



**Former Clever Clowns
Nursery, Greenbrow Road,
Wythenshawe:**

Noise Assessment

SK Developments

7 March 2024

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EXECUTIVE SUMMARY

The results of a noise measurement survey and desk-based assessment of noise are presented, with respect to the proposed residential development of land at Greenbrow Road, Wythenshawe, Manchester, formerly the Clever Clowns Day Nursery.

The assessment shows that the site is principally affected by traffic noise from Greenbrow Road and that, with respect to internal noise levels in habitable rooms, to achieve the Council's noise criteria, windows will need to remain closed. Consequently, a ventilation strategy will be required.

Suitable mitigation measures are recommended to ensure that the residential amenity of future residents of the development will be suitably protected and the assessment concludes that, with these measures in place, noise need not be a reason for refusal of planning permission.

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1. INTRODUCTION

- 1.1 EnviroSolution Ltd was commissioned by SK Developments to undertake an assessment of noise affecting the proposed residential development of land comprising the former Clever Clowns Day Nursery at Greenbrow Road, Wythenshawe, Greater Manchester.
- 1.2 The site, indicated in Figure 1, is set within a primarily residential area with a small row of local shops nearby.

Figure 1: Site area and surroundings



- 1.3 The plans involve the demolition of the existing building and the construction of a single apartment block, comprising 20 apartments, as indicated in Figure 2.

Figure 2: Indicative site layout



- 1.4 Traffic noise from Greenbrow Road dominates the ambient noise affecting the site during the day and night time and, other than the local shops, there are no significant commercial or industrial uses in the immediate vicinity.
- 1.5 This report presents the results of a noise measurement survey and a desk-based assessment of environmental noise affecting the site with respect to its proposed residential use. Where appropriate, recommendations for suitable noise control and mitigation measures are discussed.
- 1.6 A glossary of acoustic terminology is provided at Appendix A.

2. GUIDANCE

Noise – national and local policy guidance

- 2.1 Planning policies are set at both a national and local level. With respect to national policy, assessment of the suitability of a site for residential development is guided by the National Planning Policy Framework (NPPF), issued in March 2012 and amended in 2018, 2019, 2021 and 2023.
- 2.2 With regard to noise, the NPPF (“the Framework”) does not provide specific noise policies or defined noise limits, but rather is intended to enable the planning system to support the Government’s aims and objectives with respect to sustainable development, and provides “a *framework within which locally-prepared plans for housing and other development can be produced*” and “*requires that applications for planning permission be determined in accordance with the development plan, unless material considerations indicate otherwise*”.
- 2.3 None of the current local or national planning policies preclude residential development of the site.
- 2.4 Additional national planning guidance is provided in the Government’s Noise Policy Statement for England (NPSE – “the Noise Policy”), to which the Framework makes specific reference as the main source of national guidance specifically on planning and noise.
- 2.5 The Noise Policy has a long term vision to “*Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development*”. The vision is supported by three key aims intended to promote sustainable development with respect to noise so that “*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*”.
- 2.6 Health is defined by the World Health Organisation as “*a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity, and recognises the enjoyment of the highest attainable standard of health as one of the fundamental rights of every human being*” and the Noise Policy makes “*a distinction between ‘quality of life’ which is a subjective measure that refers to people’s emotional, social and physical well being and ‘health’ which refers to physical and mental well being*”.
- 2.7 However, the Noise Policy recognises that it is not currently possible to define a single objective noise level having specific effects on people, hence the emphasis on “promoting” improvements to health and quality of life through effective management of noise, considered in the context of the wider environment and factors other than noise.
- 2.8 Additional guidance is given in the Planning Practice Guidance Note (PPG) on noise, issued in March 2014, alongside the NPPF and updated in 2018 and July 2019. This “*advises on how planning can manage potential noise impacts in new development*”. The PPG suggests the following noise exposure hierarchy, based on average responses to noise:

Table 1: PPG noise exposure and response hierarchy

Perception	Examples of outcomes	Increasing effect level	Action
<i>No Observed Effect Level (NOEL)</i>			
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
<i>Lowest Observed Adverse Effect Level (LOAEL)</i>			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
<i>Significant Observed Adverse Effect Level (SOAEL)</i>			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

2.10 Beyond this, however, the guidance is relatively generic. It avoids specifying 'acceptable' environmental noise levels as the acceptability of a source of is both subjective and context-dependant.

2.11 Local planning policy is defined in the Council's Core Strategy (CS) Development Plan Document, adopted in July 2012.

2.12 Policy **DM1 Development Management** states:

"All development should have regard to the following specific issues for which more detailed guidance may be given within a supplementary planning document:-

- Effects on amenity, including privacy, light, noise, vibration, air quality, odours, litter, vermin, birds, road safety and traffic generation. This could also include proposals which would be sensitive to existing environmental conditions, such as noise".*

2.13 Retained policies from the previous Unitary Development Plan (UDP) include Citywide Development Control Policy **26 Development and Noise**. Policy 26.1 states:

"The Council intends to use the development control process to reduce the impact of noise on people living and working in, or visiting, the City. In giving effect to this intention, the Council will consider both:

a) the effect of new development proposals which are likely to be generators of noise;

and

b) the implications of new development being exposed to existing noise sources which are effectively outside planning control".

2.14 Policy **DC26.4** states:

"Where the Council believes that an existing noise source might result in an adverse impact upon a proposed new development, or where a new proposal might generate potentially unacceptable levels of noise, it will in either case require the applicant to provide an assessment of the likely impact and of the measures he proposes to deal satisfactorily with it.

Such measures might include the following:

a) engineering solutions, including reduction of noise at source, improving sound insulation of sensitive buildings or screening by purpose-built barriers;

b) layout solutions, including consideration of the distance between the source of the noise and the buildings or land affected by it and screening by natural barriers or other buildings or noncritical rooms within a building; and

c) administrative steps, including limiting the operating times of the noise source, restricting activities allowed on the site or specifying an acceptable noise limit. Any or all of these factors will be considered appropriate for inclusion in conditions on any planning permission.

Policy **DC26.5** states:

"The Council will control noise levels by requiring, where necessary, high levels of noise insulation in new development as well as noise barriers where this is appropriate".

2.15 Nothing in local planning policy precludes the proposed development.

Noise – technical guidance

2.16 In May 2017, a Working Group consisting of representatives of the Association of Noise Consultants (ANC), Institute of Acoustics (IOA) and Chartered Institute of Environmental Health (CIEH) produced a Professional Practice Guidance (Pro PG) document¹. The guidance

¹ ANC, IOA & CIEH (2017) *Pro PG: Planning & Noise Professional Practice Guidance on Planning & Noise: New*

was produced “to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England” and “which encourages better acoustic design for new residential development and aims to protect people from the harmful effects of noise”. Its primary aim is “to assist the delivery of sustainable development by promoting good health and wellbeing through the effective management of noise. It seeks to do that through encouraging a good acoustic design process in and around proposed new residential development having regard to national policy on planning and noise”.

- 2.17 The guidance identifies that “Good acoustic design is about more than the numbers. It is a holistic design process that creates places that are both comfortable and attractive to live in, where acoustics is considered integral to the living environment.

Good acoustic design can involve, for example, careful site layouts and better orientation of rooms within dwellings. Good acoustic design does not mean “gold plating” or significantly increasing costs. This guidance seeks to encourage and promote design outcomes that are proportionate and reasonable in the particular circumstances of each development site”.

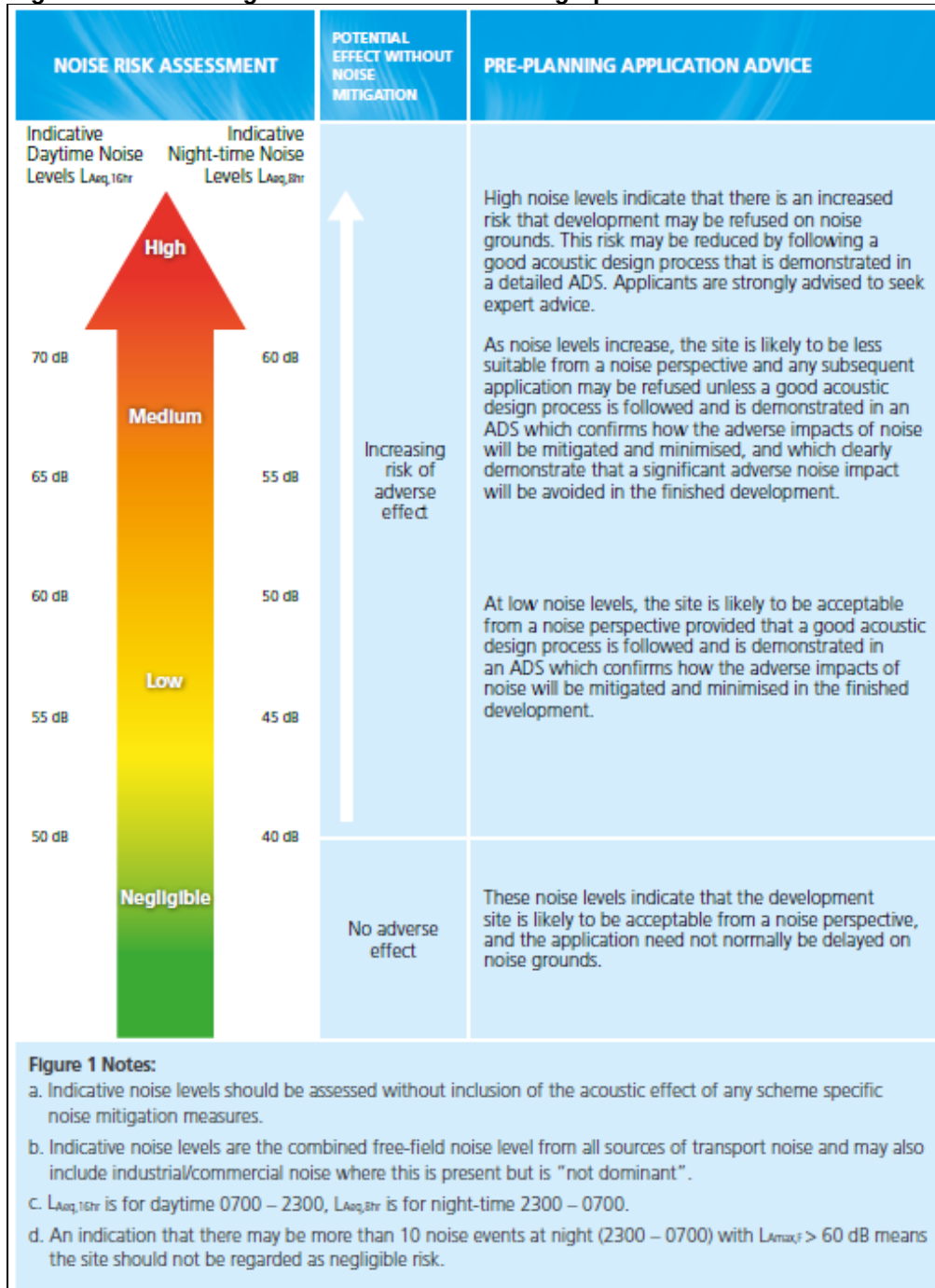
- 2.18 It should be noted that the Pro PG “does not constitute an official government code of practice and neither replaces nor provides an authoritative interpretation of the law or government policy on which users should take their own advice as appropriate”.

- 2.19 The guidance “advocates a systematic, proportionate, risk based, 2-stage, approach. The approach encourages early consideration of noise issues, facilitates straightforward accelerated decision making for lower risk sites, and assists proper consideration of noise issues where the acoustic environment is challenging”. The two sequential stages are:

- Stage 1 – an initial noise risk assessment of the proposed development site; and
- Stage 2 – a systematic consideration of four key elements.

- 2.20 Figure 1 of the guidance provides a useful graphical overview of the Stage 1 risk assessment considerations, reproduced as Figure 3.

Figure 3: ProPG Stage 1 risk assessment info-graphic



2.21 The four key elements to be undertaken in parallel during Stage 2 of the recommended approach are:

- Element 1 – demonstrating a “Good Acoustic Design Process”;
- Element 2 – observing internal “Noise Level Guidelines”;
- Element 3 – undertaking an “External Amenity Area Noise Assessment”; and
- Element 4 – consideration of “Other Relevant Issues”.

2.22 “The approach is underpinned by the preparation and delivery of an “Acoustic Design Statement” (ADS). An ADS for a site assessed as high risk should be more detailed than for a

site assessed as low risk. An ADS should not be necessary for a site assessed as negligible risk”.

- 2.23 Additional specific advice is provided in Manchester City Council’s document “*Planning and Noise: Technical Guidance*” issued in October 2022. This references British Standard (BS) 8233: 2014 *Guidance on sound insulation and noise reduction for buildings* gives recommendations for internal noise levels for residential dwellings in order to protect residential amenity, based on health-based research, as follows:
- Living rooms during the day 35 dB $L_{Aeq,16hour}$
 - Dining rooms during the day 40 dB $L_{Aeq,16hour}$
 - Bedrooms during the day 35 dB $L_{Aeq,16hour}$
 - Bedrooms during the night 30 dB $L_{Aeq,8hour}$
- 2.24 These values can be taken to be broadly equivalent with the LOAEL in the PPG. Note that these are not specific criteria or ‘target’ noise levels, merely indicative recommendations which will be context-dependant. However, most Local Authorities tend to apply the recommended noise levels as strict criteria.
- 2.25 In most standard modern properties, the walls and roof provide relatively high levels of sound insulation of greater than 40 dB; the weakest part of a building facade, with respect to noise, is generally the windows. Modern construction methods for new residential properties incorporate standard thermal double-glazing which, the standard suggests, will provide approximately 33 dB R_w of sound attenuation when closed. The standard does not specifically give sound attenuation values for partially open windows, although the worked example (G.1) at Annex G of the Standard indicates that a partially open window would provide 15 dB of sound attenuation.
- 2.26 For calculation of noise ingress through a closed window, this requires that the external measured/calculated sound pressure level is a ‘façade’ level i.e. subject to the addition of façade-reflected sound energy; this requires the addition of 3 dB to any measured/calculated ‘free-field’ levels.
- 2.27 Conversely, calculation of noise ingress through a partially open window, requires that the external measured/calculated sound pressure level is a ‘free-field’ level i.e. without the addition of façade-reflected sound energy; this requires the subtraction of 3 dB from any measured/calculated ‘façade’ levels.
- 2.28 With regard to night time maximum (L_{AFmax}) noise levels, BS 8233 (Note 4) states the following:
“Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values”.
- 2.29 Other recent guidance² states “it is considered that if, in bedrooms at night, the $L_{Amax,F}$ from individual noise events (from all sources) would not normally exceed 45dB more than 10 times a night, then this represents a reasonable threshold below which the effects of individual noise events on sleep can be regarded as negligible”. Consequently, the 10th highest measured night time maximum noise level is used.

² ANC, IOA & CIEH (2017) Pro PG: Planning & Noise Professional Practice Guidance on Planning & Noise: New Residential Development

2.30 Manchester City Council's technical guidance states the following:

"In the context of government policy, the Council require that developments aim for:

1. A noise level between the No Observed Effect Level (this is the level of noise exposure below which no effect at all on health or quality of life can be detected) and the Lowest Observed Adverse Effect Level (this is the level of noise exposure above which adverse effects on health and quality of life can be detected). Conditions may be attached.

If point 1 cannot be achieved, then:

2. If the assessment results in a level between the Lowest Observed Adverse Effect Level and the Significant Observed Adverse Effect Level (this is the level of noise exposure above which significant adverse effects on health and quality of life occur), mitigation will be necessary to reduce the level and thus conditions will be attached.

If points 1 & 2 cannot be achieved, then:

3. If the assessment results in a Significant Observed Adverse Effect Level after mitigation, the application will be recommended for refusal".

2.31 Consequently, the document states that:

"The Council has adopted the following noise limits for residential properties:

- Bedrooms (night time - 23.00 - 07.00) 30 dB L_{Aeq} (individual noise events should not normally exceed 45 dB L_{Amax,F} by more than 10 times)*
- Living Rooms (daytime - 07.00 - 23.00) 35 dB L_{Aeq}".*

2.32 The assessment also makes reference to the recently published Approved Document (AD) O of the Building Regulations 2010 "Overheating". This is applicable to new dwellings and, whilst, technically, an issue for Building Control determination at a later stage in the development process, the requirements for ventilation affect the noise mitigation provided by the building envelope and its design; hence, it is necessary to consider the implications of the AD at the Planning Stage.

2.33 Requirement 01 of the AD "Overheating mitigation" states that:

(1) Reasonable provision must be made in respect of a dwelling, institution or any other building containing one or more rooms for residential purposes, other than a room in a hotel ("residences") to-

- (a) limit unwanted solar gains in summer;*
- (b) provide an adequate means to remove heat from the indoor environment.*

(2) In meeting the obligations in paragraph (1)-

- (a) account must be taken of the safety of any occupant, and their reasonable enjoyment of the residence; and*
- (b) mechanical cooling may only be used where insufficient heat is capable of being removed from the indoor environment without it".*

2.34 With respect to categorising residential buildings, the document provides a "Simplified method" under which this site would be categorised as being a "moderate risk location" for overheating; this applies to all properties in "England, excluding high risk parts of London in (b)".

2.35 Paragraph 1.4 states:

"For the purposes of following the simplified method, it should be identified whether the

dwellinghouse or each residential unit, shared communal room and common space is able to have cross-ventilation, i.e. it has openings on opposite façades". Openings on adjacent facades is insufficient.

2.36 The significance of referencing the AD is demonstrated in Section 2 of the document:

"2.10 Excess heat should be removed from the residential building by any of the following means.

- a. Opening windows (the effectiveness of this method is improved by cross-ventilation).*
- b. Ventilation louvres in external walls.*
- c. A mechanical ventilation system.*
- d. A mechanical cooling system*

2.11 The building should be constructed to meet requirement O1 using passive means as far as reasonably practicable. It should be demonstrated to the building control body that all practicable passive means of limiting unwanted solar gains and removing excess heat have been used first before adopting mechanical cooling. Any mechanical cooling (air-conditioning) is expected to be used only where requirement O1 cannot be met using openings".

2.37 In other words, any requirement for windows to remain closed to achieve suitable (guideline) internal noise conditions, may affect the overheating/cooling strategy and, subsequently, the design of the building(s). This is clarified further on in Section where it is stated that:

"In the Secretary of State's view, requirement O1(2)(a) is met in a new residential building if the building's overheating mitigation strategy for use by occupants takes account of all of the following.

- a. Noise at night – paragraphs 3.2 to 3.4.*
- b. Pollution – paragraph 3.5.*
- c. Security – paragraphs 3.6 and 3.7.*
- d. Protection from falling – paragraphs 3.8 to 3.10.*
- e. Protection from entrapment – paragraph 3.11".*

2.38 Section 3 of the AD provides the following noise-specific guidance:

"Noise

3.2 In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).

3.3 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)".*

2.39 Unusually, these values are not in accordance with those provided in BS 8233, which are 5 to 10 dB lower. Consequently, this assessment, conservatively, references the BS 8233 values.

3. METHODOLOGY

- 3.1 The assessment incorporated a noise measurement survey comprising the use of a single sound level meter located at the front boundary of the property overlooking Greenbrow Road.
- 3.2 The meter recorded continuous, consecutive 1-minute and 5-minute free-field sound pressure levels between 12:00pm on Wednesday 15 November and 1:00pm on Thursday 16 November 2023. Additionally, the meter recorded 1/3rd octave band acoustic frequency data for every 5-minute measurement sample as well as a continuous audio recording throughout the survey.
- 3.3 The measurement positions are shown in Figures 4 and 5.

Figure 4: Noise measurement position

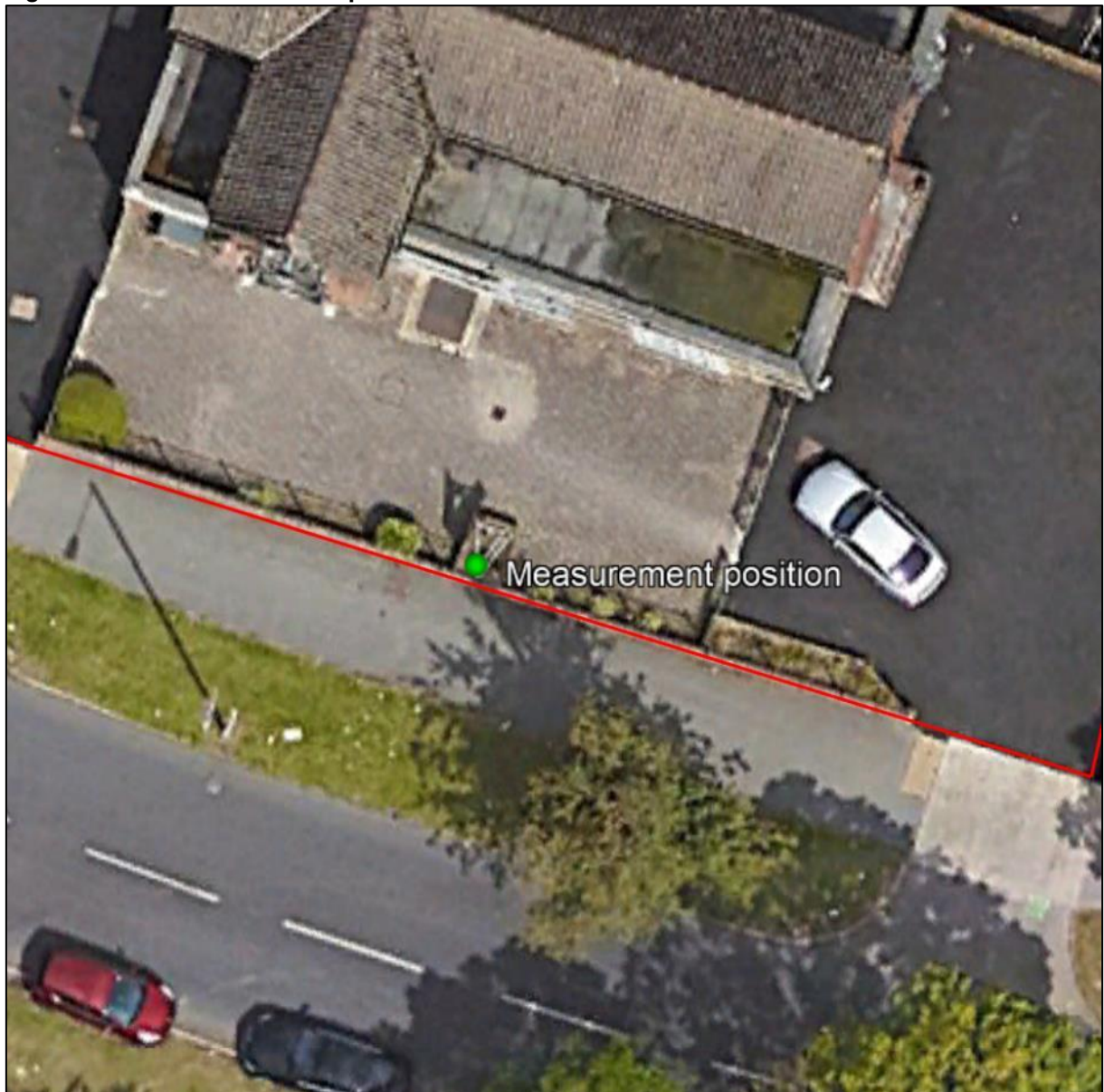


Figure 5: Photograph of meter in position (microphone circled)



- 3.4 The measurements were undertaken using an NTI XL2 Class 1 (IEC 61672: 2013) integrating, averaging sound level meter, placed in a locked, weatherproof case with the microphone, protected by a proprietary wind-shield, solidly fixed to the sign at the front of the property, with a clear and unobstructed line of sight of Greenbrow Road.
- 3.5 The meter was field-calibrated before and after the survey and no variation in calibration tone was observed. The weather during the survey was cool with periods of very light rain and moderate winds on the afternoon of the 15 November, reducing to calm, dry conditions overnight; on collection of the meter, the surface of the road was noted to be dry.
- 3.6 The measurement position was 7 metres from the edge of Greenbrow Road whilst the proposed building façade will be approximately 8 metres from the edge of the road; the difference in distance is negligible so the measured data are taken to be the levels that would affect the proposed building facade.
- 3.7 The assessment was undertaken principally with respect to the requirements of the Council's adopted criteria, as specified in paragraph 2.31.

4 DATA, RESULTS, ASSESSMENT & DISCUSSION

Survey results

- 4.1 The recorded measurement data, rounded to the nearest whole integer, for the day time (7:00am to 11:00pm) and night time (11:00pm to 7:00am) periods, are summarised in Table 2; the 2 partial daytime data sets were combined to produce a single day time data set. The night time maximum (L_{AFmax}) is the 10th highest level.

Table 2: Measurement data

Period	Measured noise (dB)	
	L_{Aeq}	L_{AFmax}^*
Day	62	-
Night	55	74

* 10th highest

- 4.2 The 5-minute data are presented in tabular format at Appendix B but the 1-minute data are too numerous to present in this report in tabular format - these data are available on request as are the audio recordings.
- 4.3 With respect to potential effects of adverse weather conditions on the measured data, examination of the data for the afternoon/evening of the 15 November and for the morning of the 16 November showed that the measured level, on both days, was 62 dB L_{Aeq} ; this indicates that the light rain and moderate winds on the 15 November did not adversely affect the measurement data.
- 4.4 With respect to noise from the adjacent shops, the layout of the site, presented in Figures 2 and 6, shows that, not only will there be no windows on the side façade of the apartments facing the shops, but that the apartment block will be entirely screened from the shops by the intervening 3-storey apartment block; noise from the shops is, therefore, not considered to be a significant cause for concern.

Figure 6: Proposed layout of development



- 4.5 Table 3 presents the calculated internal noise levels in habitable rooms closest to, and facing, Greenbrow Road, assuming 15 dB and 33 dB R_w of sound attenuation through an open and closed window, respectively; for the calculation of noise ingress through a closed window, the free-field noise data presented in Table 2 were subject to the addition of 3 dB to derive a façade level, as described in paragraph 2.26.

Table 3: Internal noise calculations

Period	Measured noise (dB)	
	L_{Aeq}	L_{AFmax}
Windows closed		
Day	32	-
Night	25	44
Windows open		
Day	47	-
Night	40	59

* 10th highest value

- 4.6 Relative to the Council's criteria, the data in Table 3 show that, with windows closed, the internal noise levels will be suitable for the preservation of residential amenity.
- 4.7 With windows partially open, however, the data show that the criteria will be exceeded. Consequently, glazing for habitable rooms at the front of the building, facing Greenbrow Road, will need to remain closed. As the sound affecting the building is associated with road traffic, it is additionally recommended that glazing in bedrooms closest to, and facing, Greenbrow

Road, achieve a sound insulation value of $33 \text{ dB } R_w + C_{tr}$ in order to fully protect residents at night; C_{tr} is a correction factor that provides additional protection against low frequency noise arising from the operation of diesel engines, heavy goods vehicles and buses etc.

- 4.8 It is evident, therefore, that habitable rooms at the front of the building and facing Greenbrow Road, will also require the provision of sufficient levels of both background and cooling ventilation without the need to open windows, in accordance with the requirements of Approved Documents F and O of the Building Regulations 2010, whilst ensuring that the Council's criterion noise levels are achieved.
- 4.9 Background ventilation *may* be achieved through the use of acoustically-attenuating trickle ventilation units, specified to achieve a minimum performance of at least $36 \text{ dB } D_{n,e,w} + C_{tr}$, when open. This, however, may not provide sufficient levels of cooling ventilation which may require the provision of a mechanical ventilation strategy which must, therefore, form part of a wider overheating mitigation and ventilation strategy; the project is not yet sufficiently developed for the full overheating mitigation and ventilation strategy to have been prepared. Compliance with the Building Regulations is, in any case, a matter for determination by the Council's Building Control Department, post-planning. However, in order to ensure that residential amenity is sufficiently protected, a suitably worded condition can be applied to any planning permission for the development, such as the following example, derived from those recommended by the Planning Inspectorate:
- "The building envelope shall be constructed so as to provide sufficient protection against external noise, so as to ensure that the Council's criterion internal noise levels are achieved, as recommended in the Noise Assessment Report prepared by EnviroSolution Ltd <reference>, with windows shut and other means of overheating prevention and ventilation provided. The necessary works shall be completed before the dwellings are occupied and be retained thereafter".*
- 4.10 With the provision of suitable glazing and ventilation, the assessment concludes that the residential amenity of future residents of the property will be suitably protected.

5 CONCLUSION

- 5.1 The assessment has shown that the site is principally affected, during the day and night time, by traffic noise from Greenbrow Road.
- 5.2 The assessment concluded that, with windows closed, noise levels in habitable rooms with windows at the front of the building, facing Greenbrow Road, will meet the Council's noise criteria; the assessment recommends, however, that glazing for bedrooms on facades closest to, and facing, Greenbrow Road, should be uprated to provide 33 dB $R_W + C_{tr}$ of sound insulation.
- 5.3 Additionally, for these rooms, windows would need to remain closed to achieve the Council's criteria and alternative means of providing both background and cooling ventilation will be required; the use of acoustically-attenuating trickle ventilation is offered as a means of providing background ventilation and the assessment notes that mechanical ventilation may be required to provide suitable levels of cooling ventilation. However, the assessment notes that these considerations must form part of a wider overheating mitigation and ventilation strategy. A suitably worded planning condition is recommended to provide for this whilst ensuring compliance with the internal (habitable room) noise levels required by the Council.
- 5.4 For habitable rooms with windows facing towards the rear of the property, these may be opened for ventilation and the Council's criteria achieved.
- 5.5 Noise from the nearby shops is not considered to be a cause for concern as the proposed building is entirely screened from them by the intervening 3-storey apartment building.
- 5.6 The assessment concludes, therefore, that with these mitigation measures in place, the residential amenity of future residents of the development will be suitably protected and that noise need not be a reason for refusal of planning permission.

APPENDIX A

Glossary of acoustic terms

Ambient noise: the noise from all sources, both near and far, at any given time. Conventionally defined using the A-weighted equivalent continuous noise level (L_{Aeq}) [see below].

Background noise level (dB L_{A90}): In the UK, the 90th percentile noise level (L_{A90}) is generally used to define 'background' noise. This is a statistical parameter describing the noise level that is exceeded for 90% of the measurement or assessment time. Its value lies in the fact that it is a statistical value, towards the lower end of a measured range of data, and which is relatively 'stable' i.e. not adversely affected by occasional high-energy noise events.

Decibel (dB): a unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 micro-Pascals (μPa), the threshold of normal hearing is in the region of 0 dB, and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.

dB(A) / A-weighting: decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change (in steady noise) of 3 dB(A) is the minimum perceptible under normal conditions and a change of 10 dB(A) corresponds roughly to halving or doubling the *loudness* of a sound. The background noise level in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).

$L_{Aeq,T}$: the equivalent continuous sound level - the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). L_{Aeq} is used to describe many types of noise and can be measured directly with an integrating sound level meter.

L_{Amax} : the maximum single-event noise level attained during a measurement period.

Noise: any audible sound. Often defined as unwanted sound. Can be damaging to hearing if it is too loud or can be just annoying if it interferes with the normal enjoyment of others.

Sound / sound pressure: a fluctuation in air pressure over the static ambient pressure.

Sound pressure level: the sound pressure relative to a standard reference pressure of 20 μPa (20×10^{-6}) on the decibel scale.

APPENDIX B: Data

Table 4: Measured 5-minute noise data

Date	Time	Measured noise (dB)	
		L _{Aeq}	L _{AFmax}
15/11/2023	12:00:00	59.8	73.4
15/11/2023	12:05:00	61.6	79.4
15/11/2023	12:10:00	61.5	74.2
15/11/2023	12:15:00	61.1	73.2
15/11/2023	12:20:00	59.6	70.3
15/11/2023	12:25:00	57.0	70.6
15/11/2023	12:30:00	58.2	69.3
15/11/2023	12:35:00	61.7	75.1
15/11/2023	12:40:00	60.2	70.7
15/11/2023	12:45:00	60.9	74.7
15/11/2023	12:50:00	60.4	73.7
15/11/2023	12:55:00	60.5	70.7
15/11/2023	13:00:00	62.1	76.2
15/11/2023	13:05:00	58.3	68.4
15/11/2023	13:10:00	60.2	72.7
15/11/2023	13:15:00	62.9	73.2
15/11/2023	13:20:00	58.2	70.3
15/11/2023	13:25:00	61.3	71.9
15/11/2023	13:30:00	60.6	76.2
15/11/2023	13:35:00	59.5	72.5
15/11/2023	13:40:00	60.2	73.5
15/11/2023	13:45:00	59.8	72.1
15/11/2023	13:50:00	62.4	75.2
15/11/2023	13:55:00	58.5	72.3
15/11/2023	14:00:00	60.9	75.5
15/11/2023	14:05:00	60.5	73.0
15/11/2023	14:10:00	58.6	72.9
15/11/2023	14:15:00	60.4	73.5
15/11/2023	14:20:00	60.5	74.0
15/11/2023	14:25:00	59.6	70.3
15/11/2023	14:30:00	62.9	77.6
15/11/2023	14:35:00	61.6	74.4
15/11/2023	14:40:00	60.3	72.8
15/11/2023	14:45:00	62.7	73.5
15/11/2023	14:50:00	60.9	70.5
15/11/2023	14:55:00	70.5	91.5
15/11/2023	15:00:00	61.0	71.8
15/11/2023	15:05:00	61.8	74.3
15/11/2023	15:10:00	60.7	71.5
15/11/2023	15:15:00	60.2	71.2
15/11/2023	15:20:00	63.1	73.8
15/11/2023	15:25:00	63.7	80.7

Date	Time	Measured noise (dB)	
		L _{Aeq}	L _{AFmax}
15/11/2023	15:30:00	62.9	72.6
15/11/2023	15:35:00	64.1	72.3
15/11/2023	15:40:00	62.9	73.0
15/11/2023	15:45:00	64.2	77.7
15/11/2023	15:50:00	62.9	76.2
15/11/2023	15:55:00	63.7	74.3
15/11/2023	16:00:00	63.6	72.9
15/11/2023	16:05:00	62.6	73.6
15/11/2023	16:10:00	63.6	77.7
15/11/2023	16:15:00	63.1	74.3
15/11/2023	16:20:00	62.2	70.5
15/11/2023	16:25:00	63.0	72.2
15/11/2023	16:30:00	62.8	74.4
15/11/2023	16:35:00	62.4	72.3
15/11/2023	16:40:00	62.7	74.1
15/11/2023	16:45:00	63.1	73.8
15/11/2023	16:50:00	64.1	72.7
15/11/2023	16:55:00	63.2	74.5
15/11/2023	17:00:00	63.7	74.2
15/11/2023	17:05:00	62.2	72.6
15/11/2023	17:10:00	62.9	75.0
15/11/2023	17:15:00	63.9	76.0
15/11/2023	17:20:00	64.2	74.2
15/11/2023	17:25:00	63.5	76.5
15/11/2023	17:30:00	64.2	76.9
15/11/2023	17:35:00	63.5	71.9
15/11/2023	17:40:00	62.7	73.7
15/11/2023	17:45:00	63.1	73.7
15/11/2023	17:50:00	63.8	74.0
15/11/2023	17:55:00	60.5	70.7
15/11/2023	18:00:00	63.5	72.8
15/11/2023	18:05:00	61.7	72.2
15/11/2023	18:10:00	62.6	72.0
15/11/2023	18:15:00	63.5	72.6
15/11/2023	18:20:00	62.1	74.3
15/11/2023	18:25:00	61.7	70.5
15/11/2023	18:30:00	61.9	74.0
15/11/2023	18:35:00	63.3	76.3
15/11/2023	18:40:00	64.1	77.6
15/11/2023	18:45:00	62.3	74.1
15/11/2023	18:50:00	62.2	75.2
15/11/2023	18:55:00	62.2	73.1
15/11/2023	19:00:00	61.9	73.4
15/11/2023	19:05:00	63.7	74.9
15/11/2023	19:10:00	62.0	73.9

Date	Time	Measured noise (dB)	
		L _{Aeq}	L _{AFmax}
15/11/2023	19:15:00	62.6	73.2
15/11/2023	19:20:00	61.2	74.3
15/11/2023	19:25:00	61.9	74.6
15/11/2023	19:30:00	63.6	75.6
15/11/2023	19:35:00	63.8	74.2
15/11/2023	19:40:00	62.0	71.3
15/11/2023	19:45:00	60.3	73.7
15/11/2023	19:50:00	60.7	72.4
15/11/2023	19:55:00	61.9	72.7
15/11/2023	20:00:00	62.5	72.7
15/11/2023	20:05:00	60.7	73.0
15/11/2023	20:10:00	62.1	76.4
15/11/2023	20:15:00	60.6	73.4
15/11/2023	20:20:00	55.4	69.3
15/11/2023	20:25:00	59.8	72.8
15/11/2023	20:30:00	59.7	75.8
15/11/2023	20:35:00	59.1	73.7
15/11/2023	20:40:00	59.1	71.5
15/11/2023	20:45:00	59.0	72.9
15/11/2023	20:50:00	59.6	78.1
15/11/2023	20:55:00	60.1	77.6
15/11/2023	21:00:00	59.9	72.7
15/11/2023	21:05:00	59.5	73.1
15/11/2023	21:10:00	58.8	73.7
15/11/2023	21:15:00	60.2	73.9
15/11/2023	21:20:00	58.7	72.3
15/11/2023	21:25:00	59.5	75.1
15/11/2023	21:30:00	58.3	71.6
15/11/2023	21:35:00	57.7	70.7
15/11/2023	21:40:00	56.2	72.1
15/11/2023	21:45:00	55.8	69.0
15/11/2023	21:50:00	57.8	73.4
15/11/2023	21:55:00	56.2	73.3
15/11/2023	22:00:00	58.7	73.1
15/11/2023	22:05:00	58.6	73.8
15/11/2023	22:10:00	57.3	71.5
15/11/2023	22:15:00	53.3	65.6
15/11/2023	22:20:00	54.9	69.1
15/11/2023	22:25:00	58.1	71.9
15/11/2023	22:30:00	56.8	69.1
15/11/2023	22:35:00	58.5	74.1
15/11/2023	22:40:00	59.9	83.0
15/11/2023	22:45:00	54.8	69.4
15/11/2023	22:50:00	57.3	72.2
15/11/2023	22:55:00	57.7	71.3

Date	Time	Measured noise (dB)	
		L _{Aeq}	L _{AFmax}
15/11/2023	23:00:00	56.4	72.6
15/11/2023	23:05:00	57.2	73.8
15/11/2023	23:10:00	56.8	72.6
15/11/2023	23:15:00	55.9	67.3
15/11/2023	23:20:00	55.5	65.0
15/11/2023	23:25:00	57.1	71.5
15/11/2023	23:30:00	55.8	69.9
15/11/2023	23:35:00	54.9	67.3
15/11/2023	23:40:00	56.0	68.1
15/11/2023	23:45:00	55.2	69.7
15/11/2023	23:50:00	52.9	67.3
15/11/2023	23:55:00	53.3	65.9
16/11/2023	00:00:00	55.9	71.9
16/11/2023	00:05:00	56.1	70.1
16/11/2023	00:10:00	55.4	74.4
16/11/2023	00:15:00	53.8	71.2
16/11/2023	00:20:00	54.7	72.3
16/11/2023	00:25:00	55.3	68.9
16/11/2023	00:30:00	52.6	67.4
16/11/2023	00:35:00	53.1	67.4
16/11/2023	00:40:00	52.6	69.5
16/11/2023	00:45:00	55.6	74.0
16/11/2023	00:50:00	45.8	50.8
16/11/2023	00:55:00	54.9	75.5
16/11/2023	01:00:00	55.2	70.8
16/11/2023	01:05:00	51.8	69.7
16/11/2023	01:10:00	53.4	72.3
16/11/2023	01:15:00	47.2	53.0
16/11/2023	01:20:00	46.1	51.4
16/11/2023	01:25:00	45.4	52.6
16/11/2023	01:30:00	45.3	49.6
16/11/2023	01:35:00	49.2	67.7
16/11/2023	01:40:00	43.6	47.8
16/11/2023	01:45:00	43.3	48.4
16/11/2023	01:50:00	52.0	71.8
16/11/2023	01:55:00	48.8	66.1
16/11/2023	02:00:00	47.2	59.5
16/11/2023	02:05:00	48.5	65.2
16/11/2023	02:10:00	47.7	53.7
16/11/2023	02:15:00	51.9	71.4
16/11/2023	02:20:00	46.8	51.3
16/11/2023	02:25:00	46.3	58.2
16/11/2023	02:30:00	46.1	52.2
16/11/2023	02:35:00	47.9	53.0
16/11/2023	02:40:00	50.1	57.2

Date	Time	Measured noise (dB)	
		L _{Aeq}	L _{AFmax}
16/11/2023	02:45:00	49.7	57.8
16/11/2023	02:50:00	48.2	54.9
16/11/2023	02:55:00	50.3	58.0
16/11/2023	03:00:00	55.8	72.2
16/11/2023	03:05:00	50.1	55.4
16/11/2023	03:10:00	50.7	62.9
16/11/2023	03:15:00	53.9	72.2
16/11/2023	03:20:00	50.2	53.7
16/11/2023	03:25:00	52.4	56.4
16/11/2023	03:30:00	53.6	70.2
16/11/2023	03:35:00	53.6	70.0
16/11/2023	03:40:00	51.1	56.1
16/11/2023	03:45:00	49.3	53.0
16/11/2023	03:50:00	49.4	53.4
16/11/2023	03:55:00	52.8	68.7
16/11/2023	04:00:00	50.7	56.7
16/11/2023	04:05:00	51.5	65.4
16/11/2023	04:10:00	50.9	54.5
16/11/2023	04:15:00	53.9	68.5
16/11/2023	04:20:00	53.2	66.2
16/11/2023	04:25:00	51.4	54.7
16/11/2023	04:30:00	61.2	81.1
16/11/2023	04:35:00	53.2	69.8
16/11/2023	04:40:00	49.9	59.3
16/11/2023	04:45:00	50.3	63.8
16/11/2023	04:50:00	54.3	69.2
16/11/2023	04:55:00	57.0	75.2
16/11/2023	05:00:00	52.8	67.0
16/11/2023	05:05:00	53.3	67.8
16/11/2023	05:10:00	53.2	67.5
16/11/2023	05:15:00	57.6	73.5
16/11/2023	05:20:00	53.2	65.1
16/11/2023	05:25:00	52.6	61.9
16/11/2023	05:30:00	53.2	65.3
16/11/2023	05:35:00	56.0	73.7
16/11/2023	05:40:00	58.2	71.1
16/11/2023	05:45:00	59.0	72.5
16/11/2023	05:50:00	58.0	73.9
16/11/2023	05:55:00	58.3	72.9
16/11/2023	06:00:00	56.6	74.0
16/11/2023	06:05:00	58.6	72.6
16/11/2023	06:10:00	59.9	74.6
16/11/2023	06:15:00	58.4	75.7
16/11/2023	06:20:00	60.0	73.2
16/11/2023	06:25:00	60.1	79.3

Date	Time	Measured noise (dB)	
		L _{Aeq}	L _{AFmax}
16/11/2023	06:30:00	58.2	74.1
16/11/2023	06:35:00	56.5	71.9
16/11/2023	06:40:00	59.3	73.0
16/11/2023	06:45:00	61.8	76.5
16/11/2023	06:50:00	60.9	72.0
16/11/2023	06:55:00	60.9	72.6
16/11/2023	07:00:00	60.4	72.6
16/11/2023	07:05:00	59.7	74.9
16/11/2023	07:10:00	60.5	74.2
16/11/2023	07:15:00	63.2	74.6
16/11/2023	07:20:00	61.3	74.0
16/11/2023	07:25:00	62.5	74.4
16/11/2023	07:30:00	64.4	74.6
16/11/2023	07:35:00	63.9	75.2
16/11/2023	07:40:00	64.5	74.6
16/11/2023	07:45:00	65.7	72.9
16/11/2023	07:50:00	64.5	72.5
16/11/2023	07:55:00	65.7	74.0
16/11/2023	08:00:00	64.2	73.8
16/11/2023	08:05:00	64.2	74.0
16/11/2023	08:10:00	63.6	72.9
16/11/2023	08:15:00	63.4	81.0
16/11/2023	08:20:00	64.4	73.5
16/11/2023	08:25:00	63.2	73.1
16/11/2023	08:30:00	63.3	73.7
16/11/2023	08:35:00	63.1	72.0
16/11/2023	08:40:00	63.2	74.7
16/11/2023	08:45:00	62.5	72.1
16/11/2023	08:50:00	62.3	75.4
16/11/2023	08:55:00	62.3	73.5
16/11/2023	09:00:00	62.5	71.0
16/11/2023	09:05:00	62.7	70.6
16/11/2023	09:10:00	63.3	77.8
16/11/2023	09:15:00	59.7	72.2
16/11/2023	09:20:00	62.0	73.7
16/11/2023	09:25:00	60.4	73.5
16/11/2023	09:30:00	60.7	72.1
16/11/2023	09:35:00	61.0	71.5
16/11/2023	09:40:00	60.9	72.7
16/11/2023	09:45:00	61.7	73.5
16/11/2023	09:50:00	61.9	73.1
16/11/2023	09:55:00	60.7	70.2
16/11/2023	10:00:00	62.3	74.4
16/11/2023	10:05:00	60.3	73.0
16/11/2023	10:10:00	59.8	69.4

Date	Time	Measured noise (dB)	
		L _{Aeq}	L _{AFmax}
16/11/2023	10:15:00	60.6	76.3
16/11/2023	10:20:00	59.2	70.3
16/11/2023	10:25:00	57.3	72.8
16/11/2023	10:30:00	58.9	71.2
16/11/2023	10:35:00	61.7	78.1
16/11/2023	10:40:00	56.5	67.6
16/11/2023	10:45:00	58.7	71.0
16/11/2023	10:50:00	60.4	73.4
16/11/2023	10:55:00	62.0	74.3
16/11/2023	11:00:00	61.4	73.8
16/11/2023	11:05:00	58.3	70.5
16/11/2023	11:10:00	61.0	75.4
16/11/2023	11:15:00	60.5	72.8
16/11/2023	11:20:00	61.1	71.7
16/11/2023	11:25:00	60.7	72.4
16/11/2023	11:30:00	58.1	72.0
16/11/2023	11:35:00	58.9	71.5
16/11/2023	11:40:00	61.6	75.6
16/11/2023	11:45:00	59.8	73.3
16/11/2023	11:50:00	59.0	68.8
16/11/2023	11:55:00	60.8	76.4
16/11/2023	12:00:00	62.1	77.6
16/11/2023	12:05:00	59.0	71.4
16/11/2023	12:10:00	58.9	70.5
16/11/2023	12:15:00	61.0	72.0
16/11/2023	12:20:00	60.4	70.7
16/11/2023	12:25:00	60.1	72.6
16/11/2023	12:30:00	60.4	76.5
16/11/2023	12:35:00	60.1	71.0
16/11/2023	12:40:00	60.0	75.6
16/11/2023	12:45:00	60.2	71.7
16/11/2023	12:50:00	58.5	73.6
16/11/2023	12:55:00	64.2	86.6