Azymuth Acoustics UK

Professional Acoustic Services

Discharge of Planning Conditions
Ref: AA0126.1

Highfields Apartments
New North Road,
Huddersfield

On behalf of

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Disclaimer

This report has been prepared by Azymuth Acoustics UK with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporating our Standard Terms and Conditions of Business and taking into account the resources devoted to it by agreement with the Client.

We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at their own discretion and risk.

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1.0 Introduction

Azymuth Acoustics UK (henceforth Azymuth) were appointed by Broadgrove Planning & Development Ltd in February 2024 to undertake acoustic testing at the Highfields Apartments, Huddersfield.

Additional testing has been instructed in order to assist with the discharge of planning conditions in relation to internal noise levels. Azymuth had previously undertaken a Noise Impact Assessment (NIA) of the site in October 2018 (ref: AA0126 New North Rd Noise Assessment Report 311018). The purpose of the testing is to confirm that previously issued mitigation advice in this assessment is accurate and that the internal noise levels are of an acceptable level that achieve the target conditioned criteria.

Additional information has been provided to aid the discharging of a planning condition as relates to the proposed woodchip biomass boiler.

1.1 Measurement Procedure

The instrumentation used for the acoustic testing consisted of a SvanTek 977 / Svantek 971 type 1 precision sound level meter. The equipment was calibrated before and after measurements. The sound level meter measured A-weighted (fast response) noise levels as well as octave bands noise levels for all measurement record.

Measurements were taken ~1m from the first-floor bedroom and living room windows in Plot F.8. This apartment was chosen as it would be deemed to be one of the worst dwellings affected by external (traffic) noise. The instrumentation measured the internal noise levels to be experienced by the apartment over a continuous time period taking into account rush-hour as well as the night-time.

Measurements in the Bedroom and Living Room of Plot F.8 were undertaken over a continuous period between 15:30hrs on Friday 5th April and 23:30hrs on Sunday 7th April 2024.

Additional internal and external (roadside) measurements were also undertaken at the same time over a ten-minute period as a means of calculating the overall sound insulation provided by the glazing and secondary glazing of the apartment.

The noise measurements were undertaken using the sound level meter at the position(s) shown in Figure 1 below:

- Position A: Plot F.8 - Living Room
- Position B: Plot F.8 - Bedroom
- Position C: External measurement (~1.5m from roadside)

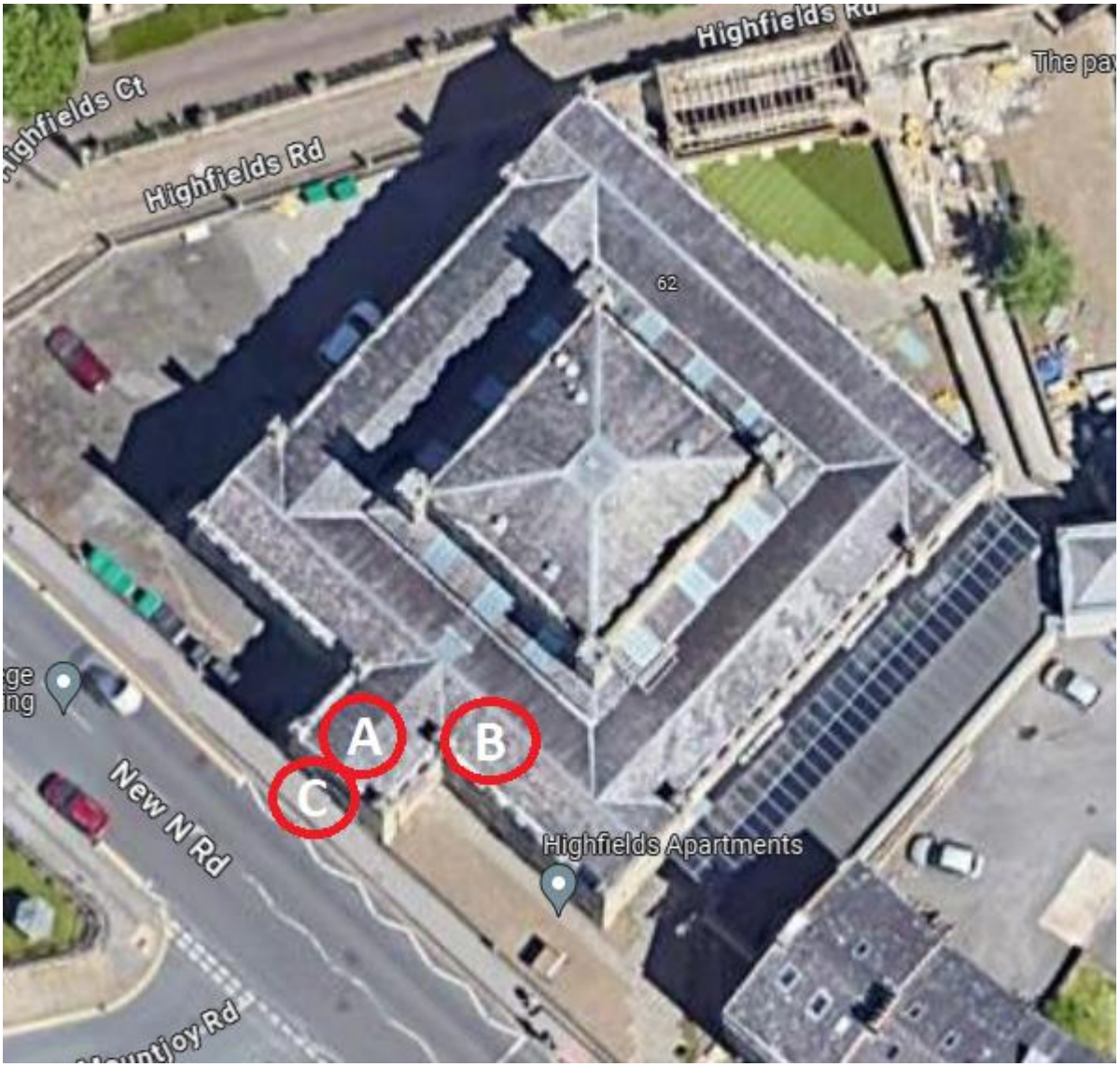

Figure 1 – Noise measurement position(s)

Full results of the noise levels recorded during the course of the survey are included in Appendix B of this report.

2.0 Assessment Criteria

In order to assess the extent of any measures required in order to comply with suitable conditions relating to potential noise sources, Azymuth has reviewed various guidance documents and standards, these include:

- British Standard 8233:2014
- World Health Organisation Guidelines on Community Noise
- Kirklees Council Planing Application No: 2021/70/92291/W - Conditions 9, 12 and 22

2.1 British Standard 8233: 2014

BS 8233 provides a code of practice for the sound insulation of a variety of building types affected by general environmental noise. It provides recommendations for control of noise in and around buildings and suggests appropriate internal ambient noise level criteria / limits for a variety of different situations including residential properties.

The following table summarises the noise limits suggested by BS 8233 applying to residential properties:

Activity	Room	Good Design Range $L_{Aeq,T}$ dB	
		07:00-23:00hrs	23:00-07:00hrs
Resting	Living Room	35	-
Dining	Dining Room / Area	40	-
Sleeping (daytime resting)	Bedroom (at night)	35	30

Table 1 – Noise Limits for Residential Properties Suggested in BS 8233

2.2 World Health Organisation Environmental Noise Guidelines (ENG) 2018

The main purpose of the 2018 WHO guidelines is to provide recommendations for protecting human health from exposure to environmental noise originating from the following sources: transportation (road traffic, railway and aircraft), wind turbines and leisure activities.

The guidelines set out to define recommended exposure levels for environmental noise in order to protect population health. Exposure limits are average levels defined over a period of one year, measured outdoors in free field at the most exposed façade. It should be noted that the document does not provide guideline limit values for multiple noise sources in combination.

The 2018 guidelines supersede the Community Noise Guidelines from 1999. Nevertheless, the document recommends that all CNG indoor guideline values and any values not covered by the current guidelines should remain valid. As such, the following guidance would remain appropriate:

For protection against sleep disturbance inside dwellings, night-time noise levels should not exceed 30dB L_{Aeq} for continuous noise and 45dB L_{Amax} for typical single sound events (which are exceeded 15 times or more per night – see ProPG Appendix A.12 for more details).

To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise (interpreted as noise from all sources combined) should not exceed 55dB L_{Aeq} on balconies, terraces and in outdoor living areas.

It should be noted that exposure levels defined in ENG and CNG are for guidance purposes as relates potential adverse health impacts and should not be interpreted as absolute limits or regulations.

2.3 Kirklees Council Planning Application No: 2021/70/92291/W

The following conditions have been issued by the local council.

2.3.1 Condition 9

'Prior to the commencement of development (excluding soft strip-out and demolition works) at a specified existing building, a schedule of all existing windows of that building (including details of the type, materials, age and condition of each window) shall be submitted to and approved in writing by the Local Planning Authority. Prior to the commencement of development (excluding soft strip-out and demolition works) at a specific existing or proposed building, detailed drawings including plans, elevations and sections of all proposed external windows and doors of that building (including details of retention, refurbishment, replacement and any measures related to noise mitigation) shall be submitted to and approved in writing by the Local Planning Authority. The details so approved shall be implemented in full to the satisfaction of the Local Planning Authority prior to the first occupation of the development hereby approved, and shall be so retained thereafter unless otherwise agreed in writing by the Local Planning Authority'

2.3.2 Condition 12

'Prior to the commencement of development (excluding soft strip-out and demolition works) at a specified building, details of a sound insulation and noise control scheme designed to protect the amenity of future residents of that building and existing residents from noise from road traffic and other sources shall be submitted to and approved in writing by the Local Planning Authority. None of the residential units hereby approved shall be occupied until the works comprised within the approved sound insulation scheme have been completed. The approved works shall be retained thereafter'

2.3.3 Condition 22

'The woodchip-fuelled biomass boiler hereby approved shall be installed and operated in accordance with:

- *Biomass Screening Assessment (NJD Environmental Associates, NJD21-*
- *0150-001R, November 2021)*
- *Product data document (ETA, 939017-001, 16/12/2020);*
- *Acoustic emissions data sheet (ETA, 09/12/2020); and*
- *Emissions Certificate (Ofgem, BLT 0150/20, 24/04/2020).*

The boiler shall thereafter be maintained in accordance with the documents hereby approved'

3.0 Assessment of Internal Noise Levels

3.1 Plot F.8: Bedroom

The following table summarises the noise measurement data for the Bedroom of Plot F.8 over the measurement period.

Location	Period	L_{Amax}	L_{Aeq}	L_{A10}	L_{A50}	L_{A90}
Plot F.8: Bedroom	Day	49.3	30.6	31.6	28.6	27.0
Plot F.8: Bedroom	Night	43.9	**28.9**	29.7	28.0	27.2

Table 3 – Summary of daytime and night-time noise levels Plot F.8 Bedroom

3.2 Plot F.8: Living Room

The following table summarises the noise measurement data for the Living Room of Plot F.8 over the measurement period.

Location	Period	L_{Amax}	L_{Aeq}	L_{A10}	L_{A50}	L_{A90}
Plot F.8: Living Room	Day	51.8	**30.2**	32.3	26.6	20.9
Plot F.8: Living Room	Night	46.0	25.5	27.5	18.9	16.3

Table 4 – Summary of daytime and night-time noise levels Plot F.8 Living Room

A graph of the noise measurement data is included in Appendix C of this report.

4.0 Assessment of Glazing Sound Insulation

Synchronised noise measurements were undertaken over a ten-minute daytime period both externally (~1.5m from the roadside) and internally in the living room of Plot F.8 as a means of estimating the sound insulation provided by the façade/glazing.

Location	External/ Internal	L_{Amax}	L_{Aeq}	L_{A10}	L_{A50}	L_{A90}
Roadside Measurement	External	86.6	73.8	77.3	70.6	60.3
Plot F.8: Living Room	Internal	45.2	31.7	34.5	29.1	22.0

Table 5 – Comparison of external and internal noise measurements in Living Room

Using the above data Azymuth have calculated that the approximate sound insulation provided by the /glazing is 42dB R_W which is inline with the recommendations contained within the original NIA undertaken by Azymuth.

5.0 Assessment of Woodchip Biomass Boiler Noise

The proposed woodchip biomass boiler is assumed to be of type ETA eHack 240. In normal operation noise levels emitting from this unit are likely to be in the range of 40-50dBA as per the supplied acoustic emissions document.

The proposed boiler is located on the ground floor of the Link Tower beside the main building. The boiler room has 1no. flat directly adjacent.

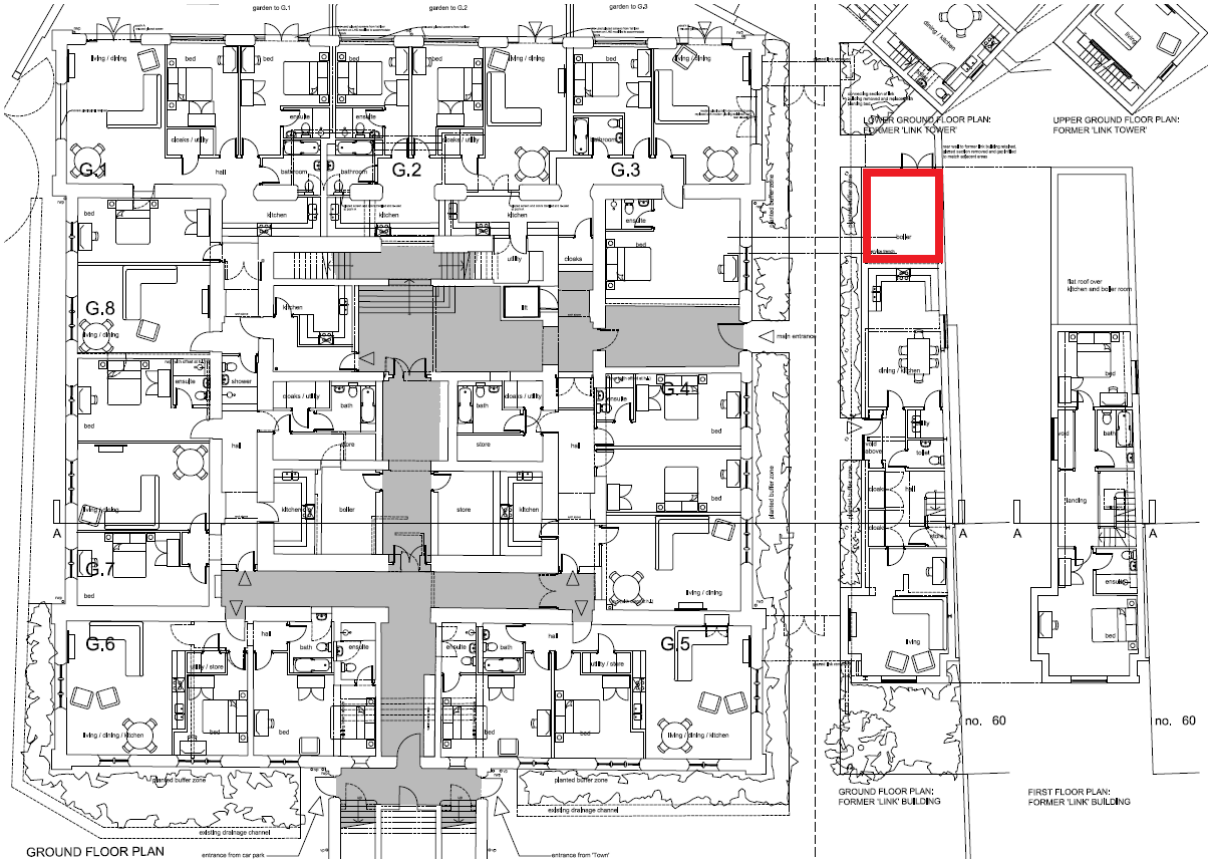

Figure 2 – Location of boiler room

The wall separating the boiler room from the flat is believed to be constructed of 300mm dense blockwork.

Azymuth have calculated that the noise level as a result of the boiler shall be 1dBA in the flat directly adjacent.

The full calculation can be found in Appendix D.

6.0 Summary

Azymuth were appointed by Broadgrove Planning & Development Ltd in February 2024 to undertake acoustic testing at the Highfields Apartments, Huddersfield. The purpose of the testing was to aid the discharge of planning conditions relating to internal noise.

Planning condition 12 issued by Kirklees Council states that all future residents of the development shall be protected from traffic and other noise sources.

The internal noise level targets specified in the initial conditioned noise impact assessment undertaken by Azymuth are as follows:

- Daytime noise levels not to exceed 35dB $L_{Aeq,16hr}$ in living rooms / bedrooms
- Daytime noise levels not to exceed 40dB $L_{Aeq,16hr}$ in dining room / kitchen
- Noise levels in bedrooms not to exceed 35dB $L_{Aeq,16hr}$ for daytime periods
- Night-time noise levels in bedrooms not to exceed 30dB $L_{Aeq,8hr}$

The daytime noise levels in Plot F.8 were measured to be 30.2dB $L_{Aeq,\ 16hr}$ in the Living Room and 30.6dB $L_{Aeq,\ 16hr}$ in the Bedroom. The night-time noise levels in the Bedroom were measured to be 28.9dB $L_{Aeq,\ 8hr}$. The measured noise levels are compliant with the target criteria allowing for the discharge of Condition 12.

Azymuth have assessed the noise levels both externally and internally to estimate the sound reduction performance of the glazing. The glazing has been calculated to provide ~42dB R_w of sound reduction which is inline with the recommendations contained within the original NIA undertaken by Azymuth.

Azymuth have provided noise break thru calculations for the flats directy adjacent and above the boiler room housing the proposed wood chip biomass boiler. Noise levels within these adjacent flats have been found to be below 6dBA as a result of noise emitting from the boiler itself and as such is likely to be inaudible over normal domestic background noise levels.

Appendix A – Glossary of Acoustic Terms

Decibel (dB)
This is the unit used to measure sound. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro Pascal to 100 Pascal).

dB (A)
This is a measure of the overall noise level of sound across the audible spectrum with a frequency weighting (i.e. A-weighting) to compensate for the sensitivity of the human ear to sound of different frequencies. The A-weighting curve is implemented in sound level meters using an electronic filter that approximately corresponds to the frequency response of the ear.

Octave Band Noise Level
The human ear is sensitive to sound over a range of frequencies between approximately 20Hz to 20kHz. The ear is also generally more sensitive to medium and high frequencies than to low frequencies. In order to define the frequency content of a noise, the spectrum can be divided into frequency bands. The most commonly used frequency bands are octave bands, in which the mid-frequency of each band is twice that of the band below it.

L_{Aeq}
This is the equivalent steady sound level in dB(A) containing the same acoustic energy as the actual fluctuating sound level over a given time period.

Reverberation Time (RT or sometimes T_{30} or T_{60})
This is the time taken for the reverberant sound energy in an enclosure to decay one millionth of its equilibrium value, i.e. by 60dB, after the source has been switched off. The reverberation time is frequency dependent and it is customary to measure its value in octave or one-third octave bands. Reverberation occurs when sound waves are repeatedly reflected from each surface of the room.

Sound Reduction Index (SRI)
Difference measured between the amount of energy flowing towards the wall in the source room and the total amount of energy entering the receiving room (usual range 100 - 3150Hz for one third octave band values). The SRI varies with frequency and is measured in a laboratory in either octave or one-third octave bands.

SRI = L1 - L2 + 10 log (S/A), where:
L1 = Noise level in the source room
L2 = Noise levels in the receiving room
S = Surface area of test specimen
A = Equivalent acoustic absorption area in the receiving room

Weighted Sound Reduction Index (R_w)
This is a weighted single figure descriptor of the sound insulation performance of a partition measured under laboratory conditions. The procedure used to quantify the R_w is to compare the sound reduction index (SRI) in each of the one-third octave bands from 100Hz to 3150Hz against a set of standard reference curves.

Appendix B – Noise Survey Data

Start	Plot	Time	L_{Amax}	L_{Aeq}	L_{A10}	L_{A50}	L_{A90}
Friday 5th April 2024							
16:00:00	Bedroom	00:30:00	49.6	29.8	31.5	28.4	25.8
16:30:00	Bedroom	00:30:00	48.1	29.7	31.7	28.5	25.7
17:00:00	Bedroom	00:30:00	54.9	31.6	32.5	29.4	27.1
17:30:00	Bedroom	00:30:00	53.4	30.9	32	29.1	26.8
18:00:00	Bedroom	00:30:00	51.5	30.2	31.9	28.3	26.2
18:30:00	Bedroom	00:30:00	63.4	33	31.9	28.5	26.1
19:00:00	Bedroom	00:30:00	47.8	29.3	31.1	27.9	25.7
19:30:00	Bedroom	00:30:00	50.9	30.1	31.3	27.5	25.5
20:00:00	Bedroom	00:30:00	47.5	29.5	31.1	27.4	25.8
20:30:00	Bedroom	00:30:00	49.8	29.7	30.8	27.1	25.9
21:00:00	Bedroom	00:30:00	42.3	28.3	30.3	26.9	25.7
21:30:00	Bedroom	00:30:00	60	29.9	30	27.1	26
22:00:00	Bedroom	00:30:00	44.4	28.4	30.5	26.8	25.7
22:30:00	Bedroom	00:30:00	57.9	30.5	30.9	26.8	25.5
23:00:00	Bedroom	00:30:00	55.3	29.8	30.7	26.9	26.1
23:30:00	Bedroom	00:30:00	57.2	31	30.7	26.8	25.9
Saturday 6th April 2024							
00:00:00	Bedroom	00:30:00	49.9	28.2	29.9	26.5	25.5
00:30:00	Bedroom	00:30:00	38.6	27.6	29.5	26.6	26
01:00:00	Bedroom	00:30:00	40.7	27.3	28.5	26.5	26
01:30:00	Bedroom	00:30:00	52.4	28	28.7	26.6	26.1
02:00:00	Bedroom	00:30:00	45.3	27.1	27.7	26.6	26.1
02:30:00	Bedroom	00:30:00	46.6	28	28.6	26.7	26.1
03:00:00	Bedroom	00:30:00	45	27.6	27.9	26.9	26.1
03:30:00	Bedroom	00:30:00	43.9	27.7	28.2	26.8	26.1
04:00:00	Bedroom	00:30:00	45.6	27.5	27.9	27.1	26.2
04:30:00	Bedroom	00:30:00	40	27.3	27.8	26.7	26.1
05:00:00	Bedroom	00:30:00	42.1	27.6	27.9	27.3	26.3
05:30:00	Bedroom	00:30:00	42.6	28.2	29.2	27.5	27
06:00:00	Bedroom	00:30:00	47	28.9	29.8	28.1	27.2
06:30:00	Bedroom	00:30:00	42	29.1	30.2	28.5	27.5
07:00:00	Bedroom	00:30:00	47.1	29.7	30.9	28.2	27.2
07:30:00	Bedroom	00:30:00	52.3	29.9	30.9	27.6	26.7
08:00:00	Bedroom	00:30:00	41.3	28.8	30.9	27.4	26.2
08:30:00	Bedroom	00:30:00	42.1	29.1	31.2	27.6	26.3
09:00:00	Bedroom	00:30:00	45.9	29.9	31.9	27.8	26.2
09:30:00	Bedroom	00:30:00	42.5	29.6	31.6	28.1	26.3
10:00:00	Bedroom	00:30:00	52	30.9	31.8	28.1	26.1
10:30:00	Bedroom	00:30:00	56.5	30.1	31.6	28.4	26.3
11:00:00	Bedroom	00:30:00	49.2	29.9	31.4	28.2	26.3
11:30:00	Bedroom	00:30:00	56	30	31.4	28.5	26.3
12:00:00	Bedroom	00:30:00	49.7	30.6	31.9	28.8	26.5
12:30:00	Bedroom	00:30:00	45.9	30.1	31.9	29	26.5
13:00:00	Bedroom	00:30:00	43.6	30	31.8	29	26.7
13:30:00	Bedroom	00:30:00	52.1	31.2	33	29.5	26.9

Start	Plot	Time	L_{Amax}	L_{Aeq}	L_{A10}	L_{A50}	L_{A90}
14:00:00	Bedroom	00:30:00	51.4	30.6	32.3	29.4	27.1
14:30:00	Bedroom	00:30:00	46.9	30.3	32	29	26.8
15:00:00	Bedroom	00:30:00	48.4	29.9	31.6	28.6	26.4
15:30:00	Bedroom	00:30:00	48.1	29.8	31.5	28.3	26.1
16:00:00	Bedroom	00:30:00	52.2	30.4	31.6	28.4	25.9
16:30:00	Bedroom	00:30:00	45.8	30	31.9	28	25.5
17:00:00	Bedroom	00:30:00	49.1	30.3	31.6	28.7	26.7
17:30:00	Bedroom	00:30:00	61.8	32.2	32.1	29.1	27.1
18:00:00	Bedroom	00:30:00	47.5	29.8	31.4	28.4	26.2
18:30:00	Bedroom	00:30:00	46.5	29.5	31.3	27.8	25.8
19:00:00	Bedroom	00:30:00	46.1	29.1	30.9	27.6	25.9
19:30:00	Bedroom	00:30:00	46.8	29.1	31.1	27.8	26
20:00:00	Bedroom	00:30:00	62.5	32.2	31.2	27.6	26.1
20:30:00	Bedroom	00:30:00	40	28.4	30.3	27.2	26.1
21:00:00	Bedroom	00:30:00	43.8	29	30.9	27.6	26.3
21:30:00	Bedroom	00:30:00	48.5	29.9	32.3	28.4	26.8
22:00:00	Bedroom	00:30:00	52.2	29.8	31.9	27.9	26.9
22:30:00	Bedroom	00:30:00	44.4	29.1	31	27.9	27
23:00:00	Bedroom	00:30:00	48.4	29.1	31.1	27.7	27
23:30:00	Bedroom	00:30:00	48.4	29	30.9	27.8	26.8
Sunday 7th April 2024							
00:00:00	Bedroom	00:30:00	43.4	28.8	30.4	27.8	27.1
00:30:00	Bedroom	00:30:00	43.1	28.7	29.9	28	27.1
01:00:00	Bedroom	00:30:00	39.5	28.7	29.6	28.3	27.3
01:30:00	Bedroom	00:30:00	48.1	28.9	29.5	28.3	27.3
02:00:00	Bedroom	00:30:00	41.9	29.4	30.3	28.8	28
02:30:00	Bedroom	00:30:00	42.2	29.2	29.9	28.6	28
03:00:00	Bedroom	00:30:00	44.2	29.5	29.9	29.1	28.1
03:30:00	Bedroom	00:30:00	39.4	29.5	30.1	29.2	28.2
04:00:00	Bedroom	00:30:00	46.1	29.6	29.9	29.3	28.3
04:30:00	Bedroom	00:30:00	37.4	29.6	30.3	29.5	29
05:00:00	Bedroom	00:30:00	36.7	30.2	30.9	30	29.2
05:30:00	Bedroom	00:30:00	40.6	30.4	30.9	30.2	29.3
06:00:00	Bedroom	00:30:00	38.5	30.4	30.9	30.3	29.4
06:30:00	Bedroom	00:30:00	41.5	30.3	30.9	29.9	29.1
07:00:00	Bedroom	00:30:00	43.4	30.3	31.2	29.6	28.5
07:30:00	Bedroom	00:30:00	40.2	30.9	32.1	30.3	29.3
08:00:00	Bedroom	00:30:00	51.7	30.7	32.3	29.7	28.9
08:30:00	Bedroom	00:30:00	45	30.4	31.9	29.5	28.5
09:00:00	Bedroom	00:30:00	49.7	31	32.4	29.7	29
09:30:00	Bedroom	00:30:00	46.8	30.6	32.4	29.7	28.5
10:00:00	Bedroom	00:30:00	44.8	31.2	32.7	30.3	29.2
10:30:00	Bedroom	00:30:00	46.7	31.3	32.7	30.4	29.2
11:00:00	Bedroom	00:30:00	49.4	31.1	32.5	30.2	29.1
11:30:00	Bedroom	00:30:00	44.6	30.4	32	29.6	28.2
12:00:00	Bedroom	00:30:00	45.1	30.7	32.4	29.7	28.2
12:30:00	Bedroom	00:30:00	49.4	30.6	31.9	29.4	27.9
13:00:00	Bedroom	00:30:00	55.3	31.6	32.2	29.4	27.6
13:30:00	Bedroom	00:30:00	48.8	31.1	32.5	29.8	28.1

Start	Plot	Time	L_{Amax}	L_{Aeq}	L_{A10}	L_{A50}	L_{A90}
14:00:00	Bedroom	00:30:00	59.6	32.4	32.4	29.5	27.6
14:30:00	Bedroom	00:30:00	50.2	30.7	32.1	29.5	27.6
15:00:00	Bedroom	00:30:00	52.1	30.4	31.8	29.3	27.5
15:30:00	Bedroom	00:30:00	43.4	30.2	31.9	29.3	27.3
16:00:00	Bedroom	00:30:00	50.5	29.9	31.6	28.9	27.3
16:30:00	Bedroom	00:30:00	43.3	30	31.7	28.9	27.2
17:00:00	Bedroom	00:30:00	42.3	30.2	31.8	29.5	28.1
17:30:00	Bedroom	00:30:00	71.9	37.6	31.8	29.2	27.8
18:00:00	Bedroom	00:30:00	47.3	30.4	31.8	29.1	27.7
18:30:00	Bedroom	00:30:00	54.3	30.3	31.4	28.8	27.4
19:00:00	Bedroom	00:30:00	47.9	29.9	31.6	28.7	27.4
19:30:00	Bedroom	00:30:00	58.2	31.4	31.7	28.8	27.5
20:00:00	Bedroom	00:30:00	61.8	31.8	31.3	28.8	27.8
20:30:00	Bedroom	00:30:00	48.1	29.6	31	28.7	28
21:00:00	Bedroom	00:30:00	39.8	29.1	30.7	28.6	27.5
21:30:00	Bedroom	00:30:00	44.1	29.7	31.3	28.8	27.5
22:00:00	Bedroom	00:30:00	53.1	30.1	30.6	28.5	27.4
22:30:00	Bedroom	00:30:00	40.3	29.2	30.8	28.5	27.5
23:00:00	Bedroom	00:30:00	38.3	28.8	30	28.3	27.3
23:30:00	Bedroom	00:30:00	41.5	28.9	30.1	28.2	27.2

Table B1 – Fully tabulated internal noise measurement results for Plot F.8 Bedroom

Start	Plot	Time	L_{Amax}	L_{Aeq}	L_{A10}	L_{A50}	L_{A90}
Friday 5th April 2024							
16:00:00	Living	00:30:00	49.9	30.9	33.2	28.5	21.1
16:30:00	Living	00:30:00	44.6	30.3	33.2	28.6	22.3
17:00:00	Living	00:30:00	53	31.2	33.1	28.9	23.2
17:30:00	Living	00:30:00	51.5	30.9	33	28.7	22.1
18:00:00	Living	00:30:00	52.2	30.4	32.8	27.7	21
18:30:00	Living	00:30:00	60.2	32.4	33.1	28.3	21.9
19:00:00	Living	00:30:00	45.3	29.6	32.3	27.7	22.3
19:30:00	Living	00:30:00	53.9	30.6	32.5	26.6	21.2
20:00:00	Living	00:30:00	51.7	29.4	32.2	26.3	20.2
20:30:00	Living	00:30:00	55.3	30.2	31.9	25.2	19.5
21:00:00	Living	00:30:00	49.5	27.7	31.2	24.1	18.9
21:30:00	Living	00:30:00	56.6	29	30.7	24.5	20.2
22:00:00	Living	00:30:00	47	27.9	31.5	24.1	19.4
22:30:00	Living	00:30:00	53.8	29.8	31.9	23.7	18.8
23:00:00	Living	00:30:00	51.5	28.1	31.3	22.9	17.7
23:30:00	Living	00:30:00	55.2	30.4	31.7	22.6	17.1
Saturday 6th April 2024							
00:00:00	Living	00:30:00	45.2	26.3	30.7	21.1	17.3
00:30:00	Living	00:30:00	44.1	25.9	30.1	20.2	16.5
01:00:00	Living	00:30:00	47.7	24.6	28.5	17	15.5
01:30:00	Living	00:30:00	51	25.6	28.3	18	15.7
02:00:00	Living	00:30:00	40.9	22.8	25	19.3	17.4
02:30:00	Living	00:30:00	45.2	25.4	28.2	19.4	16.4
03:00:00	Living	00:30:00	44.6	23.4	25.6	17.5	15.8
03:30:00	Living	00:30:00	41.2	23.7	26.1	17.1	15.8
04:00:00	Living	00:30:00	39.5	22	23.8	16.9	15.6
04:30:00	Living	00:30:00	43.4	22.2	23.7	16.6	15.6
05:00:00	Living	00:30:00	45.7	22.4	23.4	16.7	15.5
05:30:00	Living	00:30:00	48.2	24.9	27.2	18.2	16
06:00:00	Living	00:30:00	47.1	25.6	28.5	20.1	17.1

Table B2 – Fully tabulated internal noise measurement results for Plot F.8 Living Room

Start	Location	Time	L_{Amax}	L_{Aeq}	L_{A10}	L_{A50}	L_{A90}
Friday 5th April 2024							
11:20:00	External	00:05:00	87	74	77.5	70.5	61.7
11:25:00	External	00:05:00	86.2	73.5	77.1	70.7	58.8
11:20:00	Living	00:05:00	45.3	32	34.8	29	22.9
11:25:00	Living	00:05:00	45.1	31.4	34.2	29.1	21

Table B3 – Summary of synchronised external/internal measurements

Appendix C – Graphed Results

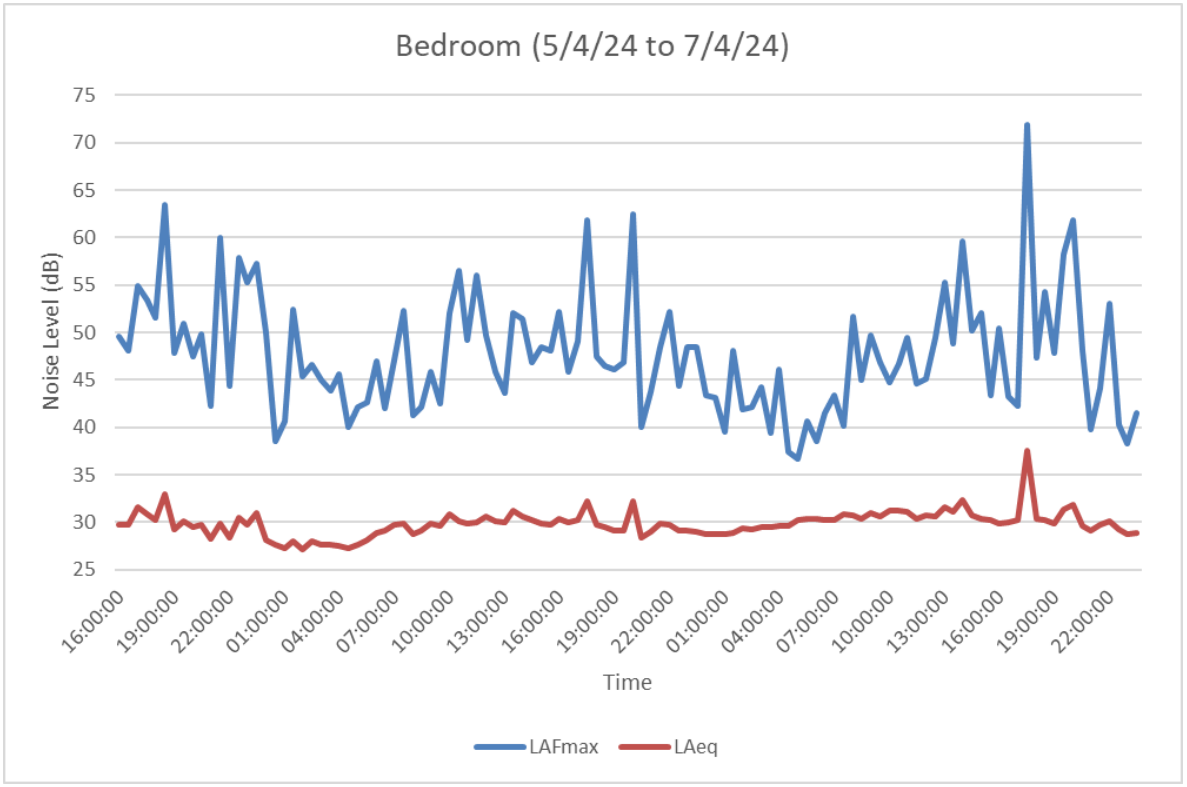

Figure C1 – Plot F.8 Bedroom graphed measurement data

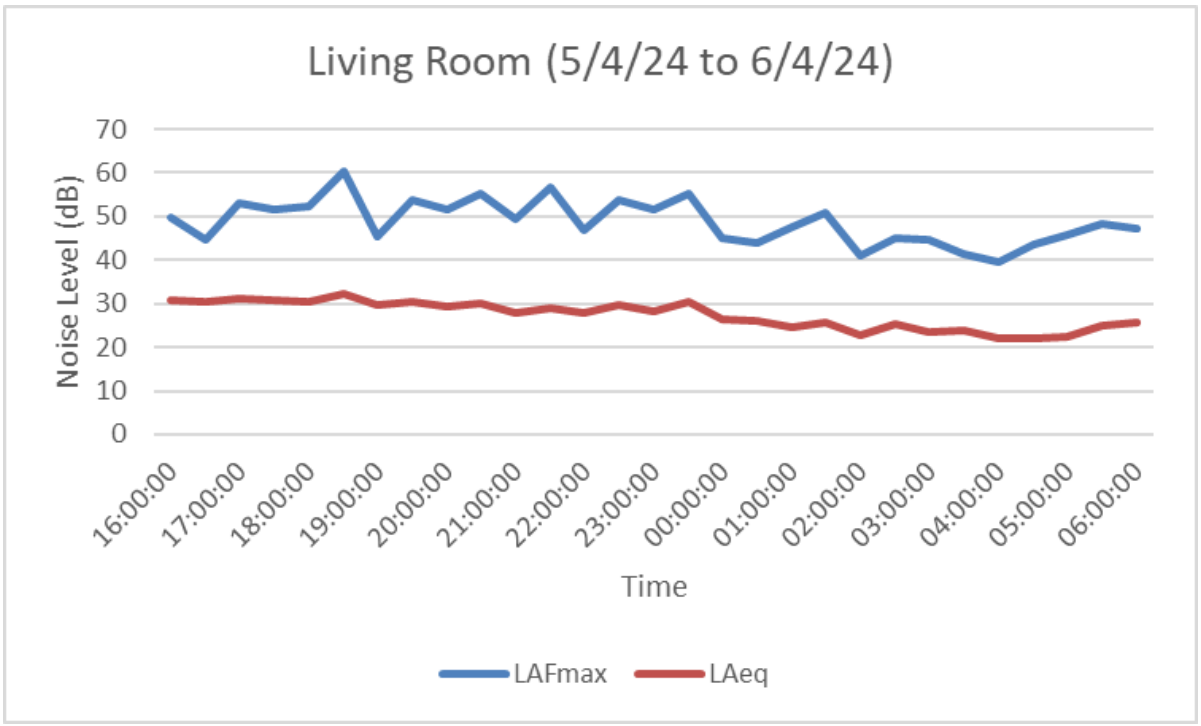

Figure C2 – Plot F.8 Living Room graphed measurement data

Appendix D – Break Thru Calculations

Highfields Apartments, Huddersfield								
From boiler room (GF) to kitchen through wall								
Noise transmission reverb room to reverb room								
		OCTAVE BAND CENTRE FREQUENCY						
		125	250	500	1K	2K	4K	Total A
Typical noise output from boiler		52	50	47	44	41	39	49.8
Common area,S m2	8.216							
10LogS	9.15							
Volume of receiving room, V m3	52.78							
10LogV	17.22							
RT of receiving room		1	1	1	1	1	1	
10 Log RT		0	0	0	0	0	0	
Calc SRI of common partition								
SRI ELEMENT 1	mm dense block	44	43	49	57	66	70	
AREA ELEMENT1	8.216							
SRI ELEMENT 2								
AREA ELEMENT 2								
SRI ELEMENT3								
AREA ELEMENT3								
Composite SRI		**44**	**43**	**49**	**57**	**66**	**70**	
SPL in receiving room		**8**	**7**	**-2**	**-13**	**-25**	**-31**	
A-WEIGHTING		-16	-9	-3	0	1	1	
A-WEIGHTED LEVELS		-8	-2	-5	-13	-24	-30	
dBA	**1**							
NR	15							

Figure D1 – Boiler room to adjacent flat break thru calculation