



St Werburgh Developments Limited

**25 & 25A CHANDOS ROAD SOUTH,
CHORLTON-CUM-HARDY**

NOISE ASSESSMENT FOR PLANNING PURPOSES

01 November 2022

AEC REPORT: P4753/R01/DMT

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1.0 INTRODUCTION

- 1.1 Acoustic & Engineering Consultants Limited (AEC) has been instructed by St Werburgh Developments Limited to undertake a noise assessment in relation to the two Air Source Heat Pumps (ASHP) located at the newly constructed residential properties, 25 and 25A Chandos Road South, Chorlton-Cum-Hardy.
- 1.2 This development has planning approval (App No. 128754/FO/2020), however, there are two conditions relating to the noise emissions from the ASHPs. Conditions 16 & 17 are reproduced below:

16) Prior to the installation of any externally mounted ancillary plant, equipment (including Air Source Heat Pump) and servicing shall be acoustically insulated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location, submitted to and approved in writing by the City Council as local planning authority in order to secure a reduction in the level of noise emanating from the equipment.

Reason - To safeguard the amenities of the occupiers of nearby residential accommodation, pursuant to policies SP1 and DM1 of the Core Strategy.

17) Prior to occupation of the development a verification report shall be submitted to and approved in writing by the City Council as local planning authority to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic report. The report shall also undertake post completion testing to confirm that the noise criteria have been met. Any instances of non - conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria.

Reason - To safeguard the amenities of the occupiers of nearby residential accommodation, pursuant to policies SP1 and DM1 of the Core Strategy.

- 1.3 This report details the findings of a baseline noise survey (without the ASHPs operating), the operational noise levels from ASHPs, and provides an acoustic assessment in relation to the nearest residential properties, as required to satisfy the above conditions.
- 1.4 Acoustic terminology is discussed in brief in Appendix A.

2.0 BACKGROUND AND SITE DESCRIPTION

Site Location

- 2.1 The site is in a residential area surrounded by other residential properties, as indicated in Figure 2.1 below. In terms of noise sources in the area, the A6010 (Wilbraham Road) is located approximately 150 metres to the north, and the South Manchester Line of the Metrolink Tram network is located approximately 130 metres to the south.

Figure 2.1 – Indicative Site Location

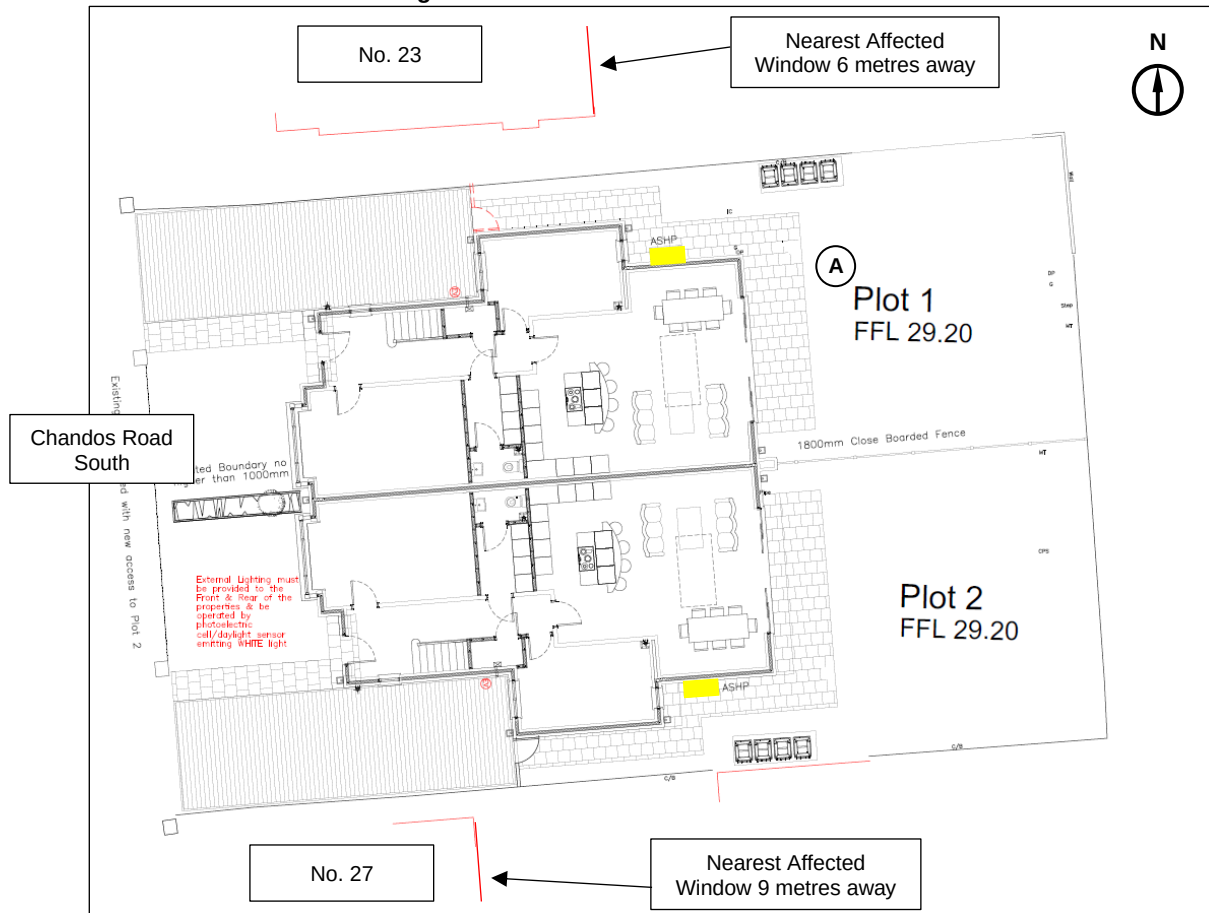


- 2.2 The nearest residential receptors are the existing properties either side of the site, namely, 23 Chandos Road South to the north and 27 Chandos Road South to the south. See Figure 2.1 above and a more detailed image in Figure 3.1 below.

3.0 NOISE MEASUREMENTS

- 3.1 An attended noise level survey was undertaken by AEC on Thursday 20th October 2022, between approximately 1900 and 0020h. This survey comprised source noise measurements of the ASHPs during normal operation and baseline noise level measurements in the late evening / night-time, without the ASHPs operating.
- 3.2 Baseline measurements were taken at one location in the rear garden of 25 Chandos Road South, identified as A on the attached Figure 3.1, below. The ASHPs are highlighted yellow.

Figure 3.1 – Noise Measurement Location



- 3.3 Source noise measurements were also undertaken of the ASHP operating. Noise levels were taken at distances of 1 and 2 metres from the ASHP and these levels were cross referenced to the manufacturer supplied noise data. This is discussed below.
- 3.4 All measurements were undertaken under free-field conditions and in general accordance with BS7445-1: 2003 '*Description and measurement of environmental noise. Guide to quantities and procedures*'.

Baseline Noise Levels

- 3.5 The evening / night-time ambient (dB_{LAeq}) and background (dB_{LA90}) noise levels (without the ASHPs operating), are presented in Table 3.1 below.

Table 3.1 – Typical Night-time Ambient and Background Noise levels (ASHPs Off)

Measurement Location	Noise Levels, dB	
	Ambient, $L_{Aeq,T}$	Background, $L_{A90,T}$
A	41	37

- 3.6 Although the noise levels were relatively consistent, due to distant road traffic noise levels, the lowest measured levels have been presented in Table 3.1 and used in this assessment.
- 3.7 Baseline noise levels between 0500-0700h would typically be the same or slightly noisier than those presented above. Although background noise levels may drop slightly further in the middle of the night, between say 0030h and 0500h, the ASHPs would typically not be operating during these periods when most people are asleep. Furthermore, the middle of the night, when people are asleep, is considered to be not as sensitive as around 2200-0000h, when people are more likely to be awake and trying to get to sleep.

ASHP Source Noise Levels

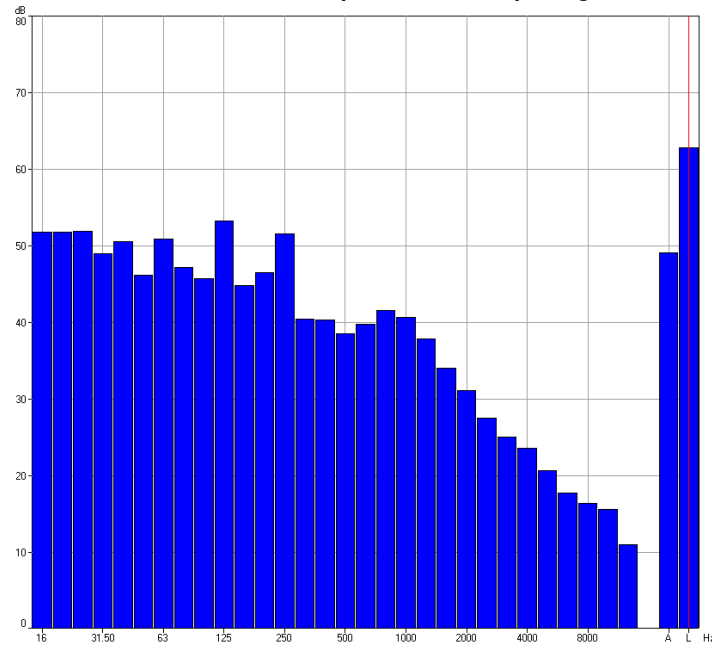
- 3.8 The ASHP was forced to operate at what would be full operating duty to heat up the house in cold conditions. Measurements were taken approximately 30cm above the fence at approximately 2 metres from the ASHP. There was a slightly elevated angle of approximately 45 degrees. This was approximately in the direct line of sight between the ASHP and 1st floor window of 23 Chandos Road South.
- 3.9 Multiple measurements were taken with the ASHP on and off. There was some ambient/background noise in the measurements due to distant road traffic which is corrected for below.

Table 3.2 – Summary of Measured ASHP Noise Levels @ 2 metres

Condition	Specific Noise Level, $L_{Aeq,T}$	Comments
ASHP (ON)	48	Typically – $48dB_{LAeq,T}$, but road traffic noise was affecting measured noise levels slightly.
ASHP (OFF)	43	$43dB_{LAeq,T}$ due to road traffic noise
ASHP Corrected Level	46	ASHP noise only

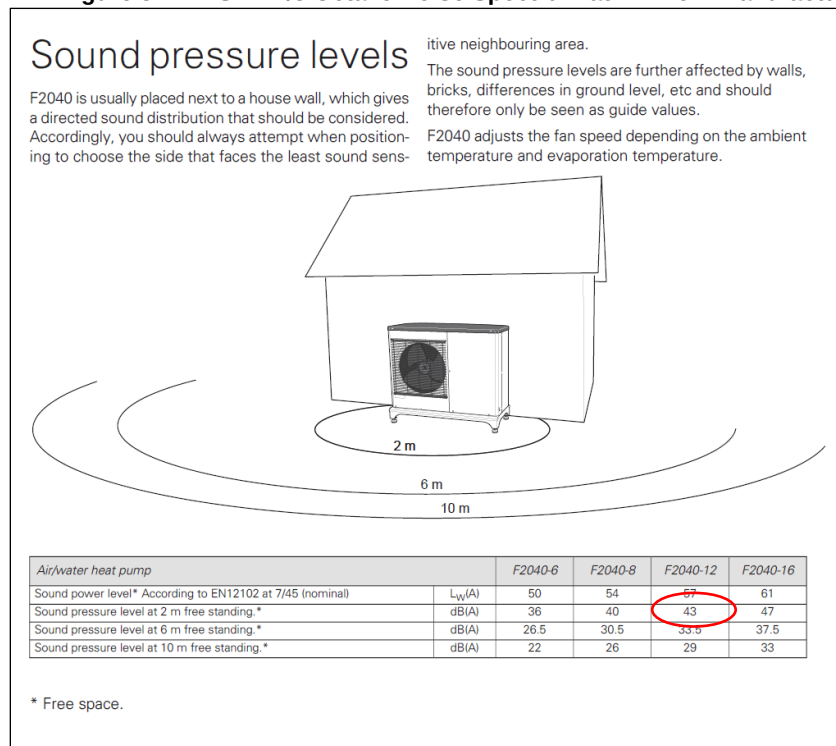
- 3.10 The measured third octave band spectrum noise data for the ASHP is shown in Figure 3.2 below.

Figure 3.2 – ASHP 1/3 Octave Noise Spectrum at 2m (Background Affected)



- 3.11 The installed unit is a NIBE Heat Pump Type F2040-12. The manufacturer noise data states a noise level of 43dB_{L_{Aeq,T}} at 2 metres for a unit in “Free Space” i.e. no vertical reflective planes. However, the ASHPs are located on the external walls of the new residential properties. This acoustically reflective plane increases noise levels by +3dB.

Figure 3.1 – ASHP 1/3 Octave Noise Spectrum at 2m from Manufacturer



4.0 BASIS OF ASSESSMENT

National Planning Policy Framework

- 4.4 Current national planning policies are set out in the National Planning Policy Framework (NPPF) published by the Department for Communities and Local Government, dated March 2012, and revised in February 2019.
- 4.5 The planning policies which relate specifically to noise, were updated in July 2021, and are presented in paragraphs 174, 185 and 187 which are reproduced below:

“174. Planning policies and decisions should contribute to and enhance the natural and local environment by:

- (e) 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.*

185. 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:

- (a) 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.*
- (b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*

187. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.”

- 4.6 Further to the above, the Governments ‘*Planning Practice Guidance*’ (PPG) published on 6 March 2014 and updated on 22 July 2019 states:

‘Noise needs to be considered when development may create additional noise, or would be sensitive to the prevailing acoustic environment (including any anticipated changes to that environment from activities that are permitted but not yet commenced). When preparing plans, or taking decisions about new development, there may also be opportunities to

make improvements to the acoustic environment. Good acoustic design needs to be considered early in the planning process to ensure that the most appropriate and cost-effective solutions are identified from the outset.'

- 4.7 In addition, the guidance indicates that, whilst noise can override other planning concerns, it is important to look at noise in the context of the wider characteristics of a development proposal, its likely users, and its surroundings, as these can have an important effect as to whether or not noise is likely to pose a concern.

BS4142: 2014+A1:2019 – Condenser Noise Limits

- 4.8 The most appropriate guidance for assessing noise from the external ASHP is contained within BS4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound' (BS4142). This standard provides methods for assessing industrial/commercial sound by comparing the specific sound level (that directly attributable to the industrial/commercial sound) to the prevailing background sound level ($\text{dBL}_{A90, T}$) over relevant periods that the plant operates.
- 4.9 It is necessary to determine the specific sound level from the industrial/commercial plant over a period of one hour during the daytime and/or 15 minutes during the night-time. The specific sound level relates to the specific industrial/commercial sound source only and has to be corrected to take account of other sound sources generally in the area, i.e. the residual sound. Daytime is normally considered to be over the period 0700 to 2300 hours, and night-time 2300 to 0700 hours.
- 4.10 BS4142, in section 9, states that certain acoustic features can increase the significance of impact. Where present at the assessment location, such features are considered by adding a correction to the specific sound level to obtain the rating level. A correction should be applied if one or more of the following features occur, or are expected to be present:
- | | |
|-----------------------|---|
| <i>Tonality-</i> | for sound ranging from not tonal to prominently tonal a correction of 0 to 6dB should be considered. |
| <i>Impulsivity-</i> | A correction of up to 9dB can be applied for sound that is highly impulsive, considering both the rapidity and overall change in sound level. |
| <i>Other-</i> | Where a sound features characteristics that are neither tonal nor impulsive but are readily distinctive against the residual environment a penalty of 3dB can be applied. |
| <i>Intermittency-</i> | If intermittency is distinctive against the residual environment a penalty of 3dB can be applied. |
- 4.11 The potential tonality of the ASHPs has been assessed based on the 'objective method' provided in BS 4142, which is reproduced below for reference.

Annex C
(normative)

Objective method for assessing the audibility of tones in sound: One-third octave method

The test for the presence of a prominent, discrete-frequency spectral component (tone) typically compares the $L_{\text{Zeq,T}}$ sound pressure level averaged over the time when the tone is present in a one-third-octave band with the time-average linear sound pressure levels in the adjacent one-third-octave bands. For a prominent, discrete tone to be identified as present, the time-averaged sound pressure level in the one-third-octave band of interest is required to exceed the time-averaged sound pressure levels of both adjacent one-third-octave bands by some constant level difference.

The level differences between adjacent one-third-octave bands that identify a tone are:

- 15 dB in the low-frequency one-third-octave bands (25 Hz to 125 Hz);
- 8 dB in the middle-frequency one-third-octave bands (160 Hz to 400 Hz); and
- 5 dB in the high-frequency one-third-octave bands (500 Hz to 10 000 Hz).

- 4.12 The significance of the potential impact is indicated by the difference between the background sound level and the rating level. Typically, the greater this difference, the greater the magnitude of the 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.
 - **If 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.**
 - 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.

Local Authority Limits

- 4.13 As stated in the introduction above, MCC has placed a condition on the ASHP noise to achieve a rating level of -5dB below the background noise levels at the nearest noise sensitive premises. This is based on an assessment in general accordance with BS4142, discussed above, and should be subject to contextual factors and consideration of absolute noise levels where appropriate.

5.0 NOISE ASSESSMENT

Source Noise Levels (NIME - F2040-12)

- 5.1 Based on the source noise level measurements described in Section 3, the measured noise level at 2 metres from the ASHP, when operating at full duty, is **46dBL_{Aeq,T}**.
- 5.2 The manufacturer data provided states a level of 43dBL_{Aeq,T}, however, this does not include reflections off buildings, which has added +3dB to the measured noise levels.

Noise Levels at Nearest Receptors

- 5.3 Using the noise level at 2 metres and applying the appropriate screening and distance corrections, the noise levels at the nearest windows of the adjacent properties has been determined. This is presented in Table 5.1 below.

Table 5.1 – Specific Noise Levels @ Receptors (dBL_{Aeq,T})

Receptor Location	Source Noise Level, dBL _{Aeq,T} @2m	Distance Correction, dB	Screening Correction, dB	Resulting Free-Field Noise level at Receptor, dBL _{Aeq,T}
No. 23 – Ground	46	-10	-10	26
No. 23 – 1 st Floor		-11	0	35
No. 27 – Ground		-13	-10	23
No. 27 – 1 st Floor		-14	-5*	27

*Partial screening estimated (See Figure 3.1 for receptor locations)

BS4142 Noise Assessment

- 5.4 Based on the resulting noise levels reported in Table 5.1 and the measured background noise level of 37dBL_{A90,T}, a BS4142 assessment is provided in Table 5.2 below.

BS4142 Sound Character Penalty

- 5.5 Comparing the measured noise level spectrum presented in Figure 3.1 above, to the criteria in the BS4142 objective method for assessing tonality, demonstrates that the ASHP noise is not tonal.
- 5.6 The broadband fan noise from the ASPH is not dissimilar to domestic boiler noise and no is more intermittent, therefore, there is an argument that no acoustic feature correct need be applied.

BS4142 Rating Level Assessment

- 5.7 Table 5.2 shows the BS4142 assessments for the late evening and night-time period.

Table 5.2 – Assessment of External Building Service Plant (Late evening / Night)

Plant Item	Free-Field Sound Pressure Level at Nearest Receptor(s), dBL _{Aeq,T}			
	No.23 Ground Floor	No.23 1 st Floor	No.27 Ground Floor	No.27 1 st Floor
Total Specific Sound Level (dBL _{Aeq,T})	26	35	23	27
Rating Correction (dB)	0	0	0	0
[A] Rating Level (dBL _{Ar,Tr})	26	35	23	27
[B] Background Noise Level (dBL _{A90,15mins})	37	37	37	37
Assessment of Rating above Background [A-B] Green = MCC Condition met)	-9	-2	-14	-10
BS4142 Assessment	Indication of low impact	Indication of low impact	Indication of low impact	Indication of low impact

- 5.8 In accordance with the guidance in BS4142, the assessment in Table 5.2 above indicates “*low impacts, depending on the context*” at the surrounding residential apartments, i.e. the ASHP noise levels are equal to, or less than, the existing background noise levels.
- 5.9 The MCC criteria of -5dB below background has been achieved at all receptors, except for the 1st Floor window of No.23 Chandos Road South, where there is a marginal exceedance.

Internal Noise Levels

- 5.10 BS4142 states that ‘*where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.*’
- 5.11 The predicted noise levels from the ASHPs have been assessed against the guidance provided in the World Health Organisation Guidelines for Community Noise and BS8233:2014 which provide acceptable internal noise levels. Table 4 of Section 7.7.2 in BS8233:2014 provides indoor ambient noise levels for dwellings, and is reproduced in the following Table 5.3.

Table 5.3 – Internal Noise Level Limits within Habitable Rooms

Activity	Location	Noise Limit, dB	
		Daytime 0700 – 2300h L _{Aeq, 16h}	Night-Time 2300 – 0700h L _{Aeq, 8h}
Resting	Living Room	35	-
Dining	Dining Room/Area	40	-
Sleeping (daytime resting)	Bedroom	35	30

- 5.12 The following Table 5.4 shows the predicted internal noise levels relating to the 1st Floor of 23 Chandos Road South, assuming that a partially open window provides 15dB attenuation from outside to inside.

Table 5.4 – Predicted Internal Noise Levels at No.23 (1st Floor)

Night-time External Sound Level (dBL _{Aeq,T})	Sound reduction external to internal (dB)	Predicted Internal noise level (dBL _{Aeq,T})
35	15	20

- 5.13 The predicted internal noise level of 20dBL_{Aeq,T} is significantly below the recommended noise level of 30dBL_{Aeq,8hrs} for bedrooms during the night-time period.
- 5.14 The above assessment demonstrates that noise from the ASHP would be suitably controlled to achieve appropriate internal noise levels in the worst affected neighbouring property. Based on the assessment findings in Table 5.2 and 5.4, the measured ASHP noise levels could be considered acceptable and suitable to discharge Conditions 16 & 17, subject to approval from MCC.
- 5.15 In accordance with national planning policy, and as already stated above, noise shouldn't be considered in isolation. It is understood that ASHPs are low carbon technology (compared to traditional heating systems) and are a part of the solution for the government meeting its carbon neutral goals.

APPENDIX A – Acoustic Terminology in Brief

Sound Description

Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air. The rate at which the pressure fluctuations occur determines the pitch or *frequency* of the sound. The frequency is expressed in Hertz (*Hz*), that is, cycles per second. The human ear is sensitive to sounds from about 20 Hertz to 20,000 Hertz. Although sound can be of one discrete frequency - a 'pure tone' - most sound is made up of many different frequencies.

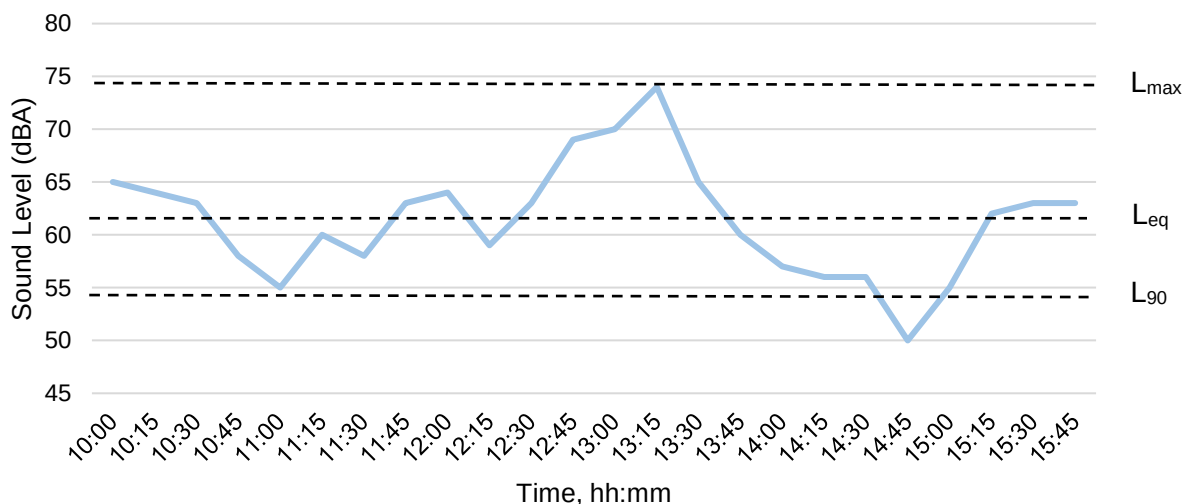
The human ear is more sensitive to some frequencies than others, and modern instruments can measure sound in the same subjective way. This is the basis of the A-weighted sound pressure level *dBA*, normally used to assess the effect of noise on people. The *dBA* weighting emphasises or reduces the importance of certain frequencies within the audible range.

Sound Units

In order to assess environmental noise, measurements are carried out by sampling over specific periods of time, such as fifteen minutes or one hour, the statistically determined results being used to quantify various aspects of the sound.

The figure below shows an example of sound level varying with time. Because of this time variation, the same period of sound can be described by several different levels. The most common of these are described below. It should be noted that in many instances in the main body of text, the unit will be preceded by a *dB* descriptor in the report e.g. $L_{Aeq,T}$ could be written $dB L_{Aeq,T}$.

Example of Sound Varying with Time



Unit Type	Acoustic Unit	Description
Standard Acoustic Units		
Ambient Sound Level	$L_{Aeq, T}$	The equivalent continuous (A-weighted) sound level. It may be thought of as the “average” sound level over a given time, T. It is used for assessing noise from various sources: industrial and commercial premises, construction sites, railways and other intermittent noises and can be considered as the “ambient” noise level.
Percentile Level	L_{A1}	The (A-weighted) sound level exceeded for 1% of a measurement period. It is the value generally used to indicate a ‘typical’ maximum noise level.
	L_{A10}	The (A-weighted) sound level exceeded for 10% of a measurement period. It is the value often used to describe traffic noise.
	L_{A90}	The (A-weighted) sound level exceeded for 90% of a measurement period. It is the value often used to describe background noise.
Maximum Sound level	L_{Amax}	The maximum (A-weighted) sound level measured during a given time. ‘Fast’ or ‘Slow’ meter response should be cited.
Additional Acoustic Units		
Sound Exposure Level (SEL)	L_{AE}	The sound exposure level is a notional noise level and describes the average L_{Aeq} noise level of an event over a given time period as if it occurred during a one second period. This allows the L_{Aeq} to be determined over a time period with a number of distinct events.
Free-field Level	-	This refers to the sound level measured outside, away from reflecting surfaces.
Façade Level	-	This refers to the sound level measured outside, at 1m from a hard-reflecting surface, typically 3dB greater than the free-field level.
BS 4142:2014+A1:2019 Additional Acoustic Units		
Ambient Sound Level	$L_{Aeq, T}$	Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T.
Background Sound Level	L_{A90}	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting, F, and quoted to the nearest whole number of decibels.
Rating Level	$L_{Ar, Tr}$	Specific sound level plus any adjustment for the characteristic features of the sound
Residual Sound	$L_{Aeq, T}$	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
Specific Sound Level	$L_{Aeq, Tr}$	Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, r.

APPENDIX B – Noise Survey Details

TABLE B1 – Measurement Details

Date & Time of Survey:	Thursday 20 October 2022, 1900 to 0020h					
Personnel:	David Terry (AEC)					
Equipment Used:	B&K 2260 Real Time Analyser (AEC Kit 2)					
Calibration:	The sound level analyser, which conforms to BS EN 61672-1: 2013 ' <i>Electroacoustics – Sound level meters - Part 1 Specifications</i> ' for Class 1 Type Z meters, was in calibration and check calibrated before and after the measurement periods using a Brüel & Kjær type 4231 (94dB) calibrator. There was no significant drift of calibration. Calibration certificates are available on request.					
Weather Conditions:	Date	Period	Wet/Dry	Temp°C	Wind Speed & Direction	Cloud Cover
	20/10/2022	Evening/Night	Dry	15°C	Negligible	40%
Measurement Locations:	Measurements were undertaken at one location in the rear of 25 Chandos Road South, identified as A on Figure 3.1 and described below. A – centrally in the rear garden of 25 Chandos Road South.					
Measurement Details:	Measurements were between 10 to 15 minutes in duration and were relatively consistent. Measurements were undertaken over various periods in terms of L_{eq} , L_{90} , and L_{max} .					
Façade / Free-Field:	A - free-field Full results for the attended measurements are given in Table B1.					
Measured Data:	Full 1/3 octave band centre frequency data was obtained for all measurements.					

TABLE B1 – Measured Daytime Noise Levels (Baseline)

Location	Period, h	Noise Level, dB			Comments
		L_{Aeq}	L_{A90}	$L_{Amax, F}$	
A	1925 – 1935	43.3	40.9	49.2	Distant road traffic & Aircraft. Local Car movements. Tram movements.
	2215 – 2225	41.3	38.9	56.6	
	2303 – 2313	42.5	37.2	58.8	
	2330 – 2355	42.4	37.7	53.7	
	0000 – 0010	41.2	37.9	49.5	