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Building Compliance Consultants

Town and Country Planning Act 1990

VERIFICATION REPORT - INTERNAL NOISE SURVEY

Land Off Barton Road, Turnchapel, Plymouth PL9 9RH

Noise Surveyor

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HHL Project Ref: 11003/20

LPA Ref: 17/01246/FUL

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Executive Summary

Hilsdon Holmes Limited have been commissioned by Eliot Developments (SW) Limited to carry out a post-completion survey of internal ambient noise levels in Plot 4 at their scheme on Barton Road in Turnchapel, Plymouth.

The results from the surveys are required to be submitted to The Local Planning Authority to discharge conditions 13 & 20 (Ref.1).

This compliance report demonstrates that the survey results meet the internal ambient noise criteria set out in BS 8233:2014 Sound Insulation and Noise Reduction for Buildings and the requirements of the planning conditions 13 & 20 (detailed in Section 2.2).

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1. Introduction

Hilsdon Holmes Limited has been instructed by Eliot Developments (SW) Limited to carry out post-completion acoustic tests which are required to discharge conditions 13 and 20 of the consented scheme.

Eliot Developments are constructing six of the seven houses on a residential development of 7 dwellings off Barton Road and associated works pursuant to outline planning permission 17/01246/FUL (Ref.2).

This compliance report details results from a survey of the prevailing internal ambient noise levels in Plot 4 of the scheme so that a comparison can be made between the noise levels recorded at the site and noise criteria that the Local Planning Authority apply.

The scope of the assessment is to measure the noise levels within the open-plan Living / Dining room / Kitchen and Bedroom 1 with regards to recommended indoor noise target criteria of BS 8233:2014 (Ref.3) relating to environmental noise.

2. Planning Permission

This section sets out the planning permission, the noise condition attached to the approval of reserved matters and related assessment criteria and guidance which has been followed and is referred to in this report.

2.1 Description of the Development

The erection of 7 dwellings & associated works accessed from Barton Road and associated works pursuant to planning permission 17/01246/FUL (Ref.2).

2.2 Noise Related Planning Condition

The Plymouth City Council Approval (Application Ref.17/01246/FUL) (Ref.2) dated 11/10/17 conditions schedule lists the following conditions related to noise as follows:

CONDITION 13: NOISE VERIFICATION REPORT:-

PRE-OCCUPATION

Details of verification report demonstrating that the dwellings hereby permitted meet the internal noise levels in Condition 20 shall be submitted to and approved in writing by the local planning authority before any one of the dwellings is occupied.

Reason: *To ensure that the noise insulation standards are met in order that the proposed dwellings achieve a satisfactory living standard and do not experience unacceptable levels of noise disturbance to comply with policies CS22 and CS34 of the Plymouth Local Development Framework Core Strategy (2006-2021) 2007 and paragraphs 17 and 123 of the National Planning Policy Framework 2012.*

CONDITION 20: INTERNAL SOUND LEVELS:-

All dwellings shall be constructed in accordance with BS 8233:2014 so as to provide sound insulation against externally generated noise. The good room criteria shall be applied, meaning there must be no more than 35 dB LAeq for living rooms (0700 to 2300 daytime) and 30 dB LAeq for bedrooms (2300 to 0700 night-time), with windows shut and other means of ventilation provided.

Reason: *To ensure that the proposed dwellings hereby permitted achieve a satisfactory living standard and do not experience unacceptable levels of noise disturbance to comply with policies CS22 and CS34 of the Plymouth Local Development Framework Core Strategy (2006-2021) 2007 and paragraphs 17 and 123 of the National Planning Policy Framework 2012.*

2.3 British Standard 8233:2014

BS 8233: 2014 Guidance on Sound Insulation and Noise Reduction for Buildings (Ref.3) provides recommended levels for overall noise in the design of a building. These are the sum-total of structure-borne and airborne noise sources. The levels assume normal diurnal fluctuations in external environmental noise. These levels are based on annual average data and do not have to be achieved in all circumstances. The guidelines are designed to achieve reasonable resting/sleeping conditions in bedrooms and good listening conditions in other rooms. Those most appropriate to the residential environment are reproduced in **Table 1.1**.

Table 1.1: Internal Ambient Noise Levels for Dwellings: BS8233:2014

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	
Dining	Dining area	40 dB $L_{Aeq,16hour}$	
Sleeping (daytime resting)	Bedrooms	35 $L_{Aeq,16hour}$	30 $L_{Aeq,8hour}$

3 Post Completion Tests

3.1 Noise Surveys Methodology and Equipment

Noise surveys were carried out from 18:00 on Friday 27th November 2020 until 08:00 on Monday 30th November 2020.

Noise levels were recorded in the open-plan Living / Dining room / Kitchen of Plot 4 and in Bedroom 1 of Plot 4, as indicated in **Figure 2**, for the daytime and night-time periods.

Plot 4 was largely complete when surveyed – final fix was completed with kitchens fitted, bathrooms fitted, extract and trickle vents fitted (and left open), external doors and windows fixed, draught stripped and adjusted to close, door furniture fitted with mains power in the dwelling. The open-plan Living / Dining room / Kitchen had hardwood flooring fitted and Bedroom 1 was carpeted.

There was an absence of construction activity on the site from 16.30 hours on Friday 27th November to 08.00 hours on Monday 30th November. This ensured that internal sound levels were accurately measured.

Noise measurements utilised 1no. NTi Audio XL-2 and Acoustic Analyser Type 1 Precision Sound Level Meter, which holds current certificates of calibration. Before and after the measurement period the equipment was calibrated to ensure that the equipment had remained within reasonable calibration limits (+/- 0.5 dB).

Measurements in Plot 4 (which is typical of the dwellings at the scheme) were first taken inside the open-plan Living / Dining Room / Kitchen (18:00 27/11/20 to 19:00 28/11/20), then inside Bedroom 1 (19:00 28/11/20 to 08:00 30/11/20) where facades overlook Barton Road in order to assess the ingress of ambient noise levels from external environmental noise.

Noise measurement microphone position was at a height of 1.2m tripod mounted above floor level in the centre of the room

The noise monitoring location within Plot 4 rooms are indicated in **Figure 2** whilst the location of Plot 4 within the scheme is shown on a site layout plan in **Figure 1**.

4 Results of Monitoring Internal Dwelling Rooms

4.1 Internal Ambient Noise Levels

	DAY	NIGHT
PLOT 4, 4-STOREY HOUSE	L_{Aeq,16 hour}	L_{Aeq, 8 hour}
Open-plan Living / Dining room / Kitchen (1 st floor)	25.0	22.3
Bedroom 1 (3 rd floor)	23.4	20.4

The internal ambient noise levels ($L_{Aeq, 16 \text{ hour}}$ 07:00 to 23:00 and $L_{Aeq, 8 \text{ hour}}$ 23:00 to 07:00) for the above rooms have been calculated from the full measured period noise levels as noted in the previous section.

5 Conclusions

Post-completion tests of internal sound levels have been undertaken within Plot 4, first in the open-plan Living / Dining room / Kitchen on the first floor and then in Bedroom 1 on the top third floor overlooking Barton Road in Turnchapel – refer to **Figures 1 & 2** for details.

Noise surveys have been conducted in the above habitable rooms and results show compliance with the standards set out in BS 8233:2014 Sound Insulation and Noise Reduction for Buildings.

The construction of the six houses by Eliot Development (SW) Limited has ensured that the amenities of the future residents are not adversely affected by noise in accordance with policies CS22 and CS34 of the Plymouth Local Development Framework Core Strategy (2006-2021) 2007 and paragraphs 17 and 123 of the National Planning Policy Framework 2012

The test results demonstrate that condition No. 20 attached to Approval of Reserved Matters 17/01246/FUL (Ref.2) dated 11/10/17 has been met and this validation report satisfies condition No. 13 attached to same.

References

1. Plymouth City Council Approval with Conditions dated 11/10/17
2. Plymouth City Council Planning Permission Ref: 17/01246/FUL
3. BS 8233:2014 "Guidance on Sound Insulation and Noise Reduction for Buildings"

Appendix 1: Glossary of Terms

Term	Description
'A'- Weighting	<i>This is the main way of adjusting measured sound pressure levels to consider human hearing, and our uneven frequency response.</i>
Decibel (dB)	<i>This is a tenth (deci-) of a bel. The decibel can be a measure of the magnitude of sound, changes in sound level and a measure of sound insulation. Decibels are not an absolute unit of measurement but are an expression of ratio between two quantities expressed in logarithmic form.</i>
$L_{Aeq,T}$	<i>The equivalent steady sound level in dB containing the same acoustic energy as the actual fluctuating sound level over the given period, T. T may be as short as 1 second when used to describe a single event, or as long as 24 hours when used to describe the noise climate at a specified location. $L_{Aeq,T}$ can be measured directly with an integrating sound level meter.</i>
SEL	<p><i>Sound Exposure Level SEL is the logarithmic measure of the A-weighted, Sound Pressure Level squared and integrated over a stated period of time or event, relative to a reference sound pressure value. SEL is any L_{eq} noise level or event 'commonly' normalized to 1 second.</i></p> <p><i>$SEL = L_{eq} + 10 \cdot \log_{10} T$ where T is in seconds.</i></p> <p><i>Sound Exposure Level is numerically equivalent to the total sound energy.</i></p>
L_{A10}	<i>The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 10 per cent of a given time and is the L_{A10T}. The L_{A10} is used to describe the levels of road traffic noise at a particular location.</i>
L_{A50}	<i>The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 50 per cent of a given time and is the L_{A50T}.</i>
L_{A90}	<i>The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 90 per cent of a given time and is the L_{A90T}. The L_{A90} is used to describe the background noise levels at a particular location.</i>
L_{Amax}	<i>The 'A'-weighted maximum sound pressure level measured over a measurement period.</i>
NR	<i>Sound Pressure Levels measured in octave bands are compared with these curves from which a noise rating (NR) is obtained. It will be seen that higher frequencies (where the ear is more sensitive) are given heavier noise ratings than lower ones, information not taken into consideration in usual measurements.</i>

Noise is often defined as sound that is undesired by the recipient. Whilst it is impossible to measure nuisance caused by noise directly, it is possible to measure the loudness of that noise. 'Loudness' is related to both sound pressure and frequency, both of which can be measured. The human ear is sensitive to a wide range of sound levels. The sound pressure level of the threshold of pain is over a million times that of the quietest audible sound. In order to reduce the relative magnitudes of the numbers involved, a logarithmic scale of decibels (dB) is normally used, based on a reference level of the lowest audible sound.

The response of the human ear is not constant over all frequencies. It is therefore usual to weight the measured frequencies to approximate the human response. The resulting 'A' weighted decibel, dB (A), has been shown to correlate closely to the subjective human response.

When related to changes in noise, a change of ten decibels from say 60 dB (A) to 70 dB (A) would represent a doubling in 'loudness'. Similarly, a decrease in noise from 70 dB (A) to 60 dB (A) would represent a halving in 'loudness'. A change of 3 dB (A) is generally considered to be just perceptible. **Table A.1** details typical noise levels

Table A.1: Typical Noise Levels

Approximate Noise Level (dB(A))	Example
0	Limit of hearing
30	Rural area at night
40	Library
50	Quiet office
60	Normal conversation at 1 m
70	In car noise without radio
80	Household vacuum cleaner at 1 m
100	Pneumatic drill at 1 m
120	Threshold of pain

Appendix 2: Noise Survey Equipment

The following acoustic measurement instrumentation was deployed.

- NTi XL2-TA Audio and Acoustic Sound Analyzer A2A-14149-EO (UKAS certificate No. U34666, Expires: April 2022).
- ½ inch Preamplifier MA220 Serial No.7401 (UKAS certificate No. U34666, Expires: April 2022).
- ½ inch Measurement Microphone MC230A Serial No.A15516 (UKAS certificate No. U34665, Expires: April 2022).
- Sound Calibrator Larson Davis CAL200 class 1 Serial No. 15344 (UKAS certificate No. U35631, Expires: Sep 2021).
 - o Calibration level 114 dB at 1kHz
- Microphone windshield for 0.5” microphone, foam, (d=60mm)

All acoustic measurement instrumentation has current UKAS Certificates of Calibration traceable to UK National Standards BS 7580: Part 1 1997. The sound level meter was calibrated prior to commencement of the survey and the internal and acoustic calibration level checked regularly during and on completion of the survey to ensure accuracy. No change was found to have occurred.

Figure 1 - Site Plan

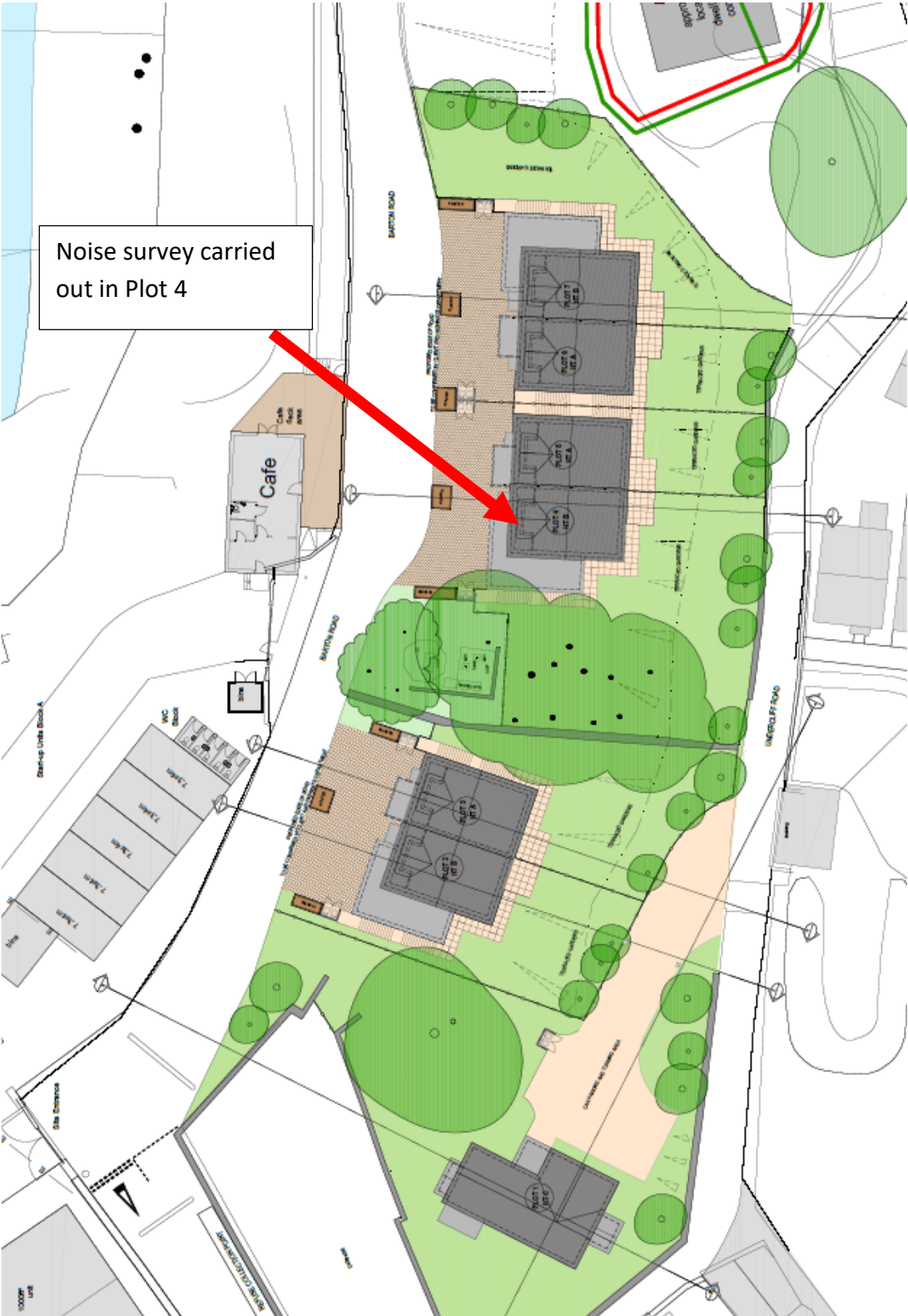
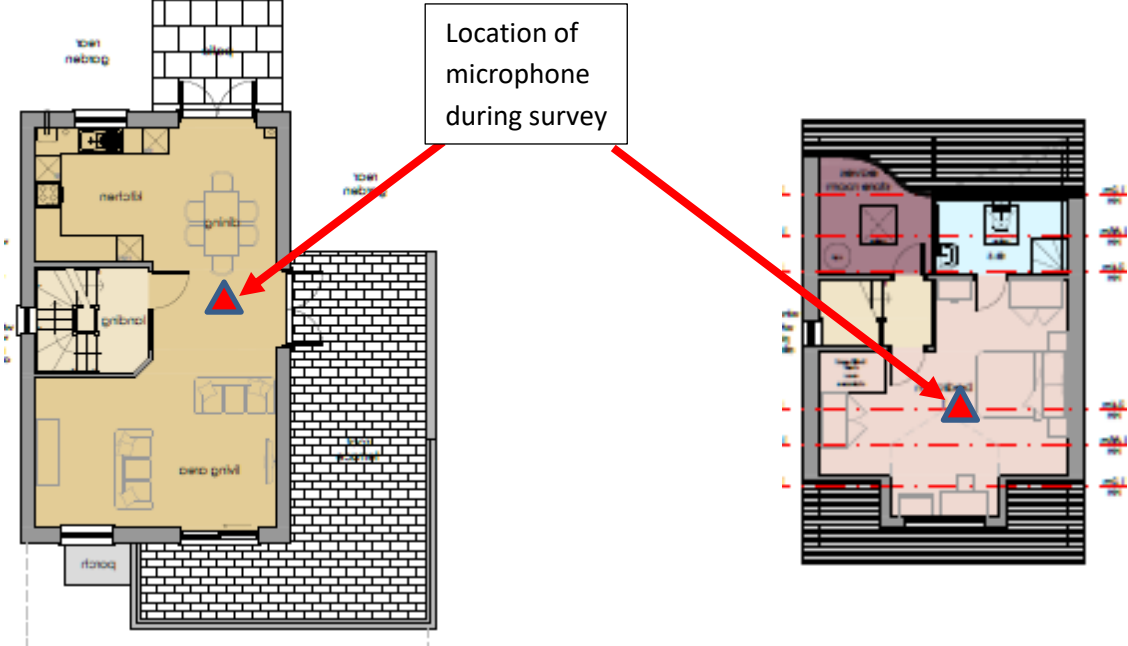


Figure 2 - Survey microphone locations



Plot 4 – First floor plan

Plot 4 – Third floor plan