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# 119 - 121 High Street
# Barnet EN5 5UZ

**Noise Impact Assessment Report**
**Report 27095.NIA.01**

**Arima Properties Ltd**
**16 Fairgreen, Cockfosters**
**Barnet, EN4 0QS**

| Report 27095.NIA.01<br>Revision History | | | |
|---|---|---|---|
| First Issue Date: 08/09/2023 | | | |
| A | | D | |
| B | | E | |
| C | | F | |

| Written by: | Checked by: | Approved by: |
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## 1.0 INTRODUCTION

KP Acoustics Ltd has been commissioned by Arima Properties Ltd, 16 Fairgreen, Cockfosters, Barnet, EN4 0QS, to assess the suitability of the site at 119 - 121 High Street, Barnet, EN5 5UZ for a residential development in accordance with the provisions of the National Planning Policy Framework and the Noise Policy Statement for England (NPSE).

This report presents the results of the environmental survey undertaken in order to measure prevailing background noise levels and outlines any necessary mitigation measures.

## 2.0 SITE SURVEYS

### 2.1 Site Description

The site is bounded by Barnet High street to the east, and commercial units to the north, south and west. Entrance to the site is located to the east. At the time of the survey, the background noise climate was dominated by road traffic noise from surrounding roads.

### 2.2 Environmental Noise Survey Procedure

Noise surveys were undertaken on the proposed site as shown in Figure 2.1. The locations were chosen in order to collect data representative of the worst-case levels expected on the site due to all nearby sources.

Continuous automated monitoring was undertaken for between 11:11 on 22/08/2023 and 11:11 on 23/08/2023, and 19:42 on 23/08/2023 and 19:12 on 24/08/2023.

Weather conditions were generally dry with light winds and therefore suitable for the measurement of environmental noise. The measurement procedure complied with ISO 1996-2:2017 Acoustics '*Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels*'.

### 2.3 Internal Noise Survey Procedure

A noise survey was undertaken within the internal area of the building in order to assess worst-case levels with the current external building fabric configuration.

Continuous automated monitoring was undertaken for the duration of the survey between 11:52 on 22/08/2023 and 11:52 on 23/08/2023. Microphones installed internally were positioned within the diffuse field of the room, ensuring the microphone was at least 1.5m from any reflective surface. The noise measurement position is detailed in Table 2.1 and shown in Figure 2.2.

## 2.4 Measurement Positions

Measurement positions are as described within Table 2.1 and shown within Figures 2.1.

| Icon | Descriptor | Location Description |
|---|---|---|
| (red) | External Measurement Position 1 | The microphone was installed on a window on the first floor of the east façade, as shown in Figure 2.2. The microphone was located within 1.5 metres of the nearest surface and therefore includes local reflections. |
| (yellow) | External Measurement Position 2 | The microphone was installed on extended poll at approximately first floor height towards the west façade, as shown in Figure 2.2. The microphone was positioned within free-field conditions at least 1.5 metres from the nearest surface. |
| (blue) | Internal Measurement Position | Located on the 1st floor of the building within a room on the west façade overlooking Barnet High Street. The microphone was installed on a tripod at 1.5m from the window on the external façade and positioned at 1.5m above the floor. |

**Table 2.1 Measurement positions and descriptions**

**Figure 2.1 External site measurement positions (Image Source: Google Maps)**

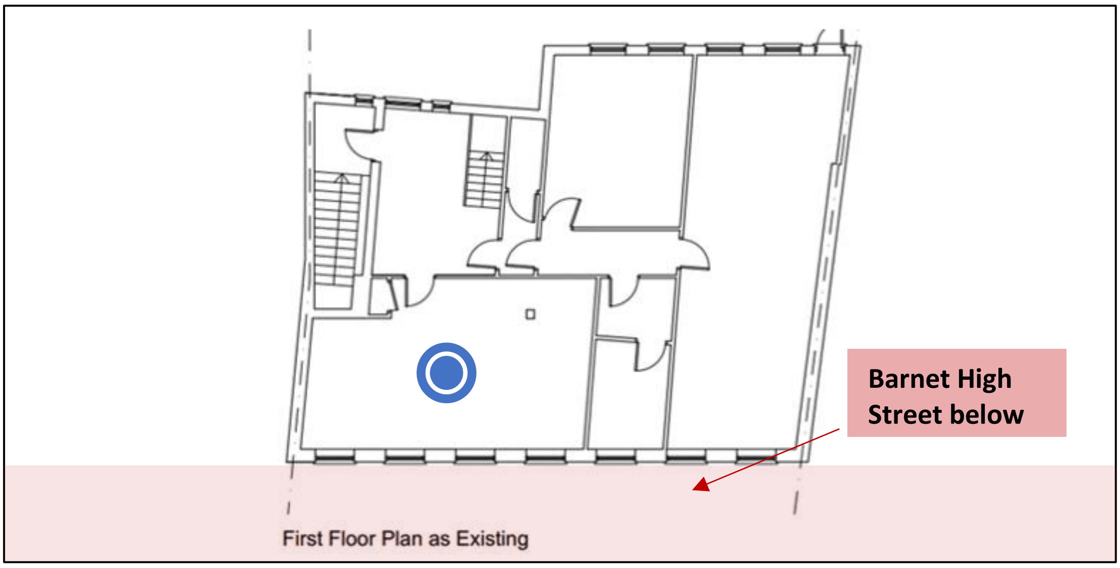


**Figure 2.2 Internal measurement position (Image Source: Google Maps)**

## 2.5 Equipment

The equipment calibration was verified before and after use and no abnormalities were observed. The equipment used is described within Table 2.2.

| Measurement instrumentation | | Serial no. | Date | Cert no. |
|---|---|---|---|---|
| Noise Kit 3 | Svantek Type 977 Class 1 Sound Level Meter | 34104 | 23/03/2022 | 1502092-1 |
| | Free-field microphone ACO 7052E | 66830 | | |
| | Preamp Svantek SV12L | 17293 | | |
| | Svantek External windshield | - | - | - |
| Noise Kit 22 | NTI Audio XL2 Class 1 Sound Level Meter | A2A-21138-E0 | 21/07/2022 | UK-22-068 |
| | Free-field microphone NTI Acoustics MC230A | A21849 | | |
| | Preamp NTI Acoustics MA220 | 11031 | | |
| | NTI Audio External Weatherproof Shroud | - | - | - |
| Noise Kit 27 | NTI Audio XL2 Class 1 Sound Level Meter | A2A-21174-E0 | 21/07/2022 | UK-22-070 |
| | Free-field microphone NTI Acoustics MC230A | A23539 | | |
| | Preamp NTI Acoustics MA220 | 11025 | | |
| | NTI Audio External Weatherproof Shroud | - | - | - |
| B&K Type 4231 Class 1 Calibrator | | 2147411 | 05/06/2023 | UCRT23/1739 |

**Table 2.2 Measurement instrumentation**

# 3.0 RESULTS

## 3.1 Internal Noise Surveys

The $L_{Aeq: 5min}$ and $L_{Amax: 5min}$ acoustic parameters were measured throughout the duration of the internal noise survey. Measured levels are shown as a time history in Figure 27095.TH3.

Measured noise levels are representative of noise exposure levels expected to be experienced in all spaces on the east façades of the development, and are shown in Table 3.1.

| Time Period | Internal Noise Measurement Position (Measured Noise level – dBA) |
|---|---|
| Daytime $L_{Aeq,16hour}$ | 40 |
| Night-time $L_{Aeq,8hour}$ | 35 |

**Table 3.1 Current internal average noise levels for daytime and night time**

## 3.2 External Noise Surveys

The $L_{Aeq: 5min}$, $L_{Amax: 5min}$, $L_{A10: 5min}$ and $L_{A90: 5min}$ acoustic parameters were measured throughout the duration of the survey. Measured levels are shown as a time history in Figures 27095.TH1-2.

Measured noise levels are representative of noise exposure levels expected to be experienced by all facades of the proposed development, and are shown in Table 3.2.

| Time Period | Noise Measurement Position 1 (Measured Noise level – dBA) | Noise Measurement Position 2 (Measured Noise level – dBA) |
|---|---|---|
| Daytime $L_{Aeq,16hour}$ | 68 | 50 |
| Night-time $L_{Aeq,8hour}$ | 62 | 46 |

**Table 3.1 Site average noise levels for daytime and night time**

Please note that the measurement at Noise Measurement Position 1 was located at a distance less than 1.5 metres from the nearest reflective surface and therefore a 3dB correction has been applied to the results in Table 3.1 to obtain a free-field measurement as per ISO1996 Part 2.

# 4.0 NOISE ASSESSMENT GUIDANCE

## 4.1 Noise Policy Statement for England 2021

The National Planning Policy Framework (NPPF) has superseded and replaces Planning Policy Guidance Note 24 (PPG24), which previously covered issues relating to noise and planning in England. Paragraph 174 of NPPF 2021 states that planning policies and decisions should aim to:

- preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans

In addition, Paragraph 185 of the NPPF states that ‘*Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should’:*

- Mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life
- Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason

The Noise Policy Statement for England (NPSE) was developed by DEFRA and published in March 2010 with the aim to ‘Promote good health and good quality of life through the effective management of noise within the context of Government policy on sustainable development.’

Noise Policy Statement England (NPSE) noise policy aims are as follows:

*Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.*

- *Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life*

The Noise Policy Statement England (NPSE) outlines observed effect levels relating to the above, as follows:

- NOEL – No Observed Effect Level
    - This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
- LOAEL – Lowest Observed Adverse Effect Level
    - This is the level above which adverse effects on health and quality of life can be detected.
- SOAEL – Significant Observed Adverse Effect Level

- This is the level above which significant adverse effects on health and quality of life occur.

As stated in The Noise Policy Statement England (NPSE), it is not currently possible to have a single objective based measure that defines SOAEL that is applicable to all sources of noise in all situations. Specific noise levels are not stated within the guidance for this reason, and allow flexibility in the policy until further guidance is available.

## 4.2 Planning Practice Guidance – Noise (PPG-N)

Planning Practice Guidance – Noise (PPG) was introduced by the Ministry of Housing, Communities & Local Government in March 2014 and revised in July 2019. It is an online digital resource that "advises on how planning can manage potential noise impacts in new development". It gives guidance on establishing whether noise will likely cause a concern, factors of influence on noise impact and methods by which planning can address adverse effects of noise sources.

A noise exposure hierarchy table is provided within the guidance that follows the same observed effect descriptors given within the NPSE guidance, i.e. NOEL, NOAEL and LOAEL and SOAEL.

For a NOAEL descriptor: "A noise has no adverse effect so long as the exposure does not cause any change in behaviour, attitude or other physiological responses of those affected by it. The noise may slightly affect the acoustic character of an area but not to the extent there is a change in quality of life"

## 4.3 ProPG: Planning and Noise

As outlined above, the National Planning Policy Framework encourages improved standards of design, although it provides no specific noise levels which should be achieved on site for varying standards of acoustic acceptability, or a prescriptive method for the assessment of noise.

ProPG: Planning and Noise was published in May 2017 in order to encourage better acoustic design for new residential schemes in order to protect future residents from the harmful effects of noise. This guidance can be seen as the missing link between the current NPPF and its predecessor, PPG24 (Planning Policy Guidance 24: Planning and Noise), which provided a prescriptive method for assessing sites for residential development, but without the nuance of 'good acoustic design' as outlined in ProPG.

ProPG allows the assessor to take a holistic approach to consider the site's suitability, taking into consideration numerous design factors which previously may not have been considered alongside the noise level measured on site, for example the orientation of the building in relation to the main source of noise incident upon it.

It should be noted this document is not an official government code of practice, and neither replaces nor provides an authoritative interpretation of the law or government policy, and therefore should be seen as a good practice document only.

### 4.4 The London Plan: Policy D12 Agent of Change

The London Plan states the following with regards to existing noise generating sources and new residential developments:

*A. The Agent of Change principle places the responsibility for mitigating impacts from existing noise-generating activities or uses on the proposed new noise-sensitive development.*

*B. Boroughs should ensure that planning decisions reflect the Agent of Change principle and take account of existing noise-generating uses in a sensitive manner when new development, particularly residential, is proposed nearby.*

*C. Development proposals should manage noise and other potential nuisances by:*

- *Ensuring good acoustic design to mitigate and minimise existing and potential impacts of noise generated by existing uses located in the area*
- *Exploring mitigation measures early in the design stage, with necessary and appropriate provisions secured through planning obligations*
- *Separating new noise-sensitive development where possible from existing noise-generating businesses through distance, screening, internal layout, sound-proofing and insulation, and other acoustic design measures.*

*D. Development should be designed to ensure that established noise-generating venues remain viable and can continue or grow without unreasonable restrictions being placed on them.*

*E. New noise-generating development, such as industrial uses, music venues, pubs, rail infrastructure, schools and sporting venues proposed close to residential and other noise-sensitive development should put in place measures such as soundproofing to mitigate and manage any noise impacts for neighbouring residents and businesses.*

F. *Boroughs should refuse development proposals that have not clearly demonstrated how noise impacts will be mitigated and managed.'*

## 4.5 BS8233:2014

BS8233:2014 *'Sound insulation and noise reduction for buildings'* describes recommended internal noise levels for residential spaces. These levels are shown in Table 4.1.

| Activity | Location | 07:00 to 23:00 | 23:00 to 07:00 |
|---|---|---|---|
| Resting | Living Rooms | 35 dB(A) | - |
| Dining | Dining Room/area | 40 dB(A) | - |
| Sleeping (daytime resting) | Bedrooms | 35 dB(A) | 30 dB(A) |

**Table 4.1 BS8233 recommended internal background noise levels**

It should be noted that the recommended internal noise levels outlined above are not applicable under "purge ventilation" conditions as defined by Approved Document F of the Building Regulations, as this should only occur occasionally (e.g. to remove odour from painting or burnt food). However, the levels above should be achieved whilst providing sufficient background ventilation, either via passive or mechanical methods.

The external building fabric would need to be carefully designed to achieve these recommended internal levels.

## 4.6 WHO Guidelines for Community Noise (1999)

WHO Guidelines for Community Noise (1999) recommends that internal noise levels for individual events should not exceed 45dB $L_{Amax}$ more than 10-15 times per night.

It should be noted that this impact is increasingly being regarded as 'LOAEL' for this number of exceedances, as described in Section 4.1.

The external building fabric would need to be carefully designed to ensure that the above guidance is achieved.

## 4.7 Approved Document O (ed. 2021)

Approved Document O (ADO) supports Part O of Schedule 1 to the Building Regulations 2010. ADO introduces requirements for residential premises in order to prevent overheating from occurring. There are two specific requirements from ADO:

<u>Requirement O1 (1):</u>

To limit unwanted solar gains in summer and to provide adequate means to remove heat from the indoor environment.

Requirement O1 (2):

(a) Account must be taken of the safety of the occupant, and their reasonable enjoyment of the residence.

(b) Mechanical cooling may only be used where sufficient heat cannot be removed from the indoor environment without it.

The statutory guidance to support Requirement O1(2)(a) contains requirements relating to noise at night.

### 4.7.1 Application

The guidance within ADO applies to new residential buildings only and are defined within the following table:

| Title | Purpose for which the building is intended to be used. |
|---|---|
| Residential (dwellings) | Dwellings, which includes both dwellinghouses and flats. |
| Residential (institutions) | Home, school or other similar establishment, where people sleep on the premises. The building may be living accommodation for the care or maintenance of any of the following.<br>A. Older and disabled people, due to illness or other physical or mental condition.<br>B. People under the age of 5 years. |
| Residential (other) | Residential college, hall of residence and other student accommodation, and living accommodation for children ages 5 years or older. |

**Table 4.2 Residential buildings within the scope of ADO (ref. Table 0.1 of Approved Document O)**

Paragraphs 3.2 and 3.3 of ADO specifically refer to noise within bedrooms at night. Whilst any habitable room could be used as a bedroom, it is proposed that the scope is confined to those rooms specifically designated as bedrooms.

### 4.7.2 Internal Noise Level Targets

ADO sets internal noise level targets within Paragraph 3.3 of the document:

*"Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.*

*a. 40dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am)*

*b. 55dB $L_{AFmax}$, more than 10 times a night (between 11pm and 7am)."*

Where an openable window for the removal of excess heat is predicted to result in the above internal noise levels to be exceeded, then the overheating mitigation strategy must adopt one of the alternative means listed within Paragraph 2.10 of ADO (presented within Section 4.7.3 of this report). This constraint applies regardless of which method is used to demonstrate compliance with Requirement O1 (1).

### 4.7.3 Methods to Remove Excess Heat

Paragraph 2.10 of ADO lists the means for removing excess heat from dwellings according to the following:

- Openable windows
- Ventilation louvres in external walls
- A mechanical ventilation system
- A mechanical cooling system

## 5.0 EXTERNAL BUILDING FABRIC SPECIFICATION

As shown in Table 3.1, internally measured noise levels exceed the recommended noise levels outlined within BS8233:2014.

Therefore, in order to ensure that the development is suitable for residential use, the existing building fabric should be upgraded.

Sound reduction performance calculations have been undertaken in order to specify the minimum performance required from glazed and non-glazed elements in order to achieve the recommended internal noise levels shown in Table 4.1, taking into account average and maximum noise levels monitored during the environmental noise survey.

As a more robust assessment, $L_{Amax}$ spectrum values of night-time peaks have also been considered and incorporated into the glazing calculation in order to cater for the interior limit of 45 dB $L_{Amax}$ for individual events, as recommended in WHO Guidelines.

Please note that the glazed and non-glazed element calculations would need to be finalised once all design proposals are finalised.

### 5.1 Non-Glazed Elements

The exact construction of the non-glazed external building fabric is unknown, however, it is understood that it would be based upon the construction proposed in Table 5.1 and would be expected to provide the minimum figures shown in the following table when tested in accordance with the BS EN ISO 10140 series of standards.

| Element | Octave band centre frequency SRI, dB | | | | | |
|---|---|---|---|---|---|---|
| | 125Hz | 250Hz | 500Hz | 1kHz | 2kHz | 4kHz |
| Brickwork Cavity Wall | 41 | 43 | 48 | 50 | 55 | 55 |

**Table 5.1 Assumed sound reduction performance for non-glazed elements**

## 5.2 Glazed Elements

Minimum octave band sound reduction index (SRI) values required for all glazed elements to be installed are shown in Table 5.2.The performance is specified for the whole window unit, including the frame, seals, etc. as appropriate. Sole glass performance data would not demonstrate compliance with this specification.

Glazing performance calculations have been based both on average measured night-time noise levels as well as verified against the $L_{Amax}$ spectrum of individual events in order to comply with a maximum internal noise level of 45dB(A) in bedrooms as recommended by World Health Organisation Guidelines. The combined most robust results of these calculations are shown in Table 5.2.

| Elevation | Octave band centre frequency SRI, dB | | | | | | $R_w$ (C;$C_{tr}$), dB |
|---|---|---|---|---|---|---|---|
| | 125Hz | 250Hz | 500Hz | 1kHz | 2kHz | 4kHz | |
| East Elevations | 25 | 29 | 37 | 44 | 40 | 32 | 39 (-1;-4) |
| West Elevations | 17 | 20 | 26 | 32 | 33 | 26 | 30 (-1;-4) |

**Table 5.2 Required glazing performance**

The nominated glazing supplier should verify that their proposed window system meets the attenuation figures shown at each centre frequency band as shown in Table 5.2.

Example glazing types that would be expected achieve the above spectral values are shown in Table 5.3.

| Elevation | Example glazing type |
|---|---|
| East Elevations | 10/12/10 |
| West Elevations | *Any Double Glazing* |

**Table 5.3 Example glazing types**

All major building elements should be tested in accordance with the BS EN ISO 10140 series of standards.

Independent testing at a UKAS accredited laboratory will be required in order to confirm the performance of the chosen system for an 'actual' configuration.

If the existing windows are to be maintained, we would recommend that a secondary glazing system is installed, such as those provided by SelectaGlaze, who provide several systems which would achieve the project requirements:

- S20 Vertical Sliding System, comprised of 50mm cavity from the existing window system, with 4-6.4mm standard glass (Provides 39dB $R_w$ with primary window)
- HS10 Horizontal Sliding System, comprised of 50mm cavity from the existing window system, 4-6.4mm standard glass (Provides 39dB $R_w$ with primary window)
- HC45 Hinged Casement System, comprised of 50mm cavity from the existing window system, 4-6.4mm standard glass (Provides 41dB $R_w$ with primary window)

# 6.0 VENTILATION AND OVERHEATING

## 6.1 Ventilation Strategy

Based on the noise levels measured on site, appropriate ventilation systems are outlined in Table 6.1 below in order to ensure the internal noise environment is not compromised.

| Ventilation System | Whole Dwelling Ventilation | Extract Ventilation |
|---|---|---|
| ADF System 1 | Trickle vents providing a minimum performance of:<br>East Elevations - 42dB $D_{,n,e,w}$<br>West Elevations - 23dB $D_{,n,e,w}$ | Intermittent extract fans |
| ADF System 3 | Continuous mechanical extract (low rate) and trickle vents for supply providing a minimum performance of:<br>East Elevations - 42dB $D_{,n,e,w}$<br>West Elevations - 23dB $D_{,n,e,w}$ | Continuous mechanical extract (high rate) with trickle vents providing inlet air |
| ADF System 4 | Continuous mechanical supply and extract (low rate) | Continuous mechanical supply and extract (high rate) |

**Table 6.1 Ventilation systems**

Where trickle vents are proposed, a typical number has been assumed based on the room size and number of windows. As trickle vents introduce a weak point in the building façade, it should be noted that increasing the number of trickle vents will reduce the composite performance of the facade. If more trickle vents are required, the required insulation should be increased by '+10*LOG(N)' where N is the number of vents proposed. If trickle vents are proposed, the total number of trickle vents for each sensitive space should be confirmed so that calculations can be accurately revised.

In the case of mechanical ventilation, systems should be designed to meet the internal noise levels as defined in CIBSE Guide A (2015), as shown in Table 6.2.

| Room Type | LAeq, dB | NR |
|---|---|---|
| Bedrooms | 30 | 25 |
| Living Rooms | 35 | 30 |
| Kitchen | 45-50 | 40-45 |

**Table 6.2 CIBSE Guide A 2015 guidance levels for mechanical building services**

In all cases, purge ventilation would be provided by openable windows. As outlined in Section 4.5, the internal noise level requirement would not be applicable during purge conditions as this would only occur occasionally.

## 6.2 Openable Windows

Approved Document O (ADO) only applies to Bedrooms during night. The advice within this section would therefore only apply to Bedrooms during night-time hours (23:00-07:00) to ensure that the internal noise level targets of 40dB(A) $L_{eq,T}$ and 55dB(A) $L_{max}$ are not exceeded.

Table 6.3 presents the open area of the window as a % of the floor area which would need to be achieved to ensure that sufficient attenuation is provided from outside to inside.

| Elevation | Sound Reduction Required to Achieve ADO Target Internal $L_{Aeq}$ Noise Levels | Sound Reduction Required to Achieve ADO Target Internal $L_{Amax}$ Noise Levels | Maximum Open Area of the Window as a Percentage of the Floor Area to Achieve ADO Target Internal Noise Levels |
|---|---|---|---|
| East | 25 dB | 28 dB | 0 % |
| West | 6 dB | 0 dB | 11 % |

**Table 6.3 Window open areas**

The overheating model should inform the design team whether the % open areas above would be sufficient to remove excess heat. In the event they are insufficient, other options to limit solar gains into the building should be investigated (such as those outlined in Section 2.7 of Approved Document O), or other means of removing excess heat should be explored (as outlined in Section 2.10 of the Approved Document).

*Note: Acoustic open area is the measurable, cross-sectional, geometric area of an opening. For a partially open window, this is considered to be the lesser of either the size of the hole in the window frame that is left by the opening light, or the combined cross-sectional area around the opening light through which air must pass to move from outside to inside. The area around a hinged opening light includes the triangular areas on the sides adjacent to the hinge, and the rectangular area on the side opposite the hinge. This should not be used for comparing the air-flow performance of elements because this will also be dependent on factors such as depth (length of air-path), surface roughness and tortuosity.*

## 6.3 Overheating Control Strategies

Where the open areas specified above are not sufficient for controlling overheating, then one or more of the following strategies will need to be adhered to:

- Fixed shading devices comprising any of the following:
  - Shutters
  - External blinds
  - Overhangs
  - Awnings
- Glazing design, involving any of the following solutions
  - Size
  - Orientation
  - G-value
- Building design, e.g. the placement of balconies
- Shading provided by adjacent buildings structures or landscaping.
- Ventilation louvres in external walls
- A mechanical ventilation system
- A mechanical cooling system

KP Acoustics would be happy to review any proposals to ensure that they adhere to the internal noise levels targeted within ADO.

## 7.0 NOISE TRANSFER PREDICTIONS

In order to assess direct noise transfer from the Ground floor commercial units and to the proposed residential units above, a sound insulation investigation was undertaken as described below.

### 7.1 Procedure

High volume pink noise was generated from one loudspeaker within one of the ground floor commercial units, positioned to obtain a diffuse sound field. A spatial average of the resulting one-third octave band noise levels between 100 Hz and 3150 Hz was obtained by using a moving microphone technique over a minimum period of 15 seconds at each of two positions.

The same measurement procedure was undertaken within the existing office space on the first floor where living spaces are proposed.

The results of the tests were rated in accordance with BS EN ISO 717-1: 1997 '*Rating of sound insulation in buildings and of building elements. Part 1 Airborne sound insulation*'.

The background noise levels in the receiver rooms were measured during the tests and the receiving room levels corrected in accordance with BS EN ISO 140 Part 4.

The dominant source of background noise observed during the tests was road traffic noise from the surrounding roads.

### 7.2 Results

The level difference between rooms, as provided by the existing shared partitions, is presented below in Table 7.1.

| Test Element | Level Difference, D (dB) in each Octave Frequency Band | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 63Hz | 125Hz | 250Hz | 500Hz | 1kHz | 2kHz | 4kHz | 8kHz |
| Party Floor | -25 | -26 | -31 | -39 | -44 | -52 | -62 | -69 |

**Table 7.1 Airborne test results**

### 7.3 Direct Noise Transfer Predictions

Further to discussions with the client, it is understood that the proposed use of the ground floor commercial units are currently unknown.

Considering the typical type of commercial units located within the local vicinity, it is likely the unit will either entail retail or hospitality use. Using a typical source level of a busy restaurant 80dB(A) to represent a worst case source noise levels within the ground floor ccommercial unit, and taking into account the measured $D_w$ of the proposed separating floor construction,

Table 7.2 shows predicted sound pressure levels within the proposed First Floor residential bedrooms. Full calculations are shown in Appendix B.

As the proposed operational hours of the commercial unit are currently unknown, the nighttime internal noise requirements of BS8233:2014 will used within the assessment.

| Receiver | BS8233:2014 Requirement During Nighttime Hours (23:00-07:00) | Predicted Noise Levels Within Proposed First Floor Bedrooms |
|---|---|---|
| First floor Residential | 30 dB(A) | 38 dB(A) |

**Table 7.2 Predicted noise levels in residential above due to the commercial unit operation within first floor bedrooms**

As shown in Table 7.1 and Appendix B, the direct noise transfer through the separating floor with the proposed construction is predicted to be above the criterion stipulated in BS8233 and therefore, mitigation measures are recommended.

### 7.4 Noise Mitigation Proposals

Further to discussions with the client, it is understood that the exact construction of the existing floor is currently unknown. Therefore, the existing floor construction has been assumed as described below which would be expected to meet the approximate performance of the measured test results within Table 7.1.

- Assumed wooden floorboards
- 200mm Joists without mineral wool in the cavity
- Suspended ceiling with mineral fibre tiles

If the existing separating floor construction differs significantly from the assumed construction given above, KP Acoustics should be notified so that any recommendations can be revised. It is understood that the exiting suspended ceiling is to be removed.

To address the airborne sound insulation for the single joist system, we would recommend the following upgrades:

- Existing Joists with Min 100mm Mineral wool insulation (density 45kg/m$^3$) installed in the void if not already installed in areas.
- 2x15mm Gyproc Fireline plasterboard layers fixed to the joists.
- GAH-2 resilient hangers installed to the Fireline to create a void of ≥150mm between the joist and the plasterboard with min 100mm Mineral wool insulation (density 45kg/m3).
- 2x15mm Gyproc Fireline plasterboard layers fixed to the resilient hangers.

The above recommendations are only applicable providing the assumed floor construction is accurate. If is it found that the separating floor construction assumed above is incorrect, the recommended mitigation measured must be revised in line with the actual floor construction observed. With the proposed floor upgrades, we predict that the resulting direct transfer noise from the ground floor commercial within the first floor residential will be below the BS8233:2014 internal noise criterion.

## 8.0 CONCLUSION

An environmental noise survey has been undertaken at 119 - 121 High Street, Barnet, EN5 5UZ allowing the assessment of daytime and night-time levels likely to be experienced by the proposed development.

Measured noise levels allowed a robust glazing specification to be proposed which would provide internal noise levels for all residential environments of the development commensurate to the design range of BS8233:2014.

No further mitigation measures should be required in order to protect the proposed habitable spaces from external noise intrusion.

The maximum openable area for bedroom windows with the development has been presented based upon the requirements of Approved Document O.

The results of the sound insulation investigation indicate that direct noise transfer to the proposed 1st floor residential Flats do not currently comply with the recommended absolute internal noise criterion of BS8233:2014 with a considered worst case noise source.

Mitigation measures have been recommended to minimize the direct noise transfer from the ground floor commercial which, should they be followed, would provide an additional benefit for the tenants of the first-floor residential flats by means of a reduction in noise transmission.

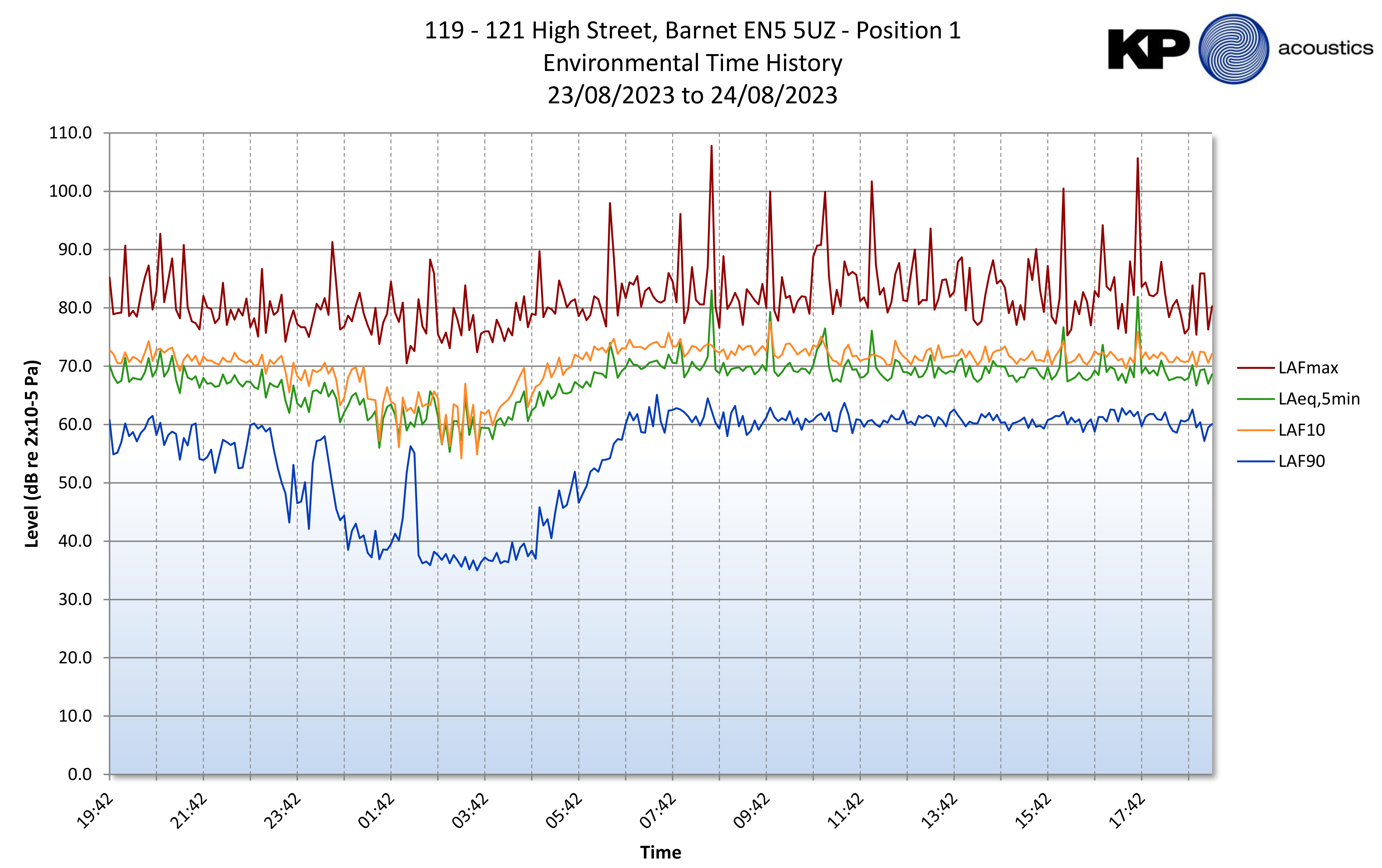


Figure 27095.TH1

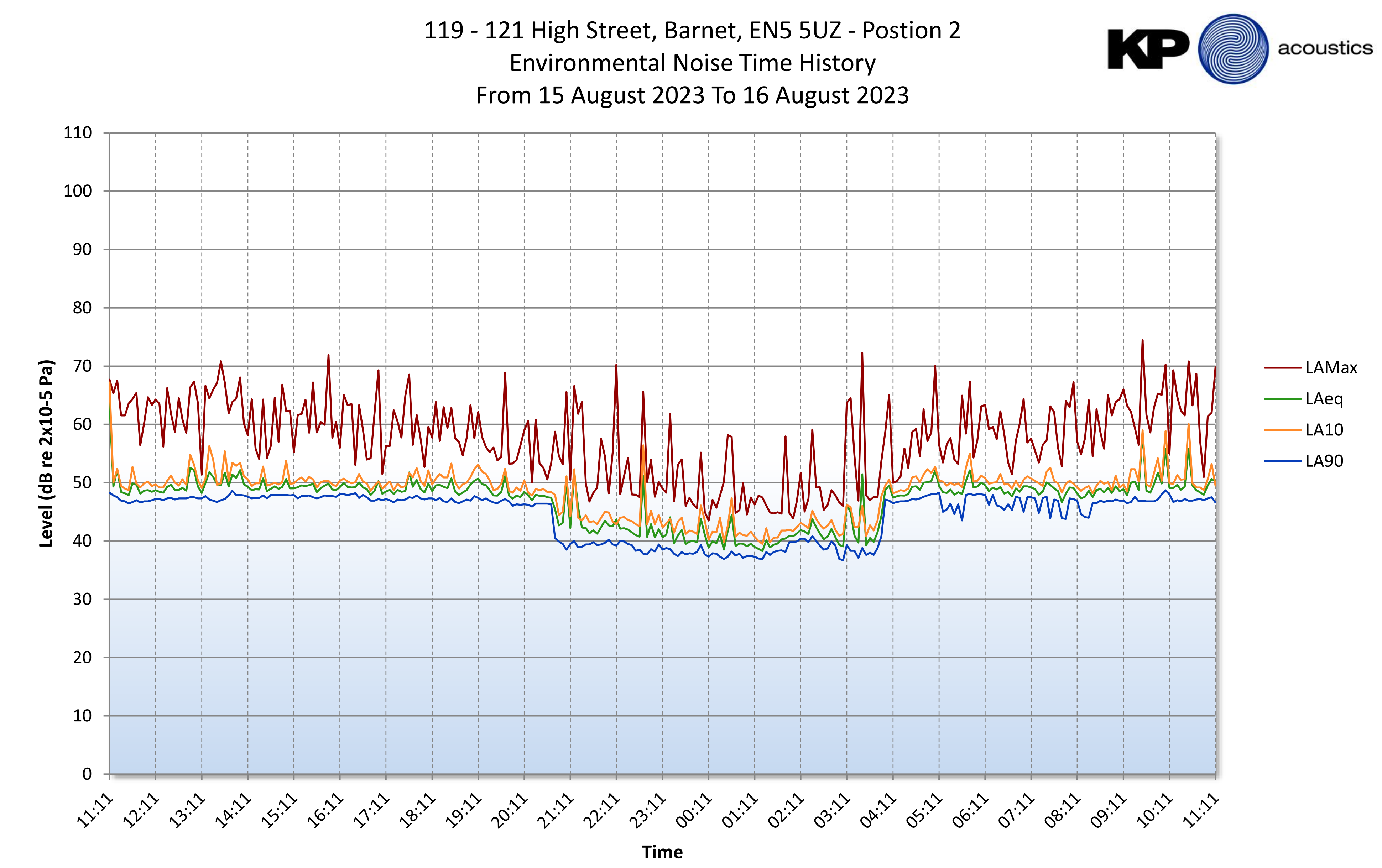


**Figure 27095.TH2**

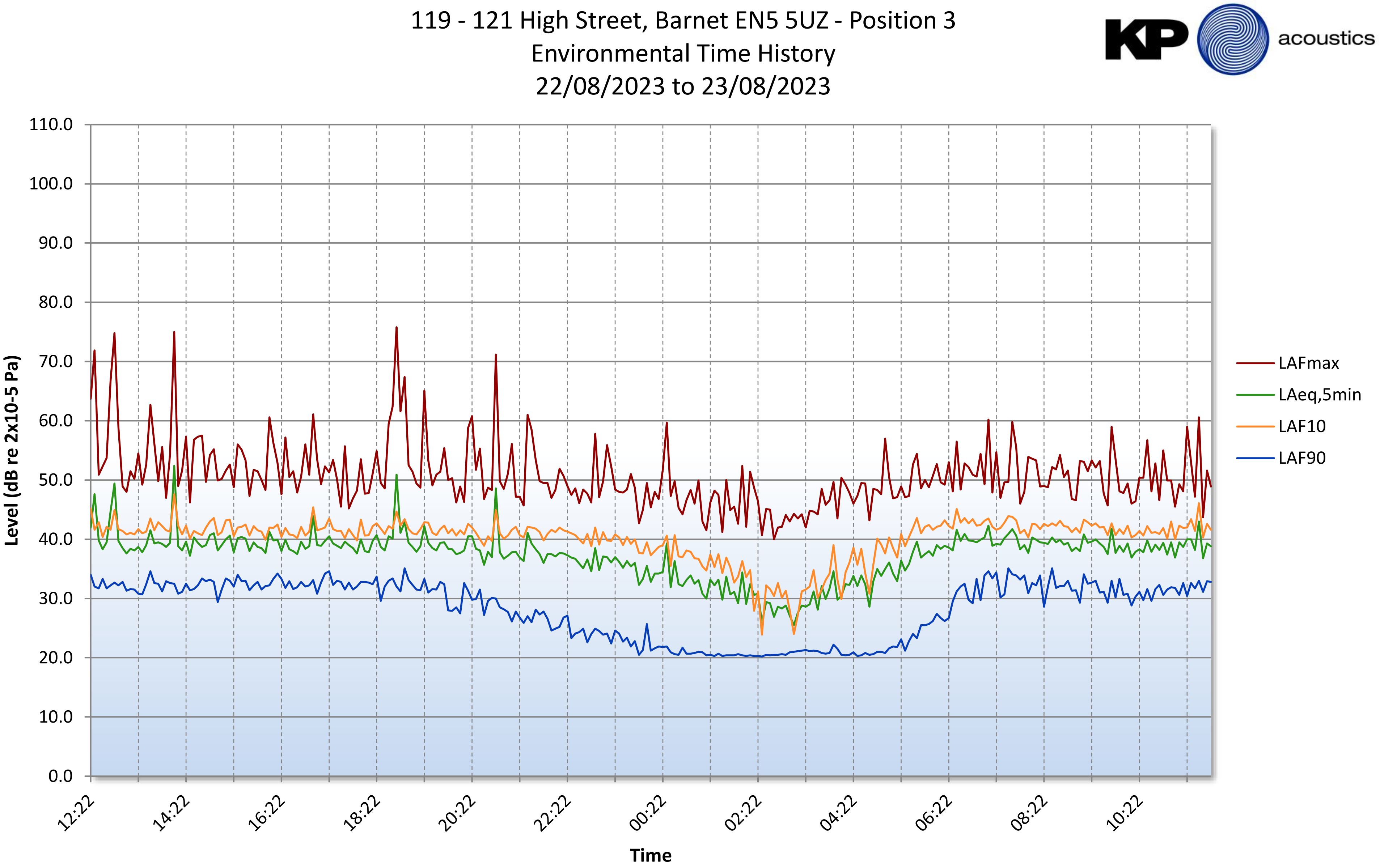


Figure 27095.TH3

# APPENDIX A

## GENERAL ACOUSTIC TERMINOLOGY

### Decibel scale - dB

In practice, when sound intensity or sound pressure is measured, a logarithmic scale is used in which the unit is the 'decibel', dB. This is derived from the human auditory system, where the dynamic range of human hearing is so large, in the order of $10^{13}$ units, that only a logarithmic scale is the sensible solution for displaying such a range.

### Decibel scale, 'A' weighted - dB(A)

The human ear is less sensitive at frequency extremes, below 125Hz and above 16Khz. A sound level meter models the ears variable sensitivity to sound at different frequencies. This is achieved by building a filter into the Sound Level Meter with a similar frequency response to that of the ear, an A-weighted filter where the unit is dB(A).

**$L_{eq}$**

The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level $L_{eq}$. The $L_{eq}$ is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period.

**$L_{10}$**

This is the level exceeded for no more than 10% of the time. This parameter is often used as a "not to exceed" criterion for noise.

**$L_{90}$**

This is the level exceeded for no more than 90% of the time. This parameter is often used as a descriptor of "background noise" for environmental impact studies.

**$L_{max}$**

This is the maximum sound pressure level that has been measured over a period.

### Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 11 such octave bands whose centre frequencies are defined in accordance with international standards. These centre frequencies are: 16, 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000 and 16000 Hertz.

Environmental noise terms are defined in BS7445, *Description and Measurement of Environmental Noise*.

# APPENDIX A

## APPLIED ACOUSTIC TERMINOLOGY

### Addition of noise from several sources

Noise from different sound sources combines to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than a single source and 4 sources produce a 6dB higher sound level.

### Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3dB for each doubling of distance.

### Subjective impression of noise

Hearing perception is highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a guide to explain increases or decreases in sound levels for many scenarios.

| Change in sound level (dB) | Change in perceived loudness |
|---|---|
| 1 | Imperceptible |
| 3 | Just barely perceptible |
| 6 | Clearly noticeable |
| 10 | About twice as loud |

### Transmission path(s)

The transmission path is the path the sound takes from the source to the receiver. Where multiple paths exist in parallel, the reduction in each path should be calculated and summed at the receiving point. Outdoor barriers can block transmission paths, for example traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and construction.

### Ground-borne vibration

In addition to airborne noise levels caused by transportation, construction, and industrial sources there is also the generation of ground-borne vibration to consider. This can lead to structure-borne noise, perceptible vibration, or in rare cases, building damage.

### Sound insulation - Absorption within porous materials

Upon encountering a porous material, sound energy is absorbed. Porous materials which are intended to absorb sound are known as absorbents, and usually absorb 50 to 90% of the energy and are frequency dependent. Some are designed to absorb low frequencies, some for high frequencies and more exotic designs being able to absorb very wide ranges of frequencies. The energy is converted into both mechanical movement and heat within the material; both the stiffness and mass of panels affect the sound insulation performance.

# APPENDIX B
# 119 - 121 High Street, Barnet EN5 5UZ

## DIRECT NOISE TRANSFER CALCULATIONS

| Source: Existing ground floor commerical space<br>Receiver: Proposed Residential, First floor flat | Frequency, Hz<br>63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k | dB(A) |
|---|---|---|---|---|---|---|---|---|---|
| Sound Pressure level of worst case activity within ground floor commerical, dB | 60 | 70 | 75 | 75 | 75 | 75 | 70 | 70 | 80 |
| On site SRI of separating floor, dB | -25 | -26 | -32 | -39 | -44 | -52 | -62 | -69 | |
| **Sound Pressure Level at Within Receiver Space** | **35** | **44** | **43** | **36** | **31** | **23** | **8** | **1** | **38** |