monitoring and assessment strategy.

4. Environmental Baseline Noise Survey

4.1 Sensitive Receptors

Existing properties within the vicinity of the Development are predominantly a combination of various retail uses and offices in nature; however, there are some residential properties around the Site. The nearest representative residential noise sensitive receptors (NSRs) to the Site are presented as **Table 4** and illustrated in **Figure 1**.

Table 4: Noise Sensitive Receptors

NSR Ref. (Figure 1)	Description	Distance From Site Boundary
A	Phoenix Street, Residential Properties	7m (north)
B	Charing Cross Road, Residential Properties	19m (west)
C	Trentishoe Mansions, Residential Properties	0m (south-west)
D	Shaftesbury Avenue, Residential Properties	18m (south)
E	Pendrell House, Residential Properties	49m (east)

4.2 Baseline Conditions

A baseline environmental noise survey was carried out at four key locations between Monday 2nd and Thursday 5th of November 2015, as described in **Table 5** and illustrated in **Figure 1**, to establish and quantify the existing noise climate at and within the vicinity of the Site.

The attended noise measurements (ST1 and ST2) were carried out concurrently with the un-attended long-term noise measurements (LT1 and LT2) to allow direct comparison between measurement positions and to determine noise attenuation with height.

Table 5: Noise Monitoring Locations

Monitoring Location (Figure 1)	Description	Observations and Predominant Noise Sources
LT1	Un-attended façade measurement facing onto Stacey Street (East) and overlooking Shaftesbury Avenue (South).	Dominant noise source was road traffic noise from Shaftesbury Avenue, with contributory noise from the surrounding road networks and human activities.
LT2	Un-attended façade measurement facing onto Charing Cross Road (West).	Dominant noise source was road traffic noise from Charing Cross Road, with contributory noise from the surrounding road networks and human activities.
ST1	Attended free-field measurement at the north-eastern boundary.	Dominant noise source was road traffic noise from the surrounding road networks and human activities, with occasional aircrafts passing.
ST2	Attended free-field measurement facing Charing Cross Road (western boundary).	Dominant noise source was road traffic noise from Charing Cross Road, with contributory noise from the surrounding road networks and human activities.
ST3	Attended free-field measurement facing Shaftesbury Avenue (southern boundary).	Dominant noise source was road traffic noise from Shaftesbury Avenue, with contributory noise from the surrounding road networks and human activities with occasional aircrafts passing.

Notes: LT (long-term); ST (short-term)

The noise parameters logged throughout the survey period were L_{Aeq}, L_{A90} $L_{A10,}$ and L_{Amax} measured as contiguous 5-minute periods. These parameters are described in full in Appendix A. The L_{Aeq} level is the equivalent continuous sound pressure level over the measurement period; L_{A90} is used as a descriptor of background noise levels and is the noise level exceeded for 90% of the measurement period, L_{A10} is the noise level which is achieved for 10% of the monitoring period and is often used to describe road traffic noise and L_{Amax} is an indicator of the highest sound level during the measurement period.

The weather was dry and wind speeds were under 5m/s for the duration of the survey. Monitoring was undertaken by trained and competent staff being members of the Institute of Acoustics (IOA).

A summary of the baseline survey results are presented as **Table 6** with full details provided within **Appendix B**.

Table 6: Summary of Baseline Noise Monitoring Results (free-field)

Monitoring Location (Figure 1)	Period	$L_{Aeq,T}$ dB	$L_{A10,T}$ dB	$L_{A90,T}$ dB		$L_{AFmax,5min}$ dB
		Ave[1]	Ave[2]	Range	Ave[2]	90th Percentile[3]
LT1 (Stacey Street; Shaftesbury Avenue)	Day (07:00 – 19:00)	63	63	52 – 69	59	80
	Evening (19:00 – 23:00)	58	58	53 – 58	55	75
	Night (23:00 – 07:00)	55	58	48 – 62	54	73
LT2 (Charing Cross Road)	Day (07:00 – 19:00)	64	64	53 – 77	60	72
	Evening (19:00 – 23:00)	62	62	55 – 67	59	71
	Night (23:00 – 07:00)	60	61	48 – 66	55	69
ST1	Day (12:10 – 12:45)	64	63	57 – 61	59	86
ST2	Day (13:40 – 14:40)	72	58	62 – 66	64	97
ST3	Day (14:55 – 15:55)	71	58	62 – 66	64	95

Notes: [1] Logarithmic average over the day / evening / night survey periods.

[2] Arithmetic average over the day / evening / night survey periods.

[3] The 90th percentile L_{AFmax} value (equivalent to the 10th highest measured L_{AFmax} level) is presented and considered representative of typical L_{AFmax} levels experienced.

All figures rounded to nearest whole decibel.

4.2.1 Other Considerations

As previously discussed, the London Underground Northern Line is located to the west of the Site under Charring Cross road. Given that it does not run directly under the Site, structure-borne noise was only assessed subjectively. No perceptible levels of both tactile and audible vibration were noted at the time of the visit. On this basis, the suitability of the Site with regard to baseline vibration and structure-borne re-radiated noise are not considered further.

5. Noise Assessment

5.1 Suitability of the Site for Office Use

A 3 dimensional Cadna-A® noise model was produced taking account of the key prevailing noise source affecting the Site, namely road traffic noise from Shaftesbury Avenue and Charing Cross Road. The output of the noise model was calibrated using the results of the baseline noise survey summarised in **Table 6**.

5.1.1 External Noise Levels

Between the fifth and eleventh floors there are several terrace areas illustrated (drawing references 231_SK_1683 to 231_SK_1689). The predicted noise levels within these areas are greater than 50dB $L_{Aeq,16h}$ but are predominantly below 60dB $L_{Aeq,16h}$ which is considered to be acceptable given its use class and location. Although not strictly required, it is recommended that consideration is given to mitigation to lower noise levels within some of these areas. This is discussed further within the Mitigation Section of this report.

5.1.2 Internal Noise Levels

Prevailing daytime building façade noise levels are presented as **Figure 2**. The highest façade noise levels occur on the western façade of the building directly adjacent to Charing Cross Road, with a maximum daytime façade noise level of 73dB $L_{Aeq,16h}$ predicted within the first four floor levels. On the south-eastern façade of the building adjacent to Shaftesbury Avenue the maximum daytime façade noise level is predicted to be 71dB $L_{Aeq,16h}$ between ground and third floor. The predicted noise levels at the façades on the floors which are stepped back, are lower due to the shielding afforded by the building itself, with noise levels ranging from 52 to 68dB $L_{Aeq,16h}$.

The ventilation strategy for the building is understood to be mechanical ventilation in combination with sealed windows. Provided glazing with suitable sound insulation is installed in combination with an appropriate ventilation system, the requirements of BS 8333:2014 and BCO 2014 should be satisfied. Notwithstanding this, within the Mitigation Section of this report the indicative composite and glazing performance to satisfy the required noise criteria are presented.

5.2 Fixed Mechanical Plant & Building Services

Any items of fixed plant associated with the operation of the Development would have the potential to generate noise. At this stage in the design process, specific details of the proposed nature, type and number of such plant are unavailable, although the proposed refurbishment includes replacing all the existing plant at roof and basement level.

Given the plant detailed design is not complete at this stage it was not possible to undertake a quantitative noise assessment to determine compliance with LBC's noise criteria. On this basis suitable limits to which any such plant should conform to allow compliance with LBC criteria are discussed within the Mitigation Section of this report.

6. Mitigation

6.1 External Noise

Should the amenity areas between 5th and 11th floors be used mitigation to lower noise levels is recommended, although this is not a requirement for office use. This could be achieved through provision of solid glass balustrades , if required.

6.2 Internal Noise

The noise assessment indicates that an internal ambient noise level (IANL) of 40 $L_{Aeq,16h}$ as recommended within BS 8233:2014 could be achieved where the glazing performance complies with the minimum sound insulation presented in **Table 7**. This would allow compliance with BCO criteria. The indicative minimum sound insulation assumes the solid portion of the façade provides sufficient sound insulation so as not to undermine that required by the glazed element. It should be noted that the sound insulation performance is for the glazing system as a whole (including framing, seals, openable lights etc.) as opposed to the glass panels alone.

Table 7: Indicative Façade Sound Insulation Performance for Glazing Elements

Façade	Level	Period	Maximum Incident Noise Level at Façade (dB)	Target Criteria (dB)	Indicative Minimum Sound Insulation of Glazing dB Rw+Ctr[1] (dB)
Northern Façade	(GF to 6F)	Daytime $L_{Aeq,16hr}$	68	40	28
	(7F to 11F)		57	40	25
Eastern Façade	(Gf to 4F)	Daytime $L_{Aeq,16hr}$	67	40	27
	(5F to 11F)		64	40	25
Southern Façade	(GF to 6F)	Daytime $L_{Aeq,16hr}$	71	40	31
	(7F to 11F)		56	40	25
Western Façade	(GF to 5F)	Daytime $L_{Aeq,16hr}$	73	40	33
	(6F to 11F)		58	40	25

Note: Indicative minimum sound insulation for glazing based on noise levels measured at LT1 and LT2 measurement locations.
[1] Minimum of 25dB Rw+Ctr recommended.

On the northern, southern and western façades, lower noise levels are predicted at the higher floor where the building is stepped back.

6.3 Fixed Mechanical Plant & Building Services

It is LBC policy that the level of noise emitted from any new plant would be designed to give a cumulative noise rating level ($L_{Ar,Tr}$) of 10dB (or 15dB if tonal) below the current prevailing background noise level (L_{A90}) at a distance of 1m from the façade of the nearest sensitive receptors during which plant is or may be in operation.

Table 8 presents recommended plant noise limits based on LBC requirements to protect the existing amenity of the area based on 10dB below the measured prevailing background noise levels within the vicinity of the nearest NSRs. This is a conservative approach because where the plant has no acoustic character, a noise limit of 5dB below the prevailing background noise level would be compliant with DP28

of LBC. Where prevailing background noise levels are greater than 60dB L_{A90}, LBC requires that the cumulative plant noise level does not exceed 55dB L_{Aeq}.

The nearest NSRs are the residential proprieties located to the north of the site boundary as identified in **Figure 1**.

Table 8: LBC Plant Noise Limits at Nearest Noise Sensitive Premises

Location	Period	Average Measured (dB $L_{A90, 5min}$)	Plant Noise Emission Limit (dB $L_{Ar,5min}$)
NSR A[1]	Day	60	≤50
	Evening	59	≤49
	Night	55	≤45
NSR B[1]	Day	60	≤50
	Evening	59	≤49
	Night	55	≤45
NSR C[1]	Day	60	≤50
	Evening	59	≤49
	Night	55	≤45
NSR D[2]	Day	59	≤49
	Evening	55	≤45
	Night	54	≤44
NSR E[2]	Day	59	≤49
	Evening	55	≤45
	Night	54	≤44

Note: [1] Recommended plant noise limits derived from LT2 measurement data;[2] measured data presented derived from LT1 position.

7. Conclusions

A noise assessment was undertaken to determine the suitability of the existing building at 125 Shaftesbury Avenue to be refurbished and extended for continued retail and office use, and to assess the potential effect of the Development on nearby NSRs.

The prevailing noise climate at and within the vicinity of the Site was established through baseline survey conducted over typical weekdays covering the day, evening and night-time periods. The dominant noise source affecting the Site was road traffic noise; namely from Charing Cross Road to the west and Shaftesbury Avenue to the south.

The results of the baseline noise survey were used to develop a 3-dimentional Cadna-A® noise model allowing prediction of noise incident on the Development's façades. The results of the noise model were used to provide indicative required sound insulation performance of the glazed elements of the façades to provide appropriate internal ambient noise levels (IANLs) for office use. The results indicate that standard thermal double glazing, albeit high performing on the western and southern façades at lower floor levels, would allow appropriate IANLs to be achieved. The required performance of the glazing would, however, need to specified at each 1/1 octave band at reserved matters design stage.

It is understood that the ventilation strategy for the Development is mechanical ventilation in combination with sealed windows. This is considered to be appropriate given the high prevailing noise levels which would not allow a natural ventilation strategy (opening of windows) to be adopted without exceeding the recommended internal ambient noise levels for office use.

The prevailing baseline noise levels established through survey were used to derive recommended plant noise limits at the nearest sensitive receptors, satisfying the noise requirements of LBC. Potential effects could, however, be controlled through a suitably worded planning condition to safeguard the residential amenity of the area.

During a visit to the Site and the surrounding area, no perceptible levels of both tactile and audible vibration were noted. However, consideration would be given to structure-borne noise during design stages to ensure a high quality commercial development is provided.

In summary, provided appropriate mitigation measures are incorporated into the scheme design, suitable flexible retail and office uses could be provided at 125 Shaftsbury Avenue. Furthermore, control of noise emissions from fixed mechanical plant and building services to those recommended would safeguard the existing amenity of the area.

FIGURES

Figure 1: Site, Noise Monitoring & Noise Sensitive Receptors Location Plan

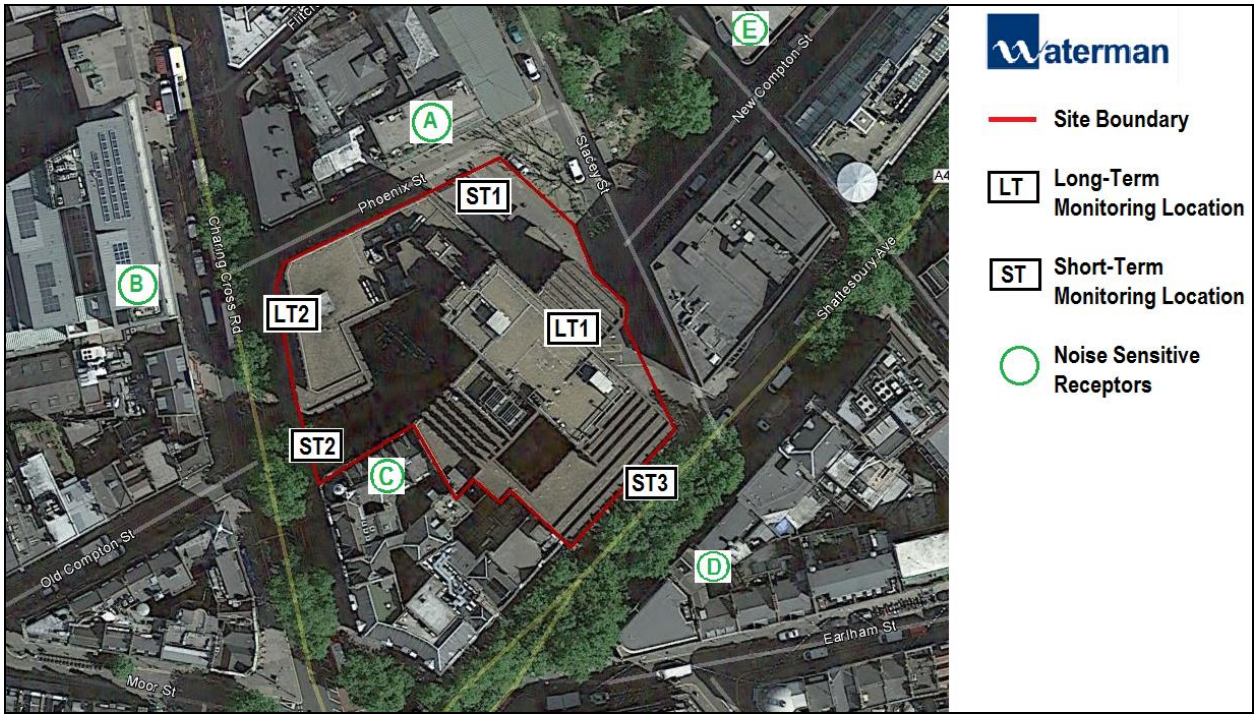


Figure 2: Predicted Daytime Façade Noise Levels (LAeq,16h)

APPENDICES

A. Acoustic Terminology

Ambient sound	The totally encompassing sound in a given situation at a given time, usually composed of sound from all sources near and far.
Assessment period	The period in a day over which assessments are made.
A-weighting	A frequency weighting applied to measured or predicted sounds levels in order to compensate for the non-linearity of human hearing.
Background noise	Background noise is the term used to describe the noise measured in the absence of the noise under investigation. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L_{90} noise level (see below).
Broadband	Containing the full range of frequencies.
Decibel [dB]	The level of noise is measured objectively using a Sound Level Meter. This instrument has been specifically developed to mimic the operation of the human ear. The human ear responds to minute pressure variations in the air. These pressure variations can be likened to the ripples on the surface of water but of course cannot be seen. The pressure variations in the air cause the eardrum to vibrate and this is heard as sound in the brain. The stronger the pressure variations, the louder the sound that is heard. The range of pressure variations associated with everyday living may span over a range of a million to one. On the top range may be the sound of a jet engine and on the bottom of the range may be the sound of a pin dropping. Instead of expressing pressure in units ranging from a million to one, it is found convenient to condense this range to a scale 0 to 120 and give it the units of decibels. The following are examples of the decibel readings of every day sounds; Four engine jet aircraft at 100m 120dB Riveting of steel plate at 10m 105dB Pneumatic drill at 10m 90dB Circular wood saw at 10m 80dB Telephone bell at 10m 65dB Male speech, average at 10m 50dB Whisper at 10m 25dB
dB(A): **A-weighted decibels**	The ear is not as effective in hearing low frequency sounds as it is hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the 'A' filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter. The sound pressure level in dB(A) gives a close indication of the subjective loudness of the noise.
Do-Minimum	Describes a scenario under which the road scheme that is under consideration does not proceed.
Façade Noise Level	A noise level measured or predicted at the façade of a building, typically at a distance of 1m, containing a contribution made up of reflections from the façade itself (+3dB).
L_{Amax} noise level	This is the maximum noise level recorded over the measurement period.
L_{Amin} noise level	This is the lowest level during the measurement period.
$L_{Aeq,T}$ noise level	This is the 'equivalent continuous A-weighted sound pressure level, in decibels' and is defined in British Standard BS 7445 as the 'value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval, T, has the same mean square sound pressure as a sound under consideration whose level varies with time'. It is a unit commonly used to describe construction noise, noise from industrial premises

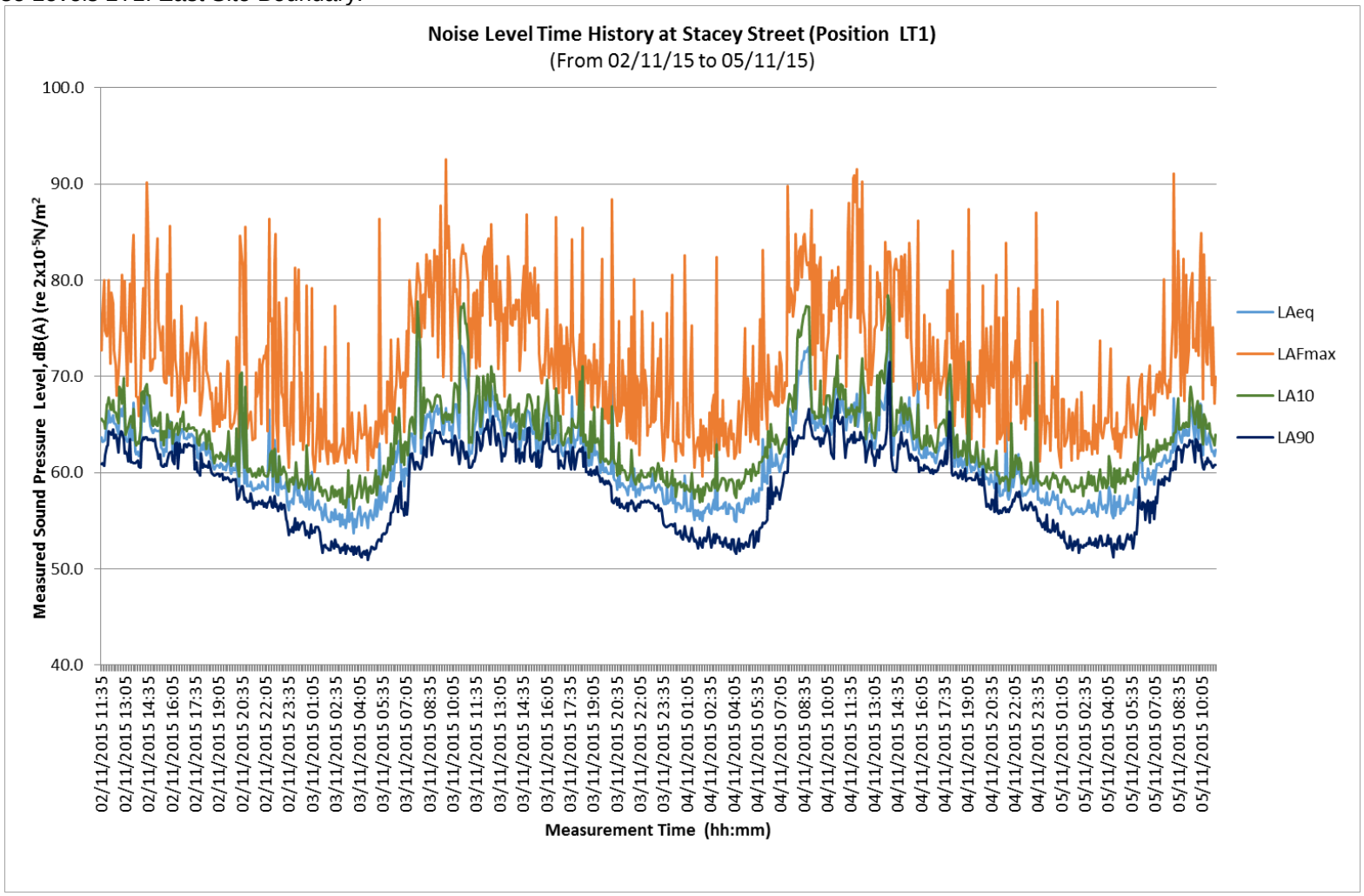
and is the most suitable unit for the description of other forms of environmental noise.

L_{A90} noise level This is the noise level that is exceeded for 90% of the measurement period and gives an indication of the noise level during quieter periods. It is often referred to as the background noise level and is used in the assessment of disturbance from industrial noise.

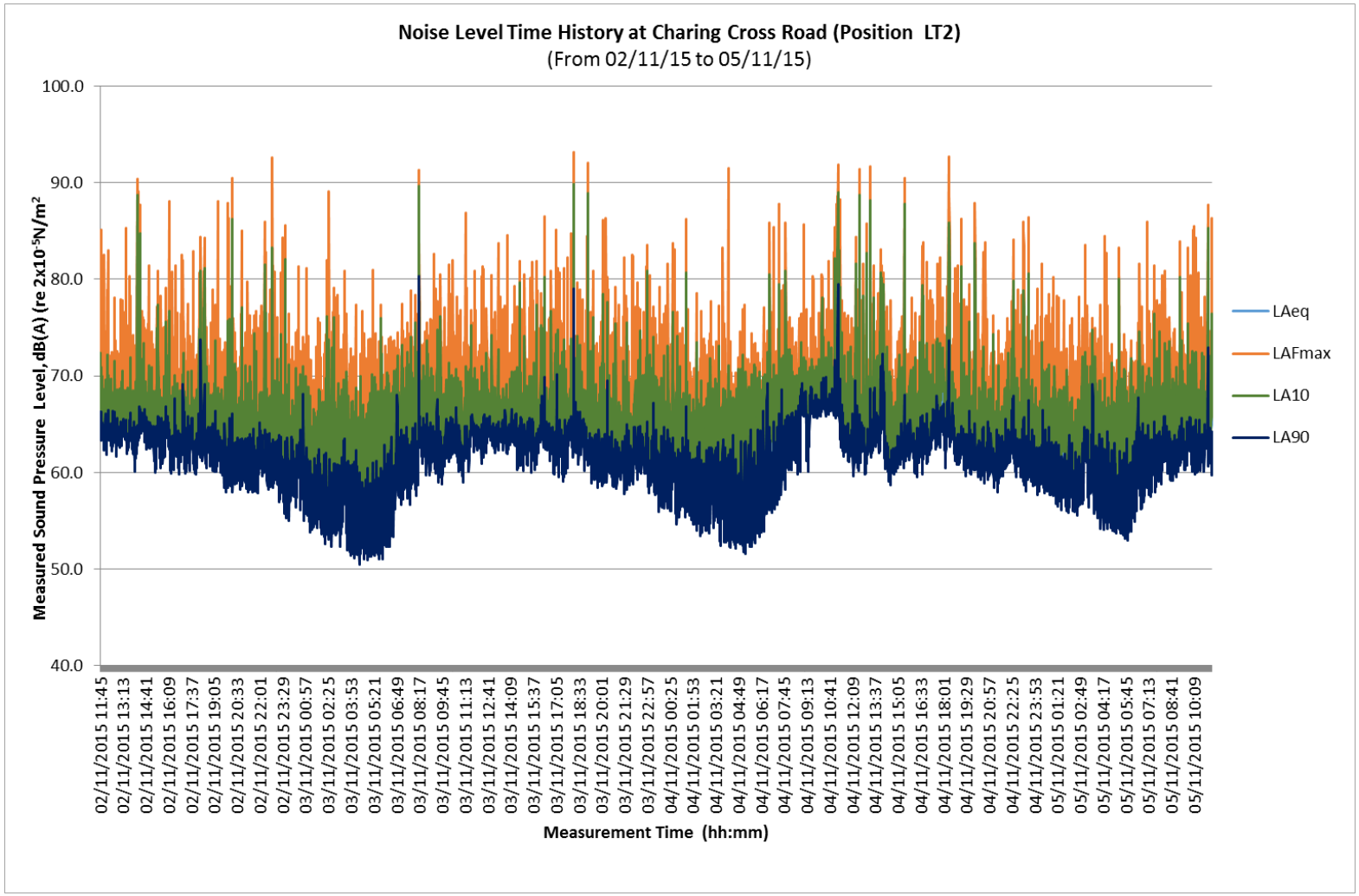
L_{A10} noise level This is the noise level which is achieved for 10% of the monitoring period and is often used to describe road traffic noise.

B. Baseline Noise Survey

Monitored Noise Levels LT1: East Site Boundary.



Monitored Noise Levels LT2: West Site Boundary.



ST1: Free Field Measurement at North-east Site Boundary.

Address	Start Time	L_{Aeq}	L_{A10}	L_{A01}	L_{A90}	L_{Amax}
1	02/11/2015 12:10	61.2	63.0	67.9	58.7	71.9
2	02/11/2015 12:15	66.1	68.4	73.6	60.1	81.3
3	02/11/2015 12:20	66.5	69.1	74.5	60.9	86.5
4	02/11/2015 12:25	61.6	62.8	67.2	59.6	74.3
5	02/11/2015 12:30	60.9	62.9	65.8	58.1	79.7
6	02/11/2015 12:35	61.0	63.0	66.4	57.9	73.1
7	02/11/2015 12:40	63.0	64.1	71.1	57.4	85.7

ST2: Free Field Measurement at West Site Boundary.

Address	Start Time	L_{Aeq}	L_{A10}	L_{A01}	L_{A90}	L_{Amax}
1	02/11/2015 13:40	69.5	72.0	76.0	65.4	81.6
2	02/11/2015 13:45	67.2	69.1	73.6	64.0	78.5
3	02/11/2015 13:50	66.6	69.0	71.9	63.7	74.3
4	02/11/2015 13:55	66.4	68.5	72.7	61.9	80.1
5	02/11/2015 14:00	67.3	69.6	74.3	63.8	76.7
6	02/11/2015 14:05	79.2	73.9	94.1	63.8	98.8
7	02/11/2015 14:10	68.7	70.1	79.5	63.8	83.1
8	02/11/2015 14:15	78.0	73.3	92.6	66.4	98.4
9	02/11/2015 14:20	67.1	69.3	73.7	63.3	77.6
10	02/11/2015 14:25	68.8	71.2	74.2	65.6	81.8
11	02/11/2015 14:30	67.1	69.1	73.0	64.4	76.9
12	02/11/2015 14:35	68.8	70.9	73.5	66.1	75.7

ST3: Free Field Measurement at South Site Boundary.

Address	Start Time	L_{Aeq}	L_{A10}	L_{A01}	L_{A90}	L_{Amax}
1	02/11/2015 14:55	71.5	74.6	80.1	66.1	83.4
2	02/11/2015 15:00	70.4	73.2	78.3	64.8	81.5
3	02/11/2015 15:05	68.2	70.6	75.2	63.6	81.2
4	02/11/2015 15:10	72.2	75.5	81.3	65.7	88.2
5	02/11/2015 15:15	69.8	72.8	77.1	64.5	80.7
6	02/11/2015 15:20	72.2	72.7	84.6	64.9	96.1
7	02/11/2015 15:25	69.3	72.2	76.3	62.4	80.3
8	02/11/2015 15:30	69.7	72.4	78.1	62.5	85.9
9	02/11/2015 15:35	68.9	72.2	75.7	63.5	77.6
10	02/11/2015 15:40	70.0	72.4	77.2	65.7	86.0
11	02/11/2015 15:45	71.0	74.2	79.5	64.7	82.1
12	02/11/2015 15:50	74.5	73.2	86.9	63.9	96.1

Waterman

UK and Ireland Office Locations